FINAL DRAINAGE REPORT

For

TRAILS AT ASPEN RIDGE

Prepared for:
EL PASO COUNTY
Engineering Development Review Team
2880 International Circle
Colorado Springs, CO 80910

On Behalf of:
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Project No. 19.866.008

PCD File No. SF-19-002

Engineer's Statement:

This report and plan for the drainage design of Trails at Aspen Ridge was prepared by me (or under my direct supervision) and is correct to the best of my knowledge and belief. Said report and plan has been prepared in accordance with the El Paso County Drainage Criteria Manual and is in conformity with the master plan of the drainage basin.

1/8/2020

Jesse Sullivan
Registered Professional Engineer
State of Colorado
No. 55600

Date

COLORADO LICENSED
SEALED
JESSE D. SULLIVAN
55600
1/8/2020
PROFESSIONAL ENGINEER

Developer's Statement:

I, the owner/developer have read and will comply with all of the requirements specified in this drainage report and plan.

COLA, LLC
Business Name

By: _____ 1-7-2020
Date

Title: COO

Address: 555 Middle Creek Parkway, Suite 380
Colorado Springs, CO 80921

El Paso County:

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

Jennifer Irvine, P.E.
County Engineer / ECM Administrator

Approved
By: Elizabeth Nijkamp
Date:02/13/2020
El Paso County Planning & Community Development

Conditions:

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I. Introduction

The Trails at Aspen Ridge Filing No. 1 development is within the Waterview East (Waterview II) Subdivision, which is within El Paso County jurisdiction and is comprised of a total of 55.820 acres (Note: 5.003 acres PUD and Filing No. 1 overlap) of single-family residential, open space, and public right-of-way. The site is located within the 721.8-acre Waterview Development in the 419.8-acre portion of the development east of Powers. The Trails at Aspen Ridge development was referred to as Waterview East or Waterview II in the original Waterview Master Development Drainage Study (MDDP).

Figure 1 - Project Location

II. PURPOSE AND SCOPE OF STUDY

The purpose of this Final Drainage Report (FDR) is to identify and evaluate the offsite and onsite drainage patterns associated with the Trails at Aspen Ridge development (55.820 acres) and to

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provide hydrologic and hydraulic analyses of this area to ensure compliance with the El Paso County Drainage Criteria Manual (DCM) and the most recent MDDP Amendment, as well as provide effective, safe routing to downstream outfalls.

III. GENERAL LOCATION AND DESCRIPTION

Trails at Aspen Ridge Filing No. 1 is within the Waterview subdivision, which extends from Grinnell Road on the west to approximately one-half mile east of the north-south portion of Powers Boulevard. The west portion of the subdivision (Waterview I) is bounded on the north by an east-west portion of Powers Boulevard and on the south by Bradley Road. The east portion of the subdivision (Waterview East/Waterview II) is bounded on the north by the Colorado Springs Airport and on the south, approximately 3,260 feet south of the Bradley and Powers intersection by property owned by the State of Colorado. The subject of this report, Trails at Aspen Ridge Filing No. 1, is in the Waterview East portion of the overall Waterview Subdivision and located southeast of the intersection of Powers Boulevard and Bradley Road. More specifically, the study area is located as follows:

A. General Location: The southwest ¼ and the northwest ¼ of Section 9, Township 15 South, Range 65 West of the 6th P.M. in the County of El Paso, State of Colorado.

B. Surrounding Streets and Developments:

a. North: Trails at Aspen Ridge PUD and Bradley Road.

b. East: Several undeveloped properties. See DR-02 for location and ownership

c. South: Undeveloped property owned by the State of Colorado

d. West: Powers Boulevard, Big Johnson Reservoir, and the Waterview I Subdivision (Filings 1 through 7).

C. Drainageway: Portions of the site are within two different major drainage basins.

a. West Fork Jimmy Camp Creek: There appears to be a broad swale running through the middle of this portion of the project area. Flows are conveyed in a southeasterly direction. Total area of basin considered in this report is approximately 165.2 acres. This includes approximately 52.5 acres in Trails at Aspen Ridge Filing No. 1, 77.3 acres of the Trails at Aspen Ridge PUD, and 35.1 acres of offsite

b. Big Johnson Reservoir/Crews Gulch: The final major drainage basin in the studied area is on the west side and is within the Big Johnson Reservoir/Crews Gulch Drainage Basin. Total area of Trails at Aspen Ridge Filing No. 1 within the Big Johnson Reservoir basin is 2.72 acres.

D. Irrigation Facilities

No known functioning irrigation facilities are within the project area.

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E. Utilities and Encumbrances

a) **Storm Sewer:** There are two existing 42" CMP cross road culverts crossing Bradley Road approximately 950 feet east of its intersection with Powers Boulevard.

b) **Sanitary Sewer:** There is no existing sanitary sewer on site. Proposed sanitary sewer for Filing No. 1 will connect to an existing manhole south of the southeast corner of the development.

c) **Gas:** There is an existing petroleum line running just inside the Powers Boulevard easement along the west side of the proposed development.

d) **Water:** There are no known water encumbrances on the site. Proposed water for the development will connect to existing water mains south of the southeast and southwest corners of the development.

e) **Electric:** There is an existing overhead electric easement parallel to the east side of the development with two sets of overhead lines.

F. Referenced Drainage Reports

This site is within the Waterview II or Waterview East portion of the Waterview Subdivision. This study looks at Trails at Aspen Ridge Filing No. 1, which takes up the south 55.820 acres of the Waterview East Subdivision. The two reports below were used as references for this report.

"Amendment to Waterview Master Drainage Development Plan", completed by Springs Engineering, dated July 2014 *(MDDP-2014)*

"MDDP for Waterview East and PDR for Trails at Aspen Ridge", completed by Matrix Design Group, Dated September 2019. (MDDPA-Matrix) (Approved September 2019)
Note: This report supersedes a previously approved PDR "Springs East at Waterview" by Stantec (SP-17-010).

G. Land Uses

Land uses for the proposed development will be single family residential, public roads, and open space.

IV. SOIL CONDITIONS

Soils can be classified in four different hydrologic groups, A, B, C, or D to help predict stormwater runoff rates. Hydrologic group "A" is characterized by deep, well-drained coarse-grained soils with a rapid infiltration rate when thoroughly wet and having a low runoff potential. Group "D" typically has a clay layer at or near to the surface, or a very shallow depth to impervious bedrock and has a very slow infiltration rate and a high runoff potential. See Soils Map; Appendix C. Table 4.1 on the following page lists the soil types present in the development area:

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Table 4.1 – NRCS Soil Survey for El Paso County

SOIL ID NUMBER	***SOIL***	***HYDROLOGIC CLASSIFICATION***	***PERMEABILITY***	***PERCENT ON SITE***
52	Manzanst clay loam, 0 to 3 percent slopes	C	Well Drained	11.6%
56	Nelson-Tassel fine sandy loams, 3 to 18 percent slopes	B	Well Drained	79.5%
86	Stoneham sandy loam, 3 to 8 percent slopes	B	Well Drained	8.9%

Predevelopment site conditions are undeveloped and ground cover consists of sparse natural vegetative land cover.

V. Project Characteristics

A. Major Basin Descriptions

As mentioned in Section I. E. 3., the Trails at Aspen Ridge project is divided between three different major drainage basins. The project location in each of these major drainage basins is at or near the head of each basin.

A. Big Johnson Reservoir:

a. **Onsite Flows:** Approximately 3 acres of Filing No. 1 is located within the Big Johnson Reservoir Basin. This portion of the Filing No. 1 at the east boundary of the Big Johnson Reservoir drainage basin. Runoff in this portion of the site sheet flows to the west at slopes ranging from 3 to 5 percent until reaching Powers Boulevard, eventually crossing Powers Boulevard via a 48-inch crossroad pipe south of the proposed development (approximately 3440 feet south of Bradley Road) and a 60-inch crossroad pipe approximately 2040 feet south of Bradley Road.

b. **Offsite Flows:** Under existing conditions and proposed conditions a portion of the Trails at Aspen Ridge PUD (MDDPA-Matrix: Sub-basin O) is upstream of the portion of Filing No. 1 within the Big Johnson Reservoir drainage basin. Existing conditions runoff will sheet flow to the southeast across the Filing No. 1 boundary, eventually draining to the Powers Boulevard ditch. Under Filing No. 1 conditions, prior to construction of the PUD roads, offsite runoff will sheet flow to the west and then south towards the West Pond.

B. West Fork Jimmy Camp Creek:

a. **Onsite Flows:** Approximately 52.8 acres of Filing No. 1 is within the West Fork Jimmy Camp Creek Basin. Under predevelopment conditions flows in this area generally flow south and to the east. After development flows will generally sheet flow to adjacent streets, where they will be conveyed via gutter flow towards sump or at-grade inlets

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which will capture the flows. Flows will then be conveyed to the proposed East Pond via storm sewer.

b. **Offsite Flows:** The first offsite basin upstream of Filing No. 1 is the Trails at Aspen Ridge PUD (77.3 acres). Upstream of the PUD there are two additional offsite areas. The first is approximately 14.5 acres of commercially zoned area in two lots just north of the PUD and south of Bradley Road. (Legacy Hill Drive runs between the two lots). The second, on the north side of Bradley Road, is approximately 19.6 acres (12.3 acres of the West Fork Jimmy Camp Creek Basin plus an additional 7.3 acres of Big Johnson Reservoir drainage area diverted into the West Fork Jimmy Camp Creek by CDOT construction of Powers Boulevard).

Flows from the offsite sub-basin north of Bradley Road (OS-1) sheet flow to Bradley Road or Powers Boulevard where they are collected in the road ditch and conveyed across Bradley Road and onto the project via two existing 36-inch CMPs. Runoff south of Bradley Road under predevelopment conditions generally sheet flows to the south and slightly east within the West Fork Jimmy Camp Creek Drainage Basin (DBPS-WFJCC) at slopes ranging from 2 to 9 percent. There appears to be a broad swale running along the middle of this basin in a southeasterly direction.

C. Regulatory Floodplain

Per the ***Flood Insurance Rate Map (FIRM)*** 08041C0768-G, effective date December 7, 2018, published by the Federal Emergency Management Agency (FEMA), no portion of Trails at Aspen Ridge (Waterview East) lies within any designated 100-year floodplain. This map can be found in Appendix C.

VI. Drainage Design Criteria

A. Design References

As required by El Paso County, Colorado, this report has been prepared in accordance to the criteria set forth in the ***City of Colorado Springs and El Paso County Drainage Criteria Manual Volume 1 & 2*** (Drainage Criteria Manual or DCM), the El Paso County Engineering Criteria Manual (ECM), and El Paso County Resolutions 15-042 and 19-245.

In addition to the DCM, the ***Urban Storm Drainage Criteria Manuals, Volumes 1-3*** (UDFCD), published by the Urban Drainage and Flood Control District, latest update, have been used to supplement the Drainage Criteria Manual for water quality capture volume (WQCV).

B. Design Frequency

Design frequency is based on the DCM. The 100-year storm event was used as the major storm for the project, and the 5-year storm event was used as the minor storm.

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C. Design Discharge

a. Method of Analysis

The hydrology for this project uses the Rational Method as recommended by the Drainage Criteria Manual for the minor and major storms for drainage basins less than 100-acres in size. The Rational Method uses the following equation: $Q=C*i*A$

Where:

Q = Maximum runoff rate in cubic feet per second (cfs)
C = Runoff coefficient
i = Average rainfall intensity (inches per hour)
A = Area of drainage sub-basin (acres)

b. Runoff Coefficient

Rational Method coefficients from Table 6-6 of the Drainage Criteria Manual for developed land were utilized in the Rational Method calculations. See Appendix B for more information.

c. Time of Concentration

The time of concentration consists of the initial time of overland flow and the travel time in a channel to the inlet or point of interest. A minimum time of concentrations of 5 minutes is utilized for urban areas.

d. Rainfall Intensity

The hypothetical rainfall depths for the 1-hour storm duration were taken from Table 6-2 of the Drainage Criteria Manual. Table 6.1, below, lists the rainfall depth for the Major and Minor 1-hour storm events.

Table 6.1 – Project Area 1-Hour Rainfall Depth

Storm Recurrence Interval	Rainfall Depth (inches)
5-year	1.50
100-year	2.52

The rainfall intensity equation for the Rational Method was taken from Drainage Criteria Manual Volume 1 Figure 6-5.

e. StormCAD Analysis

1. Routing

Storm CAD was utilized to analyze the routing of runoff through the proposed storm sewer system. Catchments were created in the model and calibrated to match the values calculated in the Rational Method spreadsheet.

2. HGL Profiles

StormCAD was also used to determine the Hydraulic Grade Profiles for the major and minor storms. The standard method was used to calculate head loss in the system with K coefficients taken from Table 9-4 of the DCM.

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Table 9-4. STORMCAD Standard Method Coefficients

Bend Loss		
Bend Angle	**K Coefficient**	
0°	0.05	
22.5°	0.10	
45°	0.40	
60°	0.64	
90°	1.32	
LATERAL LOSS		
One Lateral K Coefficient		
Bend Angle	Non-surcharged	Surcharged
45°	0.27	0.47
60°	0.52	0.90
90°	1.02	1.77
Two Laterals K Coefficient		
45°	0.96	
60°	1.16	
90°	1.52	

VII. Drainage Basins and Sub-basins

As mentioned in previous sections, the Trails as Aspen Ridge Filing No. 1 development includes two major basins. Approximately 5.4 percent of Trails at Aspen Ridge Filing No. 1 is in the Big Johnson Reservoir drainage basin, with the remaining 94.6 percent in the West Fork Jimmy Camp Creek drainage basin.

A. The ***predevelopment conditions*** for the site have been analyzed and are presented by design points (Table 3.2) and are described as follows:

1. Big Johnson Reservoir:
   The portion of Filing No. 1 within the Big Johnson Reservoir is within the ***MDDPA-Matrix*** Sub-basin BJR-2. Under existing conditions runoff in this sub-basin sheet flows west to the Powers Boulevard road ditch where flows are conveyed to an existing 48-inch CMP crossroad pipe south of Design Point BJR-2 (Q_5 = 2.1 cfs, Q_{100} = 14.3 cfs).

2. West Fork Jimmy Camp Creek:
   The middle portion of the studied area is within the West Fork tributary to Jimmy Camp Creek. A portion of this basin is upstream of Bradley Road. Flows in that sub-basin (OS-1: Q_5 = 5.0 cfs, Q_{100} = 25.3 cfs) sheet flow to the road ditch and are conveyed to two 36-inch

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CMP crossroad pipes which direct the water across Bradley Road and on to the proposed development area.

The next downstream sub-basin is WF-1 (Q_5 = 17.2 cfs, Q_{100} = 115.2 cfs) which includes 14.5 Acres of commercially zoned offsite area, 81.99 acres of offsite Trails at Aspen Ridge PUD, 32.09 Acres of Trails at Aspen Ridge Filing No. 1, and 5.00 Acres which are in both Filing No. 1 and the PUD. Flows in this sub-basin sheet flow towards the middle of the sub-basins where they join flows from OS-1 and are conveyed via a broad swale in a southeasterly direction and out of the study area.

The third sub-basin within the West Fork basin is sub-basin WF-2 (Q_5 = 5.4 cfs, Q_{100} = 36.5 cfs) which includes 15.77 Acres of Filing No. 1 and 5.38 Acres of the PUD. Flows in this basin sheet flow in an easterly direction where they are captured by another broad swale at the south limit of the study area and conveyed in a southeasterly direction.

Total discharge to the West Fork Jimmy Camp Creek basin is approximately 22.4 cfs for the Q_5 event and 145.4 cfs for the Q_{100} event.

Existing conditions consider all of the areas as undeveloped. Sub-basins and Design points are summarized in the tables below and on the following page:

Table 7.1
Trails at Aspen Ridge, Filing No. 1
FDR
Existing Conditions Sub-basin Summary Table

Area ID	Area (Acres)	Q5 (cfs)	Q100 (cfs)
Big Johnson Reservoir / BJR-1	39.94	6.4	43.2
Big Johnson Reservoir / BJR-2	8.85	2.13	14.32
West Fork Jimmy Camp Creek / OS - 1	19.60	4.96	25.28
West Fork Jimmy Camp Creek / WF-1	119.08	17.15	115.23
West Fork Jimmy Camp Creek / WF-2	21.15	5.43	36.51

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Table 7.2 **Trails at Aspen Ridge, Filing No. 1** **FDR** **Existing Design Point Summary**				
Design Point	**Sub-Basins**	**Total Area (ac.)**	**Q(5) (cfs)**	**Q(100) (cfs)**
BJR-1	BJR-1	39.94	6.4	43.2
BJR-2	BJR-2	8.85	2.13	14.32
TO BIG JOHNSON RESERVOIR	BJR-2	**48.79**	**8.6**	**57.5**
OS-1	OS-1 (7.3 Acres diverted by CDOT from Big Johnson)	19.60	4.96	25.28
WF-1	WF-1 & OS-1	138.69	17.01	108.84
WF-2	WF-2	21.15	5.43	36.51
TO WEST FORK JIMMY CAMP CREEK	WF-1, WF-2, & OS-1 (Basins are parallel, so this is a sum of WF-1 & WF-2.)	**159.84**	**22.44**	**145.35**

B. The fully developed conditions for the site are as follows:

1. Big Johnson Reservoir:

For Filing No. 1 runoff from the small area within Big Johnson Reservoir Basin will be directed to the West Pond. Sub-basins and Design Points within this major basin are summarized in Tables 7.3, 7.4, and 7.5 below:

Table 7.3 Trails at Aspen Ridge Big Johnson Reservoir Proposed Conditions - Sub-basin Summary			
Basin	**Area**	Q5	Q100
	acres	cfs	cfs
O-1 (Filing No. 1)	1.63	2.72	5.99
O-2 (Future)	2.97	3.96	8.73
O-2a (Future)	1.12	1.82	4.00
O-2b (Future)	0.57	0.78	1.71
O-2c (Future)	1.05	1.14	2.51
O-2d (Future)	0.60	1.09	2.41
O-2e (Future)	0.51	0.74	1.62
O-2f (Future)	0.65	1.13	2.48
O-2g (Future)	2.04	2.74	6.04
P (Future)	8.0	1.72	11.57
N (Future)	13.8	3.14	21.08
Q-1 (Filing No. 1)	1.09	1.1	3.8
Q2 (Future)	1.36	0.3	1.7
OS-2 (Offsite)	11.4	1.73	11.65

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Table 7.4 Trails at Aspen Ridge Big Johnson Reservoir Proposed Design Point Summary					
Design Point	**Sub-Basins**	**Downstream Design Point**	**Total Area (ac.)**	**Q(5) (cfs)**	**Q(100) (cfs)**
O	O-1, O-2	P	2.95	6.4	14.0
P	N, O-1, O-2, O-2a-g, P	P2	34.69	13.4	47.6
P2	N/A	Powers Ditch	34.69	0.2	23.9
Q	Q-1, Q2	Powers Ditch	2.45	1.4	5.5
OS-2	OS-2	Powers Ditch	11.4	1.7	11.7
To Big Johnson Reservoir			48.79	3.3	41.1

Table 7.5 Trails at Aspen Ridge Big Johnson Reservoir Proposed Design Point Flow Description	
Design Point	**Description**
O	This design point combines flows from Sub-basins O-1 and O-2. These flows will be captured and treated in the West Pond. The West Pond will discharge to the Powers Boulevard ditch. Future development in the Big Johnson Reservoir Basin will involve construction of the West Pond indicated in ***MDDPA-Matrix*** and extension of the storm sewer from its now proposed termination in the sediment capture pond over to the pond. The storm sewer extension will have additional on-grade inlets which will reduce the runoff captured by the 10' inlet at this design point.
P	This design point represents the total flows into the West Pond under Filing No. 1 build out conditions.
P2	This design point represents the discharge from the West Pond under Filing No. 1 developed conditions.
Q	- Flows in the sub-basin tributary to this design point will sheet flow to the west until reaching the Powers Boulevard road ditch where they will be conveyed to the south via channelized ditch flow to a 48" CMP cross road culvert. These flows are not practicable to detain or treat because they are on the outside edge of the property and lower than the proposed detention basin. However, because this design point will contribute less than one acre (MDDPA-Matrix Sub-basin Q: 0.87 Acres or 2.4% of the applicable development area, 0.62 Acres in Q1 which is a sub-area of Sub-basin Q) of developed area to the Big Johnson Reservoir Basin, according to ECM Section 1.7.1.C.1, compliance with the county's MS4 permit is maintained. - In accordance with ECM Section I.7.1.B.7, regarding sites excluded from the requirements of Section 1.7 "Post Construction Storm Water Management", since approximately 1.53 acres of this sub-basin may be disturbed but will remain undeveloped green spaces after stabilization of the site, this area qualifies as an excluded site.
OS-2	This design point reflects the runoff to the Powers Boulevard ditch from the commercially zoned area north of the Trails at Aspen Ridge PUD. Future development of this off-site sub-basin will require on site detention and an FDR.

Drawings of these sub-basins and design points are illustrated in Drawing DR-02 in Appendix D.

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2. **<u>West Fork – Jimmy Camp Creek:</u>**
Under proposed conditions flows for this basin will be directed to a proposed detention pond (East Pond) near the southeast corner of the proposed Trails at Aspen Ridge development. Sub-basins and Design Points and SWMM Outfall summary information for this major basin are summarized in the Q5 and Q100 SWMM Outfall Loading tables and hydrology Tables 7.6, 7.7, and 7.8 below and on the following pages:

Table 7.6
<u>Trails at Aspen Ridge</u>
West Fork - Jimmy Camp Creek
Proposed Conditions - Sub-basin Summary

Basin	Area	Q5	Q100
	acres	cfs	cfs
OS-1	19.67	4.0	26.8
A-1	12.34	4.4	18.9
A-2	1.09	2.7	5.2
A-3	4.98	2.2	9.0
A-4	0.12	0.6	1.0
B-1	1.06	1.8	4.1
C-1	3.27	5.9	12.9
C-2	1.19	2.4	5.3
C-3	4.60	8.4	18.5
C-4	0.36	1.6	3.0
C-5	3.13	5.7	12.5
C-6	0.07	0.3	0.6
C-7	2.20	4.0	8.8
C-8	0.06	0.3	0.5
D-1	2.21	1.6	5.2
E-1	6.43	3.9	12.2
E-2	2.14	3.9	8.7
F-1	1.49	2.7	6.0
F-2	0.58	1.1	2.5
F-3	1.25	2.3	5.0
F-4	0.58	1.1	2.5
F-5	2.27	3.5	7.8
F-6	1.00	1.7	3.9
F-7	5.06	7.5	16.5
F-8	0.84	1.5	3.3
G-1	1.11	2.1	4.6
H-1	3.60	5.6	12.3
H-2	1.16	1.9	4.2
H-3	2.97	4.7	10.3
H-4	0.92	1.6	3.6
H-5	2.42	4.0	8.9
H-6	2.46	4.1	9.1
H-7	2.03	3.0	6.6
H-8	0.97	1.7	3.8
H-9a	1.95	2.3	5.8
H-9b	0.38	0.6	1.3
H-10	1.33	2.5	5.5
H-11	3.42	5.0	11.0
I-1	3.13	5.6	12.4
I-2	0.59	1.9	3.8
I-3	4.18	7.1	15.6

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Table 7.7a Design Point Summary						
StormCAD						
Design Point	Total Drainage Area	Surface		Storm Sewer		Downstream Design Point
		Q5 (cfs)	Q100 (cfs)	Q5 (cfs)	Q100 (cfs)	
1-OS	**19.67**	4.0	26.8	-	-	A
1-A	**12.34**	3.5	17.6	-	-	A
2-A	**1.09**	2.7	5.2	-	-	A
3-A	**4.98**	2.2	8.9	-	-	A
4-A	**0.12**	0.6	1.0	-	-	A
A	**38.20**	-	-	12.0	55.6	B
1-B	**1.06**	1.8	4.1	-	-	B
B	**39.26**	-	-	12.7	57.1	C
1-C	**3.27**	5.9	12.9	-	-	C
2-C	**1.19**	2.4	5.3	-	-	C
3-C	**4.60**	8.4	18.5	-	-	C
4-C	**0.36**	1.6	3.0	-	-	C
5-C	**3.13**	5.7	12.5	-	-	C
6-C	**0.07**	0.3	0.6	-	-	C
7-C	**2.20**	4.0	8.8	-	-	C
8-C	**0.06**	0.3	0.5	-	-	C
C	**54.13**	-	-	27.6	90.2	D
1-D	**2.21**	1.6	5.2	-	-	D
D	**56.34**	0.0	0.0	28.1	92.1	E
1-E	**6.43**	2.6	11.4	-	-	E
2-E	**2.14**	3.9	8.7	-	-	E
E	**64.91**	-	-	33.7	108.8	F
1-F	**2.07**	2.7	6.0	2.7	6.0	3-F
2-F	**0.58**	1.1	2.5	1.6	3.6	3-F
3-F	**3.32**	2.3	5.0	3.8	8.4	4-F
4-F	**3.89**	1.1	2.5	5.0	11.1	5-F
5-F	**6.16**	3.5	7.8	6.6	14.6	6-F
6-F	**7.16**	1.7	3.9	7.9	17.5	8-F
7-F	**5.06**	7.5	16.5	7.5	16.5	8-F
8-F	**13.07**	1.5	3.3	16.2	35.8	F
F	**77.97**	-	-	43.5	131.0	G
1-G	**1.11**	2.1	4.6	-	-	G
G	**79.08**	-	-	44.2	132.7	M
1-H	**3.60**	5.9	13.1	-	-	1-2 H
2-H	**1.16**	1.9	4.2	-	-	1-2 H
1-2 H	**4.76**	-	-	9.0	19.8	1-4 H

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Table 7.7b Design Point Summary						
StormCAD						
Design Point	Total Drainage Area	Surface		Storm Sewer		Downstream Design Point
		Q5 (cfs)	Q100 (cfs)	Q5 (cfs)	Q100 (cfs)	
3-H	**2.97**	4.7	10.3	-	-	1-4 H
4-H	**0.92**	1.6	3.6	-	-	1-4 H
1-4 H	**8.65**	-	-	16.4	36.1	1-6 H
5-H	**2.42**	4.0	8.9	-	-	1-6 H
6-H	**2.46**	3.9	8.6	-	-	1-6 H
1-6 H	**13.53**	-	-	20.2	44.9	1-8 H
7-H	**2.03**	2.9	6.4	-	-	1-8 H
8-H	**0.97**	1.7	3.7	-	-	1-8 H
1-8 H	**16.52**	-	-	23.3	49.3	1-10 H
9a-H	**1.95**	2.3	5.7	-	-	9b-H
9b-H	**0.38**	0.6	1.4	2.8	6.5	10-H
10-H	**1.33**	2.4	5.2	-	-	1-10 H
1-10 H	**20.17**	-	-	29.6	66.5	11-H
11-H	**3.42**	5.0	11.0	-	-	H
H	**23.59**			37.4	83.0	M
1-I	**3.13**	5.6	12.4	-	-	K
2-I	**0.59**	1.9	3.8	-	-	K
K-OS	**37.74**			57.3	122.1	K
K	**41.46**	-	-	62.2	133.3	3-I
3-I	**4.18**	7.8	17.2	7.8	17.2	M
I	**45.64**	-	-	66.5	143.4	M
M	**158.60**	-	-	**154.5**	**382.1**	East Pond Discharge
East Pond Discharge SWMM Discharge (MDDPA-Matrix)	**158.60**	-	-	21.1	127.4	Existing Swale
R Rational Method	**1.87**	-	-	5.6	11.7	Existing Swale
O	**4.57**	6.4	14.0	6.4	14.0	Sediment Capture
P UD-Detention	**34.69**	1.8	44.2	-	-	P2
P2 West Pond Discharge UD-Detention	**34.69**	-	-	0.2	23.9	Powers Boulevard Ditch
Q Rational Method	**1.09**	1.1	3.8	-	-	Powers Boulevard Ditch

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Table 7.8a Design Point Descriptions		
Design Point	**Description**	**Downstream Design Point**
1-OS	- This design point is at the downstream end of the offsite sub-basin (OS-1) north of Bradley Road. Flows in Sub-basin OS-1 will sheet flow to the road ditch running along Bradley and Powers Boulevard. Once channelized in the ditch flows will be directed to a proposed 24-inch RCP storm pipe sleeved into one of the existing 36-inch CMP cross road pipes to minimize disturbance to Bradley Road and avoid conflicts with existing utilities along the north side of Bradley Road. From there flows will be conveyed on to design point A. The second existing 42" CMP will be plugged. - Please note that approximately 7.3 acres of the area tributary to this design point have been diverted from the Big Johnson Reservoir by CDOT construction of Powers Boulevard. Future development of that portion of the tributary sub-basin must redirect these flows to the Big Johnson Reservoir to maintain compliance with the two relevant DBPS reports. - Development of the OS-1 Sub-basin will require onsite detention and an FDR.	A
1-A	-This design point is located at a sump inlet on the north side of Frontside Drive and just west of the Legacy Hill Drive Roundabout. -Please note that the commercial lot to within Sub-basin A-1 will be treated as undeveloped for the purposes of this report. Per MDDPA-Matrix, future development of this lot will require on-site detention as described in the referenced MDDP. -Development of this basin will require **full spectrum onsite detention** and an FDR. -Onsite detention shall tie into the back of the curb inlet at Design Point 1-A via the 18" storm sewer stubbed out of the back of the inlet to the road right of way	A
2-A	-This design point is located at a sump inlet on the south side of Frontside Drive and just west of the Legacy Hill Drive Roundabout. -Flow to This design point is primarily from street drainage along Frontside Drive.	A
3-A	-This design point is located at a sump inlet on the north side of Frontside Drive and just east of the Legacy Hill Drive Roundabout. -Please note that the commercial lot within Sub-basin A-3 will be treated as undeveloped for the purposes of this report. Per MDDPA-Matrix, future development of this lot will require on-site detention as shown in MDDPA-Matrix. -Development of this basin will require **full spectrum onsite detention** and an FDR. -On-site detention shall tie into the back of the adjacent curb inlet via the 18-inch storm sewer stubbed out of the back of the inlet to the road right of way.	A
4-A	-This design point is located at a sump inlet on the south side of Frontside Drive and just east of the Legacy Hill Drive Roundabout. -Flow to This design point is almost exclusively from street drainage along Frontside Drive.	A
A	-This design point represents the manhole combining drainage from Design points OS-1 and 1-A through 4-A.	B
1-B	-This design point represents the on-grade inlet south of Frontside Drive.	B
B	-This design point represents the manhole on Legacy Hill Drive combining the flows from design point A with design point 1-B.	C

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Table 7.8b Design Point Descriptions		
Design Point	**Description**	**Downstream Design Point**
1-C	-This is an offsite design point in a future filing. This is located at a sump inlet on the west side of Drinking Horse Drive. -Future filing	C
2-C	-This is an offsite design point in a future filing. This is located at a sump inlet on the east side of Drinking Horse Drive. -Future filing	C
3-C	-This design point is at a sump inlet just west of Legacy Hill Drive on the north side of Moose Meadow Street.	C
4-C	-This design point is at a sump inlet just west of Legacy Hill Drive on the south side of Moose Meadow Street.	C
5-C	-This design point is at a sump inlet just east of Legacy Hill Drive on the north side of Moose Meadow Street.	C
6-C	-This design point is at a sump inlet just east of Legacy Hill Drive on the south side of Moose Meadow Street.	C
7-C	-This is an offsite design point in a future filing. This design point is located at a sump inlet on the north side of Moose Meadow Street between future Roundhouse Drive and Beartrack Point. -Future filing	C
8-C	-This is an offsite design point in a future filing. This is located at a sump inlet on the north side of Moose Meadow Street between future Roundhouse Drive and Beartrack Point. -Future filing	C
C	-This design point is at a manhole in Legacy Hill Drive at its intersection with Moose Meadow Street. It reflects the combination of flows from design points 1-C through 8-C with flows from design point B.	D
1-D	-This design point is an on-grade inlet on Legacy Hill Drive northwest of its intersection with Sunday Gulch.	D
D	-This design point combines flows from design point 1-D with flows from design point C at a manhole in Legacy Hill Drive northwest of its intersection with Sunday Gulch Drive.	E
1-E	-This design point is located at a sump inlet on Falling Rock Drive just west of Sunday Gulch Drive which captures flows from Sub-basin E-1 and flow bypass from design point 1-D.	E
2-E	-This is a sump inlet across the street from design point 1-E. -During lower probability events flows to design point 1-E may equalize across the street to this design point.	E

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Table 7.8c Design Point Descriptions		
Design Point	**Description**	**Downstream Design Point**
E	This design point is at a manhole at the intersection of Sunday Gulch Drive and Falling Rock Drive. Flows from Design points 1-E, 2-E, and D are combined at this design point.	F
1-F	-This design point is at an at-grade inlet on the west side of future Lazy Ridge Drive. -Future filing.	3-F
2-F	-This design point is at an at-grade inlet on the east side of future Lazy Ridge Drive. -Future filing.	3-F
3-F	-This design point is at an at-grade inlet on the west side of future Lazy Ridge Drive. -Flows from Sub-basin F-3 are combined with storm sewer flows from design points 1-F and 2-F -Future filing.	4-F
4-F	-This design point is at an at-grade inlet on the east side of future Lazy Ridge Drive. -Flows from sub-basin F-4 are combined with flows from 1-F, 2-F and 3-F. -Future filing.	5-F
5-F	-This design point is at an at-grade inlet on the west side of Wagon Hammer Drive. -Flows from Sub-basin F-5 are combined with storm sewer flows from design points 1-F, 2-F, 3-F, and 4-F	6-F
6-F	-This design point is at an at-grade inlet on the east side of Wagon Hammer Drive. -Flows from Sub-basin F-6 are combined with storm sewer flows from design points 1-F, 2-F, 3-F, 4-F, and 5-F	8-F
7-F	-This design point is at a sump inlet located on the north side of Lookout Court just west of its intersection with Sunday Gulch Drive. -This inlet captures flows from Sub-basin F-7	8-F
8-F	-This design point is at a sump inlet and manhole on the south side of Lookout Court just west of its intersection with Sunday Gulch Drive. -Flows from Sub-basin F-8 are combined with flows from design points 1-F, 2-F, 3-F, 4-F, 5-F, 6-F, and 7-F.	F
F	-This design point combines flows from design points 1-F through 8-F with flows from design point E. -Variance Drop Manhole	G
1-G	-This design point is at an at-grade inlet capturing flows from Sub-basin G.	G
G	-This design point reflects the combination of surface flows from design point 1-G with storm sewer flows from design point F	M
1-H	-This design point is at a sump inlet on the west side of Lazy Ridge Drive capturing flows from Sub-basin H-1.	1-2 H
2-H	-This design point is at a sump inlet on the east side of Lazy Ridge Drive capturing flows from Sub-basin H-2.	1-2 H
1-2 H	-Flows from design points 1-H and 2-H are combined at this manhole on the south side of Buffalo Horn Drive at its intersection with Lazy Ridge Drive.	1-4 H

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Table 7.8d Design Point Descriptions		
Design Point	**Description**	**Downstream Design Point**
3-H	-This design point is at a sump inlet on the west side of Wagon Hammer Drive capturing flows from Sub-basin H-3	1-4 H
4-H	-This design point is at a sump inlet on the east side of Wagon Hammer Drive capturing flows from Sub-basin H-5	1-4 H
1-4 H	-Flows from design point 1-2 H are combined with flows from 3-H and 4-H at this manhole on the south side of Buffalo Horn Drive at its intersection with Wagon Hammer Drive.	1-6 H
5-H	-This is an at-grade inlet on the north side of Buffalo Horn Drive just west of its intersection with Windy Pass Court.	1-6 H
6-H	-This is an at-grade inlet on the south side of Buffalo Horn Drive just west of its intersection with Windy Pass Court.	1-6 H
1-6 H	-Flows from design point 1-4 H are combined with flows from 5-H and 6-H at this manhole on the south side of Buffalo Horn Drive west of its intersection with Windy Pass Court.	1-8 H
7-H	-This design point is at an on-grade inlet on the west side of Sunday Gulch Drive just north of its intersection with Buffalo Horn Drive. -This inlet captures flows from Sub-basin H-7	1-8 H
8-H	-This design point is at an on-grade inlet on the east side of Sunday Gulch Drive just north of its intersection with Buffalo Horn Drive. -This inlet captures flows from Sub-basin H-8	1-8 H
1-8 H	-Flows from design point 1-6 H are combined with flows from 7-H and 8-H at this manhole on the south side of Buffalo Horn Drive west of its intersection with Sunday Gulch Drive.	1-10 H
9a-H	-This design point is near the south boundary of Filing No. 1 where a flared end section captures flows from a swale running along this southern boundary of the study area. -This design point captures flows from Sub-basin H-9a.	9b-H
9b-H	-This design point is near the south boundary of Filing No. 1 where a Type C Inlet captures flows within Sub-basin H-9b. -This design point combines flows from Sub-basins H-9a and H-9b.	10-H
10-H	-This design point is at a sump inlet on the south side of the cul-de-sac at the east end of Buffalo Horn Drive. Surface flows from Sub-basin H-10 are combined with storm sewer flows from design point 9-H.	1-10 H
1-10 H	-Flows from design points 10-H and 1-8 H are combined at a manhole towards the north side of the cul-de-sac at the east end of Buffalo Horn Drive.	11-H
11-H	-This design point is at a sump inlet on the north side of the cul-de-sac at the east end of Buffalo Horn Drive. -This inlet captures flows from Sub-basin H-11	H
H	-This design point combines storm sewer flows from design point 11-H and 1-10 H	M

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Table 7.8e Design Point Descriptions		
Design Point	**Description**	**Downstream Design Point**
1-I	-This design point is at a sump inlet on the north side of Legacy Hill Drive just west of its intersection with Big Johnson Drive. -Flows from Sub-basin I-1 are captured at this inlet.	K
2-I	-This design point is at a sump inlet on the south side of Legacy Hill Drive just west of its intersection with Big Johnson Drive. -Flows from Sub-basin I-2 are captured at this inlet.	K
K-OS	-This design point is at the storm sewer stub out from Filing No. 1. Future filings in Trails at Aspen Ridge will extend the storm sewer to the north along Big Johnson Drive.	K
K	-This design point combines storm sewer flows from design points K-OS, 2-I, and 1-I in a manhole located at the intersection of Big Johnson Drive and Legacy Hill Drive.	3-I
3-I	-This design point is at a sump inlet at the south side of the cul-de-sac at the east end of Falling Rock Drive. -Flows from Sub-basin I-3 are captured by this inlet	M
I	-This design point represents the combination of storm sewer flows from design point K with flows captured by the inlet at design point 3-I	M
M	-This design point represents the combinate of all of the flows directed to the East Pond. -Included Sub-basins: OS-1, A-1 to A-4, B-1, C-1 to C-8, D-1, E-1, E-2, F-1 to F-8, H-1 to H-11, I-1 to I-3 and M	East Pond Discharge
East Pond Discharge	-This design point is at the discharge structure from the East Pond. -Developed flows from the proposed improvements will be metered out by this structure at predevelopment levels as determined by a combination of UD-Detention and SWMM modeling of the Full Spectrum Extended Detention Basin	Existing Swale
R	- This design point reflects the sheet flows discharging from Sub-basin R-1 which is located just downstream of the proposed East Pond. These flows are not practicable to detain because the area is on a slope at the outer edge of the property and at a lower elevation than the pond, and per ECM Section 1.7.1.C.1, as less than 1 acre (0.67 Acres or 0.5% of the applicable development area) of the undetained flows within the West Fork – Jimmy Camp Creek basin will be developed lots, compliance with the MS4 permit is maintained. - Per ECM Section I.7.1.B.7, regarding sites excluded from the requirements of Section 1.7 "Post Construction Storm Water Management", approximately 1.23 acres of the tributary area may be disturbed but will remain undeveloped green spaces after stabilization of the site.	Existing Swale

- Generally, flows will sheet flow off the developed lots towards adjacent streets which will capture flows and direct them downstream to the nearest inlets. After capture in inlets the flows will be conveyed onwards towards the downstream detention basin via storm sewer.

- Flows in Sub-basins O-1 and R-1 sheet flow off the site and into the Powers Boulevard Ditch and an existing swale, respectively.

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3. **Jimmy Camp Creek (Marksheffel Branch)**
   Under proposed conditions this project will be adding a crossroad culvert in the Bradley Road median to allow drainage of the existing median ditch (Design Point BR1 as well as a crossroad pipe across the future access point for Blackmer Street towards the northeast corner of the PUD. This sub-basin (Design Point BR2). Neither of the sub-basins tributary to these design points will require detention. BR1 will not require detention as it is CDOT right of way and detention is not feasible. BR-2 will not require detention as the tributary area falls under ECM section I.7.B.7. The tributary area may be disturbed during construction but will remain undeveloped green space after stabilization of the site.

Table 7.9
Trails at Aspen Ridge-Bradley Road
Jimmy Camp Creek
Proposed Conditions - Sub-basin Summary

Basin/Design Point	Area	Q5	Q100
	acres	cfs	cfs
BR1	0.31	0.8	1.6
BR2 – Filing No. 1 (Worst Case)	4.49	3.4	10.0
– Full Buildout	2.81	2.9	7.4

Note that for BR2 the initial condition for Filing No. 1 will have a larger drainage area than will existing under fully developed conditions for the PUD. The area which will ultimately be tributary to the crossroad pipe will not be developed but will be green space after stabilization of the site has been completed.

Table 7.10
Design Point Descriptions

Design Point	Description	Downstream Design Point
BR1	- This design point reflects a Type C inlet located in the existing Bradley Road median ditch upstream of the proposed access to Trails at Aspen Ridge Filing No. 1, Legacy Hill Drive. - Flows will sheet flow off of the upstream Bradley Road pavement (existing), eventually channelized in the Bradley Road median ditch and conveyed to the proposed Type C inlet.	Bradley Road Median Ditch
BR2	- Flows in the tributary area will sheet flow to the Bradley Road ditch where they will be conveyed downstream to a proposed 18-inch Flared End Section (FES) and crossroad pipe which will convey the flows across the proposed access for Blackmer Street. Flows will continue down the Bradley Road ditch following historical flow patterns.	Bradley Road Ditch (South Side)

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VIII. Drainage Facility Design

A. Street Capacity

The width of the typical section for Legacy Hill Drive will be 53 feet from back of curb to back of curb. Other streets will have a typical width of 35 feet from back of curb to back of curb. Curb heights will be 6-inch. Legacy Hill Drive will utilize EPC Type A curb and gutter. Residential streets will generally utilize EPC Optional Type C curb and gutter with EPC Type A curb and gutter used for the curb radii through intersections. The following table (Table 8.1) lists streets and capacities by Design Point:

Table 8.1a
Street Capacities

Trails at Aspen Ridge

Street	*Location*	*DESIGN POINT*	*Slope %*	*ROAD CAPACITY MINOR STORM (cfs)*	*Q_5 TOTAL FLOW (cfs)*	*ROAD CAPACITY MAJOR STORM (cfs)*	*Q_{100} TOTAL FLOW (cfs)*
Frontside Drive	North side west of Legacy	1-A	2.9	**14.3**	**4.4**	**39.5**	**18.9**
Frontside Drive	South side west of legacy	2-A	2.9	**14.3**	**2.7**	**39.5**	**5.2**
Frontside Drive	North side east of Legacy	3-A	1.2	**9.0**	**2.2**	**38.0**	**9.0**
Frontside Drive	South side east of Legacy	4-A	1.2	**9.0**	**0.6**	**38.0**	**1.0**
Legacy Hill Drive	West Side, 445 feet south of Frontside Drive	1-B	3.1	**17.6**	**1.8**	**57.6**	**4.1**
Drinking Horse Court	West Side just north of Moose Meadow	1-C	5.0	**18.8**	**5.9**	**32.5**	**12.9**
Drinking Horse Court	East Side just north of Moose Meadow	2-C	5.0	**18.8**	**2.4**	**32.5**	**5.3**
Moose Meadow St.	North side west of Legacy	3-C	3.4	**15.5**	**8.4**	**38.0**	**19.2**
Moose Meadow St.	South side west of legacy	4-C	3.4	**15.5**	**1.6**	**38.0**	**3.0**
Moose Meadow St.	North side east of Legacy	5-C	2.1	**10.4**	**5.7**	**41.6**	**12.5**
Moose Meadow St.	South side east of Legacy	6-C	2.1	**10.4**	**0.3**	**41.6**	**0.6**
Moose Meadow St.	North side east of Roundhouse Drive	7-C	1.6	**10.3**	**4.0**	**46.7**	**8.8**
Moose Meadow St.	South side east of Roundhouse Drive	8-C	1.6	**10.3**	**0.3**	**46.7**	**0.5**
Legacy Hill Drive	Southwest side, 185 feet west of Sunday Gulch	1-D	4.1	**16.2**	**1.6**	**66.3**	**5.2**
Falling Rock Drive	North side west of Sunday Gulch	1-E	4.3	**16.5**	**4.4**	**35.0**	**15.8**
Falling Rock Drive	South side west of Sunday Gulch	2-E	4.3	**16.5**	**3.9**	**35.0**	**8.7**
Lazy Ridge Drive	West side, 350' south of Falling Rock Drive	1-F	0.7	**7.0**	**2.7**	**32.0**	**6.0**
Lazy Ridge Drive	East Side, 350' south of Falling Rock Drive	2-F	0.7	**7.0**	**1.1**	**32.0**	**2.5**
Lazy Ridge Drive	West side, 680' south of Falling Rock Drive	3-F	0.7	**7.0**	**3.5**	**32.0**	**8.8**
Lazy Ridge Drive	East Side, 680' south of Falling Rock Drive	4-F	0.7	**7.0**	**1.3**	**32.0**	**3.5**
Wagon Hammer Dr.	West side, 830' south of Falling Rock Drive	5-F	0.8	**7.0**	**3.5**	**32.0**	**7.8**
Wagon Hammer Dr.	East Side, 830' south of Falling Rock Drive	6-F	0.8	**7.0**	**1.7**	**32.0**	**3.9**
Lookout Court	North side west of Legacy	7-F	2.2	**10.4**	**7.5**	**41.6**	**16.5**
Lookout Court	South side west of legacy	8-F	2.2	**10.4**	**1.5**	**41.6**	**3.3**

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Table 8.1b Street Capacities							
TRAILS AT ASPEN RIDGE							
Street	***Location***	***DESIGN POINT***	***Slope %***	***ROAD CAPACITY (MINOR STORM)***	***Q (5) TOTAL FLOW***	***ROAD CAPACITY (MAJOR STORM)***	***Q(100) TOTAL FLOW (cfs)***
Sunday Gulch Drive	Across from Lookout Court	1-G	4.0	**20.5**	**2.1**	**35.0**	**4.6**
Lazy Ridge Drive	West side just north of Buffalo Horn Drive	1-H	0.8	**7.0**	**6.1**	**32.0**	**16.0**
Lazy Ridge Drive	East side just north of Buffalo Horn Drive	2-H	0.8	**7.0**	**1.9**	**32.0**	**4.7**
Wagon Hammer Drive	West side just north of Buffalo Horn Drive	3-H	0.7	**7.0**	**5.2**	**32.0**	**13.3**
Wagon Hammer Drive	East side just north of Buffalo Horn Drive	4-H	0.7	**7.0**	**1.6**	**32.0**	**4.2**
Buffalo Horn Drive	North side just west of Windy Pass Court	5-H	3.4	**15.5**	**4.0**	**38.0**	**8.9**
Buffalo Horn Drive	South side just west of Windy Pass Court	6-H	3.4	**15.5**	**4.1**	**38.0**	**9.1**
Sunday Gulch Drive	West side just north of Buffalo Horn Drive	7-H	2.5	**12.8**	**3.0**	**40.5**	**6.6**
Sunday Gulch Drive	East side just north of Buffalo Horn Drive	8-H	2.5	**12.8**	**1.7**	**40.5**	**4.8**
Buffalo Horn Drive	North side of cul-de-sac	10-H	3.0	**14.3**	**3.1**	**39.5**	**9.1**
Buffalo Horn Drive	South side of cul-de-sac	11-H	3.0	**14.3**	**5.9**	**39.5**	**18.0**
Legacy Hill Drive	North side just west of Big Johnson Drive	1-I	1.9	**16.1**	**5.6**	**48.0**	**12.4**
Legacy Hill Drive	South side just west of Big Johnson Drive	2-I	1.9	**10.4**	**1.9**	**41.6**	**3.8**
Falling Rock Drive	South side of cul-de-sac	3-I	3.0	**14.3**	**7.1**	**39.5**	**15.6**
Buffalo Horn Drive	at intersection with Triple Tree Loop	O	1.0	**8.5**	**6.4**	**37.0**	**14.8**

Nomograph 7-7 from the DCM is shown below and on the following page:

Figure 7-7. Street Capacity Charts Residential (Detached Sidewalk)

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Notes:

- Capacities for Legacy Hill Drive calculated using UD Inlet with Minor Storm: 6-inch depth and 20-foot TMAX and Major Storm: 12" depth and 26-foot TMAX.
- For Legacy Hill Drive EPC Type A curb and gutter was used and for all other streets, EPC Optional Type C curb and gutter was used.
- The nomograph (Figure 7-7) above was used to calculate capacities for the Type A (Local/Residential) streets within the project area. Compared to requirements in the El Paso DCM this nomograph is slightly more conservative for the major storm (7.8-inch depth versus 12-inch depth in Table 6-1 of the El Paso County DCM) and identical for the minor/initial storm.

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B. Inlet Capacity

In accordance with the county DCM, this project will use Type R inlets. On-grade inlet capacities were determined utilizing UD-Inlet. Sump inlet capacities were determined utilizing DCM Nomograph 8-11 shown below. The following Table 8.2 lists inlets by design point and corresponding capacity. Table 6.3 describes overflow routing for each sump inlet.

Figure 2-Inlet Capacity - Sump Conditions (DCM Figure 8-11)

Please see Appendix C for CDOT standard M-604-12.

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Table 8.2a
PROPOSED INLET SUMMARY
Trails at Aspen Ridge

DESIGN POINT	SUB-BASINS	TOTAL AREA (AC)	INLET			Q(5) BYPASS FLOWS (cfs)	Q(5) TOTAL INFLOW	Q5 INLET CAPACTIY	Q(100) BYPASS FLOWS (cfs)	Q(100) TOTAL INFLOW (cfs)	Q100 INLET CAPACITY	NOTES:
			SIZE (Ft.)	TYPE	CONDITION							
1-A	A-1	12.34	**10.0**	**R**	**Sump**	-	**4.4**	**4.4**	-	**18.9**	**18.9**	
2-A	A-2	1.09	**5.0**	**R**	**Sump**	-	**2.7**	**2.7**	-	**5.2**	**5.2**	
3-A	A-3	4.98	**5.0**	**R**	**Sump**	-	**2.2**	**2.2**	-	**9.0**	**9.0**	
4-A	A-4	0.12	**5.0**	**R**	**Sump**	-	**0.6**	**0.6**	-	**1.0**	**1.0**	
1-B	B-1	3.27	**10.0**	**R**	**On-Grade**	-	**1.8**	**1.8**	**0.7**	**4.1**	**3.4**	***Bypass to DP 3-C***
1-C	C-1	1.19	**10.0**	**R**	**Sump**	-	**5.9**	**5.9**	-	**12.9**	**12.9**	
2-C	C-2	4.60	**5.0**	**R**	**Sump**	-	**2.4**	**2.4**	-	**5.3**	**5.3**	
3-C	C-3	0.36	**10.0**	**R**	**Sump**	-	**8.4**	**8.4**	-	**19.2**	**19.2**	***Bypass from 1-B. (Q5=10.0, Q100=11.1, EQUAL FLOW ACROSS CROWN)***
4-C	C-4	3.13	**5.0**	**R**	**Sump**	-	**1.6**	**1.6**	-	**3.0**	**3.0**	***(Q5=10.0, Q100=11.1, EQUAL FLOW ACROSS CROWN)***
5-C	C-5	0.07	**10.0**	**R**	**Sump**	-	**5.7**	**5.7**	-	**12.5**	**12.5**	
6-C	C-6	2.20	**5.0**	**R**	**Sump**	-	**0.3**	**0.3**	-	**0.6**	**0.6**	
7-C	C-7	0.06	**5.0**	**R**	**Sump**	-	**4.0**	**4.0**	-	**8.8**	**8.8**	
8-C	C-8	6.43	**5.0**	**R**	**Sump**	-	**0.3**	**0.3**	-	**0.5**	**0.5**	
1-D	D-1	2.14	**15.0**	**R**	**On-Grade**	**0.5**	**1.6**	**1.1**	**3.6**	**5.2**	**1.6**	***Bypass to 1-E***
1-E	E-1	1.25	**10.0**	**R**	**Sump**	-	**4.4**	**4.4**	-	**15.8**	**15.8**	***Bypass from 1-D. (Q5=7.5, Q100=17.5, EQUAL FLOW ACROSS CROWN)***
2-E	E-2	0.58	**5.0**	**R**	**Sump**	-	**3.9**	**3.9**	-	**8.7**	**8.7**	***(Q5=7.5, Q100=17.5, EQUAL FLOW ACROSS CROWN)***
1-F	F-1	2.27	**5.0**	**R**	**On-Grade**	**1.2**	**2.7**	**1.5**	**3.8**	**6.0**	**2.2**	**Bypass to 3-F**

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Table 8.2b
PROPOSED INLET SUMMARY
Trails at Aspen Ridge

DESIGN POINT	SUB-BASINS	TOTAL AREA (AC)	INLET			Q(5) BYPASS FLOWS (cfs)	Q(5) TOTAL INFLOW (cfs)	Q5 INLET CAPACTIY (cfs)	Q(100) BYPASS FLOWS (cfs)	Q(100) TOTAL INFLOW (cfs)	Q100 INLET CAPACITY (cfs)	NOTES:
			SIZE (Ft.)	TYPE	CONDITION							
2-F	F-2	1.00	5.0	R	On-Grade	0.2	1.1	0.9	1.0	2.5	1.5	Bypass to 4-F
3-F	F-3	5.06	10.0	R	On-Grade	0.5	3.5	3.0	3.7	8.8	5.1	Bypass from 1-F, Bypass to 1-H
4-F	F-4	0.84	10.0	R	On-Grade	-	1.3	1.3	0.5	3.5	3.0	Bypass from 2-F, Bypass to 2-H
5-F	F-5	1.11	10.0	R	On-Grade	0.5	3.5	3.0	3.0	7.8	4.8	Bypass to 3-H
6-F	F-6	3.60	10.0	R	On-Grade	-	1.7	1.7	0.6	3.9	3.3	Bypass to 4-H
7-F	F-7	1.16	10.0	R	Sump	-	7.5	7.5	-	16.5	16.5	
8-F	F-8	2.97	5.0	R	Sump	-	1.5	1.5	-	3.3	3.3	
1-G	G-1	0.92	10.0	R	On-Grade	-	2.1	2.1	1.0	4.6	3.6	Bypass to 8-H
1-H	H-1	2.42	10.0	R	Sump	-	6.1	6.1	-	16.0	16.0	Bypass from 3-F
2-H	H-2	2.46	5.0	R	Sump	-	1.9	1.9	-	4.7	4.7	Bypass from 4-F
3-H	H-3	3.42	10.0	R	Sump	-	5.2	5.2	-	13.3	13.3	Bypass from 5-F
4-H	H-4	1.95	5.0	R	Sump	-	1.6	1.6	-	4.2	4.2	Bypass from 6-F
5-H	H-5	1.33	10.0	R	On-Grade	0.7	4.0	3.3	3.8	8.9	5.1	Bypass to 11-H
6-H	H-6	2.46	10.0	R	On-Grade	0.6	4.1	3.5	3.6	9.1	5.5	Bypass to 10-H
7-H	H-7	2.03	10.0	R	On-Grade	0.2	3.0	2.8	2.1	6.6	4.5	Bypass to 11-H
8-H	H-8	0.97	10.0	R	On-Grade	-	1.7	1.7	1.1	4.8	3.7	Bypass from 1-G, Bypass to 11-H
9-H	H-9b	0.38	4 X 4	C	Sump		0.6	0.6		1.3	1.3	
10-H	H-10	1.33	5.0	R	Sump	-	3.1	3.1	-	9.1	9.1	Bypass from 6-H
11-H	H-11	3.42	10.0	R	Sump	-	5.9	5.9	-	18.0	18.0	Bypass from 5-H, 7-H, & 8-H
1-I	I-1	3.13	10.0	R	Sump	-	5.6	5.6	-	12.4	12.4	
2-I	I-2	0.59	5.0	R	Sump	-	1.9	1.9	-	3.8	3.8	
3-I	I-3	4.18	10.0	R	Sump	-	7.1	7.1	-	15.6	15.6	
O	O-1, O-2	4.57	10.0	R	Sump	-	6.4	6.4	-	14.8	14.8	0.8 cfs flow bypass from offsite upstream sub-basin

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Table 8.3a Overflow Routing Trails at Aspen Ridge, Filing No. 1	
Inlet	***Overflow Routing Under Inlet Blockage Conditions***
1-A	If this inlet is blocked flows will surcharge the crown of the road and be captured by Inlet 2-A
2-A	Overflow for this inlet will cross the crown of Frontside Drive and enter Inlet 1-C. If both inlets are blocked, overflows will be routed via curb and gutter through the roundabout and down Legacy Hill Drive to Inlet 1-B
1-C	This inlet will overflow across the crown of the road to Inlet 2-C
2-C	Surcharge of this inlet will overflow across the crown of the road to Inlet 1-C. If both inlets are blocked surcharge will flow via curb and gutter to Inlet 3-C on Moose Meadow Street.
3-C	Overflow for this inlet will cross the crown of Moose Meadow Street and enter Inlet 4-C
4-C	Overflows from this inlet will cross the crown of Moose Meadow and enter inlet 3-C. If both inlets are blocked, flows will follow the curb and gutter to the east to Legacy Hill Drive and south to Inlet 1-D
5-C	Blockage of this inlet will cause flows to surcharge the crown of Moose Meadow Street and enter Inlet 6-C
6-C	Overflows from this inlet will cross the crown of Moose Meadow and enter inlet 5-C. If both inlets are blocked, flows will follow the curb and gutter to the east to Legacy Hill Drive and south to Inlet 1-I
7-C	Blockage of this inlet will cause flows to surcharge the crown of Moose Meadow Street and enter Inlet 8-C
8-C	-Blockage of this inlet will cause flows to overflow the crown of Moose Meadow and enter Inlet 7-C. If both inlets &-C and 8-C are blocked, overflow via curb and gutter will be diverted to Beartrack Point and Roundhouse Drive. Eventually these flows will be captured by inlet 1-I. -Future development will likely install inlets near the intersection of Roundhouse Drive and Bird Ridge Drive which will then intercept the flows.
1-E	Blockage of this inlet will cause flows to surcharge the crown of Falling Rock Drive and enter Inlet 2-E.
2-E	Overflows from this inlet will cross the crown of Falling Rock Drive and enter Inlet 1-E. In the case of blockage of both Inlets 1-E and 2-E, flows will be diverted via curb and gutter to Sunday Gulch Drive and eventually be captured by Inlet 7-F.
7-F	Overflows from this inlet will cross the crown of Lookout Court and enter Inlet 8-F.
8-F	Overflows from this inlet will cross the crown of Lookout Court and enter Inlet 7-F. If both 7-F and 8-F are blocked flows will be diverted via Sunday Gulch curb and gutter to Inlet 7-H(on-grade) with any flows in excess of Inlet 7-H capacity flowing onward to Inlet 11-H.
1-H	Blockage of this inlet will cause flows to surcharge the crown of Lazy Ridge Drive and enter Inlet 2-H.

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Table 8.3b Overflow Routing Trails at Aspen Ridge, Filing No. 1	
Inlet	***Overflow Routing Under Inlet Blockage Conditions***
2-H	Overflows from this inlet will cross the crown of Lazy Ridge Drive and enter Inlet 1-H. If Inlets 1-H and 2-H are both blocked, flows will be diverted to the east via Buffalo Horn Drive curb and gutter to Inlet 3-H.
3-H	Blockage of this inlet will cause flows to cross over the crown of Wagon Hammer Drive and enter Inlet 4-H
4-H	Blockage of Inlet 4-H will cause flows to cross the crown of Wagon Hammer Drive and enter Inlet 3-H. If both inlets are blocked the flows will be diverted to the east via curb and gutter on Buffalo Horn Drive to on-grade Inlet 5-H. Flows in excess of the capacity of Inlet 5-H will continue on via curb and gutter to Inlet 11-H.
9-H	Blockage of this inlet will cause flows to be directed east and south via sheet flow to existing swales and then onward via historic drainage patterns.
10-H	Overflow from this inlet will either cross the crown of the Buffalo Horn Drive cul-de-sac or flow via curb and gutter to Inlet 11-H.
11-H	In case of Blockage flows to Inlet 11-H will surcharge the back of curb and be directed via swale north to the East Pond. Deeper flows may be partially diverted east around the pond to the existing swale east of the property.
1-I	Surcharge of this inlet will overflow across the crown of Legacy Hill Drive to Inlet 2-I.
2-I	Blockage of this inlet will cause flows to cross the crown of Legacy Hill Drive and enter Inlet 1-I. If both inlets 1-I and 2-I are blocked flows will be conveyed to the east and south along Legacy Hill Drive and Big Johnson Drive to Inlet 3-I.
3-I	If this inlet is blocked overflow will surcharge the curb and gutter of the Falling Rock Drive cul-de-sac and flow along the maintenance access drive and into the East Pond.
1-O	In case of blockage, flows to this inlet will surcharge the curb and gutter and be directed to the Powers Boulevard ditch via a drainage tract between the two lots immediately west of the inlet.

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C. Storm Sewer Capacities

Storm sewer capacities and HGL's were analyzed in StormCAD. The table below lists relevant pipe information. HGL profiles for the Q5 and Q100 events can be found in Appendix A.

Table 8.4a					
STORM PIPE SUMMARY TABLE					
PIPE LABEL	**PIPE DIA. (IN)**	**PIPE LENGTH (FT)**	**% GRADE**	**Q100 PIPE FLOW (cfs)**	**Velocity (Ft/s)**
PIPE 1	24	168.3	3.4%	26.80	14.0
PIPE 2	24	488.9	2.7%	26.80	12.9
PIPE 3	30	169.4	0.5%	20.62	4.2
PIPE 4	30	33.8	0.5%	19.40	3.6
PIPE 5	30	23.1	0.5%	5.20	1.1
PIPE 6	24	210.3	0.5%	7.48	3.0
PIPE 7	18	37.1	0.5%	8.90	5.0
PIPE 8	18	21.1	0.5%	1.00	0.6
PIPE 9	30	444.0	3.0%	52.34	15.9
PIPE 10	18	13.8	2.0%	4.10	6.8
PIPE 11	30	396.7	3.0%	53.83	16.2
PIPE 12	30	49.9	1.0%	38.04	7.8
PIPE 13	18	30.7	1.0%	18.50	10.9
PIPE 14	18	7.7	1.0%	3.00	4.7
PIPE 15	24	15.8	1.0%	17.47	5.6
PIPE 16	30	101.2	1.0%	21.29	4.4
PIPE 17	24	30.7	1.0%	12.50	4.0
PIPE 18	18	7.7	1.0%	0.60	0.3
PIPE 19	24	25.7	0.9%	9.16	5.2
PIPE 20	42	201.7	3.0%	85.82	18.1
PIPE 21	42	193.4	3.0%	85.59	18.1
PIPE 22	42	184.7	3.0%	85.36	18.1
PIPE 23	24	15.3	1.0%	5.20	5.3
PIPE 24	42	169.7	3.0%	89.61	18.2
PIPE 25	42	172.5	1.4%	89.40	13.5
PIPE 26	30	68.3	0.5%	33.48	3.7
PIPE 27	18	7.6	1.0%	8.70	15.6
PIPE 28	18	30.8	1.0%	11.40	4.3
PIPE 29	48	226.6	1.5%	113.17	14.6
PIPE 30	48	244.1	1.5%	112.76	14.6
PIPE 31	48	211.9	2.5%	112.31	17.7
PIPE 32	48	31.7	2.2%	134.59	17.7
PIPE 33	48	147.4	2.2%	136.31	17.8
PIPE 34	30	39.6	1.2%	35.81	10
PIPE 35	18	29.9	1.0%	16.50	9.3
PIPE 36	18	8.4	1.0%	3.30	1.9
PIPE 37	24	212.9	2.1%	17.31	10.7
PIPE 38	18	210.4	3.0%	17.35	11.7

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Table 8.4b					
STORM PIPE SUMMARY TABLE					
PIPE LABEL	**PIPE DIA. (IN)**	**PIPE LENGTH (FT)**	**% GRADE**	**Q100 PIPE FLOW (cfs)**	**VELOCITY ft/s**
PIPE 39	18	94.1	6.0%	17.48	15.6
PIPE 40	18	38.3	3.0%	14.61	11.4
PIPE 41	18	126.4	4.0%	11.13	12.1
PIPE 42	18	8.4	1.0%	13.10	8.8
PIPE 43	18	30.0	0.5%	4.20	2.6
PIPE 44	24	59.2	1.0%	19.82	6.3
PIPE 45	24	270.0	3.8%	19.73	13.6
PIPE 46	24	54.5	0.5%	17.05	5.4
PIPE 47	18	8.8	0.5%	10.30	7.5
PIPE 48	18	30.4	0.5%	3.60	2.4
PIPE 49	30	503.0	3.2%	36.12	14.8
PIPE 50	24	29.9	0.5%	8.90	1.6
PIPE 51	24	8.4	1.9%	8.60	1.7
PIPE 52	30	361.1	2.3%	44.64	13.7
PIPE 53	24	58.4	1.5%	7.21	2.3
PIPE 54	18	7.7	0.8%	6.40	2.4
PIPE 55	18	30.7	0.9%	3.70	2.0
PIPE 56	30	252.5	2.0%	49.07	13.1
PIPE 57	42	57.2	2.95%	66.27	17.3
PIPE 58	42	108.3	0.6%	82.80	9.3
PIPE 59	42	16.2	0.55%	82.38	8.9
PIPE 60	30	42.1	0.5%	21.46	5.8
PIPE 61	30	93.2	0.5%	13.00	4.8
PIPE 62	30	459.0	0.5%	8.00	2.9
PIPE 63	48	89.0	1.5%	124.51	3.1
PIPE 64	24	118.8	1.0%	15.95	9.7
PIPE 65	18	46.2	1.0%	12.40	11
PIPE 66	18	10.2	1.0%	3.80	7
PIPE 67	48	279.6	1.1%	136.03	2.3
PIPE 68	48	123.1	1.5%	134.95	13
PIPE 69	48	88.3	2.2%	134.35	10.5
PIPE 70	48	90.1	2.1%	134.10	17.8
PIPE 71	48	190.5	2.0%	146.18	17.5
PIPE 72	48	56.1	2.0%	145.58	17.5
PIPE 73	30 x 19	23.2	0.5%	14.00	17.4
PIPE 74	30 x 19	38.6	0.2%	14.00	5.7
PIPE 75	18	154	6.3%	10.00	17.8
PIPE 76	18	16	1.72%	10.00	7.2
BRADLET MEDIAN	14 x 23	153.4	1.0%	1.6	6.5
PIPE 142	48	37	3.5%	67.5 (Undeveloped)	17.7

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D. CDOT Culverts across Powers Boulevard

The west side of the project drains to the Powers Boulevard Ditch. The flows cross Powers Boulevard at a 60-inch culvert adjacent to the West Pond and at a 48-inch culvert near the southwest corner of the site. Flows within these two culverts remain in compliance with CDOT requirements. See Table 8.5 Below:

Table 8.5
Powers Boulevard
Crossroad Culvert Calculations

Sub-Basin	Drainage Area (Acres)	Minor Storm (cfs)	Velocity (ft/s) *Req. min. 3 ft/s*	Major Storm *Proposed* (cfs)	Major Storm *Existing* (cfs)
OS-2	11.44	1.73		11.65	
West Pond Full Buildout Discharge	34.34	0.70		26.20	
Powers Boulevard Right of Way	4.96	7.01		16.40	
60-Inch Culvert	**50.74**	**9.45**	**6.40**	**54.26**	**59.6**
Q1	1.09	1.13		3.79	
Powers R/W and Adjacent Property	4.53	4.69		13.76	
48-Inch Culvert	**5.62**	**5.82**	**5.67**	**17.55**	**24.9**

E. Detention

Summary information for the East Pond is listed below. Supporting UD-Detention spreadsheets for the East Pond can be found in Appendix A and full build out SWMM analysis can be found in ***MDDP-Matrix***. The East and West Ponds will be privately owned and maintained by the Waterview II Metropolitan District.

Table 8.6
Pond Summary Table

Major Basin	Pond ID	Analysis Method	Contributing Basins	Approximate Detention Volumes			EX 5 Year	Proposed 5 Year	EX 100 Year	Proposed 100 Year
				WQCV	EURV	Q100				
				Ac.-Ft.	Ac.-Ft.	Ac.-Ft.	(CFS)	(CFS)	(CFS)	(CFS)
West Fork Jimmy Camp Creek	East Pond	UD-Detention	OS-1, A, B, C, D, E, F, G, J, K, I, H, M	**F1**: 1.472 **FB**: 4.890	3.117 6.581	16.137 18.041	22.3 22.3	**1.2** **5.6**	144.6 144.6	**72.0** **138.2**
Big Johnson Reservoir	West Pond	UD-Detention	O, P	**F1**: 0.06 **FB**: 0.579	0.098 1.924	1.366 4.204	0.7 0.7	0.2 0.7	30.1 30.1	23.9 26.2

Trails at Aspen Ridge, Filing No. 1 = **F1**, Trails at Aspen Ridge, Full Buildout = **FB**

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Emergency Overflows

Table 8.7 Emergency Overflow Weirs		
Major Basin	**Pond ID**	**Description of Emergency Overflow Weir**
Big Johnson	West Pond	Emergency overflows from the West Pond will discharge directly to the Powers Boulevard ditch and continue via historic drainage patterns.
West Fork - Jimmy Camp Creek	East Pond	The emergency overflow weir for this pond will release emergency overflows to a proposed swale along the edge of the development boundary and direct the flows south to an existing swale flowing to the southeast. Flows will then follow historic patterns.
	Future Southwest Commercial Detention	The emergency overflow weir for this future pond will outlet emergency flows to either Frontside Drive or Legacy Hill Drive. Flows will then be conveyed southward via gutter flow to downstream stormwater infrastructure.
	Future Southeast Commercial Detention	The emergency overflow weir for this future pond will outlet emergency flows to either Frontside Drive or Legacy Hill Drive. Flows will then be conveyed southward via gutter flow to downstream stormwater infrastructure.
	Future North Commercial Detention	The emergency overflow weir for this future pond will outlet emergency flows to the Bradley Road Ditch. Flows in excess of the capacity of the Trails at Aspen Ridge storm sewer infrastructure will be conveyed eastward via the road ditch.

Outfall Analysis

East Pond

The outfall for the East Pond has been analyzed to confirm that the receiving swale should remain stable after construction of the pond. Hydraflow Express was utilized to check the velocity of the anticipated Q100 Discharge and calculated a velocity in the 48" outfall pipe of 12.9 feet per second. A second Hydraflow calculation was performed at the narrowest point in the swale receiving the discharge. The results of this calculation indicated that the anticipated velocity of a Q100 discharge from the pond is around 3.7 feet per second which is well below the maximum 100-year velocity and barely above the maximum low flow velocity indicated for erosive soils in Table 12-3 (shown below) of the DCM regarding Hydraulic Design Criteria for natural unlined channels. Additionally, the outfall will discharge to a rip rap lined low tailwater basin designed in accordance with UDFCD criteria.

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Table 12-3. Hydraulic Design Criteria for Natural Unlined Channels

Design Parameter	Erosive Soils or Poor Vegetation	Erosion Resistant Soils and Vegetation
Maximum Low-flow Velocity (ft/sec)	3.5 ft/sec	5.0 ft/sec
Maximum 100-year Velocity (ft/sec)	5.0 ft/sec	7.0 ft/sec
Froude No., Low-flow	0.5	0.7
Froude No., 100-year	0.6	0.8
Maximum Tractive Force, 100-year	0.60 lb/sf	1.0 lb/sf

[1] Velocities, Froude numbers and tractive force values listed are average values for the cross section.
[2] "Erosion resistant" soils are those with 30% or greater clay content. Soils with less than 30% clay content shall be considered "erosive soils."

The Web Soil Survey for the site indicates that the Soils for the receiving swale are are classified as Stoneham sandy loam which is likely an erosive soil.

After receiving the East Pond Discharge, the existing swale will convey the stormwater to an existing detention feature on an adjacent property. According to the West Fork – Jimmy Camp Creek DBPS (See DPBS plan Sheet 6 in Appendix C) this existing detention feature is expected to receive up to 380 cfs for a Q100 event. The tributary drainage area treated by the East Pond makes up approximately 70 percent of the area tributary to the existing offsite pond. As the anticipated discharge from the East Pond is less than half (Filing No. 1: 72 cfs, Full Buildout: 138.2 cfs) the flow listed in the DBPS, the existing detention feature should not be adversely affected.

West Pond

The outfall for the West Pond is located upstream of an existing 60-inch CMP across Powers Boulevard. The predevelopment discharge to this location from the project area is estimated to be 43.2 cfs for the major storm and 6.4 cfs for the minor storm. Under proposed conditions the highest anticipated discharges according to UD-Detention are 26.2 for the major storm and 0.7 for the minor storm. Worst case post development total flows to the Powers Boulevard Ditch is approximately 41.1 cfs which is lower than the predevelopment values and will have an approximate depth of 4 inches in the Powers Boulevard Ditch. This includes the discharge from OS-2 for the major storm of 11.7 cfs (***MDDPA-Matrix***). The receiving 60-inch culvert has been modeled in Hydraflow Express and has a capacity of approximately 291 cfs under channel flow conditions which far exceeds the anticipated flows. The above items indicate that the outfall location is suitable and in compliance with DCM requirements.

SWMM Analysis: West Fork – Jimmy Camp Creek

Please note that the MDDPA-Matrix report analyzed the full buildout of the area tributary to the East Pond using pond inflow hydrographs generated in SWMM and input to UD-Detention because full build out of the basin will include detention ponds for the commercial areas along Bradley Road in series with the East Pond. However, as these commercial areas are not anticipated to be developed prior to Trails at Aspen Ridge Filing No. 1, analysis of the East Pond for this filing

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utilized only the UD-Detention spreadsheet and considered all the upstream areas as undeveloped in order to provide an outlet structure for the East Pond which will conform to detention requirements in the DCM.

Phasing:

East Pond

This development will include construction of the East Pond in compliance with MDDPA-Matrix. The pond will be built to the size required for full development of the upstream basin. (Not including development of the commercial areas. These areas are required to construct full spectrum detention as part of the development.) The orifice plate for the outlet structure will be sized to accommodate only the Filing No. 1 developed flows and will be switched out as necessary to allow future filings to comply with the DCM and ***MDDPA-Matrix*** criteria.

West Pond

A very small portion of Filing No. 1 is designed to drain to the West Pond, however most of the storm sewer to convey storm water to this pond will be constructed in a later filing. To provide treatment and detention for the runoff from this portion of Filing No. 1, a temporary swale will be graded to convey the runoff into the West Pond. The west pond will be constructed to nearly the full volume required for the full buildout. A partial infiltration sand filter will be constructed initially to comply with UDFCD recommendations. The outlet structure for the West Pond will be constructed to the full depth required for full development of the tributary area, but the orifice plate will be sized to accommodate the Filing No. 1 conditions. Future development in the tributary basin will require updating the outlet structure and will modify the pond from a Sand Filter (SF) to an Extended Detention Basin (EDB) to comply with the DCM.

Jurisdictional Dam Determination:

Embankment for both the East Pond and West Pond is below the criteria for a jurisdictional dam. A Non-Jurisdictional Impoundment Structure Application has been completed along with this report and is included in Appendix C and as a separate submittal.

IX. Environmental Evaluations

A. WETLAND IMPACTS

There are no designated wetland or riparian areas on site, and no anticipated impacts.

B. STORMWATER QUALITY

All on-site detention facilities shall be designed to accommodate water quality requirements. As the development of each parcel progresses, the detention guidelines outlined in this report are to be upheld.

Per Chapter 4, Section 4.1, of the El Paso County DCM, Volume 2, the DCM requires a Four Step Process for receiving water protection that focuses on reducing runoff volumes, treating the water quality capture volume (WQCV), stabilizing drainageways, and implementing long-term source controls.

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Step 1: **Employ Runoff Reduction Practices**

- Site specific landscaping will be done on each lot to decrease the connectivity of impervious areas. Grass lined swales will be used where possible to allow ground infiltration.

Step 2: **Stabilize Drainageways.**

- The site is in the Big Johnson Reservoir and West Fork – Jimmy Camp Creek basins. Drainage fees, to be paid by the relevant Trails at Aspen Ridge (Waterview East) developers at the time of platting, will help fund proposed channel improvements. Information on future improvements to the respective channels was unavailable for this report.

Step 3: **Provide Water Quality Capture Volume**

- Each pond, or series of ponds, meets the DCM standards for the release rates of Full Spectrum Detention Ponds for Water Quality Capture Volumes.

Step 4: **Consider Need for Industrial and Commercial BMPs**

- There are no commercial or industrial components of this development, therefore no BMPs of this nature are required. The Full Spectrum Detention BMP is provided for the proposed Development by the East Pond.

C. PERMITTING REQUIREMENTS

No additional permitting requirements are expected at this time.

X. Erosion Control Plan

A grading and erosion control plan (GEC) for Trails at Aspen Ridge Filing No. 1 will be completed. An updated GEC was submitted with the PUD for the full Trails at Aspen Ridge site. The GEC incorporates straw wattles, straw bale check dams, silt fence, vehicle tracking control, inlet & outlet control, sedimentation basins and other best management practices (BMPs) identified in the DCM Volume 2. Please refer to the GEC for phasing and procedural information for adaptations between the Filing No. 1 GEC and the overall GEC.

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XI. Drainage Fees

A. Fee Calculation

Table 11.1
TRAILS AT ASPEN RIDGE FILING NO. 1
Final Drainage Report
2019 Drainage and Bridge Fees

	Impervious Area (ac.)	Fee/ Imp. Acre	Fee Due	Reimbursable Const. Costs	Fee Due at Platting	Drainage Fee Credit
Big Johnson Reservoir						
Drainage Fee	1.340	$18,350.00	$24,590.17	$0.00	$24,590.17	$0.00
Bridge Fee	1.340	$2,370.00	$3,175.95	$0.00	$3,175.95	$0.00
West Fork Jimmy Camp Creek						
Drainage Fee	28.697	$12,564.00	$360,545.12	$0.00	$360,545.12	$0.00
Bridge Fee	28.697	$3,717.00	$106,665.57	$0.00	$106,665.57	$0.00
				$0.00	***$494,976.82***	

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XII. Construction Cost Opinion

Table 12.1 Engineer's Estimate of Probable Construction Costs				
Trails at Aspen Ridge Filing No. 1				
Public Non-Reimbursable				
Item	**Unit**	**Quantity**	**Unit Cost**	**Extension**
18" RCP	LF	909.9	$65.00	$59,143.50
24" RCP	LF	2577.33	$78.00	$201,031.74
30" RCP	LF	2439.42	$97.00	$236,623.74
30" x 19" HERCP	LF	200.9	$97.00	$19,487.30
14" x 23" HERCP	LF	153.4	$65.00	$9,971.00
42" RCP	LF	1104.02	$160.00	$176,643.20
48" RCP	LF	1817.02	$195.00	$354,318.90
TYPE I MANHOLE	EA	16	$11,627.00	$186,032.00
TYPE II MANHOLE	EA	21	$6,395.00	$134,295.00
5' INLET	EA	10	$6,200.40	$62,004.00
10' INLET	EA	21	$7,993.86	$167,871.00
15' INLET	EA	1	$10,633.00	$10,633.00
TYPE C INLET	EA	2	$4,640.00	$9,280.00
14" x 23" Horizontal Elliptical-FES	EA	1	$390.00	$390.00
18" FES	EA	2	$385.00	$770.00
19" x 30" Horizontal Elliptical-FES	EA	1	$582.00	$582.00
24" FES	EA	1	$468.00	$468.00
48" FES	EA	1	$1,500.00	$1,500.00
DETENTION/WQ POND (Private: Waterview II Metro Dist.)	EA	2	$241,795.00	$483,590.00
		Sub Total		$2,114,634.38
		10% Contingency		$211,463.44
		TOTAL:		$2,326,097.82

Since the engineer has no control over the cost of labor, materials, equipment or services furnished by others, or over the contractor's method of determining prices, or over the competitive bidding or market conditions, the opinion of probable construction costs provided herein are made on the basis of the engineer's experience and qualifications and represents the best judgment as an experienced and qualified professional familiar with the construction industry. The engineer cannot, and does not guarantee that proposals, bid or actual construction costs will not vary from either of the opinions of probable cost.

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XIII. References

1. ***El Paso County and City of Colorado Springs Drainage Criteria Manual, Volume 1 & 2***, El Paso County, May 2014
2. ***El Paso County Engineering Criteria Manual,*** El Paso County, Rev. December 2016
3. ***Web Soil Survey of El Paso County Area, Colorado. Unites States Department of Agriculture Soil Conservation Service***.
4. ***Flood Insurance Rate Maps for El Paso County, Colorado and Incorporated Areas, Panel 768 of 1300, Federal Emergency Management Agency***, Effective Date December 7, 2018.
5. ***Urban Storm Drainage Criteria Manual, Vol. 1-3*** by Urban Drainage and Flood Control District (UDFCD), January 2016
6. ***West Fork Jimmy Camp Creek Drainage Basin Planning Study*** by Kiowa Engineering, revised October 2003
7. ***Jimmy Camp Creek Drainage Basin Planning Study, Development of Alternatives & Design of Selected Plan, Report*** by Kiowa Engineering, March 2015
8. **Big Johnson Reservoir/Crews Gulch Drainage Basin Planning Study,** by Kiowa Engineering, September 1991.
9. **"Amendment to Waterview Master Drainage Development Plan"**, completed by Springs Engineering, dated July 2014 *(MDDP-2014)*
10. **"Master Drainage Development Plan Amendment for Waterview East & Preliminary Drainage Plan for Trails at Aspen Ridge",** Completed by Matrix Design Group, Dated September 2019 (MDDPA-Matrix)

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XIV. Appendices

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APPENDIX A

HYDROLOGIC AND HYDRAULIC CALCULATIONS

Project Name:	TRAILS AT ASPEN RIDGE FILING NO. 1
Project Location:	EL PASO COUNTY
Designer	KZ & JTS
Notes:	Existing Condition

Average Channel Velocity	5	ft/s
Average Slope for Initial Flow	0.04	ft/ft

Channel Flow Type Key

Heavy Meadow	2
Tillage/Field	3
Short Pasture and Lawns	4
Nearly Bare Ground	5
Grassed Waterway	6
Paved Areas	7

		Area		Rational 'C' Values								Flow Lengths				Initial Flow		Channel Flow				Tc	Rainfall Intensity & Rational Flow Rate			
				Surface Type 2 (Impervious)			Surface Type 3 (Undeveloped)			Composite																
Major Basin / Sub-basin	**Comments**	sf	acres	C5	C100	Area (SF)	C5	C100	Area	C5	C100	Initial ft	True Initial Length ft	Channel ft	rue Channe Length ft	Average Slope	Initial Tc (min)	Average (%) Slope	Channel Flow Type (See Key above) Ground Type	Velocity (ft/s)	Channel Tc (min)	Total (min)	i5 in/hr	Q5 cfs	i100 in/hr	Q100 cfs
Big Johnson Reservoir / BJR-1	***Offsite for Filing No. 1***	1,739,574.1	39.94	0.90	0.96		0.09	0.36	1,739,574	0.09	0.36	709.00	300.00	2094.00	2503.00	0.052	27.91	3.599	5.000	1.9	22.3	50.2	1.8	**6.4**	3.0	**43.2**
Big Johnson Reservoir / BJR-2	***-Located at south end of study area. -A portion of this area is in Filing No. 1***	385,700.5	8.85	0.90	0.96		0.09	0.36	385,701	0.09	0.36	300.00	300.00	760.00	760.00	0.040	19.84	5.014	5.000	2.2	5.7	25.5	2.7	**2.1**	4.5	**14.3**
West Fork Jimmy Camp Creek / OS - 1	***- The most northwestern portion of this basin (7.268 Acres) outside of the proposed Trails at Aspen Ridge development was rerouted out of the Big Johnson Reservoir basin by CDOT construction of Powers Boulevard and Bradley Road. Future development of the rerouted area will require routing the flows back to the Big Johnson Reservoir to return the area to compliance with the relevant DBPS studies.***	853,953.7	19.60	0.90	0.96	42031.00	0.09	0.36	811,923	0.13	0.39	621.00	300.00	2146.00	2467.00	0.106	19.79	2.470	5.000	1.5	26.5	46.3	1.9	**4.8**	3.1	**24.1**
West Fork Jimmy Camp Creek / WF-1		5,187,332.2	119.08	0.90	0.96		0.09	0.36	5,187,332	0.09	0.36	530.00	300.00	3811.00	4041.00	0.089	20.22	2.940	5.000	1.7	39.5	59.8	1.6	**17.1**	2.7	**115.2**
West Fork Jimmy Camp Creek / WF-2	***Located at south end of study area.***	921,440.7	21.15	0.90	0.96		0.09	0.36	921,441	0.09	0.36	300.00	300.00	1014.00	1014.00	0.080	15.74	6.114	5.000	2.5	6.8	22.6	2.8	**5.4**	4.8	**36.5**
Marksheffel Tributary to Jimmy Camp Creek / MKT-1	***-Offsite for Filing No. 1 -Located at northeast corner of Trails at Aspen Ridge PUD***	314,083.1	7.21	0.90	0.96		0.09	0.36	314,083	0.09	0.36	300.00	300.00	1125.00	1125.00	0.056	17.74	3.000	5.000	1.7	10.8	28.6	2.5	**1.6**	4.2	**10.9**
EXISTING CONDITIONS - DESIGN POINTS	***INCLUDED SUB-BASINS***																									
BJR-1	***BJR-1***	1,739,574.1	39.94	0.90	0.96	0.00	0.09	0.36	1,739,574	0.09	0.36	709.00	300.00	2094.00	2503.00	0.052	27.91	3.599	5.000	1.9	22.3	50.2	1.8	**6.4**	3.0	**43.2**
BJR-2	***BJR-2***	385,700.5	8.85	0.90	0.96		0.09	0.36	385,701	0.09	0.36	300.00	300.00	760.00	760.00	0.040	19.84	5.014	5.000	2.2	5.7	25.5	2.7	**2.1**	4.5	**14.3**
TO BIG JOHNSON RESERVOIR	***BJR-1 & BJR-2 (Basins are parallel so this is a sum of BJR-1 & BJR-2.)***	2,125,274.6	48.79	0.90	0.96	0.00	0.09	0.36	2,125,275	0.09	0.36	709.00	300.00	2854.00	3263.00	0.052	27.91	5.014	5.000					**8.6**		**57.5**
OS-1	***OS-1 (Note: 7.3 Acres diverted by CDOT from Big Johnson)***	853,953.7	19.60	0.90	0.96	42031.00	0.09	0.36	811,923	0.13	0.39	621.00	300.00	2146.00	2467.00	0.106	19.79	2.470	5.000	1.5	26.5	46.3	1.9	**4.8**	3.1	**24.1**
WF-1	***WF-1 & OS-1***	6,041,285.9	138.69	0.90	0.96	42031.00	0.09	0.36	5,999,255	0.10	0.36	621.00	300.00	5957.00	6278.00	0.106	20.49	2.771	5.000	1.6	63.7	84.2	1.3	**16.9**	2.1	**108.1**
WF-2	***WF-2***	921,440.7	21.15	0.90	0.96	0.00	0.09	0.36	921,441	0.09	0.36	300.00	300.00	1014.00	1014.00	0.080	15.74	6.114	5.000	2.5	6.8	22.6	2.8	**5.4**	4.8	**36.5**
TO WEST FORK JIMMY CAMP CREEK	***WF-1, WF-2, & OS-1 (Basins are parallel so this is a sum of WF-1 & WF-2.)***	6,962,726.5	159.84	0.90	0.96	42031.00	0.09	0.36	6,920,696	0.09	0.36		0.00		0.00		#DIV/0!		5.000					**22.3**		**144.6**
MKT-1 TO MARKSHEFFEL TRIBUTARY TO JIMMY CAMP CREEK	***MKT-1***	314,083.1	7.21	0.90	0.96	0.00	0.09	0.36	314,083	0.09	0.36	300.00	300.00	1125.00	1125.00	0.056	17.74	3.000	5.000	1.7	10.8	28.6	2.5	**1.6**	4.2	**10.9**

Note: Q2, Q5 & Q10 are based on C5; Q25, Q50 & Q100 are based on C100

Project Name:	TRAILS AT ASPEN RIDGE FILING NO. 1
Project Location:	EL PASO COUNTY
Designer	KZ & JTS
Notes:	Proposed Condition

Average Channel Velocity 4 ft/s (If specific channel vel is used, this will be ignored)
Average Slope for Initial Flow 0.04 ft/ft (If Elevations are used, this will be ignored)

Channel Flow Type Key
Heavy Meadow 2
Tillage/Field 3
Short Pasture and Lawns 4
Nearly Bare Ground 5
Grassed Waterway 6
Paved Areas 7

	Area		Rational 'C' Values														Flow Lengths				Initial Flow		Channel Flow				Tc	Rainfall Intensity & Rational Flow Rate					
			Surface Type 1 Residential 1/8 or less (65% Imp.)			Surface Type 2 Pavement (100% Imp.)			Surface Type 3 Park (7% Imp.)			Surface Type 4 Undeveloped (2% Imp.)			Composite		Initial	True Initial	Channel	True Channel	Average (decimal)	Initial	Average (%)	Channel Flow Type (See Key above)	Velocity	Channel	Total	i2	Q2	i5	Q5	i100	Q100
Basin	sf	acres	C5	C100	Area (SF)	C5	C100	Area (SF)	C5	C100	Area	C5	C100	Area	C5	C100	ft	Length ft	ft	Length ft	Slope	Tc (min)	Slope	Ground Type	(ft/s)	Tc (min)	(min)	in/hr	cfs	in/hr	cfs	in/hr	cfs
OS-1	857,033	19.67	0.45	0.59		0.90	0.96		0.12	0.39		0.09	0.36	857033	0.09	0.36	780.00	300.00	300.00	780.00	0.10	23.57	1.40	5	1.2	11.0	34.6	1.8	3.2	2.2	**3.98**	3.7	**26.77**
A-1	537,354	12.34	0.45	0.59		0.90	0.96	47144	0.12	0.39		0.09	0.36	490210	0.16	0.41	861.00	300.00	869.00	1430.00	0.09	24.30	1.10	7	2.1	11.4	35.7	1.7	3.5	2.2	**4.39**	3.7	**18.88**
A-2	47,525	1.09	0.45	0.59	22315	0.90	0.96	25,211	0.12	0.39		0.09	0.36		0.69	0.79	116.00	116.00	819.00	819.00	0.01	7.50	1.10	7	2.1	6.5	14.0	2.8	2.1	3.6	**2.70**	6.0	**5.19**
A-3	216,948	4.98	0.45	0.59		0.90	0.96	22990	0.12	0.39		0.09	0.36	193958	0.18	0.42	441.00	300.00	562.00	703.00	0.04	22.01	1.00	7	2.0	5.9	27.9	2.0	1.8	2.5	**2.23**	4.2	**9.02**
A-4	5,198	0.12	0.45	0.59		0.90	0.96	5,198	0.12	0.39		0.09	0.36		0.90	0.96	0.00	0.00	132.00	132.00	0.01	0.00	1.00	7	2.0	1.1	5.0	4.0	0.4	5.1	**0.55**	8.6	**0.99**
B-1	46,101	1.06	0.45	0.59	46101	0.90	0.96		0.12	0.39		0.09	0.36		0.45	0.59	185.00	185.00	400.00	400.00	0.04	10.03	3.40	7	3.7	1.8	11.8	3.0	1.5	3.8	**1.84**	6.4	**4.06**
C-1	142,658	3.27	0.45	0.59	142658	0.90	0.96		0.12	0.39		0.09	0.36		0.45	0.59	192.00	192.00	519.00	519.00	0.06	8.92	4.20	7	4.1	2.1	11.0	3.1	4.7	3.9	**5.87**	6.6	**12.92**
C-2	51,819	1.19	0.45	0.59	51819	0.90	0.96		0.12	0.39		0.09	0.36		0.45	0.59	74.00	74.00	519.00	519.00	0.05	5.89	4.80	7	4.4	2.0	7.9	3.5	1.9	4.5	**2.41**	7.5	**5.32**
C-3	200,322	4.60	0.45	0.59	200322	0.90	0.96		0.12	0.39		0.09	0.36		0.45	0.59	162.00	162.00	710.00	710.00	0.09	7.16	3.25	7	3.6	3.3	10.5	3.2	6.7	4.0	**8.41**	6.8	**18.53**
C-4	15,505	0.36	0.45	0.59		0.90	0.96	15505	0.12	0.39		0.09	0.36		0.90	0.96	0.00	0.00	630.00	630.00	0.01	0.00	5.00	7	4.5	2.3	5.0	4.0	1.3	5.1	**1.65**	8.6	**2.95**
C-5	136,286	3.13	0.45	0.59	136286	0.90	0.96		0.12	0.39		0.09	0.36		0.45	0.59	95.00	95.00	822.00	822.00	0.04	7.18	3.80	7	3.9	3.5	10.7	3.2	4.5	4.0	**5.67**	6.7	**12.50**
C-6	3,110	0.07	0.45	0.59		0.90	0.96	3110	0.12	0.39		0.09	0.36		0.90	0.96	0.00	0.00	100.00	100.00	0.01	0.00	1.90	7	2.8	0.6	5.0	4.0	0.3	5.1	**0.33**	8.6	**0.59**
C-7	95,674	2.20	0.45	0.59	95674	0.90	0.96		0.12	0.39		0.09	0.36		0.45	0.59	110.00	110.00	800.00	800.00	0.05	7.33	3.90	7	3.9	3.4	10.7	3.2	3.2	4.0	**3.98**	6.7	**8.77**
C-8	2,419	0.06	0.45	0.59		0.90	0.96	2419	0.12	0.39		0.09	0.36		0.90	0.96	0.00	0.00	88.00	88.00	0.01	0.00	1.90	7	2.8	0.5	5.0	4.0	0.2	5.1	**0.26**	8.6	**0.46**
D-1	96,065	2.21	0.45	0.59		0.90	0.96	14,978	0.12	0.39	81087	0.09	0.36		0.24	0.48	473.00	300.00	555.00	728.00	0.06	18.49	4.00	7	4.0	3.0	21.5	2.3	1.2	2.9	**1.56**	4.9	**5.19**
E-1	280,195	6.43	0.45	0.59	47833	0.90	0.96	30357	0.12	0.39	202005	0.09	0.36		0.26	0.49	859.00	300.00	1450.00	2009.00	0.06	24.50	4.02	7	4.0	8.4	32.9	1.8	3.1	2.3	**3.89**	3.9	**12.16**
E-2	93,093	2.14	0.45	0.59	93093	0.90	0.96		0.12	0.39		0.09	0.36		0.45	0.59	193.00	193.00	503.00	503.00	0.08	8.13	3.90	7	3.9	2.1	10.2	3.2	3.1	4.1	**3.94**	6.8	**8.68**
F-1	64,835	1.49	0.45	0.59	64835	0.90	0.96		0.12	0.39		0.09	0.36		0.45	0.59	180.00	180.00	630.00	630.00	0.09	7.55	3.00	7	3.5	3.0	10.6	3.2	2.2	4.0	**2.71**	6.7	**5.97**
F-2	25,293	0.58	0.45	0.59	25293	0.90	0.96		0.12	0.39		0.09	0.36		0.45	0.59	60.00	60.00	354.00	354.00	0.04	5.71	0.70	7	1.7	3.5	9.2	3.4	0.9	4.2	**1.11**	7.1	**2.45**
F-3	54,388	1.25	0.45	0.59	54388	0.90	0.96		0.12	0.39		0.09	0.36		0.45	0.59	180.00	180.00	322.00	322.00	0.09	7.55	0.70	7	1.7	3.2	10.8	3.2	1.8	4.0	**2.26**	6.7	**4.98**
F-4	25,110	0.58	0.45	0.59	25110	0.90	0.96		0.12	0.39		0.09	0.36		0.45	0.59	60.00	60.00	322.00	322.00	0.04	5.71	0.70	7	1.7	3.2	8.9	3.4	0.9	4.3	**1.12**	7.2	**2.47**
F-5	98,690	2.27	0.45	0.59	98690	0.90	0.96		0.12	0.39		0.09	0.36		0.45	0.59	187.00	187.00	550.00	550.00	0.04	10.08	0.80	7	1.8	5.1	15.2	2.7	2.8	3.4	**3.54**	5.8	**7.79**
F-6	43,725	1.00	0.45	0.59	43725	0.90	0.96		0.12	0.39		0.09	0.36		0.45	0.59	68.00	68.00	550.00	550.00	0.03	6.69	0.80	7	1.8	5.1	11.8	3.0	1.4	3.8	**1.75**	6.5	**3.85**
F-7	220,319	5.06	0.45	0.59	220319	0.90	0.96		0.12	0.39		0.09	0.36		0.45	0.59	332.00	300.00	868.00	900.00	0.05	12.47	2.75	7	3.3	4.6	17.0	2.6	5.9	3.3	**7.49**	5.5	**16.49**
F-8	36,790	0.84	0.45	0.59	36790	0.90	0.96		0.12	0.39		0.09	0.36		0.45	0.59	137.00	137.00	297.00	297.00	0.03	9.50	3.00	7	3.5	1.4	10.9	3.1	1.2	4.0	**1.52**	6.7	**3.35**
G-1	48,375	1.11	0.45	0.59	48375	0.90	0.96		0.12	0.39		0.09	0.36		0.45	0.59	80.00	80.00	667.00	667.00	0.05	6.12	2.45	7	3.1	3.6	9.7	3.3	1.7	4.1	**2.09**	7.0	**4.60**
H-1	156,776	3.60	0.45	0.59	156776	0.90	0.96		0.12	0.39		0.09	0.36		0.45	0.59	180.00	180.00	667.00	667.00	0.05	9.18	0.80	7	1.8	6.2	15.4	2.7	4.4	3.4	**5.59**	5.7	**12.30**
H-2	50,742	1.16	0.45	0.59	50742	0.90	0.96		0.12	0.39		0.09	0.36		0.45	0.59	84.00	84.00	667.00	667.00	0.03	7.44	0.80	7	1.8	6.2	13.6	2.9	1.5	3.6	**1.91**	6.1	**4.20**
H-3	129,347	2.97	0.45	0.59	129347	0.90	0.96		0.12	0.39		0.09	0.36		0.45	0.59	192.00	192.00	517.00	517.00	0.04	10.21	0.80	7	1.8	4.8	15.0	2.7	3.7	3.5	**4.66**	5.8	**10.27**
H-4	39,883	0.92	0.45	0.59	39883	0.90	0.96		0.12	0.39		0.09	0.36		0.45	0.59	57.00	57.00	517.00	517.00	0.03	6.12	0.80	7	1.8	4.8	10.9	3.1	1.3	4.0	**1.65**	6.7	**3.62**
H-5	105,275	2.42	0.45	0.59	105275	0.90	0.96		0.12	0.39		0.09	0.36		0.45	0.59	175.00	175.00	493.00	493.00	0.03	10.73	2.83	7	3.3	2.5	13.2	2.9	3.2	3.7	**4.02**	6.2	**8.85**
H-6	107,181	2.46	0.45	0.59	107181	0.90	0.96		0.12	0.39		0.09	0.36		0.45	0.59	156.00	156.00	1028.00	1028.00	0.05	8.55	3.75	7	3.8	4.5	13.0	2.9	3.3	3.7	**4.12**	6.2	**9.07**
H-7	88,272	2.03	0.45	0.59	88272	0.90	0.96		0.12	0.39		0.09	0.36		0.45	0.59	258.00	258.00	506.00	506.00	0.03	13.03	1.20	7	2.2	3.8	16.9	2.6	2.4	3.3	**3.01**	5.5	**6.64**
H-8	42,304	0.97	0.45	0.59	42304	0.90	0.96		0.12	0.39		0.09	0.36		0.45	0.59	60.50	60.50	506.00	506.00	0.02	7.22	1.20	7	2.2	3.8	11.1	3.1	1.4	3.9	**1.74**	6.6	**3.83**
H-9a	84,792	1.95	0.45	0.59	64592	0.90	0.96		0.12	0.39	20200	0.09	0.36		0.37	0.54	246.00	246.00	649.00	649.00	0.05	12.28	1.90	6	2.1	5.2	17.5	2.6	1.9	3.2	**2.35**	5.4	**5.76**
H-9b	16,350	0.38	0.45	0.59	12615	0.90	0.96		0.12	0.39	3735	0.09	0.36		0.37	0.54	129.00	129.00	137.00	137.00	0.03	10.06	1.10	6	1.6	1.5	11.5	3.1	0.4	3.9	**0.55**	6.5	**1.34**
H-10	57,758	1.33	0.45	0.59	57758	0.90	0.96		0.12	0.39		0.09	0.36		0.45	0.59	60.00	60.00	640.00	640.00	0.03	6.28	2.20	7	3.0	3.6	9.9	3.3	2.0	4.1	**2.48**	6.9	**5.46**
H-11	148,966	3.42	0.45	0.59	148966	0.90	0.96		0.12	0.39		0.09	0.36		0.45	0.59	237.00	237.00	864.00	864.00	0.03	12.49	2.00	7	2.8	5.1	17.6	2.5	4.0	3.2	**4.99**	5.4	**10.98**
I-1	136,188	3.13	0.45	0.59	136188	0.90	0.96		0.12	0.39		0.09	0.36		0.45	0.59	120.00	120.00	1104.00	1104.00	0.09	6.28	3.80	7	3.9	4.7	11.0	3.1	4.4	4.0	**5.61**	6.6	**12.35**
I-2	25,770	0.59	0.45	0.59		0.90	0.96	18039	0.12	0.39	7731	0.09	0.36		0.67	0.79	43.00	43.00	352.00	352.00	0.02	4.07	2.00	7	2.8	2.1	6.1	3.8	1.5	4.8	**1.92**	8.1	**3.82**
I-3	182,282	4.18	0.45	0.59	182282	0.90	0.96		0.12	0.39		0.09	0.36		0.45	0.59	153.00	153.00	718.00	718.00	0.04	9.12	2.80	7	3.3	3.6	12.7	3.0	5.6	3.7	**7.07**	6.3	**15.58**
K-OS (Fully Developed)	1,643,891	37.74	0.45	0.59	1485029	0.90	0.96	158862	0.12	0.39	0	0.09	0.36	0	0.49	0.63	266.00	266.00	2409.00	2409.00	0.09	8.56	3.39	5	1.8	22.1	30.7	1.9	35.6	2.4	**44.91**	4.0	**95.67**
K-OS (Undeveloped)	2,036,719	46.76	0.45	0.59		0.90	0.96		0.12	0.39		0.09	0.36	2036719	0.09	0.36	327.00	300.00	1470.00	1497.00	0.06	17.69	3.40	5	1.8	13.5	31.2	1.9	8.0	2.4	**10.04**	4.0	**67.50**
M	447,971	10.28	0.45	0.59	115721	0.90	0.96		0.12	0.39	332250	0.09	0.36		0.21	0.44	437.00	300.00	10.00	147.00	0.06	18.53	1.00	6	1.5	1.6	20.2	2.4	5.1	3.0	**6.39**	5.0	**23.09**
N (Future)	602,572	13.83	0.45	0.59		0.90	0.96		0.12	0.39		0.09	0.36	602572	0.09	0.36	150.00	150.00	1229.00	1229.00	0.03	15.44	2.50	5	1.6	13.0	28.4	2.0	2.5	2.5	**3.14**	4.2	**21.08**
O-1 (Filing No. 1)	70,850	1.63	0.45	0.59	70850	0.90	0.96		0.12	0.39		0.09	0.36		0.45	0.59	138.00	138.00	457.00	457.00	0.03	9.24	1.00	7	2.0	3.8	13.0	2.9	2.2	3.7	**2.72**	6.2	**5.99**
O-2 (Future)	129,552	2.97	0.45	0.59	129552	0.90	0.96		0.12	0.39		0.09	0.36		0.45	0.59	331.00	300.00	515.00	546.00	0.03	15.60	0.75	7	1.7	5.4	21.0	2.3	3.1	2.9	**3.96**	4.9	**8.73**
O-2a (Future)	49,413	1.13	0.45	0.59	49413	0.90	0.96		0.12	0.39		0.09	0.36		0.45	0.59	71.00	71.00	719.00	719.00	0.03	7.22	0.75	7	1.7	7.2	14.4	2.8	1.4	3.5	**1.82**	5.9	**4.00**
O-2b (Future)	24,683	0.57	0.45	0.59	24683	0.90	0.96		0.12	0.39		0.09	0.36		0.45	0.59	71.00	71.00	1269.00	1269.00	0.03	7.22	0.75	7	1.7	12.6	19.9	2.4	0.6	3.0	**0.78**	5.1	**1.71**
O-2c (Future)	45,777	1.05	0.45	0.59	45777	0.90	0.96		0.12	0.39		0.09	0.36		0.45	0.59	328.00	300.00	1270.00	1298.00	0.02	17.75	0.70	7	1.7	12.9	30.7	1.9	0.9	2.4	**1.14**	4.0	**2.51**
O-2d (Future)	26,083	0.60	0.45	0.59	26083	0.90	0.96		0.12	0.39		0.09	0.36		0.45	0.59	70.00	70.00	278.00	278.00	0.02	8.20	1.00	7	2.0	2.3	10.5	3.2	0.9	4.0	**1.09**	6.8	**2.41**
O-2e (Future)	22,115	0.51	0.45	0.59	22115	0.90	0.96		0.12	0.39		0.09	0.36		0.45	0.59	138.00	138.00	182.00	182.00	0.01	16.30	1.00	7	2.0	1.5	17.8	2.5	0.6	3.2	**0.74**	5.4	**1.62**
O-2f (Future)	28,444	0.65	0.45	0.59	28444	0.90	0.96		0.12	0.39		0.09	0.36		0.45	0.59	189.00	189.00	240.00	240.00	0.03	10.80	2.40	7	3.1	1.3	12.1	3.0	0.9	3.8	**1.13**	6.4	**2.48**
O-2g (Future)	88,754	2.04	0.45	0.59	88754	0.90	0.96		0.12	0.39		0.09	0.36		0.45	0.59	75.00	75.00	1038.00	1038.00	0.01	12.01	1.00	7	2.0	8.7	20.7	2.4	2.2	3.0	**2.74**	5.0	**6.04**
P (Future)	349,063	8.01	0.45	0.59		0.90	0.96		0.12	0.39		0.09	0.36	349063	0.09	0.36	560.00	300.00	378.00	638.00	0.06	23.68	2.00	5	1.4	7.5	31.2	1.9	1.4	2.4	**1.72**	4.0	**11.57**
Q-1	47,333	1.09	0.45	0.59	15530	0.90	0.96		0.12	0.39	31803	0.09	0.36		0.23	0.46	122.00	122.00	216.00	216.00	0.17	6.71	3.95	7	3.9	0.9	7.6	3.6	0.9	4.5	**1.13**	7.6	**3.79**
Q-2	59,056	1.36	0.45	0.59		0.90	0.96		0.12	0.39		0.09	0.36	59056	0.09	0.36	100.00	100.00	375.00	375.00	0.00	39.17	6.00	5	2.4	2.6	41.7	1.6	0.2	2.0	**0.25**	3.3	**1.65**
R-1	81,300	1.87	0.45	0.59	29098	0.90	0.96		0.12	0.39	52202	0.09	0.36		0.24	0.46	21.00	21.00	220.00	220.00	0.33	2.22	10.00	5	3.2	1.2	5.0	4.0	1.8	5.1	**2.29**	8.6	**7.45**
OS-1	857,033	19.67	0.45	0.59	0	0.90	0.96	0	0.12	0.39	0	0.09	0.36	857033	0.09	0.36	258.00	258.00	1357.00	1357.00	0.03	20.84	1.81	7	2.7	8.4	29.3	1.9	3.5	2.5	**4.38**	4.1	**29.46**
OS-2	498,467	11.44	0.45	0.59	0	0.90	0.96	0	0.12	0.39	0	0.09	0.36	498467	0.09	0.36	971.00	300.00	1411.00	2082.00	0.04	34.50	2.83	5	1.7	20.7	55.2	1.3	1.4	1.7	**1.73**	2.8	**11.65**
Bradley Road Median Culvert	13,596	0.31	0.45	0.59		0.90	0.96	10090	0.12	0.39	3506	0.09	0.36		0.70	0.81	257.00	257.00	166.00	166.00	0.02	9.99	2.41	4	1.1	2.6	12.5	3.0	0.7	3.7	**0.82**	6.3	**1.61**
Future Blackmer Street Culvert Filing No. 1 Conditions	195,382	4.49	0.45	0.59		0.90	0.96	43,024	0.12	0.39	152358	0.09	0.36		0.29	0.52	99.00	99.00	1136.00	1136.00	0.02	11.45	2.99	4	1.2	15.9	27.3	2.0	2.7	2.6	**3.37**	4.3	**10.00**
Future Blackmer Street Culvert TAR Fully developed conditions	122,416	2.81	0.45	0.59		0.90	0.96	43024	0.12	0.39	79392	0.09	0.36		0.39	0.59	99.00	99.00	1136.00	1136.00	0.02	10.00	2.99	4	1.2	15.9	25.9	2.1	2.3	2.6	**2.94**	4.4	**7.39**

Note: Q2, Q5 & Q10 are based on C5; Q25, Q50 & Q100 are based on C100

Design Point Routing						
StormCAD						
Design Point	Total Drainage Area	Surface		Storm Sewer		Downstream Design Point
		Q5	Q100	Q5	Q100	
1-OS	**19.67**	4.0	26.8	-	-	A
1-A	**12.34**	3.5	17.6	-	-	A
2-A	**1.09**	2.7	5.2	-	-	A
3-A	**4.98**	2.2	8.9	-	-	A
4-A	**0.12**	0.6	1.0	-	-	A
A	**38.20**	-	-	12.0	55.6	B
1-B	**1.06**	1.8	4.1	-	-	B
B	**39.26**	-	-	12.7	57.1	C
1-C	**3.27**	5.9	12.9	-	-	C
2-C	**1.19**	2.4	5.3	-	-	C
3-C	**4.60**	8.4	18.5	-	-	C
4-C	**0.36**	1.6	3.0	-	-	C
5-C	**3.13**	5.7	12.5	-	-	C
6-C	**0.07**	0.3	0.6	-	-	C
7-C	**2.20**	4.0	8.8	-	-	C
8-C	**0.06**	0.3	0.5	-	-	C
C	**54.13**	-	-	27.6	90.2	D
1-D	**2.21**	1.6	5.2	-	-	D
D	**56.34**	0.0	0.0	28.1	92.1	E
1-E	**6.43**	2.6	11.4	-	-	E
2-E	**2.14**	3.9	8.7	-	-	E
E	**64.91**	-	-	33.7	108.8	F
1-F	**2.07**	2.7	6.0	2.7	6.0	3-F
2-F	**0.58**	1.1	2.5	1.6	3.6	3-F
3-F	**3.32**	2.3	5.0	3.8	8.4	4-F
4-F	**3.89**	1.1	2.5	5.0	11.1	5-F
5-F	**6.16**	3.5	7.8	6.6	14.6	6-F
6-F	**7.16**	1.7	3.9	7.9	17.5	8-F
7-F	**5.06**	7.5	16.5	7.5	16.5	8-F
8-F	**13.07**	1.5	3.3	16.2	35.8	F
F	**77.97**	-	-	43.5	131.0	G
1-G	**1.11**	2.1	4.6	-	-	G
G	**79.08**	-	-	44.2	132.7	M
1-H	**3.60**	5.9	13.1	-	-	1-2 H
2-H	**1.16**	1.9	4.2	-	-	1-2 H
1-2 H	**4.76**	-	-	9.0	19.8	1-4 H
3-H	**2.97**	4.7	10.3	-	-	1-4 H
4-H	**0.92**	1.6	3.6	-	-	1-4 H
1-4 H	**8.65**	-	-	16.4	36.1	1-6 H
5-H	**2.42**	4.0	8.9	-	-	1-6 H
6-H	**2.46**	3.9	8.6	-	-	1-6 H
1-6 H	**13.53**	-	-	20.2	44.9	1-8 H
7-H	**2.03**	2.9	6.4	-	-	1-8 H
8-H	**0.97**	1.7	3.7	-	-	1-8 H
1-8 H	**16.52**	-	-	23.3	49.3	1-10 H
9a-H	**1.95**	2.3	5.7	-	-	
9b-H	**0.38**	0.6	1.4	2.8	6.5	10-H
10-H	**1.33**	2.4	5.2	-	-	1-10 H
1-10 H	**20.17**	-	-	29.6	66.5	11-H
11-H	**3.42**	5.0	11.0	-	-	H
H	**23.59**			37.4	83.0	M
1-I	**3.13**	5.6	12.4	-	-	K
2-I	**0.59**	1.9	3.8	-	-	K
K-OS	**37.74**			57.3	122.1	K
K	**41.46**	-	-	62.2	133.3	3-I
3-I	**4.18**	7.8	17.2	7.8	17.2	M
I	**45.64**	-	-	66.5	143.4	M
M	**195.07**	-	-	**158.2**	**426.5**	East Pond Discharge
East Pond Discharge SWMM Discharge (MDDPA-Matrix)	**195.07**	-	-	21.1	127.4	Existing Swale
R Rational Method	**1.09**	-	-	1.1	3.7	Existing Swale
O	**11.91**	-	-	6.4	14.0	P
P	**34.69**	13.4	47.6	-	-	P2
P2	**34.69**	-	-	0.2	23.9	Powers Boulvard Ditch
QRational Method	**2.04**	1.1	3.8	-	-	Powers Boulvard Ditch
BR1	**0.31**	-	-	0.8	1.6	Bradley Road Ditch
BR2	**4.49**	-	-	3.4	10	Bradley Road Ditch

StormCad Basins Layout-Trails at Aspen Ridge Filing No. 1

INLET OS-1
BRADLEY RD MEDIAN CULVERT
FES 11
BRADLEY RD TYPE C INLET
PIPE - 1 (STM-JC)
MH - 1 (STM-JC)

FES-12
PIPE 75
MH-47
PIPE 76
FES-13
OS-1
MH - 1
PIPE - 2
INLET 3-A
MH - 4
PIPE - 6
INLET 1-A
PIPE - 3
MH - 2
INLET 4-A
MH - 3
INLET 2-A
PIPE - 9
INLET B-1
MH - 5
PIPE - 10
PIPE - 11
INLET 5-C
INLET 3-C
MH - 8
INLET 6-C
MH - 6
INLET 4-C
MH - 9
PIPE - 14
PIPE - 20
PIPE - 21
MH - 10
MH - 11
INLET 1-D
MH - 12
INLET 1-I
MH - 30
MH - 31
PIPE - 64
INLET 2-I
PIPE - 63

StormCad Layout-Trails at Aspen Ridge Filing No. 1

Q5 HGLs

ID\Label		144 \ PIPE - 9 (STM-JC)	142 \ PIPE - 2 (STM-JC)	141 \ PIPE - 1 (STM-JC)
Link Length (ft)		444.2	489.1	168.4
Rise (in)\Material		30.0 \ RCP	24.0 \ RCP	24.0 \ RCP
Flow (cfs)		12.02	3.94	3.97
Slope (ft/ft)		0.030	0.027	0.034
ID\Label	50 \ MH - 5 (STM-JC)	40 \ MH - 2 (STM-JC)	39 \ MH - 1 (STM-JC)	346 \ OS-1
Ground (ft)	5900.44	5913.93	5924.34	5926.60
Invert (ft)	5889.10	5903.42	5917.61	5924.26
Station (ft)	0.0	444.2	933.3	1101.7

ID\Label	146 \ PIPE - 5 (STM-JC)	147 \ PIPE - 4 (STM-JC)
Link Length (ft)	23.1	33.8
Rise (in)\Material	30.0 \ RCP	30.0 \ RCP
Flow (cfs)	2.72	4.38
Slope (ft/ft)	0.005	0.005

ID\Label	41 \ INLET 2-A (STM-JC)	42 \ MH - 3 (STM-JC)	46 \ INLET 1-A (STM-JC)
Ground (ft)	5911.72	5911.52	5911.03
Invert (ft)	5904.87	5904.76	5904.76
Station (ft)	0.0	23.1	56.8

ID\Label		149 \ PIPE - 8 (STM-JC)	148 \ PIPE - 7 (STM-JC)
Link Length (ft)		21.1	37.1
Rise (in)\Material		18.0 \ RCP	18.0 \ RCP
Flow (cfs)		0.56	2.24
Slope (ft/ft)		0.005	0.005
ID\Label	44 \ INLET 4-A (STM-JC)	45 \ MH - 4 (STM-JC)	319 \ INLET 3-A
Ground (ft)	5911.38	5911.37	5911.46
Invert (ft)	5906.37	5905.96	5906.45
Station (ft)	0.0	21.1	58.2

ID\Label		145 \ PIPE - 6 (STM-JC)	143 \ PIPE - 3 (STM-JC)
Link Length (ft)		210.4	169.4
Size (in)\Material		24.0 \ RCP	30.0 \ RCP
Flow (cfs)		2.51	6.03
Slope (ft/ft)		0.007	0.005
ID\Label	45 \ MH - 4 (STM-JC)	40 \ MH - 2 (STM-JC)	42 \ MH - 3 (STM-JC)
Ground (ft)	5911.37	5913.93	5911.52
Invert (ft)	5905.96	5903.42	5904.76
Station (ft)	0.0	210.4	379.7

Inlet 1-B to DPB - 5-yr
Label: MH - 5 (STM-JC)
Type: Manhole
ID: 50
Label: INLET 1-B (STM-JC)
Type: Catch Basin
ID: 298
Label: PIPE - 10 (STM-JC)
Type: Conduit
ID: 152
EGL
HGL
Elevation (ft)
ID\Label
152 \ PIPE - 10 (STM-JC)
Link Length (ft)
13.8
Rise (in)\Material
18.0 \ RCP
Flow (cfs)
1.52
Slope (ft/ft)
0.020
ID\Label
50 \ MH - 5 (STM-JC)
298 \ INLET 1-B (STM-JC)
Ground (ft)
5900.44
5900.61
Invert (ft)
5889.10
5891.38
Station (ft)
0.0
13.8

ID\Label	153 \ PIPE - 11 (STM-JC)	162 \ PIPE - 20 (STM-JC)	168 \ PIPE - 21 (STM-JC)	176 \ PIPE - 22 (STM-JC)	183 \ PIPE - 24 (STM-JC)	190 \ PIPE - 25 (STM-JC)
Link Length (ft)	396.9	201.8	193.5	184.8	169.7	172.5
Rise (in)\Material	30.0 \ RCP	42.0 \ RCP	42.0 \ RCP	42.0 \ RCP	42.0 \ RCP	42.0 \ RCP
Flow (cfs)	12.74	27.61	27.50	27.39	28.07	27.98
Slope (ft/ft)	0.030	0.030	0.030	0.030	0.030	0.014

ID\Label	50 \ MH - 5 (STM-JC)	60 \ MH - 6 (STM-JC)	67 \ MH - 9 (STM-JC)	77 \ MH - 10 (STM-JC)	84 \ MH - 11 (STM-JC)	91 \ MH - 12 (STM-JC)	93 \ MH - 13 (STM-JC)
Ground (ft)	5900.44	5886.64	5879.66	5872.12	5864.86	5858.79	5856.09
Invert (ft)	5889.10	5876.19	5869.14	5862.34	5855.79	5849.70	5846.72
Station (ft)	0.0	396.9	598.7	792.1	977.0	1146.7	1319.2

ID\Label	159 \ PIPE - 14 (STM-JC)	158 \ PIPE - 13 (STM-JC)	
Link Length (ft)	7.7	30.7	
Rise (in)\Material	18.0 \ RCP	18.0 \ RCP	
Flow (cfs)	1.67	8.75	
Slope (ft/ft)	0.010	0.010	
ID\Label	57 \ INLET 4-C (STM-JC)	59 \ MH - 7 (STM-JC)	299 \ INLET 3-C (STM-JC)
Ground (ft)	5886.94	5886.64	5886.98
Invert (ft)	5878.77	5877.69	5879.00
Station (ft)	0.0	7.7	38.3

ID\Label	160 \ PIPE - 18 (STM-JC)	164 \ PIPE - 17 (STM-JC)	
Link Length (ft)	7.7	30.7	
Rise (in)\Material	18.0 \ RCP	24.0 \ RCP	
Flow (cfs)	0.32	5.68	
Slope (ft/ft)	0.010	0.010	
ID\Label	58 \ INLET 6-C (STM-JC)	64 \ MH - 8 (STM-JC)	61 \ INLET 5-C (STM-JC)
Ground (ft)	5886.72	5886.35	5886.57
Invert (ft)	5879.28	5878.20	5879.01
Station (ft)	0.0	7.7	38.3

ID\Label		161 \ PIPE - 12 (STM-JC)	163 \ PIPE - 16 (STM-JC)
Link Length (ft)		49.9	101.2
Rise (in)\Material		30.0 \ RCP	30.0 \ RCP
Flow (cfs)		17.56	9.89
Slope (ft/ft)		0.010	0.010
ID\Label	59 \ MH - 7 (STM-JC)	60 \ MH - 6 (STM-JC)	64 \ MH - 8 (STM-JC)
Ground (ft)	5886.64	5886.64	5886.35
Invert (ft)	5877.69	5876.19	5878.20
Station (ft)	0.0	49.9	151.1

ID\Label	182 \ PIPE - 23 (STM-JC)	
Link Length (ft)	15.3	
Rise (in)\Material	24.0 \ RCP	
Flow (cfs)	1.08	
Slope (ft/ft)	0.010	
ID\Label	84 \ MH - 11 (STM-JC)	300 \ INLET 1-D (STM-JC)
Ground (ft)	5864.86	5865.13
Invert (ft)	5855.79	5858.44
Station (ft)	0.0	15.3

ID\Label	194 \ PIPE - 27 (STM-JC)	195 \ PIPE - 28 (STM-JC)	
Link Length (ft)	7.6	30.8	
ise (in)\Material	24.0 \ RCP	24.0 \ RCP	
Flow (cfs)	3.94	4.25	
Slope (ft/ft)	0.010	0.010	
ID\Label	94 \ INLET 2-E (STM-JC)	96 \ MH - 14	301 \ INLET 1-E (STM-JC)
Ground (ft)	5855.48	5855.11	5855.47
Invert (ft)	5849.73	5848.65	5849.96
Station (ft)	0.0	7.6	38.3

DPE West Lat - 5-yr
Label: MH - 14
Type: Manhole
ID: 96
Label: MH - 13 (STM-JC)
Type: Manhole
ID: 93
Label: PIPE - 26 (STM-JC)
Type: Conduit
ID: 192
EGL
HGL
Elevation (ft)
ID\Label
192 \ PIPE - 26 (STM-JC)
Link Length (ft)
68.3
Rise (in)\Material
30.0 \ RCP
Flow (cfs)
6.47
Slope (ft/ft)
0.005
ID\Label
96 \ MH - 14
93 \ MH - 13 (STM-JC)
Ground (ft)
5855.11
5856.09
Invert (ft)
5848.65
5846.72
Station (ft)
0.0
68.3

ID\Label	135 \ PIPE - 41 (STM-JC)	184 \ PIPE - 40 (STM-JC)	185 \ PIPE - 39 (STM-JC)	191 \ PIPE - 38 (STM-JC)	204 \ PIPE - 37 (STM-JC)	211 \ PIPE - 34 (STM-JC)
Link Length (ft)	232.9	38.4	94.3	210.5	213.0	39.6
Rise (in)\Material	18.0 \ RCP	18.0 \ RCP	18.0 \ RCP	18.0 \ RCP	24.0 \ RCP	30.0 \ RCP
Flow (cfs)	4.97	6.64	7.94	7.91	7.83	16.23
Slope (ft/ft)	0.040	0.030	0.060	0.030	0.021	0.012

ID\Label	305 \ INLET 4-F (STM-JC)	312 \ INLET 5-F (STM-JC)	311 \ INLET 6-F (STM-JC)	92 \ MH - 20 (STM-JC)	106 \ MH - 19 (STM-JC)	117 \ INLET 1-G (STM-JC)	112 \ MH - 17 (STM-JC)
Ground (ft)	5875.22	5863.63	5863.58	5857.65	5847.07	5841.39	5841.93
Invert (ft)	5866.60	5856.29	5854.14	5847.49	5840.18	5835.11	5827.08
Station (ft)	0.0	232.9	271.3	365.5	576.0	789.0	828.6

DPE to Headwall-2 - 5-yr
Elevation (ft)
EGL
HGL
Label: MH - 13 (STM-JC)
Type: Manhole
ID: 93
Label: MH - 15 (STM-JC)
Type: Manhole
ID: 97
Label: MH - 16 (STM-JC)
Type: Manhole
ID: 102
Label: MH - 17 (STM-JC)
Type: Manhole
ID: 112
Label: INLET 1-G
Type: Catch Basin
ID: 321
Label: PIPE - 29 (STM-JC)
Type: Conduit
ID: 193
Label: PIPE - 30 (STM-JC)
Type: Conduit
ID: 196
Label: PIPE - 31 (STM-JC)
Type: Conduit
ID: 201
Label: PIPE - 32
Type: Conduit
ID: 208
Label: PIPE - 33
Type: Conduit
ID: 207
Label: HEADWALL 2 (STM-JC)
Type: Outfall
ID: 130

| | | |

Inlet 7-F to Inlet 8-F - 5-yr
Label: INLET 8-F (STM-JC)
Type: Manhole
ID: 115
Label: INLET 1-G (STM-JC)
Type: Manhole
ID: 117
Label: INLET 7-F (STM-JC)
Type: Manhole
ID: 113
Label: PIPE - 36 (STM-JC)
Type: Conduit
ID: 214
Label: PIPE - 35 (STM-JC)
Type: Conduit
ID: 212
EGL
HGL
Elevation (ft)
ID\Label
214 \ PIPE - 36 (STM-JC)
212 \ PIPE - 35 (STM-JC)
Link Length (ft)
8.4
29.9
Rise (in)\Material
18.0 \ RCP
18.0 \ RCP
Flow (cfs)
1.51
7.49
Slope (ft/ft)
0.010
0.010
ID\Label
115 \ INLET 8-F (STM-JC)
117 \ INLET 1-G (STM-JC)
113 \ INLET 7-F (STM-JC)
Ground (ft)
5841.66
5841.39
5841.75
Invert (ft)
5836.20
5835.11
5836.41
Station (ft)
0.0
8.4
38.3

ID\Label		172 \ PIPE - 73 (STM-JC)									173 \ PIPE - 74 (STM-JC)											
Link Length (ft)		23.2									175.1											
Rise (in)\Material		19.2 \ Concrete									19.2 \ Concrete											
Flow (cfs)		5.84									5.83											
Slope (ft/ft)		0.005									0.003											
ID\Label	72 \ INLET 1-O		71 \ MH - 36																			76 \ FES - 4 (STM-JC)
Ground (ft)	5875.96		5876.55																			5872.52
Invert (ft)	5871.42		5871.06																			5870.19
Station (ft)	0.0		23.2																			198.3

Inlet 1-H to Inlet 2-H - 5-yr

ID\Label		179 \ PIPE - 42 (STM-JC)	180 \ PIPE - 43 (STM-JC)
Link Length (ft)		8.4	30.0
Rise (in)\Material		18.0 \ RCP	18.0 \ RCP
Flow (cfs)		7.02	2.09
Slope (ft/ft)		0.010	0.005
ID\Label	307 \ INLET 1-H (STM-JC)	81 \ MH - 21	308 \ INLET 2-H (STM-JC)
Ground (ft)	5870.21	5869.90	5870.19
Invert (ft)	5865.57	5864.99	5865.64
Station (ft)	0.0	8.4	38.5

ID\Label	188 \ PIPE - 47 (STM-JC)	189 \ PIPE - 48 (STM-JC)	
Link Length (ft)	8.8	30.4	
Rise (in)\Material	18.0 \ RCP	18.0 \ RCP	
Flow (cfs)	6.04	1.93	
Slope (ft/ft)	0.005	0.005	
ID\Label	309 \ INLET 3-H (STM-JC)	90 \ MH - 24 (STM-JC)	310 \ INLET 4-H (STM-JC)
Ground (ft)	5859.37	5859.12	5859.35
Invert (ft)	5854.73	5854.18	5854.84
Station (ft)	0.0	8.8	39.2

ID\Label	209 \ PIPE - 51 (STM-JC)	210 \ PIPE - 50 (STM-JC)	
Link Length (ft)	8.4	29.9	
Rise (in)\Material	24.0 \ RCP	24.0 \ RCP	
Flow (cfs)	2.39	2.30	
Slope (ft/ft)	0.019	0.005	
ID\Label	314 \ INLET 6-H (STM-JC)	114 \ MH - 25 (STM-JC)	313 \ INLET 5-H (STM-JC)
Ground (ft)	5842.08	5841.72	5842.08
Invert (ft)	5837.60	5836.44	5837.59
Station (ft)	0.0	8.4	38.3

ID\Label		217 \ PIPE - 54 (STM-JC)	219 \ PIPE - 55 (STM-JC)
Link Length (ft)		7.7	30.7
Rise (in)\Material		18.0 \ RCP	18.0 \ RCP
Flow (cfs)		2.03	1.65
Slope (ft/ft)		0.008	0.009
ID\Label	315 \ INLET 7-H (STM-JC)	120 \ MH - 27 (STM-JC)	316 \ INLET 8-H (STM-JC)
Ground (ft)	5835.86	5835.51	5835.44
Invert (ft)	5830.19	5829.63	5830.42
Station (ft)	0.0	7.7	38.3

ID\Label	177 \ PIPE - 44 (STM-JC)	178 \ PIPE - 45 (STM-JC)	186 \ PIPE - 49 (STM-JC)	213 \ PIPE - 52 (STM-JC)	220 \ PIPE - 56 (STM-JC)	227 \ PIPE - 57 (STM-JC)	222 \ PIPE - 58 (STM-JC)	223 \ PIPE - 59 (STM-JC)
Link Length (ft)	59.2	270.2	503.2	361.1	252.5	57.2	108.3	16.2
Rise (in)\Material	24.0 \ RCP	24.0 \ RCP	30.0 \ RCP	30.0 \ RCP	30.0 \ RCP	42.0 \ RCP	34.0 \ RCP	42.0 \ RCP
Flow (cfs)	9.00	8.96	16.35	20.23	23.29	25.98	32.83	32.65
Slope (ft/ft)	0.010	0.038	0.032	0.023	0.020	0.038	0.006	0.006

ID\Label	81 \ MH - 21	78 \ MH - 22	87 \ MH - 23 (STM-JC)	114 \ MH - 25 (STM-JC)	122 \ MH - 26 (STM-JC)	128 \ MH - 28 (STM-JC)	317 \ INLET 11-H (STM-JC)	124 \ MH - 29 (STM-JC)	132 \ HEADWALL 3 (STM-JC)
Ground (ft)	5869.90	5871.01	5860.21	5841.72	5835.22	5828.15	5827.40	5829.[illegible]	5825.08
Invert (ft)	5864.99	5864.11	5852.91	5836.44	5828.16	5822.73	5820.23	5819.[illegible]	5819.19
Station (ft)	0.0	59.2	329.4	832.7	1193.8	1446.4	1503.5	1611.[illegible]	1628.1

3-H/4-H Lat - 5-yr
Label: MH - 24 (STM-JC)
Type: Manhole
ID: 90
Label: MH - 23 (STM-JC)
Type: Manhole
ID: 87
Label: PIPE - 46 (STM-JC)
Type: Conduit
ID: 187
EGL
HGL
Elevation (ft)
ID\Label
187 \ PIPE - 46 (STM-JC)
Link Length (ft)
54.5
Rise (in)\Material
24.0 \ RCP
Flow (cfs)
7.72
Slope (ft/ft)
0.005
ID\Label
90 \ MH - 24 (STM-JC)
87 \ MH - 23 (STM-JC)
Ground (ft)
5859.12
5860.21
Invert (ft)
5854.18
5852.91
Station (ft)
0.0
54.5

ID\Label	218 \ PIPE - 53 (STM-JC)	
Link Length (ft)	58.4	
Rise (in)\Material	24.0 \ RCP	
Flow (cfs)	3.40	
Slope (ft/ft)	0.015	
ID\Label	120 \ MH - 27 (STM-JC)	122 \ MH - 26 (STM-JC)
Ground (ft)	5835.51	5835.22
Invert (ft)	5829.63	5828.16
Station (ft)	0.0	58.4

ID\Label	347 \ FES-2	226 \ PIPE - 62 (STM-JC)	126 \ INLET 9-H (STM-JC)	225 \ PIPE - 61 (STM-JC)	318 \ INLET 10-H (STM-JC)	224 \ PIPE - 60 (STM-JC)	128 \ MH - 28 (STM-JC)
Link Length (ft)		459.0		93.2		42.1	
Rise (in)\Material		24.0 \ RCP		30.0 \ RCP		30.0 \ RCP	
Flow (cfs)		2.52		2.89		5.97	
Slope (ft/ft)		0.010		0.005		0.005	
Ground (ft)	5831.50		5828.70		5829.04		5828.15
Invert (ft)	5829.16		5824.11		5823.44		5822.73
Station (ft)	0.0		459.0		552.2		594.3

ID\Label	133 \ PIPE - 63 (STM-JC)	199 \ PIPE - 67 (STM-JC)	205 \ PIPE - 68 (STM-JC)	206 \ PIPE - 69 (STM-JC)	215 \ PIPE - 70 (STM-JC)	216 \ PIPE - 71 (STM-JC)	221 \ PIPE - 72 (STM-JC)
Link Length (ft)	187.3	279.6	123.1	88.3	90.1	190.5	56.1
Rise (in)\Material	48.0 \ RCP	48.0 \ RCP	48.0 \ RCP	48.0 \ RCP	48.0 \ RCP	48.0 \ RCP	48.0 \ RCP
Flow (cfs)	57.34	62.23	61.58	61.30	61.15	66.34	66.19
Slope (ft/ft)	0.005	0.010	0.010	0.022	0.021	0.020	0.020

ID\Label	99 \ MH - 45 (STM-JC)	101 \ MH - 31 (STM-JC)	107 \ MH - 32 (STM-JC)	108 \ MH - 33 (STM-JC)	116 \ MH - 34 (STM-JC)	118 \ INLET 5-I (STM-JC)	123 \ MH - 35 (STM-JC)	131 \ HEADWALL 1 (STM-JC)
Ground (ft)	5851.22	5850.04	5845.00	5844.06	5841.45	5840.33	5832.02	5826.64
Invert (ft)	5841.15	5839.91	5836.11	5833.88	5830.94	5828.05	5820.67	5822.14
Station (ft)	0.0	187.3	466.9	590.1	678.4	768.5	959.0	1015.1

Note: this HGL profile represents the temporary RCP culvert picking up flows from the low spot/sediment basin north of Legacy Hill Drive. Future filings will remove pipe 142.

ID\Label	203 \ PIPE - 66 (STM-JC)	202 \ PIPE - 65 (STM-JC)	
Link Length (ft)	10.2	46.2	
Rise (in)\Material	18.0 \ RCP	18.0 \ RCP	
Flow (cfs)	1.93	5.62	
Slope (ft/ft)	0.010	0.010	
ID\Label	104 \ INLET 2-I (STM-JC)	105 \ MH - 30 (STM-JC)	103 \ INLET 1-I (STM-JC)
Ground (ft)	5849.31	5849.07	5849.31
Invert (ft)	5844.90	5844.30	5845.26
Station (ft)	0.0	10.2	56.4

ID\Label		200 \ PIPE - 64 (STM-JC)	
Link Length (ft)		118.8	
Rise (in)\Material		24.0 \ RCP	
Flow (cfs)		7.16	
Slope (ft/ft)		0.025	
ID\Label	105 \ MH - 30 (STM-JC)		101 \ MH - 31 (STM-JC)
Ground (ft)	5849.07		5850.04
Invert (ft)	5844.30		5839.91
Station (ft)	0.0		118.8

BRADLEY RD MEDIAN CULVERT - 5-yr
Elevation (ft)
Label: BRADLEY RD TYPE C INLET
Type: Manhole
ID: 406
Label: FES 11
Type: Outfall
ID: 407
Label: BRADLEY RD MEDIAN CULVERT
Type: Conduit
ID: 408
EGL
HGL
ID\Label
408 \ BRADLEY RD MEDIAN CULVERT
Link Length (ft)
153.4
Rise (in)\Material
14.2 \ Concrete
Flow (cfs)
2.94
Slope (ft/ft)
0.010
ID\Label
406 \ BRADLEY RD TYPE C INLET
407 \ FES 11
Ground (ft)
5930.03
5930.50
Invert (ft)
5927.15
5925.61
Station (ft)
0.0
153.4

FES-12 to FES 13 - 5-yr
Elevation (ft)
Label: FES-12
Type: Manhole
ID: 411
Label: MH-47
Type: Manhole
ID: 412
Label: FES-13
Type: Outfall
ID: 413
Label: PIPE 75
Type: Conduit
ID: 414
Label: PIPE 76
Type: Conduit
ID: 415
EGL
HGL
ID\Label
414 \ PIPE 75
415 \ PIPE 76
Link Length (ft)
18.0
68.0
Rise (in)\Material
18.0 \ Concrete
18.0 \ Concrete
Flow (cfs)
3.37
3.37
Slope (ft/ft)
0.125
0.012
ID\Label
411 \ FES-12
412 \ MH-47
413 \ FES-13
Ground (ft)
5890.00
5890.00
5887.00
Invert (ft)
5888.00
5885.45
5884.66
Station (ft)
0.0
18.0
86.0

Q100 HGLs

ID\Label	144 \ PIPE - 9 (STM-JC)	142 \ PIPE - 2 (STM-JC)	141 \ PIPE - 1 (STM-JC)	
Link Length (ft)	444.2	489.1	168.4	
Rise (in)\Material	30.0 \ RCP	24.0 \ RCP	24.0 \ RCP	
Flow (cfs)	53.95	26.69	26.78	
Slope (ft/ft)	0.030	0.027	0.034	
ID\Label	50 \ MH - 5 (STM-JC)	40 \ MH - 2 (STM-JC)	39 \ MH - 1 (STM-JC)	346 \ OS-1 (FES)
Ground (ft)	5900.44	5913.93	5924.34	5927.60
Invert (ft)	5889.10	5903.42	5917.61	5924.26
Station (ft)	0.0	444.2	933.3	1101.7

ID\Label		146 \ PIPE - 5 (STM-JC)	147 \ PIPE - 4 (STM-JC)
Link Length (ft)		23.1	33.8
Rise (in)\Material		30.0 \ RCP	30.0 \ RCP
Flow (cfs)		5.20	17.60
Slope (ft/ft)		0.005	0.005
ID\Label	41 \ INLET 2-A (STM-JC)	42 \ MH - 3 (STM-JC)	46 \ INLET 1-A (STM-JC)
Ground (ft)	5911.72	5911.52	5911.03
Invert (ft)	5904.87	5904.76	5904.76
Station (ft)	0.0	23.1	56.8

ID\Label	149 \ PIPE - 8 (STM-JC)	148 \ PIPE - 7 (STM-JC)	
Link Length (ft)	21.1	37.1	
Rise (in)\Material	18.0 \ RCP	18.0 \ RCP	
Flow (cfs)	1.00	8.90	
Slope (ft/ft)	0.005	0.005	
ID\Label	44 \ INLET 4-A (STM-JC)	45 \ MH - 4 (STM-JC)	319 \ INLET 3-A
Ground (ft)	5911.38	5911.37	5911.46
Invert (ft)	5906.37	5904.97	5906.45
Station (ft)	0.0	21.1	58.2

ID\Label	145 \ PIPE - 6 (STM-JC)	143 \ PIPE - 3 (STM-JC)	
Link Length (ft)	210.4	169.4	
Rise (in)\Material	24.0 \ RCP	30.0 \ RCP	
Flow (cfs)	9.37	20.70	
Slope (ft/ft)	0.007	0.005	
ID\Label	45 \ MH - 4 (STM-JC)	40 \ MH - 2 (STM-JC)	42 \ MH - 3 (STM-JC)
Ground (ft)	5911.37	5913.93	5911.52
Invert (ft)	5905.96	5903.42	5904.76
Station (ft)	0.0	210.4	379.7

Inlet 1-B to DPB - 100-yr
Label: MH - 5 (STM-JC)
Type: Manhole
ID: 50
Label: INLET 1-B
Type: Catch Basin
ID: 298
Label: PIPE - 10 (STM-JC)
Type: Conduit
ID: 152
EGL
HGL
Elevation (ft)
ID\Label
152 \ PIPE - 10 (STM-JC)
Link Length (ft)
13.8
Rise (in)\Material
18.0 \ RCP
Flow (cfs)
3.40
Slope (ft/ft)
0.020
ID\Label
50 \ MH - 5 (STM-JC)
298 \ INLET 1-B
Ground (ft)
5900.44
5900.61
Invert (ft)
5889.10
5891.38
Station (ft)
0.0
13.8

ID\Label	153 \ PIPE - 11 (STM-JC)	162 \ PIPE - 20 (STM-JC)	168 \ PIPE - 21 (STM-JC)	176 \ PIPE - 22 (STM-JC)	183 \ PIPE - 24 (STM-JC)	190 \ PIPE - 25 (STM-JC)
Link Length (ft)	396.9	201.8	193.5	184.8	169.7	172.5
Rise (in)\Material	30.0 \ RCP	42.0 \ RCP	42.0 \ RCP	42.0 \ RCP	42.0 \ RCP	42.0 \ RCP
Flow (cfs)	55.44	87.43	87.20	86.97	89.36	89.16
Slope (ft/ft)	0.030	0.030	0.030	0.030	0.030	0.014

ID\Label	50 \ MH - 5 (STM-JC)	60 \ MH - 6 (STM-JC)	67 \ MH - 9 (STM-JC)	77 \ MH - 10 (STM-JC)	84 \ MH - 11 (STM-JC)	91 \ MH - 12 (STM-JC)	93 \ MH - 13 (STM-JC)
Ground (ft)	5900.44	5886.64	5879.66	5872.12	5864.86	5858.79	5856.09
Invert (ft)	5889.10	5876.19	5869.14	5862.34	5855.79	5849.70	5846.72
Station (ft)	0.0	396.9	598.7	792.1	977.0	1146.7	1319.2

ID\Label	159 \ PIPE - 14 (STM-JC)	158 \ PIPE - 13 (STM-JC)	
Link Length (ft)	7.7	30.7	
Rise (in)\Material	18.0 \ RCP	18.0 \ RCP	
Flow (cfs)	3.00	19.23	
Slope (ft/ft)	0.010	0.010	
ID\Label	57 \ INLET 4-C (STM-JC)	59 \ MH - 7 (STM-JC)	299 \ INLET 3-C
Ground (ft)	5886.94	5886.64	5886.98
Invert (ft)	5878.77	5877.69	5879.00
Station (ft)	0.0	7.7	38.3

ID\Label	160 \ PIPE - 18 (STM-JC)	164 \ PIPE - 17 (STM-JC)	
Link Length (ft)	7.7	30.7	
Rise (in)\Material	18.0 \ RCP	24.0 \ RCP	
Flow (cfs)	0.60	12.50	
Slope (ft/ft)	0.010	0.010	
ID\Label	58 \ INLET 6-C (STM-JC)	64 \ MH - 8 (STM-JC)	61 \ INLET 5-C (STM-JC)
Ground (ft)	5886.72	5886.35	5886.57
Invert (ft)	5879.28	5878.20	5879.01
Station (ft)	0.0	7.7	38.3

ID\Label	163 \ PIPE - 16 (STM-JC)	161 \ PIPE - 12 (STM-JC)	
Link Length (ft)	101.2	49.9	
Rise (in)\Material	30.0 \ RCP	30.0 \ RCP	
Flow (cfs)	21.63	38.03	
Slope (ft/ft)	0.010	0.010	
ID\Label	64 \ MH - 8 (STM-JC)	60 \ MH - 6 (STM-JC)	59 \ MH - 7 (STM-JC)
Ground (ft)	5886.35	5886.64	5886.64
Invert (ft)	5878.20	5876.19	5877.69
Station (ft)	0.0	101.2	151.1

ID\Label	182 \ PIPE - 23 (STM-JC)	
Link Length (ft)	15.3	
Rise (in)\Material	24.0 \ RCP	
Flow (cfs)	3.60	
Slope (ft/ft)	0.010	
ID\Label	84 \ MH - 11 (STM-JC)	300 \ Inlet 1-D
Ground (ft)	5864.86	5865.13
Invert (ft)	5855.79	5858.44
Station (ft)	0.0	15.3

Inlet 1-E to Inlet 2-E - 100-yr
Elevation (ft)
Label: INLET 2-E (STM-JC)
Type: Manhole
ID: 94
Label: MH - 14 (STM-JC)
Type: Manhole
ID: 96
Label: INLET 1-E
Type: Catch Basin
ID: 301
Label: PIPE - 27 (STM-JC)
Type: Conduit
ID: 194
Label: PIPE - 28 (STM-JC)
Type: Conduit
ID: 195
EGL
HGL

| | | |

ID\Label	192 \ PIPE - 26 (STM-JC)	
Link Length (ft)	68.3	
Rise (in)\Material	30.0 \ RCP	
Flow (cfs)	18.30	
Slope (ft/ft)	0.005	
ID\Label	93 \ MH - 13 (STM-JC)	96 \ MH - 14 (STM-JC)
Ground (ft)	5856.09	5855.11
Invert (ft)	5846.72	5848.65
Station (ft)	0.0	68.3

4-F to DPF - 100-yr
Elevation (ft)
EGL
HGL
Label: INLET 4-F
Type: Catch Basin
ID: 305
Label: PIPE - 41 (STM-JC)
Type: Conduit
ID: 135
Label: CB-15
Type: Catch Bas
ID: 312
Label: CB-14
Type: Catch Basin
ID: 311
Label: PIPE - 40 (STM-JC)
Type: Conduit
ID: 184
Label: PIPE - 39 (STM-JC)
Type: Conduit
ID: 185
Label: MH - 20 (STM-JC)
Type: Manhole
ID: 92
Label: PIPE - 38 (STM-JC)
Type: Conduit
ID: 191
Label: MH - 19 (STM-JC)
Type: Manhole
ID: 106
Label: PIPE - 37 (STM-JC)
Type: Conduit
ID: 204
Label: MH - 18 (STM-JC)
Type: Manhole
ID: 117
Label: PIPE - 34 (STM-JC)
Type: Conduit
ID: 211
Label: MH - 17 (STM-JC)
Type: Manhole
ID: 112

| | | |

ID\Label	130 \ HEADWALL - 2 (STM-JC)	207 \ PIPE - 33 (STM-JC)	321 \ Inlet 1-G	208 \ PIPE - 32 (STM-JC)	112 \ MH - 17 (STM-JC)	201 \ PIPE - 31 (STM-JC)
Link Length (ft)		147.4		31.7		211.9
Rise (in)\Material		48.0 \ RCP		48.0 \ RCP		48.0 \ RCP
Flow (cfs)		128.78		127.05		104.76
Slope (ft/ft)		0.039		0.022		0.025
Ground (ft)	5828.00		5842.14		5841.93	
Invert (ft)	5822.14		5825.38		5827.08	
Station (ft)	0.0		147.4		179.2	

ID\Label	102 \ MH - 16 (STM-JC)	196 \ PIPE - 30 (STM-JC)	97 \ MH - 15 (STM-JC)	193 \ PIPE - 29 (STM-JC)	93 \ MH - 13 (STM-JC)
Link Length (ft)		244.1		226.7	
Rise (in)\Material		48.0 \ RCP		48.0 \ RCP	
Flow (cfs)		105.18		105.57	
Slope (ft/ft)		0.015		0.015	
Ground (ft)	5849.56		5853.85		5856.09
Invert (ft)	5838.45		5843.11		5846.72
Station (ft)	391.1		635.2		861.9

Note: FES 2 in title indicates Headwall 2

ID\Label	214 \ PIPE - 36 (STM-JC)	212 \ PIPE - 35 (STM-JC)	
Link Length (ft)	8.4	29.9	
Rise (in)\Material	18.0 \ RCP	18.0 \ RCP	
Flow (cfs)	3.30	16.50	
Slope (ft/ft)	0.010	0.010	
ID\Label	115 \ INLET 8-F (STM-JC)	117 \ MH - 18 (STM-JC)	113 \ INLET 7-F (STM-JC)
Ground (ft)	5841.66	5841.39	5841.75
Invert (ft)	5836.20	5835.11	5836.41
Station (ft)	0.0	8.4	38.3

ID\Label	173 \ PIPE - 74 (STM-JC)	172 \ PIPE - 73 (STM-JC)	
Link Length (ft)	175.1	23.2	
Rise (in)\Material	19.0 \ RCP	19.0 \ Concrete	
Flow (cfs)	12.84	12.86	
Slope (ft/ft)	0.003	0.005	
ID\Label	76 \ FES - 4 (STM-JC)	71 \ MH - 152 (STM-JC)	72 \ INLET 1-O
Ground (ft)	5872.52	5876.55	5875.96
Invert (ft)	5870.19	5871.06	5871.42
Station (ft)	0.0	175.1	198.3

ID\Label		180 \ PIPE - 43 (STM-JC)	179 \ PIPE - 42 (STM-JC)
Link Length (ft)		30.0	8.4
Rise (in)\Material		18.0 \ RCP	18.0 \ RCP
Flow (cfs)		4.63	15.46
Slope (ft/ft)		0.005	0.010
ID\Label	308 \ INLET 2-H	81 \ MH - 21 (STM-JC)	307 \ INLET 1-H
Ground (ft)	5870.19	5869.90	5870.21
Invert (ft)	5865.64	5864.99	5865.57
Station (ft)	0.0	30.0	38.5

ID\Label	189 \ PIPE - 48 (STM-JC)	188 \ PIPE - 47 (STM-JC)	
Link Length (ft)	30.4	8.8	
Rise (in)\Material	18.0 \ RCP	18.0 \ RCP	
Flow (cfs)	4.22	13.33	
Slope (ft/ft)	0.005	0.005	
ID\Label	310 \ INLET 4-H	90 \ MH - 24 (STM-JC)	309 \ INLET 3-H
Ground (ft)	5859.35	5859.12	5859.37
Invert (ft)	5854.84	5854.18	5854.73
Station (ft)	0.0	30.4	39.2

ID\Label	209 \ PIPE - 51 (STM-JC)	210 \ PIPE - 50 (STM-JC)	
Link Length (ft)	8.4	29.9	
Rise (in)\Material	24.0 \ RCP	24.0 \ RCP	
Flow (cfs)	5.27	5.08	
Slope (ft/ft)	0.019	0.005	
ID\Label	314 \ INLET 6-H	114 \ MH - 25 (STM-JC)	313 \ INLET 5-H
Ground (ft)	5842.08	5841.72	5842.08
Invert (ft)	5837.60	5836.44	5837.59
Station (ft)	0.0	8.4	38.3

ID\Label	218 \ PIPE - 53 (STM-JC)	
Link Length (ft)	58.4	
Rise (in)\Material	24.0 \ RCP	
Flow (cfs)	7.20	
Slope (ft/ft)	0.015	
ID\Label	120 \ MH - 27 (STM-JC)	122 \ MH - 26 (STM-JC)
Ground (ft)	5835.51	5835.22
Invert (ft)	5829.63	5828.16
Station (ft)	0.0	58.4

ID\Label	177 \ PIPE - 44 (STM-JC)	178 \ PIPE - 45 (STM-JC)	186 \ PIPE - 49 (STM-JC)	213 \ PIPE - 52 (STM-JC)	220 \ PIPE - 56 (STM-JC)	227 \ PIPE - 57 (STM-JC)	222 \ PIPE - 58 (STM-JC)	223 \ PIPE - 59 (STM-JC)
Link Length (ft)	59.2	270.2	503.2	361.1	252.5	57.2	108.3	16.2
Rise (in)\Material	24.0 \ RCP	24.0 \ RCP	30.0 \ RCP	30.0 \ RCP	30.0 \ RCP	42.0 \ RCP	42.0 \ RCP	42.0 \ RCP
Flow (cfs)	19.82	19.73	36.13	44.92	49.29	61.16	77.34	76.99
Slope (ft/ft)	0.010	0.038	0.032	0.023	0.020	0.030	0.006	0.006

ID\Label	81 \ MH - 21 (STM-JC)	78 \ MH - 22 (STM-JC)	87 \ MH - 23 (STM-JC)	114 \ MH - 25 (STM-JC)	122 \ MH - 26 (STM-JC)	128 \ MH - 28 (STM-JC)	317 \ CB-20	124 \ MH - 29 (STM-JC)	132 \ HEADWALL-3 (STM-JC)
Ground (ft)	5869.90	5871.01	5860.21	5841.72	5835.22	5828.15	5827.40	5825.08	
Invert (ft)	5864.99	5864.11	5852.91	5836.44	5828.16	5822.73	5820.23	5819.19	
Station (ft)	0.0	59.2	329.4	832.7	1193.8	1446.4	1503.5	1611.8	1628.1

ID\Label		187 \ PIPE - 46 (STM-JC)
Link Length (ft)		54.5
Rise (in)\Material		24.0 \ RCP
Flow (cfs)		17.05
Slope (ft/ft)		0.005
ID\Label	90 \ MH - 24 (STM-JC)	87 \ MH - 23 (STM-JC)
Ground (ft)	5859.12	5860.21
Invert (ft)	5854.18	5852.91
Station (ft)	0.0	54.5

ID\Label	218 \ PIPE - 53 (STM-JC)	
Link Length (ft)	58.4	
Rise (in)\Material	24.0 \ RCP	
Flow (cfs)	7.20	
Slope (ft/ft)	0.015	
ID\Label	120 \ MH - 27 (STM-JC)	122 \ MH - 26 (STM-JC)
Ground (ft)	5835.51	5835.22
Invert (ft)	5829.63	5828.16
Station (ft)	0.0	58.4

ID\Label	226 \ PIPE - 62 (STM-JC)	225 \ PIPE - 61 (STM-JC)	224 \ PIPE - 60 (STM-JC)
Link Length (ft)	459.0	93.2	42.1
Rise (in)\Material	24.0 \ RCP	30.0 \ RCP	30.0 \ RCP
Flow (cfs)	5.77	6.67	13.94
Slope (ft/ft)	0.010	0.005	0.005

ID\Label	347 \ FES 2	126 \ INLET 9-H (STM-JC)	318 \ CB-21	128 \ MH - 28 (STM-JC)
Ground (ft)	5831.50	5828.70	5829.04	5828.15
Invert (ft)	5829.16	5824.11	5823.44	5822.73
Station (ft)	0.0	459.0	552.2	594.3

ID\Label	133 \ PIPE - 63 (STM-JC)	199 \ PIPE - 67 (STM-JC)	205 \ PIPE - 68 (STM-JC)	206 \ PIPE - 69 (STM-JC)	215 \ PIPE - 70 (STM-JC)	216 \ PIPE - 71 (STM-JC)	221 \ PIPE - 72 (STM-JC)
Link Length (ft)	187.3	279.6	123.1	88.3	90.1	190.5	56.1
Rise (in)\Material	48.0 \ RCP	48.0 \ RCP	48.0 \ RCP	48.0 \ RCP	48.0 \ RCP	48.0 \ RCP	48.0 \ RCP
Flow (cfs)	122.12	132.92	131.82	131.23	130.98	143.01	142.42
Slope (ft/ft)	0.005	0.010	0.010	0.022	0.021	0.020	0.020

ID\Label	99 \ MH - 45 (STM-JC)	101 \ MH - 31 (STM-JC)	107 \ MH - 32 (STM-JC)	108 \ MH - 33 (STM-JC)	116 \ MH - 34 (STM-JC)	118 \ INLET 5-I (STM-JC)	123 \ MH - 35 (STM-JC)	131 \ HEADWALL - 1 (STM-JC)
Ground (ft)	5851.22	5850.04	5845.00	5844.06	5841.45	5840.33	5832.02	5826.64
Invert (ft)	5841.15	5839.91	5836.11	5833.88	5830.94	5828.05	5820.67	5822.14
Station (ft)	0.0	187.3	466.9	590.1	678.4	768.5	959.0	1015.1

Note: This HGL profile represents the undeveloped flows conveyed from the low spot/sediment basin just north of Legacy Hill Drive.

ID\Label	203 \ PIPE - 66 (STM-JC)	202 \ PIPE - 65 (STM-JC)		
Link Length (ft)	10.2	46.2		
Rise (in)\Material	18.0 \ RCP	18.0 \ RCP		
Flow (cfs)	4.08	12.40		
Slope (ft/ft)	0.010	0.010		
ID\Label	104 \ INLET 2-I (STM-JC)	105 \ MH - 30 (STM-JC)		103 \ INLET 1-I (STM-JC)
Ground (ft)	5849.31	5849.07		5849.31
Invert (ft)	5844.90	5844.30		5845.26
Station (ft)	0.0	10.2		56.4

ID\Label		200 \ PIPE - 64 (STM-JC)	
Link Length (ft)		118.8	
Rise (in)\Material		24.0 \ RCP	
Flow (cfs)		15.48	
Slope (ft/ft)		0.025	
ID\Label	105 \ MH - 30 (STM-JC)		101 \ MH - 31 (STM-JC)
Ground (ft)	5849.07		5850.04
Invert (ft)	5844.30		5839.91
Station (ft)	0.0		118.8

BRADLEY RD MEDIAN CULVERT - 100-yr
Elevation (ft)
Label: BRADLEY TYPE C INLET
Type: Catch Basin
ID: 414
Label: FES 11
Type: Outfall
ID: 415
Label: BRADLEY RD MEDIAN CULVERT
Type: Conduit
ID: 416
EGL
HGL
ID\Label
416 \ BRADLEY RD MEDIAN CULVERT
Link Length (ft)
153.4
Rise (in)\Material
14.2 \ Concrete
Flow (cfs)
7.39
Slope (ft/ft)
0.010
ID\Label
414 \ BRADLEY TYPE C INLET
415 \ FES 11
Ground (ft)
5930.03
5930.50
Invert (ft)
5927.15
5925.61
Station (ft)
0.0
153.4

ID\Label	422 \ PIPE 75	423 \ PIPE 76	
Link Length (ft)	16.0	80.5	
Rise (in)\Material	18.0 \ Concrete	18.0 \ Concrete	
Flow (cfs)	10.00	10.00	
Slope (ft/ft)	0.066	0.017	
ID\Label	419 \ FES 12	420 \ MH-47	421 \ FES 13
Ground (ft)	5890.00	5890.00	5887.00
Invert (ft)	5886.81	5885.36	5884.01
Station (ft)	0.0	16.0	96.5

Figure 8-11. Inlet Capacity Chart Sump Conditions , Curb Opening (Type R) Inlet

SUMP INLETS:
DP 1-A: 18.9 CFS=> 10' INLET
DP 2-A: 5.2 CFS=> 5' INLET
DP 3-A: 9.0 CFS=> 5' INLET
DP 4-A: 1.0 CFS=> 5' INLET
DP 1-C: 12.9 CFS=> 10' INLET
DP 2-C: 5.3 CFS=> 5' INLET
DP 3-C: 11.1 CFS=> 10' INLET
DP 4-C: 11.1 CFS=> 10' INLET
DP 5-C: 12.5 CFS=> 10' INLET
DP 6-C: 0.6 CFS=> 5' INLET
DP 7-C: 8.8 CFS=> 5' INLET
DP 8-C: 0.5 CFS=> 5' INLET
DP 1-E: 16.65 CFS=> 10' INLET
DP 2-E: 16.65 CFS=> 10' INLET

DP 7-F: 16.5 CFS=> 10' INLET
DP 8-F: 3.3 CFS=> 5' INLET
DP 1-H: 16.0 CFS=> 10' INLET
DP 2-H: 4.7 CFS=> 5' INLET
DP 3-H: 13.3 CFS=> 10' INLET
DP 4-H: 4.2 CFS=> 5' INLET
DP 9-H: 13.0 CFS=> 10' INLET
DP 10-H: 8.8 CFS=> 5' INLET
DP 11-H: 18.0 CFS=> 10' INLET
DP 1-I: 12.4 CFS=> 10' INLET
DP 2-I: 4.7 CFS=> 5' INLET
DP 3-I: 15.6 CFS=> 10' INLET

Notes:
1. The standard inlet parameters must apply to use this chart.

PROPOSED INLET SUMMARY
TRAILS AT ASPEN RIDGE FILING NO. 1

DESIGN POINT	SUB-BASINS	TOTAL AREA (AC)	INLET			Q(5) BYPASS FLOWS (cfs)	Q(5) TOTAL INFLOW (cfs)	Q5 INLET CAPACTIY (cfs)	Q(100) BYPASS FLOWS (cfs)	Q(100) TOTAL INFLOW (cfs)	Q100 INLET CAPACITY (cfs)	NOTES:
			SIZE (Ft.)	TYPE	CONDITION							
1-A	A-1	12.34	10.0	R	Sump		4.4	4.4		18.9	18.9	
2-A	A-2	1.09	5.0	R	Sump		2.7	2.7		5.2	5.2	
3-A	A-3	4.98	5.0	R	Sump		2.2	2.2		9.0	9.0	
4-A	A-4	0.12	5.0	R	Sump		0.6	0.6		1.0	1.0	
1-B	B-1	3.27	10.0	R	On-Grade		1.8	1.8	0.7	4.1	3.4	Bypass goes to DP 3-C
1-C	C-1	1.19	10.0	R	Sump		5.9	5.9		12.9	12.9	
2-C	C-2	4.60	5.0	R	Sump		2.4	2.4		5.3	5.3	
3-C	C-3	0.36	10.0	R	Sump		8.4	8.4		19.2	19.2	Receives bypass from 1-B. (Q5=10.0, Q100=11.1, EQUAL FLOW ACROSS
4-C	C-4	3.13	5.0	R	Sump		1.6	1.6		3.0	3.0	(Q5=10.0, Q100=11.1, EQUAL FLOW ACROSS CROWN)
5-C	C-5	0.07	10.0	R	Sump		5.7	5.7		12.5	12.5	
6-C	C-6	2.20	5.0	R	Sump		0.3	0.3		0.6	0.6	
7-C	C-7	0.06	5.0	R	Sump		4.0	4.0		8.8	8.8	
8-C	C-8	6.43	5.0	R	Sump		0.3	0.3		0.5	0.5	
1-D	D-1	2.14	15.0	R	On-Grade	0.5	1.6	1.1	3.6	5.2	1.6	Bypass goes to 1-E (MUST BE 15' TO MAKE 1-E AND 2-E NOT BE 15'-ers)
1-E	E-1	1.25	10.0	R	Sump		4.4	4.4		15.8	15.8	Recieves bypass from 1-D. (Q5=7.5, Q100=17.5, EQUAL FLOW ACROSS
2-E	E-2	0.58	5.0	R	Sump		3.9	3.9		8.7	8.7	(Q5=7.5, Q100=17.5, EQUAL FLOW ACROSS CROWN)
1-F	F-1	2.27	5.0	R	On-Grade	1.2	2.7	1.5	3.8	6.0	2.2	Bypass goes to 3-F
2-F	F-2	1.00	5.0	R	On-Grade	0.2	1.1	0.9	1.0	2.5	1.5	Bypass goes to 4-F
3-F	F-3	5.06	10.0	R	On-Grade	0.5	3.5	3.0	3.7	8.8	5.1	Recieves bypass from 1-F, Bypass goes to 1-H
4-F	F-4	0.84	10.0	R	On-Grade		1.3	1.3	0.5	3.5	3.0	Recieves bypass from 2-F, Bypass goes to 2-H
5-F	F-5	1.11	10.0	R	On-Grade	0.5	3.5	3.0	3.0	7.8	4.8	Bypass goes to 3-H
6-F	F-6	3.60	10.0	R	On-Grade		1.7	1.7	0.6	3.9	3.3	Bypass goes to 4-H
7-F	F-7	1.16	10.0	R	Sump		7.5	7.5		16.5	16.5	
8-F	F-8	2.97	5.0	R	Sump		1.5	1.5		3.3	3.3	
1-G	G-1	0.92	10.0	R	On-Grade		2.1	2.1	1.0	4.6	3.6	Bypass goes to 8-H
1-H	H-1	2.42	10.0	R	Sump		6.1	6.1		16.0	16.0	Receives bypass from 3-F
2-H	H-2	2.46	5.0	R	Sump		1.9	1.9		4.7	4.7	Recieves bypass from 4-F
3-H	H-3	3.42	10.0	R	Sump		5.2	5.2		13.3	13.3	Recieves bypass from 5-F
4-H	H-4	1.95	5.0	R	Sump		1.6	1.6		4.2	4.2	Receives bypass from 6-F
5-H	H-5	1.33	10.0	R	On-Grade	0.7	4.0	3.3	3.8	8.9	5.1	Bypass goes to 11-H
6-H	H-6	2.46	10.0	R	On-Grade	0.6	4.1	3.5	3.6	9.1	5.5	Bypass goes to 10-H
7-H	H-7	2.03	10.0	R	On-Grade	0.2	3.0	2.8	2.1	6.6	4.5	Bypass goes to 11-H
8-H	H-8	0.97	10.0	R	On-Grade		1.7	1.7	1.1	4.8	3.7	Recieves bypass from 1-G, Bypass goes to 11-H
9-H	H-9b	0.38	4 X 4	C	Sump		0.6	0.6		1.3	1.3	
10-H	H-10	1.33	5.0	R	Sump		3.1	3.1		9.1	9.1	Recieves bypass from 6-H
11-H	H-11	3.42	10.0	R	Sump		5.9	5.9		18.0	18.0	Recieves bypass from 5-H, 7-H, & 8-H
1-I	I-1	3.13	10.0	R	Sump		5.6	5.6		12.4	12.4	
2-I	I-2	0.59	5.0	R	Sump		1.9	1.9		3.8	3.8	
3-I	I-3	4.18	10.0	R	Sump		7.1	7.1		15.6	15.6	
O	O-1, O-2	4.57	10.0	R	Sump		6.4	6.4		14.8	14.8	0.8 cfs flow bypas from upstream sub-basin

Figure 8-10. Inlet Capacity Chart Sump Conditions, Area (Type C) Inlet

Notes:
1. The standard inlet parameters must apply to use these charts.

Worksheet Protected

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

LID Credit by Impervious Reduction Factor (IRF) Method

UD-BMP (Version 3.06, November 2016)

User Input

Calculated cells

***Design Storm: 1-Hour Rain Depth	WQCV Event	0.60	inches
***Minor Storm: 1-Hour Rain Depth	5-Year Event	1.50	inches
***Major Storm: 1-Hour Rain Depth	100-Year Event	2.52	inches
Optional User Defined Storm	CUHP		
(CUHP) NOAA 1 Hour Rainfall Depth and Frequency for User Defined Storm	100-Year Event	2.52	
Max Intensity for Optional User Defined Storm	2.51496		

Designer: Jesse Sullivan
Company: Matrix Design Group
Date: June 26, 2019
Project: FDR: Trails at Aspen Ridge Filing No. 1
Location: El Paso County, CO

SITE INFORMATION (USER-INPUT)

Sub-basin Identifier	A-1	A-2	A-3	A-4	B-1	C-1	C-2	C-3	C-4	C-5	C-6	C-7	C-8	D-1
Receiving Pervious Area Soil Type	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Clay Loam	Sandy Loam	Sandy Loam
Total Area (ac., Sum of DCIA, UIA, RPA, & SPA)	12.336	1.091	4.924	0.119	1.058	1.058	1.058	1.058	0.356	3.129	0.071	2.196	0.056	2.205
Directly Connected Impervious Area (DCIA, acres)	2.272	0.912	0.528	0.119	0.688	0.688	0.688	0.688	0.356	2.034	0.071	1.428	0.056	0.344
Unconnected Impervious Area (UIA, acres)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Receiving Pervious Area (RPA, acres)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Separate Pervious Area (SPA, acres)	10.064	0.179	4.397	0.000	0.370	0.370	0.370	0.370	0.000	1.095	0.000	0.769	0.000	1.862
RPA Treatment Type: Conveyance (C), Volume (V), or Permeable Pavement (PP)	C	C	C	C	C	C	C	C	C	C	C	C	C	C

CALCULATED RESULTS (OUTPUT)

	A-1	A-2	A-3	A-4	B-1	C-1	C-2	C-3	C-4	C-5	C-6	C-7	C-8	D-1
Total Calculated Area (ac, check against input)	12.336	1.091	4.924	0.119	1.058	1.058	1.058	1.058	0.356	3.129	0.071	2.196	0.056	2.205
Directly Connected Impervious Area (DCIA, %)	18.4%	83.6%	10.7%	100.0%	65.0%	65.0%	65.0%	65.0%	100.0%	65.0%	100.0%	65.0%	100.0%	15.6%
Unconnected Impervious Area (UIA, %)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Receiving Pervious Area (RPA, %)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Separate Pervious Area (SPA, %)	81.6%	16.4%	89.3%	0.0%	35.0%	35.0%	35.0%	35.0%	0.0%	35.0%	0.0%	35.0%	0.0%	84.4%
A_R (RPA / UIA)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
I_a Check	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
f / I for WQCV Event:	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	0.4	1.7	1.7
f / I for 5-Year Event:	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.2	0.5	0.5
f / I for 100-Year Event:	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.1	0.3	0.3
f / I for Optional User Defined Storm CUHP:	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.12	0.31	0.31
IRF for WQCV Event:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
IRF for 5-Year Event:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
IRF for 100-Year Event:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
IRF for Optional User Defined Storm CUHP:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Total Site Imperviousness: I_{total}	18.4%	83.6%	10.7%	100.0%	65.0%	65.0%	65.0%	65.0%	100.0%	65.0%	100.0%	65.0%	100.0%	15.6%
Effective Imperviousness for WQCV Event:	18.4%	83.6%	10.7%	100.0%	65.0%	65.0%	65.0%	65.0%	100.0%	65.0%	100.0%	65.0%	100.0%	15.6%
Effective Imperviousness for 5-Year Event:	18.4%	83.6%	10.7%	100.0%	65.0%	65.0%	65.0%	65.0%	100.0%	65.0%	100.0%	65.0%	100.0%	15.6%
Effective Imperviousness for 100-Year Event:	18.4%	83.6%	10.7%	100.0%	65.0%	65.0%	65.0%	65.0%	100.0%	65.0%	100.0%	65.0%	100.0%	15.6%
Effective Imperviousness for Optional User Defined Storm CUHP:	18.4%	83.6%	10.7%	100.0%	65.0%	65.0%	65.0%	65.0%	100.0%	65.0%	100.0%	65.0%	100.0%	15.6%

LID / EFFECTIVE IMPERVIOUSNESS CREDITS

	A-1	A-2	A-3	A-4	B-1	C-1	C-2	C-3	C-4	C-5	C-6	C-7	C-8	D-1
WQCV Event CREDIT: Reduce Detention By:	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
This line only for 10-Year Event	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
100-Year Event CREDIT**: Reduce Detention By:	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.3%	0.0%	0.4%	0.1%
User Defined CUHP CREDIT: Reduce Detention By:	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Total Site Imperviousness:	**35.4%**
Total Site Effective Imperviousness for WQCV Event:	**35.4%**
Total Site Effective Imperviousness for 5-Year Event:	**35.4%**
Total Site Effective Imperviousness for 100-Year Event:	**35.4%**
Total Site Effective Imperviousness for Optional User Defined Storm CUHP:	**35.4%**

Notes:

* Use Green-Ampt average infiltration rate values from Table 3-3.
** Flood control detention volume credits based on empirical equations from Storage Chapter of USDCM.
*** Method assumes that 1-hour rainfall depth is equivalent to 1-hour intensity for calculation purposed

Worksheet Protected

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

LID Credit by Impervious Reduction Factor (IRF) Method

UD-BMP (Version 3.06, November 2016)

User Input

Calculated cells

***Design Storm: 1-Hour Rain Depth	WQCV Event	0.60	inches
***Minor Storm: 1-Hour Rain Depth	5-Year Event	1.50	inches
***Major Storm: 1-Hour Rain Depth	100-Year Event	2.52	inches
Optional User Defined Storm	CUHP		
(CUHP) NOAA 1 Hour Rainfall Depth and Frequency for User Defined Storm	100-Year Event	2.52	
Max Intensity for Optional User Defined Storm	2.51496		

Designer: Jesse Sullivan
Company: Matrix Design Group
Date: June 26, 2019
Project: FDR: Trails at Aspen Ridge Filing No. 1
Location: El Paso County, CO

SITE INFORMATION (USER-INPUT)

Sub-basin Identifier	E-1	E-2	F-1	F-2	F-3	F-4	F-5	F-6	F-7	F-8	G-1	H-1	H-2	H-3
Receiving Pervious Area Soil Type	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam
Total Area (ac., Sum of DCIA, UIA, RPA, & SPA)	6.432	2.137	1.488	0.581	1.249	0.576	2.266	1.004	5.058	0.845	1.111	3.599	1.165	2.969
Directly Connected Impervious Area (DCIA, acres)	1.411	1.389	0.967	0.377	0.812	0.375	1.473	0.652	3.288	0.549	0.722	2.339	0.757	1.930
Unconnected Impervious Area (UIA, acres)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Receiving Pervious Area (RPA, acres)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Separate Pervious Area (SPA, acres)	5.022	0.748	0.521	0.203	0.437	0.202	0.793	0.351	1.770	0.296	0.389	1.260	0.408	1.039
RPA Treatment Type: Conveyance (C), Volume (V), or Permeable Pavement (PP)	C	C	C	C	C	C	C	C	C	C	C	C	C	C

CALCULATED RESULTS (OUTPUT)

Total Calculated Area (ac, check against input)	6.432	2.137	1.488	0.581	1.249	0.576	2.266	1.004	5.058	0.845	1.111	3.599	1.165	2.969
Directly Connected Impervious Area (DCIA, %)	21.9%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%
Unconnected Impervious Area (UIA, %)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Receiving Pervious Area (RPA, %)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Separate Pervious Area (SPA, %)	78.1%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%
A_R (RPA / UIA)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
I_a Check	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
f / I for WQCV Event:	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
f / I for 5-Year Event:	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
f / I for 100-Year Event:	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
f / I for Optional User Defined Storm CUHP:	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31
IRF for WQCV Event:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
IRF for 5-Year Event:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
IRF for 100-Year Event:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
IRF for Optional User Defined Storm CUHP:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Total Site Imperviousness: I_{total}	21.9%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%
Effective Imperviousness for WQCV Event:	21.9%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%
Effective Imperviousness for 5-Year Event:	21.9%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%
Effective Imperviousness for 100-Year Event:	21.9%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%
Effective Imperviousness for Optional User Defined Storm CUHP:	21.9%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%	65.0%

LID / EFFECTIVE IMPERVIOUSNESS CREDITS

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

Total Site Imperviousness:	**55.9%**
Total Site Effective Imperviousness for WQCV Event:	**55.9%**
Total Site Effective Imperviousness for 5-Year Event:	**55.9%**
Total Site Effective Imperviousness for 100-Year Event:	**55.9%**
Total Site Effective Imperviousness for Optional User Defined Storm CUHP:	**55.9%**

Notes:

* Use Green-Ampt average infiltration rate values from Table 3-3.
** Flood control detention volume credits based on empirical equations from Storage Chapter of USDCM.
*** Method assumes that 1-hour rainfall depth is equivalent to 1-hour intensity for calculation purposed

Worksheet Protected

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

LID Credit by Impervious Reduction Factor (IRF) Method

UD-BMP (Version 3.06, November 2016)

User Input

Calculated cells

***Design Storm: 1-Hour Rain Depth	WQCV Event	0.60	inches
***Minor Storm: 1-Hour Rain Depth	5-Year Event	1.50	inches
***Major Storm: 1-Hour Rain Depth	100-Year Event	2.52	inches
Optional User Defined Storm	CUHP		
(CUHP) NOAA 1 Hour Rainfall Depth and Frequency for User Defined Storm	100-Year Event	2.52	
Max Intensity for Optional User Defined Storm	2.51496		

Designer:	**Jesse Sullivan**
Company:	**Matrix Design Group**
Date:	**June 26, 2019**
Project:	**FDR: Trails at Aspen Ridge Filing No. 1**
Location:	**El Paso County, CO**

SITE INFORMATION (USER-INPUT)

Sub-basin Identifier	H-4	H-5	H-6	H-7	H-8	H-9	H-10	H-11	I-1	I-2	I-3	M	O-1	Q-1
Receiving Pervious Area Soil Type	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Clay Loam	Clay Loam	Sandy Loam	Sandy Loam	Sandy Loam
Total Area (ac., Sum of DCIA, UIA, RPA, & SPA)	0.916	2.417	2.335	2.026	0.971	2.320	1.326	3.420	3.126	0.592	4.185	10.284	1.626	1.087
Directly Connected Impervious Area (DCIA, acres)	0.595	1.571	1.518	1.317	0.631	0.000	0.862	2.223	2.032	0.414	2.720	0.000	1.057	0.000
Unconnected Impervious Area (UIA, acres)	0.000	0.000	0.000	0.000	0.000	0.907	0.000	0.000	0.000	0.000	0.000	1.727	0.000	0.232
Receiving Pervious Area (RPA, acres)	0.000	0.000	0.000	0.000	0.000	1.413	0.000	0.000	0.000	0.000	0.000	8.557	0.000	0.855
Separate Pervious Area (SPA, acres)	0.320	0.846	0.817	0.709	0.340	0.000	0.464	1.197	1.094	0.177	1.465	0.000	0.569	0.000
RPA Treatment Type: Conveyance (C), Volume (V), or Permeable Pavement (PP)	C	C	C	C	C	C	C	C	C	C	C	C	C	C

CALCULATED RESULTS (OUTPUT)

Total Calculated Area (ac, check against input)	0.916	2.417	2.335	2.026	0.971	2.320	1.326	3.420	3.126	0.592	4.185	10.284	1.626	1.087
Directly Connected Impervious Area (DCIA, %)	65.0%	65.0%	65.0%	65.0%	65.0%	0.0%	65.0%	65.0%	65.0%	70.0%	65.0%	0.0%	65.0%	0.0%
Unconnected Impervious Area (UIA, %)	0.0%	0.0%	0.0%	0.0%	0.0%	39.1%	0.0%	0.0%	0.0%	0.0%	0.0%	16.8%	0.0%	21.3%
Receiving Pervious Area (RPA, %)	0.0%	0.0%	0.0%	0.0%	0.0%	60.9%	0.0%	0.0%	0.0%	0.0%	0.0%	83.2%	0.0%	78.7%
Separate Pervious Area (SPA, %)	35.0%	35.0%	35.0%	35.0%	35.0%	0.0%	35.0%	35.0%	35.0%	30.0%	35.0%	0.0%	35.0%	0.0%
A_R (RPA / UIA)	0.000	0.000	0.000	0.000	0.000	1.559	0.000	0.000	0.000	0.000	0.000	4.956	0.000	3.689
I_a Check	1.000	1.000	1.000	1.000	1.000	0.390	1.000	1.000	1.000	1.000	1.000	0.170	1.000	0.210
f / I for WQCV Event:	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	0.4	0.4	1.7	1.7	1.7
f / I for 5-Year Event:	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.2	0.2	0.5	0.5	0.5
f / I for 100-Year Event:	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.1	0.1	0.3	0.3	0.3
f / I for Optional User Defined Storm CUHP:	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.12	0.12	0.31	0.31	0.31
IRF for WQCV Event:	1.00	1.00	1.00	1.00	1.00	0.61	1.00	1.00	1.00	1.00	1.00	0.44	1.00	0.53
IRF for 5-Year Event:	1.00	1.00	1.00	1.00	1.00	0.88	1.00	1.00	1.00	1.00	1.00	0.72	1.00	0.85
IRF for 100-Year Event:	1.00	1.00	1.00	1.00	1.00	0.92	1.00	1.00	1.00	1.00	1.00	0.75	1.00	0.89
IRF for Optional User Defined Storm CUHP:	1.00	1.00	1.00	1.00	1.00	0.92	1.00	1.00	1.00	1.00	1.00	0.75	1.00	0.89
Total Site Imperviousness: I_{total}	65.0%	65.0%	65.0%	65.0%	65.0%	39.1%	65.0%	65.0%	65.0%	70.0%	65.0%	16.8%	65.0%	21.3%
Effective Imperviousness for WQCV Event:	65.0%	65.0%	65.0%	65.0%	65.0%	23.8%	65.0%	65.0%	65.0%	70.0%	65.0%	7.4%	65.0%	11.2%
Effective Imperviousness for 5-Year Event:	65.0%	65.0%	65.0%	65.0%	65.0%	34.3%	65.0%	65.0%	65.0%	70.0%	65.0%	12.1%	65.0%	18.1%
Effective Imperviousness for 100-Year Event:	65.0%	65.0%	65.0%	65.0%	65.0%	35.8%	65.0%	65.0%	65.0%	70.0%	65.0%	12.7%	65.0%	19.0%
Effective Imperviousness for Optional User Defined Storm CUHP:	65.0%	65.0%	65.0%	65.0%	65.0%	35.8%	65.0%	65.0%	65.0%	70.0%	65.0%	12.7%	65.0%	19.0%

LID / EFFECTIVE IMPERVIOUSNESS CREDITS

WQCV Event CREDIT: Reduce Detention By:	0.0%	0.0%	0.0%	0.0%	0.0%	26.5%	0.0%	0.0%	0.0%	0.0%	0.0%	49.1%	0.0%	39.0%
This line only for 10-Year Event	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
100-Year Event CREDIT**: Reduce Detention By:	0.0%	0.0%	0.0%	0.0%	0.0%	8.5%	0.0%	0.0%	0.0%	0.0%	0.0%	27.6%	0.0%	11.9%
User Defined CUHP CREDIT: Reduce Detention By:	0.0%	0.0%	0.0%	0.0%	0.0%	6.5%	0.0%	0.0%	0.0%	0.0%	0.0%	16.3%	0.0%	7.3%

Total Site Imperviousness:	**48.6%**
Total Site Effective Imperviousness for WQCV Event:	**44.7%**
Total Site Effective Imperviousness for 5-Year Event:	**46.9%**
Total Site Effective Imperviousness for 100-Year Event:	**47.2%**
Total Site Effective Imperviousness for Optional User Defined Storm CUHP:	**47.2%**

Notes:

* Use Green-Ampt average infiltration rate values from Table 3-3.
** Flood control detention volume credits based on empirical equations from Storage Chapter of USDCM.
*** Method assumes that 1-hour rainfall depth is equivalent to 1-hour intensity for calculation purposed

Worksheet Protected

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

LID Credit by Impervious Reduction Factor (IRF) Method

UD-BMP (Version 3.06, November 2016)

User Input

Calculated cells

***Design Storm: 1-Hour Rain Depth	WQCV Event	0.60	inches
***Minor Storm: 1-Hour Rain Depth	5-Year Event	1.50	inches
***Major Storm: 1-Hour Rain Depth	100-Year Event	2.52	inches
Optional User Defined Storm	CUHP		
(CUHP) NOAA 1 Hour Rainfall Depth and Frequency for User Defined Storm	100-Year Event	2.52	
Max Intensity for Optional User Defined Storm	2.51496		

Designer: Jesse Sullivan
Company: Matrix Design Group
Date: June 26, 2019
Project: FDR: Trails at Aspen Ridge Filing No. 1
Location: El Paso County, CO

SITE INFORMATION (USER-INPUT)

Sub-basin Identifier	R-1	OS-1												
Receiving Pervious Area Soil Type	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Clay Loam	Clay Loam	Sandy Loam	Sandy Loam	Sandy Loam
Total Area (ac., Sum of DCIA, UIA, RPA, & SPA)	1.866	19.675												
Directly Connected Impervious Area (DCIA, acres)	0.000	0.000												
Unconnected Impervious Area (UIA, acres)	0.668	0.000												
Receiving Pervious Area (RPA, acres)	1.198	19.675												
Separate Pervious Area (SPA, acres)	0.000	0.000												
RPA Treatment Type: Conveyance (C), Volume (V), or Permeable Pavement (PP)	C	C	C	C	C	C	C	C	C	C	C	C	C	C
			MISSING INPUT	MISSING INPUT	MISSING INPUT	MISSING INPUT	MISSING INPUT	MISSING INPUT	MISSING INPUT	MISSING INPUT	MISSING INPUT	MISSING INPUT	MISSING INPUT	MISSING INPUT

CALCULATED RESULTS (OUTPUT)

Total Calculated Area (ac, check against input)	1.866	19.675												
Directly Connected Impervious Area (DCIA, %)	0.0%	0.0%												
Unconnected Impervious Area (UIA, %)	35.8%	0.0%												
Receiving Pervious Area (RPA, %)	64.2%	100.0%												
Separate Pervious Area (SPA, %)	0.0%	0.0%												
A_R (RPA / UIA)	1.794	0.000												
I_a Check	0.360	1.000												
f / I for WQCV Event:	1.7	1.7												
f / I for 5-Year Event:	0.5	0.5												
f / I for 100-Year Event:	0.3	0.3												
f / I for Optional User Defined Storm CUHP:	0.31	0.31												
IRF for WQCV Event:	0.59	1.00												
IRF for 5-Year Event:	0.87	1.00												
IRF for 100-Year Event:	0.91	1.00												
IRF for Optional User Defined Storm CUHP:	0.91	1.00												
Total Site Imperviousness: I_{total}	35.8%	0.0%												
Effective Imperviousness for WQCV Event:	21.3%	0.0%												
Effective Imperviousness for 5-Year Event:	31.2%	0.0%												
Effective Imperviousness for 100-Year Event:	32.6%	0.0%												
Effective Imperviousness for Optional User Defined Storm CUHP:	32.6%	0.0%												

LID / EFFECTIVE IMPERVIOUSNESS CREDITS

WQCV Event CREDIT: Reduce Detention By:	28.2%	N/A												
This line only for 10-Year Event	N/A	N/A												
100-Year Event CREDIT**: Reduce Detention By:	9.0%	N/A												
User Defined CUHP CREDIT: Reduce Detention By:	6.6%	0.0%												

Total Site Imperviousness:	**3.1%**
Total Site Effective Imperviousness for WQCV Event:	**1.8%**
Total Site Effective Imperviousness for 5-Year Event:	**2.7%**
Total Site Effective Imperviousness for 100-Year Event:	**2.8%**
Total Site Effective Imperviousness for Optional User Defined Storm CUHP:	**2.8%**

Notes:

* Use Green-Ampt average infiltration rate values from Table 3-3.
** Flood control detention volume credits based on empirical equations from Storage Chapter of USDCM.
*** Method assumes that 1-hour rainfall depth is equivalent to 1-hour intensity for calculation purposed

Version 4.05 Released March 2017

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

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

Project: Trails at Aspen Ridge Filing No. 1

Inlet ID: 1-F

Gutter Geometry (Enter data in the blue cells)				
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.8		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} =	16.0		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 =	0.007		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} =	16.0	16.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	Q_{allow} =	7.8	7.8	cfs

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017

Design Information (Input)		MINOR	MAJOR	
Type of Inlet: CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	0.0	0.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**1.5**	**2.2**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**1.2**	**3.8**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**57**	**37**	**%**

Version 4.05 Released March 2017

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

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

Project: Trails at Aspen Ridge Filing No. 1

Inlet ID: 2-F

Gutter Geometry (Enter data in the blue cells)				
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.8		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} =	16.0		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 =	0.007		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} =	16.0	16.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	Q_{allow} =	7.8	7.8	cfs

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017

Design Information (Input)		MINOR	MAJOR	
Type of Inlet: CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	0.0	0.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	5.00	5.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**0.9**	**1.5**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.2**	**1.0**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**86**	**60**	**%**

Version 4.05 Released March 2017

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

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

Project: Trails at Aspen Ridge Filing No. 1

Inlet ID: 3-F

Gutter Geometry (Enter data in the blue cells)				
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.8		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} =	16.0		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 =	0.007		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} =	16.0	16.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	Q_{allow} =	7.8	7.8	cfs

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

WARNING: MAJOR STORM max. allowable capacity is less than the design flow given on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017

Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	0.0	0.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: WARNING: Q > ALLOWABLE Q FOR MAJOR STORM		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**3.0**	**5.1**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.5**	**3.7**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**87**	**58**	**%**

Type of Inlet: CDOT Type R Curb Opening

Version 4.05 Released March 2017

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

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

Project: Trails at Aspen Ridge Filing No. 1

Inlet ID: 4-F

Gutter Geometry (Enter data in the blue cells)				
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.8		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} =	16.0		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 =	0.007		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} =	16.0	16.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	Q_{allow} =	7.8	7.8	cfs

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017

Design Information (Input)		MINOR	MAJOR	
Type of Inlet: CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	0.0	0.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**1.3**	**3.0**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.5**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**87**	**%**

Version 4.05 Released March 2017

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

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

Project: Trails at Aspen Ridge Filing No. 1

Inlet ID: 5-F

Gutter Geometry (Enter data in the blue cells)				
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.8		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} =	16.0		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 =	0.008		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} =	16.0	16.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	Q_{allow} =	**8.4**	**8.4**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017

Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	0.0	0.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**3.0**	**4.8**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.5**	**3.0**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**87**	**62**	**%**

Version 4.05 Released March 2017

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

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

Project: Trails at Aspen Ridge Filing No. 1

Inlet ID: 6-F

Gutter Geometry (Enter data in the blue cells)				
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.8		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} =	16.0		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 =	0.008		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} =	16.0	16.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	Q_{allow} =	**8.4**	**8.4**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017

Design Information (Input)		MINOR	MAJOR	
Type of Inlet (CDOT Type R Curb Opening)	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	0.0	0.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**1.7**	**3.3**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.00**	**0.6**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**83**	**%**

Version 4.05 Released March 2017

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

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

Project: Trails at Aspen Ridge Filing No. 1

Inlet ID: 1-G

Gutter Geometry (Enter data in the blue cells)				
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0		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 =	0.025		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} =	6.0	6.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	Q_{allow} =	**17.2**	**17.2**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017

Design Information (Input)		MINOR	MAJOR	
Type of Inlet: CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	0.0	0.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**2.1**	**3.6**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**1.0**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**99**	**78**	**%**

Version 4.05 Released March 2017

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

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

Project: Trails at Aspen Ridge Filing No. 1

Inlet ID: 5-H

Gutter Geometry (Enter data in the blue cells)				
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.8		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} =	16.0		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 =	0.033		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} =	16.0	16.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	Q_{allow} =	**17.0**	**17.0**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017

Design Information (Input)		MINOR	MAJOR	
Type of Inlet (CDOT Type R Curb Opening)	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	0.0	0.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**3.3**	**5.1**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.7**	**3.8**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**83**	**57**	**%**

Version 4.05 Released March 2017

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

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

Project: **Trails at Aspen Ridge Filing No. 1**

Inlet ID: **6-H**

Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.8	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} =	16.0	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 =	0.033	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} =	16.0	16.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	Q_{allow} =	**17.0**	**17.0**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017

Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	0.0	0.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**3.4**	**5.2**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.7**	**3.9**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**82**	**57**	**%**

Version 4.05 Released March 2017

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

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

Project: Trails at Aspen Ridge Filing No. 1

Inlet ID: 7-H

Gutter Geometry (Enter data in the blue cells)				
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0		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 =	0.025		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} =	6.0	6.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	Q_{allow} =	**17.2**	**17.2**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017

Design Information (Input)		MINOR	MAJOR	
Type of Inlet: CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	0.0	0.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**2.7**	**4.4**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.3**	**2.2**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**91**	**66**	**%**

Version 4.05 Released March 2017

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

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

Project: Trails at Aspen Ridge Filing No. 1

Inlet ID: 8-H

Gutter Geometry (Enter data in the blue cells)				
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	8.0		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 =	0.025		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} =	6.0	6.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	Q_{allow} =	**17.2**	**17.2**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017

Design Information (Input)		MINOR	MAJOR	
Type of Inlet (CDOT Type R Curb Opening)	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	0.0	0.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**1.7**	**3.7**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**1.1**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**77**	**%**

Version 4.05 Released March 2017

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

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

Project: Trails at Aspen Ridge Filing No. 1

Inlet ID: 1-B

Gutter Geometry (Enter data in the blue cells)				
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0		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} =	26.0		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 =	0.034		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} =	16.0	21.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**17.1**	**17.1**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017

Design Information (Input)		MINOR	MAJOR	
Type of Inlet: CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	0.0	0.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**1.8**	**3.4**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.7**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**82**	**%**

Version 4.05 Released March 2017

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

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

Project: Trails at Aspen Ridge Filing No. 1

Inlet ID: 1-D

Gutter Geometry (Enter data in the blue cells)				
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	13.0		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} =	26.0		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} =	16.0	21.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes
MINOR STORM Allowable Capacity is based on Depth Criterion		Minor Storm	Major Storm	
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**16.3**	**16.3**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017

Design Information (Input)		MINOR	MAJOR	
Type of Inlet: CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	0.0	0.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	
Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**1.6**	**4.9**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.3**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**95**	**%**

Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Thursday, Aug 29 2019

K-OS (Undeveloped) Swale to 48Inch End Section

Trapezoidal

Bottom Width (ft)	= 4.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 5.00
Invert Elev (ft)	= 1.00
Slope (%)	= 1.00
N-Value	= 0.025

Calculations

Compute by:	Known Q
Known Q (cfs)	= 67.50

Highlighted

Depth (ft)	= 1.36
Q (cfs)	= 67.50
Area (sqft)	= 12.84
Velocity (ft/s)	= 5.26
Wetted Perim (ft)	= 15.21
Crit Depth, Yc (ft)	= 1.36
Top Width (ft)	= 14.88
EGL (ft)	= 1.79

	East Pond Ultimate Buildout		West Pond Ultimate Buildout		Bradley Road Median Culvert		Blackmer St. Crossroad at Intersection with Bradley	
Pipe Size (D)	48	Inches	24	Inches	18	Inches	18	Inches
Q	129.6	cfs	24.1	cfs	7.4	cfs	10	cfs
L	24	Feet	15	Feet	15	Feet	15	Feet
W	7	Feet	4	Feet	4	Feet	4	Feet
D	2	Feet	1	Feet	0	Feet	0	Feet
d_{50}	0.53	Feet	0.51	Feet	0.15	Feet	0.20	Feet
	6.31	Inches	6.13	Inches	1.85	Inches	2.44	Inches
Depth of Flow	3	Feet	0.9	Feet	1.0	Feet	1.0	Feet
Q/D^1.5	16.20		8.52		4.03		5.44	
Yt/D	0.750		0.450		0.653		0.667	
Rip Rap	Type L		Type L		Type L for 3 x D Downstream		Type L for 3 x D Downstream	
Length	24	Feet	15	Feet	4.5	Feet	4.5	Feet
Width of Rock	19.0	Feet	10.0	Feet	4.5	Feet	4.5	Feet

Use D_o instead of D whenever flow is supercritical in the barrel.
** Use Type L for a distance of 3D downstream.

Figure 9-38. Riprap erosion protection at circular conduit outlet (valid for Q/D2.5 ≤ 6.0)

CLASSIFICATION AND GRADATION OF ORDINARY RIP RAP

Rip Rap Designation by Weight	% Smaller Than Given Size (inches)	Intermediate Rock Dimension	d50* (inches)
Type VL	70 – 100	12	6**
	50 – 70	9	
	35 – 50	6	
	2 - 10	2	
Type L	70 – 100	15	9**
	50 – 70	12	
	35 – 50	9	
	2 - 10	3	
Type M	70 – 100	21	12
	50 – 70	18	
	35 – 50	12	
	2 - 10	4	
Type H	70 – 100	30	18
	50 – 70	24	
	35 – 50	18	
	2 - 10	6	
Type VH	70 – 100	42	24
	50 – 70	33	
	35 – 50	24	
	2 - 10	9	

* d50 = Mean particle size
** Bury types VL and L with native top soil and revegetate to protect from vandalism.

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

Figure 9-37. Low tailwater riprap basin

East Pond - Forebay Sizing						Required Low Flow Capacity	
Storm Sewer Leg	StormCAD Q100 Flows	Proportion of Total Flow to Pond	Proportional Volume		Forebay Volume		
NE (Design Point I)	143.36	0.36	1560.5	Combine	**3511.071**	2.8	cfs
NW (Design Point G)	132.74	0.45	1950.6				
S (Design Point H)	82.95	0.19	**823.6**		823.6	0.8	cfs
Total flow to pond	359.05	1	4334.7		4334.7		

WQCV from UD-Detention	3.317	Ac.-Ft
3%	0.09951	Ac.-Ft
	4334.6556	Cu. Ft

Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Friday, Jun 28 2019

Trails at Aspen Ridge Filing No. 1: East Pond Trickle Channel Capacity

Rectangular

Bottom Width (ft)	=	8.00
Total Depth (ft)	=	0.50
Invert Elev (ft)	=	1.00
Slope (%)	=	1.00
N-Value	=	0.016

Calculations

Compute by:		Q vs Depth
No. Increments	=	10

Highlighted

Depth (ft)	=	0.50
Q (cfs)	=	21.63
Area (sqft)	=	4.00
Velocity (ft/s)	=	5.41
Wetted Perim (ft)	=	9.00
Crit Depth, Yc (ft)	=	0.50
Top Width (ft)	=	8.00
EGL (ft)	=	0.95

Figure 13-12b. Emergency Spillway Profile at Embankment

Figure 13-12c. Emergency Spillway Protection

Per UD-Detention:
Full Buildout Undetained Q100 = 430.8cfs
Length of Spillway = 136 feet
Unit flow = 3.16 cfs/ft

Figure 13-12d. Riprap Types for Emergency Spillway Protection

Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Sep 17 2019

Emergency Flows along Levee

User-defined

Invert Elev (ft)	=	5815.52
Slope (%)	=	2.80
N-Value	=	0.025

Calculations

Compute by:		Known Q
Known Q (cfs)	=	430.80

(Sta, El, n)-(Sta, El, n)...

(0.00, 5826.00)-(34.12, 5815.52, 0.025)-(187.00, 5819.12, 0.025)

Highlighted

Depth (ft)	=	1.52
Q (cfs)	=	430.80
Area (sqft)	=	52.82
Velocity (ft/s)	=	8.16
Wetted Perim (ft)	=	69.74
Crit Depth, Yc (ft)	=	1.86
Top Width (ft)	=	69.50
EGL (ft)	=	2.55

Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Monday, Jun 24 2019

Swale Downstream of East Pond (Q100)

User-defined

Invert Elev (ft)	=	5813.61
Slope (%)	=	1.59
N-Value	=	0.035

Calculations

Compute by:		Known Q
Known Q (cfs)	=	127.40

Highlighted

Depth (ft)	=	0.85
Q (cfs)	=	127.40
Area (sqft)	=	38.43
Velocity (ft/s)	=	3.31
Wetted Perim (ft)	=	76.22
Crit Depth, Yc (ft)	=	0.78
Top Width (ft)	=	76.08
EGL (ft)	=	1.02

(Sta, El, n)-(Sta, El, n)...

(21.29, 5820.48)-(42.23, 5813.62, 0.035)-(56.78, 5813.61, 0.035)-(126.85, 5814.62, 0.035)-(237.00, 5820.55, 0.035)

Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Sep 24 2019

East Pond - Q100 Discharge

Circular

Diameter (ft)	= 4.00
Invert Elev (ft)	= 1.00
Slope (%)	= 2.10
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 138.20

Highlighted

Depth (ft)	= 2.38
Q (cfs)	= 138.20
Area (sqft)	= 7.82
Velocity (ft/s)	= 17.68
Wetted Perim (ft)	= 7.06
Crit Depth, Yc (ft)	= 3.49
Top Width (ft)	= 3.92
EGL (ft)	= 7.24

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: Trails at Aspen Ridge

Basin ID: West Fork of Jimmy Camp Creek: East Pond(located in Sub-basin M)(Full Buildout)

Example Zone Configuration (Retention Pond)

Required Volume Calculation

Selected BMP Type =	**EDB**			
Watershed Area =	157.90	acres		
Watershed Length =	3,742	ft		
Watershed Slope =	0.030	ft/ft		
Watershed Imperviousness =	45.40%	percent		
Percentage Hydrologic Soil Group A =	0.0%	percent		
Percentage Hydrologic Soil Group B =	87.0%	percent		
Percentage Hydrologic Soil Groups C/D =	13.0%	percent		
Desired WQCV Drain Time =	40.0	hours		
Location for 1-hr Rainfall Depths =	User Input			
Water Quality Capture Volume (WQCV) =	2.553	acre-feet	Optional User Override 1-hr Precipitation	
Excess Urban Runoff Volume (EURV) =	7.491	acre-feet		
2-yr Runoff Volume (P1 = 1.19 in.) =	6.103	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	8.512	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	11.664	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	16.728	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	20.230	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	24.794	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.55 in.) =	38.509	acre-feet	3.55	inches
Approximate 2-yr Detention Volume =	5.710	acre-feet		
Approximate 5-yr Detention Volume =	7.997	acre-feet		
Approximate 10-yr Detention Volume =	10.523	acre-feet		
Approximate 25-yr Detention Volume =	11.595	acre-feet		
Approximate 50-yr Detention Volume =	12.129	acre-feet		
Approximate 100-yr Detention Volume =	13.732	acre-feet		

Stage-Storage Calculation

Zone 1 Volume (WQCV) =	2.553	acre-feet
Zone 2 Volume (EURV - Zone 1) =	4.938	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	6.241	acre-feet
Total Detention Basin Volume =	13.732	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

Depth Increment = 1 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	443	0.010		
5817	--	1.00	--	--	--	6,211	0.143	3,265	0.075
5818	--	2.00	--	--	--	31,782	0.730	22,007	0.505
5819	--	3.00	--	--	--	76,551	1.757	76,490	1.756
5820	--	4.00	--	--	--	116,770	2.681	173,150	3.975
5821	--	5.00	--	--	--	141,034	3.238	302,052	6.934
5822	--	6.00	--	--	--	154,951	3.557	450,045	10.332
5823	--	7.00	--	--	--	165,754	3.805	610,397	14.013
5824	--	8.00	--	--	--	174,708	4.011	780,628	17.921
5825	--	9.00	--	--	--	180,233	4.138	958,098	21.995
5826	--	10.00	--	--	--	186,799	4.288	1,141,614	26.208
	--		--	--	--				
	--		--	--	--				
	--		--	--	--			

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Project: Trails at Aspen Ridge

Basin ID: West Fork of Jimmy Camp Creek-East Pond. (Full Buildout with SWMM Hydrographs)

Example Zone Configuration (Retention Pond)

	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.41	2.553	Orifice Plate
Zone 2 (EURV)	5.18	4.938	Rectangular Orifice
Zone 3 (100-year)	6.93	6.241	Weir&Pipe (Restrict)
		13.732	Total

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

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)
Underdrain Orifice Diameter =	N/A	inches

Calculated Parameters for Underdrain

Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	4.00	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	N/A	inches
Orifice Plate: Orifice Area per Row =	N/A	inches

Calculated Parameters for Plate

WQ Orifice Area CHECK CELLS AB84:BE84	N/A	ft^2
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft^2

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.73	3.47					
Orifice Area (sq. inches)	26.00	3.00						

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Rectangular	Not Selected	
Invert of Vertical Orifice =	5.18	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	8.00	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Height =	15.00	N/A	inches
Vertical Orifice Width =	24.00		inches

Calculated Parameters for Vertical Orifice

	Zone 2 Rectangular	Not Selected	
Vertical Orifice Area =	2.50	N/A	ft^2
Vertical Orifice Centroid =	0.63	N/A	feet

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

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	6.95	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	14.50	N/A	feet
Overflow Weir Slope =	0.00	N/A	H:V (enter zero for flat grate)
Horiz. Length of Weir Sides =	9.50	N/A	feet
Overflow Grate Open Area % =	70%	N/A	%, grate open area/total area
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H_t =	6.95	N/A	feet
Over Flow Weir Slope Length =	9.50	N/A	feet
Grate Open Area / 100-yr Orifice Area =	8.62	N/A	should be $\geq$ 4
Overflow Grate Open Area w/o Debris =	96.43	N/A	ft^2
Overflow Grate Open Area w/ Debris =	48.21	N/A	ft^2

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

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.50	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	48.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	40.00		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	11.19	N/A	ft^2
Outlet Orifice Centroid =	1.80	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	2.30	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	8.05	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	136.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

Spillway Design Flow Depth=	1.01	feet
Stage at Top of Freeboard =	10.06	feet
Basin Area at Top of Freeboard =	4.29	acres

Routed Hydrograph Results

Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	0.53	1.07	1.19	1.50	1.75	2.00	2.25	2.52	3.55
Calculated Runoff Volume (acre-ft) =	2.553	7.491	6.103	8.512	11.664	16.728	20.230	24.794	38.509
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	6.373	8.682	9.212	12.694	16.432	21.907	26.696	31.518	33.910
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.01	0.04	0.24	0.73	1.00	1.33	2.22
Predevelopment Peak Q (cfs) =	0.0	0.0	2.1	5.8	37.2	114.6	157.3	210.2	349.8
Peak Inflow Q (cfs) =	67.7	74.9	83.8	123.0	162.5	244.8	334.3	430.8	448.9
Peak Outflow Q (cfs) =	2.0	2.1	2.1	5.6	13.3	50.0	88.2	138.2	165.4
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.0	0.4	0.4	0.6	0.7	0.5
Structure Controlling Flow =	Plate	Plate	Plate	Vertical Orifice 1	Vertical Orifice 1	Overflow Grate 1	Overflow Grate 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	0.3	0.7	1.2	1.2
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	45	57	59	67	67	67	65	64	64
Time to Drain 99% of Inflow Volume (hours) =	**46**	59	61	70	71	71	70	70	70
Maximum Ponding Depth (ft) =	4.33	4.90	5.10	5.87	6.62	7.41	7.71	8.04	8.16
Area at Maximum Ponding Depth (acres) =	2.86	3.18	3.27	3.52	3.71	3.89	3.95	4.01	4.03
Maximum Volume Stored (acre-ft) =	4.890	6.581	7.227	9.872	12.548	15.551	16.766	18.041	18.524

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Detention Basin Outlet Structure Design

Outflow Hydrograph Workbook Filename: _____

Storm Inflow Hydrographs **UD-Detention, Version 3.07 (February 2017)**

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

User-Defined	SOURCE	USER	USER	USER	USER	USER	USER	USER	USER	USER
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
15.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:15:00	0.05	0.16	0.20	0.49	0.82	1.40	1.99	1.73	2.59
Hydrograph	0:30:00	0.79	5.53	6.27	10.11	14.38	22.08	29.41	38.00	38.17
Constant	0:45:00	13.04	66.20	75.47	118.72	162.47	244.81	334.30	430.75	448.91
1.057	1:00:00	18.78	74.88	83.80	122.99	161.71	229.11	286.12	331.36	346.20
	1:15:00	16.06	52.52	58.59	82.43	110.71	157.31	180.41	200.54	222.45
	1:30:00	21.05	35.03	38.06	52.69	73.86	101.97	105.14	125.75	140.70
	1:45:00	67.69	25.73	27.58	37.77	52.89	71.29	82.33	85.27	99.35
	2:00:00	37.53	20.45	21.50	29.05	51.62	52.32	62.86	73.70	76.35
	2:15:00	23.70	15.63	16.38	21.13	26.94	36.07	43.14	50.34	59.38
	2:30:00	16.31	11.68	12.13	14.95	13.27	14.86	28.06	32.53	36.74
	2:45:00	11.92	9.11	9.39	11.32	8.45	10.24	24.47	22.02	24.07
	3:00:00	9.08	7.34	7.52	8.77	13.94	7.38	8.30	15.15	16.48
	3:15:00	7.14	6.08	6.19	7.09	6.19	9.68	6.54	6.71	14.94
	3:30:00	5.76	5.15	5.21	5.90	6.64	8.21	7.36	12.16	13.91
	3:45:00	4.76	4.44	4.47	5.02	5.42	3.81	3.97	8.93	10.21
	4:00:00	3.99	3.90	3.89	4.35	4.65	6.99	3.41	3.55	3.86
	4:15:00	3.41	3.46	3.44	3.83	4.06	4.29	3.11	5.90	4.43
	4:30:00	2.96	3.11	3.08	3.42	3.60	3.81	3.94	4.12	5.36
	4:45:00	2.59	2.83	2.78	3.09	3.23	3.40	3.51	3.61	3.59
	5:00:00	2.30	2.60	2.54	2.82	2.93	3.07	3.16	3.24	3.26
	5:15:00	2.06	2.40	2.34	2.60	2.69	2.80	2.87	2.94	2.96
	5:30:00	1.85	2.24	2.17	2.41	2.49	2.58	2.64	2.70	2.71
	5:45:00	1.69	2.10	2.03	2.25	2.32	2.40	2.45	2.50	2.50
	6:00:00	1.55	2.03	1.94	2.12	2.10	2.24	2.29	2.33	2.33
	6:15:00	1.44	1.89	1.93	2.03	2.02	2.12	2.27	2.07	2.32
	6:30:00	1.35	2.15	1.44	1.90	1.76	1.75	2.40	2.11	1.98
	6:45:00	1.24	1.66	1.45	2.12	1.70	1.83	2.03	1.96	1.95
	7:00:00	1.13	1.98	1.36	1.64	1.60	1.79	1.89	1.88	1.80
	7:15:00	1.09	1.77	1.45	1.77	1.53	1.31	1.96	1.69	1.71
	7:30:00	1.03	1.52	1.43	1.92	1.57	1.94	1.82	1.97	1.94
	7:45:00	0.98	1.30	1.39	1.45	1.66	1.46	1.45	1.41	1.63
	8:00:00	0.93	1.60	1.31	1.83	1.58	1.53	1.74	1.82	1.32
	8:15:00	0.89	1.40	1.26	1.52	1.35	1.63	1.28	1.73	1.43
	8:30:00	0.85	1.36	1.23	1.37	1.30	1.32	1.49	1.29	1.45
	8:45:00	0.82	1.50	1.22	1.50	1.41	1.31	1.43	1.26	1.45
	9:00:00	0.79	1.22	1.13	1.33	1.29	1.39	1.61	1.23	1.31
	9:15:00	0.76	1.34	1.09	1.41	1.49	1.26	1.59	1.22	1.50
	9:30:00	0.74	1.24	1.16	1.37	1.36	1.48	1.35	1.20	1.38
	9:45:00	0.72	1.23	1.14	1.40	1.36	1.28	1.27	1.18	1.35
	10:00:00	0.70	1.18	1.09	1.30	1.38	1.35	1.23	1.42	1.29
	10:15:00	0.68	1.17	1.07	1.46	1.41	1.21	1.27	1.32	1.37
	10:30:00	0.66	1.15	1.05	1.38	1.17	1.13	1.35	1.34	1.45
	10:45:00	0.64	1.14	1.04	1.10	1.20	1.24	1.16	1.34	1.17
	11:00:00	0.63	1.11	1.02	1.09	1.25	1.17	1.11	1.24	1.15
	11:15:00	0.62	1.10	1.00	1.17	1.19	1.20	1.10	1.27	1.10
	11:30:00	0.60	1.09	0.99	1.14	1.16	1.14	1.11	1.19	1.16
	11:45:00	0.59	1.08	0.97	1.15	1.14	1.15	1.15	1.18	1.16
	12:00:00	0.58	1.05	0.96	1.11	1.13	1.13	1.14	1.14	1.15
	12:15:00	0.57	1.04	0.94	1.10	1.11	1.12	1.12	1.13	1.13
	12:30:00	0.56	1.03	0.93	1.09	1.10	1.11	1.11	1.12	1.12
	12:45:00	0.55	1.02	0.92	1.07	1.09	1.09	1.10	1.10	1.11
	13:00:00	0.55	1.01	0.91	1.06	1.08	1.08	1.09	1.09	1.09
	13:15:00	0.54	1.00	0.89	1.05	1.07	1.07	1.07	1.08	1.08
	13:30:00	0.53	0.99	0.88	1.04	1.05	1.06	1.06	1.07	1.07
	13:45:00	0.52	0.98	0.87	1.03	1.04	1.05	1.05	1.06	1.06
	14:00:00	0.52	0.97	0.86	1.02	1.03	1.04	1.04	1.05	1.05
	14:15:00	0.51	0.96	0.85	1.01	1.02	1.03	1.03	1.04	1.04
	14:30:00	0.51	0.95	0.84	1.00	1.01	1.02	1.02	1.02	1.03
	14:45:00	0.50	0.94	0.83	0.99	1.00	1.01	1.01	1.01	1.02
	15:00:00	0.49	0.93	0.82	0.98	1.00	1.00	1.00	1.00	1.01
	15:15:00	0.49	0.92	0.81	0.97	0.99	0.99	0.99	0.99	1.00
	15:30:00	0.48	0.91	0.80	0.97	0.98	0.98	0.99	0.98	0.99
	15:45:00	0.48	0.91	0.79	0.96	0.97	0.97	0.98	0.98	0.98
	16:00:00	0.48	0.90	0.79	0.95	0.96	0.97	0.97	0.97	0.98
	16:15:00	0.47	0.89	0.78	0.94	0.95	0.96	0.96	0.96	0.97
	16:30:00	0.47	0.88	0.77	0.93	0.95	0.95	0.95	0.95	0.96
	16:45:00	0.46	0.88	0.76	0.93	0.94	0.94	0.94	0.94	0.95
	17:00:00	0.46	0.86	0.75	0.92	0.93	0.94	0.94	0.94	0.94
	17:15:00	0.46	0.86	0.74	0.91	0.92	0.93	0.93	0.93	0.94
	17:30:00	0.45	0.85	0.73	0.90	0.92	0.92	0.92	0.92	0.93

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: Trails at Aspen Ridge - Filing No. 1

Basin ID: West Fork of Jimmy Camp Creek: East Pond(located in Sub-basin M)

Example Zone Configuration (Retention Pond)

Required Volume Calculation

Selected BMP Type =	**EDB**			
Watershed Area =	157.90	acres		
Watershed Length =	3,742	ft		
Watershed Slope =	0.030	ft/ft		
Watershed Imperviousness =	21.11%	percent		
Percentage Hydrologic Soil Group A =	0.0%	percent		
Percentage Hydrologic Soil Group B =	87.0%	percent		
Percentage Hydrologic Soil Groups C/D =	13.0%	percent		
Desired WQCV Drain Time =	40.0	hours		
Location for 1-hr Rainfall Depths =	User Input			
Water Quality Capture Volume (WQCV) =	1.581	acre-feet	Optional User Override 1-hr Precipitation	
Excess Urban Runoff Volume (EURV) =	3.276	acre-feet		
2-yr Runoff Volume (P1 = 1.19 in.) =	2.486	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	3.763	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	6.297	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	11.965	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	15.637	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	20.423	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.55 in.) =	33.696	acre-feet	3.55	inches
Approximate 2-yr Detention Volume =	2.318	acre-feet		
Approximate 5-yr Detention Volume =	3.533	acre-feet		
Approximate 10-yr Detention Volume =	5.392	acre-feet		
Approximate 25-yr Detention Volume =	6.563	acre-feet		
Approximate 50-yr Detention Volume =	6.924	acre-feet		
Approximate 100-yr Detention Volume =	8.521	acre-feet		

Stage-Storage Calculation

Zone 1 Volume (WQCV) =	1.581	acre-feet
Zone 2 Volume (EURV - Zone 1) =	1.695	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	5.244	acre-feet
Total Detention Basin Volume =	8.521	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

Depth Increment = 1 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	443	0.010		
5817	--	1.00	--	--	--	6,211	0.143	3,265	0.075
5818	--	2.00	--	--	--	31,782	0.730	22,007	0.505
5819	--	3.00	--	--	--	76,551	1.757	76,490	1.756
5820	--	4.00	--	--	--	116,770	2.681	173,150	3.975
5821	--	5.00	--	--	--	141,034	3.238	302,052	6.934
5822	--	6.00	--	--	--	154,951	3.557	450,045	10.332
5823	--	7.00	--	--	--	165,754	3.805	610,397	14.013
5824	--	8.00	--	--	--	174,708	4.011	780,628	17.921
5825	--	9.00	--	--	--	180,233	4.138	958,098	21.995
5826	--	10.00	--	--	--	186,799	4.288	1,141,614	26.208
	--		--	--	--				
	--		--	--	--				
	--		--	--	--			

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Project: Trails at Aspen Ridge - Filing No. 1

Basin ID: West Fork of Jimmy Camp Creek-East Pond. (Filing No. 1 Conditions)

Example Zone Configuration (Retention Pond)

	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.90	1.581	Orifice Plate
Zone 2 (EURV)	3.73	1.695	Rectangular Orifice
Zone 3 (100-year)	5.48	5.244	Weir&Pipe (Restrict)
		8.521	Total

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

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)
Underdrain Orifice Diameter =	N/A	inches

Calculated Parameters for Underdrain

Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	2.90	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	8.00	inches
Orifice Plate: Orifice Area per Row =	N/A	inches

Calculated Parameters for Plate

WQ Orifice Area CHECK CELLS AB84:BE84	N/A	ft^2
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft^2

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.70	1.40	2.10	2.80			
Orifice Area (sq. inches)	4.10	4.20	4.20	4.20	4.30			

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Rectangular	Not Selected	
Invert of Vertical Orifice =	3.73	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	6.95	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Height =	15.00	N/A	inches
Vertical Orifice Width =	24.00		inches

Calculated Parameters for Vertical Orifice

	Zone 2 Rectangular	Not Selected	
Vertical Orifice Area =	2.50	N/A	ft^2
Vertical Orifice Centroid =	0.63	N/A	feet

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

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	6.94	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	14.50	N/A	feet
Overflow Weir Slope =	0.00	N/A	H:V (enter zero for flat grate)
Horiz. Length of Weir Sides =	9.50	N/A	feet
Overflow Grate Open Area % =	75%	N/A	%, grate open area/total area
Debris Clogging % =	45%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H_t =	6.94	N/A	feet
Over Flow Weir Slope Length =	9.50	N/A	feet
Grate Open Area / 100-yr Orifice Area =	9.23	N/A	should be $\geq$ 4
Overflow Grate Open Area w/o Debris =	103.31	N/A	ft^2
Overflow Grate Open Area w/ Debris =	56.82	N/A	ft^2

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

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.50	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	48.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	40.00		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	11.19	N/A	ft^2
Outlet Orifice Centroid =	1.80	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	2.30	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	8.08	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	136.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

Spillway Design Flow Depth=	0.85	feet
Stage at Top of Freeboard =	9.93	feet
Basin Area at Top of Freeboard =	4.28	acres

Routed Hydrograph Results

Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	0.53	1.07	1.19	1.50	1.75	2.00	2.25	2.52	3.55
Calculated Runoff Volume (acre-ft) =	1.581	3.276	2.486	3.763	6.297	11.965	15.637	20.423	33.696
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	1.581	3.275	2.486	3.762	6.292	11.954	15.628	20.421	33.687
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.01	0.04	0.24	0.73	1.00	1.33	2.22
Predevelopment Peak Q (cfs) =	0.0	0.0	2.1	5.8	37.2	114.6	157.3	210.2	349.8
Peak Inflow Q (cfs) =	27.5	56.3	42.9	64.6	106.8	199.0	257.6	332.5	532.3
Peak Outflow Q (cfs) =	0.7	1.0	0.9	1.2	6.3	16.9	20.6	76.9	263.8
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.2	0.2	0.1	0.1	0.4	0.8
Structure Controlling Flow =	Plate	Plate	Plate	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Grate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.5	1.1
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	57	49	62	68	67	66	63	55
Time to Drain 99% of Inflow Volume (hours) =	**42**	62	53	67	74	76	76	75	71
Maximum Ponding Depth (ft) =	2.83	3.66	3.31	3.85	4.61	5.98	6.85	7.52	8.52
Area at Maximum Ponding Depth (acres) =	1.58	2.37	2.04	2.54	3.01	3.55	3.77	3.91	4.08
Maximum Volume Stored (acre-ft) =	1.472	3.117	2.345	3.583	5.684	10.261	13.407	15.980	19.983

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: **Trails at Aspen Ridge**

Basin ID: **West Fork of Jimmy Camp Creek: East Pond (Please note that this sheet was used only to determine the WQCV with the Commercial areas fully developed. Also this area does not include the area along Powers diverted from the Big Johnson Basin.)**

Example Zone Configuration (Retention Pond)

Required Volume Calculation

Selected BMP Type =	**EDB**	
Watershed Area =	150.60	acres
Watershed Length =	3,742	ft
Watershed Slope =	0.030	ft/ft
Watershed Imperviousness =	67.00%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	87.0%	percent
Percentage Hydrologic Soil Groups C/D =	13.0%	percent
Desired WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	
Water Quality Capture Volume (WQCV) =	3.289	acre-feet
Excess Urban Runoff Volume (EURV) =	10.877	acre-feet

Optional User Override 1-hr Precipitation

Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool									

Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Aug 20 2019

West Pond Outlet Pipe

Circular

Diameter (ft)	= 2.00
Invert Elev (ft)	= 1.00
Slope (%)	= 1.00
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 23.90

Highlighted

Depth (ft)	= 1.80
Q (cfs)	= 24.10
Area (sqft)	= 2.98
Velocity (ft/s)	= 8.09
Wetted Perim (ft)	= 5.00
Crit Depth, Yc (ft)	= 1.74
Top Width (ft)	= 1.20
EGL (ft)	= 2.82

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: Trails at Aspen Ridge Filing No. 1 Buildout: West Pond

Basin ID: Big Johnson Reservoir

Example Zone Configuration (Retention Pond)

Required Volume Calculation

Selected BMP Type =	**SF**			
Watershed Area =	34.69	acres		
Watershed Length =	2,691	ft		
Watershed Slope =	0.020	ft/ft		
Watershed Imperviousness =	3.83%	percent		
Percentage Hydrologic Soil Group A =	8.6%	percent		
Percentage Hydrologic Soil Group B =	81.2%	percent		
Percentage Hydrologic Soil Groups C/D =	10.2%	percent		
Desired WQCV Drain Time =	40.0	hours	**Drain Time Too Long**	
Location for 1-hr Rainfall Depths =	User Input			
Water Quality Capture Volume (WQCV) =	0.065	acre-feet	Optional User Override 1-hr Precipitation	
Excess Urban Runoff Volume (EURV) =	0.111	acre-feet		
2-yr Runoff Volume (P1 = 1.19 in.) =	0.071	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	0.137	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	0.499	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	1.729	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	2.512	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	3.566	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.55 in.) =	6.349	acre-feet	3.55	inches
Approximate 2-yr Detention Volume =	0.066	acre-feet		
Approximate 5-yr Detention Volume =	0.129	acre-feet		
Approximate 10-yr Detention Volume =	0.383	acre-feet		
Approximate 25-yr Detention Volume =	0.573	acre-feet		
Approximate 50-yr Detention Volume =	0.582	acre-feet		
Approximate 100-yr Detention Volume =	0.811	acre-feet		

Stage-Storage Calculation

Zone 1 Volume (WQCV) =	0.065	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.046	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.700	acre-feet
Total Detention Basin Volume =	0.811	acre-feet
Initial Surcharge Volume (ISV) =	N/A	ft^3
Initial Surcharge Depth (ISD) =	N/A	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	N/A	ft
Slope of Trickle Channel (S_{TC}) =	N/A	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Media Surface	--	0.00	--	--	--	1,135	0.026		
5870	--	0.68	--	--	--	10,433	0.240	3,829	0.088
5871	--	1.68	--	--	--	29,339	0.674	23,819	0.547
5872	--	2.68	--	--	--	42,908	0.985	59,942	1.376
5873	--	3.68	--	--	--	52,399	1.203	107,596	2.470
5874	--	4.68	--	--	--	59,117	1.357	163,354	3.750
5875	--	5.68	--	--	--	65,896	1.513	225,860	5.185
5876	--	6.68	--	--	--	69,857	1.604	293,737	6.743

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Project: Trails at Aspen Ridge Filing No. 1 Buildout: West Pond

Basin ID: Big Johnson Reservoir

Example Zone Configuration (Retention Pond)

	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	0.57	0.065	Filtration Media
Zone 2 (EURV)	0.77	0.046	Orifice Plate
Zone 3 (100-year)	2.05	0.700	Weir&Pipe (Restrict)
		0.811	Total

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

Underdrain Orifice Invert Depth =	1.92	ft (distance below the filtration media surface)
Underdrain Orifice Diameter =	0.70	inches

Calculated Parameters for Underdrain

Underdrain Orifice Area =	0.0	ft^2
Underdrain Orifice Centroid =	0.03	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Invert of Lowest Orifice =	0.57	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	3.50	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	0.80	inches
Orifice Plate: Orifice Area per Row =	2.66	sq. inches (diameter = 1-13/16 inches)

Calculated Parameters for Plate

WQ Orifice Area per Row =	1.847E-02	ft^2
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft^2

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.57	0.64	0.70	1.50				
Orifice Area (sq. inches)	2.66	2.66	2.66	648.00				

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

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

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected	
Vertical Orifice Area =	N/A	N/A	ft^2
Vertical Orifice Centroid =	N/A	N/A	feet

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

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	3.50	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	6.00	N/A	feet
Overflow Weir Slope =	4.00	N/A	H:V (enter zero for flat grate)
Horiz. Length of Weir Sides =	4.00	N/A	feet
Overflow Grate Open Area % =	70%	N/A	%, grate open area/total area
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H_t =	4.50	N/A	feet
Over Flow Weir Slope Length =	4.12	N/A	feet
Grate Open Area / 100-yr Orifice Area =	6.85	N/A	should be $\geq$ 4
Overflow Grate Open Area w/o Debris =	17.32	N/A	ft^2
Overflow Grate Open Area w/ Debris =	8.66	N/A	ft^2

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

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.17	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	24.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	18.00		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	2.53	N/A	ft^2
Outlet Orifice Centroid =	0.83	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	2.09	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	4.70	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	40.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

Spillway Design Flow Depth=	0.00	feet
Stage at Top of Freeboard =	5.70	feet
Basin Area at Top of Freeboard =	1.51	acres

Routed Hydrograph Results

Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	0.53	1.07	1.19	1.50	1.75	2.00	2.25	2.52	3.55
Calculated Runoff Volume (acre-ft) =	0.065	0.111	0.071	0.137	0.499	1.729	2.512	3.566	6.349
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	0.065	0.110	0.071	0.137	0.499	1.729	2.512	3.567	6.344
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.01	0.02	0.14	0.45	0.63	0.87	1.48
Predevelopment Peak Q (cfs) =	0.0	0.0	0.3	0.7	4.7	15.6	21.8	30.1	51.4
Peak Inflow Q (cfs) =	0.8	1.4	0.9	1.8	6.3	21.7	31.3	44.2	77.7
Peak Outflow Q (cfs) =	0.0	0.1	0.0	0.1	0.9	13.4	18.5	23.9	28.6
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.2	0.2	0.9	0.8	0.8	0.6
Structure Controlling Flow =	Filtration Media	Plate	Filtration Media	Plate	Plate	Plate	Plate	Plate	Outlet Plate 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	-0.4
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	40	50	43	52	64	41	29	23	16
Time to Drain 99% of Inflow Volume (hours) =	**41**	52	44	54	70	62	58	51	34
Maximum Ponding Depth (ft) =	0.54	0.71	0.57	0.79	1.50	1.87	2.20	2.68	4.18
Area at Maximum Ponding Depth (acres) =	0.20	0.25	0.20	0.29	0.60	0.73	0.83	0.98	1.28
Maximum Volume Stored (acre-ft) =	0.060	0.098	0.066	0.119	0.433	0.673	0.931	1.366	3.078

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: Trails at Aspen Ridge: West Pond Full Buildout

Basin ID: Big Johnson Reservoir

Example Zone Configuration (Retention Pond)

Required Volume Calculation

Selected BMP Type =	**EDB**			
Watershed Area =	34.69	acres		
Watershed Length =	2,691	ft		
Watershed Slope =	0.020	ft/ft		
Watershed Imperviousness =	55.10%	percent		
Percentage Hydrologic Soil Group A =	8.6%	percent		
Percentage Hydrologic Soil Group B =	81.2%	percent		
Percentage Hydrologic Soil Groups C/D =	10.2%	percent		
Desired WQCV Drain Time =	40.0	hours		
Location for 1-hr Rainfall Depths =	User Input			
Water Quality Capture Volume (WQCV) =	0.638	acre-feet	Optional User Override 1-hr Precipitation	
Excess Urban Runoff Volume (EURV) =	2.053	acre-feet		
2-yr Runoff Volume (P1 = 1.19 in.) =	1.670	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	2.275	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	2.984	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	4.003	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	4.751	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	5.719	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.55 in.) =	8.742	acre-feet	3.55	inches
Approximate 2-yr Detention Volume =	1.565	acre-feet		
Approximate 5-yr Detention Volume =	2.139	acre-feet		
Approximate 10-yr Detention Volume =	2.737	acre-feet		
Approximate 25-yr Detention Volume =	2.997	acre-feet		
Approximate 50-yr Detention Volume =	3.142	acre-feet		
Approximate 100-yr Detention Volume =	3.474	acre-feet		

Stage-Storage Calculation

Zone 1 Volume (WQCV) =	0.638	acre-feet
Zone 2 Volume (EURV - Zone 1) =	1.415	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	1.421	acre-feet
Total Detention Basin Volume =	3.474	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	246	0.006		
5868	--	0.38	--	--	--	677	0.016	169	0.004
5869	--	1.38	--	--	--	10,080	0.231	5,453	0.125
5870	--	2.38	--	--	--	31,059	0.713	26,123	0.600
5871	--	3.38	--	--	--	43,216	0.992	63,261	1.452
5872	--	4.38	--	--	--	49,683	1.141	109,710	2.519
5873	--	5.38	--	--	--	56,580	1.299	162,842	3.738
5874	--	6.38	--	--	--	64,298	1.476	223,281	5.126
5875	--	7.38	--	--	--	72,897	1.673	291,878	6.701
5876	--	8.38	--	--	--	86,794	1.993	371,724	8.534
	--		--	--	--				
	--		--	--	--				
	--		--	--	--			

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Project: Trails at Aspen Ridge: West Pond Full Buildout

Basin ID: Big Johnson Reservoir

Example Zone Configuration (Retention Pond)

	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.44	0.638	Orifice Plate
Zone 2 (EURV)	3.97	1.415	Circular Orifice
Zone 3 (100-year)	5.18	1.421	Weir&Pipe (Restrict)
		3.474	Total

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

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)
Underdrain Orifice Diameter =	N/A	inches

Calculated Parameters for Underdrain

Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	2.44	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	9.80	inches
Orifice Plate: Orifice Area per Row =	2.40	sq. inches (diameter = 1-3/4 inches)

Calculated Parameters for Plate

WQ Orifice Area per Row =	1.667E-02	ft^2
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft^2

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.81	1.63					
Orifice Area (sq. inches)	2.40	2.40	2.40					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Circular	Not Selected	
Invert of Vertical Orifice =	2.44	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	3.97	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	2.85	N/A	inches

Calculated Parameters for Vertical Orifice

	Zone 2 Circular	Not Selected	
Vertical Orifice Area =	0.04	N/A	ft^2
Vertical Orifice Centroid =	0.12	N/A	feet

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

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	5.36	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	65.00	N/A	feet
Overflow Weir Slope =	4.00	N/A	H:V (enter zero for flat grate)
Horiz. Length of Weir Sides =	4.00	N/A	feet
Overflow Grate Open Area % =	70%	N/A	%, grate open area/total area
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H_t =	6.36	N/A	feet
Over Flow Weir Slope Length =	4.12	N/A	feet
Grate Open Area / 100-yr Orifice Area =	75.09	N/A	should be $\geq$ 4
Overflow Grate Open Area w/o Debris =	187.60	N/A	ft^2
Overflow Grate Open Area w/ Debris =	93.80	N/A	ft^2

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

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.25	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	24.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	17.80		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	2.50	N/A	ft^2
Outlet Orifice Centroid =	0.82	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	2.08	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	6.56	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	30.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

Spillway Design Flow Depth=	0.80	feet
Stage at Top of Freeboard =	8.36	feet
Basin Area at Top of Freeboard =	1.99	acres

Routed Hydrograph Results

Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	0.53	1.07	1.19	1.50	1.75	2.00	2.25	2.52	3.55
Calculated Runoff Volume (acre-ft) =	0.638	2.053	1.670	2.275	2.984	4.003	4.751	5.719	8.742
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	0.638	2.053	1.670	2.276	2.985	4.004	4.752	5.714	8.739
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.01	0.02	0.14	0.45	0.63	0.87	1.48
Predevelopment Peak Q (cfs) =	0.0	0.0	0.3	0.7	4.7	15.6	21.8	30.1	51.4
Peak Inflow Q (cfs) =	8.1	25.7	20.9	28.4	37.1	49.6	58.6	70.2	106.1
Peak Outflow Q (cfs) =	0.3	0.7	0.6	0.7	0.8	2.2	11.9	26.2	36.9
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.0	0.2	0.1	0.5	0.9	0.7
Structure Controlling Flow =	Plate	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Grate 1	Overflow Grate 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	0.0	0.1	0.1	0.2
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	67	61	70	79	90	89	87	81
Time to Drain 99% of Inflow Volume (hours) =	**41**	72	66	75	86	98	97	96	93
Maximum Ponding Depth (ft) =	2.35	3.84	3.49	4.04	4.65	5.41	5.58	5.74	6.74
Area at Maximum Ponding Depth (acres) =	0.70	1.06	1.01	1.09	1.18	1.30	1.33	1.36	1.55
Maximum Volume Stored (acre-ft) =	0.579	1.924	1.552	2.139	2.820	3.777	3.988	4.204	5.670

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Sep 3 2019

Powers Boulevard - 60-Inch Culvert

Circular

Diameter (ft)	= 5.00
Invert Elev (ft)	= 1.00
Slope (%)	= 2.56
N-Value	= 0.020

Calculations

Compute by:	Q vs Depth
No. Increments	= 20

Highlighted

Depth (ft)	= 4.75
Q (cfs)	= 291.02
Area (sqft)	= 19.28
Velocity (ft/s)	= 15.10
Wetted Perim (ft)	= 13.48
Crit Depth, Yc (ft)	= 4.63
Top Width (ft)	= 2.16
EGL (ft)	= 8.29

Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Sep 24 2019

Powers Ditch: Total flows including Ultimate West Pond Discharge

User-defined

Invert Elev (ft)	= 5866.90
Slope (%)	= 1.90
N-Value	= 0.025

Calculations

Compute by:	Known Q
Known Q (cfs)	= 41.10

Highlighted

Depth (ft)	= 0.30
Q (cfs)	= 41.10
Area (sqft)	= 13.72
Velocity (ft/s)	= 3.00
Wetted Perim (ft)	= 60.98
Crit Depth, Yc (ft)	= 0.32
Top Width (ft)	= 60.95
EGL (ft)	= 0.44

(Sta, El, n)-(Sta, El, n)...

(9.40, 5880.40)-(53.50, 5867.00, 0.025)-(99.70, 5866.90, 0.025)-(118.50, 5867.30, 0.025)-(145.30, 5876.24, 0.025)

Cut/Fill Report

Generated: 2019-09-19 15:07:08

By user: jesse_sullivan

Drawing: \\Eros\Projects\19.886.008 Trails at Aspen Ridge\200 Drainage\201 Drainage Reports\FDR\DWG\\\Eros\Projects\19.886.008 Trails at Aspen Ridge\200 Drainage\201 Drainage Reports\FDR\DWG\DR02-Filing 1 Basins_20190905.dwg

Volume Summary

Name	Type	Cut Factor	Fill Factor	2d Area (Sq. Ft.)	Cut (Cu. Yd.)	Fill (Cu. Yd.)	Net (Cu. Yd.)
West Pond Cut-Fill	full	1.00	1.00	139707.70	11232.53	5209.10	6023.43<Cut>

Totals

	2d Area (Sq. Ft.)	Cut (Cu. Yd.)	Fill (Cu. Yd.)	Net (Cu. Yd.)
Total	139707.70	11232.53	5209.10	6023.43<Cut>

* Value adjusted by cut or fill factor other than 1.0

Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Friday, Jan 3 2020

Powers 60-inch Culvert - Minor Storm Event

Circular

Diameter (ft)	=	5.00
Invert Elev (ft)	=	5864.64
Slope (%)	=	2.55
N-Value	=	0.020

Calculations

Compute by:		Known Q
Known Q (cfs)	=	9.45

Highlighted

Depth (ft)	=	0.64
Q (cfs)	=	9.450
Area (sqft)	=	1.48
Velocity (ft/s)	=	6.37
Wetted Perim (ft)	=	3.67
Crit Depth, Yc (ft)	=	0.85
Top Width (ft)	=	3.35
EGL (ft)	=	1.27

CDOT Drainage Design Manual, Page 9-20: Minimum Velocity for Minor Event = 3 ft/s

Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Friday, Jan 3 2020

Powers 60-Inch Culvert - Major Storm Event

Circular

Diameter (ft)	=	5.00
Invert Elev (ft)	=	5864.64
Slope (%)	=	2.55
N-Value	=	0.020

Calculations

Compute by:		Known Q
Known Q (cfs)	=	54.26

Highlighted

Depth (ft)	=	1.52
Q (cfs)	=	54.26
Area (sqft)	=	5.07
Velocity (ft/s)	=	10.71
Wetted Perim (ft)	=	5.85
Crit Depth, Yc (ft)	=	2.07
Top Width (ft)	=	4.60
EGL (ft)	=	3.30

Note: Maximum Discharge (54.26 cfs) to the Powers Ditch will be slightly lower than the estimated pre-project value of 59.6 cfs (Based on a 44.9 Acre Tributary Area).
No downstream issues are anticipated.

Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Friday, Oct 4 2019

48-Inch Diameter Powers Boulevard Culvert Q5 Event

Circular

Diameter (ft)	= 4.00
Invert Elev (ft)	= 5845.05
Slope (%)	= 2.50
N-Value	= 0.020

Calculations

Compute by:	Known Q
Known Q (cfs)	= 5.80

Highlighted

Depth (ft)	= 0.54
Q (cfs)	= 5.800
Area (sqft)	= 1.02
Velocity (ft/s)	= 5.67
Wetted Perim (ft)	= 3.02
Crit Depth, Yc (ft)	= 0.70
Top Width (ft)	= 2.74
EGL (ft)	= 1.04

CDOT Drainage Design Manual, Page 9-20: Minimum Velocity for Minor Event = 3 ft/s

APPENDIX B

STANDARD DESIGN CHARTS AND TABLES

El Paso County Drainage Basin Fees

Resolution No. 18-470

Basin Number	Receiving Waters	Year Studied	Drainage Basin Name	2019 Drainage Fee (per Impervious Acre)	2019 Bridge Fee (per Impervious Acre)
Drainage Basins with DBPS's:					
CHMS0200	Chico Creek	2013	Haegler Ranch	$10,324	$1,524
CHWS1200	Chico Creek	2001	Bennett Ranch	$11,558	$4,433
CHWS1400	Chico Creek	2013	Falcon	$29,622	$4,069
FOFO2000	Fountain Creek	2001	West Fork Jimmy Camp Creek	$12,564	$3,717
FOFO2600	Fountain Creek	1991*	Big Johnson / Crews Gulch	$18,350	$2,370
FOFO2800	Fountain Creek	1988*	Widefield	$18,350	$0
FOFO2900	Fountain Creek	1988*	Security	$18,350	$0
FOFO3000	Fountain Creek	1991*	Windmill Gulch	$18,350	$275
FOFO3100 / FOFO3200	Fountain Creek	1988*	Carson Street / Little Johnson	$11,192	$0
FOFO3400	Fountain Creek	1984*	Peterson Field	$13,235	$1,004
FOFO3600	Fountain Creek	1991*	Fisher's Canyon	$18,350	$0
FOFO4000	Fountain Creek	1996	Sand Creek	$18,940	$5,559
FOFO4200	Fountain Creek	1977	Spring Creek	$9,517	$0
FOFO4600	Fountain Creek	1984*	Southwest Area	$18,350	$0
FOFO4800	Fountain Creek	1991	Bear Creek	$18,350	$1,004
FOFO5400	Fountain Creek	1977	21st Street	$5,521	$0
FOFO5600	Fountain Creek	1964	19th Street	$3,611	$0
FOFO5800	Fountain Creek	1964	Camp Creek	$2,033	$0
FOMO0400	Monument Creek	1986*	Mesa	$9,598	$0
FOMO1000	Monument Creek	1981	Douglas Creek	$11,540	$255
FOMO1200	Monument Creek	1977	Templeton Gap	$11,847	$275
FOMO1400	Monument Creek	1976	Pope's Bluff	$3,676	$627
FOMO1600	Monument Creek	1976	South Rockrimmon	$4,314	$0
FOMO1800	Monument Creek	1973	North Rockrimmon	$5,521	$0
FOMO2000	Monument Creek	1971	Pulpit Rock	$6,085	$0
FOMO2200	Monument Creek	1994	Cottonwood Creek / S. Pine	$18,350	$1,004
FOMO2400	Monument Creek	1966	Dry Creek	$14,486	$524
FOMO3600	Monument Creek	1989*	Black Squirrel Creek	$8,331	$524
FOMO3700	Monument Creek	1987*	Middle Tributary	$15,312	$0
FOMO3800	Monument Creek	1987*	Monument Branch	$18,350	$0
FOMO4000	Monument Creek	1996	Smith Creek	$7,481	$1,004
FOMO4200	Monument Creek	1989*	Black Forest	$18,350	$500
FOMO5200	Monument Creek	1993*	Dirty Woman Creek	$18,350	$1,004
FOMO5300	Fountain Creek	1993*	Crystal Creek	$18,350	$1,004
Miscellaneous Drainage Basins: [1]					
CHBS0800	Chico Creek		Book Ranch	$17,217	$2,492
CHEC0400	Chico Creek		Upper East Chico	$9,380	$272
CHWS0200	Chico Creek		Telephone Exchange	$10,306	$241
CHWS0400	Chico Creek		Livestock Company	$16,976	$202
CHWS0600	Chico Creek		West Squirrel	$8,849	$3,672
CHWS0800	Chico Creek		Solberg Ranch	$18,350	$0
FOFO1200	Fountain Creek		Crooked Canyon	$5,540	$0
FOFO1400	Fountain Creek		Calhan Reservoir	$4,625	$270
FOFO1600	Fountain Creek		Sand Canyon	$3,342	$0
FOFO2000	Fountain Creek		Jimmy Camp Creek[3]	$18,350	$858
FOFO2200	Fountain Creek		Fort Carson	$14,486	$524
FOFO2700	Fountain Creek		West Little Johnson	$1,209	$0
FOFO3800	Fountain Creek		Stratton	$8,801	$394
FOFO5000	Fountain Creek		Midland	$14,486	$524
FOFO6000	Fountain Creek		Palmer Trail	$14,486	$524
FOFO6800	Fountain Creek		Black Canyon	$14,486	$524
FOMO4600	Monument Creek		Beaver Creek	$10,970	$0
FOMO3000	Monument Creek		Kettle Creek	$9,909	$0
FOMO3400	Monument Creek		Elkhorn	$1,665	$0
FOMO5000	Monument Creek		Monument Rock	$7,953	$0
FOMO5400	Monument Creek		Palmer Lake	$12,717	$0
FOMO5600	Monument Creek		Raspberry Mountain	$4,278	$0
PLPL0200	Monument Creek		Bald Mountain	$9,116	$0
Interim Drainage Basins: [2]					
FOFO1800	Fountain Creek		Little Fountain Creek	$2,346	$0
FOMO4400	Monument Creek		Jackson Creek	$7,263	$0
FOMO4800	Monument Creek		Teachout Creek	$5,044	$758

1. The miscellaneous drainage fee previous to September 1999 resolution was the average of all drainage fees for basins with Basin Planning Studies perform

2. Interim Drainage Fees are based upon draft Drainage Basin Planning Studies or the Drainage Basin Identification and Fee Estimation Report. (Best availabl

3. This is an interim fee and will be adjusted when a DBPS is completed. In addition to the Drainage Fee a surety in the amount of $7,285 per impervious acre sh the DBPS results in a fee greater than the current fee. Fees paid in excess of the future revised fee will be reimbursed. See Resolution 06-326 (9/14/06) and Res

EPC Stormwater Management *Jennifer Irvine, P.E.*

depths over the duration of the storm as a fraction of the 1-hour depth and is also shown in Figure 6-19. By applying the 1-hour depths shown in Table 6-2 to the values shown in Table 6-3, a short-duration project design storm can be developed for any return period storm from a 2-year up to 100-year frequency. By applying the appropriate 1-hour depth for other project locations, a project design storm can be created for any location.

Table 6-3. 2-Hour Design Storm Distribution, ≤ 1 mi^2

Time (minutes)	Fraction of 1-Hour Rainfall Depth	Time (minutes)	Fraction of 1-Hour Rainfall Depth
5	0.014	65	1.004
10	0.046	70	1.018
15	0.079	75	1.030
20	0.120	80	1.041
25	0.179	85	1.052
30	0.258	90	1.063
35	0.421	95	1.072
40	0.712	100	1.082
45	0.824	105	1.091
50	0.892	110	1.100
55	0.935	115	1.109
60	0.972	120	1.119

- **Frontal Storms**: The characteristics of longer-duration "frontal storms" (general) is less well understood than the shorter duration thunderstorms and should be studied further. However, some events of this nature have been observed, such as the April 1999 storm which produced flooding on Fountain Creek, showing that these types of events do occur and tend to produce hazardous flood flows. In addition, modeling of the Jimmy Camp Creek drainage basin using the 24-hour, Type II distribution shows that it produces results reasonably comparably to recorded flow data. Therefore, the NRCS 24-hour Type II distribution has replaced the Type IIa distribution as the standard, long-duration design storm. This distribution can be applied to drainage basins up to 10 square miles without a DARF correction and is shown in Table 6-4. This distribution is included as a standard storm option in the HEC-HMS program.

Table 6-6. Runoff Coefficients for Rational Method
(Source: UDFCD 2001)

Land Use or Surface Characteristics	Percent Impervious	Runoff Coefficients											
		2-year		5-year		10-year		25-year		50-year		100-year	
		HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D
Business													
Commercial Areas	95	0.79	0.80	0.81	0.82	0.83	0.84	0.85	0.87	0.87	0.88	0.88	0.89
Neighborhood Areas	70	0.45	0.49	0.49	0.53	0.53	0.57	0.58	0.62	0.60	0.65	0.62	0.68
Residential													
1/8 Acre or less	65	0.41	0.45	0.45	0.49	0.49	0.54	0.54	0.59	0.57	0.62	0.59	0.65
1/4 Acre	40	0.23	0.28	0.30	0.35	0.36	0.42	0.42	0.50	0.46	0.54	0.50	0.58
1/3 Acre	30	0.18	0.22	0.25	0.30	0.32	0.38	0.39	0.47	0.43	0.52	0.47	0.57
1/2 Acre	25	0.15	0.20	0.22	0.28	0.30	0.36	0.37	0.46	0.41	0.51	0.46	0.56
1 Acre	20	0.12	0.17	0.20	0.26	0.27	0.34	0.35	0.44	0.40	0.50	0.44	0.55
Industrial													
Light Areas	80	0.57	0.60	0.59	0.63	0.63	0.66	0.66	0.70	0.68	0.72	0.70	0.74
Heavy Areas	90	0.71	0.73	0.73	0.75	0.75	0.77	0.78	0.80	0.80	0.82	0.81	0.83
Parks and Cemeteries	7	0.05	0.09	0.12	0.19	0.20	0.29	0.30	0.40	0.34	0.46	0.39	0.52
Playgrounds	13	0.07	0.13	0.16	0.23	0.24	0.31	0.32	0.42	0.37	0.48	0.41	0.54
Railroad Yard Areas	40	0.23	0.28	0.30	0.35	0.36	0.42	0.42	0.50	0.46	0.54	0.50	0.58
Undeveloped Areas													
Historic Flow Analysis-- Greenbelts, Agriculture	2	0.03	0.05	0.09	0.16	0.17	0.26	0.26	0.38	0.31	0.45	0.36	0.51
Pasture/Meadow	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50
Forest	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50
Exposed Rock	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Offsite Flow Analysis (when landuse is undefined)	45	0.26	0.31	0.32	0.37	0.38	0.44	0.44	0.51	0.48	0.55	0.51	0.59
Streets													
Paved	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Gravel	80	0.57	0.60	0.59	0.63	0.63	0.66	0.66	0.70	0.68	0.72	0.70	0.74
Drive and Walks	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Roofs	90	0.71	0.73	0.73	0.75	0.75	0.77	0.78	0.80	0.80	0.82	0.81	0.83
Lawns	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50

3.2 Time of Concentration

One of the basic assumptions underlying the Rational Method is that runoff is a function of the average rainfall rate during the time required for water to flow from the hydraulically most remote part of the drainage area under consideration to the design point. However, in practice, the time of concentration can be an empirical value that results in reasonable and acceptable peak flow calculations.

For urban areas, the time of concentration (t_c) consists of an initial time or overland flow time (t_i) plus the travel time (t_t) in the storm sewer, paved gutter, roadside drainage ditch, or drainage channel. For non-urban areas, the time of concentration consists of an overland flow time (t_i) plus the time of travel in a concentrated form, such as a swale or drainageway. The travel portion (t_t) of the time of concentration can be estimated from the hydraulic properties of the storm sewer, gutter, swale, ditch, or drainageway. Initial time, on the other hand, will vary with surface slope, depression storage, surface cover, antecedent rainfall, and infiltration capacity of the soil, as well as distance of surface flow. The time of concentration is represented by Equation 6-7 for both urban and non-urban areas.

Figure 6-25. Estimate of Average Concentrated Shallow Flow

Figure 7-7. Street Capacity Charts Residential (Detached Sidewalk)

These charts shall only be used for the standard street sections as shown. The capacity shown is based on ½ the street section as calculated by the UD-Inlet spreadsheets. Minor storm capacities are based on no crown overtopping, curb height or maximum allowable spread widths. Major storm capacities are based on flow being containing within the public right-of-way, including conveyance capacity behind the curb. The UDFCD Safety Reduction Factor was applied. An 'n_{STREET}' of 0.016 and 'n_{BACK}' of 0.020 was used. Calculations were done using UD-Inlet 3.00.xls, March, 2011.

Figure 8-11. Inlet Capacity Chart Sump Conditions , Curb Opening (Type R) Inlet

SUMP INLETS:
DP 1-A: 18.9 CFS=> 10' INLET
DP 2-A: 5.2 CFS=> 5' INLET
DP 3-A: 9.0 CFS=> 5' INLET
DP 4-A: 1.0 CFS=> 5' INLET
DP 1-C: 12.9 CFS=> 10' INLET
DP 2-C: 5.3 CFS=> 5' INLET
DP 3-C: 11.1 CFS=> 10' INLET
DP 4-C: 11.1 CFS=> 10' INLET
DP 5-C: 12.5 CFS=> 10' INLET
DP 6-C: 0.6 CFS=> 5' INLET
DP 7-C: 8.8 CFS=> 5' INLET
DP 8-C: 0.5 CFS=> 5' INLET
DP 1-E: 16.65 CFS=> 10' INLET
DP 2-E: 16.65 CFS=> 10' INLET

DP 7-F: 16.5 CFS=> 10' INLET
DP 8-F: 3.3 CFS=> 5' INLET
DP 1-H: 16.0 CFS=> 10' INLET
DP 2-H: 4.7 CFS=> 5' INLET
DP 3-H: 13.3 CFS=> 10' INLET
DP 4-H: 4.2 CFS=> 5' INLET
DP 9-H: 13.0 CFS=> 10' INLET
DP 10-H: 8.8 CFS=> 5' INLET
DP 11-H: 18.0 CFS=> 10' INLET
DP 1-I: 12.4 CFS=> 10' INLET
DP 2-I: 4.7 CFS=> 5' INLET
DP 3-I: 15.6 CFS=> 10' INLET

Notes:
1. The standard inlet parameters must apply to use this chart.

PLAN VIEW

★ FOR LENGTH (L) GREATER THAN 5 FT. PROVIDE MAINTENANCE ACCESS AT BOTH ENDS.

■ ADDITIONAL MANHOLE RING AND COVER REQUIRED WHEN L=10 FT. OR MORE. CUT REINFORCEMENT BAR ACCORDINGLY.

* WHEN A TYPE R INLET IS USED WITH MOUNTABLE CURB AND GUTTER, 5 FT. TRANSITION SHALL BE CONSTRUCTED. TRANSITION SHALL BE PAID FOR AS CURB AND GUTTER.

TRANSITION CURB

GENERAL NOTES:

SEE SHEET 2.

SECTION A–A REGULAR INLET

CURB FACE ASSEMBLY

◆ PLACE ENTIRE ASSEMBLY BEFORE POURING CONCRETE.

▲ – FOR A 1'-0" PAN SLOPE 2" PER FT.

♥ A 2 IN. DIAMETER TEMPORARY HOLE FOR DRAINAGE SHALL BE PLACED AT SUBGRADE ELEVATION OR A MINIMUM THREE INCHES BELOW ROAD BASE. THE HOLE SHALL BE PLUGGED WITH CONCRETE BEFORE ACCEPTANCE OF THE INLET.

SECTION B–B END VIEW

NOTE: MANHOLE RING AND COVER, STATION POINT AND OUTFLOW PIPE SHALL BE LOCATED AT THE SAME END OF THE INLET.

SECTION A–A INLET WITH DROP BOX~H>5 FT.

SECTIONS C–C & D–D (DOTTED BARS ARE IN SECTION D–D)

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CURB INLET TYPE R

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Sheet No. 1 of 2

MARK	BAR # OR SIZE	O.C. SPACING	TYPE	ALL INLETS		INLETS: H ≤ 5 FT.				INLETS: H > 5 FT.			
				L = 5 FT.		L = 10 FT.		L = 15 FT.		L = 10 FT.		L = 15 FT.	
				NO. REQ'D.	LENGTH	NO. REQ'D.	LENGTH	NO. REQ'D.	LENGTH	NO. REQ'D.	LENGTH	NO. REQ'D.	LENGTH
401	4	11"	II	15	*	21	*	26	*	11	*	11	*
402	4	11"	II	7	*	13	*	18	*	7	*	7	*
403	4	9"	II	*	4'–0"	*	4'–0"	*	4'–0"	*	4'–0"	*	4'–0"
405	4	6"	VI	11	6'–10"	21	6'–10"	31	6'–10"	11	6'–10"	11	6'–10"
406	4	6"	VIII	7	8'–10"	7	13'–10"	7	18'–10"	7	8'–10"	7	8'–10"
407	4	9"	II	*	5'–10"	*	10'–10"	*	15'–10"	*	5'–10"	*	5'–10"
408	4	12"	II	3	6'–10"	3	11'–10"	3	16'–0"	3	11'–10"	3	16'–0"
409	4	8"	II	6	5'–10"	6	10'–10"	6	15'–10"	6	10'–10"	6	15'–10"
410	4	11"	VII							3	*	3	*
411	4	11"	II							3	5'–2"	3	10–2"
412	4	11"	II							3	2'–9"	3	2'–9"
413	4	9"	II							7	10'–10"	7	15'–10"
501	5	5½"	IV	11	3'–4"	22	3'–4"	33	3'–4"	22	3'–4"	33	3'–4"
502	5	5½"	III							11	11'–5"	17	11'–5"
503	5	5½"	II	5	3'–6"	16	3'–6"	27	3'–6"	6	3'–6"	6	3'–6"
504	5	5½"	IX									5	8'–4"
601	6	2½"	V	2	8'–10"	2	8'–10"	2	8'–10"	2	8'–10"	4	8'–10"
■8[8.5				1	5'–10"	1	10'–10"	1	15'–10"	1	10'–10"	1	15'–10"
				2 BARS, 1 RODS	——	4 BARS, 3 RODS	——	8 BARS, 5 RODS	——	4 BARS, 3 RODS	——	8 BARS, 5 RODS	——
						REGULAR INLETS				DROP BOX INLETS			

* VARIABLE REFER TO TABLE TWO.

■ INCLUDE #4, 18 IN. BARS (SEE CHANNEL LAYOUT).

TABLE ONE ~ BAR LIST FOR CURB INLETS, TYPE "R"

"H"	LENGTH			NO. REQ'D. REGULAR		NO. REQ'D. DROP BOX		L = 5 FT.		L = 10 FT.		L = 15 FT.	
	401	402	410	403	407	403	407	CONC. CU. YDS.	STEEL LBS.	CONC. CU. YDS.	STEEL LBS.	CONC. CU. YDS.	STEEL LBS.
3'–0"	2'–8"	1'–8"		10	7			3.2	285	5.3	497	7.4	706
3'–6"	3'–2"	2'–2"		10	7			3.4	305	5.7	528	7.9	747
4'–0"	3'–8"	2'–8"		12	9			3.7	326	6.0	559	8.4	786
4'–6"	4'–2"	3'–2"		12	9			3.9	334	6.4	571	8.8	803
5'–0"	4'–8"	3'–8"		14	11			4.1	354	6.7	602	9.3	844
5'–6"	5'–2"	4'–2"	3'–5"	16	13	15	6	4.4	375	6.0	607	7.4	850
6'–0"	5'–8"	4'–8"	3'–11"	16	13	16	6	4.6	382	6.2	616	7.6	860
6'–6"	6'–2"	5'–2"	4'–5"	18	15	18	8	4.8	402	6.4	637	7.8	880
7'–0"	6'–8"	5'–8"	4'–11"	20	17	19	10	5.0	423	6.6	654	8.0	897
7'–6"	7'–2"	6–2"	5'–5"	20	17	20	10	5.3	430	6.9	664	8.3	907
8'–0"	7'–8"	6'–8"	5'–11"	22	19	22	12	5.5	451	7.1	684	8.5	927
8'–6"	8'–2"	7'–2"	6'–5"	24	21	23	14	5.7	471	7.3	702	8.7	944
9'–0"	8'–8"	7'–8"	6'–11"	24	21	24	14	6.0	479	7.6	711	9.0	954
9'–6"	9'–2"	8'–2"	7'–5"	26	23	26	16	6.2	499	7.8	732	9.2	974
10'–0"	9'–8"	8'–8"	7'–11"	28	25	27	18	6.4	520	8.0	749	9.4	992
10'–6"	10'–2"	9'–2"	8'–5"	28	25	28	18	6.7	527	8.3	759	9.7	1001
11'–0"	10'–8"	9'–8"	8'–11"	30	27	30	20	6.9	547	8.5	779	9.9	1022

NOTES: FOR L=5 FT., L=10 FT., AND L=15 FT.
REGULAR INLETS: TOTAL QUANTITIES NEEDED ARE OUTSIDE THE HEAVY BLACK LINE.
DROP BOX INLETS: TOTAL QUANTITIES NEEDED ARE INSIDE THE HEAVY BLACK LINE.

STEEL WEIGHTS DO NOT INCLUDE STRUCTURAL STEEL CHANNEL.

TABLE TWO ~ BARS AND QUANTITIES VARIABLE WITH "H"

PLAN VIEW

ELEVATION VIEW
MANHOLE COVER (TYP.)

PLAN VIEW

ELEVATION VIEW
MANHOLE RING (TYP.)

WEIGHTS: COVER = 125 LBS.
+ RING = 135 LBS.
TOTAL = 260 LBS.

GENERAL NOTES

1. CONCRETE SHALL BE CLASS B. INLET MAY BE CAST–IN–PLACE OR PRECAST.
2. CONCRETE WALLS SHALL BE FORMED ON BOTH SIDES AND SHALL BE 8 IN. THICK.
3. INLET STEPS SHALL BE IN CONFORMANCE WITH AASHTO M 199.
4. CURB FACE ASSEMBLY SHALL BE GALVANIZED AFTER WELDING.
5. EXPOSED CONCRETE CORNERS SHALL BE CHAMFERED ¾ IN. CURB AND GUTTER CORNERS SHALL BE FINISHED TO MATCH THE EXISTING CURB AND GUTTER BEYOND THE TRANSITION GUTTER.
6. REINFORCING BARS SHALL BE DEFORMED AND SHALL HAVE A 2 IN. MINIMUM CLEARANCE. ALL REINFORCING BARS SHALL BE EPOXY COATED.
7. DIMENSIONS AND WEIGHTS OF TYPICAL MANHOLE RING AND COVER ARE NOMINAL.
8. MATERIAL FOR MANHOLE RINGS AND COVERS SHALL BE GRAY OR DUCTILE CAST IRON IN ACCORDANCE WITH SUBSECTION 712.06.
9. SINCE PIPE ENTRIES INTO THE INLET ARE VARIABLE, THE DIMENSIONS SHOWN ARE TYPICAL. ACTUAL DIMENSIONS AND QUANTITIES FOR CONCRETE AND REINFORCEMENT SHALL BE AS REQUIRED IN THE WORK. QUANTITIES INCLUDE VOLUMES OCCUPIED BY PIPES.
10. STRUCTURAL STEEL SHALL BE GALVANIZED AND SHALL BE IN ACCORDANCE WITH SUBSECTION 712.06.

SECTION AT HOLE (TYP.)

CHANNEL LAYOUT DETAILS

SEE CURB FACE ASSEMBLY ON SHEET 1.

BAR BENDING DIAGRAMS ~ (DIMENSIONS ARE OUT–TO–OUT OF BAR)

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Project Development Branch SRJ/LTA

CURB INLET TYPE R

Issued By: Project Development Branch on July 04, 2006

STANDARD PLAN NO.
M-604-12
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Figure 8-10. Inlet Capacity Chart Sump Conditions, Area (Type C) Inlet

Notes:
1. The standard inlet parameters must apply to use these charts.

APPENDIX C

REPORT REFERENCES

EXCERPTS FROM DBPS
WEST FORK JIMMY CAMP CREEK

on the design plans. The purpose of the detention basins is to limit peak discharges at the basin's outfall to Jimmy Camp Creek to the existing hydrologic condition. The regional basins have also been sited within each of the major land developments to more locally control runoff to existing levels. Wherever practical, the regional detention basins should be designed so as to take advantage of the adjacent roadway embankments. It is not anticipated that any of the regional detention basins will be subject to State Engineer's regulations. Stormwater quality measures should be designed into the regional stormwater detention basins. These measures would include the provision of a water quality and sediment pool area in addition to the volume required for stormwater detention.

Right-of-Way

For the most part the main channels within the basin which pass through undeveloped areas and the right-of-way can be dedicated as part of the land development process. For those segments of the drainageway where floodplain preservation is the recommended plan, a combination of open space dedication (such as park-land and greenbelts), in combination with a more narrow dedicated right-of-way along the low flow area of the drainageway should be obtained through the land development process. Land acquisition will be required for the regional detention basins. The dedication of easements and right-of-way for the drainageways and detention basins would be accomplished at the time of development planning and platting of the parcels that lie adjacent to or upstream of the stormwater facility.

Cost Estimates and Drainage Basin Fees

Cost estimates have been prepared and are contained within the DBPS. The cost of the major drainageway facilities has been determined for each jurisdiction. The facility cost estimate will be used in the determination of the drainage and bridge fees for this basin. Bridge crossing costs have been determined as well for the basin.

Presented on Table 17 through 19 is the cost and plattable acreage (i.e., that area available for platting into subdivisions), data associated with the determination of drainage and bridge fees for the basin. The plattable acreage has been determined using a combination of assessor's maps, aerial photographs and topographic mapping that covering the watershed. As presented on Table 17, the reductions in the area available for platting have been listed. The reductions are mostly attributable to areas that are already platted, known roadway or planned road right-of-ways for minor and major arterials, and the area underlying the proposed detention basins.

Drainage basin fees have been determined for those areas that are within the City of Colorado Springs and El Paso County. The City of Fountain does not have a drainage basin fee system and therefore no fees have been calculated for the areas within the City of Fountain. The area of the basin within the City of Colorado Springs lies within the Colorado Centre development and the Banning-Lewis Ranch Flood Conservancy District (District). It is the intent of the City of Colorado Springs that the District will be responsible for all drainage, detention and bridge improvement construction and maintenance. Prior to any development within the City, specific agreements will have to be finalized between the City and the District. The drainage and bridge fees calculated for the County areas have been determined in accordance with Resolution No. 99-383. The percent impervious values listed on Exhibit 3 of this resolution where applied when calculating the weighted percent impervious value for the sub-basins within the County.

Kiowa Engineering Corporation
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Colorado Springs, Colorado
80904
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West Fork Jimmy Camp Creek Drainage Basin Planning Study

MAJOR DEVELOPMENT & LAND USE MAP

EL PASO COUNTY, COLORADO

Project No.:	9893
Date:	6/99
Design:	RNW
Drawn:	CAD
Check:	RNW
Revisions:	

FIGURE 2

FIRMETTE

MAP SCALE 1" = 500'

250 0 500 1000 FEET

50 0 150 300 METERS

NFIP

PANEL 0768G

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 768 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS

COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	080060	0768	G
EL PASO COUNTY	080059	0768	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
08041C0768G

MAP REVISED
DECEMBER 7, 2018

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

USDA NRCS WEB SOIL SURVEY REPORT

Hydrologic Soil Group—El Paso County Area, Colorado

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

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

Soil Rating Lines

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

Soil Rating Points

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

Water Features

Streams and Canals

Transportation

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

Background

Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 16, Sep 10, 2018

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

Date(s) aerial images were photographed: Apr 12, 2017—Nov 17, 2017

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
56	Nelson-Tassel fine sandy loams, 3 to 18 percent slopes	B	4.8	41.2%
86	Stoneham sandy loam, 3 to 8 percent slopes	B	5.7	49.2%
108	Wiley silt loam, 3 to 9 percent slopes	B	1.1	9.6%
Totals for Area of Interest			**11.6**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Hydrologic Soil Group—El Paso County Area, Colorado

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

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- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
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- C/D
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Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
8	Blakeland loamy sand, 1 to 9 percent slopes	A	17.8	8.6%
31	Fort Collins loam, 3 to 8 percent slopes	B	0.0	0.0%
52	Manzanst clay loam, 0 to 3 percent slopes	C	21.0	10.2%
56	Nelson-Tassel fine sandy loams, 3 to 18 percent slopes	B	137.7	66.8%
86	Stoneham sandy loam, 3 to 8 percent slopes	B	5.3	2.6%
108	Wiley silt loam, 3 to 9 percent slopes	B	24.3	11.8%
Totals for Area of Interest			**206.0**	**100.0%**

Description

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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:

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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

NON-JURISDICTIONAL DAM CONSTRUCTION NOTICE OF INTENT

COLORADO
Division of Water Resources
Department of Natural Resources
www.water.state.co.us P 303.866.3581

NON-JURISDICTIONAL WATER IMPOUNDMENT STRUCTURE[1]

This notice is required per Section 37-87-125, C.R.S. (1998) and
must be submitted to the Division Engineer's Office a minimum of 45 days prior to construction.

OWNER INFORMATION

Name: COLA Telephone/E-Mail: (____)_____/_____

Address: 555 Middle Creek Parkway, Suite 380 Colorado Springs CO 80921
Street / P.O. Box/ Rural Route City State Zip Code

Responsible Person: Kevin Hart Telephone/E-Mail: (____)_____/ khart@aspenviewhomes.net

Address: 555 Middle Creek Parkway, Suite 380 Colorado Springs CO 80921
Street / P.O. Box/ Rural Route City State Zip Code

Contractor: Wade Fothergill Telephone/E-Mail: (____)_____/ Wade@dwireex.com

STRUCTURE INFORMATION

Name of Dam: East Pond Embankment Water Division: 2 Water District: 10

Location: *(Provide Section, Township, Range, **and** GPS Point taken at crest of dam above streamline/outlet)*

- Section: 9, Township: 15 S, Range: 65 W, 6th P.M.

- Northing 4289456.7333 meters, Easting 528312.0339 meters (*Datum should be UTM, NAD 83)*

Dam Dimensions:

- Vertical Height[2]: 9 ft., Length: 522 ft., Crest Width: 10 ft., Slopes: U/S: 3:1 (H:1V), D/S 3:1 (H:1V)

Reservoir:

- Surface Area[1]: 3.9 acres, Capacity[1]: 16 acre-feet, Drainage Area*: 158 acres
**(If drainage area is unknown leave blank and a spillway size will be assigned):*

Emergency Spillway: *(See Table 1, Spillway Sizing Guidelines)*

- Bottom Width: 135 ft., Side Slopes: 3:1 H:1V, Freeboard[3]: 3 ft

Outlet Conduit Type: RCP, Size: 48 inches, Location: Southeast corner of pond

Stream Name or Water Source[4]: West Fork Jimmy Camp Crk Proposed Water Use: Stormwater Quality and Detention

Water Court Case ***or*** WDID : #10 - Fountain Creek
(Water District Identification Number)

_____
Signature of Owner Date

Office Use Only

DIVISION ENGINEER'S REQUIREMENTS: _____

_____

_____

_____

Dam I.D._____ Signature of Division Engineer Date

[1] A "Non-Jurisdictional Structure" is a dam creating a reservoir with a capacity of 100 acre-feet or less *and* a surface area of 20 acres or less *and* a vertical height (footnote 2) of 10 feet or less. Non-jurisdictional size dams are regulated and subject to the authority of the State Engineer consistent with sections 37-87-102 and 37-87-105 C.R.S.

[2] "Vertical Height" is measured from the elevation of the lowest point of the natural surface of the ground or the invert of the outlet conduit (whichever is lower) where that point occurs along the longitudinal centerline of the dam up to the crest of the emergency spillway of the dam.

[3] "Freeboard" is the vertical distance from the bottom of spillway to the crest of the dam. Minimum Freeboard is 3 feet.

[4] If construction in reservoir intercepts groundwater, a well permit is required. (Well permit applications can be found at www.water.state.co.us)

COLORADO
Division of Water Resources
Department of Natural Resources
www.water.state.co.us P 303.866.3581

NON-JURISDICTIONAL WATER IMPOUNDMENT STRUCTURE[1]

This notice is required per Section 37-87-125, C.R.S. (1998) and
must be submitted to the Division Engineer's Office a minimum of 45 days prior to construction.

OWNER INFORMATION

Name: COLA Telephone/E-Mail: (____)_____/_____

Address: 555 Middle Creek Parkway, Suite 380 Colorado Springs CO 80921
Street / P.O. Box/ Rural Route City State Zip Code

Responsible Person: Kevin Hart Telephone/E-Mail: (____)_____/ khart@aspenviewhomes.net

Address: 555 Middle Creek Parkway, Suite 380 Colorado Springs CO 80921
Street / P.O. Box/ Rural Route City State Zip Code

Contractor: Wade Fothergill Telephone/E-Mail: (____)_____/ Wade@dwireex.com

STRUCTURE INFORMATION

Name of Dam: West Pond Embankment Water Division: 2 Water District: 10

Location: *(Provide Section, Township, Range, **and** GPS Point taken at crest of dam above streamline/outlet)*

- Section: 9, Township: 15 S, Range: 65 W, 6th P.M.

- Northing 4289665.30 meters, Easting 527600.63 meters (*Datum should be UTM, NAD 83)*

Dam Dimensions:

- Vertical Height[2]: 9 ft., Length: 600 ft., Crest Width: 12 ft., Slopes: U/S: 4:1 (H:1V), D/S 3:1 (H:1V)

Reservoir:

- Surface Area[1]: 1.6 acres, Capacity[1]: 5.8 acre-feet, Drainage Area*: 34.7 acres
**(If drainage area is unknown leave blank and a spillway size will be assigned):*

Emergency Spillway: *(See Table 1, Spillway Sizing Guidelines)*

- Bottom Width: 40 ft., Side Slopes: 3:1 H:1V, Freeboard[3]: 3 ft

Outlet Conduit Type: RCP, Size: 48 inches, Location: Pond west side, embankment midpoint

Stream Name or Water Source[4]: Big Johnson Reservoir Proposed Water Use: Stormwater Quality and Detention

Water Court Case ***or*** WDID : #10 - Fountain Creek
(Water District Identification Number)

_____
Signature of Owner Date

Office Use Only

DIVISION ENGINEER'S REQUIREMENTS: _____

_____

_____

_____

Dam I.D._____ Signature of Division Engineer Date

[1] A "Non-Jurisdictional Structure" is a dam creating a reservoir with a capacity of 100 acre-feet or less *and* a surface area of 20 acres or less *and* a vertical height (footnote 2) of 10 feet or less. Non-jurisdictional size dams are regulated and subject to the authority of the State Engineer consistent with sections 37-87-102 and 37-87-105 C.R.S.

[2] "Vertical Height" is measured from the elevation of the lowest point of the natural surface of the ground or the invert of the outlet conduit (whichever is lower) where that point occurs along the longitudinal centerline of the dam up to the crest of the emergency spillway of the dam.

[3] "Freeboard" is the vertical distance from the bottom of spillway to the crest of the dam. Minimum Freeboard is 3 feet.

[4] If construction in reservoir intercepts groundwater, a well permit is required. (Well permit applications can be found at www.water.state.co.us)

COLORADO
Division of Water Resources
Department of Natural Resources

Table 1 DAM SAFETY BRANCH Spillway Sizing Guidelines for Non-Jurisdictional Dams

Drainage Area (Acres)	Minimum Recommended Bottom Width[1] (Feet) Low Intensity Rainfall Zone	Minimum Recommended Bottom Width[1] (Feet) High Intensity Rainfall Zone
175	8	8
225	8	10
275	8	12
325	8	15
375	10	17
425	11	19
475	12	21
525	13	24
575	15	26
625	16	28
675	17	30
725	19	33
775	20	35
825	21	37
875	22	39
925	24	42
975	25	44
1025	26	46
1075	28	48
1125	29	51
1175	30	53
1225	31	55
1275	33	57
1325	34	59
1375	35	62
1425	37	64
1475	38	66

[1]Minimum recommended bottom width for drainage areas less than 175 acres is 8 feet

Spillway Section

COLORADO
Division of Water Resources
Department of Natural Resources

Rainfall Intensity Zones for Non-Jurisdictional Dam Spillway Sizing

COLORADO
Division of Water Resources
Department of Natural Resources

DAM SAFETY BRANCH Specifications for Construction of Non-Jurisdictional Dams

- Site Selection:
  - Foundation soils should be firm to provide adequate support for the embankment and should have low permeability to allow for water retention. Site selection should consider potential downstream property damage in the event of a dam failure. Construction of dams in boggy areas, areas with non-uniform fractured rock, or sands/gravels is not recommended and an engineer should be hired to evaluate the site conditions. Any part of the reservoir basin excavated below grade cannot expose groundwater.

- Embankment Design:
  - Backfill material to be used for construction of the cutoff trench and embankment should be a suitable clay material and contain no material larger than 6 inches in diameter.
  - The upstream slope should be constructed with a slope no steeper than 3:1, and the downstream slope should be no steeper than 2:1 (see cross section below). The dam crest should have a minimum width of 10 feet and the surface should be graded with positive drainage toward the reservoir basin.
  - It is recommended that rock rip rap or other suitable material be placed on the upstream slope of the embankment to protect it from wave action. A suitable gravel or geosynthetic material should be placed under the rip rap to prevent fine material from washing out from behind the larger rock.
  - The embankment should be fenced to restrict livestock from accessing the dam since they damage the protective vegetation and increase erosion.

- Embankment Construction
  - The topsoil and all organic material should be removed from the foundation of the proposed dam site. Organic soil should only be reused for placement on the completed embankment to promote the re-growth of vegetation.
  - A cutoff trench should be excavated under the full length of the centerline of the dam with sloping sides (1:1 min.), a minimum bottom width of 3 feet and a depth of 3 feet.
  - The foundation of the dam should be scarified/ripped to a depth of 6-inches to provide proper contact between the native foundation and embankment. This surface should then be moisture treated before placement of fill.
  - Fill material should be placed in layers not exceeding 12 inches in thickness prior to compaction. Suitable backfill material should have enough clay and moisture content to roll a small ball by hand. If this cannot be done, the soil is likely too dry or does not have adequate clay content.
  - Each lift should be thoroughly compacted using a sheeps foot compactor. Care should be taken not to allow the top layers of the soil to dry out between placement of lifts.
  - Fill should be placed in uniform lifts that cover the entire embankment length and width.

- Outlet
  - Unless a waiver is granted in writing by the Division Engineer, all non-jurisdictional dams require an outlet conduit positioned at the natural low point of the reservoir basin. A minimum diameter of 12 inches is recommended and should be controlled at the upstream end by a valve and trash rack.

- Emergency Spillway
  - The spillway should have sufficient width to provide capacity to route the runoff from the drainage basin above the dam during rainfall/runoff events.
  - The emergency spillway should be located on natural ground far enough away to prevent erosion of the dam embankment. A spillway over the dam embankment is not acceptable.
  - A minimum of 3 feet of freeboard is required from the bottom of the emergency spillway to the top of the dam.
  - To determine the minimum spillway width, see the attached table for your area and drainage basin size.

- Example Plan View and Cross Section

Plan View

Cross Section Through Dam at Outlet

APPENDIX D

MAPS

Trails at Aspen Ridge Vicinity Map

Know what's below. Call before you dig.

Trails at Aspen Ridge Filing No. 1 Final Drainage Report Existing Design Point Summary				
Design Point	**Sub-Basins**	**Total Area (ac.)**	**Q(5) (cfs)**	**Q(100) (cfs)**
BJR-1	BJR-1	39.94	6.43	43.22
BJR-2	BJR-2	8.85	2.13	14.32
TO BIG JOHNSON RESERVOIR	BJR-1 & BJR-2 (Basins are parallel so this is a sum of BJR-1 & BJR-2.)	**48.79**	**8.56**	**57.54**
OS-1	OS-1 (Note: 7.3 Acres diverted by CDOT from Big Johnson)	19.60	4.79	24.15
WF-1	WF-1 & OS-1	138.69	16.90	108.09
WF-2	WF-2	21.15	5.43	36.51
TO WEST FORK JIMMY CAMP CREEK	WF-1, WF-2, & OS-1 (Basins are parallel so this is a sum of WF-1 & WF-2.)	**159.84**	**22.33**	**144.60**

Trails at Aspen Ridge Filing No. 1 Final Drainage Report Existing Conditions Basin Summary Table			
Area ID	**Area (Acres)**	**Q5 (cfs)**	**Q100 (cfs)**
Big Johnson Reservoir / BJR-1	39.94	6.43	43.22
Big Johnson Reservoir / BJR-2	8.85	2.13	14.32
West Fork Jimmy Camp Creek / OS - 1	19.60	4.79	24.15
West Fork Jimmy Camp Creek / WF-1	119.08	17.15	115.23
West Fork Jimmy Camp Creek / WF-2	21.15	5.43	36.51

LEGEND

DESIGN POINT IDENTIFIER — L

BASIN IDENTIFICATION — BASIN

BASIN FLOWS — Q5 Q100

BASIN AREA — AREA

BASIN BOUNDARY

DBPS BASIN BOUNDARY

EXISTING CONTOURS — 5985

GRAPHIC SCALE

150' 0' 150' 300'

(IN FEET)
1 inch = 150 ft.

REFERENCE DRAWINGS
X-886-PR SITE
10415-Storm Base-2017
886-PR Legacy Drive
X-886-EX SURVEY
X-Title(Drainage)

NO.	DATE	DESCRIPTION	BY

REVISIONS

NAME: S:\19.886.008 Trails at Aspen Ridge\200 Drainage\201 Drainage Reports\FDR\DWG\DR01-TAR FDR.dwg
PCP: Matrix.ctb
PLOT DATE: Fri Jun 28, 2019 11:25am

BENCHMARK DATA(ELEV.)
(DATUM)
(DESCRIPTION/LOCATION)

VERTICAL BENCHMARK:

BASIS OF BEARING:

PREPARED UNDER MY DIRECT SUPERVISION, FOR AND ON BEHALF OF MATRIX DESIGN GROUP, INC.

Matrix DESIGN GROUP
2435 Research Parkway, Suite 300 Colorado Springs, CO 80920
Phone 719-575-0100
Fax 719-575-0208

COLA, LLC.

TRAILS AT ASPEN RIDGE: FILING #1
FINAL DRAINAGE REPORT

DESIGNED BY: JTS
DRAWN BY: JTS
CHECKED BY:
SCALE
HORIZ:
VERT:
DATE ISSUED: September 2019
SHEET NO. 1 OF 4 SHEETS

DR-01

811 Know what's below. Call before you dig.

Trails at Aspen Ridge Proposed Conditions Sub-basin Summary			
Basin	Area	Q5	Q100
	acres	cfs	cfs
West Fork - Jimmy Camp Creek			
OS-1	19.67	4.0	26.8
A-1	12.34	4.4	18.9
A-2	1.09	2.7	5.2
A-3	4.98	2.2	9.0
A-4	0.12	0.6	1.0
B-1	1.06	1.8	4.1
C-1	3.27	5.9	12.9
C-2	1.19	2.4	5.3
C-3	4.60	8.4	18.5
C-4	0.36	1.6	3.0
C-5	3.13	5.7	12.5
C-6	0.07	0.3	0.6
C-7	2.20	4.0	8.8
C-8	0.06	0.3	0.5
D-1	2.21	1.6	5.2
E-1	6.43	3.9	12.2
E-2	2.14	3.9	8.7
F-1	1.49	2.7	6.0
F-2	0.58	1.1	2.5
F-3	1.25	2.3	5.0
F-4	0.58	1.1	2.5
F-5	2.27	3.5	7.8
F-6	1.00	1.7	3.9
F-7	5.06	7.5	16.5
F-8	0.84	1.5	3.3
G-1	1.11	2.1	4.6
H-1	3.60	5.6	12.3
H-2	1.16	1.9	4.2
H-3	2.97	4.7	10.3
H-4	0.92	1.6	3.6
H-5	2.42	4.0	8.9
H-6	2.46	4.1	9.1
H-7	2.03	3.0	6.6
H-8	0.97	1.7	3.8
H-9a	1.95	2.3	5.8
H-10	1.33	2.5	5.5
H-11	3.42	5.0	11.0
I-1	3.13	5.6	12.4
I-2	0.59	1.9	3.8
I-3	4.18	7.1	15.6
R-1	1.87	2.3	7.4
BR1	0.31	0.8	1.6
BR2	4.49	3.4	10.0
Big Johnson Reservoir			
O-1 (Filing No. 1)	1.63	2.7	6.0
O-2 (Future)	2.97	4.0	8.7
O-2a (Future)	1.13	1.8	4.0
O-2b (Future)	0.57	0.8	1.7
O-2c (Future)	1.05	1.1	2.5
O-2d (Future)	0.60	1.1	2.4
O-2e (Future)	0.51	0.7	1.6
O-2f (Future)	0.65	1.1	2.5
O-2g (Future)	2.04	2.7	6.0
P (Future)	8.01	1.7	11.6
Q-1	1.09	1.1	3.8
Q-2	1.36	0.2	1.6
OS-2	11.44	1.7	11.7

Design Point Routing StormCAD					
Design Point	Total Drainage Area	Surface		Storm Sewer	
		Q5	Q100	Q5	Q100
1-OS	**19.67**	4.0	26.8	-	-
1-A	**12.34**	3.5	17.6	-	-
2-A	**1.09**	2.7	5.2	-	-
3-A	**4.98**	2.2	8.9	-	-
4-A	**0.12**	0.6	1.0	-	-
A	**38.20**	-	-	12.0	55.6
1-B	**1.06**	1.8	4.1	-	-
B	**39.26**	-	-	12.7	57.1
1-C	**3.27**	5.9	12.9	-	-
2-C	**1.19**	2.4	5.3	-	-
3-C	**4.60**	8.4	18.5	-	-
4-C	**0.36**	1.6	3.0	-	-
5-C	**3.13**	5.7	12.5	-	-
6-C	**0.07**	0.3	0.6	-	-
7-C	**2.20**	4.0	8.8	-	-
8-C	**0.06**	0.3	0.5	-	-
C	**54.13**	-	-	27.6	90.2
1-D	**2.21**	1.6	5.2	-	-
D	**56.34**	0.0	0.0	28.1	92.1
1-E	**6.43**	2.6	11.4	-	-
2-E	**2.14**	3.9	8.7	-	-
E	**64.91**	-	-	33.7	108.8
1-F	**2.07**	2.7	6.0	2.7	6.0
2-F	**0.58**	1.1	2.5	1.6	3.6
3-F	**3.32**	2.3	5.0	3.8	8.4
4-F	**3.89**	1.1	2.5	5.0	11.1
5-F	**6.16**	3.5	7.8	6.6	14.6
6-F	**7.16**	1.7	3.9	7.9	17.5
7-F	**5.06**	7.5	16.5	7.5	16.5
8-F	**13.07**	1.5	3.3	16.2	35.8
F	**77.97**	-	-	43.5	131.0
1-G	**1.11**	2.1	4.6	-	-
G	**79.08**	-	-	44.2	132.7
1-H	**3.60**	5.9	13.1	-	-
2-H	**1.16**	1.9	4.2	-	-
1-2 H	**4.76**	-	-	9.0	19.8
3-H	**2.97**	4.7	10.3	-	-
4-H	**0.92**	1.6	3.6	-	-
1-4 H	**8.65**	-	-	16.4	36.1
5-H	**2.42**	4.0	8.9	-	-
6-H	**2.46**	3.9	8.6	-	-
1-6 H	**13.53**	-	-	20.2	44.9
7-H	**2.03**	2.9	6.4	-	-
8-H	**0.97**	1.7	3.7	-	-
1-8 H	**16.52**	-	-	23.3	49.3
9a-H	**1.95**	2.3	5.7	-	-
9b-H	**0.38**	0.6	1.4	2.8	6.5
10-H	**1.33**	2.4	5.2	-	-
1-10 H	**20.17**	-	-	29.6	66.5
11-H	**3.42**	5.0	11.0	-	-
H	**23.59**			37.4	83.0
1-I	**3.13**	5.6	12.4	-	-
2-I	**0.59**	1.9	3.8	-	-
K-OS	**37.74**			57.3	122.1
K	**41.46**	-	-	62.2	133.3
3-I	**4.18**	7.8	17.2	7.8	17.2
I	**45.64**	-	-	66.5	143.4
M	**195.07**	-	-	**158.2**	**426.5**
East Pond Discharge SWMM Discharge (MDDPA-Matrix)	**195.07**	-	-	21.1	127.4
R Rational Method	**1.09**	-	-	1.1	3.7
O	**11.91**	-	-	6.4	14.0
P	**34.69**	13.4	47.6	-	-
P2	**34.69**	-	-	0.2	23.9
Q Rational Method	**2.04**	1.1	3.8	-	-
BR1	**0.31**	-	-	0.8	1.6
BR2	**4.49**	-	-	3.4	10

Pond Summary Table										
Major Basin	Pond ID	Analysis Method	Contributing Basins	Approximate Detention Volumes			EX 5-YR (CFS)	PR 5-YR (CFS)	EX 100-YR (CFS)	PR 100-YR (CFS)
				WQCV	EURV	Q100				
				Ac_r-Ft.	Ac_r-Ft.	Ac_r-Ft.				
West Fork - Jimmy Camp Creek	East Pond	UD-Detention	OS-1, A, B, C, D, E, F, G, J, K, I, H, M	**FI:** 1.472	3.117	16.137	22.3	**1.2**	144.6	**72**
				FB: 4.890	6.581	18.041	22.3	**5.6**	144.6	**138.2**
Big Johnson Reservoir	West Pond	UD-Detention	O, P	**FI:** 0.06	0.098	1.366	0.7	0.2	30.1	23.9
				FB: 0.453	1.917	4.52	0.7	0.7	30.1	15.5

Trails at Aspen Ridge, Filing No. 1 = F1, Trails at Aspen Ridge, Full Buildout = FB

LEGEND

DESIGN POINT IDENTIFIER — L
BASIN IDENTIFICATION — BASIN
BASIN FLOWS — Q5 Q100
BASIN AREA — AREA
BASIN BOUNDARY
DBPS BASIN BOUNDARY
EXISTING CONTOURS
PROPOSED CONTOURS

GRAPHIC SCALE
150' 0' 150' 300'
(IN FEET)
1 inch = 150 ft.

REFERENCE DRAWINGS
X-886-PR SITE
10415-Storm Base-2017
886-PR Legacy Drive
X-Title(Drainage)
19-886-PR-UTIL
X-886-PR SITE_F1
X-886-PR STORM_F1
X-886-EX SURVEY

NO.	DATE	DESCRIPTION	BY
		REVISIONS	

NAME: S:\19_886.008 Trails at Aspen Ridge\200 Drainage\201 Drainage Reports\FDR\DWG\DR02-Basins20190923.dwg
PCP: Matrix.ctb
PLOT DATE: Tue Sep 24, 2019 3:59pm

BENCHMARK DATA(ELEV.)
(DATUM)
(DESCRIPTION/LOCATION)

VERTICAL BENCHMARK:

BASIS OF BEARING:

PREPARED UNDER MY DIRECT SUPERVISION, FOR AND ON BEHALF OF MATRIX DESIGN GROUP, INC.

Matrix DESIGN GROUP
2435 Research Parkway, Suite 300 Colorado Springs, CO 80920
Phone 719-575-0100
Fax 719-575-0208

COLA, LLC.

TRAILS AT ASPEN RIDGE FILING #1
FINAL DRAINAGE REPORT

DESIGNED BY: JTS
DRAWN BY: JTS
CHECKED BY:
SCALE
HORIZ:
VERT:
DATE ISSUED: September 2019
SHEET NO. 2 OF 4 SHEETS
DR-02

Know what's below. Call before you dig.

LEGEND

- OFFSITE FUTURE STORM PIPE
- FILING NO. 1 STORM PIPE
- EXISTING STORM PIPE

GRAPHIC SCALE

150' 0' 150' 300'

(IN FEET)
1 inch = 150 ft.

REFERENCE DRAWINGS
X-886-PR SITE_F1
X-886-PR SITE
10415-Storm Base-2017
X-886-PR STORM
X-Title(Drainage)
X-886-PR STORM_F1

NO.	DATE	DESCRIPTION	BY

REVISIONS

NAME: S:\19.886.008 Trails at Aspen Ridge\200 Drainage\201 Drainage Reports\FDR\DWG\DR03-Storm.dwg
PCP: Matrix.ctb
PLOT DATE: Wed Sep 25, 2019 8:05am

BENCHMARK DATA(ELEV.) _____
(DATUM)
(DESCRIPTION/LOCATION) _____

VERTICAL BENCHMARK:

BASIS OF BEARING:

PREPARED UNDER MY DIRECT SUPERVISION, FOR AND ON BEHALF OF MATRIX DESIGN GROUP, INC.

Matrix DESIGN GROUP
2435 Research Parkway, Suite 300
Colorado Springs, CO 80920
Phone 719-575-0100
Fax 719-575-0208

COLA, LLC.

TRAILS AT ASPEN RIDGE FILING #1
FINAL DRAINAGE REPORT
STORM SEWER EXHIBIT

DESIGNED BY: JTS
DRAWN BY: JTS
CHECKED BY:
SCALE
HORIZ:
VERT:
DATE ISSUED: September 2019
SHEET NO. 3 OF 4 SHEETS

DR-03

Know what's below. Call before you dig.

STORM PIPE SUMMARY TABLE

PIPE LABEL	PIPE DIA. (IN)	PIPE LENGTH (FT)	% GRADE	PIPE FLOW (cfs)
PIPE 1	24	168.3	3.4%	26.80
PIPE 2	24	488.9	2.7%	26.80
PIPE 3	30	169.4	0.5%	20.62
PIPE 4	30	33.8	0.5%	19.40
PIPE 5	30	23.1	0.5%	5.20
PIPE 6	24	210.3	0.5%	7.48
PIPE 7	18	37.1	0.5%	8.90
PIPE 8	18	21.1	0.5%	1.00
PIPE 9	30	444.0	3.0%	52.34
PIPE 10	18	13.8	2.0%	4.10
PIPE 11	30	396.7	3.0%	53.83
PIPE 12	30	49.9	1.0%	38.04
PIPE 13	18	30.7	1.0%	18.50
PIPE 14	18	7.7	1.0%	3.00
PIPE 15	24	15.8	1.0%	17.47
PIPE 16	30	101.2	1.0%	21.29
PIPE 17	24	30.7	1.0%	12.50
PIPE 18	18	7.7	1.0%	0.60
PIPE 19	24	25.7	0.2%	9.16
PIPE 20	42	201.7	3.0%	85.82
PIPE 21	42	193.4	3.0%	85.59
PIPE 22	42	184.7	3.0%	85.36
PIPE 23	24	15.3	1.0%	5.20
PIPE 24	42	169.7	3.0%	89.61
PIPE 25	42	172.5	1.4%	89.40
PIPE 26	30	68.3	0.5%	33.48
PIPE 27	18	7.6	1.0%	8.70
PIPE 28	18	30.8	1.0%	11.40
PIPE 29	48	226.6	1.5%	113.17
PIPE 30	48	244.1	1.5%	112.76
PIPE 31	48	211.9	2.5%	112.31
PIPE 32	48	31.7	2.2%	134.59
PIPE 33	48	147.4	2.2%	136.31
PIPE 34	30	39.6	1.2%	35.81
PIPE 35	18	29.9	1.0%	16.50
PIPE 36	18	8.4	1.0%	3.30
PIPE 37	24	212.9	2.1%	17.31
PIPE 38	18	210.4	3.0%	17.35
PIPE 39	18	94.1	6.0%	17.48
PIPE 40	18	38.3	3.0%	14.61
PIPE 41	18	126.4	4.0%	11.13
PIPE 42	18	8.4	1.0%	13.10
PIPE 43	18	30.0	0.5%	4.20
PIPE 44	24	59.2	1.0%	19.82
PIPE 45	24	270.0	3.8%	19.73
PIPE 46	24	54.5	0.5%	17.05
PIPE 47	18	8.8	0.5%	10.30
PIPE 48	18	30.4	0.5%	3.60
PIPE 49	30	503.0	3.2%	36.12
PIPE 50	24	29.9	0.5%	8.90
PIPE 51	24	8.4	1.9%	8.60
PIPE 52	30	361.1	2.3%	44.64
PIPE 53	24	58.4	1.5%	7.21
PIPE 54	18	7.7	0.8%	6.40
PIPE 55	18	30.7	0.9%	3.70
PIPE 56	30	252.5	2.0%	49.07
PIPE 57	42	57.2	2.95%	66.27
PIPE 58	42	108.3	0.6%	82.80
PIPE 59	42	16.2	0.55%	82.38
PIPE 60	30	42.1	0.5%	21.46
PIPE 61	30	93.2	0.5%	13.00
PIPE 62	30	459.0	0.5%	8.00
PIPE 63	48	89.0	1.5%	124.51
PIPE 64	24	118.8	1.0%	15.95
PIPE 65	18	46.2	1.0%	12.40
PIPE 66	18	10.2	1.0%	3.80
PIPE 67	48	279.6	1.1%	136.03
PIPE 68	48	123.1	1.5%	134.95
PIPE 69	48	88.3	2.2%	134.35
PIPE 70	48	90.1	2.1%	134.10
PIPE 71	48	190.5	2.0%	146.18
PIPE 72	48	56.1	2.0%	145.58
PIPE 73	30 X 19	23.2	0.5%	14.00
PIPE 74	30 X 19	38.6	0.3%	14.00
PIPE 75	18	10.0	6.3%	10.00
PIPE 76	18	76.0	1.7%	10.00
PIPE 77 Bradley Median Culvert	14 x 23	153.4	1.0%	1.60

STORM SUMMARY TABLE

INLET LABEL	INLET OPENING (FT)	FLOW TO INLET (cfs)	FLOW CAPTURED cfs)
INLET 1-A	10	17.5	17.5
INLET 2-A	5	5.2	5.2
INLET 3-A	5	9.02	9.02
INLET 4-A	10	1	1
INLET 1-B	10	4.1	3.4
INLET 3-C	10	11.1	11.1
INLET 4-C	10	11.1	11.1
INLET 5-C	10	12.5	12.5
INLET 6-C	5	0.6	0.6
INLET 1-D	15	11.8	8.2
INLET 1-E	10	16.65	16.65
INLET 2-E	10	16.65	16.65
INLET 1-F	5	6	2.2
INLET 2-F	5	2.5	1.5
INLET 3-F	10	8.8	5.1
INLET 4-F	10	3.5	3
INLET 5-F	10	7.8	4.8
INLET 6-F	10	3.9	3.3
INLET 7-F	10	16.5	16.5
INLET 8-F	5	3.3	3.3
INLET 1-G	10	4.6	3.6
INLET 1-H	10	16	16
INLET 2-H	5	4.7	4.7
INLET 3-H	10	13.3	13.3
INLET 4-H	5	4.2	4.2
INLET 5-H	10	8.9	5.1
INLET 6-H	10	8.6	5
INLET 7-H	10	6.4	4.3
INLET 8-H	10	4.7	3.6
INLET 9-H	3' x 3'	13	13
INLET 10-H	5	8.8	8.8
INLET 11-H	10	18	18
INLET 1-I	10	12.4	12.4
INLET 2-I	5	4.7	4.7
INLET 3-I	10	15.6	15.6

REFERENCE DRAWINGS
X-886-PR SITE_F1
X-886-PR SITE
10415-Storm Base-2017
X-886-PR STORM
X-Title(Drainage)
X-886-PR STORM_F1

NO.	DATE	DESCRIPTION	BY

REVISIONS

NAME: S:\19.886.008 Trails at Aspen Ridge\200 Drainage\201 Drainage Reports\FDR\DWG\DR03-Filing-1.dwg
PCP: Matrix.ctb
PLOT DATE: Wed Sep 25, 2019 8:23am

BENCHMARK DATA(ELEV.)
(DATUM)
(DESCRIPTION/LOCATION)

VERTICAL BENCHMARK:

BASIS OF BEARING:

PREPARED UNDER MY DIRECT SUPERVISION, FOR AND ON BEHALF OF MATRIX DESIGN GROUP, INC.

Matrix DESIGN GROUP
2435 Research Parkway, Suite 300 Colorado Springs, CO 80920
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COLA, LLC.

TRAILS AT ASPEN RIDGE FILING #1

FINAL DRAINAGE REPORT
STORM PIPE SCHEDULE

DESIGNED BY: JTS
DRAWN BY: JTS
CHECKED BY:
SCALE
HORIZ:
VERT:
DATE ISSUED: September 2019
SHEET NO. 4 OF 4 SHEETS

DR-04