

# WARE MALCOMB

ARCHITECTURE	CIVIL ENGINEERING
PLANNING	BRANDING
INTERIORS	BUILDING MEASUREMENT

December 9, 2022

Town of Castle Rock  
100 N. Wilcox Street  
Castle Rock, CO 80104  
Attn: Kevin Buffington

Re: Drainage Conformance Letter  
Meadows Filing No. 19, Lot 2 North Parcel D2A, Senior Housing – SDP22-0032

Dear Mr. Buffington:

This letter has been prepared in lieu of a formal drainage report as the Meadows Filing No. 19, Lot 2 North Parcel D2A, Senior Housing (site) is part of the Master Drainage study Phase III Drainage Report for The Meadows Filing No. 19 Lot 2 North (CD21-0042), prepared by Terracina Design, LLC, dated February 2022. The site project is located north of Timber Mill Pkwy and south of East Plum Creek. The site is in a portion of Section 28, Township 7 South, Range 67 West of the 6<sup>th</sup> Principal Meridian, Castle Rock, Colorado. The object of this letter is to demonstrate that the proposed development within Lot 2 North parcel D2A complies with Master Drainage study CD21-0042. We acknowledge that the Town of Castle Rock's review of this letter is only for general conformance with submittal requirements, current design criteria, and standard engineering principles and practices.

### Description of Property

The proposed development includes construction of a new 200-unit affordable senior housing multifamily with associated parking lots and landscaping on an undeveloped 5.5 +/- acre site. The proposed site plan will result in a weighted imperviousness of 68%.

The site has been classified by the Natural Resources Conservation Service (NRCS) as 37.6% Bresser sandy loam (hydrologic group B), 29.2% Newlin gravelly sandy loam (hydrologic group B), 7.6% Sampson loam (hydrologic group B), and 25.6% Sandy wet alluvial land (hydrologic group D). Vegetation is light, with most of the site consisting of sparse grass cover. The NRCS web soil survey has been included in the appendix of this letter.

According to the Flood Insurance Rate Map Number 08035C0167G, dated March 16, 2016, the project site is located within zone X which is of minimal flood hazard. The FIRM Map has been included in the appendix of this letter for reference.

### Master Study

According to the Master Drainage study CD21-0042, Pond A was designed for 33.4 acres which includes the 5.467 acres of the site. Pond A was designed as a Full-spectrum detention facility that includes an additional 0.5 times the 100-year detention volume as water quality capture volume. As Pond A will provide water quality and detention to the site, no on-site water quality/detention facility is required. The improvements are anticipating having no impacts on downstream conditions. The site is part of CD21-0042 Basins A6 and A7. These basins were analyzed for the design of Pond A to be 90% imperviousness and with a total runoff of 51.23 cfs and 45.76 cfs respectively.

### Stormwater Quality Design Process

The four steps process of section 14.1.1 of the Town of Castle Rock Storm Drainage Design and Technical Criteria Manual (SDDTC), was considered for the design of the site.

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Roof drains are disconnected and daylighting into the area around the building that includes different types of surfaces to allow infiltration before the runoff reaches the proposed storm network. In addition, as mentioned above, water capture volume and detention are being provided for the site within Pond A designed by Terracina Design, Phase III Drainage Report for The Meadows Filing No. 19 Lot 2 North (CD21-0042), dated February 2022. Also, during construction, various best management practices will be put in place to prevent sedimentation and any potential contamination within adjacent roadways, properties, and existing storm systems and natural channels.

## Maintenance

The owner, successors, and heirs are responsible for all on-site private drainage facilities. Inlets should be checked routinely and cleared of debris, as necessary.

## Hydrologic Criteria

In accordance with the Town of Castle Rock Storm Drainage Design and Technical Criteria Manual (SDDTC), the minor storm for the proposed development type is evaluated as the 5-year storm, and the major storm is evaluated as the 100-year storm. For this letter, the site was divided in several sub-basins which encompasses the site plus part of the proposed joint access on the east side of the site for a total of approximately 5.61 (+/-) acres with a proposed weighted imperviousness of 70%.

The design storms were found using the SDDTC Table 6-1 and have been evaluated with 1-hour point rainfall depths of 1.43 inches for the 5-year storm and 2.60 inches for the 100-year storm. These 1-hour point rainfall depths were used to determine rainfall intensity for hydrologic calculations.

The peak discharge for the storm sewer analysis was calculated using the following Rational Method formula:

$$Q = C i A$$

Where:

Q = peak discharge (cfs)

C = runoff coefficient from UDFCD manual

i = rainfall intensity (inches/hour)

A = drainage area (acres)

Runoff coefficients, or "C" values, have been calculated for the site in accordance with Mile Hight Flood District, UDFCD manual. Refer to Appendix A for the weighted "C" values used in the calculations. Using the Rational Method, the total peak rate of runoff was found to be 30.3 cfs for the major storm. As mentioned above, the master drainage study accounted for basin A6 and A7 to create 51.23 cfs and 45.76 cfs runoff, respectively. The master study also designed the storm sewer to be able to carry these mentioned flows. The proposed site is creating 30.3 cfs which is considerably less than what the master study anticipated. Therefore, the site is complying with the master drainage study, and the existing storm sewer can receive the runoff from the site to safely be conveyed to Pond A.

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## Summary

The calculations included in this letter and the following appendices analyze the storm runoff from the proposed improvements in Meadows Filing No. 19, Lot 2 North Parcel D2A, Senior Housing to demonstrate that the imperviousness and runoff for the developed parcel complies with the Master Drainage study CD21-0042.

Basin ID	Area (acres)	Imperviousness (%)	Q <sub>5</sub> (cfs)	Q <sub>100</sub> (cfs)
A06	9.73	90	25.54	51.23
A07	7.59	90	22.81	45.76
Site	5.61	70	12.9	30.3

Should you have any questions or comments, please feel free to contact me at (303) 561-3333.

Sincerely,

Ware Malcomb,



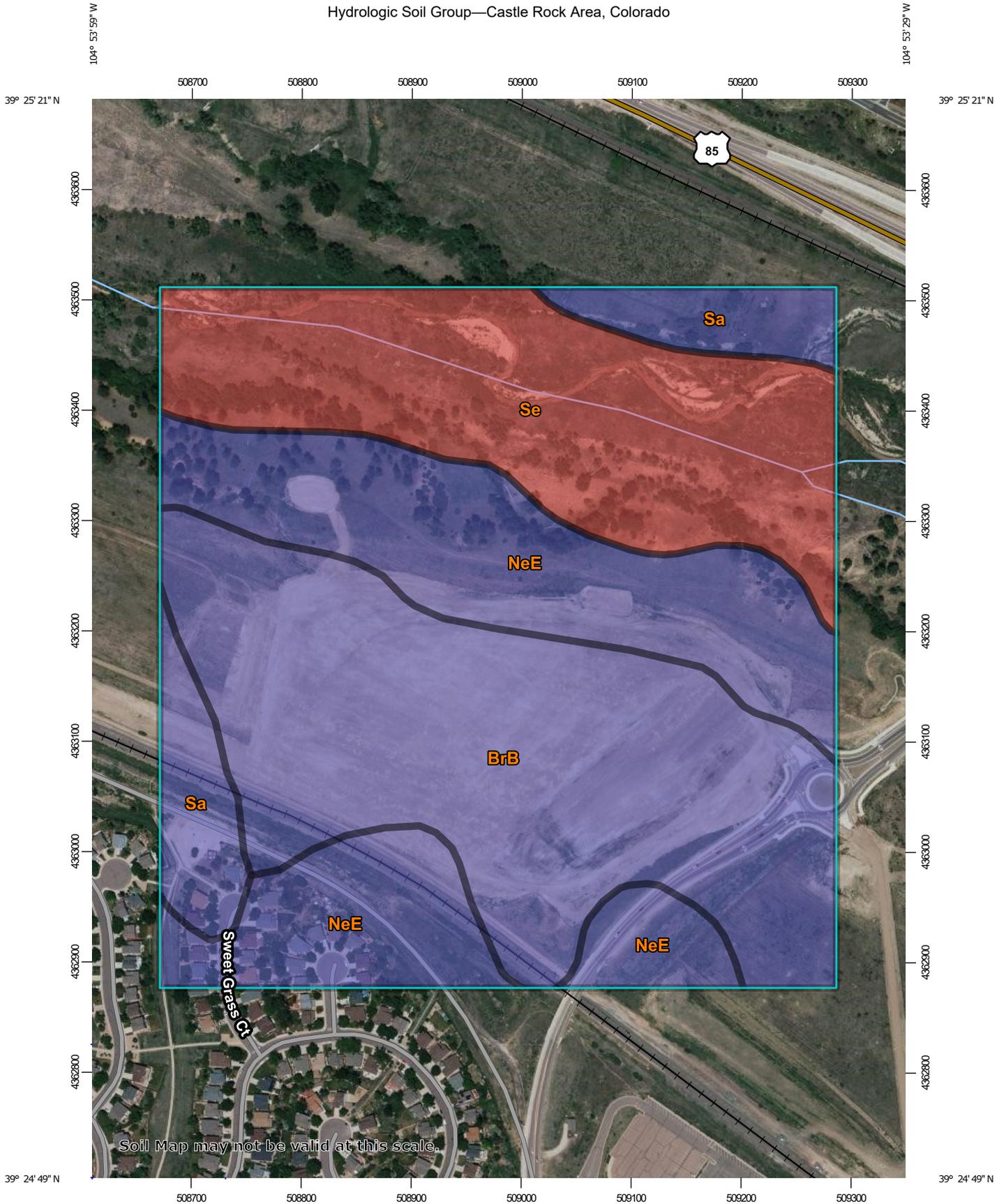
Ted Swan, PE  
Director of Civil Engineering

CC: Ileana Contreras [icontreras@waremalcomb.com](mailto:icontreras@waremalcomb.com) 303.689.1518

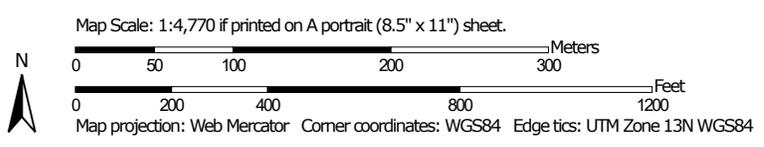
# **APPENDIX A:**

SOIL CLASSIFICATION  
FEMA MAP

Hydrologic Soil Group—Castle Rock Area, Colorado



Soil Map may not be valid at this scale.



## MAP LEGEND

### Area of Interest (AOI)

 Area of Interest (AOI)

### Soils

#### Soil Rating Polygons

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

#### Soil Rating Lines

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

#### Soil Rating Points

 A  
 A/D  
 B  
 B/D

 C  
 C/D  
 D  
 Not rated or not available

### Water Features

 Streams and Canals

### Transportation

 Rails  
 Interstate Highways  
 US Routes  
 Major Roads  
 Local Roads

### Background

 Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

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

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

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

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

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

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

Soil Survey Area: Castle Rock Area, Colorado  
 Survey Area Data: Version 14, Aug 31, 2021

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

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
BrB	Bresser sandy loam, cool, 1 to 3 percent slopes	B	36.4	37.6%
NeE	Newlin gravelly sandy loam, 8 to 30 percent slopes	B	28.3	29.2%
Sa	Sampson loam	B	7.4	7.6%
Se	Sandy wet alluvial land	D	24.8	25.6%
<b>Totals for Area of Interest</b>			<b>96.9</b>	<b>100.0%</b>

### 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.

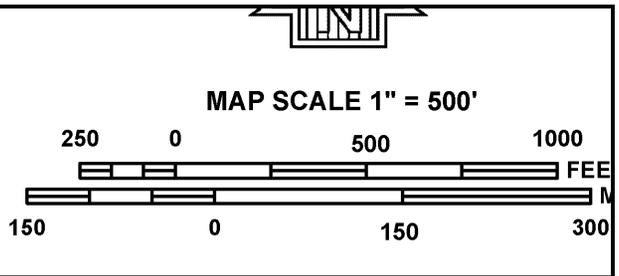
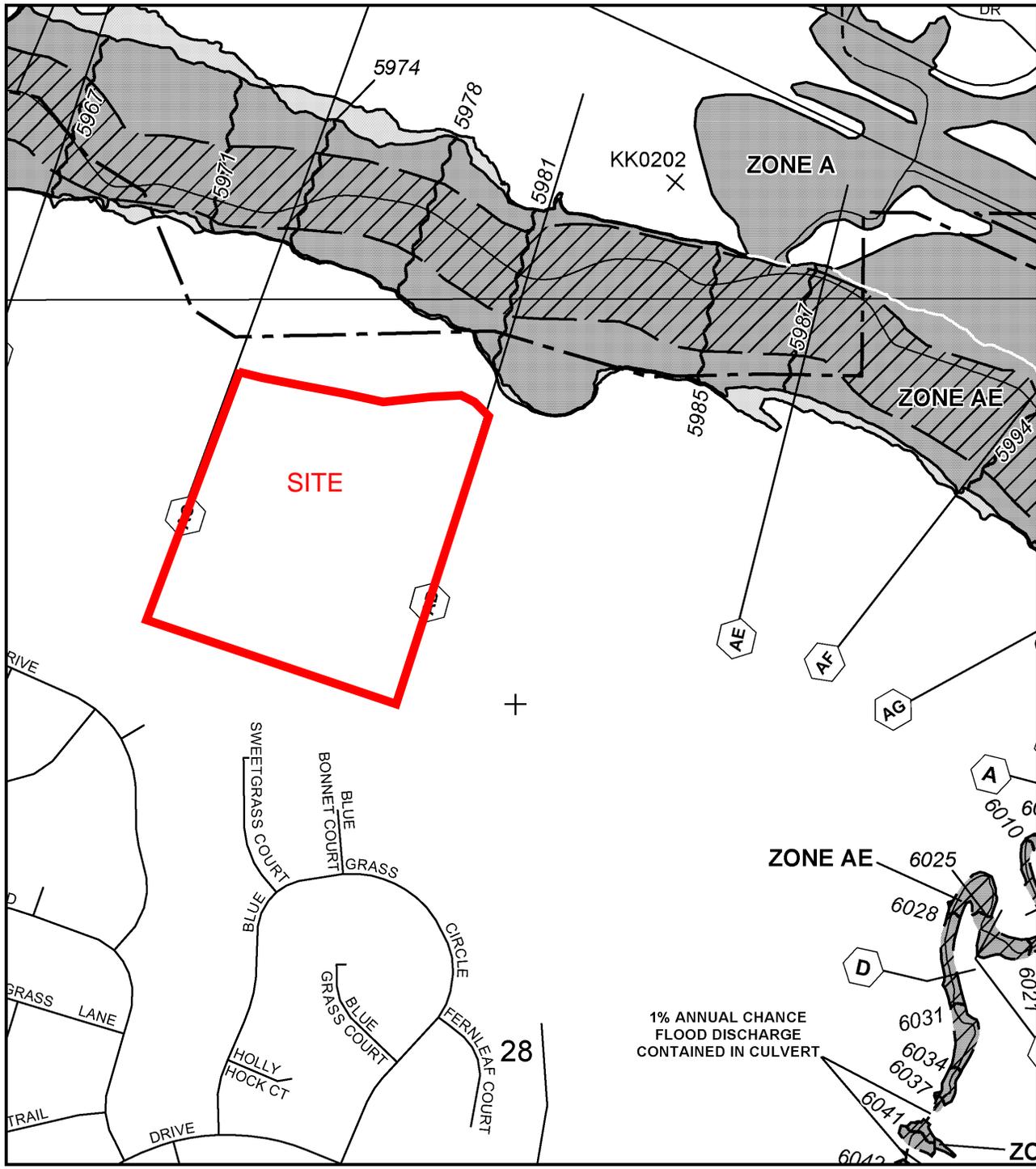
If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

## Rating Options

*Aggregation Method: Dominant Condition*

*Component Percent Cutoff: None Specified*

*Tie-break Rule: Higher*



PANEL 0167G

## FIRM

### FLOOD INSURANCE RATE MAP DOUGLAS COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 167 OF 495  
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
CASTLE ROCK, TOWN OF	080050	0167	G
DOUGLAS COUNTY	080049	0167	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**  
08035C0167G  
**MAP REVISED**  
MARCH 16, 2016

Federal Emergency Management Agency

This is an official FIRMette showing a portion of the above-referenced flood map created from the MSC FIRMette Web tool. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For additional information about how to make sure the map is current, please see the Flood Hazard Mapping Updates Overview Fact Sheet available on the FEMA Flood Map Service Center home page at <https://msc.fema.gov>.

# **APPENDIX B:**

HYDROLOGY CALCULATIONS  
HYDRAULIC CALCULATIONS

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PROJECT: The Meadows Lot 2N D2A

JOB NO.: DCS22-4026

CALC. BY: ICA

DATE: 8/30/2022

= FORMULA CELLS  
 = USER INPUT CELLS

Project Location	
User Input	▼

## IDF Rainfall Data

T <sub>d</sub>	P <sub>1</sub> : 1-hour Rainfall Depths (inches)	
	Minor Storm	Major Storm
	5-Year	100-Year
Minutes	<b>1.43</b>	<b>2.60</b>
5	4.85	8.82
10	3.87	7.03
20	2.81	5.11
30	2.24	4.08
40	1.88	3.42
50	1.63	2.97
60	1.45	2.63
120	0.89	1.62

Equation 5-1  $I = (28.5 * P_1) / (10 + T_d)^{0.786}$   
 I = rainfall intensity (inches per hour)  
 P<sub>1</sub> = 1-hour point rainfall depth (inches)  
 T<sub>d</sub> = storm duration (minutes)

Reference:

- 1) Urban Drainage and Flood Control District - Urban Storm Drainage Criteria Manual Volume 1, 2017
- 2) NOAA Atlas 14, Volume 8, Version 2  
[http://hdsc.nws.noaa.gov/hdsc/pfds/pfds\\_map\\_cont.html?bkmrk=co](http://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html?bkmrk=co)



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Calculated By: ICA

Date: 10/13/2022

**STANDARD FORM SF-2**  
**TIME OF CONCENTRATION SUMMARY**

Project: The Meadows Lot 2N D2A  
Job No.: DCS22-4026  
Checked By: DFA

SUB-BASIN DATA				INITIAL/OVERLAND TIME (t <sub>i</sub> )			TRAVEL TIME (t <sub>t</sub> )					t <sub>c</sub> CHECK (URBANIZED BASINS)			FINAL t <sub>c</sub>	REMARKS
Basin	i	C <sub>5</sub>	AREA Ac	LENGTH Ft	SLOPE %	t <sub>i</sub> Min	LENGTH Ft	Cv	SLOPE %	VEL. FPS	t <sub>t</sub> Min	COMP. t <sub>c</sub>	L <sub>t</sub> Ft	S <sub>t</sub> %	tc (Equation 6-5) Min	Min
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)		(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
A0	0.60	0.49	0.84	91	3.8	6.73	174	20	1.1	2.09	1.38	8.1	174	1.09	17.4	8.12
A1	0.78	0.65	0.32	103	6.8	4.35	72	20	2.5	3.18	0.38	4.7	72	2.52	13.2	5.00
A2	0.83	0.71	0.28	94	2.0	5.47	86	20	1.1	2.1	0.7	6.2	86	1.12	12.5	6.15
A3	0.86	0.73	0.84	73	5.4	3.23	542	20	2.1	2.9	3.2	6.4	542	2.05	14.3	6.39
OS1	1.00	0.86	0.14	43	5.9	1.58	304	20	3.8	3.9	1.3	2.9	304	3.75	10.1	5.00
B1	0.47	0.38	0.11	56	2.0	7.70	68	15	2.0	2.1	0.5	8.2	68	2.01	18.5	8.24
B2	0.53	0.43	0.44	95	2.0	9.39	41	15	2.9	2.6	0.3	9.7	41	2.93	17.3	9.65
B3	0.46	0.37	0.09	40	2.0	6.69	14	15	3.1	2.6	0.1	6.8	14	3.06	18.4	6.78
B4	0.89	0.76	0.83	72	3.2	3.57	375	20	2.0	2.8	2.2	5.8	375	2.03	12.9	5.76
B5	0.42	0.34	0.46	32	2.0	6.22	33	15	2.0	2.1	0.3	6.5	33	2.00	19.1	6.48
B6	0.66	0.55	1.27	160	3.3	8.51	90	20	1.4	2.4	0.6	9.1	90	1.40	15.5	9.15

Equation 6-3

$$t_i = ((0.395(1.1 - C_5) \sqrt{L}) / (S_o^{0.33}))$$

Equation 6-5

$$t_c = (26 - 17i) + (L_t / (60(14i + 9) \sqrt{S_o}))$$

= FORMULA CELLS  
 = USER INPUT CELLS

Heavy Meadow	2.5
Tillage/Field	5
Short Pasture and Lawns	7
Nearly Bare Ground	10
Grassed Waterway	15
Paved Areas and Shallow Paved Swales	20

Calculated By: ICA  
 Date: 10/13/2022  
 Checked By: DFA  
 5-Year  
 1-hour rainfall= 1.43

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

Project: The Meadows Lot 2N D2A  
 Job No.: DCS22-4026  
 Design Storm: 5-Year

= FORMULA CELLS  
 = USER INPUT CELLS

BASIN	DIRECT RUNOFF								TOTAL RUNOFF				STREET		PIPE			LENGTH (FT)	VELOCITY (FPS)	t <sub>r</sub> (MIN)	REMARKS
	DESIGN POINT	AREA DESIGN	AREA (AC)	RUNOFF COEFF	t <sub>c</sub> (MIN)	C * A (AC)	I (IN/HR)	Q (CFS)	t <sub>c</sub> (MIN)	S (C * A) (CA)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW	DESIGN FLOW (CFS)	SLOPE (%)	PIPE DIAM. (IN.)				
	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
A0	0		0.84	0.49	8.1	0.42	4.18	1.7													
A1	1		0.32	0.65	5.0	0.21	4.85	1.0													
	2								8.1	0.6	4.18	2.6									
A2	3		0.28	0.71	6.2	0.20	4.58	0.9													
	4								8.1	0.8	4.18	3.4									
OS1	5		0.14	0.86	5.0	0.12	4.85	0.6													
A3	6		0.84	0.73	6.4	0.62	4.53	2.8	6.4	0.7	4.53	3.3									
	7								8.1	1.6	4.18	6.5									
	8								8.1	1.6	4.18	6.5									
B1	9		0.11	0.38	8.2	0.04	4.16	0.2													
B2	10		0.44	0.43	9.7	0.19	3.92	0.7													
B3	11		0.09	0.37	6.8	0.03	4.44	0.1	9.7	0.2	3.92	0.9									
	12								9.7	0.3	3.92	1.0									
B4	13		0.83	0.76	5.8	0.63	4.66	2.9													
	14								9.7	0.9	3.92	3.5									
B5	15		0.46	0.34	6.5	0.16	4.50	0.7													
	16								9.7	1.0	3.92	4.1									
B6	17		1.27	0.55	9.1	0.69	4.00	2.8	9.7	1.7	3.92	6.8									
	18								9.7	3.3	3.92	12.9									

Calculated By: ICA  
 Date: 10/13/2022  
 Checked By: DFA  
 100-Year  
 1-hour rainfall: 2.60

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

Project: The Meadows Lot 2N D2A  
 Job No.: DCS22-4026  
 Design Storm: 100-Year

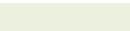
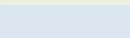
= FORMULA CELLS  
 = USER INPUT CELLS

BASIN	DIRECT RUNOFF								TOTAL RUNOFF				STREET		PIPE			LENGTH (FT)	VELOCITY (FPS)	t <sub>r</sub> (MIN)	REMARKS
	DESIGN POINT	AREA DESIGN	AREA (AC)	RUNOFF COEFF	t <sub>c</sub> (MIN)	C * A (AC)	I (IN/HR)	Q (CFS)	t <sub>c</sub> (MIN)	S (C * A) (CA)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW	DESIGN FLOW (CFS)	SLOPE (%)	PIPE DIAM. (IN.)				
	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
A0	0		0.84	0.71	8.1	0.60	7.60	<b>4.5</b>													
A1	1		0.32	0.79	5.0	0.25	8.82	<b>2.2</b>													
	2								8.1	0.8	7.60	<b>6.4</b>									
A2	3		0.28	0.82	6.2	0.23	8.32	<b>1.9</b>													
	4								8.1	1.1	7.60	<b>8.2</b>									
OS1	5		0.14	0.90	5.0	0.12	8.82	<b>1.1</b>													
A3	6		0.84	0.83	6.4	0.70	8.23	<b>5.8</b>	6.4	0.8	8.23	<b>6.8</b>									
	7								8.1	1.9	7.60	<b>14.4</b>									
	8								8.1	1.9	7.60	<b>14.4</b>									
B1	9		0.11	0.65	8.2	0.07	7.56	<b>0.5</b>													
B2	10		0.44	0.67	9.7	0.30	7.13	<b>2.1</b>													
B3	11		0.09	0.64	6.8	0.06	8.07	<b>0.4</b>	9.7	0.4	7.13	<b>2.5</b>									
	12								9.7	0.4	7.13	<b>3.0</b>									
B4	13		0.83	0.84	5.8	0.70	8.48	<b>5.9</b>													
	14								9.7	1.1	7.13	<b>8.0</b>									
B5	15		0.46	0.62	6.5	0.29	8.19	<b>2.4</b>													
	16								9.7	1.4	7.13	<b>10.1</b>									
B6	17		1.27	0.74	9.1	0.93	7.28	<b>6.8</b>	9.7	2.3	7.13	<b>16.7</b>									
	18								9.7	4.2	7.13	<b>30.3</b>									

PROJECT: The Meadows Lot 2N D2A  
 JOB NO.: DCS22-4026  
 CALC. BY: ICA  
 DATE: 10/13/2022

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RUNOFF SUMMARY						
BASIN LABEL	DESIGN POINT	AREA	LOCAL (CFS)		ACCUMULATIVE (CFS)	
			Q5	Q100	Q5	Q100
A0	0	0.84	1.74	4.53		
A1	1	0.32	1.00	2.21		
	2				2.6	6.4
A2	3	0.28	0.91	1.92		
	4				3.4	8.2
OS1	5	0.14	0.57	1.07		
A3	6	0.84	2.79	5.76	3.3	6.8
	7				6.5	14.4
	8				6.5	14.4
B1	9	0.11	0.17	0.52		
B2	10	0.44	0.74	2.13		
B3	11	0.09	0.14	0.44	0.9	2.5
	12				1.0	3.0
B4	13	0.83	2.93	5.94		
	14				3.5	8.0
B5	15	0.46	0.70	2.35		
	16				4.1	10.1
B6	17	1.27	2.78	6.81	6.8	16.7
	18				12.9	30.3

 = FORMULA CELLS  
 = USER INPUT CELLS

# INLET MANAGEMENT

Worksheet Protected

<b>INLET NAME</b>	<a href="#">SD-INLET-A6.1 - DP1</a>	<a href="#">SD-INLET-A5.1 - DP3</a>	<a href="#">SD-INLET-A3.1 - DP6</a>
Site Type (Urban or Rural)	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET
Hydraulic Condition	In Sump	In Sump	In Sump
Inlet Type	Denver No. 16 Combination	Denver No. 16 Combination	Denver No. 16 Combination

## USER-DEFINED INPUT

### User-Defined Design Flows

Minor $Q_{Known}$ (cfs)	1.0	0.9	3.3
Major $Q_{Known}$ (cfs)	2.2	1.9	6.8

### Bypass (Carry-Over) Flow from Upstream

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

### Watershed Characteristics

Subcatchment Area (acres)			
Percent Impervious			
NRCS Soil Type			

### Watershed Profile

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

### Minor Storm Rainfall Input

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

### Major Storm Rainfall Input

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

## CALCULATED OUTPUT

<b>Minor Total Design Peak Flow, <math>Q</math> (cfs)</b>	<b>1.0</b>	<b>0.9</b>	<b>3.3</b>
<b>Major Total Design Peak Flow, <math>Q</math> (cfs)</b>	<b>2.2</b>	<b>1.9</b>	<b>6.8</b>
Minor Flow Bypassed Downstream, $Q_b$ (cfs)	N/A	N/A	N/A
Major Flow Bypassed Downstream, $Q_b$ (cfs)	N/A	N/A	N/A

# INLET MANAGEMENT

Worksheet Protected

<b>INLET NAME</b>	<a href="#">SD-INLET-B5.1 - DP13</a>	<a href="#">SD-INLET-B2.1 - DP17</a>	<a href="#">SD-INLET-A8 - DP0</a>
Site Type (Urban or Rural)	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET
Hydraulic Condition	In Sump	In Sump	In Sump
Inlet Type	Denver No. 16 Combination	Denver No. 16 Combination	Denver No. 16 Combination

## USER-DEFINED INPUT

### User-Defined Design Flows

Minor $Q_{Known}$ (cfs)	2.9	2.8	1.7
Major $Q_{Known}$ (cfs)	5.9	6.8	4.5

### Bypass (Carry-Over) Flow from Upstream

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

### Watershed Characteristics

Subcatchment Area (acres)			
Percent Impervious			
NRCS Soil Type			

### Watershed Profile

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

### Minor Storm Rainfall Input

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

### Major Storm Rainfall Input

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

## CALCULATED OUTPUT

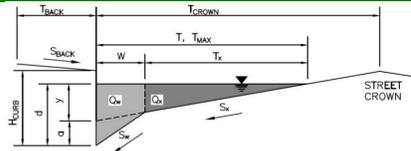
<b>Minor Total Design Peak Flow, <math>Q</math> (cfs)</b>	<b>2.9</b>	<b>2.8</b>	<b>1.7</b>
<b>Major Total Design Peak Flow, <math>Q</math> (cfs)</b>	<b>5.9</b>	<b>6.8</b>	<b>4.5</b>
Minor Flow Bypassed Downstream, $Q_b$ (cfs)	N/A	N/A	N/A
Major Flow Bypassed Downstream, $Q_b$ (cfs)	N/A	N/A	N/A

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

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

**Project:** Castle View Apartments

**Inlet ID:** SD-INLET-A8 - DPO



**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb  
 Side Slope Behind Curb (leave blank for no conveyance credit behind curb)  
 Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

$T_{BACK} = 15.0$  ft  
 $S_{BACK} = 0.020$  ft/ft  
 $n_{BACK} = 0.013$

Height of Curb at Gutter Flow Line  
 Distance from Curb Face to Street Crown  
 Gutter Width  
 Street Transverse Slope  
 Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)  
 Street Longitudinal Slope - Enter 0 for sump condition  
 Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$H_{CURB} = 6.00$  inches  
 $T_{CROWN} = 62.0$  ft  
 $W = 2.00$  ft  
 $S_X = 0.043$  ft/ft  
 $S_W = 0.083$  ft/ft  
 $S_D = 0.000$  ft/ft  
 $n_{STREET} = 0.013$

Max. Allowable Spread for Minor & Major Storm  
 Max. Allowable Depth at Gutter Flowline for Minor & Major Storm  
 Check boxes are not applicable in SUMP conditions

	Minor Storm	Major Storm	
$T_{MAX} =$	62.0	62.0	ft
$d_{MAX} =$	6.0	12.0	inches
	<input type="checkbox"/>	<input type="checkbox"/>	

[MINOR STORM Allowable Capacity is based on Depth Criterion](#)  
[MAJOR STORM Allowable Capacity is based on Depth Criterion](#)

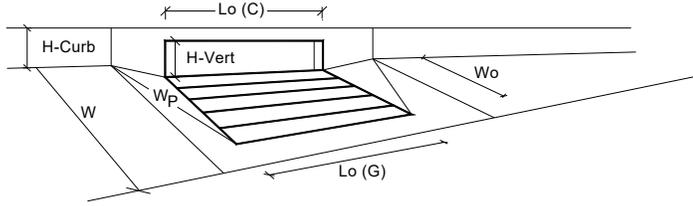
$Q_{allow} =$ 

Minor Storm	Major Storm
<b>SUMP</b>	<b>SUMP</b>

 cfs

# INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



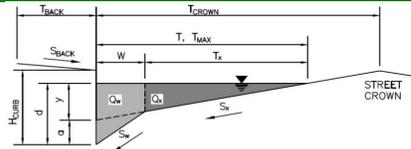
Design Information (Input)	MINOR	MAJOR	
Type of Inlet <span style="float: right;">Denver No. 16 Combination</span>	<b>Denver No. 16 Combination</b>		
Local Depression (additional to continuous gutter depression 'a' from above)	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)	1	1	
Water Depth at Flowline (outside of local depression)	6.0	12.0	inches
<b>Grate Information</b>	MINOR	MAJOR	<input type="checkbox"/> Override Depths
Length of a Unit Grate	L <sub>o</sub> (G) = 3.00	3.00	feet
Width of a Unit Grate	W <sub>o</sub> = 1.73	1.73	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A <sub>ratio</sub> = 0.31	0.31	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C <sub>f</sub> (G) = 0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C <sub>w</sub> (G) = 3.60	3.60	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C <sub>o</sub> (G) = 0.60	0.60	
<b>Curb Opening Information</b>	MINOR	MAJOR	
Length of a Unit Curb Opening	L <sub>o</sub> (C) = 3.00	3.00	feet
Height of Vertical Curb Opening in Inches	H <sub>vert</sub> = 6.50	6.50	inches
Height of Curb Orifice Throat in Inches	H <sub>throat</sub> = 5.25	5.25	inches
Angle of Throat (see USDCM Figure ST-5)	Theta = 0.00	0.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W <sub>p</sub> = 2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C <sub>f</sub> (C) = 0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C <sub>w</sub> (C) = 3.70	3.70	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C <sub>o</sub> (C) = 0.66	0.66	
<b>Grate Flow Analysis (Calculated)</b>	MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef = 1.00	1.00	
Clogging Factor for Multiple Units	Clog = 0.50	0.50	
<b>Grate Capacity as a Weir (based on Modified HEC22 Method)</b>	MINOR	MAJOR	
Interception without Clogging	Q <sub>wi</sub> = 6.0	17.6	cfs
Interception with Clogging	Q <sub>wa</sub> = 3.0	8.8	cfs
<b>Grate Capacity as an Orifice (based on Modified HEC22 Method)</b>	MINOR	MAJOR	
Interception without Clogging	Q <sub>oi</sub> = 5.6	7.8	cfs
Interception with Clogging	Q <sub>oa</sub> = 2.8	3.9	cfs
<b>Grate Capacity as Mixed Flow</b>	MINOR	MAJOR	
Interception without Clogging	Q <sub>mi</sub> = 5.2	10.6	cfs
Interception with Clogging	Q <sub>ma</sub> = 2.6	5.3	cfs
Resulting Grate Capacity (assumes clogged condition)	<b>Q<sub>Grate</sub> = 2.6</b>	<b>3.9</b>	<b>cfs</b>
<b>Curb Opening Flow Analysis (Calculated)</b>	MINOR	MAJOR	
Clogging Coefficient for Multiple Units	Coef = 1.00	1.00	
Clogging Factor for Multiple Units	Clog = 0.17	0.17	
<b>Curb Opening as a Weir (based on Modified HEC22 Method)</b>	MINOR	MAJOR	
Interception without Clogging	Q <sub>wi</sub> = 2.0	8.5	cfs
Interception with Clogging	Q <sub>wa</sub> = 1.7	7.0	cfs
<b>Curb Opening as an Orifice (based on Modified HEC22 Method)</b>	MINOR	MAJOR	
Interception without Clogging	Q <sub>oi</sub> = 5.7	7.5	cfs
Interception with Clogging	Q <sub>oa</sub> = 4.7	6.3	cfs
<b>Curb Opening Capacity as Mixed Flow</b>	MINOR	MAJOR	
Interception without Clogging	Q <sub>mi</sub> = 2.9	6.9	cfs
Interception with Clogging	Q <sub>ma</sub> = 2.4	5.7	cfs
Resulting Curb Opening Capacity (assumes clogged condition)	<b>Q<sub>Curb</sub> = 1.7</b>	<b>5.7</b>	<b>cfs</b>
<b>Resultant Street Conditions</b>	MINOR	MAJOR	
Total Inlet Length	L = 3.00	3.00	feet
Resultant Street Flow Spread (based on street geometry from above)	T = 9.8	21.4	ft
Resultant Flow Depth at Street Crown	d <sub>CROWN</sub> = 0.0	0.0	inches
<b>Low Head Performance Reduction (Calculated)</b>	MINOR	MAJOR	
Depth for Grate Midwidth	d <sub>Grate</sub> = 0.523	1.023	ft
Depth for Curb Opening Weir Equation	d <sub>Curb</sub> = 0.33	0.83	ft
Combination Inlet Performance Reduction Factor for Long Inlets	RF <sub>Combination</sub> = 0.94	1.00	
Curb Opening Performance Reduction Factor for Long Inlets	RF <sub>Curb</sub> = 1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF <sub>Grate</sub> = 0.94	1.00	
Total Inlet Interception Capacity (assumes clogged condition)	<b>Q<sub>s</sub> = 3.9</b>	<b>8.7</b>	<b>cfs</b>
<b>Inlet Capacity IS GOOD for Minor and Major Storms(&gt;Q PEAK)</b>	Q <sub>PEAK REQUIRED</sub> = 1.7	4.5	cfs

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

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

**Project:** Castle View Apartments

**Inlet ID:** SD-INLET-A6.1 - DP1



**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb  
 Side Slope Behind Curb (leave blank for no conveyance credit behind curb)  
 Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

$T_{BACK} = 15.0$  ft  
 $S_{BACK} = 0.020$  ft/ft  
 $n_{BACK} = 0.013$

Height of Curb at Gutter Flow Line  
 Distance from Curb Face to Street Crown  
 Gutter Width  
 Street Transverse Slope  
 Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)  
 Street Longitudinal Slope - Enter 0 for sump condition  
 Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$H_{CURB} = 6.00$  inches  
 $T_{CROWN} = 62.0$  ft  
 $W = 2.00$  ft  
 $S_X = 0.043$  ft/ft  
 $S_W = 0.083$  ft/ft  
 $S_D = 0.000$  ft/ft  
 $n_{STREET} = 0.013$

Max. Allowable Spread for Minor & Major Storm  
 Max. Allowable Depth at Gutter Flowline for Minor & Major Storm  
 Check boxes are not applicable in SUMP conditions

	Minor Storm	Major Storm	
$T_{MAX} =$	62.0	62.0	ft
$d_{MAX} =$	6.0	12.0	inches
	<input type="checkbox"/>	<input type="checkbox"/>	

[MINOR STORM Allowable Capacity is based on Depth Criterion](#)  
[MAJOR STORM Allowable Capacity is based on Depth Criterion](#)

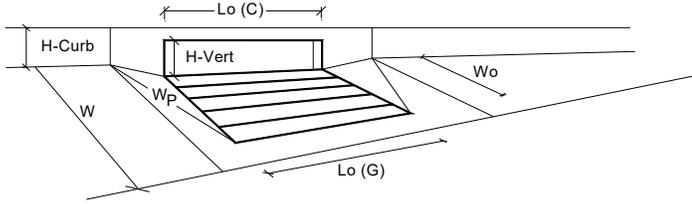
$Q_{allow} =$ 

Minor Storm	Major Storm
<b>SUMP</b>	<b>SUMP</b>

 cfs

# INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



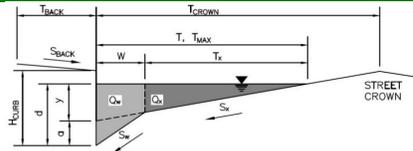
			MINOR	MAJOR	
<b>Design Information (Input)</b> <span style="float: right;">Denver No. 16 Combination</span>					
Type of Inlet	Denver No. 16 Combination				
Local Depression (additional to continuous gutter depression 'a' from above)					
Number of Unit Inlets (Grate or Curb Opening)					
Water Depth at Flowline (outside of local depression)					
<b>Grate Information</b>					
Length of a Unit Grate	$L_o (G) =$	3.00	3.00	feet	<input type="checkbox"/> Override Depths
Width of a Unit Grate	$W_o =$	1.73	1.73	feet	
Area Opening Ratio for a Grate (typical values 0.15-0.90)	$A_{ratio} =$	0.31	0.31		
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	$C_f (G) =$	0.50	0.50		
Grate Weir Coefficient (typical value 2.15 - 3.60)	$C_w (G) =$	3.60	3.60		
Grate Orifice Coefficient (typical value 0.60 - 0.80)	$C_o (G) =$	0.60	0.60		
<b>Curb Opening Information</b>					
Length of a Unit Curb Opening	$L_o (C) =$	3.00	3.00	feet	
Height of Vertical Curb Opening in Inches	$H_{vert} =$	6.50	6.50	inches	
Height of Curb Orifice Throat in Inches	$H_{throat} =$	5.25	5.25	inches	
Angle of Throat (see USDCM Figure ST-5)	$\theta =$	0.00	0.00	degrees	
Side Width for Depression Pan (typically the gutter width of 2 feet)	$W_p =$	2.00	2.00	feet	
Clogging Factor for a Single Curb Opening (typical value 0.10)	$C_f (C) =$	0.10	0.10		
Curb Opening Weir Coefficient (typical value 2.3-3.7)	$C_w (C) =$	3.70	3.70		
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	$C_o (C) =$	0.66	0.66		
<b>Grate Flow Analysis (Calculated)</b>					
Clogging Coefficient for Multiple Units	Coef =	1.00	1.00		
Clogging Factor for Multiple Units	Clog =	0.50	0.50		
<b>Grate Capacity as a Weir (based on Modified HEC22 Method)</b>					
Interception without Clogging	$Q_{wi} =$	6.0	17.6	cfs	
Interception with Clogging	$Q_{wa} =$	3.0	8.8	cfs	
<b>Grate Capacity as an Orifice (based on Modified HEC22 Method)</b>					
Interception without Clogging	$Q_{oi} =$	5.6	7.8	cfs	
Interception with Clogging	$Q_{oa} =$	2.8	3.9	cfs	
<b>Grate Capacity as Mixed Flow</b>					
Interception without Clogging	$Q_{mi} =$	5.2	10.6	cfs	
Interception with Clogging	$Q_{ma} =$	2.6	5.3	cfs	
Resulting Grate Capacity (assumes clogged condition)	<b><math>Q_{Grate} =</math></b>	<b>2.6</b>	<b>3.9</b>	<b>cfs</b>	
<b>Curb Opening Flow Analysis (Calculated)</b>					
Clogging Coefficient for Multiple Units	Coef =	1.00	1.00		
Clogging Factor for Multiple Units	Clog =	0.17	0.17		
<b>Curb Opening as a Weir (based on Modified HEC22 Method)</b>					
Interception without Clogging	$Q_{wi} =$	2.0	8.5	cfs	
Interception with Clogging	$Q_{wa} =$	1.7	7.0	cfs	
<b>Curb Opening as an Orifice (based on Modified HEC22 Method)</b>					
Interception without Clogging	$Q_{oi} =$	5.7	7.5	cfs	
Interception with Clogging	$Q_{oa} =$	4.7	6.3	cfs	
<b>Curb Opening Capacity as Mixed Flow</b>					
Interception without Clogging	$Q_{mi} =$	2.9	6.9	cfs	
Interception with Clogging	$Q_{ma} =$	2.4	5.7	cfs	
Resulting Curb Opening Capacity (assumes clogged condition)	<b><math>Q_{Curb} =</math></b>	<b>1.7</b>	<b>5.7</b>	<b>cfs</b>	
<b>Resultant Street Conditions</b>					
Total Inlet Length	$L =$	3.00	3.00	feet	
Resultant Street Flow Spread (based on street geometry from above)	$T =$	9.8	21.4	ft	
Resultant Flow Depth at Street Crown	$d_{CROWN} =$	0.0	0.0	inches	
<b>Low Head Performance Reduction (Calculated)</b>					
Depth for Grate Midwidth	$d_{Grate} =$	0.523	1.023	ft	
Depth for Curb Opening Weir Equation	$d_{Curb} =$	0.33	0.83	ft	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination} =$	0.94	1.00		
Curb Opening Performance Reduction Factor for Long Inlets	$RF_{Curb} =$	1.00	1.00		
Grated Inlet Performance Reduction Factor for Long Inlets	$RF_{Grate} =$	0.94	1.00		
Total Inlet Interception Capacity (assumes clogged condition)	<b><math>Q_s =</math></b>	<b>3.9</b>	<b>8.7</b>	<b>cfs</b>	
<b>Inlet Capacity IS GOOD for Minor and Major Storms(&gt;Q PEAK)</b>	$Q_{PEAK REQUIRED} =$	1.0	2.2	cfs	

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

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

**Project:** Castle View Apartments

**Inlet ID:** SD-INLET-A5.1 - DP3



**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb  
 Side Slope Behind Curb (leave blank for no conveyance credit behind curb)  
 Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

$T_{BACK} = 5.0$  ft  
 $S_{BACK} = 0.140$  ft/ft  
 $n_{BACK} = 0.013$

Height of Curb at Gutter Flow Line  
 Distance from Curb Face to Street Crown  
 Gutter Width  
 Street Transverse Slope  
 Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)  
 Street Longitudinal Slope - Enter 0 for sump condition  
 Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$H_{CURB} = 6.00$  inches  
 $T_{CROWN} = 44.0$  ft  
 $W = 2.00$  ft  
 $S_X = 0.020$  ft/ft  
 $S_W = 0.083$  ft/ft  
 $S_D = 0.000$  ft/ft  
 $n_{STREET} = 0.013$

Max. Allowable Spread for Minor & Major Storm  
 Max. Allowable Depth at Gutter Flowline for Minor & Major Storm  
 Check boxes are not applicable in SUMP conditions

	Minor Storm	Major Storm	
$T_{MAX} =$	44.0	44.0	ft
$d_{MAX} =$	6.0	12.0	inches
	<input type="checkbox"/>	<input type="checkbox"/>	

[MINOR STORM Allowable Capacity is based on Depth Criterion](#)  
[MAJOR STORM Allowable Capacity is based on Depth Criterion](#)

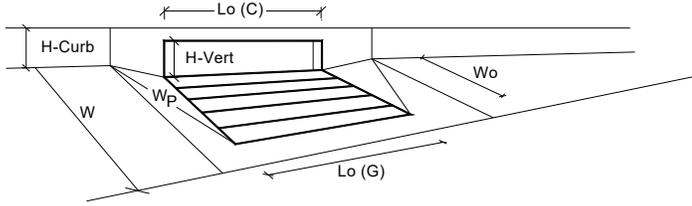
$Q_{allow} =$ 

Minor Storm	Major Storm
<b>SUMP</b>	<b>SUMP</b>

 cfs

# INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



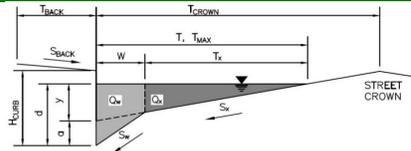
			MINOR	MAJOR	
<b>Design Information (Input)</b>	Denver No. 16 Combination				
Type of Inlet	Denver No. 16 Combination				
Local Depression (additional to continuous gutter depression 'a' from above)					
Number of Unit Inlets (Grate or Curb Opening)					
Water Depth at Flowline (outside of local depression)					
<b>Grate Information</b>					
Length of a Unit Grate					
Width of a Unit Grate					
Area Opening Ratio for a Grate (typical values 0.15-0.90)					
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)					
Grate Weir Coefficient (typical value 2.15 - 3.60)					
Grate Orifice Coefficient (typical value 0.60 - 0.80)					
<b>Curb Opening Information</b>					
Length of a Unit Curb Opening					
Height of Vertical Curb Opening in Inches					
Height of Curb Orifice Throat in Inches					
Angle of Throat (see USDCM Figure ST-5)					
Side Width for Depression Pan (typically the gutter width of 2 feet)					
Clogging Factor for a Single Curb Opening (typical value 0.10)					
Curb Opening Weir Coefficient (typical value 2.3-3.7)					
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)					
			MINOR	MAJOR	<input type="checkbox"/> Override Depths
Type =	Denver No. 16 Combination				
$a_{local}$ =	2.00	2.00			inches
No =	1	1			
Ponding Depth =	6.0	12.0			inches
$L_o$ (G) =	3.00	3.00			feet
$W_o$ =	1.73	1.73			feet
$A_{ratio}$ =	0.31	0.31			
$C_f$ (G) =	0.50	0.50			
$C_w$ (G) =	3.60	3.60			
$C_o$ (G) =	0.60	0.60			
			MINOR	MAJOR	
$L_o$ (C) =	3.00	3.00			feet
$H_{vert}$ =	6.50	6.50			inches
$H_{throat}$ =	5.25	5.25			inches
Theta =	0.00	0.00			degrees
$W_p$ =	2.00	2.00			feet
$C_f$ (C) =	0.10	0.10			
$C_w$ (C) =	3.70	3.70			
$C_o$ (C) =	0.66	0.66			
<b>Grate Flow Analysis (Calculated)</b>			MINOR	MAJOR	
Clogging Coefficient for Multiple Units					
Clog =	1.00	1.00			
Clogging Factor for Multiple Units					
Clog =	0.50	0.50			
<b>Grate Capacity as a Weir (based on Modified HEC22 Method)</b>			MINOR	MAJOR	
Interception without Clogging					
$Q_{wi}$ =	6.0	17.6			cfs
Interception with Clogging					
$Q_{wa}$ =	3.0	8.8			cfs
<b>Grate Capacity as an Orifice (based on Modified HEC22 Method)</b>			MINOR	MAJOR	
Interception without Clogging					
$Q_{oi}$ =	5.6	7.8			cfs
Interception with Clogging					
$Q_{oa}$ =	2.8	3.9			cfs
<b>Grate Capacity as Mixed Flow</b>			MINOR	MAJOR	
Interception without Clogging					
$Q_{mi}$ =	5.2	10.6			cfs
Interception with Clogging					
$Q_{ma}$ =	2.6	5.3			cfs
<b>Resulting Grate Capacity (assumes clogged condition)</b>					
$Q_{Grate}$ =	2.6	3.9			cfs
<b>Curb Opening Flow Analysis (Calculated)</b>			MINOR	MAJOR	
Clogging Coefficient for Multiple Units					
Coef =	1.00	1.00			
Clogging Factor for Multiple Units					
Clog =	0.17	0.17			
<b>Curb Opening as a Weir (based on Modified HEC22 Method)</b>			MINOR	MAJOR	
Interception without Clogging					
$Q_{wi}$ =	2.0	8.5			cfs
Interception with Clogging					
$Q_{wa}$ =	1.7	7.0			cfs
<b>Curb Opening as an Orifice (based on Modified HEC22 Method)</b>			MINOR	MAJOR	
Interception without Clogging					
$Q_{oi}$ =	5.7	7.5			cfs
Interception with Clogging					
$Q_{oa}$ =	4.7	6.3			cfs
<b>Curb Opening Capacity as Mixed Flow</b>			MINOR	MAJOR	
Interception without Clogging					
$Q_{mi}$ =	2.9	6.9			cfs
Interception with Clogging					
$Q_{ma}$ =	2.4	5.7			cfs
<b>Resulting Curb Opening Capacity (assumes clogged condition)</b>					
$Q_{Curb}$ =	1.7	5.7			cfs
<b>Resultant Street Conditions</b>			MINOR	MAJOR	
Total Inlet Length					
L =	3.00	3.00			feet
Resultant Street Flow Spread (based on street geometry from above)					
T =	18.7	43.7			ft
Resultant Flow Depth at Street Crown					
$d_{CROWN}$ =	0.0	0.0			inches
<b>Low Head Performance Reduction (Calculated)</b>			MINOR	MAJOR	
Depth for Grate Midwidth					
$d_{Grate}$ =	0.523	1.023			ft
Depth for Curb Opening Weir Equation					
$d_{Curb}$ =	0.33	0.83			ft
Combination Inlet Performance Reduction Factor for Long Inlets					
$RF_{Combination}$ =	0.94	1.00			
Curb Opening Performance Reduction Factor for Long Inlets					
$RF_{Curb}$ =	1.00	1.00			
Grated Inlet Performance Reduction Factor for Long Inlets					
$RF_{Grate}$ =	0.94	1.00			
Total Inlet Interception Capacity (assumes clogged condition)			MINOR	MAJOR	
$Q_s$ =	3.9	8.7			cfs
<b>Inlet Capacity IS GOOD for Minor and Major Storms(&gt;Q PEAK)</b>			MINOR	MAJOR	
$Q_{PEAK REQUIRED}$ =	0.9	1.9			cfs

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

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

**Project:** Castle View Apartments

**Inlet ID:** SD-INLET-A3.1 - DP6



**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb  
 Side Slope Behind Curb (leave blank for no conveyance credit behind curb)  
 Manning's Roughness Behind Curb (typically between 0.012 and 0.020)  
 Height of Curb at Gutter Flow Line  
 Distance from Curb Face to Street Crown  
 Gutter Width  
 Street Transverse Slope  
 Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)  
 Street Longitudinal Slope - Enter 0 for sump condition  
 Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$T_{BACK} = 5.0$  ft  
 $S_{BACK} = 0.020$  ft/ft  
 $n_{BACK} = 0.013$

$H_{CURB} = 6.00$  inches  
 $T_{CROWN} = 42.0$  ft  
 $W = 2.00$  ft  
 $S_X = 0.020$  ft/ft  
 $S_W = 0.083$  ft/ft  
 $S_D = 0.000$  ft/ft  
 $n_{STREET} = 0.013$

Max. Allowable Spread for Minor & Major Storm  
 Max. Allowable Depth at Gutter Flowline for Minor & Major Storm  
 Check boxes are not applicable in SUMP conditions

	Minor Storm	Major Storm	
$T_{MAX} =$	42.0	42.0	ft
$d_{MAX} =$	6.0	12.0	inches
	<input type="checkbox"/>	<input type="checkbox"/>	

[MINOR STORM Allowable Capacity is based on Depth Criterion](#)  
[MAJOR STORM Allowable Capacity is based on Depth Criterion](#)

$Q_{allow} =$ 

Minor Storm	Major Storm
<b>SUMP</b>	<b>SUMP</b>

 cfs

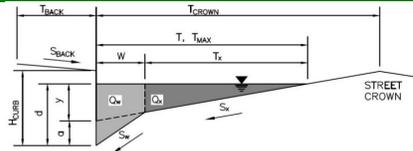


## ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

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

**Project:** Castle View Apartments

**Inlet ID:** SD-INLET-B5.1 - DP13



**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb  
 Side Slope Behind Curb (leave blank for no conveyance credit behind curb)  
 Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

$T_{BACK} = 5.0$  ft  
 $S_{BACK} = 0.020$  ft/ft  
 $n_{BACK} = 0.013$

Height of Curb at Gutter Flow Line  
 Distance from Curb Face to Street Crown  
 Gutter Width  
 Street Transverse Slope  
 Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)  
 Street Longitudinal Slope - Enter 0 for sump condition  
 Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$H_{CURB} = 6.00$  inches  
 $T_{CROWN} = 62.0$  ft  
 $W = 2.00$  ft  
 $S_X = 0.030$  ft/ft  
 $S_W = 0.083$  ft/ft  
 $S_D = 0.000$  ft/ft  
 $n_{STREET} = 0.013$

Max. Allowable Spread for Minor & Major Storm  
 Max. Allowable Depth at Gutter Flowline for Minor & Major Storm  
 Check boxes are not applicable in SUMP conditions

	Minor Storm	Major Storm	
$T_{MAX} =$	62.0	62.0	ft
$d_{MAX} =$	6.0	12.0	inches
	<input type="checkbox"/>	<input type="checkbox"/>	

[MINOR STORM Allowable Capacity is based on Depth Criterion](#)  
[MAJOR STORM Allowable Capacity is based on Depth Criterion](#)

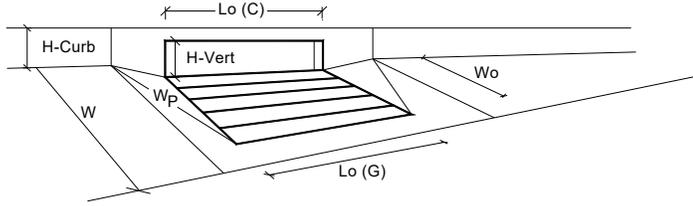
$Q_{allow} =$ 

Minor Storm	Major Storm
<b>SUMP</b>	<b>SUMP</b>

 cfs

# INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



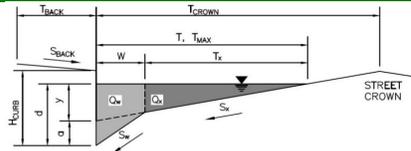
<b>Design Information (Input)</b>	Denver No. 16 Combination		
Type of Inlet	MINOR	MAJOR	
Local Depression (additional to continuous gutter depression 'a' from above)	Denver No. 16 Combination		
Number of Unit Inlets (Grate or Curb Opening)	Type =		
Water Depth at Flowline (outside of local depression)	$a_{local} =$	2.00	2.00 inches
<b>Grate Information</b>	No =	1	1
Length of a Unit Grate	Ponding Depth =	6.0	12.0 inches
Width of a Unit Grate			<input type="checkbox"/> Override Depths
Area Opening Ratio for a Grate (typical values 0.15-0.90)	$L_o (G) =$	3.00	3.00 feet
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	$W_o =$	1.73	1.73 feet
Grate Weir Coefficient (typical value 2.15 - 3.60)	$A_{ratio} =$	0.31	0.31
Grate Orifice Coefficient (typical value 0.60 - 0.80)	$C_f (G) =$	0.50	0.50
<b>Curb Opening Information</b>	$C_w (G) =$	3.60	3.60
Length of a Unit Curb Opening	$C_o (G) =$	0.60	0.60
Height of Vertical Curb Opening in Inches			
Height of Curb Orifice Throat in Inches	$L_o (C) =$	3.00	3.00 feet
Angle of Throat (see USDCM Figure ST-5)	$H_{vert} =$	6.50	6.50 inches
Side Width for Depression Pan (typically the gutter width of 2 feet)	$H_{throat} =$	5.25	5.25 inches
Clogging Factor for a Single Curb Opening (typical value 0.10)	Theta =	0.00	0.00 degrees
Curb Opening Weir Coefficient (typical value 2.3-3.7)	$W_p =$	2.00	2.00 feet
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	$C_f (C) =$	0.10	0.10
	$C_w (C) =$	3.70	3.70
	$C_o (C) =$	0.66	0.66
<b>Grate Flow Analysis (Calculated)</b>			
Clogging Coefficient for Multiple Units	MINOR	MAJOR	
Clogging Factor for Multiple Units	Coef =	1.00	1.00
Grate Capacity as a Weir (based on Modified HEC22 Method)	Clog =	0.50	0.50
Interception without Clogging			
Interception with Clogging	$Q_{wi} =$	6.0	17.6 cfs
Grate Capacity as a Orifice (based on Modified HEC22 Method)	$Q_{wa} =$	3.0	8.8 cfs
Interception without Clogging			
Interception with Clogging	$Q_{oi} =$	5.6	7.8 cfs
Grate Capacity as Mixed Flow	$Q_{oa} =$	2.8	3.9 cfs
Interception without Clogging			
Interception with Clogging	$Q_{mi} =$	5.2	10.6 cfs
Resulting Grate Capacity (assumes clogged condition)	$Q_{ma} =$	2.6	5.3 cfs
<b>Curb Opening Flow Analysis (Calculated)</b>	<b><math>Q_{Grate} =</math></b>	<b>2.6</b>	<b>3.9 cfs</b>
Clogging Coefficient for Multiple Units	MINOR	MAJOR	
Clogging Factor for Multiple Units	Coef =	1.00	1.00
Curb Opening as a Weir (based on Modified HEC22 Method)	Clog =	0.17	0.17
Interception without Clogging			
Interception with Clogging	$Q_{wi} =$	2.0	8.5 cfs
Curb Opening as an Orifice (based on Modified HEC22 Method)	$Q_{wa} =$	1.7	7.0 cfs
Interception without Clogging			
Interception with Clogging	$Q_{oi} =$	5.7	7.5 cfs
Curb Opening Capacity as Mixed Flow	$Q_{oa} =$	4.7	6.3 cfs
Interception without Clogging			
Interception with Clogging	$Q_{mi} =$	2.9	6.9 cfs
Resulting Curb Opening Capacity (assumes clogged condition)	$Q_{ma} =$	2.4	5.7 cfs
	<b><math>Q_{Curb} =</math></b>	<b>1.7</b>	<b>5.7 cfs</b>
<b>Resultant Street Conditions</b>			
Total Inlet Length	MINOR	MAJOR	
Resultant Street Flow Spread (based on street geometry from above)	L =	3.00	3.00 feet
Resultant Flow Depth at Street Crown	T =	13.1	29.8 ft
	$d_{CROWN} =$	0.0	0.0 inches
<b>Low Head Performance Reduction (Calculated)</b>			
Depth for Grate Midwidth	MINOR	MAJOR	
Depth for Curb Opening Weir Equation	$d_{Grate} =$	0.523	1.023 ft
Combination Inlet Performance Reduction Factor for Long Inlets	$d_{Curb} =$	0.33	0.83 ft
Curb Opening Performance Reduction Factor for Long Inlets	$RF_{Combination} =$	0.94	1.00
Grated Inlet Performance Reduction Factor for Long Inlets	$RF_{Curb} =$	1.00	1.00
	$RF_{Grate} =$	0.94	1.00
Total Inlet Interception Capacity (assumes clogged condition)			
<b>Inlet Capacity IS GOOD for Minor and Major Storms(&gt;Q PEAK)</b>	$Q_s =$	3.9	8.7 cfs
	$Q_{PEAK REQUIRED} =$	2.9	5.9 cfs

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

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

**Project:** Castle View Apartments

**Inlet ID:** SD-INLET-B2.1 - DP17



**Gutter Geometry:**

Maximum Allowable Width for Spread Behind Curb  
 Side Slope Behind Curb (leave blank for no conveyance credit behind curb)  
 Manning's Roughness Behind Curb (typically between 0.012 and 0.020)

$T_{BACK} = 5.0$  ft  
 $S_{BACK} = 0.250$  ft/ft  
 $n_{BACK} = 0.013$

Height of Curb at Gutter Flow Line  
 Distance from Curb Face to Street Crown  
 Gutter Width  
 Street Transverse Slope  
 Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)  
 Street Longitudinal Slope - Enter 0 for sump condition  
 Manning's Roughness for Street Section (typically between 0.012 and 0.020)

$H_{CURB} = 6.00$  inches  
 $T_{CROWN} = 62.0$  ft  
 $W = 2.00$  ft  
 $S_X = 0.050$  ft/ft  
 $S_W = 0.083$  ft/ft  
 $S_D = 0.000$  ft/ft  
 $n_{STREET} = 0.013$

Max. Allowable Spread for Minor & Major Storm  
 Max. Allowable Depth at Gutter Flowline for Minor & Major Storm  
 Check boxes are not applicable in SUMP conditions

	Minor Storm	Major Storm	
$T_{MAX} =$	62.0	62.0	ft
$d_{MAX} =$	6.0	12.0	inches
	<input type="checkbox"/>	<input type="checkbox"/>	

[MINOR STORM Allowable Capacity is based on Depth Criterion](#)  
[MAJOR STORM Allowable Capacity is based on Depth Criterion](#)

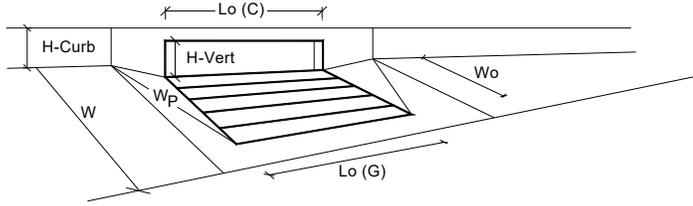
$Q_{allow} =$ 

Minor Storm	Major Storm
<b>SUMP</b>	<b>SUMP</b>

 cfs

# INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.01 (April 2021)



<b>Design Information (Input)</b>	Denver No. 16 Combination		
Type of Inlet	MINOR	MAJOR	
Local Depression (additional to continuous gutter depression 'a' from above)	Denver No. 16 Combination		
Number of Unit Inlets (Grate or Curb Opening)	No = 2	2	inches
Water Depth at Flowline (outside of local depression)	Ponding Depth = 6.0		12.0 inches
<b>Grate Information</b>			<input type="checkbox"/> Override Depths
Length of a Unit Grate	L <sub>o</sub> (G) = 3.00		3.00 feet
Width of a Unit Grate	W <sub>o</sub> = 1.73		1.73 feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A <sub>ratio</sub> = 0.31		
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C <sub>f</sub> (G) = 0.50		0.50
Grate Weir Coefficient (typical value 2.15 - 3.60)	C <sub>w</sub> (G) = 3.60		3.60
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C <sub>o</sub> (G) = 0.60		0.60
<b>Curb Opening Information</b>			
Length of a Unit Curb Opening	L <sub>o</sub> (C) = 3.00		3.00 feet
Height of Vertical Curb Opening in Inches	H <sub>vert</sub> = 6.50		6.50 inches
Height of Curb Orifice Throat in Inches	H <sub>throat</sub> = 5.25		5.25 inches
Angle of Throat (see USDCM Figure ST-5)	Theta = 0.00		0.00 degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W <sub>p</sub> = 2.00		2.00 feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C <sub>f</sub> (C) = 0.10		0.10
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C <sub>w</sub> (C) = 3.70		3.70
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C <sub>o</sub> (C) = 0.66		0.66
<b>Grate Flow Analysis (Calculated)</b>			
Clogging Coefficient for Multiple Units	Coef = 1.50		1.50
Clogging Factor for Multiple Units	Clog = 0.38		0.38
<b>Grate Capacity as a Weir (based on Modified HEC22 Method)</b>			
Interception without Clogging	Q <sub>wi</sub> = 6.6		25.7 cfs
Interception with Clogging	Q <sub>wa</sub> = 4.1		16.1 cfs
<b>Grate Capacity as an Orifice (based on Modified HEC22 Method)</b>			
Interception without Clogging	Q <sub>oi</sub> = 11.2		15.7 cfs
Interception with Clogging	Q <sub>oa</sub> = 7.0		9.8 cfs
<b>Grate Capacity as Mixed Flow</b>			
Interception without Clogging	Q <sub>mi</sub> = 7.8		18.1 cfs
Interception with Clogging	Q <sub>ma</sub> = 4.8		11.3 cfs
Resulting Grate Capacity (assumes clogged condition)	<b>Q<sub>Grate</sub> = 4.1</b>		<b>9.8 cfs</b>
<b>Curb Opening Flow Analysis (Calculated)</b>			
Clogging Coefficient for Multiple Units	Coef = 1.00		1.00
Clogging Factor for Multiple Units	Clog = 0.08		0.08
<b>Curb Opening as a Weir (based on Modified HEC22 Method)</b>			
Interception without Clogging	Q <sub>wi</sub> = 3.0		16.9 cfs
Interception with Clogging	Q <sub>wa</sub> = 2.8		15.5 cfs
<b>Curb Opening as an Orifice (based on Modified HEC22 Method)</b>			
Interception without Clogging	Q <sub>oi</sub> = 11.4		15.0 cfs
Interception with Clogging	Q <sub>oa</sub> = 10.4		13.8 cfs
<b>Curb Opening Capacity as Mixed Flow</b>			
Interception without Clogging	Q <sub>mi</sub> = 5.0		13.7 cfs
Interception with Clogging	Q <sub>ma</sub> = 4.6		12.6 cfs
Resulting Curb Opening Capacity (assumes clogged condition)	<b>Q<sub>Curb</sub> = 2.8</b>		<b>12.6 cfs</b>
<b>Resultant Street Conditions</b>			
Total Inlet Length	L = 6.00		6.00 feet
Resultant Street Flow Spread (based on street geometry from above)	T = 8.7		18.7 ft
Resultant Flow Depth at Street Crown	d <sub>CROWN</sub> = 0.0		0.0 inches
<b>Low Head Performance Reduction (Calculated)</b>			
Depth for Grate Midwidth	d <sub>Grate</sub> = 0.523		1.023 ft
Depth for Curb Opening Weir Equation	d <sub>Curb</sub> = 0.33		0.83 ft
Combination Inlet Performance Reduction Factor for Long Inlets	RF <sub>Combination</sub> = 0.71		1.00
Curb Opening Performance Reduction Factor for Long Inlets	RF <sub>Curb</sub> = 1.00		1.00
Grated Inlet Performance Reduction Factor for Long Inlets	RF <sub>Grate</sub> = 0.71		1.00
Total Inlet Interception Capacity (assumes clogged condition)	<b>Q<sub>s</sub> = 6.2</b>		<b>20.1 cfs</b>
<b>Inlet Capacity IS GOOD for Minor and Major Storms(&gt;Q PEAK)</b>	Q <sub>PEAK REQUIRED</sub> = 2.8		6.8 cfs

# **APPENDIX C:**

## **MS4 COMPLIANCE SUMMARY**



# Summary of Water Quality Conformance to MS4 Permit

The purpose of this worksheet is to document conformance with the Town of Castle Rock’s MS4 permit with regard to permanent water quality on land disturbance projects.

**Project Name** Castle View Apartments, Lot 2 North, The Meadows PD Filing No. 19

**Project Owner** Castle View Owner LLC

**Project Location** Town of Castle Rock

**ToCR Project Number** SDP22-0032

**Total Site Area** 5.467 **acres**

**Total Size of Common Plan of Development** \_\_\_\_\_ **acres**

**Check all that apply:**

**Project within Plum Creek Basin**

**Project within Cherry Creek Basin**

**Estimated construction completion date** Spring 2024

1. The water quality control measure(s) for applicable development sites shall meet one of the following base design standards as per the SDDTCM Section 14.4. Please select all design standards that were applied to meet conformance with the MS4 on this site.

- WQCV standard
- Pollutant removal standard
- Runoff reduction standard
- Applicable site draining to regional WQVC control measure (accepts drainage prior to discharging to WOTS)
- Applicable site draining to regional WQVC control facility (with receiving pervious area control measure upstream of WOTS)
- Constrained redevelopment sites standard
  - Imperviousness of existing site \_\_\_\_\_/\_\_\_\_\_ (Imp. Ac/Site Ac) = \_\_\_\_%
  - Variance required TCV No. \_\_\_\_\_
- Existing control measure with WQCV per previous criteria standards
  - Reference Construction Permit No. \_\_\_\_\_
- Cherry Creek Basin only, choose one:  Tier 1  Tier 2  Tier 3
- No control measures provided (See Permanent WQ Worksheet for applicability)

# Summary of Water Quality Conformance to MS4 Permit

2. Was an exclusion to water quality applied as per SDDTCM Section 13.1.5?  Yes  No

i. If yes, please select all that apply, provide total excluded impervious area(s) and submit variance, as applicable: TCV No. \_\_\_\_\_

- Pavement management site  
Excluded impervious area: \_\_\_\_\_ acres
- Excluded roadway redevelopment  
Excluded impervious area: \_\_\_\_\_ acres
- Excluded existing roadway areas  
Excluded impervious area: \_\_\_\_\_ acres
- Above ground and below ground utilities
- Large lot single family home
- Non-residential and non-commercial infiltration  
Excluded impervious area: \_\_\_\_\_ acres
- Land disturbance for land to remain undeveloped  
Excluded impervious area: \_\_\_\_\_ acres
- Stream Stabilization Sites  
Excluded impervious area: \_\_\_\_\_ acres
- Trails  
Excluded impervious area: \_\_\_\_\_ acres
- Oil and Gas Exploration

3. For Development and Redevelopment sites, following any exclusions claimed above, was any portion of the site excluded up to 20% of the site and not to exceed one acre?  Yes  No

If yes, complete the following:

Excluded area: \_\_\_\_\_ acres  
Total Site area: \_\_\_\_\_ acres, \_\_\_\_\_ % site excluded

4. For Constrained sites, was any portion of the site excluded up to 50% of the site and not to exceed 50% of the impervious area?  Yes  No

If yes, complete the following:

Excluded area: \_\_\_\_\_ acres  
Excluded impervious area: \_\_\_\_\_ acres  
Total Site area: \_\_\_\_\_ acres, \_\_\_\_\_ % site excluded  
Total Impervious area: \_\_\_\_\_ acres, \_\_\_\_\_ % impervious excluded

# **APPENDIX D:**

## DRAINAGE MAP

**MEADOWS SENIOR HOUSING  
PUBLIC IMPROVEMENT CONSTRUCTION PLANS**  
TIMBER MILL PARKWAY & N. MEADOWS DR.  
CASTLE ROCK, CO 80109

**DRAINAGE PLAN**

NO.	DATE	REMARKS
1	10/12/2022	1ST CD SUBMITTAL

JOB NO.:	DCS22-4026
PA / PM:	T. SWAN
DESIGNED:	I. CONTRERAS
DATE:	08/15/2022
PLOT DATE:	12/09/22

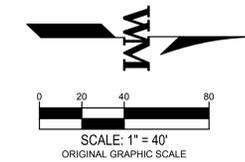
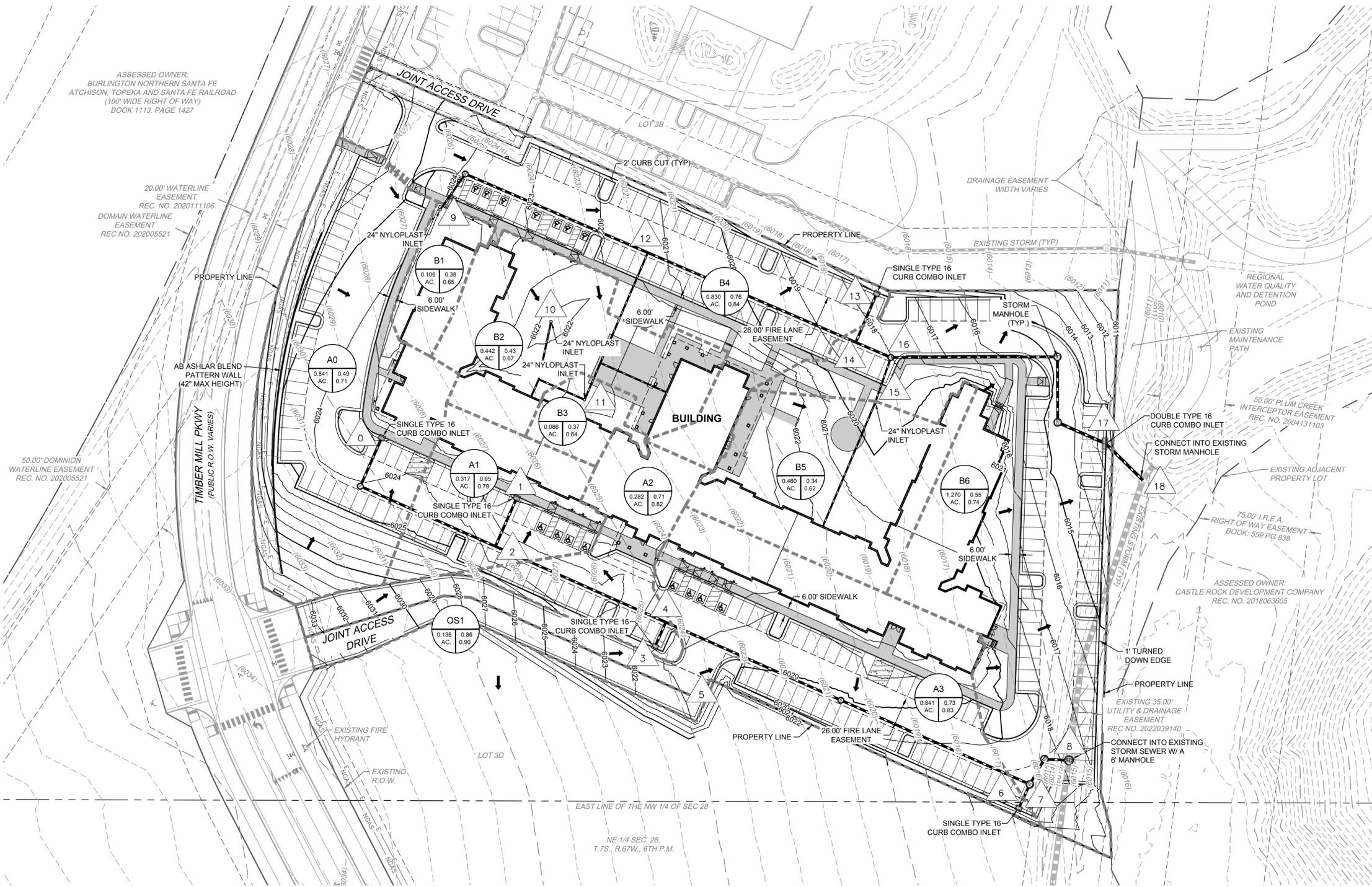
SHEET  
**DR1**

**LEGEND:**

- PROPERTY LINE
- RIGHT-OF-WAY LINE
- PROPOSED 5' CONTOUR
- PROPOSED 1' CONTOUR
- EXISTING 5' CONTOUR
- EXISTING 1' CONTOUR
- PROPOSED STORM LINE
- EXISTING STORM LINE
- PROPOSED STORM INLET
- EXISTING STORM INLET
- BASIN BOUNDARY
- EMERGENCY OVERFLOW PATH
- DESIGN POINT
- FLOW DIRECTION
- EXISTING FLOW DIRECTION

**BASIN DESIGNATION**

- 5 YR "C" VALUE
- AREA
- 100 YR "C" VALUE



WARE MALCOMB assumes no responsibility for utility locations. The utilities shown on this drawing have been plotted from the best available information. It is, however, the contractors responsibility to field verify the location of all utilities prior to the commencement of any construction.

TOWN OF CASTLE ROCK APPROVAL  
PLANS ARE HEREBY APPROVED FOR ONE YEAR  
FROM DATE OF DEVELOPMENT SERVICES APPROVAL



DEVELOPMENT SERVICES DATE

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# **APPENDIX D:**

EXCERPTS OF PHASE III DRAINAGE REPORT FOR THE  
MEADOWS FILING NO. 19 LOT 2 NORTH  
PROJECT NO. CD21-0042



**PHASE III DRAINAGE REPORT  
FOR  
The Meadows Filing No. 19 Lot 2 North  
Castle Rock, CO  
Project No. CD21-0042**

**PREPARED FOR:**

CASTLE ROCK DEVELOPMENT CO.  
3033 E. 1<sup>ST</sup> AVE. #310  
DENVER, COLORADO 80206  
303-394-5500  
CONTACT: R.C HANISCH

**PREPARED BY:**

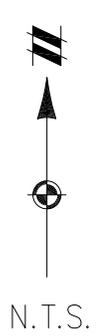
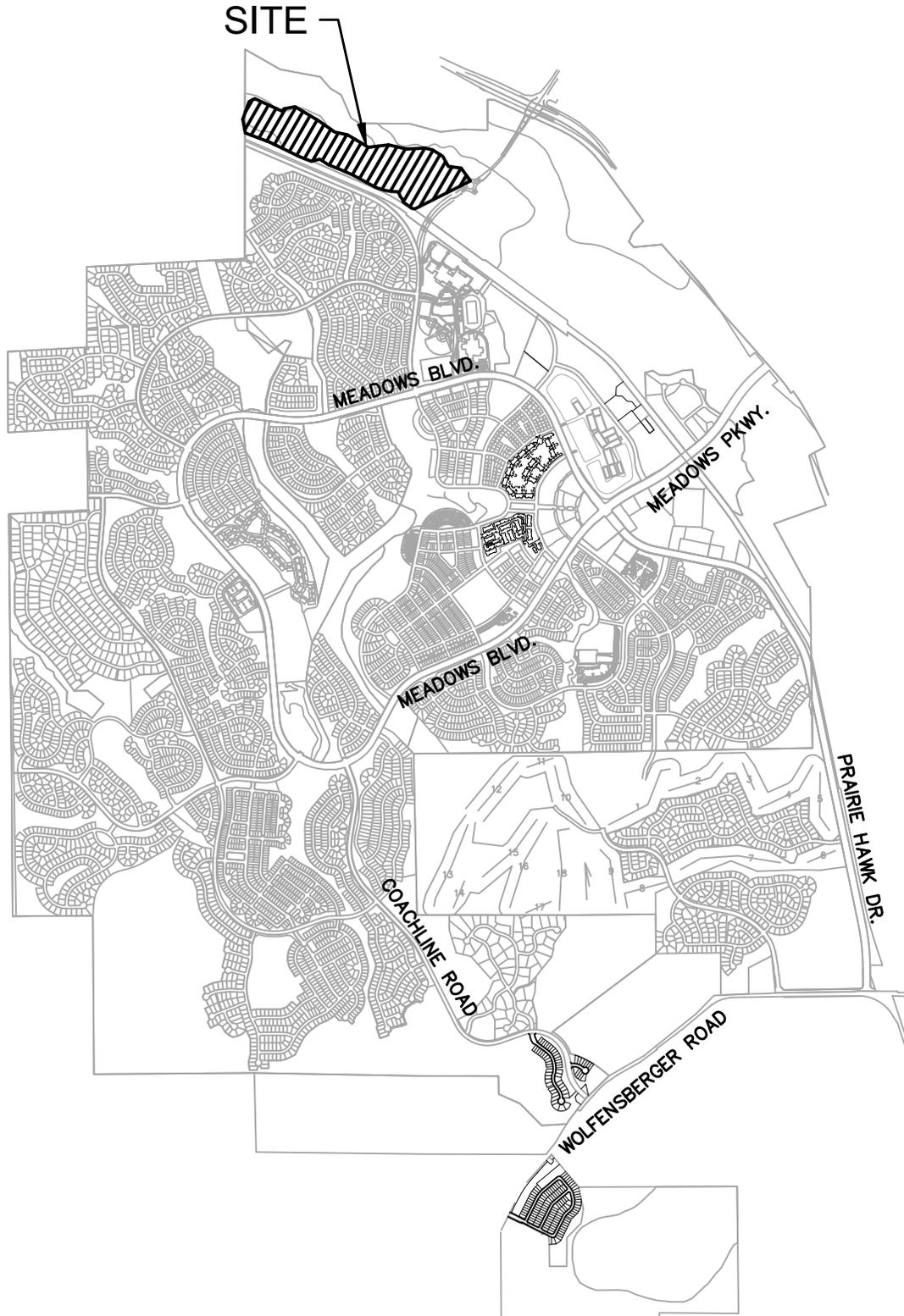
TERRACINA DESIGN, LLC  
10200 E. GIRARD AVENUE  
BUILDING A, SUITE 314  
DENVER, CO 80231  
PHONE: 303-632-8867  
CONTACT: MARTIN METSKER, PE  
PROJECT NUMBER: 14-003

FEBRUARY 2022

**t e r r a c i n a   d e s i g n**

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Landscape Architecture, Planning & Engineering  
10200 E. Girard Avenue, A-314. Denver, CO 80231 PH: 303.632.8867



Project Name: Meadows Filing 19 Lot 2 North

Prepared By: MJG



# Percent Impervious Calculations

Basin Id	Design Point	Total Basin Area	Streets				Weighted % Impervious	
			Total	Historic	Roof	Paved		Gravel
				2%	90%	100%		40%
A01	A01	2.22	0.00	2.22			90.0%	
A02	A02	6.71	0.00	6.71			90.0%	
A03	A03	0.48	0.08		0.40		83.2%	
A04	A04	0.69	0.13		0.56		82.1%	
A05	A05	2.65	0.00	2.65			90.0%	
A06	A06	9.73	0.00	9.73			90.0%	
A07	A07	7.59	0.00	7.59			90.0%	
A08	A08	2.08	2.08				2.0%	
A09	A09	0.49	0.12		0.37		76.4%	
A10	A10	0.73	0.13		0.60		82.0%	
B1	B1	7.75	0.00	7.75			90.0%	
C1	C1	0.58	0.21		0.37		63.9%	
C2	C2	0.82	0.19		0.64		77.9%	
C3	C3	1.91	0.00	1.91			90.0%	
C4	C4	2.00	0.00	2.00			90.0%	
C5	C5	4.76	0.00	4.76			90.0%	
C6	C6	0.95	0.00	0.28		0.68	54.5%	
C7	C7	0.74	0.74				2.0%	
C8	C8	1.35	0.34		1.00		75.0%	
C9	C9	1.36	0.62		0.74		55.1%	
CO1	CO1	4.56	2.49			2.07	19.3%	
CO2	CO2	3.79	2.22			1.56	17.7%	
D1	D1	4.80	0.66		0.37	3.77	39.4%	
C10	C10	0.14	0.05		0.09		64.6%	
C11	C11	0.09	0.03		0.06		65.5%	

Project Name: Meadows Filing 19 Lot 2 North

Prepared By: MJG

## Peak Runoff Rational Method (5-Year Event)

Rainfall Depth-Duration-Frequency (1-hr) =							1.43
Design Point	Basin ID	Basin Area (Ac)	Runoff Coeff (5-Year)	$T_c$ (min)	C X A	I (in/hr)	Q (cfs)
A01	A01	2.22	0.77	6.0	1.71	4.62	7.91
A02	A02	6.71	0.77	9.3	5.18	3.98	20.61
A03	A03	0.48	0.72	5.0	0.35	4.85	1.68
A04	A04	0.69	0.71	13.3	0.49	3.43	1.67
A05	A05	2.65	0.77	11.2	2.05	3.69	7.56
A06	A06	9.73	0.77	13.6	7.52	3.39	25.54
A07	A07	7.59	0.77	9.9	5.87	3.89	22.81
A08	A08	2.08	0.05	29.3	0.11	2.28	0.24
A09	A09	0.49	0.66	5.7	0.33	4.69	1.53
A10	A10	0.73	0.71	9.6	0.52	3.93	2.04
B1	B1	7.75	0.77	13.8	5.99	3.38	20.23
C1	C1	0.58	0.56	5.0	0.32	4.85	1.57
C2	C2	0.82	0.67	7.7	0.56	4.27	2.37
C3	C3	1.91	0.77	5.0	1.48	4.85	7.17
C4	C4	2.00	0.77	5.0	1.54	4.85	7.48
C5	C5	4.76	0.77	5.0	3.68	4.85	17.83
C6	C6	0.95	0.48	19.8	0.46	2.83	1.30
C7	C7	0.74	0.05	17.1	0.04	3.04	0.12
C8	C8	1.35	0.65	13.5	0.87	3.41	2.98
C9	C9	1.36	0.49	16.6	0.66	3.09	2.04
CO1	CO1	4.56	0.19	34.4	0.88	2.07	1.82
CO2	CO2	3.79	0.18	42.0	0.68	1.82	1.24
D1	D1	4.80	0.36	23.3	1.72	2.59	4.47
C10	C10	0.14	0.56	5.0	0.08	4.85	0.37
C11	C11	0.09	0.57	5.0	0.05	4.85	0.24

Project Name: Meadows Filing 19 Lot 2 North

Prepared By: MJG

## Peak Runoff Rational Method (100-Year Event)

Rainfall Depth-Duration-Frequency (1-hr) =							2.60
Design Point	Basin ID	Basin Area (Ac)	Runoff Coeff (100-Year)	$T_c$ (min)	C X A	I (in/hr)	Q (cfs)
A01	A01	2.22	0.85	6.0	1.89	8.39	15.87
A02	A02	6.7054	0.85300	9.3100	5.72	7.23	41.36
A03	A03	0.48	0.83	5.0	0.40	8.82	3.51
A04	A04	0.69	0.82	13.3	0.56	6.23	3.51
A05	A05	2.65	0.85	11.2	2.26	6.71	15.17
A06	A06	9.73	0.85	13.6	8.30	6.17	51.23
A07	A07	7.59	0.85	9.9	6.48	7.07	45.76
A08	A08	2.08	0.49	29.3	1.02	4.14	4.24
A09	A09	0.49	0.80	5.7	0.39	8.52	3.34
A10	A10	0.73	0.82	9.6	0.60	7.15	4.31
B1	B1	7.75	0.85	13.8	6.61	6.14	40.58
C1	C1	0.58	0.75	5.0	0.43	8.82	3.82
C2	C2	0.82	0.80	7.7	0.66	7.76	5.14
C3	C3	1.91	0.85	5.0	1.63	8.82	14.38
C4	C4	2.00	0.85	5.0	1.70	8.82	15.01
C5	C5	4.76	0.85	5.0	4.06	8.82	35.77
C6	C6	0.95	0.71	19.8	0.67	5.14	3.46
C7	C7	0.74	0.49	17.1	0.37	5.53	2.02
C8	C8	1.35	0.79	13.5	1.07	6.19	6.60
C9	C9	1.36	0.71	16.6	0.96	5.62	5.41
CO1	CO1	4.56	0.56	34.4	2.57	3.76	9.64
CO2	CO2	3.79	0.56	42.0	2.11	3.32	6.99
D1	D1	4.80	0.65	23.3	3.10	4.72	14.63
C10	C10	0.14	0.75	5.0	0.10	8.82	0.90
C11	C11	0.09	0.75	5.0	0.07	8.82	0.58

**Runoff Summary Table**

Design Point	Basin ID	Basin Area	5-YEAR Runoff (CFS)	100-YEAR Runoff (CFS)
A01	A01	2.22	7.91	15.87
A02	A02	6.71	20.61	41.36
A03	A03	0.48	1.68	3.51
A04	A04	0.69	1.67	3.51
A05	A05	2.65	7.56	15.17
A06	A06	9.73	25.54	51.23
A07	A07	7.59	22.81	45.76
A08	A08	2.08	0.24	4.24
A09	A09	0.49	1.53	3.34
A10	A10	0.73	2.04	4.31
B1	B1	7.75	20.23	40.58
C1	C1	0.58	1.57	3.82
C2	C2	0.82	2.37	5.14
C3	C3	1.91	7.17	14.38
C4	C4	2.00	7.48	15.01
C5	C5	4.76	17.83	35.77
C6	C6	0.95	1.30	3.46
C7	C7	0.74	0.12	2.02
C8	C8	1.35	2.98	6.60
C9	C9	1.36	2.04	5.41
CO1	CO1	4.56	1.82	9.64
CO2	CO2	3.79	1.24	6.99
D1	D1	4.80	4.47	14.63
C10	C10	0.14	0.37	0.90
C11	C11	0.09	0.24	0.58



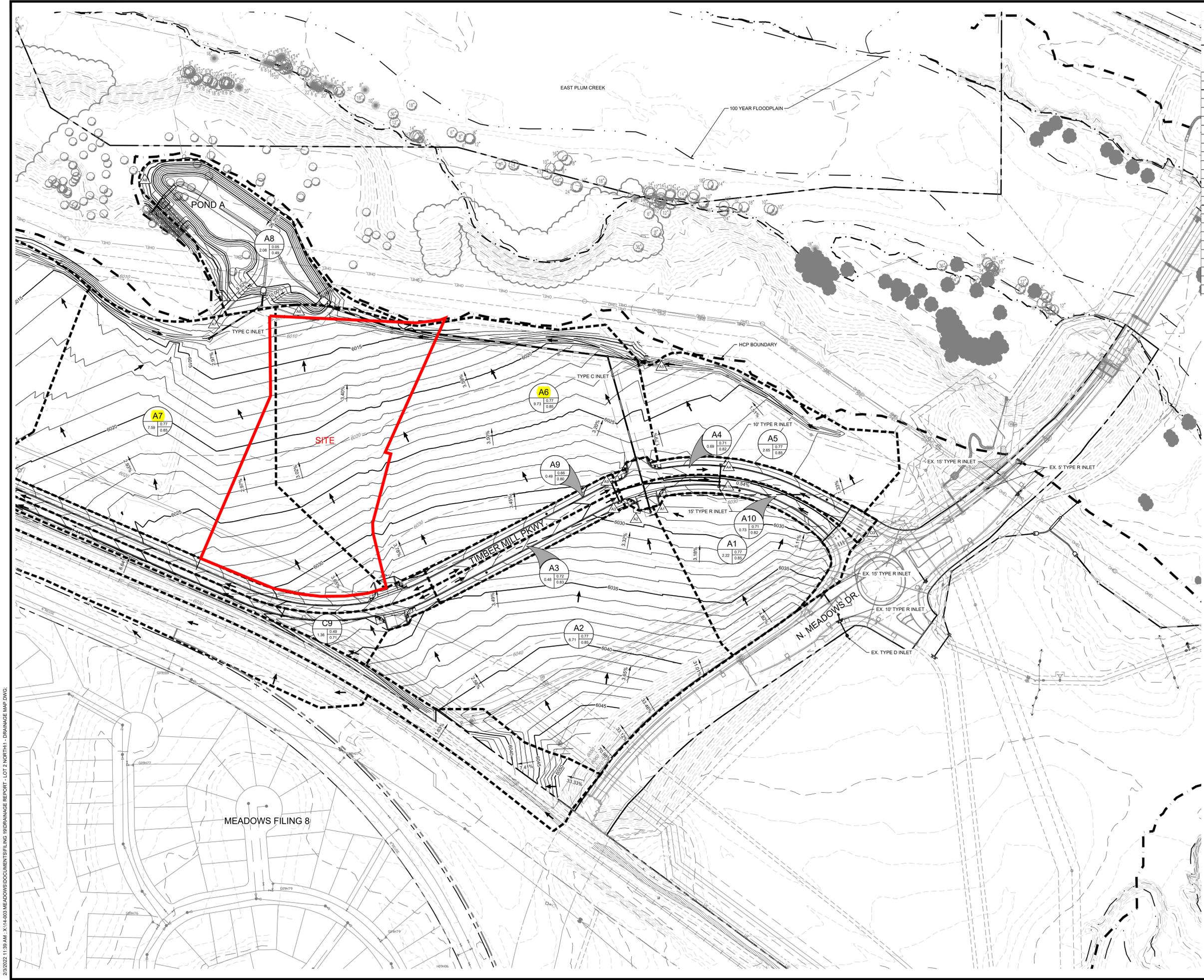
CALL & SURVEYORS IN ADVANCE BEFORE YOU DIG GRADE OR EXCAVATE FOR THE MARKING OF UNDERGROUND UTILITY.  
TERRACCINA ASSUMES NO RESPONSIBILITY FOR EXISTING UTILITY LOCATIONS (HORIZONTAL AND VERTICAL). THIS PLAN IS BASED ON THE BEST AVAILABLE INFORMATION. IT IS THE FIELD VERIFY THE LOCATION OF ALL UTILITIES PRIOR TO THE COMMENCEMENT OF ANY CONSTRUCTION ACTIVITIES.



#	REVISION DESCRIPTION	DATE BY

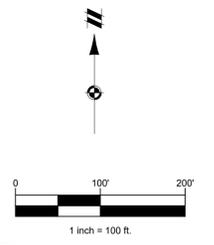
**THE MEADOWS**  
TOWN OF CASTLE ROCK, COLORADO  
MEADOWS FILING 19 LOT 2 NORTH  
DRAINAGE PLAN

DESIGNED BY: DB  
DRAWN BY: DB  
CHECKED BY: MM  
JOB NO. 14-003  
SHEET 1 OF 2



**LEGEND:**

- PROPERTY BOUNDARY LINE
- PROPOSED EASEMENT
- EXISTING HCP BOUNDARY
- GRADING
- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- PROPOSED MAJOR CONTOUR
- PROPOSED MINOR CONTOUR
- STORM DRAIN
- MANHOLE and PIPE
- INLET
- FLARED END SECTION
- DRAINAGE
- EX BASIN DESIGNATION FROM REFERENCED REPORT
- BASIN DESIGNATION
- 5 YEAR COEFFICIENTS
- 100 YEAR COEFFICIENTS
- BASIN BOUNDARY
- DIRECTIONAL FLOW ARROW
- EMERGENCY OVERTFLOW PATH
- DESIGN POINT



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Runoff Summary Table

Design Point	Basin ID	Basin Area	5-YEAR Runoff (CFS)	100-YEAR Runoff (CFS)
A01	A01	2.22	7.91	15.87
A02	A02	6.71	20.61	41.36
A03	A03	0.48	1.68	3.51
A04	A04	0.69	1.67	3.51
A05	A05	2.65	7.56	15.17
A06	A06	9.73	25.54	51.23
A07	A07	7.59	22.81	45.76
A08	A08	2.08	0.24	4.24
A09	A09	0.49	1.53	3.34
A10	A10	0.73	2.04	4.31
B1	B1	7.75	20.23	40.58
C1	C1	0.58	1.57	3.82
C2	C2	0.82	2.37	5.14
C3	C3	1.91	7.17	14.38
C4	C4	2.00	7.48	15.01
C5	C5	4.76	17.83	35.77
C6	C6	0.95	1.30	3.46
C7	C7	0.74	0.12	2.02
C8	C8	1.35	2.98	6.60
C9	C9	1.36	2.04	5.41
CO1	CO1	4.56	1.82	9.64
CO2	CO2	3.79	1.24	6.99
D1	D1	4.80	4.47	14.63
C10	C10	0.14	0.37	0.90
C11	C11	0.09	0.24	0.58



CALL A SURVEYOR IN ADVANCE BEFORE YOU DIG GRADE OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES.

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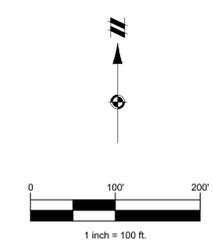
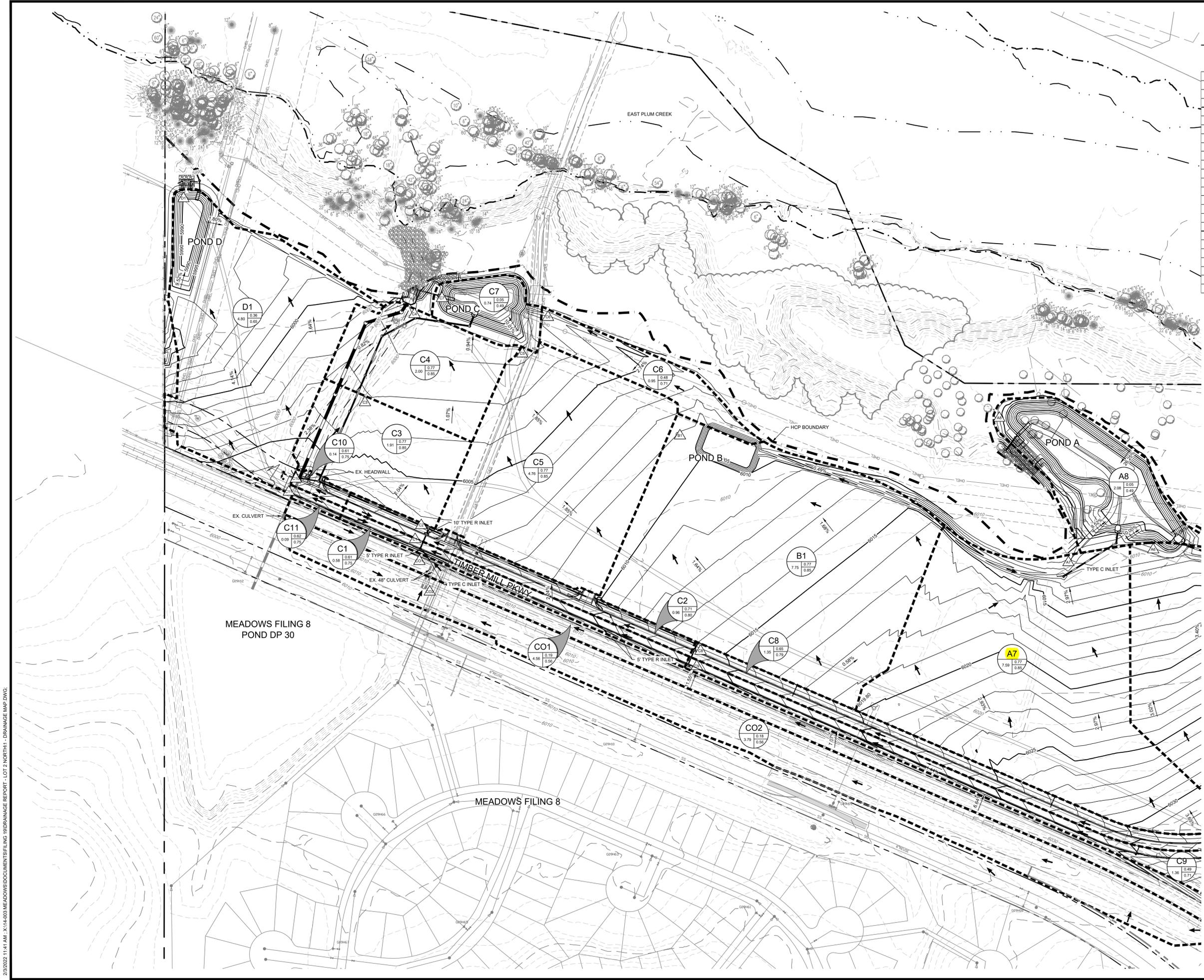
DATE	REVISION DESCRIPTION

THE MEADOWS  
TOWN OF CASTLE ROCK, COLORADO  
MEADOWS FILING 19 LOT 2 NORTH  
DRAINAGE PLAN

DESIGNED BY: DB  
DRAWN BY: DB  
CHECKED BY: MM

JOB NO.  
14-003

SHEET  
2 OF 2



- LEGEND:**
- PROPERTY BOUNDARY LINE
  - - - PROPOSED EASEMENT
  - - - EXISTING HCP BOUNDARY
  - GRADING**
  - - - EXISTING MAJOR CONTOUR
  - - - EXISTING MINOR CONTOUR
  - - - PROPOSED MAJOR CONTOUR
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  - (X) BASIN DESIGNATION
  - (X) 5 YEAR COEFFICIENTS
  - (X) 100 YEAR COEFFICIENTS
  - BASIN BOUNDARY
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  - EMERGENCY OVERTFLOW PATH
  - △ DESIGN POINT

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