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Master
Development
Drainage
Plan /
Preliminary
Drainage
Report

Eagle Rising

Project No. 61145

January 10, 2023

PCD File No.

Master Development Drainage Plan / Preliminary Drainage Report

For

Eagle Rising

Project No. 61145

January 10, 2023

Prepared for

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Master Development Drainage Plan / Preliminary Drainage Report

The purpose of this Master Development Drainage Plan / Preliminary Drainage Report is to identify drainage patterns and quantities within and affecting the proposed Eagle Rising development and Eagle Rising subdivision. The development project is a residential subdivision with seventeen (17) 2.5± acre lots, and two (2) tracts. The report will identify specific solutions to problems on-site and off-site resulting from the proposed project. The report and included maps present results of hydrologic and drainage facilities analyses. The report will discuss the recommended drainage improvements to the site and identify drainage requirements relative to the proposed project. This report has been prepared and submitted in accordance with the requirements of the El Paso County development approval process. An Appendix is included with this report with pertinent calculations and graphs used in the drainage analyses and design.

1. General Location and Description

1.1. Location

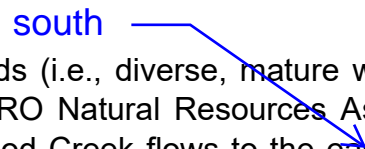
The proposed Eagle Rising project and is located within the east one-half of Section 29, Township 12 South, Range 65 west of the 6th principal meridian in El Paso County, Colorado. The Eagle Rising project site consists of 70.8+/- acres and is situated east of Black Forest Road north of Highland Park subdivision filing No. 2. The site contains two existing single-family residences, a large barn, and several ancillary buildings. The El Paso County Assessor's Schedule Numbers for the site are 5229000034 and 5229000035. The proposed site has never been platted. A Vicinity Map is included in the Appendix.

The south edge of the site is adjacent to Highland Park Subdivision Filing No. 2 zoned RR-2.5 (Rural Residential (2.5 acres). Lots 9, 10 & 11 Eagle Wing Estates zoned RR-2.5 each containing a single family residence are located adjacent to the west side of the site. Also adjacent to the west side of the site is an unplatted parcel containing a single-family residence zoned RR-5. Lots 135, 136, 137, 141 & 142, Highland Park Filing No. 3, vacant lots zoned RR-2.5, are all adjacent to the east side of the site. Lot 1, Poco Subdivision, containing a single-family residence zoned RR-5, is also adjacent to the east side of the site. Also, adjacent to the east side of the site are lots 8 & 9 block 19 Park Forest Estates Filing No 2 zoned RR-5, containing a single-family residence. Lot 14 block 18, and lot 5

block 19, Park Forest Estates Filing No. 2, each containing a single-family residence and zoned RR-5, are adjacent to the north of the site. The site is located in El Paso County's Cottonwood Creek Drainage Basin.

1.2. Description of Property

The Eagle Rising site is 70.8+/- acres and is zoned RR-2.5 (Residential Rural (2.5 Acres)). The property is the location of two (2) single-family residences, a large barn, several ancillary buildings with two existing unpaved driveways. In addition, there are two on-line ponds along the main stem of Cottonwood Creek. These two man-made ponds along the said channel reach which were believed to be constructed around the 1950's. The purpose for their construction is unknown due to lack of history but is speculated to be for livestock use.



The site is covered with native grass and weeds (i.e., diverse, mature wetland fauna, upland shrubs, and riparian overstory – see ERO Natural Resources Assessment) in good condition, and coniferous trees. Cottonwood Creek flows to the east through the eastern portion of the site. The existing site topography slopes toward Cottonwood Creek with grades that range from 1% to 12%. Cottonwood Creek flows north to south to the east through the Eagle Rising site with all storm runoff flows from said Eagle Rising flowing into Cottonwood Creek. The site is located in the Cottonwood Creek Drainage Basin. The flows from in Cottonwood Creek are tributary to Monument Creek.

According to the National Resource Conservation Service, there are two (2) soil types in the Eagle Rising site. Kettle gravelly loamy sand (map unit 40) makes up a portion of the soil in the northern end of the site. The soil is deep and somewhat excessively drained. Permeability is moderately rapid, surface runoff is slow, and the hazard of erosion is slight to moderate. Kettle gravelly loamy sand is classified as being part of Hydrologic Soil Group B.

The other soil type is Pring Coarse Sandy Loam (map unit 71) which makes up the rest of the site. The soil is deep and well drained. Permeability is moderately rapid, surface runoff is slow, and the hazard of erosion is slight to moderate. Pring Coarse Sandy Loam is classified as being part of Hydrologic Soil Group B.

A portion of the Soil Map and data tables from the National Cooperative Soil Survey and relevant Official Soil Series Descriptions (OSD) are included in the **Appendix**.^{1 2}

Cottonwood Creek, a major drainage way, runs through the eastern portion of the Eagle Rising site. The 100-year water surface elevation for the drainage-way was determined by hydraulic analysis utilizing HEC-RAS as prepared by M.V.E., Inc. which is included and accepted in this report. No build areas are shown on the Preliminary Plan for Eagle Rising that include the 100-year inundated area determine in the hydraulic analyses as

¹ WSS

² OSD

well as Construction/Disturbance Limits from the Wetland Determination Mapping for the project. Two existing ponds, which are to remain, are present in the drainageway.

The current Flood Insurance Study of the region includes Flood Insurance Rate Maps (FIRM), effective on December 7, 2018.³ The proposed subdivision is included in the Community Panels Numbered 08041C0527 G and 08041C0535 G of the Flood Insurance Rate Maps for the El Paso County. A small area in the southeastern corner of the Eagle Rising Site is shown to be included in a 100-year flood hazard area as determined by FEMA. A portion of the current FEMA Flood Insurance Rate Maps with the site delineated is included in the **Appendix**.

2. Drainage Basins and Sub-Basins

2.1. Major Basin Description

The Eagle Rising site is located in the Cottonwood Creek Drainage Basin (FOMO2200) of the Fountain Creek Major Drainage Basin. The Cottonwood Creek Drainage Basin Covers an area of approximately 19 square miles and drains to Monument Creek. The Cottonwood Creek Drainage Basin Planning Study Final Report⁴ (DBPS), July 2019, prepared by Matrix Design Group provides development recommendations and requirements for drainage development in the Cottonwood Creek Drainage Basin. The Cottonwood Creek Drainage Basin encompasses a part of the northeast portion of the City of Colorado Springs and extends to the north and east. The drainage basin and Cottonwood Creek drain southwest into Monument Creek. The Eagle Rising site is located north of Cottonwood Creek as it flows offsite towards Monument Creek. The site is located in portions of sub-basins UC100, UC120, and UC130 upstream of Design Point UUC126 and downstream of Design Point JUC 82 of the DBPS. No improvements are recommended on or near the Eagle Rising site. More specifically the DBPS Figure 4-7 shows no deficiencies for the Reaches RUC104, RUC106, & RUC126 that effect Eagle Rising Reinstated Preliminary Plan. The DBPS report indicates that the Stormwater Condition Assessment Program (SCAP) database for the data collected for Cottonwood Creek and South Pine Creek drainage basins shows a small percentage (less than 3%) of the channels and channel banks evaluated have a rating of “poor” with respect to their current condition. About 10% of the grade control structures evaluated were rated as “poor”, so are not expected to function as intended. These grade control structures were not on Eagle Rising property. The proposed Eagle Rising project is in conformance with the DBPS.

Add a statement that this report was adopted by the City but the last DBPS adopted by the County was dated 1994

³ FIRM
⁴ DBPS

2.2. Other Drainage Reports

The “Eagle Rising Preliminary Drainage Report” by M&S Civil Consultants, Inc. dated June 2013 and Revised July, 2013 was reviewed in preparation of this Master Development Drainage Plan / Preliminary Drainage Report.⁵ Said report is not approved and therefore was only used for informational purposes. Calculations in said report were reviewed and found to not be in compliance with the current Drainage Design Criteria used to for the preparation of this report.

2.3. Sub-Basin Description

The existing drainage patterns of the Eagle Rising development project are described by various sub-basins making up Existing Design Points and Developed Design Points. All existing sub-basin delineations and data are depicted on the attached **Eagle Rising Hydrology Map Existing (On-Site)**.

3. Drainage Design Criteria

3.1. Development Criteria Reference

This Master Development Drainage Plan / Preliminary Drainage Report for Eagle Rising has been prepared according to the report guidelines presented in the latest edition of El Paso County Drainage Criteria Manual (DCM)⁶. The County has also adopted portions of the City of Colorado Springs Drainage Criteria Manual Volumes 1 and 2, especially concerning the calculation of rainfall runoff flow rates.^{7 8} The hydrologic analysis is based on a collection of data from the DCM, the NRCS Web Soil Survey⁹, and existing topographic data by Land Resource Associates.

3.2. Hydrologic Criteria

This For this Master Development Drainage Plan / Preliminary Drainage Report, 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

⁵ 2015 PDR

⁶ DCM Section 4.3 and Section 4.4

⁷ CS DCM Vol 1

⁸ CS DCM Vol 2

⁹ WSS

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.¹⁰

4. Drainage Facility Design

4.1. General Concept

The intent of the drainage concept presented in this Master Development Drainage Plan / Preliminary Drainage Report is to allow for the development Eagle Rising which consists of seventeen (17) 2.5-acre lots, and two (2) tracts while maintaining the existing drainage patterns on the site. The site will be in compliance with the County's Stormwater Management regulations. Major and minor storm flows will continue to be safely conveyed through the site and downstream.

The proposed drainage facilities for the development of Eagle Rising are minimal. The proposed use of the land being 2.5 acre lots does not lead to the necessity of onsite drainage facilities, other than culverts to convey the existing flows under the proposed roadways and driveways. The DBPS Existing and Future City & County Land Use upstream of Eagle Rising is shown as being almost completely developed in their Figures 3-5 & 3-6. As mentioned above, the existing channel is currently witnessing close to the ultimate flows from the existing upstream developed property with minimum signs of deterioration.

The existing and proposed drainage hydrologic conditions are described in more detail below. Input data and results for all calculations are included in the **Appendix**. Drainage maps for the hydrology are also included in the **Appendix**.

4.2. Hydrologic Conditions

4.2.1. Existing Hydrologic Conditions

The Eagle Rising Development is approximately 70.8+/- acres in size. The site primarily consists of grass land with slopes ranging from 4% to 12% and greater adjacent to Cottonwood Creek. The Cottonwood Creek main stem and several tributary branches are located within the site boundary. In addition, there are two on-line ponds along the main stem. These two man-made ponds along the channel reach which were believed to be constructed around the 50's. The purpose for their construction is unknown due to lack of history but is speculated to be for livestock use. These ponds are part of the Eagle Rising 70.8+/- acres property ownership. Water rights within the ponds for the ponds are a separate issue as to their ownership. There are two existing single – family residences, a large barn, and several ancillary buildings present. Existing gravel roadways provide access. There is no evidence of severe erosion or degradation of existing channel. However, it has been mentioned by the previous owner that the existing ponds have

¹⁰ DCM

Provide documentation from State Engineer that the ponds can remain.

overflowed at the existing locations, into the downstream channel. Also, there is no evidence of large sediment transfer deposits in the channel way or in the existing ponds.

The slopes located on the downstream ends of the ponds have been improved to ensure safety according to ENTEC Engineering, Inc recommendations, monitoring and testing. Pursuant to past recommendations in the Soil, Geology, Geologic Hazard Study¹¹ for Eagle Rising Filing No.1 prepared by Entech Engineering, Inc. and dated June 29, 2022 (Revised December 13, 2022) the downstream pond slopes have been regraded to a 2.5:1 slopes, maximum and stabilized. The downstream slopes were cleaned of organics and had the soft areas re-compacted. The fill was benched into the existing compacted slopes and the toes keyed into the existing ground. No other improvements to the pond embankments or overflow structures are proposed at this time.

Pond 1 & Pond 2 along the main stem (described in the Description of Property narrative) were treated as wide channels due to their limited capacity for storage. Utilizing this approach is conservative in nature because the model assumes no storage; therefore, yielding a certain amount of velocity thru the pond reach, albeit minor. Upon field investigation, outlet structures and pipes were discovered. This was not taken into consideration in the model since the outlet pipe size (12" diameter north pond & 18" diameter south pond) is not large enough to convey a significant amount of flow and is thought to be used as an overflow structure during minor storm events only. A "mixed" flow regime approach was used in the model. This approach is typically used for reaches of channels when you have a "mixture" of subcritical and supercritical flow regimes as was evident from review of the model's output data.

Wet land areas are defined in the 'Water Resource Assessment for Eagle Rising Subdivision'¹², prepared by ERO Resources Corporation, Denver, Co and dated Sept. 14, 2012 denotes most of the on-site Cottonwood Creek natural drainageway as wetlands. Any future proposed construction of grade control structures within the wetlands would require approval by the Corps of Engineers a Section 404 permit. Note that damage to the natural wetlands compared to the benefit of any grade control structures would need to be evaluated.

Field observation of said Ponds 1 & 2, existing grade control structures & bank stabilization, and wetlands are entirely consistent with a constructed wetland- Channel' as described in the El Paso County, Colorado Drainage Criteria manual under Constructed Wetlands Channel (CWC) – Sediment Facility. The wetlands were most likely established after the construction of Ponds 1 & 2 in and around the 1950's. The Ponds 1 & 2 helped attenuate the stormwater flows in Cottonwood Creek over the years from the 1950's which most likely aided in the growth of the wetlands. Also, with the ponds constructed not to drain all stored water, most likely provided ground water was

¹¹ SGS
¹² WRA

LOI says wetlands
moved - reference
updated 2022 report?

extended downstream and promoted growth of the wetlands. The existing grade structures in Cottonwood Creek at the lower and upper ends of the site complete what M.V.E., Inc. considers a constructed wetlands channel. These wetlands generally provide natural aesthetic qualities, wildlife habitat, erosion control, and pollutant removal.

The upstream existing land use and future land use is shown to be the same in said Cottonwood Creek DBPS - 2019 which are shown as 2.5 Acre Rural Residential, Woods (Fair Condition), Natural Open Space (Fair Condition), and Civic uses. The planned developed flows for Cottonwood Creek per said DBPS are closely matched to the current flows routed through the site. These designated Cottonwood Creek channel design storm water flows are shown as **Design Points 82, 84, 102, 104, 124, & 126** as listed in said Cottonwood Creek DBPS-2019 and shown on the EXISTING (ON-SITE) DRAINAGE MAP in the **Appendix**.

A brief description of each existing drainage basin adjacent to and affecting the proposed Eagle Rising Development including runoff rates, and drainage patterns is provided for in this section of the report. A summary of existing runoff for the basins and designated design points are depicted on the EXISTING (ON-SITE) DRAINAGE MAP in the **Appendix**. The off-site drainage area impacting Eagle Rising Development and more particularly on-site drainage areas have been divided into existing drainage basins described as follows:

The included Eagle Rising Hydrology Maps (Existing On-Site) depict the existing topographic mapping, drainage basin delineations, drainage patterns, existing drives, drainage facilities, and runoff quantities with a data table including drainage areas and flow rates. The existing hydraulic calculations for this 'Eagle Rising Master Development Drainage Plan / Preliminary Drainage Report' are included in the **Appendix**.

COTTONWOOD CREEK 2019 CHANNEL DESIGN POINTS

Design Point 82 (DP 82) storm water flows ($Q_5=58$ cfs, $Q_{100}=410$ cfs) are generated from off-site Upper Cottonwood (UC) sub-basins delineated in said Cottonwood Creek DBPS - 2019. These sub-basins are located at the top of the Cottonwood Creek watershed and consist of 2.5 Acre Rural Residential, Woods (Fair Condition), Natural Open Space (Fair Condition), and Civic uses. **DP 82** consists of 1.48 square miles and is located on the main stem of Cottonwood Creek at the sites northern boundary where creek flow enters the Eagle Rising development. Velocity is 4.0 fps with a Froude # of 0.44 during the 100yr storm. Field observation by M.V.E., Inc. personnel indicated the area was well vegetated with dense brush with a N Value of 0.12, and no evidence of erosion was observed.

Design Point 84 (DP 84) storm water flows (Q5=69 cfs, Q100=470 cfs) are generated from **DP 82** plus adjacent Upper Cottonwood (UC) sub-basins delineated in said Cottonwood Creek DBPS – 2019. **DP 84** consists of 1.66 square miles and is located on the main stem of Cottonwood Creek. Velocity is 5.9 fps with a Froude # of 0.87 during the 100yr storm. Field observation by M.V.E., Inc. personnel indicated the area was well vegetated with dense willow brush and upland shrubs with a N Value of 0.12, and no evidence of erosion was observed.

Design Point 102 (DP 102) storm water flows (Q5=76 cfs, Q100=560 cfs) are generated from **DP 82 and DP 84** plus adjacent Upper Cottonwood (UC) sub-basins delineated in said Cottonwood Creek DBPS – 2019. **DP 102** consists of 1.90 square miles and is located on the main stem of Cottonwood Creek. Velocity is 3.9 fps with a Froude # of 0.65 during the 100yr storm. Field observation by M.V.E., Inc. personnel indicated the area was well vegetated with grass and weeds (see ERO reference above) with a N Value of 0.35, and no evidence of erosion was observed.

Just north of **DP 102** is an existing rip-rap grade check within Cottonwood Creek channel. Field observation by M.V.E., Inc. personnel indicated the area was well vegetated, said check was stable, and no evidence of erosion was observed.

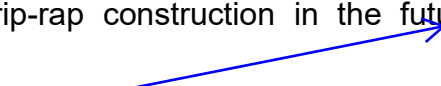
provide design details please



Just to the east of **DP 102** is an existing rip-rap grade control structure at the entrance of the swale at **DP M&S1**. Field observation by M.V.E., Inc. personnel indicated the area was well vegetated, said control structure was stable, and no evidence of erosion was observed.

Design Point 104 (DP 104) storm water flows (Q5=95 cfs, Q100=700 cfs) are generated from **DP 82, DP 84, and DP 102** plus adjacent Upper Cottonwood (UC) sub-basins delineated in said Cottonwood Creek DBPS – 2019. **DP 104** consists of 2.24 square miles and is located on the main stem of Cottonwood Creek. Velocity is 6.1fps with a Froude # of 0.95 during the 100yr storm. Field observation by M.V.E., Inc. personnel indicated the area was well vegetated with grass and weeds (see ERO reference above) with a N Value of 0.35, and no evidence of erosion was observed. This is in the Pond 1 overflow spillway. The spillway will require additional swale and rip-rap construction in the future to adequately convey the storm water overflows.

at the time of final plat




Just to the east of **DP 104** is existing rip-rap bank protection along the eastern side of Pond 1 where Cottonwood Creek is curving to the south and continues as the spillway. Field observation by M.V.E., Inc. personnel observed that the area was well vegetated, said bank stabilization was stable, and there was no evidence of erosion.

100/750?



Design Point 124 (DP 124) storm water flows (Q5=95 cfs, Q100=700 cfs) are generated from **DP 82, DP 84, DP 102, and DP 104** plus adjacent Upper Cottonwood (UC) sub-

this could be confusing to a reader, thinking that all of these are added together.



basins delineated in said Cottonwood Creek DBPS – 2019. **DP 124** consists of 2.34 square miles and is located on the main stem of Cottonwood Creek. Velocity is 2.8 fps with a Froude # of 0.28 during the 100yr storm. Field observation by M.V.E., Inc. personnel indicated the area was well vegetated with dense brush with a N Value of 0.12, and no evidence of erosion was observed.

Design Point 126 (DP 126) storm water flows (Q5=120 cfs, Q100=820 cfs) are generated from **DP 82, DP 84, DP 102, DP 104, DP 125 and DP 126** plus adjacent Upper Cottonwood (UC) sub-basins delineated in said Cottonwood Creek DBPS – 2019. This point is located on the main stem of Cottonwood Creek. Velocity is 1.94 fps with a Froude # of 0.21 during the 100yr storm. Field observation by M.V.E., Inc. personnel indicated the area was well vegetated with dense brush with a N Value of 0.12, and no evidence of erosion was observed. Just downstream of DP 126 is an existing rip-rap grade check within Cottonwood Creek channel. Field observation by M.V.E., Inc. personnel indicated the area was well vegetated, said check was stable, and no evidence of erosion was observed.

124?

OFF-SITE DESIGN POINTS

Design Point 4 (DP 4) storm water flows (Q5=9.2 cfs, Q100=52.2 cfs) are generated from off-site basin OS-B1A consisting of 24.9 acres. This sub-basin has been created to determine the storm water flow at the northern and western site boundary line. This basin consists of 2.5 Acre Rural Residential, Woods (Fair Condition), Natural Open Space (Fair Condition), and Civic uses

please clarify what civic uses

Design Point 5 (DP 5) storm water flows (Q5=11.9 cfs, Q100=76.7 cfs) are generated from off-site d consisting of 41.0 acres. This sub-basin has been created to determine the storm water flow at the western site boundary line. to the basin line. This basin consists of 2.5 Acre Rural Residential, Woods (Fair Condition), and Natural Open Space (Fair Condition).

missing text?

Design Point E7 (DP E7) storm water flows (Q5=0.6 cfs, Q100=4.0 cfs) are generated from off-site basin OS-B1C consisting of 1.8 acres. Off-site basin OS-B1C consists of Natural Open Space (Fair Condition).

Design Point E8 (DP E8) storm water flows (Q5=1.6 cfs, Q100=11.8 cfs) are generated from off-site basin OS-B1D consisting of 6.0 acres. Off-site basin OS-B1C consists of Natural Open Space (Fair Condition).

Design Point E10 (DP E10) storm water flows (Q5=3.1 cfs, Q100=20.5 cfs) are generated from off-site basin OS-B1E consisting of 10.1 acres. Off-site basin OS-B1C consists of 2.5 Acre Rural Residential, and Natural Open Space (Fair Condition).

Design Point E11 (DP E11) storm water flows (Q5=3.8 cfs, Q100=21.3 cfs) are generated from off-site basin OS-B3A consisting of 9.1 acres. Off-site basin OS-B3A consists of 2.5 Acre Rural Residential, and Natural Open Space (Fair Condition).

Design Point E13 (DP E13) storm water flows (Q5=1.1 cfs, Q100=6.2 cfs) are generated from off-site basin OS-B3B consisting of 2.5 acres. Off-site basin OS-B3B consists of 2.5 Acre Rural Residential, and Natural Open Space (Fair Condition). Storm water flows exit said basin via a 24" RC pipe.

Design Point E15 (DP E15) storm water flows (Q5=2.5cfs, Q100=13.9cfs) are generated from off-site basin OS-B3C consisting of 5.95 acres. Off-site basin OS-B3C has been created to determine the flow at the western site boundary and does not mix with on-site flow. This basin consists of 2.5 Acre Rural Residential, and Natural Open Space (Fair Condition) adjacent to the western boundary of the Eagle Wing proposed preliminary plan.

Design Point 1-M&S (DP 1-M&S) Storm water flows (Q5=76.2 cfs, Q100=135.6 cfs) are generated from off-site basins A6, A7, & A10 consisting of 285.6 acres. This basin consists of 2.5 Acre Rural Residential, 5.0 Acre Rural Residential, 35 Acre Tracts, and Natural Open Space (Fair Condition) adjacent to eastern boundary of the proposed Eagle Wing Preliminary Plan. These storm water flows enter Cottonwood Creek and are included in the Cottonwood Creek channel storm water flows.

Design Point 2-M&S (DP 2-M&S) Storm water flows (Q5=35.7 cfs, Q100=63.6 cfs) are generated from off-site basin A11 consisting of 76.1 acres. This basin consists of 2.5 Acre Rural Residential, and Natural Open Space (Fair Condition) adjacent to eastern boundary of the proposed Eagle Wing Preliminary Plan. These storm water flows enter Cottonwood Creek and are included in the Cottonwood Creek channel storm water flows.

Design Point 3-M&S (DP 3-M&S) Storm water flows (Q5=71.5 cfs, Q100=127.3 cfs) are generated from off-site basin A12 consisting of 76.2 acres. This basin consists of 2.5 Acre Rural Residential, and Natural Open Space (Fair Condition) adjacent to eastern boundary of the proposed Eagle Wing Preliminary Plan. These storm water flows enter Cottonwood Creek and are included in the Cottonwood Creek channel storm water flows.

Design Point 4-M&S (DP 4-M&S) Storm water flows (Q5=5.9 cfs, Q100=14.1 cfs) are generated from off-site basin OS-B4A consisting of 5.2 acres. This basin consists of 2.5 Acre Rural Residential, and Natural Open Space (Fair Condition) adjacent to eastern boundary of the proposed Eagle Wing Preliminary Plan. These storm water flows enter Cottonwood Creek and are included in the Cottonwood Creek channel storm water flows.

Design Point 5-M&S (DP 5-M&S) Storm water flows (Q5=9.3 cfs, Q100=22.2 cfs) are generated from off-site basin OS-B4B consisting of 8.1 acres. This basin consists of 2.5 Acre Rural Residential, and Natural Open Space (Fair Condition) adjacent to eastern

boundary of the proposed Eagle Wing Preliminary Plan. These storm water flows enter Cottonwood Creek and are included in the Cottonwood Creek channel storm water flows.

Design Point 6-M&S (DP 6-M&S) Storm water flows ($Q_5=12.7$ cfs, $Q_{100}=30.1$ cfs) are generated from off-site basin OS-B4C consisting of 13.4 acres. This basin consists of 2.5 Acre Rural Residential, and Natural Open Space (Fair Condition) adjacent to eastern boundary of the proposed Eagle Wing Preliminary Plan. These storm water flows enter Cottonwood Creek and are included in the Cottonwood Creek channel storm water flows.

ON-SITE DESIGN POINTS

Design Point 6 (DP 6) storm water flows ($Q_5=22.0$ cfs, $Q_{100}=134.1$ cfs) are generated from off-site **DP 4** and **DP 5**, and on-site basins EX-B and EX-C consisting totally of 71.87 acres. The summation of these flows at **DP 6** are combined in an existing small local depression area. The depression appears to be man-made, possibly for livestock watering. The current condition of the depression appears to hold some water at certain times of year but not continually. The downstream end of the depression area is a small bank to trap the water in the existing natural swale. The depression area is proposed to be left intact and not disturbed.

Design Point 6A (DP 6A) storm water flows ($Q_5=3.6$ cfs, $Q_{100}=12.6$ cfs) are generated from off-site **DP E7** and on-site basin EX-E1 consisting totally of 5.25 acres. The summation of these flows at **DP 6A** will combine with **DP 6B** and enter Cottonwood Creek.

Design Point 6B (DP 6B) storm water flows ($Q_5=23.5$ cfs, $Q_{100}=141.5$ cfs) are generated from on-site **DP E6** and on-site basin EX-D consisting totally of 78.97 acres. The summation of these flows at **DP 6B** will combine with **DP 6A** and enter Cottonwood Creek.

Design Point 6C (DP 6C) storm water flows ($Q_5=26.6$ cfs, $Q_{100}=152.3$ cfs) are generated from on-site **DP E6A** and **DP 6B** consisting totally of 84.22 acres. The summation of these flows at **DP 6C** enter Cottonwood Creek. Also, on-site Basins EX-A1 storm water flows ($Q_5=1.5$ cfs, $Q_{100}=10.7$ cfs) consisting of 4.95 acres and EX-A2 storm water flows of ($Q_5=0.5$ cfs, $Q_{100}=3.9$ cfs) consisting of 1.74 acres enter Cottonwood Creek. These storm water flows are included in the Cottonwood Creek channel **Design Points**.

Design Point 7 (DP E7) storm water flows ($Q_5=9.7$ cfs, $Q_{100}=30.2$ cfs) are generated from off-site **DP E8** and on-site basin EX-F1 consisting totally of 12.48 acres. On-site basin EX-F1 consists of a single family residence, a portion of a barn, a portion of a gravel road, and Natural Open Space (Fair Condition).

and an arena?

Design Point 8 (DP E8) storm water flows (Q5=4.7 cfs, Q100=18.6 cfs) are generated from on-site basin EX-E2 consisting of 7.77 acres. On-site basin EX-E2 consists of a portion of a storage barn, a garage, and a small hot house, and Natural Open Space (Fair Condition). These storm water flows enter Cottonwood Creek and are included in the Cottonwood Creek channel storm water flows.

Design Point 8A (DP 8A) storm water flows (Q5=9.2 cfs, Q100=50.8 cfs) are generated from off-site **DP E10** and **DP E11** and on-site basins EX-H and EX-I consist totally of 24.92 acres. On-site basin EX-F1 consists of a portion of a gravel road, and Natural Open Space (Fair Condition). Storm water flows exit basin at the existing 2 - 24" R.C. Pipes under said gravel road.

Design Point 9 (DP 9) storm water flows (Q5=9.7 cfs, Q100=32.0 cfs) are generated from off-site **DP E8** and **DP E11** and on-site basins EX-F2 consisting totally of 14.50 acres. On-site basin EX-F2 consists of a portion of a gravel road, and Natural Open Space (Fair Condition). Storm water flows exit basin and enter Cottonwood Creek and are included in the Cottonwood Creek channel storm water flows.

Design Point 10 (DP 10) storm water flows (Q5=1.0 cfs, Q100=6.5 cfs) are generated from on-site basin EX-G consisting of 2.98 acres. On-site basin EX-F1 consists of Natural Open Space (Fair Condition). ← State that flows enter Pond 2

Design Point 11 (DP 11) storm water flows (Q5=2.2cfs, Q100=13.5 cfs) are generated from off-site **DP E13** and on-site basin EX-M consisting totally of 6.60 acres. On-site basin EX-M consists of Natural Open Space (Fair Condition). These storm water flows enter Cottonwood Creek and are included in the Cottonwood Creek channel storm water flows.

Design Point 12 (DP 12) storm water flows (Q5=9.8 cfs, Q100=53.6 cfs) are generated from off-site **DP E10, DP E11, DP 8A**, and on-site basins EX-J consisting totally of 27.34 acres. On-site basin EX-J consists of Natural Open Space (Fair Condition). These storm water flows enter Cottonwood Creek and are included in the Cottonwood Creek channel storm water flows. (Pond 2)

Design Point 13 (DP 13) storm water flows (Q5=2.9 cfs, Q100=17.4 cfs) are generated from on-site basin EX-L consisting totally of 8.09 acres. On-site basin EX-L consists of Natural Open Space (Fair Condition) and storm water flows exit the site along the southern boundary line.

4.2.2. Developed Hydrologic Conditions

Required drainage facilities for development of Eagle Rising are minimal. A new hydraulic analysis of Cottonwood Creek has been performed for the reach within the new "Reinstated Preliminary Plan" for Eagle Rising. These hydraulic calculations were performed with the the new & current El Paso Drainage Criteria. The proposed use of the

See comment memo.

Modeling indicates that stabilization is required in some areas.

land being 2.5 acre lots does not lead to the necessity of onsite drainage facilities, other than culverts to convey the existing flows under the proposed roadways and driveways. As mentioned above, the existing channel is currently witnessing close to the ultimate flows from the existing upstream developed property. The channel will be left in a natural condition for its aesthetic value, better water quality conditions, for both engineering and economic considerations. The 100 year storm water flow level has been established by this study and used to provide the no build easements above said 100 year levels for the Lots that are impacted in the Eagle Rising Re-instated Preliminary Plan.

The impact to the proposed Lots was found to be only the increase in water surface elevation up to the said 100-year storm water flow level. The No-Build easements should be placed at a minimum of 2' above said 100-year studied elevation. No geologic hazards, soil hazards were found to impact these areas. State whether the proposed no-build line encompasses this area.

Existing Ponds 1 & 2 are not used for detention of the increase in existing Eagle Rising site storm water flows compared to the Eagle Rising developed storm water flow. The existing north Pond 1 has a 12" outlet culvert with control gate and overflow riser with trash rack. The south Pond 2 has an 18" culvert structure. Both outlet control structures release Eagle Rising storm water flows at their existing historic rate. The ponds are considered useful detention on the channel even though this is not required for the Eagle Rising Development project. The Owner/Developer qualifies for 50% of the costs of these small on-site ponds as they meet the criteria of **3.10.4a Reimbursement of Construction Costs for On-Site Ponds**, El Paso County Engineering Design Criteria Manual. Said section 3.10.4a also reads "It is important to note that reductions for meeting certain on site detention criteria and for development that consists of 2.5 or 5.0 acres lots (discussed above) cannot both be applied to the same development. Owner/Developer will elect the fee reduction mechanism at the Final Platting stage.

A brief description of each developed drainage basin including developed runoff rates, drainage patterns and any drainage facilities for each basin is provided in this section of the report. A summary of peak developed runoff for the basins and designated design points are depicted on the Proposed Hydrologic Map (on-site) in the **Appendix**. The site has been divided into twenty-two developed drainage basins described as follows:

Design Point 6 (DP 6) storm water flows (Q5=22.5 cfs, Q100=134.7 cfs) are generated from off-site **DP 4** and **DP 5**, and on-site developed basins B and C consisting totally of 71.87 acres. The summation of these flows at **DP 6** are combined in an existing small local depression area. The depression appears to be man-made, possibly for livestock watering. The current condition of the depression appears to hold some water at certain times of year but not continually. The downstream end of the depression area is a small bank to trap the water in the existing natural swale. The depression area is proposed to be left intact, non-disturbed, and is within a drainage easement. Developed storm water flow increases at this **DP 6** by 0.5 cfs for Q5 and by 0.6 cfs for Q100. These are negligible increases for the developed condition and are very close to the existing conditions.

This is not applicable and the ponds would need to meet FSD drain time criteria if so and if they are needed.

A drainage easement is proposed for the existing swale between **DP 4** and basin B with storm water flows of $Q_5=11.6$ cfs, $Q_{100}=63.3$ cfs. The slope of the existing swale is approximately 2.7% for the Reach. The velocities are 1.8 fps and 3.4 fps, depths of 0.2' and 0.5' during the 5yr and 100yr storms respectively for the Reach. This velocity values are within the permissible velocities denoted in the Soil, Geology, Geologic Hazard Study for Eagle Rising Filing No. 1 prepared by Entech Engineering, Inc. and dated June 29, 2022 (Revised December 13, 2022) for this project the values are between 4 to 7 fps with 7 fps being used for established vegetation. The Reach is therefore considered non-erosive in nature. Therefore, no improvements are proposed for this Reach.

A drainage easement is proposed for the existing swale between **DP 5** and basin C with storm water flows of $Q_5=12.6$ cfs, $Q_{100}=80.7$ cfs. The slope of the existing swale is approximately 1.6% for the Reach. The velocities are 2.1 fps and 3.5 fps, depths of 0.4' and 1.0' during the 5yr and 100yr storms respectively for the Reach. This velocity values are within the permissible velocities denoted in the Soil, Geology, Geologic Hazard Study for Eagle Rising Filing No. 1 prepared by Entech Engineering, Inc. and dated June 29, 2022 (Revised December 13, 2022) for this project the values are between 4 to 7 fps with 7 fps being used for established vegetation. The Reach is therefore considered non-erosive in nature. Therefore, no improvements are proposed for this Reach.

Design Point 6A (DP 6A) storm water flows ($Q_5=3.0$ cfs, $Q_{100}=12.0$ cfs) are generated from off-site **DP E7** and on-site basin E1 consisting totally of 5.25 acres. Developed storm water flow decreases at this **DP 6A** by 0.6 cfs for Q_5 and by 0.6 cfs for Q_{100} . These are negligible decreases for the developed condition and are very close to the existing conditions. The summation of these flows at **DP 6A** will combine with **DP 6B** and enter Cottonwood Creek. Rip rap needs to be added to existing drainage swale.

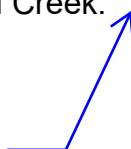
provide detail on the proposed riprap



Design Point 6B (DP 6B) storm water flows ($Q_5=24.4$ cfs, $Q_{100}=142.6$ cfs) are generated from on-site **DP E6** and on-site basin D consisting totally of 78.97 acres. Developed storm water flow therefore increases at this **DP 6B** by 0.9 cfs for Q_5 and by 1.1 cfs for Q_{100} . These are negligible increases for the developed condition and are very close to the existing conditions. The summation of these flows at **DP 6B** will combine with **DP 6A** and enter Cottonwood Creek.

Design Point 6C (DP 6C) storm water flows ($Q_5=27.0$ cfs, $Q_{100}=152.9$ cfs) are generated from on-site **DP 6A** and **DP 6B** consisting totally of 84.22 acres. Developed storm water flow therefore increases at this **DP 6** by 0.4 cfs for Q_5 and by 0.6 cfs for Q_{100} . These are negligible increases for the developed condition and are very close to the existing conditions. No detention of storm waters is required for this insignificant increase in the Developed Peak Runoff Rates. The summation of these flows at **DP 6A** and **DP 6B** will combine and enter Cottonwood Creek.

Address whether any stabilization is needed at this outfall.



Also, on-site Basins EX-A1 storm water flows (Q5=1.5 cfs, Q100=10.7 cfs) consisting of 4.95 acres and EX-A2 storm water flows of (Q5=0.5 cfs, Q100=3.9 cfs) consisting of 1.74 acres enter Cottonwood Creek. There are no increase or decrease to these storm water flows as there is no change in the existing condition. These storm water flows are included in the Cottonwood Creek channel **Design Points**.

by the developer?

Design Point 7 (DP 7) storm water flows (Q5=5.9cfs, Q100=25.8 cfs) are generated from off-site **DP E8** and on-site basin F1 consisting totally of 12.48 acres . The purpose of **DP 7** is to understand the proposed flows at the two flag lot drive crossings and to size the driveway culvert to provide access Lots 3,4,5,& 6 and Lots 6, 7, 8 & 9. At this time the exact location of the driveway culverts are unknown. However, a 30" RC Pipe or equivalent should be installed under each driveway to adequately convey the flows. When the lots are developed a portion (128,000+/- SF) of the existing gravel area will re-vegetated increasing the pervious area. Developed storm water flow decreases at this **DP 7** by 3.8 cfs for Q5 and by 4.4 cfs for Q100. These are significant decreases for the developed condition and are less than the existing conditions.

Design Point 9 (DP 9) storm water flows (Q5=6.4 cfs, Q100=28.3 cfs) are generated from on-site **DP E7** and on-site basin F2 consisting totally of 14.50 acres. Developed storm water flow decreases at this **DP 9** by 0.0 cfs for Q5 and by 3.7 cfs for Q100. These are negligible decreases for the developed condition and are close to the existing conditions. No detention of storm waters is required for this insignificant increase in the Developed Peak Runoff Rates. The summation of these flows at **DP 9** will enter Cottonwood Creek. A drainage easement is proposed for the existing swale which will convey the flows into the Cottonwood Creek Channel. The slope of the existing swale is approximately 3.8% for Reach 1 and 5.7% for Reach 2. At the steepest and most defined point along Reach 2 the velocities are 2.8 fps and 4.0 fps, depths of 0.5' and 0.8' during the 5yr and 100yr storms respectively. These velocity values are within the permissible velocities denoted in the Soil, Geology, Geologic Hazard Study for Eagle Rising Filing No. 1 prepared by Entech Engineering, Inc. and dated June 29, 2022 (Revised December 13, 2022). For this project the values are between 4 to 7 fps with 7 fps being used for established vegetation. Reach 1 & 2 are therefore considered non-erosive in nature. Therefore, no improvements are proposed. At the downstream end of the drainage-way, flows reach Cottonwood Creek. Since the drainage-way outfall is immediately adjacent to the creek, short in nature, well vegetated, no required improvements are recommended these Reaches.

address the existing riprap

Design Point 8A (DP 8A) storm water flows (Q5=10.0 cfs, Q100=51.8 cfs) are generated from off-site **DP E10** and **DP E11** and on-site basins H and I consisting totally of 24.92 acres. Storm water flows exit basin at the existing 2 - 24" R.C. Pipes under the existing gravel road. Developed storm water flow therefore increases at this **DP 8A** by 0.8 cfs for Q5 and by 1.0 cfs for Q100. These are negligible increases for the developed condition and are very close to the existing conditions.

state whether the pipes are adequate or will overtop

Design Point 10 (DP 10) storm water flows (Q5=1.5 cfs, Q100=7.2 cfs) are generated from on-site basin G consisting totally of 2.98 acres. Developed storm water flow therefore decreases at this **DP 9** by 1.2 cfs for Q5 and by 1.5 cfs for Q100. These are negligible decreases for the developed condition and are close to the existing conditions. No detention of storm waters is required for this insignificant increase in the Developed Peak Runoff Rates. The summation of these flows at **DP 12** will enter Cottonwood Creek.

Design Point 12 (DP 12) storm water flows (Q5=11.0 cfs, Q100=55.1 cfs) are generated from on-site **DP 8A** and on-site basin J consisting totally of 27.34 acres. Developed storm water flow therefore increases at this **DP 12** by 1.2 cfs for Q5 and by 1.5 cfs for Q100. These are negligible decreases for the developed condition and are close to the existing conditions. No detention of storm waters is required for this insignificant increase in the Developed Peak Runoff Rates. The summation of these flows at **DP 12** will enter Cottonwood Creek. A drainage easement is proposed for the existing swale between **DP 8A** and **DP 12** with storm water flows of Q5=11.0 cfs, Q100=55.1 cfs. The slope of the existing swale is approximately 4.8% for the Reach. The velocities are 3.6 fps and 5.5 fps, depths of 0.6' and 1.1' during the 5yr and 100yr storms respectively for the Reach. These velocity values are within the permissible velocities denoted in the Soil, Geology, Geologic Hazard Study for Eagle Rising Filing No. 1 prepared by Entech Engineering, Inc. and dated June 29, 2022 (Revised December 13, 2022). For this project the values are between 4 to 7 fps with 7 fps being used for established vegetation. The Reach is therefore considered non-erosive in nature. Therefore, no improvements are required for this Reach. At the downstream end of the drainage-way, flows reach Cottonwood Creek. Since the drainage-way outfall is immediately adjacent to the creek, short in nature, well vegetated, no proposed improvements are recommended these Reaches.

Design Point 13 (DP 13) storm water flows (Q5=3.4 cfs, Q100=18.0 cfs) are generated from off-site **DP E15** and on-site basin L consisting totally of 8.09 acres. Developed storm water flow therefore increases at this **DP 13** by 0.5 cfs for Q5 and by 0.6 cfs for Q100. These are negligible increases for the developed condition and are close to the existing conditions. No detention of storm waters is required for this insignificant increase in the Developed Peak Runoff Rates. The summation of these flows at **DP 13** flow overland across the Eagle Rising southern boundary and eventually will enter Cottonwood Creek.

Erosion Control

Address why this is different than existing conditions

address the existing riprap and if erosion is occurring

The only public infrastructure construction to be associated with this subdivision is the Eagle Wing Drive turnaround and will require best management practices (BMP's). The BMP's for the Eagle Wing Drive turn around will be shown on the Grading & Erosion Control Plan when Eagle Rising Filing No.1 is prepared. Any required best management practices (BMP's) for the individual lot home construction will be handled on the BESQCP for each lot at time of building permit.

At this time, proposed home pads and ancillary structures (sheds, animal corals, etc.) locations are not known. It shall be the responsibility of the home builder and

and Kurie Road

subsequently the homeowner to ensure flows from stormwater are appropriately routed around said structures to prevent flooding and damage to property. This can be accomplished using broad swales as opposed to ditches which tend to concentrate flows and are therefore more susceptible to erosion. Swales shall be protected from erosion until such time that vegetation is established. A civil engineer can aid in determination of swale placement and erosion control measures to be used.

4.3. Water Quality Enhancement Best Management Practices

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 drainage ways, and implementing long term source controls”. The Four Step Process is incorporated in this project and the elements are discussed below. The site is not subject to Post Construction Stormwater Treatment requirements.

1. Runoff Reduction Practices are employed in this project. Impervious surfaces have been reduced as much as practically possible. There is only minimal concrete or other hard surfaces proposed. Minimized Directly Connected Impervious Areas (MDCIA) is employed on the project because runoff passes through a private roadside ditch and an open space meadow area before leaving the site.

These private roadside ditches are being used as Receiving Pervious Area (RPA) as detailed in the **BMP Area ID** map attached in the **Appendix**. The RPA has established vegetation. The slope at the UIA:RPA interface prevents any accumulation of sediment from interfering with runoff entering the existing private roadway ditch. 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%. The runoff generated from the impervious areas of the gravel road will be treated for water quality

Areas being used as RPA constitute vegetated areas down-gradient of impervious areas as specified in Water Quality Control Volume reduction procedure detailed in Chapter 4, Fact Sheet T-00 “Quantifying Runoff Reduction” of the Urban Storm Drainage Criteria Manual, Volume 3¹³. Permanent seeding will follow the proposed construction, and temporary irrigation will establish a grass cover. The volume reduction calculation was made with the aid of the “UD-BMP_v3.07” spreadsheet developed by Mile High Flood District and is attached in the **Appendix**¹⁴ showing a WQCV reduction more than 60%.

by the RPAs

¹³ USDCM-V.3, Chapter 3, Section 4.3

¹⁴ UD-BMP-Worksheet-v3.07

State where and address the other areas with riprap and the pond spillways and what can be done for stabilization of the main channel...

According to the updated Volume 1 of the County's Drainage Criteria Manual, Chapter 6, Section 2.3, based on a technical memorandum prepared for the City titled "Water Quality Capture Volume Analysis for Colorado Springs" (Wright Water Engineers 2011) that highlighted the high similarity between the MHFD data and the data from the Colorado Springs gages, the County's Drainage Criteria Manual states that **"the UDFCD results and methods for the WQCV are acceptable for determining the WQCV in Colorado Springs"**¹⁵. Based on that recommendation, the **WQCV Rainfall Depth** of 0.6 inches was used. The assumption of 0.6 inches for WQCV Rainfall Depth is a conservative assumption for the El Paso County region as the data from the Colorado Springs Analysis shows. The Depth of Average Runoff Producing Storm, d_6 , of 0.42 inches was used corresponding to the El Paso County region in the Mean Annual Storm Precipitation Depths Map (Driscoll et.al., 1989) provided in the "UD-BMP_v3.07" spreadsheet.

2. There is one drainage path on the site that is required to be stabilized with appropriate rip-rap treatment. Rip-rap will be added to existing eroded area to reduce water velocities to promote stabilization.
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%. The runoff generated from the impervious areas of the gravel road will be treated for water quality by utilizing the runoff reduction standard. Stormwater runoff from the proposed roadway will be collected in the roadside ditches and will infiltrate into the ground, evaporate, or evapotranspire a quantity of water equal to at least 60% of what the calculated WQCV would be if all impervious area for the applicable development site discharged without infiltration. Runoff Reduction calculations are included in the appendix.
4. The rural residential development is not anticipated to contain storage of potentially harmful substances or use of potentially harmful substances. No site specific or other source control BMPs are required.

5. Drainage and Bridge Fees

The site is located within the Cottonwood Creek Drainage Basin of Fountain Creek, El Paso Basin Number FOMO2200, which was last studied in 1994. Fees associated with this basin are Drainage Fees of \$19,752 per impervious acre and Bridge Fees of \$1,080 per 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, reduction in the per acre Drainage Fee are allowed pursuant to El Paso County

¹⁵ DCM, Chapter 6, Section 2.3

2022 fees should be used for the final plat (\$21,134 and \$1,156)

Resolution 99-383 in the amount of 25% for lots 2.5 acres or larger will be utilized for this project.

Fees will be calculated in accordance with the future final plat.

6. Conclusion

This Master Development Drainage Plan / Preliminary Drainage Report presents existing and proposed drainage conditions for the proposed Eagle Rising project. The development contains 70.8+/- acres with seventeen (17) 2.5-acre single family residential lots, and associated roadways which will have negligible and inconsequential effects on the existing site drainage and drainage conditions downstream. The proposed project will not, with respect to stormwater runoff, negatively impact the adjacent properties and downstream properties.

References

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NRCS Official Soil Series Descriptions. United States Department of Agriculture, Natural Resources Conservation Service ("http://soils.usda.gov/technical/classification/osd/index.html", accessed March, 2018).

Flood Insurance Rate Map. Federal Emergency Management Agency, National Flood Insurance Program (Washington D.C.: FEMA, December 7, 2018).

Cottonwood Creek Drainage Basin Planning Study. Matrix Design Group (Colorado Springs: El Paso County, July, 2019). ← (not adopted by County)

Reference the older one also

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Design Procedure Form: Runoff Reduction Spreadsheet. Mile High Flood District ("https://mhfd.org/wp-content/uploads/2020/03/UD-BMP_v3.07.xlsm", accessed August, 2022).

Add El Paso County Engineering Criteria Manual

Appendices

7. General Maps and Supporting Data

Vicinity Map

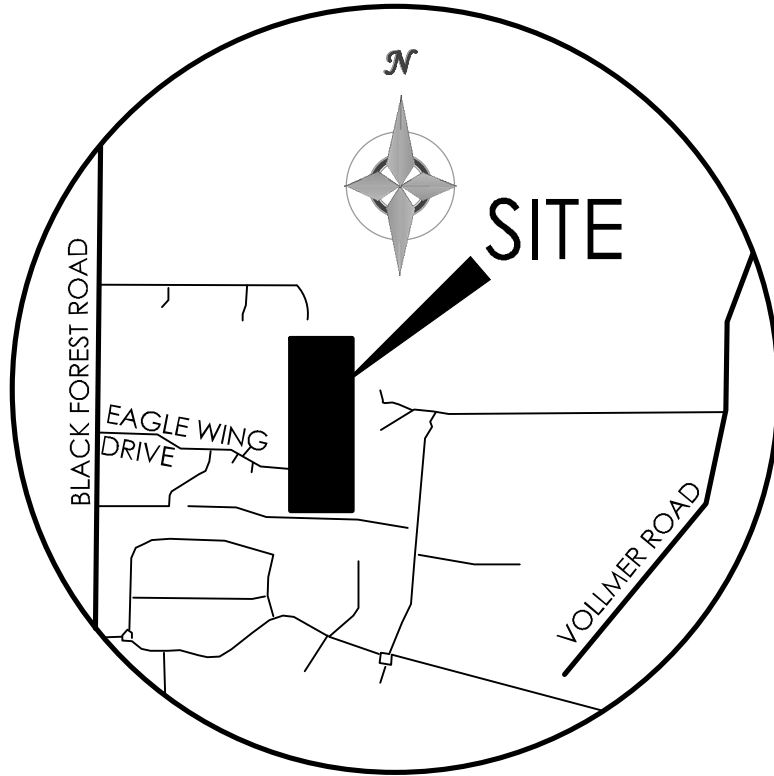
Portions of Flood Insurance Rate Map

NRCS Soil Map and Tables

SCS Soil Type Descriptions

Hydrologic Soil Group Map and Tables

Site Photographs



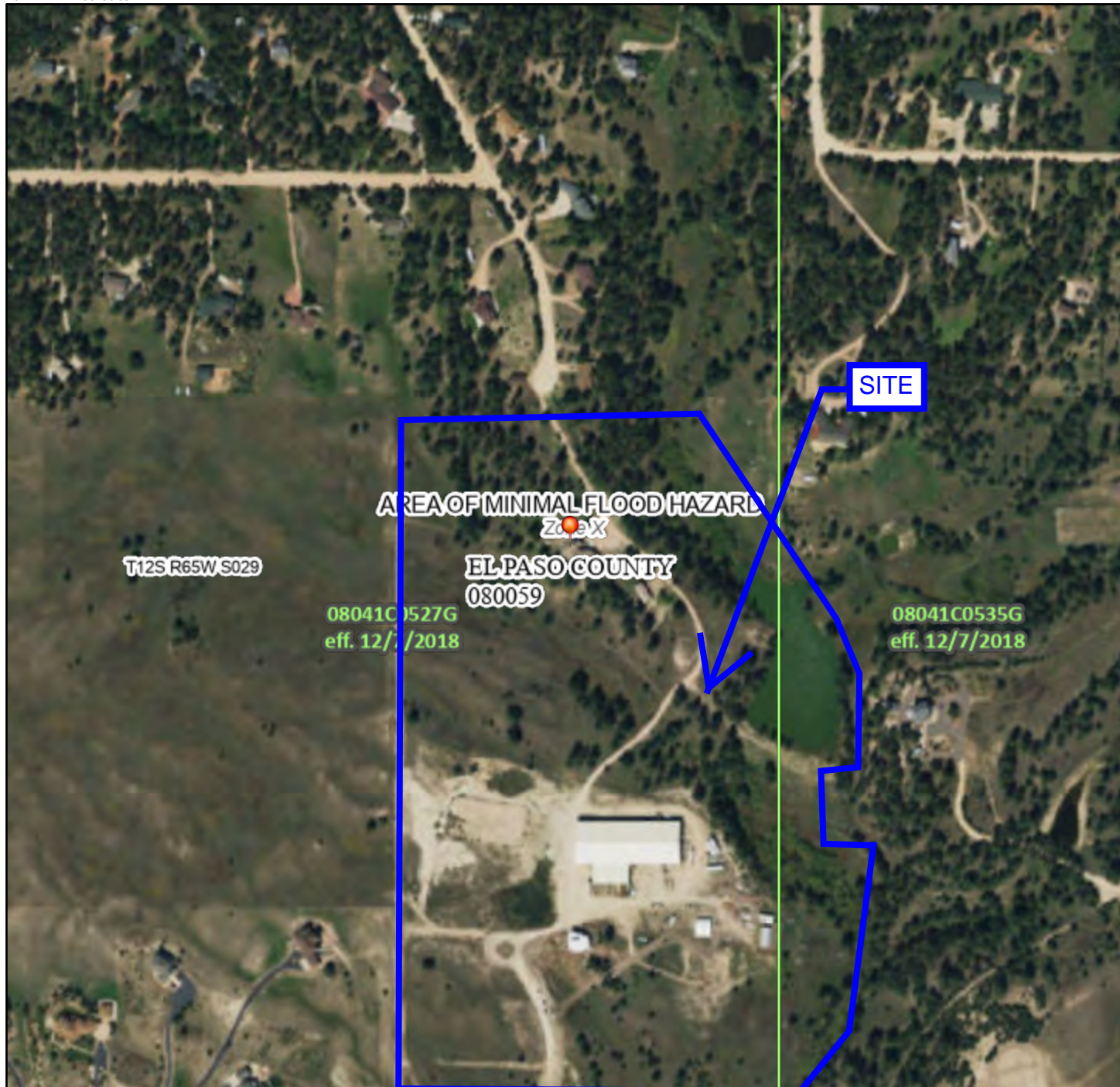
VICINITY MAP

NOT TO SCALE

National Flood Hazard Layer FIRMMette



104°41'41"W 38°58'59"N



Legend

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

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

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

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

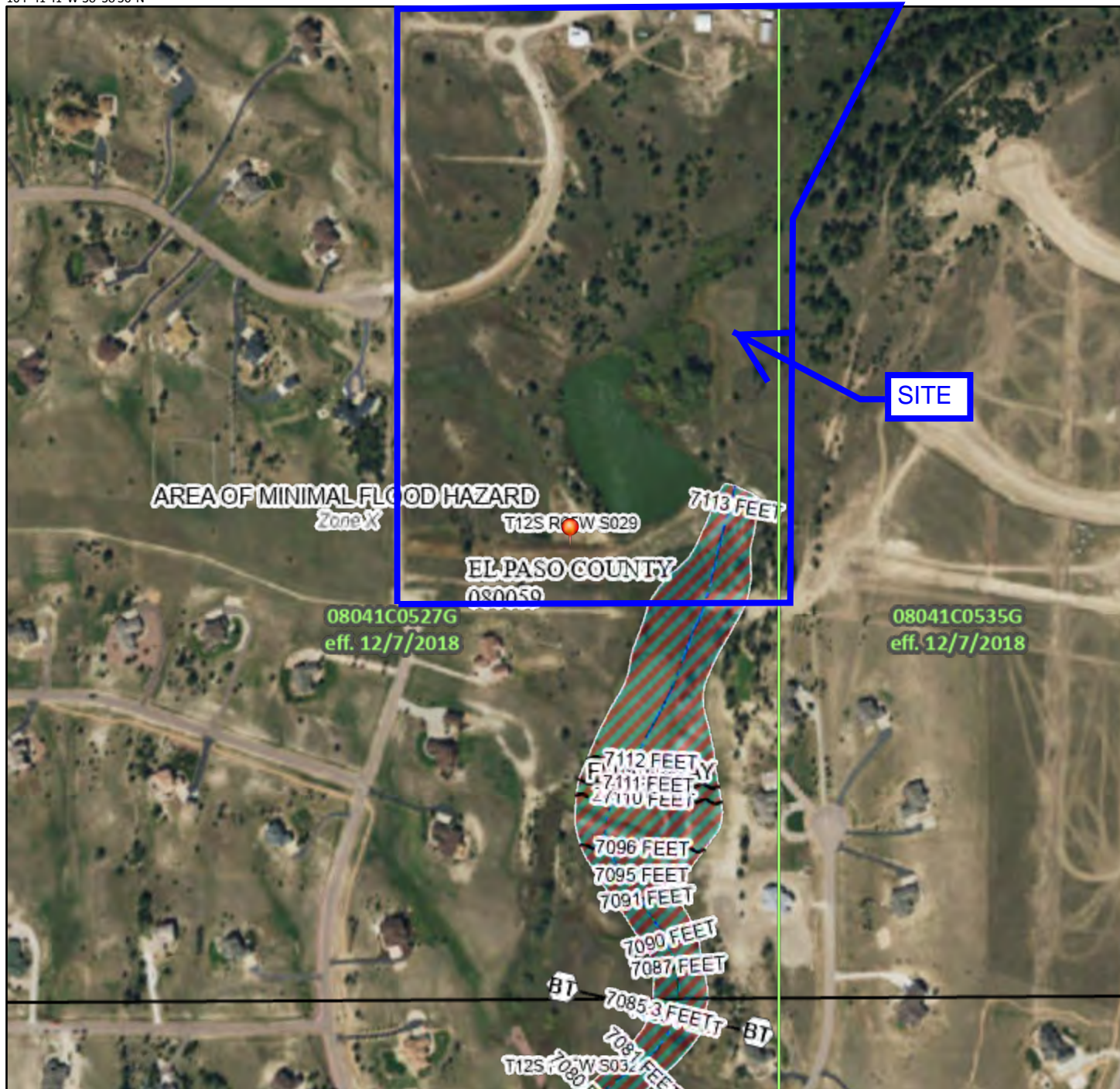
The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on **11/15/2021 at 6:32 PM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded 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



104°41'41"W 38°58'36"N



Legend

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

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) Zone A, V, A99
		With BFE or Depth Zone AE, AO, AH, VE, AR
		Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
		Future Conditions 1% Annual Chance Flood Hazard Zone X
		Area with Reduced Flood Risk due to Levee. See Notes. Zone X
		Area with Flood Risk due to Levee Zone D

OTHER AREAS		NO SCREEN Area of Minimal Flood Hazard Zone X
		Effective LOMRs
GENERAL STRUCTURES		Area of Undetermined Flood Hazard Zone D
		Channel, Culvert, or Storm Sewer
		Levee, Dike, or Floodwall

OTHER FEATURES		20.2 Cross Sections with 1% Annual Chance
		17.5 Water Surface Elevation
		Coastal Transect
		Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary
		Coastal Transect Baseline
		Profile Baseline
		Hydrographic Feature

MAP PANELS		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

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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.



United States
Department of
Agriculture

NRCS

Natural
Resources
Conservation
Service

A product of the National
Cooperative Soil Survey,
a joint effort of the United
States Department of
Agriculture and other
Federal agencies, State
agencies including the
Agricultural Experiment
Stations, and local
participants

Custom Soil Resource Report for El Paso County Area, Colorado



Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (<http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/>) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (<https://offices.sc.egov.usda.gov/locator/app?agency=nrcs>) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

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scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

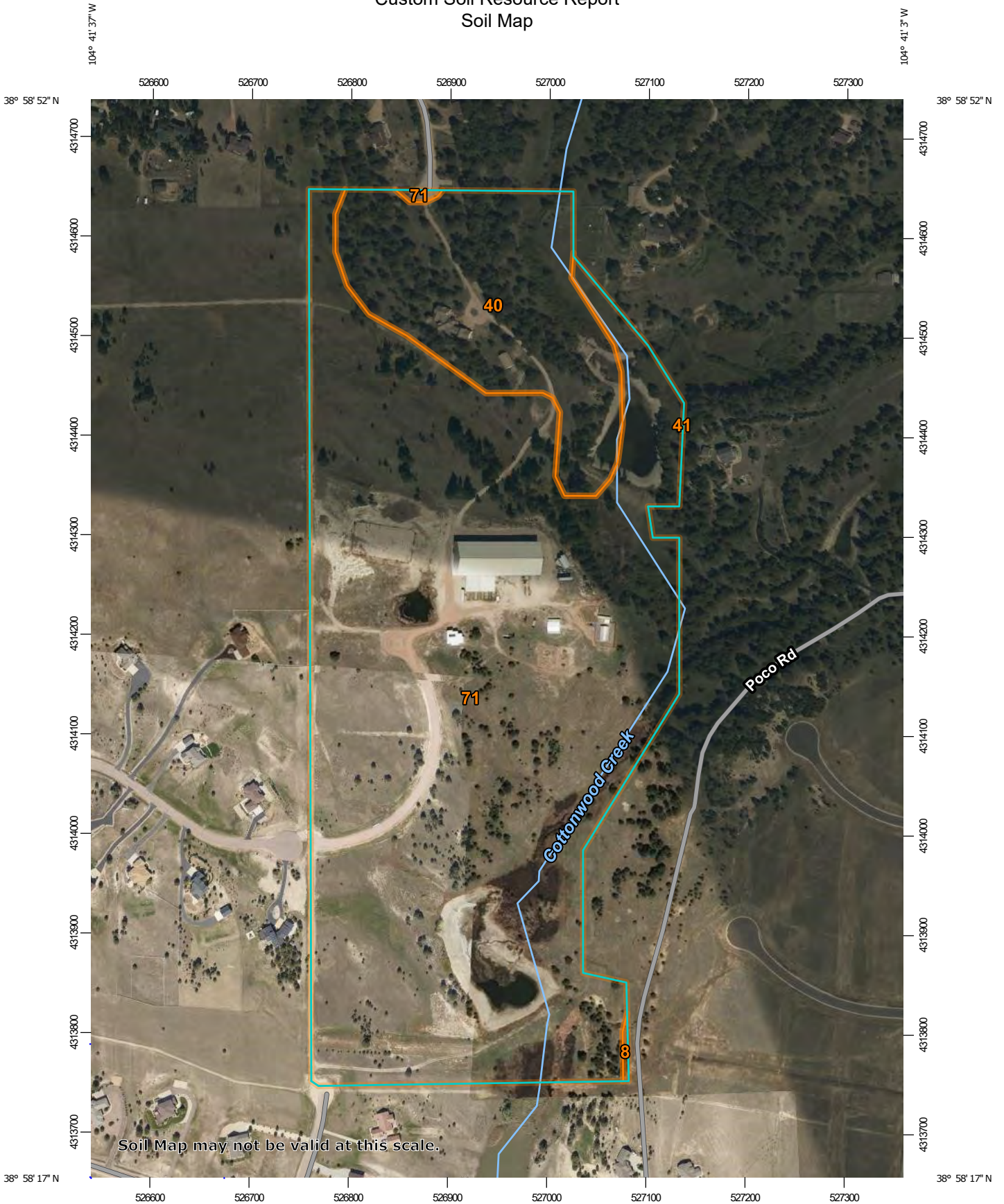
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identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report Soil Map



Map Scale: 1:5,280 if printed on A portrait (8.5" x 11") sheet.

0 50 100 200 300 Meters


0 250 500 1000 1500 Feet

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




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 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: Aug 19, 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	0.1	0.1%
40	Kettle gravelly loamy sand, 3 to 8 percent slopes	12.3	16.9%
41	Kettle gravelly loamy sand, 8 to 40 percent slopes	0.0	0.0%
71	Pring coarse sandy loam, 3 to 8 percent slopes	60.5	83.0%
Totals for Area of Interest		72.9	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.

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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, talf
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
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 content: 5 percent
Available water supply, 0 to 60 inches: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: R049XB210CO - Sandy Foothill
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

40—Kettle gravelly loamy sand, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 368g

Elevation: 7,000 to 7,700 feet

Farmland classification: Not prime farmland

Map Unit Composition

Kettle and similar soils: 85 percent

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

Description of Kettle

Setting

Landform: Hills

Landform position (three-dimensional): Side slope

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Sandy alluvium derived from arkose

Typical profile

E - 0 to 16 inches: gravelly loamy sand

Bt - 16 to 40 inches: gravelly sandy loam

C - 40 to 60 inches: extremely gravelly loamy sand

Properties and qualities

Slope: 3 to 8 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Somewhat excessively drained

Runoff class: Low

Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water supply, 0 to 60 inches: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: B

Ecological site: F048AY908CO - Mixed Conifer

Hydric soil rating: No

Minor Components

Other soils

Percent of map unit:
Hydric soil rating: No

Pleasant

Percent of map unit:
Landform: Depressions
Hydric soil rating: Yes

41—Kettle gravelly loamy sand, 8 to 40 percent slopes

Map Unit Setting

National map unit symbol: 368h
Elevation: 7,000 to 7,700 feet
Farmland classification: Not prime farmland

Map Unit Composition

Kettle and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kettle

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy alluvium derived from arkose

Typical profile

E - 0 to 16 inches: gravelly loamy sand
Bt - 16 to 40 inches: gravelly sandy loam
C - 40 to 60 inches: extremely gravelly loamy sand

Properties and qualities

Slope: 8 to 40 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e

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Hydrologic Soil Group: B
Ecological site: F048AY908CO - Mixed Conifer
Hydric soil rating: No

Minor Components

Pleasant

Percent of map unit:
Landform: Depressions
Hydric soil rating: Yes

Other soils

Percent of map unit:
Hydric soil rating: No

71—Pring coarse sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 369k
Elevation: 6,800 to 7,600 feet
Farmland classification: Not prime farmland

Map Unit Composition

Pring and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pring

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Arkosic alluvium derived from sedimentary rock

Typical profile

A - 0 to 14 inches: coarse sandy loam
C - 14 to 60 inches: gravelly sandy loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 6.0 inches)

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Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 3e

Hydrologic Soil Group: B

Ecological site: R048AY222CO - Loamy Park

Hydric soil rating: No

Minor Components

Pleasant

Percent of map unit:

Landform: Depressions

Hydric soil rating: Yes

Other soils

Percent of map unit:

Hydric soil rating: No

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is severely eroded and blowouts have developed, the new seeding should be fertilized.

Windbreaks and environmental plantings are generally suited to this soil. Soil blowing is the main limitation for the establishment of trees and shrubs. This limitation can be overcome by cultivating only in the tree rows and leaving a strip of vegetation between the rows. Supplemental irrigation may be necessary when planting and during dry periods. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

This soil is suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. In cropland areas, habitat favorable for ring-necked pheasant, mourning dove, and many nongame species can be developed by establishing areas for nesting and escape cover. For pheasant, the provision of undisturbed nesting cover is vital and should be included in plans for habitat development. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

This soil has good potential for use as homesites. Shallow excavation is severely limited because cut banks cave in. This sandy soil requires special management practices to reduce water erosion and soil blowing. Capability subclasses IIIe, irrigated, and IVe, nonirrigated.

7—Bijou sandy loam, 3 to 8 percent slopes. This deep, well drained soil is on flood plains, terraces, and uplands. It formed in sandy alluvium and eolian material derived from arkose deposits. Elevation ranges from 5,400 to 6,200 feet. The average annual precipitation is about 13 inches, the average annual air temperature is about 49 degrees F, and the average frost-free period is about 145 days.

Typically, the surface layer is brown sandy loam about 4 inches thick. The subsoil is brown or grayish brown sandy loam about 24 inches thick. The substratum is pale brown loamy coarse sand.

Included with this soil in mapping are small areas of Olney sandy loam, 3 to 5 percent slopes; Valent sand, 1 to 9 percent slopes; Vona sandy loam, 3 to 9 percent slopes; and Wigton loamy sand, 1 to 8 percent slopes.

Permeability of this Bijou soil is rapid. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Organic matter content of the surface layer is low. Surface runoff is slow, and the hazards of erosion and soil blowing are moderate.

Almost all areas of this soil are used for range.

This soil is suited to the production of native vegetation suitable for grazing. Because of the hazards of water erosion and soil blowing, the soil is not suited to nonirrigated crops.

Native vegetation is dominantly blue grama, sand dropseed, needleandthread, side-oats grama, and buckwheat.

Seeding is a suitable practice if the range has deteriorated. Seeding the native grasses is a good practice. If the range is severely eroded and blowouts have developed, the new seeding should be fertilized. Brush control and grazing management may be needed to improve the depleted range. Grazing should be managed so that enough forage is left standing to protect the soil from blowing, to increase infiltration of water, and to catch and hold snow.

Windbreaks and environmental plantings are generally suited to this soil. Soil blowing is the main limitation for the establishment of trees and shrubs. This limitation can be overcome by cultivating only in the tree rows and leaving a strip of vegetation between the rows. Supplemental irrigation may be needed when planting and during dry periods. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

This soil is suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, by properly managing livestock grazing, and by reseeding range where needed.

This soil has good potential for use as homesites. Shallow excavation is severely limited because cut banks cave in. This soil requires special management practices to reduce water erosion and soil blowing. Capability subclass VIe.

8—Blakeland loamy sand, 1 to 9 percent slopes. This deep, somewhat excessively drained soil formed in alluvial and eolian material derived from arkosic sedimentary rock on uplands. The average annual precipitation is about 15 inches, the average annual air temperature is about 47 degrees F, and the average frost-free period is about 135 days.

Typically, the surface layer is dark grayish brown loamy sand about 11 inches thick. The substratum, to a depth of 27 inches, is brown loamy sand; it grades to pale brown sand that extends to a depth of 60 inches.

Included with this soil in mapping are small areas of Bresser sandy loam, 0 to 3 percent slopes; Bresser sandy loam, 3 to 5 percent slopes; Truckton sandy loam, 0 to 3 percent slopes; Truckton sandy loam, 3 to 9 percent slopes; and Stapleton sandy loam, 3 to 8 percent slopes. In some areas, mainly north of Colorado Springs in the Cottonwood Creek area, arkosic beds of sandstone and shale are at a depth of 0 to 40 inches.

Permeability of this Blakeland soil is rapid. Effective rooting depth is 60 inches or more. Available water capacity is low to moderate. Organic matter content of the surface layer is medium. Surface runoff is slow, the hazard of erosion is moderate, and the hazard of soil blowing is severe.

Most areas of this soil are used for range, homesites, and wildlife habitat.

Native vegetation is dominantly western wheatgrass, side-oats grama, and needleandthread. This soil is best suited to deep-rooted grasses.

Proper range management is necessary to prevent excessive removal of plant cover from the soil. Interseeding improves the existing vegetation. Deferment of grazing in spring increases plant vigor and soil stability. Proper location of livestock watering facilities helps to control grazing.

Windbreaks and environmental plantings are fairly well suited to this soil. Blowing sand and low available water capacity are the main limitations for the establishment of trees and shrubs. The soil is so loose that trees need to be planted in shallow furrows and plant cover needs to be maintained between the rows. Supplemental irrigation may be needed to insure survival. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, and Siberian elm. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

This soil is suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

This soil has good potential for urban development. Soil blowing is a hazard if protective vegetation is removed. Special erosion control practices must be provided to minimize soil losses. Capability subclass VIe.

9—Blakeland complex, 1 to 9 percent slopes. This complex is on uplands, mostly in the Falcon area. The average annual precipitation is about 15 inches, the average annual air temperature is about 47 degrees F, and the frost-free period is about 135 days.

This complex is about 60 percent Blakeland loamy sand, about 30 percent Fluvaquentic Haplaquolls, and 10 percent other soils.

Included with these soils in mapping are areas of Columbine gravelly sandy loam, 0 to 3 percent slopes, Ellicott loamy coarse sand, 0 to 5 percent slopes, and Ustic Torrifluvents, loamy.

The Blakeland soil is in the more sloping areas. It is deep and somewhat excessively drained. It formed in sandy alluvium and eolian material derived from arkosic sedimentary rock. Typically, the surface layer is dark grayish brown loamy sand about 11 inches thick. The substratum, to a depth of 27 inches, is brown loamy sand; it grades to pale brown sand that extends to a depth of 60 inches or more.

Permeability of the Blakeland soil is rapid. The effective rooting depth is more than 60 inches. The available water capacity is moderate to low. Surface runoff is slow, and the hazard of erosion is moderate.

The Fluvaquentic Haplaquolls are in swale areas. They are deep, poorly drained soils. They formed in alluvium derived from arkosic sedimentary rock. Typically, the surface layer is brown. The texture is variable throughout. The water table is at a depth of 0 to 3 feet.

The Blakeland soil is well suited to deep-rooted grasses. Native vegetation is dominantly western wheatgrass, side-oats grama, and needleandthread. Rangeland vegetation on the Fluvaquentic Haplaquolls is dominantly tall grasses, including sand bluestem, switchgrass, prairie cordgrass, little bluestem, and sand reedgrass. Cattails and bulrushes are common in the swampy areas.

Proper range management is needed to prevent excess removal of plant cover from these soils. It is also needed to maintain the productive grasses. Interseeding improves the existing vegetation. Deferment of grazing during the growing season increases plant vigor and soil stability, and it helps to maintain and improve range condition. Proper location of livestock watering facilities helps to control grazing of animals.

Windbreaks and environmental plantings are fairly well suited to these soils. Blowing sand and low available water capacity are the main limitations to the establishment of trees and shrubs. The soils are so loose that trees need to be planted in shallow furrows and plant cover needs to be maintained between the rows. Supplemental irrigation may be needed to insure survival. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, and Siberian elm. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

The Blakeland soil is well suited to wildlife habitat. It is best suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed. Wetland wildlife can be attracted to the Fluvaquentic Haplaquolls and the wetland habitat can be enhanced by several means. Shallow water developments can be created by digging or by blasting potholes to create open-water areas. Fencing to control livestock grazing is beneficial, and it allows wetland plants such as cattails, reed canarygrass, and rushes to grow. Control of unplanned burning and prevention of drainage that would remove water from the wetlands are good practices. Openland wildlife use the vegetation on these soils for nesting and escape cover. These shallow marsh areas are especially important for winter cover if natural vegetation is allowed to grow.

The Blakeland soil has good potential for homesites, roads, and streets. It needs to be protected from erosion when vegetation has been removed from building sites. The Fluvaquentic Haplaquolls have poor potential for homesites. Their main limitations for this use are the high water table and the hazard of flooding. Capability subclass VIe.

10—Blendon sandy loam, 0 to 3 percent slopes. This deep, well drained soil formed in sandy arkosic alluvium on alluvial fans and terraces. The average annual precipitation is about 15 inches, the mean annual air temperature is about 47 degrees F, and the average frost-free period is about 135 days.

pricklypear occur. Ample amounts of litter and forage should be left on the soil because of the high hazard of soil blowing.

Windbreaks and environmental plantings are generally well suited to this soil. Summer fallow a year prior to planting and continued cultivation for weed control are needed to insure establishment and survival of plantings. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, Siberian peashrub, and American plum.

Depending on land use, this soil can produce habitat that is suitable for either rangeland wildlife, such as antelope, or for openland wildlife, such as pheasant, cottontail, and mourning dove. Availability of irrigation water largely determines the land use. Where no irrigation water is available, this soil is mainly used as rangeland, a use that favors rangeland wildlife. If this soil is used as rangeland, fences, livestock water developments, and proper livestock grazing use are practices that enhance habitat for rangeland wildlife. Production of crops such as wheat, corn, and alfalfa provides suitable habitat for openland wildlife, especially pheasant. Among the practices that increase openland wildlife populations are planting trees and shrubs and providing undisturbed nesting cover.

The main limitation of this soil for urban use is shrink-swell potential. Buildings and roads need to be designed to overcome this limitation. Roads need to be designed to minimize frost-heave damage. Capability subclasses IVE, nonirrigated, and IIe, irrigated.

40—Kettle gravelly loamy sand, 3 to 8 percent slopes. This deep, well drained soil formed in sandy arkosic deposits on uplands. Elevation ranges from 7,000 to 7,700 feet. The average annual precipitation is about 18 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

Typically, the surface layer is gray gravelly loamy sand about 3 inches thick. The subsurface layer is light gray gravelly loamy sand about 13 inches thick. The subsoil is very pale brown gravelly sandy loam about 24 inches thick. It consists of a matrix of loamy coarse sand that has thin bands of coarse sandy loam or sandy clay loam. The substratum to a depth of 60 inches or more is light yellowish brown extremely gravelly loamy sand.

Included with this soil in mapping are small areas of Alamosa loam, 1 to 3 percent slopes; Elbeth sandy loam, 3 to 8 percent slopes; Pring coarse sandy loam, 3 to 8 percent slopes; Tomah-Crowfoot loamy sands, 3 to 8 percent slopes; and a few rock outcrops.

Permeability of this Kettle soil is rapid. Effective rooting depth is 60 inches or more. Available water capacity is low to moderate. Surface runoff is slow, and the hazard of erosion is slight to moderate. A few gullies have formed in drainageways.

This soil is used for woodland, livestock grazing, wildlife habitat, recreation, and homesites.

This soil is suited to the production of ponderosa pine. It is capable of producing about 2,240 cubic feet or 4,900 board feet (International rule), of merchantable timber per acre from a fully stocked, even-aged stand of 80-year-old trees. The main limitation for the production or harvesting of timber is the low available water capacity. The low available water capacity also influences seedling survival, especially in areas where understory plants are plentiful. Erosion must be kept to a minimum when harvesting timber.

This soil has good potential for mule deer, tree squirrels, cottontail rabbit, and wild turkey. These animals obtain their food and shelter from pine trees, shrubs, and ground cover, which provide browse, forbs, fruit, and seeds. The presence of ponderosa pine and Gambel oak should encourage wild turkey populations; however, where water is not naturally present, wildlife watering facilities must be provided to attract and maintain wild turkey and other wildlife species. Livestock grazing management is vital on this soil if wildlife populations are to be maintained.

This soil has good potential for use as homesites. Plans for homesite development on this soil should provide for the preservation of as many trees as possible in order to maintain the esthetic value of the sites. During seasons of low precipitation, fire may become a hazard to homesites. This hazard can be minimized by installing firebreaks and reducing the amount of litter on the forest floor. Capability subclass VIe.

41—Kettle gravelly loamy sand, 8 to 40 percent slopes. This deep, well drained soil formed in sandy arkosic deposits on uplands. Elevation ranges from 7,000 to 7,700 feet. The average annual precipitation is about 18 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

Typically, the surface layer is gray gravelly loamy sand about 3 inches thick. The subsurface layer is light gray gravelly loamy sand about 13 inches thick. The subsoil is very pale brown gravelly sandy loam about 24 inches thick. It consists of a matrix of loamy coarse sand that has thin bands of coarse sandy loam or sandy clay loam. The substratum to a depth of 60 inches or more is light yellowish brown extremely gravelly loamy sand.

Included with this soil in mapping are small areas of Elbeth sandy loam, 8 to 15 percent slopes; Pring coarse sandy loam, 8 to 15 percent slopes; Tomah-Crowfoot loamy sands, 8 to 15 percent slopes; and a few rock outcrops.

Permeability of this Kettle soil is rapid. Effective rooting depth is 60 inches or more. Available water capacity is low to moderate. Surface runoff is medium, and the hazard of erosion is moderate. Some gullies have formed in drainageways.

The soil is used for woodland, livestock grazing, wildlife habitat, recreation, and homesites.

This soil is suited to the production of ponderosa pine. It is capable of producing 2,240 cubic feet, or 4,900 board

feet (International rule), of merchantable timber per acre from a fully stocked, even-aged stand of 80-year-old trees. The main limitation for this use is the moderate hazard of erosion. Measures must be taken to reduce erosion when harvesting timber, especially on the steeper slopes. The low to moderate available water capacity also influences seedling survival, especially in areas where understory plants are plentiful.

This soil has good potential for mule deer, tree squirrel, cottontail, and wild turkey. These animals obtain their food and shelter from pine trees, shrubs, and ground cover, which provide browse, forbs, fruit, and seeds. The presence of ponderosa pine and Gambel oak should encourage wild turkey populations; however, where water is not naturally present, wildlife watering facilities must be provided to attract and maintain wild turkey and other wildlife species. Livestock grazing management is vital on this soil if wildlife populations are to be maintained.

The moderately sloping to steep slopes limit the suitability of this soil for homesites. Special practices must be provided to minimize surface runoff and thus keep erosion to a minimum. This soil requires special site or building designs because of the slope. Deep cuts, to provide essentially level building sites, may expose bedrock. Access roads must be designed to provide adequate cut-slope grade, and drains must be used to control surface runoff and keep soil losses to a minimum. During seasons of low precipitation, fire may become a hazard to homesites. This hazard can be minimized by installing firebreaks and reducing the amount of litter on the forest floor. Capability subclass VIe.

42—Kettle-Rock outcrop complex. This gently rolling to very steep complex, is mostly on the side slopes of uplands. Slopes range from 8 to 60 percent. Elevation ranges from 6,800 to 7,700 feet. The average annual precipitation is about 18 inches, and average annual air temperature is about 43 degrees F.

The Kettle soil makes up about 60 percent of the complex, Rock outcrop about 20 percent, and other soils about 20 percent.

Included with this complex in mapping are areas of Peyton-Pring complex, 8 to 15 percent slopes; Elbeth sandy loam, 8 to 15 percent slopes; and Elbeth-Pring complex, 5 to 50 percent slopes.

The Kettle soil is deep and well drained. It formed in sandy arkosic deposits, mostly on the lower slopes of the complex. Slope is commonly less than 20 percent. Typically, the surface layer is gray, medium acid or slightly acid gravelly loamy sand about 3 inches thick. The subsurface layer is light gray, medium acid gravelly loamy sand about 13 inches thick. The subsoil is very pale brown, medium acid or slightly acid gravelly sandy loam about 24 inches thick. It consists of loamy coarse sand that has thin bands of coarse sandy loam or sandy clay loam. The substratum to a depth of 60 inches or more is light yellowish brown extremely gravelly loamy sand.

Permeability of the Kettle soil is rapid. Effective rooting depth is more than 60 inches. Available water capaci-

ty is low to moderate. Surface runoff is medium to rapid, and the hazard of erosion is slight to high. Soil slippage and deep gullies are common.

Rock outcrop is mostly in the form of vertical cliffs. Large stones are common on the lower slopes of this complex.

This complex is suited to the production of ponderosa pine. It is capable of producing 2,240 cubic feet, or 4,900 board feet (International rule), of merchantable timber per acre from a fully stocked, even-aged stand of 80-year-old trees. The main limitation of this complex for this use is the presence of Rock outcrop and the moderate hazard of erosion on the Kettle soil. Measures must be taken to minimize erosion when harvesting timber, especially on the steeper slopes. The low to moderate available water capacity also influences seedling survival, especially where understory plants are plentiful.

This complex has good potential for producing habitat for mule deer, tree squirrels, cottontail, and wild turkey. These animals obtain their food and shelter from pine trees, shrubs, and ground cover, which provide browse, forbs, fruit, and seeds. The presence of ponderosa pine and Gambel oak should encourage wild turkey populations; however, where water is not naturally present, wildlife watering facilities must be provided to attract and maintain wild turkey and other wildlife species. Livestock grazing management is vital on this soil if wildlife populations are to be maintained.

The moderate to very steep slopes limit the potential of this complex for homesites. Special practices must be provided to minimize surface runoff and thus keep erosion to a minimum. Special site or building designs are required because of the slope. Deep cuts, to provide essentially level building sites, can expose bedrock. The limitation of large stones on the soil surface can be overcome through the use of heavy equipment when preparing building sites. Access roads must be designed to provide adequate cut-slope grade, and drains must be used to control surface runoff and thus keep soil losses to a minimum. Deep cuts along the uphill side of the roads can expose the bedrock. Capability subclass VIIe.

43—Kim loam, 1 to 8 percent slopes. This deep, well drained soil formed in calcareous loamy sediment on fans and uplands. Elevation ranges from 5,300 to 5,600. The average annual precipitation is about 13 inches, the average annual temperature is about 49 degrees F, and the average frost-free period is about 145 days.

Typically, the surface layer is brown loam about 4 inches thick. The substratum is very pale brown loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Fort Collins loam, 3 to 8 percent slopes; Midway clay loam, 3 to 25 percent slopes, and Wiley silt loam, 3 to 9 percent slopes.

Permeability of this Kim soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is high. Surface runoff is medium, and the hazard of erosion is moderate.

Almost all areas of this soil are used as rangeland.

survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

These soils are suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

These soils have a good potential for homesites. The main limitations, especially on the Peyton soil, are low bearing strength and frost-action potential. Buildings and roads can be designed to overcome these limitations. Access roads should have adequate cut-slope grade and be provided with drains to control surface runoff and keep soil losses to a minimum. Capability subclass VIe.

69—Peyton-Pring complex, 8 to 15 percent slopes. These gently to moderately sloping soils are on valley side slopes and on uplands. Elevation ranges from 6,800 to 7,600 feet. The average annual precipitation is about 17 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

The Peyton soil makes up about 40 percent of the complex, the Pring soil about 30 percent, and other soils about 30 percent.

Included with these soils in mapping are areas of Holderness loam, 8 to 15 percent slopes; Tomah-Crowfoot loamy sands, 8 to 15 percent slopes; Kettle gravelly loamy sand, 8 to 40 percent slopes; and a few areas of Rock outcrop.

The Peyton soil is commonly on the less sloping part of the landscape. It is deep, noncalcareous, and well drained. It formed in alluvium and residuum derived from weathered, arkosic, sedimentary rock. Typically, the surface layer is grayish brown sandy loam about 12 inches thick. The subsoil, about 23 inches thick, is pale brown sandy clay loam in the upper 13 inches and pale brown sandy loam in the lower 10 inches. The substratum is pale brown sandy loam to a depth of 60 inches or more.

Permeability of the Peyton soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is high. Surface runoff is medium to rapid, and the hazard of erosion is moderate to high. Some gullies have developed along drainageways and livestock trails.

The Pring soil is deep, noncalcareous, and well drained. It formed in sandy sediment derived from weathered, arkosic, sedimentary rock. Typically, the surface layer is dark grayish brown coarse sandy loam about 4 inches thick. The substratum is dark grayish brown coarse sandy loam about 10 inches thick over pale brown gravelly sandy loam that extends to a depth of 60 inches or more.

Permeability of the Pring soil is rapid. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is medium to rapid, and the hazard of erosion is moderate to high. Some gullies have developed along drainageways and livestock trails.

The soils in this complex are used as rangeland, for wildlife habitat, and for homesites.

These soils are well suited to the production of native vegetation suitable for grazing. The dominant native species are mountain muhly, bluestem grasses, needle-andthread, and blue grama. These soils are subject to invasion of Kentucky bluegrass and Gambel oak. Common forbs are hairy goldenrod, geranium, milkvetch, low larkspur, fringed sage, and buckwheat.

Properly locating livestock watering facilities helps to control grazing. Timely deferment of grazing is needed to protect the plant cover.

Windbreaks and environmental plantings generally are suited to these soils. Soil blowing is the main limitation to the establishment of trees and shrubs. This limitation can be overcome by cultivating only in the tree rows and leaving a strip of vegetation between the rows. Supplemental irrigation may be needed when planting and during dry periods. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

These soils are well suited to wildlife habitat. They are best suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

These soils have good potential for use as homesites. The main limitations are steepness of slope, limited ability to support a load, and frost-action potential. Buildings and roads can be designed to overcome these limitations. These soils also require special site or building designs because of the slope. Access roads should have adequate cut-slope grade, and drains should be provided to control surface runoff and keep soil losses to a minimum. Capability subclass VIe.

70—Pits, gravel. Gravel pits are in nearly level to rolling areas. They are open excavations several feet deep and commonly 5 acres or less in size.

Gravel pits are very low in natural fertility and are highly susceptible to soil blowing. A cover of weeds or straw helps to control erosion.

Windbreaks and environmental plantings generally are not suited to these areas. Onsite investigation is needed to determine if plantings are feasible. Capability subclass VIIIs.

71—Pring coarse sandy loam, 3 to 8 percent slopes. This deep, noncalcareous, well drained soil formed in sandy sediment derived from arkosic sedimentary rock on valley side slopes and on uplands. Elevation ranges from 6,800 to 7,600 feet. The average annual precipitation is about 17 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

Typically, the surface layer is dark grayish brown coarse sandy loam about 4 inches thick. The substratum is dark grayish brown coarse sandy loam about 10 inches thick over pale brown gravelly sandy loam that extends to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Alamosa loam, 1 to 3 percent slopes, along drainageways; Cruckton sandy loam, 1 to 9 percent slopes; Peyton sandy loam, 1 to 5 percent slopes; Peyton sandy loam, 5 to 9 percent slopes; and Tomah-Crowfoot loamy sands, 3 to 8 percent slopes. In some places arkose beds of sandstone and shale are at a depth of 0 to 40 inches.

Permeability of this Pring soil is rapid. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is medium, and the hazard of erosion is moderate.

Almost all areas of this soil are used as rangeland. Some areas previously cultivated have been reseeded to grass. This soil is also used for wildlife habitat and homesites.

This soil is well suited to the production of native vegetation suitable for grazing by cattle and sheep. Rangeland vegetation is mainly mountain muhly, little bluestem, needleandthread, Parry oatgrass, and junegrass.

Deferment of grazing in spring helps to maintain vigor and production of the cool-season bunchgrasses. Fencing and properly locating livestock watering facilities help to control grazing.

Windbreaks and environmental plantings generally are suited to this soil. The hazard of soil blowing is the main limitation to the establishment of trees and shrubs. This limitation can be overcome by cultivating only in the tree rows and leaving a strip of vegetation between the rows. Supplemental irrigation may be needed when planting and during dry periods. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

This soil is suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

This soil is well suited for use as homesites. Erosion control practices are needed to control soil blowing and water erosion on construction sites where the ground cover has been removed. Capability subclass IVe.

72—Pring coarse sandy loam, 8 to 15 percent slopes. This deep, noncalcareous, well drained soil formed in sandy sediment derived from arkosic sedimentary rock on valley side slopes and on uplands. Elevation ranges from 6,800 to 7,600 feet. The average annual precipitation is about 17 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

Typically, the surface layer is dark grayish brown coarse sandy loam about 4 inches thick. The substratum is dark grayish brown coarse sandy loam about 10 inches thick over pale brown gravelly sandy loam that extends to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Cruckton sandy loam, 1 to 9 percent slopes; Peyton sandy

loam, 5 to 9 percent slopes; and Tomah-Crowfoot loamy sands, 8 to 15 percent slopes. Arkose beds of sandstone and shale are at a depth of 0 to 40 inches in some places.

Permeability of this Pring soil is rapid. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is medium, and the hazard of erosion is moderate. Some gullies have developed along drainageways.

Almost all areas of this soil are used as rangeland. Some areas previously cultivated have been reseeded to grass. This soil is also used for wildlife habitat and as homesites.

This soil is well suited to the production of native vegetation suitable for grazing by cattle and sheep. The native vegetation is mainly mountain muhly, little bluestem, needleandthread, Parry oatgrass, and junegrass.

Deferment of grazing in spring helps to maintain the vigor and production of the cool-season bunchgrasses. Fencing and properly locating livestock watering facilities help to control grazing.

Windbreaks and environmental plantings generally are suited to this soil. The hazard of soil blowing is the main limitation to the establishment of trees and shrubs. This limitation can be overcome by cultivating only in the tree rows and leaving a strip of vegetation between the rows. Supplemental irrigation may be needed when planting and during dry periods. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

This soil is suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

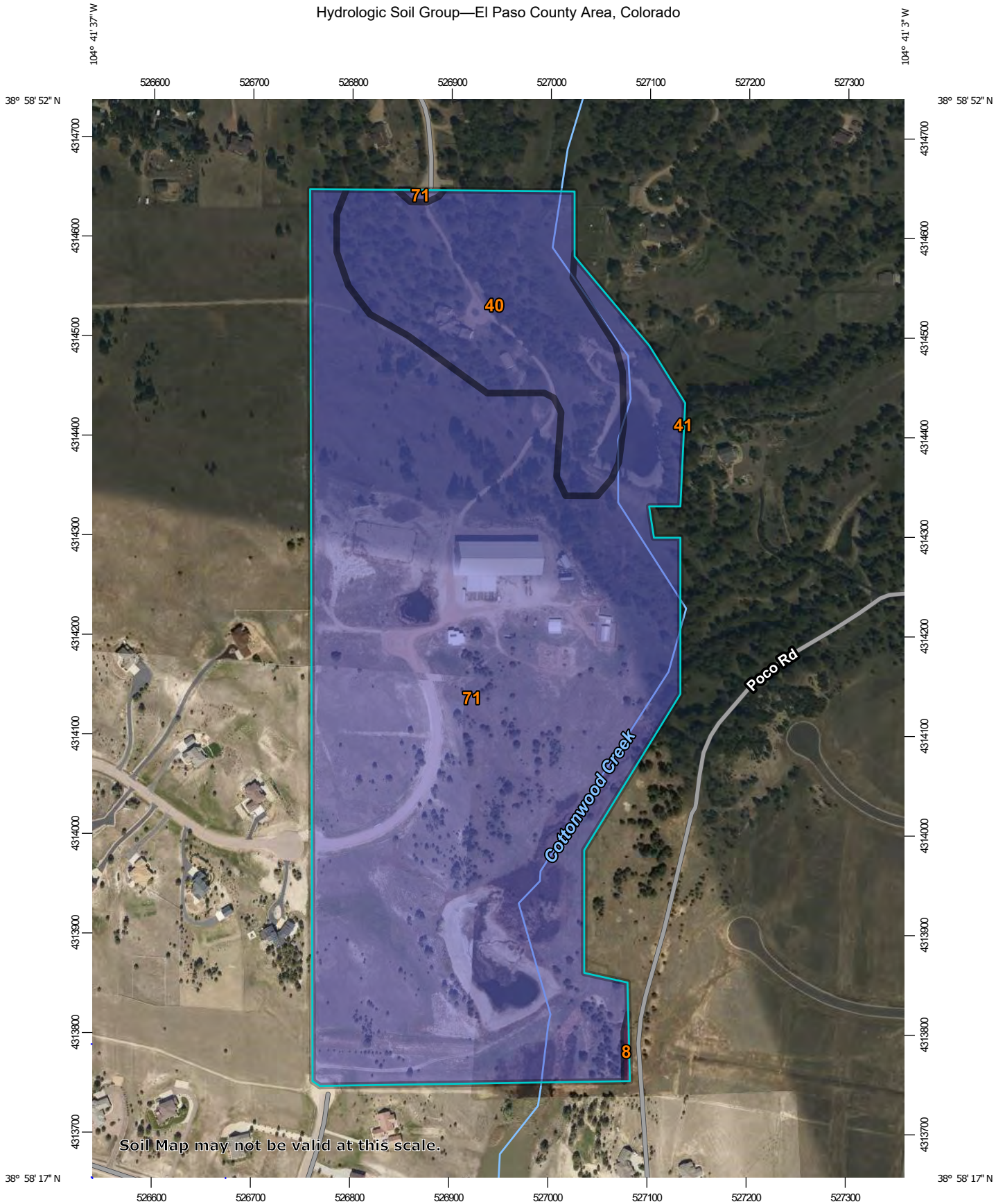
This soil has good potential for urban uses. The main limitation is slope. Special site or building designs are needed because of the slope. Access roads must have adequate cut-slope grade and be provided with drains to control surface runoff. Capability subclass VIe.

73—Razor clay loam, 3 to 9 percent slopes. This moderately deep, well drained, clayey soil formed in residuum derived from calcareous shale on uplands. Elevation ranges from 5,300 to 6,100 feet. The average annual precipitation is about 13 inches, the average annual air temperature is about 49 degrees F, and the average frost-free period is about 145 days.

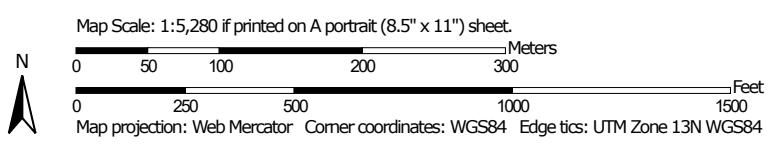
Typically, the surface layer is light brownish gray clay loam about 3 inches thick. The subsoil is grayish brown heavy clay loam or clay about 15 inches thick. The substratum is grayish brown clay that grades to calcareous shale at a depth of about 31 inches. Visible lime is in the lower part of the subsoil and in the substratum.

Included with this soil in mapping are small areas of Midway clay loam, 3 to 25 percent slopes; Heldt clay loam, 0 to 3 percent slopes; and Stoneham sandy loam, 3 to 8 percent slopes.

Hydrologic Soil Group—El Paso County Area, Colorado



Soil Map may not be valid at this scale.



MAP LEGEND

Area of Interest (AOI)









 Area of Interest (AOI)

Soils

Soil Rating Polygons





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

Soil Rating Lines

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

Soil Rating Points


-  A
-  A/D
-  B
-  B/D

-  C
-  C/D
-  D
-  Not rated or not available


Water Features

 Streams and Canals

Transportation

-  Rails
-  Interstate Highways
-  US Routes
-  Major Roads
-  Local Roads

Background

 Aerial Photography

MAP INFORMATION

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

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: Aug 19, 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.

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	0.1	0.1%
40	Kettle gravelly loamy sand, 3 to 8 percent slopes	B	12.3	16.9%
41	Kettle gravelly loamy sand, 8 to 40 percent slopes	B	0.0	0.0%
71	Pring coarse sandy loam, 3 to 8 percent slopes	B	60.5	83.0%
Totals for Area of Interest			72.9	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



1

Looking downstream
from 250 feet
downstream of
Cottonwood Creek
DBPS Design Point
82.

September 27, 2022



2

Looking upstream
from 250 feet
downstream of
Cottonwood Creek
DBPS Design Point
82.

September 27, 2022



3

Looking upstream
from Cottonwood
Creek DBPS Design
Point 84.

September 27, 2022



4

Looking downstream
from 200 feet
downstream of
Cottonwood Creek
DBPS Design Point
84.

September 27, 2022



5

Looking upstream
from Cottonwood
Creek DBPS Design
Point 102.

September 27, 2022



6

Looking upstream
from Cottonwood
Creek DBPS Design
Point 102.

September 27, 2022



7

Looking upstream
from Cottonwood
Creek DBPS Design
Point 102.

September 27, 2022



8

Looking upstream of
tributary , from
Cottonwood Creek
DBPS Design Point
102.

September 27, 2022



9

Looking downstream
from Cottonwood
Creek DBPS Design
Point 102.

September 27, 2022



10

Looking northeast
from 100 feet
downstream of
Cottonwood Creek
DBPS Design Point
102.

September 27, 2022



11

Looking downstream from 200 feet downstream of Cottonwood Creek DBPS Design Point 102. Emergency spillway on left corner of pond.

September 27, 2022



12

Looking upstream from 200 feet downstream of Cottonwood Creek DBPS Design Point 102.

September 27, 2022



13

Buried and partially buried riprap at emergency overflow, from Cottonwood Creek DBPS Design Point 104.

September 27, 2022



14

Looking at heavy vegetation downstream, from Design Point 6C.

September 27, 2022



15

Looking at riprap
upstream tributary
flow, from Design
Point 6B.

September 27, 2022



16

Looking southwest
across stream from
450 feet downstream
of Cottonwood Creek
DBPS Design Point
104.

September 27, 2022



17

Looking up stream
from 450 feet
downstream of
Cottonwood Creek
DBPS Design Point
104.

September 27, 2022



18

Looking upstream
from 300 feet
upstream of
Cottonwood Creek
DBPS Design Point
124.

September 27, 2022



19

Looking west
across channel from
100 feet upstream
of Cottonwood
Creek DBPS
Design Point 124.

September 27, 2022



20

Looking
downstream at the
upper banks from
100 feet upstream of
Cottonwood Creek
DBPS Design Point
124.

September 27, 2022



21

Looking upstream
from Design Point 8.

September 27, 2022



22

Looking downstream
from Design Point 8.

September 27, 2022



23

On the east side of the creek looking west from 200 feet downstream of Design Point 9.

September 27, 2022



24

Looking southwest towards pond embankment from 400 feet downstream of Design Point 10.

September 27, 2022



25

Looking downstream
towards offsite pond
and riprap from
Cottonwood Creek
DBPS Design Point
126.

September 27, 2022



26

Looking upstream
from Cottonwood
Creek DBPS Design
Point 126.

September 27, 2022



27

Looking upstream towards riprap for Pond 2 emergency overflow from east bank 550 feet downstream of Design Point 10.

September 27, 2022



28

Looking across channel, from east bank 550 feet downstream of Design Point 10.

September 27, 2022



29

Looking upstream from the west bank 500 feet downstream of Design Point 10.

September 27, 2022



30

Looking north at culverts, on the east side of the road from 100 feet south of Design Point 8A.

September 27, 2022



31

Riprap lining
downstream from
DP8A, from 100 feet
north of Design Point
12.

September 27, 2022



32

Looking northwest
up tributary stream
from 100 feet
northwest of Design
Point 9.

September 27, 2022



33

Looking east, on west bank of creek 100 feet northwest of Design Point 9.

September 27, 2022



34

Riprap lined swale from barn area to creek, in need of additional riprap. Just west of Design Point 104.

September 27, 2022

Needs to be designed



35

Looking west, existing riprap lined swale in need of additional riprap in area of Design Point 6A.

September 27, 2022



36

Looking at riprap on tributary flow upstream of DP6B, from Design Point 6A.

September 27, 2022

8. Hydrologic Calculations

Runoff Coefficients and Percent Imperviousness Table 6-6

Colorado Springs Rainfall Intensity Duration Frequency Table 6-5

Hydrologic Calculations Summary Form SF-1 for Existing & Developed Conditions

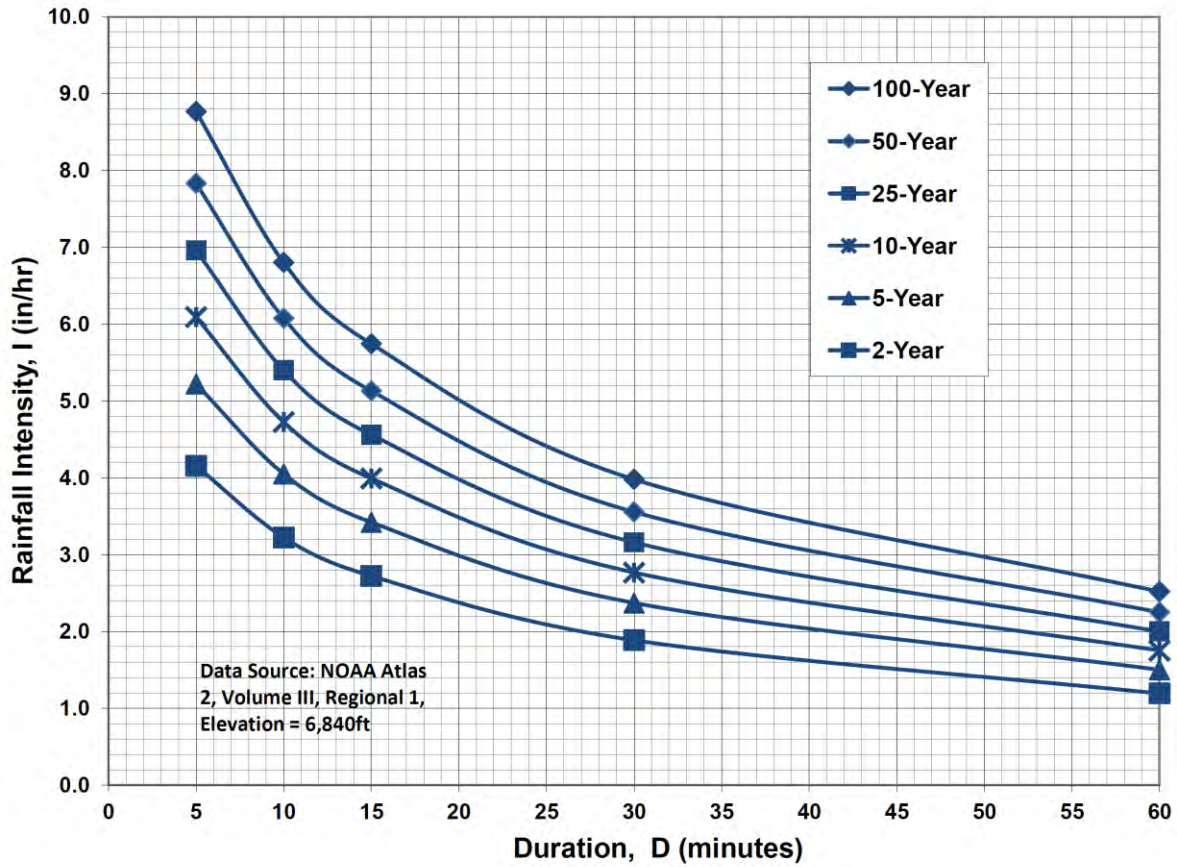
Hydrologic Calculations Summary 5-yr Form SF-2 for Existing & Developed Conditions

Hydrologic Calculations Summary 100-yr Form SF-2 for Existing & Developed Conditions

Runoff Reduction Calculations

Runoff Reduction Map

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.

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

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

Sub-Basin	Sub-Basin Data				Overland			Shallow Channel				Channelized				t _c Check		
	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)	t _c (min)
EX-A1	4.95	0.08	0.35	0%	299	11%	14.6	337	0.059	1.7	3.3	0	0.000	0.0	0.0	636	13.5	13.5
EX-A2	1.74	0.08	0.35	0%	154	13%	9.8	238	0.059	1.7	2.3	0	0.000	0.0	0.0	392	12.2	12.1
EX-B	4.35	0.12	0.38	5%	100	8%	9.1	176	0.031	1.2	2.4	240	0.023	3.2	1.2	516	12.9	12.7
EX-C	1.66	0.08	0.35	0%	100	5%	10.8	238	0.050	1.6	2.5	0	0.000	0.0	0.0	338	11.9	11.9
EX-D	7.10	0.12	0.38	6%	100	7%	9.3	160	0.088	2.1	1.3	621	0.034	4.2	2.5	881	14.9	13.1
EX-E1	3.41	0.28	0.49	30%	100	7%	7.8	0	0.000	0.0	0.0	865	0.016	2.7	5.3	965	15.4	13.1
EX-E2	7.77	0.18	0.42	15%	299	3%	19.3	222	0.054	1.6	2.3	618	0.024	3.8	2.7	1139	16.3	16.3
EX-F1	6.45	0.42	0.58	51%	100	2%	9.8	343	0.012	0.8	7.6	239	0.056	4.9	0.8	682	13.8	13.8
EX-F2	2.02	0.08	0.35	1%	84	4%	11.0	306	0.046	1.5	3.4	241	0.050	3.5	1.1	631	13.5	13.5
EX-G	2.98	0.10	0.36	2%	126	10%	9.7	186	0.032	1.3	2.5	427	0.042	3.6	2.0	739	14.1	14.1
EX-H	4.10	0.14	0.40	8%	100	4%	10.9	382	0.050	1.6	4.1	208	0.058	4.2	0.8	690	13.8	13.8
EX-I	1.64	0.17	0.42	11%	100	9%	8.1	166	0.030	1.2	2.3	147	0.020	1.2	2.0	413	12.3	12.3
EX-J	2.42	0.14	0.39	7%	100	7%	9.1	144	0.076	1.9	1.2	274	0.036	3.4	1.3	518	12.9	11.7
EX-K	2.65	0.08	0.35	0%	150	9%	11.1	0	0.000	0.0	0.0	0	0.000	0.0	0.0	150	10.8	10.8
EX-L	2.14	0.08	0.35	0%	206	5%	15.2	224	0.020	1.0	3.8	0	0.000	0.0	0.0	430	12.4	12.4
EX-M	4.10	0.10	0.36	2%	108	4%	12.2	453	0.022	1.0	7.3	312	0.032	1.5	3.5	873	14.9	14.9
OS-B1A	24.88	0.12	0.40	10%	300	6%	17.0	1000	0.047	1.5	11.0	344	0.020	3.1	1.9	1644	19.1	19.1
OS-B1B	40.97	0.10	0.37	5%	300	5%	18.5	1000	0.055	1.6	10.2	711	0.020	3.0	3.9	2011	21.2	21.2
OS-B1C	1.84	0.08	0.35	0%	300	2%	24.1	228	0.039	1.4	2.7	0	0.000	0.0	0.0	528	12.9	12.9
OS-B1D	6.03	0.08	0.35	0%	300	3%	22.2	942	0.034	1.3	12.2	0	0.000	0.0	0.0	1242	16.9	16.9
OS-B1E	10.12	0.10	0.37	4%	300	7%	16.8	1000	0.035	1.3	12.7	104	0.058	4.5	0.4	1404	17.8	17.8
OS-B3A	9.06	0.12	0.40	11%	300	4%	19.4	638	0.052	1.6	6.7	0	0.000	0.0	0.0	938	15.2	15.2
OS-B3B	2.50	0.12	0.40	11%	300	4%	20.0	336	0.054	1.6	3.5	0	0.000	0.0	0.0	636	13.5	13.5
OS-B3C	5.95	0.12	0.40	11%	300	3%	20.6	694	0.040	1.4	8.2	0	0.000	0.0	0.0	994	15.5	15.5

Note: calculations were not reviewed in detail with this submittal

Job No.: **61145**
 Project: **Eagle Rising - Preliminary/Final (Developed)**

Date: **1/4/2023 11:19**
 Calcs By: **O. Ali**
 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)	
A1	4.95	0.12	0.38	6%	299	11%	13.9	337	0.059	1.7	3.3	0	0.000	0.0	0.0	636	13.5	13.5
A2	1.74	0.08	0.35	0%	154	13%	9.8	238	0.059	1.7	2.3	0	0.000	0.0	0.0	392	12.2	12.1
B	4.35	0.15	0.40	9%	100	8%	8.8	176	0.031	1.2	2.4	240	0.023	3.2	1.2	516	12.9	12.5
C	1.66	0.11	0.37	3%	100	5%	10.6	238	0.050	1.6	2.5	0	0.000	0.0	0.0	338	11.9	11.9
D	7.10	0.14	0.40	9%	100	7%	9.1	160	0.088	2.1	1.3	621	0.034	4.2	2.5	881	14.9	12.8
E1	3.41	0.23	0.45	21%	100	7%	8.3	0	0.000	0.0	0.0	865	0.016	2.7	5.3	965	15.4	13.6
E2	7.77	0.20	0.43	17%	299	3%	18.8	222	0.054	1.6	2.3	618	0.024	3.8	2.7	1139	16.3	16.3
F1	6.45	0.22	0.45	20%	100	2%	12.6	343	0.012	0.8	7.6	239	0.056	4.9	0.8	682	13.8	13.8
F2	2.02	0.15	0.40	9%	84	4%	10.3	306	0.046	1.5	3.4	241	0.050	3.5	1.1	631	13.5	13.5
G	2.98	0.14	0.39	8%	126	10%	9.3	186	0.032	1.3	2.5	427	0.042	3.6	2.0	739	14.1	13.7
H	4.10	0.20	0.44	15%	100	4%	10.3	382	0.050	1.6	4.1	208	0.058	4.2	0.8	690	13.8	13.8
I	1.64	0.21	0.45	17%	100	9%	7.8	166	0.030	1.2	2.3	147	0.020	1.2	2.0	413	12.3	12.0
J	2.42	0.19	0.43	14%	100	7%	8.7	144	0.076	1.9	1.2	274	0.036	3.4	1.3	518	12.9	11.2
K	2.65	0.08	0.35	0%	150	9%	11.1	0	0.000	0.0	0.0	0	0.000	0.0	0.0	150	10.8	10.8
L	2.14	0.14	0.39	8%	206	5%	14.3	224	0.022	1.0	3.6	0	0.000	0.0	0.0	430	12.4	12.4
M	4.10	0.13	0.39	6%	108	4%	11.8	453	0.022	1.0	7.3	312	0.032	1.5	3.5	873	14.9	14.9
OS-B1A	24.88	0.12	0.40	10%	300	6%	17.0	1000	0.047	1.5	11.0	344	0.020	3.1	1.9	1644	19.1	19.1
OS-B1B	40.97	0.10	0.37	5%	300	5%	18.5	1000	0.055	1.6	10.2	711	0.020	3.0	3.9	2011	21.2	21.2
OS-B1C	1.84	0.08	0.35	0%	300	2%	24.1	228	0.039	1.4	2.7	0	0.000	0.0	0.0	528	12.9	12.9
OS-B1D	6.03	0.08	0.35	0%	300	3%	22.2	942	0.034	1.3	12.2	0	0.000	0.0	0.0	1242	16.9	16.9
OS-B1E	10.12	0.10	0.37	4%	300	7%	16.8	1000	0.035	1.3	12.7	104	0.058	4.5	0.4	1404	17.8	17.8
OS-B3A	9.06	0.12	0.40	11%	300	4%	19.4	638	0.052	1.6	6.7	0	0.000	0.0	0.0	938	15.2	15.2
OS-B3B	2.50	0.12	0.40	11%	300	4%	20.0	336	0.054	1.6	3.5	0	0.000	0.0	0.0	636	13.5	13.5
OS-B3C	5.95	0.12	0.40	11%	300	3%	20.6	694	0.040	1.4	8.2	0	0.000	0.0	0.0	994	15.5	15.5

Job No.: **61145**
 Project: **Eagle Rising - Preliminary/Final (Existing)**
 Design Storm: **5-Year Storm (20% Probability)**
 Jurisdiction: **DCM**

Date: **1/4/2023 11:19**
 Calcs By: **O. Ali**
 Checked By: _____

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	CA	I5	Q5	t _c	CA	I5	Q5	Slope	Length	Q	Q	Slope	Mnngs	Length	D _{pipe}	Length	V _{osc}	t _t
				(min)	(Acres)	(in/hr)	(cfs)	(min)	(Acres)	(in/hr)	(cfs)	(%)	(ft)	(cfs)	(cfs)	(%)	n	(ft)	(in)	(ft)	(ft/s)	(min)
	EX-A1	4.95	0.08	13.5	0.40	3.68	1.46															
	EX-A2	1.74	0.08	12.1	0.14	3.84	0.53															
	EX-B	4.35	0.12	12.7	0.51	3.77	1.92															
	EX-C	1.66	0.08	11.9	0.13	3.87	0.52															
	EX-D	7.10	0.12	13.1	0.87	3.73	3.26															
	EX-E1	3.41	0.28	13.1	0.95	3.72	3.53															
EX-DP8	EX-E2	7.77	0.18	16.3	1.40	3.39	4.74															
	EX-F1	6.45	0.42	13.8	2.68	3.65	9.78															
	EX-F2	2.02	0.08	13.5	0.17	3.68	0.63															
EX-DP10	EX-G	2.98	0.10	14.1	0.29	3.61	1.03															
	EX-H	4.10	0.14	13.8	0.59	3.64	2.16															
	EX-I	1.64	0.17	12.3	0.29	3.82	1.09															
	EX-J	2.42	0.14	11.7	0.34	3.89	1.32															
	EX-K	2.65	0.08	10.8	0.21	4.01	0.85															
	EX-L	2.14	0.08	12.4	0.17	3.81	0.65															
	EX-M	4.10	0.10	14.9	0.40	3.54	1.42															
EX-DP6		71.87	0.10					22.3	7.50	2.93	22.0											
EX-DP6A		5.25	0.21					17.9	1.10	3.25	3.6											
EX-DP6B		78.97	0.11					24.1	8.37	2.81	23.5											
EX-DP6C		84.22	0.11					24.1	9.47	2.81	26.6											
EX-DP7		12.48	0.25					20.4	3.16	3.06	9.7											
EX-DP8A		24.92	0.12					19.5	2.93	3.12	9.2											
EX-DP9		14.50	0.23					22.8	3.33	2.89	9.7											
EX-DP11		6.60	0.11					18.1	0.70	3.24	2.3											
EX-DP12		27.34	0.12					21.2	3.27	3.00	9.8											
EX-DP13		8.09	0.11					17.2	0.89	3.32	2.9											
	OS-B1A	24.88	0.12	19.1	2.90	3.16	9.16															
	OS-B1B	40.97	0.10	21.2	3.95	3.00	11.87															
	OS-B1C	1.84	0.08	12.9	0.15	3.74	0.55															
	OS-B1D	6.03	0.08	16.9	0.48	3.34	1.61															
	OS-B1E	10.12	0.10	17.8	0.96	3.26	3.15															
	OS-B3A	9.06	0.12	15.2	1.09	3.50	3.81															
	OS-B3B	2.50	0.12	13.5	0.30	3.68	1.10															
	OS-B3C	5.95	0.12	15.5	0.71	3.47	2.48															

DCM: $I = C1 * \ln(tc) + C2$
 C1: 1.5
 C1: 7.583

Job No.: **61145**
 Project: **Eagle Rising - Preliminary/Final** (Developed)
 Design Storm: **5-Year Storm** (20% Probability)
 Jurisdiction: **DCM**

Date: **1/4/2023 11:19**
 Calcs By: **O. Ali**
 Checked By: _____

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 _{disc} (ft/s)	t _t (min)		
DP8	A1	4.95	0.12	13.5	0.61	3.68	2.25																	
	A2	1.74	0.08	12.1	0.14	3.84	0.53																	
	B	4.35	0.15	12.5	0.64	3.80	2.43																	
	C	1.66	0.11	11.9	0.18	3.87	0.68																	
	D	7.10	0.14	12.8	1.03	3.75	3.85																	
	E1	3.41	0.23	13.6	0.77	3.67	2.84																	
	E2	7.77	0.20	16.3	1.56	3.39	5.29																	
	F1	6.45	0.22	13.8	1.44	3.65	5.25																	
	F2	2.02	0.15	13.5	0.30	3.68	1.10																	
	DP10	G	2.98	0.14	13.7	0.42	3.66	1.52																
		H	4.10	0.20	13.8	0.81	3.64	2.93																
		I	1.64	0.21	12.0	0.35	3.86	1.34																
		J	2.42	0.19	11.2	0.45	3.95	1.79																
K		2.65	0.08	10.8	0.21	4.01	0.85																	
L		2.14	0.14	12.4	0.30	3.81	1.15																	
M		4.10	0.13	14.9	0.53	3.54	1.89																	
DP6		71.87	0.11					22.3	7.67	2.93	22.5													
DP6A		5.25	0.18					17.9	0.92	3.25	3.0													
DP6B		78.97	0.11					24.1	8.70	2.81	24.4													
DP6C		84.22	0.11					24.1	9.62	2.81	27.0													
DP7		12.48	0.15					20.4	1.92	3.06	5.9													
DP8A		24.92	0.13					19.5	3.21	3.12	10.0													
DP9		14.50	0.15					22.8	2.22	2.89	6.4													
DP11		6.60	0.13					18.1	0.83	3.24	2.7													
DP12		27.34	0.13					21.2	3.66	3.00	11.0													
DP13		8.09	0.13					17.2	1.02	3.32	3.4													
	OS-B1A	24.88	0.12	19.1	2.90	3.16	9.16																	
	OS-B1B	40.97	0.10	21.2	3.95	3.00	11.87																	
	OS-B1C	1.84	0.08	12.9	0.15	3.74	0.55																	
	OS-B1D	6.03	0.08	16.9	0.48	3.34	1.61																	
	OS-B1E	10.12	0.10	17.8	0.96	3.26	3.15																	
	OS-B3A	9.06	0.12	15.2	1.09	3.50	3.81																	
	OS-B3B	2.50	0.12	13.5	0.30	3.68	1.10																	
	OS-B3C	5.95	0.12	15.5	0.71	3.47	2.48																	

DCM: $I = C1 * \ln(tc) + C2$
 C1: 1.5
 C2: 7.583

Job No.: **61145**
 Project: **Eagle Rising - Preliminary/Final (Existing)**
 Design Storm: **100-Year Storm (1% Probability)**
 Jurisdiction: **DCM**

Date: **1/4/2023 11:19**
 Calcs By: **O. Ali**
 Checked By: _____

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	CA	I100	Q100	t _c	CA	I100	Q100	Slope	Length	Q	Q	Slope	Mnngs	Length	D _{Pipe}	Length	V _{0sc}	t _t
				(min)	(Acres)	(in/hr)	(cfs)	(min)	(Acres)	(in/hr)	(cfs)	(%)	(ft)	(cfs)	(cfs)	(%)	n	(ft)	(in)	(ft)	(ft/s)	(min)
	EX-A1	4.95	0.35	13.5	1.73	6.17	10.69															
	EX-A2	1.74	0.35	12.1	0.61	6.44	3.93															
	EX-B	4.35	0.38	12.7	1.64	6.32	10.38															
	EX-C	1.66	0.35	11.9	0.58	6.50	3.79															
	EX-D	7.10	0.38	13.1	2.70	6.26	16.94															
	EX-E1	3.41	0.49	13.1	1.66	6.25	10.38															
	EX-E2	7.77	0.42	16.3	3.26	5.70	18.55															
	EX-F1	6.45	0.58	13.8	3.76	6.12	23.00															
	EX-F2	2.02	0.35	13.5	0.71	6.18	4.41															
	EX-G	2.98	0.36	14.1	1.08	6.07	6.54															
	EX-H	4.10	0.40	13.8	1.63	6.11	9.99															
	EX-I	1.64	0.42	12.3	0.69	6.41	4.41															
	EX-J	2.42	0.39	11.7	0.96	6.54	6.25															
	EX-K	2.65	0.35	10.8	0.93	6.73	6.25															
	EX-L	2.14	0.35	12.4	0.75	6.39	4.79															
	EX-M	4.10	0.36	14.9	1.49	5.94	8.85															
	EX-DP6	71.87	0.38					22.3	27.30	4.91	134.1											
	EX-DP6A	5.25	0.44					17.9	2.31	5.46	12.6											
	EX-DP6B	78.97	0.38					24.1	30.00	4.71	141.5											
	EX-DP6C	84.22	0.38					24.1	32.31	4.71	152.3											
	EX-DP7	12.48	0.47					20.4	5.87	5.14	30.2											
	EX-DP8A	24.92	0.39					19.5	9.68	5.25	50.8											
	EX-DP9	14.50	0.45					22.8	6.58	4.86	32.0											
	EX-DP11	6.60	0.38					18.1	2.49	5.44	13.5											
	EX-DP12	27.34	0.39					21.2	10.64	5.04	53.6											
	EX-DP13	8.09	0.39					17.2	3.13	5.57	17.4											
	OS-B1A	24.88	0.40	19.1	9.86	5.30	52.23															
	OS-B1B	40.97	0.37	21.2	15.21	5.04	76.72															
	OS-B1C	1.84	0.35	12.9	0.64	6.28	4.04															
	OS-B1D	6.03	0.35	16.9	2.11	5.61	11.84															
	OS-B1E	10.12	0.37	17.8	3.73	5.48	20.46															
	OS-B3A	9.06	0.40	15.2	3.63	5.88	21.30															
	OS-B3B	2.50	0.40	13.5	1.00	6.17	6.18															
	OS-B3C	5.95	0.40	15.5	2.38	5.82	13.87															

DCM: $I = C1 * \ln(t_c) + C2$
 C1: 2.52
 C1: 12.735

Sub-Basin OS-B1A (DP4) Runoff Calculations

Job No.: 61145
 Project: Eagle Rising - Preliminary/Final
 Jurisdiction: DCM
 Runoff Coefficient: Surface Type

Date: 1/4/2023 11:19
 Calcs by: O. Ali
 Checked by: _____
 Soil Type: B
 Urbanization: Urban

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
2-1/2 Acre	942,816	21.64	0.08	0.12	0.22	0.31	0.36	0.4	11%
5 Acre	99,743	2.29	0.06	0.1	0.2	0.29	0.34	0.38	7%
Pasture/Meadow	41,339	0.95	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	1,083,898	24.88	0.08	0.12	0.22	0.31	0.36	0.40	10.2%

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	1,644	72	-	-	-	-	
Initial Time	300	18	0.060	-	17.0	19.1	DCM Eq. 6-8
Shallow Channel	1,000	47	0.047	1.5	11.0	-	DCM Eq. 6-9
Channelized	344	7	0.020	3.1	1.9	-	V-Ditch
				t_c	19.1 min.		

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.52	3.16	3.68	4.21	4.73	5.30
Runoff (cfs)	4.8	9.2	19.7	32.0	41.9	52.2
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	4.8	9.2	19.7	32.0	41.9	52.2

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

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin OS-B1B (DP5) Runoff Calculations

Job No.: 61145
 Project: Eagle Rising - Preliminary/Final
 Jurisdiction: DCM
 Runoff Coefficient: Surface Type

Date: 1/4/2023 11:19
 Calcs by: O. Ali
 Checked by: _____
 Soil Type: B
 Urbanization: Urban

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
2-1/2 Acre	601,016	13.80	0.08	0.12	0.22	0.31	0.36	0.4	11%
5 Acre	267,802	6.15	0.06	0.1	0.2	0.29	0.34	0.38	7%
Pasture/Meadow	915,935	21.03	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	1,784,753	40.97	0.05	0.10	0.18	0.28	0.33	0.37	4.8%

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	2,011	84	-	-	-	-	
Initial Time	300	15	0.050	-	18.5	21.2	DCM Eq. 6-8
Shallow Channel	1,000	55	0.055	1.6	10.2	-	DCM Eq. 6-9
Channelized	711	14	0.020	3.0	3.9	-	V-Ditch
				t_c	21.2 min.		

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.40	3.00	3.50	4.01	4.51	5.04
Runoff (cfs)	4.5	11.9	26.0	45.3	60.2	76.7
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	4.5	11.9	26.0	45.3	60.2	76.7

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

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin OS-B1C (DP-E7) Runoff Calculations

Job No.: 61145
 Project: Eagle Rising - Preliminary/Final
 Jurisdiction: DCM
 Runoff Coefficient: Surface Type

Date: 1/4/2023 11:19
 Calcs by: O. Ali
 Checked by: _____
 Soil Type: B
 Urbanization: Urban

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
Pasture/Meadow	80,078	1.84	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	80,078	1.84	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	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)
Total	528	16	-	-	-	-
Initial Time	300	7	0.023	-	24.1	12.9 DCM Eq. 6-8
Shallow Channel	228	9	0.039	1.4	2.7	- DCM Eq. 6-9
Channelized			0.000	0.0	0.0	- V-Ditch
				t_c	12.9 min.	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.99	3.74	4.37	4.99	5.62	6.28
Runoff (cfs)	0.1	0.6	1.2	2.3	3.1	4.0
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.1	0.6	1.2	2.3	3.1	4.0

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

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin OS-B1D (DP-E8) Runoff Calculations

Job No.: 61145
 Project: Eagle Rising - Preliminary/Final
 Jurisdiction: DCM
 Runoff Coefficient: Surface Type

Date: 1/4/2023 11:19
 Calcs by: O. Ali
 Checked by: _____
 Soil Type: B
 Urbanization: Urban

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
Pasture/Meadow	262,653	6.03	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	262,653	6.03	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	1,242	41	-	-	-	-	
Initial Time	300	9	0.030	-	22.2	16.9	DCM Eq. 6-8
Shallow Channel	942	32	0.034	1.3	12.2	-	DCM Eq. 6-9
Channelized			0.000	0.0	0.0	-	V-Ditch
				t_c	16.9 min.		

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.67	3.34	3.90	4.46	5.01	5.61
Runoff (cfs)	0.3	1.6	3.5	6.7	9.1	11.8
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.3	1.6	3.5	6.7	9.1	11.8

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

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin OS-B1E (DP-E10) Runoff Calculations

Job No.:	<u>61145</u>	Date:	<u>1/4/2023 11:19</u>
Project:	<u>Eagle Rising - Preliminary/Final</u>	Calcs by:	<u>O. Ali</u>
Jurisdiction	DCM	Checked by:	
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	
2-1/2 Acre Pasture/Meadow	168,070	3.86	0.08	0.12	0.22	0.31	0.36	0.4	11%
	272,638	6.26	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	440,708	10.12	0.04	0.10	0.18	0.27	0.32	0.37	4.2%

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	1,404	61	-	-	-	-
Initial Time	300	20	0.067	-	16.8	17.8 DCM Eq. 6-8
Shallow Channel	1,000	35	0.035	1.3	12.7	- DCM Eq. 6-9
Channelized	104	6	0.058	4.5	0.4	- V-Ditch
				t_c	17.8 min.	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.61	3.26	3.81	4.35	4.90	5.48
Runoff (cfs)	1.1	3.1	6.8	12.0	16.0	20.5
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	1.1	3.1	6.8	12.0	16.0	20.5

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

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin OS-B3A (DP-E11) Runoff Calculations

Job No.: 61145
 Project: Eagle Rising - Preliminary/Final
 Jurisdiction: DCM
 Runoff Coefficient: Surface Type

Date: 1/4/2023 11:19
 Calcs by: O. Ali
 Checked by: _____
 Soil Type: B
 Urbanization: Urban

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
2-1/2 Acre	394,804	9.06	0.08	0.12	0.22	0.31	0.36	0.4	11%
Combined	394,804	9.06	0.08	0.12	0.22	0.31	0.36	0.40	11.0%

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	938	45	-	-	-	-	
Initial Time	300	12	0.040	-	19.4	15.2	DCM Eq. 6-8
Shallow Channel	638	33	0.052	1.6	6.7	-	DCM Eq. 6-9
Channelized			0.000	0.0	0.0	-	V-Ditch
				t_c	15.2 min.		

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.80	3.50	4.08	4.67	5.25	5.88
Runoff (cfs)	2.0	3.8	8.1	13.1	17.1	21.3
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	2.0	3.8	8.1	13.1	17.1	21.3

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

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin OS-B3B (DP-E13) Runoff Calculations

Job No.: 61145
 Project: Eagle Rising - Preliminary/Final
 Jurisdiction: DCM
 Runoff Coefficient: Surface Type

Date: 1/4/2023 11:19
 Calcs by: O. Ali
 Checked by: _____
 Soil Type: B
 Urbanization: Urban

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
2-1/2 Acre	109,046	2.50	0.08	0.12	0.22	0.31	0.36	0.4	11%
Combined	109,046	2.50	0.08	0.12	0.22	0.31	0.36	0.40	11.0%

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	636	29	-	-	-	-
Initial Time	300	11	0.037	-	20.0	13.5 DCM Eq. 6-8
Shallow Channel	336	18	0.054	1.6	3.5	- DCM Eq. 6-9
Channelized			0.000	0.0	0.0	- V-Ditch
				t_c	13.5 min.	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.93	3.68	4.29	4.90	5.51	6.17
Runoff (cfs)	0.6	1.1	2.4	3.8	5.0	6.2
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.6	1.1	2.4	3.8	5.0	6.2

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

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin OS-B3C (DP-E15) Runoff Calculations

Job No.: 61145
 Project: Eagle Rising - Preliminary/Final
 Jurisdiction: DCM
 Runoff Coefficient: Surface Type

Date: 1/4/2023 11:19
 Calcs by: O. Ali
 Checked by: _____
 Soil Type: B
 Urbanization: Urban

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
2-1/2 Acre	259,332	5.95	0.08	0.12	0.22	0.31	0.36	0.4	11%
Combined	259,332	5.95	0.08	0.12	0.22	0.31	0.36	0.40	11.0%

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	994	38	-	-	-	-
Initial Time	300	10	0.033	-	20.6	15.5 DCM Eq. 6-8
Shallow Channel	694	28	0.040	1.4	8.2	- DCM Eq. 6-9
Channelized			0.000	0.0	0.0	- V-Ditch
				t_c	15.5 min.	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.77	3.47	4.05	4.63	5.20	5.82
Runoff (cfs)	1.3	2.5	5.3	8.5	11.2	13.9
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	1.3	2.5	5.3	8.5	11.2	13.9

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

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin EX-A1 Runoff Calculations

Job No.: 61145
 Project: Eagle Rising - Preliminary/Final
 Jurisdiction: DCM
 Runoff Coefficient: Surface Type

Date: 1/4/2023 11:19
 Calcs by: O. Ali
 Checked by: _____
 Soil Type: B
 Urbanization: Urban

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
Pasture/Meadow	215,572	4.95	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	215,572	4.95	0.02	0.08	0.15	0.25	0.30	0.35	0.0%

215572

Basin Travel Time

	Shallow Channel Ground Cover		Short Pasture/Lawns			
	$L_{max,Overland}$	300 ft	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)
Total	636	52	-	-	-	-
Initial Time	299	32	0.107	-	14.6	13.5 DCM Eq. 6-8
Shallow Channel	337	20	0.059	1.7	3.3	- DCM Eq. 6-9
Channelized			0.000	0.0	0.0	- V-Ditch
				t_c	13.5 min.	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.93	3.68	4.29	4.90	5.51	6.17
Runoff (cfs)	0.3	1.5	3.2	6.1	8.2	10.7
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.3	1.5	3.2	6.1	8.2	10.7

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

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin EX-A2 Runoff Calculations

Job No.: 61145
 Project: Eagle Rising - Preliminary/Final
 Jurisdiction: DCM
 Runoff Coefficient: Surface Type

Date: 1/4/2023 11:19
 Calcs by: O. Ali
 Checked by: _____
 Soil Type: B
 Urbanization: Urban

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
Pasture/Meadow	75,899	1.74	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	75,899	1.74	0.02	0.08	0.15	0.25	0.30	0.35	0.0%

75899

Basin Travel Time

	Shallow Channel Ground Cover		Short Pasture/Lawns			
	$L_{max,Overland}$	300 ft	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)
Total	392	34	-	-	-	-
Initial Time	154	20	0.130	-	9.8	12.2 DCM Eq. 6-8
Shallow Channel	238	14	0.059	1.7	2.3	- DCM Eq. 6-9
Channelized			0.000	0.0	0.0	- V-Ditch
				t_c	12.1 min.	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	3.06	3.84	4.48	5.12	5.76	6.44
Runoff (cfs)	0.1	0.5	1.2	2.2	3.0	3.9
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.1	0.5	1.2	2.2	3.0	3.9

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

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin EX-B Runoff Calculations

Job No.: 61145
 Project: Eagle Rising - Preliminary/Final
 Jurisdiction: DCM
 Runoff Coefficient: Surface Type

Date: 1/4/2023 11:19
 Calcs by: O. Ali
 Checked by: _____
 Soil Type: B
 Urbanization: Urban

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
Roofs	1,676	0.04	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	7,329	0.17	0.89	0.9	0.92	0.94	0.95	0.96	100%
Pasture/Meadow	180,315	4.14	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	189,320	4.35	0.06	0.12	0.19	0.28	0.33	0.38	4.7%

189320

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	516	19	-	-	-		
Initial Time	100	8	0.075	-	9.1	12.9	DCM Eq. 6-8
Shallow Channel	176	6	0.031	1.2	2.4	-	DCM Eq. 6-9
Channelized	240	6	0.023	3.2	1.2	-	V-Ditch
				t_c	12.7 min.		

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	3.01	3.77	4.39	5.02	5.65	6.32
Runoff (cfs)	0.8	1.9	3.5	6.1	8.1	10.4
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.8	1.9	3.5	6.1	8.1	10.4

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

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin EX-C Runoff Calculations

Job No.: 61145
 Project: Eagle Rising - Preliminary/Final
 Jurisdiction: DCM
 Runoff Coefficient: Surface Type

Date: 1/4/2023 11:19
 Calcs by: O. Ali
 Checked by: _____
 Soil Type: B
 Urbanization: Urban

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
Pasture/Meadow	72,522	1.66	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	72,522	1.66	0.02	0.08	0.15	0.25	0.30	0.35	0.0%

72522

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	338	17	-	-	-	-	
Initial Time	100	5	0.050	-	10.8	11.9	DCM Eq. 6-8
Shallow Channel	238	12	0.050	1.6	2.5	-	DCM Eq. 6-9
Channelized			0.000	0.0	0.0	-	V-Ditch
				t_c	11.9 min.		

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	3.09	3.87	4.52	5.16	5.81	6.50
Runoff (cfs)	0.1	0.5	1.1	2.1	2.9	3.8
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.1	0.5	1.1	2.1	2.9	3.8

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

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin EX-D Runoff Calculations

Job No.: 61145
 Project: Eagle Rising - Preliminary/Final
 Jurisdiction: DCM
 Runoff Coefficient: Surface Type

Date: 1/4/2023 11:19
 Calcs by: O. Ali
 Checked by: _____
 Soil Type: B
 Urbanization: Urban

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
Roofs	5,302	0.12	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	6,215	0.14	0.89	0.9	0.92	0.94	0.95	0.96	100%
Pasture/Meadow	288,588	6.63	0.02	0.08	0.15	0.25	0.3	0.35	0%
Gravel	9,370	0.22	0.57	0.59	0.63	0.66	0.68	0.7	80%
Combined	309,475	7.10	0.07	0.12	0.19	0.29	0.33	0.38	6.0%

309475

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	881	42	-	-	-		
Initial Time	100	7	0.070	-	9.3	14.9	DCM Eq. 6-8
Shallow Channel	160	14	0.088	2.1	1.3	-	DCM Eq. 6-9
Channelized	621	21	0.034	4.2	2.5	-	V-Ditch
				t_c	13.1 min.		

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.98	3.73	4.35	4.97	5.59	6.26
Runoff (cfs)	1.4	3.3	5.9	10.1	13.2	16.9
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	1.4	3.3	5.9	10.1	13.2	16.9

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

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin EX-E1 Runoff Calculations

Job No.: 61145
 Project: Eagle Rising - Preliminary/Final
 Jurisdiction: DCM
 Runoff Coefficient: Surface Type

Date: 1/4/2023 11:19
 Calcs by: O. Ali
 Checked by: _____
 Soil Type: B
 Urbanization: Urban

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
Roofs	15,215	0.35	0.71	0.73	0.75	0.78	0.8	0.81	90%
Gravel	38,377	0.88	0.57	0.59	0.63	0.66	0.68	0.7	80%
Pasture/Meadow	94,964	2.18	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	148,556	3.41	0.23	0.28	0.34	0.41	0.45	0.49	29.9%

148556

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	965	21	-	-	-		
Initial Time	100	7	0.070	-	7.8	15.4	DCM Eq. 6-8
Shallow Channel			0.000	0.0	0.0	-	DCM Eq. 6-9
Channelized	865	14	0.016	2.7	5.3	-	V-Ditch
				t_c	13.1 min.		

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	6.25
Runoff (cfs)	2.4	3.5	5.0	6.9	8.6	10.4
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	2.4	3.5	5.0	6.9	8.6	10.4

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

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin EX-E2 (EX-DP8) Runoff Calculations

Job No.: 61145
 Project: Eagle Rising - Preliminary/Final
 Jurisdiction: DCM
 Runoff Coefficient: Surface Type

Date: 1/4/2023 11:19
 Calcs by: O. Ali
 Checked by: _____
 Soil Type: B
 Urbanization: Urban

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
Roofs	12,616	0.29	0.71	0.73	0.75	0.78	0.8	0.81	90%
Gravel	50,194	1.15	0.57	0.59	0.63	0.66	0.68	0.7	80%
Pasture/Meadow	275,673	6.33	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	338,483	7.77	0.13	0.18	0.24	0.33	0.37	0.42	15.2%

338483

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	1,139	37	-	-	-		
Initial Time	299	10	0.033	-	19.3	16.3	DCM Eq. 6-8
Shallow Channel	222	12	0.054	1.6	2.3	-	DCM Eq. 6-9
Channelized	618	15	0.024	3.8	2.7	-	V-Ditch
				t_c	16.3 min.		

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.71	3.39	3.96	4.53	5.09	5.70
Runoff (cfs)	2.7	4.7	7.5	11.6	14.8	18.6
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	2.7	4.7	7.5	11.6	14.8	18.6

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

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin EX-F1 Runoff Calculations

Job No.: 61145
 Project: Eagle Rising - Preliminary/Final
 Jurisdiction: DCM
 Runoff Coefficient: Surface Type

Date: 1/4/2023 11:19
 Calcs by: O. Ali
 Checked by: _____
 Soil Type: B
 Urbanization: Urban

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
Roofs	9,594	0.22	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	7,538	0.17	0.89	0.9	0.92	0.94	0.95	0.96	100%
Pasture/Meadow	103,459	2.38	0.02	0.08	0.15	0.25	0.3	0.35	0%
Gravel	160,546	3.69	0.57	0.59	0.63	0.66	0.68	0.7	80%
Combined	281,137	6.45	0.38	0.42	0.47	0.52	0.55	0.58	51.4%

281137

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	682	20	-	-	-	-	
Initial Time	100	2	0.020	-	9.8	13.8	DCM Eq. 6-8
Shallow Channel	343	4	0.012	0.8	7.6	-	DCM Eq. 6-9
Channelized	239	14	0.056	4.9	0.8	-	V-Ditch
				t_c	13.8 min.		

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.91	3.65	4.26	4.86	5.47	6.12
Runoff (cfs)	7.2	9.8	12.8	16.3	19.5	23.0
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	7.2	9.8	12.8	16.3	19.5	23.0

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

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin EX-F2 Runoff Calculations

Job No.: 61145
 Project: Eagle Rising - Preliminary/Final
 Jurisdiction: DCM
 Runoff Coefficient: Surface Type

Date: 1/4/2023 11:19
 Calcs by: O. Ali
 Checked by: _____
 Soil Type: B
 Urbanization: Urban

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
Pasture/Meadow	87,492	2.01	0.02	0.08	0.15	0.25	0.3	0.35	0%
Paved	476	0.01	0.89	0.9	0.92	0.94	0.95	0.96	100%
Combined	87,968	2.02	0.02	0.08	0.15	0.25	0.30	0.35	0.5%

87968

Basin Travel Time

	Shallow Channel Ground Cover		Short Pasture/Lawns			
	$L_{max,Overland}$	300 ft	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)
Total	631	29	-	-	-	-
Initial Time	84	3	0.036	-	11.0	13.5 DCM Eq. 6-8
Shallow Channel	306	14	0.046	1.5	3.4	- DCM Eq. 6-9
Channelized	241	12	0.050	3.5	1.1	- V-Ditch
t_c					13.5 min.	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.94	3.68	4.29	4.90	5.52	6.18
Runoff (cfs)	0.1	0.6	1.3	2.5	3.4	4.4
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.1	0.6	1.3	2.5	3.4	4.4

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

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin EX-G (EX-DP10) Runoff Calculations

Job No.: 61145
 Project: Eagle Rising - Preliminary/Final
 Jurisdiction: DCM
 Runoff Coefficient: Surface Type

Date: 1/4/2023 11:19
 Calcs by: O. Ali
 Checked by: _____
 Soil Type: B
 Urbanization: Urban

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
Pasture/Meadow	127,367	2.92	0.02	0.08	0.15	0.25	0.3	0.35	0%
Paved	2,498	0.06	0.89	0.9	0.92	0.94	0.95	0.96	100%
Combined	129,865	2.98	0.04	0.10	0.16	0.26	0.31	0.36	1.9%

129865

Basin Travel Time

	Shallow Channel Ground Cover		Short Pasture/Lawns			
	L _{max,Overland} (ft)	ΔZ ₀ (ft)	S ₀ (ft/ft)	v (ft/s)	t (min)	t _{Alt} (min)
Total	739	36	-	-	-	-
Initial Time	126	12	0.095	-	9.7	14.1 DCM Eq. 6-8
Shallow Channel	186	6	0.032	1.3	2.5	- DCM Eq. 6-9
Channelized	427	18	0.042	3.6	2.0	- V-Ditch
t_c					14.1 min.	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.89	3.61	4.22	4.82	5.42	6.07
Runoff (cfs)	0.3	1.0	2.1	3.8	5.1	6.5
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.3	1.0	2.1	3.8	5.1	6.5

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

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin EX-H Runoff Calculations

Job No.: 61145
 Project: Eagle Rising - Preliminary/Final
 Jurisdiction: DCM
 Runoff Coefficient: Surface Type

Date: 1/4/2023 11:19
 Calcs by: O. Ali
 Checked by: _____
 Soil Type: B
 Urbanization: Urban

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
Pasture/Meadow	164,577	3.78	0.02	0.08	0.15	0.25	0.3	0.35	0%
Paved	14,101	0.32	0.89	0.9	0.92	0.94	0.95	0.96	100%
Combined	178,678	4.10	0.09	0.14	0.21	0.30	0.35	0.40	7.9%

178678

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	690	35	-	-	-	-	
Initial Time	100	4	0.040	-	10.9	13.8	DCM Eq. 6-8
Shallow Channel	382	19	0.050	1.6	4.1	-	DCM Eq. 6-9
Channelized	208	12	0.058	4.2	0.8	-	V-Ditch
				t_c	13.8 min.		

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.91	3.64	4.25	4.86	5.46	6.11
Runoff (cfs)	1.1	2.2	3.7	6.1	7.9	10.0
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	1.1	2.2	3.7	6.1	7.9	10.0

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

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin EX-I Runoff Calculations

Job No.: 61145
 Project: Eagle Rising - Preliminary/Final
 Jurisdiction: DCM
 Runoff Coefficient: Surface Type

Date: 1/4/2023 11:19
 Calcs by: O. Ali
 Checked by: _____
 Soil Type: B
 Urbanization: Urban

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
Pasture/Meadow	63,090	1.45	0.02	0.08	0.15	0.25	0.3	0.35	0%
Paved	8,194	0.19	0.89	0.9	0.92	0.94	0.95	0.96	100%
Combined	71,284	1.64	0.12	0.17	0.24	0.33	0.37	0.42	11.5%

71284

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	413	17	-	-	-		
Initial Time	100	9	0.090	-	8.1	12.3	DCM Eq. 6-8
Shallow Channel	166	5	0.030	1.2	2.3	-	DCM Eq. 6-9
Channelized	147	3	0.020	1.2	2.0	-	V-Ditch
				t_c	12.3 min.		

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	3.05	3.82	4.46	5.09	5.73	6.41
Runoff (cfs)	0.6	1.1	1.7	2.7	3.5	4.4
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.6	1.1	1.7	2.7	3.5	4.4

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

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin EX-J Runoff Calculations

Job No.: 61145
 Project: Eagle Rising - Preliminary/Final
 Jurisdiction: DCM
 Runoff Coefficient: Surface Type

Date: 1/4/2023 11:19
 Calcs by: O. Ali
 Checked by: _____
 Soil Type: B
 Urbanization: Urban

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
Pasture/Meadow	97,872	2.25	0.02	0.08	0.15	0.25	0.3	0.35	0%
Paved	7,699	0.18	0.89	0.9	0.92	0.94	0.95	0.96	100%
Combined	105,571	2.42	0.08	0.14	0.21	0.30	0.35	0.39	7.3%

105571

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	518	28	-	-	-		
Initial Time	100	7	0.070	-	9.1	12.9	DCM Eq. 6-8
Shallow Channel	144	11	0.076	1.9	1.2	-	DCM Eq. 6-9
Channelized	274	10	0.036	3.4	1.3	-	V-Ditch
				t_c	11.7 min.		

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	3.11	3.89	4.54	5.19	5.84	6.54
Runoff (cfs)	0.6	1.3	2.3	3.8	4.9	6.3
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.6	1.3	2.3	3.8	4.9	6.3

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

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin EX-K Runoff Calculations

Job No.: 61145
 Project: Eagle Rising - Preliminary/Final
 Jurisdiction: DCM
 Runoff Coefficient: Surface Type

Date: 1/4/2023 11:19
 Calcs by: O. Ali
 Checked by: _____
 Soil Type: B
 Urbanization: Urban

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
Pasture/Meadow	115,609	2.65	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	115,609	2.65	0.02	0.08	0.15	0.25	0.30	0.35	0.0%

115609

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	150	13	-	-	-	-
Initial Time	150	13	0.087	-	11.1	10.8 DCM Eq. 6-8
Shallow Channel			0.000	0.0	0.0	- DCM Eq. 6-9
Channelized			0.000	0.0	0.0	- V-Ditch
				t_c	10.8 min.	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	3.20	4.01	4.68	5.35	6.01	6.73
Runoff (cfs)	0.2	0.9	1.9	3.5	4.8	6.3
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.2	0.9	1.9	3.5	4.8	6.3

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

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin EX-L Runoff Calculations

Job No.: 61145
 Project: Eagle Rising - Preliminary/Final
 Jurisdiction: DCM
 Runoff Coefficient: Surface Type

Date: 1/4/2023 11:19
 Calcs by: O. Ali
 Checked by: _____
 Soil Type: B
 Urbanization: Urban

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
Pasture/Meadow	93,208	2.14	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	93,208	2.14	0.02	0.08	0.15	0.25	0.30	0.35	0.0%

93208

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	430	16	-	-	-	-
Initial Time	206	11	0.053	-	15.2	12.4 DCM Eq. 6-8
Shallow Channel	224	5	0.020	1.0	3.8	- DCM Eq. 6-9
Channelized			0.000	0.0	0.0	- V-Ditch
				t_c	12.4 min.	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	3.04	3.81	4.44	5.08	5.71	6.39
Runoff (cfs)	0.1	0.7	1.4	2.7	3.7	4.8
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.1	0.7	1.4	2.7	3.7	4.8

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

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin EX-M Runoff Calculations

Job No.: 61145
 Project: Eagle Rising - Preliminary/Final
 Jurisdiction: DCM
 Runoff Coefficient: Surface Type

Date: 1/4/2023 11:19
 Calcs by: O. Ali
 Checked by: _____
 Soil Type: B
 Urbanization: Urban

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
Paved	3,980	0.09	0.89	0.9	0.92	0.94	0.95	0.96	100%
Pasture/Meadow	174,550	4.01	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	178,530	4.10	0.04	0.10	0.17	0.27	0.31	0.36	2.2%

178530

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	873	24	-	-	-		
Initial Time	108	4	0.037	-	12.2	14.9	DCM Eq. 6-8
Shallow Channel	453	10	0.022	1.0	7.3	-	DCM Eq. 6-9
Channelized	312	10	0.032	1.5	3.5	-	V-Ditch
			t_c	14.9 min.			

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.82	3.54	4.13	4.72	5.30	5.94
Runoff (cfs)	0.5	1.4	2.8	5.1	6.8	8.8
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.5	1.4	2.8	5.1	6.8	8.8

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

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Combined Sub-Basin Runoff Calculations - DP6 Existing

Includes Basins OS-B1A OS-B1B EX-B EX-C

Job No.:	61145	Date:	1/4/2023 11:19
Project:	Eagle Rising - Preliminary/Final	Calcs by:	O. Ali
Jurisdiction	DCM	Checked by:	
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	1,210,111	27.78	0.02	0.08	0.15	0.25	0.3	0.35	0%
2-1/2 Acre	1,543,832	35.44	0.08	0.12	0.22	0.31	0.36	0.4	11%
5 Acre	367,545	8.44	0.06	0.1	0.2	0.29	0.34	0.38	7%
Roofs	1,676	0.04	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	7,329	0.17	0.89	0.9	0.92	0.94	0.95	0.96	100%
Gravel	-	0.00	0.57	0.59	0.63	0.66	0.68	0.7	80%
Combined	3,130,493	71.87	0.06	0.10	0.19	0.29	0.34	0.38	6.5%

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-B1B	-	2,011	84	-	-	-	-	21.2
Channelized-1	V-Ditch	2	378	9	77	0	2	5.7	1.1
Channelized-2									
Channelized-3									
Total			2,389	93					

2 = Natural, Winding, minimal vegetation/shallow grass

t_c (min) 22.3

Storage Volume

		40 -hr release time							
EURV	0.00 (in)	a =	1						Detention is NOT required
WQCV	0.00 (in)								Water Quality is NOT required
i (return period)	5-year	10-year	100-year						
K _i (ft)	0.0000	0.0000	0						
V _i (acre-ft)	0.000	0.000	0		EURV	0%		0	0
V _i (ft ³)	0	0	0		WQCV	0%	0	0	0

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

Contributing Basins/Areas

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

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

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.34	2.93	3.42	3.90	4.39	4.91
Site Runoff (cfs)	9.54	21.95	47.25	80.28	106.06	134.13
OffSite Runoff (cfs)	-	0.00	-	-	-	0.00
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	-	22.0	-	-	-	134.1

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

C1	1.19	1.5	1.75	2	2.25	2.52
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- DP6A Existing

Includes Basins OS-B1C EX-E1

Job No.:	61145	Date:	1/4/2023 11:19
Project:	Eagle Rising - Preliminary/Final	Calcs by:	O. Ali
Jurisdiction	DCM	Checked by:	
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	
2-1/2 Acre	-	0.00	0.08	0.12	0.22	0.31	0.36	0.4	11%
5 Acre	-	0.00	0.06	0.1	0.2	0.29	0.34	0.38	7%
Gravel	38,377	0.88	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%
Pasture/Meadow	175,042	4.02	0.02	0.08	0.15	0.25	0.3	0.35	0%
Roofs	15,215	0.35	0.71	0.73	0.75	0.78	0.8	0.81	90%
Combined	228,634	5.25	0.16	0.21	0.27	0.35	0.40	0.44	19.4%

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-B1C	-	528	16	-	-	-	-	12.9
Channelized-1	V-Ditch	2	963	36	4	0	2	3.2	5.0
Channelized-2									
Channelized-3									
Total			1,491	52					

2 = Natural, Winding, minimal vegetation/shallow grass

t_c (min) 17.9

Storage Volume

		40 -hr release time							
EURV	0.00 (in)	a =	1						Detention is NOT required
WQCV	0.00 (in)								Water Quality is NOT required
i (return period)	5-year	10-year	100-year						
K _i (ft)	0.0000	0.0000	0						
V _i (acre-ft)	0.000	0.000	0		EURV	0%		0	0
V _i (ft ³)	0	0	0		WQCV	0%	0	0	0

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

Contributing Basins/Areas

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

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

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.60	3.25	3.80	4.34	4.88	5.46
Site Runoff (cfs)	2.16	3.57	5.39	8.06	10.17	12.59
OffSite Runoff (cfs)	-	0.00	-	-	-	0.00
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	-	3.6	-	-	-	12.6

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

C1	1.19	1.5	1.75	2	2.25	2.52
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- DP6B Existing

Includes Basins OS-B1A OS-B1B EX-B EX-C EX-D

Job No.:	61145	Date:	1/4/2023 11:19
Project:	Eagle Rising - Preliminary/Final	Calcs by:	O. Ali
Jurisdiction	DCM	Checked by:	
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	
2-1/2 Acre	1,543,832	35.44	0.08	0.12	0.22	0.31	0.36	0.4	11%
5 Acre	367,545	8.44	0.06	0.1	0.2	0.29	0.34	0.38	7%
Gravel	9,370	0.22	0.57	0.59	0.63	0.66	0.68	0.7	80%
Paved	13,544	0.31	0.89	0.9	0.92	0.94	0.95	0.96	100%
Pasture/Meadow	1,498,699	34.41	0.02	0.08	0.15	0.25	0.3	0.35	0%
Roofs	6,978	0.16	0.71	0.73	0.75	0.78	0.8	0.81	90%
Combined	3,439,968	78.97	0.06	0.11	0.19	0.29	0.34	0.38	6.5%

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-B1B	-	2,011	84	-	-	-	-	21.2
Channelized-1	V-Ditch	2	1,083	32	77	0	2	6.1	2.9
Channelized-2									
Channelized-3									
Total			3,094	116					

2 = Natural, Winding, minimal vegetation/shallow grass

t_c (min) 24.1

Storage Volume

		40 -hr release time							
EURV	0.00 (in)	a =	1						Detention is NOT required
WQCV	0.00 (in)								Water Quality is NOT required
i (return period)	5-year	10-year	100-year						
K _i (ft)	0.0000	0.0000	0						
V _i (acre-ft)	0.000	0.000	0		EURV	0%		0	0
V _i (ft ³)	0	0	0		WQCV	0%	0	0	0

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

Contributing Basins/Areas

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

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

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.25	2.81	3.28	3.75	4.21	4.71
Site Runoff (cfs)	10.21	23.52	49.78	84.64	111.76	141.47
OffSite Runoff (cfs)	-	0.00	-	-	-	0.00
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	-	23.5	-	-	-	141.5

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

C1	1.19	1.5	1.75	2	2.25	2.52
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- DP6C Existing

Includes Basins OS-B1A OS-B1B EX-B EX-C EX-D OS-B1C EX-E1

Job No.:	61145	Date:	1/4/2023 11:19
Project:	Eagle Rising - Preliminary/Final	Calcs by:	O. Ali
Jurisdiction	DCM	Checked by:	
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	
2-1/2 Acre	1,543,832	35.44	0.08	0.12	0.22	0.31	0.36	0.4	11%
5 Acre	367,545	8.44	0.06	0.1	0.2	0.29	0.34	0.38	7%
Gravel	47,747	1.10	0.57	0.59	0.63	0.66	0.68	0.7	80%
Paved	13,544	0.31	0.89	0.9	0.92	0.94	0.95	0.96	100%
Pasture/Meadow	1,673,741	38.42	0.02	0.08	0.15	0.25	0.3	0.35	0%
Roofs	22,193	0.51	0.71	0.73	0.75	0.78	0.8	0.81	90%
Combined	3,668,602	84.22	0.06	0.11	0.20	0.29	0.34	0.38	7.3%

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-B1B	-	2,011	84	-	-	-	-	21.2
Channelized-1	V-Ditch	2	1,083	32	77	0	2	6.1	2.9
Channelized-2									
Channelized-3									
Total			3,094	116					

2 = Natural, Winding, minimal vegetation/shallow grass

t_c (min) 24.1

Storage Volume

		40 -hr release time							
EURV	0.00 (in)	a =	1						Detention is NOT required
WQCV	0.00 (in)								Water Quality is NOT required
i (return period)	5-year	10-year	100-year						
K _i (ft)	0.0000	0.0000	0						
V _i (acre-ft)	0.000	0.000	0		EURV	0%		0	0
V _i (ft ³)	0	0	0		WQCV	0%	0	0	0

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

Contributing Basins/Areas

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

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

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.25	2.81	3.28	3.75	4.21	4.71
Site Runoff (cfs)	12.08	26.60	54.43	91.60	120.54	152.34
OffSite Runoff (cfs)	-	0.00	-	-	-	0.00
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	-	26.6	-	-	-	152.3

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

C1	1.19	1.5	1.75	2	2.25	2.52
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 - DP7 Existing

Includes Basins OS-B1D EX-F1

Job No.:	61145	Date:	1/4/2023 11:19
Project:	Eagle Rising - Preliminary/Final	Calcs by:	O. Ali
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	366,112	8.40	0.02	0.08	0.15	0.25	0.3	0.35	0%
2-1/2 Acre	-	0.00	0.08	0.12	0.22	0.31	0.36	0.4	11%
5 Acre	-	0.00	0.06	0.1	0.2	0.29	0.34	0.38	7%
Roofs	9,594	0.22	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	7,538	0.17	0.89	0.9	0.92	0.94	0.95	0.96	100%
Gravel	160,546	3.69	0.57	0.59	0.63	0.66	0.68	0.7	80%
Combined	543,790	12.48	0.21	0.25	0.31	0.39	0.43	0.47	26.6%

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-B1D	-	1,242	41	-	-	-	-	16.9
Channelized-1	V-Ditch	2	869	32	12	0	2	4.2	3.5
Channelized-2									
Channelized-3									
Total			2,111	73					

2 = Natural, Winding, minimal vegetation/shallow grass

t_c (min) 20.4

Storage Volume

		40 -hr release time			Detention is NOT required		
EURV	0.00 (in)	a = 1			Water Quality is NOT required		
WQCV	0.00 (in)						
i (return period)	5-year	10-year	100-year	Design Volume (ft³)			
K _i (ft)	0.0000	0.0000	0	% Storage	100-year	WQCV	Total
V _i (acre-ft)	0.000	0.000	0	EURV	0%	0	0
V _i (ft ³)	0	0	0	WQCV	0%	0	0

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

Contributing Basins/Areas _____

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

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

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.45	3.06	3.57	4.08	4.59	5.14
Site Runoff (cfs)	6.32	9.69	13.96	19.88	24.66	30.15
OffSite Runoff (cfs)	-	0.00	-	-	-	0.00
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	-	9.7	-	-	-	30.2

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

C1	1.19	1.5	1.75	2	2.25	2.52
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 - DP8A Existing

Includes Basins OS-B1E OS-B3A EX-H EX-I

Job No.:	61145	Date:	1/4/2023 11:19
Project:	Eagle Rising - Preliminary/Final	Calcs by:	O. Ali
Jurisdiction	DCM	Checked by:	
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	500,305	11.49	0.02	0.08	0.15	0.25	0.3	0.35	0%
2-1/2 Acre	562,874	12.92	0.08	0.12	0.22	0.31	0.36	0.4	11%
5 Acre	-	0.00	0.06	0.1	0.2	0.29	0.34	0.38	7%
Roofs	-	0.00	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	22,295	0.51	0.89	0.9	0.92	0.94	0.95	0.96	100%
Gravel	-	0.00	0.57	0.59	0.63	0.66	0.68	0.7	80%
Combined	1,085,474	24.92	0.07	0.12	0.20	0.30	0.34	0.39	7.8%

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-B1E	-	1,404	61	-	-	-	-	17.8
Channelized-1	V-Ditch	2	524	22	20	0	2	5.0	1.7
Channelized-2									
Channelized-3									
Total			1,928	83					

2 = Natural, Winding, minimal vegetation/shallow grass

t_c (min) 19.5

Storage Volume

				40 -hr release time					
EURV	0.00 (in)			a =	1				Detention is NOT required
WQCV	0.00 (in)								Water Quality is NOT required
i (return period)	5-year	10-year	100-year						
K _i (ft)	0.0000	0.0000	0						
V _i (acre-ft)	0.000	0.000	0		EURV	0%		0	0
V _i (ft ³)	0	0	0		WQCV	0%	0	0	0

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

Contributing Basins/Areas OS-B4B

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

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

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.50	3.12	3.65	4.17	4.69	5.25
Site Runoff (cfs)	4.29	9.16	18.36	30.66	40.24	50.77
OffSite Runoff (cfs)	-	0.00	-	-	-	0.00
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	-	9.2	-	-	-	50.8

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

C1	1.19	1.5	1.75	2	2.25	2.52
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 - DP9 Existing

Includes Basins OS-B1D EX-F1 EX-F2

Job No.:	61145	Date:	1/4/2023 11:19
Project:	Eagle Rising - Preliminary/Final	Calcs by:	O. Ali
Jurisdiction	DCM	Checked by:	
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	453,604	10.41	0.02	0.08	0.15	0.25	0.3	0.35	0%
2-1/2 Acre	-	0.00	0.08	0.12	0.22	0.31	0.36	0.4	11%
5 Acre	-	0.00	0.06	0.1	0.2	0.29	0.34	0.38	7%
Roofs	9,594	0.22	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	8,014	0.18	0.89	0.9	0.92	0.94	0.95	0.96	100%
Gravel	160,546	3.69	0.57	0.59	0.63	0.66	0.68	0.7	80%
Combined	631,758	14.50	0.18	0.23	0.29	0.37	0.41	0.45	23.0%

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	OS-B1D	-	1,242	41	-	-	-	-	16.9
Channelized-1	V-Ditch	2	1,500	58	12	0	2	4.3	5.9
Channelized-2									
Channelized-3									
Total			2,742	99					

2 = Natural, Winding, minimal vegetation/shallow grass

t_c (min) 22.8

Storage Volume

		40 -hr release time							
EURV	0.00 (in)	a =	1						Detention is NOT required
WQCV	0.00 (in)								Water Quality is NOT required
i (return period)	5-year	10-year	100-year						
K _i (ft)	0.0000	0.0000	0						
V _i (acre-ft)	0.000	0.000	0		EURV	0%		0	0
V _i (ft ³)	0	0	0		WQCV	0%	0	0	0

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

Contributing Basins/Areas OS-B4B

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

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

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.32	2.89	3.38	3.86	4.34	4.86
Site Runoff (cfs)	6.09	9.65	14.25	20.77	25.98	31.97
OffSite Runoff (cfs)	-	0.00	-	-	-	0.00
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	-	9.7	-	-	-	32.0

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

C1	1.19	1.5	1.75	2	2.25	2.52
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 - DP11 Existing

Includes Basins OS-B3B EX-M

Job No.:	61145	Date:	1/4/2023 11:19
Project:	Eagle Rising - Preliminary/Final	Calcs by:	O. Ali
Jurisdiction	DCM	Checked by:	
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	174,550	4.01	0.02	0.08	0.15	0.25	0.3	0.35	0%
2-1/2 Acre	109,046	2.50	0.08	0.12	0.22	0.31	0.36	0.4	11%
5 Acre	-	0.00	0.06	0.1	0.2	0.29	0.34	0.38	7%
Roofs	-	0.00	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	3,980	0.09	0.89	0.9	0.92	0.94	0.95	0.96	100%
Gravel	-	0.00	0.57	0.59	0.63	0.66	0.68	0.7	80%
Combined	287,576	6.60	0.05	0.11	0.19	0.28	0.33	0.38	5.6%

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-B3B	-	636	29	-	-	-	-	13.5
Channelized-1	V-Ditch	2	873	24	6	0	2	3.2	4.6
Channelized-2									
Channelized-3									
Total			1,509	53					

2 = Natural, Winding, minimal vegetation/shallow grass

t_c (min) 18.1

Storage Volume

		40 -hr release time							
EURV	0.00 (in)	a =	1						Detention is NOT required
WQCV	0.00 (in)								Water Quality is NOT required
i (return period)	5-year	10-year	100-year						
K _i (ft)	0.0000	0.0000	0						
V _i (acre-ft)	0.000	0.000	0		EURV	0%		0	0
V _i (ft ³)	0	0	0		WQCV	0%	0	0	0

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

Contributing Basins/Areas OS-B4B

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

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

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.59	3.24	3.78	4.32	4.86	5.44
Site Runoff (cfs)	0.94	2.28	4.67	8.05	10.64	13.55
OffSite Runoff (cfs)	-	0.00	-	-	-	0.00
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	-	2.3	-	-	-	13.5

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

C1	1.19	1.5	1.75	2	2.25	2.52
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 - DP12 Existing

Includes Basins OS-B1E OS-B3A EX-H EX-I EX-J

Job No.:	61145	Date:	1/4/2023 11:19
Project:	Eagle Rising - Preliminary/Final	Calcs by:	O. Ali
Jurisdiction	DCM	Checked by:	
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	598,177	13.73	0.02	0.08	0.15	0.25	0.3	0.35	0%
2-1/2 Acre	562,874	12.92	0.08	0.12	0.22	0.31	0.36	0.4	11%
5 Acre	-	0.00	0.06	0.1	0.2	0.29	0.34	0.38	7%
Roofs	-	0.00	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	29,994	0.69	0.89	0.9	0.92	0.94	0.95	0.96	100%
Gravel	-	0.00	0.57	0.59	0.63	0.66	0.68	0.7	80%
Combined	1,191,045	27.34	0.07	0.12	0.20	0.30	0.34	0.39	7.7%

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-B1E	-	1,404	61	-	-	-	-	17.8
Channelized-1	V-Ditch	2	955	34	20	0	2	4.7	3.4
Channelized-2									
Channelized-3									
Total			2,359	95					

2 = Natural, Winding, minimal vegetation/shallow grass

t_c (min) 21.2

Storage Volume

		40 -hr release time							
EURV	0.00 (in)	a =	1						Detention is NOT required
WQCV	0.00 (in)								Water Quality is NOT required
i (return period)	5-year	10-year	100-year						
K _i (ft)	0.0000	0.0000	0						
V _i (acre-ft)	0.000	0.000	0		EURV	0%		0	0
V _i (ft ³)	0	0	0		WQCV	0%	0	0	0

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

Contributing Basins/Areas OS-B4B

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

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

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.40	3.00	3.51	4.01	4.51	5.04
Site Runoff (cfs)	4.62	9.82	19.41	32.40	42.49	53.64
OffSite Runoff (cfs)	-	0.00	-	-	-	0.00
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	-	9.8	-	-	-	53.6

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

C1	1.19	1.5	1.75	2	2.25	2.52
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 - DP13 Existing

Includes Basins OS-B3C EX-L

Job No.:	61145	Date:	1/4/2023 11:19
Project:	Eagle Rising - Preliminary/Final	Calcs by:	O. Ali
Jurisdiction	DCM	Checked by:	
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	93,208	2.14	0.02	0.08	0.15	0.25	0.3	0.35	0%
2-1/2 Acre	259,332	5.95	0.08	0.12	0.22	0.31	0.36	0.4	11%
5 Acre	-	0.00	0.06	0.1	0.2	0.29	0.34	0.38	7%
Roofs	-	0.00	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	-	0.00	0.89	0.9	0.92	0.94	0.95	0.96	100%
Gravel	-	0.00	0.57	0.59	0.63	0.66	0.68	0.7	80%
Combined	352,540	8.09	0.06	0.11	0.20	0.29	0.34	0.39	8.1%

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-B3C	-	994	38	-	-	-	-	15.5
Channelized-1	V-Ditch	2	430	16	14	0	2	4.4	1.6
Channelized-2									
Channelized-3									
Total			1,424	54					

2 = Natural, Winding, minimal vegetation/shallow grass

t_c (min) 17.2

Storage Volume

		40 -hr release time							
EURV	0.00 (in)	a =	1						Detention is NOT required
WQCV	0.00 (in)								Water Quality is NOT required
i (return period)	5-year	10-year	100-year						
K _i (ft)	0.0000	0.0000	0						
V _i (acre-ft)	0.000	0.000	0		EURV	0%		0	0
V _i (ft ³)	0	0	0		WQCV	0%	0	0	0

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

Contributing Basins/Areas OS-B4B

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

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

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.65	3.32	3.87	4.43	4.98	5.57
Site Runoff (cfs)	1.38	2.94	6.31	10.54	13.87	17.44
OffSite Runoff (cfs)	-	0.00	-	-	-	0.00
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	-	2.9	-	-	-	17.4

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

C1	1.19	1.5	1.75	2	2.25	2.52
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.

Sub-Basin A1 Runoff Calculations

Job No.: 61145
 Project: Eagle Rising - Preliminary/Final
 Jurisdiction: DCM
 Runoff Coefficient: Surface Type

Date: 1/4/2023 11:19
 Calcs by: O. Ali
 Checked by: _____
 Soil Type: B
 Urbanization: Urban

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
Pasture/Meadow	202,272	4.64	0.02	0.08	0.15	0.25	0.3	0.35	0%
Roofs	8,500	0.20	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	4,800	0.11	0.89	0.9	0.92	0.94	0.95	0.96	100%
Combined	215,572	4.95	0.07	0.12	0.19	0.29	0.33	0.38	5.8%

215572

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	636	52	-	-	-	-	
Initial Time	299	32	0.107	-	13.9	13.5	DCM Eq. 6-8
Shallow Channel	337	20	0.059	1.7	3.3	-	DCM Eq. 6-9
Channelized			0.000	0.0	0.0	-	V-Ditch
				t_c	13.5 min.		

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.93	3.68	4.29	4.90	5.51	6.17
Runoff (cfs)	1.0	2.3	4.0	6.9	9.1	11.7
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	1.0	2.3	4.0	6.9	9.1	11.7

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

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin A2 Runoff Calculations

Job No.: 61145
 Project: Eagle Rising - Preliminary/Final
 Jurisdiction: DCM
 Runoff Coefficient: Surface Type

Date: 1/4/2023 11:19
 Calcs by: O. Ali
 Checked by: _____
 Soil Type: B
 Urbanization: Urban

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
Pasture/Meadow	75,899	1.74	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	75,899	1.74	0.02	0.08	0.15	0.25	0.30	0.35	0.0%

75899

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	392	34	-	-	-	-
Initial Time	154	20	0.130	-	9.8	12.2 DCM Eq. 6-8
Shallow Channel	238	14	0.059	1.7	2.3	- DCM Eq. 6-9
Channelized			0.000	0.0	0.0	- V-Ditch
				t_c	12.1 min.	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	3.06	3.84	4.48	5.12	5.76	6.44
Runoff (cfs)	0.1	0.5	1.2	2.2	3.0	3.9
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.1	0.5	1.2	2.2	3.0	3.9

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

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin B Runoff Calculations

Job No.: 61145
 Project: Eagle Rising - Preliminary/Final
 Jurisdiction: DCM
 Runoff Coefficient: Surface Type

Date: 1/4/2023 11:19
 Calcs by: O. Ali
 Checked by: _____
 Soil Type: B
 Urbanization: Urban

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
Roofs	6,776	0.16	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	10,209	0.23	0.89	0.9	0.92	0.94	0.95	0.96	100%
Pasture/Meadow	172,335	3.96	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	189,320	4.35	0.09	0.15	0.21	0.31	0.35	0.40	8.6%

189320

Basin Travel Time

	Shallow Channel	Ground Cover	Short Pasture/Lawns				
$L_{max,Overland}$	300	ft	C_v	7			
L (ft)	516	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	100	19	-	-	-	-	
Initial Time	176	6	0.075	-	8.8	12.9	DCM Eq. 6-8
Shallow Channel	240	6	0.031	1.2	2.4	-	DCM Eq. 6-9
Channelized		6	0.023	3.2	1.2	-	V-Ditch
				t_c	12.5 min.		

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	3.03	3.80	4.43	5.07	5.70	6.38
Runoff (cfs)	1.2	2.4	4.1	6.7	8.7	11.1
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	1.2	2.4	4.1	6.7	8.7	11.1

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

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin C Runoff Calculations

Job No.: 61145
 Project: Eagle Rising - Preliminary/Final
 Jurisdiction: DCM
 Runoff Coefficient: Surface Type

Date: 1/4/2023 11:19
 Calcs by: O. Ali
 Checked by: _____
 Soil Type: B
 Urbanization: Urban

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
Roofs	1,698	0.04	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	959	0.02	0.89	0.9	0.92	0.94	0.95	0.96	100%
Pasture/Meadow	69,865	1.60	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	72,522	1.66	0.05	0.11	0.17	0.27	0.32	0.37	3.4%

72522

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	338	17	-	-	-		
Initial Time	100	5	0.050	-	10.6	11.9	DCM Eq. 6-8
Shallow Channel	238	12	0.050	1.6	2.5	-	DCM Eq. 6-9
Channelized			0.000	0.0	0.0	-	V-Ditch
				t_c	11.9 min.		

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	3.09	3.87	4.52	5.16	5.81	6.50
Runoff (cfs)	0.2	0.7	1.3	2.3	3.1	4.0
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.2	0.7	1.3	2.3	3.1	4.0

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

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin D Runoff Calculations

Job No.: 61145
 Project: Eagle Rising - Preliminary/Final
 Jurisdiction: DCM
 Runoff Coefficient: Surface Type

Date: 1/4/2023 11:19
 Calcs by: O. Ali
 Checked by: _____
 Soil Type: B
 Urbanization: Urban

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
Roofs	11,254	0.26	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	9,576	0.22	0.89	0.9	0.92	0.94	0.95	0.96	100%
Pasture/Meadow	279,275	6.41	0.02	0.08	0.15	0.25	0.3	0.35	0%
Gravel	9,370	0.22	0.57	0.59	0.63	0.66	0.68	0.7	80%
Combined	309,475	7.10	0.09	0.14	0.21	0.30	0.35	0.40	8.8%

309475

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	881	42	-	-	-	-	
Initial Time	100	7	0.070	-	9.1	14.9	DCM Eq. 6-8
Shallow Channel	160	14	0.088	2.1	1.3	-	DCM Eq. 6-9
Channelized	621	21	0.034	4.2	2.5	-	V-Ditch
				t_c	12.8 min.		

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	3.00	3.75	4.38	5.00	5.63	6.30
Runoff (cfs)	1.9	3.9	6.5	10.8	14.0	17.7
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	1.9	3.9	6.5	10.8	14.0	17.7

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

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin E1 Runoff Calculations

Job No.: 61145
 Project: Eagle Rising - Preliminary/Final
 Jurisdiction: DCM
 Runoff Coefficient: Surface Type

Date: 1/4/2023 11:19
 Calcs by: O. Ali
 Checked by: _____
 Soil Type: B
 Urbanization: Urban

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
Roofs	17,165	0.39	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	1,152	0.03	0.89	0.9	0.92	0.94	0.95	0.96	100%
Pasture/Meadow	111,118	2.55	0.02	0.08	0.15	0.25	0.3	0.35	0%
Gravel	19,121	0.44	0.57	0.59	0.63	0.66	0.68	0.7	80%
Combined	148,556	3.41	0.18	0.23	0.29	0.37	0.41	0.45	21.5%

148556

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	965	21	-	-	-	-	
Initial Time	100	7	0.070	-	8.3	15.4	DCM Eq. 6-8
Shallow Channel			0.000	0.0	0.0	-	DCM Eq. 6-9
Channelized	865	14	0.016	2.7	5.3	-	V-Ditch
				t_c	13.6 min.		

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.93	3.67	4.28	4.89	5.50	6.15
Runoff (cfs)	1.8	2.8	4.2	6.2	7.7	9.5
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	1.8	2.8	4.2	6.2	7.7	9.5

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

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin E2 (DP8) Runoff Calculations

Job No.: 61145
 Project: Eagle Rising - Preliminary/Final
 Jurisdiction: DCM
 Runoff Coefficient: Surface Type

Date: 1/4/2023 11:19
 Calcs by: O. Ali
 Checked by: _____
 Soil Type: B
 Urbanization: Urban

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
Roofs	26,889	0.62	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	5,760	0.13	0.89	0.9	0.92	0.94	0.95	0.96	100%
Pasture/Meadow	269,259	6.18	0.02	0.08	0.15	0.25	0.3	0.35	0%
Gravel	36,575	0.84	0.57	0.59	0.63	0.66	0.68	0.7	80%
Combined	338,483	7.77	0.15	0.20	0.26	0.35	0.39	0.43	17.5%

338483

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	1,139	37	-	-	-	-	
Initial Time	299	10	0.033	-	18.8	16.3	DCM Eq. 6-8
Shallow Channel	222	12	0.054	1.6	2.3	-	DCM Eq. 6-9
Channelized	618	15	0.024	3.8	2.7	-	V-Ditch
				t_c	16.3 min.		

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.71	3.39	3.96	4.53	5.09	5.70
Runoff (cfs)	3.1	5.3	8.1	12.2	15.5	19.2
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	3.1	5.3	8.1	12.2	15.5	19.2

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

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin F1 Runoff Calculations

Job No.: 61145
 Project: Eagle Rising - Preliminary/Final
 Jurisdiction: DCM
 Runoff Coefficient: Surface Type

Date: 1/4/2023 11:19
 Calcs by: O. Ali
 Checked by: _____
 Soil Type: B
 Urbanization: Urban

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
Roofs	19,794	0.45	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	13,312	0.31	0.89	0.9	0.92	0.94	0.95	0.96	100%
Pasture/Meadow	215,748	4.95	0.02	0.08	0.15	0.25	0.3	0.35	0%
Gravel	32,283	0.74	0.57	0.59	0.63	0.66	0.68	0.7	80%
Combined	281,137	6.45	0.17	0.22	0.28	0.37	0.41	0.45	20.3%

281137

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	682	20	-	-	-	-	
Initial Time	100	2	0.020	-	12.6	13.8	DCM Eq. 6-8
Shallow Channel	343	4	0.012	0.8	7.6	-	DCM Eq. 6-9
Channelized	239	14	0.056	4.9	0.8	-	V-Ditch
				t_c	13.8 min.		

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.91	3.65	4.26	4.86	5.47	6.12
Runoff (cfs)	3.3	5.3	7.8	11.5	14.5	17.8
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	3.3	5.3	7.8	11.5	14.5	17.8

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

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin F2 Runoff Calculations

Job No.: 61145
 Project: Eagle Rising - Preliminary/Final
 Jurisdiction: DCM
 Runoff Coefficient: Surface Type

Date: 1/4/2023 11:19
 Calcs by: O. Ali
 Checked by: _____
 Soil Type: B
 Urbanization: Urban

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
Roofs	5,100	0.12	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	3,253	0.07	0.89	0.9	0.92	0.94	0.95	0.96	100%
Pasture/Meadow	79,615	1.83	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	87,968	2.02	0.09	0.15	0.21	0.31	0.35	0.40	8.9%

87968

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	631	29	-	-	-	-
Initial Time	84	3	0.036	-	10.3	13.5 DCM Eq. 6-8
Shallow Channel	306	14	0.046	1.5	3.4	- DCM Eq. 6-9
Channelized	241	12	0.050	3.5	1.1	- V-Ditch
				t_c	13.5 min.	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.94	3.68	4.29	4.90	5.52	6.18
Runoff (cfs)	0.5	1.1	1.8	3.0	3.9	5.0
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.5	1.1	1.8	3.0	3.9	5.0

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

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin G (DP10) Runoff Calculations

Job No.: 61145
 Project: Eagle Rising - Preliminary/Final
 Jurisdiction: DCM
 Runoff Coefficient: Surface Type

Date: 1/4/2023 11:19
 Calcs by: O. Ali
 Checked by: _____
 Soil Type: B
 Urbanization: Urban

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
Roofs	5,100	0.12	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	5,394	0.12	0.89	0.9	0.92	0.94	0.95	0.96	100%
Pasture/Meadow	119,371	2.74	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	129,865	2.98	0.08	0.14	0.21	0.30	0.35	0.39	7.7%

129865

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	739	36	-	-	-		
Initial Time	126	12	0.095	-	9.3	14.1	DCM Eq. 6-8
Shallow Channel	186	6	0.032	1.3	2.5	-	DCM Eq. 6-9
Channelized	427	18	0.042	3.6	2.0	-	V-Ditch
				t_c	13.7 min.		

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.92	3.66	4.27	4.88	5.49	6.14
Runoff (cfs)	0.7	1.5	2.6	4.4	5.7	7.2
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.7	1.5	2.6	4.4	5.7	7.2

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

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin H Runoff Calculations

Job No.: 61145
 Project: Eagle Rising - Preliminary/Final
 Jurisdiction: DCM
 Runoff Coefficient: Surface Type

Date: 1/4/2023 11:19
 Calcs by: O. Ali
 Checked by: _____
 Soil Type: B
 Urbanization: Urban

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
Roofs	7,650	0.18	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	19,307	0.44	0.89	0.9	0.92	0.94	0.95	0.96	100%
Pasture/Meadow	151,721	3.48	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	178,678	4.10	0.14	0.20	0.26	0.35	0.39	0.44	14.7%

178678

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	690	35	-	-	-	-	
Initial Time	100	4	0.040	-	10.3	13.8	DCM Eq. 6-8
Shallow Channel	382	19	0.050	1.6	4.1	-	DCM Eq. 6-9
Channelized	208	12	0.058	4.2	0.8	-	V-Ditch
				t_c	13.8 min.		

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.91	3.64	4.25	4.86	5.46	6.11
Runoff (cfs)	1.7	2.9	4.5	6.9	8.8	10.9
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	1.7	2.9	4.5	6.9	8.8	10.9

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

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin I Runoff Calculations

Job No.: 61145
 Project: Eagle Rising - Preliminary/Final
 Jurisdiction: DCM
 Runoff Coefficient: Surface Type

Date: 1/4/2023 11:19
 Calcs by: O. Ali
 Checked by: _____
 Soil Type: B
 Urbanization: Urban

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
Roofs	2,550	0.06	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	9,527	0.22	0.89	0.9	0.92	0.94	0.95	0.96	100%
Pasture/Meadow	59,207	1.36	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	71,284	1.64	0.16	0.21	0.27	0.36	0.40	0.45	16.6%

71284

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	413	17	-	-	-		
Initial Time	100	9	0.090	-	7.8	12.3	DCM Eq. 6-8
Shallow Channel	166	5	0.030	1.2	2.3	-	DCM Eq. 6-9
Channelized	147	3	0.020	1.2	2.0	-	V-Ditch
				t_c	12.0 min.		

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	3.08	3.86	4.50	5.14	5.78	6.47
Runoff (cfs)	0.8	1.3	2.0	3.0	3.8	4.7
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.8	1.3	2.0	3.0	3.8	4.7

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

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin J Runoff Calculations

Job No.: 61145
 Project: Eagle Rising - Preliminary/Final
 Jurisdiction: DCM
 Runoff Coefficient: Surface Type

Date: 1/4/2023 11:19
 Calcs by: O. Ali
 Checked by: _____
 Soil Type: B
 Urbanization: Urban

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
Roofs	5,100	0.12	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	9,725	0.22	0.89	0.9	0.92	0.94	0.95	0.96	100%
Pasture/Meadow	90,746	2.08	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	105,571	2.42	0.13	0.19	0.25	0.34	0.38	0.43	13.6%

105571

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	518	28	-	-	-		
Initial Time	100	7	0.070	-	8.7	12.9	DCM Eq. 6-8
Shallow Channel	144	11	0.076	1.9	1.2	-	DCM Eq. 6-9
Channelized	274	10	0.036	3.4	1.3	-	V-Ditch
				t_c	11.2 min.		

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	3.15	3.95	4.61	5.27	5.93	6.64
Runoff (cfs)	1.0	1.8	2.8	4.3	5.5	6.9
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	1.0	1.8	2.8	4.3	5.5	6.9

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

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin K Runoff Calculations

Job No.: 61145
 Project: Eagle Rising - Preliminary/Final
 Jurisdiction: DCM
 Runoff Coefficient: Surface Type

Date: 1/4/2023 11:19
 Calcs by: O. Ali
 Checked by: _____
 Soil Type: B
 Urbanization: Urban

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
Pasture/Meadow	115,609	2.65	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	115,609	2.65	0.02	0.08	0.15	0.25	0.30	0.35	0.0%

115609

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	150	13	-	-	-	-
Initial Time	150	13	0.087	-	11.1	10.8 DCM Eq. 6-8
Shallow Channel			0.000	0.0	0.0	- DCM Eq. 6-9
Channelized			0.000	0.0	0.0	- V-Ditch
				t_c	10.8 min.	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	3.20	4.01	4.68	5.35	6.01	6.73
Runoff (cfs)	0.2	0.9	1.9	3.5	4.8	6.3
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.2	0.9	1.9	3.5	4.8	6.3

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

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin L Runoff Calculations

Job No.: 61145
 Project: Eagle Rising - Preliminary/Final
 Jurisdiction: DCM
 Runoff Coefficient: Surface Type

Date: 1/4/2023 11:19
 Calcs by: O. Ali
 Checked by: _____
 Soil Type: B
 Urbanization: Urban

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
Roofs	5,100	0.12	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	2,880	0.07	0.89	0.9	0.92	0.94	0.95	0.96	100%
Pasture/Meadow	85,228	1.96	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	93,208	2.14	0.08	0.14	0.21	0.30	0.35	0.39	8.0%

93208

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	430	16	-	-	-	-
Initial Time	206	11	0.053	-	14.3	12.4 DCM Eq. 6-8
Shallow Channel	224	5	0.022	1.0	3.6	- DCM Eq. 6-9
Channelized			0.000	0.0	0.0	- V-Ditch
				t_c	12.4 min.	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	3.04	3.81	4.44	5.08	5.71	6.39
Runoff (cfs)	0.6	1.1	2.0	3.3	4.2	5.4
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.6	1.1	2.0	3.3	4.2	5.4

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

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Sub-Basin M Runoff Calculations

Job No.: 61145
 Project: Eagle Rising - Preliminary/Final
 Jurisdiction: DCM
 Runoff Coefficient: Surface Type

Date: 1/4/2023 11:19
 Calcs by: O. Ali
 Checked by: _____
 Soil Type: B
 Urbanization: Urban

Basin Land Use Characteristics

Surface	Area		Runoff Coefficient						% Imperv.
	(SF)	(Acres)	C2	C5	C10	C25	C50	C100	
Roofs	5,100	0.12	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	6,860	0.16	0.89	0.9	0.92	0.94	0.95	0.96	100%
Pasture/Meadow	166,570	3.82	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	178,530	4.10	0.07	0.13	0.20	0.29	0.34	0.39	6.4%

178530

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	873	24	-	-	-		
Initial Time	108	4	0.037	-	11.8	14.9	DCM Eq. 6-8
Shallow Channel	453	10	0.022	1.0	7.3	-	DCM Eq. 6-9
Channelized	312	10	0.032	1.5	3.5	-	V-Ditch
				t_c	14.9 min.		

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.82	3.54	4.13	4.72	5.30	5.94
Runoff (cfs)	0.8	1.9	3.3	5.6	7.4	9.4
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.8	1.9	3.3	5.6	7.4	9.4

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

C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

Combined Sub-Basin Runoff Calculations - DP6 Developed

Includes Basins OS-B1A OS-B1B B C

Job No.:	61145	Date:	1/4/2023 11:19
Project:	Eagle Rising - Preliminary/Final	Calcs by:	O. Ali
Jurisdiction	DCM	Checked by:	
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	1,199,474	27.54	0.02	0.08	0.15	0.25	0.3	0.35	0%
2-1/2 Acre	1,543,832	35.44	0.08	0.12	0.22	0.31	0.36	0.4	11%
5 Acre	367,545	8.44	0.06	0.1	0.2	0.29	0.34	0.38	7%
Roofs	8,474	0.19	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	11,168	0.26	0.89	0.9	0.92	0.94	0.95	0.96	100%
Gravel	-	0.00	0.57	0.59	0.63	0.66	0.68	0.7	80%
Combined	3,130,493	71.87	0.06	0.11	0.19	0.29	0.34	0.38	6.8%

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-B1B	-	2,011	84	-	-	-	-	21.2
Channelized-1	V-Ditch	2	378	9	77	0	2	5.7	1.1
Channelized-2									
Channelized-3									
Total			2,389	93					

2 = Natural, Winding, minimal vegetation/shallow grass

t_c (min) 22.3

Storage Volume

		40 -hr release time							
EURV	0.00 (in)	a =	1						Detention is NOT required
WQCV	0.00 (in)								Water Quality is NOT required
i (return period)	5-year	10-year	100-year						
K _i (ft)	0.0000	0.0000	0						
V _i (acre-ft)	0.000	0.000	0		EURV	0%		0	0
V _i (ft ³)	0	0	0		WQCV	0%	0	0	0

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

Contributing Basins/Areas

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

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

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.34	2.93	3.42	3.90	4.39	4.91
Site Runoff (cfs)	9.97	22.46	47.80	80.84	106.66	134.74
OffSite Runoff (cfs)	-	0.00	-	-	-	0.00
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	-	22.5	-	-	-	134.7

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

C1	1.19	1.5	1.75	2	2.25	2.52
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- DP6A Developed

Includes Basins OS-B1C E1

Job No.:	61145	Date:	1/4/2023 11:19
Project:	Eagle Rising - Preliminary/Final	Calcs by:	O. Ali
Jurisdiction	DCM	Checked by:	
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	
2-1/2 Acre	-	0.00	0.08	0.12	0.22	0.31	0.36	0.4	11%
5 Acre	-	0.00	0.06	0.1	0.2	0.29	0.34	0.38	7%
Gravel	19,121	0.44	0.57	0.59	0.63	0.66	0.68	0.7	80%
Paved	1,152	0.03	0.89	0.9	0.92	0.94	0.95	0.96	100%
Pasture/Meadow	191,196	4.39	0.02	0.08	0.15	0.25	0.3	0.35	0%
Roofs	17,165	0.39	0.71	0.73	0.75	0.78	0.8	0.81	90%
Combined	228,634	5.25	0.12	0.18	0.24	0.33	0.37	0.42	14.0%

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	OS-B1C	-	528	16	-	-	-	-	12.9
Channelized-1	V-Ditch	2	963	36	4	0	2	3.2	5.0
Channelized-2									
Channelized-3									
Total			1,491	52					

2 = Natural, Winding, minimal vegetation/shallow grass

t_c (min) 17.9

Storage Volume

		40 -hr release time							
EURV	0.00 (in)	a =	1						Detention is NOT required
WQCV	0.00 (in)								Water Quality is NOT required
i (return period)	5-year	10-year	100-year						
K _i (ft)	0.0000	0.0000	0						
V _i (acre-ft)	0.000	0.000	0		EURV	0%		0	0
V _i (ft ³)	0	0	0		WQCV	0%	0	0	0

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

Contributing Basins/Areas

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

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

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.60	3.25	3.80	4.34	4.88	5.46
Site Runoff (cfs)	1.67	3.00	4.76	7.46	9.55	11.95
OffSite Runoff (cfs)	-	0.00	-	-	-	0.00
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	-	3.0	-	-	-	12.0

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

C1	1.19	1.5	1.75	2	2.25	2.52
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- DP6B Developed

Includes Basins OS-B1A OS-B1B B C D

Job No.:	61145	Date:	1/4/2023 11:19
Project:	Eagle Rising - Preliminary/Final	Calcs by:	O. Ali
Jurisdiction	DCM	Checked by:	
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	
2-1/2 Acre	1,543,832	35.44	0.08	0.12	0.22	0.31	0.36	0.4	11%
5 Acre	367,545	8.44	0.06	0.1	0.2	0.29	0.34	0.38	7%
Gravel	9,370	0.22	0.57	0.59	0.63	0.66	0.68	0.7	80%
Paved	20,744	0.48	0.89	0.9	0.92	0.94	0.95	0.96	100%
Pasture/Meadow	1,478,749	33.95	0.02	0.08	0.15	0.25	0.3	0.35	0%
Roofs	19,728	0.45	0.71	0.73	0.75	0.78	0.8	0.81	90%
Combined	3,439,968	78.97	0.06	0.11	0.20	0.29	0.34	0.38	7.0%

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	OS-B1B	-	2,011	84	-	-	-	-	21.2
Channelized-1	V-Ditch	2	1,083	32	77	0	2	6.1	2.9
Channelized-2									
Channelized-3									
Total			3,094	116					

2 = Natural, Winding, minimal vegetation/shallow grass

t_c (min) 24.1

Storage Volume

		40 -hr release time							
EURV	0.00 (in)	a =	1						Detention is NOT required
WQCV	0.00 (in)								Water Quality is NOT required
i (return period)	5-year	10-year	100-year						
K _i (ft)	0.0000	0.0000	0						
V _i (acre-ft)	0.000	0.000	0		EURV	0%		0	0
V _i (ft ³)	0	0	0		WQCV	0%	0	0	0

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

Contributing Basins/Areas

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

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

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.25	2.81	3.28	3.75	4.21	4.71
Site Runoff (cfs)	10.99	24.44	50.77	85.64	112.83	142.58
OffSite Runoff (cfs)	-	0.00	-	-	-	0.00
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	-	24.4	-	-	-	142.6

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

C1	1.19	1.5	1.75	2	2.25	2.52
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- DP6C Developed

Includes Basins OS-B1A OS-B1B B C D OS-B1C E1

Job No.:	61145	Date:	1/4/2023 11:19
Project:	Eagle Rising - Preliminary/Final	Calcs by:	O. Ali
Jurisdiction	DCM	Checked by:	
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	
2-1/2 Acre	1,543,832	35.44	0.08	0.12	0.22	0.31	0.36	0.4	11%
5 Acre	367,545	8.44	0.06	0.1	0.2	0.29	0.34	0.38	7%
Gravel	28,491	0.65	0.57	0.59	0.63	0.66	0.68	0.7	80%
Paved	21,896	0.50	0.89	0.9	0.92	0.94	0.95	0.96	100%
Pasture/Meadow	1,669,945	38.34	0.02	0.08	0.15	0.25	0.3	0.35	0%
Roofs	36,893	0.85	0.71	0.73	0.75	0.78	0.8	0.81	90%
Combined	3,668,602	84.22	0.07	0.11	0.20	0.29	0.34	0.39	7.5%

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-B1B	-	2,011	84	-	-	-	-	21.2
Channelized-1	V-Ditch	2	1,083	32	77	0	2	6.1	2.9
Channelized-2									
Channelized-3									
Total			3,094	116					

2 = Natural, Winding, minimal vegetation/shallow grass

t_c (min) 24.1

Storage Volume

		40 -hr release time							
EURV	0.00 (in)	a =	1						Detention is NOT required
WQCV	0.00 (in)								Water Quality is NOT required
i (return period)	5-year	10-year	100-year						
K _i (ft)	0.0000	0.0000	0						
V _i (acre-ft)	0.000	0.000	0		EURV	0%		0	0
V _i (ft ³)	0	0	0		WQCV	0%	0	0	0

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

Contributing Basins/Areas

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

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

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.25	2.81	3.28	3.75	4.21	4.71
Site Runoff (cfs)	12.43	27.02	54.88	92.08	121.07	152.89
OffSite Runoff (cfs)	-	0.00	-	-	-	0.00
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	-	27.0	-	-	-	152.9

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

C1	1.19	1.5	1.75	2	2.25	2.52
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 - DP7 Developed

Includes Basins OS-B1D F1

Job No.:	61145	Date:	1/4/2023 11:19
Project:	Eagle Rising - Preliminary/Final	Calcs by:	O. Ali
Jurisdiction	DCM	Checked by:	
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	478,401	10.98	0.02	0.08	0.15	0.25	0.3	0.35	0%
2-1/2 Acre	-	0.00	0.08	0.12	0.22	0.31	0.36	0.4	11%
5 Acre	-	0.00	0.06	0.1	0.2	0.29	0.34	0.38	7%
Roofs	19,794	0.45	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	13,312	0.31	0.89	0.9	0.92	0.94	0.95	0.96	100%
Gravel	32,283	0.74	0.57	0.59	0.63	0.66	0.68	0.7	80%
Combined	543,790	12.48	0.10	0.15	0.22	0.31	0.36	0.40	10.5%

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-B1D	-	1,242	41	-	-	-	-	16.9
Channelized-1	V-Ditch	2	869	32	12	0	2	4.2	3.5
Channelized-2									
Channelized-3									
Total			2,111	73					

2 = Natural, Winding, minimal vegetation/shallow grass

t_c (min) 20.4

Storage Volume

		40 -hr release time							
EURV	0.00 (in)	a =	1						Detention is NOT required
WQCV	0.00 (in)								Water Quality is NOT required
i (return period)	5-year	10-year	100-year						
K _i (ft)	0.0000	0.0000	0						
V _i (acre-ft)	0.000	0.000	0		EURV	0%		0	0
V _i (ft ³)	0	0	0		WQCV	0%	0	0	0

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

Contributing Basins/Areas

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

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

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.45	3.06	3.57	4.08	4.59	5.14
Site Runoff (cfs)	3.03	5.89	9.78	15.83	20.46	25.83
OffSite Runoff (cfs)	-	0.00	-	-	-	0.00
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	-	5.9	-	-	-	25.8

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

C1	1.19	1.5	1.75	2	2.25	2.52
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 - DP8A Developed

Includes Basins OS-B1E OS-B3A H I

Job No.:	61145	Date:	1/4/2023 11:19
Project:	Eagle Rising - Preliminary/Final	Calcs by:	O. Ali
Jurisdiction	DCM	Checked by:	
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	483,566	11.10	0.02	0.08	0.15	0.25	0.3	0.35	0%
2-1/2 Acre	562,874	12.92	0.08	0.12	0.22	0.31	0.36	0.4	11%
5 Acre	-	0.00	0.06	0.1	0.2	0.29	0.34	0.38	7%
Roofs	10,200	0.23	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	28,834	0.66	0.89	0.9	0.92	0.94	0.95	0.96	100%
Gravel	-	0.00	0.57	0.59	0.63	0.66	0.68	0.7	80%
Combined	1,085,474	24.92	0.08	0.13	0.21	0.30	0.35	0.40	9.2%

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-B1E	-	1,404	61	-	-	-	-	17.8
Channelized-1	V-Ditch	2	524	22	20	0	2	5.0	1.7
Channelized-2									
Channelized-3									
Total			1,928	83					

2 = Natural, Winding, minimal vegetation/shallow grass

t_c (min) 19.5

Storage Volume

		40 -hr release time							
EURV	0.00 (in)	a =	1						Detention is NOT required
WQCV	0.00 (in)								Water Quality is NOT required
i (return period)	5-year	10-year	100-year						
K _i (ft)	0.0000	0.0000	0						
V _i (acre-ft)	0.000	0.000	0		EURV	0%		0	0
V _i (ft ³)	0	0	0		WQCV	0%	0	0	0

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

Contributing Basins/Areas OS-B4B

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

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

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.50	3.12	3.65	4.17	4.69	5.25
Site Runoff (cfs)	5.02	10.02	19.30	31.61	41.24	51.82
OffSite Runoff (cfs)	-	0.00	-	-	-	0.00
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	-	10.0	-	-	-	51.8

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

C1	1.19	1.5	1.75	2	2.25	2.52
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 - DP9 Developed

Includes Basins OS-B1D F1 F2

Job No.:	61145	Date:	1/4/2023 11:19
Project:	Eagle Rising - Preliminary/Final	Calcs by:	O. Ali
Jurisdiction	DCM	Checked by:	
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	558,016	12.81	0.02	0.08	0.15	0.25	0.3	0.35	0%
2-1/2 Acre	-	0.00	0.08	0.12	0.22	0.31	0.36	0.4	11%
5 Acre	-	0.00	0.06	0.1	0.2	0.29	0.34	0.38	7%
Roofs	24,894	0.57	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	16,565	0.38	0.89	0.9	0.92	0.94	0.95	0.96	100%
Gravel	32,283	0.74	0.57	0.59	0.63	0.66	0.68	0.7	80%
Combined	631,758	14.50	0.10	0.15	0.22	0.31	0.36	0.40	10.3%

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-B1D	-	1,242	41	-	-	-	-	16.9
Channelized-1	V-Ditch	2	1,500	58	12	0	2	4.3	5.9
Channelized-2									
Channelized-3									
Total			2,742	99					

2 = Natural, Winding, minimal vegetation/shallow grass

t_c (min) 22.8

Storage Volume

		40 -hr release time							
EURV	0.00 (in)	a =	1						Detention is NOT required
WQCV	0.00 (in)								Water Quality is NOT required
i (return period)	5-year	10-year	100-year						
K _i (ft)	0.0000	0.0000	0						
V _i (acre-ft)	0.000	0.000	0		EURV	0%		0	0
V _i (ft ³)	0	0	0		WQCV	0%	0	0	0

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

Contributing Basins/Areas OS-B4B

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

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

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.32	2.89	3.38	3.86	4.34	4.86
Site Runoff (cfs)	3.30	6.43	10.70	17.35	22.43	28.33
OffSite Runoff (cfs)	-	0.00	-	-	-	0.00
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	-	6.4	-	-	-	28.3

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

C1	1.19	1.5	1.75	2	2.25	2.52
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 - DP11 Developed

Includes Basins OS-B3B M

Job No.:	61145	Date:	1/4/2023 11:19
Project:	Eagle Rising - Preliminary/Final	Calcs by:	O. Ali
Jurisdiction	DCM	Checked by:	
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	166,570	3.82	0.02	0.08	0.15	0.25	0.3	0.35	0%
2-1/2 Acre	109,046	2.50	0.08	0.12	0.22	0.31	0.36	0.4	11%
5 Acre	-	0.00	0.06	0.1	0.2	0.29	0.34	0.38	7%
Roofs	5,100	0.12	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	6,860	0.16	0.89	0.9	0.92	0.94	0.95	0.96	100%
Gravel	-	0.00	0.57	0.59	0.63	0.66	0.68	0.7	80%
Combined	287,576	6.60	0.08	0.13	0.21	0.30	0.35	0.39	8.2%

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-B3B	-	636	29	-	-	-	-	13.5
Channelized-1	V-Ditch	2	873	24	6	0	2	3.2	4.6
Channelized-2									
Channelized-3									
Total			1,509	53					

2 = Natural, Winding, minimal vegetation/shallow grass

t_c (min) 18.1

Storage Volume

		40 -hr release time			Detention is NOT required			
EURV	0.00 (in)	a = 1			Water Quality is NOT required			
WQCV	0.00 (in)							
i (return period)	5-year	10-year	100-year	Design Volume (ft³)				
K _i (ft)	0.0000	0.0000	0	% Storage	100-year	WQCV	Total	
V _i (acre-ft)	0.000	0.000	0	EURV	0%	0	0	0
V _i (ft ³)	0	0	0	WQCV	0%	0	0	0

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

Contributing Basins/Areas OS-B4B

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

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

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.59	3.24	3.78	4.32	4.86	5.44
Site Runoff (cfs)	1.29	2.70	5.13	8.51	11.14	14.06
OffSite Runoff (cfs)	-	0.00	-	-	-	0.00
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	-	2.7	-	-	-	14.1

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

C1	1.19	1.5	1.75	2	2.25	2.52
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 - DP12 Developed

Includes Basins OS-B1E OS-B3A H I J

Job No.:	61145	Date:	1/4/2023 11:19
Project:	Eagle Rising - Preliminary/Final	Calcs by:	O. Ali
Jurisdiction	DCM	Checked by:	
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	574,312	13.18	0.02	0.08	0.15	0.25	0.3	0.35	0%
2-1/2 Acre	562,874	12.92	0.08	0.12	0.22	0.31	0.36	0.4	11%
5 Acre	-	0.00	0.06	0.1	0.2	0.29	0.34	0.38	7%
Roofs	15,300	0.35	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	38,559	0.89	0.89	0.9	0.92	0.94	0.95	0.96	100%
Gravel	-	0.00	0.57	0.59	0.63	0.66	0.68	0.7	80%
Combined	1,191,045	27.34	0.09	0.13	0.22	0.31	0.36	0.40	9.6%

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-B1E	-	1,404	61	-	-	-	-	17.8
Channelized-1	V-Ditch	2	955	34	20	0	2	4.7	3.4
Channelized-2									
Channelized-3									
Total			2,359	95					

2 = Natural, Winding, minimal vegetation/shallow grass

t_c (min) 21.2

Storage Volume

		40 -hr release time							
EURV	0.00 (in)	a =	1						Detention is NOT required
WQCV	0.00 (in)								Water Quality is NOT required
i (return period)	5-year	10-year	100-year						
K _i (ft)	0.0000	0.0000	0						
V _i (acre-ft)	0.000	0.000	0		EURV	0%		0	0
V _i (ft ³)	0	0	0		WQCV	0%	0	0	0

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

Contributing Basins/Areas OS-B4B

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

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

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.40	3.00	3.51	4.01	4.51	5.04
Site Runoff (cfs)	5.61	10.99	20.68	33.69	43.86	55.06
OffSite Runoff (cfs)	-	0.00	-	-	-	0.00
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	-	11.0	-	-	-	55.1

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

C1	1.19	1.5	1.75	2	2.25	2.52
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 - DP13 Developed

Includes Basins OS-B3C L

Job No.:	61145	Date:	1/4/2023 11:19
Project:	Eagle Rising - Preliminary/Final	Calcs by:	O. Ali
Jurisdiction	DCM	Checked by:	
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	85,228	1.96	0.02	0.08	0.15	0.25	0.3	0.35	0%
2-1/2 Acre	259,332	5.95	0.08	0.12	0.22	0.31	0.36	0.4	11%
5 Acre	-	0.00	0.06	0.1	0.2	0.29	0.34	0.38	7%
Roofs	5,100	0.12	0.71	0.73	0.75	0.78	0.8	0.81	90%
Paved	2,880	0.07	0.89	0.9	0.92	0.94	0.95	0.96	100%
Gravel	-	0.00	0.57	0.59	0.63	0.66	0.68	0.7	80%
Combined	352,540	8.09	0.08	0.13	0.22	0.31	0.36	0.40	10.2%

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-B3C	-	994	38	-	-	-	-	15.5
Channelized-1	V-Ditch	2	430	16	14	0	2	4.4	1.6
Channelized-2									
Channelized-3									
Total			1,424	54					

2 = Natural, Winding, minimal vegetation/shallow grass

t_c (min) 17.2

Storage Volume

		40 -hr release time							
EURV	0.00 (in)	a =	1						Detention is NOT required
WQCV	0.00 (in)								Water Quality is NOT required
i (return period)	5-year	10-year	100-year						
K _i (ft)	0.0000	0.0000	0						
V _i (acre-ft)	0.000	0.000	0		EURV	0%		0	0
V _i (ft ³)	0	0	0		WQCV	0%	0	0	0

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

Contributing Basins/Areas **OS-B4B**

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

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

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.65	3.32	3.87	4.43	4.98	5.57
Site Runoff (cfs)	1.74	3.37	6.78	11.01	14.37	17.96
OffSite Runoff (cfs)	-	0.00	-	-	-	0.00
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	-	3.4	-	-	-	18.0

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

C1	1.19	1.5	1.75	2	2.25	2.52
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.

Design Procedure Form: Runoff Reduction

UD-BMP (Version 3.07, March 2018)

Sheet 1 of 1

Designer: O. Ali
Company: M.V.E., Inc.
Date: February 2, 2023
Project: Eagle Rising
Location: Eagle Wing Drive

SITE INFORMATION (User Input in Blue Cells)

WQCV Rainfall Depth = 0.60 inches
 Depth of Average Runoff Producing Storm, d_b = 0.42 inches (for Watersheds Outside of the Denver Region, Figure 3-1 in USDCM Vol. 3)

Area Type	UIA:RPA																			
Area ID	1																			
Downstream Design Point ID	1																			
Downstream BMP Type	None																			
DCIA (ft ²)	--																			
UIA (ft ²)	33,190																			
RPA (ft ²)	17,355																			
SPA (ft ²)	--																			
HSG A (%)	0%																			
HSG B (%)	100%																			
HSG C/D (%)	0%																			
Average Slope of RPA (ft/ft)	0.167																			
UIA:RPA Interface Width (ft)	895.00																			

CALCULATED RUNOFF RESULTS

Area ID	1																			
UIA:RPA Area (ft ²)	50,545																			
L / W Ratio	0.06																			
UIA / Area	0.6566																			
Runoff (in)	0.00																			
Runoff (ft ³)	0																			
Runoff Reduction (ft ³)	1383																			

CALCULATED WQCV RESULTS

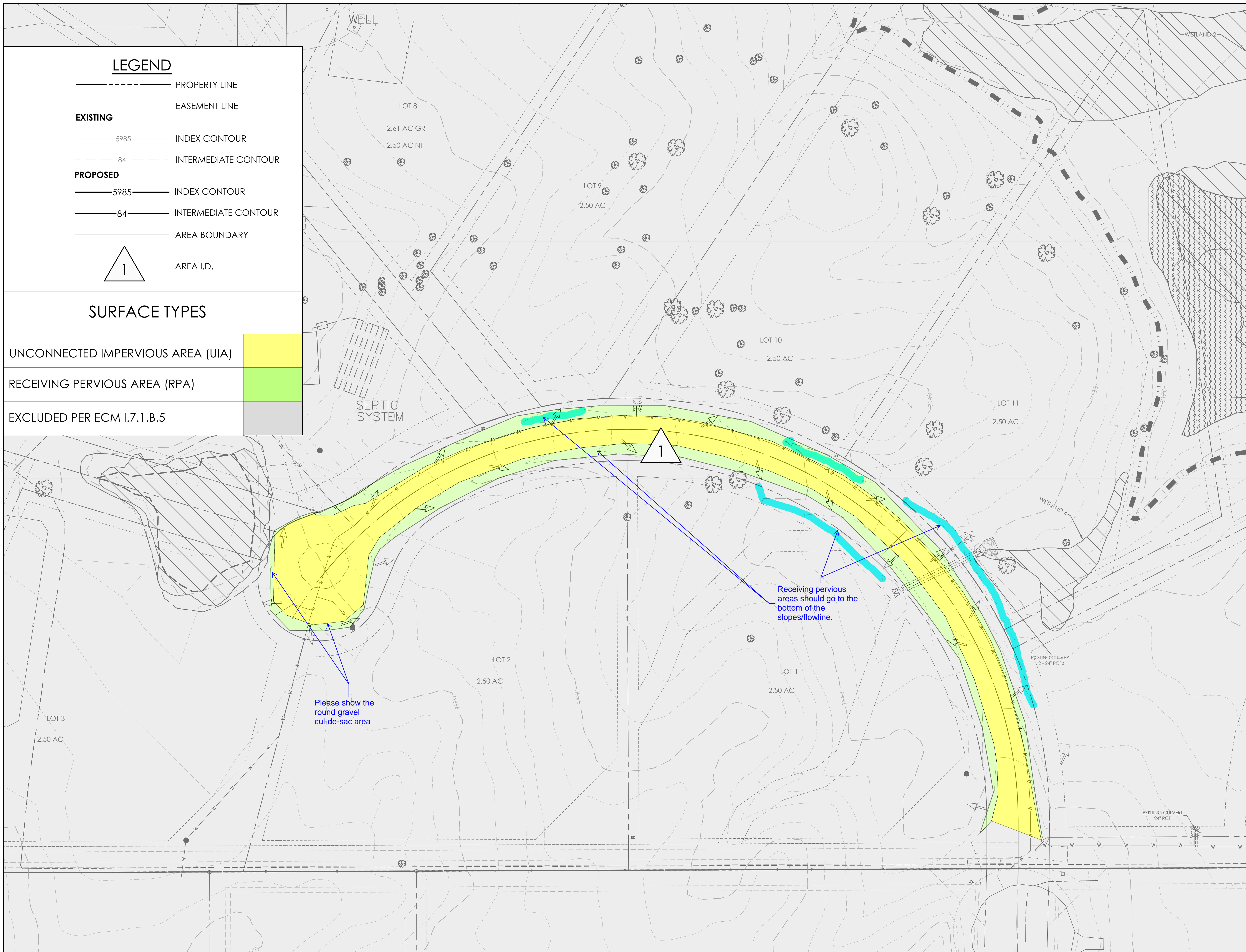
Area ID	1																			
WQCV (ft ³)	1351																			
WQCV Reduction (ft ³)	1351																			
WQCV Reduction (%)	100%																			
Untreated WQCV (ft ³)	0																			

CALCULATED DESIGN POINT RESULTS (sums results from all columns with the same Downstream Design Point ID)

Downstream Design Point ID	1																			
DCIA (ft ²)	0																			
UIA (ft ²)	33,190																			
RPA (ft ²)	17,355																			
SPA (ft ²)	0																			
Total Area (ft ²)	50,545																			
Total Impervious Area (ft ²)	33,190																			
WQCV (ft ³)	1,351																			
WQCV Reduction (ft ³)	1,351																			
WQCV Reduction (%)	100%																			
Untreated WQCV (ft ³)	0																			

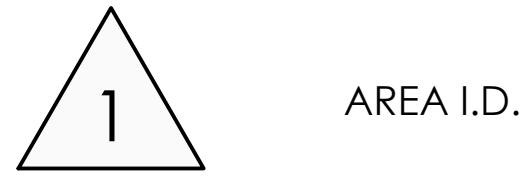
CALCULATED SITE RESULTS (sums results from all columns in worksheet)

Total Area (ft ²)	50,545
Total Impervious Area (ft ²)	33,190
WQCV (ft ³)	1,351
WQCV Reduction (ft ³)	1,351
WQCV Reduction (%)	100%
Untreated WQCV (ft ³)	0



LEGEND

- — — — — PROPERTY LINE
- — — — — EASEMENT LINE
- EXISTING**
- - - - -5985- - - - - INDEX CONTOUR
- - - - -84 - - - - - INTERMEDIATE CONTOUR
- PROPOSED**
- — — — —5985— — — — — INDEX CONTOUR
- — — — -84— — — — - INTERMEDIATE CONTOUR
- — — — — AREA BOUNDARY



AREA I.D.

SURFACE TYPES

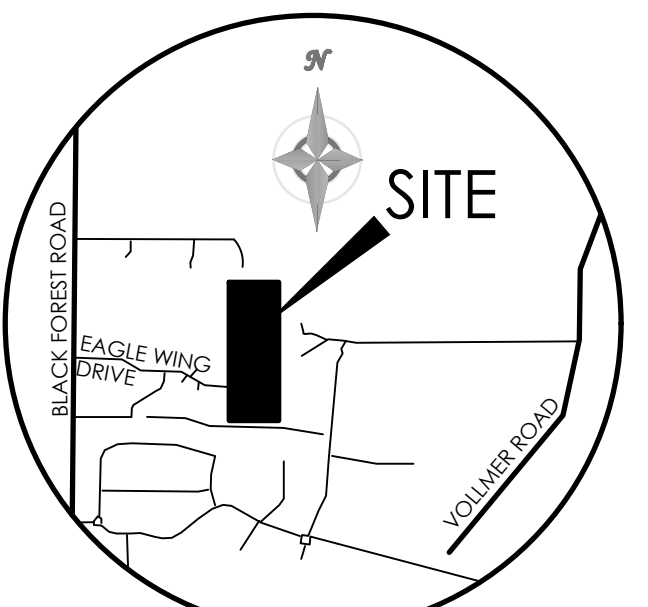
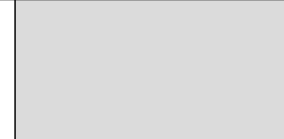
UNCONNECTED IMPERVIOUS AREA (UIA)



RECEIVING PERVIOUS AREA (RPA)

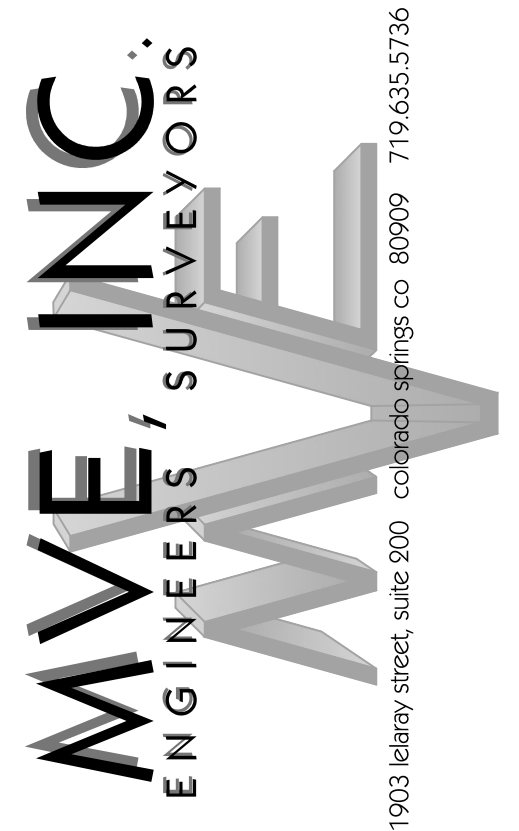
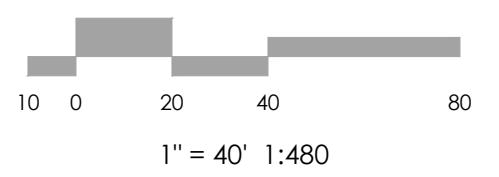
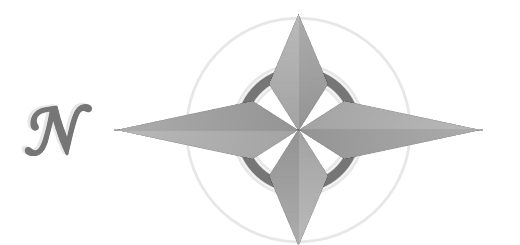


EXCLUDED PER ECM 1.7.1.B.5



VICINITY MAP
NOT TO SCALE

BENCHMARK



REVISIONS

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

EAGLE RISING

**BMP AREA ID
MAP**

MVE PROJECT 61145
 MVE DRAWING BMP-Area

JANUARY 3, 2023
 SHEET 1 OF 1

9. Hydraulic Calculations

Culvert Calculations

Ditch Flow Calculations

HEC-RAS Water Surface Elevations Calculations

Culvert Report

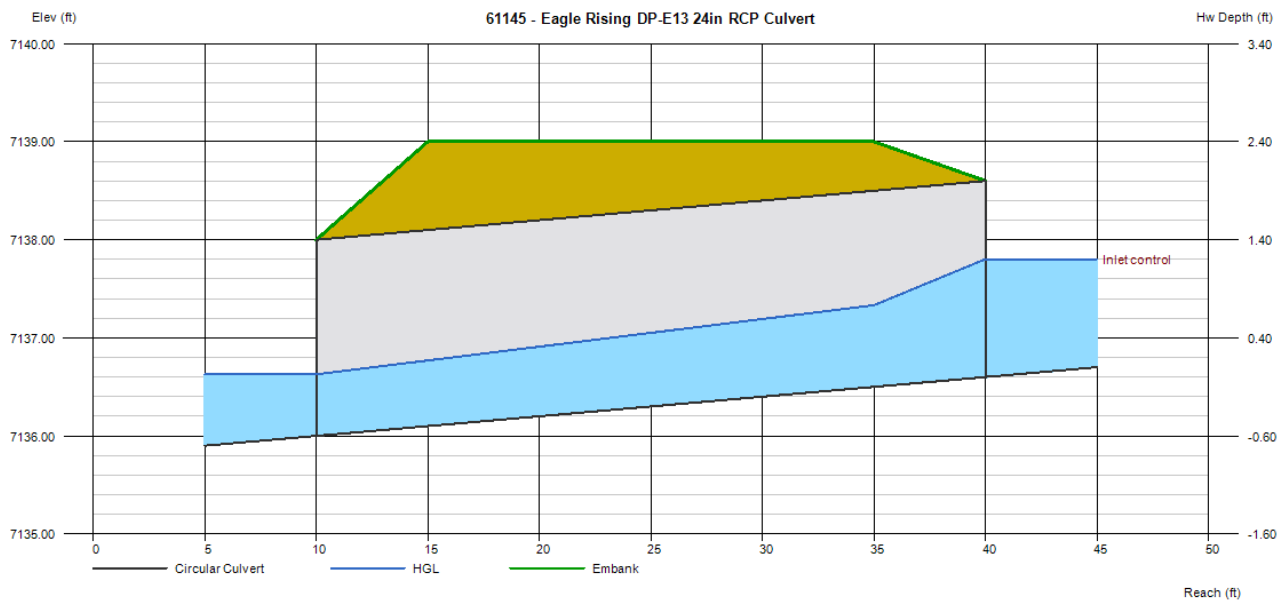
61145 - Eagle Rising DP-E13 24in RCP Culvert

Invert Elev Dn (ft) = 7136.00
Pipe Length (ft) = 30.00
Slope (%) = 2.00
Invert Elev Up (ft) = 7136.60
Rise (in) = 24.0
Shape = Circular
Span (in) = 24.0
No. Barrels = 1
n-Value = 0.013
Culvert Type = Circular Concrete
Culvert Entrance = Groove end projecting (C)
Coeff. K,M,c,Y,k = 0.0045, 2, 0.0317, 0.69, 0.2

Embankment
Top Elevation (ft) = 7139.00
Top Width (ft) = 20.00
Crest Width (ft) = 100.00

Calculations
Qmin (cfs) = 1.10
Qmax (cfs) = 6.20
Tailwater Elev (ft) = Normal

Highlighted
Qtotal (cfs) = 6.10
Qpipe (cfs) = 6.10
Qovertop (cfs) = 0.00
Veloc Dn (ft/s) = 7.22
Veloc Up (ft/s) = 4.63
HGL Dn (ft) = 7136.63
HGL Up (ft) = 7137.47
Hw Elev (ft) = 7137.80
Hw/D (ft) = 0.60
Flow Regime = Inlet Control



Culvert Report

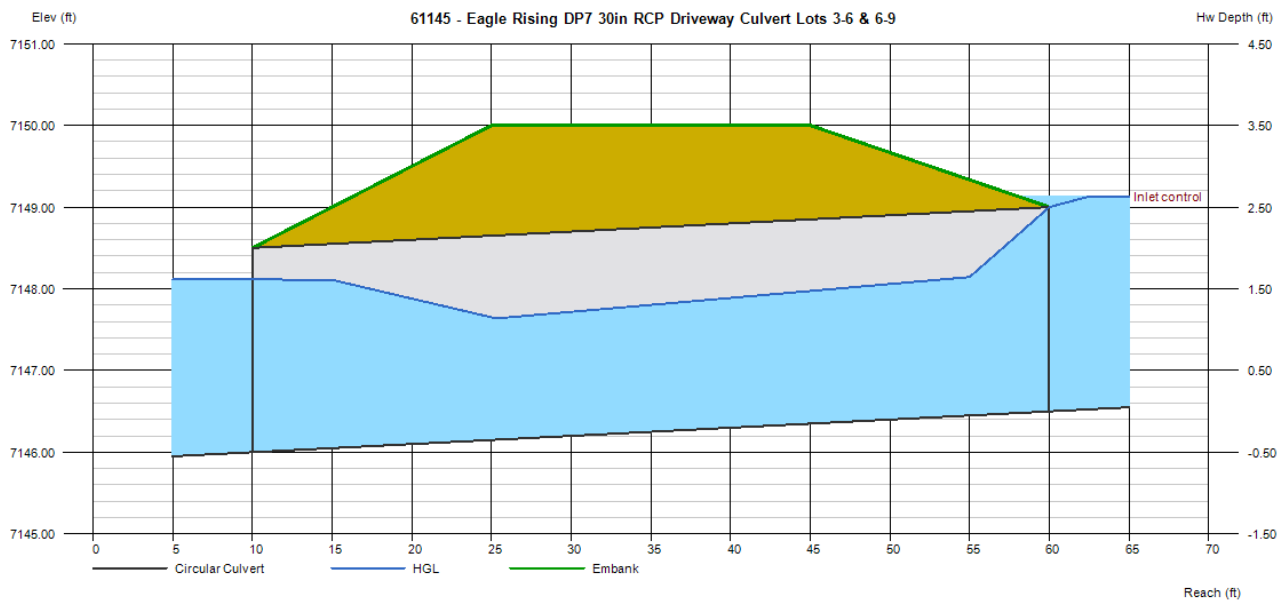
61145 - Eagle Rising DP7 30in RCP Driveway Culvert Lots 3-6 & 6-9

Invert Elev Dn (ft) = 7146.00
 Pipe Length (ft) = 50.00
 Slope (%) = 1.00
 Invert Elev Up (ft) = 7146.50
 Rise (in) = 30.0
 Shape = Circular
 Span (in) = 30.0
 No. Barrels = 1
 n-Value = 0.013
 Culvert Type = Circular Concrete
 Culvert Entrance = Groove end projecting (C)
 Coeff. K,M,c,Y,k = 0.0045, 2, 0.0317, 0.69, 0.2

Embankment
 Top Elevation (ft) = 7150.00
 Top Width (ft) = 20.00
 Crest Width (ft) = 115.00

Calculations
 Qmin (cfs) = 0.00
 Qmax (cfs) = 25.80
 Tailwater Elev (ft) = (dc+D)/2

Highlighted
 Qtotal (cfs) = 25.80
 Qpipe (cfs) = 25.80
 Qovertop (cfs) = 0.00
 Veloc Dn (ft/s) = 5.83
 Veloc Up (ft/s) = 7.12
 HGL Dn (ft) = 7148.12
 HGL Up (ft) = 7148.23
 Hw Elev (ft) = 7149.13
 Hw/D (ft) = 1.05
 Flow Regime = Inlet Control



Culvert Report

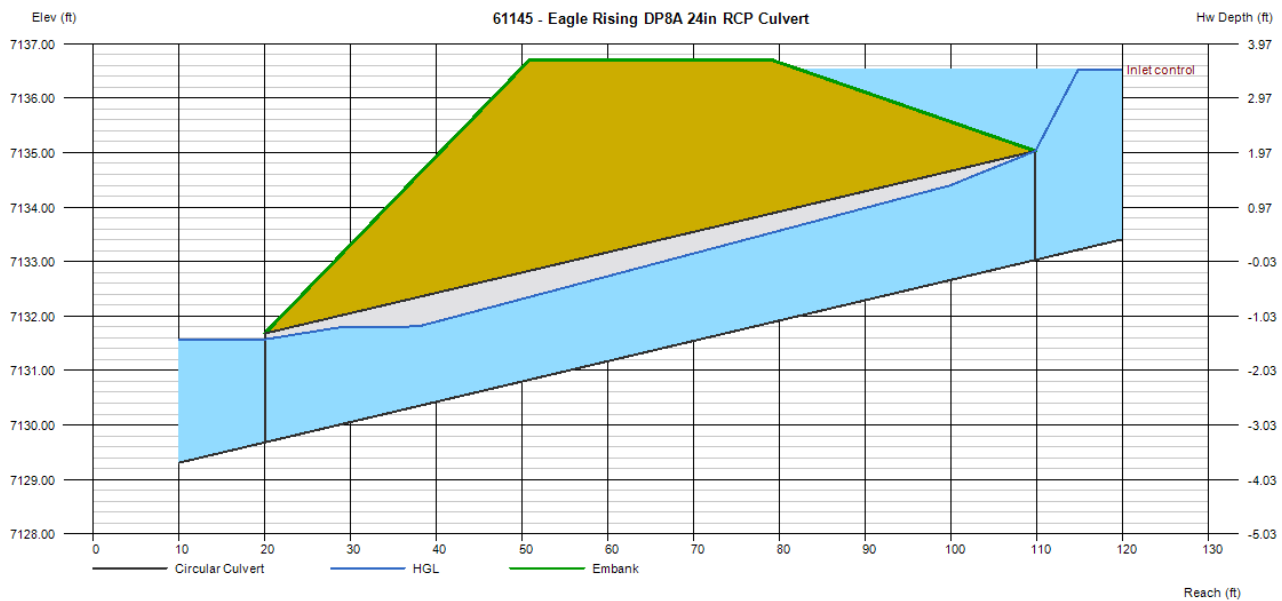
61145 - Eagle Rising DP8A 24in RCP Culvert

Invert Elev Dn (ft)	=	7129.68
Pipe Length (ft)	=	89.80
Slope (%)	=	3.73
Invert Elev Up (ft)	=	7133.03
Rise (in)	=	24.0
Shape	=	Circular
Span (in)	=	24.0
No. Barrels	=	2
n-Value	=	0.013
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Groove end projecting (C)
Coeff. K,M,c,Y,k	=	0.0045, 2, 0.0317, 0.69, 0.2

Embankment	
Top Elevation (ft)	= 7136.71
Top Width (ft)	= 28.00
Crest Width (ft)	= 205.00

Calculations	
Qmin (cfs)	= 0.00
Qmax (cfs)	= 51.80
Tailwater Elev (ft)	= (dc+D)/2

Highlighted	
Qtotal (cfs)	= 51.80
Qpipe (cfs)	= 51.80
Qovertop (cfs)	= 0.00
Veloc Dn (ft/s)	= 8.42
Veloc Up (ft/s)	= 8.76
HGL Dn (ft)	= 7131.57
HGL Up (ft)	= 7134.81
Hw Elev (ft)	= 7136.53
Hw/D (ft)	= 1.75
Flow Regime	= Inlet Control



Channel Report

Basin B - Swale Calculation - Reach (Q5)

Trapezoidal

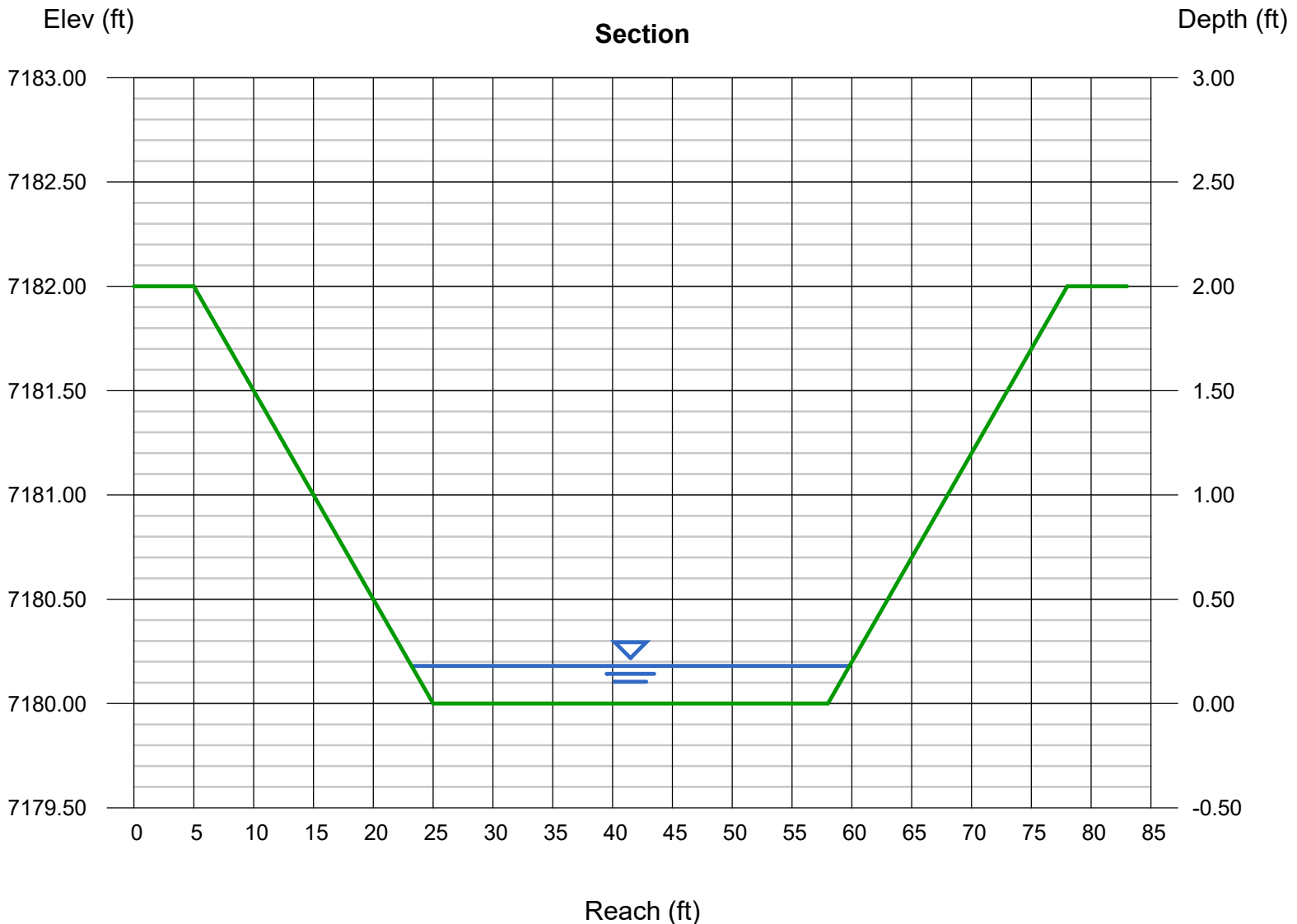
Bottom Width (ft) = 33.00
Side Slopes (z:1) = 10.00, 10.00
Total Depth (ft) = 2.00
Invert Elev (ft) = 7180.00
Slope (%) = 2.70
N-Value = 0.040

Highlighted

Depth (ft) = 0.18
Q (cfs) = 11.60
Area (sqft) = 6.26
Velocity (ft/s) = 1.85
Wetted Perim (ft) = 36.62
Crit Depth, Yc (ft) = 0.16
Top Width (ft) = 36.60
EGL (ft) = 0.23

Calculations

Compute by: Known Q
Known Q (cfs) = 11.60



Channel Report

Basin B - Swale Calculation - Reach (Q100)

Trapezoidal

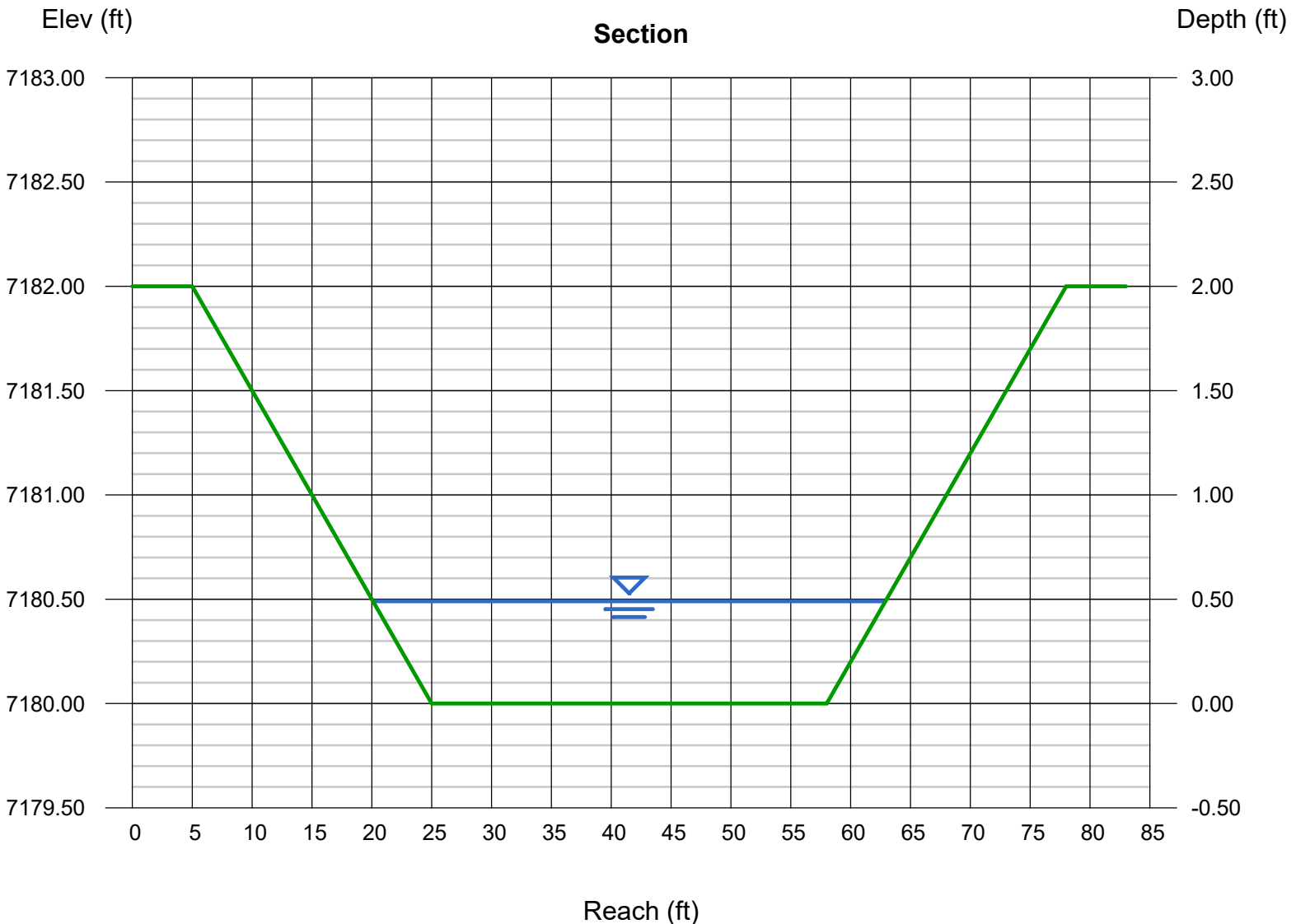
Bottom Width (ft) = 33.00
Side Slopes (z:1) = 10.00, 10.00
Total Depth (ft) = 2.00
Invert Elev (ft) = 7180.00
Slope (%) = 2.70
N-Value = 0.040

Highlighted

Depth (ft) = 0.49
Q (cfs) = 63.30
Area (sqft) = 18.57
Velocity (ft/s) = 3.41
Wetted Perim (ft) = 42.85
Crit Depth, Yc (ft) = 0.47
Top Width (ft) = 42.80
EGL (ft) = 0.67

Calculations

Compute by: Known Q
Known Q (cfs) = 63.30



Channel Report

Basin C - Swale Calculation - Reach (Q5)

Trapezoidal

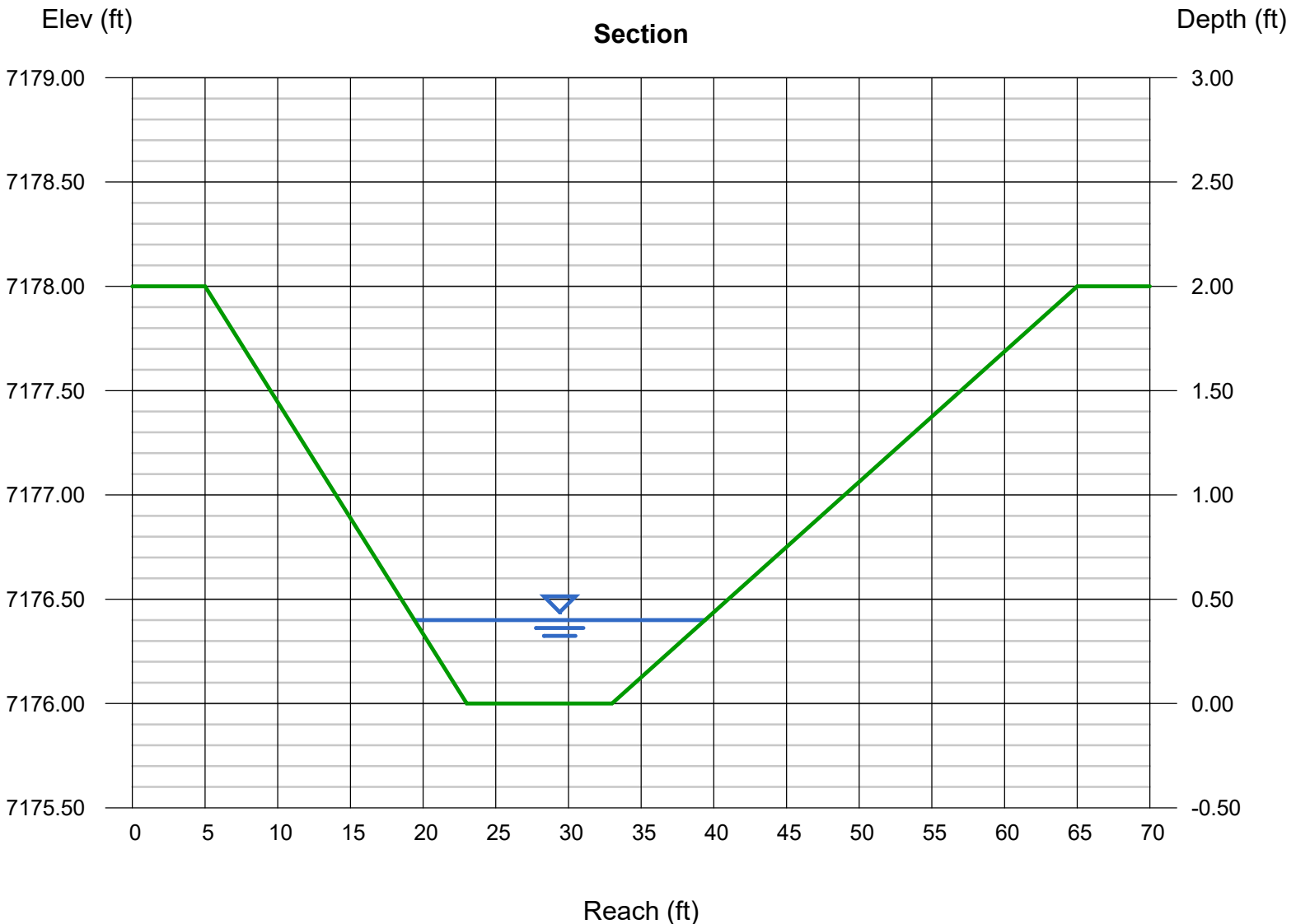
Bottom Width (ft) = 10.00
Side Slopes (z:1) = 9.00, 16.00
Total Depth (ft) = 2.00
Invert Elev (ft) = 7176.00
Slope (%) = 1.60
N-Value = 0.040

Highlighted

Depth (ft) = 0.40
Q (cfs) = 12.60
Area (sqft) = 6.00
Velocity (ft/s) = 2.10
Wetted Perim (ft) = 20.03
Crit Depth, Yc (ft) = 0.32
Top Width (ft) = 20.00
EGL (ft) = 0.47

Calculations

Compute by: Known Q
Known Q (cfs) = 12.60



Channel Report

Basin C - Swale Calculation - Reach (Q100)

Trapezoidal

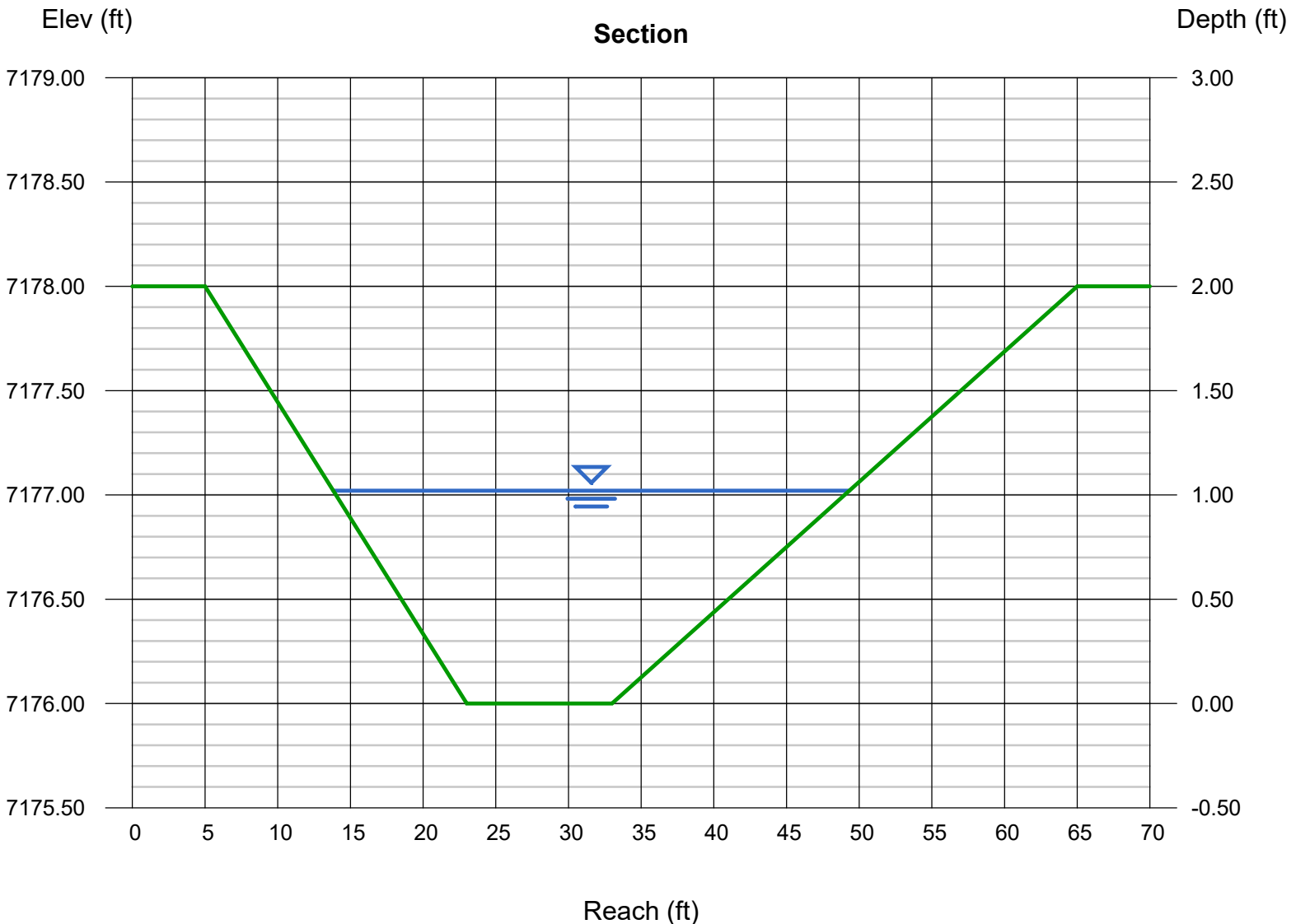
Bottom Width (ft) = 10.00
Side Slopes (z:1) = 9.00, 16.00
Total Depth (ft) = 2.00
Invert Elev (ft) = 7176.00
Slope (%) = 1.60
N-Value = 0.040

Highlighted

Depth (ft) = 1.02
Q (cfs) = 80.70
Area (sqft) = 23.20
Velocity (ft/s) = 3.48
Wetted Perim (ft) = 35.59
Crit Depth, Yc (ft) = 0.89
Top Width (ft) = 35.50
EGL (ft) = 1.21

Calculations

Compute by: Known Q
Known Q (cfs) = 80.70



Channel Report

Basin D - Swale Calculation - Reach (Q5)

Trapezoidal

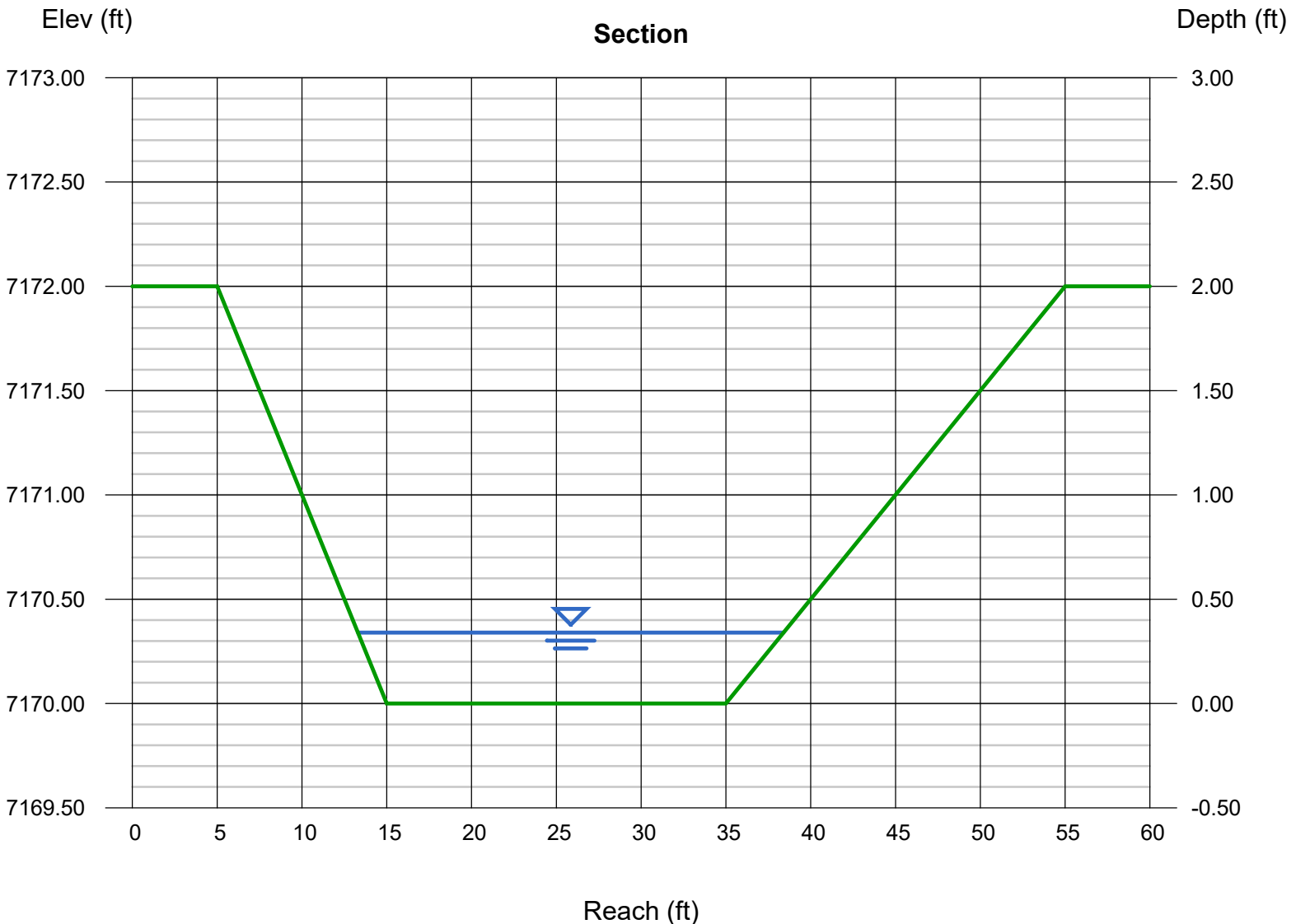
Bottom Width (ft) = 20.00
Side Slopes (z:1) = 5.00, 10.00
Total Depth (ft) = 2.00
Invert Elev (ft) = 7170.00
Slope (%) = 3.70
N-Value = 0.040

Highlighted

Depth (ft) = 0.34
Q (cfs) = 24.40
Area (sqft) = 7.67
Velocity (ft/s) = 3.18
Wetted Perim (ft) = 25.15
Crit Depth, Yc (ft) = 0.35
Top Width (ft) = 25.10
EGL (ft) = 0.50

Calculations

Compute by: Known Q
Known Q (cfs) = 24.40



Channel Report

Basin D - Swale Calculation - Reach (Q100)

Trapezoidal

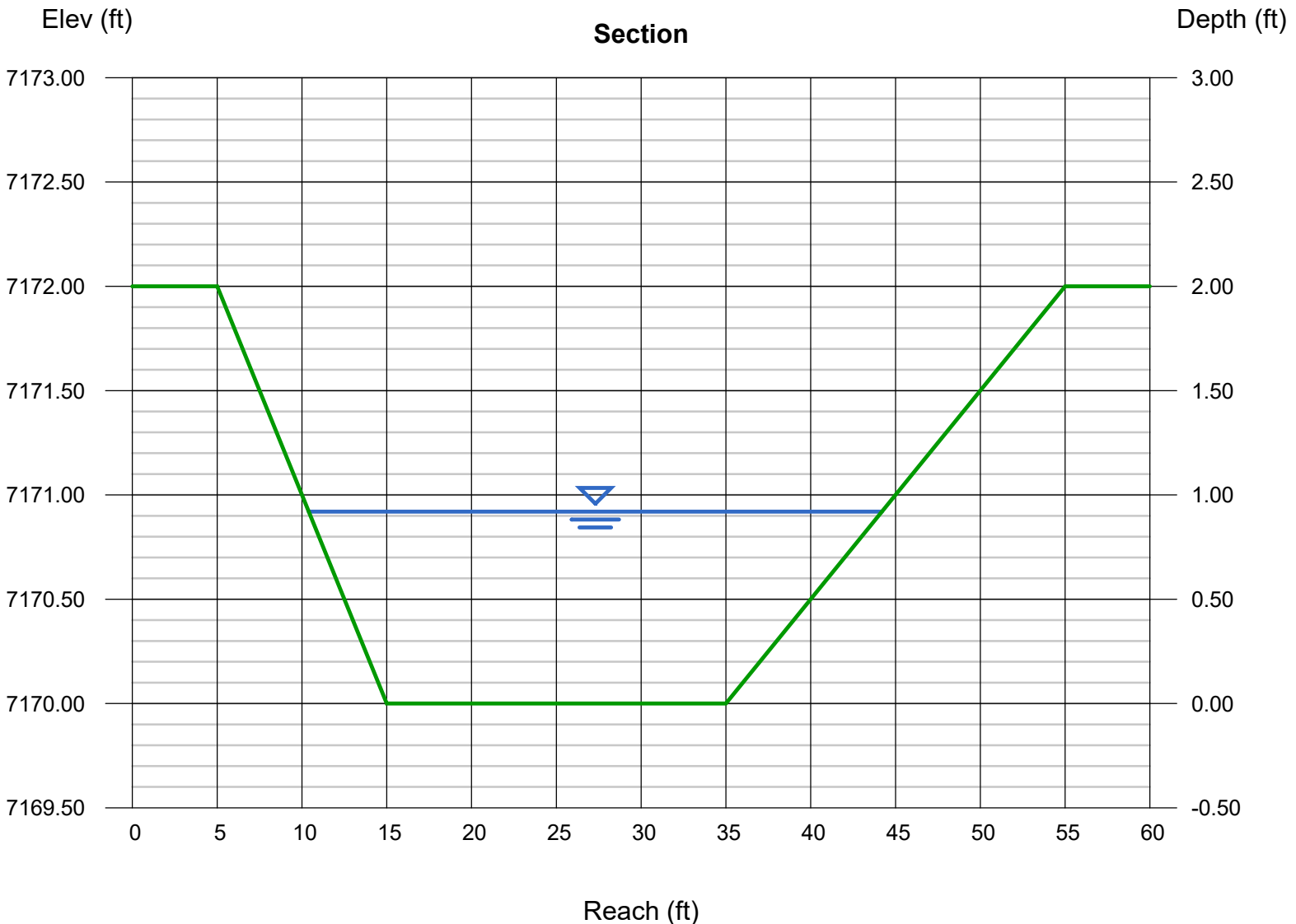
Bottom Width (ft) = 20.00
Side Slopes (z:1) = 5.00, 10.00
Total Depth (ft) = 2.00
Invert Elev (ft) = 7170.00
Slope (%) = 3.70
N-Value = 0.040

Highlighted

Depth (ft) = 0.92
Q (cfs) = 142.60
Area (sqft) = 24.75
Velocity (ft/s) = 5.76
Wetted Perim (ft) = 33.94
Crit Depth, Yc (ft) = 1.02
Top Width (ft) = 33.80
EGL (ft) = 1.44

Calculations

Compute by: Known Q
Known Q (cfs) = 142.60



Channel Report

Basin F2 Swale Calculation - Reach 1 (Q5)

Triangular

Side Slopes (z:1) = 10.00, 10.00

Total Depth (ft) = 2.00

Invert Elev (ft) = 7146.00

Slope (%) = 3.80

N-Value = 0.040

Calculations

Compute by: Known Q

Known Q (cfs) = 6.40

Highlighted

Depth (ft) = 0.48

Q (cfs) = 6.400

Area (sqft) = 2.30

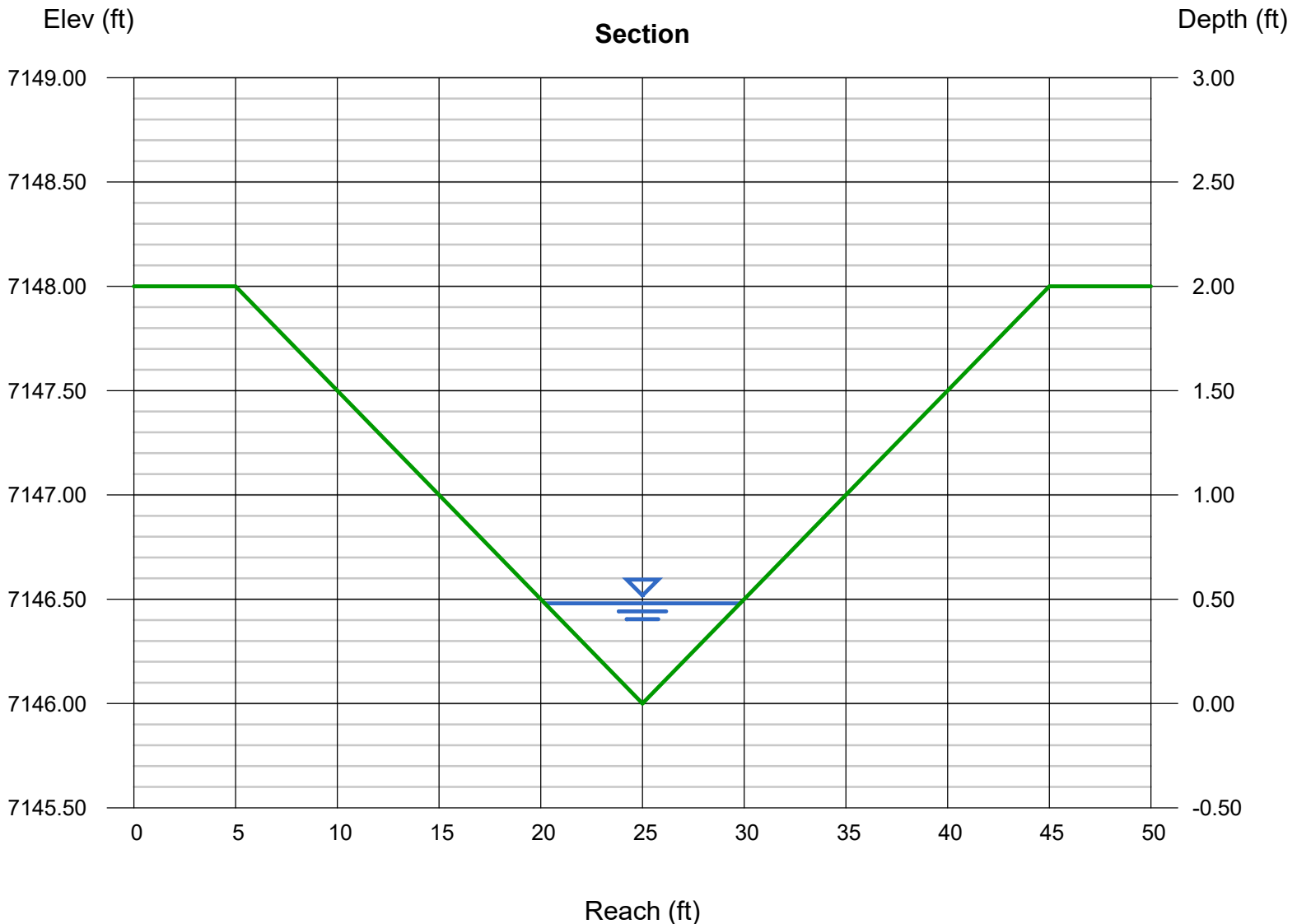
Velocity (ft/s) = 2.78

Wetted Perim (ft) = 9.65

Crit Depth, Yc (ft) = 0.48

Top Width (ft) = 9.60

EGL (ft) = 0.60



Channel Report

Basin F2 Swale Calculation - Reach 1 (Q100)

Triangular

Side Slopes (z:1) = 10.00, 10.00
Total Depth (ft) = 2.00

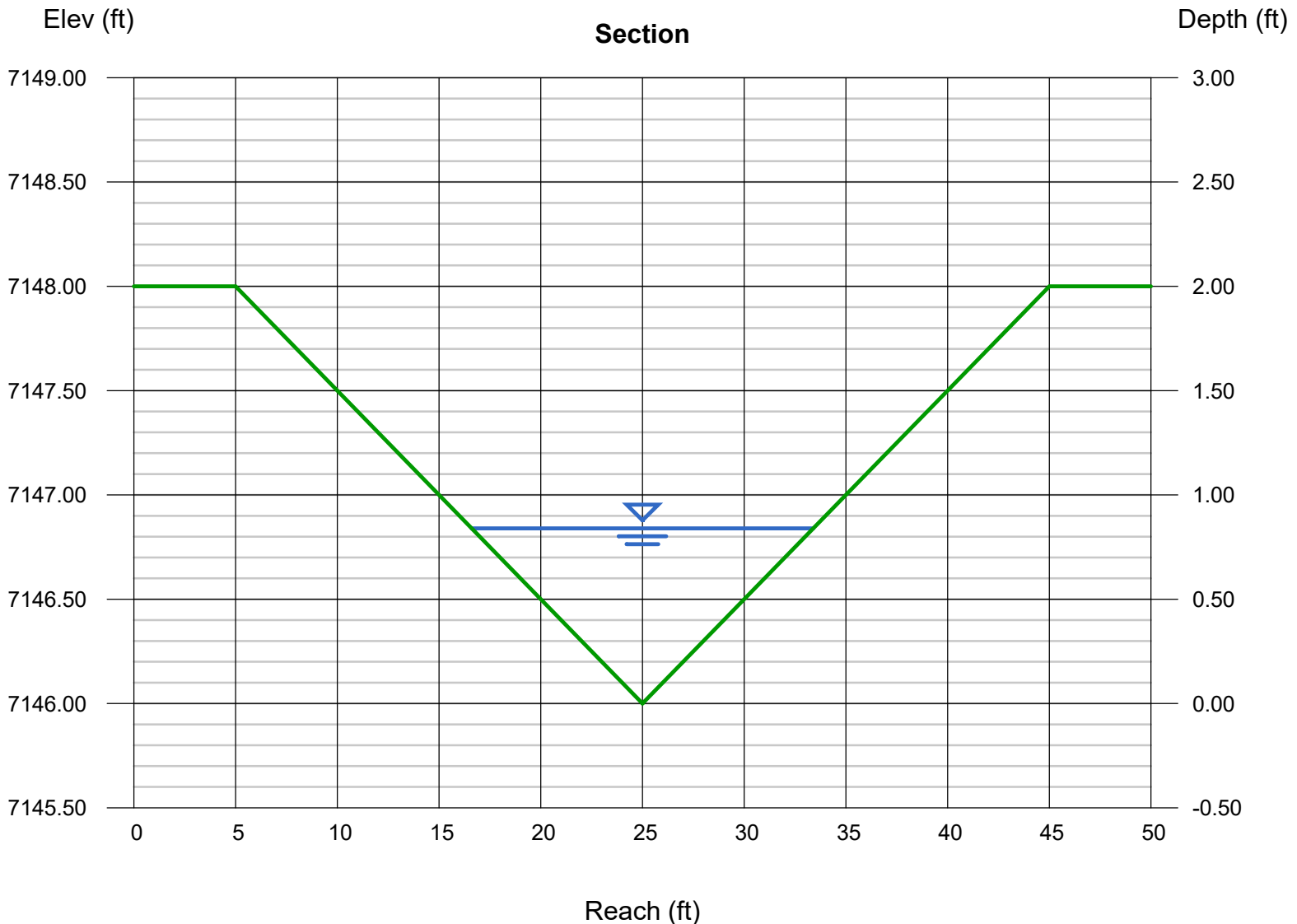
Invert Elev (ft) = 7146.00
Slope (%) = 3.80
N-Value = 0.040

Calculations

Compute by: Known Q
Known Q (cfs) = 28.30

Highlighted

Depth (ft) = 0.84
Q (cfs) = 28.30
Area (sqft) = 7.06
Velocity (ft/s) = 4.01
Wetted Perim (ft) = 16.88
Crit Depth, Yc (ft) = 0.87
Top Width (ft) = 16.80
EGL (ft) = 1.09



Channel Report

Basin F2 Swale Calculation - Reach 2 (Q5)

Triangular

Side Slopes (z:1) = 6.00, 6.00

Total Depth (ft) = 2.00

Invert Elev (ft) = 7132.00

Slope (%) = 5.70

N-Value = 0.040

Calculations

Compute by: Known Q

Known Q (cfs) = 6.40

Highlighted

Depth (ft) = 0.54

Q (cfs) = 6.400

Area (sqft) = 1.75

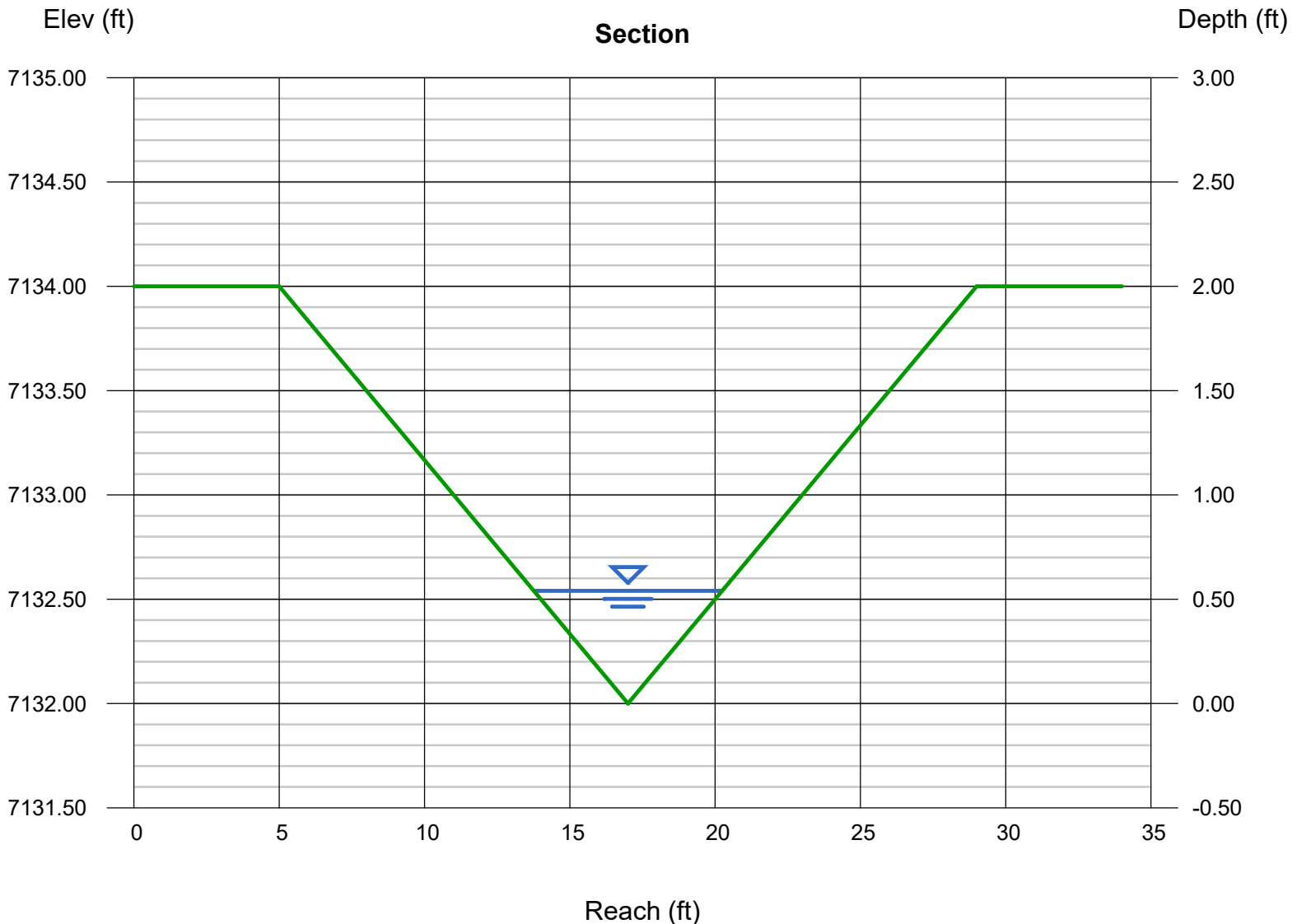
Velocity (ft/s) = 3.66

Wetted Perim (ft) = 6.57

Crit Depth, Yc (ft) = 0.59

Top Width (ft) = 6.48

EGL (ft) = 0.75



Channel Report

Basin F2 Swale Calculation - Reach 2 (Q100)

Triangular

Side Slopes (z:1) = 6.00, 6.00

Total Depth (ft) = 2.00

Invert Elev (ft) = 7132.00

Slope (%) = 5.70

N-Value = 0.040

Calculations

Compute by: Known Q

Known Q (cfs) = 28.30

Highlighted

Depth (ft) = 0.95

Q (cfs) = 28.30

Area (sqft) = 5.41

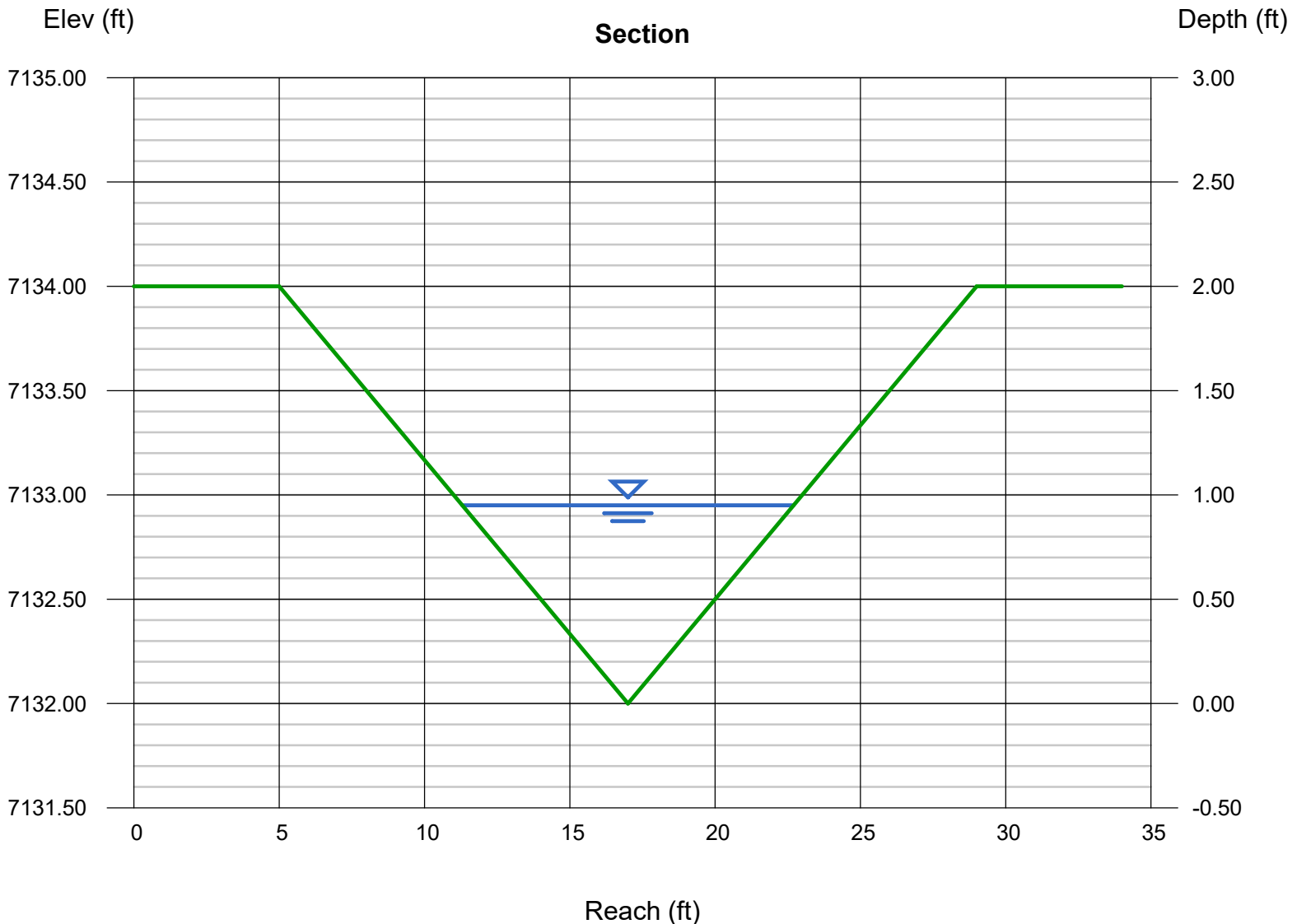
Velocity (ft/s) = 5.23

Wetted Perim (ft) = 11.56

Crit Depth, Yc (ft) = 1.07

Top Width (ft) = 11.40

EGL (ft) = 1.37



Channel Report

Basin J - Swale Calculation - Reach (Q5)

Triangular

Side Slopes (z:1) = 8.00, 8.00

Total Depth (ft) = 2.00

Invert Elev (ft) = 7132.00

Slope (%) = 4.80

N-Value = 0.040

Calculations

Compute by: Known Q

Known Q (cfs) = 11.00

Highlighted

Depth (ft) = 0.62

Q (cfs) = 11.00

Area (sqft) = 3.08

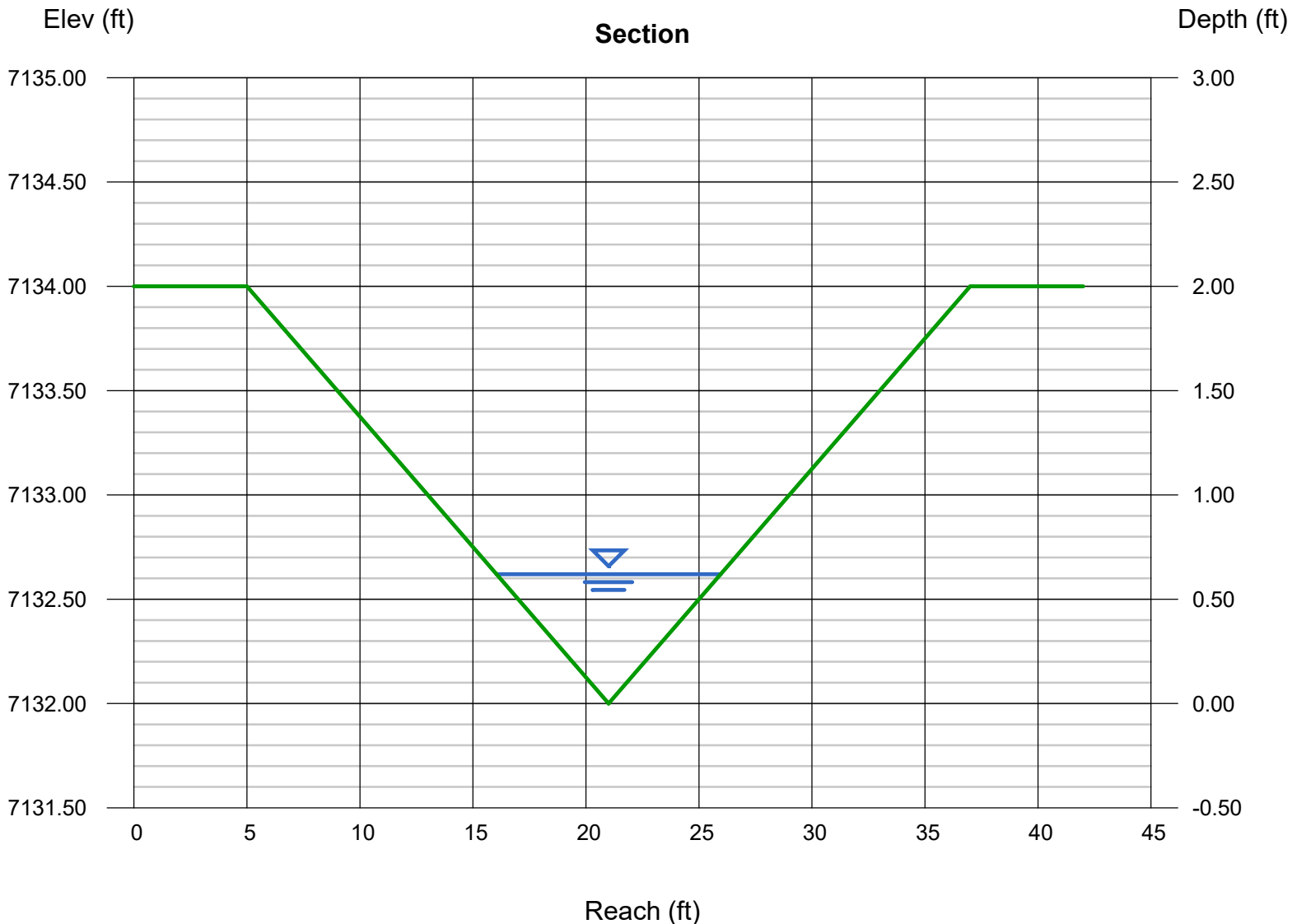
Velocity (ft/s) = 3.58

Wetted Perim (ft) = 10.00

Crit Depth, Yc (ft) = 0.66

Top Width (ft) = 9.92

EGL (ft) = 0.82



Channel Report

Basin J - Swale Calculation - Reach (Q100)

Triangular

Side Slopes (z:1) = 8.00, 8.00

Total Depth (ft) = 2.00

Invert Elev (ft) = 7132.00

Slope (%) = 4.80

N-Value = 0.040

Calculations

Compute by: Known Q

Known Q (cfs) = 55.10

Highlighted

Depth (ft) = 1.12

Q (cfs) = 55.10

Area (sqft) = 10.04

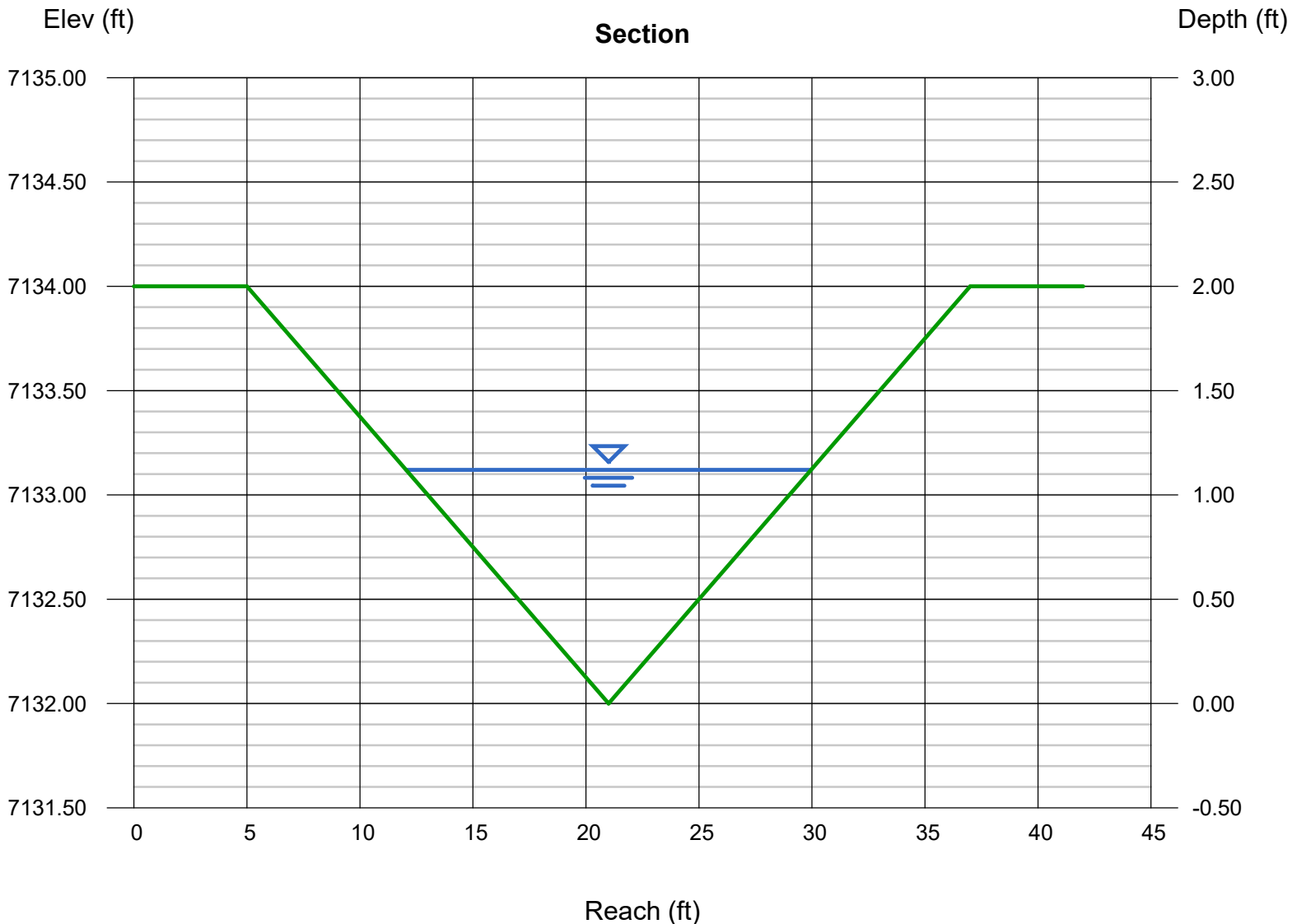
Velocity (ft/s) = 5.49

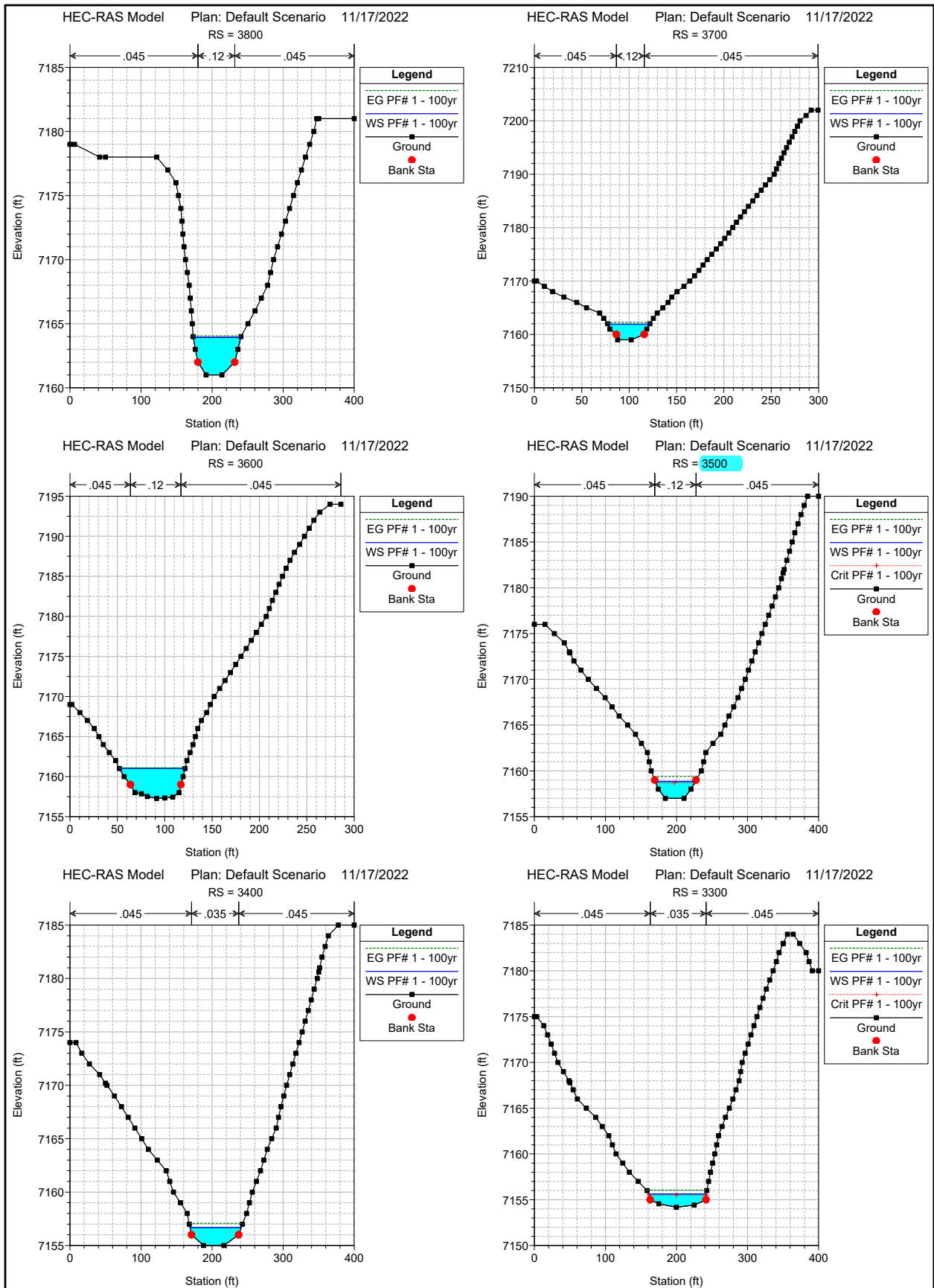
Wetted Perim (ft) = 18.06

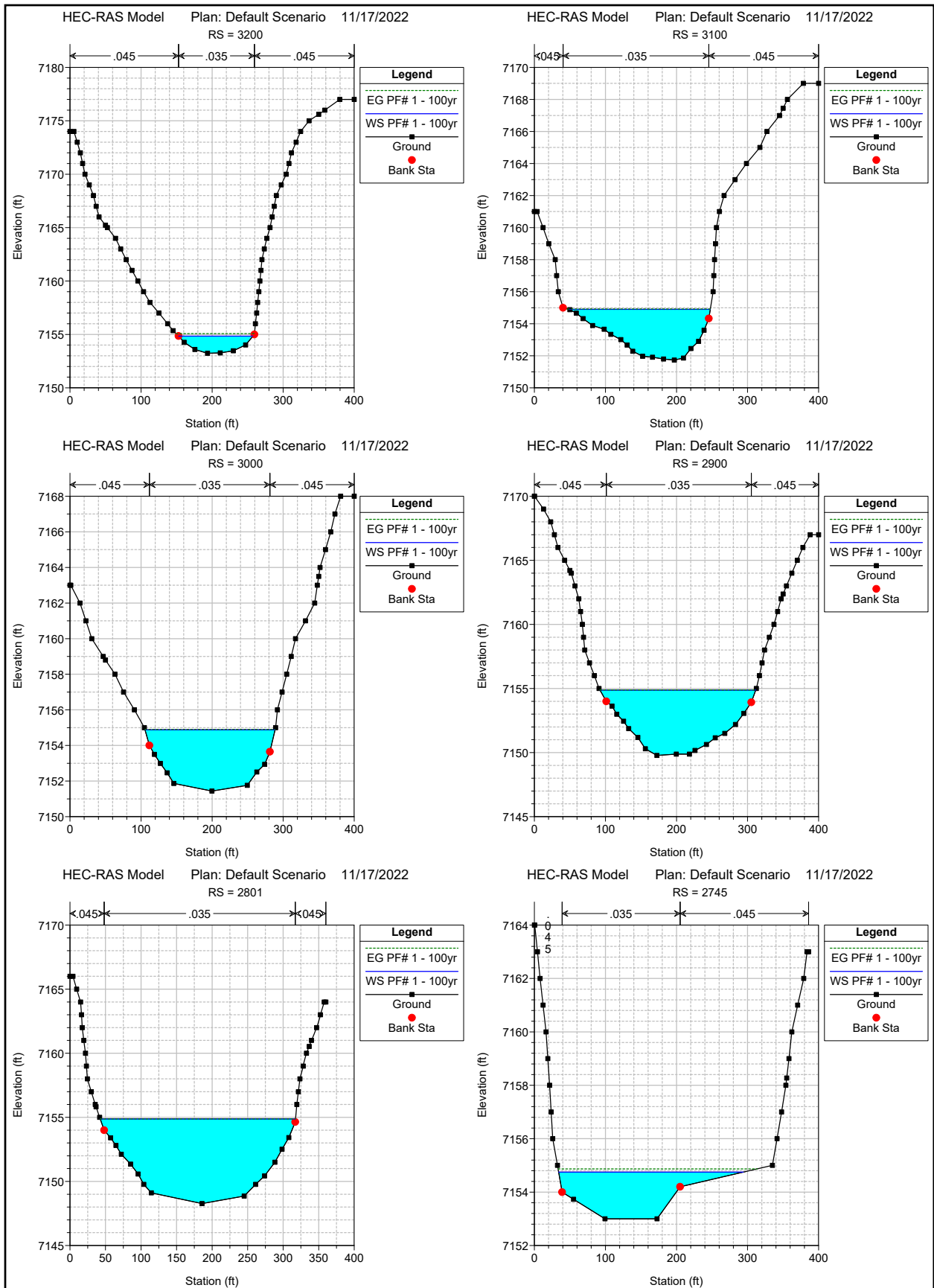
Crit Depth, Yc (ft) = 1.25

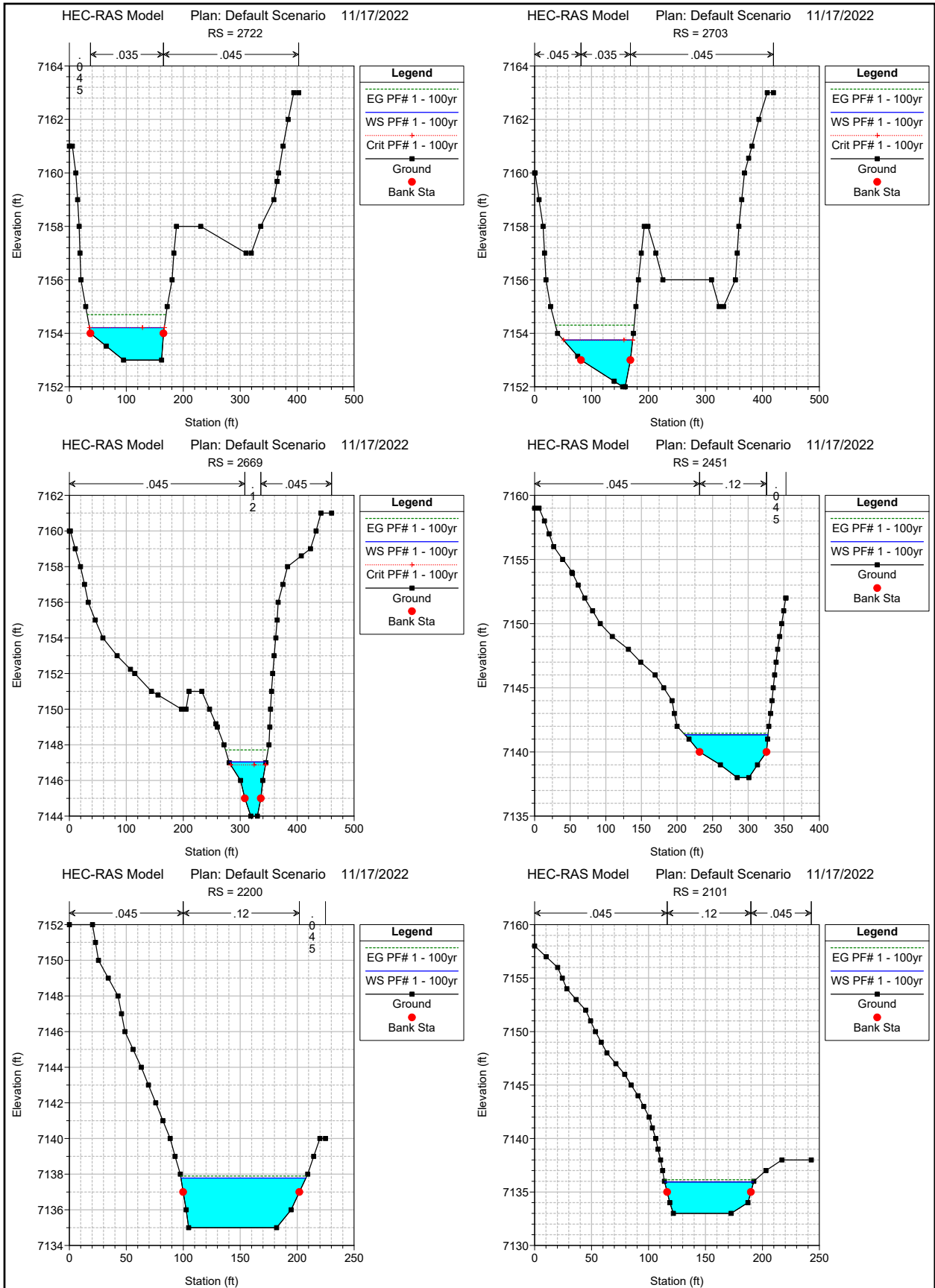
Top Width (ft) = 17.92

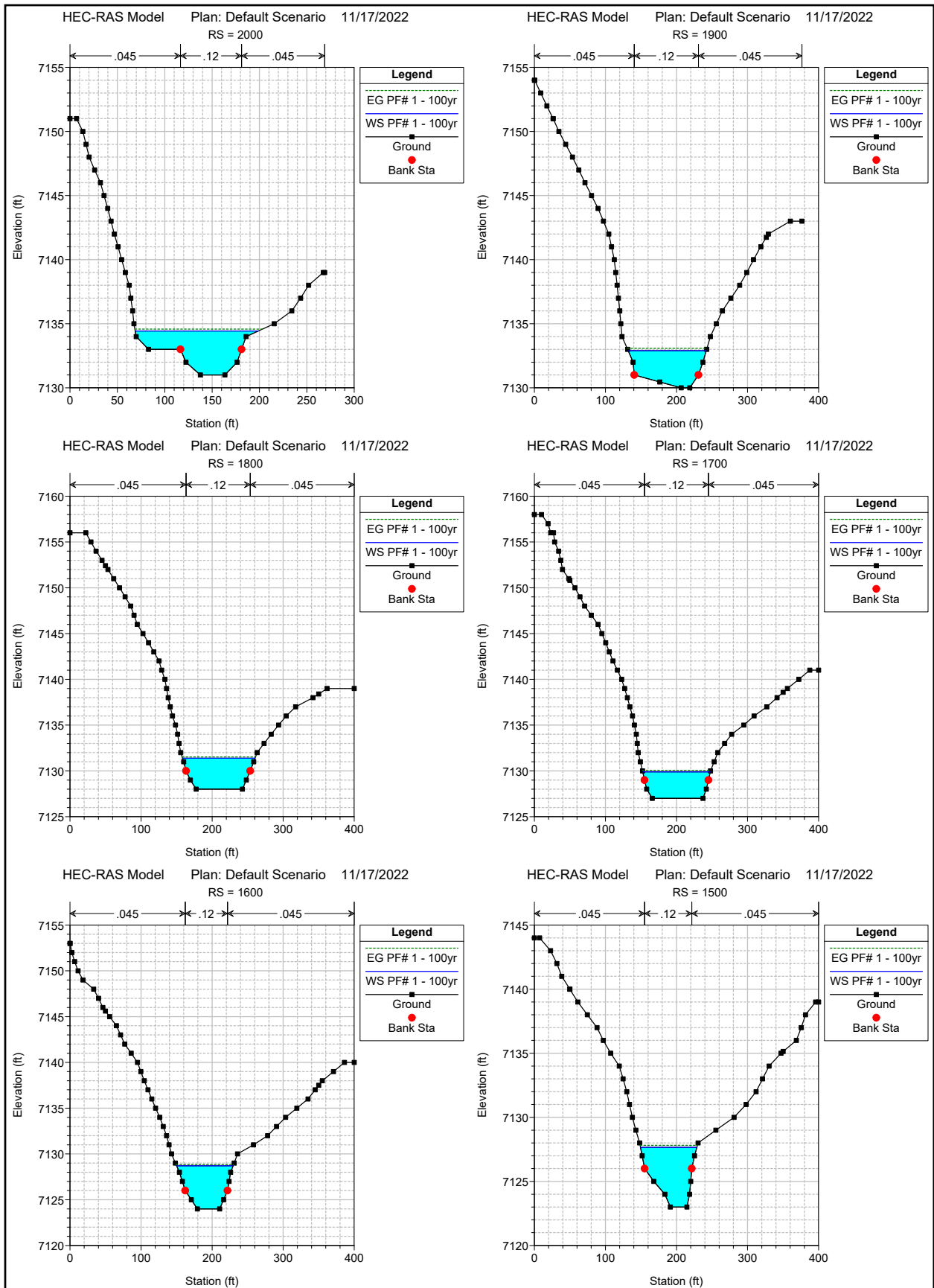
EGL (ft) = 1.59

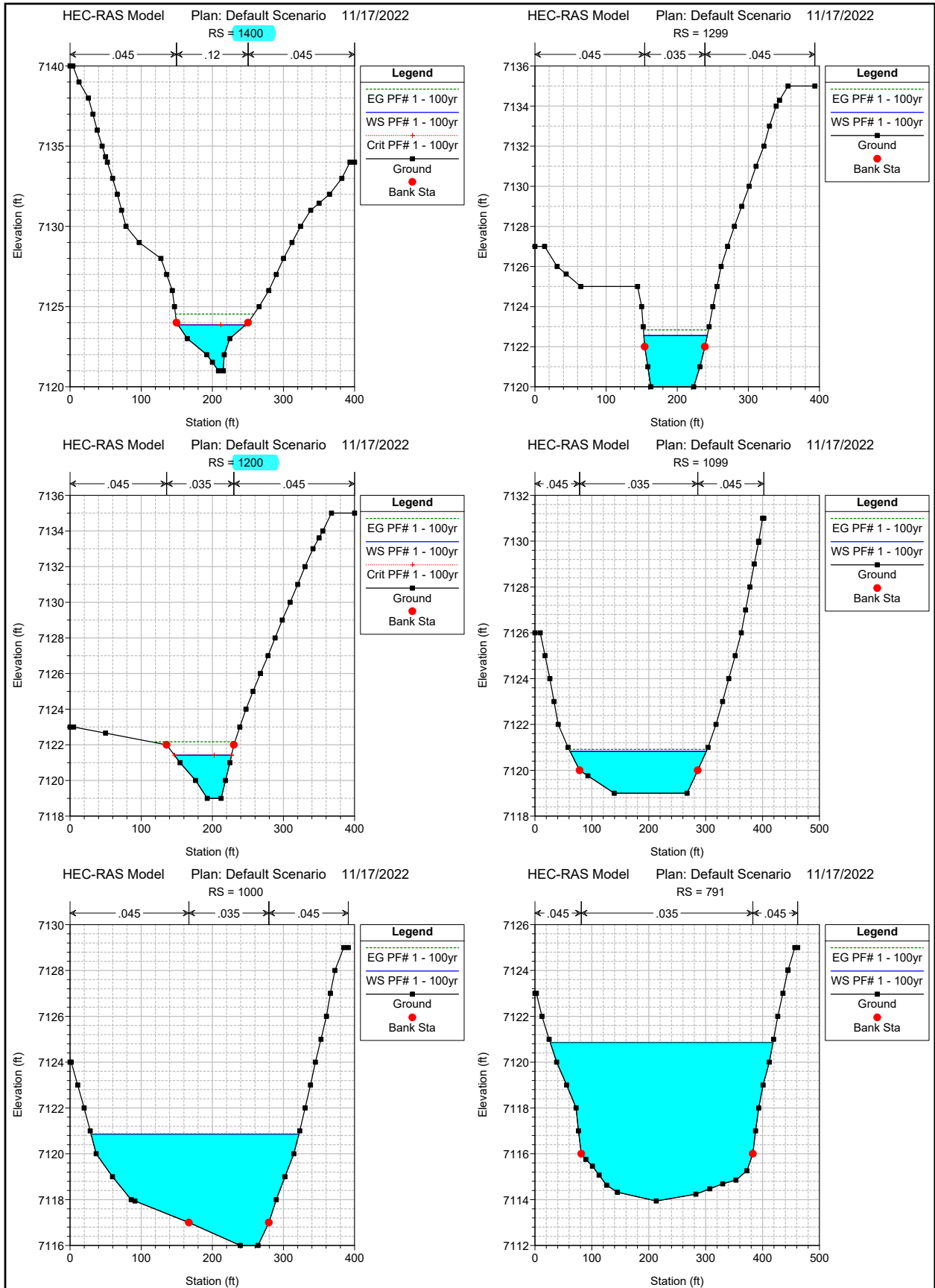


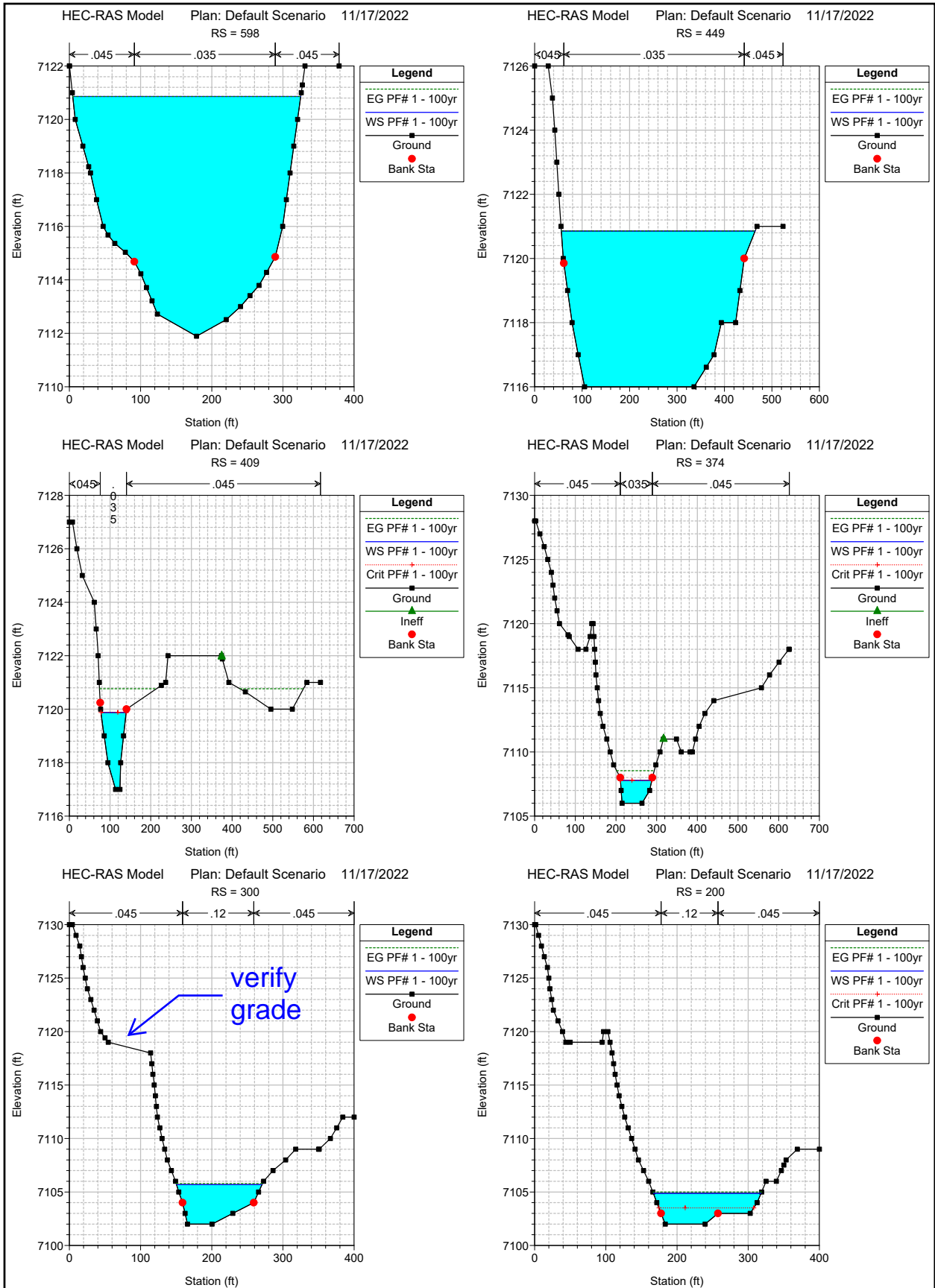




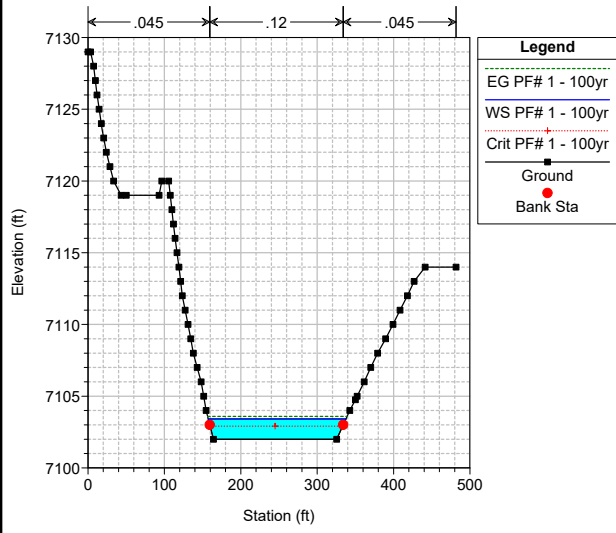






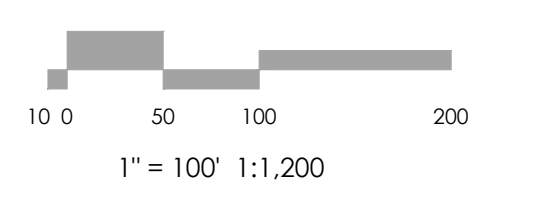
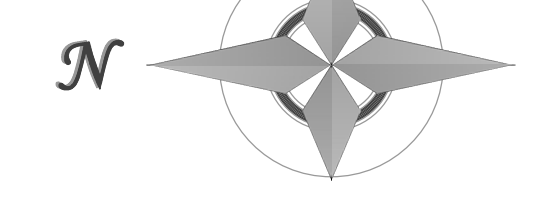
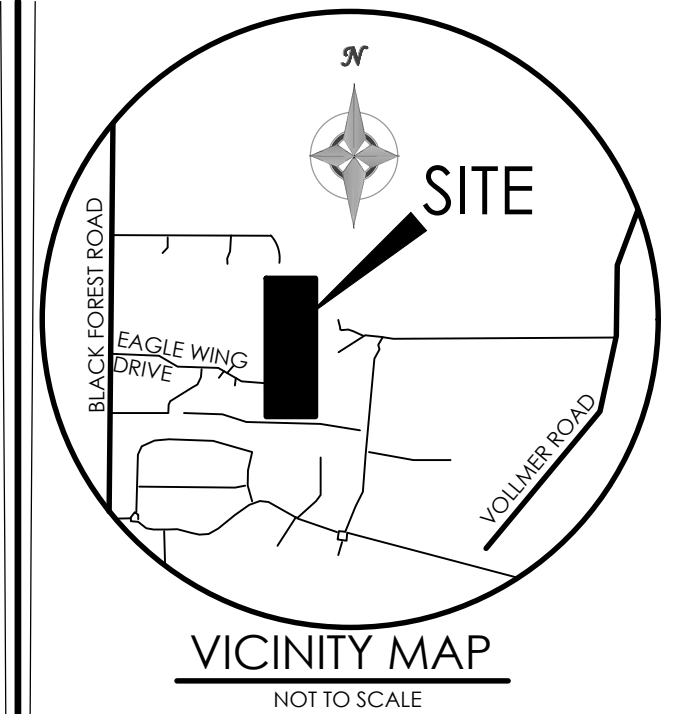


HEC-RAS Model Plan: Default Scenario 11/17/2022
RS = 100



LEGEND

—	PROPERTY LINE
- - -	EASEMENT LINE
---	LOT LINE
EXISTING	
- - -	INDEX CONTOUR
---	INTERMEDIATE CONTOUR
PROPOSED	
- - -	INDEX CONTOUR
---	INTERMEDIATE CONTOUR



MVE, INC.
ENGINEERS / SURVEYORS

1903 Library Street, Suite 200 Colorado Springs, CO 80909 719.635.5736

REVISIONS

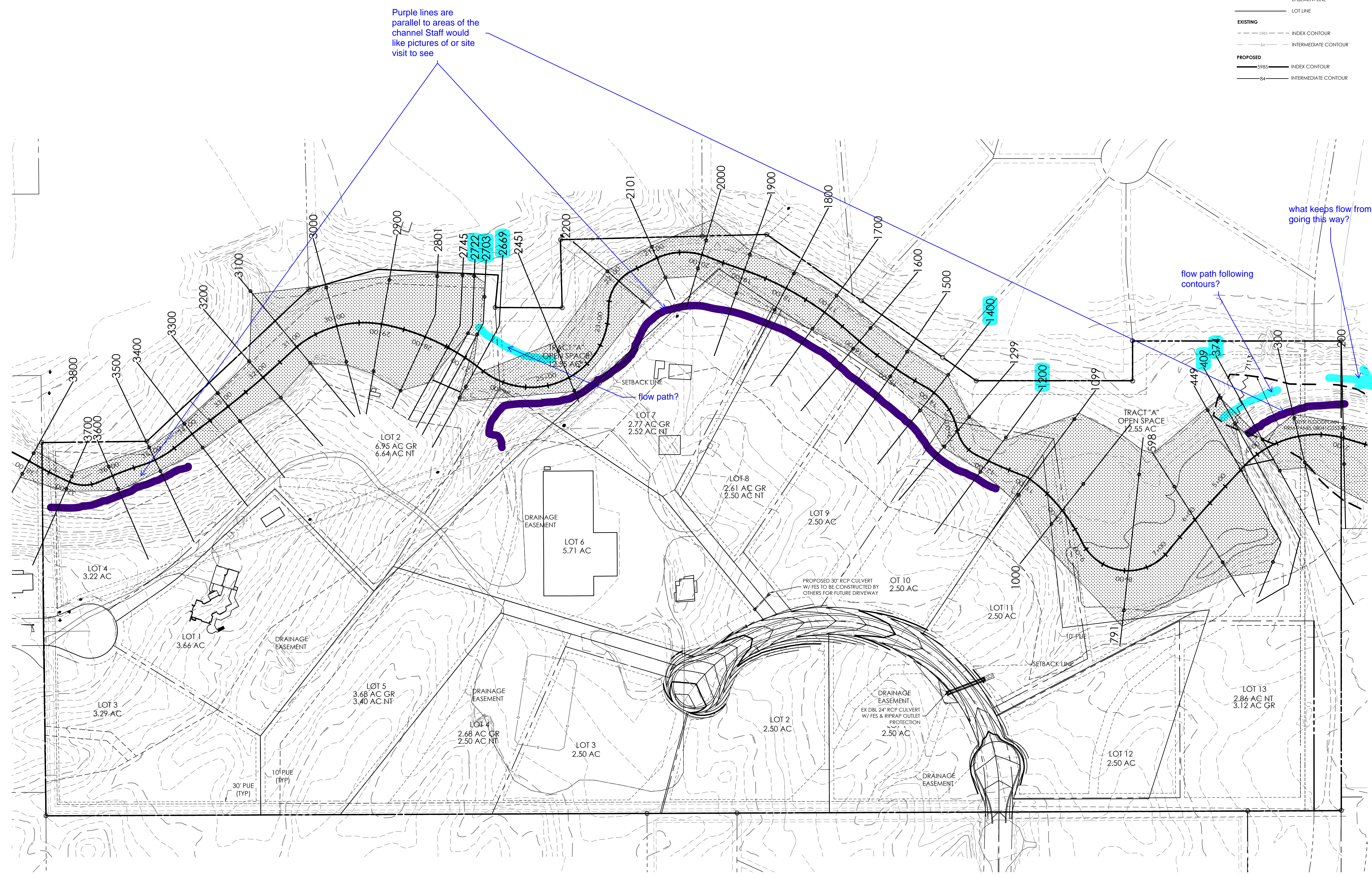
DESIGNED BY _____
 DRAWN BY _____
 CHECKED BY _____
 AS-BUILTS BY _____
 CHECKED BY _____

EAGLE RISING
 FILING NO.1

PROPOSED
 DRAINAGE MAP
 HECRAS SECTIONS

MVE PROJECT 61145
 MVE DRAWING DRN-MAP-HECRAS

NOVEMBER 15, 2022
 SHEET 1 OF 1



Purple lines are parallel to areas of the channel Staff would like pictures of or site visit to see

flow path?

flow path following contours?

what keeps flow from going this way?

LOT 1 3.66 AC
 LOT 2 6.95 AC GR 6.64 AC NT
 LOT 3 3.29 AC
 LOT 4 3.22 AC
 LOT 5 3.68 AC GR 3.40 AC NT
 LOT 6 5.71 AC
 LOT 7 2.77 AC GR 2.52 AC NT
 LOT 8 2.61 AC GR 2.50 AC NT
 LOT 9 2.50 AC
 LOT 10 2.50 AC
 LOT 11 2.50 AC
 LOT 12 2.50 AC
 LOT 13 2.86 AC NT 3.12 AC GR

TRACT "A" OPEN SPACE 2.55 AC

PROPOSED 30" RCP CULVERT W/ FES TO BE CONSTRUCTED BY OTHERS FOR FUTURE DRIVEWAY

DRAINAGE EASEMENT

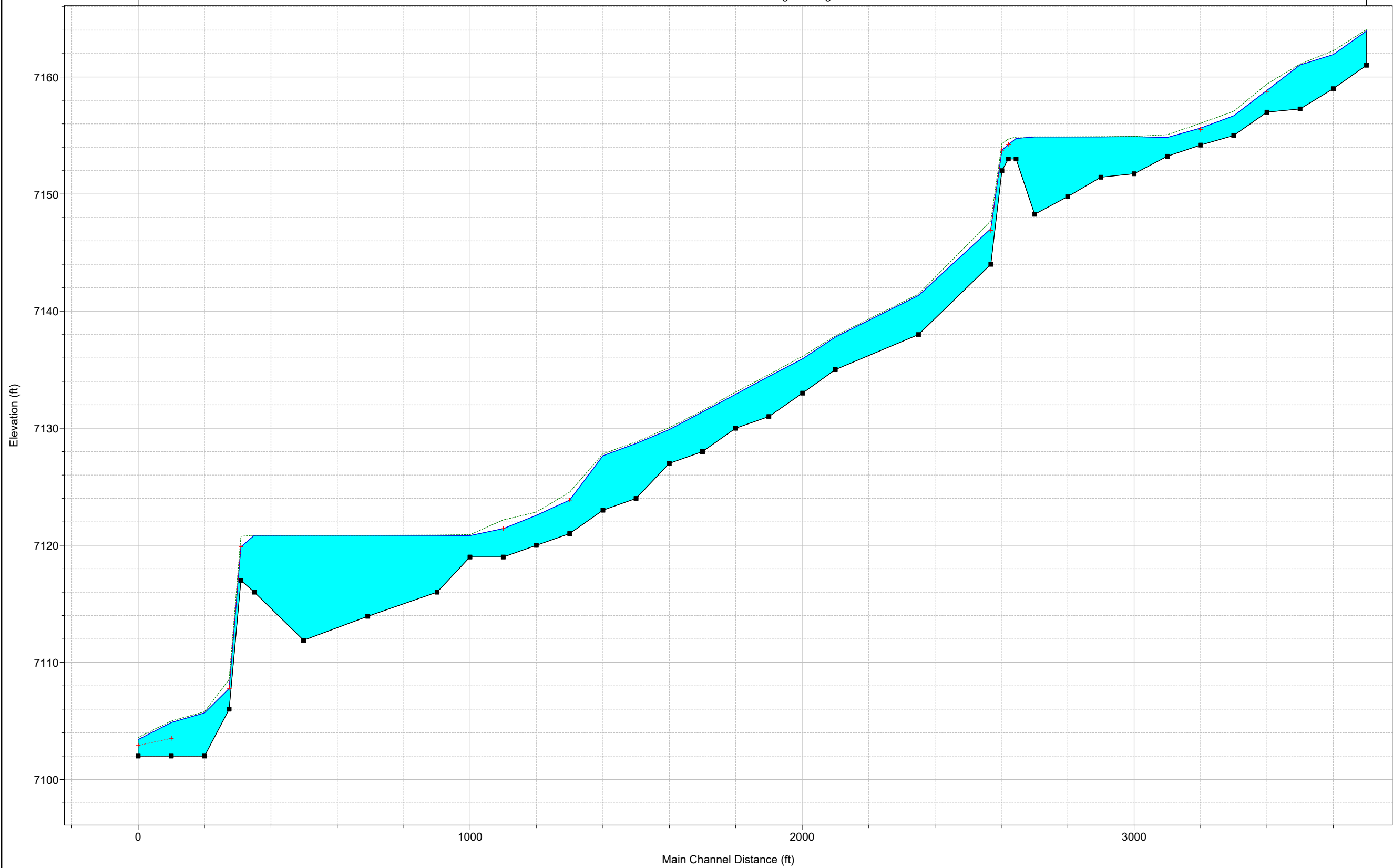
30' PUE (TYP)

10' PUE (TYP)

SETBACK LINE

INDEX CONTOUR

INTERMEDIATE CONTOUR



Legend

- EG PF# 1 - 100yr
- WS PF# 1 - 100yr
- Crit PF# 1 - 100yr
- Ground

HEC-RAS Plan: Default Scenario River: Cottonwood Creek Reach: Eagle Rising Profile: PF# 1 - 100yr

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Max Chl Dpth (ft)	Hydr Depth C (ft)	Flow Area (sq ft)	Top Width (ft)	Vel Chnl (ft/s)	Froude # Chl
Eagle Rising	3800	PF# 1 - 100yr	410.00	7161.00	7163.94		7164.05	0.012109	2.93	2.65	152.06	66.86	2.61	0.28
Eagle Rising	3700	PF# 1 - 100yr	410.00	7159.00	7161.92		7162.24	0.029305	2.92	2.66	94.28	44.14	4.03	0.44
Eagle Rising	3600	PF# 1 - 100yr	410.00	7157.27	7161.03		7161.10	0.005420	3.76	3.37	197.13	69.42	2.04	0.20
Eagle Rising	3500	PF# 1 - 100yr	470.00	7157.00	7158.86	7158.71	7159.40	0.142197	1.86	1.42	79.91	56.29	5.88	0.87
Eagle Rising	3400	PF# 1 - 100yr	470.00	7155.00	7156.69		7157.08	0.008872	1.69	1.40	95.16	72.07	5.01	0.75
Eagle Rising	3300	PF# 1 - 100yr	470.00	7154.18	7155.63	7155.51	7156.05	0.012276	1.45	1.15	91.65	81.96	5.17	0.85
Eagle Rising	3200	PF# 1 - 100yr	470.00	7153.23	7154.84		7155.08	0.007121	1.61	1.15	119.77	104.39	3.92	0.65
Eagle Rising	3100	PF# 1 - 100yr	470.00	7151.73	7154.90		7154.93	0.000309	3.17	2.01	396.65	199.43	1.19	0.15
Eagle Rising	3000	PF# 1 - 100yr	560.00	7151.44	7154.88		7154.90	0.000192	3.44	2.81	483.23	182.97	1.17	0.12
Eagle Rising	2900	PF# 1 - 100yr	560.00	7149.78	7154.88		7154.89	0.000055	5.10	3.67	755.95	219.29	0.75	0.07
Eagle Rising	2801	PF# 1 - 100yr	560.00	7148.27	7154.88		7154.88	0.000013	6.61	4.83	1300.80	274.98	0.43	0.03
Eagle Rising	2745	PF# 1 - 100yr	700.00	7153.00	7154.75		7154.87	0.002708	1.75	1.45	266.79	259.88	2.83	0.41
Eagle Rising	2722	PF# 1 - 100yr	700.00	7153.00	7154.21	7154.21	7154.70	0.017942	1.21	0.98	125.47	131.38	5.59	1.00
Eagle Rising	2703	PF# 1 - 100yr	700.00	7152.00	7153.75	7153.75	7154.31	0.015041	1.75	1.27	123.15	121.42	6.11	0.95
Eagle Rising	2669	PF# 1 - 100yr	700.00	7144.00	7147.04	7146.88	7147.72	0.065271	3.04	2.74	107.17	64.73	6.18	0.66
Eagle Rising	2451	PF# 1 - 100yr	700.00	7138.00	7141.34		7141.46	0.015438	3.34	2.48	247.56	116.63	2.81	0.32
Eagle Rising	2200	PF# 1 - 100yr	700.00	7135.00	7137.78		7137.89	0.013151	2.78	2.57	264.70	109.72	2.65	0.29
Eagle Rising	2101	PF# 1 - 100yr	750.00	7133.00	7135.93		7136.15	0.024330	2.93	2.71	201.29	78.09	3.73	0.40
Eagle Rising	2000	PF# 1 - 100yr	750.00	7131.00	7134.43		7134.58	0.010411	3.43	2.97	259.23	129.85	2.60	0.27
Eagle Rising	1900	PF# 1 - 100yr	820.00	7130.00	7132.90		7133.09	0.022089	2.90	2.47	239.09	109.97	3.36	0.38
Eagle Rising	1800	PF# 1 - 100yr	820.00	7128.00	7131.39		7131.52	0.011479	3.39	3.12	290.28	102.12	2.83	0.28
Eagle Rising	1700	PF# 1 - 100yr	820.00	7127.00	7129.89		7130.06	0.019219	2.89	2.72	246.73	95.07	3.33	0.36
Eagle Rising	1600	PF# 1 - 100yr	820.00	7124.00	7128.70		7128.84	0.008320	4.70	4.23	275.45	79.56	2.94	0.25
Eagle Rising	1500	PF# 1 - 100yr	820.00	7123.00	7127.65		7127.82	0.012667	4.65	3.63	251.47	79.41	3.27	0.30
Eagle Rising	1400	PF# 1 - 100yr	820.00	7121.00	7123.87	7123.87	7124.54	0.198074	2.87	1.31	124.73	95.26	6.57	1.01
Eagle Rising	1299	PF# 1 - 100yr	820.00	7120.00	7122.56		7122.84	0.003337	2.56	2.28	194.44	89.18	4.24	0.49
Eagle Rising	1200	PF# 1 - 100yr	820.00	7119.00	7121.42	7121.42	7122.17	0.015883	2.42	1.48	118.52	80.34	6.92	1.00
Eagle Rising	1099	PF# 1 - 100yr	820.00	7119.00	7120.83		7120.92	0.001638	1.83	1.64	352.73	239.24	2.39	0.33
Eagle Rising	1000	PF# 1 - 100yr	820.00	7116.00	7120.85		7120.87	0.000092	4.85	4.47	953.80	292.08	1.10	0.09
Eagle Rising	791	PF# 1 - 100yr	820.00	7113.94	7120.86		7120.86	0.000008	6.92	6.33	2085.37	391.40	0.42	0.03
Eagle Rising	598	PF# 1 - 100yr	820.00	7111.89	7120.86		7120.86	0.000007	8.97	7.92	2040.13	320.26	0.46	0.03
Eagle Rising	449	PF# 1 - 100yr	820.00	7116.00	7120.85		7120.86	0.000021	4.85	4.24	1621.77	408.30	0.51	0.04
Eagle Rising	409	PF# 1 - 100yr	820.00	7117.00	7119.88	7119.88	7120.77	0.015149	2.88	1.76	108.41	61.72	7.56	1.01
Eagle Rising	374	PF# 1 - 100yr	820.00	7106.00	7107.78	7107.78	7108.54	0.015803	1.78	1.52	116.74	76.83	7.02	1.00
Eagle Rising	300	PF# 1 - 100yr	820.00	7102.00	7105.69		7105.79	0.009663	3.69	3.03	320.21	120.06	2.54	0.26
Eagle Rising	200	PF# 1 - 100yr	820.00	7102.00	7104.87	7103.51	7105.00	0.006474	2.87	2.72	327.90	151.21	1.94	0.21
Eagle Rising	100	PF# 1 - 100yr	820.00	7102.00	7103.41	7102.91	7103.59	0.049853	1.41	1.37	240.78	180.32	3.41	0.51

Areas of concern are highlighted

NATURAL STREAMS			
Minor streams (top width at flood stage 100 ft)			
a. Streams on plain			
1. Clean, straight, full stage, no rifts or deep pools	0.025	0.030	0.033
2. Same as above, but more stones and weeds	0.030	0.035	0.040
3. Clean, winding, some pools and shoals	0.033	0.040	0.045
4. Same as above, but some weeds and stones	0.035	0.045	0.050
5. Same as above, lower stages, more ineffective slopes and sections	0.040	0.048	0.055
6. Same as 4, but more stones	0.045	0.050	0.060
7. Sluggish reaches, weedy, deep pools	0.050	0.070	0.080
8. Very weedy reaches, deep pools, or floodways with heavy stand of timber and underbrush	0.075	0.100	0.150

CHANNEL BOTTOM w/ DENSE BRUSH → USE 0.12

CHANNEL BOTTOM w/ GRASS & WEEDS → USE 0.035

OVERBANKS w/ WEEDS, STONES & TREES → USE 0.045

10. Report Maps

Reinstated Preliminary Plan

Figure 3-5 Existing City & County Land Use

Figure 3-6 Future City & County Land Use

Figure 4-7 Deficiencies Map

Existing (ON-SITE) Drainage Map

Developed (ON-SITE) Drainage Map

DEVELOPMENT NOTES:

- TRACT A - USE OPEN SPACE - TO BE PLACED INTO A CONSERVATION EASEMENT AND OWNED AND MAINTAINED BY HOME OWNERS ASSOCIATION OR OTHER ENTITY ACCEPTABLE TO BOTH THE APPLICANT AND THE BOARD OF COUNTY COMMISSIONERS.
- AREAS WITHIN PLATTED DRAINAGE EASEMENTS AND TRACT A SHALL BE A DRAINAGE & DRAINAGE MAINTENANCE ACCESS EASEMENT IN ITS ENTIRETY GRANTED TO EL PASO COUNTY. NO BUILDINGS, BUILDING PERMITS, WELLS OR SEPTIC SYSTEMS SHALL BE ALLOWED WITHIN THIS AREA.
- NO MOTORIZED TRAILS OR TRAIL EASEMENTS ARE INCLUDED WITHIN THIS APPLICATION.
- THE EAGLE WING DRIVE EXTENSION SHALL BE OWNED AND MAINTAINED BY THE HOME OWNERS ASSOCIATION. THE KURIE ROAD EXTENSION SHALL BE OWNED AND MAINTAINED BY EL PASO COUNTY. BOTH ROADWAY EXTENSIONS SHALL BE GRAVEL SURFACED AND DESIGNED AND CONSTRUCTED TO EL PASO COUNTY STANDARDS.
- WATER TO A CENTRAL DISTRIBUTION SYSTEM OWNED AND OPERATED BY THE PARK FOREST WATER DISTRICT. FIRE HYDRANTS TO BE PROVIDED WITH THE CENTRAL WATER DISTRIBUTION SYSTEM PER THE BLACK FOREST FIRE PROTECTION DISTRICT'S CODE AND SPECIFICATION REQUIREMENTS.
- WASTE WATER TO BE INDIVIDUAL ON SITE SEPTIC SYSTEMS.
- THIS PROPERTY IS LOCATED WITHIN AND SERVICED BY MOUNTAIN VIEW ELECTRIC ASSOCIATION SERVICE DISTRICT, THE BLACK FOREST FIRE DISTRICT, THE ACADEMY SCHOOL DISTRICT NO. 20 AND THE BLACK HILLS ENERGY CORPORATION SERVICE DISTRICT.
- MAXIMUM BUILDING HEIGHT - 35'
- BUILDING SETBACKS FOR FRONT, SIDE AND REAR YARDS - 25' UNLESS SHOWN OTHERWISE.
- STANDARD DRAINAGE AND UTILITY EASEMENTS: FRONT - 15', SIDE - 10', REAR - 10' AND PERIMETER 30'.
- PROPOSED METHOD OF GUARANTEEING FUNDS SHALL BE APPROVED BY AND ACCEPTABLE TO THE EL PASO COUNTY ATTORNEYS OFFICE.
- ALL RECORDED EASEMENTS WHOSE LOCATION CAN BE DEFINED ARE SHOWN ON THE PLAN. A UTILITY MAINTENANCE EASEMENT WHICH AFFECTS THE ENTIRE PROPERTY IS RECORDED IN BK 3873 PG 917 OF THE EL PASO COUNTY PUBLIC RECORDS.
- UTILITY LINES PROVIDING SERVICE TO EXISTING BUILDINGS AND FACILITIES MAY BE RELOCATED DEPENDING UPON FINAL UTILITY ENGINEERING PROVIDED BY INDIVIDUAL UTILITY COMPANIES.

STANDARD DSD PLAT NOTES

- THE FOLLOWING REPORTS HAVE BEEN SUBMITTED IN ASSOCIATION WITH THE PRELIMINARY PLAN FOR THIS SUBDIVISION AND ARE ON FILE AT THE COUNTY DEVELOPMENT SERVICES DEPARTMENT: TRANSPORTATION IMPACT STUDY; DRAINAGE REPORT; WATER RESOURCES REPORT; WASTEWATER DISPOSAL REPORT; GEOLOGY AND SOILS REPORT; FIRE PROTECTION REPORT; NATURAL FEATURES REPORT.
- ALL PROPERTY OWNERS ARE RESPONSIBLE FOR MAINTAINING PROPER STORM WATER DRAINAGE IN AND THROUGH THEIR PROPERTY. PUBLIC DRAINAGE EASEMENTS AS SPECIFICALLY NOTED ON THE PLAT SHALL BE MAINTAINED BY THE LOT OWNERS UNLESS OTHERWISE INDICATED. STRUCTURES, FENCES, MATERIALS OR LANDSCAPING THAT COULD IMPED THE FLOW OR RUNOFF SHALL NOT BE PLACED IN DRAINAGE EASEMENTS.
- DEVELOPER SHALL COMPLY WITH FEDERAL AND STATE LAWS, REGULATIONS, ORDINANCES, REVIEW AND PERMIT REQUIREMENTS, AND OTHER AGENCY REQUIREMENTS, IF ANY, OF APPLICABLE AGENCIES INCLUDING, BUT NOT LIMITED TO, THE COLORADO DIVISION OF WILDLIFE, COLORADO DEPARTMENT OF TRANSPORTATION, U.S. ARMY CORPS OF ENGINEERS AND THE U.S. FISH AND WILDLIFE SERVICE REGARDING THE ENDANGERED SPECIES ACT, PARTICULARLY AS RELATED TO THE LISTED SPECIES IDENTIFIED IN THE PROJECT'S ENVIRONMENTAL ASSESSMENT.
- NO DRIVEWAY SHALL BE ESTABLISHED UNLESS AN ACCESS PERMIT HAS BEEN GRANTED BY EL PASO COUNTY.
- MAILBOXES SHALL BE INSTALLED IN ACCORDANCE WITH EL PASO COUNTY AND US POSTAL SERVICE REGULATIONS.
- THE DEVELOPER SHALL BE RESPONSIBLE FOR THE FINAL DESIGN, CONSTRUCTION, AND MAINTENANCE OF PRIVATE DETENTION POND/WATER QUALITY BMP(S) AS DESCRIBED IN THE APPROVED PRELIMINARY/FINAL DRAINAGE REPORT FOR THIS SUBDIVISION. FINAL DESIGN, CONSTRUCTION DRAWINGS AND DRAINAGE REPORT UPDATES FOR THE DETENTION POND/WATER QUALITY BMP(S) SHALL BE PROVIDED WITH FINAL PLAT SUBMITTALS. THE DETENTION POND/WATER QUALITY BMP(S) SHALL BE CONSTRUCTED AND COMPLETED PRIOR TO THE ISSUANCE OF ANY BUILDING PERMITS.

GEOLOGIC HAZARDS NOTE:

PORTIONS OF THE FOLLOWING LOTS HAVE BEEN FOUND TO BE IMPACTED BY GEOLOGIC HAZARDS. MITIGATION MEASURES AND A MAP OF THE HAZARD AREA CAN BE FOUND IN THE SOILS, GEOLOGY, HAZARDS AND WASTE WATER STUDY FOR THE EAGLE RISING SUBDIVISION BY ENTECH ENGINEERING DATED 5/30/2012 AND 9/14/12 AND REVISED 1/9/23, IN COUNTY PLANNING AND

AREAS OF PONDED WATER: LOTS 3, 6, 11 & 16 (PORTIONS OF)
 AREAS OF POTENTIALLY SHALLOW GROUND WATER: LOTS 1, 7, 8, 9 & 10 (PORTIONS OF)
 AREAS OF SEASONALLY WET SOILS: LOTS 4, 5, 6, 9, 10, 11, 14, 15, 16 & 17 (PORTIONS OF)
 AREAS WHERE SEPTIC SYSTEMS ARE NOT RECOMMENDED: LOTS 3, 6, 7, 8, 9, 10, 11, 14, 15, 16 & 17 (PORTIONS OF)
 AREAS WHERE SHALLOW BEDROCK MAY REQUIRE ENGINEERED SEPTIC SYSTEMS: LOTS 3, 5, 8, 12 & 14 (PORTIONS OF)
 AREAS WHERE 30%+ SLOPES EXIST: LOT 17 (PORTIONS OF)

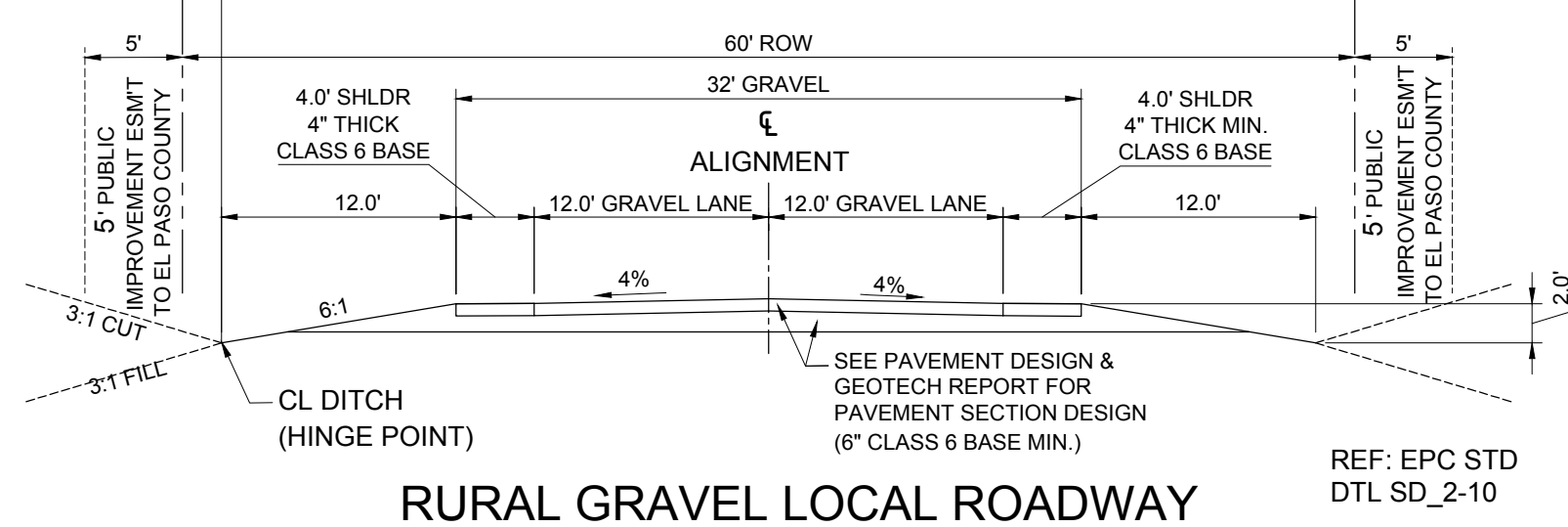
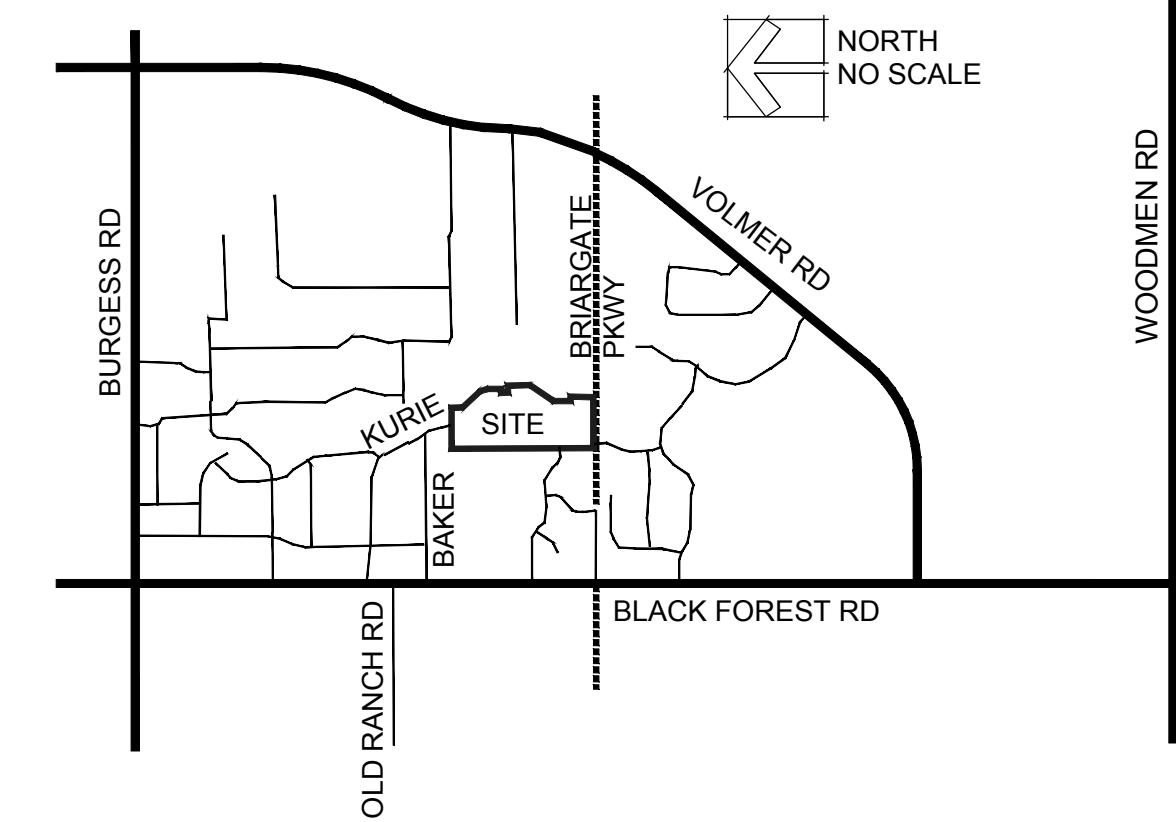
TYPICAL LINE SCHEDULE

- ① FRONT BLDG SETBACK AT 200' MIN. LOT WIDTH
- ② 25' BUILDING SETBACK
- ③ 15' FRONT UTILITY & DRAINAGE EASEMENT
- ④ 10' SIDE AND REAR UTILITY & DRAINAGE EASEMENT
- ⑤ 30' PERIMETER UTILITY & DRAINAGE EASEMENT
- ⑥ DRAINAGE EASEMENT WIDTH VARIES

PROPERTY OWNERS:

- CASAS LIMITED PARTNERSHIP #4
PO BOX 2076
COLORADO SPRINGS, CO 80901-2076
- IQ INVESTORS LLC
PO BOX 2076
COLORADO SPRINGS, CO 80901-2976
- DEVELOPER
MYPAD, INC.
- STEPHEN J. JACOBS, JR., PRESIDENT
PO BOX 2076
COLORADO SPRINGS, CO 80901-2976

VICINITY MAP

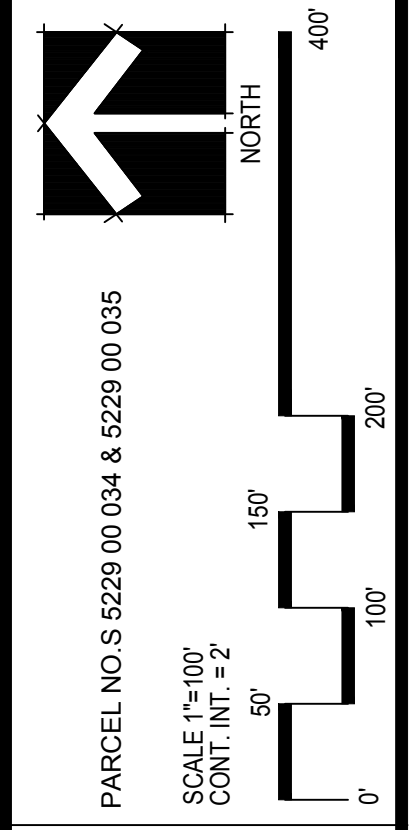
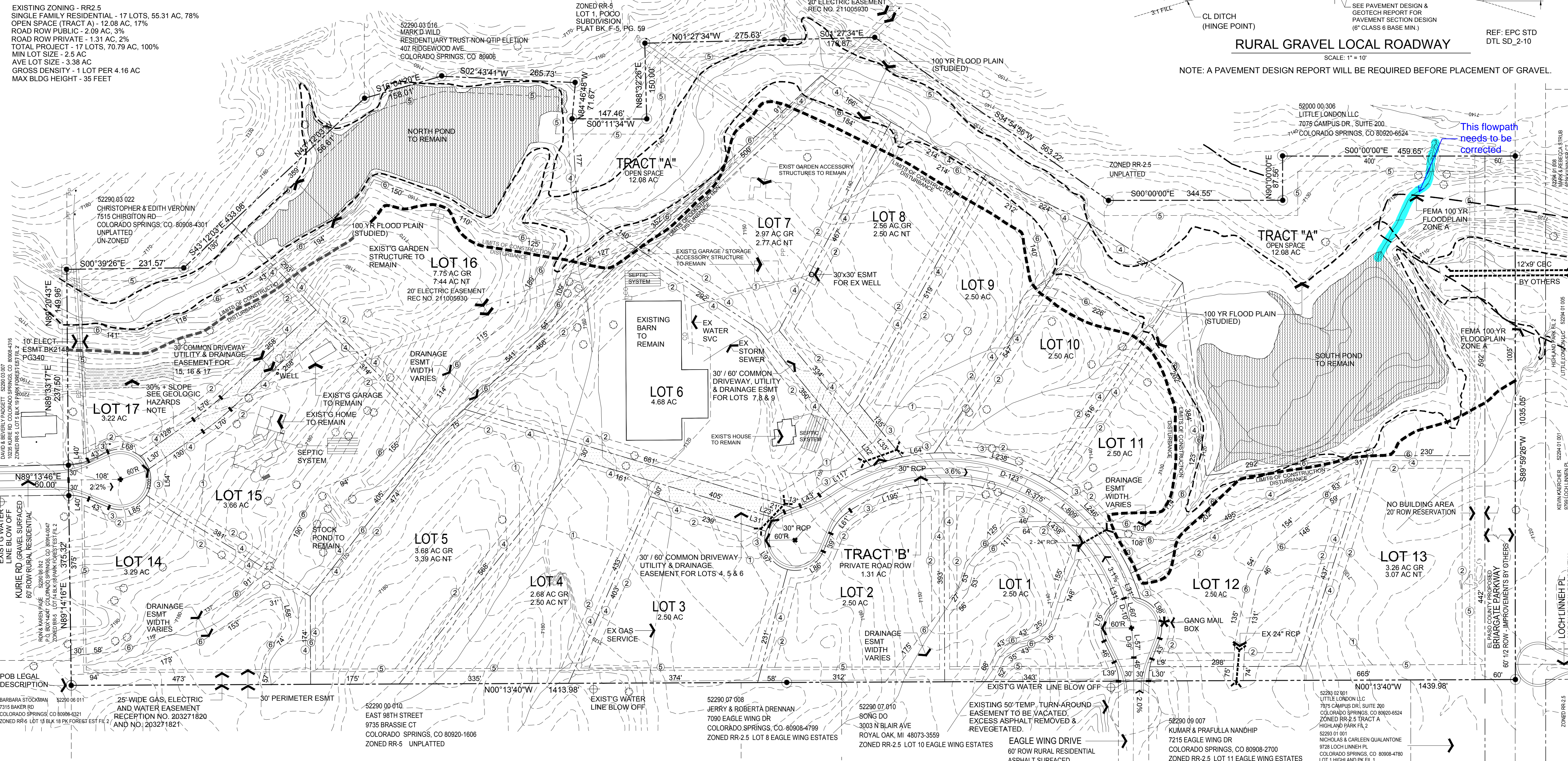


RURAL GRAVEL LOCAL ROADWAY

NOTE: A PAVEMENT DESIGN REPORT WILL BE REQUIRED BEFORE PLACEMENT OF GRAVEL.

DEVELOPMENT DATA -

- EXISTING ZONING - RR2.5
- SINGLE FAMILY RESIDENTIAL - 17 LOTS, 55.31 AC, 78%
- OPEN SPACE (TRACT A) - 12.08 AC, 17%
- ROAD ROW PUBLIC - 2.09 AC, 3%
- ROAD ROW PRIVATE - 1.31 AC, 2%
- TOTAL PROJECT - 17 LOTS, 70.79 AC, 100%
- MIN LOT SIZE - 2.5 AC
- AVE LOT SIZE - 3.38 AC
- GROSS DENSITY - 1 LOT PER 4.16 AC
- MAX BLDG HEIGHT - 35 FEET



LRA
LAND RESOURCE ASSOCIATES

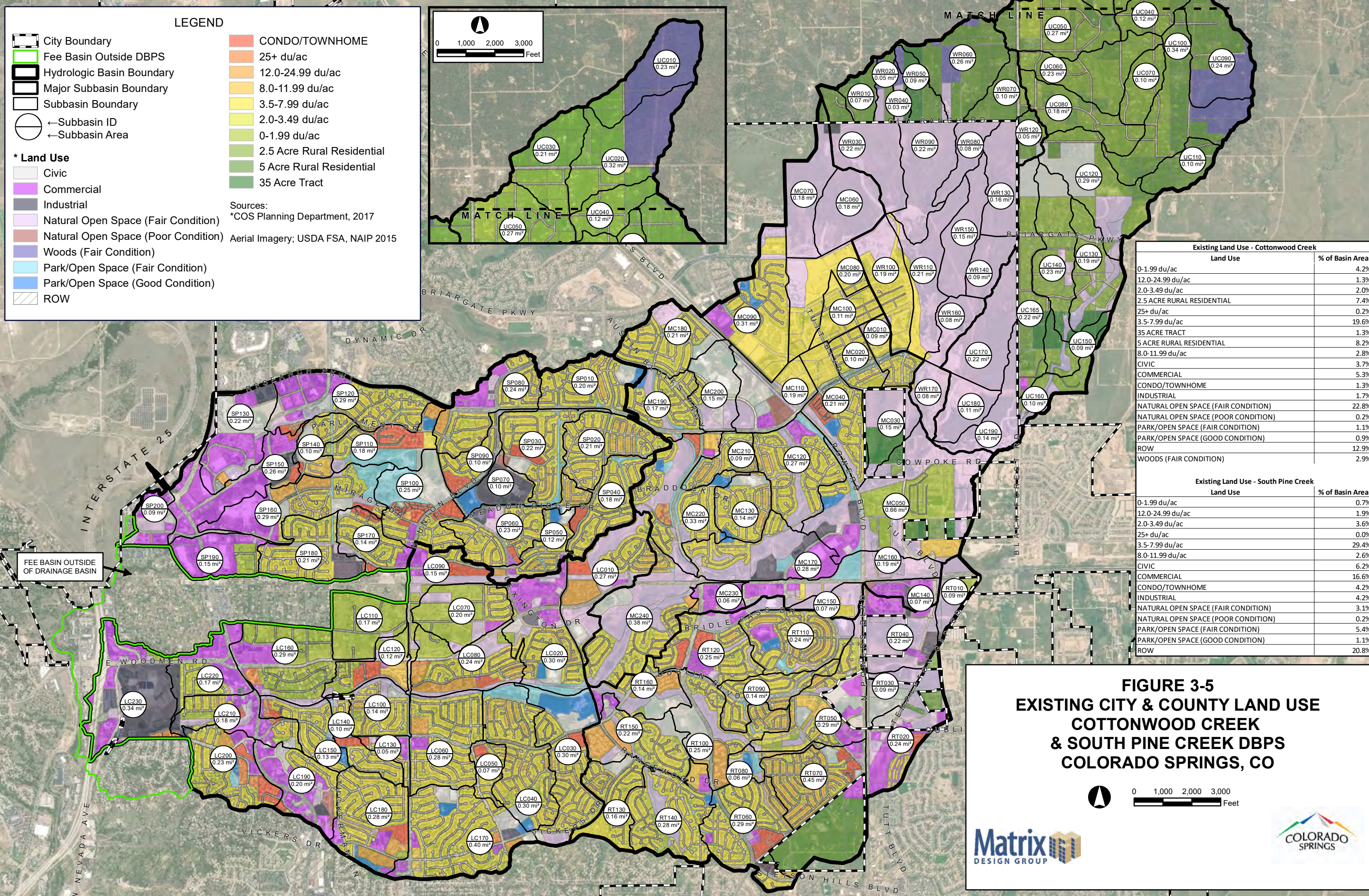
9735 MOUNTAIN RD.
CHIPITA PARK, CO 80809
719-684-2298

PRELIMINARY PLAN - REINSTATED
EAGLE RISING
CASAS LIMITED PARTNERSHIP #4
P.O. BOX 2076, COLORADO SPRINGS, CO 80901-2076

ISSUED FOR:
COUNTY REINSTATEMENT
DATE - DEC 08, 2022
project number
computer file
issue date
APRIL 16, 2022
drawn by
DFJ
checked by

revisions
JAN 06, 2023
JAN 13, 2023

sheet number
1
PCD PROJECT NUMBER
SP205



LEGEND

- City Boundary
- Fee Basin Outside DBPS
- Hydrologic Basin Boundary
- Major Subbasin Boundary
- Subbasin Boundary
- ← Subbasin ID
- ← Subbasin Area

*** Land Use**

- Civic
- Commercial
- Industrial
- Natural Open Space (Fair Condition)
- Natural Open Space (Poor Condition)
- Woods (Fair Condition)
- Park/Open Space (Fair Condition)
- Park/Open Space (Good Condition)
- ROW
- CONDO/TOWNHOME
- 25+ du/ac
- 12.0-24.99 du/ac
- 8.0-11.99 du/ac
- 3.5-7.99 du/ac
- 2.0-3.49 du/ac
- 0-1.99 du/ac
- 2.5 Acre Rural Residential
- 5 Acre Rural Residential
- 35 Acre Tract

Sources:
 *COS Planning Department, 2017
 Aerial Imagery; USDA FSA, NAIP 2015

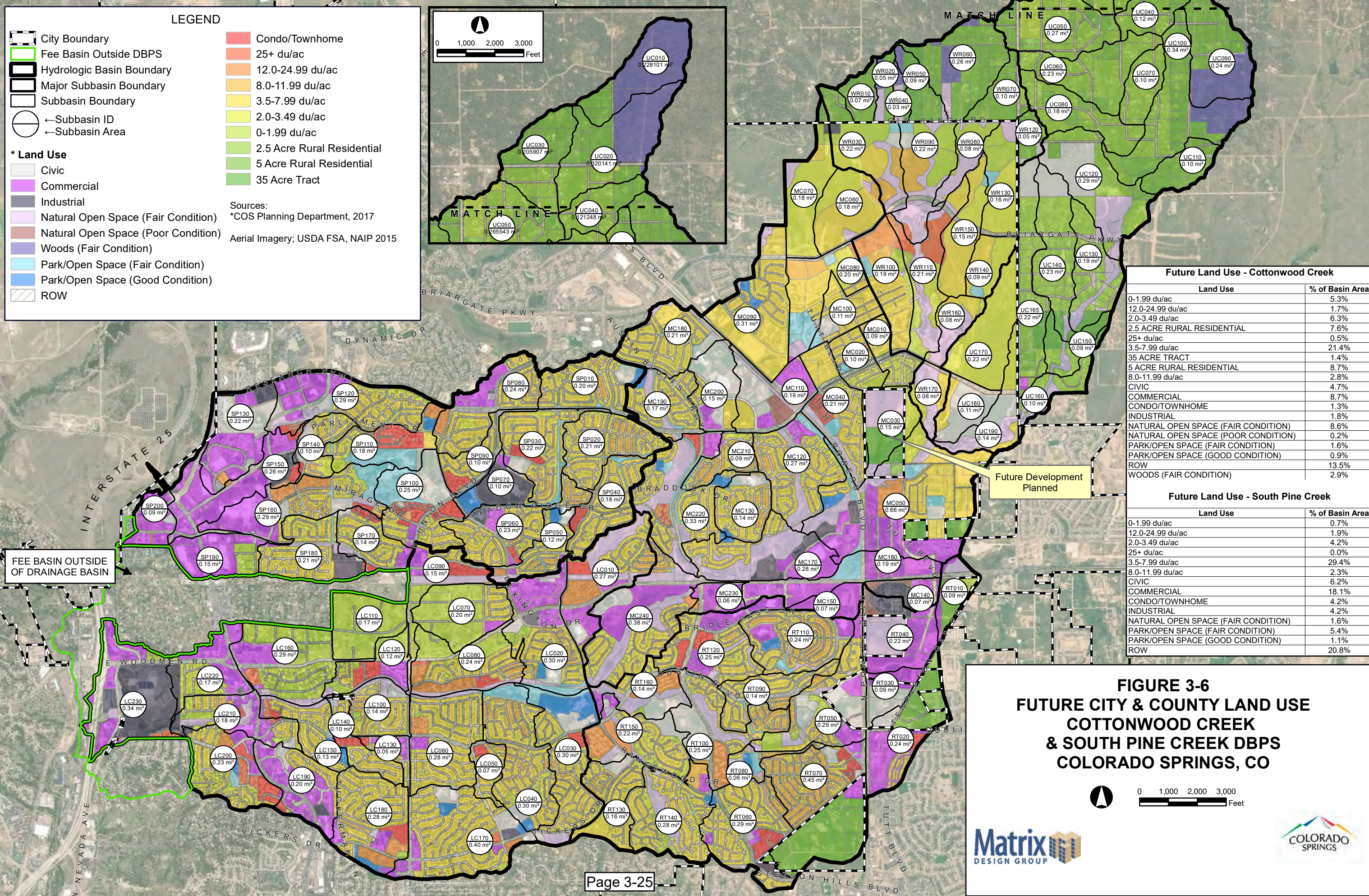
Existing Land Use - Cottonwood Creek		
Land Use	Area (mi ²)	% of Basin Area
0-1.99 du/ac	0.23	4.2%
12.0-24.99 du/ac	0.18	1.3%
2.0-3.49 du/ac	0.23	2.0%
2.5 ACRE RURAL RESIDENTIAL	0.29	7.4%
25+ du/ac	0.22	0.2%
3.5-7.99 du/ac	0.18	19.6%
35 ACRE TRACT	0.09	1.3%
5 ACRE RURAL RESIDENTIAL	0.22	8.2%
8.0-11.99 du/ac	0.10	2.8%
CIVIC	0.22	3.7%
COMMERCIAL	0.18	5.3%
CONDO/TOWNHOME	0.23	1.3%
INDUSTRIAL	0.11	1.7%
NATURAL OPEN SPACE (FAIR CONDITION)	0.21	22.8%
NATURAL OPEN SPACE (POOR CONDITION)	0.11	0.2%
PARK/OPEN SPACE (FAIR CONDITION)	0.14	1.1%
PARK/OPEN SPACE (GOOD CONDITION)	0.10	0.9%
ROW	0.29	12.9%
WOODS (FAIR CONDITION)	0.15	2.9%

Existing Land Use - South Pine Creek		
Land Use	Area (mi ²)	% of Basin Area
0-1.99 du/ac	0.15	0.7%
12.0-24.99 du/ac	0.21	1.9%
2.0-3.49 du/ac	0.23	3.6%
25+ du/ac	0.10	0.0%
3.5-7.99 du/ac	0.23	29.4%
8.0-11.99 du/ac	0.15	2.6%
CIVIC	0.21	6.2%
COMMERCIAL	0.15	16.6%
CONDO/TOWNHOME	0.09	4.2%
INDUSTRIAL	0.07	4.2%
NATURAL OPEN SPACE (FAIR CONDITION)	0.17	3.1%
NATURAL OPEN SPACE (POOR CONDITION)	0.06	0.2%
PARK/OPEN SPACE (FAIR CONDITION)	0.14	5.4%
PARK/OPEN SPACE (GOOD CONDITION)	0.09	1.1%
ROW	0.24	20.8%

**FIGURE 3-5
 EXISTING CITY & COUNTY LAND USE
 COTTONWOOD CREEK
 & SOUTH PINE CREEK DBPS
 COLORADO SPRINGS, CO**

0 1,000 2,000 3,000 Feet

FILE: G:\gis_projects\Cottonwood_Creek_DBPs_2017\active\maps\DBPs_Report\Figure_3-5_CottonwoodCreek_Land_Use_Existing_20190530.mxd, 5/20/2019, Draw: Phillips



LEGEND

- City Boundary
- Fee Basin Outside DBPS
- Hydrologic Basin Boundary
- Major Subbasin Boundary
- Subbasin Boundary
- ← Subbasin ID
- ← Subbasin Area

*** Land Use**

- Civic
- Commercial
- Industrial
- Natural Open Space (Fair Condition)
- Natural Open Space (Poor Condition)
- Woods (Fair Condition)
- Park/Open Space (Fair Condition)
- Park/Open Space (Good Condition)
- ROW

- Condo/Townhome
- 25+ du/ac
- 12.0-24.99 du/ac
- 8.0-11.99 du/ac
- 3.5-7.99 du/ac
- 2.0-3.49 du/ac
- 0-1.99 du/ac
- 2.5 Acre Rural Residential
- 5 Acre Rural Residential
- 35 Acre Tract

Sources:
 *COS Planning Department, 2017
 Aerial Imagery; USDA FSA, NAIP 2015

0 1,000 2,000 3,000
 Feet

Future Land Use - Cottonwood Creek

Land Use	% of Basin Area
0-1.99 du/ac	5.3%
12.0-24.99 du/ac	1.7%
2.0-3.49 du/ac	6.3%
2.5 ACRE RURAL RESIDENTIAL	7.6%
25+ du/ac	0.5%
3.5-7.99 du/ac	21.4%
35 ACRE TRACT	1.4%
5 ACRE RURAL RESIDENTIAL	8.7%
8.0-11.99 du/ac	2.8%
CIVIC	4.7%
COMMERCIAL	8.7%
CONDO/TOWNHOME	1.3%
INDUSTRIAL	1.8%
NATURAL OPEN SPACE (FAIR CONDITION)	8.6%
NATURAL OPEN SPACE (POOR CONDITION)	0.2%
PARK/OPEN SPACE (FAIR CONDITION)	1.6%
PARK/OPEN SPACE (GOOD CONDITION)	0.9%
ROW	13.5%
WOODS (FAIR CONDITION)	2.9%

Future Land Use - South Pine Creek

Land Use	% of Basin Area
0-1.99 du/ac	0.7%
12.0-24.99 du/ac	1.9%
2.0-3.49 du/ac	4.2%
25+ du/ac	0.0%
3.5-7.99 du/ac	29.4%
8.0-11.99 du/ac	2.3%
CIVIC	6.2%
COMMERCIAL	18.1%
CONDO/TOWNHOME	4.2%
INDUSTRIAL	4.2%
NATURAL OPEN SPACE (FAIR CONDITION)	1.6%
PARK/OPEN SPACE (FAIR CONDITION)	5.4%
PARK/OPEN SPACE (GOOD CONDITION)	1.1%
ROW	20.8%

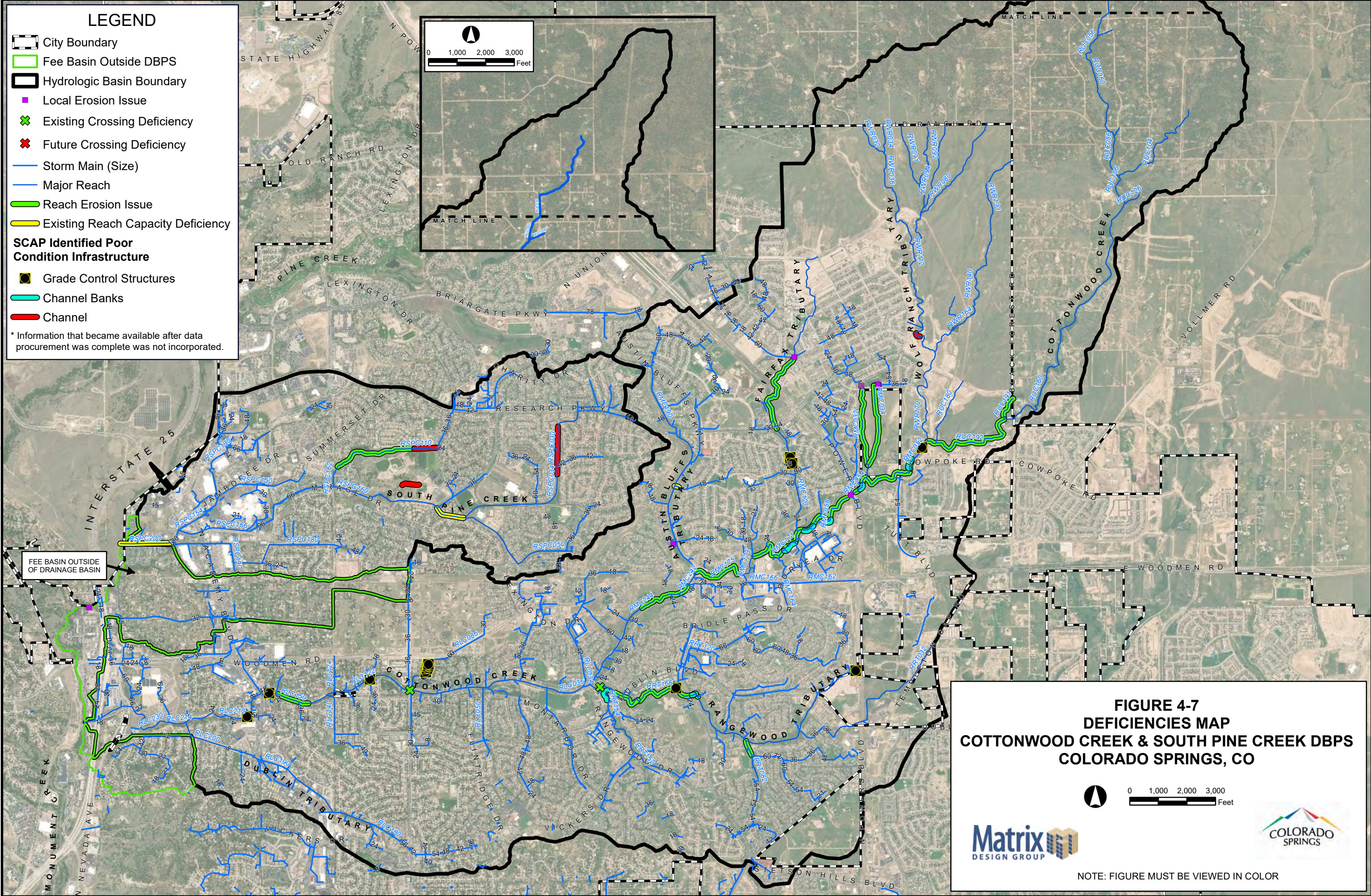
**FIGURE 3-6
 FUTURE CITY & COUNTY LAND USE
 COTTONWOOD CREEK
 & SOUTH PINE CREEK DBPS
 COLORADO SPRINGS, CO**

0 1,000 2,000 3,000
 Feet

Matrix
 DESIGN GROUP

COLORADO SPRINGS

FILE: G:\proj\GIS\Cottonwood_Creek_DBPs_2017\active\MapDBPs_Report\Figure_3_6_CottonwoodCreek_Land_Use_Future_20190530.mxd, 5/30/2019, Drew_Phillips



LEGEND

- City Boundary
- Fee Basin Outside DBPS
- Hydrologic Basin Boundary
- Local Erosion Issue
- Existing Crossing Deficiency
- Future Crossing Deficiency
- Storm Main (Size)
- Major Reach
- Reach Erosion Issue
- Existing Reach Capacity Deficiency

SCAP Identified Poor Condition Infrastructure

- Grade Control Structures
- Channel Banks
- Channel

* Information that became available after data procurement was complete was not incorporated.

FIGURE 4-7 DEFICIENCIES MAP COTTONWOOD CREEK & SOUTH PINE CREEK DBPS COLORADO SPRINGS, CO

Matrix
DESIGN GROUP

COLORADO SPRINGS

NOTE: FIGURE MUST BE VIEWED IN COLOR

FILE G:\gis_projects\Cottonwood_Creek_DBPS_2017\active\map\DBPS_Report\Figure_4.7_CottonwoodCree_e.dwg 4/11/2019 jpf.dwt

Also provide a plan showing the surrounding offsite sub-basins (can use M&S plan previously provided)

Provide excerpts from the DBPS showing these flows

OFF-SITE DRAINAGE BASIN SUMMARY TABLE					
DESIGN POINT	INCLUDED BASINS	AREA (AC)	Tc (MIN)	RUNOFF	
				Q5	Q100
4	OS-B1A	24.9	19.1	9.2	52.2
5	OS-B1B	41.0	21.2	11.9	76.7
E7	OS-B1C	1.8	12.9	0.6	4.0
E8	OS-B1D	6.0	16.9	1.6	11.8
E10	OS-B1E	10.1	17.8	3.1	20.5
E11	OS-B3A	9.1	15.2	3.8	21.3
E13	OS-B3B	2.5	13.5	1.1	6.2
E15	OS-B3C	5.95	15.5	2.5	13.9
1-M&S*	A6, A7, A10	285.6	77.7	76.2	135.6
2-M&S*	A11	76.1	31.7	35.7	63.6
3-M&S*	A12	76.2	31.7	71.5	127.3
4-M&S*	OS-B4A	5.2	12.1	5.9	14.1
5-M&S*	OS-B4B	8.1	11.8	9.3	22.2
6-M&S*	OS-B4C	13.4	18.3	12.7	30.1

*DATA FOR THE MARKED FLOWS ARE FROM EAGLE RISING FILING NO. 1, APPROVED PRELIMINARY DRAINAGE REPORT, 2013 BY M&S CIVIL CONSULTANTS, INC.

ON-SITE DRAINAGE BASIN SUMMARY TABLE					
DESIGN POINT	INCLUDED BASINS	AREA (AC)	Tc (MIN)	RUNOFF	
				Q5	Q100
EX-A1	EX-A1	4.95	13.5	1.5	10.7
EX-A2	EX-A2	1.74	12.1	0.5	3.9
EX-B	EX-B	4.35	12.7	1.9	10.4
EX-C	EX-C	1.66	11.9	0.5	3.8
EX-D	EX-D	7.10	13.1	3.3	16.9
EX-E1	EX-E1	3.41	13.1	3.5	10.4
EX-E2	EX-E2	7.77	16.3	4.7	18.6
EX-F1	EX-F1	6.45	13.8	9.8	23.0
EX-F2	EX-F2	2.02	13.5	0.6	4.4
EX-G	EX-G	2.98	14.1	1.0	6.5
EX-H	EX-H	4.10	13.8	2.2	10.0
EX-I	EX-I	1.64	12.3	1.1	4.4
EX-J	EX-J	2.42	11.7	1.3	6.3
EX-K	EX-K	2.65	10.8	0.9	6.3
EX-L	EX-L	2.14	12.4	0.7	4.8
EX-M	EX-M	4.10	14.9	1.4	8.8

ON-SITE DESIGN POINTS					
DESIGN POINT	INCLUDED BASINS	AREA (AC)	Tc (MIN)	RUNOFF	
				Q5	Q100
DP6	OS-B1A, OS-B1B, EX-B, EX-C	71.87	22.3	22.0	134.1
DP6A	OS-B1C, EX-E1	5.25	17.9	3.6	12.6
DP6B	DP6, EX-D	78.97	19.1	23.5	141.5
DP6C	DP6A, DP6B	84.22	19.1	26.6	152.3
DP7	OS-B1D, EX-F1	12.48	20.4	9.7	30.2
DP8	EX-E2	7.77	16.3	4.7	18.6
DP8A	OS-B1E, OS-B3A, EX-H, EX-I	24.92	19.5	9.2	50.8
DP9	OS-B1D, EX-F1, EX-F2	14.50	22.8	9.7	32.0
DP10	EX-G	2.98	14.1	1.0	6.5
DP11	OS-B3B, EX-M	6.60	18.1	2.3	13.5
DP12	OS-B1E, OS-B3A, EX-H, EX-I, EX-J	27.34	21.2	9.8	53.6
DP13	OS-B3C, EX-L	8.09	17.2	2.9	17.4

DATA FROM COTTONWOOD CREEK 2019 DBPS			
DESIGN POINT	AREA (SQ MI)	RUNOFF	
		Q5	Q100
82	1.48	58	410
84	1.66	69	470
102	1.9	76	560
104	2.24	95	700
124	2.34	100	750
126	2.63	120	820

LEGEND

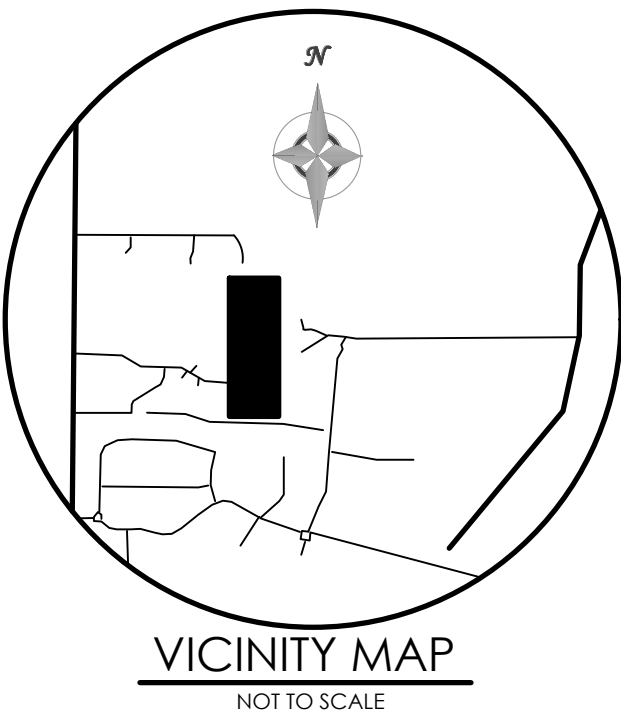
PROPERTY LINE
EASEMENT LINE
LOT LINE

EXISTING
INDEX CONTOUR
INTERMEDIATE CONTOUR
BASIN BOUNDARY
TIME OF CONCENTRATION
100 YEAR STORM WATER FLOOD LEVEL
GENERAL FLOW/DIRECTION
SLOPE DIRECTION AND GRADE
BASIN LABEL
AREA IN ACRES
PERCENT IMPERVIOUS

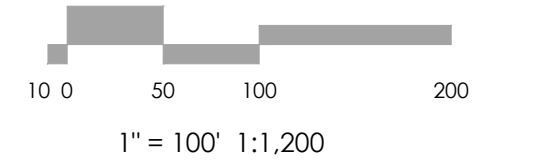
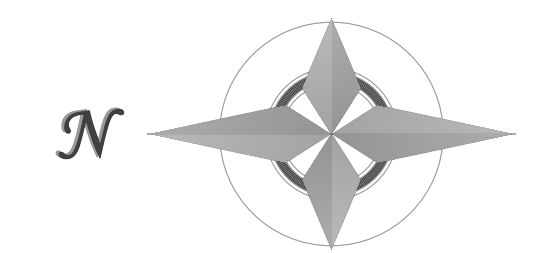
DESIGN POINT
COTTONWOOD CREEK
DBPS DESIGN POINT

M&S DESIGN POINT

PROPOSED
INDEX CONTOUR
INTERMEDIATE CONTOUR



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ENGINEERS, SURVEYORS

1903 Leary Street, Suite 200 Colorado Springs, CO 80909 719.635.5736

REVISIONS

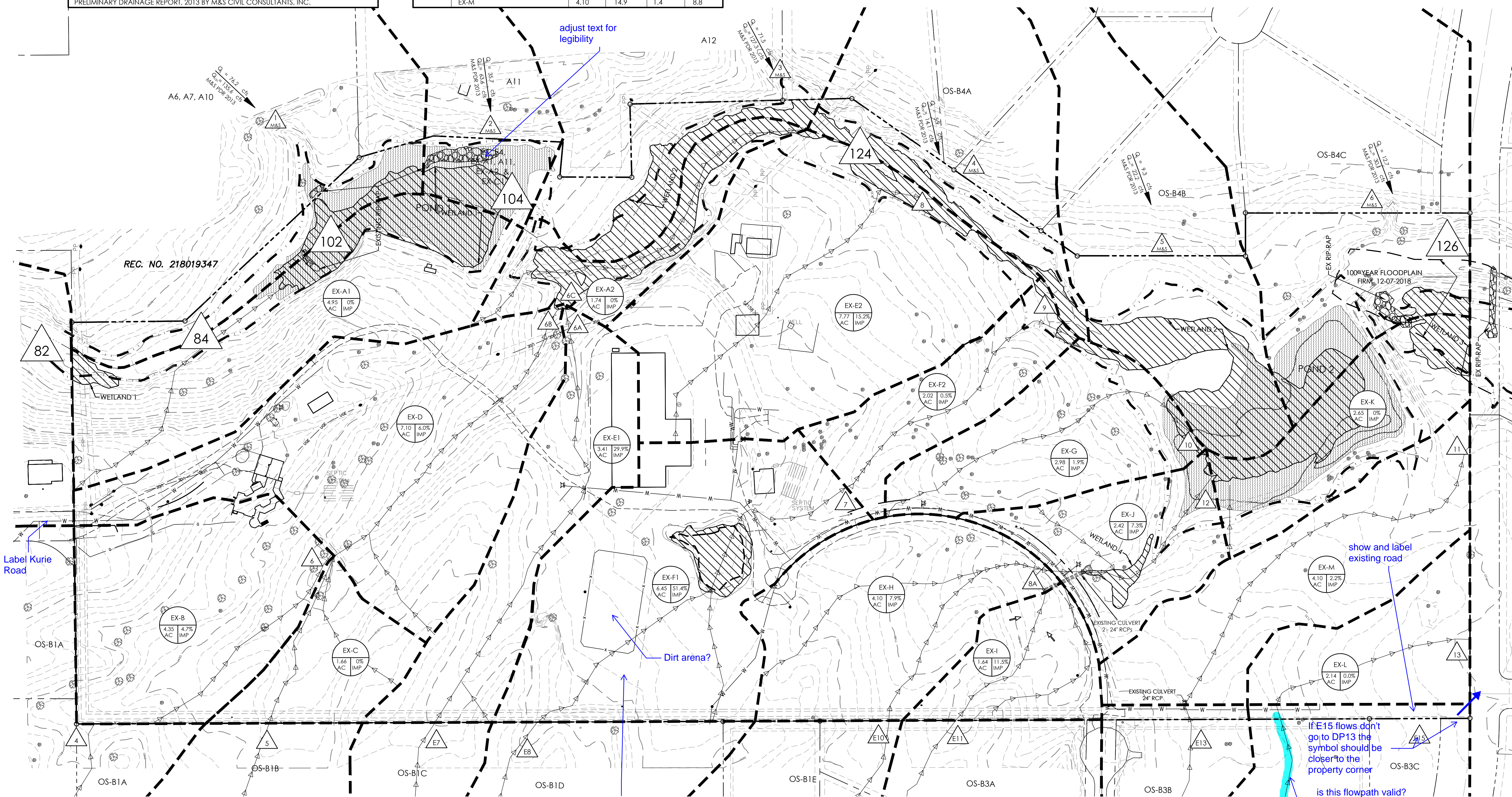
DESIGNED BY
DRAWN BY
CHECKED BY
AS-BUILTS BY
CHECKED BY

EAGLE RISING
PRELIMINARY PLAT

EXISTING
(ON - SITE)
DRAINAGE MAP

MVE PROJECT 61145
MVE DRAWING DRN-MAP-EX

JANUARY 4, 2023
SHEET 1 OF 1



Label Kurie Road

adjust text for legibility

Dirt arena?

show and label existing road

if E15 flows don't go to DP13 the symbol should be closer to the property corner

is this flowpath valid? provide basin information if so

Show and label dirt stockpiles

OFF-SITE DRAINAGE BASIN SUMMARY TABLE

DESIGN POINT	INCLUDED BASINS	AREA (AC)	Tc (MIN)	RUNOFF	
				Q5	Q100
4	OS-B1A	24.9	19.1	9.2	52.2
5	OS-B1B	41.0	21.2	11.9	76.7
E7	OS-B1C	1.8	12.9	0.6	4.0
E8	OS-B1D	6.0	16.9	1.6	11.8
E10	OS-B1E	10.1	17.8	3.1	20.5
E11	OS-B3A	9.1	15.2	3.8	21.3
E13	OS-B3B	2.5	13.5	1.1	6.2
E15	OS-B3C	5.95	15.5	2.5	13.9
1-M&S*	A6, A7, A10	285.6	77.7	76.2	135.6
2-M&S*	A11	76.1	31.7	35.7	63.6
3-M&S*	A12	76.2	31.7	71.5	127.3
4-M&S*	OS-B4A	5.2	12.1	5.9	14.1
5-M&S*	OS-B4B	8.1	11.8	9.3	22.2
6-M&S*	OS-B4C	13.4	18.3	12.7	30.1

*DATA FOR THE MARKED FLOWS ARE FROM EAGLE RISING FILING NO. 1, APPROVED PRELIMINARY DRAINAGE REPORT, 2013 BY M&S CIVIL CONSULTANTS, INC.

ON-SITE BASINS

DESIGN POINT	INCLUDED BASINS	AREA (AC)	Tc (MIN)	RUNOFF	
				Q5	Q100
A1		4.95	13.5	2.3	11.7
A2		1.74	12.1	0.5	3.9
B		4.35	12.5	2.4	11.1
C		1.66	11.9	0.7	4.0
D		7.10	12.8	3.9	17.7
E1		3.41	13.6	2.8	9.5
E2		7.77	16.3	5.3	19.2
F1		6.45	13.8	5.3	17.8
F2		2.02	13.5	1.1	5.0
G		2.98	13.7	1.5	7.2
H		4.10	13.8	2.9	10.9
I		1.64	12.0	1.3	4.7
J		2.42	11.2	1.8	6.9
K		2.65	10.8	0.9	6.3
L		2.14	12.4	1.1	5.4
M		4.10	14.9	1.9	9.4

ON-SITE DESIGN POINTS

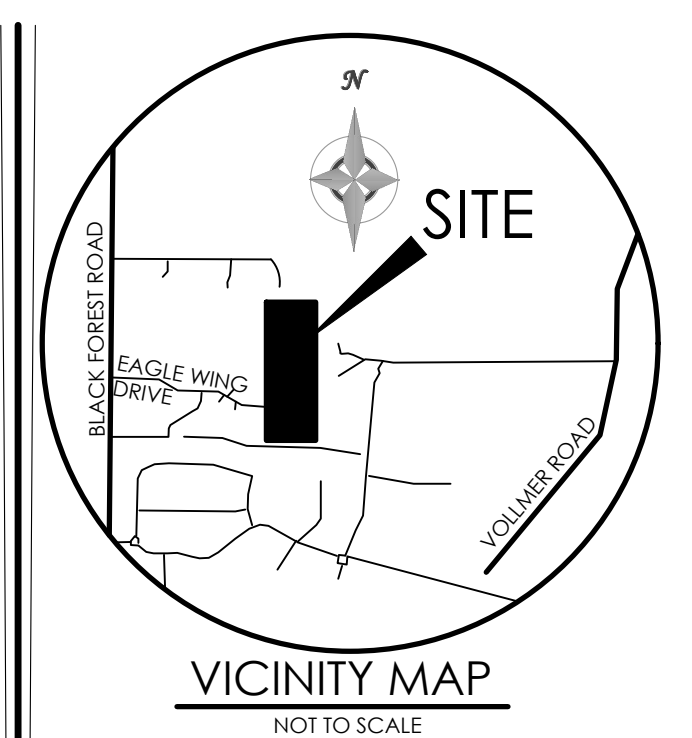
DESIGN POINT	INCLUDED BASINS	AREA (AC)	Tc (MIN)	RUNOFF	
				Q5	Q100
DP6	OS-B1A, OS-B1B, B, C	71.87	22.3	22.5	134.7
DP6A	OS-B1C, E1	5.25	17.9	3.0	12.0
DP6B	DP6, D	78.97	19.1	24.4	142.6
DP6C	DP6A, DP6B	84.22	19.1	27.0	152.9
DP7	OS-B1D, F1	12.48	20.4	5.9	25.8
DP8	E2	7.77	16.3	5.3	19.2
DP8A	OS-B1E, OS-B3A, H, I	24.92	19.5	10.0	51.8
DP9	OS-B1D, F1, F2	14.50	22.8	6.4	28.3
DP10	G	2.98	13.7	1.5	7.2
DP11	OS-B3B, M	6.60	18.1	2.7	14.1
DP12	OS-B1E, OS-B3A, H, I, J	27.34	21.2	11.0	55.1
DP13	OS-B3C, L	8.09	17.2	3.4	18.0

DATA FROM COTTONWOOD CREEK 2019 DBPS

DESIGN POINT	AREA (SQ MI)	RUNOFF	
		Q5	Q100
82	1.48	58	410
84	1.66	69	470
102	1.9	76	560
104	2.24	95	700
124	2.34	100	750
126	2.63	120	820

LEGEND

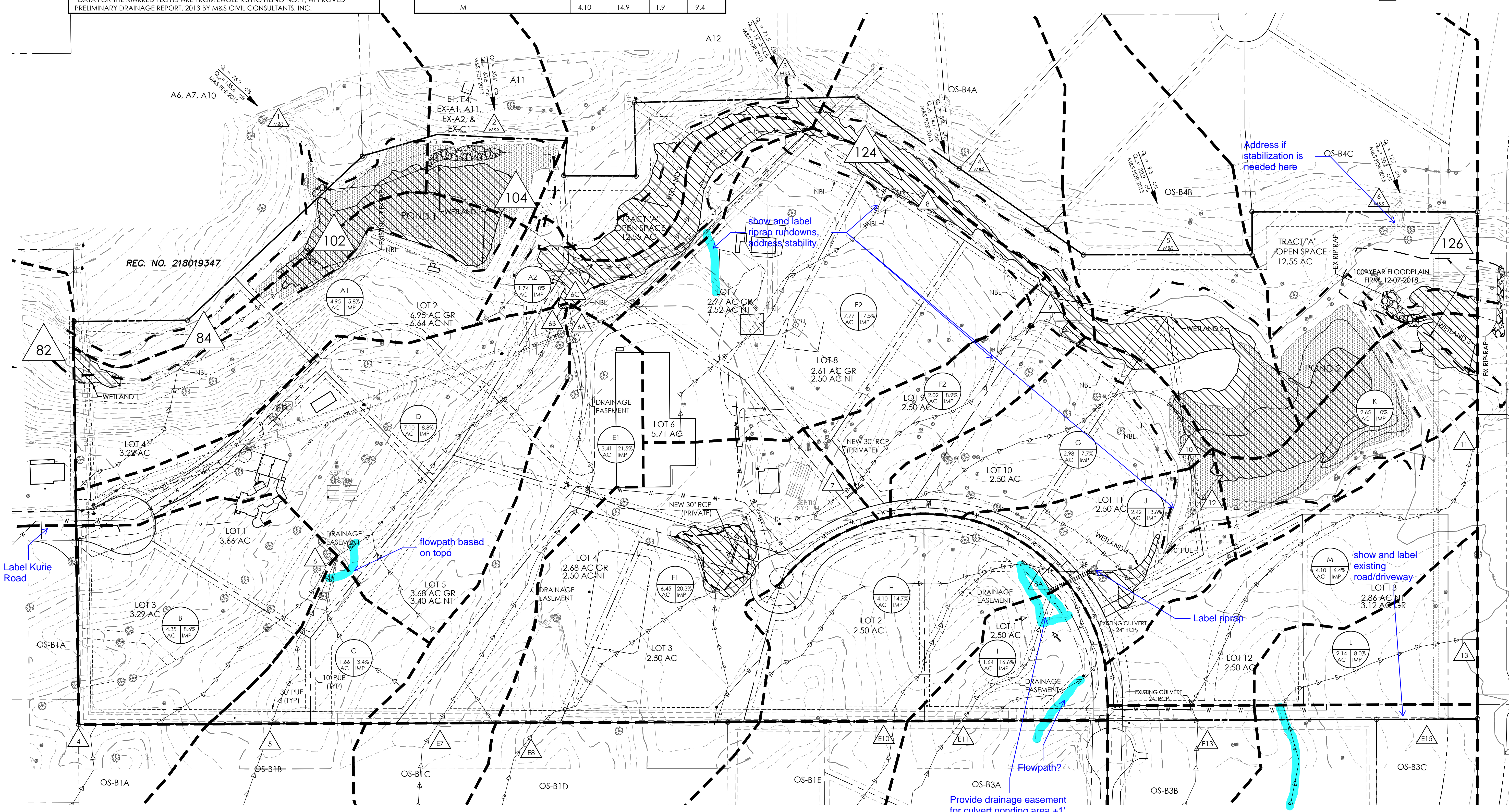
- PROPERTY LINE
- EASEMENT LINE
- LOT LINE
- NBL NO BUILD LIMIT LINE
- EXISTING INDEX CONTOUR
- PROPOSED INDEX CONTOUR
- INTERMEDIATE CONTOUR
- BASIN BOUNDARY
- TIME OF CONCENTRATION
- 100 YEAR STORM WATER FLOOD LEVEL
- GENERAL FLOW/DIRECTION
- SLOPE DIRECTION AND GRADE
- BASIN LABEL
- AREA IN ACRES
- PERCENT IMPERVIOUS
- DESIGN POINT
- COTTONWOOD CREEK DBPS DESIGN POINT
- M&S DESIGN POINT



BENCHMARK

MVE, INC.
ENGINEERS, SURVEYORS

1903 Leary Street, Suite 300 Colorado Springs, CO 80909 719.635.5736



REVISIONS

DESIGNED BY _____
DRAWN BY _____
CHECKED BY _____
AS-BUILTS BY _____
CHECKED BY _____

EAGLE RISING
PRELIMINARY PLAT

DEVELOPED
(ON - SITE)
DRAINAGE MAP

MVE PROJECT 61145
MVE DRAWING DRN-MAP-DEV

JANUARY 4, 2023
SHEET 1 OF 1