

---

# Drainage Conformance Letter

**Woodspring Suites – Castle Rock**

**Lot 1, Block 4, Promenade at Castle Rock Filing  
No. 1, Amendment 27  
Castle Rock, Colorado**

**Originally Submitted: May 3<sup>rd</sup>, 2024  
Resubmitted: September 27<sup>th</sup>, 2024**

**SDP24-0018**

---

Prepared For:

## **KT Development**

7951 Maplewood Ave, Suite 122  
Greenwood Village, CO 80111  
Contact: Luke Taylor  
Phone: 303-906-9002

---

Prepared By:



Contact: Michael Drago, PE  
Email: mdrago@k2civilconsultants.com

---

## **ENGINEER'S CERTIFICATION**

I affirm that this report and plan for the Drainage Conformance Design of Woodspring Suites – Castle Rock was prepared by me (or under my direct supervisions) in accordance with the provisions of the Town of Castle Rock Drainage Design and Technical Criteria for the owners thereof. I understand that the Town of Castle Rock does not and will not assume liability for drainage facilities designed by others.

---

Michael Drago, PE  
Registered Professional Engineer  
State of Colorado No. 59225

Date

## **DEVELOPER'S STATEMENT**

KT Development hereby certifies that the drainage facilities for Woodspring Suites – Castle Rock shall be constructed according to the design presented in this report. I understand that the Town of Castle Rock does not and will not assume liability for the drainage facilities designed and/or certified by my engineer and that the Town of Castle Rock review drainage plans pursuant to the Municipal Code; but cannot, on behalf of Woodspring Suites – Castle Rock, guarantee the final drainage design revision will absolve KT Development and/or their successors and/or assigns of future liability for improper design.

---

Name of Developer

---

Authorized Signature

## **Introduction**

This Drainage Conformance Letter has been prepared for the Woodspring Suites – Castle Rock located at Lot 1, Block 4 of Promenade at Castle Rock – Filing No. 1, Amendment No. 27 (Site). The purposed of this letter is to show that the proposed development conforms to the provisions of Town of Castle Rock Storm Drainage Design and Technical Criteria Manual (TOCR), Mile High Flood District (MHFD), and the *Phase III Drainage Report for Promenade at Castle Filing No. 1*, prepared by Bowman Consulting, approved July 22, 2015 (Master Drainage Report).

## **Location**

The project site is located off Promenade Parkway between Castle Rock Parkway and Factory Shops Blvd, which lies within the north half of Section 27, Township 7 South, Range 67 West of the 6<sup>th</sup> Principal Meridian, Town of Castle Rock, County of Douglas, State of Colorado. Lot 1 is bounded on the north by Tract A, Chipolte to the west, ENT Bank to the east and Sam's Club across the shared private drive to the south. Refer to the Vicinity Map below for reference.



**VICINITY MAP**

**Description of Property**

Lot 1 is 2.26 acres and is currently undeveloped consisting of unirrigated native weeds and grasses. The site currently drains from the northeast to the southwest at 1-3% slopes. The existing slopes at the norther perimeter of the site reach up to 25%. There is an existing 84" storm sewer pipe at the southern property boundary with an existing 24" storm sewer stub for connection and outfall from the developed runoff of this project site.

Per the NRCS Soil Survey, the subsurface characteristics consist of primarily of Kutch sandy loam and a small portion of Stony rough land. The soils onsite have a very slow infiltration rate and are defined as hydrological soil group D. Refer to the Appendix for the NRCS Soil Survey Map.

The site is located within Zone "X", areas determined to be outside 0.2% annual chance floodplain, as designated on the Flood Insurance Rate Map (FIRM) 08035C0167G, map effective date 03/16/2024. Refer to the Appendix for the FIRMette.

There are no major drainageways, irrigation canals or ditches within the project site.

Woodspring Suites will consist of a 48,660 sf (4-story) extended stay hotel with 122 rooms, associated drives, parking, walks, and landscaping. The proposed storm infrastructure includes private on-site inlets and storm piping that connects to the existing storm sewer in the south portion of the site and ultimately be conveyed to existing detention and water quality facility as outlined in the Master Drainage Report.

**Major Drainage Basins**

The proposed Woodspring Suites is located within a 2.26-acre parcel of commercially zoned vacant parcel. The project site lies within Basins 52 and 53 of the Master Drainage Report. Per the Master Drainage Report the existing pond and surrounding storm infrastructure has been designed based on the below commercial values which results in an allowed imperviousness for the development of 63% for Basin 52 and 80% for Basin 53. Runoff from the site is expected to be collected onsite with proposed storm infrastructure and conveyed via storm sewer to existing 24" storm sewer stub located on the southern side of the site.

| Basin | Area        | Imperviousness |
|-------|-------------|----------------|
| 52    | 14.24 acres | 63%            |
| 53    | 11.47 acres | 80%            |

Detention and water quality for this proposed development is provided in the existing Regional Pond as outlined in the Master Drainage Report. The site is located within the East Plum Creek Tributary B watershed, which includes a reach through the Promenade project that is contained

within an underground conduit. The conduits outfalls to an open channel on the east side of State Highway 85 just north of Promenade Parkway. The open channel outfalls to the existing online Regional Pond before crossing State Highway 85 near the Castle Rock Parkway and State Highway 85 interchange before outfalling to East Plum Creek.

In the developed condition, the proposed development improvements result is an impervious value of 61.5%, which is lower than the minimum allowed impervious (Basin 52 – 63%), therefore there are no required improvements to the existing storm sewer infrastructure or detention facility. The proposed development anticipates to utilize sheet runoff for a portion of the development and tie into the existing storm inlet located on the south side of the project site following historic drainage patterns as outlined in the Master Drainage Report.

Refer to the Appendix for basin maps and calculations.

### **Minor Drainage Basins**

The site in the proposed condition consists of six onsite total basins (A-1, A-2, A-3, A-4, A-5, and A-6) which direct flows to on-site inlets where they are ultimately detention within existing storm sewer infrastructure and the Regional Detention Pond as described within the Master Drainage Report. Three off-site basins (OFF-1, OFF-2, and OFF-3) were also analyzed as part of this report. The following is a description of the proposed drainage basins.

**Basin A-1** – Basin A-1 is 0.55 acres, comprised of the northwest parking lot, drive aisles, and sidewalk areas on-site for an impervious value of 76.7%. The 5-year and 100-year C values were determined to be 0.66 and 0.79, respectively; and the anticipated 5-year and 100-year runoff flows are 1.72 cfs and 3.75 cfs, respectively. Flows from A-1 are conveyed to the west portion of the site as sheet flow or through a 3' concrete pan towards Inlet A-1 (5' Type R Inlet). Flows are captured at Design Point 1, where they are then conveyed south through underground stormwater piping and eventually connect to existing infrastructure within the Private Drive on the south side of the site. These flows ultimately discharge into the Regional Pond as described within the Master Drainage Report.

**Basin A-2** – Basin A-2 is 0.29 acres, comprised of the southwest parking, drive aisles, and sidewalk areas on-site for an impervious value of 91.4%. The 5-year and 100-year C values were determined to be 0.78 and 0.86, respectively; and the anticipated 5-year and 100-year runoff flows are 1.11 cfs and 2.21 cfs, respectively. Flows from A-2 are conveyed to the southwest portion of the site as sheet flow or through a 3' concrete pan towards Inlet A-2 (5' Type R Inlet). Flows are captured at Design Point 2, where they are conveyed east through underground stormwater piping and connect into existing infrastructure within the Private Drive on the south side of the site. These flows ultimately discharge into the Regional Pond as described within the Master Drainage Report.

**Basin A-3** – Basin A-3 is 0.30 acres, comprised of the proposed Woodspring Suites hotel for an impervious value of 95.0%. The 5-year and 100-year C values were determined to be 0.81 and 0.87, respectively; and the anticipated 5-year and 100-year runoff flows are 1.18 cfs and 2.30 cfs, respectively. Flows from A-3 drain towards the south side of the proposed hotel roof, where they are conveyed into an underground roof drain and flow towards MH-1 (5' Manhole) at Design Point 5. Flows are conveyed south through underground stormwater piping and connect into existing infrastructure within the Private Drive on the south side of the site. These flows ultimately discharge into the Regional Pond as described within the Master Drainage Report.

**Basin A-4** – Basin A-4 is 0.50 acres, comprised of the northwest parking lot, drive aisles, and sidewalk areas on-site for an impervious value of 76.3%. The 5-year and 100-year C values were determined to be 0.66 and 0.79, respectively; and the anticipated 5-year and 100-year runoff flows are 1.51 cfs and 3.31 cfs, respectively. Flows from A-4 are conveyed to the east portion of the site as sheet flow or through a 3' concrete pan towards Inlet A-4 (5' Type R Inlet). Flows are captured at Design Point 3, where they are then conveyed south through underground stormwater piping and eventually connect to existing infrastructure within the Private Drive on the south side of the site. These flows ultimately discharge into the Regional Pond as described within the Master Drainage Report.

**Basin A-5** – Basin A-5 is 0.25 acres, comprised of the SE parking lot, drive aisles, and sidewalk areas on-site for an impervious value of 83.5%. The 5-year and 100-year C values were determined to be 0.72 and 0.82, respectively; and the anticipated 5-year and 100-year runoff flows are 0.85 cfs and 1.78 cfs, respectively. Flows from A-5 are conveyed to the southeast portion of the site as sheet flow or through a 3' concrete pan towards Inlet A-5 (5' Type R Inlet). Flows are captured at Design Point 4, where they are conveyed west through underground stormwater piping and connect into existing infrastructure within the Private Drive on the south side of the site. These flows ultimately discharge into the Regional Pond as described within the Master Drainage Report.

**Basin A-6** – Basin A-6 is 0.38 acres, comprised of the two access drives onto the private drive on the southern portion of the site, in addition to the sidewalk and landscape area on the south side of the site for an impervious value of 54.5%. The 5-year and 100-year C values were determined to be 0.48 and 0.70, respectively; and the anticipated 5-year and 100-year runoff flows are 0.77 cfs and 2.05 cfs, respectively. Flows from A-6 are conveyed directly south into the Private Drive on the south side of the site (Design Point 6). Flows are captured by the northern 2' gutter within the private drive and continue towards the west where they will be captured by an existing inlet within the Private Drive. These flows ultimately discharge into the Regional Pond as described within the Master Drainage Report.

There will be 3 off-site basins that will be analyzed as part of this compliance letter that follow the patterns described within the Master Drainage Report. The basins are as follows:

**Basin OFF-1** – Basin OFF-1 is 0.04 acres, comprised of the northwest landscaping south of the existing retaining wall for an impervious value of 5.0%. The 5-year and 100-year C values were determined to be 0.08 and 0.17, respectively; and the anticipated 5-year and 100-year runoff flows are 0.01 cfs and 0.17 cfs, respectively. Flows from OFF-1 sheet flow south onto the proposed site, where they sheet flow towards Design Point 1 and are captured by Inlet A-1 (5' Type R Inlet). Stormwater is then conveyed through underground stormwater piping south where they connect into existing stormwater infrastructure within the Private Drive. These flows ultimately discharge into the Regional Pond as described within the Master Drainage Report.

**Basin OFF-2** – Basin OFF-2 is 0.04 acres, comprised of the northeast landscaping south of the existing retaining wall for an impervious value of 5.0%. The 5-year and 100-year C values were determined to be 0.08 and 0.17, respectively; and the anticipated 5-year and 100-year runoff flows are 0.02 cfs and 0.18 cfs, respectively. Flows from OFF-2 sheet flow south onto the proposed site, where they sheet flow towards Design Point 3 and are captured by Inlet A-4 (5' Type R Inlet). Stormwater is then conveyed through underground stormwater piping south where they connect into existing stormwater infrastructure within the Private Drive. These flows ultimately discharge into the Regional Pond as described within the Master Drainage Report.

**Basin OFF-3** – Basin OFF-2 is 0.58 acres, comprised of landscape area north of the existing retaining wall for an impervious value of 5.0%. The 5-year and 100-year C values were determined to be 0.08 and 0.17, respectively; and the anticipated 5-year and 100-year runoff flows are 0.21 cfs and 0.82 cfs, respectively. Flows from OFF-3 sheet flow south into an existing grass lined swale north of the proposed project and are conveyed west towards Design Point 7. Flows in this sub-basin continue towards the Regional Pond as described within the Master Drainage Report.

Refer to the Appendix for excerpts of the Master Drainage Report and the Proposed Drainage Plan.

### **Drainage Design Criteria**

#### **Regulations:**

This drainage report was prepared in accordance with the Town of Castle Rock Storm Drainage Design and Technical Criteria Manual (TOCR) and the Mile High Flood District (MHFD), Drainage Criterial Manuals.

#### **Drainage Studies, Master Plans, Site Constraints:**

The project site has been previously analyzed in the following study:

- Phase III Drainage Report for Promenade at Castle Filing No. 1 Castle Rock, CO, approved July 22, 2015.

As outlined in sections above, the Master Drainage Reports accounted for an allowed imperviousness for the development of 63% for Basin 52 and 80% for Basin 53. In the developed

condition, the proposed development improvements result is an impervious value of 61.5%, which is lower than the minimum allowed impervious (Basin 52 – 63%), therefore there are no required improvements to the existing storm sewer infrastructure or detention facility.

**Hydrology:**

Runoff was calculated per the Town of Castle Rock Storm Drainage Design and Technical Criteria Manual. The rainfall intensities for the proposed site were determined using Figure 6.1 of the ToCR manual.

$$I = \frac{28.5 P_1}{(10 + T_c)^{0.786}}$$

Where:

I = rainfall intensity (inches per hour)

P1 = 1.43 - 5yr and 2.60 - 100 yr one-hour rainfall depth (inches) per RA-1 through RA-6 provided in the Mile High Flood District manual

Tc = time of concentration (minutes)

**Calculation Method**

The Rational Method was used to calculate runoff values for the 5-year and 100-year design storms.

$$Q = CIA$$

Where:

Q = peak discharge (cfs)

C = runoff coefficient

I = rainfall intensity (inches/hour)

A = drainage area (acres)

The runoff coefficients used in the calculation method are from MHFD's Tables 6-3 and 6-4.

**Hydraulics:**

All site storm sewer are intended to be private and maintained privately by the property owner. The 24" storm sewer connection to the 84" conduit will be public and maintained by the Town of Castle Rock. Storm sewer is sized to convey the 100-year storm event. Inlets have been sized to capture runoff using the UD-Inlet software from MHFD and Bentley StormCAD software was used to verify storm sewer pipe hydraulic grade lines and velocities.

**Detention and Water Quality Enhancement:**

The Master Drainage Report sized the Regional Detention Pond for two stage storage that includes the Excess Urban Runoff Volume (EURV) and 100-year detention plus Water Quality Capture Volume (WQCV). Per the Master Drainage Report, the pond for an allowed imperviousness for the development of 63% for Basin 52 and 80% for Basin 53. In the developed condition, the proposed development improvements result is an impervious value of 61.5%, which is lower than the minimum allowed impervious (Basin 52 – 63%). Therefore, the required water quality for this project has been accounted for in the existing Regional Pond.

**Stormwater Quality Design Four Step Process**

The proposed development and subsequent lot developments will follow the “Four Step Process” as mandated by the Drainage Criteria Manual as follows:

**Step 1: Reduce Runoff Volume to the Maximum Extent Practicable**

Runoff has been limited to the maximum extent practicable by utilizing a inlets and roof drain connections to underground storm sewer and reduce the amount of runoff.

**Step 2: Provide Water Quality Capture Volume and Flood Control Detention Via Full-Spectrum Detention**

Regional Pond will provide Water Quality Capture Volume (WQVC) and 100-year plus WQCV detention for the site.

**Step 3: Utilize Stream Channel Stabilization Techniques**

There are no drainageways adjacent to this project site or onsite.

**Step 4: Undertake Source Control**

During initial construction, erosion control measures (CCMs) including vehicle tracking control, stabilized staging area, construction fence, and silt fence will be in place to provide source control of sediment within the site. During interim conditions, inlet protection and rock socks will be installed at proposed inlets and along the proposed curb and gutter within the site. The final condition will provide permanent seeding of all disturbed areas provided per permanent CCM requirements. No other potential pollutants are anticipated with this site post- construction.

In addition to the source control measures associated with construction, there are additional measures to be in place with the developed condition. Site us of hotel will minimize risk for illicit discharges form material storage, vehicle maintenance and manufacturing as these site activities are not generally associated with hotel use. Waste receptables will be provided onsite for trash disposal. During a snowstorm event, the snow will be shoveled into the provided landscape areas

to promote infiltration. The site will also utilize general good housekeeping practices and preventative maintenance.

### **Compliance with Standards**

The proposed development conforms to the provisions of Town of Castle Rock Storm Drainage Design and Technical Criteria Manual (TOCR), Mile High Flood District (MHFD), and the *Phase III Drainage Report for Promenade at Castle Filing No. 1*, prepared by Bowman Consulting, approved July 22, 2015 (Master Drainage Report).

There are no variances associated with drainage being requested as part of this development.

### **List of References**

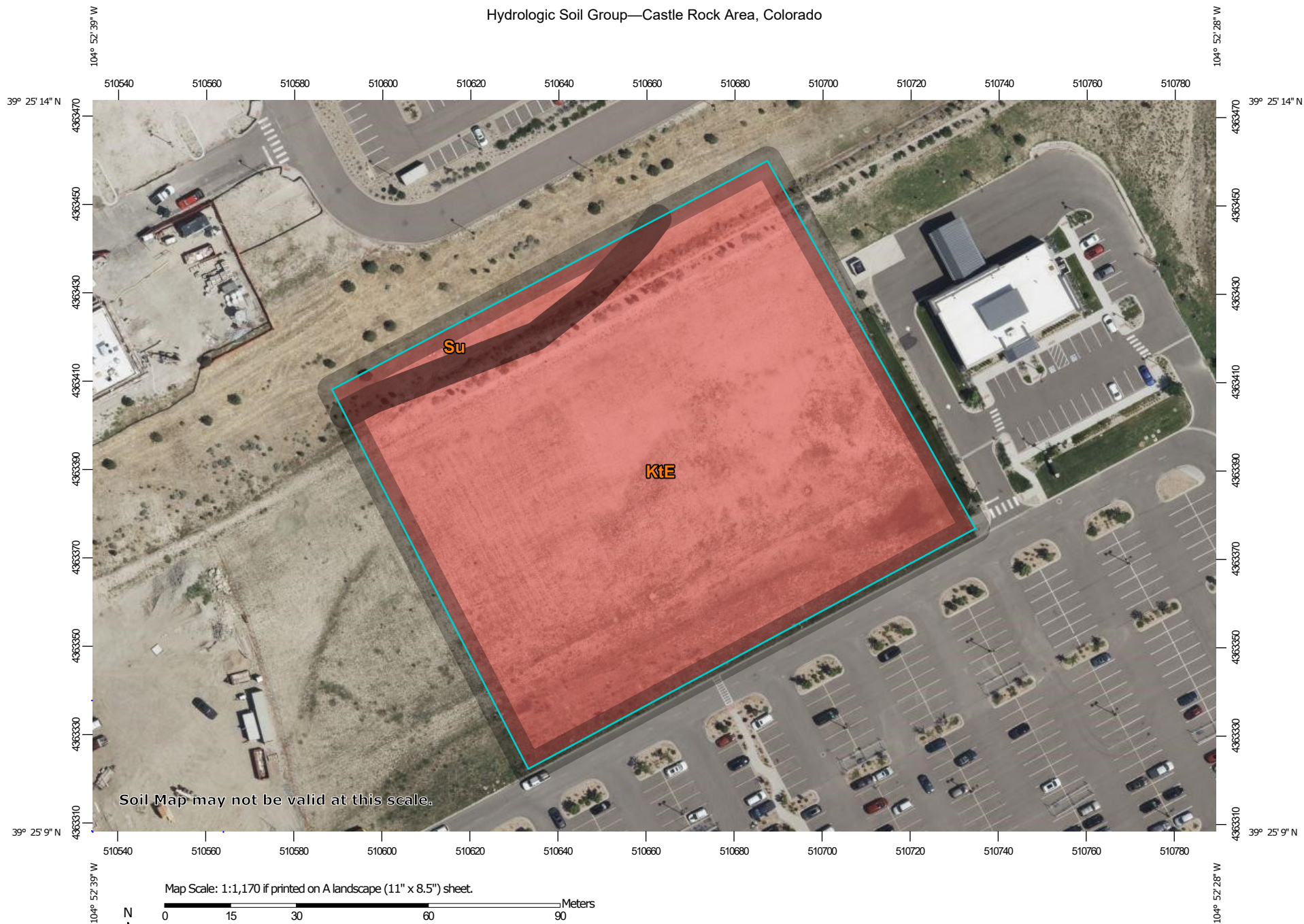
1. Town of Castle Rock Storm Drainage Design and Technical Criteria Manual
2. Urban Storm Drainage Criteria Manual, Vol. 1 and Vol. 2, Urban Drainage and Flood Control District (UDFCD), 2017
3. *Phase III Drainage Report for Promenade at Castle Filing No. 1*, prepared by Bowman Consulting, approved July 22, 2015

## **APPENDIX**

- APPENDIX A
  - FEMA Firmette
  - NRCS Soil Survey
- APPENDIX B
  - Hydrology Calculations
- APPENDIX C
  - Hydraulic Calculations
- APPENDIX D
  - Master Drainage Report
    - Excerpts
    - Existing Drainage Map
- APPENDIX E
  - Developed Drainage Map

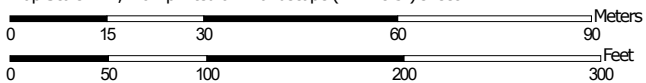
## **APPENDIX A** **FIRM, Soil Survey**

# Hydrologic Soil Group—Castle Rock Area, Colorado



Soil Map may not be valid at this scale.

Map Scale: 1:1,170 if printed on A landscape (11" x 8.5") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84



**Natural Resources  
Conservation Service**

Web Soil Survey  
National Cooperative Soil Survey

4/1/2024  
Page 1 of 4

## 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 16, Aug 24, 2023

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

Date(s) aerial images were photographed: Mar 1, 2023—Sep 1, 2023

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 |
|------------------------------------|------------------------------------------|--------|--------------|----------------|
| KtE                                | Kutch sandy loam, 5 to 20 percent slopes | D      | 2.6          | 94.3%          |
| Su                                 | Stony rough land                         | D      | 0.2          | 5.7%           |
| <b>Totals for Area of Interest</b> |                                          |        | <b>2.7</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

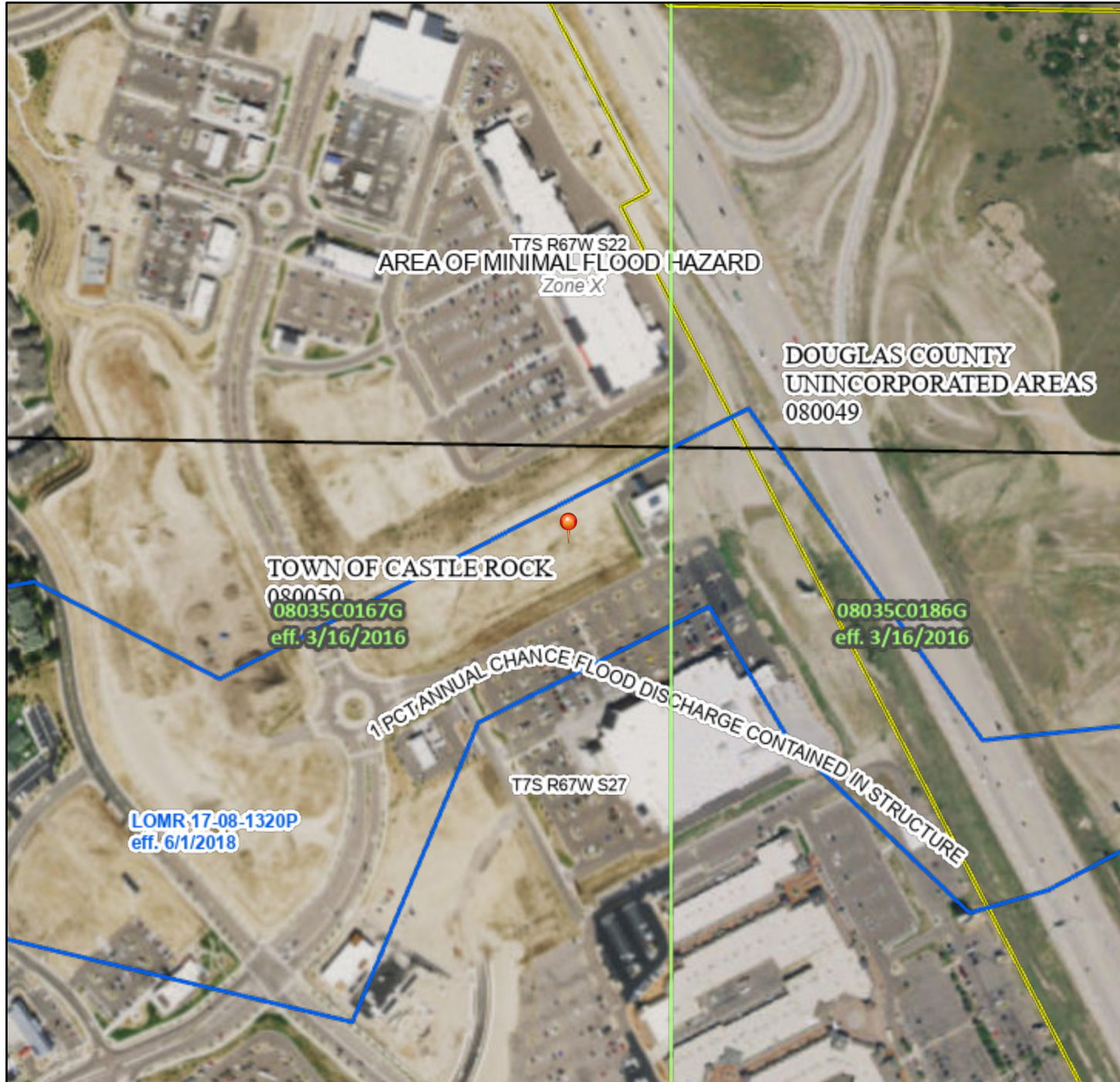
*Component Percent Cutoff: None Specified*

*Tie-break Rule: Higher*

# National Flood Hazard Layer FIRMette



104°52'52"W 39°25'26"N



0 250 500 1,000 1,500 2,000 Feet

1:6,000

104°52'15"W 39°24'58"N

Basemap Imagery Source: USGS National Map 2023

## Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

|                             |  |                                                                                                                                                                   |
|-----------------------------|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SPECIAL FLOOD HAZARD AREAS  |  | Without Base Flood Elevation (BFE)<br>Zone A, V, A99                                                                                                              |
|                             |  | With BFE or Depth Zone AE, AO, AH, VE, AR                                                                                                                         |
|                             |  | Regulatory Floodway                                                                                                                                               |
| OTHER AREAS OF FLOOD HAZARD |  | 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X |
|                             |  | Future Conditions 1% Annual Chance Flood Hazard Zone X                                                                                                            |
|                             |  | Area with Reduced Flood Risk due to Levee. See Notes. Zone X                                                                                                      |
|                             |  | Area with Flood Risk due to Levee Zone D                                                                                                                          |
| OTHER AREAS                 |  | NO SCREEN Area of Minimal Flood Hazard Zone X                                                                                                                     |
|                             |  | Effective LOMRs                                                                                                                                                   |
| GENERAL STRUCTURES          |  | Area of Undetermined Flood Hazard Zone D                                                                                                                          |
|                             |  | Channel, Culvert, or Storm Sewer                                                                                                                                  |
|                             |  | Levee, Dike, or Floodwall                                                                                                                                         |
| OTHER FEATURES              |  | 20.2 Cross Sections with 1% Annual Chance Water Surface Elevation                                                                                                 |
|                             |  | 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation                                                                                                 |
|                             |  | Coastal Transect                                                                                                                                                  |
|                             |  | Base Flood Elevation Line (BFE)                                                                                                                                   |
|                             |  | Limit of Study                                                                                                                                                    |
|                             |  | Jurisdiction Boundary                                                                                                                                             |
| MAP PANELS                  |  | Coastal Transect Baseline                                                                                                                                         |
|                             |  | Profile Baseline                                                                                                                                                  |
|                             |  | Hydrographic Feature                                                                                                                                              |
|                             |  | Digital Data Available                                                                                                                                            |
|                             |  | No Digital Data Available                                                                                                                                         |
|                             |  | Unmapped                                                                                                                                                          |



The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 4/30/2024 at 7:03 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.



NOAA Atlas 14, Volume 8, Version 2  
Location name: Castle Rock, Colorado, USA\*  
Latitude: 39.4201°, Longitude: -104.8758°  
Elevation: 6137 ft\*\*

\* source: ESRI Maps

\*\* source: USGS



POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Deborah Martin, Sandra Pavlovic, Ishani Roy, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Michael Yekta, Geoffery Bonnin

NOAA, National Weather Service, Silver Spring, Maryland

[PF\\_tabular](#) | [PF\\_graphical](#) | [Maps & aerals](#)

PF tabular

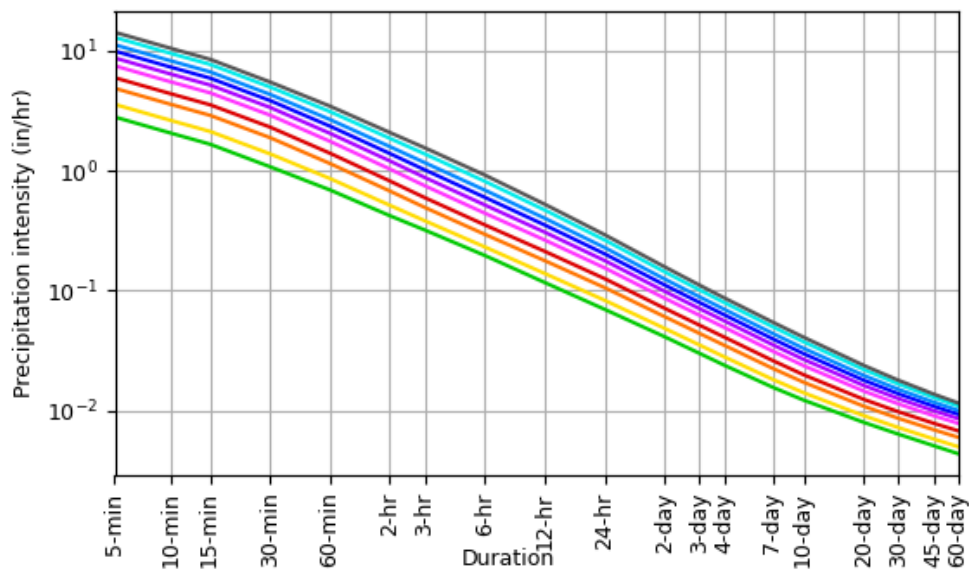
| PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour) <sup>1</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                     |                        |                        |                        |                        |                        |                        |                        |                        |                        |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| Duration                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Average recurrence interval (years) |                        |                        |                        |                        |                        |                        |                        |                        |                        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 1                                   | 2                      | 5                      | 10                     | 25                     | 50                     | 100                    | 200                    | 500                    | 1000                   |
| 5-min                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 2.80<br>(2.34-3.37)                 | 3.56<br>(2.99-4.31)    | 4.85<br>(4.06-5.88)    | 5.94<br>(4.93-7.24)    | 7.46<br>(5.95-9.47)    | 8.68<br>(6.73-11.2)    | 9.90<br>(7.38-13.1)    | 11.2<br>(7.93-15.2)    | 12.9<br>(8.74-18.0)    | 14.2<br>(9.36-20.2)    |
| 10-min                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 2.05<br>(1.72-2.47)                 | 2.61<br>(2.19-3.16)    | 3.55<br>(2.97-4.31)    | 4.35<br>(3.61-5.30)    | 5.47<br>(4.36-6.93)    | 6.35<br>(4.93-8.17)    | 7.25<br>(5.41-9.58)    | 8.18<br>(5.80-11.1)    | 9.43<br>(6.40-13.2)    | 10.4<br>(6.85-14.8)    |
| 15-min                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1.66<br>(1.40-2.01)                 | 2.12<br>(1.78-2.56)    | 2.89<br>(2.41-3.50)    | 3.54<br>(2.94-4.31)    | 4.44<br>(3.54-5.64)    | 5.16<br>(4.00-6.64)    | 5.89<br>(4.39-7.78)    | 6.65<br>(4.72-9.04)    | 7.67<br>(5.20-10.7)    | 8.45<br>(5.57-12.0)    |
| 30-min                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1.08<br>(0.906-1.30)                | 1.38<br>(1.16-1.67)    | 1.88<br>(1.57-2.28)    | 2.31<br>(1.92-2.81)    | 2.90<br>(2.31-3.67)    | 3.36<br>(2.61-4.32)    | 3.84<br>(2.86-5.06)    | 4.32<br>(3.07-5.87)    | 4.97<br>(3.37-6.96)    | 5.47<br>(3.61-7.79)    |
| 60-min                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 0.691<br>(0.581-0.835)              | 0.860<br>(0.722-1.04)  | 1.15<br>(0.959-1.39)   | 1.40<br>(1.16-1.70)    | 1.76<br>(1.41-2.24)    | 2.05<br>(1.59-2.64)    | 2.35<br>(1.75-3.11)    | 2.66<br>(1.90-3.64)    | 3.10<br>(2.11-4.36)    | 3.45<br>(2.27-4.90)    |
| 2-hr                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0.421<br>(0.356-0.506)              | 0.514<br>(0.434-0.618) | 0.676<br>(0.568-0.815) | 0.820<br>(0.684-0.993) | 1.03<br>(0.833-1.31)   | 1.20<br>(0.945-1.55)   | 1.39<br>(1.04-1.83)    | 1.58<br>(1.14-2.15)    | 1.86<br>(1.27-2.60)    | 2.08<br>(1.38-2.94)    |
| 3-hr                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0.320<br>(0.271-0.382)              | 0.382<br>(0.323-0.457) | 0.493<br>(0.416-0.592) | 0.595<br>(0.498-0.717) | 0.747<br>(0.608-0.950) | 0.876<br>(0.690-1.12)  | 1.01<br>(0.767-1.34)   | 1.16<br>(0.839-1.58)   | 1.38<br>(0.948-1.92)   | 1.55<br>(1.03-2.18)    |
| 6-hr                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0.196<br>(0.167-0.233)              | 0.231<br>(0.197-0.275) | 0.294<br>(0.249-0.351) | 0.353<br>(0.297-0.423) | 0.442<br>(0.362-0.558) | 0.518<br>(0.411-0.661) | 0.599<br>(0.457-0.785) | 0.688<br>(0.499-0.927) | 0.815<br>(0.566-1.13)  | 0.918<br>(0.616-1.28)  |
| 12-hr                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 0.117<br>(0.100-0.138)              | 0.139<br>(0.119-0.164) | 0.178<br>(0.151-0.210) | 0.212<br>(0.180-0.253) | 0.264<br>(0.216-0.330) | 0.307<br>(0.244-0.388) | 0.352<br>(0.269-0.457) | 0.401<br>(0.292-0.535) | 0.470<br>(0.328-0.645) | 0.525<br>(0.354-0.728) |
| 24-hr                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 0.070<br>(0.060-0.081)              | 0.083<br>(0.071-0.097) | 0.106<br>(0.090-0.124) | 0.126<br>(0.107-0.148) | 0.155<br>(0.127-0.191) | 0.178<br>(0.142-0.222) | 0.202<br>(0.155-0.260) | 0.228<br>(0.167-0.301) | 0.264<br>(0.185-0.359) | 0.292<br>(0.199-0.403) |
| 2-day                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 0.041<br>(0.035-0.048)              | 0.048<br>(0.042-0.056) | 0.060<br>(0.052-0.071) | 0.071<br>(0.061-0.083) | 0.086<br>(0.071-0.105) | 0.099<br>(0.079-0.122) | 0.111<br>(0.086-0.142) | 0.125<br>(0.092-0.163) | 0.143<br>(0.101-0.193) | 0.158<br>(0.108-0.216) |
| 3-day                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 0.030<br>(0.026-0.034)              | 0.035<br>(0.030-0.040) | 0.044<br>(0.038-0.051) | 0.051<br>(0.044-0.060) | 0.062<br>(0.051-0.075) | 0.070<br>(0.057-0.087) | 0.079<br>(0.061-0.100) | 0.088<br>(0.065-0.115) | 0.101<br>(0.071-0.135) | 0.111<br>(0.076-0.151) |
| 4-day                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 0.023<br>(0.020-0.027)              | 0.028<br>(0.024-0.032) | 0.035<br>(0.030-0.040) | 0.041<br>(0.035-0.047) | 0.049<br>(0.040-0.059) | 0.056<br>(0.045-0.068) | 0.062<br>(0.048-0.079) | 0.069<br>(0.051-0.090) | 0.079<br>(0.056-0.106) | 0.087<br>(0.060-0.118) |
| 7-day                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 0.015<br>(0.013-0.018)              | 0.018<br>(0.015-0.020) | 0.022<br>(0.019-0.025) | 0.026<br>(0.022-0.030) | 0.031<br>(0.026-0.037) | 0.035<br>(0.028-0.043) | 0.039<br>(0.031-0.049) | 0.044<br>(0.032-0.056) | 0.050<br>(0.035-0.066) | 0.054<br>(0.037-0.073) |
| 10-day                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 0.012<br>(0.010-0.014)              | 0.014<br>(0.012-0.016) | 0.017<br>(0.015-0.019) | 0.019<br>(0.017-0.023) | 0.023<br>(0.019-0.028) | 0.026<br>(0.021-0.032) | 0.029<br>(0.023-0.037) | 0.033<br>(0.024-0.042) | 0.037<br>(0.026-0.049) | 0.040<br>(0.028-0.055) |
| 20-day                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 0.008<br>(0.007-0.009)              | 0.009<br>(0.008-0.010) | 0.010<br>(0.009-0.012) | 0.012<br>(0.010-0.014) | 0.014<br>(0.012-0.017) | 0.016<br>(0.013-0.019) | 0.017<br>(0.014-0.022) | 0.019<br>(0.014-0.025) | 0.022<br>(0.015-0.028) | 0.023<br>(0.016-0.031) |
| 30-day                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 0.006<br>(0.005-0.007)              | 0.007<br>(0.006-0.008) | 0.008<br>(0.007-0.009) | 0.009<br>(0.008-0.011) | 0.011<br>(0.009-0.013) | 0.012<br>(0.010-0.015) | 0.013<br>(0.010-0.016) | 0.015<br>(0.011-0.019) | 0.016<br>(0.012-0.021) | 0.017<br>(0.012-0.023) |
| 45-day                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 0.005<br>(0.004-0.005)              | 0.005<br>(0.005-0.006) | 0.006<br>(0.006-0.007) | 0.007<br>(0.006-0.008) | 0.009<br>(0.007-0.010) | 0.010<br>(0.008-0.011) | 0.010<br>(0.008-0.013) | 0.011<br>(0.008-0.014) | 0.012<br>(0.009-0.016) | 0.013<br>(0.009-0.018) |
| 60-day                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 0.004<br>(0.003-0.004)              | 0.005<br>(0.004-0.005) | 0.006<br>(0.005-0.006) | 0.006<br>(0.005-0.007) | 0.007<br>(0.006-0.009) | 0.008<br>(0.007-0.010) | 0.009<br>(0.007-0.011) | 0.010<br>(0.007-0.012) | 0.010<br>(0.007-0.014) | 0.011<br>(0.008-0.015) |
| <sup>1</sup> Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).<br>Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.<br>Please refer to NOAA Atlas 14 document for more information. |                                     |                        |                        |                        |                        |                        |                        |                        |                        |                        |

[Back to Top](#)

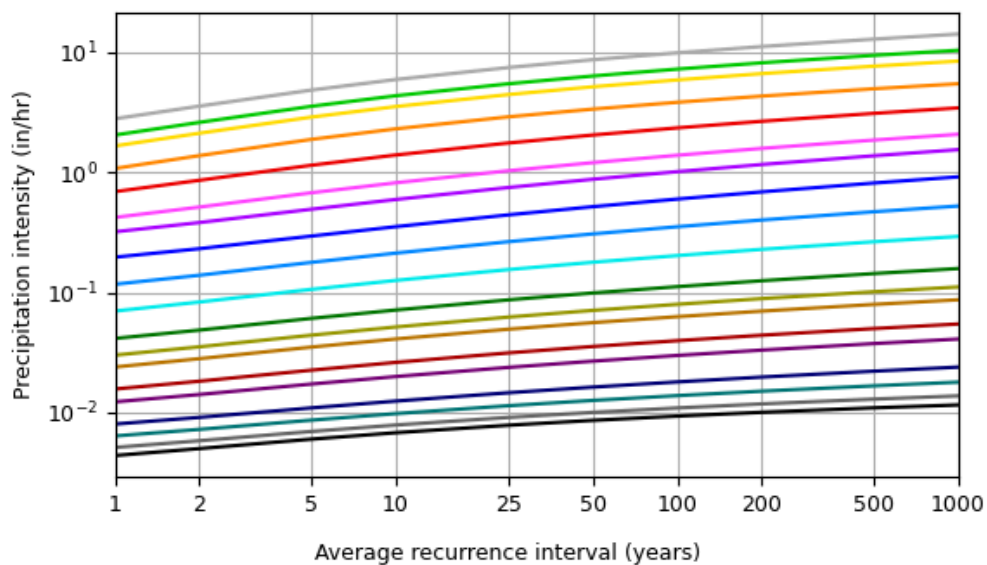
PF graphical

## PDS-based intensity-duration-frequency (IDF) curves

Latitude: 39.4201°, Longitude: -104.8758°



| Average recurrence interval (years) |      |
|-------------------------------------|------|
| 1                                   | 2    |
| 5                                   | 10   |
| 25                                  | 50   |
| 100                                 | 200  |
| 500                                 | 1000 |

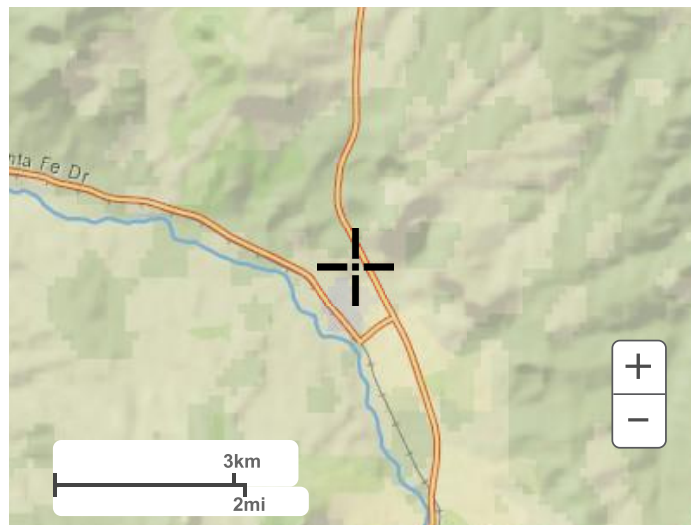


| Duration |        |
|----------|--------|
| 5-min    | 2-day  |
| 10-min   | 3-day  |
| 15-min   | 4-day  |
| 30-min   | 7-day  |
| 60-min   | 10-day |
| 2-hr     | 20-day |
| 3-hr     | 30-day |
| 6-hr     | 45-day |
| 12-hr    | 60-day |
| 24-hr    |        |

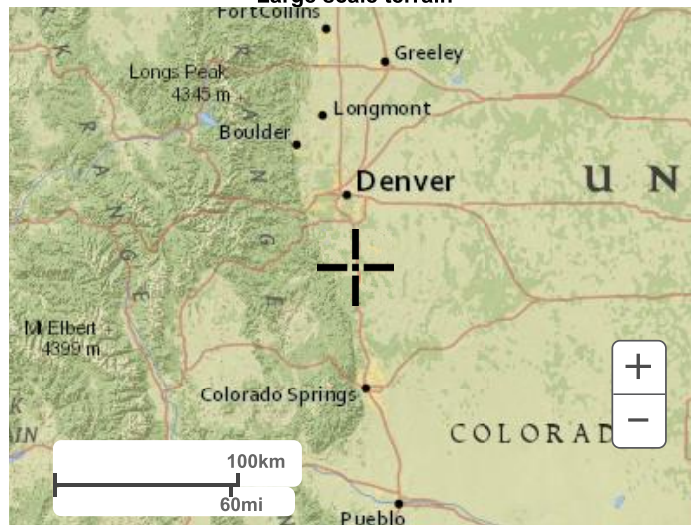
[Back to Top](#)

## Maps & aerials

Small scale terrain



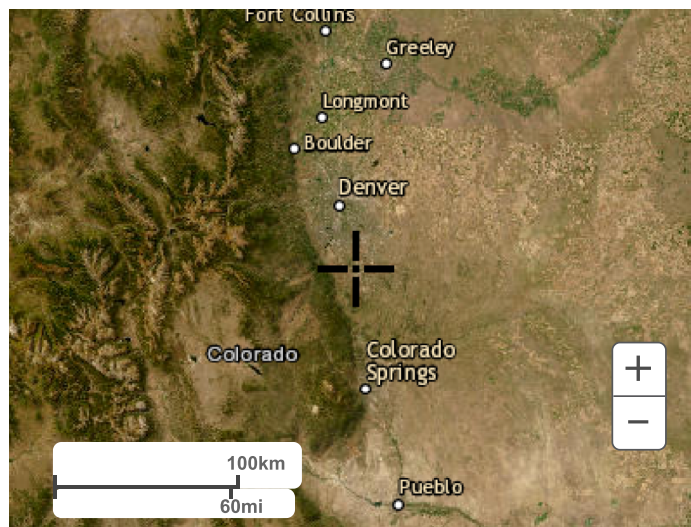
Large scale terrain



Large scale map



Large scale aerial



[Back to Top](#)

---

[US Department of Commerce](#)  
[National Oceanic and Atmospheric Administration](#)  
[National Weather Service](#)  
[National Water Center](#)  
1325 East West Highway  
Silver Spring, MD 20910  
Questions?: [HDSC.Questions@noaa.gov](mailto:HDSC.Questions@noaa.gov)

[Disclaimer](#)

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Floodway Data table shown on this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at <http://www.ngs.noaa.gov> or contact the National Geodetic Survey at the following address:

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242, or visit its website at <http://www.ngs.noaa.gov>.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

Based on updated topographic information, this map reflects more detailed and up-to-date **stream channel configurations** and **floodplain delineations** than those shown on the previous FIRM for this jurisdiction. As a result, the Flood Profiles and Floodway Data tables for multiple streams in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on the map. Also, the road to floodplain relationships for unreviewed streams may differ from what is shown on previous maps.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

If you have **questions about this map**, how to order products, or the National Flood Insurance Program in general, please call the **FEMA Map Information eXchange (FMIX)** at **1-877-FEMA-MAP** (1-877-336-2627) or visit the FEMA website at <http://www.fema.gov/business/nfip>.



**SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD**

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE AE Base Flood Elevations determined.

**ZONE AO** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.

**ZONE IV** Coastal flood zone with velocity hazard (wave action); no base flood elevations determined.

 FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

|  |             |
|--|-------------|
|  | OTHER AREAS |
|--|-------------|

**ZONE D** Areas in which flood hazards are undetermined, but possible.

 OTHERWISE PROTECTED AREAS (CPA)

1% Annual Chance Floodplain Boundary

— Floodway boundary

..... CBRS and OPA bou

dividing special flood depths, or flood

\*Referenced to the North American Vertical Datum of 1988

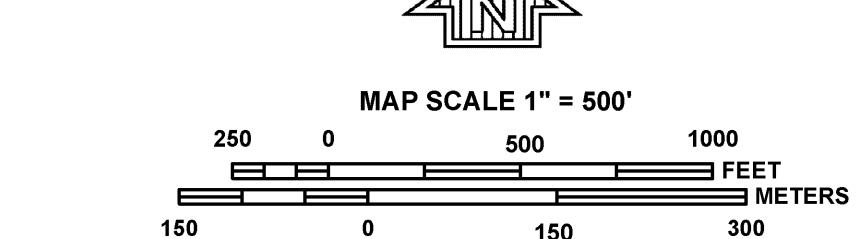
45° 02' 08", 93° 02' 12" Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere

• M1.5 River Mile

EFFECTIVE DATE OF COUNTYWIDE

SEPTEMBER 30, 2005

For community map revision history prior to countywide mapping, refer to the Community



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.



**Federal Emergency Management Agency**

## **APPENDIX B**

### **Hydrology Calculations**

DEVELOPED CONDITION

Runoff Coefficients

|          |                                          |
|----------|------------------------------------------|
| Project: | KT - CASTLE ROCK, CO - PROMENADE PARKWAY |
| Section: | Developed Condition                      |

|             |     |       |          |
|-------------|-----|-------|----------|
| Created by: | MRD | Date: | 5/6/2024 |
| Checked by: | KMH | Date: |          |

NRCS HSG D

| Sub-Basin Data    |                                       |      | Composite C    |                |                 |                  |      | Sub Area (Roof) |                |                 |                  |     |      | Sub Area (Drives/Walks) |                |                 |                  |     |      | Sub Area (Landscape) |                |                 |                  |     |      |
|-------------------|---------------------------------------|------|----------------|----------------|-----------------|------------------|------|-----------------|----------------|-----------------|------------------|-----|------|-------------------------|----------------|-----------------|------------------|-----|------|----------------------|----------------|-----------------|------------------|-----|------|
| Basin ID          | Description                           | Area | C <sub>2</sub> | C <sub>5</sub> | C <sub>10</sub> | C <sub>100</sub> | (%)  | C <sub>2</sub>  | C <sub>5</sub> | C <sub>10</sub> | C <sub>100</sub> | (%) | (ac) | C <sub>2</sub>          | C <sub>5</sub> | C <sub>10</sub> | C <sub>100</sub> | (%) | (ac) | C <sub>2</sub>       | C <sub>5</sub> | C <sub>10</sub> | C <sub>100</sub> | (%) | (ac) |
| Developed Onsite  |                                       |      |                |                |                 |                  |      |                 |                |                 |                  |     |      |                         |                |                 |                  |     |      |                      |                |                 |                  |     |      |
| A-1               | NW Parking and Drive Aisles           | 0.55 | 0.64           | 0.66           | 0.70            | 0.79             | 76.7 | 0.79            | 0.81           | 0.83            | 0.87             | 95  | 0.00 | 0.79                    | 0.81           | 0.83            | 0.87             | 95  | 0.44 | 0.03                 | 0.08           | 0.17            | 0.50             | 5   | 0.11 |
| A-2               | SW Parking and Drive Aisles           | 0.29 | 0.76           | 0.78           | 0.80            | 0.86             | 91.4 | 0.79            | 0.81           | 0.83            | 0.87             | 95  | 0.00 | 0.79                    | 0.81           | 0.83            | 0.87             | 95  | 0.28 | 0.03                 | 0.08           | 0.17            | 0.50             | 5   | 0.01 |
| A-3               | Hotel                                 | 0.30 | 0.79           | 0.81           | 0.83            | 0.87             | 95.0 | 0.79            | 0.81           | 0.83            | 0.87             | 95  | 0.30 | 0.79                    | 0.81           | 0.83            | 0.87             | 95  | 0.00 | 0.03                 | 0.08           | 0.17            | 0.50             | 5   | 0.00 |
| A-4               | NE Parking and Drive Aisles           | 0.50 | 0.63           | 0.66           | 0.69            | 0.79             | 76.3 | 0.79            | 0.81           | 0.83            | 0.87             | 95  | 0.00 | 0.79                    | 0.81           | 0.83            | 0.87             | 95  | 0.40 | 0.03                 | 0.08           | 0.17            | 0.50             | 5   | 0.10 |
| A-5               | SE Parking and Drive Aisles           | 0.25 | 0.69           | 0.72           | 0.75            | 0.82             | 83.5 | 0.79            | 0.81           | 0.83            | 0.87             | 95  | 0.00 | 0.79                    | 0.81           | 0.83            | 0.87             | 95  | 0.21 | 0.03                 | 0.08           | 0.17            | 0.50             | 5   | 0.03 |
| A-6               | Access Drives and Public Improvements | 0.38 | 0.45           | 0.48           | 0.53            | 0.70             | 54.5 | 0.79            | 0.81           | 0.83            | 0.87             | 95  | 0.00 | 0.79                    | 0.81           | 0.83            | 0.87             | 95  | 0.21 | 0.03                 | 0.08           | 0.17            | 0.50             | 5   | 0.17 |
| Onsite Composite  |                                       | 2.26 | 0.65           | 0.67           | 0.71            | 0.80             | 78.0 | 0.79            | 0.81           | 0.83            | 0.87             | 95  | 0.30 | 0.79                    | 0.81           | 0.83            | 0.87             | 95  | 1.53 | 0.03                 | 0.08           | 0.17            | 0.50             | 5   | 0.43 |
| OFF-1             | NW Landscaping                        | 0.04 | 0.03           | 0.08           | 0.17            | 0.50             | 5.0  | 0.79            | 0.81           | 0.83            | 0.87             | 95  | 0.00 | 0.79                    | 0.81           | 0.83            | 0.87             | 95  | 0.00 | 0.03                 | 0.08           | 0.17            | 0.50             | 5   | 0.04 |
| OFF-2             | NE Landscaping                        | 0.04 | 0.03           | 0.08           | 0.17            | 0.50             | 5.0  | 0.79            | 0.81           | 0.83            | 0.87             | 95  | 0.00 | 0.79                    | 0.81           | 0.83            | 0.87             | 95  | 0.00 | 0.03                 | 0.08           | 0.17            | 0.50             | 5   | 0.04 |
| OFF-3             | North of Existing Retaining Wall      | 0.58 | 0.03           | 0.08           | 0.17            | 0.50             | 5.0  | 0.79            | 0.81           | 0.83            | 0.87             | 95  | 0.00 | 0.79                    | 0.81           | 0.83            | 0.87             | 95  | 0.00 | 0.03                 | 0.08           | 0.17            | 0.50             | 5   | 0.58 |
| Offsite Composite |                                       | 0.66 | 0.03           | 0.08           | 0.17            | 0.50             | 5.0  | 0.79            | 0.81           | 0.83            | 0.87             | 95  | 0.00 | 0.79                    | 0.81           | 0.83            | 0.87             | 95  | 0.00 | 0.03                 | 0.08           | 0.17            | 0.50             | 5   | 0.66 |
| Site Composite    |                                       | 2.92 | 0.51           | 0.54           | 0.58            | 0.73             | 61.5 | 0.79            | 0.81           | 0.83            | 0.87             | 95  | 0.30 | 0.79                    | 0.81           | 0.83            | 0.87             | 95  | 1.53 | 0.03                 | 0.08           | 0.17            | 0.50             | 5   | 1.09 |

DEVELOPED CONDITIONS

Time of Concentration

|          |                                          |
|----------|------------------------------------------|
| Project: | KT - CASTLE ROCK, CO - PROMENADE PARKWAY |
| Section: | Developed Condition                      |

|             |     |       |          |
|-------------|-----|-------|----------|
| Created by: | MRD | Date: | 5/6/2024 |
| Checked by: | KMH | Date: |          |

Urban TOC<sub>min</sub> = 5 min  
Rural TOC<sub>min</sub> = 10 min

|                  | SUB-BASIN DATA                        |                |           | INITIAL/OVERLAND FLOW<br>(t <sub>o</sub> ) |                  |                         | TRAVEL TIME<br>(t <sub>i</sub> ) |                           |                      |                                      |                                  |                    |               |                                                           |              | T <sub>c</sub> CHECK<br>(Urbanized basins) |                                        |                                                |      | FINAL T <sub>c</sub><br>(min) |
|------------------|---------------------------------------|----------------|-----------|--------------------------------------------|------------------|-------------------------|----------------------------------|---------------------------|----------------------|--------------------------------------|----------------------------------|--------------------|---------------|-----------------------------------------------------------|--------------|--------------------------------------------|----------------------------------------|------------------------------------------------|------|-------------------------------|
|                  |                                       |                |           |                                            |                  |                         |                                  |                           | Type of Land Surface |                                      |                                  |                    |               |                                                           | TOTAL        |                                            |                                        |                                                |      |                               |
| Basin ID         | Description                           | C <sub>s</sub> | Area (ac) | Length<br>(ft)                             | Slope<br>(ft/ft) | t <sub>o</sub><br>(min) | Length<br>(ft)                   | S <sub>w</sub><br>(ft/ft) | Code                 | Description                          | Convey<br>Coef (C <sub>v</sub> ) | Velocity<br>(ft/s) | Time<br>(min) | t <sub>c</sub> = t <sub>i</sub> + t <sub>o</sub><br>(min) | (Yes<br>/No) | Length<br>(ft)                             | T <sub>c</sub> <sub>max</sub><br>(min) | T <sub>c</sub> <sub>max</sub> > t <sub>c</sub> |      |                               |
| Developed Onsite |                                       |                |           |                                            |                  |                         |                                  |                           |                      |                                      |                                  |                    |               |                                                           |              |                                            |                                        |                                                |      |                               |
| A-1              | NW Parking and Drive Aisles           | 0.66           | 0.55      | 89                                         | 0.05             | 4.39                    | 131                              | 0.01                      | 6                    | Paved areas and shallow paved swales | 20.00                            | 2.00               | 1.09          | 5.48                                                      | YES          | 220.00                                     | 11.22                                  | Regional Tc                                    | 5.48 |                               |
| A-2              | SW Parking and Drive Aisles           | 0.78           | 0.29      | 52                                         | 0.04             | 2.70                    | 152                              | 0.03                      | 6                    | Paved areas and shallow paved swales | 20.00                            | 3.16               | 0.80          | 3.50                                                      | YES          | 204.00                                     | 11.13                                  | Regional Tc                                    | 5.00 |                               |
| A-3              | Woodsprings Suites Hotel              | 0.81           | 0.30      | 100                                        | 0.02             | 4.17                    | 0                                | 0.02                      | 6                    | Paved areas and shallow paved swales | 20.00                            | 2.83               | 0.00          | 4.17                                                      | YES          | 100.00                                     | 10.56                                  | Regional Tc                                    | 5.00 |                               |
| A-4              | NE Parking and Drive Aisles           | 0.66           | 0.50      | 87                                         | 0.05             | 4.37                    | 145                              | 0.01                      | 6                    | Paved areas and shallow paved swales | 20.00                            | 1.41               | 1.71          | 6.08                                                      | YES          | 232.00                                     | 11.29                                  | Regional Tc                                    | 6.08 |                               |
| A-5              | SE Parking and Drive Aisles           | 0.72           | 0.25      | 45                                         | 0.04             | 2.94                    | 120                              | 0.02                      | 6                    | Paved areas and shallow paved swales | 20.00                            | 2.45               | 0.82          | 3.76                                                      | YES          | 165.00                                     | 10.92                                  | Regional Tc                                    | 5.00 |                               |
| A-6              | Access Drives and Public Improvements | 0.48           | 0.38      | 46                                         | 0.04             | 5.01                    | 245                              | 0.01                      | 6                    | Paved areas and shallow paved swales | 20.00                            | 1.55               | 2.64          | 7.64                                                      | YES          | 291.00                                     | 11.62                                  | Regional Tc                                    | 7.64 |                               |
| OFF-1            | NW Landscaping                        | 0.08           | 0.04      | 15                                         | 0.33             | 2.25                    | 0                                | 0.01                      | 3                    | Short pasture and lawns              | 7.00                             | 0.49               | 0.00          | 2.25                                                      | YES          | 15.00                                      | 0.08                                   | Regional Tc                                    | 5.00 |                               |
| OFF-2            | NE Landscaping                        | 0.08           | 0.04      | 15                                         | 0.33             | 2.25                    | 0                                | 0.01                      | 3                    | Short pasture and lawns              | 7.00                             | 0.70               | 0.00          | 2.25                                                      | YES          | 15.00                                      | 0.08                                   | Regional Tc                                    | 5.00 |                               |
| OFF-3            | North of Existing Retaining Wall      | 0.08           | 0.58      | 60                                         | 0.33             | 4.50                    | 325                              | 0.04                      | 5                    | Grassed waterway                     | 15.00                            | 3.11               | 1.74          | 6.24                                                      | YES          | 385.00                                     | 2.14                                   | Regional Tc                                    | 6.24 |                               |

Notes:  
t<sub>i</sub>= (0.395\*(1.1-C<sub>s</sub>)\*(L^0.5)))/(S^0.33), from UDFCD Eqn 6-3  
Velocity from V = C<sub>v</sub>\*S<sub>w</sub>^0.5, from UDFCD Eqn 6-4, C<sub>v</sub> from Table 6-2(See Sheet Design Info)  
t<sub>i</sub>=L/60V  
t<sub>i</sub> max = 10+L/180  
Final Tc > 10 min for nonurban watersheds

| UDFCD Table 6-2. NRCS Conveyance factors, K |                                      |                      |
|---------------------------------------------|--------------------------------------|----------------------|
| Code                                        | Type of Land Surface                 | Conveyance Factor, K |
| 1                                           | Heavy meadow                         | 2.5                  |
| 2                                           | Tillage/field                        | 5                    |
| 3                                           | Short pasture and lawns              | 7                    |
| 4                                           | Nearly bare ground                   | 10                   |
| 5                                           | Grassed waterway                     | 15                   |
| 6                                           | Paved areas and shallow paved swales | 20                   |

DEVELOPED CONDITIONS

Storm Drainage System Design (Rational Method Procedure)

Project:KT - CASTLE ROCK, CO - PROMENADE PARKWAY

Section:Developed Condition

Created by:MRD

Checked by:KMH

Date:5/6/2024

Date:

5 YEAR MINOR STORM

Design Storm:5-yr

P =1.43

in

| LOCATION |                 | DESIGN POINT                          | DIRECT RUNOFF            |           |                        |                         |              |              |            | TOTAL RUNOFF            |                   |                |            | STREET       |                      | PIPE                 |              |                   | TRAVEL TIME    |                   |                         | REMARKS   |
|----------|-----------------|---------------------------------------|--------------------------|-----------|------------------------|-------------------------|--------------|--------------|------------|-------------------------|-------------------|----------------|------------|--------------|----------------------|----------------------|--------------|-------------------|----------------|-------------------|-------------------------|-----------|
|          |                 |                                       | AREA<br>DESIGN<br>(name) | AREA (AC) | RUNOFF<br>COEFF (5 Yr) | t <sub>c</sub><br>(MIN) | C.A.<br>(AC) | I<br>IN / HR | Q<br>(CFS) | t <sub>c</sub><br>(MIN) | SUM (C*A)<br>(AC) | I<br>(IN / HR) | Q<br>(CFS) | SLOPE<br>(%) | STREET<br>FLOW (CFS) | DESIGN<br>FLOW (CFS) | SLOPE<br>(%) | PIPE<br>SIZE (ft) | LENGTH<br>(FT) | VELOCITY<br>(FPS) | t <sub>t</sub><br>(MIN) |           |
| DP       | (1)             | (2)                                   | (3)                      | (4)       | (5)                    | (6)                     | (7)          | (8)          | (9)        | (10)                    | (11)              | (12)           | (13)       | (14)         | (15)                 | (16)                 | (17)         | (18)              | (19)           |                   | (21)                    | (22)      |
|          | OFF-1           | NW Landscaping                        | OFF-1                    | 0.04      | 0.08                   | 5.00                    | 0.00         | 4.85         | 0.01       |                         |                   |                |            |              |                      |                      |              |                   |                |                   |                         |           |
|          | A-1             | NW Parking and Drive Aisles           | A-1                      | 0.55      | 0.66                   | 5.48                    | 0.36         | 4.73         | 1.72       |                         |                   |                |            |              |                      |                      |              |                   |                |                   |                         |           |
| 1        | OFF-1+A-1       |                                       |                          |           |                        |                         |              |              |            | 5.48                    | 0.37              | 4.73           | 1.73       |              |                      |                      |              |                   |                |                   |                         | INLET A-1 |
|          | A-2             | SW Parking and Drive Aisles           | A-2                      | 0.29      | 0.78                   | 5.00                    | 0.23         | 4.85         | 1.11       |                         |                   |                |            |              |                      |                      |              |                   |                |                   |                         |           |
| 2        | A-2 + DP2       |                                       |                          |           |                        |                         |              |              |            | 5.48                    | 0.59              | 4.73           | 2.81       |              |                      |                      |              |                   |                |                   |                         | INLET A-2 |
|          | A-4             | NE Parking and Drive Aisles           | A-4                      | 0.50      | 0.66                   | 6.08                    | 0.33         | 4.59         | 1.51       |                         |                   |                |            |              |                      |                      |              |                   |                |                   |                         |           |
|          | OFF-2           | NE Landscaping                        | OFF-2                    | 0.04      | 0.08                   | 5.00                    | 0.00         | 4.85         | 0.02       |                         |                   |                |            |              |                      |                      |              |                   |                |                   |                         |           |
| 3        | A-4 + OFF-2     |                                       |                          |           |                        |                         |              |              |            | 6.08                    | 0.33              | 4.59           | 1.52       |              |                      |                      |              |                   |                |                   |                         | INLET A-4 |
|          | A-5             | SE Parking and Drive Aisles           | A-5                      | 0.25      | 0.72                   | 5.00                    | 0.18         | 4.85         | 0.85       |                         |                   |                |            |              |                      |                      |              |                   |                |                   |                         |           |
| 4        | A-5+DP3         |                                       |                          |           |                        |                         |              |              |            | 6.08                    | 0.51              | 4.59           | 2.33       |              |                      |                      |              |                   |                |                   |                         | INLET A-5 |
|          | A-3             | Hotel                                 | A-3                      | 0.30      | 0.81                   | 5.00                    | 0.24         | 4.85         | 1.18       |                         |                   |                |            |              |                      |                      |              |                   |                |                   |                         |           |
| 5        | A-3 + DP2 + DP4 |                                       |                          |           |                        |                         |              |              |            | 6.08                    | 1.34              | 4.59           | 6.18       |              |                      |                      |              |                   |                |                   |                         | MH-1      |
|          | A-6             | Access Drives and Public Improvements | A-6                      | 0.38      | 0.48                   | 7.64                    | 0.18         | 4.27         | 0.77       |                         |                   |                |            |              |                      |                      |              |                   |                |                   |                         |           |
| 6        | A-6 + DP5       |                                       |                          |           |                        |                         |              |              |            | 7.64                    | 1.53              | 4.27           | 6.51       |              |                      |                      |              |                   |                |                   |                         |           |
|          | OFF-3           | North of Existing Retaining Wall      | OFF-3                    | 0.58      | 0.08                   | 6.24                    | 0.05         | 4.56         | 0.21       |                         |                   |                |            |              |                      |                      |              |                   |                |                   |                         |           |
| 7        | OFF-3           |                                       |                          |           |                        |                         |              |              |            | 6.24                    | 0.05              | 4.56           | 0.21       |              |                      |                      |              |                   |                |                   |                         |           |

- (1) Enter the Basin Name from C Value Sheet

(2) Basin Description linked to C-Value Sheet

(3) Enter the Basin Name from C Value Sheet

(4) Basin Area linked to C-Value Sheet

(5) Composite C linked to C-Value Sheet

(6) Time of Concentration linked to C-Value Sheet
- (7) =Column 4 x Column 5

(8) =28.5\*P/(10+Column 6)^0.786

(9) =Column 7 x Column 8

(10) =Column 6 x Column 21

(11) Add the Basin Areas (7) to get the combined basin AC

(12) =28.5\*P/(10+Column 10)^0.786
- (13) Sum of Qs

(14) Additional Street Overland Flow

(15) Additional Street Overland Flow

(16) Additional Pipe Flow

(17) Additional Pipe Flow

(18) Additional Pipe Flow
- (19) Additional Flow Length

(20) Overland Velocity

(21) =Column 16 / Column 20 / 60

DEVELOPED CONDITIONS

Storm Drainage System Design (Rational Method Procedure)

|          |                                          |
|----------|------------------------------------------|
| Project: | KT - CASTLE ROCK, CO - PROMENADE PARKWAY |
| Section: | Developed Condition                      |

|             |     |       |          |
|-------------|-----|-------|----------|
| Created by: | MRD | Date: | 5/6/2024 |
| Checked by: | KMH | Date: |          |

100 YEAR MAJOR STORM

Design Storm: 100-yr P = 2.60 in

| LOCATION |                 | DESIGN POINT                          | DIRECT RUNOFF            |           |                          |                         |              |              |            | TOTAL RUNOFF            |                   |                |            | STREET       |                      | PIPE                 |              |                   | TRAVEL TIME    |                   |                         |
|----------|-----------------|---------------------------------------|--------------------------|-----------|--------------------------|-------------------------|--------------|--------------|------------|-------------------------|-------------------|----------------|------------|--------------|----------------------|----------------------|--------------|-------------------|----------------|-------------------|-------------------------|
|          |                 |                                       | AREA<br>DESIGN<br>(name) | AREA (AC) | RUNOFF<br>COEFF (100 Yr) | t <sub>c</sub><br>(MIN) | C.A.<br>(AC) | I<br>IN / HR | Q<br>(CFS) | t <sub>c</sub><br>(MIN) | SUM (C*A)<br>(AC) | I<br>(IN / HR) | Q<br>(CFS) | SLOPE<br>(%) | STREET<br>FLOW (CFS) | DESIGN<br>FLOW (CFS) | SLOPE<br>(%) | PIPE<br>SIZE (in) | LENGTH<br>(FT) | VELOCITY<br>(FPS) | t <sub>t</sub><br>(MIN) |
| DP       | (1)             | (2)                                   | (3)                      | (4)       | (5)                      | (6)                     | (7)          | (8)          | (9)        | (10)                    | (11)              | (12)           | (13)       | (14)         | (15)                 | (16)                 | (17)         | (18)              | (19)           |                   | (21)                    |
|          | OFF-1           | NW Landscaping                        | OFF-1                    | 0.04      | 0.50                     | 5.00                    | 0.02         | 8.82         | 0.17       |                         |                   |                |            |              |                      |                      |              |                   |                |                   |                         |
|          | A-1             | NW Parking and Drive Aisles           | A-1                      | 0.55      | 0.79                     | 5.48                    | 0.44         | 8.60         | 3.75       |                         |                   |                |            |              |                      |                      |              |                   |                |                   |                         |
| 1        | OFF-1 + A-1     |                                       |                          |           |                          |                         |              |              |            | 5.48                    | 0.45              | 8.60           | 3.91       |              |                      |                      |              |                   |                |                   |                         |
|          | A-2             | SW Parking and Drive Aisles           | A-2                      | 0.29      | 0.86                     | 5.00                    | 0.25         | 8.82         | 2.21       |                         |                   |                |            |              |                      |                      |              |                   |                |                   |                         |
| 2        | A-2 + DP1       |                                       |                          |           |                          |                         |              |              |            | 5.48                    | 0.70              | 8.60           | 6.06       |              |                      |                      |              |                   |                |                   |                         |
|          | A-4             | NE Parking and Drive Aisles           | A-4                      | 0.50      | 0.79                     | 6.08                    | 0.40         | 8.35         | 3.31       |                         |                   |                |            |              |                      |                      |              |                   |                |                   |                         |
|          | OFF-2           | NE Landscaping                        | OFF-2                    | 0.04      | 0.50                     | 5.00                    | 0.02         | 8.82         | 0.18       |                         |                   |                |            |              |                      |                      |              |                   |                |                   |                         |
| 3        | A-4 + OFF-2     |                                       |                          |           |                          |                         |              |              |            | 6.08                    | 0.42              | 8.35           | 3.47       |              |                      |                      |              |                   |                |                   |                         |
|          | A-5             | SE Parking and Drive Aisles           | A-5                      | 0.25      | 0.82                     | 5.00                    | 0.20         | 8.82         | 1.78       |                         |                   |                |            |              |                      |                      |              |                   |                |                   |                         |
| 4        | A-5+DP3         |                                       |                          |           |                          |                         |              |              |            | 6.08                    | 0.62              | 8.35           | 5.16       |              |                      |                      |              |                   |                |                   |                         |
|          | A-3             | Hotel                                 | A-3                      | 0.30      | 0.87                     | 5.00                    | 0.26         | 8.82         | 2.30       |                         |                   |                |            |              |                      |                      |              |                   |                |                   |                         |
| 5        | A-3 + DP2 + DP4 |                                       |                          |           |                          |                         |              |              |            | 6.08                    | 1.58              | 8.35           | 13.22      |              |                      |                      |              |                   |                |                   |                         |
|          | A-6             | Access Drives and Public Improvements | A-6                      | 0.38      | 0.70                     | 7.64                    | 0.26         | 7.76         | 2.05       |                         |                   |                |            |              |                      |                      |              |                   |                |                   |                         |
| 6        | A-6 + DP5       |                                       |                          |           |                          |                         |              |              |            | 7.64                    | 1.85              | 7.76           | 14.34      |              |                      |                      |              |                   |                |                   |                         |
|          | OFF-3           | North of Existing Retaining Wall      | OFF-3                    | 0.58      | 0.17                     | 6.24                    | 0.10         | 8.28         | 0.82       |                         |                   |                |            |              |                      |                      |              |                   |                |                   |                         |
| 7        | OFF-3           |                                       |                          |           |                          |                         |              |              |            | 6.24                    | 0.10              | 8.28           | 0.82       |              |                      |                      |              |                   |                |                   |                         |

- (1) Enter the Basin Name from C Value Sheet
- (2) Basin Description linked to C-Value Sheet
- (3) Enter the Basin Name from C Value Sheet
- (4) Basin Area linked to C-Value Sheet
- (5) Composite C linked to C-Value Sheet
- (6) Time of Concentration linked to C-Value Sheet

- (7) =Column 4 x Column 5
- (8) =28.5\*P/(10+Column 6)^0.786
- (9) =Column 7 x Column 8
- (10) =Column 6 x Column 21
- (11) Add the Basin Areas (7) to get the combined basin AC
- (12) =28.5\*P/(10+Column 10)^0.786

- (13) Sum of Qs
- (14) Additonal Street Overland Flow
- (15) Additonal Street Overland Flow
- (16) Additonal Pipe Flow
- (17) Additonal Pipe Flow
- (18) Additonal Pipe Flow

- (19) Additional Flow Length
- (20) Overland Velocity
- (21) =Column 16 / Column 20 / 60

## **APPENDIX C**

### **Hydraulic Calculations**

**INLET MANAGEMENT**

Worksheet Protected

| INLET NAME                         | <a href="#">INLET A-1</a> | <a href="#">INLET A-2</a> | <a href="#">INLET A-4</a> |
|------------------------------------|---------------------------|---------------------------|---------------------------|
| Site Type (Urban or Rural)         |                           |                           |                           |
| Inlet Application (Street or Area) | STREET                    | STREET                    | STREET                    |
| Hydraulic Condition                | In Sump                   | In Sump                   | In Sump                   |
| Inlet Type                         | CDOT Type R Curb Opening  | CDOT Type R Curb Opening  | CDOT Type R Curb Opening  |

**USER-DEFINED INPUT****User-Defined Design Flows**

|                         |     |     |     |
|-------------------------|-----|-----|-----|
| Minor $Q_{Known}$ (cfs) | 1.7 | 1.1 | 1.5 |
| Major $Q_{Known}$ (cfs) | 3.9 | 2.2 | 3.5 |

**Bypass (Carry-Over) Flow from Upstream** [Inlets must be organized from upstream \(left\) to downstream \(right\) in order for bypass flows to be linked.](#)

|                                         |                         |                         |                         |
|-----------------------------------------|-------------------------|-------------------------|-------------------------|
| 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>1.7</b> | <b>1.1</b> | <b>1.5</b> |
| <b>Major Total Design Peak Flow, <math>Q</math> (cfs)</b> | <b>3.9</b> | <b>2.2</b> | <b>3.5</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        |

**INLET MANAGEMENT**

Worksheet Protected

|                                    |                           |
|------------------------------------|---------------------------|
| <b>INLET NAME</b>                  | <a href="#">INLET A-5</a> |
| Site Type (Urban or Rural)         |                           |
| Inlet Application (Street or Area) | STREET                    |
| Hydraulic Condition                | In Sump                   |
| Inlet Type                         | CDOT Type R Curb Opening  |

**USER-DEFINED INPUT****User-Defined Design Flows**

|                                |     |
|--------------------------------|-----|
| Minor $Q_{\text{known}}$ (cfs) | 2.3 |
| Major $Q_{\text{known}}$ (cfs) | 5.2 |

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

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

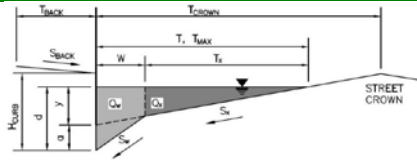
|                                                           |            |
|-----------------------------------------------------------|------------|
| <b>Minor Total Design Peak Flow, <math>Q</math> (cfs)</b> | <b>2.3</b> |
| <b>Major Total Design Peak Flow, <math>Q</math> (cfs)</b> | <b>5.2</b> |
| Minor Flow Bypassed Downstream, $Q_b$ (cfs)               | N/A        |
| Major Flow Bypassed Downstream, $Q_b$ (cfs)               | N/A        |

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

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

Project: Woodspring Suites at Promenade

Inlet ID: INLET A-1

**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)

Max. Allowable Spread for Minor &amp; Major Storm

Max. Allowable Depth at Gutter Flowline for Minor &amp; Major Storm

Check boxes are not applicable in SUMP conditions

MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

|            |   |       |       |
|------------|---|-------|-------|
| $T_{BACK}$ | = | 10.0  | ft    |
| $S_{BACK}$ | = | 0.100 | ft/ft |
| $n_{BACK}$ | = | 0.020 |       |

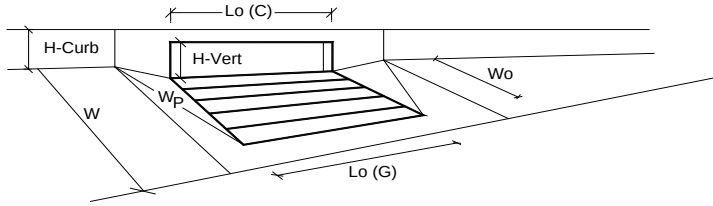
|              |   |       |        |
|--------------|---|-------|--------|
| $H_{CURB}$   | = | 6.00  | inches |
| $T_{CROWN}$  | = | 18.0  | ft     |
| $W$          | = | 2.00  | ft     |
| $S_X$        | = | 0.030 | ft/ft  |
| $S_W$        | = | 0.083 | ft/ft  |
| $S_D$        | = | 0.000 | ft/ft  |
| $n_{STREET}$ | = | 0.012 |        |

|           | Minor Storm              | Major Storm              |        |
|-----------|--------------------------|--------------------------|--------|
| $T_{MAX}$ | 10.0                     | 18.0                     | ft     |
| $d_{MAX}$ | 6.0                      | 6.0                      | inches |
|           | <input type="checkbox"/> | <input type="checkbox"/> |        |

|             | Minor Storm | Major Storm |     |
|-------------|-------------|-------------|-----|
| $Q_{allow}$ | SUMP        | SUMP        | cfs |

# INLET IN A SUMP OR SAG LOCATION

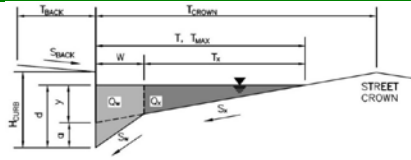
MHFD-Inlet, Version 5.03 (August 2023)



| Design Information (Input)                                                   |                          | MINOR                 |                          | MAJOR |                                          |
|------------------------------------------------------------------------------|--------------------------|-----------------------|--------------------------|-------|------------------------------------------|
| Type of Inlet                                                                | CDOT Type R Curb Opening | Type =                | CDOT Type R Curb Opening |       |                                          |
| Local Depression (additional to continuous gutter depression 'a' from above) |                          | $a_{local}$ =         | 3.00                     | 3.00  | inches                                   |
| Number of Unit Inlets (Grate or Curb Opening)                                |                          | No =                  | 1                        | 1     |                                          |
| Water Depth at Flowline (outside of local depression)                        |                          | Ponding Depth =       | 4.9                      | 6.0   | inches                                   |
| <u>Grate Information</u>                                                     |                          |                       | MINOR                    | MAJOR | <input type="checkbox"/> Override Depths |
| Length of a Unit Grate                                                       |                          | $L_o$ (G) =           | N/A                      | N/A   | feet                                     |
| Width of a Unit Grate                                                        |                          | $W_o$ =               | N/A                      | N/A   | feet                                     |
| Open Area Ratio for a Grate (typical values 0.15-0.90)                       |                          | $A_{ratio}$ =         | N/A                      | N/A   |                                          |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70)               |                          | $C_i$ (G) =           | N/A                      | N/A   |                                          |
| Grate Weir Coefficient (typical value 2.15 - 3.60)                           |                          | $C_w$ (G) =           | N/A                      | N/A   |                                          |
| Grate Orifice Coefficient (typical value 0.60 - 0.80)                        |                          | $C_o$ (G) =           | N/A                      | N/A   |                                          |
| <u>Curb Opening Information</u>                                              |                          |                       | MINOR                    | MAJOR |                                          |
| Length of a Unit Curb Opening                                                |                          | $L_o$ (C) =           | 5.00                     | 5.00  | feet                                     |
| Height of Vertical Curb Opening in Inches                                    |                          | $H_{vert}$ =          | 6.00                     | 6.00  | inches                                   |
| Height of Curb Orifice Throat in Inches                                      |                          | $H_{throat}$ =        | 6.00                     | 6.00  | inches                                   |
| Angle of Throat                                                              |                          | Theta =               | 63.40                    | 63.40 | degrees                                  |
| Side Width for Depression Pan (typically the gutter width of 2 feet)         |                          | $W_p$ =               | 2.00                     | 2.00  | feet                                     |
| Clogging Factor for a Single Curb Opening (typical value 0.10)               |                          | $C_i$ (C) =           | 0.10                     | 0.10  |                                          |
| Curb Opening Weir Coefficient (typical value 2.3-3.7)                        |                          | $C_w$ (C) =           | 3.60                     | 3.60  |                                          |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)                 |                          | $C_o$ (C) =           | 0.67                     | 0.67  |                                          |
| <u>Low Head Performance Reduction (Calculated)</u>                           |                          |                       | MINOR                    | MAJOR |                                          |
| Depth for Grate Midwidth                                                     |                          | $d_{Grate}$ =         | N/A                      | N/A   | ft                                       |
| Depth for Curb Opening Weir Equation                                         |                          | $d_{Curb}$ =          | 0.24                     | 0.33  | ft                                       |
| Grated Inlet Performance Reduction Factor for Long Inlets                    |                          | $RF_{Grate}$ =        | N/A                      | N/A   |                                          |
| Curb Opening Performance Reduction Factor for Long Inlets                    |                          | $RF_{Curb}$ =         | 1.00                     | 1.00  |                                          |
| Combination Inlet Performance Reduction Factor for Long Inlets               |                          | $RF_{combination}$ =  | N/A                      | N/A   |                                          |
| Total Inlet Interception Capacity (assumes clogged condition)                |                          | $Q_a$ =               | 3.3                      | 5.4   | cfs                                      |
| <b>Inlet Capacity IS GOOD for Minor and Major Storms (&gt;Q Peak)</b>        |                          | $Q_{PEAK REQUIRED}$ = | 1.7                      | 3.9   | cfs                                      |

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

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

Project: **Woodspring Suites at Promenade**Inlet ID: **INLET A-2****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)

$T_{BACK} = 0.0$  ft  
 $S_{BACK} =$  ft/ft  
 $n_{BACK} =$

$H_{CURB} = 6.00$  inches  
 $T_{CROWN} = 26.0$  ft  
 $W = 2.00$  ft  
 $S_x = 0.020$  ft/ft  
 $S_y = 0.083$  ft/ft  
 $S_o = 0.000$  ft/ft  
 $n_{STREET} = 0.012$

Max. Allowable Spread for Minor &amp; Major Storm

Max. Allowable Depth at Gutter Flowline for Minor &amp; Major Storm

Check boxes are not applicable in SUMP conditions

|             | Minor Storm | Major Storm |        |
|-------------|-------------|-------------|--------|
| $T_{MAX} =$ | 10.0        | 20.0        | ft     |
| $d_{MAX} =$ | 6.0         | 6.0         | inches |

☐ ☐

MINOR STORM Allowable Capacity is not applicable to Sump Condition

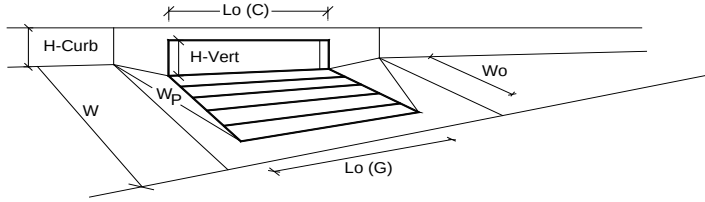
MAJOR STORM Allowable Capacity is not applicable to Sump Condition

$Q_{allow} =$

| Minor Storm | Major Storm |     |
|-------------|-------------|-----|
| SUMP        | SUMP        | cfs |

# INLET IN A SUMP OR SAG LOCATION

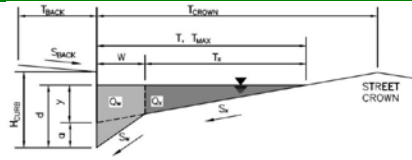
MHFD-Inlet, Version 5.03 (August 2023)



| Design Information (Input)                                                   |                          | MINOR                 |                          | MAJOR |         |
|------------------------------------------------------------------------------|--------------------------|-----------------------|--------------------------|-------|---------|
| Type of Inlet                                                                | CDOT Type R Curb Opening | Type =                | CDOT Type R Curb Opening |       |         |
| Local Depression (additional to continuous gutter depression 'a' from above) |                          | $a_{local}$ =         | 3.00                     | 3.00  | inches  |
| Number of Unit Inlets (Grate or Curb Opening)                                |                          | No =                  | 1                        | 1     |         |
| Water Depth at Flowline (outside of local depression)                        |                          | Ponding Depth =       | 3.9                      | 6.0   | inches  |
| <b>Grate Information</b>                                                     |                          | MINOR                 |                          | MAJOR |         |
| Length of a Unit Grate                                                       |                          | $L_o$ (G) =           | N/A                      | N/A   | feet    |
| Width of a Unit Grate                                                        |                          | $W_o$ =               | N/A                      | N/A   | feet    |
| Open Area Ratio for a Grate (typical values 0.15-0.90)                       |                          | $A_{ratio}$ =         | N/A                      | N/A   |         |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70)               |                          | $C_1$ (G) =           | N/A                      | N/A   |         |
| Grate Weir Coefficient (typical value 2.15 - 3.60)                           |                          | $C_w$ (G) =           | N/A                      | N/A   |         |
| Grate Orifice Coefficient (typical value 0.60 - 0.80)                        |                          | $C_o$ (G) =           | N/A                      | N/A   |         |
| <b>Curb Opening Information</b>                                              |                          | MINOR                 |                          | MAJOR |         |
| Length of a Unit Curb Opening                                                |                          | $L_o$ (C) =           | 5.00                     | 5.00  | feet    |
| Height of Vertical Opening in Inches                                         |                          | $H_{vert}$ =          | 6.00                     | 6.00  | inches  |
| Height of Curb Orifice Throat in Inches                                      |                          | $H_{throat}$ =        | 6.00                     | 6.00  | inches  |
| Angle of Throat                                                              |                          | Theta =               | 63.40                    | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet)         |                          | $W_o$ =               | 2.00                     | 2.00  | feet    |
| Clogging Factor for a Single Curb Opening (typical value 0.10)               |                          | $C_1$ (C) =           | 0.10                     | 0.10  |         |
| Curb Opening Weir Coefficient (typical value 2.3-3.7)                        |                          | $C_w$ (C) =           | 3.60                     | 3.60  |         |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)                 |                          | $C_o$ (C) =           | 0.67                     | 0.67  |         |
| <b>Low Head Performance Reduction (Calculated)</b>                           |                          | MINOR                 |                          | MAJOR |         |
| Depth for Grate Midwidth                                                     |                          | $d_{grate}$ =         | N/A                      | N/A   | ft      |
| Depth for Curb Opening Weir Equation                                         |                          | $d_{curb}$ =          | 0.16                     | 0.33  | ft      |
| Grated Inlet Performance Reduction Factor for Long Inlets                    |                          | $RF_{grate}$ =        | N/A                      | N/A   |         |
| Curb Opening Performance Reduction Factor for Long Inlets                    |                          | $RF_{curb}$ =         | 1.00                     | 1.00  |         |
| Combination Inlet Performance Reduction Factor for Long Inlets               |                          | $RF_{combination}$ =  | N/A                      | N/A   |         |
| Total Inlet Interception Capacity (assumes clogged condition)                |                          | MINOR                 |                          | MAJOR |         |
|                                                                              |                          | $Q_a$ =               | 1.8                      | 5.4   | cfs     |
| <b>Inlet Capacity IS GOOD for Minor and Major Storms (&gt;Q Peak)</b>        |                          | $Q_{PEAK REQUIRED}$ = | 1.1                      | 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: **Woodspring Suites at Promenade**Inlet ID: **INLET A-4****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)

$$\begin{aligned} T_{\text{BACK}} &= 10.0 \text{ ft} \\ S_{\text{BACK}} &= 0.100 \text{ ft/ft} \\ n_{\text{BACK}} &= 0.020 \end{aligned}$$

$$\begin{aligned} H_{\text{CURB}} &= 6.00 \text{ inches} \\ T_{\text{CROWN}} &= 26.0 \text{ ft} \\ W &= 2.00 \text{ ft} \\ S_x &= 0.030 \text{ ft/ft} \\ S_y &= 0.083 \text{ ft/ft} \\ S_o &= 0.000 \text{ ft/ft} \\ n_{\text{STREET}} &= 0.012 \end{aligned}$$

Max. Allowable Spread for Minor &amp; Major Storm

Max. Allowable Depth at Gutter Flowline for Minor &amp; Major Storm

Check boxes are not applicable in SUMP conditions

|                  | Minor Storm | Major Storm |        |
|------------------|-------------|-------------|--------|
| $T_{\text{MAX}}$ | 10.0        | 20.0        | ft     |
| $d_{\text{MAX}}$ | 6.0         | 6.0         | inches |

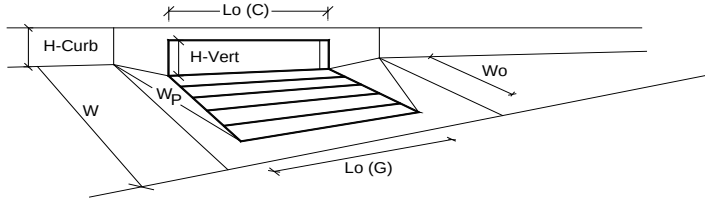
MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

|                    | Minor Storm | Major Storm |     |
|--------------------|-------------|-------------|-----|
| $Q_{\text{allow}}$ | SUMP        | SUMP        | cfs |

# INLET IN A SUMP OR SAG LOCATION

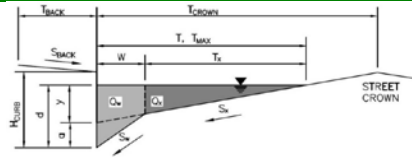
MHFD-Inlet, Version 5.03 (August 2023)



| Design Information (Input)                                                   |                          | MINOR                 |                          | MAJOR |         |
|------------------------------------------------------------------------------|--------------------------|-----------------------|--------------------------|-------|---------|
| Type of Inlet                                                                | CDOT Type R Curb Opening | Type =                | CDOT Type R Curb Opening |       |         |
| Local Depression (additional to continuous gutter depression 'a' from above) |                          | $a_{local}$ =         | 3.00                     | 3.00  | inches  |
| Number of Unit Inlets (Grate or Curb Opening)                                |                          | No =                  | 1                        | 1     |         |
| Water Depth at Flowline (outside of local depression)                        |                          | Ponding Depth =       | 4.9                      | 6.0   | inches  |
| <b>Grate Information</b>                                                     |                          | MINOR                 |                          | MAJOR |         |
| Length of a Unit Grate                                                       |                          | $L_o$ (G) =           | N/A                      | N/A   | feet    |
| Width of a Unit Grate                                                        |                          | $W_o$ =               | N/A                      | N/A   | feet    |
| Open Area Ratio for a Grate (typical values 0.15-0.90)                       |                          | $A_{ratio}$ =         | N/A                      | N/A   |         |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70)               |                          | $C_l$ (G) =           | N/A                      | N/A   |         |
| Grate Weir Coefficient (typical value 2.15 - 3.60)                           |                          | $C_w$ (G) =           | N/A                      | N/A   |         |
| Grate Orifice Coefficient (typical value 0.60 - 0.80)                        |                          | $C_o$ (G) =           | N/A                      | N/A   |         |
| <b>Curb Opening Information</b>                                              |                          | MINOR                 |                          | MAJOR |         |
| Length of a Unit Curb Opening                                                |                          | $L_o$ (C) =           | 5.00                     | 5.00  | feet    |
| Height of Vertical Opening in Inches                                         |                          | $H_{vert}$ =          | 6.00                     | 6.00  | inches  |
| Height of Curb Orifice Throat in Inches                                      |                          | $H_{throat}$ =        | 6.00                     | 6.00  | inches  |
| Angle of Throat                                                              |                          | Theta =               | 63.40                    | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet)         |                          | $W_o$ =               | 2.00                     | 2.00  | feet    |
| Clogging Factor for a Single Curb Opening (typical value 0.10)               |                          | $C_l$ (C) =           | 0.10                     | 0.10  |         |
| Curb Opening Weir Coefficient (typical value 2.3-3.7)                        |                          | $C_w$ (C) =           | 3.60                     | 3.60  |         |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)                 |                          | $C_o$ (C) =           | 0.67                     | 0.67  |         |
| <b>Low Head Performance Reduction (Calculated)</b>                           |                          | MINOR                 |                          | MAJOR |         |
| Depth for Grate Midwidth                                                     |                          | $d_{grate}$ =         | N/A                      | N/A   | ft      |
| Depth for Curb Opening Weir Equation                                         |                          | $d_{curb}$ =          | 0.24                     | 0.33  | ft      |
| Grated Inlet Performance Reduction Factor for Long Inlets                    |                          | $RF_{grate}$ =        | N/A                      | N/A   |         |
| Curb Opening Performance Reduction Factor for Long Inlets                    |                          | $RF_{curb}$ =         | 1.00                     | 1.00  |         |
| Combination Inlet Performance Reduction Factor for Long Inlets               |                          | $RF_{combination}$ =  | N/A                      | N/A   |         |
| Total Inlet Interception Capacity (assumes clogged condition)                |                          | MINOR                 |                          | MAJOR |         |
| Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)                  |                          | $Q_a$ =               | 3.3                      | 5.4   | cfs     |
|                                                                              |                          | $Q_{PEAK REQUIRED}$ = | 1.5                      | 3.5   | cfs     |

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

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

Project: **Woodspring Suites at Promenade**Inlet ID: **INLET A-5****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)

|            |   |       |       |
|------------|---|-------|-------|
| $T_{BACK}$ | = | 15.0  | ft    |
| $S_{BACK}$ | = | 0.100 | ft/ft |
| $n_{BACK}$ | = | 0.020 |       |

|              |   |       |        |
|--------------|---|-------|--------|
| $H_{CURB}$   | = | 6.00  | inches |
| $T_{CROWN}$  | = | 26.0  | ft     |
| $W$          | = | 2.00  | ft     |
| $S_X$        | = | 0.045 | ft/ft  |
| $S_W$        | = | 0.083 | ft/ft  |
| $S_0$        | = | 0.000 | ft/ft  |
| $n_{STREET}$ | = | 0.020 |        |

Max. Allowable Spread for Minor &amp; Major Storm

Max. Allowable Depth at Gutter Flowline for Minor &amp; Major Storm

Check boxes are not applicable in SUMP conditions

|           | Minor Storm | Major Storm |        |
|-----------|-------------|-------------|--------|
| $T_{MAX}$ | 10.0        | 20.0        | ft     |
| $d_{MAX}$ | 6.0         | 6.0         | inches |

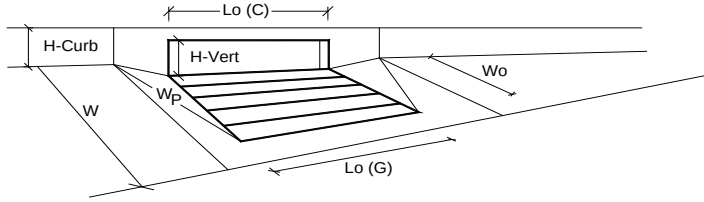
MINOR STORM Allowable Capacity is not applicable to Sump Condition

MAJOR STORM Allowable Capacity is not applicable to Sump Condition

|             | Minor Storm | Major Storm |     |
|-------------|-------------|-------------|-----|
| $Q_{allow}$ | SUMP        | SUMP        | cfs |

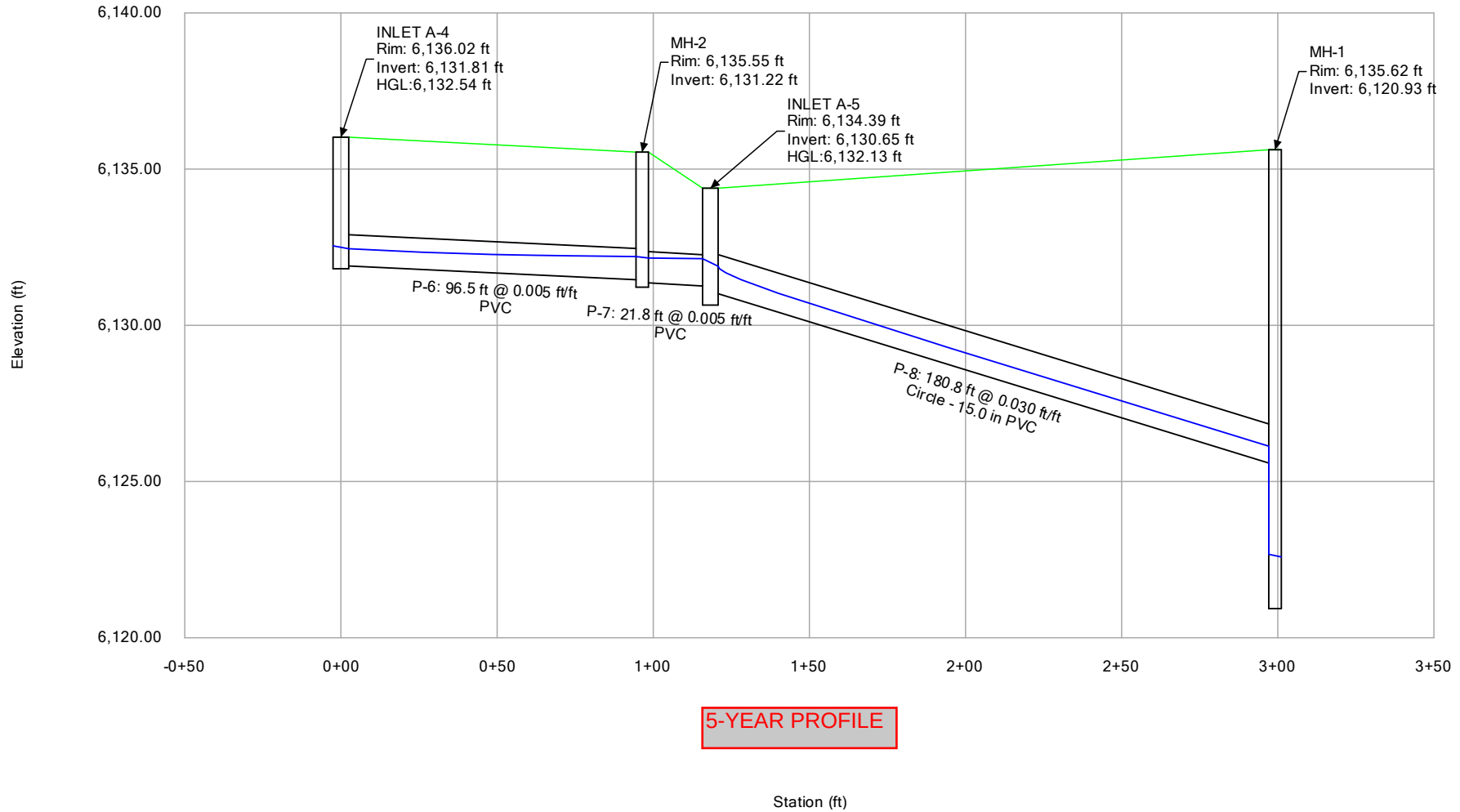
# INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)

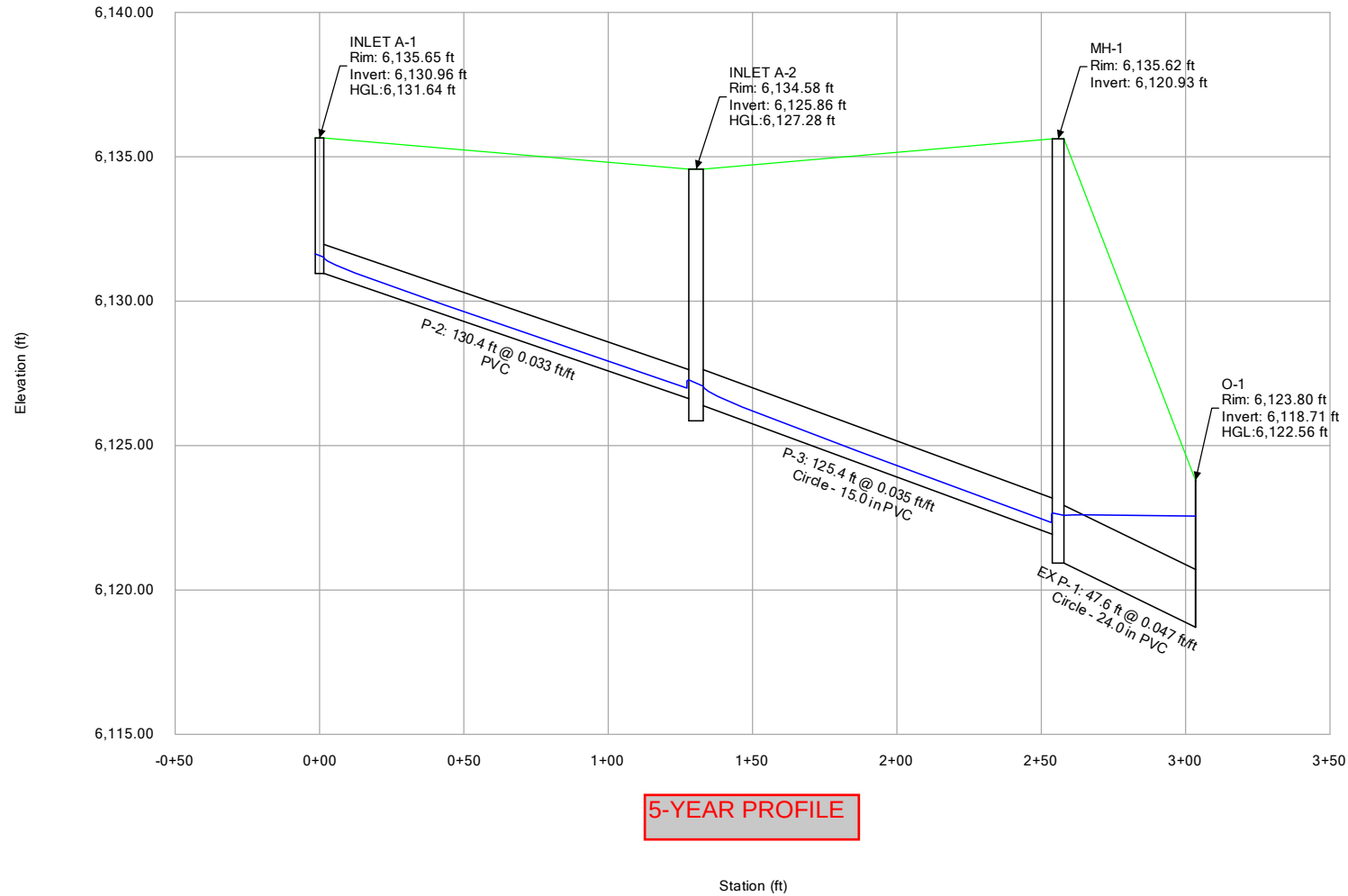


| Design Information (Input)                                                   |                          | MINOR                        |                          | MAJOR |         |
|------------------------------------------------------------------------------|--------------------------|------------------------------|--------------------------|-------|---------|
| Type of Inlet                                                                | CDOT Type R Curb Opening | Type =                       | CDOT Type R Curb Opening |       |         |
| Local Depression (additional to continuous gutter depression 'a' from above) |                          | a <sub>local</sub> =         | 3.00                     | 3.00  | inches  |
| Number of Unit Inlets (Grate or Curb Opening)                                |                          | No =                         | 1                        | 1     |         |
| Water Depth at Flowline (outside of local depression)                        |                          | Ponding Depth =              | 6.0                      | 6.0   | inches  |
| <b>Grate Information</b>                                                     |                          | MINOR                        |                          | MAJOR |         |
| Length of a Unit Grate                                                       |                          | L <sub>o</sub> (G) =         | N/A                      | N/A   | feet    |
| Width of a Unit Grate                                                        |                          | W <sub>o</sub> =             | N/A                      | N/A   | feet    |
| Open Area Ratio for a Grate (typical values 0.15-0.90)                       |                          | A <sub>ratio</sub> =         | N/A                      | N/A   |         |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70)               |                          | C <sub>1</sub> (G) =         | N/A                      | N/A   |         |
| Grate Weir Coefficient (typical value 2.15 - 3.60)                           |                          | C <sub>w</sub> (G) =         | N/A                      | N/A   |         |
| Grate Orifice Coefficient (typical value 0.60 - 0.80)                        |                          | C <sub>o</sub> (G) =         | N/A                      | N/A   |         |
| <b>Curb Opening Information</b>                                              |                          | MINOR                        |                          | MAJOR |         |
| Length of a Unit Curb Opening                                                |                          | L <sub>o</sub> (C) =         | 5.00                     | 5.00  | feet    |
| Height of Vertical Opening in Inches                                         |                          | H <sub>vert</sub> =          | 6.00                     | 6.00  | inches  |
| Height of Curb Orifice Throat in Inches                                      |                          | H <sub>throat</sub> =        | 6.00                     | 6.00  | inches  |
| Angle of Throat                                                              |                          | Theta =                      | 63.40                    | 63.40 | degrees |
| Side Width for Depression Pan (typically the gutter width of 2 feet)         |                          | W <sub>o</sub> =             | 2.00                     | 2.00  | feet    |
| Clogging Factor for a Single Curb Opening (typical value 0.10)               |                          | C <sub>1</sub> (C) =         | 0.10                     | 0.10  |         |
| Curb Opening Weir Coefficient (typical value 2.3-3.7)                        |                          | C <sub>w</sub> (C) =         | 3.60                     | 3.60  |         |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)                 |                          | C <sub>o</sub> (C) =         | 0.67                     | 0.67  |         |
| <b>Low Head Performance Reduction (Calculated)</b>                           |                          | MINOR                        |                          | MAJOR |         |
| Depth for Grate Midwidth                                                     |                          | d <sub>grate</sub> =         | N/A                      | N/A   | ft      |
| Depth for Curb Opening Weir Equation                                         |                          | d <sub>curb</sub> =          | 0.33                     | 0.33  | ft      |
| Grated Inlet Performance Reduction Factor for Long Inlets                    |                          | RF <sub>grate</sub> =        | N/A                      | N/A   |         |
| Curb Opening Performance Reduction Factor for Long Inlets                    |                          | RF <sub>curb</sub> =         | 1.00                     | 1.00  |         |
| Combination Inlet Performance Reduction Factor for Long Inlets               |                          | RF <sub>combination</sub> =  | N/A                      | N/A   |         |
| Total Inlet Interception Capacity (assumes clogged condition)                |                          | MINOR                        |                          | MAJOR |         |
| Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)                  |                          | Q <sub>a</sub> =             | 5.4                      | 5.4   | cfs     |
|                                                                              |                          | Q <sub>PEAK REQUIRED</sub> = | 2.3                      | 5.2   | cfs     |

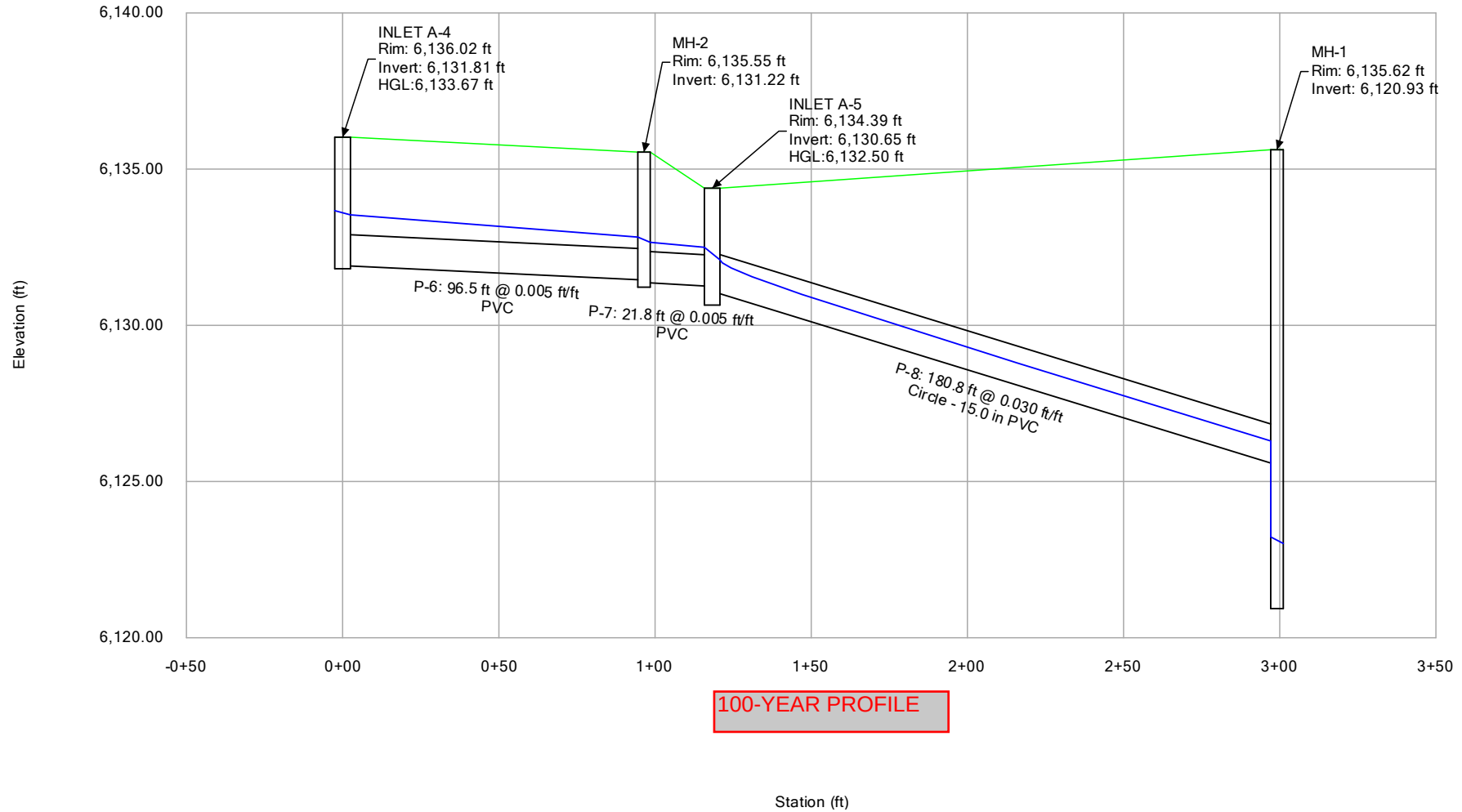
# Profile Report Engineering Profile - A-4 TO MH-1 (KT - Castle Rock - Model.stsw)



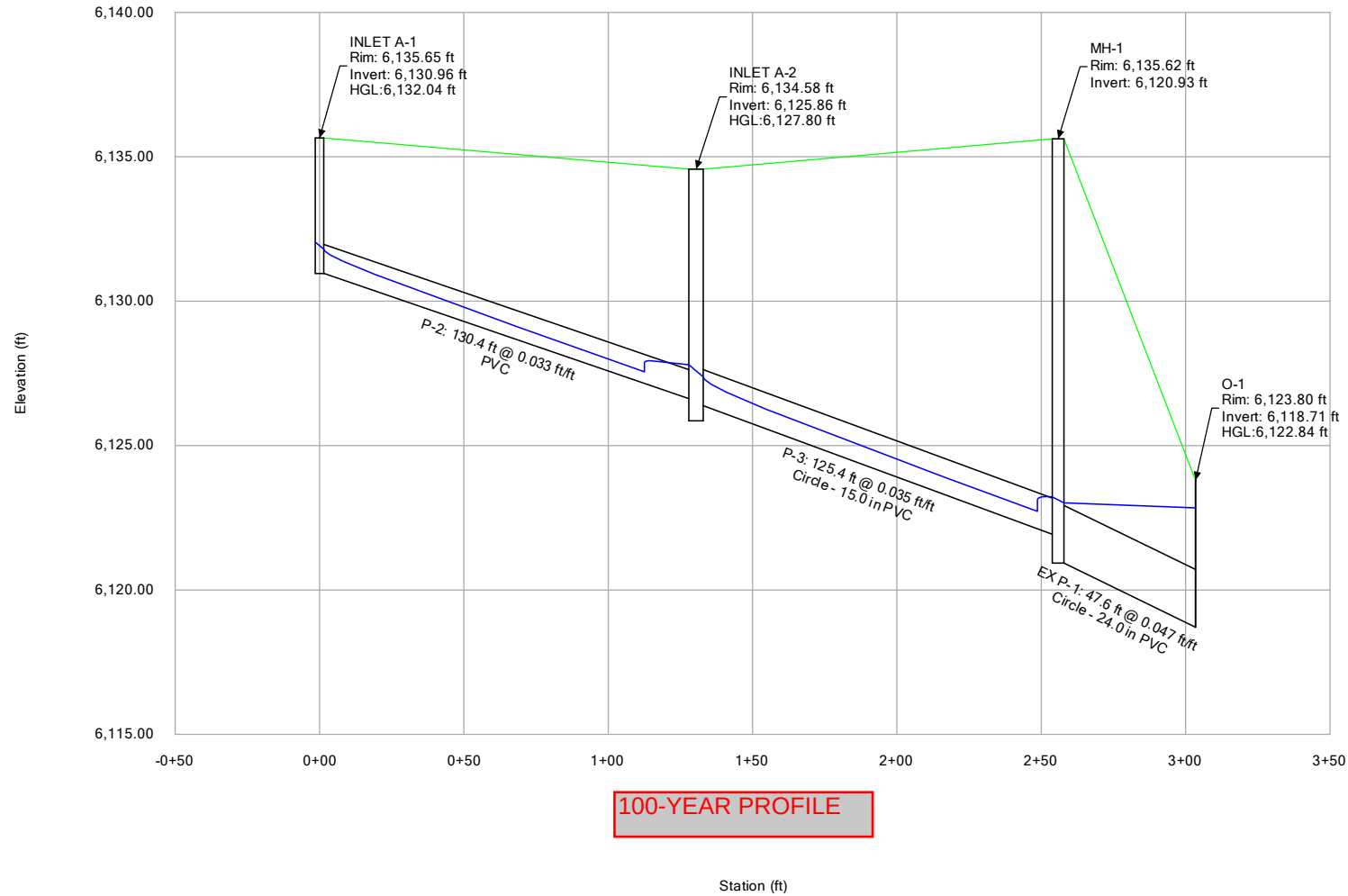
# Profile Report Engineering Profile - A-1 TO O1 (KT - Castle Rock - Model.stsw)



# Profile Report Engineering Profile - A-4 TO MH-1 (KT - Castle Rock - Model.stsw)



# Profile Report Engineering Profile - A-1 TO O1 (KT - Castle Rock - Model.stsw)



**Scenario: 5YR****Current Time Step: 0.000 h****Conduit FlexTable: Storm Pipe Info**

| Capacity<br>(Design)<br>(cfs) | Flow<br>(cfs) | Start Node | Stop Node | Elevation<br>Ground<br>(Start) (ft) | Hydraulic<br>Grade Line<br>(In) (ft) | Hydraulic<br>Grade Line<br>(Out) (ft) | Length<br>(User<br>Defined)<br>(ft) | Velocity<br>(ft/s) | Invert<br>(Start) (ft) | Invert<br>(Stop) (ft) | Slope<br>(Calculated)<br>(ft/ft) | Headloss<br>(ft) |
|-------------------------------|---------------|------------|-----------|-------------------------------------|--------------------------------------|---------------------------------------|-------------------------------------|--------------------|------------------------|-----------------------|----------------------------------|------------------|
| 2.61                          | 1.52          | INLET A-4  | MH-2      | 6,136.02                            | 6,132.45                             | 6,132.20                              | 96.5                                | 3.45               | 6,131.90               | 6,131.46              | 0.005                            | 0.25             |
| 7.04                          | 1.73          | INLET A-1  | INLET A-2 | 6,135.65                            | 6,131.52                             | 6,127.28                              | 130.4                               | 7.41               | 6,130.96               | 6,126.63              | 0.033                            | 4.25             |
| 13.18                         | 2.84          | INLET A-2  | MH-1      | 6,134.58                            | 6,127.06                             | 6,122.67                              | 125.4                               | 8.56               | 6,126.38               | 6,121.93              | 0.035                            | 4.39             |
| 12.12                         | 4.70          | INLET A-5  | MH-1      | 6,134.39                            | 6,131.89                             | 6,126.13                              | 180.8                               | 9.25               | 6,131.01               | 6,125.59              | 0.030                            | 5.76             |
| 2.61                          | 1.52          | MH-2       | INLET A-5 | 6,135.55                            | 6,132.15                             | 6,132.13                              | 21.8                                | 3.45               | 6,131.36               | 6,131.26              | 0.005                            | 0.02             |
| 52.89                         | 8.26          | MH-1       | O-1       | 6,135.62                            | 6,122.58                             | 6,122.56                              | -                                   | 12.25              | 6,120.93               | 6,118.71              | 0.047                            | 0.02             |

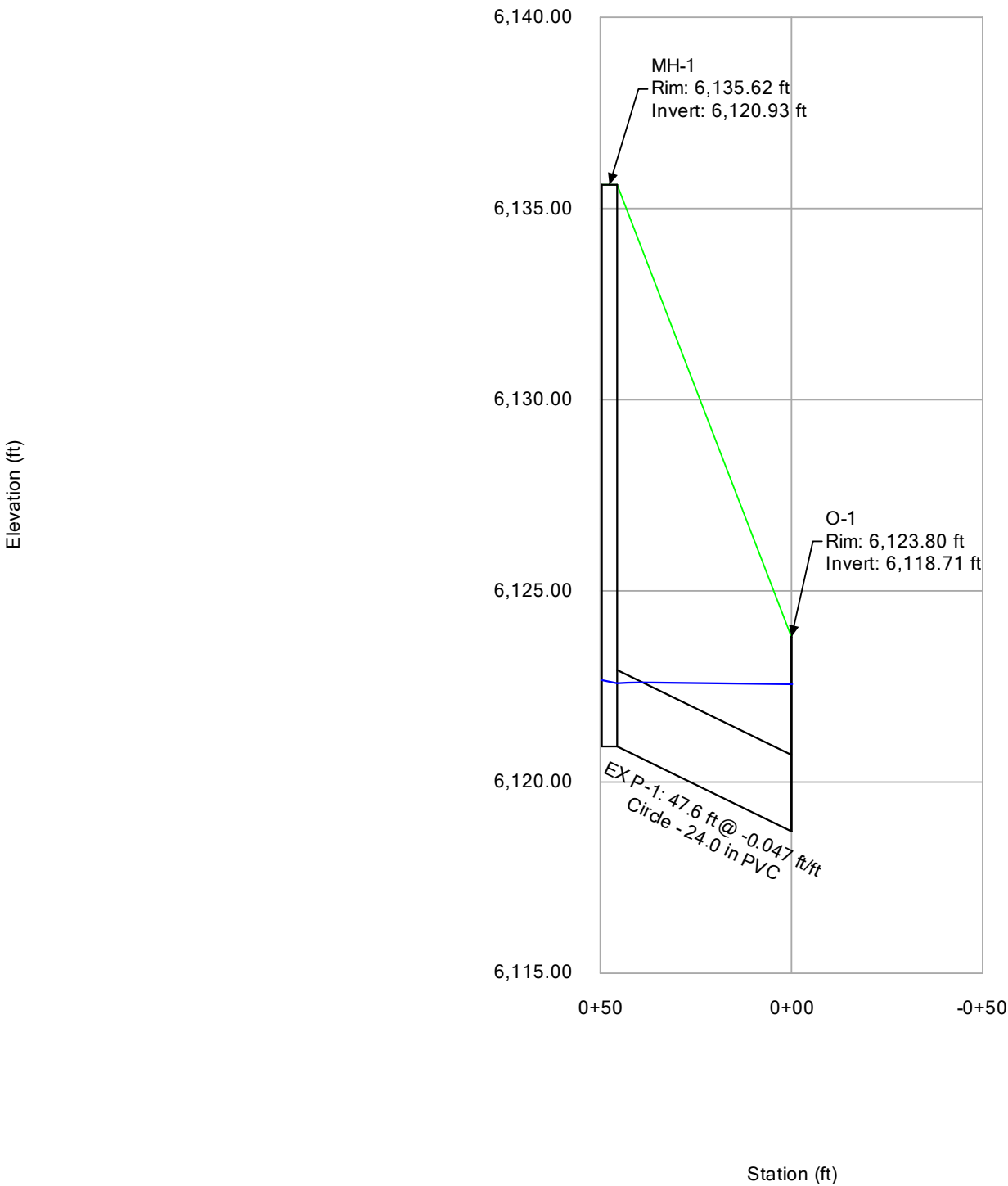
P:\KT Development\CO, Castle Rock - Promenade Parkway\07 Design\Drainage\Appendix C - Hydraulic Calcs\StormCAD\KT - Castle Rock - Model.stsw

**Scenario: 100YR**  
**Current Time Step: 0.000 h**  
**Conduit FlexTable: Storm Pipe Info**

| Capacity<br>(Design)<br>(cfs) | Flow<br>(cfs) | Start Node | Stop Node | Elevation<br>Ground<br>(Start) (ft) | Hydraulic<br>Grade Line<br>(In) (ft) | Hydraulic<br>Grade Line<br>(Out) (ft) | Length<br>(User<br>Defined)<br>(ft) | Velocity<br>(ft/s) | Invert<br>(Start) (ft) | Invert<br>(Stop) (ft) | Slope<br>(Calculated)<br>(ft/ft) | Headloss<br>(ft) |
|-------------------------------|---------------|------------|-----------|-------------------------------------|--------------------------------------|---------------------------------------|-------------------------------------|--------------------|------------------------|-----------------------|----------------------------------|------------------|
| 2.61                          | 3.31          | INLET A-4  | MH-2      | 6,136.02                            | 6,133.53                             | 6,132.82                              | 96.5                                | 4.21               | 6,131.90               | 6,131.46              | 0.005                            | 0.71             |
| 7.04                          | 3.91          | INLET A-1  | INLET A-2 | 6,135.65                            | 6,131.80                             | 6,127.80                              | 130.4                               | 9.31               | 6,130.96               | 6,126.63              | 0.033                            | 4.00             |
| 13.18                         | 6.12          | INLET A-2  | MH-1      | 6,134.58                            | 6,127.38                             | 6,123.22                              | 125.4                               | 10.54              | 6,126.38               | 6,121.93              | 0.035                            | 4.16             |
| 12.12                         | 7.42          | INLET A-5  | MH-1      | 6,134.39                            | 6,132.10                             | 6,126.30                              | 180.8                               | 10.37              | 6,131.01               | 6,125.59              | 0.030                            | 5.80             |
| 2.61                          | 3.31          | MH-2       | INLET A-5 | 6,135.55                            | 6,132.66                             | 6,132.50                              | 21.8                                | 4.21               | 6,131.36               | 6,131.26              | 0.005                            | 0.16             |
| 52.89                         | 14.84         | MH-1       | O-1       | 6,135.62                            | 6,123.01                             | 6,122.84                              | -                                   | 4.72               | 6,120.93               | 6,118.71              | 0.047                            | 0.17             |

P:\KT Development\CO, Castle Rock - Promenade Parkway\07 Design\Drainage\Appendix C - Hydraulic Calcs\StormCAD\KT - Castle Rock - Model.stsw

**Profile Report**  
**Engineering Profile - MH-1 TO EXISTING DMH3 (KT - Castle Rock -**  
**Model.stsw)**



## **APPENDIX D**

### **Master Drainage Report & Amendment Excerpts**

**PHASE III DRAINAGE REPORT  
FOR  
PROMENADE AT CASTLE FILING NO. 1  
CASTLE ROCK, CO**

*Project Number: CD15-0005*

Prepared for:

**PROMENADE CASTLE ROCK, LLC**  
5750 DTC Parkway, Suite 210  
Greenwood Village, Colorado 80111

Contact: Peter Cudlip  
Phone: 303.771.4004

Prepared by:

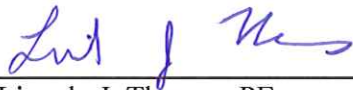


603 Park Point Drive  
Golden, Colorado 80401

Contact: Lincoln Thomas, PE  
Phone: 303.674.7355

020029-01-002  
January 31, 2015  
Revised: March 16, 2015  
Revised: June 5, 2015

"This report and plan for the Phase III drainage design of the Promenade at Castle Rock Subdivision Filing No. 1 was prepared by me (or under my direct supervision) in accordance with the provisions of the Town of Castle Rock Drainage Design and Technical Criteria for the owners thereof. I understand that the Town of Castle Rock does not and will not assume liability for drainage facilities designed by others.



Lincoln J. Thomas, PE  
State of Colorado No. 42350  
For and on behalf of Bowman Consulting



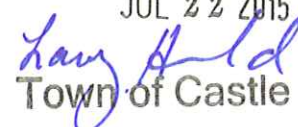
Promenade at Castle Rock, LLC hereby certifies that the drainage facilities for Promenade at Castle Rock Subdivision Filing No. 1 shall be constructed according to the design presented in this report. I understand that the Town of Castle Rock does not and will not assume liability for the drainage facilities designed and/or certified by my engineer and that the Town of Castle Rock reviews drainage plans pursuant to the Municipal Code; but cannot, on behalf of Promenade at Castle Rock, LLC, guarantee that final drainage design review will absolve Promenade at Castle Rock, LLC and/or their successors and/or assigns of future liability for improper design.



\_\_\_\_\_  
Name of Developer

  
\_\_\_\_\_  
Authorized Signature

Approved  
Development Services

JUL 22 2015  
  
Town of Castle Rock

## General Location and Description

### 1.1 Site Location

The location of the Promenade at Castle Rock Subdivision Filing No. 1 (Site) is southwest of Interstate 25, northeast of State Highway 85 and north of Meadows Parkway in the Town of Castle Rock. The site boundaries are shown on the Vicinity Map, Figure 1-1. Existing adjacent developments are to the west and southeast of the site, and include Castle Pines Commercial Filings 10a, 12, the Pines at Castle Rock Apartments, and the Factory Shops Outlets. The site is in portions of Section 22 and Section 27, Township 7 South, Range 67 West of the 6th P.M.

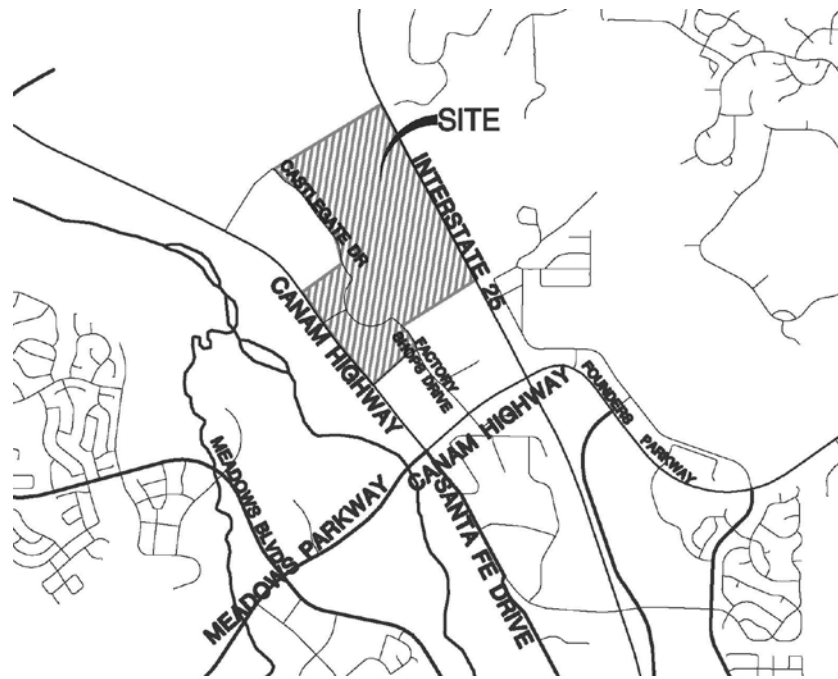


Figure 1-1  
Vicinity Map

### 1.2 Description of Property

The total area of the Site to be developed is  $\pm 163$  acres, which includes the Site and Lot 4, Castle Pines Commercial Filing 12. The ground cover is mainly short grasses. Existing grades are moderate, ranging from 1% to 40%, and averaging around 5% to 15%; slopes are vegetated. General drainage pattern for the Site is east to west.

There is one existing regional stormwater facility within the Site, the Lowe's North Pond, located in the southern portion of the Site and one existing regional stormwater facility immediately downstream of the Site, the Regional Detention Pond, located at the southeast corner of Castlegate Drive North at Highway 85. There is a significant amount of off-site tributary area from east of I-25 and the north side of North Meadows that will be conveyed through the Site. A portion of the Site will be routed through the existing Pines at Castle Rock Apartments. The Pines at Castle Rock Apartments currently have an

existing triple 48" RCP culvert, existing 42" CSP culvert and existing 24" RCP culvert running beneath Castlegate Drive West that will convey developed flows from the Site through the Pines at Castle Rock Apartments site and ultimately to the Regional Detention Pond.

The Site is within the East Plum Creek's Tributary B and Tributary C watersheds. Tributary B flows directly through the Site discharging through a series of underground conduits and open channels before reaching an existing regional detention pond located at the northwest portion of the site at the east corner of Castlegate Drive North and U.S. Highway 85. Tributary C is south of the Site and generally located north of Meadows Parkway between Interstate 25 and State Highway 85 before crossing State Highway 85 near the southern end of the Site and outfalling to East Plum Creek.

Tributary B has a regulatory floodplain, mapped as zone A, illustrated on Douglas County Flood Insurance Rate Map (FIRM) Panel 167, Map No. 08035C0167G. A State interchange project is redefining the existing floodplain. The floodplain modification is currently being studied and a CLOMR is being applied for.

Soils for the site are classified as NRCS hydrologic soils groups B, C, and D. The NRCS soil types are:

BrB – Bresser Sandy Loam  
BwD – Buick-Santanta Loams  
Sa – Sampson Loam  
KwF – Kutch-Newlin-Stapleton Complex  
Su – Stony Rough Land  
Hg – Hilly Gravelly Land  
KtE – Kutch Sandy Loam

There are no existing irrigation canals on the site. There are no stock ponds located on the site.

The proposed land use for the site is General Commercial and Multifamily.

## **2 Drainage Basins and Sub-Basins**

### **2.1 Major Drainage Basins**

The majority of the Site is located within the East Plum Creek Tributary B watershed, and a small portion of the Site is within the Tributary C watershed. The major drainageway for the Tributary B watershed is located within the boundary of the development. The major drainageway for the Tributary C watershed is to the south of the Site and is only affected by the North Lowe's Pond. Tributary B watershed was studied in Master Plan completed by CH2MHill and Tributary C was studied in Master Plan completed by Respec Consulting & Services. The recommendations of these Master Plans were taken into consideration during the design of the Site. New stormwater

detention ponds, as part of the Site development, will be constructed to the east of Interstate 25 and the existing storm sewer system upsized to an 84-inch system for the improvements of Tributary B. To accommodate the new flows from the development in the North Lowe's Pond, the outlet control structure will need to be modified during the final design for vertical development of the portion of the Site tributary to the pond. Final drainage report and construction plans for these modifications will be submitted at the time of final development of this area.

## **2.2 Minor Drainage Basins**

The total area of the development within the major basins being developed is ±169 acres and for this Phase III Drainage Report is divided into 22 sub-basins as described below. See Phase III Drainage Map for locations of sub-basins.

Sub-basin 11 flows to the south and west and contains approximately 16.05 acres at 88% imperviousness and consists of existing multifamily, neighborhood areas, and open space land uses. The Site will not change current drainage patterns or land uses for this sub-basin. The basin will outfall to the west into an existing open channel along the southern boundary of the Pines at Castle Rock Apartments then into the Regional Detention Pond (Q5=35.5 cfs, Q100=72.5 cfs).

Sub-basin 30, east of Sub-basin 11, flows from the north to the south and contains approximately 15.61 acres at 86% imperviousness. The basin consists of commercial developments and open space land use. The basin will be routed into the proposed 84" RCP storm sewer to the east in Promenade Pkwy (Design Point J15). The 84" RCP will convey the flows along the proposed roadways and will discharge to an existing open channel along the southern boundary of the Pines at Castle Rock Apartments then into the Regional Detention Pond (Q5=32.6 cfs, Q100=66.6 cfs).

Sub-basin 40, east of sub-basin 30, flows to the north and west and contains 3.58 acres at 90% imperviousness. The basin consists of commercial land use. The basin will be routed into the proposed 84" RCP storm sewer to the west in Promenade Pkwy (Design Point J15). The 84" RCP will convey the flows along the proposed roadways and will discharge to an existing open channel along the southern boundary of the Pines at Castle Rock Apartments then into the Regional Detention Pond (Q5=9.9 cfs, Q100=20.3 cfs).

Sub-basin 41, south of sub-basin 40, flows to the north and west and contains 2.20 acres at 90% imperviousness. The basin consists of commercial land use. The basin will be routed into the proposed 84" RCP storm sewer to the west in Promenade Pkwy (Design Point J10). The 84" RCP will convey the flows along the proposed roadways and will discharge to an existing open channel along the southern boundary of the Pines at Castle Rock Apartments then into the Regional Detention Pond (Q5=6.2 cfs, Q100=12.8 cfs).

Sub-basin 50, north of sub-basins 30 and 40, flows to the south and west and contains 18.37 acres at 75% imperviousness. The basin consists of commercial land use. The basin will be routed into the proposed storm sewer in Promenade Pkwy (Design Point 3) which ties into the 84" RCP storm sewer trunkline. The 84" RCP will convey the flows along

the proposed roadways and will discharge to an existing open channel along the southern boundary of the Pines at Castle Rock Apartments then into the Regional Detention Pond (Q5=29.7 cfs, Q100=66.6 cfs).

Sub-basin 51, north of sub-basins 30 and 40, flows to the south and west and contains 5.77 acres at 75% imperviousness. The basin consists of commercial land use. The basin will be routed into the proposed storm sewer in Promenade Pkwy (Design Point 4) which ties into the 84" RCP storm sewer trunkline. The 84" RCP will convey the flows along the proposed roadways and will discharge to an existing open channel along the southern boundary of the Pines at Castle Rock Apartments then into the Regional Detention Pond (Q5=10.9 cfs, Q100=23.9 cfs).

Sub-basin 52, north of sub-basins 30 and 40, flows to the south and west and contains 14.24 acres at 63% imperviousness. The basin consists of commercial and open space land use. The basin will be routed into the 84" RCP storm sewer trunkline (Design Point J25). The 84" RCP will convey the flows along the proposed roadways and will discharge to an existing open channel along the southern boundary of the Pines at Castle Rock Apartments then into the Regional Detention Pond (Q5=19.8 cfs, Q100=47.6 cfs).

Sub-basin 53, north of sub-basins 30 and 40, flows to the south and west and contains 11.47 acres at 80% imperviousness. The basin consists of commercial and open space land use. The basin will be routed into the 84" RCP storm sewer trunkline (Design Point J23). The 84" RCP will convey the flows along the proposed roadways and will discharge to an existing open channel along the southern boundary of the Pines at Castle Rock Apartments then into the Regional Detention Pond (Q5=23.5 cfs, Q100=49.4 cfs).

Sub-basin 61, north of sub-basin 30, flows to the west and south and contains 9.61 acres at 85% imperviousness. The basin consists of commercial land use. The basin will be routed into an existing 48" RCP storm sewer (Design Point 1). The existing storm sewer is currently being constructed with the North Meadows Extension project and ultimately outfalls into the Regional Detention Pond (Q5=20.2 cfs, Q100=41.8 cfs).

Sub-basin 62, north of sub-basin 30 and east of sub-basin 61, flows to the west and south and contains 16.41 acres at 56% imperviousness. The basin consists of apartments and open space land use. The basin will be routed into 3 existing 48" RCP storm sewers (Design Point J50). The existing storm sewer is a part of the Castle Pines Commercial Filing 8 of the Pines at Castle Rock Apartments. The 3 culverts run beneath Castlegate Drive and discharge into an existing drainage swale. The drainage swale runs through 3 more 48" RCP downstream, discharging back into the drainage swale, and ultimately outfalls into the Regional Detention Pond (Q5=40 cfs, Q100=81 cfs).

Sub-basin 70, west of sub-basin 60, flows southwest and contains 3.00 acres at approximately 80% imperviousness. The basin consists of apartments land use. The basin will be routed into an existing 48" corrugated steel pipe storm sewer (Design Point 114d). The storm sewer is a part of the Castle Pines Commercial Filing 2 of the Pines at Castle Rock Apartments. The system consists of a 48" CSP and RCP storm network, along with

The project design rainfall intensities were determined using Figure 6-1 of the ToCR Drainage Manual. The developed time of concentrations for the on-site basins at the design points were calculated using a spreadsheet version of the Town's "SF-2" form, included in Appendix A, in accordance with the procedures outlined in Chapter 6 of the ToCR Drainage Manual. The initial overland flow time was calculated using UDFCD's Equation RO-3. Travel times were calculated using Equation RO-4 of the UDFCD Drainage Criteria Manuals and a conveyance coefficient of 20.

The detention storage was calculated within the SWMM Model. The EURV/WQCV was calculated using Urban Drainage's BMP spreadsheet. The release of the 100-year event was designed to comply with the Tributary B and Tributary C and D master plans.

### **3.4 Hydraulics**

All storm sewers are public and sized to convey the 100-year storm event. Inlets have been sized to capture runoff using the UD-Inlet software from UDFCD. StormCAD was used to determine hydraulic gradelines and storm sewer velocities. All inlet and pipe sizes have been sized to comply with the ToCR Drainage Manual.

### **3.5 Water Quality Enhancement**

Excess Urban Runoff Volume (EURV) will be provided for the Regional Detention Pond for tributary area west of Interstate 25 and the portion of the North Meadows Interchange east of the Interstate. The existing outlet structures in the Regional Pond will be modified to provide necessary volume and release rate for the additional development.

The Town current regulations requires that stormwater quality enhancement be provided for all new development and redevelopment or "Full-Spectrum" Detention as defined in the Storm Drainage Design and Technical Criteria Manual Section 13. The approved Castle Pines Commercial Filing 10A – Part 2 Report only sized the Lowe's North Pond for the Water Quality Capture Volume (WQCV). Per this report, the pond provides water quality capture volume (WQCV) of 1.03 ac-ft for a tributary area of 34 acres with overall imperviousness of 80% (See Appendix C for calculations). The existing outlet structure for this pond will be modified at the time of final development for the tributary area to accommodate 1.44 ac-ft of WQCV.

## **4 Stormwater Management Facility Design**

### **4.1 Existing Stormwater Conveyance and Storage Facilities**

Tributary B of East Plum Creek flows directly through the Site within an existing 72" reinforced concrete pipe (RCP) that discharges into an existing open channel, which is collected by twin 66" CMP then discharging to an 84" RCP, and ultimately discharging to an open channel then into the Regional Detention Pond located at the east corner of State Highway 85 and Castle Gate Drive North. The open channel will need to be improved/stabilized in order to properly convey developed flows from the Site. There are an existing 24" RCP culvert, existing triple 48" RCP culvert and existing 42" CSP that

will convey flows from a portion of the development through the existing Pines at Castle Rock Apartments and into the Regional Detention Pond.

A portion of the development will be tributary to the existing Lowe's North Pond located at the northeast corner of Highway 85 and New Beale Street. This facility was designed to provide water quality volume and 10-year and 100-year detention per the Phase III Drainage Report Castle Pines Commercial Filing 10A part 2 – Lowes Detention Ponds prepared by Civil Design Group. The North Lowe's Pond discharges through an existing 60" RCP beneath U.S. Highway 85 into Tributary C approximately 1500' east of the confluence with East Plum Creek. Based on as-builts for this pond, the current pond provides 59,000 CF of WQCV; 318,000 CF 10-year detention and WQCV; and 400,000 CF of 100-year detention and ½ WQCV (see as-built plan prepared by Civil Design Group, Inc. in appendix)

## **4.2 Proposed Stormwater Conveyance Facilities**

Stormwater will be conveyed through the Site in storm sewers and in the streets. The existing drainage channel between the 84" outfall and Regional Detention Pond will be improved to convey developed flows, no other drainage swales are currently planned in the development. The storm sewers will be RCP, have a minimum diameter of 18-inches, and will be sized to meet TOCR street flow depth criteria for the 5 and 100-year events. The streets for the Site have drainage classification A. Flow depths shall not exceed the top of curb for the 5-year event, and shall not exceed a depth of 12-inches at the gutter flow line for the 100-year event for all roadways. Cross street flow will not occur for the 5-year event, and will not exceed 12-inches at the gutter flow line for the 100-year event.

An 84" RCP will be used to re-route existing offsite flows and developed flows through the site. The 84" RCP will connect the existing 66" RCP and 36" RCP conveying off-site flows from the east side of I-25 and the existing 84" RCP along Castlegate Drive West ultimately discharging into an open channel then into the Regional Detention Pond.

Developed flows from sub-basin 61 will be routed to the storm sewer system in North Meadows currently under construction as part of the North Meadows Extension Project. The system was analyzed with the additional flows and determined to have the available capacity to convey the additional flows. Velocities within the system slightly exceed the Town's design standards so a Technical Variance Request has been submitted.

Developed flows from sub-basin 90 will be routed to the North Lowe's Pond via underground conduits or surface flow. These conduits will be designed at the time of final development of Basin 90.

Emergency overflow paths will be incorporated into the development. In particular, paths will be provided at the low points in the development to allow water to leave the Site during events exceeding the 100-year event, or if a failure occurs in the stormwater systems.

### 4.3 Proposed Storage Facilities

Four separate stormwater facilities will provide detention for the Site, see Table 4-1 for storage summaries. 2 new ponds, identified as Northeast Pond and Grace Chapel Pond in this report, will be constructed within the Tributary B watershed just east of Interstate 25 in order to maintain capacity in the existing 84" conduit through the Site, final construction plans and drainage reports will be submitted to Douglas County for review and approval. These ponds will also provide water quality treatment for tributary flows. The Northeast Pond and Grace Chapel Ponds along with the existing Regional Detention Pond will provide stormwater detention and water quality for Tributary B.

The proposed offsite ponds will discharge through existing conduits before entering the proposed 84" RCP running through the site and ultimately discharging into the existing Regional Detention Pond. The new ponds help with the amount of flows through the Site by holding back upstream flows and allowing the downstream flows to pass through the storm network before the peak of the offsite flows makes it through the ponds.

**Table 4-1**  
**Stormwater Storage Facilities Summary**

| ID                   | Watershed Area (acres) | Total Imp. | 100-Year Inflow (cfs) | 100-Year Outflow (cfs) | EURV (acre-feet) | WQCV (acre-feet) | 100-year +WQCV (acre-feet) |
|----------------------|------------------------|------------|-----------------------|------------------------|------------------|------------------|----------------------------|
| Grace Chapel Pond(1) | 357.34                 | 15%        | 654.5                 | 532.0                  | 4.48             | 3.33             | 14.3                       |
| Northeast Pond(1)    | 59.83                  | 29%        | 122.4                 | 9.00                   | 1.23             | 0.67             | 6.23                       |
| Regional Pond        | 754.65                 | 59%*       | 961.9                 | 844.7                  | 19.0             | 5.50             | 23.6                       |
| North Lowe's Pond    | 43.72                  | 80%        | 271.0                 | 102.0                  | N/A              | 1.44             | 9.18                       |

(1) Grace Chapel Pond and Northeast Pond to be permitted through Douglas County

\*imperviousness only for drainage area downstream of Northeast and Grace Chapel Ponds

The Regional Detention Pond will also help mitigate the flows from the Site as well as the offsite flows. The Regional Detention Pond was analyzed by Tsiouvaras, Simmons, and Holderness Consulting Engineers (TSH). Their analysis and pond design will provide for a total of 5.75 ac-ft of WQCV, of which 3.51 ac-ft was for the existing conditions and North Meadows Extension Interchange project. The pond and/or outlet structure will need to be modified to provide the required EURV of 18.50 ac-ft for the Tributary B area west of I-25. The North Meadows Extension Interchange report completed by TSH also gives a 100-year WSEL of 6030.51'. With the addition of the Northeast Pond and Grace Chapel Pond, as well as stormwater infrastructure improvements, the new 100-year plus WQCV water surface elevation will be maintained at 6030.51. A SWMM output of the stage-storage table for the Regional Detention Pond can be found in the appendix.

The existing North Lowe's Pond outlet structure will be modified to accommodate the proposed development. The Pond was originally sized to take in 34 acres at 80% imperviousness. A portion of the 34 acres is a part of the existing Lowe's development,

Post-Development C Value Calculations  
Promenade at Castle Rock  
Castle Rock, Colorado

| Global Parameters <sup>1</sup> |        |
|--------------------------------|--------|
| Land Use                       | % Imp. |
| Roads                          | 100    |
| Commercial                     | 95     |
| Neighborhood Areas             | 85     |
| Apartments                     | 80     |
| Multifamily                    | 60     |
| Single Family Large Lot        | 20     |
| Open Space                     | 2      |
| Lawns, Sandy Soil              | 0      |

| Subbasin               | Total Area (acres) | Land Use Area per Sub-Basin |        |              |       |                    |        |              |        |              |       |                         |       |              |       |                   |       |         | Composite Imperviousness | C Coefficient <sup>2</sup> |          |
|------------------------|--------------------|-----------------------------|--------|--------------|-------|--------------------|--------|--------------|--------|--------------|-------|-------------------------|-------|--------------|-------|-------------------|-------|---------|--------------------------|----------------------------|----------|
|                        |                    | Roads                       |        | Commercial   |       | Neighborhood Areas |        | Apartments   |        | Multifamily  |       | Single Family Large Lot |       | Open Space   |       | Lawns, Sandy Soil |       | % Check |                          | 5-year                     | 100-year |
|                        |                    | Area (acres)                | %      | Area (acres) | %     | Area (acres)       | %      | Area (acres) | %      | Area (acres) | %     | Area (acres)            | %     | Area (acres) | %     | Area (acres)      | %     |         |                          |                            |          |
| 18A                    | 43.68              |                             |        |              |       |                    |        |              |        |              |       |                         |       |              |       |                   |       |         | 30%                      | 0.25                       | 0.47     |
| 18B                    | 9.24               |                             |        |              |       |                    |        |              |        |              |       |                         |       |              |       |                   |       |         | 30%                      | 0.25                       | 0.47     |
| 18C                    | 3.12               |                             |        |              |       |                    |        |              |        |              |       |                         |       |              |       |                   |       |         | 6%                       | 0.11                       | 0.38     |
| 18D                    | 3.79               |                             |        |              |       |                    |        |              |        |              |       |                         |       |              |       |                   |       |         | 27%                      | 0.23                       | 0.46     |
| NORTHEAST POND TOTAL   | 59.83              |                             |        |              |       |                    |        |              |        |              |       |                         |       |              |       |                   |       |         | 29%                      |                            |          |
| 19A                    | 26.02              | 0.00                        | 0.0%   | 5.06         | 19.4% | 0.00               | 0.0%   | 0.00         | 0.0%   | 0.00         | 0.0%  | 4.56                    | 17.5% | 16.40        | 63.0% | 0.00              | 0.0%  | 100.00% | 23%                      | 0.21                       | 0.45     |
| 19B                    | 25.95              | 3.24                        | 12.5%  | 5.66         | 21.8% | 0.00               | 0.0%   | 0.00         | 0.0%   | 0.00         | 0.0%  | 0.00                    | 0.0%  | 17.05        | 65.7% | 0.00              | 0.0%  | 100.00% | 35%                      | 0.27                       | 0.48     |
| 20A                    | 1.50               | 0.00                        | 0.0%   | 0.00         | 0.0%  | 0.00               | 0.0%   | 0.00         | 0.0%   | 0.00         | 0.0%  | 0.60                    | 40.0% | 0.90         | 60.0% | 0.00              | 0.0%  | 100.00% | 9%                       | 0.13                       | 0.40     |
| 20B                    | 3.35               | 0.42                        | 12.5%  | 0.00         | 0.0%  | 0.00               | 0.0%   | 0.00         | 0.0%   | 0.00         | 0.0%  | 0.47                    | 14.0% | 2.46         | 73.4% | 0.00              | 0.0%  | 100.00% | 17%                      | 0.18                       | 0.43     |
| 21*                    | 122.37             |                             |        |              |       |                    |        |              |        |              |       |                         |       |              |       |                   |       |         | 16%                      | 0.17                       | 0.43     |
| 22*                    | 123.16             |                             |        |              |       |                    |        |              |        |              |       |                         |       |              |       |                   |       |         | 5%                       | 0.10                       | 0.38     |
| 23*                    | 54.99              |                             |        |              |       |                    |        |              |        |              |       |                         |       |              |       |                   |       |         | 25%                      | 0.22                       | 0.46     |
| CHAPEL POND TOTAL      | 357.34             |                             |        |              |       |                    |        |              |        |              |       |                         |       |              |       |                   |       |         | 15%                      |                            |          |
| 3*                     | 10.75              |                             |        |              |       |                    |        |              |        |              |       |                         |       |              |       |                   |       |         | 11%                      | 0.14                       | 0.41     |
| 4*                     | 15.13              |                             |        |              |       |                    |        |              |        |              |       |                         |       |              |       |                   |       |         | 70%                      | 0.49                       | 0.62     |
| 7*                     | 11.13              |                             |        |              |       |                    |        |              |        |              |       |                         |       |              |       |                   |       |         | 70%                      | 0.49                       | 0.62     |
| 8*                     | 9.15               |                             |        |              |       |                    |        |              |        |              |       |                         |       |              |       |                   |       |         | 70%                      | 0.49                       | 0.62     |
| 10                     | 13.00              | 0.00                        | 0.0%   | 0.00         | 0.0%  | 2.01               | 15.5%  | 0.00         | 0.0%   | 9.64         | 74.2% | 0.00                    | 0.0%  | 0.00         | 0.0%  | 1.35              | 10.4% | 100.00% | 58%                      | 0.40                       | 0.55     |
| 11                     | 16.05              | 0.00                        | 0.0%   | 14.79        | 92.1% | 0.00               | 0.0%   | 0.00         | 0.0%   | 0.00         | 0.0%  | 0.00                    | 0.0%  | 1.26         | 7.9%  | 0.00              | 0.0%  | 100.00% | 88%                      | 0.69                       | 0.78     |
| 30                     | 15.61              | 0.00                        | 0.0%   | 14.18        | 90.8% | 0.00               | 0.0%   | 0.00         | 0.0%   | 0.00         | 0.0%  | 0.00                    | 0.0%  | 0.00         | 0.0%  | 1.43              | 9.2%  | 100.00% | 86%                      | 0.67                       | 0.77     |
| 40                     | 3.58               | 0.00                        | 0.0%   | 3.38         | 94.4% | 0.00               | 0.0%   | 0.00         | 0.0%   | 0.00         | 0.0%  | 0.00                    | 0.0%  | 0.00         | 0.0%  | 0.20              | 5.6%  | 100.00% | 90%                      | 0.72                       | 0.81     |
| 41                     | 2.20               | 0.00                        | 0.0%   | 2.08         | 94.5% | 0.00               | 0.0%   | 0.00         | 0.0%   | 0.00         | 0.0%  | 0.00                    | 0.0%  | 0.00         | 0.0%  | 0.12              | 5.5%  | 100.00% | 90%                      | 0.72                       | 0.81     |
| 50                     | 18.37              | 0.00                        | 0.0%   | 14.50        | 78.9% | 0.00               | 0.0%   | 0.00         | 0.0%   | 0.00         | 0.0%  | 0.00                    | 0.0%  | 0.00         | 0.0%  | 3.87              | 21.1% | 100.00% | 75%                      | 0.54                       | 0.66     |
| 51                     | 5.77               | 0.00                        | 0.0%   | 4.56         | 79.0% | 0.00               | 0.0%   | 0.00         | 0.0%   | 0.00         | 0.0%  | 0.00                    | 0.0%  | 0.00         | 0.0%  | 1.21              | 21.0% | 100.00% | 75%                      | 0.54                       | 0.66     |
| 52                     | 14.24              | 0.00                        | 0.0%   | 9.45         | 66.4% | 0.00               | 0.0%   | 0.00         | 0.0%   | 0.00         | 0.0%  | 0.00                    | 0.0%  | 0.00         | 0.0%  | 4.79              | 33.6% | 100.00% | 63%                      | 0.43                       | 0.58     |
| 53                     | 11.47              | 0.00                        | 0.0%   | 3.48         | 30.3% | 6.95               | 60.6%  | 0.00         | 0.0%   | 0.00         | 0.0%  | 0.00                    | 0.0%  | 0.00         | 0.0%  | 1.04              | 9.1%  | 100.00% | 80%                      | 0.60                       | 0.70     |
| 61                     | 9.61               | 0.00                        | 0.0%   | 0.00         | 0.0%  | 9.61               | 100.0% | 0.00         | 0.0%   | 0.00         | 0.0%  | 0.00                    | 0.0%  | 0.00         | 0.0%  | 0.00              | 0.0%  | 100.00% | 85%                      | 0.66                       | 0.75     |
| 62                     | 16.41              | 0.00                        | 0.0%   | 0.00         | 0.0%  | 0.00               | 0.0%   | 11.42        | 69.6%  | 0.00         | 0.0%  | 0.00                    | 0.0%  | 4.99         | 30.4% | 0.00              | 0.0%  | 100.00% | 56%                      | 0.39                       | 0.55     |
| 70                     | 3.00               | 0.00                        | 0.0%   | 0.00         | 0.0%  | 0.00               | 0.0%   | 3.00         | 100.0% | 0.00         | 0.0%  | 0.00                    | 0.0%  | 0.00         | 0.0%  | 0.00              | 0.0%  | 100.00% | 80%                      | 0.59                       | 0.70     |
| A1                     | 2.25               | 1.61                        | 71.6%  | 0.00         | 0.0%  | 0.00               | 0.0%   | 0.00         | 0.0%   | 0.00         | 0.0%  | 0.00                    | 0.0%  | 0.00         | 0.0%  | 0.64              | 28.4% | 100.00% | 72%                      | 0.51                       | 0.63     |
| A3                     | 1.94               | 1.57                        | 80.9%  | 0.25         | 12.9% | 0.00               | 0.0%   | 0.00         | 0.0%   | 0.00         | 0.0%  | 0.00                    | 0.0%  | 0.00         | 0.0%  | 0.12              | 6.2%  | 100.00% | 93%                      | 0.78                       | 0.85     |
| A4                     | 1.95               | 1.23                        | 63.1%  | 0.00         | 0.0%  | 0.00               | 0.0%   | 0.00         | 0.0%   | 0.00         | 0.0%  | 0.00                    | 0.0%  | 0.53         | 27.2% | 0.19              | 9.7%  | 100.00% | 64%                      | 0.44                       | 0.58     |
| A5                     | 1.63               | 0.91                        | 55.8%  | 0.00         | 0.0%  | 0.00               | 0.0%   | 0.00         | 0.0%   | 0.00         | 0.0%  | 0.00                    | 0.0%  | 0.59         | 36.2% | 0.13              | 8.0%  | 100.00% | 57%                      | 0.39                       | 0.55     |
| A6                     | 2.68               | 1.57                        | 58.6%  | 0.91         | 34.0% | 0.00               | 0.0%   | 0.00         | 0.0%   | 0.00         | 0.0%  | 0.00                    | 0.0%  | 0.00         | 0.0%  | 0.20              | 7.5%  | 100.00% | 91%                      | 0.74                       | 0.82     |
| A7                     | 1.41               | 1.06                        | 75.2%  | 0.00         | 0.0%  | 0.00               | 0.0%   | 0.00         | 0.0%   | 0.00         | 0.0%  | 0.00                    | 0.0%  | 0.00         | 0.0%  | 0.35              | 24.8% | 100.00% | 75%                      | 0.54                       | 0.66     |
| A8                     | 3.92               | 2.40                        | 61.2%  | 0.00         | 0.0%  | 0.00               | 0.0%   | 0.00         | 0.0%   | 0.00         | 0.0%  | 0.00                    | 0.0%  | 0.00         | 0.0%  | 1.52              | 38.8% | 100.00% | 61%                      | 0.42                       | 0.57     |
| A10                    | 2.14               | 2.04                        | 95.3%  | 0.00         | 0.0%  | 0.00               | 0.0%   | 0.00         | 0.0%   | 0.00         | 0.0%  | 0.00                    | 0.0%  | 0.00         | 0.0%  | 0.10              | 4.7%  | 100.00% | 95%                      | 0.81                       | 0.88     |
| A11                    | 1.62               | 1.33                        | 82.1%  | 0.00         | 0.0%  | 0.00               | 0.0%   | 0.00         | 0.0%   | 0.00         | 0.0%  | 0.00                    | 0.0%  | 0.00         | 0.0%  | 0.29              | 17.9% | 100.00% | 82%                      | 0.62                       | 0.72     |
| A12                    | 3.19               | 1.31                        | 41.1%  | 0.00         | 0.0%  | 0.00               | 0.0%   | 0.00         | 0.0%   | 0.00         | 0.0%  | 0.00                    | 0.0%  | 1.55         | 48.6% | 0.33              | 10.3% | 100.00% | 42%                      | 0.31                       | 0.50     |
| O1                     | 8.52               | 3.31                        | 38.8%  | 0.00         | 0.0%  | 0.00               | 0.0%   | 0.00         | 0.0%   | 0.00         | 0.0%  | 0.00                    | 0.0%  | 5.21         | 61.2% | 0.00              | 0.0%  | 100.00% | 40%                      | 0.30                       | 0.50     |
| O2                     | 8.34               | 0.00                        | 0.0%   | 5.36         | 64.3% | 0.00               | 0.0%   | 0.00         | 0.0%   | 0.00         | 0.0%  | 0.00                    | 0.0%  | 2.98         | 35.7% | 0.00              | 0.0%  | 100.00% | 62%                      | 0.42                       | 0.57     |
| O3                     | 1.65               | 0.00                        | 0.0%   | 0.99         | 60.0% | 0.00               | 0.0%   | 0.00         | 0.0%   | 0.00         | 0.0%  | 0.00                    | 0.0%  | 0.66         | 40.0% | 0.00              | 0.0%  | 100.00% | 58%                      | 0.40                       | 0.55     |
| O4                     | 5.06               | 0.82                        | 16.2%  | 2.65         | 52.4% | 1.15               | 22.7%  | 0.00         | 0.0%   | 0.00         | 0.0%  | 0.00                    | 0.0%  | 0.44         | 8.7%  | 0.00              | 0.0%  | 100.00% | 85%                      | 0.66                       | 0.76     |
| O5                     | 0.60               | 0.60                        | 100.0% | 0.00         | 0.0%  | 0.00               | 0.0%   | 0.00         | 0.0%   | 0.00         | 0.0%  | 0.00                    | 0.0%  | 0.00         | 0.0%  | 0.00              | 0.0%  | 100.00% | 100%                     | 0.90                       | 0.96     |
| 6                      | 13.85              | 1.38                        | 10.0%  | 0.00         | 0.0%  | 0.00               | 0.0%   | 0.00         | 0.0%   | 0.00         | 0.0%  | 1.65                    | 11.9% | 10.82        | 78.1% | 0.00              | 0.0%  | 100.00% | 14%                      | 0.16                       | 0.42     |
| 80**                   | 19.57              |                             |        |              |       |                    |        |              |        |              |       |                         |       |              |       |                   |       |         | 37%                      | 0.28                       | 0.49     |
| 85                     | 27.55              |                             |        |              |       |                    |        |              |        |              |       |                         |       |              |       |                   |       |         | 16%                      |                            |          |
| REGIONAL POND TOTAL    | 283.34             |                             |        |              |       |                    |        |              |        |              |       |                         |       |              |       |                   |       |         | 59%                      |                            |          |
| B1***                  | 14.20              |                             |        |              |       |                    |        |              |        |              |       |                         |       |              |       |                   |       |         | 80%                      | 0.60                       | 0.70     |
| 90                     | 29.52              | 0.00                        | 0.0%   | 25.00        | 84.7% | 0.00               | 0.0%   | 0.00         | 0.0%   | 0.00         | 0.0%  | 0.00                    | 0.0%  | 0.00         | 0.0%  | 4.52              | 15.3% | 100.00% | 80%                      | 0.60                       | 0.70     |
| LOWES NORTH POND TOTAL | 43.72              |                             |        |              |       |                    |        |              |        |              |       |                         |       |              |       |                   |       |         | 80%                      |                            |          |
| 17*                    | 54.14              |                             |        |              |       |                    |        |              |        |              |       |                         |       |              |       |                   |       |         | 17%                      | 0.60                       | 0.43     |
| OFFSITE FLOWS TOTAL    | 54.14              |                             |        |              |       |                    |        |              |        |              |       |                         |       |              |       |                   |       |         |                          |                            |          |

<sup>1</sup>Composite Imperviousness taken from East Plum Creek Tributary B Master Plan  
<sup>\*\*</sup>Composite Imperviousness taken from North Meadows Final Drainage Report Package 2  
<sup>\*\*\*</sup>Composite Imperviousness taken from Castle Pines Commercial Filing 10A Phase III Drainage Report  
1. From Table RO-3 and RO-5 in the UDFCD USDCM  
2. From Equations RO-6 and RO-7 and Table RO-4 in the UDFCD USDCM

STANDARD FORM SF-2  
TIME OF CONCENTRATION

Development: Promenade at Castle Rock  
Calculated By: LJT

Date: 3/13/2015

| Subbasin Data |       |      | Time of Concentration, T <sub>c</sub>   |       |                |                               |       |          |                |                                                | Minimum Tc in Urban Areas |              |                            | Final T <sub>c</sub> | Remarks           |  |  |
|---------------|-------|------|-----------------------------------------|-------|----------------|-------------------------------|-------|----------|----------------|------------------------------------------------|---------------------------|--------------|----------------------------|----------------------|-------------------|--|--|
|               |       |      | Initial/Overland Time (t <sub>i</sub> ) |       |                | Travel Time (t <sub>t</sub> ) |       |          |                |                                                | T <sub>c</sub> Check      |              |                            |                      |                   |  |  |
| Sub-Basin     | Area  | C5   | Length (300' max)                       | Slope | t <sub>i</sub> | Length                        | Slope | Velocity | t <sub>t</sub> | t <sub>c</sub> =t <sub>i</sub> +t <sub>t</sub> | Comp T <sub>c</sub>       | Total Length | T <sub>c</sub> (urban) Min |                      |                   |  |  |
|               | acres |      | ft                                      | %     | min.           | ft                            | %     | fps      | min            | min                                            | T <sub>c</sub>            | min          | min                        | min                  |                   |  |  |
| 1             | 2     | 3    | 4                                       | 5     | 6              | 7                             | 8     | 9        | 10             | 11                                             | 12                        | 13           | 14                         | 15                   |                   |  |  |
|               |       |      |                                         |       |                |                               |       |          |                |                                                |                           |              |                            |                      |                   |  |  |
| A1            | 2.25  | 0.51 |                                         |       |                |                               |       |          |                |                                                |                           |              |                            | 5.0                  | 5 minutes minimum |  |  |
|               |       |      |                                         |       |                |                               |       |          |                |                                                |                           |              |                            |                      |                   |  |  |
| A3            | 1.94  | 0.78 |                                         |       |                |                               |       |          |                |                                                |                           |              |                            | 5.0                  | 5 minutes minimum |  |  |
| A4            | 1.95  | 0.44 |                                         |       |                |                               |       |          |                |                                                |                           |              |                            | 5.0                  | 5 minutes minimum |  |  |
| A5            | 1.63  | 0.39 |                                         |       |                |                               |       |          |                |                                                |                           |              |                            | 5.0                  | 5 minutes minimum |  |  |
| A6            | 2.68  | 0.74 | 95                                      | 4.6%  | 3.9            | 670                           | 4.9%  | 4.4      | 2.5            | 6.4                                            | 6.4                       | 765          | 14.3                       | 6.4                  |                   |  |  |
| A7            | 1.41  | 0.54 |                                         |       |                |                               |       |          |                |                                                |                           |              |                            | 5.0                  | 5 minutes minimum |  |  |
| A8            | 3.92  | 0.42 | 61                                      | 25.0% | 3.3            | 725                           | 3.0%  | 3.5      | 3.5            | 6.8                                            | 6.8                       | 786          | 14.4                       | 6.8                  |                   |  |  |
|               |       |      |                                         |       |                |                               |       |          |                |                                                |                           |              |                            |                      |                   |  |  |
| A10           | 2.14  | 0.81 |                                         |       |                |                               |       |          |                |                                                |                           |              |                            | 5.0                  | 5 minutes minimum |  |  |
| A11           | 1.62  | 0.62 |                                         |       |                |                               |       |          |                |                                                |                           |              |                            | 5.0                  | 5 minutes minimum |  |  |
| A12           | 3.19  | 0.31 |                                         |       |                |                               |       |          |                |                                                |                           |              |                            | 5.0                  | 5 minutes minimum |  |  |
| 11            | 16.05 | 0.69 | 300                                     | 2.0%  | 10.3           | 725                           | 1.0%  | 2.0      | 6.0            | 16.3                                           | 16.3                      | 1025         | 15.7                       | 15.7                 |                   |  |  |
| 30            | 15.61 | 0.67 | 200                                     | 4.0%  | 7.0            | 1200                          | 1.0%  | 2.0      | 10.0           | 17.0                                           | 17.0                      | 1400         | 17.8                       | 17.0                 |                   |  |  |
| 40            | 3.58  | 0.72 | 200                                     | 3.0%  | 6.8            | 400                           | 1.0%  | 2.0      | 3.3            | 10.1                                           | 10.1                      | 600          | 13.3                       | 10.1                 |                   |  |  |
| 41            | 2.20  | 0.72 | 200                                     | 3.0%  | 6.8            | 350                           | 1.0%  | 2.0      | 2.9            | 9.7                                            | 9.7                       | 550          | 13.1                       | 9.7                  |                   |  |  |
| 50            | 18.37 | 0.54 | 300                                     | 3.0%  | 12.3           | 1000                          | 1.0%  | 2.0      | 8.3            | 20.7                                           | 20.7                      | 1300         | 17.2                       | 17.2                 |                   |  |  |
| 51            | 5.77  | 0.54 | 300                                     | 3.0%  | 12.3           | 250                           | 1.0%  | 2.0      | 2.1            | 14.4                                           | 14.4                      | 550          | 13.1                       | 13.1                 |                   |  |  |
| 52            | 14.24 | 0.43 | 300                                     | 2.0%  | 16.8           | 700                           | 1.0%  | 2.0      | 5.8            | 22.6                                           | 22.6                      | 1000         | 15.6                       | 15.6                 |                   |  |  |
| 53            | 11.47 | 0.60 | 300                                     | 2.0%  | 12.6           | 400                           | 1.0%  | 2.0      | 3.3            | 16.0                                           | 16.0                      | 700          | 13.9                       | 13.9                 |                   |  |  |
| 61            | 9.61  | 0.66 | 283                                     | 2.1%  | 10.7           | 754                           | 1.3%  | 2.3      | 5.5            | 16.2                                           | 16.2                      | 1037         | 15.8                       | 15.8                 |                   |  |  |
|               |       |      |                                         |       |                |                               |       |          |                |                                                |                           |              |                            |                      |                   |  |  |
| 70            | 3.00  | 0.59 | 150                                     | 2.0%  | 9.0            | 250                           | 1.0%  | 2.0      | 2.1            | 11.1                                           | 11.1                      | 400          | 12.2                       | 11.1                 |                   |  |  |
| O1            | 8.52  | 0.30 | 230                                     | 2.0%  | 17.7           | 1000                          | 2.0%  | 2.8      | 5.9            | 23.6                                           | 23.6                      | 1230         | 16.8                       | 16.8                 |                   |  |  |
| O2            | 8.34  | 0.42 | 300                                     | 2.0%  | 17.0           | 1200                          | 1.0%  | 2.0      | 10.0           | 27.0                                           | 27.0                      | 1500         | 18.3                       | 18.3                 |                   |  |  |
| O3            | 1.65  | 0.40 |                                         |       |                |                               |       |          |                |                                                |                           |              |                            | 5.0                  | 5 minutes minimum |  |  |
| O4            | 5.06  | 0.66 | 300                                     | 2.0%  | 11.0           | 270                           | 1.0%  | 2.0      | 2.3            | 13.3                                           | 13.3                      | 570          | 13.2                       | 13.2                 |                   |  |  |
| O5            | 0.60  | 0.90 |                                         |       |                |                               |       |          |                |                                                |                           |              |                            | 5.0                  | 5 minutes minimum |  |  |
|               |       |      |                                         |       |                |                               |       |          |                |                                                |                           |              |                            |                      |                   |  |  |
| B1            | 14.20 | 0.59 | 250                                     | 2.0%  | 11.7           | 845                           | 2.0%  | 2.1      | 6.6            | 18.4                                           | 18.4                      | 1095         | 16.1                       | 16.1                 |                   |  |  |
|               |       |      |                                         |       |                |                               |       |          |                |                                                |                           |              |                            |                      |                   |  |  |

- Notes:
- Flows calculated using the rational method, based on the methods provided in chapter 4 section 4 (rainfall), and Chapter 5 Section 2 (runoff) of the USDCM by UDFCD (2008).
  - $T_i = 0.395(1.1 - C_{10})(L)^{0.5} / S^{0.33}$
  - $V = C_v S w^{0.5}$
  - Refer to CUHP results for routing for Basins 3, 4, 8, 10, 18A, B,&C, 19 A&B, 20A&B, 21, 22, 23, 80 and 90

Job #: 20029-01-002  
Project: Promenade at Castle Rock  
Design Storm: 5-Year Storm

| STREET | DESIGN POINT | DIRECT RUNOFF       |              |            |             |             |     |            | TOTAL RUNOFF                    |                 |            |          | STREET     |                 | PIPE                              |            |              | TRAVEL TIME |               |           |         |       |
|--------|--------------|---------------------|--------------|------------|-------------|-------------|-----|------------|---------------------------------|-----------------|------------|----------|------------|-----------------|-----------------------------------|------------|--------------|-------------|---------------|-----------|---------|-------|
|        |              | Area<br>Design      | Area<br>(ac) | Coeff<br>C | Tc<br>(min) | C*A<br>(ac) | I   | Q<br>(cfs) | Tc<br>(min)                     | Sum C*A<br>(ac) | I<br>in/hr | Q<br>cfs | Slope<br>% | Street Q<br>cfs | Design Q<br>cfs                   | Slope<br>% | PIPE<br>SIZE | L<br>ft     | VEL<br>ft/sec | Tt<br>min | Q add'l | Q tot |
| 1      | 2            | 3                   | 4            | 5          | 6           | 7           | 8   | 9          | 10                              | 11              | 12         | 13       | 14         | 15              | 16                                | 17         | 18           | 19          | 20            | 21        |         |       |
|        | 1            | 61                  | 9.61         | 0.66       | 15.8        | 6.3         | 3.2 | 20.2       |                                 |                 |            |          |            |                 | 20.2                              |            | 48"          | 866         | 19            | 0.8       |         |       |
|        |              |                     |              |            |             |             |     |            |                                 |                 |            |          |            |                 |                                   |            |              |             |               |           |         |       |
|        | 2            | A1                  | 2.25         | 0.51       | 5.0         | 1.1         | 4.9 | 5.4        |                                 |                 |            |          |            |                 | 5.4                               | 1%         | 36"          | 167         | 8             | 0.3       |         |       |
|        |              | 50                  | 18.37        | 0.54       | 17.2        | 9.9         | 3   | 29.7       |                                 |                 |            |          |            |                 |                                   |            |              |             |               |           |         |       |
|        | 3            | A1,50               |              |            |             |             |     |            | 17.2                            | 11.0            | 3          | 33.0     |            |                 | 33.0                              | 2.7%       | 36"          | 372         | 14.6          | 0.4       |         |       |
|        |              | A3                  | 1.94         | 0.78       | 5.0         | 1.5         | 4.9 | 7.4        |                                 |                 |            |          |            |                 |                                   |            |              |             |               |           |         |       |
|        |              | 51                  | 5.77         | 0.54       | 13.1        | 3.1         | 3.5 | 10.9       |                                 |                 |            |          |            |                 |                                   |            |              |             |               |           |         |       |
|        | 4            | A1,A3,50,51         |              |            |             |             |     |            | 17.6                            | 15.6            | 3          | 46.8     |            |                 | 46.8                              | 2.0%       | 48"          | 447         | 17.5          | 0.4       |         |       |
|        |              | A4                  | 1.95         | 0.44       | 5.0         | 0.9         | 4.9 | 4.4        |                                 |                 |            |          |            |                 |                                   |            |              |             |               |           |         |       |
|        | 5            | A1-A4,50,51         |              |            |             |             |     |            | 18.0                            | 16.5            | 3          | 49.5     |            |                 | 49.5                              | 1.0%       | 48"          | 371         | 13            | 0.5       |         |       |
|        |              | A5                  | 1.63         | 0.39       | 5.0         | 0.6         | 4.9 | 2.9        |                                 |                 |            |          |            |                 |                                   |            |              |             |               |           |         |       |
|        | 6            | A1-A5,50,51         |              |            |             |             |     |            | 18.5                            | 17.1            | 2.9        | 49.6     |            |                 | 49.6                              | 90.0%      | 48"          | 181         | 12            | 0.3       |         |       |
|        |              |                     |              |            |             |             |     |            | 80.0                            | 17.10           | 1.2        | 20.5     |            |                 | PEAK FLOW ADDED TO SWMM MODEL J20 |            |              |             |               |           |         |       |
|        | 120          | 19A-B, 20A-B, 21-23 |              |            | 80.0        |             |     |            | Refer to SWMM results for flows |                 |            |          |            |                 |                                   |            |              |             |               |           |         |       |
|        | J35          |                     |              |            | 80.0        |             |     |            | Refer to SWMM results for flows |                 |            |          |            |                 |                                   |            |              |             |               |           |         |       |
|        |              | O1                  | 8.52         | 0.30       | 16.8        | 2.5         | 3.1 | 7.8        | 80.0                            | 2.5             | 1.2        | 3.0      |            |                 | PEAK FLOW ADDED TO SWMM MODEL J30 |            |              |             |               |           |         |       |
|        | J30          | 18A-D, J20, O1      |              |            | 80.0        |             |     |            | Refer to SWMM results for flows |                 |            |          |            |                 |                                   |            |              |             |               |           |         |       |
|        |              | 52                  | 14.24        | 0.43       | 15.6        | 6.2         | 3.2 | 19.8       | 80.0                            | 6.2             | 1.2        | 7.4      |            |                 | PEAK FLOW ADDED TO SWMM MODEL J25 |            |              |             |               |           |         |       |
|        | J25          | J30, 52             |              |            | 80          |             |     |            | Refer to SWMM results for flows |                 |            |          |            |                 |                                   |            |              |             |               |           |         |       |
|        |              | 53                  | 11.47        | 0.60       | 13.9        | 6.9         | 3.4 | 23.5       | 80.0                            | 6.9             | 1.2        | 8.3      |            |                 | PEAK FLOW ADDED TO SWMM MODEL J22 |            |              |             |               |           |         |       |
|        | J22          | J25, 53             |              |            | 80.0        |             |     |            | Refer to SWMM results for flows |                 |            |          |            |                 |                                   |            |              |             |               |           |         |       |
|        | J20          | J22,A1-A5,50,51     |              |            | 80.0        |             |     |            | Refer to SWMM results for flows |                 |            |          |            |                 |                                   |            |              |             |               |           |         |       |
|        |              | 30                  | 15.61        | 0.67       | 17.0        | 10.5        | 3.1 | 32.6       | 80.0                            | 10.5            | 1.2        | 12.6     |            |                 | PEAK FLOW ADDED TO SWMM MODEL J15 |            |              |             |               |           |         |       |
|        |              | 40                  | 3.58         | 0.72       | 10.1        | 2.6         | 3.8 | 9.9        | 80.0                            | 2.6             | 1.2        | 3.1      |            |                 | PEAK FLOW ADDED TO SWMM MODEL J15 |            |              |             |               |           |         |       |
|        | J15          | J20,30,40           |              |            | 80.0        |             |     |            | Refer to SWMM results for flows |                 |            |          |            |                 |                                   |            |              |             |               |           |         |       |

CUHP SUBCATCHMENTS

Columns with this color heading are for required user-input

Columns with this color heading are for optional override values

Columns with this color heading are for program-calculated values

|                      |                         |          |                            |                            |                |               |                           | Maximum Depression Storage<br>(Watershed inches) |            | Horton's Infiltration<br>Parameters |                                     |                          | DCIA                   |
|----------------------|-------------------------|----------|----------------------------|----------------------------|----------------|---------------|---------------------------|--------------------------------------------------|------------|-------------------------------------|-------------------------------------|--------------------------|------------------------|
| Subcatchment<br>Name | EPA SWMM Target<br>Node | Raingage | Area<br>(mi <sup>2</sup> ) | Length to<br>Centroid (mi) | Length<br>(mi) | Slope (ft/ft) | Percent<br>Imperviousness | Pervious                                         | Impervious | Initial<br>Rate<br>(in/hr)          | Decay<br>Coefficient<br>(1/seconds) | Final<br>Rate<br>(in/hr) | Level 0,<br>1, or<br>2 |
| 3                    | RegionalDetentionPond   | 5-Yr     | 0.0167949                  | 0.139772727                | 0.3513         | 0.006469003   | 11                        | 0.4                                              | 0.1        | 4.605                               | 0.001568692                         | 0.6841                   | 0                      |
| 4                    | 114b                    | 5-Yr     | 0.0236406                  | 0.116477273                | 0.2148         | 0.045855379   | 70                        | 0.4                                              | 0.1        | 4.953                               | 0.000803792                         | 0.9623                   | 0                      |
| 7                    | RegionalDetentionPond   | 5-Yr     | 0.0173906                  | 0.096969697                | 0.2434         | 0.037354086   | 70                        | 0.4                                              | 0.1        | 4.793                               | 0.001154666                         | 0.8347                   | 0                      |
| 8                    | 118c                    | 5-Yr     | 0.0142969                  | 0.110606061                | 0.2208         | 0.036878216   | 70                        | 0.4                                              | 0.1        | 4.803                               | 0.001133364                         | 0.8424                   | 0                      |
| 10                   | 113d                    | 5-Yr     | 0.0222656                  | 0.157575758                | 0.317          | 0.036704731   | 59                        | 0.4                                              | 0.1        | 4.553                               | 0.001395496                         | 0.7384                   | 0                      |
| 18A                  | NortheastPond           | 5-Yr     | 0.06825                    | 0.233712121                | 0.4636         | 0.1279        | 30                        | 0.4                                              | 0.1        | 4.256                               | 0.001742635                         | 0.6029                   | 0                      |
| 19A                  | LowerGraceChapelPond    | 5-Yr     | 0.0406563                  | 0.186742424                | 0.3809         | 0.06          | 23                        | 0.4                                              | 0.1        | 4.256                               | 0.001742635                         | 0.6029                   | 0                      |
| 19B                  | LowerGraceChapelPond    | 5-Yr     | 0.0405469                  | 0.112689394                | 0.2333         | 0.06          | 35                        | 0.4                                              | 0.1        | 2.986                               | 0.001787306                         | 0.4981                   | 0                      |
| 20A                  | LowerGraceChapelPond    | 5-Yr     | 0.0023438                  | 0.013636364                | 0.0491         | 0.023980815   | 9                         | 0.4                                              | 0.1        | 3.732                               | 0.001397444                         | 0.683                    | 0                      |
| 20B                  | LowerGraceChapelPond    | 5-Yr     | 0.0052344                  | 0.030492424                | 0.1091         | 0.023980815   | 17                        | 0.4                                              | 0.1        | 3.732                               | 0.001397444                         | 0.683                    | 0                      |
| 21                   | 121                     | 5-Yr     | 0.1912031                  | 0.45                       | 0.6809         | 0.057         | 16                        | 0.4                                              | 0.1        | 2.988                               | 0.001792789                         | 0.498                    | 0                      |
| 22                   | 122                     | 5-Yr     | 0.1924375                  | 0.282007576                | 0.5547         | 0.031410038   | 5                         | 0.4                                              | 0.1        | 2.948                               | 0.001769052                         | 0.4914                   | 0                      |
| 23                   | 123                     | 5-Yr     | 0.0859219                  | 0.265340909                | 0.633          | 0.011968881   | 25                        | 0.4                                              | 0.1        | 3                                   | 0.0018                              | 0.5                      | 0                      |
| 62                   | J50                     | 5-Yr     | 0.0256406                  | 0.070454545                | 0.2199         | 0.02          | 56                        | 0.4                                              | 0.1        | 3.581                               | 0.001741473                         | 0.5583                   | 0                      |
| 70                   | 114d                    | 5-Yr     | 0.0046875                  | 0.037878788                | 0.1117         | 0.02          | 80                        | 0.4                                              | 0.1        | 3.581                               | 0.001741473                         | 0.5583                   | 0                      |
| 80                   | J60                     | 5-Yr     | 0.0305781                  | 0.438068182                | 0.8657         | 0.06          | 37                        | 0.4                                              | 0.1        | 4.256                               | 0.001742635                         | 0.6029                   | 0                      |
| 85                   | J80                     | 5-Yr     | 0.0430469                  | 0.096590909                | 0.197          | 0.04          | 17                        | 0.4                                              | 0.1        | 4.256                               | 0.001742635                         | 0.6029                   | 0                      |
| 90                   | J90                     | 5-Yr     | 0.046125                   | 0.094886364                | 0.2411         | 0.025         | 80                        | 0.4                                              | 0.1        | 3.89                                | 0.00174                             | 0.6                      | 0                      |
| 18B                  | J36                     | 5-Yr     | 0.0144375                  | 0.133712121                | 0.2161         | 0.035         | 30.4                      | 0.4                                              | 0.1        | 3.8                                 | 0.00174                             | 0.613                    | 0                      |
| 18C                  | J36                     | 5-Yr     | 0.004875                   | 0.097537879                | 0.2256         | 0.043         | 6.1                       | 0.4                                              | 0.1        | 3.8                                 | 0.018                               | 0.6                      | 0                      |
| 18D                  | J35                     | 5-Yr     | 0.0059219                  | 0.050378788                | 0.135          | 0.04          | 26.6                      | 0.4                                              | 0.1        | 3.8                                 | 0.018                               | 0.6                      | 0                      |
| 17                   | 117                     | 5-Yr     | 0.0845938                  | 0.259276515                | 0.5917         | 0.06          | 17                        | 0.4                                              | 0.1        | 3.426                               | 0.001798023                         | 0.5281                   | 0                      |
| 6                    | 106                     | 5-Yr     | 0.0216406                  | 0.19469697                 | 0.4504         | 0.046         | 14                        | 0.4                                              | 0.1        | 4.256                               | 0.001742635                         | 0.6029                   | 0                      |

### Printouts for Storm Hydrographs

[illegible]

### Printouts for Unit Hydrographs

flow in cfs

|     | time in minutes | 3     | 4     | 7     | 8     | 10     | 18A    | 19A   | 19B    | 20A   | 20B    | 21     | 22     | 23    | 62    | 70    | 80    | 85     | 90     | 18B   | 18C  | 18D   | 17    | 6    |
|-----|-----------------|-------|-------|-------|-------|--------|--------|-------|--------|-------|--------|--------|--------|-------|-------|-------|-------|--------|--------|-------|------|-------|-------|------|
| 5   | 2.38            |       | 94.55 | 55.71 | 39.22 | 38.45  | 106.95 | 36.16 | 114.51 | 4.28  | 6.91   | 111.71 | 112.92 | 32.23 | 93.64 | 21.26 | 8.14  | 72.40  | 268.16 | 14.25 | 1.33 | 8.76  | 53.63 | 6.51 |
| 10  | 5.61            | 58.00 | 43.05 | 34.64 | 53.03 | 121.25 | 48.90  | 80.75 | 3.64   | 6.94  | 191.24 | 198.16 | 64.59  | 60.89 | 10.41 | 18.61 | 70.72 | 112.20 | 18.49  | 2.50  | 8.83 | 84.91 | 12.47 |      |
| 15  | 7.10            | 23.83 | 22.03 | 19.27 | 31.23 | 84.52  | 43.59  | 49.78 | 2.67   | 5.43  | 188.16 | 196.70 | 70.76  | 29.83 | 4.19  | 23.09 | 50.78 | 34.72  | 15.89  | 2.63  | 6.63 | 81.36 | 13.26 |      |
| 20  | 7.18            | 11.48 | 10.67 | 9.37  | 20.82 | 61.38  | 34.48  | 29.01 | 2.00   | 4.44  | 160.91 | 165.72 | 66.60  | 14.74 | 2.02  | 22.76 | 37.58 | 0.00   | 12.52  | 2.57  | 5.14 | 69.08 | 12.86 |      |
| 25  | 7.05            | 0.69  | 5.01  | 5.69  | 11.56 | 47.43  | 28.56  | 18.65 | 1.56   | 3.54  | 133.04 | 136.61 | 57.32  | 5.69  | 0.00  | 20.78 | 29.56 |        | 10.11  | 2.45  | 4.11 | 57.81 | 12.04 |      |
| 30  | 6.83            | 0.00  | 0.00  | 2.01  | 8.41  | 33.47  | 23.47  | 11.72 | 1.12   | 2.96  | 113.11 | 114.78 | 49.26  | 0.00  |       | 17.35 | 21.54 |        | 8.40   | 2.27  | 3.26 | 49.30 | 10.81 |      |
| 35  | 6.50            |       |       | 0.00  | 5.27  | 23.60  | 20.10  | 4.80  | 0.80   | 2.39  | 94.93  | 96.70  | 43.37  |       |       | 15.55 | 14.88 |        | 7.03   | 2.03  | 2.41 | 41.54 | 9.61  |      |
| 40  | 6.06            |       |       |       | 2.13  | 18.95  | 16.74  | 0.00  | 0.65   | 1.82  | 83.67  | 84.46  | 37.47  |       |       | 13.75 | 12.21 |        | 5.67   | 1.87  | 1.78 | 36.70 | 8.83  |      |
| 45  | 5.52            |       |       |       | 0.00  | 14.29  | 13.38  |       | 0.51   | 1.39  | 72.42  | 72.21  | 33.28  |       |       | 11.95 | 9.53  |        | 4.30   | 1.73  | 1.49 | 31.86 | 8.05  |      |
| 50  | 5.16            |       |       |       |       | 9.64   | 10.02  |       | 0.36   | 1.20  | 61.16  | 59.96  | 29.95  |       |       | 10.79 | 6.86  |        | 3.46   | 1.60  | 1.21 | 27.01 | 7.26  |      |
| 55  | 4.87            |       |       |       |       | 4.99   | 8.76   |       | 0.21   | 1.01  | 49.91  | 47.71  | 26.61  |       |       | 9.78  | 4.19  |        | 3.01   | 1.46  | 0.93 | 22.17 | 6.55  |      |
| 60  | 4.58            |       |       |       |       | 0.33   | 7.64   |       | 0.07   | 0.82  | 38.80  | 38.89  | 23.27  |       |       | 8.77  | 1.51  |        | 2.55   | 1.33  | 0.65 | 17.33 | 6.09  |      |
| 65  | 4.28            |       |       |       |       | 0.00   | 6.52   |       | 0.00   | 0.63  | 35.05  | 34.80  | 19.94  |       |       | 7.76  | 0.00  |        | 2.10   | 1.25  | 0.36 | 15.50 | 5.64  |      |
| 70  | 3.99            |       |       |       |       |        | 5.40   |       | 0.44   | 31.30 | 30.72  | 16.60  |        |       |       | 6.75  |       |        | 1.64   | 1.17  | 0.08 | 13.89 | 5.18  |      |
| 75  | 3.70            |       |       |       |       |        | 4.28   |       | 0.25   | 27.55 | 26.64  | 13.89  |        |       |       | 5.74  |       |        | 1.19   | 1.09  | 0.00 | 12.27 | 4.72  |      |
| 80  | 3.48            |       |       |       |       |        | 3.16   |       | 0.06   | 23.80 | 22.56  | 12.78  |        |       |       | 4.73  |       |        | 0.73   | 1.01  |      | 10.66 | 4.27  |      |
| 85  | 3.31            |       |       |       |       |        | 2.04   |       | 0.00   | 20.05 | 18.47  | 11.67  |        |       |       | 4.34  |       |        | 0.27   | 0.93  |      | 9.04  | 3.81  |      |
| 90  | 3.14            |       |       |       |       |        | 0.92   |       |        | 16.29 | 14.39  | 10.55  |        |       |       | 4.00  |       |        | 0.00   | 0.85  |      | 7.43  | 3.36  |      |
| 95  | 2.97            |       |       |       |       |        | 0.00   |       |        |       | 12.54  | 10.31  | 9.44   |       |       | 3.66  |       |        |        | 0.77  |      | 5.82  | 2.90  |      |
| 100 | 2.80            |       |       |       |       |        |        |       |        |       | 8.79   | 6.23   | 8.33   |       |       | 3.33  |       |        |        | 0.69  |      | 4.20  | 2.59  |      |
| 105 | 2.63            |       |       |       |       |        |        |       |        |       | 5.04   | 2.14   | 7.22   |       |       | 2.99  |       |        |        | 0.61  |      | 2.59  | 2.44  |      |
| 110 | 2.46            |       |       |       |       |        |        |       |        |       | 1.29   | 0.00   | 6.10   |       |       | 2.65  |       |        |        | 0.53  |      | 0.97  | 2.28  |      |
| 115 | 2.28            |       |       |       |       |        |        |       |        |       | 0.00   |        | 4.99   |       |       | 2.32  |       |        |        | 0.50  |      | 0.00  | 2.13  |      |
| 120 | 2.11            |       |       |       |       |        |        |       |        |       |        |        | 3.88   |       |       | 1.98  |       |        |        | 0.48  |      |       | 1.98  |      |
| 125 | 1.94            |       |       |       |       |        |        |       |        |       |        |        | 2.77   |       |       | 1.64  |       |        |        | 0.45  |      |       | 1.83  |      |
| 130 | 1.77            |       |       |       |       |        |        |       |        |       |        |        | 1.66   |       |       | 1.31  |       |        |        | 0.42  |      |       | 1.68  |      |
| 135 | 1.60            |       |       |       |       |        |        |       |        |       |        |        | 0.54   |       |       | 0.97  |       |        |        | 0.40  |      |       | 1.52  |      |
| 140 | 1.44            |       |       |       |       |        |        |       |        |       |        |        | 0.00   |       |       | 0.63  |       |        |        | 0.37  |      |       | 1.37  |      |
| 145 | 1.38            |       |       |       |       |        |        |       |        |       |        |        |        |       |       | 0.30  |       |        |        | 0.35  |      |       | 1.22  |      |
| 150 | 1.32            |       |       |       |       |        |        |       |        |       |        |        |        |       |       | 0.00  |       |        |        | 0.32  |      |       | 1.07  |      |
| 155 | 1.26            |       |       |       |       |        |        |       |        |       |        |        |        |       |       |       |       |        |        | 0.29  |      |       | 0.91  |      |
| 160 | 1.21            |       |       |       |       |        |        |       |        |       |        |        |        |       |       |       |       |        |        | 0.27  |      |       | 0.76  |      |
| 165 | 1.15            |       |       |       |       |        |        |       |        |       |        |        |        |       |       |       |       |        |        | 0.24  |      |       | 0.61  |      |
| 170 | 1.09            |       |       |       |       |        |        |       |        |       |        |        |        |       |       |       |       |        |        | 0.21  |      |       | 0.46  |      |
| 175 | 1.03            |       |       |       |       |        |        |       |        |       |        |        |        |       |       |       |       |        |        | 0.19  |      |       | 0.31  |      |
| 180 | 0.98            |       |       |       |       |        |        |       |        |       |        |        |        |       |       |       |       |        |        | 0.16  |      |       | 0.15  |      |
| 185 | 0.92            |       |       |       |       |        |        |       |        |       |        |        |        |       |       |       |       |        |        | 0.13  |      |       | 0.00  |      |
| 190 | 0.86            |       |       |       |       |        |        |       |        |       |        |        |        |       |       |       |       |        |        | 0.11  |      |       | 0.00  |      |
| 195 | 0.81            |       |       |       |       |        |        |       |        |       |        |        |        |       |       |       |       |        |        | 0.08  |      |       |       |      |
| 200 | 0.75            |       |       |       |       |        |        |       |        |       |        |        |        |       |       |       |       |        |        | 0.06  |      |       |       |      |
| 205 | 0.69            |       |       |       |       |        |        |       |        |       |        |        |        |       |       |       |       |        |        | 0.03  |      |       |       |      |
| 210 | 0.63            |       |       |       |       |        |        |       |        |       |        |        |        |       |       |       |       |        |        | 0.00  |      |       |       |      |
| 215 | 0.58            |       |       |       |       |        |        |       |        |       |        |        |        |       |       |       |       |        |        | 0.00  |      |       |       |      |
| 220 | 0.52            |       |       |       |       |        |        |       |        |       |        |        |        |       |       |       |       |        |        |       |      |       |       |      |
| 225 | 0.46            |       |       |       |       |        |        |       |        |       |        |        |        |       |       |       |       |        |        |       |      |       |       |      |
| 230 | 0.41            |       |       |       |       |        |        |       |        |       |        |        |        |       |       |       |       |        |        |       |      |       |       |      |
| 235 | 0.35            |       |       |       |       |        |        |       |        |       |        |        |        |       |       |       |       |        |        |       |      |       |       |      |
| 240 | 0.29            |       |       |       |       |        |        |       |        |       |        |        |        |       |       |       |       |        |        |       |      |       |       |      |
| 245 | 0.23            |       |       |       |       |        |        |       |        |       |        |        |        |       |       |       |       |        |        |       |      |       |       |      |
| 250 | 0.18            |       |       |       |       |        |        |       |        |       |        |        |        |       |       |       |       |        |        |       |      |       |       |      |
| 255 | 0.12            |       |       |       |       |        |        |       |        |       |        |        |        |       |       |       |       |        |        |       |      |       |       |      |
| 260 | 0.06            |       |       |       |       |        |        |       |        |       |        |        |        |       |       |       |       |        |        |       |      |       |       |      |
| 265 | 0.01            |       |       |       |       |        |        |       |        |       |        |        |        |       |       |       |       |        |        |       |      |       |       |      |
| 270 | 0.00            |       |       |       |       |        |        |       |        |       |        |        |        |       |       |       |       |        |        |       |      |       |       |      |

**Summary of Unit Hydrograph Parameters Used By Program and Calculated Results (Version 1.4.3)**

| Catchment Name/ID | User Comment for Catchment | Unit Hydrograph Parameters and Results |       |               |                       |               |                       |                           |            |                  | Excess Precip.     |                  | Storm Hydrograph          |                    |                           |                                       |
|-------------------|----------------------------|----------------------------------------|-------|---------------|-----------------------|---------------|-----------------------|---------------------------|------------|------------------|--------------------|------------------|---------------------------|--------------------|---------------------------|---------------------------------------|
|                   |                            | Ct                                     | Cp    | W50<br>(min.) | W50<br>Before<br>Peak | W75<br>(min.) | W75<br>Before<br>Peak | Time to<br>Peak<br>(min.) | Peak (cfs) | Volume<br>(c.f.) | Excess<br>(inches) | Excess<br>(c.f.) | Time to<br>Peak<br>(min.) | Peak Flow<br>(cfs) | Total<br>Volume<br>(c.f.) | Runoff per<br>Unit Area<br>(cfs/acre) |
| 3                 |                            | 0.299                                  | 0.158 | 70.0          | 9.99                  | 36.4          | 7.06                  | 16.6                      | 7          | 39,018           | 0.36               | 13,891           | 50.0                      | 2                  | 13,886                    | 0.21                                  |
| 4                 |                            | 0.168                                  | 0.425 | 6.6           | 2.31                  | 3.4           | 1.55                  | 6.1                       | 107        | 54,922           | 1.15               | 63,272           | 25.0                      | 37                 | 65,163                    | 2.46                                  |
| 7                 |                            | 0.184                                  | 0.407 | 7.7           | 2.71                  | 4.0           | 1.81                  | 6.5                       | 67         | 40,402           | 1.19               | 48,034           | 30.0                      | 26                 | 48,677                    | 2.32                                  |
| 8                 |                            | 0.196                                  | 0.395 | 8.6           | 3.02                  | 4.5           | 2.02                  | 6.9                       | 50         | 33,215           | 1.19               | 39,368           | 30.0                      | 20                 | 39,184                    | 2.19                                  |
| 10                |                            | 0.180                                  | 0.385 | 11.5          | 4.02                  | 6.0           | 2.69                  | 8.2                       | 58         | 51,728           | 1.05               | 54,561           | 30.0                      | 26                 | 54,078                    | 1.81                                  |
| 18A               |                            | 0.152                                  | 0.251 | 16.0          | 4.58                  | 8.3           | 3.24                  | 7.6                       | 128        | 158,558          | 0.71               | 113,194          | 30.0                      | 50                 | 112,824                   | 1.15                                  |
| 19A               |                            | 0.192                                  | 0.200 | 24.8          | 5.32                  | 12.9          | 3.76                  | 8.9                       | 49         | 94,453           | 0.62               | 58,123           | 35.0                      | 20                 | 57,993                    | 0.77                                  |
| 19B               |                            | 0.170                                  | 0.268 | 10.2          | 3.57                  | 5.3           | 2.39                  | 6.0                       | 119        | 94,199           | 0.91               | 85,468           | 30.0                      | 47                 | 84,169                    | 1.83                                  |
| 20A               |                            | 0.577                                  | 0.121 | 16.4          | 3.02                  | 8.5           | 2.13                  | 5.0                       | 4          | 5,445            | 0.33               | 1,808            | 30.0                      | 1                  | 1,780                     | 0.68                                  |
| 20B               |                            | 0.391                                  | 0.135 | 21.5          | 3.73                  | 11.2          | 2.63                  | 6.2                       | 7          | 12,161           | 0.45               | 5,424            | 30.0                      | 2                  | 5,384                     | 0.65                                  |
| 21                |                            | 0.129                                  | 0.231 | 29.5          | 6.73                  | 15.3          | 4.75                  | 11.2                      | 194        | 444,203          | 0.67               | 299,101          | 40.0                      | 89                 | 299,115                   | 0.73                                  |
| 22                |                            | 0.159                                  | 0.247 | 28.4          | 6.90                  | 14.8          | 4.88                  | 11.5                      | 203        | 447,071          | 0.55               | 244,592          | 40.0                      | 81                 | 244,729                   | 0.66                                  |
| 23                |                            | 0.148                                  | 0.235 | 36.3          | 8.05                  | 18.9          | 5.69                  | 13.4                      | 71         | 199,614          | 0.78               | 156,233          | 40.0                      | 38                 | 156,160                   | 0.70                                  |
| 62                |                            | 0.174                                  | 0.381 | 7.4           | 2.59                  | 3.9           | 1.73                  | 6.1                       | 104        | 59,568           | 1.13               | 67,046           | 30.0                      | 40                 | 69,154                    | 2.45                                  |
| 70                |                            | 0.265                                  | 0.355 | 6.5           | 2.27                  | 3.4           | 1.52                  | 5.4                       | 22         | 10,890           | 1.45               | 15,816           | 25.0                      | 10                 | 16,507                    | 3.31                                  |
| 80                |                            | 0.184                                  | 0.269 | 39.5          | 9.65                  | 20.5          | 6.82                  | 16.1                      | 23         | 71,039           | 0.82               | 57,962           | 40.0                      | 13                 | 57,874                    | 0.65                                  |
| 85                |                            | 0.203                                  | 0.185 | 16.6          | 3.86                  | 8.6           | 2.73                  | 6.4                       | 78         | 100,007          | 0.53               | 53,199           | 30.0                      | 25                 | 52,943                    | 0.92                                  |
| 90                |                            | 0.130                                  | 0.501 | 4.8           | 1.69                  | 2.5           | 1.13                  | 5.6                       | 287        | 107,158          | 1.44               | 154,324          | 25.0                      | 119                | 179,335                   | 4.02                                  |
| 18B               |                            | 0.245                                  | 0.201 | 23.2          | 5.09                  | 12.1          | 3.60                  | 8.5                       | 19         | 33,541           | 0.73               | 24,554           | 35.0                      | 8                  | 24,511                    | 0.92                                  |
| 18C               |                            | 0.485                                  | 0.140 | 55.5          | 7.45                  | 28.9          | 5.26                  | 12.4                      | 3          | 11,326           | 0.59               | 6,708            | 45.0                      | 1                  | 6,705                     | 0.44                                  |
| 18D               |                            | 0.333                                  | 0.163 | 18.9          | 3.87                  | 9.8           | 2.73                  | 6.4                       | 9          | 13,758           | 0.83               | 11,376           | 30.0                      | 5                  | 11,319                    | 1.29                                  |
| 17                |                            | 0.164                                  | 0.206 | 29.8          | 6.22                  | 15.5          | 4.39                  | 10.4                      | 85         | 196,528          | 0.64               | 125,898          | 35.0                      | 38                 | 125,895                   | 0.69                                  |
| 6                 |                            | 0.261                                  | 0.163 | 48.8          | 7.62                  | 25.4          | 5.38                  | 12.7                      | 13         | 50,276           | 0.49               | 24,661           | 45.0                      | 5                  | 24,655                    | 0.38                                  |

**Summary of CUHP Input Parameters (Version 1.4.3)**

| Catchment Name/ID | SWMM Node/ID          | Raingage Name/ID | Area<br>(sq.mi.) | Dist. to<br>Centroid<br>(miles) | Length<br>(miles) | Slope<br>(ft./ft.) | Percent<br>Imperv. | Depression Storage   |                     | Horton's Infiltration Parameters |                         |                             | DCIA Level and Fractions |                                    |                              | Percent Eff.<br>Imperv. |
|-------------------|-----------------------|------------------|------------------|---------------------------------|-------------------|--------------------|--------------------|----------------------|---------------------|----------------------------------|-------------------------|-----------------------------|--------------------------|------------------------------------|------------------------------|-------------------------|
|                   |                       |                  |                  |                                 |                   |                    |                    | Pervious<br>(inches) | Imperv.<br>(inches) | Initial Rate<br>(in./hr.)        | Final Rate<br>(in./hr.) | Decay<br>Coeff.<br>(1/sec.) | DCIA Level               | Dir. Con'ct<br>Imperv.<br>Fraction | Receiv.<br>Perv.<br>Fraction |                         |
| 3                 | RegionalDetentionPond | 5-YR             | 0.017            | 0.140                           | 0.351             | 0.006              | 11.0               | 0.40                 | 0.10                | 4.61                             | 0.68                    | 0.0016                      | 0.00                     | 0.22                               | 0.10                         | 9.04                    |
| 4                 | 114b                  | 5-YR             | 0.024            | 0.116                           | 0.215             | 0.046              | 70.0               | 0.40                 | 0.10                | 4.95                             | 0.96                    | 0.0008                      | 0.00                     | 0.92                               | 0.30                         | 67.81                   |
| 7                 | RegionalDetentionPond | 5-YR             | 0.017            | 0.097                           | 0.243             | 0.037              | 70.0               | 0.40                 | 0.10                | 4.79                             | 0.83                    | 0.0012                      | 0.00                     | 0.92                               | 0.30                         | 68.24                   |
| 8                 | 118c                  | 5-YR             | 0.014            | 0.111                           | 0.221             | 0.037              | 70.0               | 0.40                 | 0.10                | 4.80                             | 0.84                    | 0.0011                      | 0.00                     | 0.92                               | 0.30                         | 68.22                   |
| 10                | 113d                  | 5-YR             | 0.022            | 0.158                           | 0.317             | 0.037              | 59.0               | 0.40                 | 0.10                | 4.55                             | 0.74                    | 0.0014                      | 0.00                     | 0.90                               | 0.27                         | 57.26                   |
| 18A               | NortheastPond         | 5-YR             | 0.068            | 0.234                           | 0.464             | 0.128              | 30.0               | 0.40                 | 0.10                | 4.26                             | 0.60                    | 0.0017                      | 0.00                     | 0.60                               | 0.17                         | 27.63                   |
| 19A               | LowerGraceChapelPond  | 5-YR             | 0.041            | 0.187                           | 0.381             | 0.060              | 23.0               | 0.40                 | 0.10                | 4.26                             | 0.60                    | 0.0017                      | 0.00                     | 0.46                               | 0.14                         | 20.63                   |
| 19B               | LowerGraceChapelPond  | 5-YR             | 0.041            | 0.113                           | 0.233             | 0.060              | 35.0               | 0.40                 | 0.10                | 2.99                             | 0.50                    | 0.0018                      | 0.00                     | 0.70                               | 0.19                         | 33.26                   |
| 20A               | LowerGraceChapelPond  | 5-YR             | 0.002            | 0.014                           | 0.049             | 0.024              | 9.0                | 0.40                 | 0.10                | 3.73                             | 0.68                    | 0.0014                      | 0.00                     | 0.18                               | 0.09                         | 7.36                    |
| 20B               | LowerGraceChapelPond  | 5-YR             | 0.005            | 0.030                           | 0.109             | 0.024              | 17.0               | 0.40                 | 0.10                | 3.73                             | 0.68                    | 0.0014                      | 0.00                     | 0.34                               | 0.12                         | 14.66                   |
| 21                | 121                   | 5-YR             | 0.191            | 0.450                           | 0.681             | 0.057              | 16.0               | 0.40                 | 0.10                | 2.99                             | 0.50                    | 0.0018                      | 0.00                     | 0.32                               | 0.12                         | 14.33                   |
| 22                | 122                   | 5-YR             | 0.192            | 0.282                           | 0.555             | 0.031              | 5.0                | 0.40                 | 0.10                | 2.95                             | 0.49                    | 0.0018                      | 0.00                     | 0.10                               | 0.05                         | 4.28                    |
| 23                | 123                   | 5-YR             | 0.086            | 0.265                           | 0.633             | 0.012              | 25.0               | 0.40                 | 0.10                | 3.00                             | 0.50                    | 0.0018                      | 0.00                     | 0.50                               | 0.15                         | 23.09                   |
| 62                | J50                   | 5-YR             | 0.026            | 0.070                           | 0.220             | 0.020              | 56.0               | 0.40                 | 0.10                | 3.58                             | 0.56                    | 0.0017                      | 0.00                     | 0.88                               | 0.25                         | 54.60                   |
| 70                | 114d                  | 5-YR             | 0.005            | 0.038                           | 0.112             | 0.020              | 80.0               | 0.40                 | 0.10                | 3.58                             | 0.56                    | 0.0017                      | 0.00                     | 0.94                               | 0.33                         | 79.05                   |
| 80                | J60                   | 5-YR             | 0.031            | 0.438                           | 0.866             | 0.060              | 37.0               | 0.40                 | 0.10                | 4.26                             | 0.60                    | 0.0017                      | 0.00                     | 0.74                               | 0.19                         | 34.96                   |
| 85                | J80                   | 5-YR             | 0.043            | 0.097                           | 0.197             | 0.040              | 17.0               | 0.40                 | 0.10                | 4.26                             | 0.60                    | 0.0017                      | 0.00                     | 0.34                               | 0.12                         | 14.85                   |
| 90                | J90                   | 5-YR             | 0.046            | 0.095                           | 0.241             | 0.025              | 80.0               | 0.40                 | 0.10                | 3.89                             | 0.60                    | 0.0017                      | 0.00                     | 0.94                               | 0.33                         | 78.99                   |
| 18B               | J36                   | 5-YR             | 0.014            | 0.134                           | 0.216             | 0.035              | 30.4               | 0.40                 | 0.10                | 3.80                             | 0.61                    | 0.0017                      | 0.00                     | 0.61                               | 0.17                         | 28.10                   |
| 18C               | J36                   | 5-YR             | 0.005            | 0.098                           | 0.226             | 0.043              | 6.1                | 0.40                 | 0.10                | 3.80                             | 0.60                    | 0.0180                      | 0.00                     | 0.12                               | 0.06                         | 5.31                    |
| 18D               | J35                   | 5-YR             | 0.006            | 0.050                           | 0.135             | 0.040              | 26.6               | 0.40                 | 0.10                | 3.80                             | 0.60                    | 0.0180                      | 0.00                     | 0.53                               | 0.16                         | 24.85                   |
| 17                | 117                   | 5-YR             | 0.085            | 0.259                           | 0.592             | 0.060              | 17.0               | 0.40                 | 0.10                | 3.43                             | 0.53                    | 0.0018                      | 0.00                     | 0.34                               | 0.12                         | 15.16                   |
| 6                 | 106                   | 5-YR             | 0.022            | 0.195                           | 0.450             | 0.046              | 14.0               | 0.40                 | 0.10                | 4.26                             | 0.60                    | 0.0017                      | 0.00                     | 0.28                               | 0.11                         | 12.03                   |

Node Inflow Summary

| Node | Type     | Maximum<br>Lateral<br>Inflow<br>CFS | Maximum<br>Total<br>Inflow<br>CFS | Day of<br>Maximum<br>Inflow | Hour of<br>Maximum<br>Inflow | Lateral<br>Inflow<br>Volume<br>10 <sup>6</sup> gal | Total<br>Inflow<br>Volume<br>10 <sup>6</sup> gal | Flow<br>Balance<br>Error<br>Percent |
|------|----------|-------------------------------------|-----------------------------------|-----------------------------|------------------------------|----------------------------------------------------|--------------------------------------------------|-------------------------------------|
| 121  | JUNCTION | 89.26                               | 89.26                             | 0                           | 00:40                        | 2.24                                               | 2.24                                             | 0.000                               |
| 122  | JUNCTION | 80.67                               | 168.40                            | 0                           | 00:40                        | 1.83                                               | 4.07                                             | 0.000                               |
| 123  | JUNCTION | 38.31                               | 205.58                            | 0                           | 00:42                        | 1.17                                               | 5.24                                             | 0.000                               |
| 120  | JUNCTION | 250.86                              | 250.86                            | 0                           | 01:20                        | 2.92                                               | 2.92                                             | 0.000                               |
| J40  | JUNCTION | 0.00                                | 250.33                            | 0                           | 01:20                        | 0                                                  | 2.92                                             | 0.000                               |
| J10  | JUNCTION | 41.20                               | 328.78                            | 0                           | 01:19                        | 0.799                                              | 16.3                                             | 0.000                               |
| 110a | JUNCTION | 0.00                                | 327.65                            | 0                           | 01:20                        | 0                                                  | 16.4                                             | 0.000                               |
| 118c | JUNCTION | 20.08                               | 20.08                             | 0                           | 00:30                        | 0.293                                              | 0.293                                            | 0.000                               |
| 114b | JUNCTION | 37.15                               | 45.68                             | 0                           | 00:26                        | 0.487                                              | 0.611                                            | 0.000                               |
| 111a | JUNCTION | 0.00                                | 392.58                            | 0                           | 01:20                        | 0                                                  | 15.2                                             | 0.000                               |
| J80  | JUNCTION | 25.44                               | 25.44                             | 0                           | 00:30                        | 0.396                                              | 0.396                                            | 0.000                               |
| J70  | JUNCTION | 0.00                                | 24.83                             | 0                           | 00:35                        | 0                                                  | 0.393                                            | 0.000                               |
| J20  | JUNCTION | 49.60                               | 297.44                            | 0                           | 01:19                        | 0.963                                              | 14.7                                             | 0.000                               |
| J60  | JUNCTION | 12.76                               | 36.60                             | 0                           | 00:36                        | 0.433                                              | 0.825                                            | 0.000                               |
| J35  | JUNCTION | 4.90                                | 5.05                              | 0                           | 00:30                        | 0.0847                                             | 0.574                                            | 0.000                               |
| J30  | JUNCTION | 7.80                                | 301.69                            | 0                           | 01:21                        | 0.153                                              | 12.9                                             | 0.000                               |

| Node                    | Type     | Maximum<br>Lateral<br>Inflow<br>CFS | Maximum<br>Total<br>Inflow<br>CFS | Day of<br>Maximum<br>Inflow | Hour of<br>Maximum<br>Inflow | Lateral<br>Inflow<br>Volume<br>10^6 gal | Total<br>Inflow<br>Volume<br>10^6 gal | Flow<br>Balance<br>Error<br>Percent |
|-------------------------|----------|-------------------------------------|-----------------------------------|-----------------------------|------------------------------|-----------------------------------------|---------------------------------------|-------------------------------------|
| J90                     | JUNCTION | 144.81                              | 144.81                            | 0                           | 00:25                        | 18.2                                    | 18.1                                  | 0.000                               |
| 114d                    | JUNCTION | 9.93                                | 9.93                              | 0                           | 00:25                        | 0.123                                   | 0.123                                 | 0.000                               |
| J100                    | JUNCTION | 0.00                                | 26.00                             | 0                           | 08:24                        | 0                                       | 15.9                                  | 0.000                               |
| J36                     | JUNCTION | 23.69                               | 23.69                             | 0                           | 00:35                        | 9.25                                    | 9.25                                  | 0.000                               |
| J37                     | JUNCTION | 0.00                                | 28.42                             | 0                           | 00:35                        | 0                                       | 9.82                                  | -0.000                              |
| J25                     | JUNCTION | 19.80                               | 285.63                            | 0                           | 01:21                        | 0.392                                   | 13.3                                  | 0.000                               |
| J5                      | JUNCTION | 7.00                                | 329.41                            | 0                           | 01:19                        | 0.146                                   | 16.4                                  | 0.000                               |
| J22                     | JUNCTION | 23.50                               | 284.72                            | 0                           | 01:21                        | 0.473                                   | 13.7                                  | 0.000                               |
| J15                     | JUNCTION | 40.60                               | 312.55                            | 0                           | 01:19                        | 0.799                                   | 15.5                                  | 0.000                               |
| J50                     | JUNCTION | 40.20                               | 70.54                             | 0                           | 00:31                        | 0.517                                   | 1.64                                  | 0.000                               |
| 9                       | JUNCTION | 0.00                                | 0.00                              | 0                           | 00:00                        | 0                                       | 0                                     | 0.000                               |
| 117                     | JUNCTION | 37.53                               | 37.53                             | 0                           | 00:35                        | 0.942                                   | 0.942                                 | 0.000                               |
| 106                     | JUNCTION | 5.22                                | 42.40                             | 0                           | 00:40                        | 0.184                                   | 1.13                                  | 0.000                               |
| 201                     | OUTFALL  | 0.00                                | 392.50                            | 0                           | 01:20                        | 0                                       | 15.2                                  | 0.000                               |
| 112d                    | DIVIDER  | 0.00                                | 392.60                            | 0                           | 01:19                        | 0                                       | 15.2                                  | 0.000                               |
| 113d                    | DIVIDER  | 69.36                               | 342.23                            | 0                           | 01:19                        | 1.37                                    | 17.7                                  | 0.000                               |
| Regional Detention Pond | STORAGE  | 26.91                               | 450.06                            | 0                           | 00:31                        | 0.468                                   | 21.6                                  | 0.029                               |

| Node                | Type    | Maximum<br>Lateral<br>Inflow<br>CFS | Maximum<br>Total<br>Inflow<br>CFS | Day of<br>Maximum<br>Inflow | Hour of<br>Maximum<br>Inflow | Lateral<br>Inflow<br>Volume<br>10 <sup>6</sup> gal | Total<br>Inflow<br>Volume<br>10 <sup>6</sup> gal | Flow<br>Balance<br>Error<br>Percent |
|---------------------|---------|-------------------------------------|-----------------------------------|-----------------------------|------------------------------|----------------------------------------------------|--------------------------------------------------|-------------------------------------|
| LowerGraceChapelSto | STORAGE | 68.29                               | 253.25                            | 0                           | 00:40                        | 1.12                                               | 6.36                                             | 0.000                               |
| NortheastPond       | STORAGE | 50.17                               | 50.17                             | 0                           | 00:30                        | 0.844                                              | 0.844                                            | 0.024                               |
| LowesNorthPond      | STORAGE | 0.00                                | 144.81                            | 0                           | 00:25                        | 0                                                  | 18.1                                             | -0.007                              |

### Link Flow Summary

| Link | Type    | Maximum<br> Flow <br>CFS | Day of<br>Maximum<br>Flow | Hour of<br>Maximum<br>Flow | Maximum<br> Velocity <br>ft/sec | Max /<br>Full<br>Flow | Max /<br>Full<br>Depth |
|------|---------|--------------------------|---------------------------|----------------------------|---------------------------------|-----------------------|------------------------|
| 322  | CHANNEL | 88.85                    | 0                         | 00:41                      | 12.90                           | 0.04                  | 0.26                   |
| 323  | CHANNEL | 167.75                   | 0                         | 00:42                      | 9.37                            | 0.07                  | 0.34                   |
| C50  | CONDUIT | 250.33                   | 0                         | 01:20                      | 39.83                           | 0.08                  | 0.14                   |
| C40  | CONDUIT | 280.54                   | 0                         | 01:21                      | 29.54                           | 0.64                  | 0.54                   |
| 310  | CHANNEL | 330.99                   | 0                         | 01:21                      | 7.34                            | 0.01                  | 0.11                   |
| 308b | CHANNEL | 19.94                    | 0                         | 00:30                      | 12.36                           | 0.01                  | 0.16                   |
| 304a | CHANNEL | 45.46                    | 0                         | 00:28                      | 8.40                            | 0.00                  | 0.10                   |
| 401  | CONDUIT | 392.58                   | 0                         | 01:20                      | 12.90                           | 0.10                  | 0.17                   |
| 301  | CHANNEL | 392.50                   | 0                         | 01:20                      | 11.52                           | 0.02                  | 0.13                   |
| C100 | CONDUIT | 24.83                    | 0                         | 00:35                      | 13.41                           | 0.09                  | 0.21                   |
| 304b | CHANNEL | 9.48                     | 0                         | 00:28                      | 5.07                            | 0.01                  | 0.13                   |
| 302  | CHANNEL | 0.00                     | 0                         | 00:00                      | 0.00                            | 0.00                  | 0.00                   |
| 303  | CHANNEL | 342.23                   | 0                         | 01:19                      | 23.65                           | 0.01                  | 0.11                   |
| C90  | CONDUIT | 24.81                    | 0                         | 00:36                      | 14.99                           | 0.08                  | 0.19                   |
| C80  | CONDUIT | 36.54                    | 0                         | 00:37                      | 15.64                           | 0.13                  | 0.24                   |
| C110 | DUMMY   | 144.81                   | 0                         | 00:25                      |                                 |                       |                        |

| Link                  | Type    | Maximum<br> Flow <br>CFS | Day of<br>Maximum<br>Flow | Hour of<br>Maximum<br>Flow | Maximum<br> Velocity <br>ft/sec | Max /<br>Full<br>Flow | Max /<br>Full<br>Depth |
|-----------------------|---------|--------------------------|---------------------------|----------------------------|---------------------------------|-----------------------|------------------------|
| C60                   | CONDUIT | 5.04                     | 0                         | 00:30                      | 10.70                           | 0.03                  | 0.12                   |
| C65                   | CONDUIT | 23.67                    | 0                         | 00:35                      | 13.51                           | 0.12                  | 0.24                   |
| C35                   | CONDUIT | 28.42                    | 0                         | 00:35                      | 18.93                           | 0.15                  | 0.27                   |
| 16                    | DUMMY   | 205.58                   | 0                         | 00:42                      |                                 |                       |                        |
| C33                   | CONDUIT | 285.63                   | 0                         | 01:21                      | 19.38                           | 0.37                  | 0.43                   |
| C3                    | CONDUIT | 327.65                   | 0                         | 01:20                      | 17.40                           | 0.50                  | 0.50                   |
| C31                   | CONDUIT | 282.07                   | 0                         | 01:21                      | 26.82                           | 0.22                  | 0.32                   |
| C32                   | CONDUIT | 284.72                   | 0                         | 01:21                      | 21.77                           | 0.30                  | 0.38                   |
| C25                   | CONDUIT | 296.65                   | 0                         | 01:19                      | 30.39                           | 0.20                  | 0.30                   |
| C15                   | CONDUIT | 311.58                   | 0                         | 01:19                      | 25.95                           | 0.27                  | 0.35                   |
| C70                   | CONDUIT | 70.45                    | 0                         | 00:32                      | 18.44                           | 0.25                  | 0.34                   |
| 306                   | CHANNEL | 37.49                    | 0                         | 00:35                      | 12.18                           | 0.00                  | 0.05                   |
| 305                   | CONDUIT | 42.41                    | 0                         | 00:40                      | 15.15                           | 0.24                  | 0.33                   |
| C6                    | CONDUIT | 327.47                   | 0                         | 01:19                      | 20.34                           | 0.41                  | 0.44                   |
| 201                   | DUMMY   | 392.60                   | 0                         | 01:19                      |                                 |                       |                        |
| NortheastPondOutflow  | DUMMY   | 2.81                     | 0                         | 01:59                      |                                 |                       |                        |
| LowesNorthPondOutflow | DUMMY   | 26.00                    | 0                         | 08:24                      |                                 |                       |                        |

Standrad Form SF-3  
Storm Drainage System Design  
(Rational Method Procedure)

Calculated By: LJT  
Date: 1/12/2015

Job #: 20029-01-002  
Project: Promenade at Castle Rock North Meadows  
Design Storm: 100-Year Storm

[illegible]

Standard Form SF-3  
Storm Drainage System Design  
(Rational Method Procedure)

Calculated By:  
Date:

LJT  
3/13/2015

Job #: 20029-01-002  
Project: Promenade at Castle Rock  
Design Storm: 100-Year Storm

| STREET | DESIGN POINT | DIRECT RUNOFF       |           |         |          |          |     |         | TOTAL RUNOFF                    |              |         |       | STREET  |              | PIPE                              |         |           | TRAVEL TIME |            |        |         |       |
|--------|--------------|---------------------|-----------|---------|----------|----------|-----|---------|---------------------------------|--------------|---------|-------|---------|--------------|-----------------------------------|---------|-----------|-------------|------------|--------|---------|-------|
|        |              | Area Design         | Area (ac) | Coeff C | Tc (min) | C*A (ac) | I   | Q (cfs) | Tc (min)                        | Sum C*A (ac) | I in/hr | Q cfs | Slope % | Street Q cfs | Design Q cfs                      | Slope % | PIPE SIZE | L ft        | VEL ft/sec | Tt min | Q add'l | Q tot |
| 1      | 2            | 3                   | 4         | 5       | 6        | 7        | 8   | 9       | 10                              | 11           | 12      | 13    | 14      | 15           | 16                                | 17      | 18        | 19          | 20         | 21     |         |       |
|        | 1            | 61                  | 9.61      | 0.75    | 15.8     | 7.2      | 5.8 | 41.8    |                                 |              |         |       |         |              | 41.8                              |         | 48"       | 866         | 19         | 0.8    |         |       |
|        |              |                     |           |         |          |          |     |         |                                 |              |         |       |         |              |                                   |         |           |             |            |        |         |       |
|        | 2            | A1                  | 2.25      | 0.63    | 5.0      | 1.4      | 8.8 | 12.3    |                                 |              |         |       |         |              | 12.3                              | 1%      | 36"       | 167         | 8          | 0.3    |         |       |
|        |              | 50                  | 18.37     | 0.66    | 17.2     | 12.1     | 5.5 | 66.6    |                                 |              |         |       |         |              |                                   |         |           |             |            |        |         |       |
|        | 3            | A1,50               |           |         |          |          |     |         | 17.2                            | 13.5         | 5.5     | 74.3  |         |              | 74.3                              | 2.7%    | 36"       | 372         | 14.6       | 0.4    |         |       |
|        |              | A3                  | 1.94      | 0.85    | 5.0      | 1.7      | 8.8 | 15.0    |                                 |              |         |       |         |              |                                   |         |           |             |            |        |         |       |
|        |              | 51                  | 5.77      | 0.66    | 13.1     | 3.8      | 6.3 | 23.9    |                                 |              |         |       |         |              |                                   |         |           |             |            |        |         |       |
|        | 4            | A1,A3,50,51         |           |         |          |          |     |         | 17.6                            | 19.0         | 5.5     | 104.5 |         |              | 104.5                             | 2.0%    | 48"       | 447         | 17.5       | 0.4    |         |       |
|        |              | A4                  | 1.95      | 0.58    | 5.0      | 1.1      | 8.8 | 9.7     |                                 |              |         |       |         |              |                                   |         |           |             |            |        |         |       |
|        | 5            | A1-A4,50,51         |           |         |          |          |     |         | 18.0                            | 20.1         | 5.4     | 108.5 |         |              | 108.5                             | 1.0%    | 48"       | 371         | 13         | 0.5    |         |       |
|        |              | A5                  | 1.63      | 0.55    | 5.0      | 0.9      | 8.8 | 7.9     |                                 |              |         |       |         |              |                                   |         |           |             |            |        |         |       |
|        | 6            | A1-A5,50,51         |           |         |          |          |     |         | 18.5                            | 21.0         | 5.3     | 111.3 |         |              | 111.3                             | 90.0%   | 48"       | 181         | 12         | 0.3    |         |       |
|        |              |                     |           |         |          |          |     |         | 80.0                            | 21.00        | 2.2     | 46.2  |         |              | PEAK FLOW ADDED TO SWMM MODEL J20 |         |           |             |            |        |         |       |
|        | 120          | 19A-B, 20A-B, 21-23 |           |         | 80.0     |          |     |         | Refer to SWMM results for flows |              |         |       |         |              |                                   |         |           |             |            |        |         |       |
|        | J35          |                     |           |         | 80.0     |          |     |         | Refer to SWMM results for flows |              |         |       |         |              |                                   |         |           |             |            |        |         |       |
|        |              | O1                  | 8.52      | 0.50    | 16.8     | 4.2      | 5.6 | 23.5    | 80.0                            | 4.2          | 2.2     | 9.2   |         |              | PEAK FLOW ADDED TO SWMM MODEL J30 |         |           |             |            |        |         |       |
|        | J30          | 18A-D, J20, O1      |           |         | 80.0     |          |     |         | Refer to SWMM results for flows |              |         |       |         |              |                                   |         |           |             |            |        |         |       |
|        |              | 52                  | 14.24     | 0.58    | 15.6     | 8.2      | 5.8 | 47.6    | 80.0                            | 8.2          | 2.2     | 18.0  |         |              | PEAK FLOW ADDED TO SWMM MODEL J25 |         |           |             |            |        |         |       |
|        | J25          | J30, 52             |           |         | 80       |          |     |         | Refer to SWMM results for flows |              |         |       |         |              |                                   |         |           |             |            |        |         |       |
|        |              | 53                  | 11.47     | 0.70    | 13.9     | 8.1      | 6.1 | 49.4    | 80.0                            | 8.1          | 2.2     | 17.8  |         |              | PEAK FLOW ADDED TO SWMM MODEL J22 |         |           |             |            |        |         |       |
|        | J22          | J25, 53             |           |         | 80.0     |          |     |         | Refer to SWMM results for flows |              |         |       |         |              |                                   |         |           |             |            |        |         |       |
|        | J20          | J22,A1-A5,50,51     |           |         | 80.0     |          |     |         | Refer to SWMM results for flows |              |         |       |         |              |                                   |         |           |             |            |        |         |       |
|        |              | 30                  | 15.61     | 0.77    | 17.0     | 11.9     | 5.6 | 66.6    | 80.0                            | 11.9         | 2.2     | 26.2  |         |              | PEAK FLOW ADDED TO SWMM MODEL J15 |         |           |             |            |        |         |       |
|        |              | 40                  | 3.58      | 0.81    | 10.1     | 2.9      | 7   | 20.3    | 80.0                            | 2.9          | 2.2     | 6.4   |         |              | PEAK FLOW ADDED TO SWMM MODEL J15 |         |           |             |            |        |         |       |
|        | J15          | J20,30,40           |           |         | 80.0     |          |     |         | Refer to SWMM results for flows |              |         |       |         |              |                                   |         |           |             |            |        |         |       |
|        | 7            | O2                  | 8.34      | 0.57    | 18.3     | 4.8      | 5.3 | 25.4    | 80.0                            | 4.8          | 2.2     | 10.6  |         |              | PEAK FLOW ADDED TO SWMM MODEL J10 |         |           |             |            |        |         |       |
|        | 9            | O3                  | 1.65      | 0.55    | 5.0      | 0.9      | 8.8 | 7.9     | 80.0                            | 0.9          | 2.2     | 2.0   |         |              | PEAK FLOW ADDED TO SWMM MODEL J10 |         |           |             |            |        |         |       |
|        |              | O4                  | 5.06      | 0.76    | 13.2     | 3.8      | 6.3 | 23.9    | 80.0                            | 3.8          | 2.2     | 8.4   |         |              | PEAK FLOW ADDED TO SWMM MODEL J10 |         |           |             |            |        |         |       |
|        | 10           | O2-O4               |           |         |          |          |     | 18.3    | 9.5                             | 5.3          | 50.4    |       |         | 50.4         | 1.0%                              | 48"     | 122       | 8           | 0.3        |        |         |       |
|        |              | O5                  | 0.60      | 0.96    | 5.0      | 0.6      | 8.8 | 5.3     | 80.0                            | 0.6          | 2.2     | 1.3   |         |              | PEAK FLOW ADDED TO SWMM MODEL J10 |         |           |             |            |        |         |       |
|        |              | A10                 | 2.14      | 0.88    | 5.0      | 1.9      | 8.8 | 16.7    | 80.0                            | 1.9          | 2.2     | 4.2   |         |              | PEAK FLOW ADDED TO SWMM MODEL J10 |         |           |             |            |        |         |       |
|        |              | 41                  | 2.20      | 0.81    | 9.7      | 1.8      | 7.1 | 12.8    | 80.0                            | 1.8          | 2.2     | 4.0   |         |              | PEAK FLOW ADDED TO SWMM MODEL J10 |         |           |             |            |        |         |       |
|        |              | O2-                 |           |         |          |          |     |         |                                 |              |         |       |         |              |                                   |         |           |             |            |        |         |       |
|        | 11           | O5,A10,41           |           |         |          |          |     |         | 18.6                            | 13.8         | 5.3     | 73.1  |         |              | 73.1                              | 2.0%    | 48"       | 418         | 9.4        | 0.7    |         |       |
|        |              | A6                  | 2.68      | 0.82    | 6.4      | 2.2      | 8.2 | 18.0    | 80.0                            | 2.2          | 2.2     | 4.8   |         |              | PEAK FLOW ADDED TO SWMM MODEL J10 |         |           |             |            |        |         |       |
|        |              | O2-O5, A6,A10,41    |           |         |          |          |     |         | 19.3                            | 16.0         | 5.2     | 83.2  |         |              | 83.2                              | 2.0%    | 48"       | 96          | 10         | 0.2    |         |       |
|        | 12           | A7                  | 1.41      | 0.66    | 5.0      | 0.9      | 8.8 | 7.9     | 80.0                            | 0.9          | 2.2     | 2.0   |         |              | PEAK FLOW ADDED TO SWMM MODEL J10 |         |           |             |            |        |         |       |
|        | 13           |                     |           |         |          |          |     |         | 5.0                             | 0.9          | 8.8     | 7.9   |         |              |                                   |         |           |             |            |        |         |       |
|        | J10          | J15, DP 12&13       |           |         | 80.0     |          |     |         | Refer to SWMM results for flows |              |         |       |         |              |                                   |         |           |             |            |        |         |       |
|        |              | A8                  | 3.92      | 0.57    | 6.8      | 2.2      | 8.1 | 17.8    | 80.0                            | 2.2          | 2.2     | 4.8   |         |              | PEAK FLOW ADDED TO SWMM MODEL J5  |         |           |             |            |        |         |       |

Standard Form SF-3  
Storm Drainage System Design  
(Rational Method Procedure)

Calculated By:  
Date:

LJT  
3/13/2015

Job #: 20029-01-002  
Project: Promenade at Castle Rock  
Design Storm: 100-Year Storm

[illegible]

CUHP SUBCATCHMENTS

Columns with this color heading are for required user-input

Columns with this color heading are for optional override values

Columns with this color heading are for program-calculated values

|                      |                         |          |               |                            |                |               |                           | Maximum Depression Storage<br>(Watershed inches) |            | Horton's Infiltration<br>Parameters |                                     |                          | DCIA                   |
|----------------------|-------------------------|----------|---------------|----------------------------|----------------|---------------|---------------------------|--------------------------------------------------|------------|-------------------------------------|-------------------------------------|--------------------------|------------------------|
| Subcatchment<br>Name | EPA SWMM Target<br>Node | Raingage | Area<br>(mi2) | Length to<br>Centroid (mi) | Length<br>(mi) | Slope (ft/ft) | Percent<br>Imperviousness | Pervious                                         | Impervious | Initial<br>Rate<br>(in/hr)          | Decay<br>Coefficient<br>(1/seconds) | Final<br>Rate<br>(in/hr) | Level 0,<br>1, or<br>2 |
| 3                    | RegionalDetentionPond   | 100-Yr   | 0.0167949     | 0.139772727                | 0.35132576     | 0.006469003   | 11                        | 0.4                                              | 0.1        | 4.605                               | 0.001568692                         | 0.6841                   | 0                      |
| 4                    | 114b                    | 100-Yr   | 0.0236406     | 0.116477273                | 0.21479924     | 0.045855379   | 70                        | 0.4                                              | 0.1        | 4.953                               | 0.000803792                         | 0.9623                   | 0                      |
| 7                    | RegionalDetentionPond   | 100-Yr   | 0.0173906     | 0.096969697                | 0.24339962     | 0.037354086   | 70                        | 0.4                                              | 0.1        | 4.793                               | 0.001154666                         | 0.8347                   | 0                      |
| 8                    | 118c                    | 100-Yr   | 0.0142969     | 0.110606061                | 0.22079924     | 0.036878216   | 70                        | 0.4                                              | 0.1        | 4.803                               | 0.001133364                         | 0.8424                   | 0                      |
| 10                   | 113d                    | 100-Yr   | 0.0222656     | 0.157575758                | 0.31704545     | 0.036704731   | 59                        | 0.4                                              | 0.1        | 4.553                               | 0.001395496                         | 0.7384                   | 0                      |
| 18A                  | NortheastPond           | 100-Yr   | 0.06825       | 0.233712121                | 0.46363636     | 0.1279        | 30                        | 0.4                                              | 0.1        | 4.256                               | 0.001742635                         | 0.6029                   | 0                      |
| 19A                  | LowerGraceChapelPond    | 100-Yr   | 0.0406563     | 0.186742424                | 0.38087121     | 0.06          | 23                        | 0.4                                              | 0.1        | 4.256                               | 0.001742635                         | 0.6029                   | 0                      |
| 19B                  | LowerGraceChapelPond    | 100-Yr   | 0.0405469     | 0.112689394                | 0.23333333     | 0.06          | 35                        | 0.4                                              | 0.1        | 2.986                               | 0.001787306                         | 0.4981                   | 0                      |
| 20A                  | LowerGraceChapelPond    | 100-Yr   | 0.0023438     | 0.013636364                | 0.04905303     | 0.023980815   | 9                         | 0.4                                              | 0.1        | 3.732                               | 0.001397444                         | 0.683                    | 0                      |
| 20B                  | LowerGraceChapelPond    | 100-Yr   | 0.0052344     | 0.030492424                | 0.10909091     | 0.023980815   | 17                        | 0.4                                              | 0.1        | 3.732                               | 0.001397444                         | 0.683                    | 0                      |
| 21                   | 121                     | 100-Yr   | 0.1912031     | 0.45                       | 0.68089962     | 0.057         | 16                        | 0.4                                              | 0.1        | 2.988                               | 0.001792789                         | 0.498                    | 0                      |
| 22                   | 122                     | 100-Yr   | 0.1924375     | 0.282007576                | 0.55470076     | 0.031410038   | 5                         | 0.4                                              | 0.1        | 2.948                               | 0.001769052                         | 0.4914                   | 0                      |
| 23                   | 123                     | 100-Yr   | 0.0859219     | 0.265340909                | 0.633          | 0.011968881   | 25                        | 0.4                                              | 0.1        | 3                                   | 0.0018                              | 0.5                      | 0                      |
| 62                   | J50                     | 100-Yr   | 0.0256406     | 0.070454545                | 0.21988636     | 0.02          | 62                        | 0.4                                              | 0.1        | 3.581                               | 0.001741473                         | 0.5583                   | 0                      |
| 70                   | 114d                    | 100-Yr   | 0.0046875     | 0.037878788                | 0.1117         | 0.02          | 80                        | 0.4                                              | 0.1        | 3.581                               | 0.001741473                         | 0.5583                   | 0                      |
| 80                   | J60                     | 100-Yr   | 0.0305781     | 0.438068182                | 0.8657197      | 0.06          | 37                        | 0.4                                              | 0.1        | 4.256                               | 0.001742635                         | 0.6029                   | 0                      |
| 85                   | J80                     | 100-Yr   | 0.0430469     | 0.096590909                | 0.1969697      | 0.04          | 17                        | 0.4                                              | 0.1        | 4.256                               | 0.001742635                         | 0.6029                   | 0                      |
| 90                   | J90                     | 100-Yr   | 0.046125      | 0.094886364                | 0.24109848     | 0.025         | 80                        | 0.4                                              | 0.1        | 3.89                                | 0.00174                             | 0.6                      | 0                      |
| 18B                  | J36                     | 100-Yr   | 0.0144375     | 0.133712121                | 0.21609848     | 0.035         | 30.4                      | 0.4                                              | 0.1        | 3.8                                 | 0.00174                             | 0.613                    | 0                      |
| 18C                  | J36                     | 100-Yr   | 0.004875      | 0.097537879                | 0.22556818     | 0.043         | 6.1                       | 0.4                                              | 0.1        | 3.8                                 | 0.018                               | 0.6                      | 0                      |
| 18D                  | J35                     | 100-Yr   | 0.0059219     | 0.050378788                | 0.13503788     | 0.04          | 26.6                      | 0.4                                              | 0.1        | 3.8                                 | 0.018                               | 0.6                      | 0                      |
| 17                   | 117                     | 100-Yr   | 0.0845938     | 0.259276515                | 0.59166667     | 0.06          | 17                        | 0.4                                              | 0.1        | 3.426                               | 0.001798023                         | 0.5281                   | 0                      |
| 6                    | 106                     | 100-Yr   | 0.0216406     | 0.19469697                 | 0.4504         | 0.046         | 14                        | 0.4                                              | 0.1        | 4.256                               | 0.001742635                         | 0.6029                   | 0                      |

### Printouts for Storm Hydrographs

| flow in cfs |  |
|-------------|--|
|             |  |

[illegible]

### Printouts for Unit Hydrographs

flow in cfs

| Time in minutes | 3    | 4     | 7     | 8     | 10    | 18A    | 19A   | 19B    | 20A  | 20B  | 21     | 22     | 23    | 62     | 70    | 80    | 85    | 90     | 18B   | 18C  | 18D  | 17    | 6     |
|-----------------|------|-------|-------|-------|-------|--------|-------|--------|------|------|--------|--------|-------|--------|-------|-------|-------|--------|-------|------|------|-------|-------|
| 5               | 2.46 | 95.39 | 56.06 | 39.46 | 38.63 | 110.22 | 37.26 | 116.77 | 4.31 | 7.06 | 114.10 | 113.74 | 33.20 | 103.66 | 21.32 | 8.37  | 73.92 | 269.02 | 14.69 | 1.34 | 8.96 | 54.88 | 6.67  |
| 10              | 5.73 | 57.98 | 43.13 | 34.74 | 53.31 | 123.64 | 50.07 | 81.59  | 3.64 | 7.05 | 194.23 | 198.69 | 66.21 | 61.59  | 10.41 | 19.09 | 71.48 | 112.11 | 18.95 | 2.51 | 8.97 | 86.32 | 12.68 |
| 15              | 7.20 | 23.43 | 21.94 | 19.25 | 31.24 | 85.12  | 44.18 | 49.91  | 2.67 | 5.48 | 190.34 | 196.72 | 72.24 | 25.99  | 4.19  | 23.62 | 51.02 | 34.57  | 16.07 | 2.63 | 6.69 | 82.40 | 13.43 |
| 20              | 7.24 | 11.27 | 10.62 | 9.35  | 20.76 | 61.67  | 34.84 | 28.21  | 2.00 | 4.46 | 161.42 | 165.47 | 67.66 | 12.69  | 2.01  | 23.23 | 37.71 | 0.00   | 12.63 | 2.57 | 5.13 | 69.31 | 13.01 |
| 25              | 7.11 | 0.29  | 4.88  | 5.62  | 11.54 | 46.93  | 28.61 | 18.39  | 1.56 | 3.55 | 133.67 | 136.54 | 57.55 | 1.42   | 0.00  | 21.05 | 29.40 |        | 10.09 | 2.45 | 4.11 | 58.13 | 12.15 |
| 30              | 6.87 | 0.00  | 0.00  | 1.89  | 8.34  | 32.19  | 23.58 | 11.16  | 1.11 | 2.96 | 113.16 | 114.68 | 49.68 | 0.00   |       | 17.56 | 21.08 |        | 8.42  | 2.27 | 3.22 | 49.34 | 10.85 |
| 35              | 6.53 |       |       | 0.00  | 5.14  | 23.37  | 20.04 | 3.92   | 0.80 | 2.37 | 95.21  | 96.67  | 43.51 |        |       | 15.67 | 14.81 |        | 6.98  | 2.03 | 2.34 | 41.69 | 9.68  |
| 40              | 6.07 |       |       |       | 1.94  | 18.46  | 16.51 | 0.00   | 0.65 | 1.77 | 83.64  | 84.40  | 37.34 |        |       | 13.78 | 12.04 |        | 5.54  | 1.87 | 1.77 | 36.69 | 8.87  |
| 45              | 5.51 |       |       |       | 0.00  | 13.54  | 12.98 |        | 0.50 | 1.38 | 72.06  | 72.13  | 33.39 |        |       | 11.89 | 9.27  |        | 4.10  | 1.73 | 1.47 | 31.69 | 8.06  |
| 50              | 5.18 |       |       |       |       | 8.63   | 9.85  |        | 0.35 | 1.19 | 60.48  | 59.86  | 29.91 |        |       | 10.83 | 6.50  |        | 3.43  | 1.60 | 1.18 | 26.69 | 7.26  |
| 55              | 4.88 |       |       |       |       | 3.72   | 8.68  |        | 0.20 | 0.99 | 48.90  | 47.59  | 26.42 |        |       | 9.77  | 3.73  |        | 2.95  | 1.46 | 0.88 | 21.68 | 6.57  |
| 60              | 4.58 |       |       |       |       | 0.00   | 7.50  |        | 0.06 | 0.79 | 38.72  | 38.87  | 22.94 |        |       | 8.71  | 0.96  |        | 2.47  | 1.33 | 0.59 | 17.08 | 6.10  |
| 65              | 4.28 |       |       |       |       |        | 6.32  |        | 0.00 | 0.59 | 34.86  | 34.78  | 19.45 |        |       | 7.65  | 0.00  |        | 1.99  | 1.25 | 0.29 | 15.42 | 5.63  |
| 70              | 3.99 |       |       |       |       |        | 5.14  |        |      | 0.40 | 31.00  | 30.69  | 15.96 |        |       | 6.60  |       |        | 1.51  | 1.17 | 0.00 | 13.75 | 5.17  |
| 75              | 3.69 |       |       |       |       |        | 3.97  |        |      | 0.20 | 27.15  | 26.60  | 13.83 |        |       | 5.54  |       |        | 1.03  | 1.09 |      | 12.08 | 4.70  |
| 80              | 3.49 |       |       |       |       |        | 2.79  |        |      | 0.00 | 23.29  | 22.51  | 12.67 |        |       | 4.66  |       |        | 0.55  | 1.01 |      | 10.41 | 4.23  |
| 85              | 3.32 |       |       |       |       |        | 1.61  |        |      | 0.00 | 19.43  | 18.41  | 11.51 |        |       | 4.31  |       |        | 0.07  | 0.93 |      | 8.75  | 3.76  |
| 90              | 3.14 |       |       |       |       |        | 0.43  |        |      |      | 15.57  | 14.32  | 10.35 |        |       | 3.96  |       |        | 0.00  | 0.85 |      | 7.08  | 3.29  |
| 95              | 2.97 |       |       |       |       |        | 0.00  |        |      |      | 11.71  | 10.23  | 9.18  |        |       | 3.60  |       |        |       | 0.77 |      | 5.41  | 2.82  |
| 100             | 2.79 |       |       |       |       |        |       |        |      |      | 7.85   | 6.14   | 8.02  |        |       | 3.25  |       |        |       | 0.69 |      | 3.74  | 2.58  |
| 105             | 2.62 |       |       |       |       |        |       |        |      |      | 3.99   | 2.05   | 6.86  |        |       | 2.90  |       |        |       | 0.61 |      | 2.08  | 2.43  |
| 110             | 2.44 |       |       |       |       |        |       |        |      |      | 0.13   | 0.00   | 5.70  |        |       | 2.55  |       |        |       | 0.53 |      | 0.41  | 2.27  |
| 115             | 2.27 |       |       |       |       |        |       |        |      |      | 0.00   |        | 4.54  |        |       | 2.19  |       |        |       | 0.50 |      | 0.00  | 2.11  |
| 120             | 2.09 |       |       |       |       |        |       |        |      |      |        |        | 3.38  |        |       | 1.84  |       |        |       | 0.48 |      |       | 1.96  |
| 125             | 1.92 |       |       |       |       |        |       |        |      |      |        |        | 2.21  |        |       | 1.49  |       |        |       | 0.45 |      |       | 1.80  |
| 130             | 1.74 |       |       |       |       |        |       |        |      |      |        |        | 1.05  |        |       | 1.14  |       |        |       | 0.42 |      |       | 1.64  |
| 135             | 1.57 |       |       |       |       |        |       |        |      |      |        |        | 0.00  |        |       | 0.78  |       |        |       | 0.40 |      |       | 1.49  |
| 140             | 1.43 |       |       |       |       |        |       |        |      |      |        |        |       |        |       | 0.43  |       |        |       | 0.37 |      |       | 1.33  |
| 145             | 1.37 |       |       |       |       |        |       |        |      |      |        |        |       |        |       | 0.08  |       |        |       | 0.34 |      |       | 1.18  |
| 150             | 1.32 |       |       |       |       |        |       |        |      |      |        |        |       |        |       | 0.00  |       |        |       | 0.32 |      |       | 1.02  |
| 155             | 1.26 |       |       |       |       |        |       |        |      |      |        |        |       |        |       |       |       |        |       | 0.29 |      |       | 0.86  |
| 160             | 1.20 |       |       |       |       |        |       |        |      |      |        |        |       |        |       |       |       |        |       | 0.27 |      |       | 0.71  |
| 165             | 1.14 |       |       |       |       |        |       |        |      |      |        |        |       |        |       |       |       |        |       | 0.24 |      |       | 0.55  |
| 170             | 1.08 |       |       |       |       |        |       |        |      |      |        |        |       |        |       |       |       |        |       | 0.21 |      |       | 0.39  |
| 175             | 1.03 |       |       |       |       |        |       |        |      |      |        |        |       |        |       |       |       |        |       | 0.19 |      |       | 0.24  |
| 180             | 0.97 |       |       |       |       |        |       |        |      |      |        |        |       |        |       |       |       |        |       | 0.16 |      |       | 0.08  |
| 185             | 0.91 |       |       |       |       |        |       |        |      |      |        |        |       |        |       |       |       |        |       | 0.13 |      |       | 0.00  |
| 190             | 0.85 |       |       |       |       |        |       |        |      |      |        |        |       |        |       |       |       |        |       | 0.11 |      |       |       |
| 195             | 0.79 |       |       |       |       |        |       |        |      |      |        |        |       |        |       |       |       |        |       | 0.08 |      |       |       |
| 200             | 0.73 |       |       |       |       |        |       |        |      |      |        |        |       |        |       |       |       |        |       | 0.05 |      |       |       |
| 205             | 0.68 |       |       |       |       |        |       |        |      |      |        |        |       |        |       |       |       |        |       | 0.03 |      |       |       |
| 210             | 0.62 |       |       |       |       |        |       |        |      |      |        |        |       |        |       |       |       |        |       | 0.00 |      |       |       |
| 215             | 0.56 |       |       |       |       |        |       |        |      |      |        |        |       |        |       |       |       |        |       | 0.00 |      |       |       |
| 220             | 0.50 |       |       |       |       |        |       |        |      |      |        |        |       |        |       |       |       |        |       |      |      |       |       |
| 225             | 0.44 |       |       |       |       |        |       |        |      |      |        |        |       |        |       |       |       |        |       |      |      |       |       |
| 230             | 0.38 |       |       |       |       |        |       |        |      |      |        |        |       |        |       |       |       |        |       |      |      |       |       |
| 235             | 0.33 |       |       |       |       |        |       |        |      |      |        |        |       |        |       |       |       |        |       |      |      |       |       |
| 240             | 0.27 |       |       |       |       |        |       |        |      |      |        |        |       |        |       |       |       |        |       |      |      |       |       |
| 245             | 0.21 |       |       |       |       |        |       |        |      |      |        |        |       |        |       |       |       |        |       |      |      |       |       |
| 250             | 0.15 |       |       |       |       |        |       |        |      |      |        |        |       |        |       |       |       |        |       |      |      |       |       |
| 255             | 0.09 |       |       |       |       |        |       |        |      |      |        |        |       |        |       |       |       |        |       |      |      |       |       |
| 260             | 0.03 |       |       |       |       |        |       |        |      |      |        |        |       |        |       |       |       |        |       |      |      |       |       |
| 265             | 0.00 |       |       |       |       |        |       |        |      |      |        |        |       |        |       |       |       |        |       |      |      |       |       |

**Summary of Unit Hydrograph Parameters Used By Program and Calculated Results (Version 1.4.3)**

| Catchment Name/ID | User Comment for Catchment | Unit Hydrograph Parameters and Results |       |               |                       |               |                       |                           |            |                  | Excess Precip.     |                  | Storm Hydrograph          |                    |                           |                                       |
|-------------------|----------------------------|----------------------------------------|-------|---------------|-----------------------|---------------|-----------------------|---------------------------|------------|------------------|--------------------|------------------|---------------------------|--------------------|---------------------------|---------------------------------------|
|                   |                            | Ct                                     | Cp    | W50<br>(min.) | W50<br>Before<br>Peak | W75<br>(min.) | W75<br>Before<br>Peak | Time to<br>Peak<br>(min.) | Peak (cfs) | Volume<br>(c.f.) | Excess<br>(inches) | Excess<br>(c.f.) | Time to<br>Peak<br>(min.) | Peak Flow<br>(cfs) | Total<br>Volume<br>(c.f.) | Runoff per<br>Unit Area<br>(cfs/acre) |
| 3                 |                            | 0.293                                  | 0.157 | 69.3          | 9.83                  | 36.0          | 6.95                  | 16.4                      | 7          | 39,018           | 1.40               | 54,444           | 60.0                      | 9                  | 54,425                    | 0.81                                  |
| 4                 |                            | 0.167                                  | 0.427 | 6.6           | 2.29                  | 3.4           | 1.53                  | 6.1                       | 108        | 54,922           | 2.08               | 114,468          | 30.0                      | 68                 | 117,771                   | 4.47                                  |
| 7                 |                            | 0.184                                  | 0.409 | 7.7           | 2.69                  | 4.0           | 1.80                  | 6.5                       | 68         | 40,402           | 2.20               | 88,831           | 35.0                      | 49                 | 90,124                    | 4.42                                  |
| 8                 |                            | 0.195                                  | 0.397 | 8.6           | 3.00                  | 4.5           | 2.01                  | 6.9                       | 50         | 33,215           | 2.19               | 72,839           | 35.0                      | 38                 | 72,567                    | 4.19                                  |
| 10                |                            | 0.179                                  | 0.387 | 11.4          | 3.99                  | 5.9           | 2.66                  | 8.1                       | 59         | 51,728           | 2.08               | 107,666          | 35.0                      | 52                 | 106,718                   | 3.66                                  |
| 18A               |                            | 0.151                                  | 0.256 | 15.6          | 4.56                  | 8.1           | 3.22                  | 7.6                       | 132        | 158,558          | 1.77               | 280,244          | 35.0                      | 122                | 279,693                   | 2.80                                  |
| 19A               |                            | 0.190                                  | 0.203 | 24.3          | 5.29                  | 12.6          | 3.74                  | 8.8                       | 50         | 94,453           | 1.67               | 157,947          | 40.0                      | 52                 | 157,694                   | 2.01                                  |
| 19B               |                            | 0.169                                  | 0.272 | 10.0          | 3.50                  | 5.2           | 2.34                  | 6.0                       | 122        | 94,199           | 1.96               | 184,567          | 35.0                      | 99                 | 182,184                   | 3.81                                  |
| 20A               |                            | 0.568                                  | 0.120 | 16.3          | 3.00                  | 8.5           | 2.12                  | 5.0                       | 4          | 5,445            | 1.37               | 7,453            | 35.0                      | 3                  | 7,331                     | 2.25                                  |
| 20B               |                            | 0.387                                  | 0.136 | 21.1          | 3.71                  | 11.0          | 2.62                  | 6.2                       | 7          | 12,161           | 1.48               | 18,044           | 40.0                      | 7                  | 17,913                    | 1.97                                  |
| 21                |                            | 0.128                                  | 0.232 | 29.1          | 6.69                  | 15.1          | 4.72                  | 11.1                      | 197        | 444,203          | 1.73               | 769,028          | 45.0                      | 225                | 769,148                   | 1.84                                  |
| 22                |                            | 0.158                                  | 0.246 | 28.4          | 6.87                  | 14.8          | 4.86                  | 11.5                      | 203        | 447,071          | 1.61               | 718,919          | 45.0                      | 220                | 719,324                   | 1.79                                  |
| 23                |                            | 0.147                                  | 0.238 | 35.5          | 8.01                  | 18.5          | 5.66                  | 13.3                      | 73         | 199,614          | 1.84               | 366,848          | 45.0                      | 91                 | 366,517                   | 1.66                                  |
| 62                |                            | 0.169                                  | 0.408 | 6.7           | 2.35                  | 3.5           | 1.57                  | 6.0                       | 115        | 59,568           | 2.24               | 133,727          | 30.0                      | 81                 | 138,300                   | 4.95                                  |
| 70                |                            | 0.265                                  | 0.356 | 6.5           | 2.26                  | 3.4           | 1.51                  | 5.4                       | 22         | 10,890           | 2.49               | 27,089           | 30.0                      | 17                 | 28,308                    | 5.64                                  |
| 80                |                            | 0.183                                  | 0.274 | 38.6          | 9.62                  | 20.1          | 6.80                  | 16.0                      | 24         | 71,039           | 1.86               | 132,438          | 50.0                      | 31                 | 132,276                   | 1.58                                  |
| 85                |                            | 0.201                                  | 0.187 | 16.3          | 3.84                  | 8.5           | 2.71                  | 6.4                       | 79         | 100,007          | 1.59               | 159,089          | 35.0                      | 70                 | 158,407                   | 2.53                                  |
| 90                |                            | 0.130                                  | 0.501 | 4.8           | 1.69                  | 2.5           | 1.13                  | 5.6                       | 287        | 107,158          | 2.47               | 265,135          | 30.0                      | 202                | 308,564                   | 6.84                                  |
| 18B               |                            | 0.243                                  | 0.205 | 22.7          | 5.07                  | 11.8          | 3.58                  | 8.4                       | 19         | 33,541           | 1.78               | 59,600           | 40.0                      | 20                 | 59,430                    | 2.20                                  |
| 18C               |                            | 0.482                                  | 0.139 | 55.4          | 7.41                  | 28.8          | 5.23                  | 12.3                      | 3          | 11,326           | 1.66               | 18,794           | 50.0                      | 4                  | 18,784                    | 1.14                                  |
| 18D               |                            | 0.331                                  | 0.166 | 18.5          | 3.85                  | 9.6           | 2.72                  | 6.4                       | 10         | 13,758           | 1.89               | 25,973           | 35.0                      | 10                 | 25,826                    | 2.69                                  |
| 17                |                            | 0.163                                  | 0.207 | 29.4          | 6.18                  | 15.3          | 4.37                  | 10.3                      | 86         | 196,528          | 1.70               | 333,385          | 45.0                      | 96                 | 333,353                   | 1.78                                  |
| 6                 |                            | 0.259                                  | 0.164 | 48.2          | 7.56                  | 25.0          | 5.34                  | 12.6                      | 13         | 50,276           | 1.55               | 77,929           | 50.0                      | 16                 | 77,921                    | 1.17                                  |

**Summary of CUHP Input Parameters (Version 1.4.3)**

| Catchment Name/ID | SWMM Node/ID          | Raingage Name/ID | Area<br>(sq.mi.) | Dist. to<br>Centroid<br>(miles) | Length<br>(miles) | Slope<br>(ft./ft.) | Percent<br>Imperv. | Depression Storage   |                     | Horton's Infiltration Parameters |                         |                             | DCIA Level and Fractions |                                    |                              | Percent Eff.<br>Imperv. |
|-------------------|-----------------------|------------------|------------------|---------------------------------|-------------------|--------------------|--------------------|----------------------|---------------------|----------------------------------|-------------------------|-----------------------------|--------------------------|------------------------------------|------------------------------|-------------------------|
|                   |                       |                  |                  |                                 |                   |                    |                    | Pervious<br>(inches) | Imperv.<br>(inches) | Initial Rate<br>(in./hr.)        | Final Rate<br>(in./hr.) | Decay<br>Coeff.<br>(1/sec.) | DCIA Level               | Dir. Con'ct<br>Imperv.<br>Fraction | Receiv.<br>Perv.<br>Fraction |                         |
| 3                 | RegionalDetentionPond | 100-YR           | 0.017            | 0.140                           | 0.351             | 0.006              | 11.0               | 0.40                 | 0.10                | 4.61                             | 0.68                    | 0.0016                      | 0.00                     | 0.22                               | 0.10                         | 9.67                    |
| 4                 | 114b                  | 100-YR           | 0.024            | 0.116                           | 0.215             | 0.046              | 70.0               | 0.40                 | 0.10                | 4.95                             | 0.96                    | 0.0008                      | 0.00                     | 0.92                               | 0.30                         | 68.54                   |
| 7                 | RegionalDetentionPond | 100-YR           | 0.017            | 0.097                           | 0.243             | 0.037              | 70.0               | 0.40                 | 0.10                | 4.79                             | 0.83                    | 0.0012                      | 0.00                     | 0.92                               | 0.30                         | 68.80                   |
| 8                 | 118c                  | 100-YR           | 0.014            | 0.111                           | 0.221             | 0.037              | 70.0               | 0.40                 | 0.10                | 4.80                             | 0.84                    | 0.0011                      | 0.00                     | 0.92                               | 0.30                         | 68.78                   |
| 10                | 113d                  | 100-YR           | 0.022            | 0.158                           | 0.317             | 0.037              | 59.0               | 0.40                 | 0.10                | 4.55                             | 0.74                    | 0.0014                      | 0.00                     | 0.90                               | 0.27                         | 57.81                   |
| 18A               | NortheastPond         | 100-YR           | 0.068            | 0.234                           | 0.464             | 0.128              | 30.0               | 0.40                 | 0.10                | 4.26                             | 0.60                    | 0.0017                      | 0.00                     | 0.60                               | 0.17                         | 28.41                   |
| 19A               | LowerGraceChapelPond  | 100-YR           | 0.041            | 0.187                           | 0.381             | 0.060              | 23.0               | 0.40                 | 0.10                | 4.26                             | 0.60                    | 0.0017                      | 0.00                     | 0.46                               | 0.14                         | 21.43                   |
| 19B               | LowerGraceChapelPond  | 100-YR           | 0.041            | 0.113                           | 0.233             | 0.060              | 35.0               | 0.40                 | 0.10                | 2.99                             | 0.50                    | 0.0018                      | 0.00                     | 0.70                               | 0.19                         | 33.85                   |
| 20A               | LowerGraceChapelPond  | 100-YR           | 0.002            | 0.014                           | 0.049             | 0.024              | 9.0                | 0.40                 | 0.10                | 3.73                             | 0.68                    | 0.0014                      | 0.00                     | 0.18                               | 0.09                         | 7.89                    |
| 20B               | LowerGraceChapelPond  | 100-YR           | 0.005            | 0.030                           | 0.109             | 0.024              | 17.0               | 0.40                 | 0.10                | 3.73                             | 0.68                    | 0.0014                      | 0.00                     | 0.34                               | 0.12                         | 15.43                   |
| 21                | 121                   | 100-YR           | 0.191            | 0.450                           | 0.681             | 0.057              | 16.0               | 0.40                 | 0.10                | 2.99                             | 0.50                    | 0.0018                      | 0.00                     | 0.32                               | 0.12                         | 14.92                   |
| 22                | 122                   | 100-YR           | 0.192            | 0.282                           | 0.555             | 0.031              | 5.0                | 0.40                 | 0.10                | 2.95                             | 0.49                    | 0.0018                      | 0.00                     | 0.10                               | 0.05                         | 4.53                    |
| 23                | 123                   | 100-YR           | 0.086            | 0.265                           | 0.633             | 0.012              | 25.0               | 0.40                 | 0.10                | 3.00                             | 0.50                    | 0.0018                      | 0.00                     | 0.50                               | 0.15                         | 23.76                   |
| 62                | J50                   | 100-YR           | 0.026            | 0.070                           | 0.220             | 0.020              | 62.0               | 0.40                 | 0.10                | 3.58                             | 0.56                    | 0.0017                      | 0.00                     | 0.90                               | 0.28                         | 61.14                   |
| 70                | 114d                  | 100-YR           | 0.005            | 0.038                           | 0.112             | 0.020              | 80.0               | 0.40                 | 0.10                | 3.58                             | 0.56                    | 0.0017                      | 0.00                     | 0.94                               | 0.33                         | 79.36                   |
| 80                | J60                   | 100-YR           | 0.031            | 0.438                           | 0.866             | 0.060              | 37.0               | 0.40                 | 0.10                | 4.26                             | 0.60                    | 0.0017                      | 0.00                     | 0.74                               | 0.19                         | 35.62                   |
| 85                | J80                   | 100-YR           | 0.043            | 0.097                           | 0.197             | 0.040              | 17.0               | 0.40                 | 0.10                | 4.26                             | 0.60                    | 0.0017                      | 0.00                     | 0.34                               | 0.12                         | 15.57                   |
| 90                | J90                   | 100-YR           | 0.046            | 0.095                           | 0.241             | 0.025              | 80.0               | 0.40                 | 0.10                | 3.89                             | 0.60                    | 0.0017                      | 0.00                     | 0.94                               | 0.33                         | 79.31                   |
| 18B               | J36                   | 100-YR           | 0.014            | 0.134                           | 0.216             | 0.035              | 30.4               | 0.40                 | 0.10                | 3.80                             | 0.61                    | 0.0017                      | 0.00                     | 0.61                               | 0.17                         | 28.86                   |
| 18C               | J36                   | 100-YR           | 0.005            | 0.098                           | 0.226             | 0.043              | 6.1                | 0.40                 | 0.10                | 3.80                             | 0.60                    | 0.0180                      | 0.00                     | 0.12                               | 0.06                         | 5.59                    |
| 18D               | J35                   | 100-YR           | 0.006            | 0.050                           | 0.135             | 0.040              | 26.6               | 0.40                 | 0.10                | 3.80                             | 0.60                    | 0.0180                      | 0.00                     | 0.53                               | 0.16                         | 25.48                   |
| 17                | 117                   | 100-YR           | 0.085            | 0.259                           | 0.592             | 0.060              | 17.0               | 0.40                 | 0.10                | 3.43                             | 0.53                    | 0.0018                      | 0.00                     | 0.34                               | 0.12                         | 15.79                   |
| 6                 | 106                   | 100-YR           | 0.022            | 0.195                           | 0.450             | 0.046              | 14.0               | 0.40                 | 0.10                | 4.26                             | 0.60                    | 0.0017                      | 0.00                     | 0.28                               | 0.11                         | 12.68                   |

### Node Inflow Summary

| Node | Type     | Maximum<br>Lateral<br>Inflow<br>CFS | Maximum<br>Total<br>Inflow<br>CFS | Day of<br>Maximum<br>Inflow | Hour of<br>Maximum<br>Inflow | Lateral<br>Inflow<br>Volume<br>10^6 gal | Total<br>Inflow<br>Volume<br>10^6 gal | Flow<br>Balance<br>Error<br>Percent |
|------|----------|-------------------------------------|-----------------------------------|-----------------------------|------------------------------|-----------------------------------------|---------------------------------------|-------------------------------------|
| 121  | JUNCTION | 224.82                              | 224.82                            | 0                           | 00:45                        | 5.75                                    | 5.75                                  | 0.000                               |
| 122  | JUNCTION | 220.09                              | 441.86                            | 0                           | 00:45                        | 5.38                                    | 11.1                                  | 0.000                               |
| 123  | JUNCTION | 91.18                               | 531.98                            | 0                           | 00:47                        | 2.74                                    | 13.9                                  | 0.000                               |
| 120  | JUNCTION | 532.02                              | 532.02                            | 0                           | 01:20                        | 5.51                                    | 5.51                                  | 0.000                               |
| J40  | JUNCTION | 0.00                                | 530.96                            | 0                           | 01:20                        | 0                                       | 5.51                                  | -0.000                              |
| J10  | JUNCTION | 87.88                               | 695.53                            | 0                           | 01:17                        | 2.3                                     | 25.2                                  | 0.000                               |
| 110a | JUNCTION | 0.00                                | 571.81                            | 0                           | 01:02                        | 0                                       | 24.5                                  | -0.000                              |
| 118c | JUNCTION | 38.30                               | 38.30                             | 0                           | 00:35                        | 0.543                                   | 0.543                                 | 0.000                               |
| 114b | JUNCTION | 67.60                               | 83.47                             | 0                           | 00:32                        | 0.881                                   | 1.09                                  | 0.000                               |
| 111a | JUNCTION | 0.00                                | 844.71                            | 0                           | 01:04                        | 0                                       | 31.9                                  | 0.000                               |
| J80  | JUNCTION | 69.74                               | 69.74                             | 0                           | 00:35                        | 1.18                                    | 1.18                                  | 0.000                               |
| J70  | JUNCTION | 0.00                                | 68.72                             | 0                           | 00:38                        | 0                                       | 1.18                                  | 0.000                               |
| J20  | JUNCTION | 111.30                              | 581.05                            | 0                           | 01:16                        | 2.16                                    | 21.3                                  | 0.000                               |
| J60  | JUNCTION | 30.99                               | 95.59                             | 0                           | 00:41                        | 0.989                                   | 2.17                                  | 0.000                               |
| J35  | JUNCTION | 10.19                               | 13.45                             | 0                           | 00:53                        | 0.193                                   | 1.89                                  | 0.000                               |
| J30  | JUNCTION | 23.50                               | 494.10                            | 0                           | 01:16                        | 0.464                                   | 17.2                                  | 0.000                               |

| Node                    | Type     | Maximum<br>Lateral<br>Inflow<br>CFS | Maximum<br>Total<br>Inflow<br>CFS | Day of<br>Maximum<br>Inflow | Hour of<br>Maximum<br>Inflow | Lateral<br>Inflow<br>Volume<br>10^6 gal | Total<br>Inflow<br>Volume<br>10^6 gal | Flow<br>Balance<br>Error<br>Percent |
|-------------------------|----------|-------------------------------------|-----------------------------------|-----------------------------|------------------------------|-----------------------------------------|---------------------------------------|-------------------------------------|
| J90                     | JUNCTION | 271.05                              | 271.05                            | 0                           | 00:30                        | 46.9                                    | 46.9                                  | 0.000                               |
| 114d                    | JUNCTION | 16.91                               | 16.91                             | 0                           | 00:30                        | 0.212                                   | 0.212                                 | 0.000                               |
| J100                    | JUNCTION | 0.00                                | 102.00                            | 0                           | 01:00                        | 0                                       | 44.3                                  | 0.000                               |
| J36                     | JUNCTION | 37.34                               | 37.34                             | 0                           | 00:40                        | 9.6                                     | 9.6                                   | 0.000                               |
| J37                     | JUNCTION | 0.00                                | 49.70                             | 0                           | 00:45                        | 0                                       | 11.5                                  | 0.000                               |
| J25                     | JUNCTION | 47.60                               | 513.11                            | 0                           | 01:16                        | 0.945                                   | 18.1                                  | 0.000                               |
| J5                      | JUNCTION | 17.80                               | 699.72                            | 0                           | 01:17                        | 0.372                                   | 25.6                                  | 0.000                               |
| J22                     | JUNCTION | 49.40                               | 531.40                            | 0                           | 01:16                        | 0.999                                   | 19.1                                  | 0.000                               |
| J15                     | JUNCTION | 82.88                               | 617.10                            | 0                           | 01:16                        | 1.64                                    | 22.9                                  | 0.000                               |
| J50                     | JUNCTION | 81.26                               | 164.75                            | 0                           | 00:37                        | 1.03                                    | 4.11                                  | 0.000                               |
| 9                       | JUNCTION | 0.00                                | 0.00                              | 0                           | 00:00                        | 0                                       | 0                                     | 0.000                               |
| 117                     | JUNCTION | 96.48                               | 96.48                             | 0                           | 00:45                        | 2.49                                    | 2.49                                  | 0.000                               |
| 106                     | JUNCTION | 16.15                               | 111.94                            | 0                           | 00:45                        | 0.583                                   | 3.08                                  | 0.000                               |
| 201                     | OUTFALL  | 0.00                                | 844.69                            | 0                           | 01:04                        | 0                                       | 31.9                                  | 0.000                               |
| 112d                    | DIVIDER  | 0.00                                | 844.70                            | 0                           | 01:04                        | 0                                       | 31.9                                  | 0.000                               |
| 113d                    | DIVIDER  | 141.21                              | 647.83                            | 0                           | 01:03                        | 2.91                                    | 27.4                                  | 0.000                               |
| Regional Detention Pond | STORAGE  | 53.45                               | 961.88                            | 0                           | 00:36                        | 1.08                                    | 38.2                                  | 0.068                               |

| Node                 | Type    | Maximum<br>Lateral<br>Inflow<br>CFS | Maximum<br>Total<br>Inflow<br>CFS | Day of<br>Maximum<br>Inflow | Hour of<br>Maximum<br>Inflow | Lateral<br>Inflow<br>Volume<br>10 <sup>6</sup> gal | Total<br>Inflow<br>Volume<br>10 <sup>6</sup> gal | Flow<br>Balance<br>Error<br>Percent |
|----------------------|---------|-------------------------------------|-----------------------------------|-----------------------------|------------------------------|----------------------------------------------------|--------------------------------------------------|-------------------------------------|
| LowerGraceChapelPond | STORAGE | 155.74                              | 654.47                            | 0                           | 00:45                        | 2.73                                               | 16.6                                             | 0.000                               |
| NortheastPond        | STORAGE | 122.38                              | 122.38                            | 0                           | 00:35                        | 2.09                                               | 2.09                                             | 0.044                               |
| LowesNorthPond       | STORAGE | 0.00                                | 271.05                            | 0                           | 00:30                        | 0                                                  | 46.9                                             | 0.004                               |

### Link Flow Summary

| Link | Type    | Maximum<br> Flow <br>CFS | Day of<br>Maximum<br>Flow | Hour of<br>Maximum<br>Flow | Maximum<br> Velocity <br>ft/sec | Max /<br>Full<br>Flow | Max /<br>Full<br>Depth |
|------|---------|--------------------------|---------------------------|----------------------------|---------------------------------|-----------------------|------------------------|
| 322  | CHANNEL | 223.64                   | 0                         | 00:46                      | 12.90                           | 0.10                  | 0.37                   |
| 323  | CHANNEL | 441.09                   | 0                         | 00:47                      | 12.08                           | 0.17                  | 0.51                   |
| C50  | CONDUIT | 530.96                   | 0                         | 01:20                      | 48.87                           | 0.17                  | 0.23                   |
| C40  | CONDUIT | 445.16                   | 0                         | 01:16                      | 27.72                           | 1.08                  | 1.00                   |
| 310  | CHANNEL | 574.86                   | 0                         | 01:03                      | 8.59                            | 0.02                  | 0.15                   |
| 308b | CHANNEL | 37.98                    | 0                         | 00:35                      | 12.79                           | 0.01                  | 0.20                   |
| 304a | CHANNEL | 83.36                    | 0                         | 00:33                      | 10.04                           | 0.00                  | 0.12                   |
| 401  | CONDUIT | 844.71                   | 0                         | 01:04                      | 16.85                           | 0.21                  | 0.28                   |
| 301  | CHANNEL | 844.69                   | 0                         | 01:04                      | 15.01                           | 0.04                  | 0.18                   |
| C100 | CONDUIT | 68.72                    | 0                         | 00:38                      | 16.96                           | 0.28                  | 0.36                   |
| 304b | CHANNEL | 16.26                    | 0                         | 00:32                      | 5.08                            | 0.01                  | 0.16                   |
| 302  | CHANNEL | 0.00                     | 0                         | 00:00                      | 0.00                            | 0.00                  | 0.00                   |
| 303  | CHANNEL | 647.73                   | 0                         | 01:03                      | 26.85                           | 0.02                  | 0.15                   |
| C90  | CONDUIT | 68.66                    | 0                         | 00:38                      | 19.13                           | 0.23                  | 0.33                   |
| C80  | CONDUIT | 95.56                    | 0                         | 00:42                      | 19.85                           | 0.35                  | 0.41                   |
| C110 | DUMMY   | 271.05                   | 0                         | 00:30                      |                                 |                       |                        |

| Link                  | Type    | Maximum<br> Flow <br>CFS | Day of<br>Maximum<br>Flow | Hour of<br>Maximum<br>Flow | Maximum<br> Velocity <br>ft/sec | Max /<br>Full<br>Flow | Max /<br>Full<br>Depth |
|-----------------------|---------|--------------------------|---------------------------|----------------------------|---------------------------------|-----------------------|------------------------|
| C60                   | CONDUIT | 13.45                    | 0                         | 00:53                      | 14.26                           | 0.08                  | 0.19                   |
| C65                   | CONDUIT | 37.32                    | 0                         | 00:40                      | 15.38                           | 0.20                  | 0.30                   |
| C35                   | CONDUIT | 49.70                    | 0                         | 00:45                      | 22.16                           | 0.27                  | 0.35                   |
| 16                    | DUMMY   | 531.98                   | 0                         | 00:47                      |                                 |                       |                        |
| C33                   | CONDUIT | 493.49                   | 0                         | 01:16                      | 19.45                           | 0.79                  | 0.67                   |
| C3                    | CONDUIT | 571.81                   | 0                         | 01:02                      | 16.94                           | 1.08                  | 1.00                   |
| C31                   | CONDUIT | 531.12                   | 0                         | 01:16                      | 27.39                           | 0.50                  | 0.50                   |
| C32                   | CONDUIT | 511.92                   | 0                         | 01:16                      | 21.24                           | 0.67                  | 0.60                   |
| C25                   | CONDUIT | 581.70                   | 0                         | 01:16                      | 31.41                           | 0.48                  | 0.49                   |
| C15                   | CONDUIT | 615.14                   | 0                         | 01:17                      | 26.30                           | 0.65                  | 0.59                   |
| C70                   | CONDUIT | 164.62                   | 0                         | 00:37                      | 22.21                           | 0.62                  | 0.57                   |
| 306                   | CHANNEL | 96.41                    | 0                         | 00:45                      | 16.83                           | 0.01                  | 0.08                   |
| 305                   | CONDUIT | 111.84                   | 0                         | 00:46                      | 19.46                           | 0.63                  | 0.58                   |
| C6                    | CONDUIT | 694.38                   | 0                         | 01:17                      | 24.54                           | 0.86                  | 0.72                   |
| 201                   | DUMMY   | 844.70                   | 0                         | 01:04                      |                                 |                       |                        |
| NortheastPondOutflow  | DUMMY   | 9.00                     | 0                         | 01:16                      |                                 |                       |                        |
| LowesNorthPondOutflow | DUMMY   | 102.00                   | 0                         | 01:00                      |                                 |                       |                        |

### Storage Volume Summary

| Storage Unit          | Average Volume<br>1000 ft3 | Average Percent Full | Evap Percent Loss | Infil Percent Loss | Maximum Volume<br>1000 ft3 | Maximum Percent Full | Day of Maximum Volume | Hour of Maximum Volume |
|-----------------------|----------------------------|----------------------|-------------------|--------------------|----------------------------|----------------------|-----------------------|------------------------|
| RegionalDetentionPond | 22.218                     | 78                   | 0                 | 0                  | 974.587                    | 93                   | 0                     | 01:04                  |
| LowerGraceChapelPond  | 0.000                      | 0                    | 0                 | 0                  | 0.000                      | 0                    | 0                     | 00:00                  |
| NortheastPond         | 99.022                     | 30                   | 0                 | 0                  | 243.640                    | 74                   | 0                     | 01:34                  |
| LowesNorthPond        | 342.044                    | 74                   | 0                 | 0                  | 380.315                    | 83                   | 0                     | 01:06                  |

### Storage Volume Summary

| Storage Unit          | Maximum Outflow CFS |
|-----------------------|---------------------|
| RegionalDetentionPond | 844.70              |
| LowerGraceChapelPond  | 0.00                |
| NortheastPond         | 9.00                |
| LowesNorthPond        | 102.00              |

APPENDIX C  
DETENTION/WATER QUALITY ENHANCEMENT BMPS

# Design Procedure Form: Extended Detention Basin (EDB)

Sheet 1 of 4

Designer: \_\_\_\_\_  
 Company: **Bowman Consulting** \_\_\_\_\_  
 Date: **March 15, 2015** \_\_\_\_\_  
 Project: **Promenade at Castle Rock** \_\_\_\_\_  
 Location: **Regional Pond** \_\_\_\_\_

## 1. Basin Storage Volume

- A) Effective Imperviousness of Tributary Area,  $I_a$
- B) Tributary Area's Imperviousness Ratio ( $i = I_a / 100$ )
- C) Contributing Watershed Area
- D) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm
- E) Design Concept  
(Select EURV when also designing for flood control)
- F) Design Volume (1.2 WQCV) Based on 40-hour Drain Time  
 $(V_{DESIGN} = (1.0 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i) / 12 * Area * 1.2)$
- G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume  
 $(V_{WQCV\ OTHER} = (d_6 * (V_{DESIGN} / 0.43))$
- H) User Input of Water Quality Capture Volume (WQCV) Design Volume  
(Only if a different WQCV Design Volume is desired)
- I) Predominant Watershed NRCS Soil Group
- J) Excess Urban Runoff Volume (EURV) Design Volume  
 For HSG A:  $EURV_A = (0.1878i - 0.0104) * Area$   
 For HSG B:  $EURV_B = (0.1178i - 0.0042) * Area$   
 For HSG C/D:  $EURV_{C/D} = (0.1043i - 0.0031) * Area$

$I_a =$  59.0 %

$i =$  0.590

Area = 283.340 ac

$d_6 =$  \_\_\_\_\_ in

Choose One \_\_\_\_\_

☐ Water Quality Capture Volume (WQCV)

☒ Excess Urban Runoff Volume (EURV)

~~$V_{DESIGN} =$  6.590 ac-ft~~

See attached calcs

$V_{DESIGN\ OTHER} =$  \_\_\_\_\_ ac-ft

$V_{DESIGN\ USER} =$  \_\_\_\_\_ ac-ft

Choose One \_\_\_\_\_

☐ A

☒ B

☐ C / D

EURV = 18.503 ac-ft

## 2. Basin Shape: Length to Width Ratio

(A basin length to width ratio of at least 2:1 will improve TSS reduction.)

L : W = 17.0 : 1

## 3. Basin Side Slopes

- A) Basin Maximum Side Slopes  
(Horizontal distance per unit vertical, 4:1 or flatter preferred)

Z = 4.00 ft / ft

## 4. Inlet

- A) Describe means of providing energy dissipation at concentrated inflow locations:

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

# Design Procedure Form: Extended Detention Basin (EDB)

Sheet 2 of 4

**Designer:** \_\_\_\_\_  
**Company:** Bowman Consulting  
**Date:** March 15, 2015  
**Project:** Promenade at Castle Rock  
**Location:** Regional Pond

## 5. Forebay

A) Minimum Forebay Volume  
( $V_{FMIN} = 3\%$  of the WQCV)

$V_{FMIN} = 0.165$  ac-ft

B) Actual Forebay Volume

$V_F =$  \_\_\_\_\_ ac-ft

C) Forebay Depth  
( $D_F = 30$  inch maximum)

$D_F =$  \_\_\_\_\_ in

D) Forebay Discharge

i) Undetained 100-year Peak Discharge

$Q_{100} =$  \_\_\_\_\_ cfs

ii) Forebay Discharge Design Flow  
( $Q_F = 0.02 * Q_{100}$ )

$Q_F =$  \_\_\_\_\_ cfs

E) Forebay Discharge Design

Choose One \_\_\_\_\_

- ☐ Berm With Pipe  
☐ Wall with Rect. Notch  
☐ Wall with V-Notch Weir

F) Discharge Pipe Size (minimum 8-inches)

Calculated  $D_p =$  \_\_\_\_\_ in

G) Rectangular Notch Width

Calculated  $W_N =$  \_\_\_\_\_ in

## 6. Trickle Channel

A) Type of Trickle Channel

Choose One \_\_\_\_\_

- ☒ Concrete  
☐ Soft Bottom

F) Slope of Trickle Channel

$S = 0.0050$  ft / ft

## 7. Micropool and Outlet Structure

A) Depth of Micropool (2.5-feet minimum)

$D_M = 2.5$  ft

B) Surface Area of Micropool (10 ft<sup>2</sup> minimum)

$A_M = 58$  sq ft

C) Outlet Type

Choose One \_\_\_\_\_

- ☒ Orifice Plate  
☐ Other (Describe): \_\_\_\_\_

D) Depth of Design Volume (EURV or 1.2 WQCV) Based on the Design Concept Chosen Under 1.E.

$H = 13.33$  feet

E) Volume to Drain Over Prescribed Time

EURV =  $18.503$  ac-ft

F) Drain Time  
(Min  $T_D$  for WQCV= 40 hours; Max  $T_D$  for EURV= 72 hours)

$T_D = 72$  hours

G) Recommended Maximum Outlet Area per Row, ( $A_o$ )

$A_o = 4.61$  square inches

H) Orifice Dimensions:

- i) Circular Orifice Diameter or  
 ii) Width of 2" High Rectangular Orifice

$D_{orifice} =$  \_\_\_\_\_ inches  
 $W_{orifice} = 2.30$  inches

I) Number of Columns

$n_c = 1$  number

J) Actual Design Outlet Area per Row ( $A_o$ )

$A_o = 4.61$  square inches

K) Number of Rows (nr)

$n_r = 39$  number

L) Total Outlet Area ( $A_{ot}$ )

$A_{ot} = 184.0$  square inches

M) Depth of WQCV ( $H_{WQCV}$ )  
(Estimate using actual stage-area-volume relationship and  $V_{WQCV}$ )

$H_{WQCV} =$  \_\_\_\_\_ feet

N) Ensure Minimum 40 Hour Drain Time for WQCV

$T_{D\ WQCV} =$  \_\_\_\_\_ hours

# Design Procedure Form: Extended Detention Basin (EDB)

Sheet 3 of 4

Designer: \_\_\_\_\_  
 Company: Bowman Consulting  
 Date: March 15, 2015  
 Project: Promenade at Castle Rock  
 Location: Regional Pond

## 8. Initial Surge Volume

- A) Depth of Initial Surge Volume  
(Minimum recommended depth is 4 inches)
- B) Minimum Initial Surge Volume  
(Minimum volume of 0.3% of the WQCV)
- C) Initial Surge Provided Above Micropool

$D_{IS} =$  4.0 in

$V_{IS} =$  718.5 cu ft

$V_s =$  19.4 cu ft **INCREASE DEPTH OF INITIAL SURCHARGE  
OR SURFACE AREA OF MICROPOOL**

## 9. Trash Rack

- A) Type of Water Quality Orifice Used
- B) Water Quality Screen Open Area:  $A_t = 38.5 \cdot (e^{-0.095D}) \cdot A_{ot}$
- C) For 2", or Smaller, Circular Opening (See Fact Sheet T-12):
- i) Width of Water Quality Screen and Concrete Opening ( $W_{opening}$ )
  - ii) Height of Water Quality Screen ( $H_{TR}$ )
  - iii) Type of Screen, Describe if "Other"

Choose One \_\_\_\_\_

☐ Circular (up to 2" diameter)

☒ Rectangular (2" high)

$A_t =$  5,857 square inches

$W_{opening} =$  \_\_\_\_\_ inches

$H_{TR} =$  \_\_\_\_\_ inches

Choose One \_\_\_\_\_

☐ S.S. Well Screen with 60% Open Area\*

☐ Other (Describe): \_\_\_\_\_

## D) For 2" High **Rectangular Opening**:

- i) Width of Rectangular Opening ( $W_{orifice}$ )
- ii) Width of Water Quality Screen Opening ( $W_{opening}$ )
- iii) Height of Water Quality Screen ( $H_{TR}$ )
- iv) Type of Screen, Describe if "Other"

$W =$  2.30 inches

$W_{opening} =$  3.7 ft

$H_{TR} =$  15.7 ft

Choose One \_\_\_\_\_

☒ Aluminum Amico-Klemp SR Series (or equal)

☐ Other (Describe): \_\_\_\_\_

v) Cross-bar Spacing

4.0 inches

vi) Minimum Bearing Bar Size

2-1/4 inch x 3/16 inch

# Design Procedure Form: Extended Detention Basin (EDB)

Sheet 4 of 4

**Designer:** \_\_\_\_\_  
**Company:** Bowman Consulting \_\_\_\_\_  
**Date:** March 15, 2015 \_\_\_\_\_  
**Project:** Promenade at Castle Rock \_\_\_\_\_  
**Location:** Regional Pond \_\_\_\_\_

## 10. Overflow Embankment

A) Describe embankment protection for 100-year and greater overtopping:

\_\_\_\_\_  
 \_\_\_\_\_

B) Slope of Overflow Embankment  
 (Horizontal distance per unit vertical, 4:1 or flatter preferred)

$Z_E =$  \_\_\_\_\_ ft / ft

## 11. Vegetation

Choose One \_\_\_\_\_

☐ Irrigated

☒ Not Irrigated

## 12. Access

A) Describe Sediment Removal Procedures

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Notes: \_\_\_\_\_

# Bowman

## VISION LAND

603 Park Point Dr., Suite 100 • Golden, CO 80401 • Ph: (303) 674-7355  
P.O. Box 679 • 135 E. Jasper Ave. • Granby, CO 80446 • Ph: (970) 887-2600

Project: Promenade at Cattlelak Project #: 020029

Sheet No. 1 of 1

Calculated By: LJT Date: \_\_\_\_\_

Checked By: \_\_\_\_\_ Date: \_\_\_\_\_

WQW calc

$$WQW = a(0.9I^3 - 1.19I^2 + 0.78I)$$

$$WQW = 1.0(0.9(1.59)^3 - 1.19(1.59)^2 + 0.78(1.59))$$

$$WQW = 0.23 \text{ inches}$$

$$V = \left( \frac{WQW}{12} \right) \Delta$$

$$V = \left( \frac{0.23}{12} \right) 283.34 \text{ AC}$$

$$V = 5.50 \text{ AC-FT}$$

Table - Node RegionalDetentionPond

| Days | Hours    | Depth<br>(ft) | Volume<br>(ft3) | Total Inflow<br>(CFS) | Flooding<br>(CFS) |
|------|----------|---------------|-----------------|-----------------------|-------------------|
| 0    | 00:05:00 | 6.69          | 242567.70       | 0.00                  | 0.00              |
| 0    | 00:10:00 | 6.68          | 241793.50       | 4.87                  | 0.00              |
| 0    | 00:15:00 | 6.75          | 247965.40       | 44.18                 | 0.00              |
| 0    | 00:20:00 | 7.38          | 297512.80       | 271.66                | 0.00              |
| 0    | 00:25:00 | 9.15          | 452605.30       | 636.66                | 0.00              |
| 0    | 00:30:00 | 11.26         | 666999.40       | 827.13                | 0.00              |
| 0    | 00:35:00 | 13.03         | 867489.40       | 954.51                | 0.00              |
| 0    | 00:40:00 | 13.34         | 904675.60       | 931.93                | 0.00              |
| 0    | 00:45:00 | 13.54         | 928902.90       | 904.81                | 0.00              |
| 0    | 00:50:00 | 13.68         | 947203.90       | 891.76                | 0.00              |
| 0    | 00:55:00 | 13.79         | 960638.90       | 866.01                | 0.00              |
| 0    | 01:00:00 | 13.86         | 969311.60       | 870.36                | 0.00              |
| 0    | 01:05:00 | 13.90         | 973940.90       | 826.79                | 0.00              |
| 0    | 01:10:00 | 13.81         | 962196.30       | 783.96                | 0.00              |
| 0    | 01:15:00 | 13.63         | 939484.80       | 746.31                | 0.00              |
| 0    | 01:20:00 | 13.36         | 906767.10       | 677.27                | 0.00              |
| 0    | 01:25:00 | 12.92         | 853945.70       | 491.10                | 0.00              |

← 6.69'=WQCV depth

| Days | Hours    | Depth<br>(ft) | Volume<br>(ft3) | Total Inflow<br>(CFS) | Flooding<br>(CFS) |
|------|----------|---------------|-----------------|-----------------------|-------------------|
| 0    | 01:30:00 | 12.77         | 836156.90       | 175.58                | 0.00              |
| 0    | 01:35:00 | 12.75         | 833726.40       | 128.29                | 0.00              |
| 0    | 01:40:00 | 12.74         | 833042.90       | 112.17                | 0.00              |
| 0    | 01:45:00 | 12.74         | 832615.30       | 101.85                | 0.00              |
| 0    | 01:50:00 | 12.73         | 832269.90       | 93.92                 | 0.00              |
| 0    | 01:55:00 | 12.73         | 831981.80       | 87.11                 | 0.00              |
| 0    | 02:00:00 | 12.73         | 831712.30       | 80.84                 | 0.00              |
| 0    | 02:05:00 | 12.73         | 831281.00       | 70.60                 | 0.00              |
| 0    | 02:10:00 | 12.72         | 830849.10       | 60.23                 | 0.00              |
| 0    | 02:15:00 | 12.72         | 830504.50       | 52.30                 | 0.00              |
| 0    | 02:20:00 | 12.72         | 830250.40       | 46.43                 | 0.00              |
| 0    | 02:25:00 | 12.71         | 830064.80       | 42.08                 | 0.00              |
| 0    | 02:30:00 | 12.71         | 829935.50       | 39.03                 | 0.00              |
| 0    | 02:35:00 | 12.71         | 829824.90       | 36.42                 | 0.00              |
| 0    | 02:40:00 | 12.71         | 829731.60       | 34.22                 | 0.00              |
| 0    | 02:45:00 | 12.71         | 829651.80       | 32.34                 | 0.00              |
| 0    | 02:50:00 | 12.71         | 829582.40       | 30.71                 | 0.00              |
| 0    | 02:55:00 | 12.71         | 829525.50       | 29.37                 | 0.00              |

| Days | Hours    | Depth<br>(ft) | Volume<br>(ft3) | Total Inflow<br>(CFS) | Flooding<br>(CFS) |
|------|----------|---------------|-----------------|-----------------------|-------------------|
| 0    | 03:00:00 | 12.71         | 829481.50       | 28.34                 | 0.00              |
| 0    | 03:05:00 | 12.71         | 829444.60       | 27.47                 | 0.00              |
| 0    | 03:10:00 | 12.71         | 829412.10       | 26.71                 | 0.00              |
| 0    | 03:15:00 | 12.71         | 829382.80       | 26.02                 | 0.00              |
| 0    | 03:20:00 | 12.71         | 829356.10       | 25.39                 | 0.00              |
| 0    | 03:25:00 | 12.71         | 829331.50       | 24.81                 | 0.00              |
| 0    | 03:30:00 | 12.71         | 829308.80       | 24.28                 | 0.00              |
| 0    | 03:35:00 | 12.71         | 829288.80       | 23.81                 | 0.00              |
| 0    | 03:40:00 | 12.71         | 829271.90       | 23.41                 | 0.00              |
| 0    | 03:45:00 | 12.71         | 829256.90       | 23.06                 | 0.00              |
| 0    | 03:50:00 | 12.71         | 829243.30       | 22.74                 | 0.00              |
| 0    | 03:55:00 | 12.71         | 829230.70       | 22.44                 | 0.00              |
| 0    | 04:00:00 | 12.71         | 829219.10       | 22.17                 | 0.00              |
| 0    | 04:05:00 | 12.71         | 829208.40       | 21.91                 | 0.00              |
| 0    | 04:10:00 | 12.71         | 829198.60       | 21.69                 | 0.00              |
| 0    | 04:15:00 | 12.71         | 829189.70       | 21.48                 | 0.00              |
| 0    | 04:20:00 | 12.71         | 829181.40       | 21.28                 | 0.00              |
| 0    | 04:25:00 | 12.71         | 829173.40       | 21.09                 | 0.00              |

| Days | Hours    | Depth<br>(ft) | Volume<br>(ft3) | Total Inflow<br>(CFS) | Flooding<br>(CFS) |
|------|----------|---------------|-----------------|-----------------------|-------------------|
| 0    | 04:30:00 | 12.71         | 829165.80       | 20.91                 | 0.00              |
| 0    | 04:35:00 | 12.71         | 829158.30       | 20.74                 | 0.00              |
| 0    | 04:40:00 | 12.71         | 829150.90       | 20.56                 | 0.00              |
| 0    | 04:45:00 | 12.71         | 829143.80       | 20.39                 | 0.00              |
| 0    | 04:50:00 | 12.71         | 829137.30       | 20.24                 | 0.00              |
| 0    | 04:55:00 | 12.71         | 829131.90       | 20.12                 | 0.00              |
| 0    | 05:00:00 | 12.71         | 829127.20       | 20.00                 | 0.00              |
| 0    | 05:05:00 | 12.71         | 829122.80       | 19.90                 | 0.00              |
| 0    | 05:10:00 | 12.71         | 829118.80       | 19.81                 | 0.00              |
| 0    | 05:15:00 | 12.71         | 829114.90       | 19.71                 | 0.00              |
| 0    | 05:20:00 | 12.71         | 829111.10       | 19.63                 | 0.00              |
| 0    | 05:25:00 | 12.71         | 829107.60       | 19.54                 | 0.00              |
| 0    | 05:30:00 | 12.71         | 829104.30       | 19.47                 | 0.00              |
| 0    | 05:35:00 | 12.71         | 829100.90       | 19.39                 | 0.00              |
| 0    | 05:40:00 | 12.71         | 829097.60       | 19.31                 | 0.00              |
| 0    | 05:45:00 | 12.71         | 829094.40       | 19.23                 | 0.00              |
| 0    | 05:50:00 | 12.71         | 829091.10       | 19.16                 | 0.00              |
| 0    | 05:55:00 | 12.71         | 829087.90       | 19.08                 | 0.00              |

| Days | Hours    | Depth<br>(ft) | Volume<br>(ft3) | Total Inflow<br>(CFS) | Flooding<br>(CFS) |
|------|----------|---------------|-----------------|-----------------------|-------------------|
| 0    | 06:00:00 | 12.71         | 829084.80       | 19.01                 | 0.00              |
| 0    | 06:05:00 | 12.71         | 829081.70       | 18.93                 | 0.00              |
| 0    | 06:10:00 | 12.71         | 829078.60       | 18.86                 | 0.00              |
| 0    | 06:15:00 | 12.71         | 829075.60       | 18.79                 | 0.00              |
| 0    | 06:20:00 | 12.71         | 829072.60       | 18.72                 | 0.00              |
| 0    | 06:25:00 | 12.71         | 829069.60       | 18.65                 | 0.00              |
| 0    | 06:30:00 | 12.71         | 829066.80       | 18.58                 | 0.00              |
| 0    | 06:35:00 | 12.71         | 829063.80       | 18.51                 | 0.00              |
| 0    | 06:40:00 | 12.71         | 829061.00       | 18.45                 | 0.00              |
| 0    | 06:45:00 | 12.71         | 829058.10       | 18.38                 | 0.00              |
| 0    | 06:50:00 | 12.71         | 829055.40       | 18.31                 | 0.00              |
| 0    | 06:55:00 | 12.71         | 829052.60       | 18.25                 | 0.00              |
| 0    | 07:00:00 | 12.71         | 829049.90       | 18.19                 | 0.00              |
| 0    | 07:05:00 | 12.71         | 829047.30       | 18.12                 | 0.00              |
| 0    | 07:10:00 | 12.71         | 829044.60       | 18.06                 | 0.00              |
| 0    | 07:15:00 | 12.71         | 829042.00       | 18.00                 | 0.00              |
| 0    | 07:20:00 | 12.71         | 829039.40       | 17.94                 | 0.00              |
| 0    | 07:25:00 | 12.71         | 829036.80       | 17.88                 | 0.00              |

| Days | Hours    | Depth<br>(ft) | Volume<br>(ft3) | Total Inflow<br>(CFS) | Flooding<br>(CFS) |
|------|----------|---------------|-----------------|-----------------------|-------------------|
| 0    | 07:30:00 | 12.71         | 829034.30       | 17.82                 | 0.00              |
| 0    | 07:35:00 | 12.71         | 829031.80       | 17.76                 | 0.00              |
| 0    | 07:40:00 | 12.71         | 829029.30       | 17.70                 | 0.00              |
| 0    | 07:45:00 | 12.71         | 829026.90       | 17.64                 | 0.00              |
| 0    | 07:50:00 | 12.71         | 829024.50       | 17.59                 | 0.00              |
| 0    | 07:55:00 | 12.71         | 829022.10       | 17.53                 | 0.00              |
| 0    | 08:00:00 | 12.71         | 829019.80       | 17.48                 | 0.00              |
| 0    | 08:05:00 | 12.71         | 829017.50       | 17.42                 | 0.00              |
| 0    | 08:10:00 | 12.71         | 829015.20       | 17.37                 | 0.00              |
| 0    | 08:15:00 | 12.71         | 829012.90       | 17.32                 | 0.00              |
| 0    | 08:20:00 | 12.71         | 829010.80       | 17.26                 | 0.00              |
| 0    | 08:25:00 | 12.71         | 829008.60       | 17.21                 | 0.00              |
| 0    | 08:30:00 | 12.71         | 829006.40       | 17.16                 | 0.00              |
| 0    | 08:35:00 | 12.71         | 829004.30       | 17.11                 | 0.00              |
| 0    | 08:40:00 | 12.71         | 829002.10       | 17.06                 | 0.00              |
| 0    | 08:45:00 | 12.71         | 829000.10       | 17.01                 | 0.00              |
| 0    | 08:50:00 | 12.71         | 828998.00       | 16.96                 | 0.00              |
| 0    | 08:55:00 | 12.71         | 828996.00       | 16.92                 | 0.00              |

| Days | Hours    | Depth<br>(ft) | Volume<br>(ft3) | Total Inflow<br>(CFS) | Flooding<br>(CFS) |
|------|----------|---------------|-----------------|-----------------------|-------------------|
| 0    | 09:00:00 | 12.71         | 828994.00       | 16.87                 | 0.00              |
| 0    | 09:05:00 | 12.70         | 828992.00       | 16.82                 | 0.00              |
| 0    | 09:10:00 | 12.70         | 828990.10       | 16.78                 | 0.00              |
| 0    | 09:15:00 | 12.70         | 828988.20       | 16.73                 | 0.00              |
| 0    | 09:20:00 | 12.70         | 828986.30       | 16.69                 | 0.00              |
| 0    | 09:25:00 | 12.70         | 828984.40       | 16.64                 | 0.00              |
| 0    | 09:30:00 | 12.70         | 828982.60       | 16.60                 | 0.00              |
| 0    | 09:35:00 | 12.70         | 828980.80       | 16.56                 | 0.00              |
| 0    | 09:40:00 | 12.70         | 828979.00       | 16.52                 | 0.00              |
| 0    | 09:45:00 | 12.70         | 828977.30       | 16.48                 | 0.00              |
| 0    | 09:50:00 | 12.70         | 828975.50       | 16.44                 | 0.00              |
| 0    | 09:55:00 | 12.70         | 828973.80       | 16.39                 | 0.00              |
| 0    | 10:00:00 | 12.70         | 828972.10       | 16.36                 | 0.00              |
| 0    | 10:05:00 | 12.70         | 828970.40       | 16.32                 | 0.00              |
| 0    | 10:10:00 | 12.70         | 828968.80       | 16.28                 | 0.00              |
| 0    | 10:15:00 | 12.70         | 828967.20       | 16.24                 | 0.00              |
| 0    | 10:20:00 | 12.70         | 828965.60       | 16.20                 | 0.00              |
| 0    | 10:25:00 | 12.70         | 828964.10       | 16.17                 | 0.00              |

| Days | Hours    | Depth<br>(ft) | Volume<br>(ft3) | Total Inflow<br>(CFS) | Flooding<br>(CFS) |
|------|----------|---------------|-----------------|-----------------------|-------------------|
| 0    | 10:30:00 | 12.70         | 828962.50       | 16.13                 | 0.00              |
| 0    | 10:35:00 | 12.70         | 828961.00       | 16.09                 | 0.00              |
| 0    | 10:40:00 | 12.70         | 828959.50       | 16.06                 | 0.00              |
| 0    | 10:45:00 | 12.70         | 828958.10       | 16.02                 | 0.00              |
| 0    | 10:50:00 | 12.70         | 828956.60       | 15.99                 | 0.00              |
| 0    | 10:55:00 | 12.70         | 828955.20       | 15.96                 | 0.00              |
| 0    | 11:00:00 | 12.70         | 828953.80       | 15.92                 | 0.00              |
| 0    | 11:05:00 | 12.70         | 828952.40       | 15.89                 | 0.00              |
| 0    | 11:10:00 | 12.70         | 828951.00       | 15.86                 | 0.00              |
| 0    | 11:15:00 | 12.70         | 828949.60       | 15.83                 | 0.00              |
| 0    | 11:20:00 | 12.70         | 828948.30       | 15.79                 | 0.00              |
| 0    | 11:25:00 | 12.70         | 828947.00       | 15.76                 | 0.00              |
| 0    | 11:30:00 | 12.70         | 828945.80       | 15.73                 | 0.00              |
| 0    | 11:35:00 | 12.70         | 828944.40       | 15.70                 | 0.00              |
| 0    | 11:40:00 | 12.70         | 828943.20       | 15.67                 | 0.00              |
| 0    | 11:45:00 | 12.70         | 828942.00       | 15.65                 | 0.00              |
| 0    | 11:50:00 | 12.70         | 828940.80       | 15.62                 | 0.00              |
| 0    | 11:55:00 | 12.70         | 828939.60       | 15.59                 | 0.00              |

| Days | Hours    | Depth<br>(ft) | Volume<br>(ft3) | Total Inflow<br>(CFS) | Flooding<br>(CFS) |
|------|----------|---------------|-----------------|-----------------------|-------------------|
| 0    | 12:00:00 | 12.70         | 828938.40       | 15.56                 | 0.00              |
| 0    | 12:05:00 | 12.70         | 828937.30       | 15.53                 | 0.00              |
| 0    | 12:10:00 | 12.70         | 828936.10       | 15.51                 | 0.00              |
| 0    | 12:15:00 | 12.70         | 828934.90       | 15.48                 | 0.00              |
| 0    | 12:20:00 | 12.70         | 828933.90       | 15.45                 | 0.00              |
| 0    | 12:25:00 | 12.70         | 828932.80       | 15.43                 | 0.00              |
| 0    | 12:30:00 | 12.70         | 828931.70       | 15.40                 | 0.00              |
| 0    | 12:35:00 | 12.70         | 828930.60       | 15.38                 | 0.00              |
| 0    | 12:40:00 | 12.70         | 828929.60       | 15.35                 | 0.00              |
| 0    | 12:45:00 | 12.70         | 828928.60       | 15.33                 | 0.00              |
| 0    | 12:50:00 | 12.70         | 828927.60       | 15.31                 | 0.00              |
| 0    | 12:55:00 | 12.70         | 828926.60       | 15.28                 | 0.00              |
| 0    | 13:00:00 | 12.70         | 828925.60       | 15.26                 | 0.00              |
| 0    | 13:05:00 | 12.70         | 828924.70       | 15.24                 | 0.00              |
| 0    | 13:10:00 | 12.70         | 828923.80       | 15.22                 | 0.00              |
| 0    | 13:15:00 | 12.70         | 828922.80       | 15.19                 | 0.00              |
| 0    | 13:20:00 | 12.70         | 828921.90       | 15.17                 | 0.00              |
| 0    | 13:25:00 | 12.70         | 828921.00       | 15.15                 | 0.00              |

| Days | Hours    | Depth<br>(ft) | Volume<br>(ft3) | Total Inflow<br>(CFS) | Flooding<br>(CFS) |
|------|----------|---------------|-----------------|-----------------------|-------------------|
| 0    | 13:30:00 | 12.70         | 828920.10       | 15.13                 | 0.00              |
| 0    | 13:35:00 | 12.70         | 828919.30       | 15.11                 | 0.00              |
| 0    | 13:40:00 | 12.70         | 828918.40       | 15.09                 | 0.00              |
| 0    | 13:45:00 | 12.70         | 828917.60       | 15.07                 | 0.00              |
| 0    | 13:50:00 | 12.70         | 828916.70       | 15.05                 | 0.00              |
| 0    | 13:55:00 | 12.70         | 828915.90       | 15.03                 | 0.00              |
| 0    | 14:00:00 | 12.70         | 828915.10       | 15.01                 | 0.00              |
| 0    | 14:05:00 | 12.70         | 828914.30       | 14.99                 | 0.00              |
| 0    | 14:10:00 | 12.70         | 828913.60       | 14.98                 | 0.00              |
| 0    | 14:15:00 | 12.70         | 828912.80       | 14.96                 | 0.00              |
| 0    | 14:20:00 | 12.70         | 828912.00       | 14.94                 | 0.00              |
| 0    | 14:25:00 | 12.70         | 828911.30       | 14.92                 | 0.00              |
| 0    | 14:30:00 | 12.70         | 828910.60       | 14.91                 | 0.00              |
| 0    | 14:35:00 | 12.70         | 828909.90       | 14.89                 | 0.00              |
| 0    | 14:40:00 | 12.70         | 828909.10       | 14.87                 | 0.00              |
| 0    | 14:45:00 | 12.70         | 828908.40       | 14.86                 | 0.00              |
| 0    | 14:50:00 | 12.70         | 828907.80       | 14.84                 | 0.00              |
| 0    | 14:55:00 | 12.70         | 828907.10       | 14.83                 | 0.00              |

| Days | Hours    | Depth<br>(ft) | Volume<br>(ft3) | Total Inflow<br>(CFS) | Flooding<br>(CFS) |
|------|----------|---------------|-----------------|-----------------------|-------------------|
| 0    | 15:00:00 | 12.70         | 828906.40       | 14.81                 | 0.00              |
| 0    | 15:05:00 | 12.70         | 828905.80       | 14.79                 | 0.00              |
| 0    | 15:10:00 | 12.70         | 828905.20       | 14.78                 | 0.00              |
| 0    | 15:15:00 | 12.70         | 828904.60       | 14.76                 | 0.00              |
| 0    | 15:20:00 | 12.70         | 828903.90       | 14.75                 | 0.00              |
| 0    | 15:25:00 | 12.70         | 828903.30       | 14.74                 | 0.00              |
| 0    | 15:30:00 | 12.70         | 828902.80       | 14.72                 | 0.00              |
| 0    | 15:35:00 | 12.70         | 828902.20       | 14.71                 | 0.00              |
| 0    | 15:40:00 | 12.70         | 828901.60       | 14.70                 | 0.00              |
| 0    | 15:45:00 | 12.70         | 828901.10       | 14.68                 | 0.00              |
| 0    | 15:50:00 | 12.70         | 828900.50       | 14.67                 | 0.00              |
| 0    | 15:55:00 | 12.70         | 828899.90       | 14.66                 | 0.00              |
| 0    | 16:00:00 | 12.70         | 828899.40       | 14.64                 | 0.00              |
| 0    | 16:05:00 | 12.70         | 828898.90       | 14.63                 | 0.00              |
| 0    | 16:10:00 | 12.70         | 828898.40       | 14.62                 | 0.00              |
| 0    | 16:15:00 | 12.70         | 828897.90       | 14.61                 | 0.00              |
| 0    | 16:20:00 | 12.70         | 828897.40       | 14.60                 | 0.00              |
| 0    | 16:25:00 | 12.70         | 828896.90       | 14.58                 | 0.00              |

| Days | Hours    | Depth<br>(ft) | Volume<br>(ft3) | Total Inflow<br>(CFS) | Flooding<br>(CFS) |
|------|----------|---------------|-----------------|-----------------------|-------------------|
| 0    | 16:30:00 | 12.70         | 828896.40       | 14.57                 | 0.00              |
| 0    | 16:35:00 | 12.70         | 828895.90       | 14.56                 | 0.00              |
| 0    | 16:40:00 | 12.70         | 828895.40       | 14.55                 | 0.00              |
| 0    | 16:45:00 | 12.70         | 828895.00       | 14.54                 | 0.00              |
| 0    | 16:50:00 | 12.70         | 828894.60       | 14.53                 | 0.00              |
| 0    | 16:55:00 | 12.70         | 828894.10       | 14.52                 | 0.00              |
| 0    | 17:00:00 | 12.70         | 828893.70       | 14.51                 | 0.00              |
| 0    | 17:05:00 | 12.70         | 828893.30       | 14.50                 | 0.00              |
| 0    | 17:10:00 | 12.70         | 828892.80       | 14.49                 | 0.00              |
| 0    | 17:15:00 | 12.70         | 828892.40       | 14.48                 | 0.00              |
| 0    | 17:20:00 | 12.70         | 828892.00       | 14.47                 | 0.00              |
| 0    | 17:25:00 | 12.70         | 828891.60       | 14.46                 | 0.00              |
| 0    | 17:30:00 | 12.70         | 828891.20       | 14.45                 | 0.00              |
| 0    | 17:35:00 | 12.70         | 828890.80       | 14.44                 | 0.00              |
| 0    | 17:40:00 | 12.70         | 828890.40       | 14.43                 | 0.00              |
| 0    | 17:45:00 | 12.70         | 828890.10       | 14.42                 | 0.00              |
| 0    | 17:50:00 | 12.70         | 828889.70       | 14.42                 | 0.00              |
| 0    | 17:55:00 | 12.70         | 828889.40       | 14.41                 | 0.00              |

| Days | Hours    | Depth<br>(ft) | Volume<br>(ft3) | Total Inflow<br>(CFS) | Flooding<br>(CFS) |
|------|----------|---------------|-----------------|-----------------------|-------------------|
| 0    | 18:00:00 | 12.70         | 828889.00       | 14.40                 | 0.00              |
| 0    | 18:05:00 | 12.70         | 828888.70       | 14.39                 | 0.00              |
| 0    | 18:10:00 | 12.70         | 828888.30       | 14.38                 | 0.00              |
| 0    | 18:15:00 | 12.70         | 828888.00       | 14.38                 | 0.00              |
| 0    | 18:20:00 | 12.70         | 828887.70       | 14.37                 | 0.00              |
| 0    | 18:25:00 | 12.70         | 828887.30       | 14.36                 | 0.00              |
| 0    | 18:30:00 | 12.70         | 828887.00       | 14.35                 | 0.00              |
| 0    | 18:35:00 | 12.70         | 828886.70       | 14.35                 | 0.00              |
| 0    | 18:40:00 | 12.70         | 828886.40       | 14.34                 | 0.00              |
| 0    | 18:45:00 | 12.70         | 828886.10       | 14.33                 | 0.00              |
| 0    | 18:50:00 | 12.70         | 828885.80       | 14.32                 | 0.00              |
| 0    | 18:55:00 | 12.70         | 828885.50       | 14.32                 | 0.00              |
| 0    | 19:00:00 | 12.70         | 828885.30       | 14.31                 | 0.00              |
| 0    | 19:05:00 | 12.70         | 828884.90       | 14.30                 | 0.00              |
| 0    | 19:10:00 | 12.70         | 828884.70       | 14.30                 | 0.00              |
| 0    | 19:15:00 | 12.70         | 828884.40       | 14.29                 | 0.00              |
| 0    | 19:20:00 | 12.70         | 828884.20       | 14.28                 | 0.00              |
| 0    | 19:25:00 | 12.70         | 828883.90       | 14.28                 | 0.00              |

| Days | Hours    | Depth<br>(ft) | Volume<br>(ft3) | Total Inflow<br>(CFS) | Flooding<br>(CFS) |
|------|----------|---------------|-----------------|-----------------------|-------------------|
| 0    | 19:30:00 | 12.70         | 828883.60       | 14.27                 | 0.00              |
| 0    | 19:35:00 | 12.70         | 828883.40       | 14.27                 | 0.00              |
| 0    | 19:40:00 | 12.70         | 828883.10       | 14.26                 | 0.00              |
| 0    | 19:45:00 | 12.70         | 828882.90       | 14.25                 | 0.00              |
| 0    | 19:50:00 | 12.70         | 828882.70       | 14.25                 | 0.00              |
| 0    | 19:55:00 | 12.70         | 828882.40       | 14.24                 | 0.00              |
| 0    | 20:00:00 | 12.70         | 828882.20       | 14.24                 | 0.00              |
| 0    | 20:05:00 | 12.70         | 828882.00       | 14.23                 | 0.00              |
| 0    | 20:10:00 | 12.70         | 828881.80       | 14.23                 | 0.00              |
| 0    | 20:15:00 | 12.70         | 828881.60       | 14.22                 | 0.00              |
| 0    | 20:20:00 | 12.70         | 828881.30       | 14.22                 | 0.00              |
| 0    | 20:25:00 | 12.70         | 828881.10       | 14.21                 | 0.00              |
| 0    | 20:30:00 | 12.70         | 828880.90       | 14.21                 | 0.00              |
| 0    | 20:35:00 | 12.70         | 828880.70       | 14.20                 | 0.00              |
| 0    | 20:40:00 | 12.70         | 828880.50       | 14.20                 | 0.00              |
| 0    | 20:45:00 | 12.70         | 828880.30       | 14.19                 | 0.00              |
| 0    | 20:50:00 | 12.70         | 828880.10       | 14.19                 | 0.00              |
| 0    | 20:55:00 | 12.70         | 828879.90       | 14.19                 | 0.00              |

Stage, Storage Data  
Regional Pond  
Promenade at Castle Rock

| Elevation (ft., NAVD88) | Description | Depth (ft.) |       | Area (sf) | Volume (cubic-feet) <sup>1</sup> |           | Vol (AF) |
|-------------------------|-------------|-------------|-------|-----------|----------------------------------|-----------|----------|
|                         |             | Incremental | Total |           | Incremental                      | Total     |          |
| 6016                    | Pond Bottom | 0           | 0     | 0         | 0                                | 0         | 0        |
| 6017                    |             | 1           | 1     | 3,100     | 1,550                            | 1,550     | 0.0      |
| 6018                    |             | 1           | 2     | 14,371    | 8,736                            | 10,286    | 0.2      |
| 6019                    |             | 1           | 3     | 29,693    | 22,032                           | 32,318    | 0.7      |
| 6020                    |             | 1           | 4     | 46,845    | 38,269                           | 70,587    | 1.6      |
| 6021                    | *           | 1           | 5     | 62,450    | 54,648                           | 125,234   | 2.9      |
| 6022                    | *           | 1           | 6     | 70,984    | 66,717                           | 191,951   | 4.4      |
| 6022.7                  | WQCV        |             |       |           |                                  |           | 5.6      |
| 6023                    | *           | 1           | 7     | 78,482    | 74,733                           | 266,684   | 6.1      |
| 6024                    | *           | 1           | 8     | 85,460    | 81,971                           | 348,655   | 8.0      |
| 6025                    | *           | 1           | 9     | 93,811    | 89,636                           | 438,291   | 10.1     |
| 6026                    | *           | 1           | 10    | 99,836    | 96,824                           | 535,114   | 12.3     |
| 6027                    | *           | 1           | 11    | 107,169   | 103,503                          | 638,617   | 14.7     |
| 6028                    | *           | 1           | 12    | 112,405   | 109,787                          | 748,404   | 17.2     |
| 6028.7                  | EURV        |             |       |           |                                  |           | 19.0     |
| 6029                    | *           | 1           | 13    | 117,817   | 115,111                          | 863,515   | 19.8     |
| 6030                    | *           | 1           | 14    | 129,646   | 123,732                          | 987,246   | 22.7     |
| 6030.51                 | 100-YR+WQCV | 0.51        | 41.51 |           |                                  |           | 23.6     |
| 6031                    | *           | 1           | 15    | 130,000   | 129,823                          | 1,117,069 | 25.6     |
|                         |             |             |       |           |                                  |           |          |
|                         |             |             |       |           |                                  |           |          |
|                         |             |             |       |           |                                  |           |          |

1. Calculated using the Average End Method.
2. \* Denotes Area is from North Meadows Phase III Drainage Report



## REGIONAL POND ORIFICE DESIGN-100 YEAR STORM

Invert Elev.: 6010.03 ft

Allow. Release Rate: 860.00 cfs

$$Q = C_d * A (2gh)^{1/2}$$

Where:

Q=

859.7347 cfs

Release Rate

Cd=

0.65

Orifice Coefficient

A=

38.25 ft<sup>2</sup>

Area

g=

32.2 ft/sec<sup>2</sup>

Gravitational constant

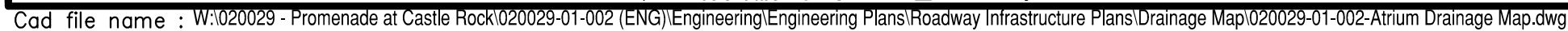
h=

18.57 ft

Head on Orifice Measured  
from Centerline

Orifice hieght =

45.90 in





## **APPENDIX E**

### **Developed Drainage Map**

SITE DEVELOPMENT PLAN

LOT 2A-2, BLOCK 4, PROMENADE AT CASTLE ROCK FILING NO. 1, AMENDMENT NO. 27  
PART OF THE NORTH HALF OF SECTION 27, TOWNSHIP 7 SOUTH, RANGE 67 WEST OF THE 6TH P.M.,  
TOWN OF CASTLE ROCK, COUNTY OF DOUGLAS, STATE OF COLORADO.

DEVELOPED DRAINAGE LEGEND

- PROPERTY BOUNDARY
- EXISTING EASEMENT
- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- PROPOSED MAJOR CONTOUR
- PROPOSED MINOR CONTOUR
- PROPOSED BASIN DELINEATION
- EXISTING SANITARY SEWER
- EXISTING WATER
- EXISTING STORM SEWER
- EXISTING UNDERGROUND ELECTRIC
- EXISTING UNDERGROUND COMM.
- EXISTING GAS
- PROPOSED STORM SEWER
- EXISTING STORM INLET AND MANHOLE
- PROPOSED STORM INLET AND MANHOLE
- PROPOSED DRAINAGE FLOW ARROWS
- DESIGN POINT
- BASIN DESIGNATION
- 5-YEAR RUNOFF COEFFICIENT
- 100-YEAR RUNOFF COEFFICIENT
- BASIN AREA IN ACRES

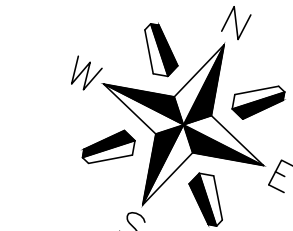
FLOOD ZONE:

PER THE FLOOD INSURANCE MAP (FIRM) NUMBER 08101C0491D  
EFFECTIVE AS OF AUGUST 15, 2019, THE PROPOSED PROJECT  
LOCATION IS LOCATED WITHIN "ZONE X". "ZONE X" HAS A 0.2%  
CHANCE OF FLOOD.

BENCHMARK:

CONTOURS SHOWN HEREON AT 1 FOOT INTERVALS BASED ON  
THE NORTHWEST PROPERTY CORNER OF THE SITE.  
MONUMENTED WITH A REBAR ATTACHED WITH A YELLOW  
PLASTIC CAP PLS 12933 HAVING AN ELEVATION OF 4847.40'  
(NAVD88 DATUM).

| DEVELOPED RUNOFF SUMMARY TABLE |                 |                     |                  |             |      |              |            |
|--------------------------------|-----------------|---------------------|------------------|-------------|------|--------------|------------|
| DESIGN POINT                   | TRIBUTARY BASIN | TRIBUTARY AREA (AC) | % IMPERVIOUSNESS | COEFFICIENT |      | TOTAL RUNOFF |            |
|                                |                 |                     |                  | C5          | C100 | Q5 (CFS)     | Q100 (CFS) |
| 1                              | OFF-1           | 0.04                | 5.0              | 0.08        | 0.50 | 0.01         | 0.17       |
|                                | A-1             | 0.55                | 76.7             | 0.66        | 0.79 | 1.72         | 3.75       |
|                                | OFF-1+A-1       |                     |                  |             |      | 1.73         | 3.91       |
| 2                              | A-2             | 0.29                | 91.4             | 0.78        | 0.86 | 1.11         | 2.21       |
|                                | A-2 + DP2       |                     |                  |             |      | 2.81         | 6.06       |
|                                | A-4             | 0.50                | 76.3             | 0.66        | 0.79 | 1.51         | 3.31       |
| 3                              | OFF-2           | 0.04                | 5.0              | 0.08        | 0.50 | 0.02         | 0.18       |
|                                | A-4 + OFF-2     |                     |                  |             |      | 1.52         | 3.47       |
|                                | A-5             | 0.25                | 83.5             | 0.72        | 0.82 | 0.85         | 1.78       |
| 4                              | A-5+DP3         |                     |                  |             |      | 2.33         | 5.16       |
|                                | A-3             | 0.30                | 95.0             | 0.81        | 0.87 | 1.18         | 2.30       |
|                                | A-3 + DP2 + DP4 |                     |                  |             |      | 6.18         | 13.22      |
| 5                              | A-6             | 0.38                | 54.5             | 0.48        | 0.70 | 0.77         | 2.05       |
|                                | A-6 + DP5       |                     |                  |             |      | 6.51         | 14.34      |
| 6                              | OFF-3           | 0.58                | 5.0              | 0.08        | 0.17 | 0.21         | 0.82       |
|                                | OFF-3           |                     |                  |             |      | 0.21         | 0.82       |



1" = 20'  
0' 10' 20' 40'  
SCALE IN FEET

SITE DEVELOPMENT PLAN  
WOODSPRING SUITES - CASTLE ROCK  
LOT 2A-2, BLOCK 4, PROMENADE AT CASTLE ROCK  
FILING NO. 1, AMENDMENT NO. 27  
TOWN OF CASTLE ROCK PROJECT NO. SDP24-0018

PRELIMINARY  
NOT FOR  
CONSTRUCTION



WOODSPRINGS SUITES - CASTLE ROCK  
PROMENADE PARKWAY, CASTLE ROCK, CO  
DEVELOPED DRAINAGE MAP

PROJECT NO.: KTD008.01  
DESIGNED BY: KH  
DRAWN BY: AG  
DATE: 5/3/2024

D.1

## **APPENDIX F**

### **WQ and MS4 Certification**

**Permanent Water Quality Determination Worksheet (Taken from 2019 SDDTCM Sections 13.1.4 and 13.1.5)**

|                 |                                                                                                                                                                                                                                                                                                                                                                                                       |                 |                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|-----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Project:</b> | <b>Woodspring Suites - Castle Rock</b>                                                                                                                                                                                                                                                                                                                                                                | <b>Project#</b> | <b>SDP24-0018</b>                                               | <b>Applicant:</b> KT Development                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Section</b>  | <b>Questions</b>                                                                                                                                                                                                                                                                                                                                                                                      | <b>Response</b> | <b>Check those that apply</b>                                   | <b>Instructions</b>                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>1</b>        | <b>Non-applicable Sites</b>                                                                                                                                                                                                                                                                                                                                                                           |                 |                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 1.1             | Will the project result in a temporary disturbance of greater than one acre?                                                                                                                                                                                                                                                                                                                          | No<br>Yes       | <input type="checkbox"/><br><input checked="" type="checkbox"/> | Proceed to section 1.2.<br>Proceed to section 2.                                                                                                                                                                                                                                                                                                                                                                     |
| 1.2             | Is the project part of a larger common plan of development or sale where multiple separate and distinct construction activities may be taking place at different times on different schedules, but remain related and are within 1/4 mile of each other? (A common plan of development will generally be documented on a site development plan, master plan, or equivalent, for the property/project) | No<br><br>Yes   | <input type="checkbox"/><br><br><input type="checkbox"/>        | Proceed to section 1.3.<br><br>Proceed to section 2.                                                                                                                                                                                                                                                                                                                                                                 |
| 1.3             | Is the project within the Cherry Creek Watershed?                                                                                                                                                                                                                                                                                                                                                     | Yes<br>No       | <input type="checkbox"/><br><input type="checkbox"/>            | Permanent water quality control measures may be required. Refer to Water Quality Control Regulation 72.7 for details and allowable exclusions.<br>Permanent water quality control measures are not required.                                                                                                                                                                                                         |
| <b>2</b>        | <b>Applicable Site Types and Exclusions by Variance</b>                                                                                                                                                                                                                                                                                                                                               |                 |                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 2.1             | Does the project have more than 35% impervious area on the existing site?                                                                                                                                                                                                                                                                                                                             | No<br>Yes       | <input type="checkbox"/><br><input checked="" type="checkbox"/> | Project is an applicable Development Site. Proceed to section 3.<br>Proceed to 2.2.                                                                                                                                                                                                                                                                                                                                  |
| 2.2             | Does the project have greater than 75% impervious area on the existing site?                                                                                                                                                                                                                                                                                                                          | No<br>Yes       | <input checked="" type="checkbox"/><br><input type="checkbox"/> | Project is an applicable Redevelopment Site. Proceed to section 3.<br>Project is an applicable Constrained Redevelopment Site. Proceed to 2.3.                                                                                                                                                                                                                                                                       |
| 2.3             | Will 100% of the runoff from the existing and proposed site be captured and treated using one or more of the allowable design standards for permanent water quality?                                                                                                                                                                                                                                  | Yes<br><br>No   | <input type="checkbox"/><br><br><input type="checkbox"/>        | No further action required.<br><br>Proceed to 2.4.                                                                                                                                                                                                                                                                                                                                                                   |
| 2.4             | Do any other water quality exclusions apply to the site?                                                                                                                                                                                                                                                                                                                                              | No<br><br>Yes   | <input type="checkbox"/><br><br><input type="checkbox"/>        | Portions of the project are excluded. Proceed with design in accordance with Constrained Redevelopment standards and apply for <b>variance</b> for <u>Constrained Redevelopment Sites</u> .<br>Proceed to section 3. Following approval of other exclusions, design remaining site in accordance with Constrained Redevelopment standards and apply for <b>variance</b> for <u>Constrained Redevelopment Sites</u> . |
| <b>3</b>        | <b>Applicable Sites with Other Exclusions by Variance</b>                                                                                                                                                                                                                                                                                                                                             |                 |                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>3.1</b>      | <b>Category 1: Roadways, bridges and trails only</b>                                                                                                                                                                                                                                                                                                                                                  |                 |                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 3.1.1           | Is the project a bike or pedestrian trail?                                                                                                                                                                                                                                                                                                                                                            | Yes<br>No       | <input type="checkbox"/><br><input type="checkbox"/>            | Proceed to next line.<br>Proceed to 3.1.2.                                                                                                                                                                                                                                                                                                                                                                           |
|                 | Is the trail for a roadway?                                                                                                                                                                                                                                                                                                                                                                           | Yes<br>No       | <input type="checkbox"/><br><input type="checkbox"/>            | Proceed to 3.1.2.<br>Project is excluded. Submit <b>variance</b> for <u>Trails Excluded from Permanent Water Quality Requirements</u> .                                                                                                                                                                                                                                                                              |
| 3.1.2           | Is the project primarily used for parking or access to parking?                                                                                                                                                                                                                                                                                                                                       | Yes<br>No       | <input type="checkbox"/><br><input type="checkbox"/>            | This exclusion does not apply. Permanent water quality is required.<br>Proceed to 3.1.3.                                                                                                                                                                                                                                                                                                                             |
| 3.1.3           | Does the project add impervious area?                                                                                                                                                                                                                                                                                                                                                                 | No<br>Yes       | <input type="checkbox"/><br><input type="checkbox"/>            | Project is excluded. Submit <b>variance</b> for <u>Pavement Management Sites Excluded from Permanent Water Quality Requirements</u> .<br>Proceed to 3.1.4.                                                                                                                                                                                                                                                           |

| Section    | Questions                                                                                                                                                                                                                                                                                                                                                                                        | Response  | Check those that apply                                          | Instructions                                                                                                                                                                                                                                                          |
|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3.1.4      | Does the project add more than 8.25 feet of paved width at any location to the existing roadway?                                                                                                                                                                                                                                                                                                 | No<br>Yes | <input type="checkbox"/><br><input type="checkbox"/>            | Project is excluded. Submit <b>variance</b> for <u>Roadway Redevelopment Sites Excluded from Permanent Water Quality Requirements</u> .<br>Proceed to next line.                                                                                                      |
|            | Does the project add more than one acre of paved area per mile to an existing roadway?                                                                                                                                                                                                                                                                                                           | No<br>Yes | <input type="checkbox"/><br><input type="checkbox"/>            | Project is excluded. Submit <b>variance</b> for <u>Roadway Redevelopment Sites Excluded from Permanent Water Quality Requirements</u> .<br>Proceed to next line.                                                                                                      |
|            | Does the project increase the width by two times or more, on average, of the original roadway area?                                                                                                                                                                                                                                                                                              | No<br>Yes | <input type="checkbox"/><br><input type="checkbox"/>            | Existing areas of site are excluded only. Submit <b>variance</b> for <u>Existing Roadway Surfaces Only Excluded from Permanent Water Quality Requirements</u> .<br>This exclusion does not apply. Permanent water quality is required.                                |
| <b>3.2</b> | <b>Category 2: Non-residential and non-commercial projects only</b>                                                                                                                                                                                                                                                                                                                              |           |                                                                 |                                                                                                                                                                                                                                                                       |
| 3.2.1      | Is the project associated with oil and gas exploration, production, processing, or treatment operations or transmission facilities, including activities necessary to prepare a site for drilling and the movement and placement of drilling equipment?                                                                                                                                          | Yes<br>No | <input type="checkbox"/><br><input type="checkbox"/>            | Project is excluded. Submit <b>variance</b> for <u>Oil and Gas Exploration Sites Excluded from Permanent Water Quality Requirements</u> .<br>Proceed to 3.2.2.                                                                                                        |
| 3.2.2      | Is the project for stream stabilization?                                                                                                                                                                                                                                                                                                                                                         | Yes<br>No | <input type="checkbox"/><br><input type="checkbox"/>            | Project is excluded. Submit <b>variance</b> for <u>Stream Stabilization Sites Excluded from Permanent Water Quality Requirements</u> .<br>Proceed to 3.2.3.                                                                                                           |
| 3.2.3      | Is the project for installation or maintenance of aboveground or underground utilities or infrastructure that does not permanently alter the terrain, ground cover, or drainage patterns from those present prior to the construction activity including activities to install, replace or maintain utilities under roadways or other paved areas that return the surface to the same condition? | Yes<br>No | <input type="checkbox"/><br><input type="checkbox"/>            | Project is excluded. Submit <b>variance</b> for <u>Aboveground and Underground Utilities Excluded from Permanent Water Quality Requirements</u> .<br>Proceed to 3.2.4.                                                                                                |
| 3.2.4      | Is the project on undeveloped land (land with no human-made structures such as buildings or pavement) that will remain undeveloped after the project?                                                                                                                                                                                                                                            | Yes<br>No | <input type="checkbox"/><br><input type="checkbox"/>            | Project is excluded. Submit <b>variance</b> for <u>Sites with Land Disturbances to Undeveloped Land that will Remain Undeveloped Excluded from Permanent Water Quality Requirements</u> .<br>Proceed to 3.2.5.                                                        |
| 3.2.5      | Will the post-project condition result in surface water discharge during the 80th percentile storm runoff event?                                                                                                                                                                                                                                                                                 | No<br>Yes | <input type="checkbox"/><br><input type="checkbox"/>            | Project is excluded. Submit <b>study</b> along with <b>variance</b> for <u>Non-residential and Non-commercial Infiltration Conditions Excluded from Permanent Water Quality Requirements</u> .<br>This exclusion does not apply. Permanent water quality is required. |
| <b>3.3</b> | <b>Category 3: Residential, Agricultural and Commercial projects</b>                                                                                                                                                                                                                                                                                                                             |           |                                                                 |                                                                                                                                                                                                                                                                       |
| 3.3.1      | Is the project a single-family residential lot, or agricultural zoned lands, greater than or equal to 2.5 acres in size per dwelling unit?                                                                                                                                                                                                                                                       | Yes<br>No | <input type="checkbox"/><br><input checked="" type="checkbox"/> | Proceed to next line.<br>Proceed to 3.3.2.                                                                                                                                                                                                                            |
|            | Is the project site greater than 10% impervious?                                                                                                                                                                                                                                                                                                                                                 | No<br>Yes | <input type="checkbox"/><br><input type="checkbox"/>            | Project is excluded. Submit <b>variance</b> for <u>Large Lot Single Family Sites Excluded from Permanent Water Quality Requirements</u> .<br>Proceed to next line.                                                                                                    |
|            | Is the project site greater than 20% impervious?                                                                                                                                                                                                                                                                                                                                                 | Yes<br>No | <input type="checkbox"/><br><input type="checkbox"/>            | This exclusion does not apply. Permanent water quality is required.<br>Proceed to next line.                                                                                                                                                                          |
|            | Will the post-project condition result in surface water discharge during the 80th percentile storm runoff event?                                                                                                                                                                                                                                                                                 | No<br>Yes | <input type="checkbox"/><br><input type="checkbox"/>            | Project is excluded. Submit <b>study</b> along with <b>variance</b> for <u>Large Lot Single Family Sites Excluded from Permanent Water Quality Requirements</u> .<br>This exclusion does not apply. Permanent water quality is required.                              |
|            |                                                                                                                                                                                                                                                                                                                                                                                                  |           |                                                                 |                                                                                                                                                                                                                                                                       |

| Section | Questions                                                                                               | Response | Check those that apply              | Instructions                                                                                                                                                                                                                       |
|---------|---------------------------------------------------------------------------------------------------------|----------|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3.3.2   | Will 100% of the runoff from the residential or commercial site be captured?                            | Yes      | <input checked="" type="checkbox"/> | This exclusion does not apply. Permanent water quality is required.                                                                                                                                                                |
|         |                                                                                                         | No       | <input type="checkbox"/>            | Proceed to next line.                                                                                                                                                                                                              |
|         | Is all or a portion of the site undeveloped or will it remain undeveloped after construction?           | Yes      | <input type="checkbox"/>            | This portion of the project is excluded. Submit <b>variance</b> for <u>Sites with Land Disturbance to Undeveloped Land that will Remain Undeveloped Excluded from Permanent Water Quality Requirements</u> . Proceed to next line. |
|         |                                                                                                         | No       | <input type="checkbox"/>            | Proceed to next line.                                                                                                                                                                                                              |
|         | Is the remaining untreated impervious area greater than 20% of the site?                                | Yes      | <input type="checkbox"/>            | This exclusion does not apply. Permanent water quality is required.                                                                                                                                                                |
|         |                                                                                                         | No       | <input type="checkbox"/>            | Proceed to next line.                                                                                                                                                                                                              |
|         | Is the remaining untreated impervious area greater than one acre?                                       | Yes      | <input type="checkbox"/>            | This exclusion does not apply. Permanent water quality is required.                                                                                                                                                                |
|         |                                                                                                         | No       | <input type="checkbox"/>            | Proceed to next line.                                                                                                                                                                                                              |
|         | Is it practicable to capture runoff from portions of the site that will not drain to a control measure? | No       | <input type="checkbox"/>            | Document justification demonstrating that it is not practicable to capture runoff from this portion of the site in the <b>drainage report</b> . No further action is needed.                                                       |
|         |                                                                                                         | Yes      | <input type="checkbox"/>            | This exclusion does not apply. Permanent water quality is required.                                                                                                                                                                |



## 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** Woodspring Suites at Promenade

**Project Owner** Jupiters Bear LLC

**Project Location** Lot 2A-2, Block 4, Promenade Filing No 1, Amendment 27

**ToCR Project Number** SD24-0018

**Total Site Area** 2.26 acres

**Total Size of Common Plan of Development** 163 acres

**Check all that apply:**

☒ **Project within Plum Creek Basin**

☐ **Project within Cherry Creek Basin**

**Estimated construction completion date** September 2025

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? ☐ ☒ ☐ ☐

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? ☐ ☒ ☐ ☐

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? ☐ ☒ ☐ ☐

If yes, complete the following:

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