



Drainage Letter

**Viewpoint Estates
Filing No. 2**

Project No. 61099

October 20, 2023

PCD File No. SP-21-005 & SF-21-042

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Drainage Letter

for

Viewpoint Estates Filing No. 2
El Paso County Colorado
Project No. 61099

October 20, 2023

prepared for

Viewpoint Estates LLC
P.O. Box 6797
Colorado Springs, CO 80909

prepared by

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61099-Viewpoint Estates Drainage Letter.odt

Statements and Acknowledgments

Please stamp and sign

Engineer's Statement

This report and plan for the drainage design of Viewpoint Estates Filing No. 2 was prepared by me (or under my direct supervision) in accordance with the provisions of The City of Colorado Springs Drainage Criteria Manual for the owners thereof. I understand that the City of Colorado Springs does not and will not assume liability for drainage facilities designed by others.

[Redacted Signature]

Charles C. Crum, P.E.
For and on Behalf of MVE, Inc.

Colorado No. 13348

[Redacted Signature]

Date

Developer's Statement

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

[Redacted Signature]

Viewpoint Estates LLC, Owner
P.O. Box 6797
Colorado Springs, CO 80909

[Redacted Signature]

Date

El Paso County

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

Joshua Palmer
County Engineer/ECM Administrator

Date

Conditions:

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Drainage Letter

Introduction:

The purpose of this Drainage Letter for Viewpoint Estates Filing No. 2 is to update the approved Final Drainage Report for Viewpoint Estates to allow the development of the proposed seven (7) lot subdivision. The owner intends to vacate and re-plat lots 71 & 72, Viewpoint Estates into seven (7) lots. The approved drainage report for the original subdivision is titled "Viewpoint Estates Final Drainage Report" prepared by Pacific Summits Engineering LTD, dated January 6, 1998 and approved by the El Paso County Engineer on October 6, 1999 with PCD Filing No. SF98040.

1 General Location and Description

1.1 Site Description:

The existing subdivision known as Viewpoint Estates is located in the South One-Half of the South One-Half of Section 10, Township 14 South, Range 63 West of the 6th P.M., El Paso County, Colorado. The current addresses for the properties to be vacated and re-platted are 21209 & 21307 Chesley Drive, and are currently vacant parcels. The vacation and re-plat is located on the north side of Highway 94, east of N. Ellicott Hwy., and west of Peyton Hwy. The site is located in both the Telephone Exchange Drainage Basin (CHWS0200), and the Ellicott Consolidated Drainage Basin (CHBS1200). Both of the drainage basins in which the site resides drain to Chico Creek. The vacation and re-plat is 24.33± acres in area, and is zoned RR-2.5 containing two (2) rural residential lots.

The site is bounded on the north by 72 residential lots in Viewpoint Estates. The east side of the Lot 72 is adjacent to a large vacant lot, zoned RR-5, that is utilized as grazing land. Highway 94 borders the south side of the site. The parcel to the west of Lot 71 is a vacant lot zoned RR-5.

The vacation and re-plat area is split east & west by existing Antelope Drive, a public paved road in a 60 ft right-of-way, running north & south through the site between existing lots 71 & 72. Highway 94, a public paved road in a 100 ft right-of-way is adjacent to the south side of the vacation and re-plat lands. Chesley Drive, a public paved road in a 60 ft right-of-way, is adjacent to the northern border and provides access to the proposed re-plat from Antelope drive.

1.2 Floodplain Statement:

According to the Federal Emergency Management Agency's Flood Insurance Rate Map (FIRM) Community Panel Number 08041C0810G, dated December 7, 2018, for El Paso County, Colorado the site is not located within any Federal Emergency Management Agency (FEMA) designated Special Flood Hazard Areas (SFHA). A portion of the **FIRM** is included with this Drainage Letter for reference.

1.3 Soils:

According to the Natural Resources Conservation Service Web National Cooperative Soil Survey, the soil of the site is made up of Blakeland Loamy Sand (map unit 8), and Truckton Sandy Loam

Drainage Letter

(map unit 96). Blakeland Loamy Sand, which makes up 78.6% of the soil on the site, is part of hydrologic soil group A. The Blakeland Loamy Sand soil is typically deep and somewhat excessively drained. The permeability of the soil is moderate to rapid, surface runoff is medium and hazard of erosion is moderate. Truckton Sandy Loam, which makes up 21.4% of the soil on the site, is part of hydrologic soil group A. The Truckton Sandy Loam soil is typically deep and well drained. The permeability of the soil is moderate to rapid, surface runoff is medium and hazard of erosion is moderate. A portion of the **National Cooperative Soil Survey Map** is included with this Drainage Letter.

1.4 Hydrologic Criteria:

For this Drainage Letter, the Rational Method as described in the *Drainage Criteria Manual* has been used for all Storm Runoff calculations, as the development and all sub-basins are less than 130 acres in area. “Colorado Springs Rainfall Intensity Duration Frequency” curves, Figure 6-5 in the DCM, was used to obtain the design rainfall values; a copy is included in the **Appendix**. The “Overland (Initial) Flow Equation” (Eq. 6-8) in the DCM, and Manning's equation with estimated depths were used in time of concentration calculations. “Runoff Coefficients for Rational Method”, Table 6-6 in the DCM, was utilized as a guide in estimating runoff coefficient and Percent Impervious values; a copy is included in the **Appendix**. Peak runoff discharges were calculated for each drainage sub-basin for both the 5-year storm event and the 100-year storm event with the Rational Method formula, (Eq. 6-5) in the DCM.

The original Viewpoint Estates Final Drainage Report by Pacific Summits Engineering, Ltd was also calculated utilizing the Rational Method. All storm water drainage flows used to establish Point of Interest flow have been directly added which provides conservative results for the total magnitude of the flow rates.

2 Drainage Basins and Sub-Basins

2.1 Existing Drainage Conditions:

The site is delineated by five on-site sub-basins. Off-site storm water flows will continue to enter the site as described in the approved Viewpoint Estates Final Drainage Report for the original subdivision from the north and travel to the south through the existing detention ponds within the vacation and re-platted area. These storm water flows will drain under US Highway 94 via existing culverts. The rational method was used to calculate the runoff quantities. The existing drainage Map is included in the **Appendix**.

Design Point 1 (DP1) has an off-site flow of $Q_{100} = 21.0$ cfs crossing under Chesley Drive via an El Paso County 18” CM Pipe. The existing 18” CM Pipe is plugged and requires El Paso County maintenance. This Design Point is designated on the included Final Drainage Plan by Pacific Summits Engineering, Ltd. and dated 6/6/99. The flow is shown as $Q = 20.97$ cfs at an 18” culvert flowing under Dans Drive which is now Chesley Drive just west of Antelope Drive.

Design Point 5 (DP5) has an off-site flow of $Q_{100} = 42.3$ cfs crossing under Chesley Drive via an El Paso County 24” CM Pipe. The existing 24” CM Pipe is plugged and requires El Paso County maintenance. This Design Point is designated on the included Final Drainage Plan by Pacific Summits Engineering, Ltd. Dated 6/6/99. The flow is shown as $Q = 42.29$ cfs at a 24” culvert flowing under Dans Drive which is now Chesley Drive just west of Antelope Drive.

Off-site sub-basin OS-1 with an area of 1.31 acres makes up the south half of the existing right of way of Chelsey Drive west of Antelope Drive. This sub-basin is made up of primarily paved area

with pasture/meadow areas south of the paved shoulder, all draining south into existing sub-basin EX-A which is in existing Lot 71. This sub-basin generates peak storm runoff discharges of $Q_5 = 3.0$ cfs and $Q_{100} = 7.1$ cfs.

On-site sub-basin EX-A, which makes up the northern portion of Lot 71, is 10.27 acres in area. This sub-basin is made up of pasture/meadow areas that slope to the south. The flows from this sub-basin drain overland to an existing detention basin located in the central portion of lot 71. This sub-basin generates peak storm runoff discharges of $Q_5 = 2.0$ cfs and $Q_{100} = 14.5$ cfs. The flows from sub-basin EX-A are combined with the off-site flows from sub-basin OS-1 and from the Viewpoint Estates Subdivision as described in the approved drainage report as noted above which enter the site at **DP1** and **DP5**. The detention basin drains to the south through an existing 18" CM Pipe that drains into sub-basin EX-B at a rate of $Q_{100} = 25.3$ cfs according to the approved Viewpoint Estates Final Drainage Report for the original subdivision.

On-site sub-basin EX-B, which makes up the smaller southern portion of Lot 71, is 1.99 acres in area. This sub-basin is made up of pasture/meadow areas that slope to the south. The stormwater flows from this sub-basin drain overland into an existing drainage ditch that runs along Highway 94. Sub-basin EX-B drains in said ditch easterly and westerly to the southern midpoint of Lot 71 and generates peak storm runoff discharges of $Q_5 = 0.4$ cfs and $Q_{100} = 3.2$ cfs.

Design Point 2 (DP2) Sub-basin EX-B flows combines with the flows from the existing Detention Basin 18" CM Pipe outlet storm water flows and exit the site to the three existing 30" CM Pipes under US Highway 94 with a combined peak storm runoff discharge of $Q_5 = 5.5+$ cfs and $Q_{100} = 28.5$ cfs.

Off-site sub-basin OS-2 with an area of 0.43 acres makes up the south half of the existing Chelsey Drive right of way east of Antelope Drive and adjacent to sub-basin EX-C. This sub-basin is made up of primarily paved area with pasture/meadow areas south of the paved shoulder, all draining south into existing sub-basin EX-C being in the western portion of existing Lot 72. This sub-basin generates peak storm runoff discharges of $Q_5 = 0.9$ cfs and $Q_{100} = 2.3$ cfs.

On-site sub-basin EX-C, makes up the western portion of Lot 72, and is 5.48 acres in area. This sub-basin is made up of pasture/meadow areas that slope to the south. The stormwater flows from this sub-basin joins with sub-basin OS-2 and drain overland into an existing drainage ditch that runs easterly along Highway 94. Sub-basin EX-D generates peak storm runoff discharges of $Q_5 = 1.3$ cfs and $Q_{100} = 9.6$ cfs.

Off-site sub-basin OS-4 with an area of 0.17 acres makes up the south half of the existing Chelsey Drive right of way east of Spotted Owl Way adjacent to sub-basin EX-E. Sub-basin OS-4 is made up of primarily paved area with pasture/meadow areas south of the paved shoulder, all draining south into existing sub-basin EX-E being in the easterly portion of existing Lot 72. This sub-basin generates peak storm runoff discharges of $Q_5 = 0.2$ cfs and $Q_{100} = 0.7$ cfs.

On-site sub-basin EX-E, makes up the eastern portion of Lot 72, and is 1.92 acres in area. This sub-basin is made up of pasture/meadow areas that slope to the south. The stormwater flows from this sub-basin joins with sub-basin OS-4 and drain overland into an existing drainage ditch that runs westerly along Highway 94. Sub-basin EX-E generates peak storm runoff discharges of $Q_5 = 0.3$ cfs and $Q_{100} = 2.5$ cfs. Design Point 4 (EX-DP4).

Design Point 3 (DP3) storm water discharges at the corner of Chesley Way and Spotted Owl Way via an existing 42" CM Pipe and an existing 24" CM Pipe from the Viewpoint Estates as described in the approved drainage report as entering site with peak storm runoff discharges for the 42" CM Pipe of $Q_{100} = 64.2$ cfs and peak storm runoff discharges for the 24" CM Pipe $Q_{100} = 21.5$ cfs (existing flows). The existing CM Pipes are plugged and require El Paso County maintenance. This

Design Point is designated on the included Final Drainage Plan by Pacific Summits Engineering, Ltd. dated 6/6/99. The flow is shown as $Q = 64.22$ cfs at the 42" culvert and 21.46 cfs at the 24" culvert flowing under Dans Drive which is now Chesley Drive at it's intersection with Jans Way.

Off-site sub-basin OS-3 with an area of 0.75 acres makes up the central south half of the existing Chelsey Drive right of way east of Antelope Drive, west of Spotted Owl Way and adjacent to sub-basin EX-C. This sub-basin is made up of primarily paved area with pasture/meadow areas south of the paved shoulder, all draining south into existing sub-basin EX-D being in the central portion of existing Lot 72. Sub-basin OS-3 generates peak storm runoff discharges of $Q_5 = 1.7$ cfs and $Q_{100} = 4.0$ cfs.

On-site sub-basin EX-D, which makes up the central portion of Lot 72, is 4.68 acres in area. This sub-basin is made up of pasture/meadow areas that slope to the south. Sub-basin EX-D generates peak storm runoff discharges of $Q_5 = 1.1$ cfs and $Q_{100} = 7.9$ cfs (existing flows). The stormwater flows from this sub-basin combining with sub-basin OS-3 stormwater flows and **DP3**. These storm water flows drain overland to an existing detention basin located in the central portion of lot 72. These combined flows exit the Detention Basin through an existing 33" CM Pipe with a peak storm runoff discharge of $Q_{100} = 42.9$ cfs according to the approved Viewpoint Estates Final Drainage Report for the original subdivision.

Design Point 4 (DP4) Sub-basins OS-2, EX-C, OS-4, and EX-E storm water flows combine with the flows from the existing Detention Basin's 33" CM outlet pipe and exit the site to the two existing 30" CM Pipes under US Highway 94 with peak storm runoff discharges of $Q_5 = 6.4+$ cfs and $Q_{100} = 56.5$ cfs.

2.2 Proposed Drainage Conditions:

The proposed development will not alter the existing basic drainage patterns of the site. The site will continue to drain off-site to the south as in existing conditions. The existing detention basins will remain in place and continue to regulate the flows from the site as in existing conditions. The proposed drainage map is included in the **Appendix**.

Viewpoint Estates Filing No. 2 contains seven (7) single family residential lots. Each of these lots is proposed to have a single-family residence with an associated driveway. Calculation of the proposed runoff discharges assumed that each residence would have a footprint of 2,000 sf, and each driveway would be 8,000 sf in size.

The site is delineated by five on-site sub-basins. Off-site flows will continue to enter the site as described in the approved Viewpoint Estates Final Drainage Report for the original subdivision. The rational method was used to calculate the runoff quantities. The proposed drainage Map is included in the **Appendix**.

Design Point 1 (DP1) has an off-site flow of $Q_{100} = 21.0$ cfs crossing under Chesley Drive via an El Paso County 18" CM Pipe. The existing 18" CM Pipe is plugged and requires El Paso County maintenance. This Design Point is designated on the included Final Drainage Plan by Pacific Summits Engineering, Ltd. and dated 6/6/99. The flow is shown as $Q = 20.97$ cfs at an 18" culvert flowing under Dans Drive which is now Chesley Drive just west of Antelope Drive.

Design Point 5 (DP5) has an off-site flow of $Q_{100} = 42.3$ cfs crossing under Chesley Drive via an El Paso County 24" CM Pipe. The existing 24" CM Pipe is plugged and requires El Paso County maintenance. This Design Point is designated on the included Final Drainage Plan by Pacific Summits Engineering, Ltd. Dated 6/6/99. The flow is shown as $Q = 42.29$ cfs at a 24" culvert flowing under Dans Drive which is now Chesley Drive just west of Antelope Drive.

Off-site sub-basin OS-1 with an area of 1.31 acres makes up the south half of the existing right of way of Chelsey Drive west of Antelope Drive. This sub-basin is made up of primarily paved area

with pasture/meadow areas south of the paved shoulder, all draining south into existing sub-basin EX-A which is in existing Lot 71. This sub-basin generates peak storm runoff discharges of $Q_5 = 3.0$ cfs and $Q_{100} = 7.1$ cfs.

On-site sub-basin A, which makes up the northern portion of Lot 71, is 10.27 acres in area. This sub-basin is made up of pasture/meadow areas and four (4) proposed single-family residences with associated driveways all sloping to the south. The flows from this sub-basin drain overland to an existing detention basin located in the central portion of lot 71. In existing conditions, this sub-basin generates a peak storm runoff discharges of $Q_5 = 2.0$ cfs and $Q_{100} = 14.5$ cfs with developed conditions of $Q_5 = 3.2$ cfs and $Q_{100} = 16.1$ cfs. This represents a negligible increase in runoff of $Q_5 = +1.2$ cfs and $Q_{100} = +1.6$ cfs that will not impact the existing downstream drainage facilities. The flows from sub-basin A are combined with the off-site flows from sub-basin OS-1 and from the Viewpoint Estates Subdivision as described in the approved drainage report as noted above which enter the site at **DP1**. The detention basin drains to the south through an existing 24" CM Pipe that drains into sub-basin B at a rate of $Q_{100} = 25.3$ cfs according to the approved Viewpoint Estates Final Drainage Report for the original subdivision.

On-site sub-basin B, which makes up the smaller southern portion of Lot 71, is 1.99 acres in area. This sub-basin is made up of pasture/meadow areas that slope to the south. The stormwater flows from this sub-basin drain overland into an existing drainage ditch that runs along Highway 94. Sub-basin B generates peak storm runoff discharges of $Q_5 = 0.4$ cfs and $Q_{100} = 3.2$ cfs.

The flows from the West Detention basin combine with the flows from sub-basin B at **DP2** and exit the site to three existing 30" CM Pipes under US Highway 94, this design point generates a peak storm runoff discharges of $Q_5 = 5.5+$ cfs and $Q_{100} = 28.5$ cfs with developed conditions of $Q_5 = 7.3+$ cfs and $Q_{100} = 28.5$ cfs. This represents a negligible increase in runoff of $Q_5 = 1.8$ cfs and $Q_{100} = < 1.0$ cfs that will not impact the existing downstream drainage facilities.

Off-site sub-basin OS-2 with an area of 0.43 acres makes up the south half of the existing Chelsey Drive right of way east of Antelope Drive adjacent to sub-basin C. This sub-basin is made up of primarily paved area with pasture/meadow areas south of the paved shoulder, all draining south into existing sub-basin C being in existing Lot 72. This sub-basin generates peak storm runoff discharges of $Q_5 = 0.9$ cfs and $Q_{100} = 2.3$ cfs.

On-site sub-basin C, makes up the northern and western portion of Lot 72, and is 5.48 acres in area. This sub-basin is made up of pasture/meadow areas and two (2) proposed single-family residences with associated driveways all sloping to the south. The stormwater flows from this sub-basin joins with sub-basin OS-2 and drain overland into an existing drainage ditch that runs easterly along Highway 94. In existing conditions, this sub-basin generates a peak storm runoff discharges of $Q_5 = 1.3$ cfs and $Q_{100} = 9.6$ cfs with developed conditions of $Q_5 = 2.1$ cfs and $Q_{100} = 10.5$ cfs. This represents a negligible difference in runoff of $Q_5 = +0.8$ cfs and $Q_{100} = +0.9$ cfs that will not impact the existing downstream drainage facilities.

Off-site sub-basin OS-4 with an area of 0.17 acres makes up the south half of the existing Chelsey Drive right of way east of Spotted Owl Way adjacent to sub-basin E. This sub-basin is made up of primarily paved area with pasture/meadow areas south of the paved shoulder, all draining south into sub-basin E being in existing Lot 72. This sub-basin generates peak storm runoff discharges of $Q_5 = 0.2$ cfs and $Q_{100} = 0.7$ cfs.

On-site sub-basin E, makes up the eastern portion of Lot 72, and is 1.92 acres in area. This sub-basin is made up of pasture/meadow areas that slope to the south. The stormwater flows from this sub-basin joins with sub-basin OS-2 and drain overland into an existing drainage ditch that runs westerly along Highway 94. There are no improvements within this sub-basin. Sub-basin E generates peak storm runoff discharges of $Q_5 = 0.3$ cfs and $Q_{100} = 2.5$ cfs.

Off-site sub-basin OS-3 with an area of 0.75 acres makes up the central south half of the existing Chelsey Drive right of way east of Antelope Drive, west of Spotted Owl way and adjacent to sub-basin D. This sub-basin is made up of primarily paved area with pasture/meadow areas south of the paved shoulder, all draining south into existing sub-basin EX-C being in the central portion of existing Lot 72. Sub-basin OS-3 generates peak storm runoff discharges of $Q_5 = 1.7$ cfs and $Q_{100} = 4.0$ cfs.

Design Point 3 (DP3) storm water discharges at the corner of Chesley Way and Spotted Owl Way via an existing 42" CM Pipe and an existing 24" CM Pipe from the Viewpoint Estates as described in the approved drainage report as entering site with peak storm runoff discharges for the 42" CM Pipe of $Q_{100} = 64.2$ cfs and peak storm runoff discharges for the 24" CM Pipe $Q_{100} = 21.5$ cfs (existing flows). The existing CM Pipes are plugged and require El Paso County maintenance. This Design Point is designated on the included Final Drainage Plan by Pacific Summits Engineering, Ltd. dated 6/6/99. The flow is shown as $Q = 64.22$ cfs at the 42" culvert and 21.46 cfs at the 24" culvert flowing under Dans Drive which is now Chesley Drive at it's intersection with Jans Way.

On-site sub-basin D, makes up the central and northern portion of Lot 72, and is 4.68 acres in area. This sub-basin is made up of pasture/meadow areas and one (1) proposed single-family residence with associated driveway all sloping to the south. In existing conditions, this sub-basin generates a peak storm runoff discharges of $Q_5 = 1.1$ cfs and $Q_{100} = 7.9$ cfs with developed conditions of $Q_5 = 1.4$ cfs and $Q_{100} = 8.4$ cfs. This represents a negligible difference in runoff of $Q_5 = +0.3$ cfs and $Q_{100} = +0.5$ cfs that will not impact the existing downstream drainage facilities. The flows from sub-basin D are combined with the off-site flows from OS-3 and flows from **DP3** with all flowing to the detention basin. These combined flows exit the Detention Basin through an existing 33" CM Pipe with a peak storm runoff discharge of $Q_{100} = 42.9$ cfs (existing/proposed flows) according to the approved Viewpoint Estates Final Drainage Report for the original subdivision.

The flows from the East Detention basin combine with the flows from sub-basin C and OS-2 at Design Point 4 (DP4) and exit the site through two existing 30" CM Pipes. In existing conditions, this design point generates a peak storm runoff discharges of $Q_5 = 6.4+$ cfs and $Q_{100} = 56.5$ cfs (existing conditions) with developed conditions of $Q_5 = 7.8+$ cfs and $Q_{100} = 57.6$ cfs. This represents a negligible increase in runoff of $Q_5 = 0.6$ cfs and $Q_{100} = 1.1$ cfs that will not impact the existing downstream drainage facilities.

Design Point 4 (DP4) Sub-basins OS-2, C, OS-4, and E storm water flows combine with the flows from the Detention Basin's 33" CM outlet pipe and exit the site to the two existing 30" CM Pipes under US Highway 94 with peak storm runoff discharges of $Q_5 = 7.8+$ cfs and $Q_{100} = 57.6$ cfs.

The increase in runoff quantities for 100 year storm events traveling to Design Points 2 & 4 are 1.4 cfs, and 1.1 cfs respectively. This minor increase in flows will have a minimal impact on the stormwater flows exiting the site. The existing detention basins will not be altered in any way and will continue to drain at the same rate as in existing conditions.

The existing detention basins will be maintained by the Viewpoint Estates HOA.

2.3 Downstream Culverts:

The Viewpoint Estates Final Drainage Report describes culverts located in Lots 71 & 72, Viewpoint Estates, that convey the flows from the site to the other side of Highway 94. The culverts outlined in the report included 3 - 30 inch CSP culverts on the south side of lot 71, and 2 - 30 inch CSP culverts on the south side of lot 72.

3 Drainage Design Criteria

3.1 Four Step Process:

The El Paso County Engineering Criteria Manual (Appendix I, Section I.7.2) requires the consideration of a “Four Step Process for receiving water protection that focuses on reducing runoff volumes, treating the water quality capture volume (WQCV), stabilizing drainageways, and implementing long term source controls”. The Four Step Process is incorporated in this project and the elements are discussed below.

The portion of the site that is contained within the 2.5-acre single family residential lots are excluded from Post Construction Stormwater Management requirements by ECM I.7.1.B.5 due to the low development density as 2.5-acre lots. There are no proposed improvements associated with the subdivision of the 2.5-acre lots. There are also no improvements planned for the right of way dedication to Highway 94. No post construction stormwater management will be necessary for the planned project.

1) Water Quality Treatment is not required on this project. Impervious surfaces have been reduced as much as practically possible with the low residential density. All impervious surfaces on the site, such as roofs and driveways will drain to the surrounding pervious areas allowing infiltration and water quality mitigation. Minimized Directly Connected Impervious Areas (MDCIA) is employed on the project because runoff from the impervious areas of the future home sites will pass over the adjacent natural grassed areas for a distance of 25 feet to 300 feet before entering a roadside ditch or natural drainage way.

2) All drainage paths on the site will remain stabilized with the natural native grass lining. No further stabilization is required.

3) The project contains no potentially hazardous uses. The site is exempted from the use of WQCV BMPs by ECM I.7.1.B.5 by virtue of the large lot rural residential nature of the site having percent imperviousness of less than 10%.

4) The site contains no storage of potentially harmful substances or use of potentially harmful substances. No Site Specific or Other Source Control BMP's are required.

No drainage improvements will be required for the project. No drainageways or culverts will be altered or impacted by this development.

3.2 Drainage Fees:

Viewpoint Estates Filing No. 2 is situated in two El Paso County Drainage Basins. The Ellicott Consolidated Drainage Basin has not been studied and is not a Fee Basin at this time. The Telephone Exchange Drainage Basin has drainage fees of \$12,962/Impervious Acre, and bridge fees of \$304/Impervious Acre. The percent Imperiousness of the 2.5-acre Rural Residential site is 11% in accordance with El Paso County Engineering Criteria Manual Appendix L Table 3-1. Also, reductions in the per acre Drainage Fee are allowed pursuant to El Paso County Resolution 99-383. A fee reduction in the of amount 25% for lots 2.5 acres or larger is utilized for this project. The Viewpoint Estates Filing No. 2 site contains 13.70 acres of land located within the Telephone Exchange Drainage Basin. The Board of County Commissioners, County of El Paso, State of Colorado Resolution No. 20-424 allows the drainage basin fee to be based on impervious acreage.

FEE CALCULATION (2023 Fees)

Telephone Exchange Drainage Basin

Correct drainage basin and
bridge fee total

Drainage Fee \$12,962 / Impervious Acre @ 13.70 Acres X 11% = \$ 19,533.73

Bridge Fee \$304 / Impervious Acre @ 13.70 Acres X 11% = \$ 458.13

Subtotal = \$ 19,991.86

25% Drainage Fee Reduction = \$ (4,997.97)

Grand Total Fees = \$ ~~14,993.90~~

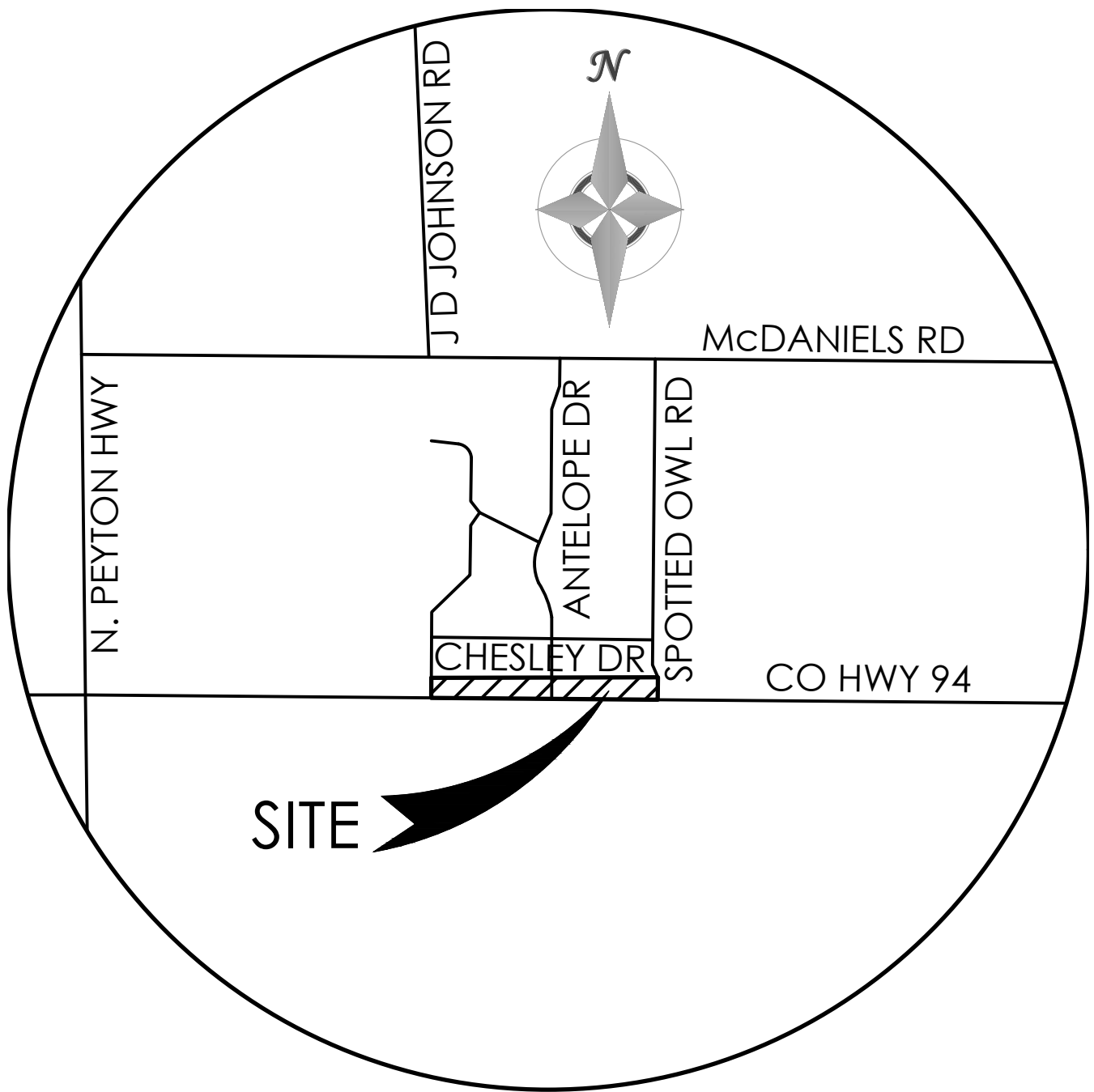
15,108.43

No 25% reduction for
bridge fee for large lot
only drainage basin
fee

4 Conclusion:

In Conclusion, the drainage patterns generated by the Viewpoint Estates Filing No. 2 site under proposed developed conditions are essentially the same as those which existed for the existing Plan. During a 100 year storm event it is expected that the storm water runoff will increase by about 2.0% for the entire site. This slight increase represents an insignificant change in the overall drainage patterns of the. The site and drainage are substantially in accordance with the previously approved Drainage Report prepared in 1998. The proposed development as described in this Drainage Letter will have no adverse impacts to downstream and surrounding developments or downstream drainage ways or storm drain facilities.

Attachments



VICINITY MAP

NOT TO SCALE

National Flood Hazard Layer FIRMette



104°26'38"W 38°50'33"N



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

1:6,000

104°26'1"W 38°50'5"N

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

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
		Area of Undetermined Flood Hazard Zone D
GENERAL STRUCTURES		Channel, Culvert, or Storm Sewer
		Levee, Dike, or Floodwall
OTHER FEATURES		20.2 Cross Sections with 1% Annual Chance Water Surface Elevation
		17.5
		Coastal Transect
		Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary
		Coastal Transect Baseline
		Profile Baseline
		Hydrographic Feature
		Digital Data Available
MAP PANELS		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 **11/8/2021 at 12:57 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.

National Flood Hazard Layer FIRMette



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
		Area of Undetermined Flood Hazard Zone D
GENERAL STRUCTURES		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
		Coastal Transect Baseline
MAP PANELS		Profile Baseline
		Hydrographic Feature
		Digital Data Available
		No Digital Data Available
		Unmapped



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

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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 4/15/2020 at 11:18:58 AM 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.

38°50'35.91"N



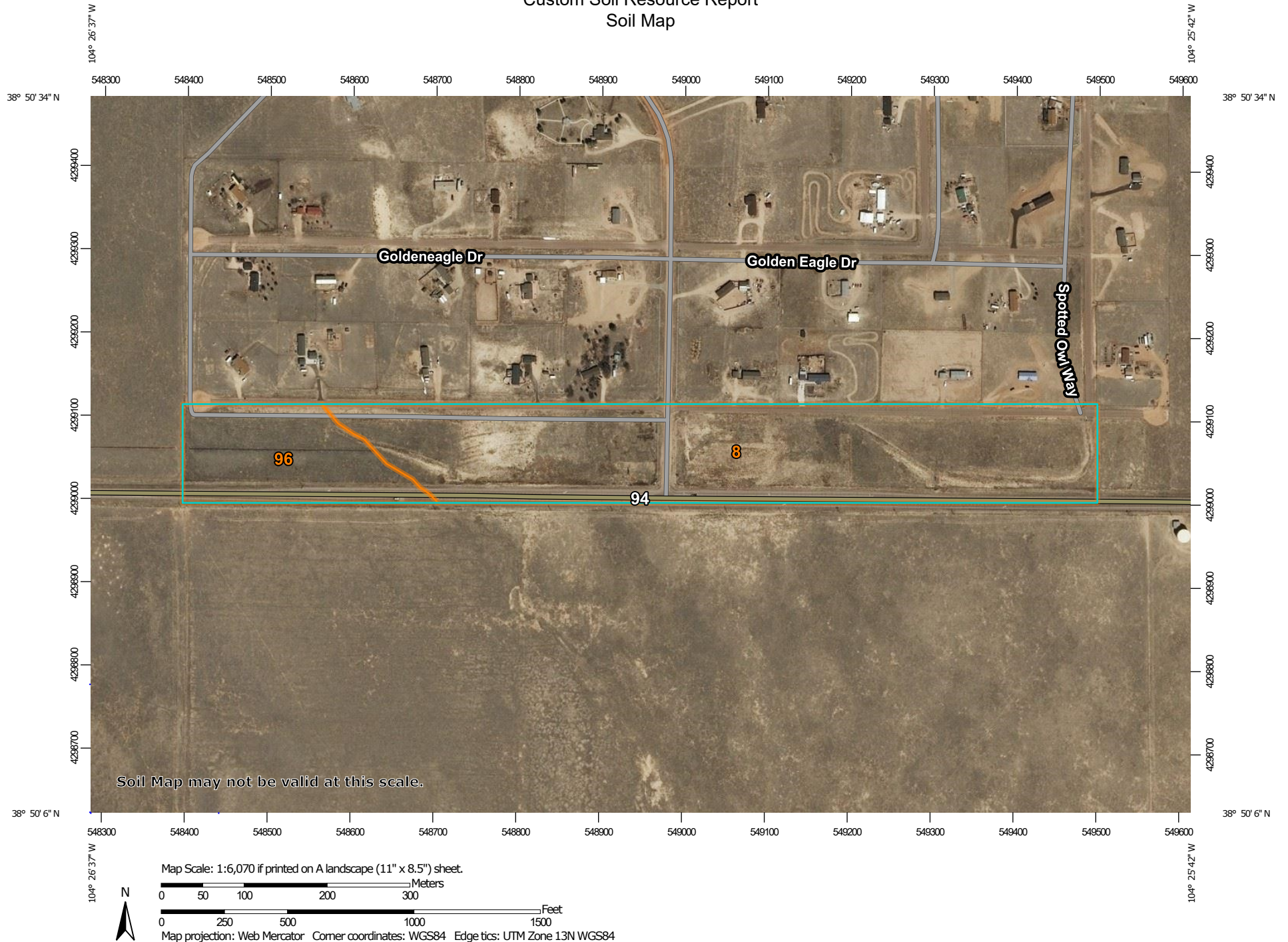
USGS The National Map: Orthoimagery. Data refreshed April, 2019.

0 250 500 1,000 1,500 2,000 Feet 1:6,000

38°50'7.88"N

104°25'36.61"W

Custom Soil Resource Report Soil Map



Custom Soil Resource Report

MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features

 Blowout

 Borrow Pit

 Clay Spot

 Closed Depression

 Gravel Pit

 Gravelly Spot

 Landfill

 Lava Flow

 Marsh or swamp

 Mine or Quarry

 Miscellaneous Water

 Perennial Water

 Rock Outcrop

 Saline Spot

 Sandy Spot

 Severely Eroded Spot

 Sinkhole

 Slide or Slip

 Sodic Spot

 Spoil Area

 Stony Spot

 Very Stony Spot

 Wet Spot

 Other

 Special Line Features

Water Features

 Streams and Canals

Transportation

 Rails

 Interstate Highways

 US Routes

 Major Roads

 Local Roads

Background

 Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 17, Sep 13, 2019

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

Date(s) aerial images were photographed: Sep 8, 2018—May 26, 2019

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
8	Blakeland loamy sand, 1 to 9 percent slopes	25.6	78.6%
96	Truckton sandy loam, 0 to 3 percent slopes	6.9	21.4%
Totals for Area of Interest		32.5	100.0%

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however,

onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

El Paso County Area, Colorado

8—Blakeland loamy sand, 1 to 9 percent slopes

Map Unit Setting

National map unit symbol: 369v
Elevation: 4,600 to 5,800 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 46 to 48 degrees F
Frost-free period: 125 to 145 days
Farmland classification: Not prime farmland

Map Unit Composition

Blakeland and similar soils: 98 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Blakeland

Setting

Landform: Hills, flats
Landform position (three-dimensional): Side slope, tal
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sedimentary rock and/or eolian deposits
derived from sedimentary rock

Typical profile

A - 0 to 11 inches: loamy sand
AC - 11 to 27 inches: loamy sand
C - 27 to 60 inches: sand

Properties and qualities

Slope: 1 to 9 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95
to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Available water storage in profile: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: Sandy Foothill (R049BY210CO)
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit: 1 percent

Hydric soil rating: No

Pleasant

Percent of map unit: 1 percent

Landform: Depressions

Hydric soil rating: Yes

96—Truckton sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 36bf

Elevation: 6,000 to 7,000 feet

Mean annual precipitation: 14 to 15 inches

Mean annual air temperature: 46 to 50 degrees F

Frost-free period: 125 to 145 days

Farmland classification: Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60

Map Unit Composition

Truckton and similar soils: 95 percent

Minor components: 5 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Truckton

Setting

Landform: Flats

Landform position (three-dimensional): Talf

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Arkosic alluvium derived from sedimentary rock and/or arkosic residuum weathered from sedimentary rock

Typical profile

A - 0 to 8 inches: sandy loam

Bt - 8 to 24 inches: sandy loam

C - 24 to 60 inches: coarse sandy loam

Properties and qualities

Slope: 0 to 3 percent

Depth to restrictive feature: More than 80 inches

Natural drainage class: Well drained

Runoff class: Very low

Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 6.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water storage in profile: Low (about 5.7 inches)

Custom Soil Resource Report

Interpretive groups

Land capability classification (irrigated): 2e

Land capability classification (nonirrigated): 3e

Hydrologic Soil Group: A

Ecological site: Sandy Foothill (R049BY210CO)

Hydric soil rating: No

Minor Components

Other soils

Percent of map unit: 4 percent

Hydric soil rating: No

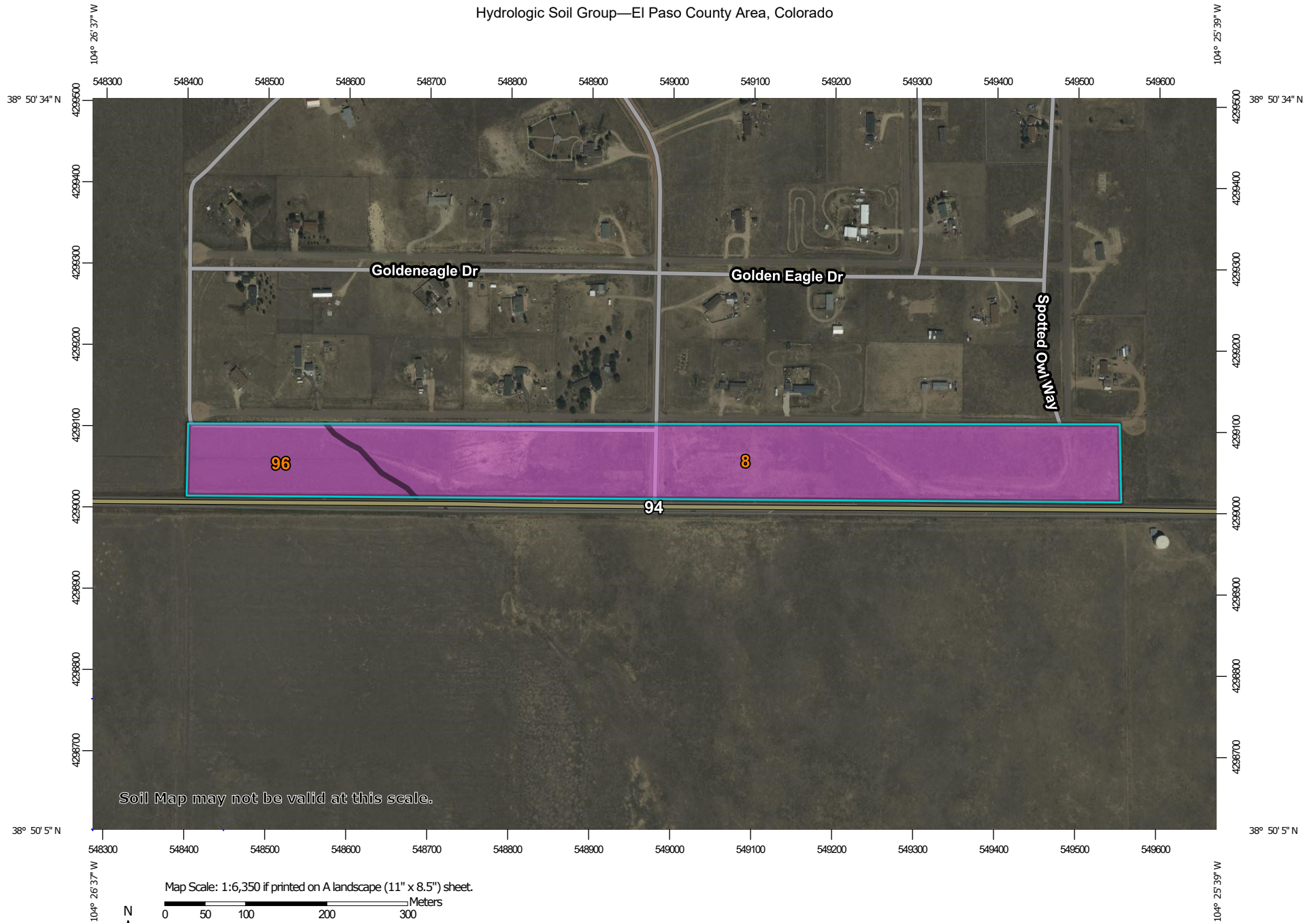
Pleasant

Percent of map unit: 1 percent

Landform: Depressions

Hydric soil rating: Yes

Hydrologic Soil Group—El Paso County Area, Colorado



Soil Map may not be valid at this scale.

Map Scale: 1:6,350 if printed on A landscape (11" x 8.5") sheet.

0 50 100 200 300 Meters

0 300 600 1200 1800 Feet

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



**Natural Resources
Conservation Service**

Web Soil Survey
National Cooperative Soil Survey

11/8/2021
Page 1 of 4


MAP LEGEND

Area of Interest (AOI)









 Area of Interest (AOI)

Soils

Soil Rating Polygons





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

Soil Rating Lines


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

Soil Rating Points






 A
 A/D
 B
 B/D

 C
 C/D
 D
 Not rated or not available

Water Features

 Streams and Canals

Transportation

 Rails
 Interstate Highways
 US Routes
 Major Roads
 Local Roads

Background

 Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: El Paso County Area, Colorado
 Survey Area Data: Version 19, Aug 31, 2021

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

Date(s) aerial images were photographed: Sep 11, 2018—Oct 20, 2018

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
8	Blakeland loamy sand, 1 to 9 percent slopes	A	21.4	81.1%
96	Truckton sandy loam, 0 to 3 percent slopes	A	5.0	18.9%
Totals for Area of Interest			26.4	100.0%

Description

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

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

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

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

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

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

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

Rating Options

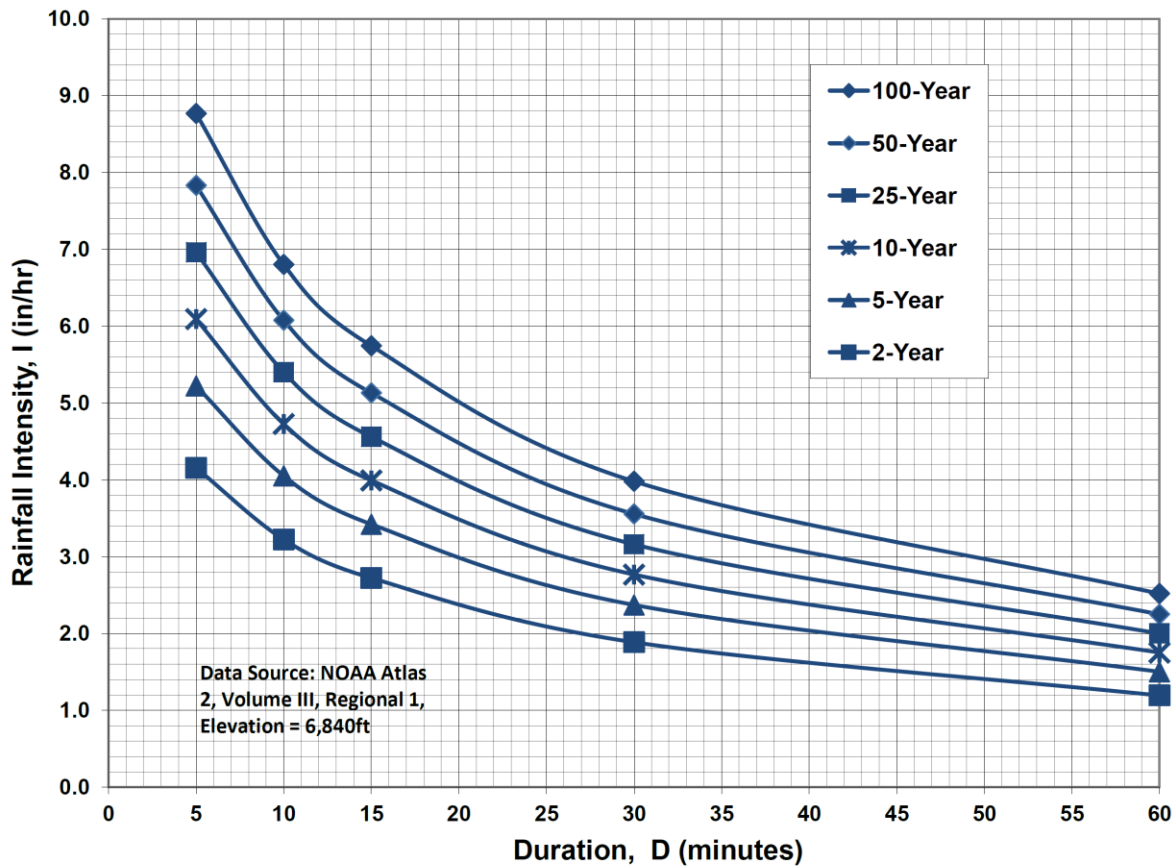
Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

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

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

Figure 6-5. Colorado Springs Rainfall Intensity Duration Frequency**IDF Equations**

$$I_{100} = -2.52 \ln(D) + 12.735$$

$$I_{50} = -2.25 \ln(D) + 11.375$$

$$I_{25} = -2.00 \ln(D) + 10.111$$

$$I_{10} = -1.75 \ln(D) + 8.847$$

$$I_5 = -1.50 \ln(D) + 7.583$$

$$I_2 = -1.19 \ln(D) + 6.035$$

Note: Values calculated by equations may not precisely duplicate values read from figure.

Job No.: **61099**
 Project: **Viewpoint Estates Filing No. 2**

Date: **10/20/2023 14:12**
 Calcs By: **JO**
 Checked By: _____

Time of Concentration (Modified from Standard Form SF-1)

Sub-Basin	Sub-Basin Data				Overland			Shallow Channel				Channelized				t _c Check		t _c (min)
	Area (Acres)	C ₅	C ₁₀₀ /CN	% Imp.	L ₀ (ft)	S ₀ (%)	t _i (min)	L _{0t} (ft)	S _{0t} (ft/ft)	v _{0sc} (ft/s)	t _t (min)	L _{0c} (ft)	S _{0c} (ft/ft)	v _{0c} (ft/s)	t _c (min)	L (min)	t _{c,alt} (min)	
OFFSITE																		
OS-1	1.31	0.45	0.62	45%	25.21	11%	2.7	0	0.000	0.0	0.0	0	0.000	0.0	0.0	25.21	0.0	5.0
OS-2	0.43	0.42	0.61	42%	30.92	10%	3.1	0	0.000	0.0	0.0	0	0.000	0.0	0.0	30.92	0.0	5.0
OS-3	0.75	0.44	0.62	44%	30.92	10%	3.1	0	0.000	0.0	0.0	0	0.000	0.0	0.0	30.92	0.0	5.0
OS-4	0.17	0.28	0.50	25%	30.92	10%	3.8	0	0.000	0.0	0.0	0	0.000	0.0	0.0	30.92	0.0	5.0
EX ONSITE																		
EX-A	10.27	0.08	0.35	0%	100	1%	18.4	680	0.015	0.8	13.4	0	0.000	0.0	0.0	780	0.0	31.8
EX-B	1.99	0.08	0.35	0%	100	1%	18.4	350	0.014	0.8	7.0	0	0.000	0.0	0.0	450	0.0	25.4
EX-C	5.48	0.08	0.35	0%	100	3%	12.8	480	0.017	0.9	8.9	0	0.000	0.0	0.0	580	0.0	21.7
EX-D	4.68	0.08	0.35	0%	100	1%	18.4	290	0.021	1.0	4.8	0	0.000	0.0	0.0	390	0.0	23.2
EX-E	1.92	0.08	0.35	0%	100	1%	18.4	1000	0.018	0.9	17.7	0	0.000	0.0	0.0	1100	0.0	36.2
PROPOSED ONSITE																		
A	10.27	0.13	0.38	7%	100	1%	17.5	680	0.015	0.8	13.4	0	0.000	0.0	0.0	780	0.0	30.9
B	1.99	0.08	0.35	0%	100	1%	18.4	350	0.014	0.8	7.0	0	0.000	0.0	0.0	450	0.0	25.4
C	5.48	0.13	0.38	7%	100	3%	12.2	480	0.017	0.9	8.9	0	0.000	0.0	0.0	580	0.0	21.1
D	4.68	0.11	0.37	4%	100	1%	17.9	290	0.021	1.0	4.8	0	0.000	0.0	0.0	390	0.0	22.7
E	1.92	0.08	0.35	0%	100	1%	18.4	1000	0.018	0.9	17.7	0	0.000	0.0	0.0	1100	0.0	36.2

Job No.: **61099**
 Project: **Viewpoint Estates Filing No. 2**
 Design Storm: **5-Year Storm (20% Probability)**
 Jurisdiction: **DCM**

Date: **10/20/2023 14:12**
 Calcs By: **JO**
 Checked By: _____

Existing Conditions Sub-Basin and Combined Flows (Modified from Standard Form SF-2)

DP	Sub-Basin	Area (Acres)	C5	Direct Runoff				Combined Runoff				Streetflow			Pipe Flow					Travel Time			
				t _c (min)	CA (Acres)	I5 (in/hr)	Q5 (cfs)	t _c (min)	CA (Acres)	I5 (in/hr)	Q5 (cfs)	Slope (%)	Length (ft)	Q (cfs)	Q (cfs)	Slope (%)	Mnngs n	Length (ft)	D _{Pipe} (in)	Length (ft)	V _{0sc} (ft/s)	t _t (min)	
OFFSITE CONDITIONS																							
	OS-1	1.31	0.45	5.0	0.59	5.17	3.0																
	OS-2	0.43	0.42	5.0	0.18	5.17	0.9																
	OS-3	0.75	0.44	5.0	0.33	5.17	1.7																
	OS-4	0.17	0.28	5.0	0.05	5.17	0.2																
EXISTING CONDITIONS																							
	EX-A	10.27	0.08	31.8	0.82	2.40	2.0																
	EX-B	1.99	0.08	25.4	0.16	2.73	0.4																
	EX-C	5.48	0.08	21.7	0.44	2.97	1.3																
	EX-D	4.68	0.08	23.2	0.37	2.87	1.1																
	EX-E	1.92	0.08	36.2	0.15	2.20	0.3																
EX DESIGN POINTS																							
EX LOT 71																				min/hr	min/hr		
EX-DP1 (VEFDR)																							
EX-DP5 (VEFDR)																							
EX W DETENTION (IN)		11.59	0.12					14.2	1.41	3.60	5.1+												
EX-DP1, OS-1, EX-A, EX-DP5																							
EX W DETENTION (OUT)																							
EX-DP2		1.99	0.08					25.4	0.16	2.73	5.7+												
EX-B, EX W DETENTION (OUT)																							
EX LOT 72																				min/hr	min/hr		
EX-DP3 (VEFDR)																							
EX E DETENTION (IN)		5.86	0.15					7.4	0.89	4.58	3.3+												
EX-DP3, OS-3, EX-D																							
EX E DETENTION (OUT)																							
EX-DP4		5.91	0.11					13.2	0.62	3.72	5.6+												
OS-2, EX-C, EX E DETENTION (OUT)																							

DCM: $I = C1 * \ln(tc) + C2$

C1: 1.5

C2: 7.583

Job No.: **61099**
 Project: **Viewpoint Estates Filing No. 2**
 Design Storm: **100-Year Storm (1% Probability)**
 Jurisdiction: **DCM**

Date: **10/20/2023 14:12**
 Calcs By: **JO**
 Checked By: _____

Existing Conditions Sub-Basin and Combined Flows (Modified from Standard Form SF-2)

DP	Sub-Basin	Area (Acres)	C100	Direct Runoff				Combined Runoff				Streetflow			Pipe Flow					Travel Time			
				t _c (min)	CA (Acres)	I100 (in/hr)	Q100 (cfs)	t _c (min)	CA (Acres)	I100 (in/hr)	Q100 (cfs)	Slope (%)	Length (ft)	Q (cfs)	Q (cfs)	Slope (%)	Mnngs n	Length (ft)	D _{Pipe} (in)	Length (ft)	V _{0sc} (ft/s)	t _t (min)	
OFFSITE CONDITIONS																							
	OS-1	1.31	0.62	5.0	0.82	8.68	7.1																
	OS-2	0.43	0.61	5.0	0.26	8.68	2.3																
	OS-3	0.75	0.62	5.0	0.46	8.68	4.0																
	OS-4	0.17	0.50	5.0	0.08	8.68	0.7																
EXISTING CONDITIONS																							
	EX-A	10.27	0.35	31.8	3.60	4.02	14.5																
	EX-B	1.99	0.35	25.4	0.70	4.58	3.2																
	EX-C	5.48	0.35	21.7	1.92	4.98	9.6																
	EX-D	4.68	0.35	23.2	1.64	4.81	7.9																
	EX-E	1.92	0.35	36.2	0.67	3.69	2.5																
EX DESIGN POINTS																							
EX LOT 71																				#####	#####		
EX-DP1 (VEFDR)											21.0*												
EX-DP5 (VEFDR)											42.3*												
EX W DETENTION (IN)		11.59	0.38					14.2	4.42	6.05	90.0												
EX-DP1, OS-1, EX-A, EX-DP5																							
EX W DETENTION (OUT)										Release Rate	25.3												
EX-DP2		1.99	0.35					25.4	0.70	4.58	28.5												
EX-B, EX W DETENTION (OUT)																							
EX LOT 72																							
EX-DP3 (VEFDR)											66.6*												
EX E DETENTION (IN)		5.86	0.40					7.4	2.36	7.70	84.8												
EX-DP3, OS-3, EX-D																							
EX E DETENTION (OUT)										Release Rate	42.9												
EX-DP4		5.91	0.37					13.2	2.18	6.24	56.5												
OS-2, EX-C, EX E DETENTION (OUT)																							

DCM: $I = C1 * \ln(tc) + C2$

C1: 2.52

C2: 12.735

* Offsite Flows Based On The Approved Viewpoint Estates Final Drainage Report (VEFDR) By Pacific Summit Engineering LLC. Dated January 1998

Job No.: **61099**
 Project: **Viewpoint Estates Filing No. 2**
 Design Storm: **5-Year Storm (20% Probability)**
 Jurisdiction: **DCM**

Date: **10/20/2023 14:12**
 Calcs By: **JO**
 Checked By: _____

Proposed Conditions Sub-Basin and Combined Flows (Modified from Standard Form SF-2)

DP	Sub-Basin	Area (Acres)	C5	Direct Runoff				Combined Runoff				Streetflow			Pipe Flow					Travel Time			
				t _c (min)	CA (Acres)	I5 (in/hr)	Q5 (cfs)	t _c (min)	CA (Acres)	I5 (in/hr)	Q5 (cfs)	Slope (%)	Length (ft)	Q (cfs)	Q (cfs)	Slope (%)	Mnngs n	Length (ft)	D _{Pipe} (in)	Length (ft)	V _{0sc} (ft/s)	t _t (min)	
OFFSITE CONDITIONS																							
	OS-1	1.31	0.45	5.0	0.59	5.17	3.0																
	OS-2	0.43	0.42	5.0	0.18	5.17	0.9																
	OS-3	0.75	0.44	5.0	0.33	5.17	1.7																
	OS-4	0.17	0.28	5.0	0.05	5.17	0.2																
PROPOSED CONDITIONS																							
	A	10.27	0.13	30.9	1.32	2.44	3.2																
	B	1.99	0.08	25.4	0.16	2.73	0.4																
	C	5.48	0.13	21.1	0.69	3.01	2.1																
	D	4.68	0.11	22.7	0.50	2.90	1.4																
	E	1.92	0.08	36.2	0.15	2.20	0.3																
PP DESIGN POINTS																							
EX LOT 71																				####	####		
DP1	(VEFDR)	11.59	0.16					14.2	1.91	5YR UNKNOWN													
DP5	(VEFDR)									5YR UNKNOWN													
W DETENTION (IN)										3.60													
DP1, OS-1, A, DP5										6.9+													
W DETENTION (OUT)										Release Rate													
DP2		1.99	0.08					25.4	0.16	2.73	6.9+												
	B, W DETENTION (OUT)										7.5+												
EX LOT 72																				####	####		
DP3	(VEFDR)	5.86	0.17					7.4	1.01	5YR UNKNOWN													
E DETENTION (IN)	DP3, OS-3, D									4.58													
EX E DETENTION (OUT)										Release Rate													
EX-DP4		5.91	0.11					13.2	0.62	3.72	3.8+												
	OS-2, EX-C, EX E DETENTION (OUT)										7.0+												

DCM: $I = C1 * \ln(tc) + C2$

C1: 1.5

C2: 7.583

* Offsite Flows Based On The Approved Viewpoint Estates Final Drainage Report (VEFDR) By Pacific Summit Engineering LLC. Dated January 1998

Job No.: **61099**
 Project: **Viewpoint Estates Filing No. 2**
 Design Storm: **100-Year Storm (1% Probability)**
 Jurisdiction: **DCM**

Date: **10/20/2023 14:12**
 Calcs By: **JO**
 Checked By: _____

Proposed Conditions Sub-Basin and Combined Flows (Modified from Standard Form SF-2)

DP	Sub-Basin	Area (Acres)	C100	Direct Runoff				Combined Runoff				Streetflow			Pipe Flow					Travel Time			
				t _c (min)	CA (Acres)	I100 (in/hr)	Q100 (cfs)	t _c (min)	CA (Acres)	I100 (in/hr)	Q100 (cfs)	Slope (%)	Length (ft)	Q (cfs)	Q (cfs)	Slope (%)	Mnngs n	Length (ft)	D _{Pipe} (in)	Length (ft)	v _{0sc} (ft/s)	t _t (min)	
OFFSITE CONDITIONS																							
	OS-1	1.31	0.62	5.0	0.82	8.68	7.1																
	OS-2	0.43	0.61	5.0	0.26	8.68	2.3																
	OS-3	0.75	0.62	5.0	0.46	8.68	4.0																
	OS-4	0.17	0.50	5.0	0.08	8.68	0.7																
PROPOSED CONDITIONS																							
	A	10.27	0.38	30.9	3.94	4.09	16.1																
	B	1.99	0.35	25.4	0.70	4.58	3.2																
	C	5.48	0.38	21.1	2.09	5.05	10.5																
	D	4.68	0.37	22.7	1.72	4.86	8.4																
	E	1.92	0.35	36.2	0.67	3.69	2.5																
PP DESIGN POINTS																							
EX LOT 71																				#####	#####		
DP1	(VEFDR)										21.0*												
DP5	(VEFDR)										42.3*												
W DETENTION (IN)		11.59	0.41					14.2	4.76	6.05	92.0												
	EX-DP1, OS-1, EX-A, EX-DP5																						
W DETENTION (OUT)										Release Rate	25.3												
DP2		1.99	0.35					25.4	0.70	4.58	28.5												
	EX-B, EX W DETENTION (OUT)																						
EX LOT 72																				#####	#####		
DP3	(VEFDR)										66.6												
E DETENTION (IN)		5.86	0.42					7.4	2.45	7.70	81.9												
	EX-DP3, OS-3, EX-D																						
EX E DETENTION (OUT)										Release Rate	42.9												
DP4		5.91	0.40					13.2	2.35	6.24	57.6												
	OS-2, EX-C, EX E DETENTION (OUT)																						

DCM: $I = C1 * \ln(t_c) + C2$

C1: 2.52

C2: 12.735

* Offsite Flows Based On The Approved Viewpoint Estates Final Drainage Report (VEFDR) By Pacific Summit Engineering LLC. Dated January 1998

Offsite Sub-Basin OS-1 Runoff Calculations

Job No.: **61099**

Date: **10/20/2023 14:12**

Project: **Viewpoint Estates Filing No. 2**

Calcs by: **JO**

Jurisdiction **DCM**
Runoff Coefficient **Surface Type**

Checked by: _____
Soil Type **A**
Urbanization **Urban**

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
Paved	25,734	0.59	0.89	0.9	0.92	0.94	0.95	0.96	100%
Pasture/Meadow	31,492	0.72	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	57,225	1.31	0.41	0.45	0.50	0.56	0.59	0.62	45.0%

57225

Basin Travel Time

Shallow Channel Ground Cover		Paved areas/shallow paved swales					
$L_{\max, \text{Overland}}$		300 ft	C_v		20		
L (ft)		ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	25	3	-	-	-	-	
Initial Time	25	3	0.113	-	2.7	-	DCM Eq. 6-8
Shallow Channel			0.000	0.0	0.0	-	DCM Eq. 6-9
Channelized			0.000	0.0	0.0	-	
			t_c		5.0 min.		

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	4.12	5.17	6.03	6.89	7.75	8.68
Runoff (cfs)	2.2	3.0	3.9	5.1	6.0	7.1
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	2.2	3.0	3.9	5.1	6.0	7.1

C2 6.035 7.583 8.847 10.111 11.375 12.735

Notes

Offsite Sub-Basin OS-2 Runoff Calculations

Job No.: **61099**

Date: **10/20/2023 14:12**

Project: **Viewpoint Estates Filing No. 2**

Calcs by: **JO**

Jurisdiction **DCM**
Runoff Coefficient **Surface Type**

Checked by: _____
Soil Type **A**
Urbanization **Urban**

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
Paved	7,885	0.18	0.89	0.9	0.92	0.94	0.95	0.96	100%
Pasture/Meadow	10,861	0.25	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	18,746	0.43	0.39	0.42	0.47	0.54	0.57	0.61	42.1%

18746

Basin Travel Time

Shallow Channel Ground Cover		Paved areas/shallow paved swales					
$L_{max, Overland}$		300 ft	C_v		20		
L (ft)		ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	31	3	-	-	-	-	
Initial Time	31	3	0.103	-	3.1	-	DCM Eq. 6-8
Shallow Channel			0.000	0.0	0.0	-	DCM Eq. 6-9
Channelized			0.000	0.0	0.0	-	
			t_c		5.0 min.		

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	4.12	5.17	6.03	6.89	7.75	8.68
Runoff (cfs)	0.7	0.9	1.2	1.6	1.9	2.3
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.7	0.9	1.2	1.6	1.9	2.3

C2 6.035 7.583 8.847 10.111 11.375 12.735

Notes

Offsite Sub-Basin OS-3 Runoff Calculations

Job No.: **61099**

Date: **10/20/2023 14:12**

Project: **Viewpoint Estates Filing No. 2**

Calcs by: **JO**

Jurisdiction: **DCM**
Runoff Coefficient: **Surface Type**

Checked by: _____
Soil Type: **A**
Urbanization: **Urban**

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
Paved	14,270	0.33	0.89	0.9	0.92	0.94	0.95	0.96	100%
Pasture/Meadow	18,470	0.42	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	32,740	0.75	0.40	0.44	0.49	0.55	0.58	0.62	43.6%

32740

Basin Travel Time

Shallow Channel Ground Cover		Paved areas/shallow paved swales					
$L_{\max, \text{Overland}}$		300 ft	C_v		20		
L (ft)		ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	31	3	-	-	-	-	
Initial Time	31	3	0.103	-	3.1	-	DCM Eq. 6-8
Shallow Channel			0.000	0.0	0.0	-	DCM Eq. 6-9
Channelized			0.000	0.0	0.0	-	
			t_c		5.0 min.		

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	4.12	5.17	6.03	6.89	7.75	8.68
Runoff (cfs)	1.2	1.7	2.2	2.9	3.4	4.0
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	1.2	1.7	2.2	2.9	3.4	4.0

C2 6.035 7.583 8.847 10.111 11.375 12.735

Notes

Offsite Sub-Basin OS-4 Runoff Calculations

Job No.: **61099**

Date: **10/20/2023 14:12**

Project: **Viewpoint Estates Filing No. 2**

Calcs by: **JO**

Jurisdiction **DCM**
Runoff Coefficient **Surface Type**

Checked by: _____
Soil Type **A**
Urbanization **Urban**

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
Paved	1,809	0.04	0.89	0.9	0.92	0.94	0.95	0.96	100%
Pasture/Meadow	5,460	0.13	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	7,270	0.17	0.24	0.28	0.34	0.42	0.46	0.50	24.9%

Basin Travel Time

Shallow Channel Ground Cover		Paved areas/shallow paved swales					
L _{max,Overland}		300 ft	C _v		20		
L (ft)		ΔZ ₀ (ft)	S ₀ (ft/ft)	v (ft/s)	t (min)	t _{Alt} (min)	
Total	31	3	-	-	-	-	
Initial Time	31	3	0.103	-	3.8	-	DCM Eq. 6-8
Shallow Channel			0.000	0.0	0.0	-	DCM Eq. 6-9
Channelized			0.000	0.0	0.0	-	
		t _c		5.0 min.			

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	4.12	5.17	6.03	6.89	7.75	8.68
Runoff (cfs)	0.2	0.2	0.3	0.5	0.6	0.7
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.2	0.2	0.3	0.5	0.6	0.7

Notes

C2 6.035 7.583 8.847 10.111 11.375 12.735

Sub-Basin EX-A Runoff Calculations

Job No.: **61099**

Date: **10/20/2023 14:12**

Project: **Viewpoint Estates Filing No. 2**

Calcs by: **JO**

Jurisdiction: **DCM**
Runoff Coefficient: **Surface Type**

Checked by: _____
Soil Type: **A**
Urbanization: **Urban**

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
Pasture/Meadow	447,487	10.27	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	447,487	10.27	0.02	0.08	0.15	0.25	0.30	0.35	0.0%

Basin Travel Time

Shallow Channel Ground Cover			Short Pasture/Lawns			
	L _{max,Overland}	300			C _v	7
	L (ft)	ΔZ ₀ (ft)	S ₀ (ft/ft)	v (ft/s)	t (min)	t _{Alt} (min)
Total	780	11	-	-	-	-
Initial Time	100	1	0.010	-	18.4	DCM Eq. 6-8
Shallow Channel	680	10	0.015	0.8	13.4	- DCM Eq. 6-9
Channelized			0.000	0.0	0.0	- V-Ditch
t _c					31.8 min.	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	1.92	2.40	2.79	3.19	3.59	4.02
Runoff (cfs)	0.4	2.0	4.3	8.2	11.1	14.5
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.4	2.0	4.3	8.2	11.1	14.5

Notes

C2 6.035 7.583 8.847 10.111 11.375 12.735

Sub-Basin EX-B Runoff Calculations

Job No.: **61099**

Date: **10/20/2023 14:12**

Project: **Viewpoint Estates Filing No. 2**

Calcs by: **JO**

Jurisdiction: **DCM**
Runoff Coefficient: **Surface Type**

Checked by: _____
Soil Type: **A**
Urbanization: **Urban**

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
Pasture/Meadow	86,860	1.99	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	86,860	1.99	0.02	0.08	0.15	0.25	0.30	0.35	0.0%

Basin Travel Time

Shallow Channel Ground Cover			Short Pasture/Lawns				
	L _{max, Overland}	300	ft		C _v	7	
	L (ft)	ΔZ ₀ (ft)	S ₀ (ft/ft)	v (ft/s)	t (min)	t _{Alt} (min)	
Total	450	6	-	-	-	-	
Initial Time	100	1	0.010	-	18.4	DCM Eq. 6-8	
Shallow Channel	350	5	0.014	0.8	7.0	- DCM Eq. 6-9	
Channelized			0.000	0.0	0.0	- V-Ditch	
				t _c	25.4 min.		

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.19	2.73	3.19	3.64	4.10	4.58
Runoff (cfs)	0.1	0.4	1.0	1.8	2.5	3.2
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.1	0.4	1.0	1.8	2.5	3.2

Notes

C2 6.035 7.583 8.847 10.111 11.375 12.735

Sub-Basin EX-C Runoff Calculations

Job No.: **61099**

Date: **10/20/2023 14:12**

Project: **Viewpoint Estates Filing No. 2**

Calcs by: **JO**

Jurisdiction: **DCM**
Runoff Coefficient: **Surface Type**

Checked by: _____
Soil Type: **A**
Urbanization: **Urban**

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
Pasture/Meadow	238,569	5.48	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	238,569	5.48	0.02	0.08	0.15	0.25	0.30	0.35	0.0%

Basin Travel Time

Shallow Channel Ground Cover		Short Pasture/Lawns					
L _{max,Overland}		300 ft	C _v		7		
L (ft)		ΔZ ₀ (ft)	S ₀ (ft/ft)	v (ft/s)	t (min)	t _{Alt} (min)	
Total	580	11	-	-	-	-	
Initial Time	100	3	0.030	-	12.8	DCM Eq. 6-8	
Shallow Channel	480	8	0.017	0.9	8.9	- DCM Eq. 6-9	
Channelized			0.000	0.0	0.0	- V-Ditch	
					t_c	21.7 min.	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.37	2.97	3.46	3.96	4.45	4.98
Runoff (cfs)	0.3	1.3	2.8	5.4	7.3	9.6
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.3	1.3	2.8	5.4	7.3	9.6

C2 6.035 7.583 8.847 10.111 11.375 12.735

Notes

Sub-Basin EX-D Runoff Calculations

Job No.: **61099**

Date: **10/20/2023 14:12**

Project: **Viewpoint Estates Filing No. 2**

Calcs by: **JO**

Jurisdiction: **DCM**
Runoff Coefficient: **Surface Type**

Checked by: _____
Soil Type: **A**
Urbanization: **Urban**

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
Pasture/Meadow	203,897	4.68	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	203,897	4.68	0.02	0.08	0.15	0.25	0.30	0.35	0.0%

Basin Travel Time

Shallow Channel Ground Cover		Short Pasture/Lawns					
L _{max,Overland}		300 ft	C _v		7		
L (ft)		ΔZ ₀ (ft)	S ₀ (ft/ft)	v (ft/s)	t (min)	t _{Alt} (min)	
Total	390	7	-	-	-	-	
Initial Time	100	1	0.010	-	18.4	DCM Eq. 6-8	
Shallow Channel	290	6	0.021	1.0	4.8	- DCM Eq. 6-9	
Channelized			0.000	0.0	0.0	- V-Ditch	
					t_c	23.2 min.	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.29	2.87	3.34	3.82	4.30	4.81
Runoff (cfs)	0.2	1.1	2.3	4.5	6.0	7.9
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.2	1.1	2.3	4.5	6.0	7.9

C2 6.035 7.583 8.847 10.111 11.375 12.735

Notes

Sub-Basin EX-E Runoff Calculations

Job No.: **61099**

Date: **10/20/2023 14:12**

Project: **Viewpoint Estates Filing No. 2**

Calcs by: **JO**

Jurisdiction **DCM**
Runoff Coefficient **Surface Type**

Checked by: _____
Soil Type **A**
Urbanization **Urban**

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
Pasture/Meadow	83,715	1.92	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	83,715	1.92	0.02	0.08	0.15	0.25	0.30	0.35	0.0%

Basin Travel Time

Shallow Channel Ground Cover			Short Pasture/Lawns			
	$L_{\max, \text{Overland}}$	300 ft			C_v	7
	L (ft)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)
Total	1,100	19	-	-	-	-
Initial Time	100	1	0.010	-	18.4	DCM Eq. 6-8
Shallow Channel	1,000	18	0.018	0.9	17.7	- DCM Eq. 6-9
Channelized			0.000	0.0	0.0	- V-Ditch
				t_c	36.2 min.	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	1.77	2.20	2.57	2.93	3.30	3.69
Runoff (cfs)	0.1	0.3	0.7	1.4	1.9	2.5
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.1	0.3	0.7	1.4	1.9	2.5

Notes

C2 6.035 7.583 8.847 10.111 11.375 12.735

Sub-Basin A Runoff Calculations

Job No.: **61099**

Date: **10/20/2023 14:12**

Project: **Viewpoint Estates Filing No. 2**

Calcs by: **JO**

Jurisdiction **DCM**
Runoff Coefficient **Surface Type**

Checked by: _____
Soil Type **A**
Urbanization **Urban**

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
Pasture/Meadow	407,487	9.35	0.02	0.08	0.15	0.25	0.3	0.35	0%
Roofs	8,000	0.18	0.71	0.73	0.75	0.78	0.8	0.81	90%
Gravel	32,000	0.73	0.57	0.59	0.63	0.66	0.68	0.7	80%
Combined	447,487	10.27	0.07	0.13	0.20	0.29	0.34	0.38	7.3%

Basin Travel Time

Shallow Channel Ground Cover			Short Pasture/Lawns			
	L _{max, Overland}	300			C _v	7
	L (ft)	ΔZ ₀ (ft)	S ₀ (ft/ft)	v (ft/s)	t (min)	t _{Alt} (min)
Total	780	11	-	-	-	-
Initial Time	100	1	0.010	-	17.5	DCM Eq. 6-8
Shallow Channel	680	10	0.015	0.8	13.4	- DCM Eq. 6-9
Channelized			0.000	0.0	0.0	- V-Ditch
				t _c	30.9 min.	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	1.95	2.44	2.84	3.25	3.66	4.09
Runoff (cfs)	1.4	3.2	5.7	9.6	12.6	16.1
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	1.4	3.2	5.7	9.6	12.6	16.1

Notes

C2 6.035 7.583 8.847 10.111 11.375 12.735

Sub-Basin B Runoff Calculations

Job No.: **61099**

Date: **10/20/2023 14:12**

Project: **Viewpoint Estates Filing No. 2**

Calcs by: **JO**

Jurisdiction **DCM**
Runoff Coefficient **Surface Type**

Checked by: _____
Soil Type **A**
Urbanization **Urban**

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
Pasture/Meadow	86,860	1.99	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	86,860	1.99	0.02	0.08	0.15	0.25	0.30	0.35	0.0%

Basin Travel Time

Shallow Channel Ground Cover			Short Pasture/Lawns				
	L _{max,Overland}	300	ft		C _v	7	
	L (ft)	ΔZ ₀ (ft)	S ₀ (ft/ft)	v (ft/s)	t (min)	t _{Alt} (min)	
Total	450	6	-	-	-		
Initial Time	100	1	0.010	-	18.4	DCM Eq. 6-8	
Shallow Channel	350	5	0.014	0.8	7.0	- DCM Eq. 6-9	
Channelized			0.000	0.0	0.0	- V-Ditch	
				t _c	25.4 min.		

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.19	2.73	3.19	3.64	4.10	4.58
Runoff (cfs)	0.1	0.4	1.0	1.8	2.5	3.2
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.1	0.4	1.0	1.8	2.5	3.2

Notes

C2 6.035 7.583 8.847 10.111 11.375 12.735

Sub-Basin C Runoff Calculations

Job No.: **61099**

Date: **10/20/2023 14:12**

Project: **Viewpoint Estates Filing No. 2**

Calcs by: **JO**

Jurisdiction **DCM**
Runoff Coefficient **Surface Type**

Checked by: _____
Soil Type **A**
Urbanization **Urban**

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
Pasture/Meadow	218,569	5.02	0.02	0.08	0.15	0.25	0.3	0.35	0%
Gravel	16,000	0.37	0.57	0.59	0.63	0.66	0.68	0.7	80%
Roofs	4,000	0.09	0.71	0.73	0.75	0.78	0.8	0.81	90%
Combined	238,569	5.48	0.07	0.13	0.19	0.29	0.33	0.38	6.9%

238569

Basin Travel Time

Shallow Channel Ground Cover			Short Pasture/Lawns			
	L _{max,Overland}	300			C _v	7
	L (ft)	ΔZ ₀ (ft)	S ₀ (ft/ft)	v (ft/s)	t (min)	t _{Alt} (min)
Total	580	11	-	-	-	-
Initial Time	100	3	0.030	-	12.2	DCM Eq. 6-8
Shallow Channel	480	8	0.017	0.9	8.9	- DCM Eq. 6-9
Channelized			0.000	0.0	0.0	- V-Ditch
				t _c	21.1 min.	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.41	3.01	3.51	4.01	4.51	5.05
Runoff (cfs)	0.9	2.1	3.7	6.3	8.3	10.5
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.9	2.1	3.7	6.3	8.3	10.5

C2 6.035 7.583 8.847 10.111 11.375 12.735

Notes

Sub-Basin D Runoff Calculations

Job No.: **61099**

Date: **10/20/2023 14:12**

Project: **Viewpoint Estates Filing No. 2**

Calcs by: **JO**

Jurisdiction: **DCM**
Runoff Coefficient: **Surface Type**

Checked by: _____
Soil Type: **A**
Urbanization: **Urban**

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
Pasture/Meadow	193,897	4.45	0.02	0.08	0.15	0.25	0.3	0.35	0%
Gravel	8,000	0.18	0.57	0.59	0.63	0.66	0.68	0.7	80%
Roofs	2,000	0.05	0.71	0.73	0.75	0.78	0.8	0.81	90%
Combined	203,897	4.68	0.05	0.11	0.17	0.27	0.32	0.37	4.0%

203897

Basin Travel Time

Shallow Channel Ground Cover		Short Pasture/Lawns					
L _{max,Overland}		300 ft	C _v		7		
L (ft)		ΔZ ₀ (ft)	S ₀ (ft/ft)	v (ft/s)	t (min)	t _{Alt} (min)	
Total	390	7	-	-	-	-	
Initial Time	100	1	0.010	-	17.9	DCM Eq. 6-8	
Shallow Channel	290	6	0.021	1.0	4.8	- DCM Eq. 6-9	
Channelized			0.000	0.0	0.0	- V-Ditch	
					t_c	22.7 min.	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.32	2.90	3.38	3.86	4.35	4.86
Runoff (cfs)	0.5	1.4	2.8	4.9	6.5	8.4
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.5	1.4	2.8	4.9	6.5	8.4

C2 6.035 7.583 8.847 10.111 11.375 12.735

Notes

Sub-Basin E Runoff Calculations

Job No.: **61099**

Date: **10/20/2023 14:12**

Project: **Viewpoint Estates Filing No. 2**

Calcs by: **JO**

Jurisdiction: **DCM**
Runoff Coefficient: **Surface Type**

Checked by: _____
Soil Type: **A**
Urbanization: **Urban**

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
Pasture/Meadow	83,715	1.92	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	83,715	1.92	0.02	0.08	0.15	0.25	0.30	0.35	0.0%

Basin Travel Time

Shallow Channel Ground Cover			Short Pasture/Lawns			
	$L_{\max, \text{Overland}}$	300 ft			C_v	7
	L (ft)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)
Total	1,100	19	-	-	-	-
Initial Time	100	1	0.010	-	18.4	DCM Eq. 6-8
Shallow Channel	1,000	18	0.018	0.9	17.7	- DCM Eq. 6-9
Channelized			0.000	0.0	0.0	- V-Ditch
				t_c	36.2 min.	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	1.77	2.20	2.57	2.93	3.30	3.69
Runoff (cfs)	0.1	0.3	0.7	1.4	1.9	2.5
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.1	0.3	0.7	1.4	1.9	2.5

Notes

C2 6.035 7.583 8.847 10.111 11.375 12.735

Combined Sub-Basin Runoff Calculations (Existing West Detention Inflow)

Includes Basins OS-1 EX-A

Job No.: **61099**

Date: **10/20/2023 14:12**

Project: **Viewpoint Estates Filing No. 2**

Calcs by: **JO**

Checked by:

Jurisdiction **DCM**

Soil Type **B**

Runoff Coefficient **Surface Type**

Urbanization **Urban**

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
Pasture/Meadow	478,979	11.00	0.02	0.08	0.15	0.25	0.3	0.35	0%
Roofs	-	0.00	0.71	0.73	0.75	0.78	0.8	0.81	90%
Gravel	-	0.00	0.57	0.59	0.63	0.66	0.68	0.7	80%
Paved	25,734	0.59	0.89	0.9	0.92	0.94	0.95	0.96	100%
Combined	504,712	11.59	0.06	0.12	0.19	0.29	0.33	0.38	5.1%

Basin Travel Time

	Sub-basin or Channel Type	Material Type	L (ft)	Elev. ΔZ_0 (ft)	Q_i (cfs)	Base or Dia (ft)	Sides z:1 (ft/ft)	v (ft/s)	t (min)
Furthest Reach	OS-1	-	25	3	-	-	-	-	5.0
Channelized-1	V-Ditch	3	780	11	7	0	2	1.4	9.2
Channelized-2									
Channelized-3									
Total			805	14					
	3 = Natural, Winding, significant vegetation								
								t_c (min)	14.2

Contributing Offsite Flows (Added to Runoff and Allowed Release, below.)

Contributing Basins/Areas Historic Off-site Flows

Q_{Minor} (cfs) - 5-year Storm

Q_{Major} 63.26 (cfs) - 100-year Storm

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.88	3.60	4.20	4.80	5.40	6.05
Site Runoff (cfs)	2.15	5.08	9.22	15.87	20.86	26.70
OffSite Runoff (cfs)	-	0.00	-	-	-	63.26
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	-	5.1	-	-	-	90.0

C2 6.035 7.583 8.847 10.111 11.375 12.735

Notes

Runoff from Offsite basins have been assumed constant, despite additional times of concentration.

Combined Sub-Basin Runoff Calculations (EX-DP2)

Includes Basins EX-B

Job No.: **61099**

Date: **10/20/2023 14:12**

Project: **Viewpoint Estates Filing No. 2**

Calcs by: **JO**

Checked by: _____

Jurisdiction **DCM**
Runoff Coefficient **Surface Type**

Soil Type **B**
Urbanization **Urban**

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
Pasture/Meadow	86,860	1.99	0.02	0.08	0.15	0.25	0.3	0.35	0%
Roofs	-	0.00	0.71	0.73	0.75	0.78	0.8	0.81	90%
Gravel	-	0.00	0.57	0.59	0.63	0.66	0.68	0.7	80%
Paved	-	0.00	0.89	0.9	0.92	0.94	0.95	0.96	100%
Combined	86,860	1.99	0.02	0.08	0.15	0.25	0.30	0.35	0.0%

Basin Travel Time

	Sub-basin or Channel Type	Material Type	L (ft)	Elev. ΔZ_0 (ft)	Q_i (cfs)	Base or Dia (ft)	Sides z:1 (ft/ft)	v (ft/s)	t (min)
Furthest Reach	B	-	450	6	-	-	-	-	25.4
Channelized-1		3							
Channelized-2									
Channelized-3									
Total			450	6					
		3 = Natural, Winding, significant vegetation							
								t_c (min)	25.4

Contributing Offsite Flows (Added to Runoff and Allowed Release, below.)

Contributing Basins/Areas	Historic Off-site Flows
Q_{Minor}	5.1 (cfs) - 5-year Storm
Q_{Major}	25.3 (cfs) - 100-year Storm

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.19	2.73	3.19	3.64	4.10	4.58
Site Runoff (cfs)	0.09	0.44	0.95	1.82	2.45	3.20
OffSite Runoff (cfs)	-	5.10	-	-	-	25.30
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	-	5.5	-	-	-	28.5

C2 6.035 7.583 8.847 10.111 11.375 12.735

Notes

Runoff from Offsite basins have been assumed constant, despite additional times of concentration.

Combined Sub-Basin Runoff Calculations (Existing East Detention Inflow)

Includes Basins OS-2 OS-3 EX-D

Job No.:	61099	Date:	10/20/2023 14:12
Project:	Viewpoint Estates Filing No. 2	Calcs by:	JO
		Checked by:	
Jurisdiction	DCM	Soil Type	B
Runoff Coefficient	Surface Type	Urbanization	Urban

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
Pasture/Meadow	233,228	5.35	0.02	0.08	0.15	0.25	0.3	0.35	0%
Roofs	-	0.00	0.71	0.73	0.75	0.78	0.8	0.81	90%
Gravel	-	0.00	0.57	0.59	0.63	0.66	0.68	0.7	80%
Paved	22,155	0.51	0.89	0.9	0.92	0.94	0.95	0.96	100%
Combined	255,383	5.86	0.10	0.15	0.22	0.31	0.36	0.40	8.7%

Basin Travel Time

	Sub-basin or Channel Type	Material Type	L (ft)	Elev. ΔZ_0 (ft)	Q_i (cfs)	Base or Dia (ft)	Sides z:1 (ft/ft)	v (ft/s)	t (min)
Furthest Reach	OS-3	-	31	3	-	-	-	-	5.0
Channelized-1	V-Ditch	2	345	6	4	0	2	2.4	2.4
Channelized-2									
Channelized-3									
Total			376	9					

2 = Natural, Winding, minimal vegetation/shallow grass

t_c
(min) **7.4**

Contributing Offsite Flows (Added to Runoff and Allowed Release, below.)

Contributing Basins/Areas Historic Off-site Flows

Q_{Minor} (cfs) - 5-year Storm
 Q_{Major} 66.6 (cfs) - 100-year Storm

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	3.66	4.58	5.35	6.11	6.88	7.70
Site Runoff (cfs)	2.05	4.06	6.80	11.10	14.37	18.18
OffSite Runoff (cfs)	-	0.00	-	-	-	66.60
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	-	4.1	-	-	-	84.8

C2 6.035 7.583 8.847 10.111 11.375 12.735

Notes

Runoff from Offsite basins have been assumed constant, despite additional times of concentration.

Combined Sub-Basin Runoff Calculations (EX-DP4)

Includes Basins OS-2 EX-C

Job No.: **61099**

Date: **10/20/2023 14:12**

Project: **Viewpoint Estates Filing No. 2**

Calcs by: **JO**

Checked by: _____

Jurisdiction **DCM**
Runoff Coefficient **Surface Type**

Soil Type **B**
Urbanization **Urban**

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
Pasture/Meadow	249,430	5.73	0.02	0.08	0.15	0.25	0.3	0.35	0%
Roofs	-	0.00	0.71	0.73	0.75	0.78	0.8	0.81	90%
Gravel	-	0.00	0.57	0.59	0.63	0.66	0.68	0.7	80%
Paved	7,885	0.18	0.89	0.9	0.92	0.94	0.95	0.96	100%
Combined	257,315	5.91	0.05	0.11	0.17	0.27	0.32	0.37	3.1%

Basin Travel Time

	Sub-basin or Channel Type	Material Type	L (ft)	Elev. ΔZ_0 (ft)	Q_i (cfs)	Base or Dia (ft)	Sides z:1 (ft/ft)	v (ft/s)	t (min)
Furthest Reach	OS-2	-	31	3	-	-	-	-	5.0
Channelized-1	V-Ditch	3	580	11	2	0	2	1.2	8.2
Channelized-2									
Channelized-3									
Total			611	14					
	3 = Natural, Winding, significant vegetation								
								t_c (min)	13.2

Contributing Offsite Flows (Added to Runoff and Allowed Release, below.)

Contributing Basins/Areas	Historic Off-site Flows
Q_{Minor}	4.1 (cfs) - 5-year Storm
Q_{Major}	42.9 (cfs) - 100-year Storm

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.97	3.72	4.34	4.96	5.58	6.24
Site Runoff (cfs)	0.82	2.31	4.45	7.94	10.54	13.59
OffSite Runoff (cfs)	-	4.10	-	-	-	42.90
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	-	6.4	-	-	-	56.5

C2 6.035 7.583 8.847 10.111 11.375 12.735

Notes

Runoff from Offsite basins have been assumed constant, despite additional times of concentration.

Combined Sub-Basin Runoff Calculations (Developed West Detention Inflow)

Includes Basins OS-1 A

Job No.: **61099**

Date: **10/20/2023 14:12**

Project: **Viewpoint Estates Filing No. 2**

Calcs by: **JO**

Checked by:

Jurisdiction **DCM**

Soil Type **B**

Runoff Coefficient **Surface Type**

Urbanization **Urban**

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
Pasture/Meadow	438,979	10.08	0.02	0.08	0.15	0.25	0.3	0.35	0%
Roofs	8,000	0.18	0.71	0.73	0.75	0.78	0.8	0.81	90%
Gravel	32,000	0.73	0.57	0.59	0.63	0.66	0.68	0.7	80%
Paved	25,734	0.59	0.89	0.9	0.92	0.94	0.95	0.96	100%
Combined	504,712	11.59	0.11	0.16	0.23	0.32	0.37	0.41	11.6%

Basin Travel Time

	Sub-basin or Channel Type	Material Type	L (ft)	Elev. ΔZ_0 (ft)	Q_i (cfs)	Base or Dia (ft)	Sides z:1 (ft/ft)	v (ft/s)	t (min)
Furthest Reach	OS-1	-	25	3	-	-	-	-	5.0
Channelized-1	V-Ditch	3	780	11	7	0	2	1.4	9.2
Channelized-2									
Channelized-3									
Total			805	14					
	3 = Natural, Winding, significant vegetation								
								t_c (min)	14.2

Contributing Offsite Flows (Added to Runoff and Allowed Release, below.)

Contributing Basins/Areas Historic Off-site Flows

Q_{Minor} (cfs) - 5-year Storm
 Q_{Major} 63.26 (cfs) - 100-year Storm

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.88	3.60	4.20	4.80	5.40	6.05
Site Runoff (cfs)	3.67	6.86	11.16	17.78	22.86	28.77
OffSite Runoff (cfs)	-	0.00	-	-	-	63.26
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	-	6.9	-	-	-	92.0

C2 6.035 7.583 8.847 10.111 11.375 12.735

Notes

Runoff from Offsite basins have been assumed constant, despite additional times of concentration.

Combined Sub-Basin Runoff Calculations (DP2)

Includes Basins B

Job No.: **61099**

Date: **10/20/2023 14:12**

Project: **Viewpoint Estates Filing No. 2**

Calcs by: **JO**

Checked by: _____

Jurisdiction **DCM**

Soil Type **B**

Runoff Coefficient **Surface Type**

Urbanization **Urban**

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
Pasture/Meadow	86,860	1.99	0.02	0.08	0.15	0.25	0.3	0.35	0%
Roofs	-	0.00	0.71	0.73	0.75	0.78	0.8	0.81	90%
Gravel	-	0.00	0.57	0.59	0.63	0.66	0.68	0.7	80%
Paved	-	0.00	0.89	0.9	0.92	0.94	0.95	0.96	100%
Combined	86,860	1.99	0.02	0.08	0.15	0.25	0.30	0.35	0.0%

Basin Travel Time

	Sub-basin or Channel Type	Material Type	L (ft)	Elev. ΔZ_0 (ft)	Q_i (cfs)	Base or Dia (ft)	Sides z:1 (ft/ft)	v (ft/s)	t (min)
Furthest Reach	b	-	450	6	-	-	-	-	25.4
Channelized-1		3							
Channelized-2									
Channelized-3									
Total			450	6					
		3 = Natural, Winding, significant vegetation							
								t_c (min)	25.4

Contributing Offsite Flows (Added to Runoff and Allowed Release, below.)

Contributing Basins/Areas Historic Off-site Flows

Q_{Minor} 6.9 (cfs) - 5-year Storm

Q_{Major} 25.3 (cfs) - 100-year Storm

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.19	2.73	3.19	3.64	4.10	4.58
Site Runoff (cfs)	0.09	0.44	0.95	1.82	2.45	3.20
OffSite Runoff (cfs)	-	6.90	-	-	-	25.30
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	-	7.3	-	-	-	28.5

C2 6.035 7.583 8.847 10.111 11.375 12.735

Notes

Runoff from Offsite basins have been assumed constant, despite additional times of concentration.

Combined Sub-Basin Runoff Calculations (Developed East Detention Inflow)

Includes Basins OS-2 OS-3 D

Job No.: **61099**

Date: **10/20/2023 14:12**

Project: **Viewpoint Estates Filing No. 2**

Calcs by: **JO**

Checked by: _____

Jurisdiction **DCM**

Soil Type **B**

Runoff Coefficient **Surface Type**

Urbanization **Urban**

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
Pasture/Meadow	223,228	5.12	0.02	0.08	0.15	0.25	0.3	0.35	0%
Roofs	2,000	0.05	0.71	0.73	0.75	0.78	0.8	0.81	90%
Gravel	8,000	0.18	0.57	0.59	0.63	0.66	0.68	0.7	80%
Paved	22,155	0.51	0.89	0.9	0.92	0.94	0.95	0.96	100%
Combined	255,383	5.86	0.12	0.17	0.24	0.33	0.37	0.42	11.9%

Basin Travel Time

	Sub-basin or Channel Type	Material Type	L (ft)	Elev. ΔZ_0 (ft)	Q_i (cfs)	Base or Dia (ft)	Sides z:1 (ft/ft)	v (ft/s)	t (min)
Furthest Reach	OS-3	-	31	3	-	-	-	-	5.0
Channelized-1	V-Ditch	2	345	6	4	0	2	2.4	2.4
Channelized-2									
Channelized-3									
Total			376	9					
2 = Natural, Winding, minimal vegetation/shallow grass									
									t_c (min) 7.4

Contributing Offsite Flows (Added to Runoff and Allowed Release, below.)

Contributing Basins/Areas Historic Off-site Flows

Q_{Minor} (cfs) - 5-year Storm

Q_{Major} 66.6 (cfs) - 100-year Storm

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	3.66	4.58	5.35	6.11	6.88	7.70
Site Runoff (cfs)	2.53	4.63	7.42	11.71	15.00	18.84
OffSite Runoff (cfs)	-	0.00	-	-	-	66.60
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	-	4.6	-	-	-	85.4

C2 6.035 7.583 8.847 10.111 11.375 12.735

Notes

Runoff from Offsite basins have been assumed constant, despite additional times of concentration.

Combined Sub-Basin Runoff Calculations (DP4)

Includes Basins OS-2 C

Job No.: **61099**

Date: **10/20/2023 14:12**

Project: **Viewpoint Estates Filing No. 2**

Calcs by: **JO**

Checked by: _____

Jurisdiction **DCM**

Soil Type **B**

Runoff Coefficient **Surface Type**

Urbanization **Urban**

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
Pasture/Meadow	229,430	5.27	0.02	0.08	0.15	0.25	0.3	0.35	0%
Roofs	4,000	0.09	0.71	0.73	0.75	0.78	0.8	0.81	90%
Gravel	16,000	0.37	0.57	0.59	0.63	0.66	0.68	0.7	80%
Paved	7,885	0.18	0.89	0.9	0.92	0.94	0.95	0.96	100%
Combined	257,315	5.91	0.09	0.15	0.21	0.30	0.35	0.40	9.4%

Basin Travel Time

	Sub-basin or Channel Type	Material Type	L (ft)	Elev. ΔZ_0 (ft)	Q_i (cfs)	Base or Dia (ft)	Sides z:1 (ft/ft)	v (ft/s)	t (min)
Furthest Reach	OS-2	-	31	3	-	-	-	-	5.0
Channelized-1	V-Ditch	3	580	11	2	0	2	1.2	8.2
Channelized-2									
Channelized-3									
Total			611	14					
	3 = Natural, Winding, significant vegetation								
								t_c (min)	13.2

Contributing Offsite Flows (Added to Runoff and Allowed Release, below.)

Contributing Basins/Areas Historic Off-site Flows

Q_{Minor} 4.6 (cfs) - 5-year Storm

Q_{Major} 42.9 (cfs) - 100-year Storm

Rainfall Intensity & Runoff


	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.97	3.72	4.34	4.96	5.58	6.24
Site Runoff (cfs)	1.61	3.23	5.45	8.93	11.57	14.66
OffSite Runoff (cfs)	-	4.60	-	-	-	42.90
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	-	7.8	-	-	-	57.6

C2 6.035 7.583 8.847 10.111 11.375 12.735

Notes

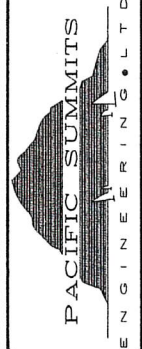
Runoff from Offsite basins have been assumed constant, despite additional times of concentration.

DATE	DESCRIPTION	CON.	APP'D

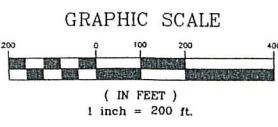
DATE: 6/6/99
RECOMMENDED: 
DAVID K. RICE JR.
R. E. # 7338

DATE: DRAWN BY: K.E.C.
DESIGNED BY: K.E.C.
CHECKED BY: D.K.R.
JOB NO.: 1001
SCALE: 1"=200'

121 ELK COURT
WINTER PARK, CO 80482
PHONE: (920) 726-6654



VIEWPOINT ESTATES
EL PASO COUNTY, COLORADO
FINAL DRAINAGE PLAN



FOUND
N.W. COR. SECTION 10
T14S, R63W, 6TH P.M.

N.E. COR. SECTION 10
T14S, R63W, 6TH P.M.
RND. NO. 5 REBAR W/ALUM
CAP L.S. 6786
N. 1/4 COR. SEC. 10
SET NO. 5 REBAR
L.S. 7338

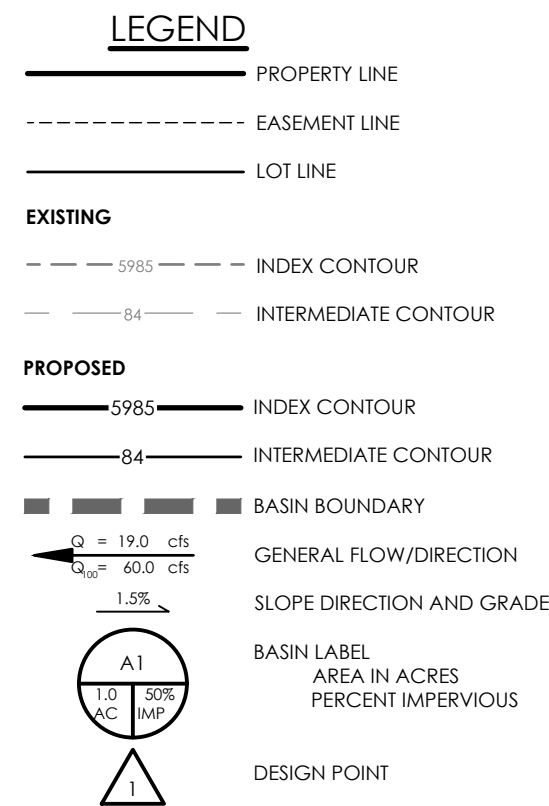
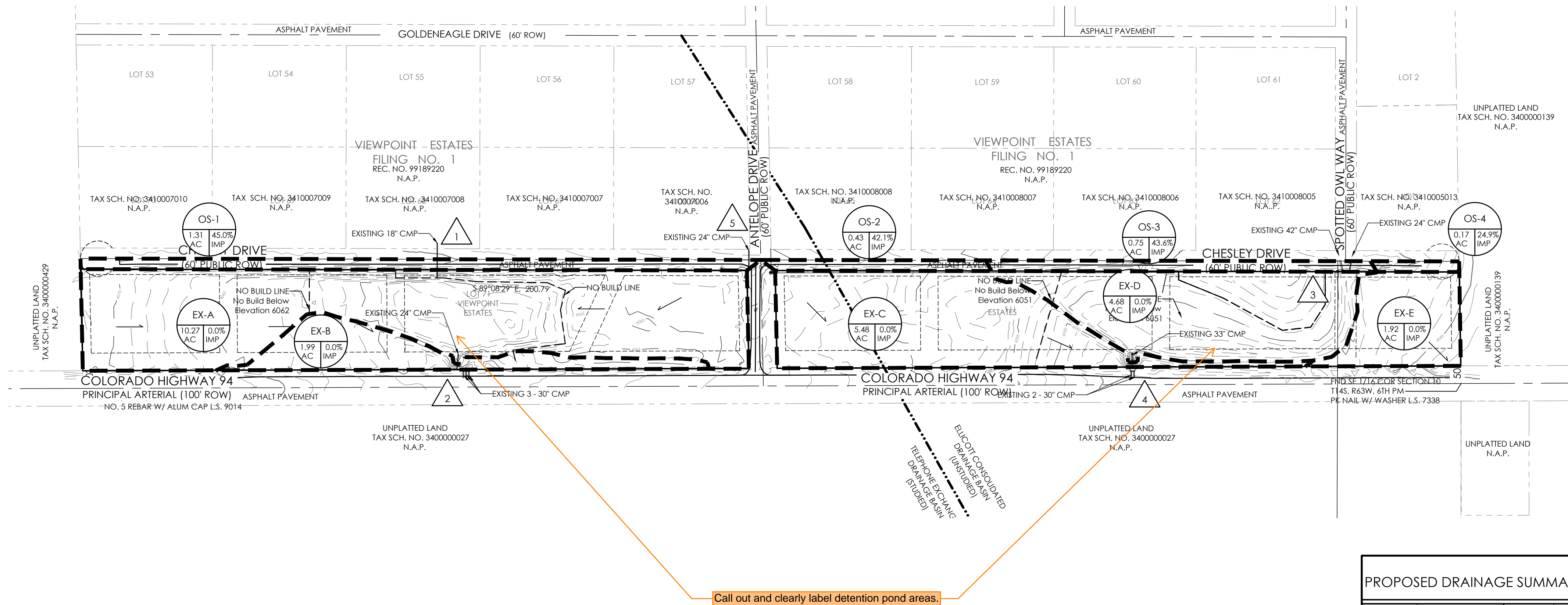


S.W. COR. SECTION 10
T14S, R63W, 6TH P.M.
CAP L.S. 9014

HIGHWAY #94 - 100' R.O.W.

(DB) DETENTION BASIN

S. 1/4 COR. SEC. 10
SET PK NAIL W/WASHER
L.S. 7338



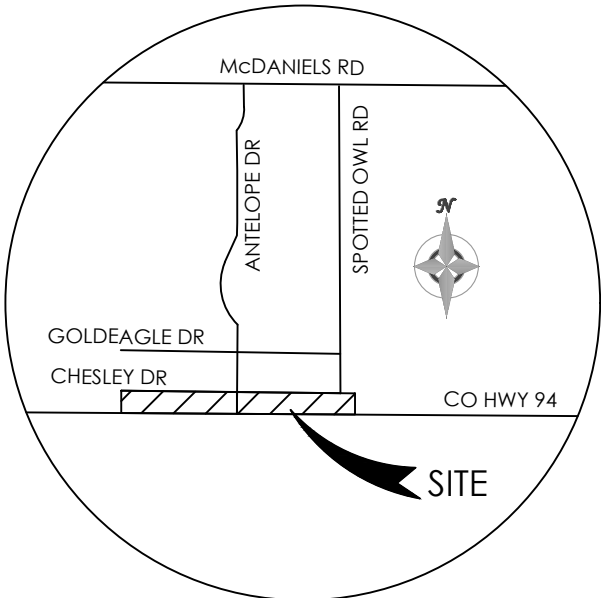
FLOODPLAIN STATEMENT

NO PORTION OF THE SUBJECT PROPERTY IS LOCATED WITHIN A FEMA DESIGNATED SPECIAL FLOOD HAZARD AREA (SFHA) AS INDICATED ON THE FLOOD INSURANCE RATE MAP (FIRM) FOR EL PASO COUNTY, COLORADO AND INCORPORATED AREAS - MAP NUMBERS 08041C0805 G AND 08041C0810 G, EFFECTIVE DECEMBER 7, 2018.

PROPOSED DRAINAGE SUMMARY TABLE

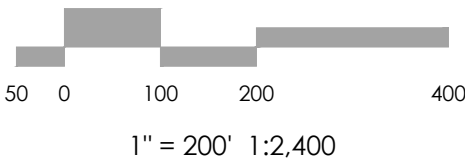
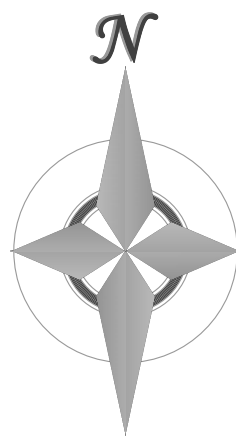
DESIGN POINT	INCLUDED BASIN(S)	AREA (AC)	Tc (MIN.)	RUNOFF	
				Q5 (CFS)	Q100 (CFS)
	OS-1	1.31	5.0	3.0	7.1
	OS-2	0.43	5.0	0.9	2.3
	OS-3	0.75	5.0	1.7	4.0
	OS-4	0.17	5.0	0.2	0.7
	EX-A	10.27	31.8	2.0	14.5
	EX-B	1.99	25.4	0.4	3.2
	EX-C	5.48	21.7	1.3	9.6
	EX-D	4.68	23.2	1.1	7.9
	EX-E	1.92	36.2	0.3	2.5
DP1*	VEFDR	-	-	-	20.97*
WEST DETENTION BASIN	OS-1, EX-A, DP1, DP5	11.59	14.2	5.1+	90.0*
	RELEASE RATE			5.1+	25.3*
DP2*	DP1, DP5, OS-1, A, B, W, DETENT.	1.99	25.4	5.5+	28.5*
DP3*	VEFDR	-	-	-	66.6*
EAST DETENTION BASIN	OS-3, DP3, EX-D	5.86	7.4	4.1+	84.8*
	RELEASE RATE			4.1+	42.9*
EX-DP4*	OS-2, EX-C, OS-4, EX-E + DETENT.	5.91	13.2	6.4+	56.5*
DP5*	VEFDR	-	-	-	42.29*

*OFFSITE FLOWS ARE BASED ON THE APPROVED VIEWPOINT ESTATES FINAL DRAINAGE REPORT (VEFDR), BY PACIFIC SUMMITTS ENGINEERING, LTD, DATED JANUARY 1998. DENOTED 100 YEAR RUNOFF.



VICINITY MAP
NOT TO SCALE

BENCHMARK



1903 Leary street, suite 200 Colorado Springs CO 80909 719.635.5736

REVISIONS
1. FEBRUARY 25, 2023
OS SUB-BASINS ADDED

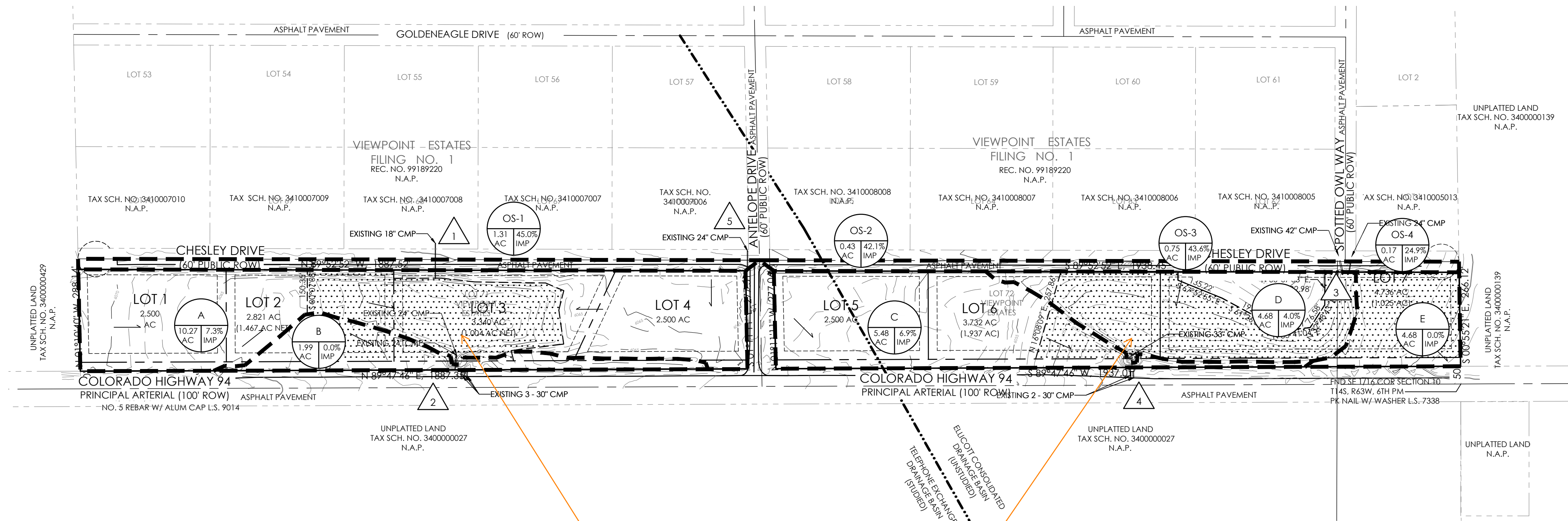
DESIGNED BY _____
DRAWN BY _____
CHECKED BY _____
AS-BUILT BY _____
CHECKED BY _____

**VIEWPOINT
ESTATES FILING NO. 2**

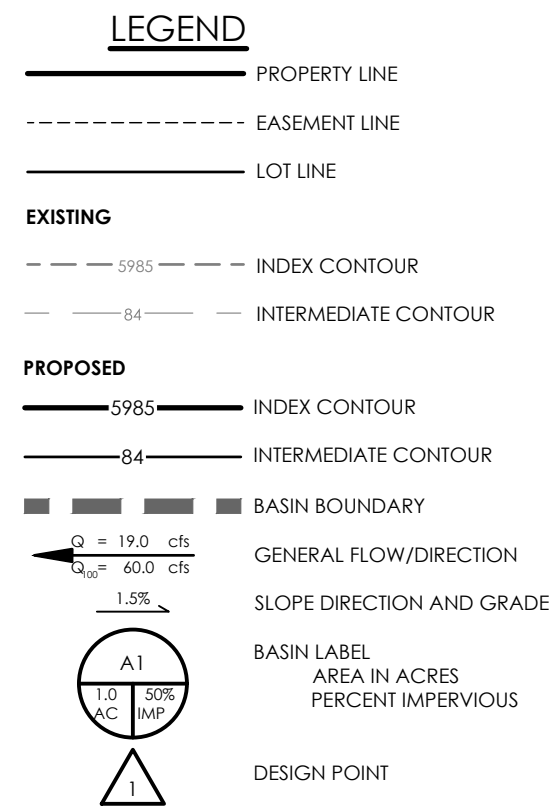
**EXISTING
DRAINAGE MAP**

MVE PROJECT 61099
MVE DRAWING EX-DRN

OCTOBER 20, 2023
SHEET 1 OF 1



Unresolved from Submittal 2 - Define hatching in legend. Are these the detention ponds?
Also Call out and clearly label detention pond areas.



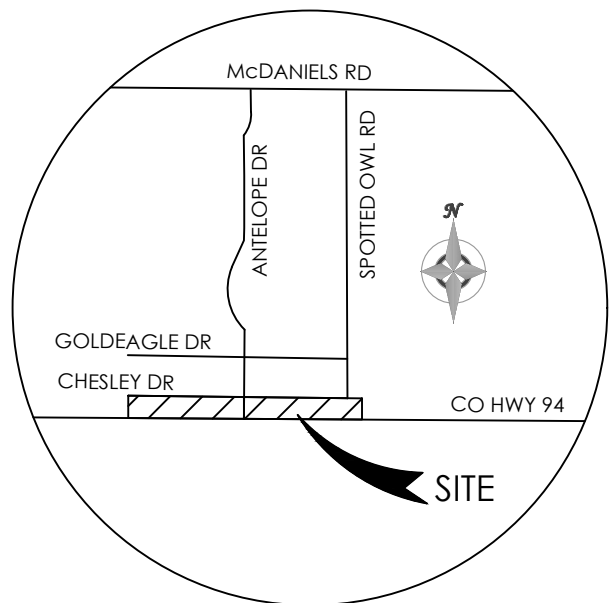
FLOODPLAIN STATEMENT

NO PORTION OF THE SUBJECT PROPERTY IS LOCATED WITHIN A FEMA DESIGNATED SPECIAL FLOOD HAZARD AREA (SFHA) AS INDICATED ON THE FLOOD INSURANCE RATE MAP (FIRM) FOR EL PASO COUNTY, COLORADO AND INCORPORATED AREAS - MAP NUMBERS 08041C0805 G AND 08041C0810 G, EFFECTIVE DECEMBER 7, 2018.

PROPOSED DRAINAGE SUMMARY TABLE

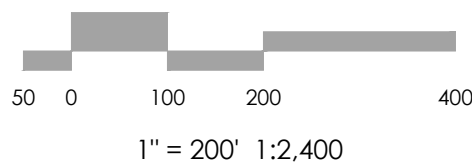
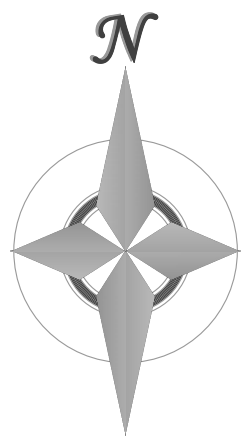
DESIGN POINT	INCLUDED BASIN(S)	AREA (AC)	Tc (MIN.)	RUNOFF	
				Q5 (CFS)	Q100 (CFS)
	OS-1	1.31	5.0	3.0	7.1
	OS-2	0.43	5.0	0.9	2.3
	OS-3	0.75	5.0	1.7	4.0
	OS-4	0.17	5.0	0.2	0.7
	A	10.27	30.9	3.2	16.1
	B	1.99	25.4	0.4	3.2
	C	5.48	21.1	2.1	10.5
	D	4.68	22.7	1.4	8.4
	E	1.92	36.2	0.3	2.5
DP1*	VEFDR	-	-	-	20.97*
WEST DETENTION BASIN	OS-1, A, DP1, DP5 RELEASE RATE	11.59	14.2	6.9+	92.0*
DP2*	DP1, DP5, OS-1, A, B, & W. DETENT	1.99	25.4	7.3+	28.5*
DP3*	VEFDR	-	-	-	66.6*
EAST DETENTION BASIN	OS-3, DP3, D RELEASE RATE	5.86	7.4	4.6+	85.4*
DP4*	OS-2, C, OS-4, E, & E. DETENT		5.91	13.2	7.8+
DP5*	VEFDR	-	-	-	42.29*

*OFFSITE FLOWS ARE BASED ON THE APPROVED VIEWPOINT ESTATES FINAL DRAINAGE REPORT (VEFDR), BY PACIFIC SUMMITTS ENGINEERING LLC, DATED JANUARY 1998. DENOTED 100 YEAR RUNOFF.



VICINITY MAP
NOT TO SCALE

BENCHMARK



REVISIONS
1. FEBRUARY 25, 2023
OS SUB-BASINS ADDED

DESIGNED BY _____
DRAWN BY _____
CHECKED BY _____
AS-BUILT BY _____
CHECKED BY _____

VIEWPOINT
ESTATES FILING NO. 2

PROPOSED
DRAINAGE MAP

MVE PROJECT 61099
PP-DRN
MVE DRAWING

OCTOBER 20, 2023
SHEET 1 OF 1

V3_Drainage Report - Final_Comments.pdf Markup Summary

Cloud+ (2)



Subject: Cloud+
Page Label: 12
Author: eschoenheit
Date: 1/18/2024 8:06:21 AM
Status:
Color: ■
Layer:
Space:

No 25% reduction for bridge fee for large lot only drainage basin fee



Subject: Cloud+
Page Label: 5
Author: eschoenheit
Date: 1/18/2024 9:50:07 AM
Status:
Color: ■
Layer:
Space:

Ensure statements between PRELIM Plan, Plat and FDR match. Add missing Panel #08041C0805G.

Highlight (2)



Subject: Highlight
Page Label: 3
Author: eschoenheit
Date: 1/18/2024 8:09:21 AM
Status:
Color: ■
Layer:
Space:



Subject: Highlight
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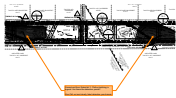
Line (1)

= \$ (4,997.97)

= \$ ~~14,993.90~~

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Page Label: 12
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Date: 1/18/2024 8:06:10 AM
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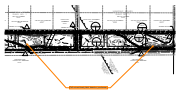
SW - Textbox with Arrow (2)



Subject: SW - Textbox with Arrow
Page Label: 59
Author: Mikayla Hartford
Date: 1/17/2024 9:22:30 AM
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Unresolved from Submittal 2 - Define hatching in legend. Are these the detention ponds?

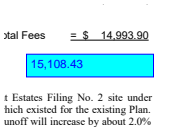
Also Call out and clearly label detention pond areas.



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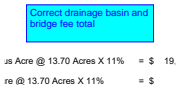
Call out and clearly label detention pond areas.

Text Box (3)



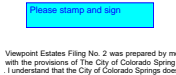
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Author: eschoenheit
Date: 1/18/2024 8:06:07 AM
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Layer:
Space:

15,108.43



Subject: Text Box
Page Label: 12
Author: eschoenheit
Date: 1/18/2024 8:07:09 AM
Status:
Color:
Layer:
Space:

Correct drainage basin and bridge fee total



Subject: Text Box
Page Label: 3
Author: eschoenheit
Date: 1/18/2024 8:09:15 AM
Status:
Color:
Layer:
Space:

Please stamp and sign