# DRAINAGE CONFORMANCE LETTER FOR WILLOW CREEK PUD LOTS 1/2

# LONE TREE, COLORADO



## Willow Creek PUD Lots 1/2

Park Meadows Dr. & Yosemite Dr. Lone Tree, Douglas County, CO

Contact: Vogel & Associates Phone: (303) 893-4288

Prepared by:

# **Bowman**

1526 Cole Blvd, Suite 100 Lakewood, Colorado 80401

Contact: Thomas Pannell, PE Phone: (303) 801-2900

> JN: 020460-01-001 **April 2023**

### Signature Page

"This conformance letter for the drainage design of Willow Creek PUD Lots 1/2 was prepared under my direct supervision in accordance with the provisions of the Douglas County Storm Drainage Design and Technical Criteria for the owners thereof. I understand that the City of Lone Tree does not and will not assume liability for drainage and erosion control facilities designed by others.

Thomas Pannell, PE State of Colorado No. 53615 For and on behalf of Bowman Consulting

Furniture Row Colo, LLC hereby certifies that the drainage facilities for Willow Creek PUD Lots 1/2 shall be constructed according to the design presented in this report. I understand that the City of Lone Tree does not and will not assume liability for the drainage facilities designed and/or certified by my engineer and that the City of Lone Tree reviews drainage plans pursuant to Lone Tree Municipal Code, Chapter 15, Article 1; but cannot, on behalf of Willow Creek PUD Lots 1/2, guarantee that final drainage design review will absolve Furniture Row Colo, LLC and/or their successors and/or assigns of future liability for improper design. I further understand that approval of the Site Improvement Plan and Final Plat does not imply approval of my engineer's drainage design."

Name of Developer		
Authorized Signature		

# 1. General Location and Description

# 1.1 Purpose

The purpose of this drainage conformance letter is to show that the existing detention pond on this site is adequately sized for lots 1 and 2 of the Willow Creek PUD project.

#### 1.2 Site Location

Willow Creek PUD Lots 1/2 (hereafter, the Site) is located in the City of Lone Tree, Portions of the West half of Section 3 and the Northeast quarter of Section 4, Quarter Section NW ¼, Township 6 South, Range 67W, Douglas County, Colorado. The Site is located in the northwest of the intersection of Park Meadows Drive and Yosemite Street. The Site consists of Lots 1 and 2 of the Park Meadows Subdivision, Filing 1, 1st Amendment and is bound by C-470 to the north, Park Meadows Drive to the south, and Willow Creek to the east.



Figure 1-1 Vicinity Map

# 1.3 Description of Property

The total area of the property is 25.29 acres. The ground cover is mainly short grasses with some trees and shrubs. Existing grades on the Site are moderate, ranging from 0-20% and averaging

around 4-7%. The slopes closer to Willow Creek are steeper, with some slopes over 30% near the creek banks. The Site generally slopes to the north and west towards Willow Creek.

Soils for the site are classified as NRCS hydrologic soils groups B and C per the Web Soil Survey from the USDA Natural Resources Conservations Service. See Appendix E for the soil map.

A small portion of the Site is within a regulatory floodplain per the Douglas County and City of Lone Tree Flood Insurance Rate Map (FIRM) Panel 42 Map No. 08035C0042F. See Appendix F for the FEMA Firm Panel.

The site was designed to drain into Pond H north of the site per the existing drainage report (Phase III Drainage Report, Pond H Upgrade, Parkway, Filing 2, 7<sup>th</sup> Amendment, March 25,2018).

# 2. Drainage Basins and Sub-Basins

# **Existing Drainage Basins**

Existing available drainage studies that impact the site are:

 Phase III Drainage Report, Pond H Upgrade, Parkway, Filing 2, 7<sup>th</sup> Amendment, March 25, 2018

See Appendix G for the above drainage study.

**Basin F4** (4.56 ac) covers the west portion of the site. It is an existing basin per the existing basin map mentioned above. The existing report used an imperviousness of 85% for this area so we took the portion of this basin that is in our site and assumed a split of 15% landscaping, 68% hardscape, and 17% roof area. The estimated 5 year flow of this site is 8.01 cfs and the 100 year flow is 19.15 cfs. This basin is designed to flow to Pond H.

**Basin H8** (20.73 ac) covers the east portion of the site. It is an existing basin per the existing basin map mentioned above. The existing report used an imperviousness of 80% for this area so we took the portion of this basin that is in our site and assumed a split of 20% landscaping, 64% hardscape, and 16% roof area. The estimated 5 year flow of this site is 38.43 cfs and the 100 year flow is 95.44 cfs. This basin is designed to flow to Pond H.

The existing drainage basin map can be found in Appendix A and the existing drainage calculations can be found in Appendix C.

## **Proposed Major Drainage Basins**

**Basin A1** (14.76 ac) encompasses Lot 1 of the site. It will consist of a mixed use building, individual residential units, asphalt parking/driveways, and landscaping areas. The 5 year flow of this site is 16.42 cfs and the 100 year flow is 48.30 cfs. This basin will outfall into Pond H as originally intended in the existing drainage report.

**Basin A2** (10.53 ac) encompasses Lot 2 of the site. It will consist of individual residential units, asphalt parking/driveways, and landscaping areas. The 5 year flow of this site is 13.61 cfs and the 100 year flow is 38.56 cfs. This basin will outfall into Pond H as originally intended in the existing drainage report.

The proposed drainage basin map can be found in Appendix B and the proposed drainage calculations can be found in Appendix D.

# 3. Drainage Design Criteria

# 3.1 Development Criteria Reference

The Site was designed to comply with the Douglas County Storm Drainage Design and Technical Criteria Manual.

# 3.2 Hydrologic Criteria

The existing site was originally split into Basin F4 and H8 per the existing drainage report. The site used to drain into 2 ponds, Pond F and Pond H. Pond F no longer exists and Pond H was upgraded to handle the added capacity of Basin F4 as well as the other basins outside of our site that originally drained to Pond F. The existing site is not developed, but the existing drainage report designed Pond H to have capacity for the site in its developed condition. The assumption was that the imperviousness of the site would be 85% in Basin F4 and 80% in Basin H8 and has a composite imperviousness of 79.7%. The existing site is designed to produce a 5 year flow of 41.67 cfs and a 100 year flow of 102.74 cfs. The proposed site plan is designed to include much more pervious area than the assumptions made in the existing drainage report. This is because the site was originally zoned for commercial use and will now be used for residential/mixed use. The composite impervious area of the proposed site is 60.7%. The proposed site will produce a 5 year flow of 28.65 cfs and a 100 year flow of 82.91 cfs. We are reducing the designed flows for these 2 existing basins by 20% so therefore Pond H has capacity as designed.

# 4. Summary

The goal of this conformance letter is to prove that the existing regional detention pond (Pond H) is adequately designed to detain the drainage that will be generated by the project site. Pond H is a full-spectrum detention pond and therefore this site will meet water quality (WQCV) and excess urban runoff volume (EURV) standards based on the Mile High Flood District. The flows on-site will be reduced from the assumptions that were made in the existing drainage report to size the existing detention pond and therefore the site has adequate drainage infrastructure in place to develop for its intended use. The site improvement plans (SIP) will also require drainage conformance letters based on the specific uses and layouts at the time of the SIP application to the city. There is also proposed drainage improvements along Willow Creek by others that are shown in Appendix H.

#### LIST OF APPENDICES

Appendix A – Existing Basin Map

Appendix B – Drainage Basin Map

Appendix C – Existing Hydrologic Calculations

Appendix D – Proposed Hydrologic Calculations

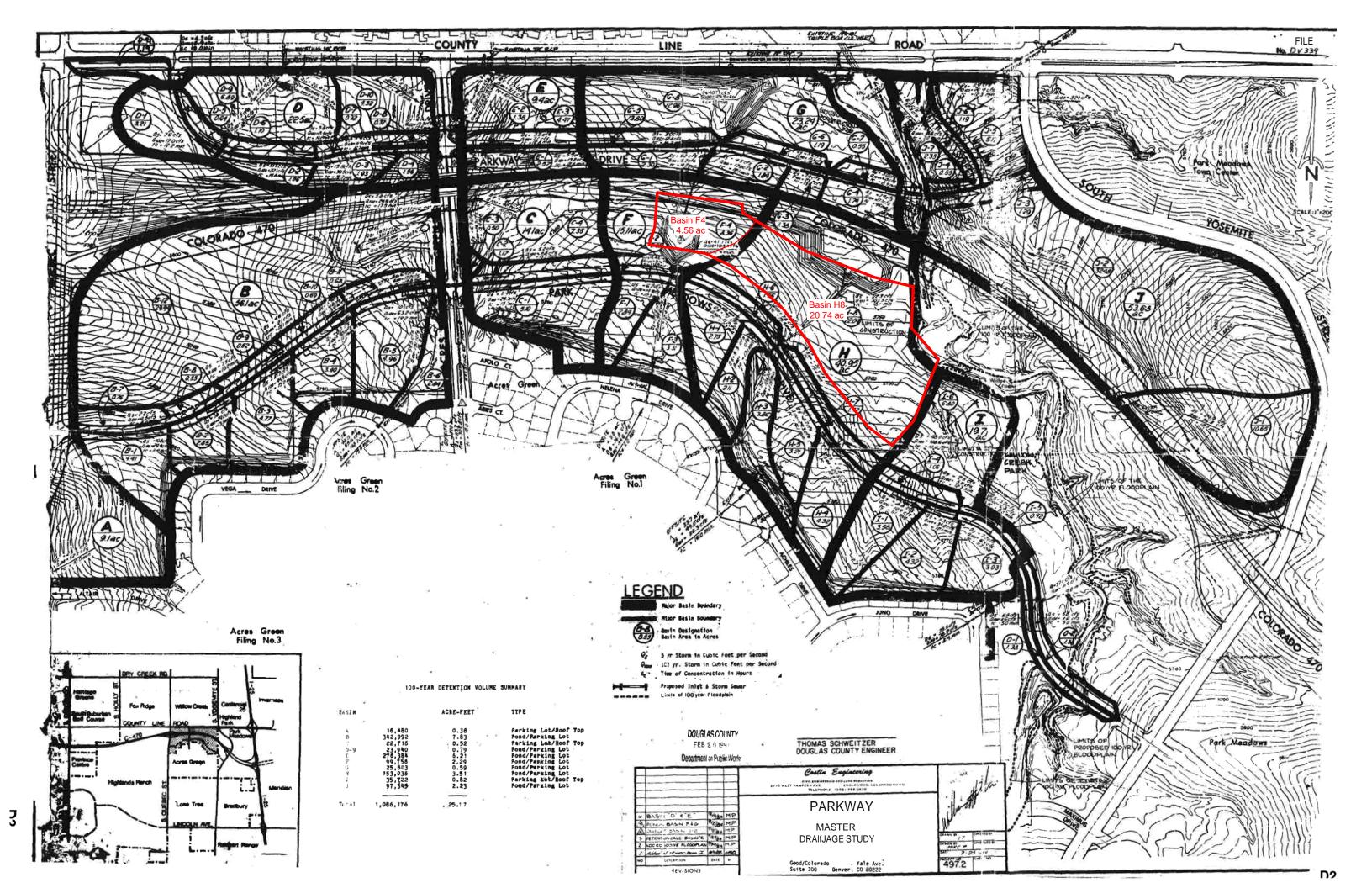
Appendix E – Soil Map

Appendix F – FEMA Firm Panel

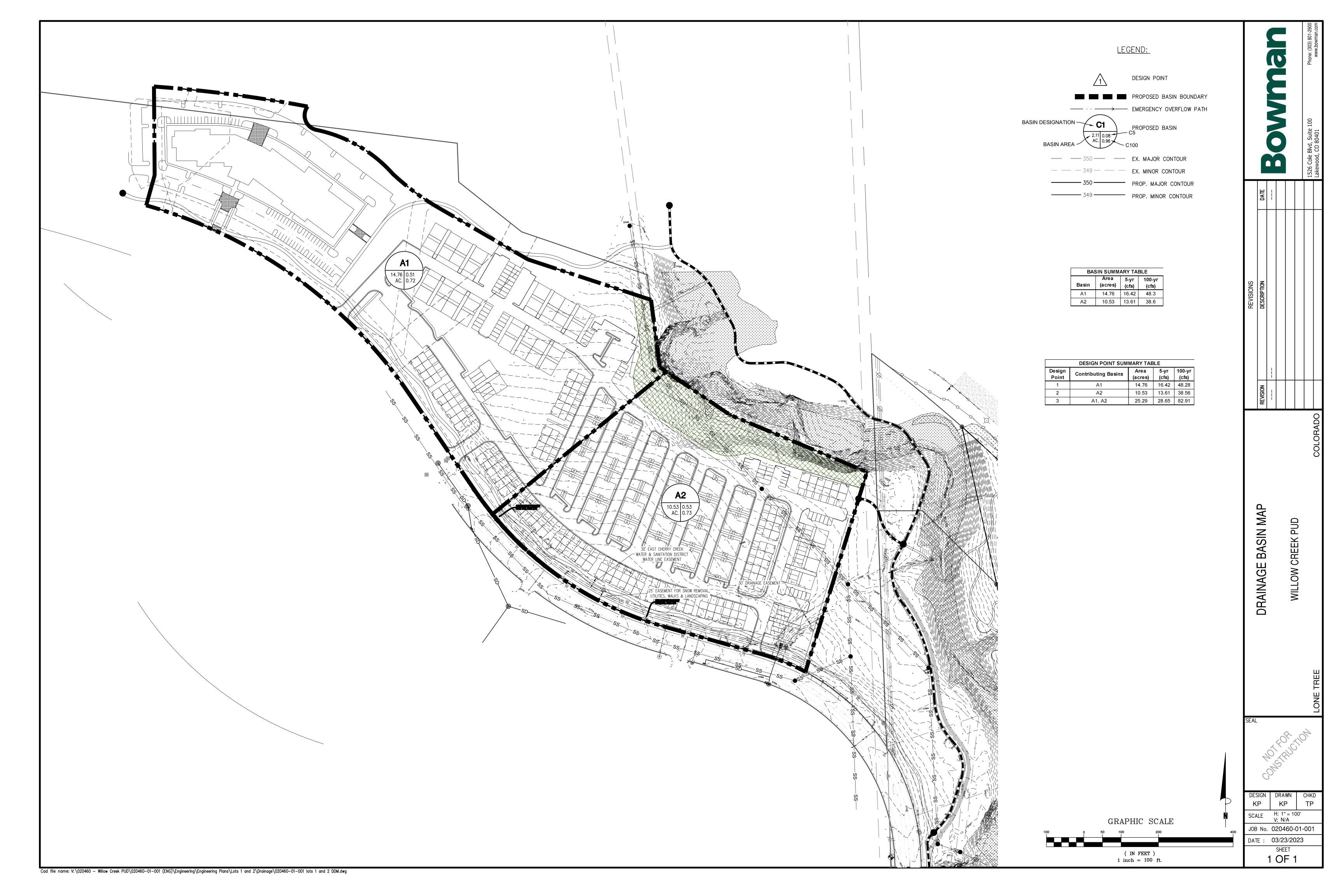
Appendix G – Existing Drainage Report

Appendix H - Proposed Willow Creek Minimal Impact Drainage Plan

# **APPENDIX A – EXISTING BASIN MAP**



# **APPENDIX B – DRAINAGE BASIN MAP**



# APPENDIX C – EXISTING HYDROLOGIC CALCULATIONS

Summary of Site Hydrology

Willow Creek PUD Lone Tree, CO

Cells of this color are for required user-input

#### Tips for using spreadsheet

1. if you need to override any values/equations in this spreadsheet - go to review tab, and choose "unprotect sheet" (this will make cells unlocked)
2. These equations are based on Urban Drainage Volume 1 from January 2016 (please check urban drainage for most recent version)\_
http://udfcd.org/volume-one

ВА	SIN SUMM	ARY TA	BLE
Basin	Area (acres)	5-yr (cfs)	100-yr (cfs)
F4	4.56	8.01	19.2
H8	20.73	38.43	95.4

	DESIGN POINT SUM	MARY TAE	BLE			
Design Point	Contributing Basins	Area (acres)	5-yr (cfs)	100-yr (cfs)		
1	F4	4.56	8.01	19.15		
2	H8	20.73	38.43	95.44		
3	F4, H8	25.29	41.65	102.70		

#### POST-DEVELOPMENT C VALUES

Clabel Descript	1
Global Paramete	ers'
Land Use	% Imp.
Open Space/Landscaping	2
Hardscape	100
Roof	90

Summa	Y
Total Area (ac)	25.29
Composite Impervious	79.7%



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<sup>1</sup> From Table 6-3 in UDFCD Volme1

<sup>2</sup> From Table 6-4 in UDFCD Volme1

Subcatchment Name	Area	NRCS Hydrologic Soil Group	Open Space	e/Landscaping	H	ardscape	Roo	of	% Check	Percent			Runo	ff Coefficie	nt, C²		
Oubcatchinicht Hame	(ac)	141.00 Hydrologic doll oroup	Area (ac)	%	Area (ac)	%	Area (ac)	%	70 OHECK	Imperviousness	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
F4	4.56	С	0.68	15.0%	3.10	68.0%	0.78	17.0%	100.00%	83.6%	0.68	0.72	0.75	0.79	0.81	0.83	0.85
H8	20.73	В	4.15	20.0%	13.27	64.0%	3.32	16.0%	100.00%	78.8%	0.63	0.66	0.69	0.74	0.77	0.79	0.82
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#### TIME OF CONCENTRATION

Designer: KP
Company: BOWMAN
Date: 4/28/2023
Project: Willow Creek PUD
Location: Lone Tree, CO

 $\begin{aligned} & t_i = \frac{0.395(1.1 - C_s)\sqrt{L_i}}{S_i^{0.33}} & Computed \ t_c = t_i + t_t \end{aligned} \end{aligned} \begin{bmatrix} t_{minimum} = 5 \ (urbal \ t_{minimum} = 10 \ (non \ t_t) \\ & t_t = \frac{L_t}{60K\sqrt{S_t}} = \frac{L_t}{60V_t} \end{aligned} \end{aligned} \end{aligned} \end{aligned}$  Regional  $t_c = (26 - 17i) + \frac{L_t}{60(14i + 9)\sqrt{S_t}}$ 

 $\begin{array}{c} t_{minimum} = 10 \text{ (non-urban)} & \hline \text{Cells of this color are for required user-input} \\ + \frac{L_t}{60(14i + 9) \sqrt{s}} & \hline \text{Selected } t_c = \max\{t_{\mininimum}, \min(Computed \, t_c \,, Regional \, t_c)\} \end{array}$ 

	Subbasi	n Data		Overlan	d (Initial) F	low Time		Channe	lized (Travel)	Flow Time			Time of 0	Concentration	
Sub-Basin	Area	% Impervious	C5	Overland Flow Length L <sub>i</sub> (ft)	Overland Flow Slope S <sub>i</sub> (ft/ft)	Overland Flow Time t <sub>i</sub> (min)	Channelized Flow Length Lt (ft)	Channelized Flow Slope St (ft/ft)	NRCS Conveyanc e Factor K		Channelized Flow Time t <sub>t</sub> (min)	Computed t <sub>c</sub> (min)	Regional t <sub>c</sub> (min)	Selected t <sub>c</sub> (min)	
F4	4.56	83.6%	0.72	300.00	0.030	8.35	1500.00	0.030	20	3.46	7.22	15.57	18.76	15.57	
H8	20.73	78.8%	0.66	300.00	0.025	10.14	300.00	0.030	20	3.46	1.44	11.58	14.05	11.58	
								•							

#### STORM DRAINAGE SYSTEM DESIGN - 5-YEAR DESIGN STORM

Designer:	KP
Company:	BOWMAN
Date:	4/28/2023
Project:	Willow Creek PUD



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			DIK	ECT RUN	OFF				TO	TOTAL RUNOFF				REET	PIPE			TRAVEL TIME					
STREET/ CONTRIBUTING BASINS	Area Design	Area (ac)	Coeff C	Tc (min)	C*A	I	Q (cfs)	Tc (min)	Sum Area (ca)	Sum C*A (ac)	l in/hr	Q cfs	-	Street Q	Q	Slope %	PIPE SIZE	L ft	VEL ft/sec	Tt min	Q add'l		Remarks
	F4	4.56	0.72	15.6	3.27	2.45	8.0	()	()	(==)			- 12		8.0	,,,							
F4								15.6	4.6	3.3	2.45	8.01			8.0								
	H8	20.73	0.66	11.6	13.71	2.80	38.4								38.4								
H8								11.6	20.7	13.7	2.80	38.43			38.4								
F4, H8								15.6	25.3	17.0	2.45	41.65			41.7								
																							·
	BASINS F4	BASINS Design F4 H8 H8	BASINS         Design         (ac)           F4         4.56           F4         H8           20.73	BASINS         Design         (ac)         C           F4         4.56         0.72           F4         H8         20.73         0.66           H8         H8         20.73         0.66	BASINS         Design         (ac)         C         (min)           F4         4.56         0.72         15.6           F4	BASINS         Design         (ac)         C         (min)         (ac)           F4         4.56         0.72         15.6         3.27           F4         H8         20.73         0.66         11.6         13.71           H8         H8         10.72         10.6         10.6         10.71	BASINS         Design         (ac)         C         (min)         (ac)           F4         4.56         0.72         15.6         3.27         2.45           F4         H8         20.73         0.66         11.6         13.71         2.80           H8         H8         10.75	BASINS         Design         (ac)         C         (min)         (ac)         (cfs)           F4         4.56         0.72         15.6         3.27         2.45         8.0           F4         H8         20.73         0.66         11.6         13.71         2.80         38.4           H8         H8         10.74	BASINS         Design         (ac)         C         (min)         (ac)         (cfs)         (min)           F4         4.56         0.72         15.6         3.27         2.45         8.0           F4	BASINS         Design         (ac)         C         (min)         (ac)         (cfs)         (min)         Area (ca)           F4         4.56         0.72         15.6         3.27         2.45         8.0           F4         4.6         15.6         4.6           H8         20.73         0.66         11.6         13.71         2.80         38.4           H8         11.6         20.7	BASINS         Design         (ac)         C         (min)         (ac)         (cfs)         (min)         Area (ca)         C'A (ac)           F4         4.56         0.72         15.6         3.27         2.45         8.0         15.6         4.6         3.3           H8         20.73         0.66         11.6         13.71         2.80         38.4         11.6         20.7         13.7           H8         11.6         20.7         13.7         13.7         11.6         20.7         13.7	BASINS         Design         (ac)         C         (min)         (ac)         (cfs)         (min)         Area (min)         C*A (ac)         in/hr           F4         4.56         0.72         15.6         3.27         2.45         8.0	BASINS         Design         (ac)         C         (min)         (ac)         (cfs)         (min)         Area (cac)         in/hr         cfs           F4         4.56         0.72         15.6         3.27         2.45         8.0	BASINS         Design (ac)         C (min)         (ac)         (cfs)         (min)         Area (cA)         C'A (ac)         in/hr         cfs         %           F4         4.56         0.72         15.6         3.27         2.45         8.0         15.6         4.6         3.3         2.45         8.01           F4         H8         20.73         0.66         11.6         13.71         2.80         38.4         11.6         20.7         13.7         2.80         38.43           H8         H8	BASINS         Design (ac)         C (min)         (ac)         (cfs)         (min)         Area (ca) (ac) (ac) (ac) in/hr         cfs         % cfs           F4         4.56         0.72         15.6         3.27         2.45         8.0         15.6         3.3         2.45         8.01           F4         H8         20.73         0.66         11.6         13.71         2.80         38.4         11.6         20.7         13.7         2.80         38.43           H8         H8 <td>BASINS         Design (ac)         C (min)         (ac)         (cfs)         (min)         Area (ca)         C*A (ac)         in/hr         cfs         %         cfs         &lt;</td> <td>BASINS         Design (ac)         C (min) (ac)         (cfs) (min) (ac)         (cfs) (min) (ac)         (ca) (ac) (ac) (ac) (ac) (ac) (ac) (ac)</td> <td>BASINS         Design (ac)         C (min)         (ac)         (cfs)         (min)         Area (ca)         C'A (ac)         in/hr         cfs         %         cfs         %         SIZE           F4         4.56         0.72         15.6         3.27         2.45         8.0         5.0         8.0</td> <td>BASINS         Design (ac)         C (min)         (ac)         (cfs)         (min)         Area (ca)         C*A (ac)         in/hr         cfs         % cfs         Q Q cfs         % SIZE         ft           F4         4.56         0.72         15.6         3.27         2.45         8.0<td>BASINS Design (ac) C (min) (ac) (cfs) (min) (ca) (cfs) (min) (ca) (cfs) (min) (ca) (ca) (ac) (in/hr cfs % cfs cfs % SIZE ft ff/sec  F4 4.56 0.72 15.6 3.27 2.45 8.0</td><td>BASINS Design (ac) C (min) (ac) (cfs) (min) (ca) (cfs) (min) (ca) (cfs) (min) (ca) (ca) (ac) (in/hr cfs % cfs cfs % SIZE ft ff/sec min  F4 4.56 0.72 15.6 3.27 2.45 8.0  </td><td>BASINS Design (ac) C (min) (ac) C (cfs) (min) (ac) (cfs) (min) (ac) (cfs) (min) (ac) (cfs) (min) (ac) (ac) (ac) (ac) (ac) (ac) (ac) (ac</td><td>BASINS Design (ac) C (min) (ac) C (cfs) (min) (ac) (cfs) (min) (ac) (cfs) (min) (ac) (ac) (ac) (ac) (ac) (ac) (ac) (ac</td></td>	BASINS         Design (ac)         C (min)         (ac)         (cfs)         (min)         Area (ca)         C*A (ac)         in/hr         cfs         %         cfs         <	BASINS         Design (ac)         C (min) (ac)         (cfs) (min) (ac)         (cfs) (min) (ac)         (ca) (ac) (ac) (ac) (ac) (ac) (ac) (ac)	BASINS         Design (ac)         C (min)         (ac)         (cfs)         (min)         Area (ca)         C'A (ac)         in/hr         cfs         %         cfs         %         SIZE           F4         4.56         0.72         15.6         3.27         2.45         8.0         5.0         8.0	BASINS         Design (ac)         C (min)         (ac)         (cfs)         (min)         Area (ca)         C*A (ac)         in/hr         cfs         % cfs         Q Q cfs         % SIZE         ft           F4         4.56         0.72         15.6         3.27         2.45         8.0 <td>BASINS Design (ac) C (min) (ac) (cfs) (min) (ca) (cfs) (min) (ca) (cfs) (min) (ca) (ca) (ac) (in/hr cfs % cfs cfs % SIZE ft ff/sec  F4 4.56 0.72 15.6 3.27 2.45 8.0</td> <td>BASINS Design (ac) C (min) (ac) (cfs) (min) (ca) (cfs) (min) (ca) (cfs) (min) (ca) (ca) (ac) (in/hr cfs % cfs cfs % SIZE ft ff/sec min  F4 4.56 0.72 15.6 3.27 2.45 8.0  </td> <td>BASINS Design (ac) C (min) (ac) C (cfs) (min) (ac) (cfs) (min) (ac) (cfs) (min) (ac) (cfs) (min) (ac) (ac) (ac) (ac) (ac) (ac) (ac) (ac</td> <td>BASINS Design (ac) C (min) (ac) C (cfs) (min) (ac) (cfs) (min) (ac) (cfs) (min) (ac) (ac) (ac) (ac) (ac) (ac) (ac) (ac</td>	BASINS Design (ac) C (min) (ac) (cfs) (min) (ca) (cfs) (min) (ca) (cfs) (min) (ca) (ca) (ac) (in/hr cfs % cfs cfs % SIZE ft ff/sec  F4 4.56 0.72 15.6 3.27 2.45 8.0	BASINS Design (ac) C (min) (ac) (cfs) (min) (ca) (cfs) (min) (ca) (cfs) (min) (ca) (ca) (ac) (in/hr cfs % cfs cfs % SIZE ft ff/sec min  F4 4.56 0.72 15.6 3.27 2.45 8.0	BASINS Design (ac) C (min) (ac) C (cfs) (min) (ac) (cfs) (min) (ac) (cfs) (min) (ac) (cfs) (min) (ac) (ac) (ac) (ac) (ac) (ac) (ac) (ac	BASINS Design (ac) C (min) (ac) C (cfs) (min) (ac) (cfs) (min) (ac) (cfs) (min) (ac) (ac) (ac) (ac) (ac) (ac) (ac) (ac

#### STORM DRAINAGE SYSTEM DESIGN - 100-YEAR DESIGN STORM

Designer:	KP
Company:	BOWMAN
Date:	4/28/2023
Project:	Willow Creek PUD



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	STREET/			DIR	ECT RUN	IOFF				TO	TAL RUN	OFF			REET		PIPE						TRAVEL	TIME
DESGIN POINT	CONTRIBUTING BASINS	Area	Area	Coeff	Тс	C*A	ı	Q	Тс	Sum Area	Sum C*A	ı	Q	Slope	Street Q	Design Q	Slope	PIPE	L	VEL	Tt	Q add'l		Remarks
	BASINS	Design	(ac)	С	(min)	(ac)		(cfs)	(min)	(ca)	(ac)	in/hr	cfs	%	cfs	cfs	%	SIZE	ft	ft/sec	min			
		F4	4.56	0.83	15.6	3.77	5.09	19.2								19.2								
1	F4								15.6	4.6	3.8	5.09	19.15			19.2								
		H8	20.73	0.79	11.6	16.43	5.81	95.4								95.4								
2	H8								11.6	20.7	16.4	5.81	95.44			95.4								
3	F4, H8								15.6	25.3	20.2	5.09	102.70			102.7								

Rainfall Data Willow Creek PUD Lone Tree, CO

Recurrence Interval (yrs)	1-hr Rainfall Depth (in)
2	0.84
5	1.10
10	1.33
25	1.68
50	1.97
100	2.28
500	3.08

# APPENDIX D – PROPOSED HYDROLOGIC CALCULATIONS

Summary of Site Hydrology

Willow Creek PUD Lone Tree, CO

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2. These equations are based on Urban Drainage Volume 1 from January 2016 (please check urban drainage for most recent version)\_
http://udfcd.org/volume-one

ВА	SIN SUMM	ARY TA	BLE
Basin	Area (acres)	5-yr (cfs)	100-yr (cfs)
A1	14.76	16.42	48.3
A2	10.53	13.61	38.6

	DESIGN POINT SUM	MARY TAE	BLE	
Design Point	Contributing Basins	Area (acres)	5-yr (cfs)	100-yr (cfs)
1	A1	14.76	16.42	48.28
2	A2	10.53	13.61	38.56
3	A1, A2	25.29	28.65	82.91

#### POST-DEVELOPMENT C VALUES

Global Parameter	s <sup>1</sup>
Land Use	% Imp.
Open Space/Landscaping	2
Hardscape	100
Roof	90

Summa	ry
Total Area (ac)	25.29
Composite Impervious	60.7%



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Cells of this color are for optional user-input

<sup>1</sup> From Table 6-3 in UDFCD Volme1

<sup>2</sup> From Table 6-4 in UDFCD Volme1

Subcatchment Name	Area	NRCS Hydrologic Soil Group	Open Space	e/Landscaping	H	ardscape	Roo	of	% Check	Percent			Runo	off Coefficie	nt, C²		
Oubcateminent Name	(ac)	Mixed Hydrologic doll ordap	Area (ac)	%	Area (ac)	%	Area (ac)	%	70 OHECK	Imperviousness	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
A1	14.76	С	6.04	40.9%	6.15	41.7%	2.57	17.4%	100.00%	58.1%	0.45	0.51	0.56	0.64	0.68	0.72	0.77
A2	10.53	В	3.60	34.2%	4.68	44.5%	2.25	21.4%	100.00%	64.4%	0.50	0.53	0.58	0.65	0.69	0.73	0.77
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#### TIME OF CONCENTRATION

Designer: KP Company: BOWMAN Date: 4/28/2023 Project: Willow Creek PUD Location: Lone Tree, CO

Bowman CONSULTING  $t_{minimum}$ = 5 (urban)  $Computed \, t_c = t_i + t_t$ 

 $t_i = \frac{0.395(1.1-C_S)\sqrt{L_i}}{S_i^{0.33}}$ 

 $t_{minimum} = 10$  (non-urban) Cells of this color are for required user-input

Regional  $t_c = (26 - 17i) + \frac{L_t}{60(14i + 9)\sqrt{S_t}}$ 

 $\text{Selected } t_c = \max\{t_{\min \text{imum}} \text{ , } \min(\text{Computed } t_c \text{ , Regional } t_c)\}$ 

	Subbasi	n Data		Overlan	d (Initial) F	low Time		Channe	lized (Travel)	Flow Time			Time of 0	Concentration	
Sub-Basin	Area	% Impervious	C5	Overland Flow Length L <sub>i</sub> (ft)	Overland Flow Slope S <sub>i</sub> (ft/ft)	Flow	Channelized Flow Length L <sub>t</sub> (ft)	Channelized Flow Slope St (ft/ft)	NRCS Conveyanc e Factor K	Channelized Flow Velocity Vt (ft/sec)	Channelized Flow Time t <sub>t</sub> (min)	Computed t <sub>c</sub> (min)	Regional t <sub>c</sub> (min)	Selected t <sub>c</sub> (min)	
A1	14.76	58.1%	0.51	300.00	0.030	12.86	1400.00	0.030	20	3.46	6.74	19.60	23.97	19.60	
A2	10.53	64.4%	0.53	300.00	0.025	13.16	450.00	0.020	20	2.83	2.65	15.81	18.00	15.81	
						·						•			

#### STORM DRAINAGE SYSTEM DESIGN - 5-YEAR DESIGN STORM

Designer: KP
Company: BOWMAN
Date: 4/28/2023
Project: Willow Greek PUD



Cells of this color are for required user-input

Cells of this color are for optional user-input

	STREET/			DIR	ECT RUN	IOFF				то	TAL RUN	IOFF		STF	REET		PIPE						TRAVEL	TIME
DESGIN POINT	CONTRIBUTING BASINS	Area	Area	Coeff	Тс	C*A	I	Q	Тс	Sum Area	Sum C*A	1	Q		Street Q	Q	Siope	PIPE	L	VEL	Tt	Q add'l		Remarks
		Design		С	(min)	(ac)		(cfs)	(min)	(ca)	(ac)	in/hr	cfs	%	cfs	cfs	%	SIZE	ft	ft/sec	min			
		A1	14.7578	0.51	19.6	7.51	2.19	16.4								16.4								
1	A1								19.6	14.8	7.5	2.19	16.42			16.4								
		A2	10.5319	0.53	15.8	5.59	2.44	13.6								13.6								
2	A2								15.8	10.5	5.6	2.44	13.61			13.6								
3	A1, A2								19.6	25.3	13.1	2.19	28.65			28.6								
																			<u> </u>				<u> </u>	
																l								

#### STORM DRAINAGE SYSTEM DESIGN - 100-YEAR DESIGN STORM

Designer: KP
Company: BOWMAN
Date: 4/28/2023
Project: Willow Greek PUD



Cells of this color are for required user-input

Cells of this color are for optional user-input

	STREET/			DIR	ECT RUN	IOFF				TC	TAL RUN	OFF			REET		PIPE						TRAVEL	TIME
DESGIN POINT	CONTRIBUTING BASINS	Area Design	Area (ac)	Coeff C	Tc (min)	C*A (ac)	I	Q (cfs)	Tc (min)	Sum Area (ca)	Sum C*A (ac)	l in/hr	Q cfs	Slope %	Street Q	Design Q cfs	Slope %	PIPE SIZE	L ft	VEL ft/sec	Tt min	Q add'l		Remarks
		A1	14.7578	0.72	19.6	10.65	4.53	48.3	()	(cu)	(40)		013	70	CIS	48.3	76	OILL		10300				
1	A1								19.6	14.8	10.7	4.53	48.28			48.3								
		A2	10.5319	0.73	15.8	7.64	5.05	38.6								38.6								
2	A2								15.8	10.5	7.6	5.05	38.56			38.6								
3	A1, A2								19.6	25.3	18.3	4.53	82.91			82.9								
				l	l	l	l	l								l								

Rainfall Data Willow Creek PUD Lone Tree, CO

Recurrence Interval (yrs)	1-hr Rainfall Depth (in)
2	0.84
5	1.10
10	1.33
25	1.68
50	1.97
100	2.28
500	3.08

# **APPENDIX E – SOIL MAP**

#### MAP LEGEND

Spoil Area

Stony Spot

Wet Spot

Other

Rails

**US Routes** 

Major Roads

Local Roads

Δ

**Water Features** 

Transportation

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**Background** 

Very Stony Spot

Special Line Features

Streams and Canals

Interstate Highways

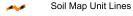
Aerial Photography

#### Area of Interest (AOI)

Area of Interest (AOI)

#### Soils

Soil Map Unit Polygons



Soil Map Unit Points

#### **Special Point Features**

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

# MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20.000.

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

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

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

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

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: Arapahoe County, Colorado Survey Area Data: Version 18, Sep 1, 2022

Soil Survey Area: Castle Rock Area, Colorado Survey Area Data: Version 15, Sep 1, 2022

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

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

Date(s) aerial images were photographed: Jun 9, 2021—Jun 12, 2021

# **MAP LEGEND**

# **MAP INFORMATION**

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.

# **Map Unit Legend**

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
FdC	Fondis silt loam, 3 to 5 percent slopes	5.0	0.8%
RID	Renohill-Litle clay loams, 3 to 9 percent slopes	14.6	2.4%
RtE	Renohill-Litle-Thedalund complex, 9 to 30 percent slopes	14.6	2.4%
Тс	Terrace escarpments	3.1	0.5%
Subtotals for Soil Survey Area	a	37.3	6.1%
Totals for Area of Interest		607.6	100.0%

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
FoD	Fondis clay loam, 3 to 9 percent slopes	181.8	29.9%
Ма	Manzanola clay loam	11.8	1.9%
NsE	Newlin-Satanta complex, 5 to 20 percent slopes	18.5	3.0%
RmE	Renohill-Buick complex, 5 to 25 percent slopes	324.6	53.4%
Sn	Satanta loam	33.5	5.5%
Subtotals for Soil Survey A	rea	570.2	93.9%
Totals for Area of Interest		607.6	100.0%

# Castle Rock Area, Colorado

# NsE—Newlin-Satanta complex, 5 to 20 percent slopes

#### **Map Unit Setting**

National map unit symbol: jqzh Elevation: 5,500 to 6,600 feet

Mean annual precipitation: 15 to 19 inches Mean annual air temperature: 49 to 51 degrees F

Frost-free period: 120 to 135 days

Farmland classification: Not prime farmland

#### **Map Unit Composition**

Newlin and similar soils: 50 percent Satanta and similar soils: 30 percent Minor components: 20 percent

Estimates are based on observations, descriptions, and transects of

the mapunit.

#### **Description of Newlin**

#### Setting

Landform: Knobs, drainageways Down-slope shape: Linear Across-slope shape: Linear

Parent material: Unconformable sandy and gravelly and/or mixed

source alluvium

#### Typical profile

H1 - 0 to 8 inches: gravelly sandy loam
H2 - 8 to 17 inches: gravelly sandy clay loam
H3 - 17 to 22 inches: gravelly sandy loam
H4 - 22 to 60 inches: very gravelly sand

#### **Properties and qualities**

Slope: 5 to 20 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained Runoff class: Medium

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None Frequency of ponding: None

Available water supply, 0 to 60 inches: Low (about 3.8 inches)

## Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: B

Ecological site: R049XC202CO - Loamy Foothill 14-19 PZ

Hydric soil rating: No

#### **Description of Satanta**

#### Setting

Landform: Knobs, drainageways Down-slope shape: Linear Across-slope shape: Linear

Parent material: Eolian deposits derived from mixed

#### **Typical profile**

H1 - 0 to 9 inches: loam H2 - 9 to 30 inches: clay loam H3 - 30 to 60 inches: loam

#### **Properties and qualities**

Slope: 5 to 10 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained Runoff class: Medium

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None Frequency of ponding: None

Calcium carbonate, maximum content: 10 percent

Available water supply, 0 to 60 inches: High (about 10.2 inches)

#### Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: B

Ecological site: R049XY214CO - Gravelly Foothill

Hydric soil rating: No

## **Minor Components**

#### **Bresser**

Percent of map unit: 6 percent

Hydric soil rating: No

## **Buick**

Percent of map unit: 6 percent

Hydric soil rating: No

#### **Truckton**

Percent of map unit: 6 percent

Hydric soil rating: No

#### Aquic haplustolls

Percent of map unit: 2 percent

Landform: Swales

Hydric soil rating: Yes

# **Data Source Information**

Soil Survey Area: Castle Rock Area, Colorado Survey Area Data: Version 15, Sep 1, 2022

# Castle Rock Area, Colorado

## RmE—Renohill-Buick complex, 5 to 25 percent slopes

#### **Map Unit Setting**

National map unit symbol: jqzy Elevation: 5,500 to 6,200 feet

Mean annual precipitation: 15 to 17 inches
Mean annual air temperature: 48 to 50 degrees F

Frost-free period: 120 to 135 days

Farmland classification: Not prime farmland

#### **Map Unit Composition**

Renohill and similar soils: 50 percent Buick and similar soils: 30 percent Minor components: 20 percent

Estimates are based on observations, descriptions, and transects of

the mapunit.

#### **Description of Renohill**

#### Setting

Landform: Hills

Landform position (three-dimensional): Side slope, base slope

Down-slope shape: Linear Across-slope shape: Linear

Parent material: Weathered, calcareous clayey shale

#### Typical profile

H1 - 0 to 3 inches: clay loam H2 - 3 to 12 inches: clay loam H3 - 12 to 24 inches: clay loam

H4 - 24 to 28 inches: unweathered bedrock

#### **Properties and qualities**

Slope: 5 to 25 percent

Depth to restrictive feature: 20 to 40 inches to paralithic bedrock

Drainage class: Well drained

Runoff class: High

Capacity of the most limiting layer to transmit water

(Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None Frequency of ponding: None

Calcium carbonate, maximum content: 15 percent

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0

mmhos/cm)

Available water supply, 0 to 60 inches: Low (about 4.3 inches)

#### Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: D

Ecological site: R049XC202CO - Loamy Foothill 14-19 PZ

Hydric soil rating: No

## **Description of Buick**

#### Setting

Landform: Hills

Landform position (three-dimensional): Base slope, side slope

Down-slope shape: Linear Across-slope shape: Linear

Parent material: Eolian deposits over silty alluvium

#### Typical profile

H1 - 0 to 4 inches: loam

H2 - 4 to 15 inches: silty clay loam

H3 - 15 to 22 inches: loam

H4 - 22 to 60 inches: sandy clay loam

#### **Properties and qualities**

Slope: 5 to 8 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained Runoff class: Medium

Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None Frequency of ponding: None

Calcium carbonate, maximum content: 10 percent

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0

mmhos/cm)

Available water supply, 0 to 60 inches: High (about 9.9 inches)

#### Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: C

Ecological site: R049XC202CO - Loamy Foothill 14-19 PZ

Hydric soil rating: No

## **Minor Components**

#### Manzanola

Percent of map unit: 6 percent

Hydric soil rating: No

#### Satanta

Percent of map unit: 6 percent

Hydric soil rating: No

#### **Fondis**

Percent of map unit: 6 percent

Hydric soil rating: No

# **Aquic haplustolls**

Percent of map unit: 2 percent Landform: Swales Hydric soil rating: Yes

# **Data Source Information**

Soil Survey Area: Castle Rock Area, Colorado Survey Area Data: Version 15, Sep 1, 2022

# Castle Rock Area, Colorado

## Sn—Satanta loam

#### **Map Unit Setting**

National map unit symbol: jr05 Elevation: 5,400 to 6,200 feet

Mean annual precipitation: 15 to 19 inches Mean annual air temperature: 48 to 50 degrees F

Frost-free period: 120 to 135 days

Farmland classification: Farmland of statewide importance

#### **Map Unit Composition**

Satanta and similar soils: 85 percent Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of

the mapunit.

#### **Description of Satanta**

#### Setting

Landform: Ridges, terraces Down-slope shape: Linear Across-slope shape: Linear

Parent material: Mixed source eolian deposits

#### Typical profile

H1 - 0 to 9 inches: loam H2 - 9 to 30 inches: clay loam H3 - 30 to 60 inches: loam

#### **Properties and qualities**

Slope: 1 to 4 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Runoff class: Low

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None Frequency of ponding: None

Calcium carbonate, maximum content: 10 percent

Available water supply, 0 to 60 inches: High (about 10.2 inches)

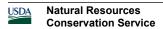
### Interpretive groups

Land capability classification (irrigated): 2e Land capability classification (nonirrigated): 3e

Hydrologic Soil Group: B

Ecological site: R049XC202CO - Loamy Foothill 14-19 PZ

Hydric soil rating: No



# **Minor Components**

#### **Fondis**

Percent of map unit: 5 percent Hydric soil rating: No

#### Sampson

Percent of map unit: 5 percent Hydric soil rating: No

## **Buick**

Percent of map unit: 2 percent Hydric soil rating: No

#### **Englewood**

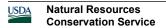
Percent of map unit: 2 percent Hydric soil rating: No

#### **Aquic haplustolls**

Percent of map unit: 1 percent Landform: Swales Hydric soil rating: Yes

# **Data Source Information**

Soil Survey Area: Castle Rock Area, Colorado Survey Area Data: Version 15, Sep 1, 2022



# **APPENDIX F – FEMA FIRM PANEL**

#### NOTES "FOUSERS

Is for use in administrating the National Flood Insurance Program. It increases the property site in the property to the control port to about sources of small size. The community map repeating unusual de-for possible updated or additional flood houses intermetion.

more distaled information in areas where Base Flood Elevations visit Bookeaps have been delement, users are encouraged to Froid Publiss and Flooleys Date and the Dames of Stitlewer sides contracted within the Flood Insurance Base (Flool Insurance Base) (Floor Insurance Authorities desireties." Those EFES are interacted for flood orating purposes only and should restee used as the side outcome? And of the Committee Com

in of the file-edways were computed at cross sections and interpolated ross sections. The filocology waive based on hydroutic considerations to requirements of the National Faluet missioner Program. Floodways 3 other portained floodway data she provided in the Faluet Insurance of for this jurisdiction.

eas not in Special Flood Hazard Avasa may be protested by **Rood** zuctures. Refer to Section 2.4 "Flood Protection Measures" of the events Study report for information on flood control structures for this

cibin used in the proporation of this map was Universal Transverse UTINI Zone 13. The horizontal dissum was NAC 83, ORIGIO sphusiol. in a in clubin, sphusiol. or Distri Parce storms used in the of FRIBEs for adjacent juridictions may result in shipf positional is map features across juridiction beautistee. These differences do he accuracy of this FRIBE.

continued to the Principal Continued to the North American Various 1988 (NAVO 88). These fixed elevations must be compared to 1988 (NAVO 88). These fixed elevations must be compared to the ground elevation referenced to the same vertical details of the principal Continued to the principal Continued Contin

Rerence System Division eudetic Survey, NOAA ng Metro Contair Vitras Highway ng Marytand 20918 3191

current elevation, description, and/or location information for banch with only jiesee contect the Information Services Branch of the Geodetic Survey of (281) T33-2422, or visit is sectoric and jugit measure. For information about adoletonal control points by Douglaw County, please wist Judick Malazia Calculate Location and County.

information shown on this FRMI was provided by the Douglas County breen and the Treen of Castle Rick Q15 Department. Additional input led by the City of Lone Tree and Town of Parker. Three data are of 2003.

reflects more detailed and up-to-closis streams shanned configurations. plain delimeations if you from shown on the products FRISA for this As a result. We protectly first and the closely coldes above in the Flood Globyl Report (which contains authorization hydroxic data) may reflect received distances that differ from what is shown in this may. Also, the cognisis installations of the first sharp and the products and products make the products of the products of the products make.

Benits shown on this map are hassed on the beat data available at the skication. Because changes doe to annexations or do annexations may unreal after this map was published, map users should no community officials to verify curried composite limit broaders.

or to the separately printed Map leales for an overview map of the wing the byout of map perceix community map repository addresses; in a Community lead to the control to the union of his part of Community as well as a listing of the panels on which each is located.

is FEMA Map Service Center at 1-800-358-9616 for information on invoducts associated with this FFIM. Available products may include second Latters of Vego Change, in Food Insurance Study report, another inner of this may. The Map Service Center may also be or suched by 00-356-9620 and its services in 1880-0eees mischana gov.

a questions about this map or questions concerning the National rance Program in general, please out 1-277-FEMA MAP (1-277-336-st the FEMA website at http://www.fama.gov. Douglas County Vertical Datum Offset Table

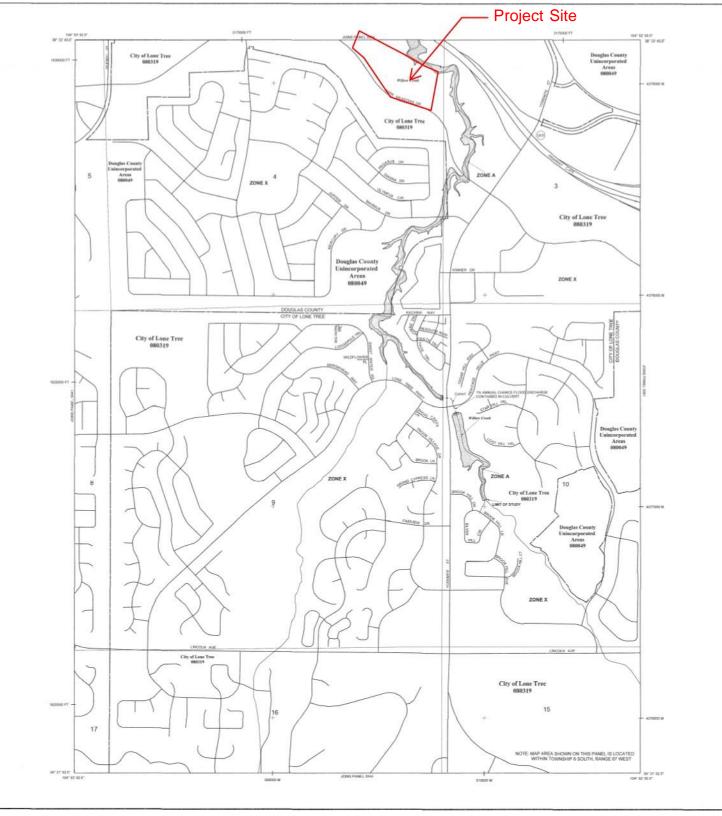
Vertical Datum Other (ft) Flooding Source

Newto Guich
Plant Cheek, Cross Section A to D
Section 34 Tribulary
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Selten Gests, Convened Tribulary
Selten Gests, Convened Tribulary
Selten Gests, Convened Tribulary
Selten Falls (Selten Cheek, Cross Section W to AM)

Flood Insurance Rate Map (FRM) was produced through a partnership between the State of Colorado Water Conservation Usan Disange and Flood Control (Statist, and the Federal Management Agency (FRMA). The State of Colorado Water Board and the Usern Disange and Flood Control Statist Water a long-term approach of Rondystan management to reduce the a long-term approach of Rondystan management to reduce the desir with Cooling A and of this electric, both the Statist of Colorado desir with Cooling and Product Country Statistics of Colorado and Colorado and Colorado principles and Product Country Statistics (Statistics).

Additional flood hazard information and resources are available from local communities, the Colonado Water Correction of the Urban Dislinage and Flood Contrel Dislinic.





#### LEGEND

SPECIAL FLOOD HAZARD AREAS (SPHAs) SUBJECT TO BY THE 1% ANNUAL CHANCE FLOOD

ZONE AE ZONE AH

ZONE AR

ZONE ARE

20ME X

Flood depths of 1 to 3 fast (assally areas of ponding); fine the determined. 20ME AO

FLOODWAY AREAS IN ZONE AS The Steadersy to the channel of a street plus by adjacent fine

OTHER AREAS

Artist differnished to be outside the 0.2% armusi chartis floridy Artist in w783. Road hazards are undetermined, full possible.

Pleading bearing Date D Investory

~~ ## ~~

(63, 907) See Fixed Direction value where uniform within struction in fact\* \*National to the North America P Vertical Deturn of 1988

A Cross section from 59° 50° 37.0° 30° 30° 50° Geographic coordinates referenced to the North. Debuts of 1963 (NAO RE), Western Hernighton

1000-meter Universal Transporter Perceior prol 5000-flust firste: Colorado State Plane coordinals system, central zone (PSPS/CDM: 502), Lambort Carec projection

Refer to lieling of Map Rapostones on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP

SEPTEMBER 30, 2005

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

1 MAP SCALE 1" = 500" 

PANEL 0042F

FIRM FLOOD IM9URAHCE RAT

AND INCORPORATED /

**PANEL 42 OF 495** (SEE MAP INDEX FOR FIRM PAN)



# APPENDIX G – EXISTING DRAINAGE REPORT

# STORM FLOW CALCULATIONS - New Furn Row Prop. @ 80% I (1) POND H Re-Design - Showing Flow Summary For Pipe Sizing

	Area	tc	Runoff	C*A	i	Q100	]	%I	%I*A
BASIN	(ac)	(min)	Coeff	(ac)	(in/hr)	(cfs)	. 1		
		Lot 1A Re	port (Furnitu	re Row) (2)					
A1	0.22	5.0	0.83	0.18				90	0.20
A2	0.42	5.3	0.90	0.38				87.06	0.37
B1	0.81	5.0	0.83	0.67				90	0.73
B2	1.00	6.3	0.94	0.94				97.1	0.97
C1	0.19	5.0	0.83	0.16				90	0.17
C2	1.10	5.5	0.92	1.01				92.64	1.02
Total to N. Outlet	3.74	6.3		3.34	7.5	25.1			
D1	0.81	5.0	0.83	0.67				90	0.73
D2	1.41	11.8	0.75	1.06				53.81	0.76
Total to S. Outlet	2.22	11.8		1.73	7.4	12.8			
E	0.43	5.0	0.50	0.22				•	0.00
Direct Runnoff to Pond	0.43	5.0 5.0	0.50	0.22	6.6	4.5		0	0.00
Direct Rullion to Polid	0.43	3.0		0.22	0.0	1.5			
	Pa	arkway Mast	er Drainage	Study (Cos	tin)				
Offsite F (3)	11.00	11.0	0.60	6.60	6.8	44.9		40	4.40
F1 (2)	2.89	12.3	0.89	2.57	- 5-7			85	2.46
F2 (2)	0.60	12.9	0.96	0.58				100	0.60
F3 (2)	3.31	12.4	0.89	2.95				85	2.81
F4 (2)	6.89	14.4	0.89	6.13				85	5.86
nto Pond F from South	24.69	14.4	0.00	18.83	6.0	113.0		6.0	3.80
Pond F Subtotal (4)	31.08	14.4		24.12	6.0	144.7			
Offsite H	33.70	16.0	0.60	20.22				40	13.48
H1	2,75	11.3	0.82	2.26				80	2.20
H2	2.11	13.1	0.82	1.73				80	1.69
H3	3.86	17.0	0,82	3.17				80	3.09
H4	4.32	12.5	0.82	3.54				80	3.46
H5	3.21	16.1	0.82	2.63				80	2.57
H6	1.56	15.4	0.82	1.28				80	1.25
H7	1.47	15.4	0.82	1.21				80	1.18
To Pond H From PMD	52.98	17.0		36.04	5.5	198.2			
H8 (5)	22.04	18.1	0.85	18.62	5.3	98.7		80	17.63
l6 (6)	6.80	10.0	0.82	5.58	7.0	39.1		80	5.44
FR Parcels to Pond H	28.84	18.1		24.20	5.4	130.7			
(7)	81.82	18.1		60.24	5.4	325.3			
(1)	07.02	10.1		00.24	5.4	323.3			
(8)	112.90	18.1		84.36	5.4	455.5			
СДОТ						- 1			
West	10,02	11.8	0.94	9.42	6.7	62.6	I	95	9.52
East	1.23	5.0	0.94	1.16	8.8	10.2			
(9)	11.25	11.8	0,04	10.58	6.7	70.9		95	1.17
(8)	11.20	11.0		10.50	0.7	70.9	- 1		
1									
(10)	124.15	18.1	0.76	94.94	5.4	512.7		0.67	83.73

NOTES:

- (1) Future Furniture Row Developed at 80% I, per UDFCD
- (2) Per Lot 1A Report (Furniture Row)
- (3) Per Costin Acres Green Tributary Area
- (4) Total Routed from Pond F inflows (pipe to Pond H)
- (5) Basin H8 = Furn. Row. % 80% I, 50% C Soils, 50% B Soils
- (6) Basin I6 = Furn. Row. 80%I, 50% B & 50% C/D Soils
- (7) Total Routed to Pond H from South & East
- (8) Total Routed to Pond H w/o CDOT Flows
- (9) Total Routed CDOT Flows to Pond H
- (10) Total Routed Flow into Pond H

RATIONAL METHOD PIPING SYSTEM FLOW INPUTS

# APPENDIX H - PROPOSED WILLOW CREEK MINIMAL IMPACT DRAINAGE PLAN

