

Phase III Drainage Report

Bella Mesa Filing No. 1
CD26-XXXX

Prepared for:

Cardel Homes
9110 East Nichols Ave, Suite 120
Denver, CO 80112
(720) 789-6823
Contact: Mike Newman

Prepared by:



June 10, 2026
Project No. 17026.007

ENGINEER'S CERTIFICATION

"I affirm that this report and plan for the Phase III drainage design of Bella Mesa South, 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."

Travis Frazier, P.E.
Registered Professional Engineer
State of Colorado No. 45342

Owner Approval:

Cardel Homes hereby certifies that the drainage facilities for Bella Mesa South will 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 Bella Mesa Filing No. 1 guarantee that final drainage design review will absolve Cardel Homes and/or their successors and/or assigns of future liability for improper design."

Name of Developer

Authorized Signature

Town of Castle Rock Approvals:

Castle Rock Water Department

Date

Development Services

Date

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Introduction – General Location and Description

INTRODUCTION

This Phase III Drainage Report presents an analysis for the proposed drainage patterns and requirements for the proposed Bella Mesa South, hereafter referred to as the Site.

Site Location

The Site consists of approximately 8.9 acres. Native grasses and weeds currently cover the Site. There is an existing floodplain to the north and to the west of the Site. The southern portion of the Site generally drains to the south and west towards Mitchell Gulch at slopes between 1% and 33%. The northern portion of the Site generally drains to the north and to the west towards Mitchell Gulch and Tract B of Founders Village Filing No. 24.

Site Description

Bella Mesa South is located in the Town of Castle Rock. More specifically, the project is located in the southeast quarter of section 8, Township 8 South, Range 66 West of the Sixth Principal Meridian, Douglas County, Colorado. The project is bound by Mitchell Gulch to the west, Mitchell Street to the East, Mikelson Boulevard to the south, and Tract B of Founders Village Filing No. 24 to the north. Please see the vicinity map in Appendix A for further reference.

There is an existing sub-regional detention pond to the north of the Site that was designed and constructed as a part of the Public Improvement Construction Plans for Founders Village Filing 24 – Phase 1A by Core Consultants dated December 28, 2018. A majority of the runoff from the Site will flow north to the existing sub-regional detention pond. The remaining runoff will flow west to Mitchell Gulch and south to Mickelson Boulevard. There are no active irrigation facilities on or across the limits of the Site.

Proposed Project Description

The proposed development will include 93 single family attached units as well as landscaping, associated roadways, and site infrastructure.

Flood Hazard and Drainage Studies Relevant to the Site

Based on the FEMA FIRM, Map 08035C0306G, effective date March 16, 2016, found in Appendix A, the Site is located within Zone X (Area of Minimal Flood Hazard) and is not located within a 100-year floodplain. The proposed site will not encroach into Mitchell Gulch or the regulated FEMA floodplain.

Soil Type

The Natural Resource Conservation Service (NRCS) soil survey map indicates that onsite soils are primarily composed of Coni rocky loam (90.9%), classified as hydrologic soil group is Type

D with a very slow infiltration rate, and Fondis clay loam (9.1%), classified as hydrologic soil group is Type C and has a slow infiltration rate. Surfacing bedrock is also preset throughout the Site, this will not have a significant impact on runoff and storm drainage infrastructure due to rock excavation and sub-excavation taking place prior to construction. Furthermore, no infiltration facilities are proposed with the development. Portions of the Site that will not be excavated will maintain their historical runoff conditions and drainage patterns, having very slow infiltration rates. A soil map has been included in Appendix A for reference. For the purposes of this report, the entire site was assumed to be Type D soil coverage.

Drainage Basin and Sub-Basins

Existing Basins

Based on the Phase III Drainage Report Founders Village Filing 24 – 1st Amendment by Redland dated May 28, 2021, the Site lies within major basins A1 and B1. Basin A1 generally flows northwest to Mitchell Gulch on the west side of the property. It includes the northern portion of the site, is comprised of 5.08 acres, and has an imperviousness of 2%. Basin B1 generally flows southwest to Mitchell Gulch on the west side of the property. It includes the southern portion of the site, is comprised of 3.78 acres, and has an imperviousness of 2%. Mitchell Gulch drains to Cherry Creek approximately two miles downstream from the property. It was anticipated that in the fully developed condition, Basin A1 and Basin B1 would have an overall imperviousness of 70%.

Major Basins

The proposed site has been divided into four basins: Basin A, Basin B, Basin C, and Offsite Basin OS.

Basin A includes the northern portion of the site and is comprised of 5.05 acres with an imperviousness of 70%. Basin A generally flows north and is collected by proposed storm sewer. The proposed storm sewer connects to the existing storm sewer at the northern edge of the Site. Ultimately, Basin A conveys flows towards Existing Detention Pond A constructed as a part of the Public Improvement Construction Plans for Founders Village Filing 24 – Phase 1A by Core Consultants dated December 28, 2018. Basin A will produce approximately 11.9 cfs in the 5-year event and 27.5 cfs in the 100-year event. The minor and major runoff are below the anticipated values described in the Phase III Drainage Report Founders Village Filing 24 – 1st Amendment by Redland dated May 28, 2021.

Basin B includes the southeastern portion of the site and is comprised of 2.14 acres with an imperviousness of 70%. The runoff from Basin B will flow north towards existing storm sewer and ultimately towards Existing Detention Pond A. Basin B will produce approximately 5.5 cfs in the 5-year event and 12.6 cfs in the 100-year event, both of which are below the anticipated values described in the Redland Report.

Basin C includes parts of the northern, western, and southern portions of the site, most of which was previously included in the Existing Basin B1. As anticipated by the Redland Report, the runoff from Basin C will generally flow west to Mitchell Gulch and south to Mikelson Boulevard. Basin C is comprised of 1.76 acres with an imperviousness of 40%. Basin C will produce approximately 2.8 cfs in the 5-year event and 9.1 cfs in the 100-year event. The combined minor and major runoff of Basin C and Basin B encompassed in Existing Basin B1, which both flow to Mitchell Gulch, and are below the anticipated values described in the Redland Report. The remainder of Basin C will remain as undisturbed land that continues to flow to Mitchell Gulch at the historic rate.

Offsite Basin OS includes parts of the western half of Mitchell Street along the eastern property boundary. It is comprised of 0.2 acres with an imperviousness of 95%. Offsite Basin OS will produce 0.7 cfs in the 5-year event and 1.5 cfs in the 100-year event. These basins will flow into the site and be collected by on-site storm sewer. The minor and major runoff contributed to Basin A and Basin B are below the anticipated values from the Redland Report.

Sub Basins

Basin A1 (0.38 Acres)

Basin A1 includes attached townhome units, sidewalk, and open space. Runoff from the basin generally sheet flows to swale 1 where it is conveyed to a Type C Inlet located in a sump condition at Design Point A1. The flow is then conveyed to proposed storm sewer. In case of inlet clogging, flows will overtop the sidewalk to the southeast and be conveyed to existing storm sewer within Mitchell Street. The basin is approximately 0.38 acres with an imperviousness of 57%.

$$C_5 = 0.50 \quad C_{100} = 0.72$$

$$Q_5 = 0.7 \text{ CFS} \quad Q_{100} = 1.7 \text{ CFS}$$

Basin A2 (0.74 Acres)

Basin A2 includes attached townhome units, sidewalk, and open space. Runoff from the basin generally sheet flows to swale 2 where it is conveyed to a Type C Inlet located in a sump condition at Design Point A2. The flow is then conveyed to proposed storm sewer. In case of inlet clogging, flows will enter Basin A1 where they overtop the sidewalk to the southeast and be conveyed to existing storm sewer within Mitchell Street. The basin is approximately 0.74 acres with an imperviousness of 51%.

$$C_5 = 0.45 \quad C_{100} = 0.69$$

$$Q_5 = 1.2 \text{ CFS} \quad Q_{100} = 3.5 \text{ CFS}$$

Basin A3 (0.33 Acres)

Basin A3 includes attached townhome units, roadway, and open space. Runoff from the basin sheet flows to the eastern flowline of private road Zola Sage Circle where it is collected in an on-grade Triple Type 16 Combination Inlet at Design Point A3. The flow is then conveyed to proposed storm sewer. The basin is approximately 0.33 acres and has an imperviousness of 76%.

$$C_5 = 0.66 \quad C_{100} = 0.80$$

$$Q_5 = 0.9 \text{ CFS} \quad Q_{100} = 2.1 \text{ CFS}$$

Basin A4 (0.35 Acres)

Basin A4 includes attached townhome units, roadway, and open space. Runoff from the basin sheet flows to the eastern flowline of private road Zola Sage Circle where it is collected in an on-grade Triple Type 16 Combination Inlet at Design Point A4. The flow is then conveyed to proposed storm sewer. The basin is approximately 0.35 acres and has an imperviousness of 78%.

$$C_5 = 0.67 \quad C_{100} = 0.80$$

$$Q_5 = 1.0 \text{ CFS} \quad Q_{100} = 2.2 \text{ CFS}$$

Basin A5 (0.35 Acres)

Basin A5 includes attached townhome units, roadway, sidewalk, and open space. Runoff from the basin generally sheet flows to the eastern flowline of private road Zola Sage Circle where it is collected in a Type 16 Combination Inlet located in a sump condition at Design Point A4. The flow is then conveyed to proposed storm sewer. In case of inlet clogging, emergency flows will overtop the roadway crown to the northwest and enter Basin A5 where it will be conveyed to proposed storm sewer. The basin is approximately 0.35 acres and has an imperviousness of 70%.

$$C_5 = 0.61 \quad C_{100} = 0.77$$

$$Q_5 = 1.0 \text{ CFS} \quad Q_{100} = 2.3 \text{ CFS}$$

Basin A6 (0.75 Acres)

Basin A6 includes attached townhome units, roadway, sidewalk, and open space. Runoff from the basin sheet flows to the western flowline of private road Zola Sage Circle where it is collected in an on-grade Type 16 Combination Inlet at Design Point A6. The flow is then

conveyed to proposed storm sewer. The basin is approximately 0.75 acres and has an imperviousness of 78%.

$$C_5 = 0.67 \quad C_{100} = 0.80$$

$$Q_5 = 2.0 \text{ CFS} \quad Q_{100} = 4.3 \text{ CFS}$$

Basin A7 (0.10 Acres)

Basin A7 includes attached townhome units, roadway, sidewalk, and open space. Runoff from the basin generally sheet flows to the western flowline of private road Zola Sage Circle where it is collected in a Triple Type 16 Combination Inlet located in a sump condition at Design Point A7. The flow is then conveyed to proposed storm sewer. In case of inlet clogging, flows will overtop the curb to the north. The basin is approximately 0.10 acres and has an imperviousness of 83%.

$$C_5 = 0.71 \quad C_{100} = 0.82$$

$$Q_5 = 0.3 \text{ CFS} \quad Q_{100} = 0.7 \text{ CFS}$$

Basin A8 (1.20 Acres)

Basin A8 includes attached townhome units, roadway, sidewalk, and open space. Runoff from the basin generally sheet flows to the centerline of Private Alley C where it is collected in a Type 16 Valley Inlet located in a sump condition at Design Point A8. The flow is then conveyed to proposed storm sewer. In case of inlet clogging, emergency flows will be collected by the redundant Type 16 Valley inlets to the northeast and southwest along the centerline of Private Alley C. If all inlets clog, flows will overtop the alley west of Design Point A8 into Basin C1. The basin is approximately 1.20 acres and has an imperviousness of 74%.

$$C_5 = 0.64 \quad C_{100} = 0.79$$

$$Q_5 = 3.0 \text{ CFS} \quad Q_{100} = 6.7 \text{ CFS}$$

Basin A9 (0.85 Acres)

Basin A9 includes attached townhome units, roadway, sidewalk, and open space. Runoff from the basin sheet flows to the centerline of Private Alley C where it is collected in a series of Type 16 Valley Inlets. The flows will first be conveyed to the single Valley Inlet at design point A9. In case of clogging, the additional triple Type 16 Valley Inlet in the sump condition will convey flows that are not captured. The basin is approximately 0.85 acres and has an imperviousness of 74%.

$$C_5 = 0.64 \quad C_{100} = 0.79$$

$$Q_5 = 2.2 \text{ CFS} \quad Q_{100} = 5.0 \text{ CFS}$$

Basin B

Basin B1 (0.37 Acres)

Basin B1 includes attached townhome units, roadway, sidewalk, and open space. Runoff from the basin generally sheet flows to the northern flowline of private road Zola Sage Circle where it is collected in a Double Type 16 Combination Inlet located in a sump condition at Design Point B1. The flow is then conveyed to proposed storm sewer. In case of clogging, emergency flows will overtop the roadway crown to the southwest and enter Basin B2 where it will be conveyed to proposed storm sewer. The basin is approximately 0.37 acres and has an imperviousness of 61%.

$$C_5 = 0.54 \quad C_{100} = 0.74$$

$$Q_5 = 0.9 \text{ CFS} \quad Q_{100} = 2.2 \text{ CFS}$$

Basin B2 (0.80 Acres)

Basin B2 includes attached townhome units, roadway, sidewalk, and open space. Runoff from the basin sheet flows to the southern flowline of private road Zola Sage Circle where it is collected in a Quad Type 16 Combination Inlet located in a sump condition at Design Point B2. The flow is then conveyed to proposed storm sewer. In case of clogging, emergency flows will overtop the sidewalk to the south and enter Basin B3 where it will be conveyed to proposed storm sewer. The basin is approximately 0.80 acres and has an imperviousness of 72%.

$$C_5 = 0.63 \quad C_{100} = 0.78$$

$$Q_5 = 2.0 \text{ CFS} \quad Q_{100} = 4.5 \text{ CFS}$$

Basin B3 (0.97 Acres)

Basin B3 includes attached townhome units, roadway, sidewalk, and open space. Runoff from the basin generally sheet flows to the centerline of Private Alley C and Private Alley D where it is collected in a Double Type 16 Combination Inlet located in a sump condition at Design Point B3. The flow is then conveyed to proposed storm sewer. In case of inlet clogging, emergency flows will overtop the edge of alley to the west and leave the site where it will flow into Mitchell Gulch. The basin is approximately 0.97 acres and has an imperviousness of 72%.

$$C_5 = 0.62 \quad C_{100} = 0.78$$

$$Q_5 = 2.6 \text{ CFS} \quad Q_{100} = 5.9 \text{ CFS}$$

Basin C

Basin C1 (1.14 Acres)

Basin C1 consists of attached townhome units, sidewalk, and open space. The basin is approximately 1.14 acres with an imperviousness of 46%. Capturing runoff from this subbasin was considered impractical from a grading perspective; therefore, runoff from the basin generally sheet flows west towards Mitchell Gulch approximately 870 linear feet of the property boundary. There is no flow concentration; therefore, the runoff from this basin does not propose any erosion concerns. The runoff from this subbasin will be treated by a grass buffer on site and further by the undeveloped land and native grasses to the west. See Water Quality Enhancement for further details.

$$C_5 = 0.42 \quad C_{100} = 0.67$$

$$Q_5 = 2.3 \text{ CFS} \quad Q_{100} = 6.8 \text{ CFS}$$

Basin C2 (0.49 Acres)

Basin C2 consists of attached townhome units, sidewalk, and open space. Capturing runoff from this subbasin was considered impractical from a grading perspective; therefore, runoff from the basin generally sheet flows to the northern flowline of Mikelson Blvd where it is conveyed to an existing Type R Inlet and existing storm sewer. The basin is approximately 0.49 acres and has an imperviousness of 34%. Basin C2 will produce 0.5 cfs in the 5-year event and 1.9 cfs in the 100-year event. Per the Mikelson Boulevard Phase III Drainage and Erosion Control Report for Castlewood Ranch LLC. By Nolte Associates, Inc. dated May 2000, the existing flow conveyed to the existing inlet is 7.6 cfs for the 5-year event and 16.2 cfs for the 100-year event. The combined flow is within the capacity of the existing inlet; therefore, the additional flow conveyed to the existing inlet from Basin C2 will have no negative impact on the existing storm sewer. The flow is then conveyed to existing Mikelson Boulevard Detention Pond.

$$C_5 = 0.31 \quad C_{100} = 0.62$$

$$Q_5 = 0.5 \text{ CFS} \quad Q_{100} = 1.9 \text{ CFS}$$

Basin C3 (0.13 Acres)

Basin C3 consists of undisturbed soil. Runoff from the basin generally sheet flows west towards Mitchell Gulch. The basin is approximately 0.13 acres with an imperviousness of 5%. This subbasin is excluded from permanent water quality treatment per section 3.3.2 of the Permanent Water Quality Determination Worksheet. See attached worksheet.

$$C_5 = 0.08 \quad C_{100} = 0.50$$

$$Q_5 = 0.03 \text{ CFS} \quad Q_{100} = 0.4 \text{ CFS}$$

Offsite Basin OS

Basin OSA5 (0.01 Acres)

Basin OSA5 includes roadway and sidewalk. Runoff from the sheet flows to the southern flowline of private road Zola Sage Circle where it is collected in a Type 16 Combination Inlet located in a sump condition at Design Point A5. The flow is then conveyed to proposed storm sewer. In case of inlet clogging, emergency flows will overtop the roadway crown to the northwest and enter Basin A7 where it will be conveyed to existing storm sewer. The basin is approximately 0.01 acres with an imperviousness of 95%.

$$C_5 = 0.81 \quad C_{100} = 0.87$$

$$Q_5 = 0.04 \text{ CFS} \quad Q_{100} = 0.1 \text{ CFS}$$

Basin OSA7 (0.11 Acres)

Basin OSA7 includes roadway and sidewalk. Runoff from the basin sheet flows to the northern flowline of private road Zola Sage Circle where it is collected in a Type 16 Combination Inlet located in a sump condition at Design Point A7. The flow is then conveyed to proposed storm sewer. In case of inlet clogging, emergency flows will overtop the curb to the north. The basin is approximately 0.11 acres with an imperviousness of 95%.

$$C_5 = 0.81 \quad C_{100} = 0.87$$

$$Q_5 = 0.4 \text{ CFS} \quad Q_{100} = 0.8 \text{ CFS}$$

Basin OSB1 (0.06 Acres)

Basin OSB1 includes roadway and sidewalk. Runoff from the basin sheet flows to the northern flowline of private road Zola Sage Circle where it is collected in a Type 16 Combination Inlet located in a sump condition at Design Point B1. The flow is then conveyed to existing storm sewer. In case of clogging, emergency flows will overtop the roadway crown to the southwest and enter Basin B2 where it will be conveyed to proposed storm sewer. The basin is approximately 0.06 acres with an imperviousness of 95%.

$$C_5 = 0.81 \quad C_{100} = 0.87$$

$$Q_5 = 0.2 \text{ CFS} \quad Q_{100} = 0.5 \text{ CFS}$$

Basin OSB2 (0.02 Acres)

Basin OSB2 includes roadway and sidewalk. Runoff from the basin sheet flows to the southern flowline of private road Zola Sage Circle where it is collected in a Type 16 Combination Inlet located in a sump condition at Design Point B2. The flow is then conveyed to existing storm sewer. In case of clogging, emergency flows will overtop the sidewalk to the south and enter Basin B3 where it will be conveyed to proposed storm sewer. The basin is approximately 0.02 acres with an imperviousness of 95%.

$$C_5 = 0.81 \quad C_{100} = 0.87$$

$$Q_5 = 0.1 \text{ CFS} \quad Q_{100} = 0.1 \text{ CFS}$$

Drainage Design Criteria

Regulations, Drainage Studies, Development Criteria Reference and Constraints

This Phase III Drainage Report is in accordance with the Town of Castle Rock Storm Drainage Design and Technical Criteria Manual dated February 2025, and the Mile High Flood District (MHFD) Storm Drainage Criteria Manual Volumes 1, 2, and 3 dated March 2024. These manuals were used as a basis of design for the Site.

This Site is within the Cherry Creek Basin and is subject to the Department of Public Health and Environment Water Quality Control Commission Cherry Creek Reservoir Control Regulation 5 CCR 1002-72.

The Site is shown within two existing drainage reports. The Site is a part of Major Basin FU-4 within Public Improvement Construction Plans for Founders Village Filing 24 – Phase 1A by Core Consultants dated December 28, 2018, hereby referred to as the *Core Report*. The Site is also a part of Basins A1 and B1 within the Phase III Drainage Report for Founders Village Filing 24 – 1st Amendment, prepared by Redland, dated May 28, 2021 (CD21-0011), hereby referred to as the *Redland Report*.

The constraints for the site include the steep grades falling away from Mitchell Street and Mikelson Blvd. towards Mitchell Gulch as well as shallow bedrock.

Hydrological Criteria

The hydrologic design was computed using the Rational Method as defined by the Mile High Flood District. The 5-year storm was used as the minor storm event, while the 100-year storm was used as the major event. The one-hour point rainfall depth used for the 5-year storm was 1.43 inches and 2.60 inches for the 100-year event. Impervious values are based on Tables 6-2 and 6-3 of Chapter 6 of the MHFD Criteria Manual Volume 1. The areas of concrete driveways and walks, disturbed soil, and roof along with their associated impervious values

from Tables 6-2 and 6-3 of Chapter 6 of the MHFD Criteria Manual Volume 1 were used to calculate a product specific impervious value for the townhome lot. This calculated value was then used throughout the calculations. The Rational Method was used to analyze the proposed condition, and calculations can be found in Appendix B and D.

Hydraulic Criteria

Preliminary street and inlet capacity calculations were completed using MHFD_Inlet, Version 6.00.

Channel Hydraulics are evaluated using the Hydraflow Express Extension for Autodesk Civil 3D, version 2020 modeling software. This method utilizes Manning's equation to compute flow rates at varying depths of flow.

$$Q = \frac{1.49}{n} AR^{2/3} \sqrt{S}$$

Where:

Q = Flow rate in cfs

n = Roughness coefficient

A = Cross-sectional area in sqft

R = Hydraulic radius

S = Channel slope in ft/ft

Water Quality Enhancement

Based on the Filing 24 Drainage Report, the existing regional extended detention basin was designed to provide water quality treatment for the full buildout of the Site, including Basins A and B. The pond has been reevaluated using the current Site layout, ultimate tributary area, and updated imperviousness assumptions. Based on the results of this evaluation, modifications to the outlet structure are necessary to accommodate the revised runoff characteristics and ensure the pond functions in accordance with drainage and water quality criteria. The existing basin includes outlet structures designed to release the water quality capture volume (WQCV), excess urban runoff volume (EURV), and the 100-year storm event. Basin C1 will be treated through by a grass buffer on-site and further by the undeveloped open space and native grasses to the west of the Site. The land is designated as Town Open Space; therefore, it will remain undeveloped. The on-site grass buffer achieves 97.1% runoff reduction. An exhibit and calculations can be found in Appendix A. Basin C3 has been determined to be excluded from requirements for water quality enhancement and full-spectrum detention. See Variances and Appendix F for further details.

Stormwater Management and Facility Design

Stormwater Conveyance Facilities

Stormwater conveyance for the Site will rely on runoff sheet flowing to the curb and gutter and will be collected into stormwater inlets at necessary intervals. Swales will also be used to collect runoff generated from the Site improvements. The storm sewer will then convey the runoff to the existing sub-regional detention pond to the north. The existing sub-regional detention pond discharges to Mitchell Gulch.

Existing Stormwater Storage Facilities

The existing sub-regional pond is located north of the Site. As stated in the Core Report, "...the future development to the west of Mitchell Street will be included in the detention pond sizing," and "water quality measures have been included in the design of the proposed extended detention basins". With the Bella Mesa Filing No. 1, Tract A, which encompasses the existing sub-regional detention pond, is dedicated for open space, utilities, and detention. A permanent stormwater drainage easement for Tract A was dedicated on July 30, 2025, at Rec No. 2025040051. Additionally, due to the proximity to Mesa Middle School, a fence will need to be installed around the entire perimeter of the pond and associated structures including the emergency spillway and outlet pipe.

Pond Conformance

The existing detention pond is intended to provide water quality treatment and detention for runoff generated from the Site and its tributary drainage basins. The pond was originally designed as part of the Founders Filing No. 24 Drainage Report prepared by CORE Consultants. Within that report, the Site was included within Future Use Basin FU-4, which encompassed approximately 15.31 acres. Although future imperviousness values were not provided for FU-4, the report identified the future land use as multi-family residential and incorporated anticipated future development conditions into the design of the regional detention facility.

Following the CORE report, the Founders Village Filing 24 - 1st Amendment CD21-0011 Drainage Report was prepared by Redland Consultants in support of the Bella Mesa Planned Development Plan. This report refined the future drainage basin delineations and development assumptions for the area tributary to the pond. The Site was identified within Basins A1 and B1, which were assigned future imperviousness values of 70 percent. Basin A1 was identified as 5.08 acres and Basin B1 as 3.76 acres. In addition, updated drainage areas and future imperviousness assumptions were provided for several surrounding tributary basins, including A2, A3, B2, and C1.

For the current development, Basins A1 and B1 from the PLD report have been further refined into Basins A, B, and C. Basins A and B are tributary to the existing pond, while Basin C is routed separately and does not contribute runoff to the facility. To evaluate the continued

adequacy of the pond, the tributary area was reevaluated using the current Site layout, future drainage assumptions from the PLD report, and the fully developed tributary basins identified in the original CORE report. The resulting tributary area to the pond was calculated to be 65.64 acres with a future imperviousness of 51.72 percent. Future imperviousness for Basins A2 and A3 was conservatively assumed to be 70 percent.

The original CORE detention design, documented within the UD-Detention spreadsheets, assumed a future tributary area of 65.41 acres with an overall imperviousness of 45.70 percent. Comparison of the original design assumptions to the updated analysis indicates a minor increase in tributary area of 0.23 acres and an increase in overall imperviousness of approximately 6.0 percent. While the tributary area remains generally consistent with the original design, the increase in imperviousness results in greater runoff volumes and peak flows being routed to the pond than were evaluated in the original analysis.

To determine conformance with current drainage criteria, the pond was reevaluated using the updated tributary area and imperviousness assumptions. Watershed length, watershed slope, hydrologic soil characteristics, and NOAA Atlas 14 rainfall data remained consistent with the original analysis. Storage-stage relationships were updated using available as-built information for the existing pond. The detention facility was then analyzed using the Mile High Flood District UD-Detention Spreadsheet, MHFD-Detention Version 4.08 (April 2026), to evaluate water quality and detention performance under current buildout conditions.

The reevaluation determined that the existing outlet structure does not provide sufficient discharge capacity to convey the increased runoff associated with the updated tributary imperviousness. Under the revised tributary conditions, the pond was unable to release the required 100-year detention volume prior to activation of the emergency spillway. As a result, modifications to the outlet structure were required to restore compliance with the original design intent and current drainage criteria.

To accommodate the increased runoff, the outlet structure was modified by raising the outlet elevation to 6.06 feet above the pond invert to an elevation of 6528.56, removing the sloped overflow grate weir, and eliminating the existing restrictor plate. These modifications increase the available outlet capacity and allow the detention facility to release the 100-year developed flow without activating the emergency spillway. The modified outlet structure continues to satisfy the required water quality capture volume (WQCV) and excess urban runoff volume (EURV) release criteria while providing sufficient capacity to convey the 100-year storm event. The following tables provide the revised pond tributary and imperviousness values and a comparison on the pond from its existing condition to the proposed.

Pond Tributary Summary			
Basin	Area (ac)	Impervious (%)	Report
B (Ex)	30.27	49%	Founder Village Filing 24
C (Ex)	7.95	50%	
OS (Ex)	6.36	41%	
A2 (Future)	8.06	70%	PLD
A3 (Future)	2.6	70%	
C1 (Future)	3.22	2%	
A	5.04	70.18%	Bella Mesa South
B	2.14	70.19%	
Totals	65.64	51.72%	

Pond Comparison Summary		
	Existing	Proposed
Tributary Area (ac)	65.41	65.64
Imperviousness (%)	45.70	51.72
WQCV (ac-ft)	1.062	1.154
EURV (ac-ft)	2.518	2.066
100-yr (ac-ft)	6.835	6.270
Spillway Elev	9.5	9.5
Freeboard	1.26	0.96
WQCV Drain Time (hr)	40	43
5-yr Drain Time 97% (hr)	65	66
Peak Outflow (cfs)	43.5	67.5

Water Quality Enhancement Best Management Practices

The existing pond will be analyzed to determine if it can accept the full site runoff for water quality. If not, pond modifications will be proposed.

Floodplain Modification

The applicable FEMA floodplain maps show that the floodplain for Mitchell Gulch lies outside the Site boundary. No floodplain modification or channel improvements are proposed with the Site. Adjacent to the Site, there is a 500-Year floodplain without base flood elevations. To the northwest of the Site, there is a 100-Year floodplain with a maximum base elevation of 6530' per Flood Insurance Rate Map (FIRM) Panel 08035C0306G with effective date March 16, 2016. The minimum lot elevation adjacent to the floodplains is 6571'. All adjacent structures, including crawlspaces, are a minimum of two feet above the adjacent floodplain base flood elevation. Floodplain maps can be found in Appendix A.

Geotechnical Investigation and Sub-surface Collection System Design

A Geologic and Preliminary Geotechnical Investigation for the Site was completed by A.G. Wassenaar Inc. dated October 10, 2018. Conclusions summarized within the report include

the presence of expansive soils, shallow bedrock, and groundwater at depths between 12 to 32 feet encountered. Foundation subsurface drainage systems were determined to be necessary for all below grade areas. These drainage systems will daylight to grade or to proposed storm sewer.

Additional Permitting Requirements

No additional permits are anticipated with the proposed development.

Conclusion

Compliance with the Town of Castle Rock Code

The drainage design for Bella Mesa South conforms to the Town of Castle Rock Storm Drainage Design and Technical Criteria Manual, with supplemental information developed from the Mile High Flood District Storm Drainage Criteria Manuals. This analysis demonstrates that the proposed facilities are developed in compliance with the appropriate criteria and constraints for the relevant development needs for the project.

Variances

This drainage report requests a variance to section 13.1.5-7 of the Town of Castle Rock Storm Drainage Design and Technical Criteria Manual which states “Sites with Land Disturbance to Undeveloped Land that will Remain Undeveloped: This exclusion applies to sites with land disturbance to undeveloped land (land with no human-made structures such as buildings or pavement) that will remain undeveloped after the site.” Basin C3, which has an area of 0.13 acres, will remain undeveloped after construction. Per the Permanent Water Quality Determination Worksheet taken from 2019 SDDTCM Sections 13.1.4 and 13.1.5, this basin is excluded from requirements for water quality enhancement and full-spectrum detention.

Drainage Concept

This analysis demonstrates that the Site conforms to assumptions made in the existing drainage reports and the Site will have no negative impacts to existing downstream drainage facilities. The existing pond will be analyzed to determine if it can accept the full site runoff for water quality. If not, pond modifications will be proposed.

The Redland Report established Existing Basin A1 and Existing Basin B1. Existing Basin A1 had an area of 5.08 acres and an anticipated imperviousness of 70%. Major Basin A has an area of 5.09 acres and has an imperviousness of 70%. The proposed basin is 0.01 acre larger than originally assumed, which is 0.2% of the original basin. This increase in area is negligible. The Site will have no negative impact on the existing storm sewer system. Existing Basin B1 had an area of 3.76 acres and an anticipated imperviousness of 70%. This area now consists of Major Basin B and Minor Basins C1 and C2. The basins have a combined area of 3.74 and

imperviousness of 59%. Both the area and the imperviousness are below the anticipated values: therefore, there should be no negative impact of Mitchell Gulch or the existing storm sewer system.

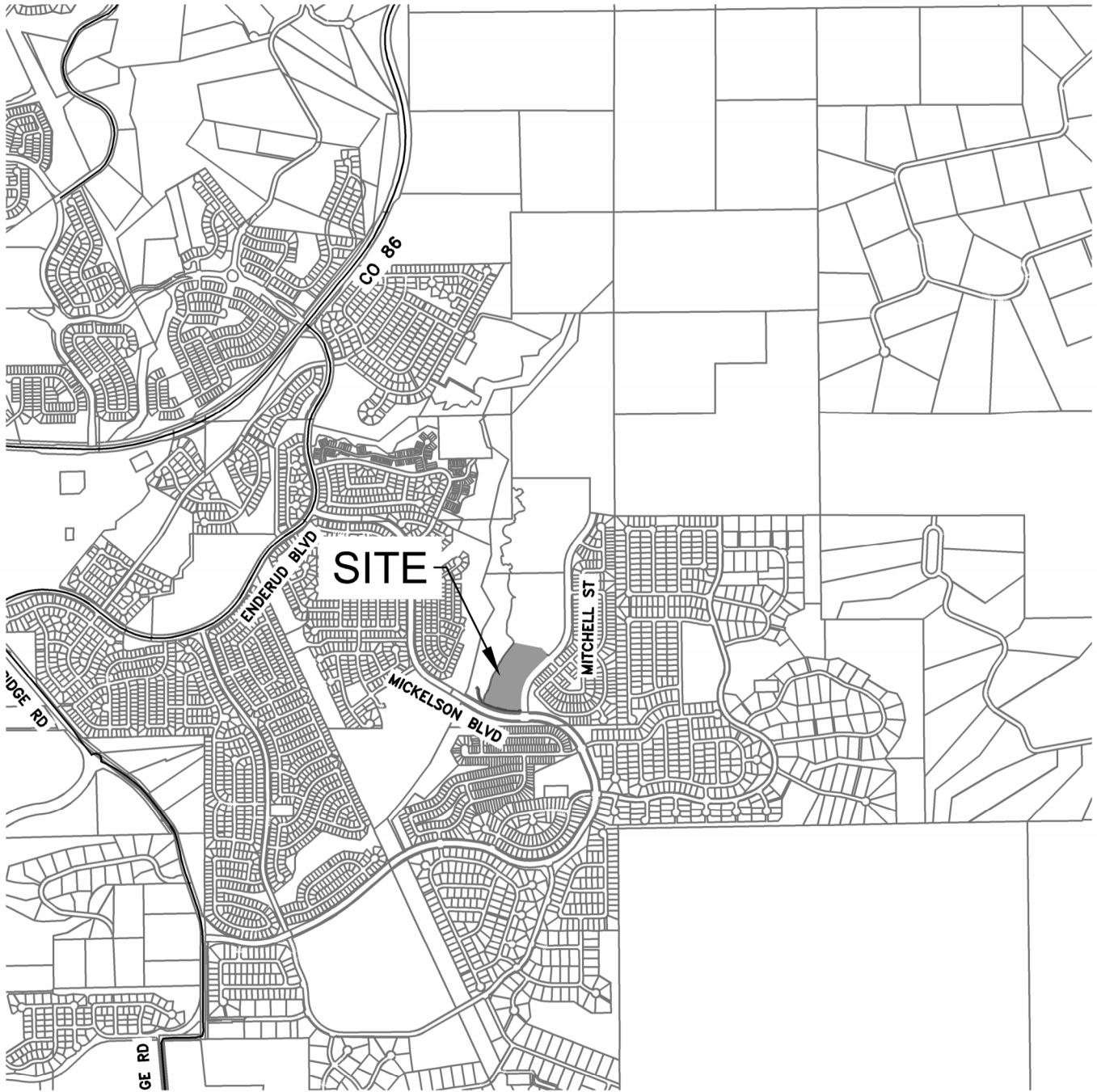
References

REFERENCES

1. *Town of Castle Rock, Storm Drainage Design and Technical Criteria Manual, February 18, 2025.*
2. *Mile High Flood District, Denver, Colorado, Urban Storm Drainage Criteria Manual, Volume 1-3, latest online addition.*
3. *Public Improvement Construction Plans for Founders Village Filing 24 – Phase 1A, Core Consultants dated December 28, 2018*
4. *Phase III Drainage Report for Founders Village Filing 24 – 1st Amendment, Redland dated May 28, 2021.*
5. *Stormwater Management Facility Operation and Maintenance (O&M) General Guidelines, Castle Rock Water, Stormwater Division dated December 12, 2012.*
6. *Geotechnical Site Development Study for Founders Village, Filing 24 West (Bella Mesa Duplexes), A.G. Wassenaar Inc., October 10, 2018.*
7. *Mikelson Boulevard Phase III Drainage and Erosion Control Report for Castlewood Ranch LLC., Nolte Associates Inc., November 1999, revised May 2000.*
8. *Department of Public Health and Environment Water Quality Control Commission Cherry Creek Reservoir Control Regulation 5 CCR 1002-72.*

Appendix A - Vicinity Map, FIRM Map, Soils Map

i:\2017\17026 -- Bella Mesa\CADD\Exhibits\17026.007 -- Bella Mesa_South\17026.007 -- Vicinity Map.dwg tab: 8X11 May 18, 2026 -- 10:38am rhopp



0 1000 2000
SCALE : 1" = 2000'

BELLA MESA SOUTH

VICINITY MAP



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• Civil Engineering • Construction Management

PROJECT NO: 17026.007

DATE: 06/04/2026

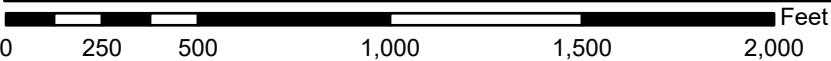
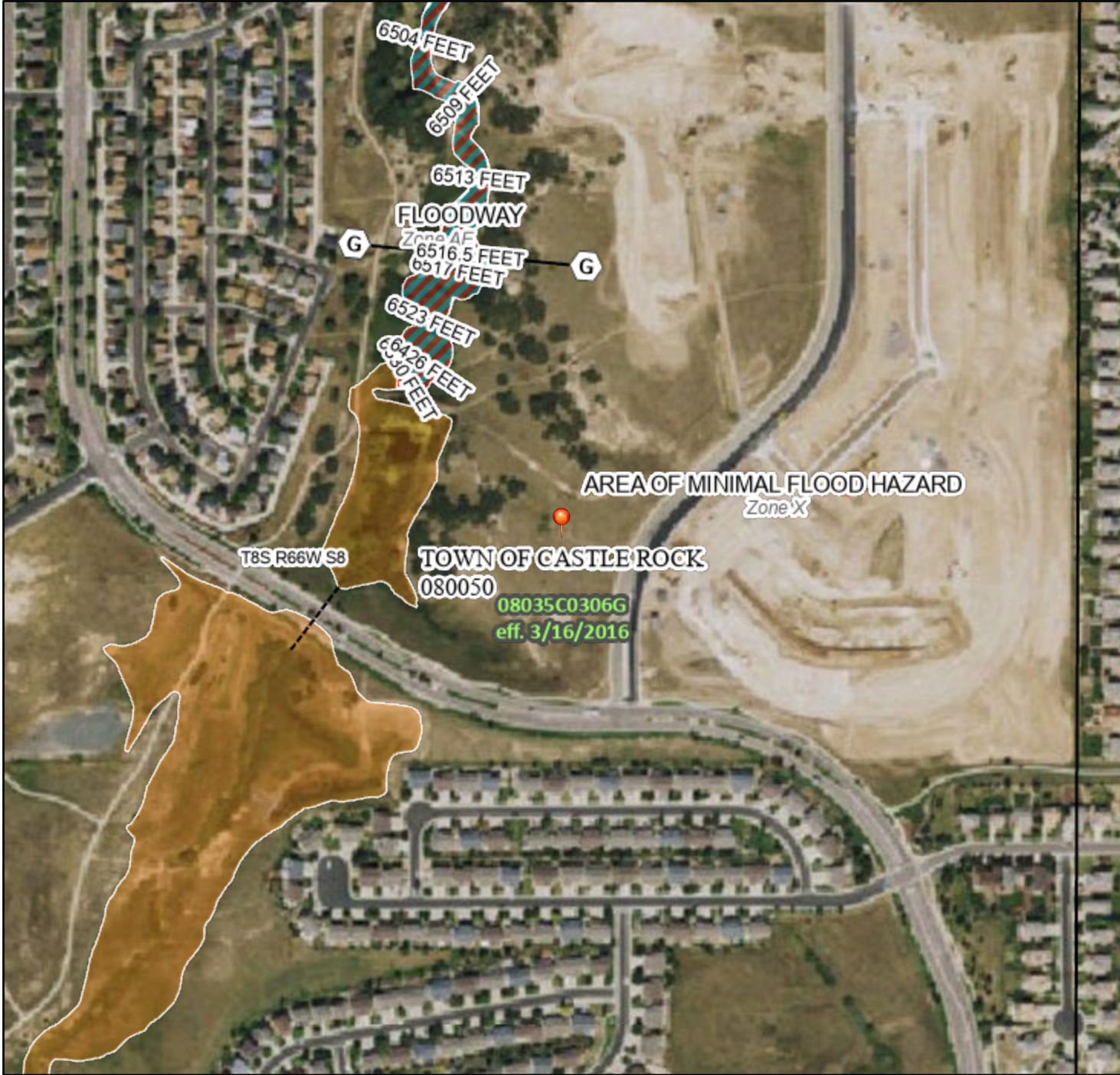
DRAWING NO:

VIC

National Flood Hazard Layer FIRMette



104°48'14"W 39°22'17"N



1:6,000

104°47'37"W 39°21'49"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) 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 5/12/2025 at 5:26 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.

Hydrologic Soil Group—Castle Rock Area, Colorado
(Bella Mesa South)



Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Receiving Pervious Areas (Including Grass Buffers and Grass Swales)

SCM Design, Version 4.02 (June 2025)

Designer: Travis Frazier

Company: Redland Consulting Group

Date: May 18, 2026

Project: 17026.007 - Bella Mesa South

Location: Castle Rock

Outfall ID: C1

DESIGN PROCEDURE AND CRITERIA FOR ALL RPAs (User Input in Blue Cells)

1. Apply Four-Cover Land Use Model to Site Layout

Design Point ID	C1	Point A	Point B								
Area Type	RPA	UIA	RPA_Buffer								
Downstream Design Point ID	--	Point B									
DCIA (ft ²)	--	--	--								
UIA (ft ²)	--	17,551	--								
RPA (ft ²)	--	--	14,276								
SPA (ft ²)	--	--	--								

2. Protect the RPA from Traffic

RPA Protection Type	--	--									
---------------------	----	----	--	--	--	--	--	--	--	--	--

3. Characterize On-site Topsoil and Determine Suitability for the RPA

HSG A (%)	--	--	0.0%								
HSG B (%)	--	--	0.0%								
HSG C/D (%)	--	--	100.0%								

4. Select Appropriate Vegetation

RPA Vegetation Type	--	--	Sod								
Irrigation Type	--	--	Permanent								

Notes:

GRASS BUFFER ADDITIONAL DESIGN PROCEDURE AND CRITERIA (User Input in Blue Cells)

1. Define the UIA:RPA pair, Ratio, and Interface Width

Sheet Flow Inflow Feature	--	--	Curbless								
Is Concrete Edger used?	--	--									
Spacing between slots (ft)	--	--	--								
Slot Opening Length (in)	--	--	--								
Blind Swale Type	--	--	--								
Spreader Energy Dissipation	--	--	--								
Total Area of UIA:RPA (ft ²)	--	--	31,827								
UIA:RPA Ratio	--	--	1.2								
UIA:RPA Interface Width (ft)	--	--	700								
L / W Ratio of UIA:RPA	--	--	0.06								

2. Buffer Length

Average Buffer Length (ft)	--	--	20								
----------------------------	----	----	----	--	--	--	--	--	--	--	--

3. Buffer Slope

Average Buffer Slope (ft/ft)	--	--	0.100								
Effective Distance (ft)	--	--	25								
Number of Level Spreaders	--	--	1								

4. Provide a Vertical Drop

Vertical Drop (in)	--	--									
Mowing Strip Provided?	--	--									

5. Calculate Runoff for UIA and RPA Pair

Imperviousness (%)	--	--	55.1%								
UIA:RPA Runoff (in)	--	--	0.01								
UIA:RPA Runoff (ft ³)	--	--	21								

6. Compare Runoff from UIA:RPA Pair to Runoff from UIA Only

UIA Runoff (ft ³)	--	--	731								
Runoff Reduction (ft ³)	--	--	710								
Runoff Reduction (%)	--	--	97.1%								

Notes: Grass Buffer is achieving 60% runoff reduction

GRASS SWALE ADDITIONAL DESIGN PROCEDURE AND CRITERIA (User Input in Blue Cells)

1. Delineate Areas Tributary to Swale

Total Tributary Area (ft ²)	--	--	--								
Imperviousness (%)	--	--	--								

2. Swale Inflows

Concentrated Flow Type	--	--	--								
Blind Swale Type	--	--	--								
Spreader Energy Dissipation	--	--	--								
Vertical Drop (in)	--	--	--								
Gutter Depression (in)	--	--	--								
Curb Opening Length (ft)	--	--	--								
Concrete Sediment Pad	--	--	--								
Min. Forebay Volume (ft ³)	--	--	--								
Design Forebay Volume (ft ³)	--	--	--								
Max. Forebay Depth (in)	--	--	--								
Design Forebay Depth (in)	--	--	--								
Calculated Notch Width (in)	--	--	--								
Design Notch Width (in)	--	--	--								
Drain Time (minutes)	--	--	--								
Energy Dissipation Type	--	--	--								

3. Swale Cross Section

Length of Swale (ft)	--	--	--								
Bottom Width (ft)	--	--	--								
Bottom Area (ft ²)	--	--	--								
Side Slopes (horiz/vert)	--	--	--								

4. Longitudinal Slope

Available Slope (ft/ft)	--	--	--								
Design Slope (ft/ft)	--	--	--								
Total Drop Height (ft)	--	--	--								
Underdrains Provided?	--	--	--								

5. Calculate Runoff from Tributary Area

Tributary Runoff (ft ³)	--	--	--								
Reduced Trib. Runoff (ft ³)	--	--	--								

6. Calculate Runoff Reduction through Swale Bottom

Volume Infiltrated (ft ³)	--	--	--								
Swale Discharge (ft ³)	--	--	--								
Runoff Reduction (%)	--	--	--								

7. Design Discharge

2-year Discharge, Q ₂ (cfs)	--	--	--								
--	----	----	----	--	--	--	--	--	--	--	--

8. Design Velocity

Vegetal Retardance Curve	--	--	--								
Velocity, V ₂ (fps)	--	--	--								

9. Design Flow Depth

Flow Depth, D ₂ (ft)	--	--	--								
Flow Area, A (ft ²)	--	--	--								
Wetted Perimeter, P (ft)	--	--	--								
Top Width, T (ft)	--	--	--								
Hydraulic Radius, R _h (ft)	--	--	--								
VR Product (ft ² /sec)	--	--	--								
Manning's n value	--	--	--								
Hydraulic Depth, D _h (ft)	--	--	--								
Froude Number	--	--	--								

10. Swale Outflows

Outflows Considered?	--	--	--								
----------------------	----	----	----	--	--	--	--	--	--	--	--

Notes:

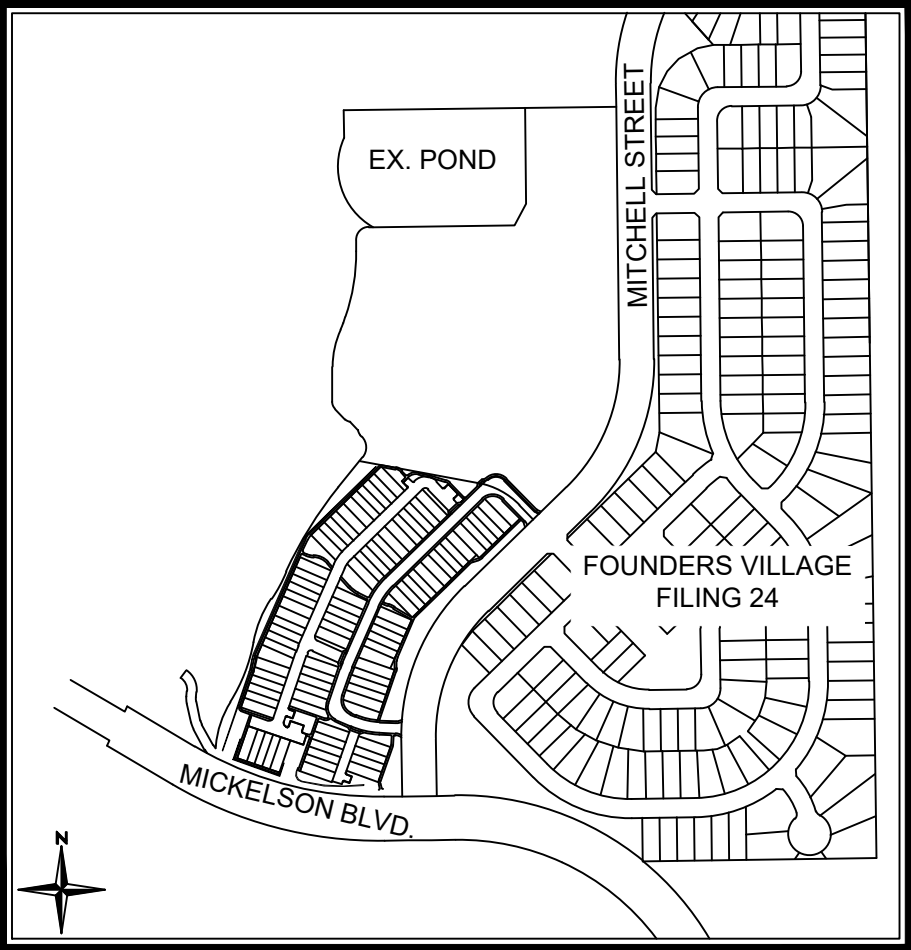
DESIGN POINT RESULT (Sums results for current column and all upstream design point columns.)

Design Point ID	C1	Point A	Point B								
Area Type	RPA	UTA	RPA Buffer								
Total Area (ft ²)	0	17,551	31,827								
Imperviousness (%)	0	100.0%	55.1%								
Tributary Runoff (ft ³)		731	731								
Runoff Reduction (ft ³)	0	0	710								
Runoff Remaining (ft ³)	0	731	21								

Total Tributary Area entered on Site Layout Worksheet is: 49,658 square feet

SITE DEVELOPMENT PLAN
BELLA MESA SOUTH

LOCATED IN THE SOUTHEAST QUARTER SECTION 8, TOWNSHIP 8 SOUTH, RANGE 66 WEST OF THE SIXTH PRINCIPAL MERIDIAN,
TOWN OF CASTLE ROCK, COUNTY OF DOUGLAS, STATE OF COLORADO.
TOWN OF CASTLE ROCK PROJECT NUMBER SDP25-0014



KEY MAP
N.T.S.

- LEGEND
- GRASS BUFFER
 - UNCONNECTED IMPERVIOUS AREA
 - SEPARATE PERVIOUS AREA
 - UIA: RPA INTERFACE WIDTH
 - BASIN BOUNDARY

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Construction Management

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CONSTRUCTION

PROJECT NO.	DATE	NO.	NOTES
17026.007	05/03/2025	1	FIRST SUBMITTAL
	09/17/2025	2	SECOND SUBMITTAL
	11/02/2025	3	THIRD SUBMITTAL
	01/13/2026	4	FOURTH SUBMITTAL
	02/12/2026	5	FIFTH SUBMITTAL
	02/22/2026	6	SIXTH SUBMITTAL

BELLA MESA SOUTH
SITE DEVELOPMENT PLAN
GRASS BUFFER EXHIBIT

SHEET

DRN

Appendix B - Hydrologic Calculations



STANDARD FORM SF-1 - DEVELOPED RUNOFF COEFFICIENTS

PROJECT NAME: Bella Mesa South
PROJECT NUMBER: 17026.007
CALCULATED BY: RJH
CHECKED BY: RAO

DATE: 6/9/2026
JURISDICTION: Castle Rock

LAND USE:	Roadways and Paved Streets	Concrete Driveways and Walks	Disturbed Soil	Townhome Lot	Undisturbed Soil
IMPERVIOUSNESS	95%	95%	20%	74%	5%
C ₂	0.78	0.78	0.14	0.59	0.03
C ₅	0.81	0.81	0.20	0.64	0.08
C ₁₀	0.84	0.84	0.28	0.68	0.17
C ₁₀₀	0.87	0.87	0.57	0.79	0.50

NRCS SOIL TYPE: TYPE D

OVERALL SITE STUDY AREA

DESIGN BASIN	DESIGN POINT	Roadways and Paved Streets (AC)	Concrete Driveways and Walks (AC)	Disturbed Soil (AC)	Townhome Lot (AC)	Undisturbed Soil (AC)	TOTAL AREA (AC)	C _d (2)	C _d (5)	C _d (10)	C _d (100)	Imp (%)
A1	A1	0	0.02	0.13	0.23	0	0.38	0.44	0.50	0.55	0.72	57%
A2	A2	0	0.05	0.34	0.35	0	0.74	0.39	0.45	0.51	0.69	51%
A3	A3	0.09	0	0.02	0.22	0	0.33	0.61	0.66	0.70	0.80	76%
A4	A4	0.09	0	0.01	0.25	0	0.35	0.63	0.67	0.71	0.80	78%
A5	A5	0.12	0.02	0.08	0.13	0	0.35	0.56	0.61	0.65	0.77	70%
A6	A6	0.20	0.06	0.05	0.44	0	0.75	0.63	0.67	0.71	0.80	78%
A7	A7	0.05	0.02	0.01	0.02	0	0.10	0.67	0.71	0.75	0.82	83%
A8	A8	0.31	0.04	0.13	0.72	0	1.20	0.59	0.64	0.68	0.79	74%
A9	A9	0.23	0.00	0.09	0.53	0	0.85	0.59	0.64	0.68	0.79	74%
ON SITE STUDY AREA		1.62	0.44	2.26	4.49	0.13	8.94	0.50	0.56	0.61	0.75	64%
		18.1%	5.0%	25.3%	50.2%	1.5%	100.0%					
OSA5	A5	0.01	0.0	0	0	0	0.01	0.78	0.81	0.84	0.87	95%
OSA7	A7	0.09	0.02	0	0	0	0.11	0.78	0.81	0.84	0.87	95%
OSB1	B1	0.05	0.01	0	0	0	0.06	0.78	0.81	0.84	0.87	95%
OSB2	B2	0.01	0.01	0	0	0	0.02	0.78	0.81	0.84	0.87	95%
OFF SITE BASINS		0.16	0.04				0.20	0.78	0.81	0.84	0.87	95%
		82.1%	17.9%				100.0%					
OVERALL STUDY AREA		1.78	0.48	2.26	4.49	0.13	9.14	0.51	0.57	0.61	0.75	65%
		19.5%	5.2%	24.7%	49.1%	1.4%	100.0%					



STANDARD FORM SF-2 - DEVELOPED TIME OF CONCENTRATION

PROJECT NAME: Bella Mesa South
PROJECT NUMBER: 17026.007
CALCULATED BY: RJH
CHECKED BY: RAO

DATE: 6/9/2026
JURISDICTION: Castle Rock

SUB-BASIN DATA			INITIAL TIME (T _i)			TRAVEL TIME (T _t)						t _c CHECK (URBANIZED BASINS)			FINAL T _c	RUNOFF COEFFICIENT	
DESIGN BASIN (1)	AREA (AC) (2)	C _s (3)	LENGTH* (FT) (4)	SLOPE (%) (5)	T _i (MINUTES) (6)	LENGTH (FT) (7)	SLOPE (%) (8)	C _v (9)	Land Surface (10)	VEL (FPS) (11)	T _t (MINUTES) (12)	COMP. t _c (13)	TOTAL LENGTH (14)	REGIONAL t _c (15)	Min. t _c	C _s	C ₁₀₀
A1	0.38	0.50	60	2.0%	7	170	0.5%	7.0	Short Pasture/Lawn	0.5	5.7	12.4	230	16.7	12.4	0.50	0.72
A2	0.74	0.45	70	2.0%	7.9	200	2.4%	7.0	Short Pasture/Lawn	1.1	3.1	11.0	270	17.6	11.0	0.45	0.69
A3	0.33	0.66	60	2.0%	4.9	240	0.6%	20.0	Paved Areas	1.6	2.5	7.4	300	13.4	7.4	0.66	0.80
A4	0.35	0.67	60	2.0%	4.8	250	0.8%	20.0	Paved Areas	1.8	2.3	7.1	310	13.1	7.1	0.67	0.80
A5	0.35	0.61	50	2.0%	5.0	90	0.7%	20.0	Paved Areas	1.7	0.9	5.9	140	14.2	5.9	0.61	0.77
A6	0.75	0.67	50	2.0%	4.4	500	0.7%	20.0	Paved Areas	1.7	5.0	9.4	550	13.5	9.4	0.67	0.80
A7	0.10	0.71	50	2.0%	4.0	90	0.2%	20.0	Paved Areas	0.9	1.7	5.6	140	12.1	5.6	0.71	0.82
A8	1.20	0.64	90	2.0%	6.3	410	1.0%	20.0	Paved Areas	2.0	3.4	9.7	500	13.9	9.7	0.64	0.79
B1	0.37	0.54	95	2.0%	6.1	110	0.8%	20.0	Paved Areas	1.8	1.0	7.1	205	15.7	7.1	0.54	0.74
B2	0.80	0.63	100	2.0%	8.2	140	1.4%	20.0	Paved Areas	2.4	1.0	9.2	240	13.8	9.2	0.63	0.78
B3	0.97	0.62	70	2.0%	5.7	240	1.6%	20.0	Paved Areas	2.5	1.6	7.3	310	14.0	7.3	0.62	0.78
C1	1.14	0.42	40	15.0%	3.2	20	20.0%	7.0	Short Pasture/Lawn	3.1	0.1	3.3	60	18.1	5.0	0.42	0.67
C2	0.49	0.31	120	3.4%	10.5	400	2.3%	20.0	Paved Areas	3.0	2.2	12.7	520	20.6	12.7	0.31	0.62
C3	0.13	0.08	170	16.2%	9.7	170	2.1%	7.0	Short Pasture/Lawn	1.0	2.8	12.5	340	25.3	12.5	0.08	0.50
OSA5	0.01	0.81	30	2.0%	2.3	180	1.6%	20.0	Paved Areas	2.5	1.2	3.5	210	10.0	5.0	0.81	0.87
OSA7	0.11	0.81	20	2.0%	1.9	240	2.3%	20.0	Paved Areas	3.0	1.3	3.2	260	10.0	5.0	0.81	0.87
OSB1	0.06	0.81	31	2.0%	2.3	170	1.7%	20.0	Paved Areas	2.6	1.1	3.4	201	10.0	5.0	0.81	0.87
OSB2	0.02	0.81	40	16.2%	1.3	170	2.1%	20.0	Paved Areas	2.9	1.0	2.3	210	10.0	5.0	0.81	0.87
A9	0.85	0.64	75	2.0%	5.8	325	1.0%	20.0	Paved Areas	2.0	2.7	8.5	400	13.8	8.5	0.64	0.79

* L = 500' max for non-urban land uses and 300' max for urban land uses

$$T_i = \frac{0.395(1.1 - C)L^{1/2}}{S^{1/3}}$$

$$T_t = \frac{L}{60V}$$

$$V = C_v S_w^{0.5}$$

$$t_c = \frac{L}{180} + 10$$

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

Table RO-2—Conveyance Coefficient, C_v

Type of Land Surface	Conveyance Coefficient, C _v
Heavy meadow	2.5
Tillage/field	5
Short pasture and lawns	7
Nearly bare ground	10
Grassed waterway	15
Paved areas and shallow paved swales	20



STANDARD FORM SF-3 - DEVELOPED
STORM DRAINAGE DESIGN - RATIONAL METHOD 5 YEAR EVENT

PROJECT NAME: Bella Mesa South
 PROJECT NUMBER: 17026.007
 CALCULATED BY: RJH
 CHECKED BY: RAO

P₁ (1-Hour Rainfall) = 1.43

DATE: 6/9/2026
 JURISDICTION: Castle Rock

STORM LINE	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE		TRAVEL TIME				REMARKS
		DESIGN BASIN	AREA (AC)	RUNOFF COEFF C _p	t _c (minutes)	C*A(AC)	I (in/hr)	Q (cfs)	t _c (minutes)	S(C*A) (ac)	I (in/hr)	Q (cfs)	SLOPE (%)	STREET FLOW(cfs)	DESIGN FLOW(cfs)	SLOPE (%)	PIPE SIZE (in)	LENGTH (ft)	VELOCITY (fps)	t _t (Minutes)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
	A1	A1	0.4	0.50	12.4	0.2	3.53	0.7													
	A2	A2	0.7	0.45	11.0	0.3	3.73	1.2													
	A3	A3	0.3	0.66	7.4	0.2	4.31	0.9													
	A4	A4	0.4	0.67	7.1	0.2	4.37	1.0													
	A5	A5	0.4	0.61	5.9	0.2	4.62	1.0													
	A6	A6	0.7	0.67	9.4	0.5	3.97	2.0													
	A7	A7	0.1	0.71	5.6	0.1	4.69	0.3													
	A8	A8	1.2	0.64	9.7	0.8	3.91	3.0													
	B1	B1	0.4	0.54	7.1	0.2	4.38	0.9													
	B2	B2	0.8	0.63	9.2	0.5	4.00	2.0													
	B3	B3	1.0	0.62	7.3	0.6	4.33	2.6													
	C1	C1	1.1	0.42	5.0	0.5	4.85	2.3													
	C2	C2	0.5	0.31	12.7	0.2	3.50	0.5													
	C3	C3	0.1	0.08	12.5	0.0	3.53	0.0													
	A5	OSA5	0.0	0.81	5.0	0.0	4.85	0.0	5.94	0.22	4.62	1.0									
	A7	OSA7	0.1	0.81	5.0	0.1	4.85	0.4	5.64	0.16	4.69	0.7									
	B1	OSB1	0.1	0.81	5.0	0.0	4.85	0.2	7.08	0.45	4.38	2.0									
	B2	OSB2	0.0	0.81	5.0	0.0	4.85	0.1	9.17	1.02	4.00	4.1									
	#N/A	A9	0.9	0.64	8.5	0.5	4.12	2.2	#N/A	#N/A	#N/A	#N/A									



STANDARD FORM SF-3 - DEVELOPED
STORM DRAINAGE DESIGN - RATIONAL METHOD 100 YEAR EVENT

PROJECT NAME: Bella Mesa South
 PROJECT NUMBER: 17026.007
 CALCULATED BY: RJH
 CHECKED BY: RAO

P₁ (1-Hour Rainfall) = 2.60

DATE: 6/9/2026
 JURISDICTION: Castle Rock

STORM LINE	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE		TRAVEL TIME				REMARKS
		DESIGN BASIN	AREA (AC)	RUNOFF COEFF C ₁₀₀	t _c (minutes)	C*A(ac)	I (in/hr)	Q (cfs)	t _c (minutes)	S(C*A) (ac)	I (in/hr)	Q (cfs)	SLOPE (%)	STREET FLOW(cfs)	DESIGN FLOW(cfs)	SLOPE (%)	PIPE SIZE (in)	LENGTH (ft)	VELOCITY (fps)	t _t (minutes)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
	A1	A1	0.4	0.72	12.4	0.3	6.43	1.7													
	A2	A2	0.7	0.69	11.0	0.5	6.77	3.5													
	A3	A3	0.3	0.80	7.4	0.3	7.83	2.1													
	A4	A4	0.4	0.80	7.1	0.3	7.94	2.2													
	A5	A5	0.4	0.77	5.9	0.3	8.41	2.3													
	A6	A6	0.7	0.80	9.4	0.6	7.21	4.3													
	A7	A7	0.1	0.82	5.6	0.1	8.53	0.7													
	A8	A8	1.2	0.79	9.7	0.9	7.11	6.7													
	B1	B1	0.4	0.74	7.1	0.3	7.96	2.2													
	B2	B2	0.8	0.78	9.2	0.6	7.27	4.5													
	B3	B3	1.0	0.78	7.3	0.8	7.88	5.9													
	C1	C1	1.1	0.67	5.0	0.8	8.82	6.8													
	C2	C2	0.5	0.62	12.7	0.3	6.36	1.9													
	C3	C3	0.1	0.50	12.5	0.1	6.42	0.4													
	A5	OSA5	0.0	0.87	5.0	0.0	8.82	0.1	5.94	0.28	8.41	2.3									
	A7	OSA7	0.1	0.87	5.0	0.1	8.82	0.8	5.64	0.17	8.53	1.5									
	B1	OSB1	0.1	0.87	5.0	0.1	8.82	0.5	7.08	0.60	7.96	4.7									
	B2	OSB2	0.0	0.87	5.0	0.0	8.82	0.1	9.17	1.26	7.27	9.2									
	#N/A	A9	0.9	0.79	8.5	0.7	7.48	5.0	#N/A	#N/A	#N/A	#N/A									



PROJECT NAME: Bella Mesa South
PROJECT NUMBER: 17026
CALCULATED BY: RJH
CHECKED BY: RAO

DATE: 6/9/2026
JURISDICTION: Castle Rock

Basin Summary Table										
Basin	Area (AC)	Runoff Coefficients				I (%)	Peak Flows (cfs)			
		C ₂	C ₅	C ₁₀	C ₁₀₀		Q ₂	Q ₅	Q ₁₀	Q ₁₀₀
A1	0.38	0.44	0.50	0.55	0.72	57%	0.4	0.7	0.9	1.7
A2	0.74	0.39	0.45	0.51	0.69	51%	0.8	1.2	1.6	3.5
A3	0.33	0.61	0.66	0.70	0.80	76%	0.6	0.9	1.2	2.1
A4	0.35	0.63	0.67	0.71	0.80	78%	0.7	1.0	1.3	2.2
A5	0.35	0.56	0.61	0.65	0.77	70%	0.7	1.0	1.2	2.3
A6	0.75	0.63	0.67	0.71	0.80	78%	1.4	2.0	2.4	4.3
A7	0.10	0.67	0.71	0.75	0.82	83%	0.2	0.3	0.4	0.7
A8	1.20	0.59	0.64	0.68	0.79	74%	2.1	3.0	3.7	6.7
A9	0.85	0.59	0.64	0.68	0.79	74%	1.5	2.2	2.8	5.0
Basin Summary Table										
Basin	Area (AC)	Runoff Coefficients				I (%)	Peak Flows (cfs)			
		C ₂	C ₅	C ₁₀	C ₁₀₀		Q ₂	Q ₅	Q ₁₀	Q ₁₀₀
B1	0.37	0.48	0.54	0.59	0.74	61%	0.6	0.9	1.1	2.2
B2	0.80	0.58	0.63	0.67	0.78	72%	1.4	2.0	2.5	4.5
B3	0.97	0.57	0.62	0.66	0.78	72%	1.8	2.6	3.2	5.9
Basin Summary Table										
Basin	Area (AC)	Runoff Coefficients				I (%)	Peak Flows (cfs)			
		C ₂	C ₅	C ₁₀	C ₁₀₀		Q ₂	Q ₅	Q ₁₀	Q ₁₀₀
C1	1.14	0.35	0.42	0.48	0.67	46%	1.4	2.3	3.0	6.8
C2	0.49	0.24	0.31	0.38	0.62	34%	0.3	0.5	0.8	1.9
Basin Summary Table										
Basin	Area (AC)	Runoff Coefficients				I (%)	Peak Flows (cfs)			
		C ₂	C ₅	C ₁₀	C ₁₀₀		Q ₂	Q ₅	Q ₁₀	Q ₁₀₀
OSA5	0.01	0.78	0.81	0.84	0.87	95%	0.0	0.0	0.0	0.1
OSA7	0.11	0.78	0.81	0.84	0.87	95%	0.3	0.4	0.5	0.8
OSB1	0.06	0.78	0.81	0.84	0.87	95%	0.2	0.2	0.3	0.5
OSB2	0.02	0.78	0.81	0.84	0.87	95%	0.0	0.1	0.1	0.1

Appendix C - Hydraulic Calculations

Active Scenario: 5 - Year
Conduit Table - Time: 0.00 hours

Label	Start Node	Stop Node	Invert (Start) (ft)	Invert (Stop) (ft)	Length (User Defined) (ft)	Velocity (ft/s)	Slope (Calculated) (ft/ft)	Diameter (in)	Flow (cfs)	Manning's n	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)
P-1	SDIN 1-3	SDIN 1-2	6,572.25	6,571.90	35.4	4.53	0.010	24.0	2.17	0.013	6,572.76	6,572.76	6,572.94	6,572.81
P-2	SDIN 1-2	SDMH 1-2	6,571.65	6,571.17	47.5	6.25	0.010	24.0	6.52	0.013	6,572.56	6,572.54	6,572.90	6,572.67
P-3	SDMH 1-1	SDMH 1-2	6,569.75	6,569.02	146.9	3.33	0.005	18.0	5.89	0.013	6,573.00	6,572.54	6,573.17	6,572.71
P-4	SDIN 1-1	SDMH 1-1	6,570.25	6,570.00	50.7	3.37	0.005	18.0	5.96	0.013	6,573.27	6,573.11	6,573.45	6,573.28
P-5	SDIN 2-2	SDMH 2-1	6,569.75	6,568.64	111.4	6.55	0.010	24.0	20.59	0.013	6,572.37	6,571.45	6,573.04	6,572.11
P-6	SDMH 2-2	SDMH 2-3	6,564.93	6,564.82	22.2	7.06	0.005	30.0	34.65	0.013	6,570.56	6,570.40	6,571.34	6,571.18
P-7	SDMH 2-1	SDMH 2-2	6,565.23	6,565.18	10.4	6.22	0.005	30.0	30.55	0.013	6,571.09	6,571.03	6,571.69	6,571.63
P-8	SDMH 2-3	SDIN 2-5	6,565.31	6,564.16	231.3	7.05	0.005	30.0	34.59	0.013	6,570.02	6,568.37	6,570.79	6,569.15
P-9	SDIN 2-8	SDMH 2-4	6,562.42	6,562.29	31.4	8.34	0.004	30.0	40.92	0.013	6,566.42	6,566.11	6,567.50	6,567.19
P-10	SDIN 2-7	SDIN 2-8	6,569.90	6,569.74	31.0	3.74	0.005	18.0	2.29	0.013	6,570.47	6,570.31	6,570.68	6,570.52
P-11	SDIN 3-2	SDIN 3-1	6,572.87	6,571.13	174.0	4.41	0.010	18.0	1.75	0.013	6,573.37	6,572.02	6,573.55	6,572.06
P-12	SDIN 2-4	SDMH 2-2	6,569.52	6,569.19	33.7	3.69	0.010	18.0	6.51	0.013	6,571.16	6,571.03	6,571.37	6,571.24
P-13	SDIN 3-1	SDIN 2-4	6,570.88	6,569.77	111.0	5.85	0.010	18.0	4.94	0.013	6,571.73	6,571.26	6,572.08	6,571.38
P-14	SDIN 2-5	SDIN 2-8	6,563.16	6,562.70	91.5	7.63	0.005	30.0	37.46	0.013	6,567.83	6,567.07	6,568.74	6,567.97
P-15	SDIN 2-6	SDIN 2-5	6,569.56	6,569.40	31.0	3.59	0.005	24.0	2.24	0.013	6,569.63	6,569.46	6,569.81	6,569.66
P-16	SDIN 2-3	SDIN 2-2	6,570.35	6,570.25	20.7	3.65	0.005	18.0	6.46	0.013	6,572.85	6,572.77	6,573.06	6,572.98
P-17	SDIN 2-1	SDIN 2-2	6,570.35	6,570.25	19.3	2.99	0.005	18.0	5.28	0.013	6,572.82	6,572.77	6,572.96	6,572.91
P-18	SDMH 2-4	SDMH 2-5	6,562.04	6,561.63	82.3	8.32	0.005	30.0	40.84	0.013	6,565.46	6,564.65	6,566.54	6,565.72

Active Scenario: 5 - Year
Conduit Table - Time: 0.00 hours

Label	Start Node	Stop Node	Invert (Start) (ft)	Invert (Stop) (ft)	Length (User Defined) (ft)	Velocity (ft/s)	Slope (Calculated) (ft/ft)	Diameter (in)	Flow (cfs)	Manning's n	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)
P-19	SDMH 2-5	SDMH 2-6	6,561.38	6,560.24	114.4	8.28	0.010	30.0	40.62	0.013	6,564.01	6,562.89	6,565.07	6,563.95
P-20	SDMH 2-6	O-1	6,559.99	6,559.23	21.3	15.95	0.036	30.0	40.32	0.013	6,562.13	6,560.84	6,563.39	6,563.10
P-21	SDMH 1-2	SDMH 1-3	6,568.52	6,568.31	42.7	3.81	0.005	24.0	11.96	0.013	6,572.34	6,572.22	6,572.56	6,572.44
P-22	SDMH 1-3	SDMH 1-4	6,568.06	6,567.61	90.0	3.78	0.005	24.0	11.87	0.013	6,572.11	6,571.86	6,572.33	6,572.08
P-23	SDMH 1-4	SDMH 1-5	6,567.36	6,567.11	50.7	3.72	0.005	24.0	11.68	0.013	6,571.75	6,571.62	6,571.97	6,571.83

Active Scenario: 5 - Year
Manhole Table - Time: 0.00 hours

Label	Elevation (Rim) (ft)	Elevation (Invert in 1) (ft)	Elevation (Invert in 2) (ft)	Elevation (Invert Out) (ft)	Headloss Coefficient (Standard)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)	Flow (Total Out) (cfs)
SDMH 1-4	6,579.87	6,567.61	(N/A)	6,567.36	0.500	6,571.86	6,571.75	6,572.08	6,571.97	11.68
SDMH 1-5	6,579.58	6,567.11	(N/A)	6,566.61	0.500	6,571.62	6,571.57	6,571.83	6,571.66	11.58
SDMH 1-3	6,579.18	6,568.31	(N/A)	6,568.06	0.500	6,572.22	6,572.11	6,572.44	6,572.33	11.87
SDMH 1-2	6,579.10	6,571.17	6,569.02	6,568.52	0.900	6,572.54	6,572.34	6,572.71	6,572.56	11.96
SDMH 2-1	6,578.39	6,568.64	6,565.58	6,565.23	0.600	6,571.45	6,571.09	6,571.53	6,571.69	30.55
SDMH 2-2	6,578.24	6,565.18	6,569.19	6,564.93	0.600	6,571.03	6,570.56	6,571.63	6,571.34	34.65
SDMH 2-3	6,578.09	6,564.82	(N/A)	6,565.31	0.500	6,570.40	6,570.02	6,571.18	6,570.79	34.59
SDMH 2-5	6,577.39	6,561.63	(N/A)	6,561.38	0.600	6,564.65	6,564.01	6,565.72	6,565.07	40.62
SDMH 2-4	6,577.05	6,562.29	(N/A)	6,562.04	0.600	6,566.11	6,565.46	6,567.19	6,566.54	40.84
SDMH 1-1	6,576.34	6,570.00	(N/A)	6,569.75	0.600	6,573.11	6,573.00	6,573.28	6,573.18	5.89
SDMH 2-6	6,574.84	6,560.24	(N/A)	6,559.99	0.600	6,562.89	6,562.13	6,563.95	6,563.39	40.32

Active Scenario: 5 - Year
Catch Basin Table - Time: 0.00 hours

Label	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Headloss Coefficient (Standard)	Flow (Total Out) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)	External CA (acres)	External Tc (min)
SDIN 1-1	6,574.72	6,570.16	0.500	5.96	6,573.36	6,573.27	6,573.53	6,573.45	0.750	7.310
SDIN 1-2	6,578.11	6,571.61	0.600	6.52	6,572.76	6,572.56	6,572.81	6,572.90	0.620	9.170
SDIN 1-3	6,578.36	6,572.16	0.000	2.17	6,572.76	6,572.76	6,572.94	6,572.94	0.270	7.080
SDIN 2-1	6,574.57	6,570.26	0.500	5.28	6,572.89	6,572.82	6,573.03	6,572.96	0.700	8.500
SDIN 2-2	6,574.52	6,569.66	0.600	20.59	6,572.77	6,572.37	6,572.91	6,573.04	1.280	5.000
SDIN 2-3	6,574.62	6,570.27	0.500	6.46	6,572.95	6,572.85	6,573.16	6,573.06	0.900	9.700
SDIN 2-4	6,577.71	6,569.53	0.500	6.51	6,571.26	6,571.16	6,571.38	6,571.37	0.260	7.440
SDIN 2-5	6,575.70	6,563.85	0.600	37.46	6,568.37	6,567.83	6,569.15	6,568.74	0.290	9.380
SDIN 2-6	6,575.70	6,569.01	0.500	2.24	6,569.72	6,569.63	6,569.91	6,569.81	0.280	7.140
SDIN 2-7	6,575.04	6,569.41	0.500	2.29	6,570.58	6,570.47	6,570.79	6,570.68	0.270	5.940
SDIN 2-8	6,575.04	6,562.89	0.600	40.92	6,567.07	6,566.42	6,567.97	6,567.50	0.340	5.600
SDIN 3-1	6,577.00	6,570.94	0.800	4.94	6,572.02	6,571.73	6,572.06	6,572.09	0.510	10.980
SDIN 3-2	6,576.91	6,572.88	0.500	1.75	6,573.46	6,573.37	6,573.64	6,573.55	0.270	12.440

Active Scenario: 100 - Year
Conduit Table - Time: 0.00 hours

Label	Start Node	Stop Node	Invert (Start) (ft)	Invert (Stop) (ft)	Length (User Defined) (ft)	Velocity (ft/s)	Slope (Calculated) (ft/ft)	Diameter (in)	Flow (cfs)	Manning's n	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)
P-1	SDIN 1-3	SDIN 1-2	6,572.25	6,571.90	35.4	4.53	0.010	24.0	2.17	0.013	6,572.76	6,572.76	6,572.94	6,572.81
P-2	SDIN 1-2	SDMH 1-2	6,571.65	6,571.17	47.5	6.25	0.010	24.0	6.52	0.013	6,572.56	6,572.54	6,572.90	6,572.67
P-3	SDMH 1-1	SDMH 1-2	6,569.75	6,569.02	146.9	3.33	0.005	18.0	5.89	0.013	6,573.00	6,572.54	6,573.17	6,572.71
P-4	SDIN 1-1	SDMH 1-1	6,570.25	6,570.00	50.7	3.37	0.005	18.0	5.96	0.013	6,573.27	6,573.11	6,573.45	6,573.28
P-5	SDIN 2-2	SDMH 2-1	6,569.75	6,568.64	111.4	6.55	0.010	24.0	20.59	0.013	6,572.37	6,571.45	6,573.04	6,572.11
P-6	SDMH 2-2	SDMH 2-3	6,564.93	6,564.82	22.2	7.06	0.005	30.0	34.65	0.013	6,570.56	6,570.40	6,571.34	6,571.18
P-7	SDMH 2-1	SDMH 2-2	6,565.23	6,565.18	10.4	6.22	0.005	30.0	30.55	0.013	6,571.09	6,571.03	6,571.69	6,571.63
P-8	SDMH 2-3	SDIN 2-5	6,565.31	6,564.16	231.3	7.05	0.005	30.0	34.59	0.013	6,570.02	6,568.37	6,570.79	6,569.15
P-9	SDIN 2-8	SDMH 2-4	6,562.42	6,562.29	31.4	8.34	0.004	30.0	40.92	0.013	6,566.42	6,566.11	6,567.50	6,567.19
P-10	SDIN 2-7	SDIN 2-8	6,569.90	6,569.74	31.0	3.74	0.005	18.0	2.29	0.013	6,570.47	6,570.31	6,570.68	6,570.52
P-11	SDIN 3-2	SDIN 3-1	6,572.87	6,571.13	174.0	4.41	0.010	18.0	1.75	0.013	6,573.37	6,572.02	6,573.55	6,572.06
P-12	SDIN 2-4	SDMH 2-2	6,569.52	6,569.19	33.7	3.69	0.010	18.0	6.51	0.013	6,571.16	6,571.03	6,571.37	6,571.24
P-13	SDIN 3-1	SDIN 2-4	6,570.88	6,569.77	111.0	5.85	0.010	18.0	4.94	0.013	6,571.73	6,571.26	6,572.08	6,571.38
P-14	SDIN 2-5	SDIN 2-8	6,563.16	6,562.70	91.5	7.63	0.005	30.0	37.46	0.013	6,567.83	6,567.07	6,568.74	6,567.97
P-15	SDIN 2-6	SDIN 2-5	6,569.56	6,569.40	31.0	3.59	0.005	24.0	2.24	0.013	6,569.63	6,569.46	6,569.81	6,569.66
P-16	SDIN 2-3	SDIN 2-2	6,570.35	6,570.25	20.7	3.65	0.005	18.0	6.46	0.013	6,572.85	6,572.77	6,573.06	6,572.98
P-17	SDIN 2-1	SDIN 2-2	6,570.35	6,570.25	19.3	2.99	0.005	18.0	5.28	0.013	6,572.82	6,572.77	6,572.96	6,572.91
P-18	SDMH 2-4	SDMH 2-5	6,562.04	6,561.63	82.3	8.32	0.005	30.0	40.84	0.013	6,565.46	6,564.65	6,566.54	6,565.72

Active Scenario: 100 - Year
Conduit Table - Time: 0.00 hours

Label	Start Node	Stop Node	Invert (Start) (ft)	Invert (Stop) (ft)	Length (User Defined) (ft)	Velocity (ft/s)	Slope (Calculated) (ft/ft)	Diameter (in)	Flow (cfs)	Manning's n	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)
P-19	SDMH 2-5	SDMH 2-6	6,561.38	6,560.24	114.4	8.28	0.010	30.0	40.62	0.013	6,564.01	6,562.89	6,565.07	6,563.95
P-20	SDMH 2-6	O-1	6,559.99	6,559.23	21.3	15.95	0.036	30.0	40.32	0.013	6,562.13	6,560.84	6,563.39	6,563.10
P-21	SDMH 1-2	SDMH 1-3	6,568.52	6,568.31	42.7	3.81	0.005	24.0	11.96	0.013	6,572.34	6,572.22	6,572.56	6,572.44
P-22	SDMH 1-3	SDMH 1-4	6,568.06	6,567.61	90.0	3.78	0.005	24.0	11.87	0.013	6,572.11	6,571.86	6,572.33	6,572.08
P-23	SDMH 1-4	SDMH 1-5	6,567.36	6,567.11	50.7	3.72	0.005	24.0	11.68	0.013	6,571.75	6,571.62	6,571.97	6,571.83

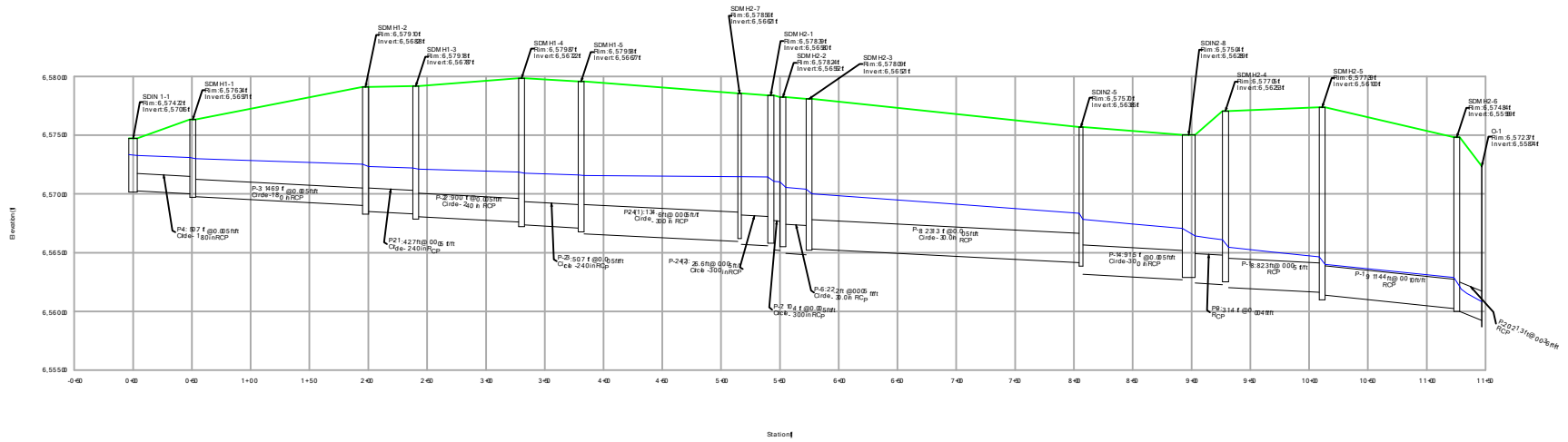
Active Scenario: 100 - Year
Manhole Table - Time: 0.00 hours

Label	Elevation (Rim) (ft)	Elevation (Invert in 1) (ft)	Elevation (Invert in 2) (ft)	Elevation (Invert Out) (ft)	Headloss Coefficient (Standard)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)	Flow (Total Out) (cfs)
SDMH 1-4	6,579.87	6,567.61	(N/A)	6,567.36	0.500	6,571.86	6,571.75	6,572.08	6,571.97	11.68
SDMH 1-5	6,579.58	6,567.11	(N/A)	6,566.61	0.500	6,571.62	6,571.57	6,571.83	6,571.66	11.58
SDMH 1-3	6,579.18	6,568.31	(N/A)	6,568.06	0.500	6,572.22	6,572.11	6,572.44	6,572.33	11.87
SDMH 1-2	6,579.10	6,571.17	6,569.02	6,568.52	0.900	6,572.54	6,572.34	6,572.71	6,572.56	11.96
SDMH 2-1	6,578.39	6,568.64	6,565.58	6,565.23	0.600	6,571.45	6,571.09	6,571.53	6,571.69	30.55
SDMH 2-2	6,578.24	6,565.18	6,569.19	6,564.93	0.600	6,571.03	6,570.56	6,571.63	6,571.34	34.65
SDMH 2-3	6,578.09	6,564.82	(N/A)	6,565.31	0.500	6,570.40	6,570.02	6,571.18	6,570.79	34.59
SDMH 2-5	6,577.39	6,561.63	(N/A)	6,561.38	0.600	6,564.65	6,564.01	6,565.72	6,565.07	40.62
SDMH 2-4	6,577.05	6,562.29	(N/A)	6,562.04	0.600	6,566.11	6,565.46	6,567.19	6,566.54	40.84
SDMH 1-1	6,576.34	6,570.00	(N/A)	6,569.75	0.600	6,573.11	6,573.00	6,573.28	6,573.18	5.89
SDMH 2-6	6,574.84	6,560.24	(N/A)	6,559.99	0.600	6,562.89	6,562.13	6,563.95	6,563.39	40.32

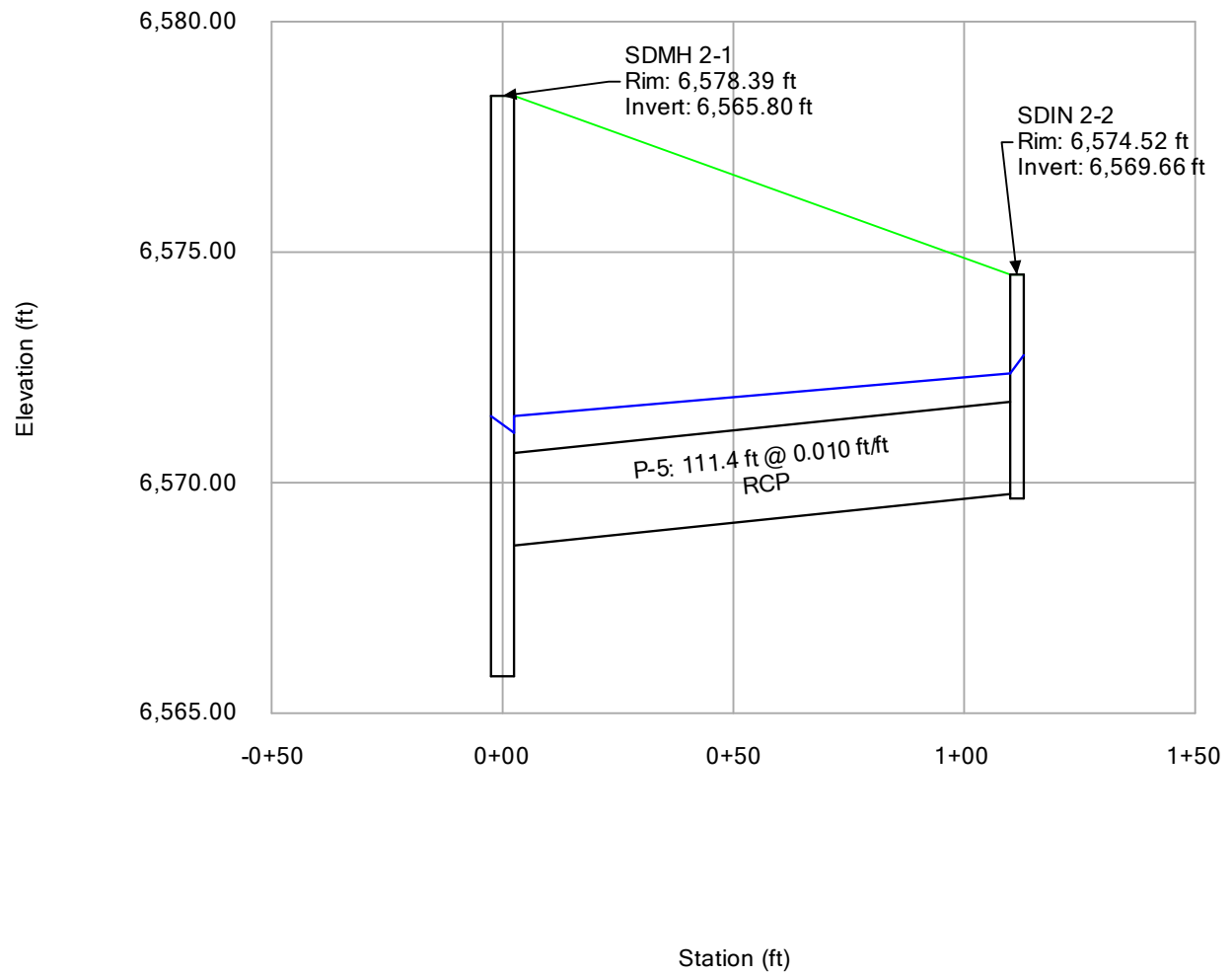
Active Scenario: 100 - Year
Catch Basin Table - Time: 0.00 hours

Label	Elevation (Rim) (ft)	Elevation (Invert) (ft)	Headloss Coefficient (Standard)	Flow (Total Out) (cfs)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Energy Grade Line (In) (ft)	Energy Grade Line (Out) (ft)	External CA (acres)	External Tc (min)
SDIN 1-1	6,574.72	6,570.16	0.500	5.96	6,573.36	6,573.27	6,573.53	6,573.45	0.750	7.310
SDIN 1-2	6,578.11	6,571.61	0.600	6.52	6,572.76	6,572.56	6,572.81	6,572.90	0.620	9.170
SDIN 1-3	6,578.36	6,572.16	0.000	2.17	6,572.76	6,572.76	6,572.94	6,572.94	0.270	7.080
SDIN 2-1	6,574.57	6,570.26	0.500	5.28	6,572.89	6,572.82	6,573.03	6,572.96	0.700	8.500
SDIN 2-2	6,574.52	6,569.66	0.600	20.59	6,572.77	6,572.37	6,572.91	6,573.04	1.280	5.000
SDIN 2-3	6,574.62	6,570.27	0.500	6.46	6,572.95	6,572.85	6,573.16	6,573.06	0.900	9.700
SDIN 2-4	6,577.71	6,569.53	0.500	6.51	6,571.26	6,571.16	6,571.38	6,571.37	0.260	7.440
SDIN 2-5	6,575.70	6,563.85	0.600	37.46	6,568.37	6,567.83	6,569.15	6,568.74	0.290	9.380
SDIN 2-6	6,575.70	6,569.01	0.500	2.24	6,569.72	6,569.63	6,569.91	6,569.81	0.280	7.140
SDIN 2-7	6,575.04	6,569.41	0.500	2.29	6,570.58	6,570.47	6,570.79	6,570.68	0.270	5.940
SDIN 2-8	6,575.04	6,562.89	0.600	40.92	6,567.07	6,566.42	6,567.97	6,567.50	0.340	5.600
SDIN 3-1	6,577.00	6,570.94	0.800	4.94	6,572.02	6,571.73	6,572.06	6,572.09	0.510	10.980
SDIN 3-2	6,576.91	6,572.88	0.500	1.75	6,573.46	6,573.37	6,573.64	6,573.55	0.270	12.440

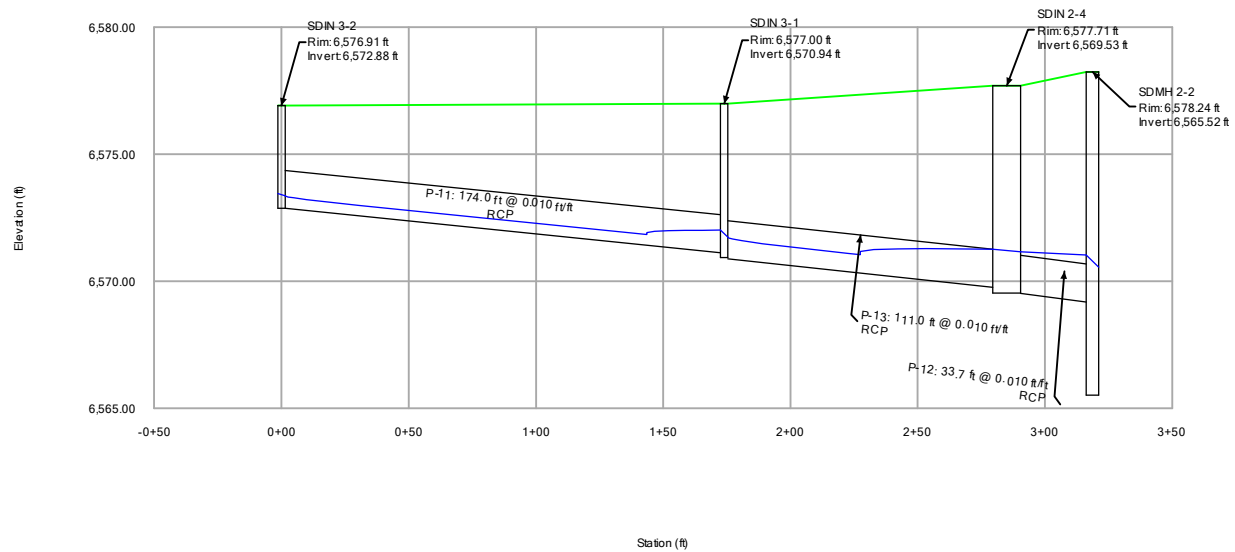
Active Scenario: 5 - Year SDIN 1-1 to Outfall



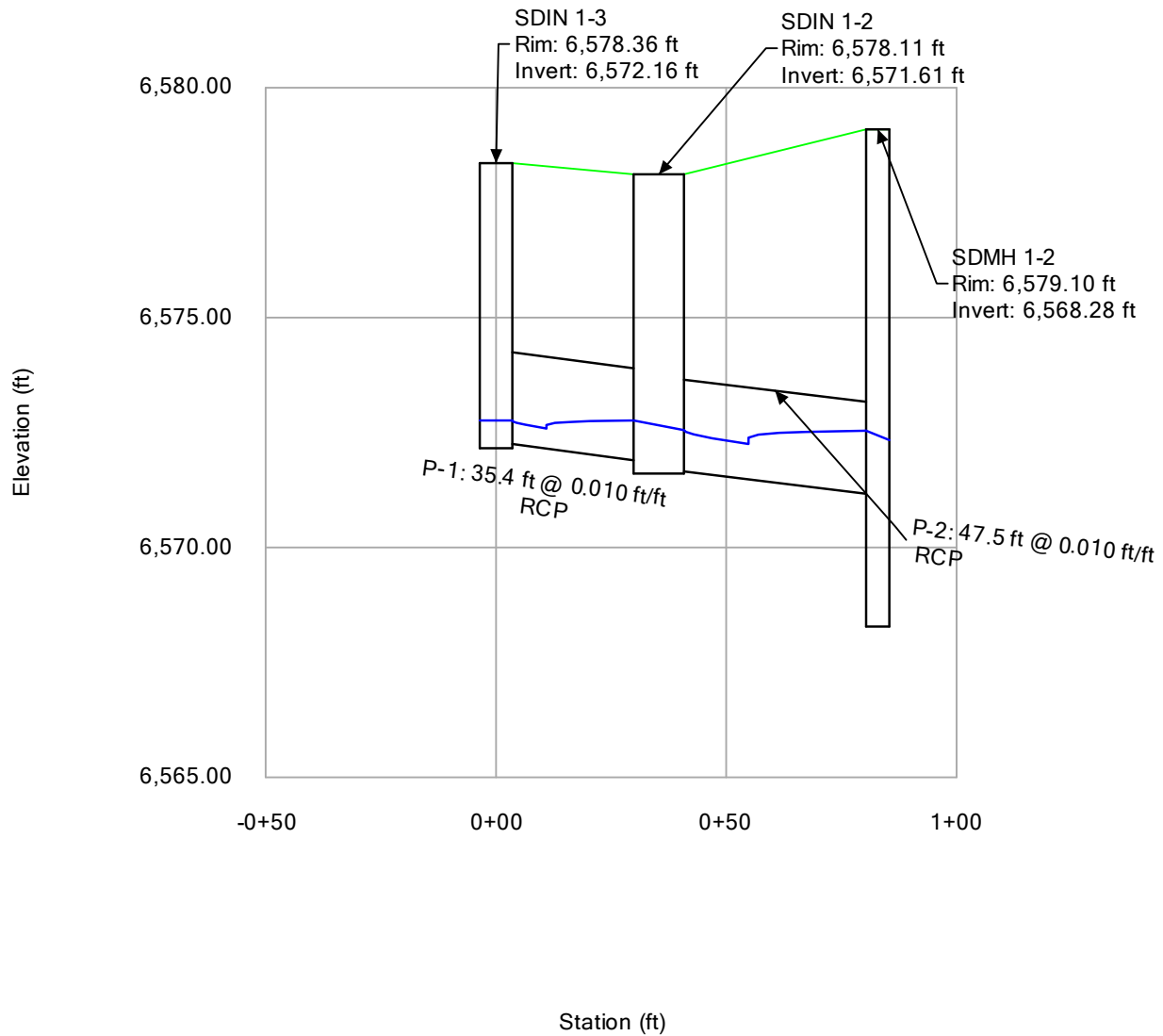
Active Scenario: 5 - Year **SDIN 2-1 to SDMH 2-1**



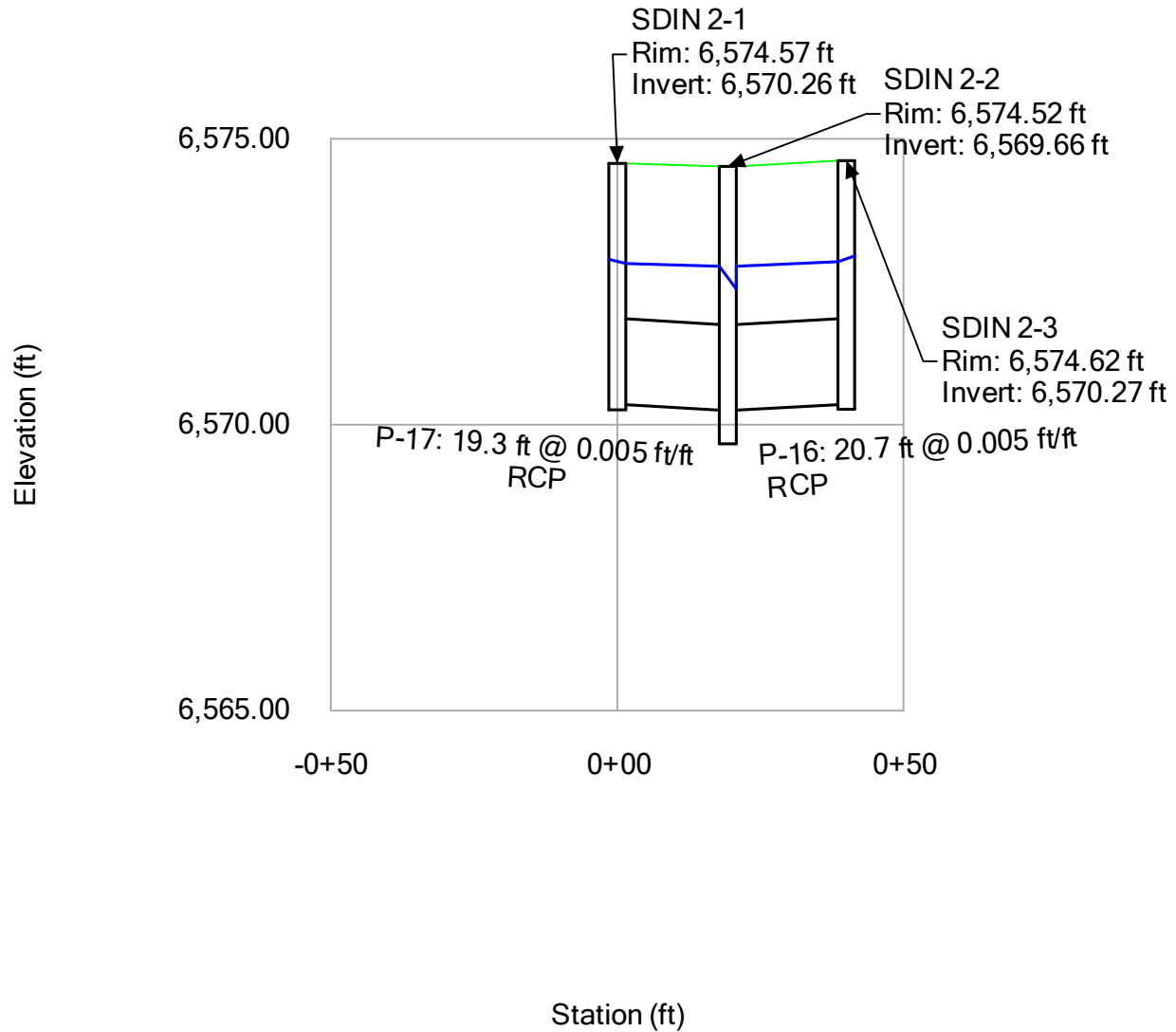
Active Scenario: 5 - Year **SDMH 2-2 to SDIN 3-2**



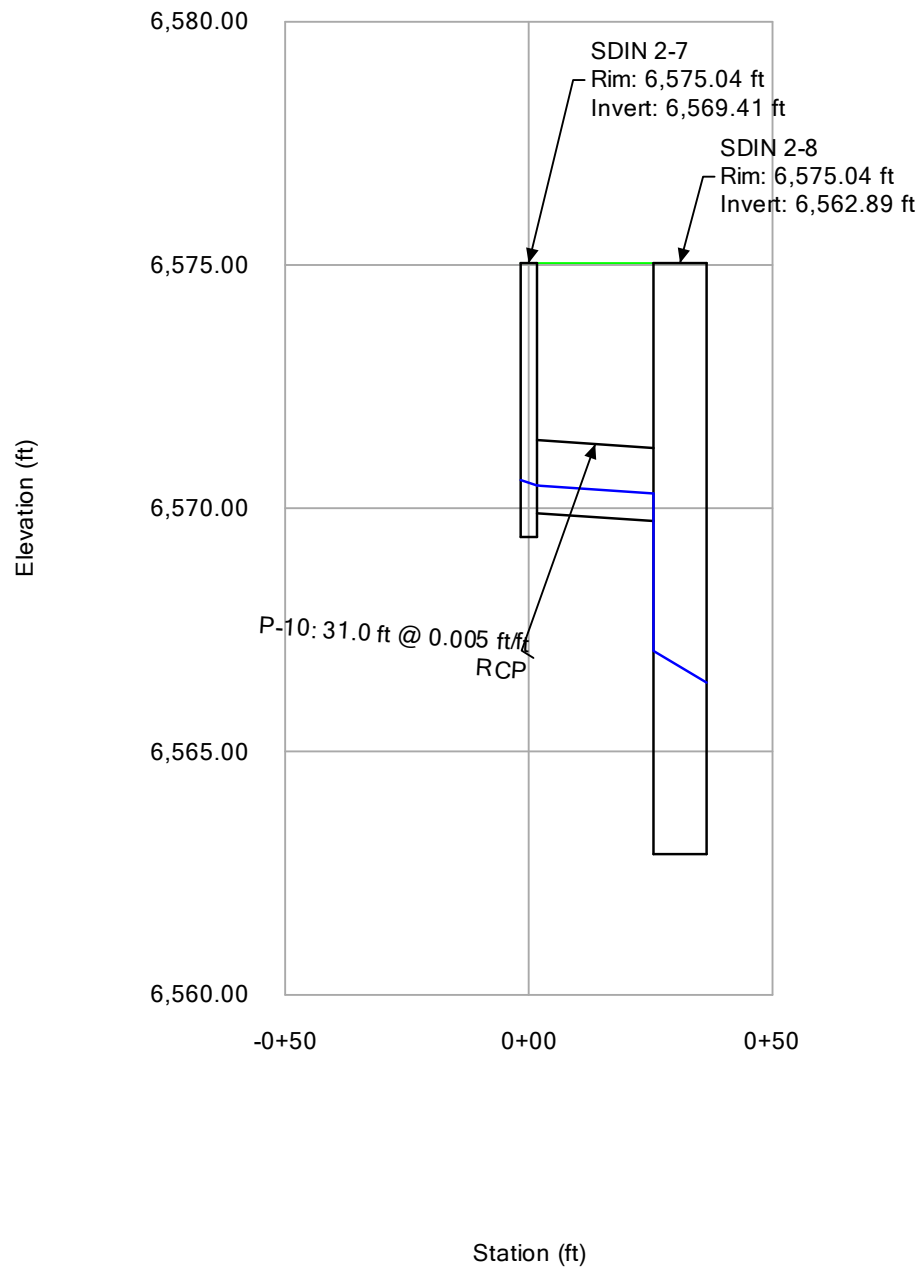
Active Scenario: 5 - Year **SDMH 1-2 to SDIN 1-3**



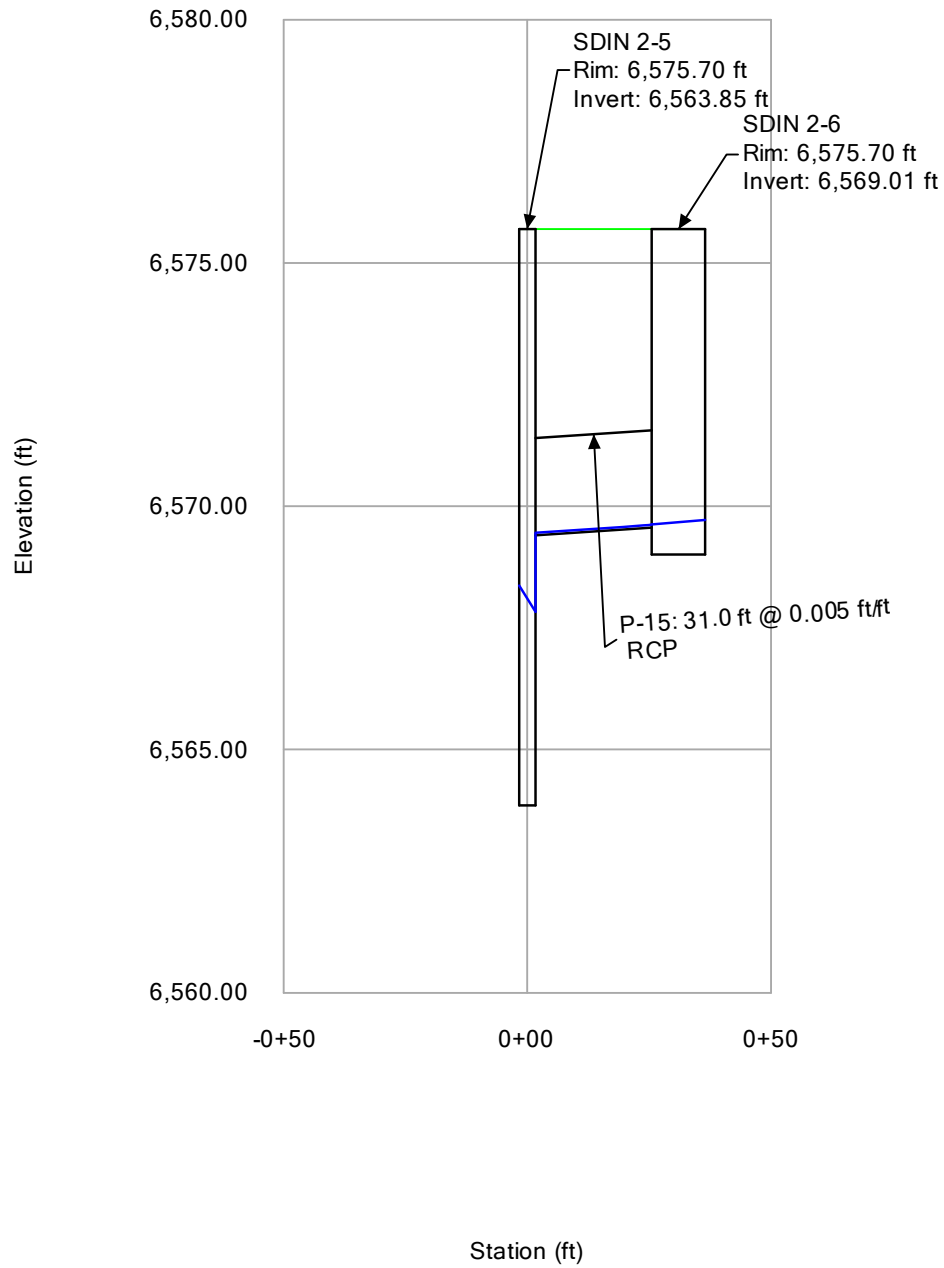
**Active Scenario: 5 - Year
SDIN 2-1 to SDIN 2-3**



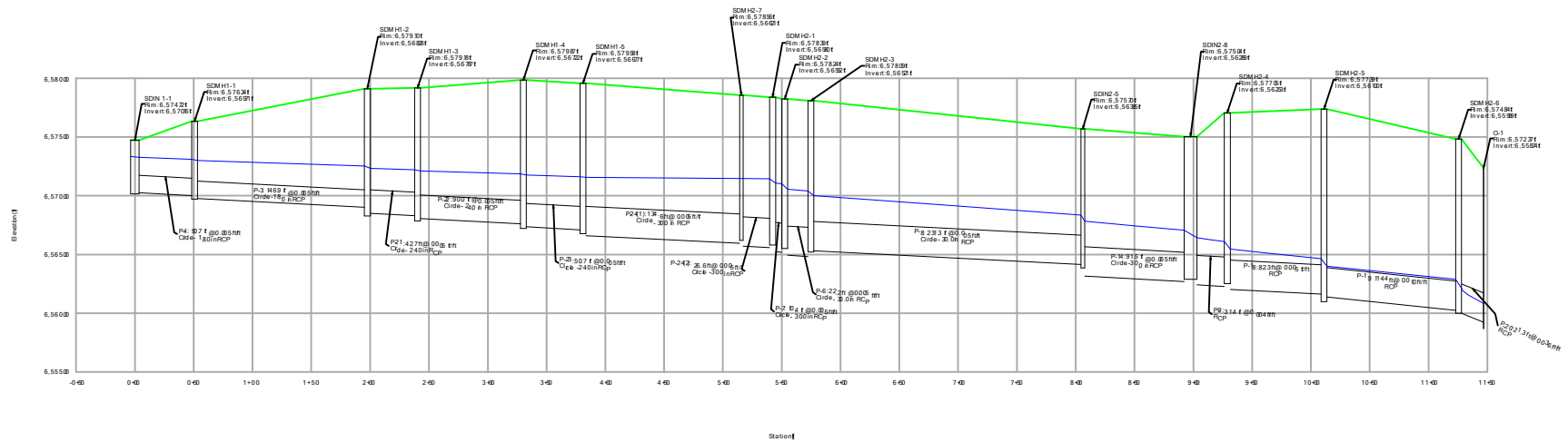
Active Scenario: 5 - Year **SDIN 2-8 to SDIN 2-7**



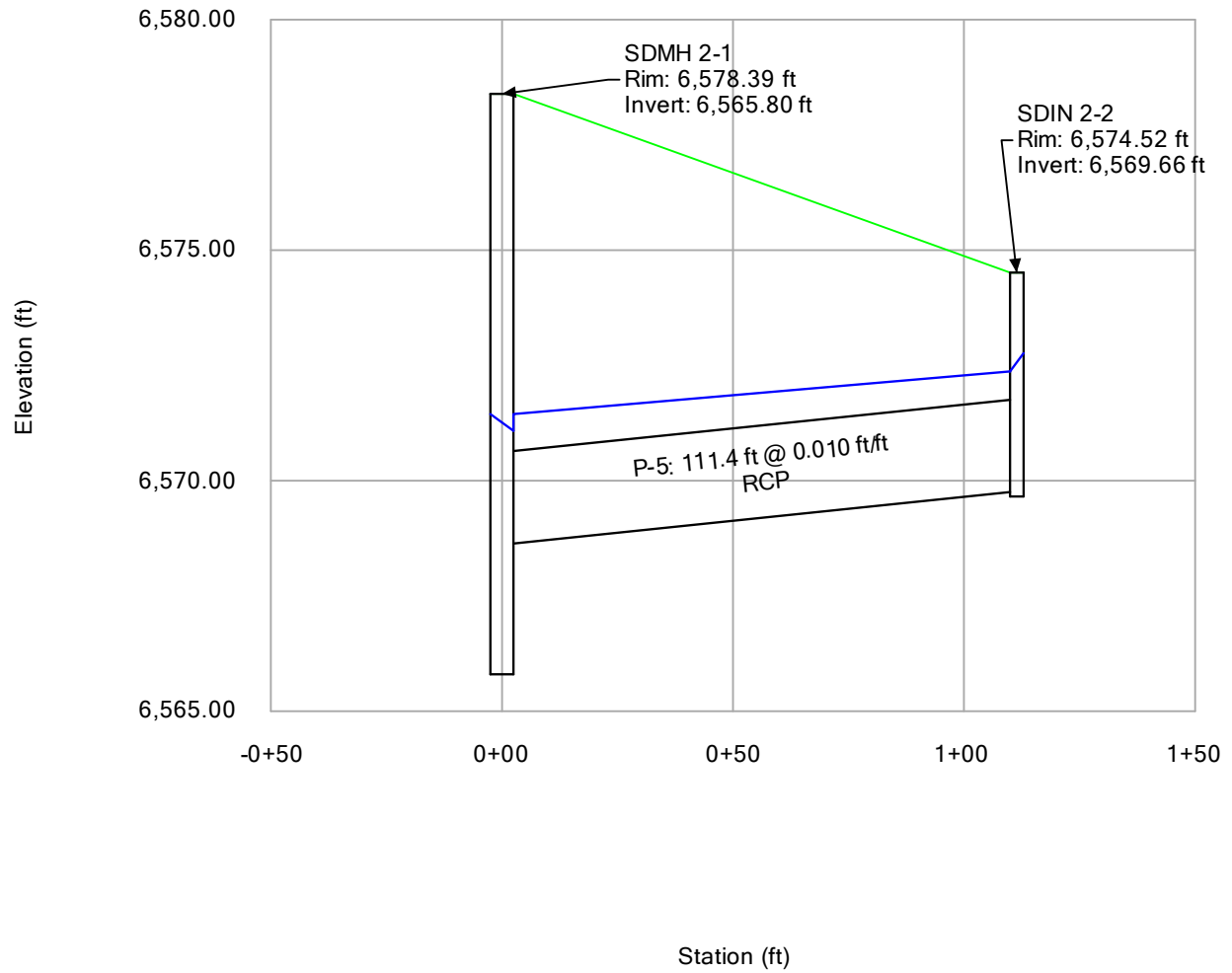
Active Scenario: 5 - Year **SDIN 2-5 to SDIN 2-6**



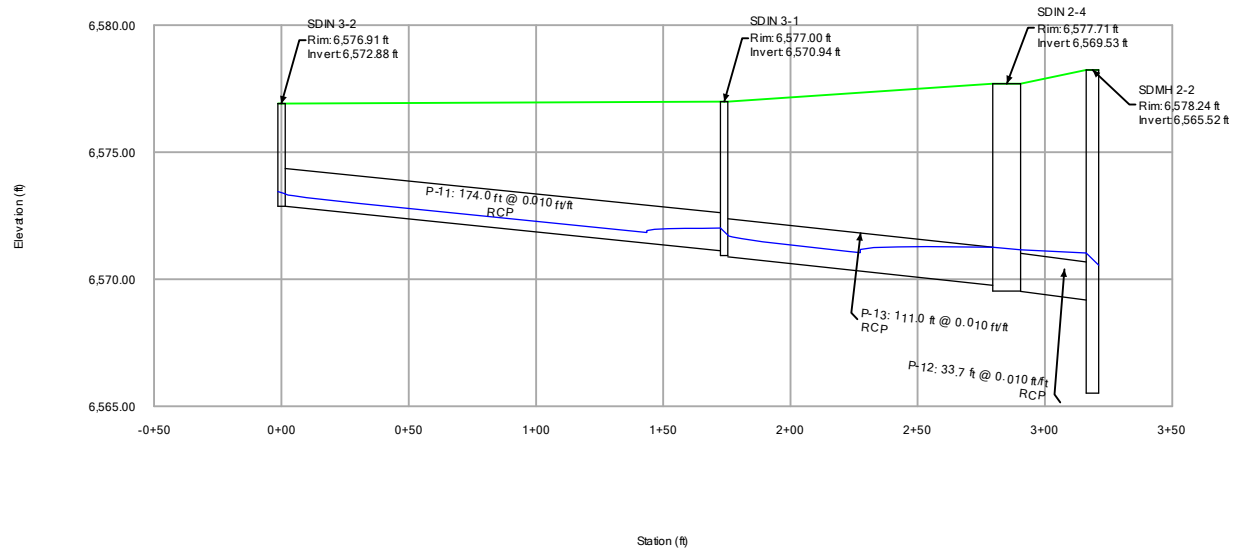
Active Scenario: 100 - Year SDIN 1-1 to Outfall



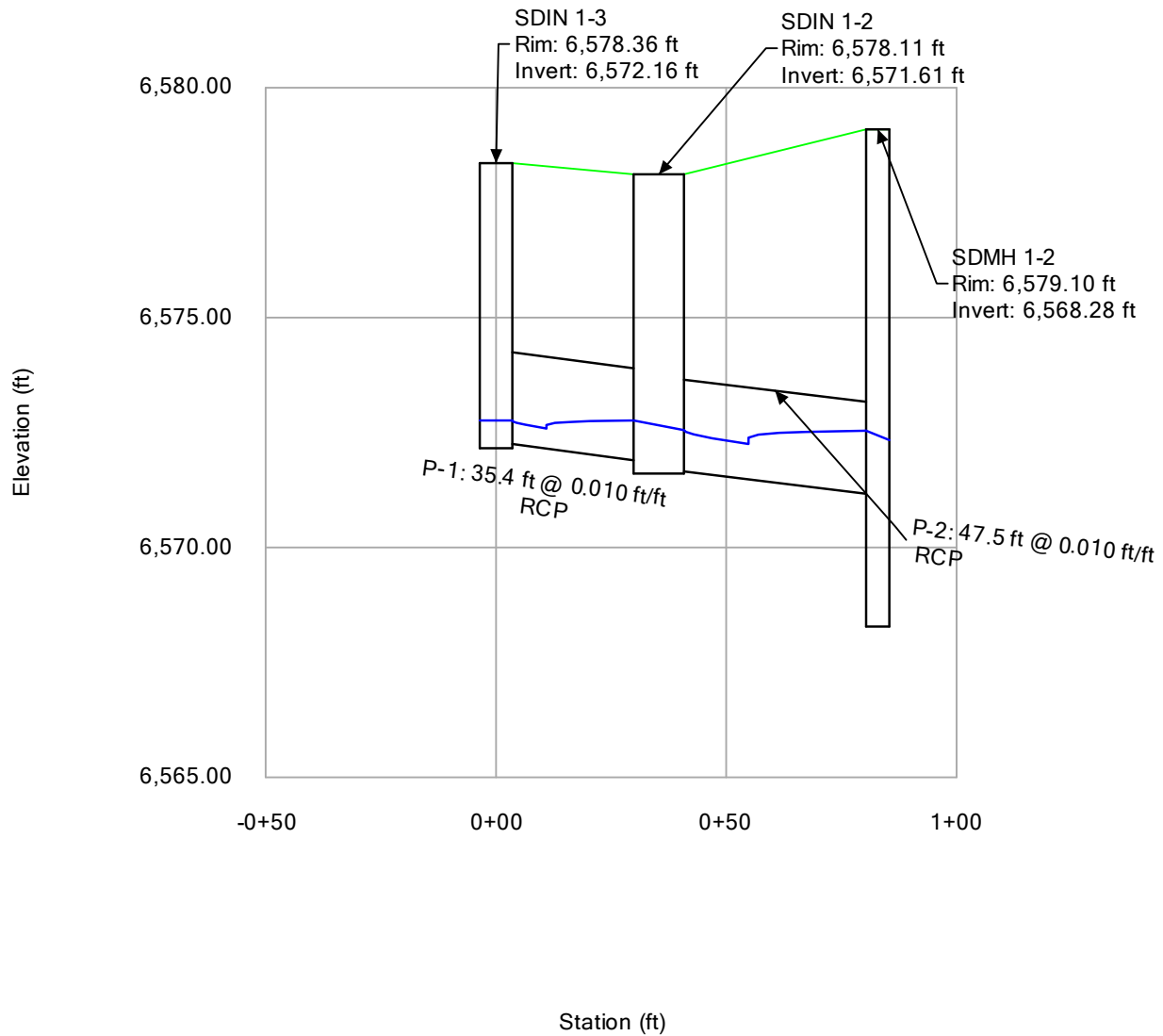
Active Scenario: 100 - Year SDIN 2-1 to SDMH 2-1



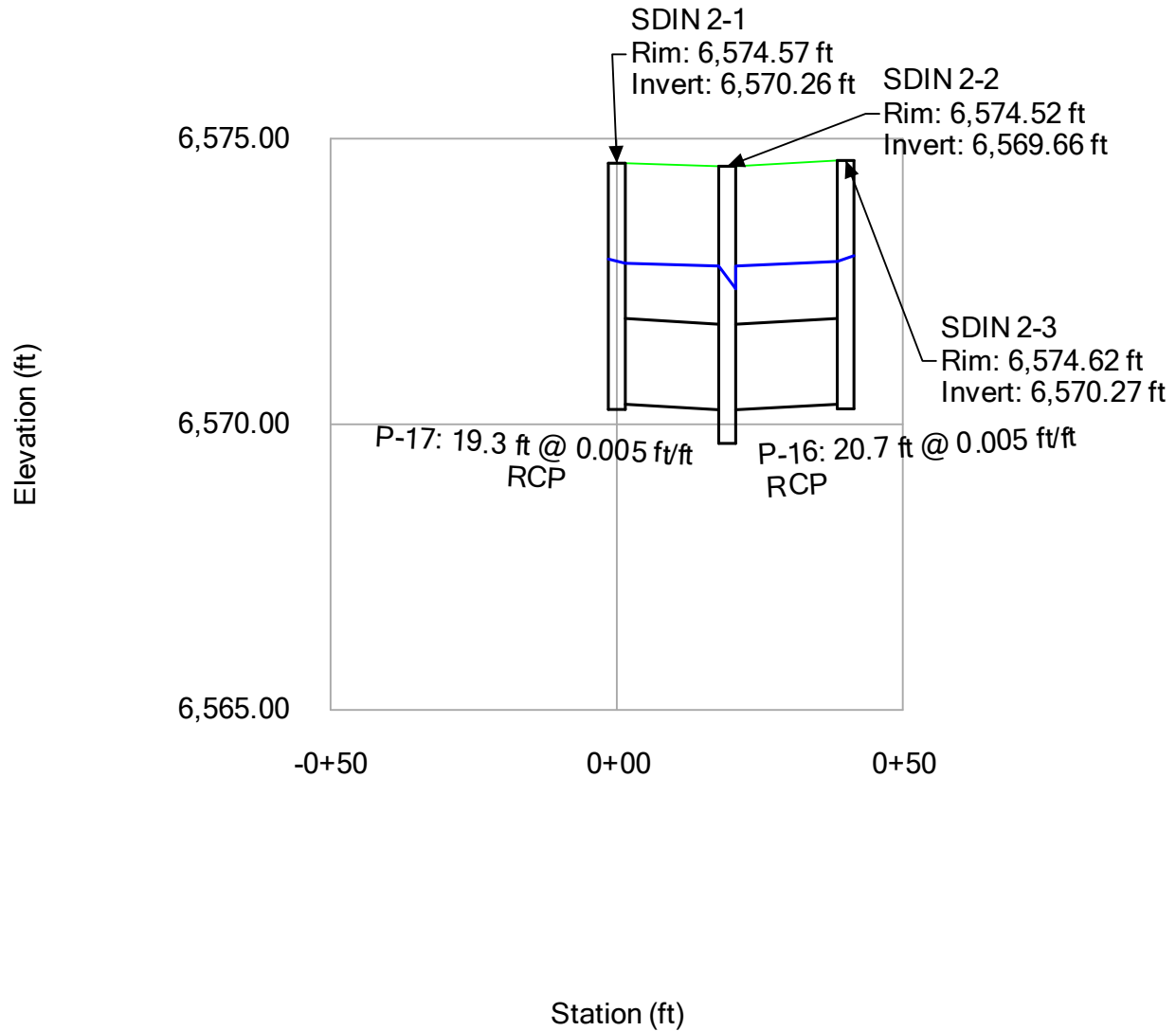
Active Scenario: 100 - Year SDMH 2-2 to SDIN 3-2



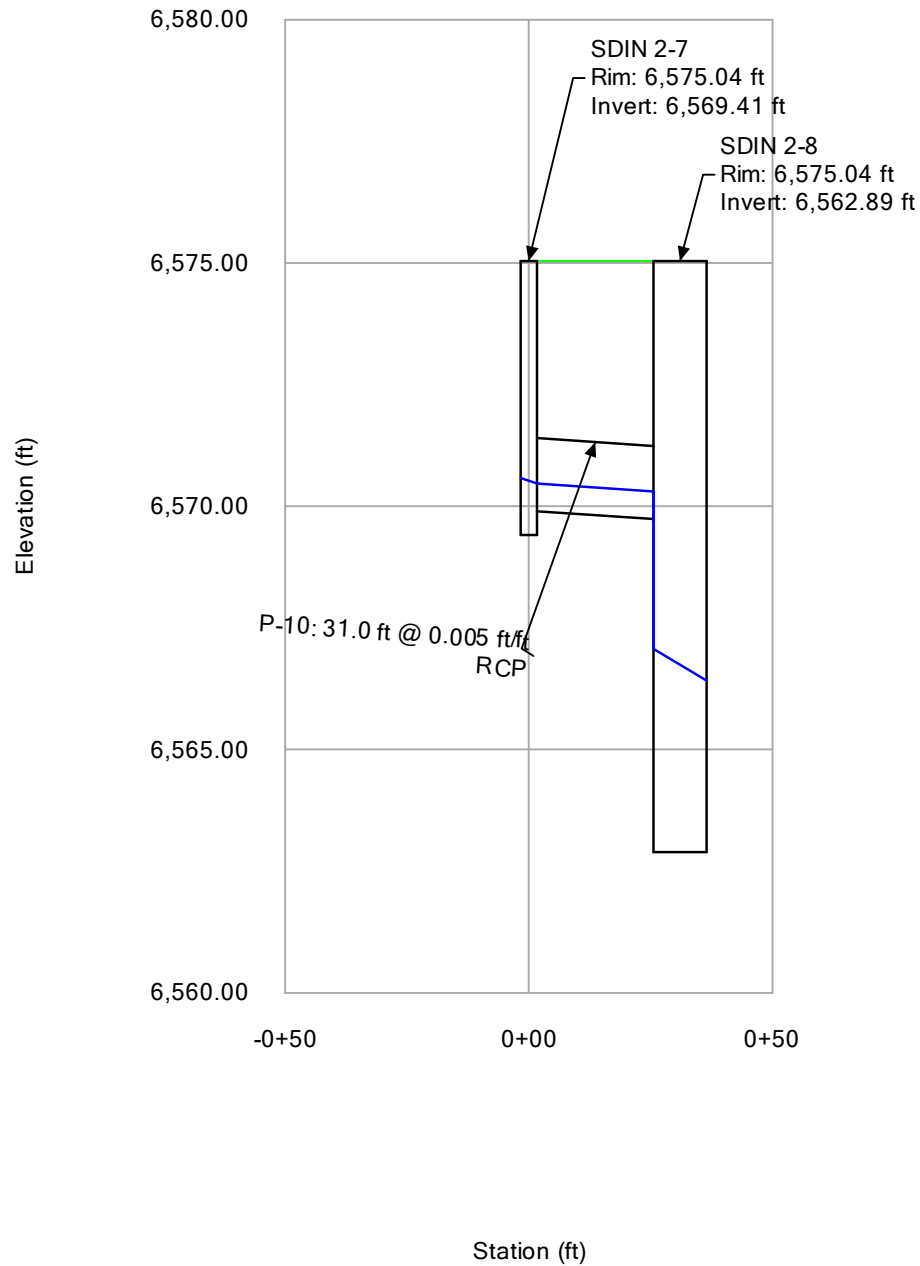
Active Scenario: 100 - Year SDMH 1-2 to SDIN 1-3



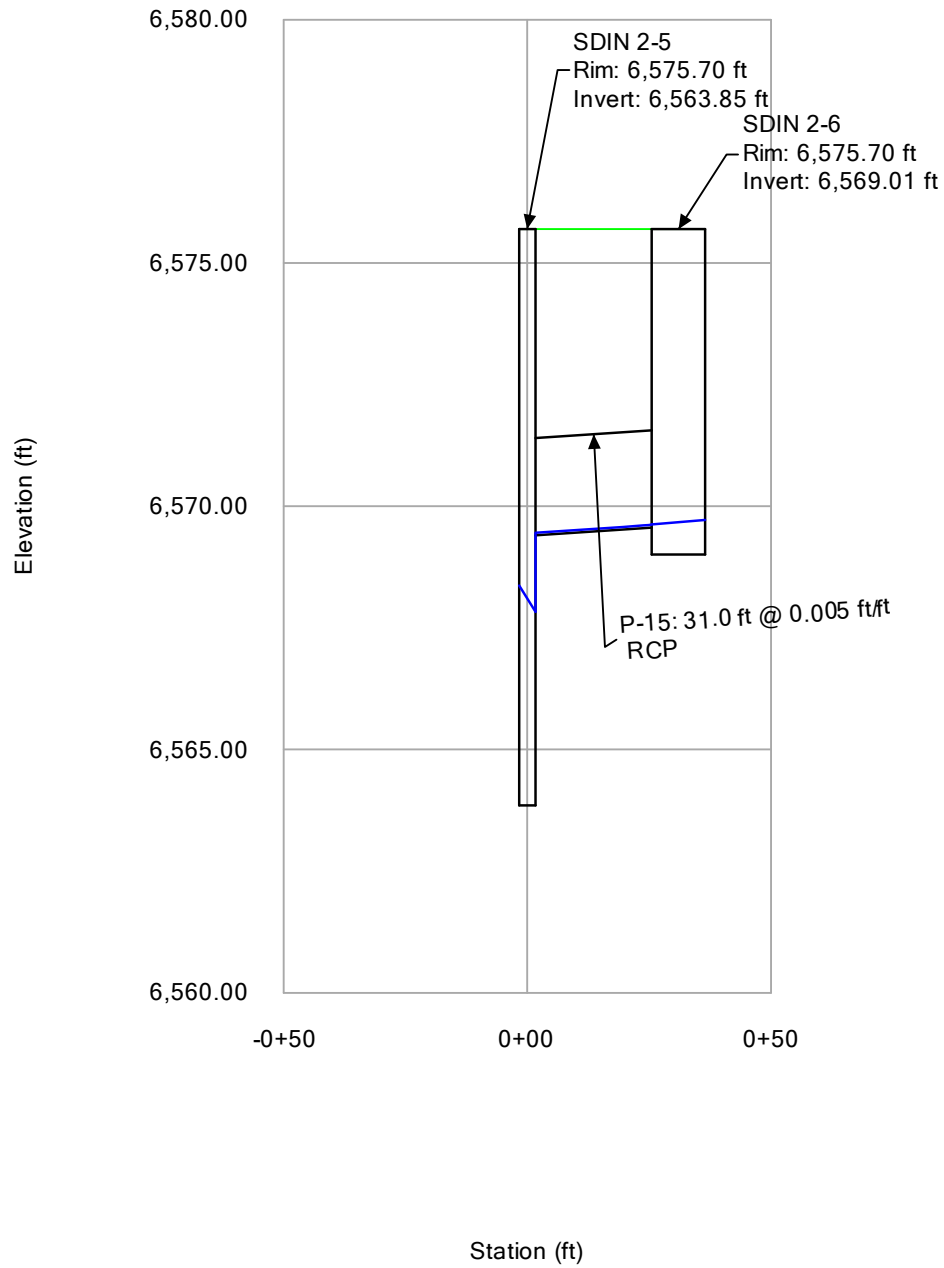
Active Scenario: 100 - Year SDIN 2-1 to SDIN 2-3



Active Scenario: 100 - Year SDIN 2-8 to SDIN 2-7



Active Scenario: 100 - Year SDIN 2-5 to SDIN 2-6



INLET MANAGEMENT

Project: Bella Mesa South

Minor: 5-year

Major: 100-year

Worksheet Protected

INLET NAME	Inlet A3	Inlet A4
Inlet Application (Street or Area)	STREET	STREET
Hydraulic Condition	On Grade	On Grade
Inlet Type	Denver No. 16 Combination	Denver No. 16 Combination
Number of Inlet Units	3	3

USER-DEFINED INPUT

User-Defined Peak Flows

Minor Peak Flow, Q (cfs)	0.90	0.90
Major Peak Flow, Q (cfs)	2.10	2.10

Bypass (Carry-Over) Flow from Upstream

Inlets must be organized from upstream (left) to downstream (right) in order for I

Receive Bypass Flow from:	No Bypass Flow Received	Inlet A3
Bypass Flow Description (Optional):		
Minor Bypass Flow Received, Q_b (cfs)	0.00	0.00
Major Bypass Flow Received, Q_b (cfs)	0.00	0.00

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	0.90	0.90
Major Total Design Peak Flow, Q (cfs)	2.10	2.10
Minor Inlet Interception Capacity, Q_a (cfs)	0.90	0.90
Major Inlet Interception Capacity, Q_a (cfs)	2.10	2.10
Minor Flow Bypassed Downstream, Q_b (cfs)	0.00	0.00
Major Flow Bypassed Downstream, Q_b (cfs)	0.00	0.00
Minor Flow Capture Percentage, C%	100%	100%
Major Flow Capture Percentage, C%	100%	100%

INLET MANAGEMENT

Project: Bella Mesa South

Minor: 5-year

Major: 100-year

Worksheet Protected

INLET NAME	Inlet A5	Inlet A6
Inlet Application (Street or Area)	STREET	STREET
Hydraulic Condition	In Sump	On Grade
Inlet Type	Denver No. 16 Combination	Denver No. 16 Combination
Number of Inlet Units	1	1

USER-DEFINED INPUT

User-Defined Peak Flows

Minor Peak Flow, Q (cfs)	1.00	2.00
Major Peak Flow, Q (cfs)	2.30	4.30

Bypass (Carry-Over) Flow from Upstream

bypass flows to be linked.

Receive Bypass Flow from:	Inlet A4	No Bypass Flow Received
Bypass Flow Description (Optional):		
Minor Bypass Flow Received, Q_b (cfs)	0.00	0.00
Major Bypass Flow Received, Q_b (cfs)	0.00	0.00

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	1.00	2.00
Major Total Design Peak Flow, Q (cfs)	2.30	4.30
Minor Inlet Interception Capacity, Q_a (cfs)	1.79	1.34
Major Inlet Interception Capacity, Q_a (cfs)	2.31	2.09
Minor Flow Bypassed Downstream, Q_b (cfs)	N/A	0.66
Major Flow Bypassed Downstream, Q_b (cfs)	N/A	2.21
Minor Flow Capture Percentage, C%	100%	67%
Major Flow Capture Percentage, C%	100%	49%

INLET MANAGEMENT

Project: Bella Mesa South

Minor: 5-year

Major: 100-year

Worksheet Protected

INLET NAME	Inlet A7	Inlet B2
Inlet Application (Street or Area)	STREET	STREET
Hydraulic Condition	In Sump	In Sump
Inlet Type	Denver No. 16 Combination	Denver No. 16 Combination
Number of Inlet Units	3	4

USER-DEFINED INPUT

User-Defined Peak Flows

Minor Peak Flow, Q (cfs)	0.30	2.00
Major Peak Flow, Q (cfs)	0.70	4.50

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	Inlet A6	No Bypass Flow Received
Bypass Flow Description (Optional):		
Minor Bypass Flow Received, Q_b (cfs)	0.66	0.00
Major Bypass Flow Received, Q_b (cfs)	2.21	0.00

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	0.96	2.00
Major Total Design Peak Flow, Q (cfs)	2.91	4.50
Minor Inlet Interception Capacity, Q_a (cfs)	4.15	5.40
Major Inlet Interception Capacity, Q_a (cfs)	4.15	5.40
Minor Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	N/A	N/A
Minor Flow Capture Percentage, C%	100%	100%
Major Flow Capture Percentage, C%	100%	100%

INLET MANAGEMENT

Project: Bella Mesa South

Minor: 5-year

Major: 100-year

Worksheet Protected

INLET NAME	Inlet B1	Inlet A2
Inlet Application (Street or Area)	STREET	AREA
Hydraulic Condition	In Sump	Swale
Inlet Type	Denver No. 16 Combination	CDOT Type C
Number of Inlet Units	2	1

USER-DEFINED INPUT

User-Defined Peak Flows

Minor Peak Flow, Q (cfs)	0.90	1.20
Major Peak Flow, Q (cfs)	2.20	3.50

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	No Bypass Flow Received	No Bypass Flow Received
Bypass Flow Description (Optional):		
Minor Bypass Flow Received, Q_b (cfs)	0.00	0.00
Major Bypass Flow Received, Q_b (cfs)	0.00	0.00

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	0.90	1.20
Major Total Design Peak Flow, Q (cfs)	2.20	3.50
Minor Inlet Interception Capacity, Q_a (cfs)	3.62	9.44
Major Inlet Interception Capacity, Q_a (cfs)	3.62	13.58
Minor Flow Bypassed Downstream, Q_b (cfs)	N/A	0.00
Major Flow Bypassed Downstream, Q_b (cfs)	N/A	0.00
Minor Flow Capture Percentage, C%	100%	100%
Major Flow Capture Percentage, C%	100%	100%

INLET MANAGEMENT

Project: Bella Mesa South

Minor: 5-year

Major: 100-year

Worksheet Protected

INLET NAME	Inlet B3	Inlet A1
Inlet Application (Street or Area)	STREET	AREA
Hydraulic Condition	In Sump	Swale
Inlet Type	Denver No. 16 Combination	CDOT Type C
Number of Inlet Units	2	1

USER-DEFINED INPUT

User-Defined Peak Flows

Minor Peak Flow, Q (cfs)	2.60	0.70
Major Peak Flow, Q (cfs)	5.90	1.70

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	No Bypass Flow Received	No Bypass Flow Received
Bypass Flow Description (Optional):		
Minor Bypass Flow Received, Q_b (cfs)	0.00	0.00
Major Bypass Flow Received, Q_b (cfs)	0.00	0.00

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	2.60	0.70
Major Total Design Peak Flow, Q (cfs)	5.90	1.70
Minor Inlet Interception Capacity, Q_a (cfs)	10.75	0.80
Major Inlet Interception Capacity, Q_a (cfs)	10.75	1.52
Minor Flow Bypassed Downstream, Q_b (cfs)	N/A	0.00
Major Flow Bypassed Downstream, Q_b (cfs)	N/A	0.18
Minor Flow Capture Percentage, C%	100%	100%
Major Flow Capture Percentage, C%	100%	90%

INLET MANAGEMENT

Project: Bella Mesa South

Minor: 5-year

Major: 100-year

Worksheet Protected

INLET NAME	Inlet A8	Inlet A8-2
Inlet Application (Street or Area)	STREET	STREET
Hydraulic Condition	On Grade	In Sump
Inlet Type	Denver No. 16 Valley Grate	Denver No. 16 Valley Grate
Number of Inlet Units	2	2

USER-DEFINED INPUT

User-Defined Peak Flows

Minor Peak Flow, Q (cfs)	3.00	0.10
Major Peak Flow, Q (cfs)	6.70	0.10

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	No Bypass Flow Received	User-Defined
Bypass Flow Description (Optional):		Inlet A9 and Inlet A8
Minor Bypass Flow Received, Q_b (cfs)	0.00	3.81
Major Bypass Flow Received, Q_b (cfs)	0.00	9.33

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	3.00	3.91
Major Total Design Peak Flow, Q (cfs)	6.70	9.43
Minor Inlet Interception Capacity, Q_a (cfs)	0.77	1.80
Major Inlet Interception Capacity, Q_a (cfs)	1.30	1.80
Minor Flow Bypassed Downstream, Q_b (cfs)	2.23	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	5.40	N/A
Minor Flow Capture Percentage, C%	26%	46%
Major Flow Capture Percentage, C%	19%	19%

INLET MANAGEMENT

Project: Bella Mesa South

Minor: 5-year

Major: 100-year

Worksheet Protected

INLET NAME	Inlet A9	Inlet A8-2
Inlet Application (Street or Area)	STREET	AREA
Hydraulic Condition	On Grade	Swale
Inlet Type	Denver No. 16 Valley Grate	User-Defined
Number of Inlet Units	2	1

USER-DEFINED INPUT

User-Defined Peak Flows

Minor Peak Flow, Q (cfs)	2.20	0.10
Major Peak Flow, Q (cfs)	5.00	0.10

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	No Bypass Flow Received	User-Defined
Bypass Flow Description (Optional):		Inlet A8 and Inlet A9
Minor Bypass Flow Received, Q_b (cfs)	0.00	3.81
Major Bypass Flow Received, Q_b (cfs)	0.00	9.33

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	2.20	3.91
Major Total Design Peak Flow, Q (cfs)	5.00	9.43
Minor Inlet Interception Capacity, Q_a (cfs)	0.62	5.77
Major Inlet Interception Capacity, Q_a (cfs)	1.08	10.09
Minor Flow Bypassed Downstream, Q_b (cfs)	1.58	0.00
Major Flow Bypassed Downstream, Q_b (cfs)	3.92	0.00
Minor Flow Capture Percentage, C%	28%	100%
Major Flow Capture Percentage, C%	22%	100%



Public Works
4175 N. Castleton Court, Castle Rock, CO 80109
720-733-2462, Fax 303-660-1025

Permit No: CON CD 18-0015

DETENTION VOLUME CERTIFICATION

Project Name: Founders Village Filing 24 - Phase 1A

Location/Address: _____

Subdivision: Founders Village

Drainage Report Title: Phase III Drainage Report for Founders Village Filing 24 - Phase 1A Construction

No. of Ponds: 1 * For multiple ponds, copy and paste table below.

Name of Pond (Tract):

<i>Include Units (CY or ac-ft)</i>	Required Volume	Design Volume	As-Built Volume	Design Elevation	As-Built Elevation
Water Quality Capture Volume	1.062 ac-ft	1.062 ac-ft	1.062 ac-ft	6525.77 ft	6525.98 ft
EURV	1.746 ac-ft	1.746 ac-ft	2.518 ac-ft	6527.76 ft	6527.80 ft
WQCV + 100- Year Detention	6.805 ac-ft	7.221 ac-ft	6.835 ac-ft	6532.00 ft	6532.03 ft
Emergency Overflow				6532.00 ft	6532.03 ft

Engineer's Statement:

I hereby certify that the detention facility (*facilities*) identified above has (*have*) been constructed according to the design presented in the approved drainage report, as surveyed by Aztec Consultants, Inc. on 03-31-2020 **. I understand that the Town of Castle Rock does not and will not assume liability for drainage facilities designed, constructed and/or certified by others.

Name: Kevin Rohrbough

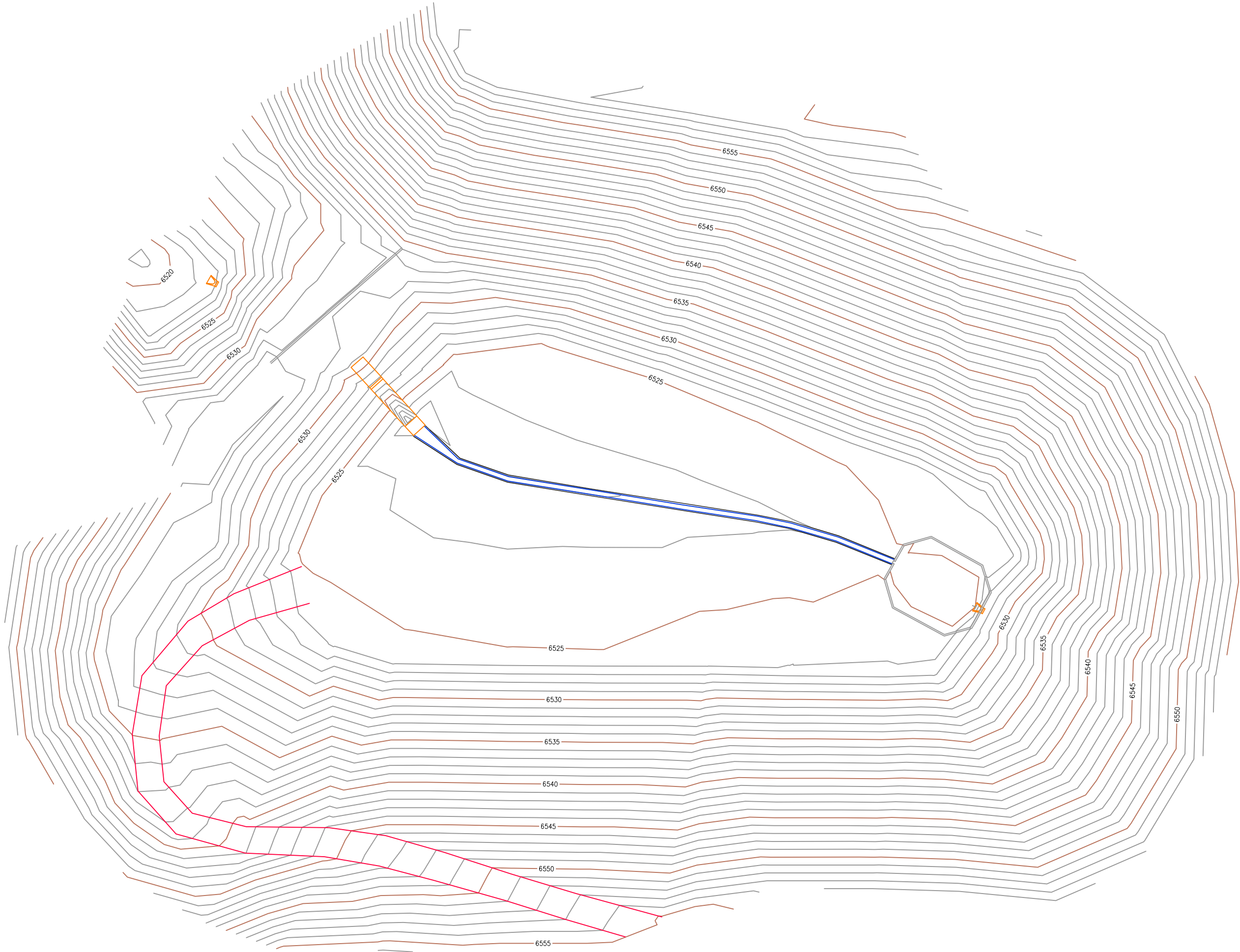
Signature: _____

Date: 04-15-2020

Company: CORE Consultants



** Include supporting documentation.



CHECKED BY: _____ DATE: _____

0 20 40 80

1 inch = 40 ft.

DATE 2020-04-13 JMS

AZTEC
CONSULTANTS, INC.

300 E. Mineral Ave, Suite 1
Littleton, Colorado 80122
Phone: (303) 713-1898
Fax: (303) 713-1897
www.aztecconsultants.com

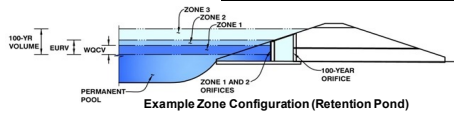
2020-03-31 POND TOPO
FOUNDERS 24

PREPARED FOR

SHEET
1
OF 1 SHEETS
JOB NO. 21419-03

MHFD-Detention, Version 4.08 (April 2026)

Basin ID: Pond B Conformance



Example Zone Configuration (Retention Pond)

Selected SCM Type =	EDB	
Watershed Area =	65.64	acres
Watershed Length =	2,746	ft
Watershed Length to Centroid =	1,200	ft
Watershed Slope =	0.026	ft/ft
Watershed Imperviousness =	51.72%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	100.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths = User Input		

Optional User Overrides

Water Quality Capture Volume (WQCV)	1.154	acre-feet
Excess Urban Runoff Volume (EUCRV)	3.220	acre-feet
2-yr Runoff Volume ($P1 = 1.06$ in.)	3.081	acre-feet
5-yr Runoff Volume ($P1 = 1.43$ in.)	4.938	acre-feet
10-yr Runoff Volume ($P1 = 1.66$ in.)	6.181	acre-feet
25-yr Runoff Volume ($P1 = 1.69$ in.)	6.543	acre-feet
50-yr Runoff Volume ($P1 = 2.26$ in.)	9.762	acre-feet
100-yr Runoff Volume ($P1 = 2.6$ in.)	11.904	acre-feet
500-yr Runoff Volume ($P1 = 3.14$ in.)	15.032	acre-feet
Approximate 2-yr Detention Volume	2.537	acre-feet
Approximate 5-yr Detention Volume	4.017	acre-feet
Approximate 10-yr Detention Volume	4.557	acre-feet
Approximate 25-yr Detention Volume	4.383	acre-feet
Approximate 50-yr Detention Volume	5.393	acre-feet
Approximate 100-yr Detention Volume	6.270	acre-feet

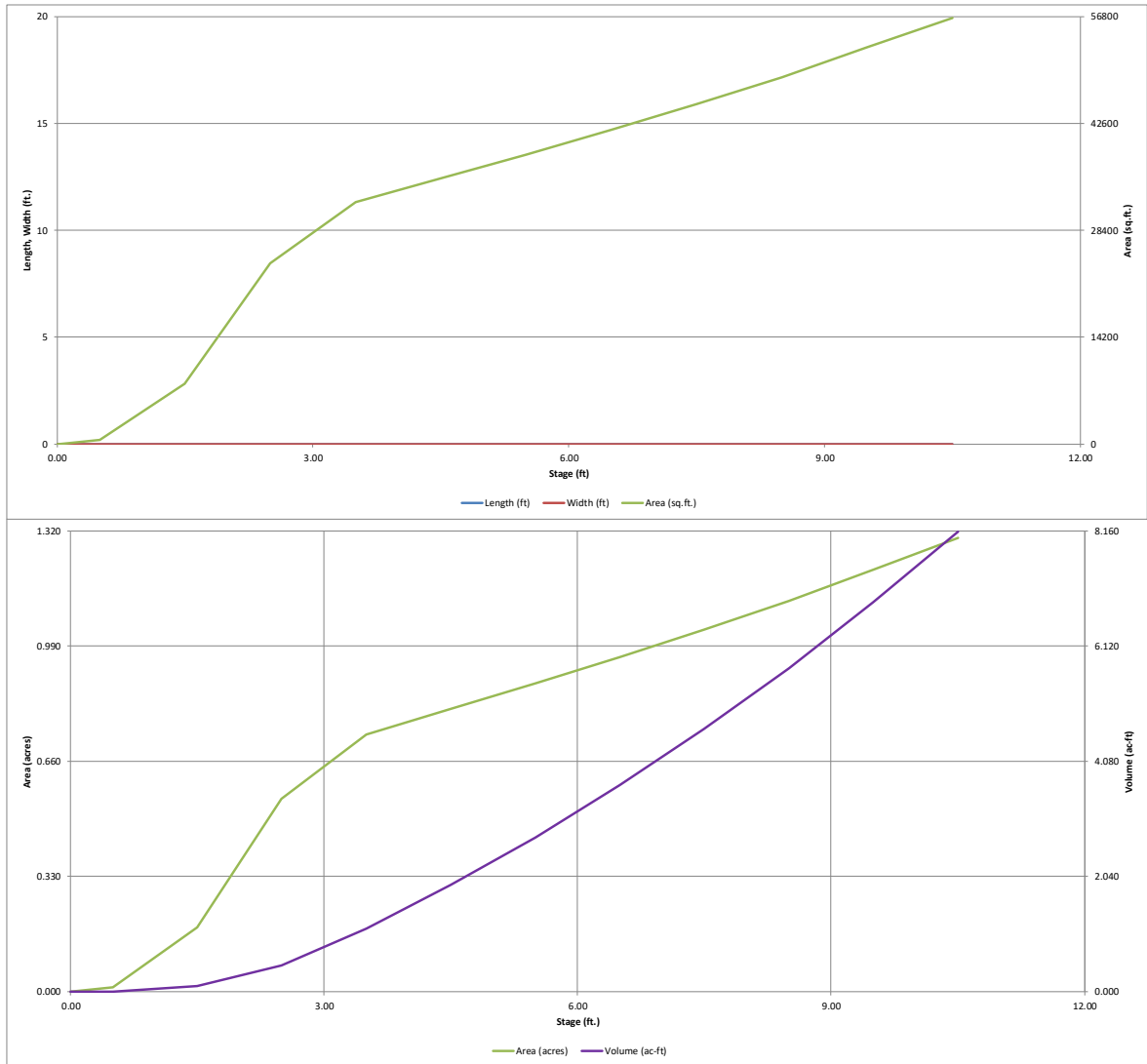
Zone 1 Volume (WQCV) =	1.154	acre-feet
Zone 2 Volume (EURV - Zone 1) =	2.066	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	3.050	acre-feet
Total Detention Basin Volume =	6.270	acre-feet
Initial Surge Volume (ISV) =	user	ft ³
Initial Surge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio (R_{LW}) =	user	

Initial Surcharge Area (A_{SV})	=	user	ft ²
Surcharge Volume Length (L_{SV})	=	user	ft
Surcharge Volume Width (W_{SV})	=	user	ft
Depth of Basin Floor (H_{FLOOR})	=	user	ft
Length of Basin Floor (L_{FLOOR})	=	user	ft
Width of Basin Floor (W_{FLOOR})	=	user	ft
Area of Basin Floor (A_{FLOOR})	=	user	ft ²
Volume of Basin Floor (V_{FLOOR})	=	user	ft ³
Depth of Main Basin (H_{MAIN})	=	user	ft
Length of Main Basin (L_{MAIN})	=	user	ft
Width of Main Basin (W_{MAIN})	=	user	ft
Area of Main Basin (A_{MAIN})	=	user	ft ²
Volume of Main Basin (V_{MAIN})	=	user	ft ³
Calculated Total Basin Volume (V_{TOTAL})	=	user	acre-feet

[illegible]

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

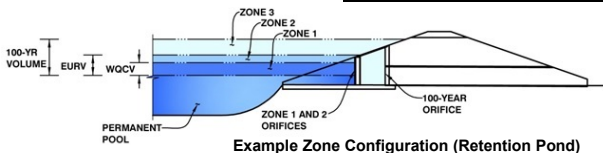
MHFD-Detention, Version 4.08 (April 2026)



DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.08 (April 2026)

Project: **Bella Mesa South**
Basin ID: **Pond B Conformance**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.56	1.154	Orifice Plate
Zone 2 (EURV)	6.05	2.066	Orifice Plate
Zone 3 (100-year)	8.98	3.050	Weir&Pipe (Restrict)
Total (all zones)		6.270	

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

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

Calculated Parameters for Underdrain

Underdrain Orifice Area = ft²
Underdrain Orifice Centroid = feet

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

Centroid of Lowest Orifice = ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate = ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing = inches
Orifice Plate: Orifice Area per Row = sq. inches

Calculated Parameters for Plate

WQ Orifice Area per Row = ft²
Elliptical Half-Width = feet
Elliptical Slot Centroid = feet
Elliptical Slot Area = ft²

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	2.00	4.00					
Orifice Area (sq. inches)	4.70	4.70	12.00					

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

User Input: Vertical Orifice (Circular or Rectangular)

Invert of Vertical Orifice = ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice = ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter = inches

Calculated Parameters for Vertical Orifice

Vertical Orifice Area = ft²
Vertical Orifice Centroid = feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

Overflow Weir Front Edge Height, H_o = ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length = feet
Overflow Weir Grate Slope = H:V
Horiz. Length of Weir Sides = feet
Overflow Grate Type =
Debris Clogging % = %

Calculated Parameters for Overflow Weir

Height of Grate Upper Edge, H_u = feet
Overflow Weir Slope Length = feet
Grate Open Area / 100-yr Orifice Area =
Overflow Grate Open Area w/o Debris = ft²
Overflow Grate Open Area w/ Debris = ft²

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

Depth to Invert of Outlet Pipe = ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter = inches
Restrictor Plate Height Above Pipe Invert = inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

Outlet Orifice Area = ft²
Outlet Orifice Centroid = feet
Half-Central Angle of Restrictor Plate on Pipe = radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

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

Calculated Parameters for Spillway

Spillway Design Flow Depth = feet
Stage at Top of Freeboard = feet
Basin Area at Top of Freeboard = acres
Basin Volume at Top of Freeboard = acre-ft

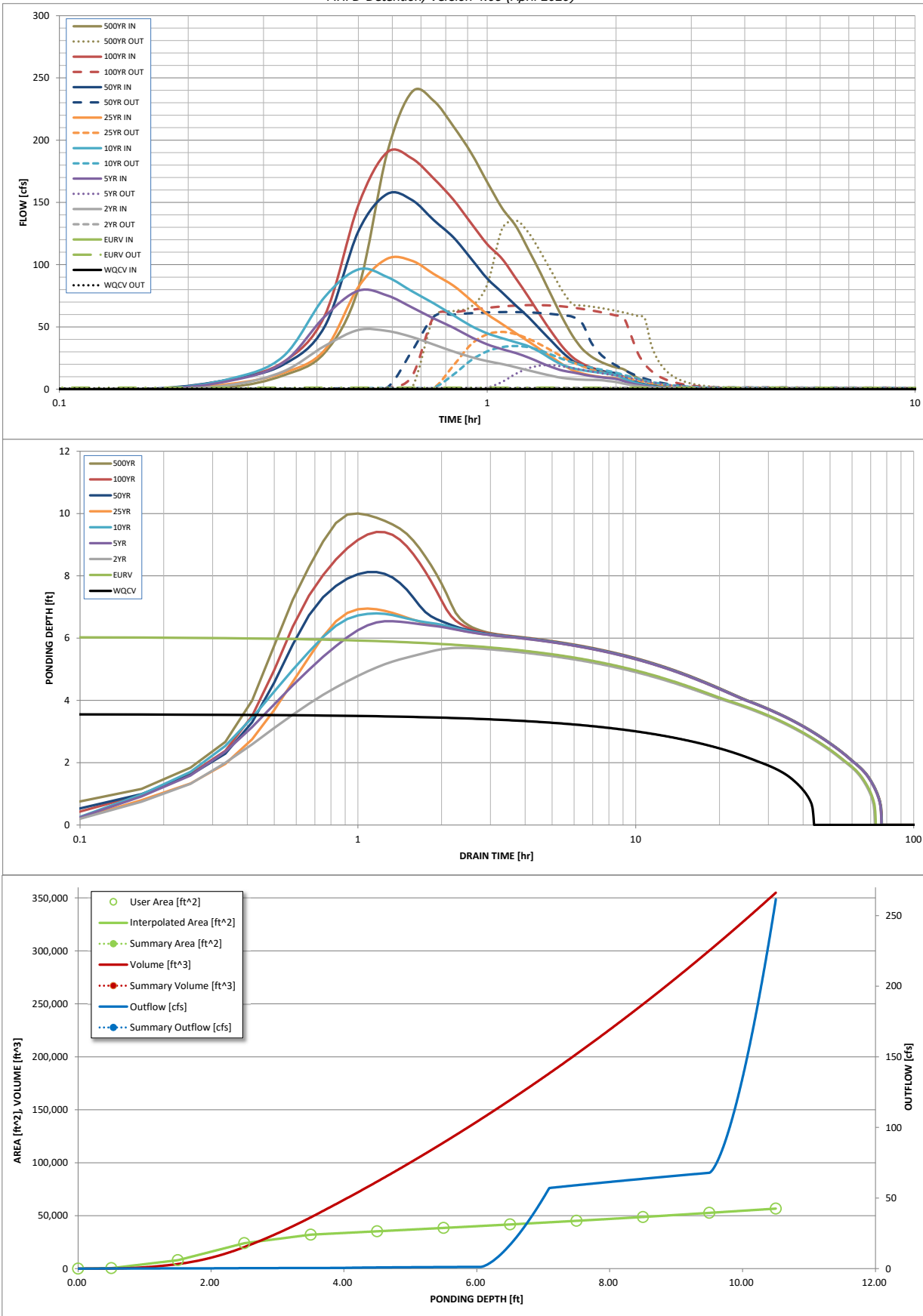
Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	1.06	1.43	1.66	1.69	2.26	2.60	3.14
One-Hour Rainfall Depth (in) =	N/A	N/A	1.06	1.43	1.66	1.69	2.26	2.60	3.14
CUHP Runoff Volume (acre-ft) =	1.154	3.220	3.081	4.938	6.181	6.543	9.762	11.904	15.032
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	3.081	4.938	6.181	6.543	9.762	11.904	15.032
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	7.9	25.4	35.1	44.2	75.6	97.7	127.8
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.12	0.39	0.53	0.67	1.15	1.49	1.95
Peak Inflow Q (cfs) =	N/A	N/A	47.6	79.1	96.2	104.7	156.7	190.2	238.7
Peak Outflow Q (cfs) =	0.5	1.3	1.2	19.2	34.7	46.0	62.0	67.5	135.5
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.8	1.0	1.0	0.8	0.7	1.1
Structure Controlling Flow =	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.4	0.8	1.1	1.4	1.6	1.6
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	41	66	66	66	64	63	59	56	53
Time to Drain 99% of Inflow Volume (hours) =	43	70	70	72	72	71	69	68	66
Maximum Ponding Depth (ft) =	3.56	6.04	5.68	6.54	6.79	6.95	8.12	9.41	10.00
Area at Maximum Ponding Depth (acres) =	0.74	0.92	0.90	0.96	0.98	0.99	1.09	1.20	1.26
Maximum Volume Stored (acre-ft) =	1.157	3.220	2.893	3.691	3.934	4.082	5.310	6.773	7.510

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.08 (April 2026)



S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

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

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.54	0.25	1.63
	0:15:00	0.00	0.00	3.29	6.68	8.27	4.15	7.76	7.89	10.97
	0:20:00	0.00	0.00	14.16	21.28	26.22	13.00	19.61	21.68	29.16
	0:25:00	0.00	0.00	34.65	58.27	73.81	31.35	50.12	58.73	80.83
	0:30:00	0.00	0.00	47.57	79.12	96.20	82.11	126.81	147.93	189.37
	0:35:00	0.00	0.00	46.75	75.34	90.16	104.65	156.68	190.15	238.69
	0:40:00	0.00	0.00	41.91	65.71	78.67	103.16	151.90	185.28	231.49
	0:45:00	0.00	0.00	35.79	56.79	68.89	92.51	135.72	169.15	211.11
	0:50:00	0.00	0.00	30.29	49.40	59.39	83.19	121.93	152.18	189.83
	0:55:00	0.00	0.00	25.82	41.88	50.86	71.46	104.92	133.38	166.33
	1:00:00	0.00	0.00	22.50	36.03	44.88	60.27	88.85	116.46	145.44
	1:05:00	0.00	0.00	20.22	32.13	40.96	52.34	77.69	104.73	131.03
	1:10:00	0.00	0.00	17.60	29.01	37.67	44.89	67.19	88.96	111.67
	1:15:00	0.00	0.00	15.05	25.35	34.46	38.28	57.75	73.87	93.11
	1:20:00	0.00	0.00	12.74	21.31	29.61	31.64	47.61	58.88	74.21
	1:25:00	0.00	0.00	10.66	17.71	23.97	25.63	38.29	45.45	57.18
	1:30:00	0.00	0.00	9.05	14.97	19.50	19.90	29.55	34.10	42.94
	1:35:00	0.00	0.00	8.13	13.50	16.93	15.36	22.85	25.69	32.57
	1:40:00	0.00	0.00	7.71	11.95	15.31	12.71	18.93	20.70	26.35
	1:45:00	0.00	0.00	7.48	10.63	14.15	11.05	16.40	17.48	22.29
	1:50:00	0.00	0.00	7.34	9.69	13.34	9.96	14.72	15.25	19.49
	1:55:00	0.00	0.00	6.56	8.99	12.46	9.21	13.54	13.67	17.49
	2:00:00	0.00	0.00	5.77	8.27	11.19	8.72	12.75	12.54	16.05
	2:05:00	0.00	0.00	4.52	6.50	8.70	6.88	10.01	9.64	12.34
	2:10:00	0.00	0.00	3.38	4.80	6.39	5.04	7.30	6.95	8.89
	2:15:00	0.00	0.00	2.53	3.56	4.68	3.73	5.37	5.13	6.54
	2:20:00	0.00	0.00	1.88	2.62	3.42	2.75	3.94	3.80	4.84
	2:25:00	0.00	0.00	1.37	1.89	2.48	2.00	2.86	2.78	3.54
	2:30:00	0.00	0.00	0.98	1.32	1.78	1.43	2.04	1.99	2.54
	2:35:00	0.00	0.00	0.69	0.92	1.27	1.03	1.47	1.44	1.83
	2:40:00	0.00	0.00	0.46	0.63	0.87	0.72	1.03	1.01	1.28
	2:45:00	0.00	0.00	0.28	0.41	0.55	0.47	0.67	0.65	0.83
	2:50:00	0.00	0.00	0.15	0.24	0.30	0.27	0.39	0.37	0.47
	2:55:00	0.00	0.00	0.06	0.11	0.13	0.13	0.18	0.17	0.22
	3:00:00	0.00	0.00	0.02	0.03	0.03	0.04	0.05	0.05	0.06
	3:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Appendix D - Reference Documents



**PHASE III DRAINAGE REPORT
FOR
FOUNDERS VILLAGE FILING 24 – PHASE 1A CONSTRUCTION
TOWN OF CASTLE ROCK, CO
PROJECT No. CD18-0015**

PREPARED FOR:

RICHMOND AMERICAN HOMES
4350 S. MONACO STREET
DENVER, CO 80237
PHONE: 720-977-3862
CONTACT: ERIC KUBLY

PREPARED BY:

CORE CONSULTANTS, INC.
1950 W. LITTLETON BOULEVARD, SUITE 109
LITTLETON, CO 80120
PHONE: 303-703-4444
CONTACT: BLAKE CALVERT
CORE PROJECT NUMBER: 18-007

DECEMBER 28, 2018

II. DRAINAGE BASINS AND SUB-BASINS

A. MAJOR DRAINAGE BASINS

The drainage patterns for the major basins will generally follow the historic patterns. The property generally drains northwest to Mitchell Gulch on the west side of the property. Mitchell Gulch drains to Cherry Creek approximately two miles downstream of the property. The site falls within Zone X, as shown on the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) panel 08035C0306G (revised March 16, 2016). A copy of this map is included in the appendix.

B. MINOR DRAINAGE BASINS

Minor Drainage Basins have been delineated using the proposed site plan and grading, as well as the lot layout for future development. In addition, the portion of Mitchell Street that has already been constructed and the future development to the west of Mitchell Street will be included in the detention pond sizing. Overall, the proposed drainage patterns for the sub-basins will generally follow the historic patterns prior to development. Although Mitchell Street has been partially constructed, the existing condition for the site will be considered fully undeveloped and the roadway will be included as part of the proposed drainage design in the total amount of detention and water quality. For sub-basins within the site, runoff will drain towards low points in the roadways. The developed minor basins will include overland flow and storm sewer collection systems which will direct stormwater to the extended detention basins at the north edge of the site and west of Mitchell Street. The site drainage will not be impacted by any irrigation facilities. The Site is to be constructed in three phases, Phase 1A, Phase 1B, and Phase 2. During grading of Phase 1A, the area for Phase 1B will be overlot graded. The storm system has been designed for the ultimate runoff from Phase 1A and Phase 1B. Minor basins have been established for the site for Phase 1A and Phase 1B, and are described below:

On-Site Basins:

Basin B-1

Basin B-1 is a 0.57-acre area with a peak flow of 3.5 cfs, comprised of roadway and landscaping. Runoff generated within this basin will drain to a type-R inlet at DP50. The flow that is captured by the inlet at DP50 combines with the flow from DP48 and DP49 at the manhole at DP51 for a cumulative flow of 136.7 cfs and is conveyed west to Detention Pond B via the proposed storm sewer system.

Basin B-2

Basin B-2 is a 1.75-acre area with a peak flow of 9.7 cfs, comprised of roadway and landscaping. Runoff generated within this basin will drain to a type-R inlet at DP49. The flow that is captured by the inlet at DP50 combines with the flow from

the adjacent property to the east (Castlewood Ranch). Runoff for this basin will sheet flow northwest onto Basin B-6.

Basin OS-12

Basin OS-12 is a 1.61 acre area with a peak flow of 5.7 cfs, comprised entirely of landscaping and roadway. Runoff for this basin will sheet flow to the existing drainage pan at the intersection of Mitchell Street and Mikelson Boulevard as it has historically and is reduced from the historic rate. Detention Pond B has been oversized to provide full spectrum detention for this Basin.

Basin OS-13

Basin OS-13 is a 0.99-acre area with a peak flow of 5.5 cfs, comprised entirely of offsite single family residential (rear portion of existing lots with Type-B drainage) on the adjacent property to the east (Castlewood Ranch). Runoff for this basin will sheet flow northwest onto Basin B-9.

Basin FU-2

Basin FU-2 is a 10.27-acre area with a peak flow of 21.5 cfs, comprised of undeveloped land. Although the proposed construction limits do not disturb this basin, future development assumptions were made to conservatively size Detention Pond B. The future runoff for this basin was approximated using impervious values for multi family residential and a future elementary school.

Basin FU-3

Basin FU-3 is a 5.66-acre area with a peak flow of 14.4 cfs, comprised of undeveloped land and a portion of roadway. Runoff generated within this basin will drain to a type-C inlet at the sump at DP52 and conveyed north to DP53 where it is combined with flow from DP51 for a cumulative flow of 118.0 cfs. Any overflow from a clogged inlet will spill northwest to Detention Pond B.

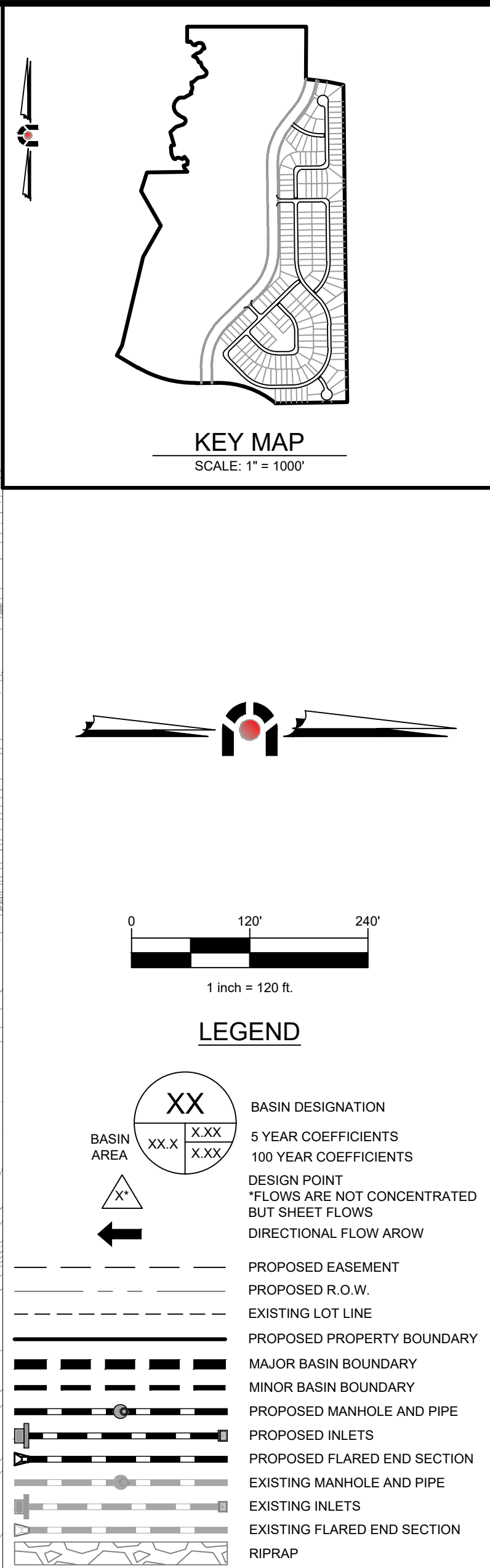
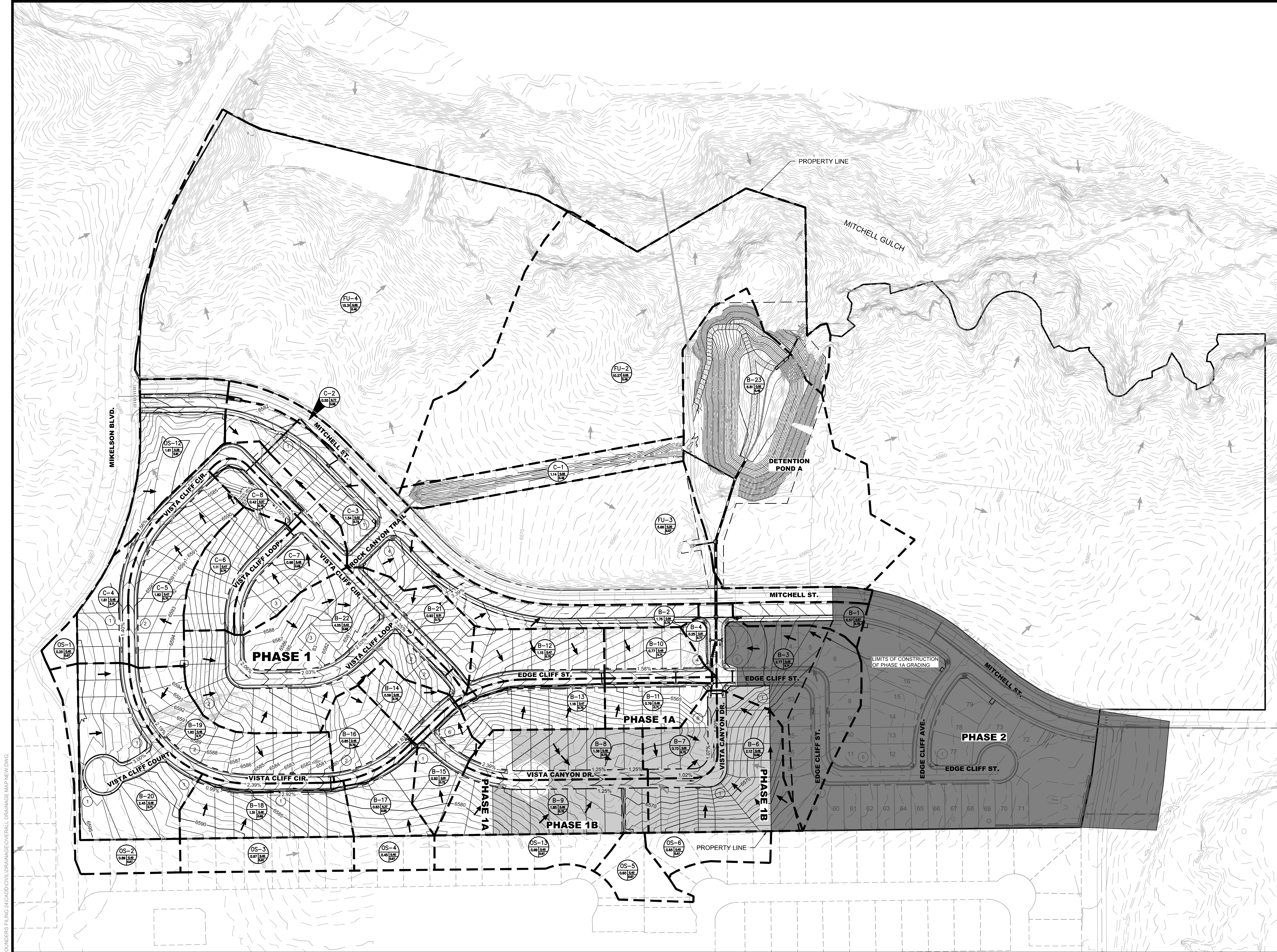
Basin FU-4

Basin FU-4 is a 15.31-acre area with a peak flow of 36.0 cfs, comprised of undeveloped land. A portion of this basin drains into an existing detention pond and although the proposed construction limits do not disturb this basin, future development assumptions were made to conservatively size Detention Pond B. The future runoff for this basin was approximated using impervious values for multi family residential and a future elementary school.

Existing Basins:

The existing basins west of Mitchell Street will continue to flow as they have historically. The Detention Ponds have been designed to accommodate future development of these basins. The runoff from these basins was approximated using impervious values for an elementary school and multifamily residential as it is zoned.

12/21/2015 3:28 PM A:\18-007 FOUNDRERS VILLAGE 24\18-007 CIVIL\DRAWINGS\OVERALL DRAINAGE MAP REV.DWG



OVERALL PROPOSED DRAINAGE MAP

CIVIL ENGINEERING
DEVELOPMENT CONSULTING
NATURAL RESOURCES CONSULTING
LAND SURVEYING
303.703.4444
1950 W. Littleton Blvd., Ste. 109
Littleton, CO 80120

CORE
CONSULTANTS

CALL 2 BUSINESS DAYS IN ADVANCE BEFORE YOU DIG GRADE OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES.

CORE ASSUMES NO RESPONSIBILITY FOR EXISTING UTILITY LOCATIONS (HORIZONTAL AND VERTICAL) OR EXISTING UTILITY DEPTHS. IT IS THE USER'S RESPONSIBILITY TO VERIFY THE LOCATION OF ALL UTILITIES PRIOR TO THE COMMENCEMENT OF ANY CONSTRUCTION ACTIVITIES.

811
Call before you dig

#	REVISION DESCRIPTION	DATE	BY
1	2ND SUBMITTAL	09/04/18	RCY
2	3RD SUBMITTAL	10/05/18	RCY
3	4TH SUBMITTAL	12/07/18	RCY
4	5TH SUBMITTAL	12/21/18	RCY
5	ISSUED FOR CONSTRUCTION	XX/XX/XX	RCY

FOUNDERS VILLAGE FILING 24
TOWN OF CASTLE ROCK, DOUGLAS COUNTY

DRAINAGE PLANS - PHASE 1
OVERALL PROPOSED DRAINAGE MAP

DESIGNED BY: RCY
DRAWN BY: BB
CHECKED BY: BC

JOB NO.
18-007

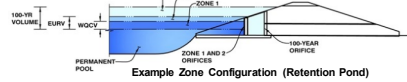
SHEET
2 OF 6

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Basin ID: POND B

ZONE 3
ZONE 2



Required Volume Calculation

Selected BMP Type = **EDB**

Watershed Area =	65.41	acres
Watershed Length =	2.746	ft
Watershed Slope =	0.026	ft/ft
Watershed Imperviousness =	45.70%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	100.0%	percent
Desired WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	Use Input	
Water Quality Capture Volume (WQCV) =	1.062	acre-feet
Excess Urban Runoff Volume (ELRV) =	2.808	acre-feet
2-yr Runoff Volume ($P_1 = 1.06$ in.)	2.343	1.06 inches
5-yr Runoff Volume ($P_1 = 1.43$ in.)	3.786	1.43 inches
10-yr Runoff Volume ($P_1 = 1.66$ in.)	4.925	1.66 inches
25-yr Runoff Volume ($P_1 = 0$ in.)	0.000	inches
50-yr Runoff Volume ($P_1 = 2.26$ in.)	8.860	2.26 inches
100-yr Runoff Volume ($P_1 = 2.61$ in.)	11.102	2.60 inches
500-yr Runoff Volume ($P_1 = 0$ in.)	0.000	inches
Approximate 2-yr Detention Volume =	2.197	acre-feet
Approximate 5-yr Detention Volume =	3.569	acre-feet
Approximate 10-yr Detention Volume =	4.052	acre-feet
Approximate 25-yr Detention Volume =	0.000	acre-feet
Approximate 50-yr Detention Volume =	4.848	acre-feet
Approximate 100-yr Detention Volume =	5.743	acre-feet

Water Quality Capture Volume (WQCV) =	1.062	acre-feet	Optional User Override 1-hr Precipitation
Excess Urban Runoff Volume (EVRV) =	2.808	acre-feet	
2-yr Runoff Volume (P1 = 1.06 in.) =	2.343	acre-feet	1.06 inches
5-yr Runoff Volume (P1 = 1.43 in.) =	3.786	acre-feet	1.43 inches
10-yr Runoff Volume (P1 = 1.66 in.) =	4.925	acre-feet	1.66 inches
25-yr Runoff Volume (P1 = 0 in.) =	0.000	acre-feet	inches
50-yr Runoff Volume (P1 = 2.26 in.) =	8.860	acre-feet	2.26 inches
100-yr Runoff Volume (P1 = 2.6 in.) =	11.102	acre-feet	2.60 inches
500-yr Runoff Volume (P1 = 0 in.) =	0.000	acre-feet	inches

Stage-Storage Calculation

Zone 1 Volume (W_{OCV})	1.062	acre-feet
Zone 2 Volume (ELUR - Zone 1)	1.746	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2)	2.935	acre-feet
Total Detention Basin Volume	5.743	acre-feet
Initial Surcharge Volume (ISV)	US6F	ft ³
Initial Surcharge Depth (ISD)	US6F	ft
Total Available Detention Depth (H_{total})	US6F	ft
Depth of Trickle Channel (H_{TC})	US6F	ft
Slope of Trickle Channel (S_{TC})	US6F	ft/ft
Slopes of Main Basin Sides (S_{main})	US6F	H/V
Basin Length-to-Width Ratio ($R_{L/W}$)	US6F	
Initial Surcharge Area (A_{IS})	US6F	ft ²
Surcharge Volume Length (L_{IS})	US6F	ft
Surcharge Volume Width (W_{IS})	US6F	ft
Depth of Basin Floor ($H_{1,000}$)	US6F	ft
Length of Basin Floor ($L_{1,000}$)	US6F	ft
Width of Basin Floor ($W_{1,000}$)	US6F	ft
Area of Basin Floor ($A_{1,000}$)	US6F	ft ²
Volume of Basin Floor ($V_{1,000}$)	US6F	ft ³
Depth of Main Basin (H_{main})	US6F	ft
Length of Main Basin (L_{main})	US6F	ft
Width of Main Basin (W_{main})	US6F	ft
Area of Main Basin (A_{main})	US6F	ft ²
Volume of Main Basin (V_{main})	US6F	ft ³
Calculated Total Basin Volume (V_{total})	US6F	acre-feet

Stage - Storage	Stage	Optional Override	Length	Width	Area	Optional Override	Area	Volume	Volume
-----------------	-------	----------------------	--------	-------	------	----------------------	------	--------	--------

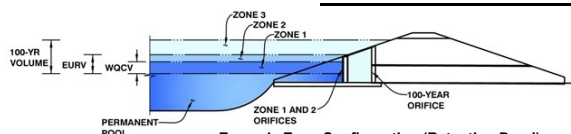
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Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Project: FOUNDERS FILING NO. 24

Basin ID: POND B



Example Zone Configuration (Retention Pond)

	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.37	1.062	Orifice Plate
Zone 2 (EURV)	5.45	1.746	Orifice Plate
Zone 3 (100-year)	8.28	2.935	Weir&Pipe (Restrict)
		5.743	Total

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

Underdrain Orifice Invert Depth = ft (distance below the filtration media surface)

Underdrain Orifice Diameter = inches

Calculated Parameters for Underdrain

Underdrain Orifice Area = ft²

Underdrain Orifice Centroid = feet

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

Invert of Lowest Orifice = ft (relative to basin bottom at Stage = 0 ft)

Depth at top of Zone using Orifice Plate = ft (relative to basin bottom at Stage = 0 ft)

Orifice Plate: Orifice Vertical Spacing = inches

Orifice Plate: Orifice Area per Row = inches

Calculated Parameters for Plate

WQ Orifice Area per Row = ft²

Elliptical Half-Width = feet

Elliptical Slot Centroid = feet

Elliptical Slot Area = ft²

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	2.00	4.00					
Orifice Area (sq. inches)	4.70	4.70	12.00					

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

User Input: Vertical Orifice (Circular or Rectangular)

Invert of Vertical Orifice = ft (relative to basin bottom at Stage = 0 ft)

Depth at top of Zone using Vertical Orifice = ft (relative to basin bottom at Stage = 0 ft)

Vertical Orifice Diameter = inches

Calculated Parameters for Vertical Orifice

Vertical Orifice Area = ft²

Vertical Orifice Centroid = feet

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

Overflow Weir Front Edge Height, H_o = ft (relative to basin bottom at Stage = 0 ft)

Overflow Weir Front Edge Length = feet

Overflow Weir Slope = H:V (enter zero for flat grate)

Horiz. Length of Weir Sides = feet

Overflow Grate Open Area % = % , grate open area/total area

Debris Clogging % = %

Calculated Parameters for Overflow Weir

Height of Grate Upper Edge, H_u = feet

Overflow Weir Slope Length = feet

Grate Open Area / 100-yr Orifice Area = should be ≥ 4

Overflow Grate Open Area w/o Debris = ft²

Overflow Grate Open Area w/ Debris = ft²

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

Depth to Invert of Outlet Pipe = ft (distance below basin bottom at Stage = 0 ft)

Outlet Pipe Diameter = inches

Restrictor Plate Height Above Pipe Invert = inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

Outlet Orifice Area = ft²

Outlet Orifice Centroid = feet

Half-Central Angle of Restrictor Plate on Pipe = radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage = ft (relative to basin bottom at Stage = 0 ft)

Spillway Crest Length = feet

Spillway End Slopes = H:V

Freeboard above Max Water Surface = feet

Calculated Parameters for Spillway

Spillway Design Flow Depth = feet

Stage at Top of Freeboard = feet

Basin Area at Top of Freeboard = acres

Routed Hydrograph Results

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	0.53	1.07	1.06	1.43	1.66	0.00	2.26	2.60	0.00
One-Hour Rainfall Depth (in) =	1.062	2.808	2.343	3.786	4.925	0.000	8.860	11.102	0.000
Calculated Runoff Volume (acre-ft) =									
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	1.060	2.805	2.341	3.782	4.921	#N/A	8.848	11.092	#N/A
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.01	0.11	0.30	0.00	0.99	1.32	0.00
Predevelopment Peak Q (cfs) =	0.0	0.0	0.8	7.2	19.7	0.0	64.4	86.5	0.0
Peak Inflow Q (cfs) =	16.7	43.7	36.6	58.7	76.0	#N/A	134.5	167.4	#N/A
Peak Outflow Q (cfs) =	0.5	1.1	1.0	7.4	19.8	#N/A	40.2	43.5	#N/A
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.0	1.0	#N/A	0.6	0.5	#N/A
Structure Controlling Flow =	Plate	Plate	Plate	Overflow Grate 1	Overflow Grate 1	#N/A	Outlet Plate 1	N/A	#N/A
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.1	0.4	#N/A	0.9	1.0	#N/A
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	#N/A	N/A	N/A	#N/A
Time to Drain 97% of Inflow Volume (hours) =	38	64	59	65	63	#N/A	58	55	#N/A
Time to Drain 99% of Inflow Volume (hours) =	40	67	63	70	69	#N/A	67	66	#N/A
Maximum Ponding Depth (ft) =	3.27	5.26	4.77	5.93	6.44	#N/A	8.22	9.50	#N/A
Area at Maximum Ponding Depth (acres) =	0.74	0.91	0.87	0.96	1.00	#N/A	1.15	1.26	#N/A
Maximum Volume Stored (acre-ft) =	0.981	2.642	2.198	3.257	3.766	#N/A	5.677	7.221	#N/A

Phase III Drainage Report

**Founders Village Filing 24 – 1st Amendment
CD21-0011**

Prepared for:

Fourth Investments, LLC
PO Box 5127
Gypsum, Colorado 81637
(970) 470.2087 voice
Contact: John V. Hill

Prepared by:



Redland
WHERE GREAT PLACES BEGIN

720.283.6783 Office
1500 West Canal Court
Littleton, Colorado 80120
REDLAND.COM

May 28, 2021
Project No. 17026.002

in a proposed storm sewer main to the west then north before out falling into the existing detention pond. By routing these flows further west before conveying it to the pond Tract B will become a more efficient parcel to develop in the future. The proposed storm sewer will be sized to not only accommodate the flows from the 'C' Basins of Founders Village Filing 24 but also future developed flows from Lot 1 and Tract B. This application does not propose an increase in the current impervious area but will approximate the future impervious values in order to ensure the storm sewer is being designed for future developed use.

Flood Hazard and Drainage Studies Relevant to the Site

Based on the FEMA FIRM, Map 08035C0306G, effective date March 16, 2016, which can be found in Appendix A, the PLD parcel and the future multi-family parcel are located within Zone X (Area of Minimal Flood Hazard) and are not located within a 100-year floodplain. Located in the existing Tract S of Founders Village Filing 24 is Mitchell Gulch which contains a FEMA designated Zone AE floodway. Proposed Tracts A, B, and Lot 1 will not encroach into Mitchell Gulch or the regulated FEMA floodplain.

Soil Type

The Natural Resource Conservation Service (NRCS) soil survey site map indicates that the soil on site is primarily Coni rocky loam (79.9%), whose hydrologic soil group is Type D, having a very slow infiltration rate and Fondis clay loam (20.1%), whose hydrologic soil group is Type C, having a slow infiltration rate. A soil map has been included in Appendix A for reference.

Drainage Basin and Sub-Basins

Major Basins

Based on the Founders Village Filing 24 Rock Canyon Phase III Drainage Report by TCB dated April 2006, the Site lies within major Basins H-1 and H-3. These basins generally flowed northwest to Mitchell Gulch on the west side of the property. Mitchell Gulch outfalls to Cherry Creek approximately two miles downstream of the property. These major Basins were divided into sub-basins in the Approved Report by Core Consultants. The intent of this application is to remain in conformance with the Approved Report and modify the sub-basins west of Mitchell Street to better route runoff around Tract B and ultimately to the existing detention pond.

Sub Basins

Basin A1 (5.08 Acres)

Basin A1 is undeveloped land located within Lot 1 on the west side of Mitchell Street. Generally, runoff from this basin sheet flows to the west and is collected in various ravines that outfall into

Mitchell Gulch. The current overall imperviousness is 2%. This condition will remain until future development will be required to treat and detain the runoff. It is anticipated that the future development will have an overall imperviousness of 70% and the runoff will flow northwest to Design Point 1 where it will be collected and enter the proposed storm sewer. Runoff will then be conveyed north in the storm sewer to the existing detention pond. Basin A1 is anticipated to produce approximately 13.0 cfs in the 5-year event and 29.9 cfs in the 100-year event in the fully developed condition.

$$C_5 = 0.61 \quad C_{100} = 0.77$$

$$Q_5 = 13.0 \text{ CFS} \quad Q_{100} = 29.9 \text{ CFS}$$

Basin A2 (8.06 Acres)

Basin A2 is undeveloped land located in Tract B on the west side of Mitchell Street just south of the existing detention pond and Mesa Middle School. Generally, runoff from this basin sheet flows to the north and west. The basin currently contains a swale running from the southeast end of the basin up to the northwestern corner. This swale conveys runoff from the Founders Village Filing 24 development on the east side of Mitchell Street to the existing detention pond.

The current overall imperviousness is 2%. This condition will remain until future development will be required to treat and detain the runoff. It is anticipated that the future development will have an overall imperviousness of 70% and the runoff will flow northwest to Design Point 2 where it will be collected and enter the proposed storm sewer. The anticipated impervious value was provided by the Douglas County School District engineer, the correspondence with the School District engineer can be found in Appendix D. Runoff will then be conveyed north in the storm sewer to the existing detention pond. Basin A2 is anticipated to produce approximately 19.9 cfs in the 5-year event and 45.8 cfs in the 100-year event in the fully developed condition.

$$C_5 = 0.61 \quad C_{100} = 0.77$$

$$Q_5 = 19.9 \text{ CFS} \quad Q_{100} = 45.8 \text{ CFS}$$

Basin A3 (2.60 Acres)

Basin A3 is undeveloped land located in Tract B on the west side of Mitchell Street, just east of the existing detention pond and south of Mesa Middle School. Generally, runoff from this basin sheet flows to the west and is collected in the existing detention pond. The current overall imperviousness is 2%. This condition will remain until future development will be required to treat and detain the runoff. It is anticipated that the future development will have an overall imperviousness of 70% and the runoff will flow west to Design Point 3 where it will enter the

existing detention pond. Basin A3 is anticipated to produce approximately 7.8 cfs in the 5-year event and 17.9 cfs in the 100-year event in the fully developed condition.

$$C_5 = 0.61 \quad C_{100} = 0.77$$

$$Q_5 = 7.8 \text{ CFS} \quad Q_{100} = 17.9 \text{ CFS}$$

Basin B1 (3.76 Acres)

Basin B1 is undeveloped land located in Lot 1 at the northwest corner of Mitchell Street and Mickelson Boulevard. Generally, runoff from this basin sheet flows to the southwest and into Mitchell Gulch. The current overall imperviousness is 2%. This condition will remain until future development will be required to treat and detain the runoff. Since this basin currently flows away from the existing detention pond, it is anticipated that the future development will provide water quality for this runoff and will over-detain in the existing detention pond so the site as a whole remains at historical release rates. It is also anticipated the overall imperviousness of the site will be 70% and the runoff will flow west to Mitchell Gulch at Design Point 4. Basin B1 is anticipated to produce approximately 8.1 cfs in the 5-year event and 18.6 cfs in the 100-year event in the fully developed condition.

$$C_2 = 0.61 \quad C_{100} = 0.77$$

$$Q_2 = 8.1 \text{ CFS} \quad Q_{100} = 18.6 \text{ CFS}$$

Basin B2 (1.46 Acres)

Basin B2 is undeveloped land located in Tract B at the northwest corner of the Site, directly south of the existing detention pond. Generally, runoff from this basin sheet flows to the west and into Mitchell Gulch at Design Point 5. The current overall imperviousness is 2%. This condition will remain, since it is highly unlikely that this basin is developed due to the proximity to Mitchell Gulch and the prevailing existing grades. Basin B2 is anticipated to produce approximately 0.2 cfs in the 5-year event and 4.0 cfs in the 100-year event.

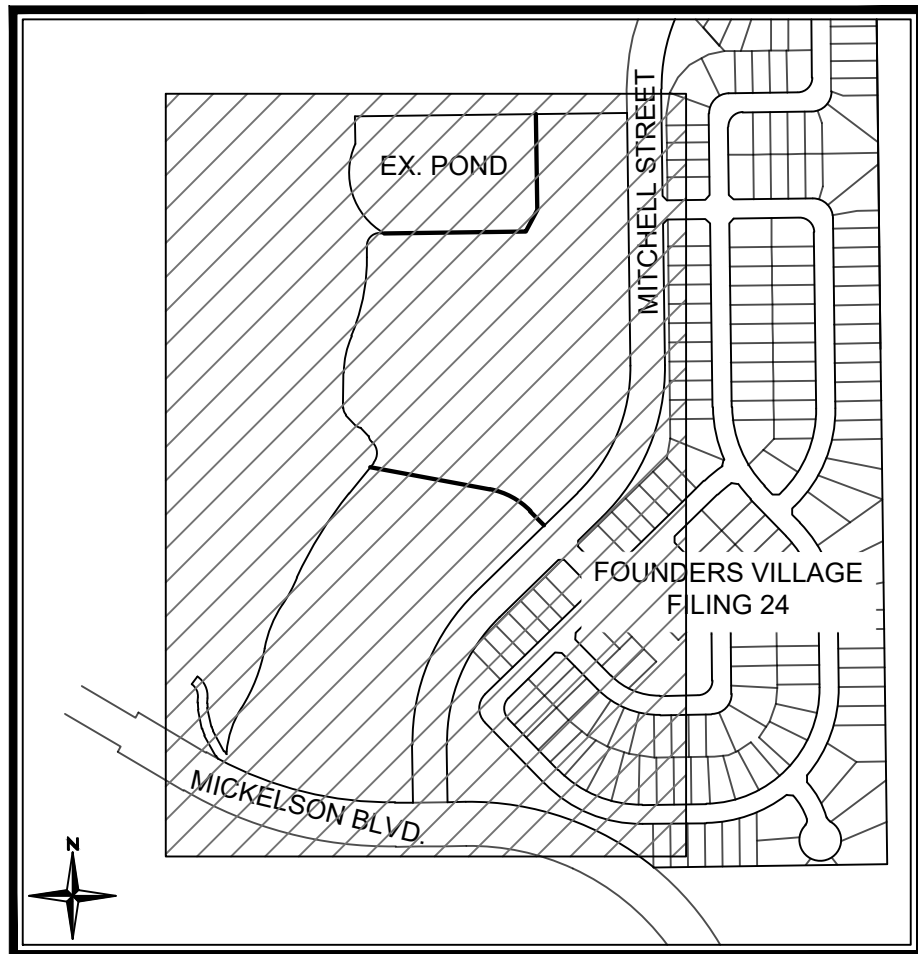
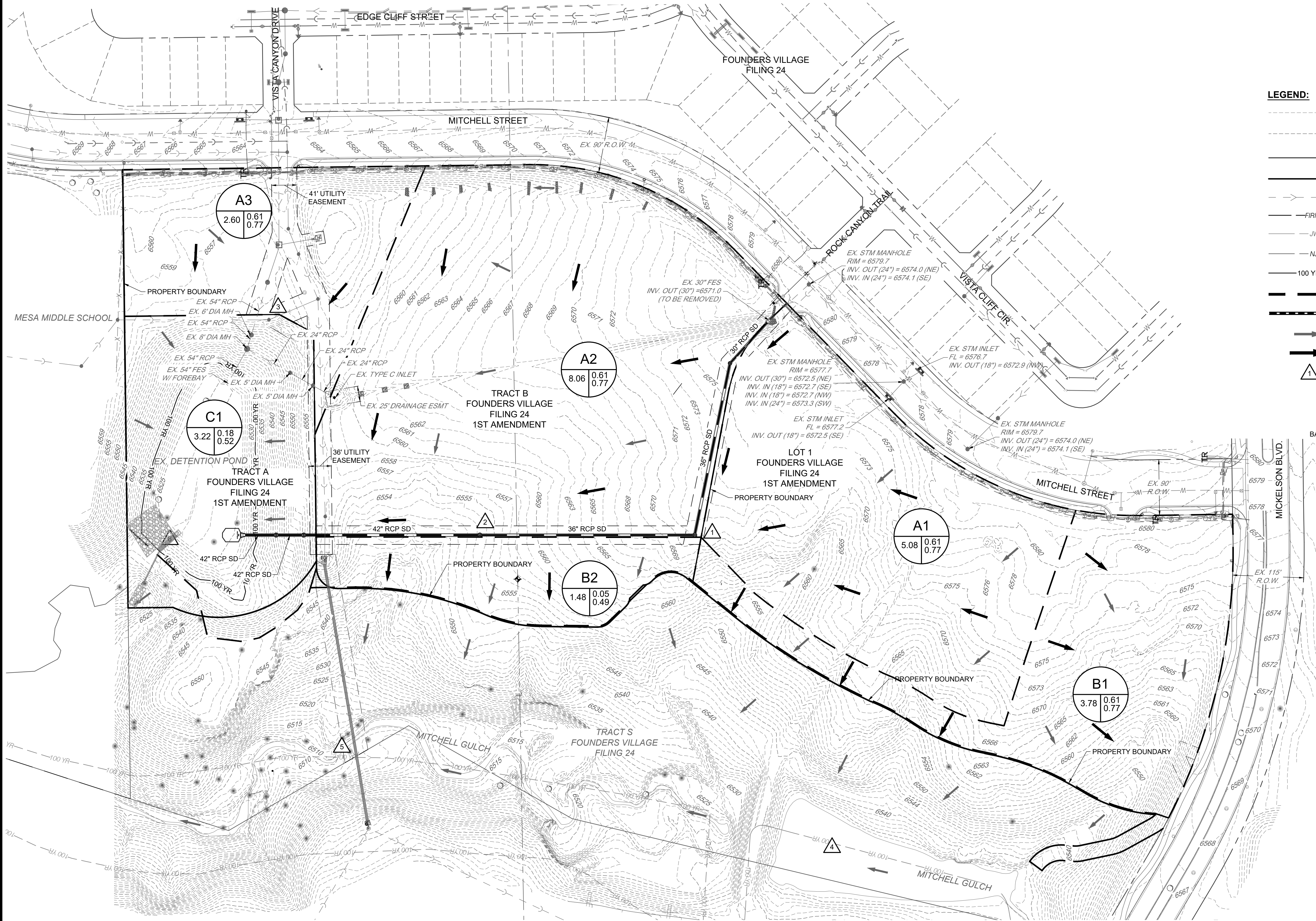
$$C_5 = 0.05 \quad C_{100} = 0.49$$

$$Q_5 = 0.2 \text{ CFS} \quad Q_{100} = 4.0 \text{ CFS}$$

Basin C1 (3.32 Acres)

Basin C1 is undeveloped land located in Tract A at the northwest corner of the Site. Generally, runoff from this basin sheet flows into the existing detention pond and outfalls to Mitchell Gulch at Design Point 6. The current overall imperviousness is 2%. This condition will remain, since it is

I:\2017\17026 - Bella Mesa\CAD\Sheet Sets\17026.002 - Bella Mesa PLD\Drawings\17026.002 - Bella Mesa PLD - SDP Drainage Map - recovery.dwg Job: Layout1 Apr 13, 2021 7:55pm erumney



LEGEND:

- EXISTING MINOR CONTOUR (2FT)
- EXISTING MAJOR CONTOUR (10 FT)
- PROPOSED MINOR CONTOUR (2FT)
- PROPOSED MAJOR CONTOUR (10 FT)
- EXISTING STORM SEWER
- EXISTING FLOODPLAIN
- EXISTING JURISDICTIONAL WETLAND
- EXISTING NON-JURISDICTIONAL WETLAND
- EXISTING 100 YEAR WATER SURFACE ELEVATION
- PROPOSED DRAINAGE BASIN
- PROPOSED STORM SEWER
- EXISTING FLOW DIRECTION
- ANTICIPATED FUTURE FLOW DIRECTION
- DESIGN POINT

DRAINAGE BASIN ID	
BASIN ACREAGE (AC)	
A	2.30
C ₅	0.18
C ₁₀₀	0.52

FOUNDERS VILLAGE FILING 24 WEST

DRAINAGE MAP

SHEET

DRG-1



DRAWN	EBR
CHECKED	MTP
APPROVED	EBR
PROJECT NO.	17026.002
HORIZ. SCALE	1" = 50'
VERT. SCALE	N/A

DATE	NO.	NOTES

FOUNDERS VILLAGE FILING 24 WEST

DRAINAGE MAP

SHEET

DRG-1



DRAWN	EBR
CHECKED	MTP
APPROVED	EBR
PROJECT NO.	17026.002
HORIZ. SCALE	1" = 50'
VERT. SCALE	N/A

DATE	NO.	NOTES

FOUNDERS VILLAGE FILING 24 WEST

DRAINAGE MAP

SHEET

DRG-1



DRAWN	EBR
CHECKED	MTP
APPROVED	EBR
PROJECT NO.	17026.002
HORIZ. SCALE	1" = 50'
VERT. SCALE	N/A

DATE	NO.	NOTES

FOUNDERS VILLAGE FILING 24 WEST

DRAINAGE MAP

SHEET

DRG-1



DRAWN	EBR
CHECKED	MTP
APPROVED	EBR
PROJECT NO.	17026.002
HORIZ. SCALE	1" = 50'
VERT. SCALE	N/A

DATE	NO.	NOTES

FOUNDERS VILLAGE FILING 24 WEST

DRAINAGE MAP

SHEET

DRG-1



DRAWN	EBR
CHECKED	MTP
APPROVED	EBR
PROJECT NO.	17026.002
HORIZ. SCALE	1" = 50'
VERT. SCALE	N/A

DATE	NO.	NOTES

FOUNDERS VILLAGE FILING 24 WEST

DRAINAGE MAP

SHEET

DRG-1



DRAWN	EBR
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APPROVED	EBR
PROJECT NO.	17026.002
HORIZ. SCALE	1" = 50'
VERT. SCALE	N/A

DATE	NO.	NOTES

FOUNDERS VILLAGE FILING 24 WEST

DRAINAGE MAP

SHEET

DRG-1



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APPROVED	EBR
PROJECT NO.	17026.002
HORIZ. SCALE	1" = 50'
VERT. SCALE	N/A

DATE	NO.	NOTES

FOUNDERS VILLAGE FILING 24 WEST

DRAINAGE MAP

SHEET

DRG-1



DRAWN	EBR
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APPROVED	EBR
PROJECT NO.	17026.002
HORIZ. SCALE	1" = 50'
VERT. SCALE	N/A

DATE	NO.	NOTES

FOUNDERS VILLAGE FILING 24 WEST

DRAINAGE MAP

SHEET

DRG-1



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CHECKED	MTP
APPROVED	EBR
PROJECT NO.	17026.002
HORIZ. SCALE	1" = 50'
VERT. SCALE	N/A

DATE	NO.	NOTES

FOUNDERS VILLAGE FILING 24 WEST

DRAINAGE MAP

SHEET

DRG-1



DRAWN	EBR
CHECKED	MTP
APPROVED	EBR
PROJECT NO.	17026.002
HORIZ. SCALE	1" = 50'
VERT. SCALE	N/A

DATE	NO.	NOTES

FOUNDERS VILLAGE FILING 24 WEST

DRAINAGE MAP

SHEET

DRG-1



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CHECKED	MTP
APPROVED	EBR
PROJECT NO.	17026.002
HORIZ. SCALE	1" = 50'
VERT. SCALE	N/A

DATE	NO.	NOTES

FOUNDERS VILLAGE FILING 24 WEST

DRAINAGE MAP

SHEET

DRG-1



DRAWN	EBR
CHECKED	MTP
APPROVED	EBR
PROJECT NO.	17026.002
HORIZ. SCALE	1" = 50'
VERT. SCALE	N/A

DATE	NO.	NOTES

FOUNDERS VILLAGE FILING 24 WEST

DRAINAGE MAP

SHEET

DRG-1



DRAWN	EBR
CHECKED	MTP
APPROVED	EBR
PROJECT NO.	17026.002
HORIZ. SCALE	1" = 50'
VERT. SCALE	N/A

DATE	NO.	NOTES

FOUNDERS VILLAGE FILING 24 WEST

DRAINAGE MAP

SHEET

DRG-1



DRAWN	EBR
CHECKED	MTP
APPROVED	EBR
PROJECT NO.	17026.002
HORIZ. SCALE	1" = 50'
VERT. SCALE	N/A

DATE	NO.	NOTES

FOUNDERS VILLAGE FILING 24 WEST

DRAINAGE MAP

SHEET

DRG-1



DRAWN	EBR
CHECKED	MTP
APPROVED	EBR
PROJECT NO.	17026.002
HORIZ. SCALE	1" = 50'
VERT. SCALE	N/A

DATE	NO.	NOTES

FOUNDERS VILLAGE FILING 24 WEST

DRAINAGE MAP

SHEET

DRG-1



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PROJECT NO.	17026.002
HORIZ. SCALE	1" = 50'
VERT. SCALE	N/A

DATE	NO.	NOTES

FOUNDERS VILLAGE FILING 24 WEST

DRAINAGE MAP

SHEET

DRG-1



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PROJECT NO.	17026.002
HORIZ. SCALE	1" = 50'
VERT. SCALE	N/A

DATE	NO.	NOTES

FOUNDERS VILLAGE FILING 24 WEST

DRAINAGE MAP

SHEET

DRG-1



DRAWN	EBR
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PROJECT NO.	17026.002
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VERT. SCALE	N/A

DATE	NO.	NOTES

FOUNDERS VILLAGE FILING 24 WEST

DRAINAGE MAP

SHEET

DRG-1



DRAWN	EBR
CHECKED	MTP
APPROVED	EBR
PROJECT NO.	17026.002
HORIZ. SCALE	1" = 50'
VERT. SCALE	N/A

DATE	NO.	NOTES

MIKELSON BOULEVARD
PHASE III DRAINAGE AND
EROSION CONTROL REPORT

for

Castlewood Ranch LLC.

David J. Erb
Orchard Pointe, Suite 5550
8480 East Orchard Road
Englewood, Colorado 80111
(303) 740-7557

prepared by

Nolte Associates, Inc.
7000 S. Yosemite Street, Suite 200
Englewood, Colorado 80112
(303) 220-1001

November 1999
Revised May 2000

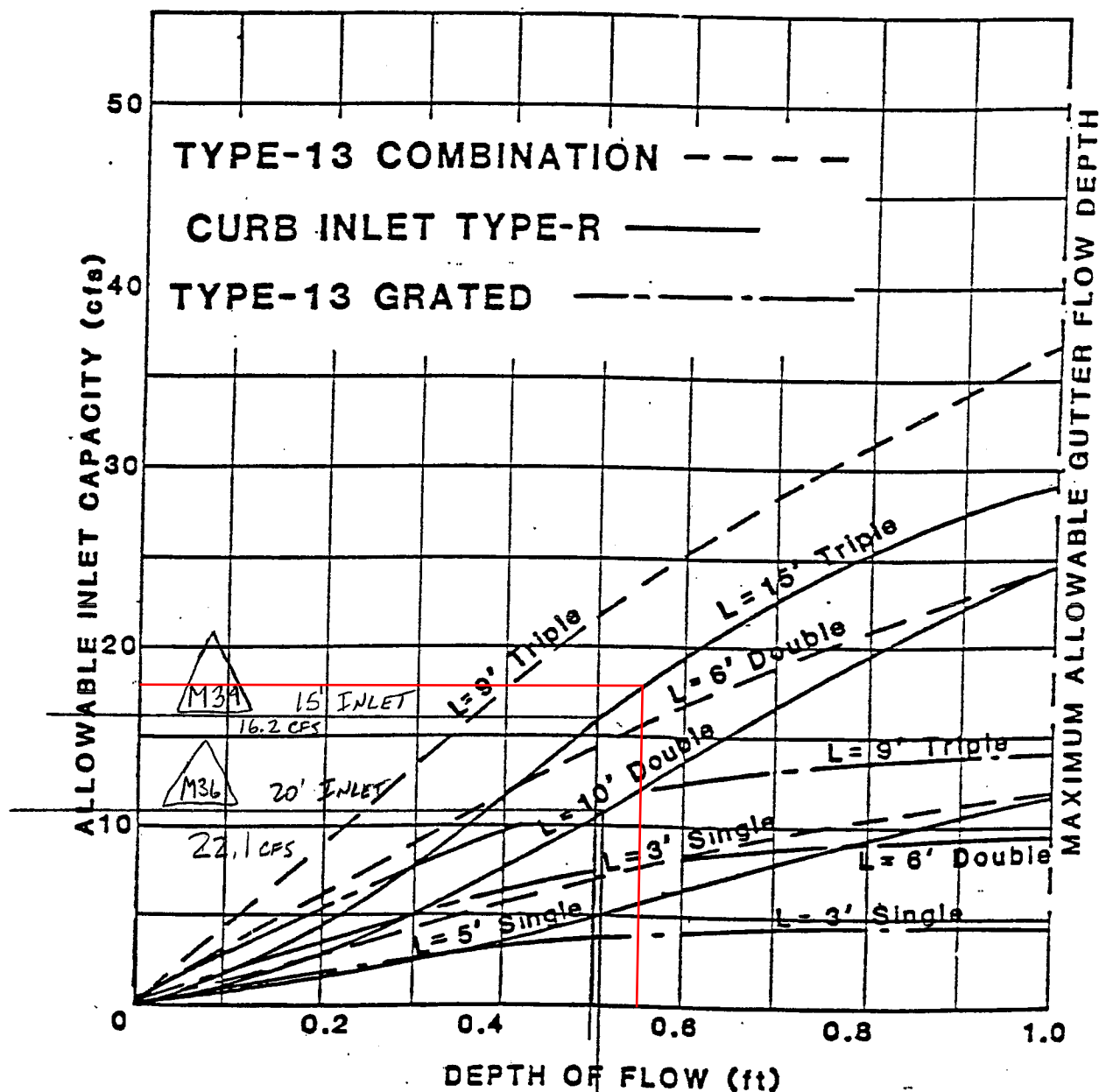
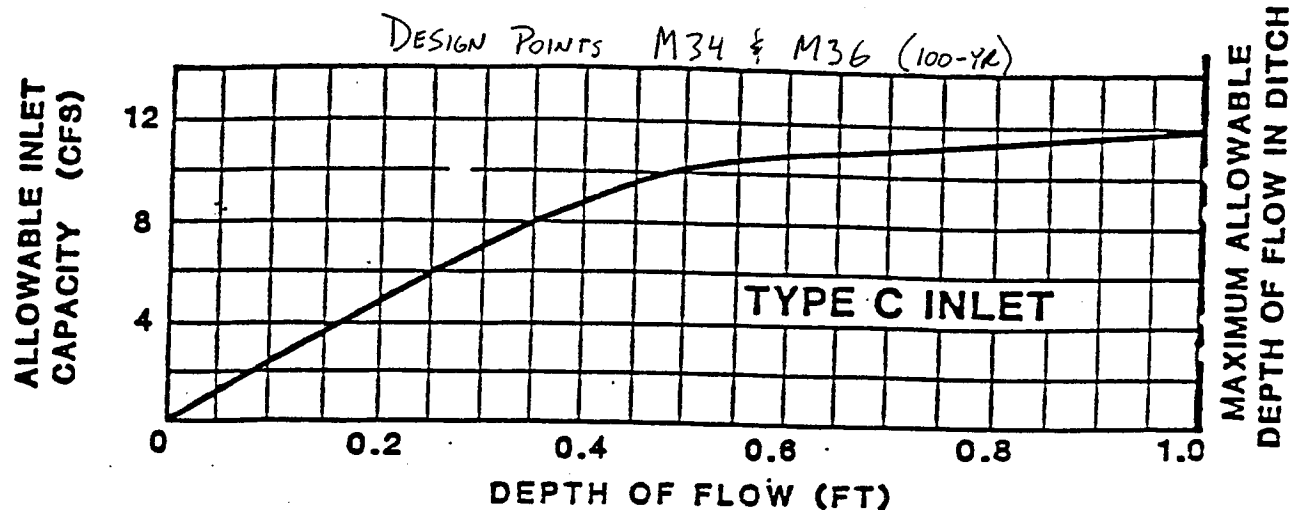
Calc. by: RBM
Chk'd by: TAA
Date: 10/11

11rational.xls

Calc. by: RBM
Chk'd by: TAY
Date: 10/11

TOWN OF CASTLE ROCK

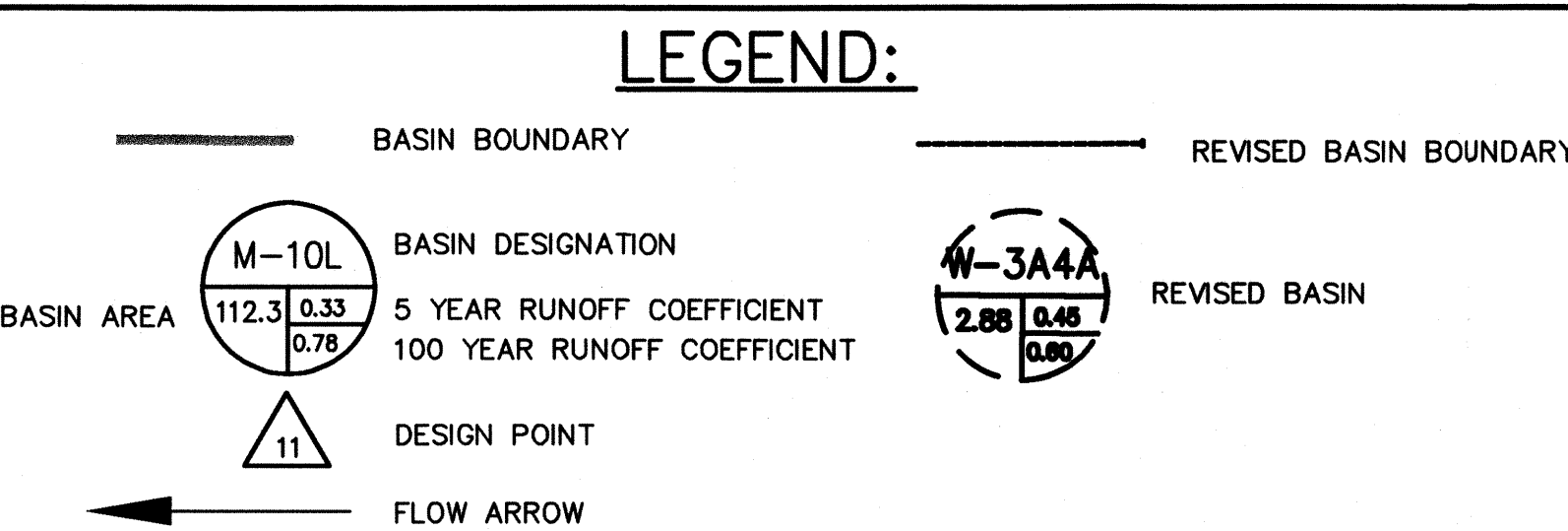
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10/11/99
7:24 AM



Y:	RBD	TOWN OF CASTLE ROCK	 PUBLIC WORKS	STD. DWG NO.
ROVED BY:		ALLOWABLE INLET CAPACITY		FIGURE 803
E: 4/11/98		SUMP CONDITIONS - ALL INLETS		

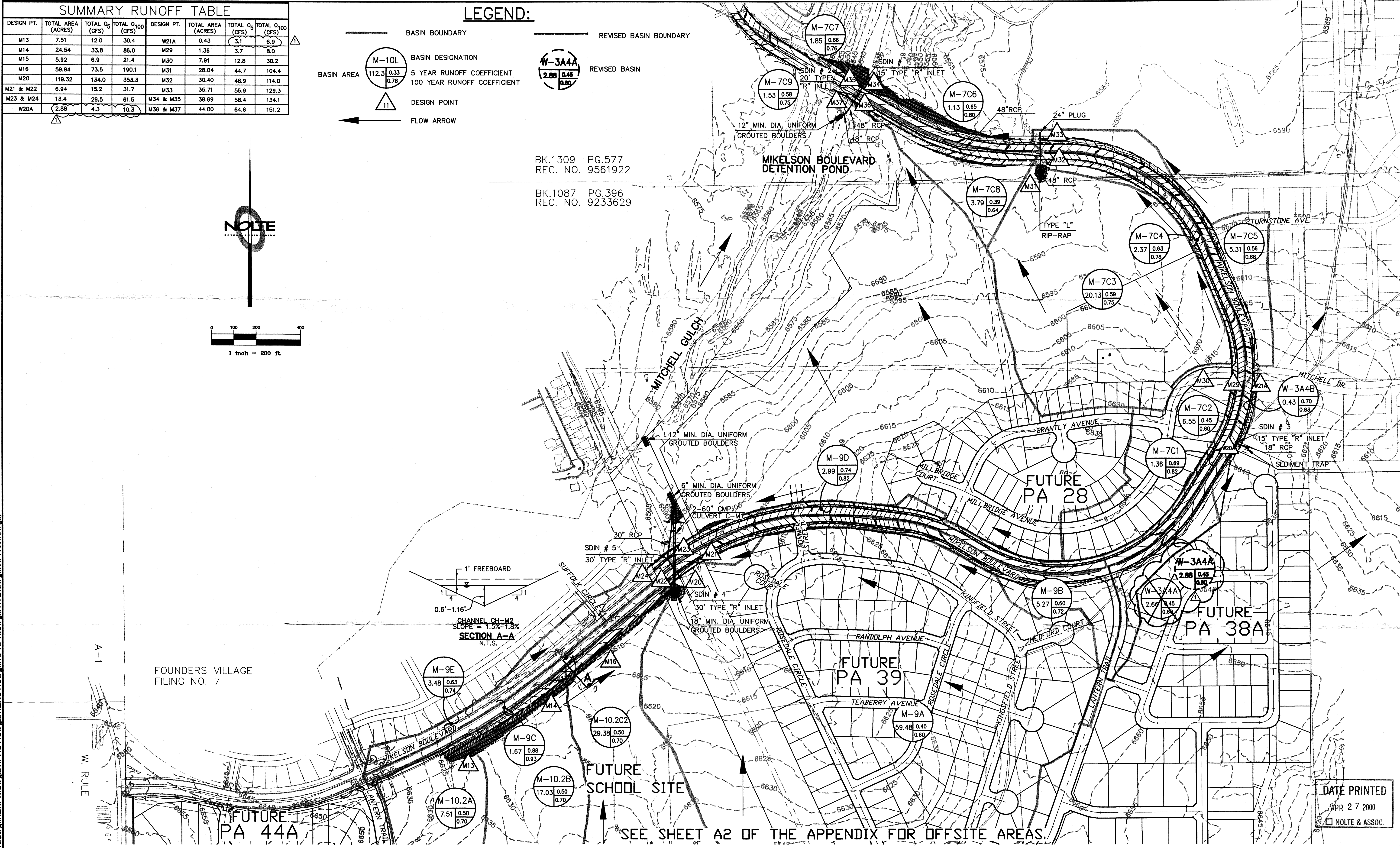
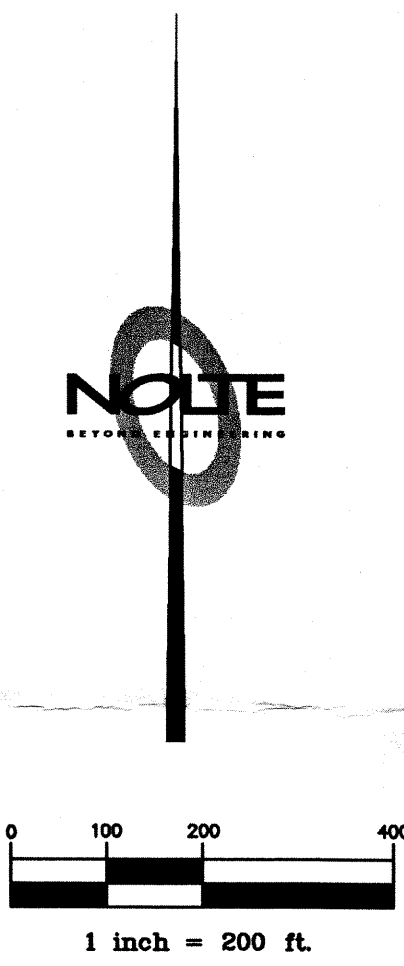
A20

SUMMARY RUNOFF TABLE							
DESIGN PT.	TOTAL AREA (ACRES)	TOTAL Q ₅ (CFS)	TOTAL Q ₁₀₀ (CFS)	DESIGN PT.	TOTAL AREA (ACRES)	TOTAL Q ₅ (CFS)	TOTAL Q ₁₀₀ (CFS)
M13	7.51	12.0	30.4	W21A	0.43	3.1	6.9
M14	24.54	33.8	86.0	M29	1.36	3.7	8.0
M15	5.92	6.9	21.4	M30	7.91	12.8	30.2
M16	59.84	73.5	190.1	M31	28.04	44.7	104.4
M20	119.32	134.0	353.3	M32	30.40	48.9	114.0
M21 & M22	6.94	15.2	31.7	M33	35.71	55.9	129.3
M23 & M24	13.4	29.5	61.5	M34 & M35	38.69	58.4	134.1
W20A	2.88	4.3	10.3	M36 & M37	44.00	64.6	151.2



BK.1309 PG.577
REC. NO. 9561922

BK.1087 PG.396
REC. NO. 9233629



\\S:\BASE.dwg...1EXCN.dwg...1EXPND.dwg...1IPRUT.dwg...1IEXUT.dwg...1IPRPN.dwg...1ITB.dwg...1IPRCN.dwg...

REVISION	DATE	BY	DESCRIPTION
1	04-26-00	RBM	Basin W-3A4A increased in size

CAUTION: The engineer preparing these plans will not be responsible for, or liable for, unauthorized changes to or uses of these plans. All changes to the plans must be in writing and must be approved by the preparer of these plans.

NOLTE

BEYOND ENGINEERING

7000 S. YOSEMITE ST., SUITE 200 ENGLEWOOD, CO. 80112
303.220.1001 TEL 303.220.9001 FAX WWW.NOLTE.COM

CASTLEWOOD RANCH

MIKELSON BOULEVARD
DRAINAGE EXHIBIT

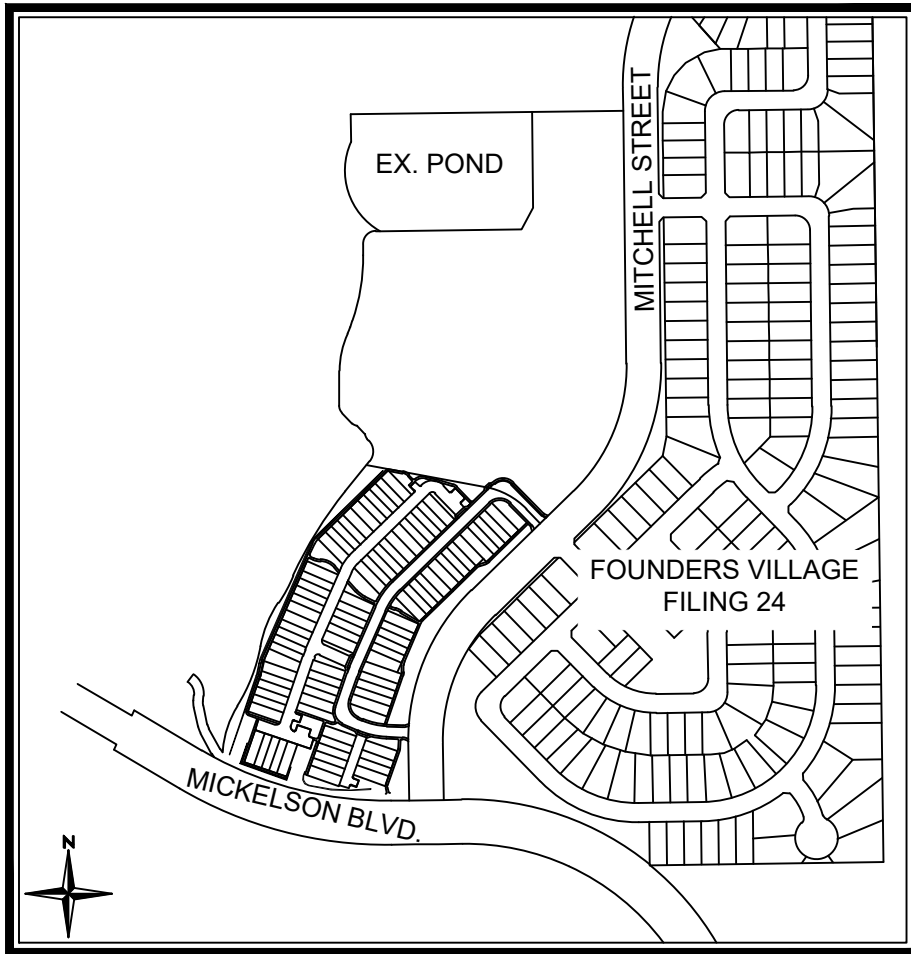
PREPARED FOR: CASTLEWOOD RANCH LLC

HORIZONTAL SCALE 1" = 200'		VERTICAL SCALE N.T.S		SHEET DR1	
DESIGNER RBM		DRAFTER HGD		CHECKED GVM	
DRAWING NAME 11DR1.DWG		PLOTING DATE 04/25/00		OF 1 SHEETS	
PATH N:\DV1600\CIVIL\Cadd\PH 11\				JOB NUMBER DV1611	

DATE PRINTED
APR 27 2000
NOLTE & ASSOC.

SITE DEVELOPMENT PLAN
BELLA MESA SOUTH

LOCATED IN THE SOUTHEAST QUARTER SECTION 8, TOWNSHIP 8 SOUTH, RANGE 66 WEST OF THE SIXTH PRINCIPAL MERIDIAN,
TOWN OF CASTLE ROCK, COUNTY OF DOUGLAS, STATE OF COLORADO.
TOWN OF CASTLE ROCK PROJECT NUMBER SDP25-0014



KEY MAP
N.T.S.

DRAINAGE LEGEND

- EXISTING MINOR CONTOUR
- EXISTING MAJOR CONTOUR
- PROPOSED MINOR CONTOUR
- PROPOSED MAJOR CONTOUR
- PROPOSED STORM SEWER LINE
- PROPOSED OPEN CHANNEL
- FEMA 100-YEAR FLOOD PLAIN
- PROPOSED BASIN BOUNDARY
- EXISTING BASIN BOUNDARY
- CURB AND GUTTER

A1
0.00 0.00 0.00
BASIN ID
5 YEAR RUNOFF
100 YEAR RUNOFF
BASIN AREA (ACRES)

PROPOSED DESIGN POINT

E1
0.00 0.00 0.00
EXISTING BASIN ID
5 YEAR RUNOFF
100 YEAR RUNOFF
BASIN AREA (ACRES)

FLOW ARROW

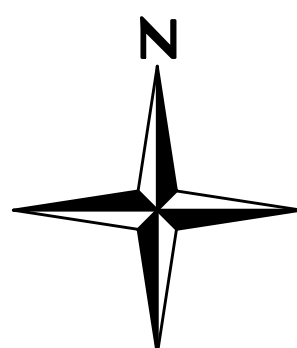
EMERGENCY OVERFLOW PATH ARROW

Basin Summary Table						
Basin	Area (AC)	Runoff Coefficients			Peak Flows (cfs)	
		C5	C100	I (%)	Q5	Q100
A1	0.38	0.50	0.72	57%	0.7	1.7
A2	0.74	0.45	0.69	51%	1.2	3.5
A3	0.33	0.66	0.80	76%	0.9	2.1
A4	0.35	0.67	0.80	78%	1.0	2.2
A5	0.35	0.61	0.77	70%	1.0	2.3
A6	0.75	0.67	0.80	78%	2.0	4.3
A7	0.10	0.71	0.82	83%	0.3	0.7
A8	1.20	0.64	0.79	74%	3.0	6.7
A9	0.85	0.64	0.79	74%	2.2	5.0

Basin Summary Table						
Basin	Area (AC)	Runoff Coefficients			Peak Flows (cfs)	
		C5	C100	I (%)	Q5	Q100
B1	0.37	0.54	0.74	61%	0.9	2.2
B2	0.80	0.63	0.78	72%	2.0	4.5
B3	0.97	0.62	0.78	72%	2.6	5.9

Basin Summary Table						
Basin	Area (AC)	Runoff Coefficients			Peak Flows (cfs)	
		C5	C100	I (%)	Q5	Q100
C1	1.14	0.42	0.67	46%	2.3	6.8
C2	0.49	0.31	0.62	34%	0.5	1.9
C3	0.13	0.08	0.50	5%	0.03	0.4

Basin Summary Table						
Basin	Area (AC)	Runoff Coefficients			Peak Flows (cfs)	
		C5	C100	I (%)	Q5	Q100
OSA5	0.01	0.81	0.87	95%	0.0	0.1
OSA7	0.11	0.81	0.87	95%	0.4	0.8
OSB1	0.06	0.81	0.87	95%	0.2	0.5
OSB2	0.02	0.81	0.87	95%	0.1	0.1



0 25 50 100
SCALE: 1" = 50'

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REDLAND.COM • Civil Engineering • Construction Management

NOT FOR
CONSTRUCTION

PROJECT NO. 17026.007		NOTES	
DATE	NO.	DATE	NO.
05/02/2025	1	FIRST SUBMITTAL	
09/17/2025	2	SECOND SUBMITTAL	
11/02/2025	3	THIRD SUBMITTAL	
01/13/2026	4	FOURTH SUBMITTAL	
02/12/2026	5	FIFTH SUBMITTAL	
02/20/2026	6	SIXTH SUBMITTAL	

BELLA MESA SOUTH
SITE DEVELOPMENT PLAN
DRAINAGE PLAN

SHEET

DRN

Appendix F - MS4 Permit and Water Quality Determination Worksheet

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

Project:	Bella Mesa South	Project#	SDP25-0014	Applicant:	Cardel Homes
Section	Questions	Response	Check those that apply	Instructions	
1	Non-applicable Sites				
1.1	Will the project result in a temporary disturbance of greater than one acre?	No Yes	☐ ☒	Proceed to section 1.2. 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 Yes	☐ ☐	Proceed to section 1.3. Proceed to section 2.	
1.3	Is the project within the Cherry Creek Watershed?	Yes No	☐ ☐	Permanent water quality control measures may be required. Refer to Water Quality Control Regulation 72.7 for details and allowable exclusions. Permanent water quality control measures are not required.	
2	Applicable Site Types and Exclusions by Variance				
2.1	Does the project have more than 35% impervious area on the existing site?	No Yes	☒ ☐	Project is an applicable Development Site. Proceed to section 3. Proceed to 2.2.	
2.2	Does the project have greater than 75% impervious area on the existing site?	No Yes	☐ ☐	Project is an applicable Redevelopment Site. Proceed to section 3. 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 No	☐ ☐	No further action required. Proceed to 2.4.	
2.4	Do any other water quality exclusions apply to the site?	No Yes	☐ ☐	Portions of the project are excluded. Proceed with design in accordance with Constrained Redevelopment standards and apply for variance for <u>Constrained Redevelopment Sites</u> . Proceed to section 3. Following approval of other exclusions, design remaining site in accordance with Constrained Redevelopment standards and apply for variance for <u>Constrained Redevelopment Sites</u> .	
3	Applicable Sites with Other Exclusions by Variance				
3.1	Category 1: Roadways, bridges and trails only				
3.1.1	Is the project a bike or pedestrian trail?	Yes No	☐ ☒	Proceed to next line. Proceed to 3.1.2.	
	Is the trail for a roadway?	Yes No	☐ ☐	Proceed to 3.1.2. Project is excluded. Submit variance 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 No	☐ ☒	This exclusion does not apply. Permanent water quality is required. Proceed to 3.1.3.	
3.1.3	Does the project add impervious area?	No Yes	☐ ☒	Project is excluded. Submit variance for <u>Pavement Management Sites Excluded from Permanent Water Quality Requirements</u> . 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 Yes	☒ ☐	Project is excluded. Submit variance for <u>Roadway Redevelopment Sites Excluded from Permanent Water Quality Requirements</u> . Proceed to next line.
	Does the project add more than one acre of paved area per mile to an existing roadway?	No Yes	☒ ☐	Project is excluded. Submit variance for <u>Roadway Redevelopment Sites Excluded from Permanent Water Quality Requirements</u> . Proceed to next line.
	Does the project increase the width by two times or more, on average, of the original roadway area?	No Yes	☒ ☐	Existing areas of site are excluded only. Submit variance for <u>Existing Roadway Surfaces Only Excluded from Permanent Water Quality Requirements</u> . This exclusion does not apply. Permanent water quality is required.
3.2	Category 2: Non-residential and non-commercial projects only			
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 No	☐ ☒	Project is excluded. Submit variance for <u>Oil and Gas Exploration Sites Excluded from Permanent Water Quality Requirements</u> . Proceed to 3.2.2.
3.2.2	Is the project for stream stabilization?	Yes No	☐ ☒	Project is excluded. Submit variance for <u>Stream Stabilization Sites Excluded from Permanent Water Quality Requirements</u> . 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 No	☐ ☒	Project is excluded. Submit variance for <u>Aboveground and Underground Utilities Excluded from Permanent Water Quality Requirements</u> . 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 No	☐ ☒	Project is excluded. Submit variance for <u>Sites with Land Disturbances to Undeveloped Land that will Remain Undeveloped Excluded from Permanent Water Quality Requirements</u> . 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 Yes	☐ ☒	Project is excluded. Submit study along with variance for <u>Non-residential and Non-commercial Infiltration Conditions Excluded from Permanent Water Quality Requirements</u> . This exclusion does not apply. Permanent water quality is required.
3.3	Category 3: Residential, Agricultural and Commercial projects			
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 No	☐ ☒	Proceed to next line. Proceed to 3.3.2.
	Is the project site greater than 10% impervious?	No Yes	☐ ☐	Project is excluded. Submit variance for <u>Large Lot Single Family Sites Excluded from Permanent Water Quality Requirements</u> . Proceed to next line.
	Is the project site greater than 20% impervious?	Yes No	☐ ☐	This exclusion does not apply. Permanent water quality is required. Proceed to next line.
	Will the post-project condition result in surface water discharge during the 80th percentile storm runoff event?	No Yes	☐ ☐	Project is excluded. Submit study along with variance for <u>Large Lot Single Family Sites Excluded from Permanent Water Quality Requirements</u> . 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 No	☐ ☒	This exclusion does not apply. Permanent water quality is required. Proceed to next line.
	Is all or a portion of the site undeveloped or will it remain undeveloped after construction?	Yes No	☒ ☐	This portion of the project is excluded. Submit variance for <u>Sites with Land Disturbance to Undeveloped Land that will Remain Undeveloped Excluded from Permanent Water Quality Requirements</u> . Proceed to next line. Proceed to next line.
	Is the remaining untreated impervious area greater than 20% of the site?	Yes No	☐ ☒	This exclusion does not apply. Permanent water quality is required. Proceed to next line.
	Is the remaining untreated impervious area greater than one acre?	Yes No	☒ ☐	This exclusion does not apply. Permanent water quality is required. Proceed to next line.
	Is it practicable to capture runoff from portions of the site that will not drain to a control measure?	No Yes	☒ ☐	Document justification demonstrating that it is not practicable to capture runoff from this portion of the site in the drainage report . No further action is needed. 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 _____

Project Owner _____

Project Location _____

ToCR Project Number _____

Total Site Area _____ acres

Total Size of Common Plan of Development _____ acres

Check all that apply:

☐ **Project within Plum Creek Basin**

☐ **Project within Cherry Creek Basin**

Estimated construction completion date _____

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

☐ WQCV standard

☐ Pollutant removal standard

☐ Runoff reduction standard

☐ Applicable site draining to regional WQVC control measure (accepts drainage prior to discharging to WOTS)

☐ Applicable site draining to regional WQVC control facility (with receiving pervious area control measure upstream of WOTS)

☐ Constrained redevelopment sites standard

• Imperviousness of existing site _____/_____ (Imp. Ac/Site Ac) = ____%

• Variance required TCV No. _____

☐ Existing control measure with WQCV per previous criteria standards

• Reference Construction Permit No. _____

☐ Cherry Creek Basin only, choose one: ☐ Tier 1 ☐ Tier 2 ☐ Tier 3

☐ No control measures provided (See Permanent WQ Worksheet for applicability)

Summary of Water Quality Conformance to MS4 Permit

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

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

☐ Pavement management site

Excluded impervious area: _____ acres

☐ Excluded roadway redevelopment

Excluded impervious area: _____ acres

☐ Excluded existing roadway areas

Excluded impervious area: _____ acres

☐ Above ground and below ground utilities

☐ Large lot single family home

☐ Non-residential and non-commercial infiltration

Excluded impervious area: _____ acres

☐ Land disturbance for land to remain undeveloped

Excluded impervious area: _____ acres

☐ Stream Stabilization Sites

Excluded impervious area: _____ acres

☐ Trails

Excluded impervious area: _____ acres

☐ Oil and Gas Exploration

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

If yes, complete the following:

Excluded area: _____ acres

Total Site area: _____ acres, _____ % site excluded

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

If yes, complete the following:

Excluded area: _____ acres

Excluded impervious area: _____ acres

Total Site area: _____ acres, _____ % site excluded

Total Impervious area: _____ acres, _____ % impervious excluded