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Master Development Drainage Plan / Preliminary Drainage Report

Eagle Rising

Project No. 61145

January 4, 2024

PCD File No.: SP205

Master Development Drainage Plan / Preliminary Drainage Report

For

Eagle Rising

Project No. 61145

January 4, 2024

Prepared for

MyPad, Inc., Casas Limited Partnership #4, and IQ Investors, LLC
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Prepared by

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Statements and Acknowledgments

Engineer's Statement

The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by the County for drainage reports and said report is in conformity with the applicable master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors, or omissions on my part in preparing this report.

1/4/24

01/04/2024

Charles C. Crum, P.E. Colorado No. 13348 Date
For and on Behalf of M.V.E., Inc.

Developer/Owner Statements

We, the developer and owners have read and will comply with all of the requirements specified in this drainage report and plan.

1/5/24

Stephen J. Jacobs, Jr., President of My Pad, Inc., Developer Date
MyPad, Inc. is the General Partner of Casas Limited Partnership #4, Owner
P.O. Box 2076
Colorado Springs, CO 80901

1/5/24

Stephen J. Jacobs, M.D., President of SESMAR Corp. Date
SESMAR Corp. is the Manager of IQ Investors, LLC, Owner
P.O. Box 2076
Colorado Springs, CO 80901

El Paso County

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

Joshua Palmer, P.E. Date
County Engineer / ECM Administrator

Conditions:

Contents

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 as presented on the Reinstated Eagle Rising Preliminary Plan. The development project is a residential subdivision with seventeen (17) 2.5± acre lots, and three (3) 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 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 70.8+/- acre Eagle Rising project site is situated east of Black Forest Road north of Highland Park subdivision filing No. 2. The site currently has two assigned addresses of 10195 Kurie Road and 7495 Eagle Wing Drive. 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 8, 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, Lots 135 & 136 are vacant, all lots are zoned RR-2.5 and 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 south 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 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 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 in this report. No build areas are shown on the Preliminary Plan for Eagle Rising which include the 100-year inundated area as determined in the hydraulic analyses together

[1] WSS
[2] OSD

with the 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 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 which combines with Fountain Creek near downtown Colorado Springs. The last Drainage Basin Planning Study of Cottonwood Creek (DBPS) approved by El Paso County was dated 1994. The Cottonwood Creek Drainage Basin Planning Study Final Report[4] (DBPS), July 2019, prepared by Matrix Design Group, adopted by the City of Colorado Springs, 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 on Cottonwood Creek as it flows towards Monument Creek. The site is 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 affect 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.

[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 in compliance with the current Drainage Design Criteria used for the preparation of this report.

The 1994 Cottonwood Creek Drainage Basin Planning Study was prepared by URS Consultants and is the current county adopted study for the watershed. However, the flowrates cited in the study affecting the creek through the site are outdated. This study referenced the 2019 Cottonwood Creek Drainage Basin Planning Study by Matrix Design Group for flowrates within the creek.

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 is 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 Survey[9], and existing topographic data by M & S Civil Consultants and proposed layout by Land Resource Associates.

3.2. Hydrologic Criteria

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

[5] 2015 PDR
[6] DCM Section 4.3 and Section 4.4
[7] CS DCM Vol 1
[8] CS DCM Vol 2
[9] WSS

calculations, as the development and all sub-basins are less than 130 acres in area. “Colorado Springs Rainfall Intensity Duration Frequency” curves, Figure 6-5 in the DCM, was used to obtain the design rainfall values; a copy is included in the **Appendix**. The “Overland (Initial) Flow Equation” (Eq. 6-8) in the DCM, and Manning's equation with estimated depths were used in time of concentration calculations. “Runoff Coefficients for Rational Method”, Table 6-6 in the DCM, was utilized as a guide in estimating runoff coefficient and Percent Impervious values; a copy is included in the **Appendix**. Peak runoff discharges were calculated for each drainage sub-basin for both the 5-year storm event and the 100-year storm event with the Rational Method formula, (Eq. 6-5) in the DCM.[10]

Peak flows for Cotton wood Creek are accepted from the DBPS and calculated using SCS Unit Hydrograph Method in accordance with the DCM.

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 three (3) 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 up-stream 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

[10] DCM

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 existence and use of the for the ponds are established by court Decree. Colorado District Court, Water Division No. 2 consents to the presence of the existing ponds located on Cottonwood Creek within the Eagle Rising Site as indicated int the water court decree for Case Number 2014CW3010. Said decree is included in the appendix. Furthermore, the Colorado Division of Water Resources, Office of the State Engineer has reviewed the Eagle Rising project at least twice in the recent past (previous review letters attached). The state engineer's office made no objection to either the court's findings concerning the existing ponds or to the physical presence of the existing ponds. "

There are two existing single-family residences, a large barn, and several ancillary buildings present on the site. Existing gravel roadways provide access. There is no evidence of severe erosion or degradation of the existing natural channel. However, it has been mentioned by the previous owner that the existing ponds have 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 Entech Engineering, Inc recommendations, monitoring and testing. Pursuant to past recommendations in the Soil, Geology, Geologic Hazard Study[11] 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 2.5h:1v 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 through 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.

[11] SGS

Wetland areas are defined in the 'Water Resource Assessment for Eagle Rising Subdivision'[12], prepared by ERO Resources Corporation, Denver, CO and dated June 13, 2023, which 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 notification and approval by U.S. Army 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 existing conditions of the creek are documented in this report with photos which are included in the Appendix along with a key map for locating the photos relative to the creek. The existing creek reach through the property includes mature and established willow and grass vegetation, two ponds, boulder grade control structures, boulder bank stabilization, and wetland vegetation located within the creek. The wetlands were most likely established after the construction of Ponds 1 & 2 during the 1950's. The ponds help attenuate the stormwater flows in Cottonwood Creek which most likely aided in the growth of the wetlands. Also, the ponds are constructed in a manner that make them capable to retain the stored water over longer periods of time which most likely provides ground water that extends downstream and promotes growth of the wetlands. The existing boulder grade structures in Cottonwood Creek at the lower and upper ends of the site complete a system that supports established wetlands providing natural aesthetic qualities, wildlife habitat, erosion control, and pollutant removal. No plans or details for the grade control structures were found in past records, however, the structures exist in good condition and are shown to be effective.

The upstream existing land use and future land use is 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

[12] WRA

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 (Q5=58 cfs, Q100=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 Mannings n (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 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 structure (no details for grade structures were found in past records) 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.

Just to the east of **DP 102** is an existing rip–rap grade structure (no details for grade structures were found in past records) 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 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 riprap construction at time of final plat in this spillway area to adequately convey the storm water overflows.

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.

Design Point 124 (DP 124) storm water flows (Q5=100 cfs, Q100=700 cfs) are generated from **DP 104** plus adjacent Upper Cottonwood (UC) sub-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 Manning's 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 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.

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 analyzed 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), and Natural Open Space (Fair Condition).

Design Point 5 (DP 5) storm water flows (Q5=11.9 cfs, Q100=76.7 cfs) are generated from off-site basin OS-B1B consisting of 41.0 acres. This sub-basin has been analyzed 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).

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 Rising 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 Rising 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 Rising 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 Rising 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 Rising 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 (Q5=12.7 cfs, Q100=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. The entire 12.7 cfs / 30.1 cfs flow generated by this basin are not concentrated at the existing ravine located near the east property line, but rather are distributed along the east boundary. A portion of the flows that formerly entered the ravine are now directed south to an offsite channel and pipe that delivers flows to Cottonwood Creek at a location south of the site. These improvements were installed as part of the development of neighboring Highland Park Filing No. 3. The ravine bottom is stable and vegetated with dense and mature brush and grasses. No further stabilization is required.

ON-SITE DESIGN POINTS

Design Point 6 (DP 6) storm water flows (Q5=22.0 cfs, Q100=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 (Q5=3.6 cfs, Q100=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 (Q5=23.5 cfs, Q100=141.5 cfs) are generated from on-site **DP 6** 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 (Q5=26.6 cfs, Q100=152.3 cfs) are generated from on-site **DP 6A** 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 (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. These storm water flows are included in the Cottonwood Creek channel **Design Points.**

Design Point 7 (DP 7) storm water flows (Q5=9.7 cfs, Q100=30.2 cfs) are generated from off-site **DP 8** 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, an arena, and Natural Open Space (Fair Condition).

Design Point 8 (DP 8) 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). DP 8A flows are conveyed under said gravel road by 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 E7** 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). These storm water 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 Pond 2 and Cottonwood Creek and are included in the Cottonwood Creek channel storm water flows**.**

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. The summation of these flows at **DP 13** flow overland across the Eagle Rising southern boundary and eventually will enter Cottonwood Creek.

4.2.2. Developed Hydrologic Conditions

The proposed Eagle Rising development entails the establishment of new large-lot single -family residential home sites that will bring the total number of residences on the site to 17. The characteristics of the on-site drainage basins are modified in the developed condition analysis to account for the new development which causes slight, but negligible increases in local peak flow rates inside the subdivision. Peak flow rates in Cottonwood Creek are not affected by the development due to proximity to the creek and the presence of significant watershed area upstream of the site. The cited DBPS considered the Eagle Rising site to be developed in the establishment of flowrates for Cottonwood Creek. Developed drainage basin and design point peak flow rates are presented below.

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 new & current El Paso Drainage Criteria. 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. 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 new hydraulic analysis indicates that in consideration of the established vegetation with high roughness coefficients, flow velocities and Froude numbers are within acceptable ranges for all locations except at the pond spillways. Field inspection of Cottonwood Creek noted no signs of channel erosion. Existing vegetation stabilizes the channel and there are no signs of erosion and channel degradation. Any required channel stabilization would damage and remove existing channel stabilizing vegetation. Also, as previously discussed, Ponds 1 & 2, existing grade control structures & bank stabilization with the existing wetlands provide the beneficial features of providing natural aesthetic qualities, wildlife habitat, erosion control, and pollutant removal. 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 extended downstream and promoted growth of the wetlands. The Cottonwood Creek channel within the area designated as the "Reinstated Preliminary Plan" for Eagle Rising is a stabilizing feature for the creek and supports the existing wetlands and the beneficial features and functions of a wetlands channel. Furthermore, U.S. Army Corps of Engineers (USACE) staff viewed the site and cottonwood creek on April 27, 2023. Based on the site visit, USACE staff verbally recommended that the creek not be disturbed.

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 storm water levels for the Lots that are impacted in the Eagle Rising Reinstated Preliminary Plan.

The impact of the creek on the proposed lots is inundation by 100-year flows. The impacted areas are encompassed in a no-build area consisting of the 100-year storm water inundation area plus the adjacent area determined by adding 2 vertical feet to the 100-year water surface elevation as calculated. The No Build Limit Line is shown on the "Reinstated Preliminary Plan" for Eagle Rising and more than encompasses the area inundated by the 100-year storm water level. Potential Geologic Hazards also included within the no-build area of the creek include floodplain, ponded water, seasonal shallow ground water, potentially seasonal shallow groundwater and downslope creep.

Existing Ponds 1 & 2 are not used for storm water 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 for detention on the channel even though this is not required for the Eagle Rising Development project. Flow attenuation effects of the ponds are not considered in the engineering analysis. Owner/Developer will elect the lots size fee reduction as provided in the Drainage Criteria Manual.

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.

A drainage easement is proposed for the existing swale between **DP 4 and** basin B with storm water flows of Q5=11.6 cfs, Q100=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 Q5=12.6 cfs, Q100=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. 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 proposed for this Reach.

Design Point 6A (DP 6A) storm water flows (Q5=3.0 cfs, Q100=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 Q5 and by 0.6 cfs for Q100. 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. Riprap needs to be added to existing drainage swale. Detail is included in the Appendix.

Design Point 6B (DP 6B) storm water flows (Q5=24.4 cfs, Q100=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 Q5 and by 1.1 cfs for Q100. 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 (Q5=27.0 cfs, Q100=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 Q5 and by 0.6 cfs for Q100. 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. Stabilization is not needed at this outfall point.

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 is 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.**

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. Currently the exact location of the driveway culverts is 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 be revegetated by developer 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 drainageway, 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. The existing riprap will remain in place.

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 the design point 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. The existing 2 - 24" R.C. Pipes are adequate, and the 100-year storm water flows will not overtop the private drive.

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 0.5 cfs for Q5 and by 0.7 cfs for Q100. These are negligible decreases for the developed condition and are close to the existing conditions. No detention of storm water 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 to these Reaches. Existing riprap at the culvert outlet is stabilized and no erosion is occurring downstream of the outlet.

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.

4.2.3. Erosion Control

The only public infrastructure construction to be associated with this subdivision is the Eagle Wing Drive turnaround and Kurie Road and will require temporary construction best management practices (BMP's). The BMPs for the Eagle Wing Drive turnaround 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 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.

4.2.4. Hydraulic Analysis

The Hydraulic Analysis of Cottonwood Creek in this report is prepared with cross sectional and longitudinal slope data from the topographic mapping of the project. Longitudinal slopes for the project reach range between 1% to 2%, except behind pond embankments and pond emergency spillways where they are milder or steeper. Ignoring the emergency spillways, the average slope is 1.2%. Manning's roughness coefficients are estimated using the Composite Roughness procedure and values selected from Table 10-1 of the DCM Volume 1 based on field observation of actual conditions. The majority of the project reach is well vegetated with mature willows, brush, trees and native grasses. These areas are assigned Manning's n value of 0.155. The areas better characterized as native grasses or cattails are assigned Manning's n of 0.069. All overbank areas have a mixture of native grasses, brush and trees with shallower flow depths. The overbank areas are assigned a Manning's n value of 0.075 throughout the reach. Standard expansion and contraction coefficients of 0.1 and 0.3 are utilized. Peak 100-year flow rates for the analysis are taken from the referenced 2019 DBPS. Flow rates in the creek range from 410 cfs at the upstream end to 820 cfs at the downstream end.

Resulting flow depths in Cottonwood Creek for the 100-year rainfall event generally range between 2 to 4 feet with depths up to 9 feet at locations immediately upstream of the pond embankments. Ignoring the ponding areas, flow depths in the creek average 3.1 feet. Channel flow velocities range from 0.4 fps to 4.5 fps, except at the pond emergency spillway where they are higher. The average flow velocity in the reach is 2.3 fps. Froude Numbers range from 0.03 to 0.42, except at the pond emergency spillways where they are higher. The average Froude Number for the reach is 0.30. The pond emergency spillways either have existing riprap protection installed as noted in this report or will have it installed at the time of filing the plat for Eagle Rising Filing No. 2 since the creek and ponds are included in the land parcel set aside for Filing No. 2. Velocities and Froude Numbers are compliant with DCM criteria for allowance of natural vegetative linings. Additional information concerning the specific types of vegetation present in this reach of Cottonwood Creek would extend allowable velocities in this reach in accordance with a Deviation Request for the vegetative lining consisting of willows and grasses that are not addressed in the DCM, but present at the site. Details and analysis of Cottonwood Creek hydraulic conditions will also be provided with the applicable Final Drainage Report.

4.2.5. Allowable Hydraulic Parameters

The DCM provides that concrete, riprap, or soil cement linings as approved by the City/County shall be used where channel bottom velocities exceed 6.0 ft/sec. Grass lined channels shall not be used where velocity exceeds permissible velocities in Table 10-4 or the Froude number is greater than 0.9 for the 100-year storm. Table 10-4 does not account for the type of vegetation present in the creek throughout the project reach. Alternatively, M.V.E., Inc. recommends the allowable velocities for willow staking and native grasses as included in the Appendix of this report. Long Native Grasses have permissible velocities of 4 fps to 6 fps, while Live Willow Stakes have permissible velocities of up to 10 fps. Allowable Shear stresses are also noted in the cited sources of up to 3.10 lbs. per sf. Certain locations exceed 3.10 lbs. per sf. However, these locations also have velocities and Froude Number that complies with the DCM. Furthermore, the actual vegetation on the site is well established and exhibits dense growth. The existing plants possess stabilizing characteristics far beyond those of recent plant stakings. Although the hydraulic analysis of the creek reach indicates acceptable velocities in accordance with the DCM, except at pond spillways, a Deviation Request is submitted in support of the higher allowable velocities for the specific type of creek vegetation found at the site.

The Cottonwood Creek channel within the area designated as the “Reinstated Preliminary Plan” for Eagle Rising contains two constructed ponds with stabilized embankments that have created wetland conditions within the creek that provides natural aesthetic qualities, wildlife habitat, erosion control, and pollutant removal. The two ponds constitute stabilizing features and provide the added benefits of supporting wetland vegetation and controlling flow rates in the creek under most conditions. The existing pond spillway at DP 104 will require riprap installation at time of final plat as noted on the Drainage Plan to protect the spillway during storm water overflows from the pond to the downstream creek drainageway. The Spillway at DP 126 has existing riprap in place and no further installation is required. The ponds have withstood repeated significantly sized rainfall events throughout decades of existence.

The creek bed, wetland areas and riparian overstory of Cottonwood Creek throughout the site are well vegetated native grasses, brush and trees as illustrated by the photos contained in the appendix of this report. The Natural Resources Assessment by ERO Resources Corporation lists the various plants found. The ERO report also contains photographic documentation of the plants and site conditions. Wetland areas feature native grasses such as Nebraska Sedge, Baltic Rush, Redtop and Broadleaf Cattail. The wetlands also contain mature, dense and well-established willows which serve to anchor the soil of the creek bed throughout the site. Specific willow species include Sandbar Willow, Strapleaf Willow, Park Willow and Shining Willow. The riparian overstory is described as containing Peachleaf Willow and Plains Cottonwood trees. Shrubs present in the riparian corridor through the site include Snowberry, Wood’s Rose, Golden Current, and Chokecherry. All these species act together to preserve the existing creek alignment and grades that are observed at the site and documented by photographic evidence.

Supplemental information concerning permissible velocities and permissible shear stresses for channel lining materials is included in the appendix. The information includes suggested permissible values for the native grasses, willows and trees that grow in the project reach. Live willow stakes are included and listed to have permissible velocities of 3 to 10 f/sec with permissible shear stress of 2.10 to 3.10 lbs/sf. However, the supplemental information assumes that the vegetation is newly planted, as in Reed Plantings, Hardwood Tree Plantings and Live Willow Stakes. In this case, the vegetative cover throughout the site is not plantings or stakes, but well established, robust and dense cover that has served to stabilize the creek bed and banks. The upper end of the permissible value range applies in this project reach.

4.2.6. Maintenance and Maintenance Access for Cottonwood Creek

Natural, well-established creeks typically do not require maintenance. The creek bed and banks within the subdivision are well-established with dense vegetation as detailed above. However, access for any needed maintenance within Cottonwood Creek is provided within the Public Utility, Drainage and Maintenance Access Easements which are located along each side front, side and rear lot line. Said Easements will be 10' wide on all side lot lines, 15' wide on all front lines and 10' wide on all rear lot lines. A Creek Access Exhibit is included in the appendix of this report to illustrate potential access routes within the easements where terrain is amenable for this use. Maintenance of the access easements is vested with the individual property owner. The property owners will preserve the creek bed and vegetation as required through an HOA or individually.

It is questionable that ECM Section 3.3.3.K which requires construction of 15' wide access roads, was intended to be applicable to natural drainages in a rural residential setting. Even so, Section 3.3.3.K.2 provides that 15' wide access roads on both sides of the channel can be omitted: *"Exclusion of Access Road. When the lack of an access road is not considered detrimental to the maintenance and integrity of the channel, the access road can be omitted under the following conditions:*

• *Where suitable exit-entry ramps are provided to intermediate channels with a minimum bottom width of 8 feet at roadway crossings and at other approved, needed locations to facilitate travel or maintenance of emergency vehicles in the channel bottom. At a minimum, one access ramp must be provided at each end of a channel."*

• *Where vehicular access to the channel on a maximum spacing of 1,000 feet and at other approved, needed locations is provided to small channels with a bottom width of less than 8 feet*." In the case of Eagle Rising the lack of constructed access roads is not detrimental to maintenance or integrity of the channel since access will be provided through easements along lot lines. Access to the creek bed is practically attainable at several locations throughout the reach utilizing the easements and not constructed roadways.

4.2.7. Cottonwood Creek Setback, Drainage Easement and No-Build Area

Drainage Easements for Cottonwood Creek and the associated Pond 1 and Pond 2 are shown on the Preliminary Plan and will be implemented on the Final Plat for each subdivision filing. The Drainage Easements are also No-Build areas and Access Easements for maintenance. The location of the Drainage Easement Lines is determined by delineating the water surface elevations, (WSE) calculated in the hydraulic analysis and then creating a line that includes all delineated wetland areas together with the area encompassing 2.0 vertical feet higher than the water calculated water surface elevation at each point along the creek reach. However, as a basis for our evaluation to help establish a no-build line we considered that for Regulatory Floodplains, FEMA authorizes structures to be places 1.0 feet higher than the Base Flood Elevation with no horizontal setback from the delineated flood extents. Therefore, out of abundance of caution 2 feet above the WSE is being used for this subdivision.

Previous drainage reports for Eagle Rising included setbacks determined using the Prudent Line methodology. El Paso County drainage criteria no longer includes Prudent Line methodology. The hydraulic analysis has been updated to include the effects of the dense vegetation present in the creek. Flow velocities and Froude Numbers for the channel indicate that the channel is well stabilized, which is confirmed by several years of observation through both wet and dry years. No vertical or lateral movement has been seen during the last decade. Significant portions of the project reach include the ponding areas of Pond 1 and Pond 2. These areas have no potential for lateral movement. These factors, combined with the presence of soil stabilizing vegetation, make the setbacks determined in this report adequate for safety of the future residential lots.

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. Because of the large lot residential exception and because of the vegetated ditches of the existing private roadway provides treatment by the runoff standards.

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 by the RPA's.

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 3[13]. 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%.

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. Drainage paths within the proposed lots have been stabilized with the addition of riprap protection. Locations are indicated on the Drainage Map and details for the riprap are included in the appendix.

   The results of the hydraulic analysis contained in this report indicate four locations that exhibit channel flow velocities that approach or exceed 6 fps

[13] USDCM-V.3, Chapter 3, Section 4.3
[14] UD-BMP-Worksheet-v3.07
[15] DCM, Chapter 6, Section 2.3

and/or have Froude Number values that equal or exceed 1.0. The affected locations are the pond emergency spillways which are protected with riprap as indicated on the Drainage Map. The presence of dense vegetation through much of the project reach serves to provide additional stabilization. The existing boulder structure, located upstream of the pond at DP 104 provides stabilization. Portions of the banks inside the DP 104 pond are lined with large boulders. The boulders have been in place for many years and are well embedded and incorporated into the creek terrain. No further improvements are needed in the creek.

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 actual 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. 2022 fees associated with this basin are Drainage Fees of $21,134 per impervious acre and Bridge Fees of $1,156 per impervious acre. The percent Imperviousness of the 2.5-acre Rural Residential site is 11% for purposes of drainage fee calculation 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 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.

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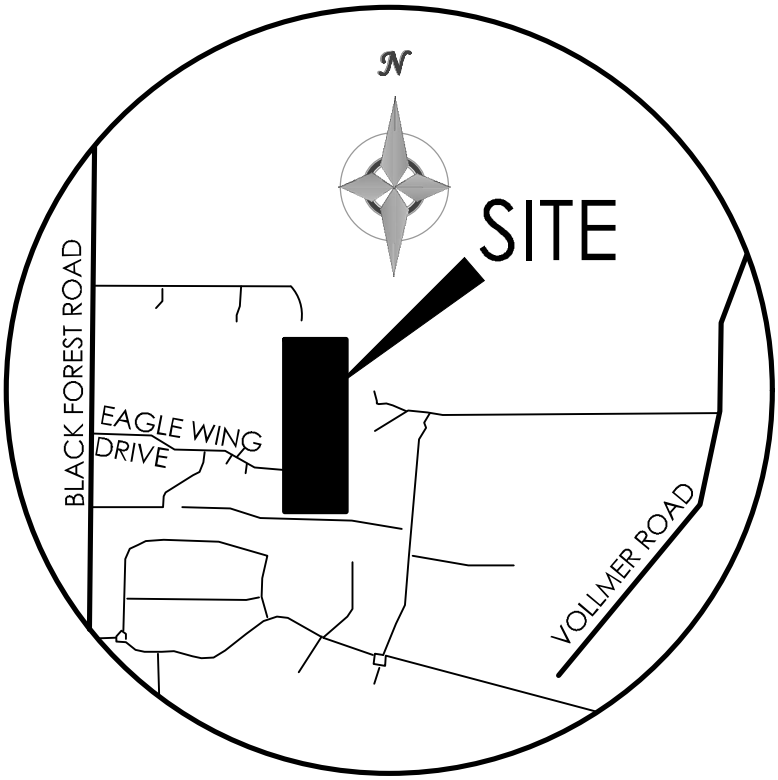
Appendices

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
Pond Water Court Decree
State Engineer's Office Prior Review Letters
Site Photograph Key Map
Site Photographs



VICINITY MAP

NOT TO SCALE

National Flood Hazard Layer FIRMette

FEMA

104°41'41"W 38°58'59"N

104°41'3"W 38°58'31"N

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

1:6,000

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

Legend

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

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

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

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 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

N

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

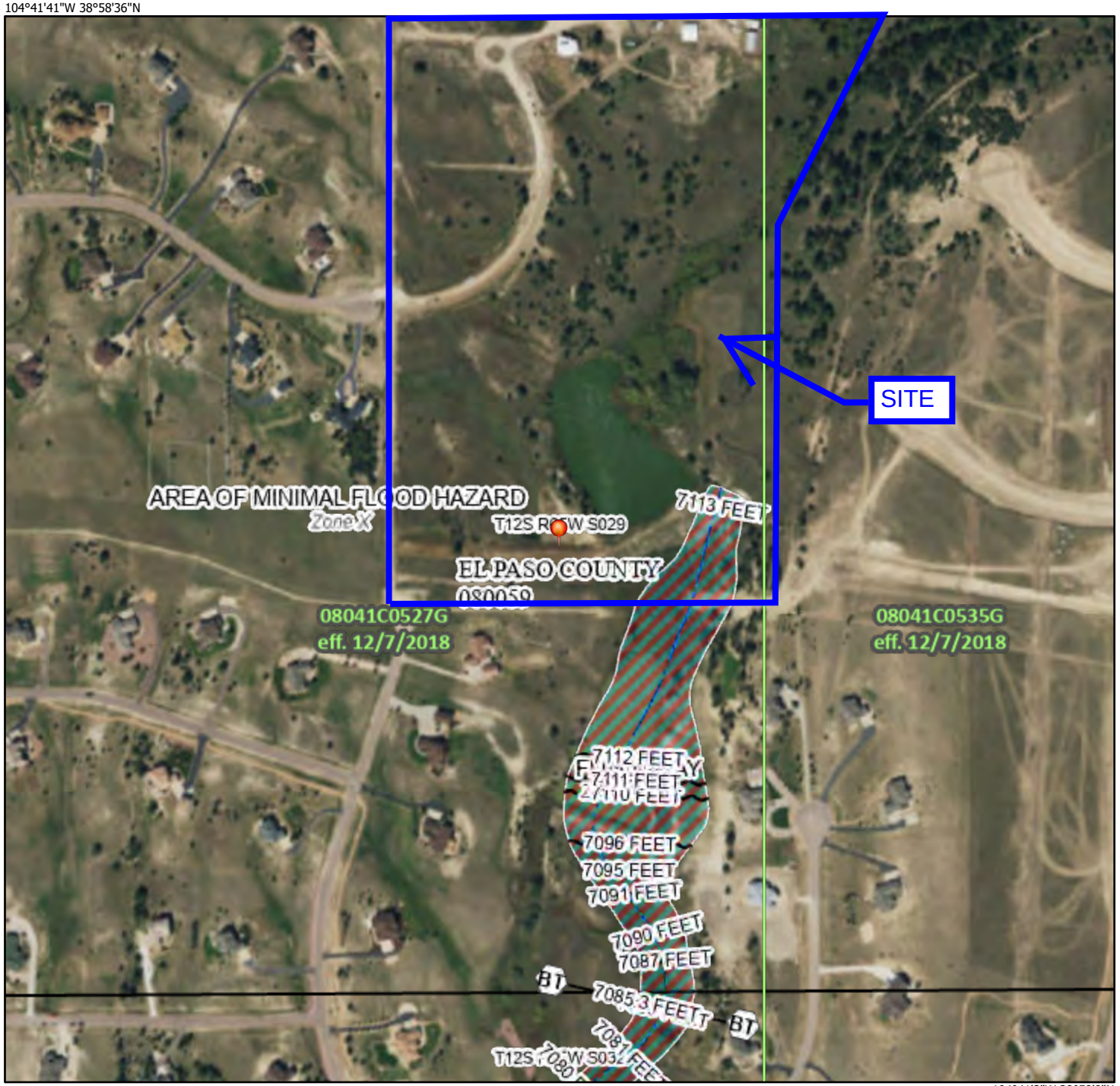
The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 11/15/2021 at 6:32 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by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

FEMA

104°41'41"W 38°58'36"N



104°41'3"W 38°58'8"N

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

1:6,000

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

Legend

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

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

OTHER AREAS OF FLOOD HAZARD
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- Levee, Dike, or Floodwall

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- 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

N

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 6:36 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.

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

March 1, 2022

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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Contents

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

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.

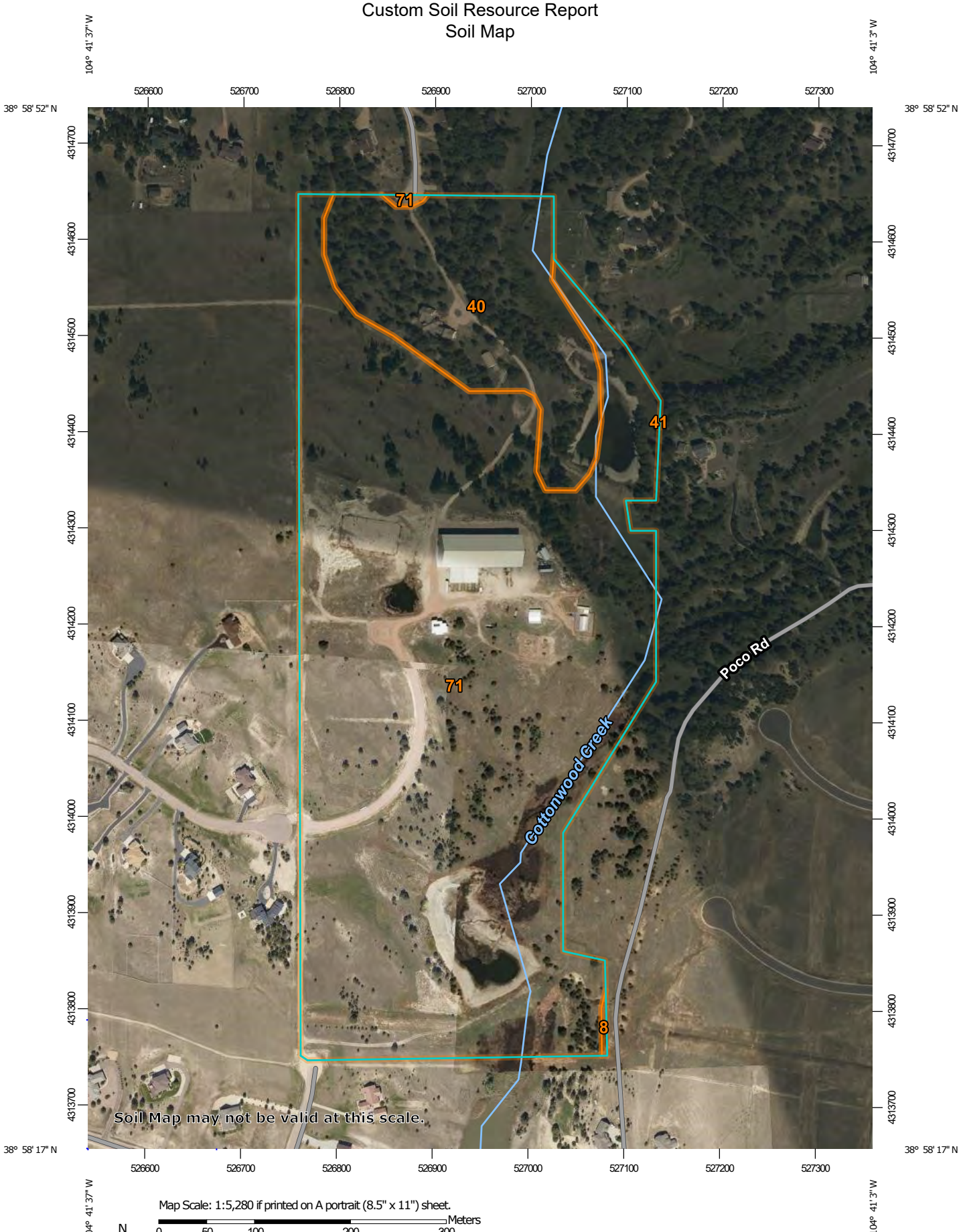
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

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.

N

Meters
0 50 100 200 300

Feet
0 250 500 1000 1500

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.

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

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)

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 capacity 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, needleandthread, 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.

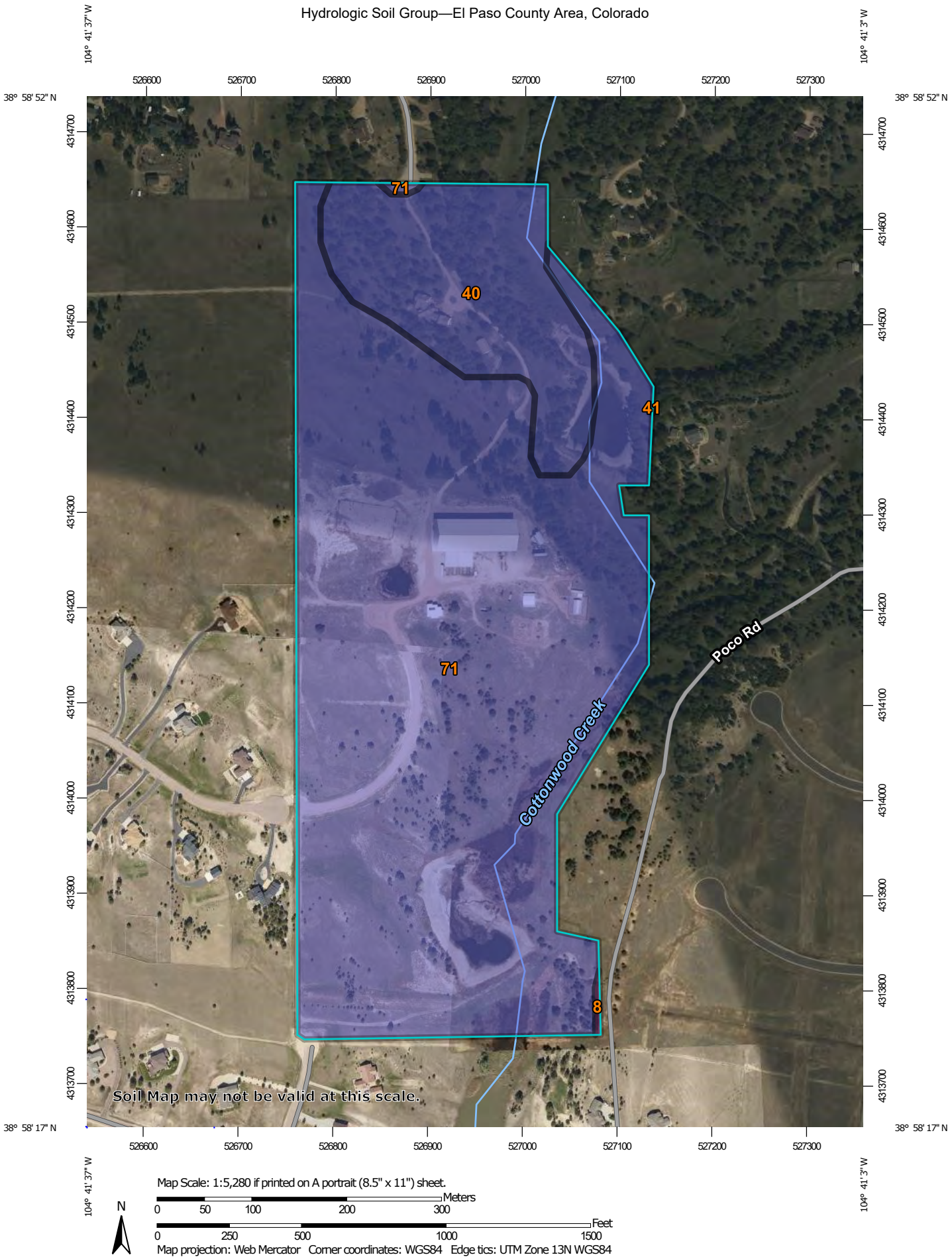
This soil is suited to habitat for openland and rangeland wildlife habitat. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

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.



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

N

Meters: 0 50 100 200 300

Feet: 0 250 500 1000 1500

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 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

DATE FILED: April 9, 2015 10:49 AM
CASE NUMBER: 2014CW3010

DISTRICT COURT, WATER DIVISION NO. 2, COLORADO Judicial Building 501 North Elizabeth Street, Suite 116 Pueblo, Colorado 81003 CONCERNING THE APPLICATION OF: PARK FOREST WATER DISTRICT, IN EL PASO COUNTY, COLORADO	**COURT USE ONLY** Case Number: 2014CW3010 (00CW18)

FINDINGS OF FACT, CONCLUSIONS OF LAW, RULING OF THE REFEREE, JUDGMENT AND DECREE

FINDINGS OF FACT

1. The Park Forest Water District ("District" or "Park Forest") filed an Application in this matter on February 28, 2014. Timely and adequate notice of this Application was duly published as required by statute on March 12, 2014, and publication costs have been paid. The Court has jurisdiction over the matters raised in the Application and all parties affected thereby, whether they have appeared or not. The lands and water rights involved in this Application are located within the boundaries of the Denver Basin, but are not located within the boundaries of a designated ground water basin.

2. The time for filing a Statement of Opposition expired on April 30, 2014. The City of Colorado Springs, acting through its enterprise entity Colorado Springs Utilities ("City"), filed a Statement of Opposition in the case on April 3, 2014. On March 2, 2015 a stipulation was filed with this Court in which the City agreed to entry to a final Decree containing terms no less stringent than those set forth herein. A Consultation Report was filed by the Division Engineer for Water Division 2 with the Court on May 8, 2014 and the Court has taken the same into consideration herein.

3. In November 2013, Park Forest incorporated additional lands into the District. Associated with the included lands were previously adjudicated groundwater water rights (Case No. 00CW84) and an augmentation plan (Case No. 10CW24), which Park Forest intends to incorporate into its existing water rights portfolio. Accordingly, in the Application for this case, Park Forest seeks to: 1) amend the plan for augmentation decreed in Case No. 00CW18, Water Division 2 to augment water use on the newly included property; 2) allow for Park Forest's use of the water rights previously adjudicated in Case No. 00CW84, Water Division 2, conveyed to Park Forest District that are associated with the property approved for inclusion into its service area in November 2013; and 3) abandon the previous augmentation plan associated with the newly included property decreed in Case No. 10CW24, Water Division 2. This amendment increases the land area to be served under the current augmentation plan and adds two (2) wells and three (3) ponds that are located on the newly included property. These structures are identified as follows:

A. Well permit # 203335

i. Legal description: SW1/4 NE1/4 Section 29, Township 12 South, Range 65 West of the 6th P.M., a distance of approximately 1980 feet from the north section line and 1840 feet from the east section line.

ii. Source: Dawson aquifer

iii. Proposed amount: 15 gpm, up to a maximum of five (5) acre-feet annually in combination with current well permit # 228940

iv. Proposed Use: Irrigation, fire protection, recreation, stock watering

B. Well permit # 228940

i. Legal description: NW1/4 SE1/4 Section 29, Township 12 South, Range 65 West of the 6th P.M., a distance of approximately 1420 feet from the south section line and 2100 feet from the east section line.

ii. Source: Dawson aquifer

iii. Amount: 15 gpm, up to a maximum of five (5) acre-feet annually in combination with current well permit # 203335

iv. Proposed Use: Irrigation, fire protection, recreation, stock watering

C. Eagle Rising Pond No. 1 aka North Pond

i. Legal description: NE1/4 NW1/4 Section 29, Township 12 South, Range 65 West of the 6th P.M. UTM coordinates: 38°58'39.78" Northing, -104°41'41.88" Easting (NAD 83).

ii. Source: Cottonwood Creek

iii. Pond surface: 2.07 acres

iv. Use: Storage, piscatorial, recreation, fire protection, augmentation releases and exchange

D. Eagle Rising Pond No. 2 aka South Pond

i. Legal description: NE1/4 NW1/4 Section 29, Township 12 South, Range 65 West of the 6th P.M. UTM coordinates: 38°58'22.02" Northing, -104°41'18.48" Easting (NAD 83).

ii. Source: Cottonwood Creek

iii. Pond surface: 2.69 acres

iv. Use: Storage, piscatorial, recreation, fire protection, augmentation releases and exchange

E. Eagle Rising Pond No. 3 aka Stock Pond

i. Legal description: NE1/4 NW1/4 Section 29, Township 12 South, Range 65 West of the 6th P.M. UTM coordinates: 38°58'35.76" Northing, -104°41'24.00" Easting (NAD 83).

ii. Source: Cottonwood Creek

iii. Pond surface: 0.24 acre

iv. Use: Storage, piscatorial, recreation, fire protection, augmentation releases and exchange

4. The District's Application seeks to add the above wells and ponds to the District's current augmentation plan and add up to 18 additional residential taps to the District's current plan. As described in the Application, the District approved the inclusion of 70.8 acres of land contiguous to the District upon which the above wells and

ponds are located. The orders approving the inclusion as adopted by the District and the El Paso County District Court, respectively, were filed with the Application. The inclusion as approved increased the District's service area to a total of 885.4 acres.

5. The current property owners intend to develop the newly included property as a residential subdivision for up to 18 lots, with potable water service to be provided by the District. The Park Forest water system operates under the current augmentation plan approved in Case No. 00CW18; paragraph 43 of that decree allows the District to pump up to 175.3 acre-feet per year of not-nontributary Dawson aquifer water, or 17,530 acre-feet cumulatively, and 70.7 acre-feet of not-nontributary Arapahoe aquifer water, or 7,070 acre-feet cumulatively. Pursuant to paragraph 17 of the District's current decree, the District intends to continue using septic return flows to augment the above wells, the ponds, and the additional residential taps as identified in paragraph 3 above. Such return flows may include those produced from use of the water and water rights conveyed to the District by the current property owner.

6. As a condition of inclusion, the current property owners conveyed all water and water rights underlying or appurtenant to the inclusion property. The Denver Basin ground water rights associated with the property previously were adjudicated for all beneficial uses in Case No. 00CW84, Water Division 2. Per paragraph 17 of that decree, the adjudicated uses for these rights include augmentation and exchange, and the return flows to be used under this amended plan may include using return flows created from use of the water and water rights adjudicated in Case No. 00CW84. The District will use such water and water rights consistent with the terms and conditions contained in the District's current augmentation plan approved in Case No. 00CW18. The District specifically reserves the right to use the water rights previously adjudicated in Case No. 00CW84 for all beneficial uses as decreed pursuant to paragraph 17 of that decree so long as any use of the not-nontributary water adjudicated thereunder is augmented. The volume of Dawson aquifer available for use under this decree, after deductions for prior use of water use by wells identified in paragraph 7 below, is 1,906 acre-feet, or 19.06 acre-feet annually.[1]

7. As regarding the current wells located on the inclusion property identified in paragraph 3 above (current permit #s 203335 and 228940), the Court finds that under paragraph 7 of the inclusion agreement between the District and the current property

[1] Presuming each well diverted the maximum allowable under each permit and per footnote 1 of the decree in Case No. 00CW84, a maximum of 41 acre-feet would have been diverted under permit # 203335 and 33 acre-feet under permit # 228940 for a total of 74 acre-feet. Per the decree in Case No. 00CW84, the total amount of not-nontributary Dawson aquifer water available under the inclusion property based on a 100-year supply is 1,980 acre-feet. Subtracting 74 acre-feet of prior diversions from the not-nontributary Dawson ground water quantification and discounting the previously agreed upon reduction of the aquifer quantification pursuant to footnote 1 of the Case No. 00CW84 decree, the total current amount available is 1,906 acre-feet (1,980 - 74 = 1,906); adjusting this figure to allow for well withdrawals over a 100-year period, the revised total annual amount available to the District is 19.06 acre-feet based on a 100-year supply from the date of this Ruling and Decree.

owners, the District is obligated to augment up to four (4) acre-feet of water annually based on a maximum of five (5) acre-feet of withdrawals from these wells or eighty-five percent (85%) of actual, annual well pumping, whichever is less. Pursuant to paragraph 15 of the decree entered in Case No. 00CW84, a court-approved augmentation plan is required to withdraw water from the not-nontributary aquifers underlying the property, and according to the well construction reports filed under these well permit numbers both wells were constructed into the Dawson aquifer. To comply with this requirement, the District agrees to augment these wells pursuant to paragraph 17 of the District's current augmentation plan decree approved in Case No. 00CW18.

8. The District's current augmentation plan approved in Case No. 00CW18 allows the District to augment pond evaporation for certain ponds specifically identified in that decree. Paragraph 26 of that decree indicates that average annual net evaporative loss is 32 inches, or 13.33 acre-feet for 5 acres of pond surface area for the three (3) ponds identified above. Paragraph 46 of that decree also allows the District to add or delete ponds to be augmented so long as the ponds are located within the District's current service area boundaries. As the Eagle Rising ponds are now within the Park Forest boundaries, evaporative losses from these ponds will be augmented by the District's return flows consistent with paragraph 17 of the current plan decreed in Case No. 00CW18. The District does not seek new water storage rights for the pond structures in this case, and the District is simply replacing the evaporative loss from each pond.

9. Per paragraph 14 of the decree in Case No. 00CW18, up to 955.3 acre-feet is potentially available annually to the District's water system. The District has five (5) wells connected to its water system (identified as Well #s 1 - 5) of which four (4) wells currently supply the District's system. Currently there are 286 residential taps connected to the District's system. Between October 2008 and October 2013 the District's water system produced an average of 92.5 acre-feet annually, and when accounting for commercial water use the District supplies an average of about 0.35 acre-feet per residential tap connection.[2]

10. Presuming 18 lots are developed within the new subdivision and an annual supply of 0.35 acre-feet per lot, the District's system would supply a total of 6.3 acre-feet to the new lots. The District's current augmentation plan presumes ten percent (10%) of all well pumping is consumed through the use of non-evaporative

[2] The District's system also supplies 19 commercial taps, 12 of which use less than 10,000 gallons per quarter of each year with the other 7 taps using more than 10,000 gallons per quarter. Total commercial demand is not separated from total annual pumping in the District's water use accounting, however, if each commercial tap is treated as using the 10,000-gallon minimum per quarter the total annual use by commercial taps would equal 2.33 acre-feet, or about 2.5% of the District's average annual water use. If this presumed commercial use were subtracted from the average annual total use, the residential tap use would be slightly below 0.32 acre-feet per tap. To account for the comparatively small commercial use, the District is using 0.35 acre-feet per tap, which is a greater demand per residential tap, to determine the new subdivision's projected water supply and augmentation requirements.

septic systems located within the District. Presuming 18 lots are developed, an average of 0.35 acre-feet of water for each lot per year is supplied and septic systems that are similar to those within the District are installed, a total of 0.63 acre-feet per year of additional water would be consumed by the new residences. When added to well depletions and pond evaporation loss, total depletions associated with the new subdivision will equal a maximum of 17.96 acre-feet at full build out (4 acre-feet for well augmentation + 13.33 acre-feet for pond evaporation + 0.63 acre-feet consumed by septic systems = 17.96 acre-feet). After accounting for water consumed by septic systems, a total of up to 5.67 acre-feet of additional return flows would be available to augment the new subdivision at full build-out, requiring the District to provide up to an additional 12.29 acre-feet per year of augmentation water to replace these depletions using current and future excess return flow credits pursuant to the decree in Case No. 00CW18.

11. Return flows from existing septic systems within the District currently are used as augmentation credit to replace stream depletions caused by the District's well pumping and water consumed by the existing septic systems. According to well pumping records submitted by the District with the Application herein, annual net stream accretions totaled 34.5 acre-feet for 2010 - 2011, 29.66 acre-feet for 2011 - 2012 and 41.83 acre-feet for 2012 - 2013 after accounting for water consumption and well pumping impacts. Under its current operations, the District's water system produces sufficient excess augmentation credits to fully augment the ponds and wells described in paragraph 3 above. Since the District currently produces excess return flow credits that are greater than required to fully augment water use under full build-out conditions on the inclusion property, the Court finds and concludes that no injury will occur to any vested water rights on Cottonwood Creek located downstream of the inclusion property.[3] As residents move into the new subdivision, increased pumping of the District's water system wells will occur and in turn generate up to an additional 5.67 acre-feet of excess return flow credits as described in paragraph 10 above. These excess credits also may be used as necessary to augment the above wells, the Eagle Rising ponds and the additional residential taps.

12. The District agrees to operate the amended augmentation plan consistent with the terms and conditions approved in Case No. 00CW18. Specifically, not less than annually the District shall complete and submit accounting forms to the State Engineer that are the same as or similar to the forms the District currently uses and

[3] The District is aware of a pond structure located on the channel of Cottonwood Creek known as the Highland Park pond, This pond was decreed a storage right in Case No. 97CW148, Water Division 2. Per paragraph 28 of the final decree entered in that case, the pond relies on "runoff, surface and underground return flows, natural precipitation" and ground water pumping. Prior excess return flow credits from the District's water system have supplied the Highland Park pond with water and will continue to do so in the future. Except in the unlikely event the District's return flow credits are insufficient, evaporative loss from the Eagle Rising ponds will be fully replaced and thus prevent injury to the Highland Park pond.

submits. Such forms shall show ground water withdrawals, stream depletions, return flows, net stream depletions, the amount required for augmenting all pond evaporation loss within the Park Forest service area including the Eagle Rising ponds, and any excess consumable return flows. The District agrees to update its current accounting forms to include the existing wells and ponds located on the inclusion property, and to otherwise update the forms as necessary in the future.

CONCLUSIONS OF LAW

13. The Court has jurisdiction in this matter pursuant to C.R.S. § 37-92-203(1).

14. The Application in this matter is one contemplated by law. C.R.S. § 37-92-302(1).

15. The Court finds that the Ruling and Decree proposed by the District in this matter complies with the requirements set forth in C.R.S. §37-90-137(9)(c). The Court has also considered the District's proposed use of the water by the wells and the Eagle Rising ponds described in paragraph 3 above, in quantity and time, the amount and timing of augmentation water to be provided, and whether injury would be caused to any owner of or other person entitled to use water under a vested water right or a conditionally decreed water right. The Court finds that under the plan for augmentation approved in Case No. 00CW18 and as amended herein, no such injury will occur and that the Decree proposed by the District complies with C.R.S. § 37-92-305(6)(a) and § 37-92-305(8).

RULING

16. The provisions of paragraphs 1-15 above are incorporated herein and made a part of the Court's Ruling.

17. The District's request to amend the plan for augmentation as described in paragraphs 5-12 above is hereby granted subject to the terms and conditions set forth herein.

18. The wells and the Eagle Rising ponds described in paragraph 3 above shall be augmented consistent with the requirements set forth in paragraph 17 of the final decree in Case No. 00CW18, Water Division 2. The District shall use existing excess return flow credits to augment the above wells and ponds, and the District may also use the additional return flows generated from septic systems located on the inclusion property as necessary for augmentation purposes. All septic systems installed on the inclusion property shall be non-evaporative and consume no more than 10% of all water that enters such systems.

19. The District further retains all rights granted and shall be subject to all terms and conditions set forth under the final decree entered in Case No. 00CW84, Water Division 2, as to the water rights awarded therein in connection with the water and water rights conveyed to the District by the current owner of the inclusion property. To the extent the District develops and makes of such water outside of the amended augmentation plan approved herein, such use shall be subject to the terms and conditions of the final decree entered in Case No. 00CW84. The decree entered in Case No. 10CW24, Water Division 2, is hereby vacated.

20. The District shall apply for new well permits for the existing wells located on the inclusion property. The State Engineer shall evaluate those applications pursuant to C.R.S. § 37-90-137(2)(a)(II) consistent with the terms and conditions of the final decree entered herein. Pursuant to C.R.S. § 37-92-305(6)(a), permits shall be issued. The District shall meter, record and report all water use associated with these wells pursuant to paragraph 21 below. These wells shall be used consistent with the terms of the well permits issued and the amended plan for augmentation approved herein.

21. Not less than annually, the District shall complete and submit accounting forms to the State Engineer which show ground water withdrawals, stream depletions, return flows, net stream depletions, the amount required for augmenting all pond evaporation loss within the Park Forest service area and any excess consumable return flows. Such forms shall be the same as or substantially similar to the forms the District currently uses and submits, The District shall update its current accounting forms to include the existing wells located on the inclusion property and the Eagle Risings ponds, and to otherwise continue to update such forms as necessary to ensure proper accounting of the District's water use.

22. The Court shall retain jurisdiction for as long as the District is required to replace depletions to the South Platte system, to determine whether the replacement of depletions to the Arkansas River system instead of the South Platte system is causing material injury to water rights tributary to the South Platte. Any person may invoke the Court's retained jurisdiction at any time the District is causing depletions (including ongoing post-pumping depletions) to Cherry Creek, and is instead replacing such depletions to Monument Creek. The person invoking the Court's retained jurisdiction shall have the burden of establishing a *prima facie* case that the District's failure to replace depletions to Cherry Creek is causing injury to water rights owned by the person invoking the Court's retained jurisdiction; except that, the State and Division Engineers may invoke the Court's retained jurisdiction by establishing a *prima facie* case that injury is occurring to any vested or conditionally decreed water rights. The District shall retain the ultimate burden that no injury is occurring, or shall propose terms and conditions

which prevent such injury. Among any other remedies it may impose, the Court may require that the District replace depletions to Cherry Creek.

23. Pursuant to C.R.S. § 37-92-304(6), the Court also retains jurisdiction over the plan for augmentation as amended herein for reconsideration of the question of whether the provisions of this Decree are necessary and/or sufficient to prevent injury to the vested water rights of others. The Court also retains jurisdiction for the purpose of determining compliance with the terms of the augmentation plan as amended. Any person seeking to invoke the Court's retained jurisdiction under this paragraph to modify the Decree shall file a verified petition with the Court. Such petition shall set forth with particularity the factual basis upon which the requested reconsideration is premised, together with proposed decretal language to effect the petition. The person lodging the petition shall have the burden of going forward to establish the *prima facie* facts alleged in the petition. If the Court finds those facts to be established, the District shall thereupon have the burden of proof to show one of the following: (a) that any modification sought by the District will avoid injury to other appropriators; (2) that any modification sought by the person filing the petition is not required to avoid injury to other appropriators; or (c) that any term or condition proposed by the District in response to the petition does avoid injury to other appropriators.

24. This Ruling shall be mailed as required by statute.

DONE this 13th day of March, 2015.

BY THE REFEREE:

Mardell R. DiDomenico, Water Referee
Water Division 2

JUDGMENT AND DECREE

The foregoing Ruling comes before the Court after the time period for raising objections to the same pursuant to C.R.S. § 37-92-304(2) has expired. The Court, having reviewed the Ruling and being familiar with the terms of the same, hereby approves and enters said Ruling as a Judgment and Decree of this Court pursuant to C.R.S. § 37-92-304(5).

DONE this 9th day of April, 2015.

BY THE COURT:

LARRY C. SCHWARTZ, WATER JUDGE
WATER DIVISION 2

COLORADO
Division of Water Resources
Department of Natural Resources

Office of the State Engineer
1313 Sherman St, Suite 818
Denver, CO 80203

November 26, 2018

Nina Ruiz
El Paso County Development Services Department
2880 International Circle, Suite 110
Colorado Springs, CO 80910-3127

RE: Eagle Rising
Filing No. 1 - Final Plat
Sec. 29, Twp. 12S, Rng. 65W, 6th P.M.
Water Division 2, Water District 10
CDWR Assigned Subdivision No. 23310

Dear Mrs. Ruiz:

We have received the submittal concerning a final plat for 8 single family residential lots and 6 tracts within a 17 lot preliminary plan. This office most recently provided comments for Eagle Rising Filing No. 1 dated September 2, 2015, a copy of which I have attached for your reference. This letter shall supersede those previous comments. The proposed supply of water for this development is to be served by the Park Forest Water District ("District") and wastewater is to be served by individual septic systems.

Water Supply Demand

The Water Supply Information Summary, Form No. GWS-76, that was included with the referral materials indicates 2.8 acre-feet/year will be required to supply the development. This breaks down to 0.3 acre-feet/lot for only 7 lots (2.1 acre-feet total) and 0.7 acre-feet/year for irrigation of landscaping. The final plat and additional documentation indicates that there will be 8 lots included in filing #1, and it is this office's understanding that the District allocates water based on an estimate of 0.4 acre-foot/year per tap. Using this allocation approach, the estimated water demand for Eagle Rising Filing No. 1 is 3.2 acre-feet/year.

Source of Water Supply

The proposed source of water is to be served by the District and an updated letter of commitment from the District was not included with the submittal. As requested in this office's September 2, 2015 letter, please provide information concerning the inclusion of this property within the District's boundaries and an updated letter of commitment from the District which details the number of lots to be served and the quantity of water committed. According to this office's records, the District does appear to have sufficient water resources to supply the proposed subdivision with a 300 year water supply.

State Engineer's Office Opinion

Based upon the above and pursuant to Section 30-28-136(1)(h)(II), C.R.S., it is our opinion that so long as the subject property is included within the District's boundaries and a letter of commitment to serve the development is supplied to this office, the proposed water supply can be provided without causing injury to decreed water rights and is expected to be adequate.

For planning purposes the county should be aware that the economic life of a water supply based on wells in a given Denver Basin aquifer may be less than the 300 years used for allocation due to anticipated water level declines. We recommend that the county determine whether it is appropriate to require development of renewable water resources for this subdivision to provide for a long-term water supply.

Should you have any questions, please feel free to contact me directly.

Sincerely,

Ivan Franco, P.E.
Water Resources Engineer

cc: Bill Tyner, Division 2 Engineer
Doug Hollister, District 10 Water Commissioner

COLORADO
Division of Water Resources
Department of Natural Resources

Office of the State Engineer
1313 Sherman St, Suite 818
Denver, CO 80203

September 2, 2015

Raimere Fitzpatrick
El Paso County Development Services Department
2880 International Circle, Suite 110
Colorado Springs, CO 80910-3127
Transmission via email: DSDcomments@elpasoco.com

RE: Eagle Rising
Filing No. 1 - Final Plat
Sec. 29, Twp. 12S, Rng. 65W, 6th P.M.
Water Division 2, Water District 10
CDWR Assigned Subdivision No. 23310

Dear Mr. Fitzpatrick:

We have received the submittal concerning a final plat for 8 single family residential lots within a 17 lot preliminary plan. This office most recently provided comments for the Eagle Rising preliminary plan dated August 9, 2013, a copy of which I have attached for your reference. The proposed supply of water for this development is to be served by the Park Forest Water District ("District") and wastewater is to be served by individual septic systems.

Water Supply Demand

There was no Water Supply Information Summary, Form No. GWS-76, provided with the submittal; however, it is this office's understanding that the District allocates water based on an estimate of 0.4 acre-foot/year per tap. Using this allocation approach, the estimated water demand for Eagle Rising Filing No. 1 is 3.2 acre-feet/year.

Source of Water Supply

The proposed source of water is to be served by the District and an updated letter of commitment from the District was not included with the submittal. As requested in this office's August 9, 2013 letter, please provide information concerning the inclusion of this property within the District's boundaries and an updated letter of commitment from the District. According to this office's records, the District does appear to have sufficient water resources to supply the proposed subdivision with a 300 year water supply.

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can be provided without causing injury to decreed water rights and is expected to be adequate.

For planning purposes the county should be aware that the economic life of a water supply based on wells in a given Denver Basin aquifer may be less than the 300 years used for allocation due to anticipated water level declines. We recommend that the county determine whether it is appropriate to require development of renewable water resources for this subdivision to provide for a long-term water supply.

Should you have any questions, please feel free to contact me directly.

Sincerely,

Caleb Foy, P.E.
Water Resources Engineer

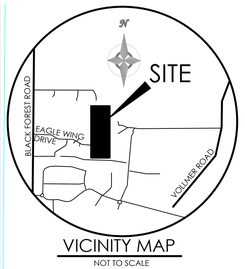
cc: Steve Witte, Division 2 Engineer (via email)
Doug Hollister, District 10 Water Commissioner (via email)

LEGEND

- PROPERTY LINE
- EASEMENT LINE
- LOT LINE

EXISTING

- 5985 — INDEX CONTOUR
- 84 — INTERMEDIATE CONTOUR
- 104 — DBPS DESIGN POINT
- 6C — LOCAL DESIGN POINT
- 14 — DRAINAGE REPORT PHOTO NUMBER / DIRECTION



VICINITY MAP
NOT TO SCALE

BENCHMARK

N

10 0 50 100 200
1" = 100' 1:1,200

MVE, INC.
ENGINEERS, SURVEYORS
1903 lelaray 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

STREAM VEGETATION PHOTO LOCATIONS

MVE PROJECT 61145
MVE DRAWING DRN-MAP-HECRAS

OCTOBER 31, 2023
SHEET 1 OF 1

LEGEND

- PROPERTY LINE
- EASEMENT LINE
- LOT LINE

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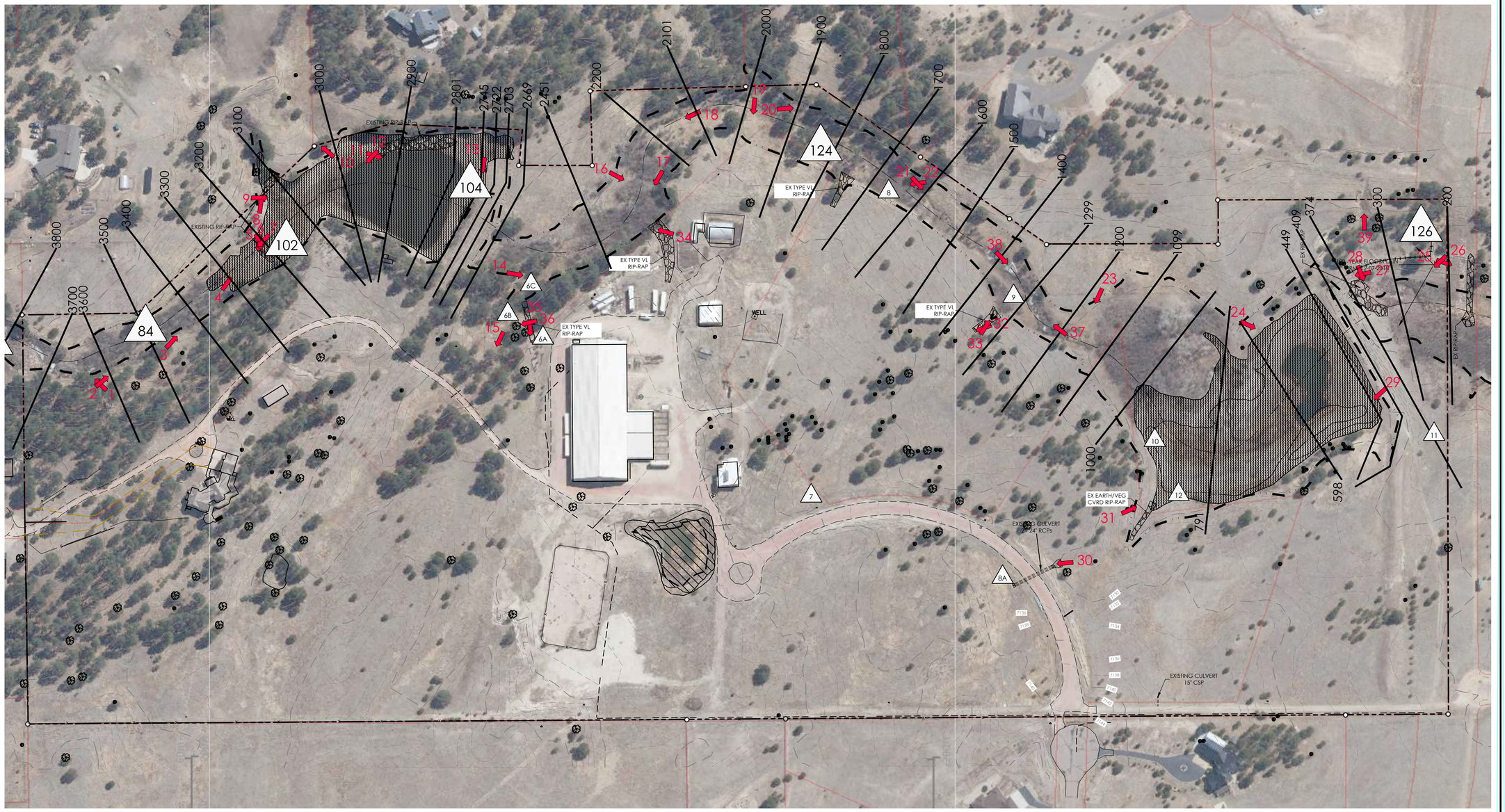

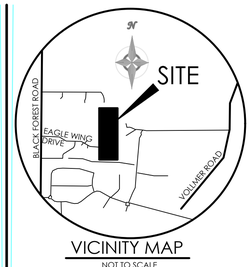

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FILING NO.1

STREAM VEGETATION
PHOTO LOCATIONS

MVE PROJECT 61145
MVE DRAWING DRN-MAP-HECRAS

OCTOBER 31, 2023
SHEET 1 OF 1

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 tributary stream, 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 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, from 100 feet northwest of Design Point 9.

September 27, 2022

34

Riprap lined swale from barn area to creek, in need of additional riprap, from 450 feet downstream of Cottonwood Creek DBPS Design Point 104.

September 27, 2022

35

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

September 27, 2022

36

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

September 27, 2022

37

Looking northeast from the centerline of the creek at HECRAS Station 1200.

December 11, 2023

38

Looking southwest from the centerline of the creek at HECRAS Station 1400.

December 11, 2023

39

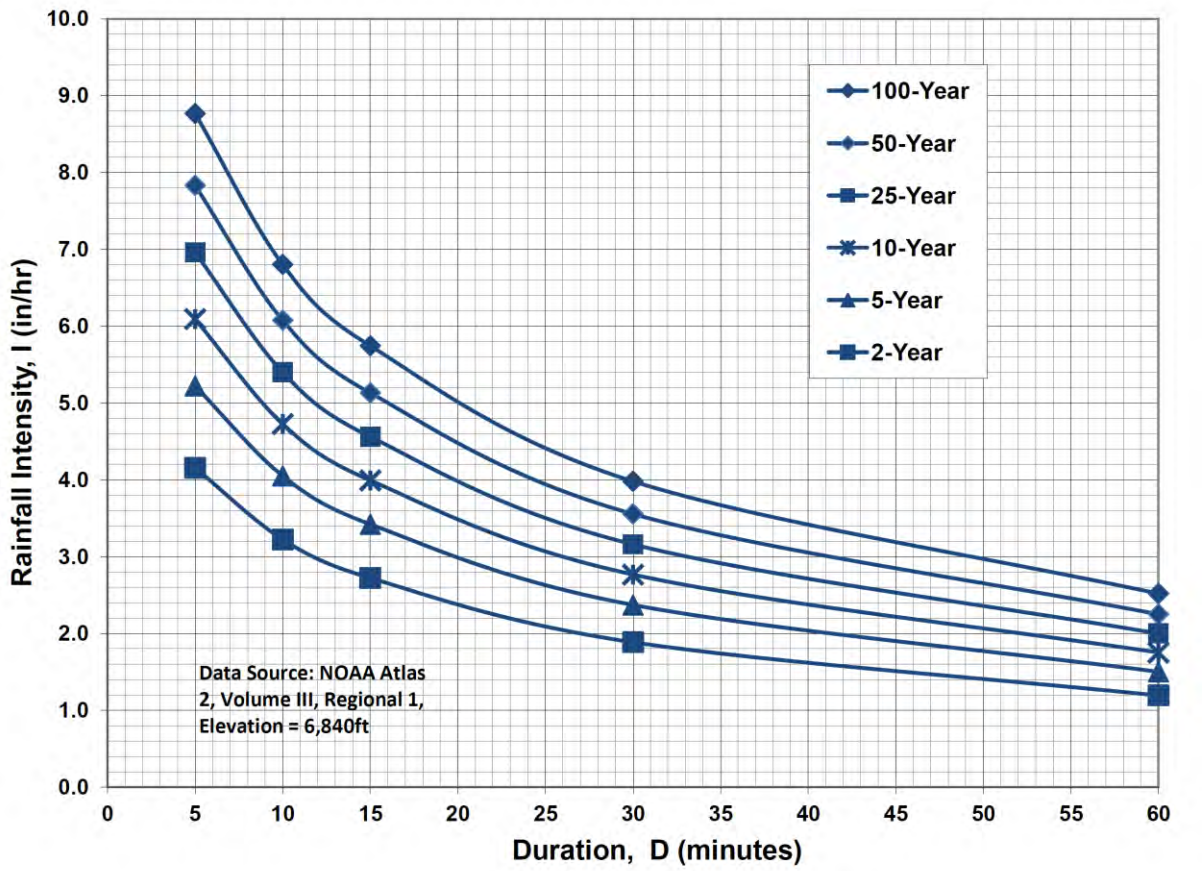
Looking east at east property line at approximately HECRAS station 300.

December 11, 2023

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

Job No.: **61145** Date: **1/4/2023 11:19**

Project: **Eagle Rising - Preliminary/Final** (Existing) 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
	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)	(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

Job No.: **61145** Date: **1/4/2023 11:19**

Project: **Eagle Rising - Preliminary/Final** (Developed) 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		
	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)
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)

				Direct Runoff				Combined Runoff				Streetflow			Pipe Flow					Travel Time		
DP	Sub-Basin	Area (Acres)	C5	t_c (min)	CA (Acres)	I5 (in/hr)	Q5 (cfs)	t_c (min)	CA (Acres)	I5 (in/hr)	Q5 (cfs)	Slope (%)	Length (ft)	Q (cfs)	Q (cfs)	Slope (%)	Mnngs n	Length (ft)	D_{Pipe} (in)	Length (ft)	v_{0sc} (ft/s)	t_t (min)
	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)

				Direct Runoff				Combined Runoff				Streetflow			Pipe Flow					Travel Time		
DP	Sub-Basin	Area (Acres)	C5	t_c (min)	CA (Acres)	I5 (in/hr)	Q5 (cfs)	t_c (min)	CA (Acres)	I5 (in/hr)	Q5 (cfs)	Slope (%)	Length (ft)	Q (cfs)	Q (cfs)	Slope (%)	Mnngs n	Length (ft)	D_{Pipe} (in)	Length (ft)	v_{0sc} (ft/s)	t_t (min)
	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															
DP8	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
C1: 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)

				Direct Runoff				Combined Runoff				Streetflow			Pipe Flow					Travel Time		
	Sub-	Area		t_c	CA	I100	Q100	t_c	CA	I100	Q100	Slope	Length	Q	Q	Slope	Mnngs	Length	D_{Pipe}	Length	v_{0sc}	t_t
DP	Basin	(Acres)	C100	(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-DP8	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-DP10	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 (tc) + C2
C1: 2.52
C1: 12.735

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

				Direct Runoff				Combined Runoff				Streetflow			Pipe Flow					Travel Time		
DP	Sub-Basin	Area (Acres)	C100	t_c (min)	CA (Acres)	I100 (in/hr)	Q100 (cfs)	t_c (min)	CA (Acres)	I100 (in/hr)	Q100 (cfs)	Slope (%)	Length (ft)	Q (cfs)	Q (cfs)	Slope (%)	Mnngs n	Length (ft)	D_{Pipe} (in)	Length (ft)	v_{0sc} (ft/s)	t_t (min)
	A1	4.95	0.38	13.5	1.89	6.17	11.66															
	A2	1.74	0.35	12.1	0.61	6.44	3.93															
	B	4.35	0.40	12.5	1.74	6.38	11.07															
	C	1.66	0.37	11.9	0.61	6.50	3.99															
	D	7.10	0.40	12.8	2.81	6.30	17.74															
	E1	3.41	0.45	13.6	1.54	6.15	9.51															
DP8	E2	7.77	0.43	16.3	3.38	5.70	19.25															
	F1	6.45	0.45	13.8	2.91	6.12	17.84															
	F2	2.02	0.40	13.5	0.81	6.18	4.98															
DP10	G	2.98	0.39	13.7	1.17	6.14	7.21															
	H	4.10	0.44	13.8	1.79	6.11	10.93															
	I	1.64	0.45	12.0	0.73	6.47	4.74															
	J	2.42	0.43	11.2	1.04	6.64	6.89															
	K	2.65	0.35	10.8	0.93	6.73	6.25															
	L	2.14	0.39	12.4	0.84	6.39	5.39															
	M	4.10	0.39	14.9	1.58	5.94	9.41															
DP6		71.87	0.38					22.3	27.42	4.91	134.7											
DP6A		5.25	0.42					17.9	2.19	5.46	12.0											
DP6B		78.97	0.38					24.1	30.24	4.71	142.6											
DP6C		84.22	0.39					24.1	32.43	4.71	152.9											
DP7		12.48	0.40					20.4	5.02	5.14	25.8											
DP8A		24.92	0.40					19.5	9.88	5.25	51.8											
DP9		14.50	0.40					22.8	5.83	4.86	28.3											
DP11		6.60	0.39					18.1	2.59	5.44	14.1											
DP12		27.34	0.40					21.2	10.92	5.04	55.1											
DP13		8.09	0.40					17.2	3.22	5.57	18.0											
	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: $I = C1 * \ln(tc) + C2$
C1: 2.52
C1: 12.735

Sub-Basin OS-B1A (DP4) Runoff Calculations

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
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**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
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**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
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 C_v: 7

	L (ft)	ΔZ_0 (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**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
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.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
2-1/2 Acre	168,070	3.86	0.08	0.12	0.22	0.31	0.36	0.4	11%
Pasture/Meadow	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**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
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**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
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**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
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**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
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 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	-	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**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
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 EX-B Runoff Calculations

Job No.:	**61145**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
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**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
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**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
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**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
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**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
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**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
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**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
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 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	-	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**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
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

$L_{max,Overland}$: 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	-	9.7	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**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
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**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
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**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
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**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
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**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
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**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
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**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
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 — 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 (ft^3)			
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**

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**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
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 — 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 (ft^3)			
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**

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**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
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 — 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 (ft^3)			
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**

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**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
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 — Detention is NOT required

EURV 0.00 (in) a = 1 — Water Quality is NOT required

WQCV 0.00 (in)

	5-year	10-year	100-year
K_i (ft)	0.0000	0.0000	0
V_i (acre-ft)	0.000	0.000	0
V_i (ft^3)	0	0	0

Design Volume (ft^3)

	% Storage	100-year	WQCV	Total
EURV	0%	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)	2.25	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**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
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 (ft^3)			
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**

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**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
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 — 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 (ft^3)			
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**

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**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
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 — 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 (ft^3)**			
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**

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**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
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 — 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 (ft^3)**			
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**

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**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
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

Detention is NOT required

Water Quality is NOT required

EURV	0.00 (in)		a =	1			
WQCV	0.00 (in)						
i (return period)	5-year	10-year	100-year		**Design Volume (ft^3)**		
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**

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**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
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 — 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 (ft^3)			
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**

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**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
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**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
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**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
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)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	516	19	-	-	-	-	
Initial Time	100	8	0.075	-	8.8	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	**12.5**	**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**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
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**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
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**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
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**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
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**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
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**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
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**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
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**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
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**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
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**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
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**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
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**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
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**	Date:	**1/4/2023 11:19**
Project:	**Eagle Rising - Preliminary/Final**	Calcs by:	**O. Ali**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
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**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
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 — Detention is NOT required

EURV 0.00 (in) a = 1 — Water Quality is NOT required

WQCV 0.00 (in)

	5-year	10-year	100-year
i (return period)			
K_i (ft)	0.0000	0.0000	0
V_i (acre-ft)	0.000	0.000	0
V_i (ft^3)	0	0	0

Design Volume (ft^3)

	% Storage	100-year	WQCV	Total
EURV	0%	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)	2.34	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**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
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 — 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 (ft^3)**			
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**

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**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
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 — 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 (ft^3)			
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**

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**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
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 — 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 (ft^3)			
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**

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**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
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 — 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 (ft^3)			
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**

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**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
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 — 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 (ft^3)			
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**

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**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
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 — 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 (ft^3)			
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**

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**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
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 (ft^3)**			
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**

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**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
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 — 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 (ft^3)			
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**

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**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
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 — 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 (ft^3)**			
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**

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_6 = 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
- 1 AREA I.D.

SURFACE TYPES

UNCONNECTED IMPERVIOUS AREA (UIA)	
RECEIVING PERVIOUS AREA (RPA)	
EXCLUDED PER ECM I.7.1.B.5	

WELL

30'X30 900 SF EXIST'G WATER WELL SITE - SEE DEV NOTE NO. 14

LOT 9
2.50 AC

LOT 10
2.50 AC

LOT 11
2.50 AC

WETLAND 2

SEPTIC SYSTEM

1

TRACT 'B'
PRIVATE ROAD ROW
1.31 AC

LOT 2
2.50 AC

LOT 3
2.50 AC

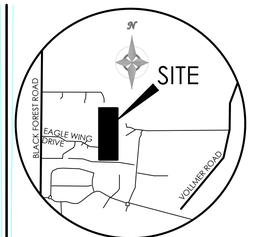
LOT 1
2.50 AC

LOT 12
2.50 AC

WETLAND 4

EAGLE WING DRIVE

EXISTING CULVERT
15" CSP



VICINITY MAP
NOT TO SCALE

BENCHMARK

N

10 0 20 40 80
1" = 40' 1:480

MVE, INC.
ENGINEERS, SURVEYORS
1903 lelaray street, suite 200 colorado springs co 80909 719.635.5736

REVISIONS

DESIGNED BY
DRAWN BY
CHECKED BY
AS-BUILTS BY
CHECKED BY

EAGLE RISING

BMP AREA ID MAP

MVE PROJECT 61145
MVE DRAWING BMP-Area

AUGUST 31, 2023
SHEET 1 OF 1

9. Hydraulic Calculations

Culvert Calculations
Ditch Flow Calculations
Manning's n Selection
HEC-RAS Water Surface Elevations Calculations
Velocity, Froude Number & Shear Stress at Channel Sections
Riprap Calculations
Supplemental Vegetative Lining Information

Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Jan 3 2023

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

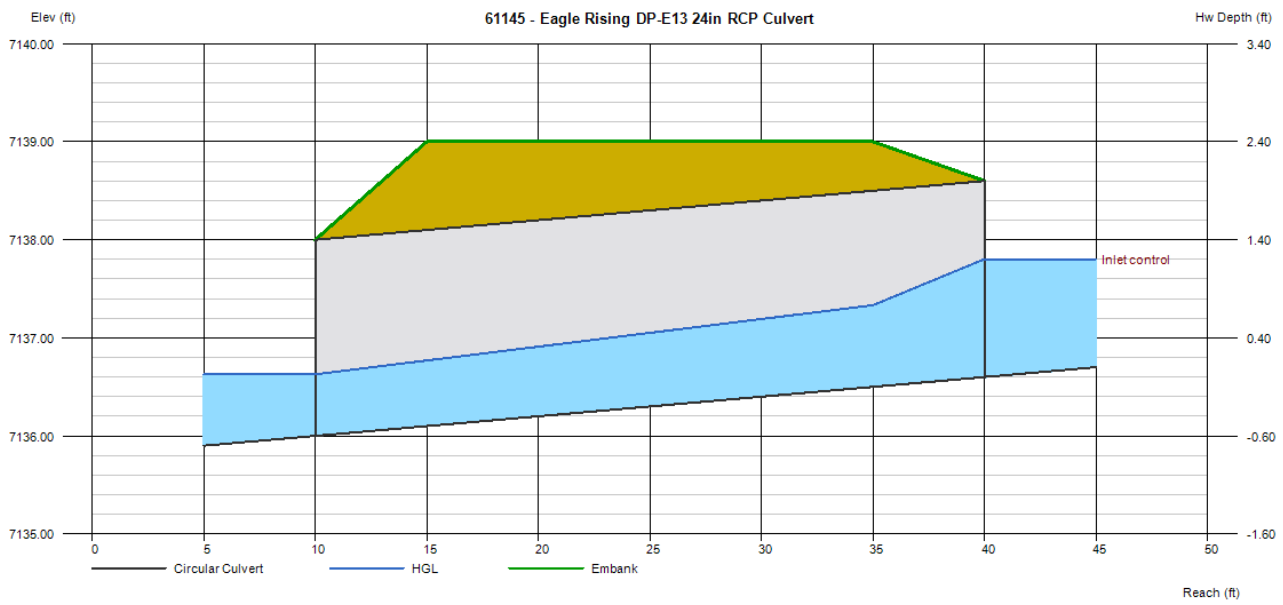
Top Elevation (ft)	=	7139.00
Top Width (ft)	=	20.00
Crest Width (ft)	=	100.00

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

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Jan 10 2023

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

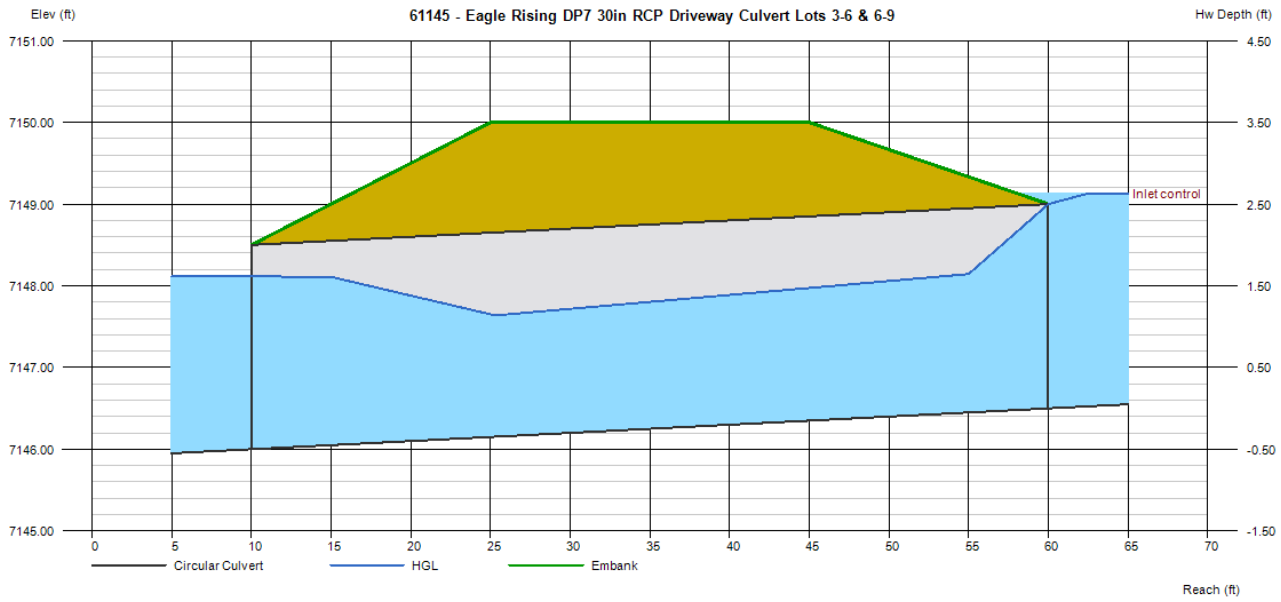
Top Elevation (ft)	=	7150.00
Top Width (ft)	=	20.00
Crest Width (ft)	=	115.00

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

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Dec 23 2022

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

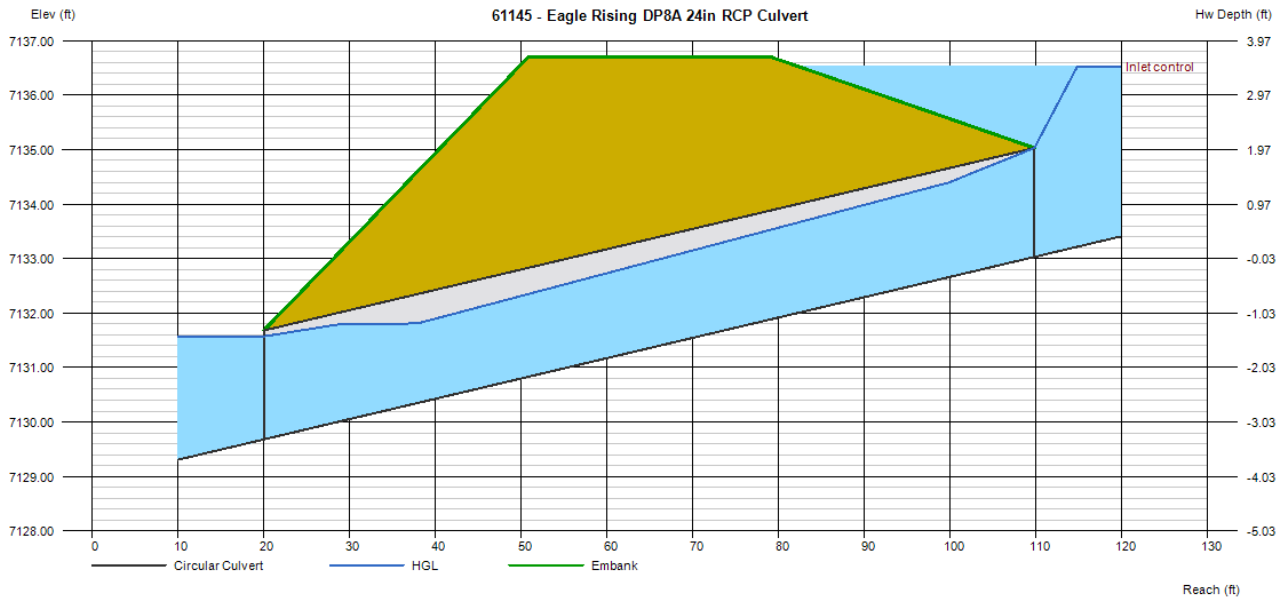
Top Elevation (ft)	=	7136.71
Top Width (ft)	=	28.00
Crest Width (ft)	=	205.00

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

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Oct 31 2023

Design Point E11 (Lot 1) - Redirect Culvert (21.3 cfs 100 Year)

Circular

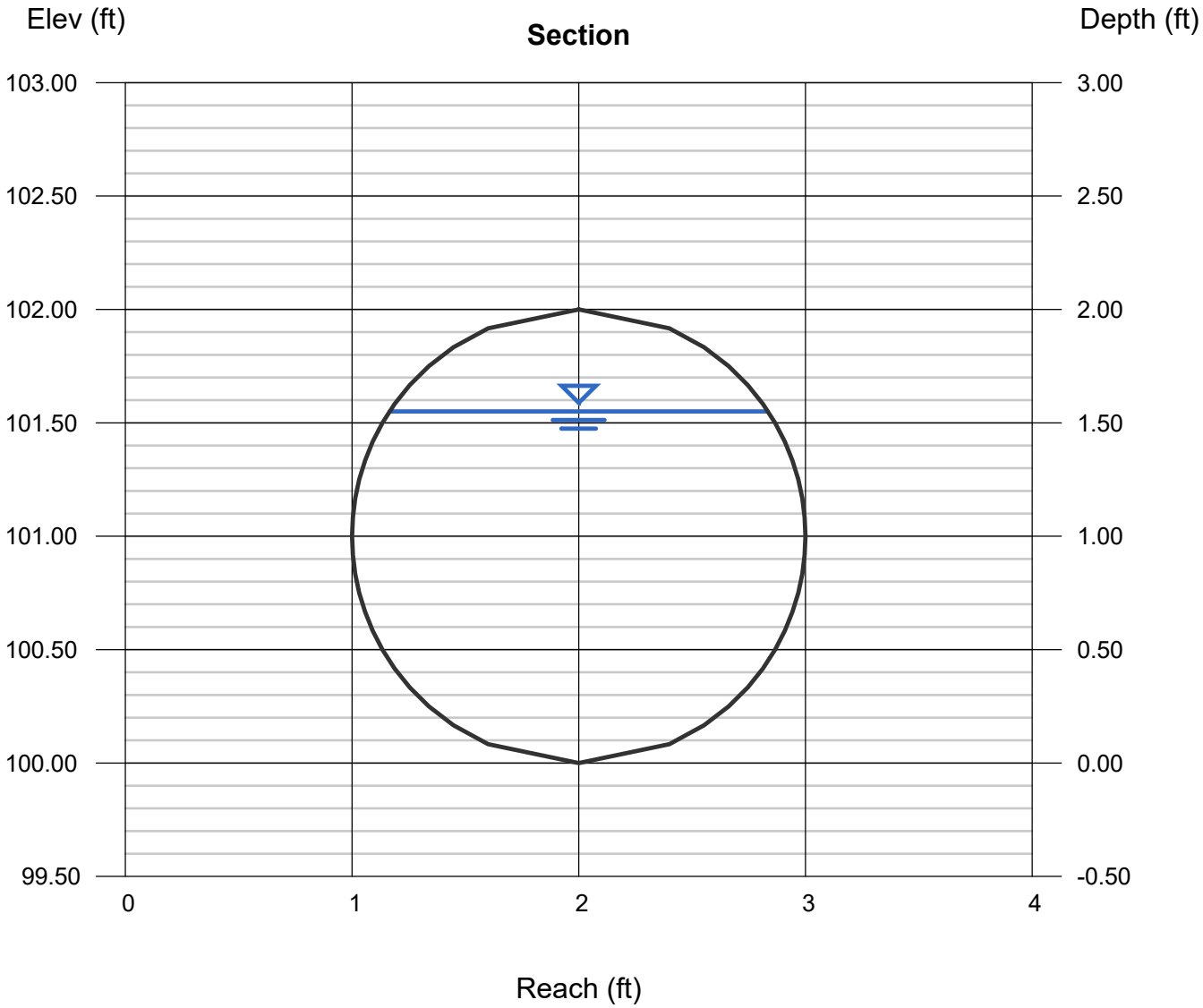
Diameter (ft)	= 2.00
Invert Elev (ft)	= 100.00
Slope (%)	= 1.00
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 21.30

Highlighted

Depth (ft)	= 1.55
Q (cfs)	= 21.30
Area (sqft)	= 2.62
Velocity (ft/s)	= 8.15
Wetted Perim (ft)	= 4.31
Crit Depth, Yc (ft)	= 1.66
Top Width (ft)	= 1.67
EGL (ft)	= 2.58



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Dec 23 2022

Basin B - Swale Calculation - Reach (Q5)

Trapezoidal

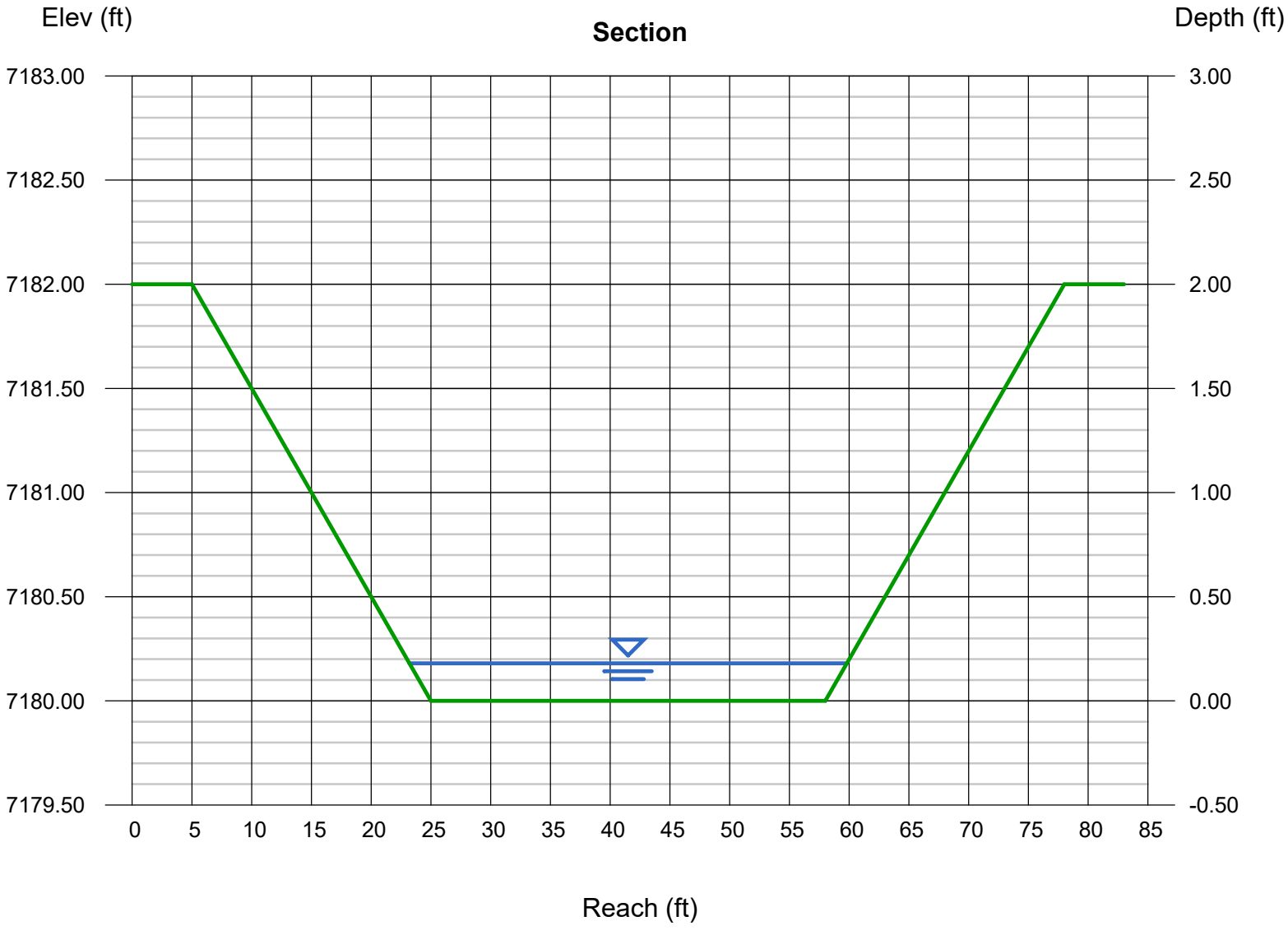
Bottom Width (ft)	= 33.00
Side Slopes (z:1)	= 10.00, 10.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 7180.00
Slope (%)	= 2.70
N-Value	= 0.040

Calculations

Compute by:	Known Q
Known Q (cfs)	= 11.60

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



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Dec 23 2022

Basin B - Swale Calculation - Reach (Q100)

Trapezoidal

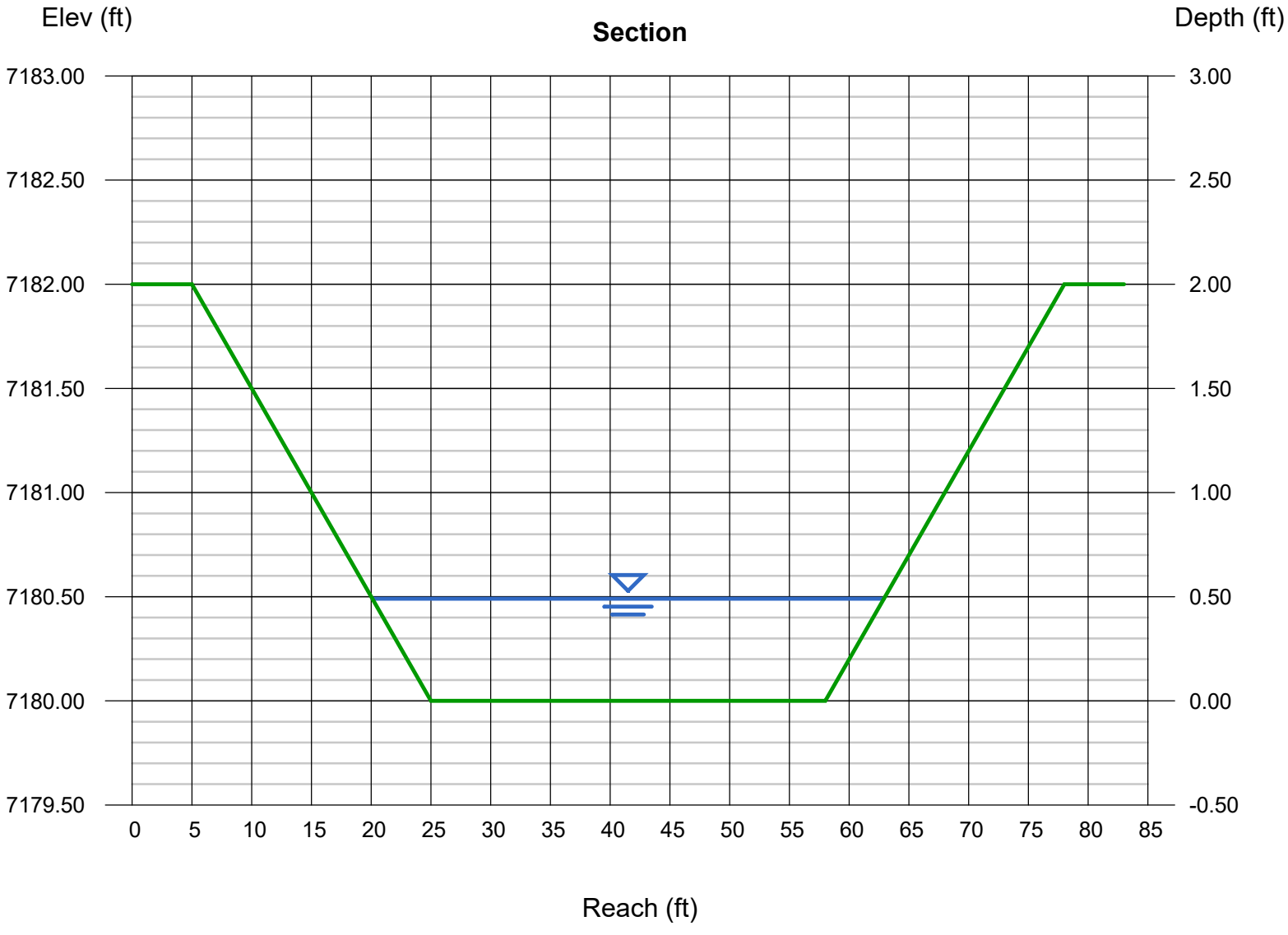
Bottom Width (ft)	= 33.00
Side Slopes (z:1)	= 10.00, 10.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 7180.00
Slope (%)	= 2.70
N-Value	= 0.040

Calculations

Compute by:	Known Q
Known Q (cfs)	= 63.30

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



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Dec 23 2022

Basin C - Swale Calculation - Reach (Q5)

Trapezoidal

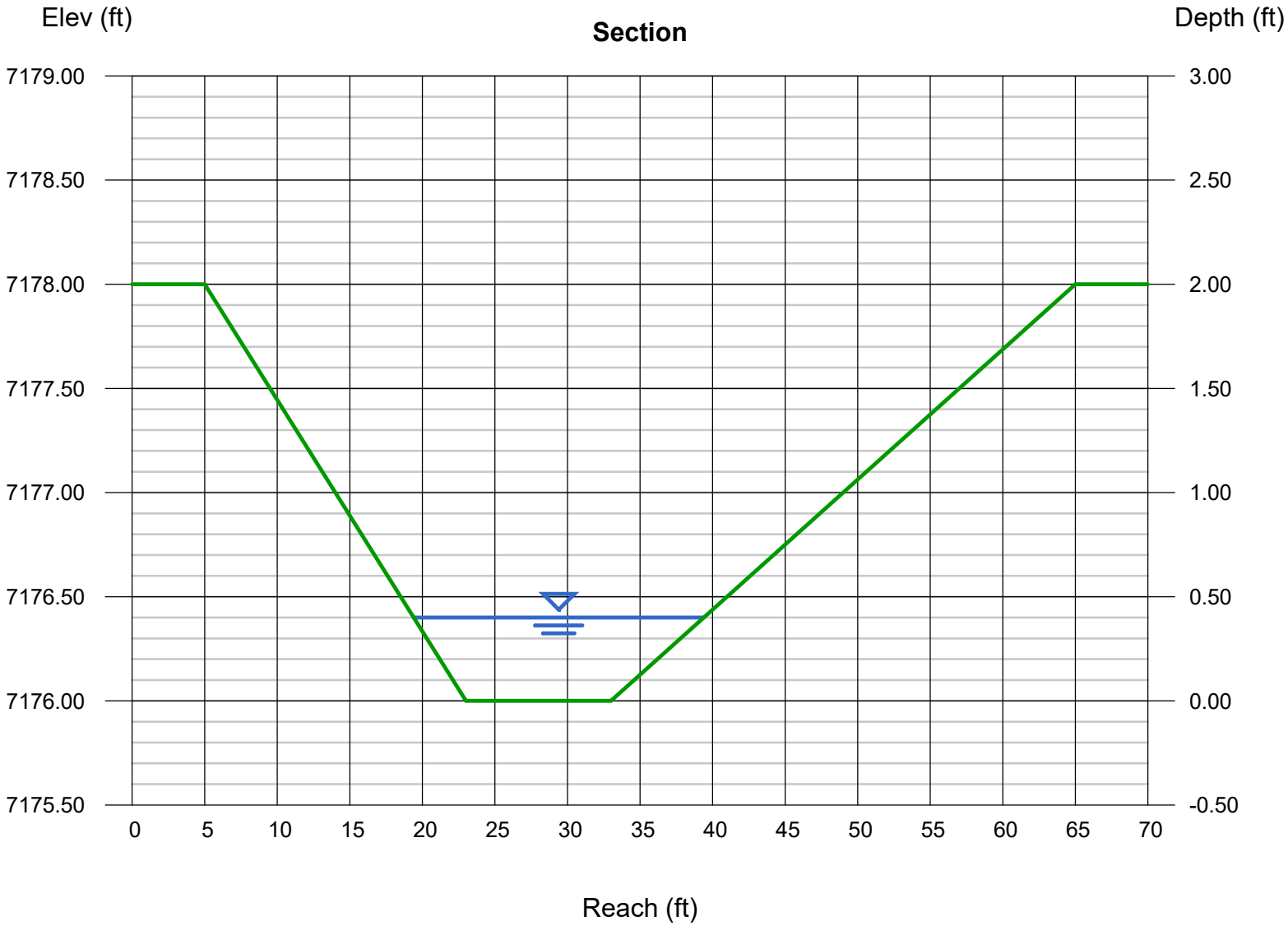
Bottom Width (ft)	= 10.00
Side Slopes (z:1)	= 9.00, 16.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 7176.00
Slope (%)	= 1.60
N-Value	= 0.040

Calculations

Compute by:	Known Q
Known Q (cfs)	= 12.60

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



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Dec 23 2022

Basin C - Swale Calculation - Reach (Q100)

Trapezoidal

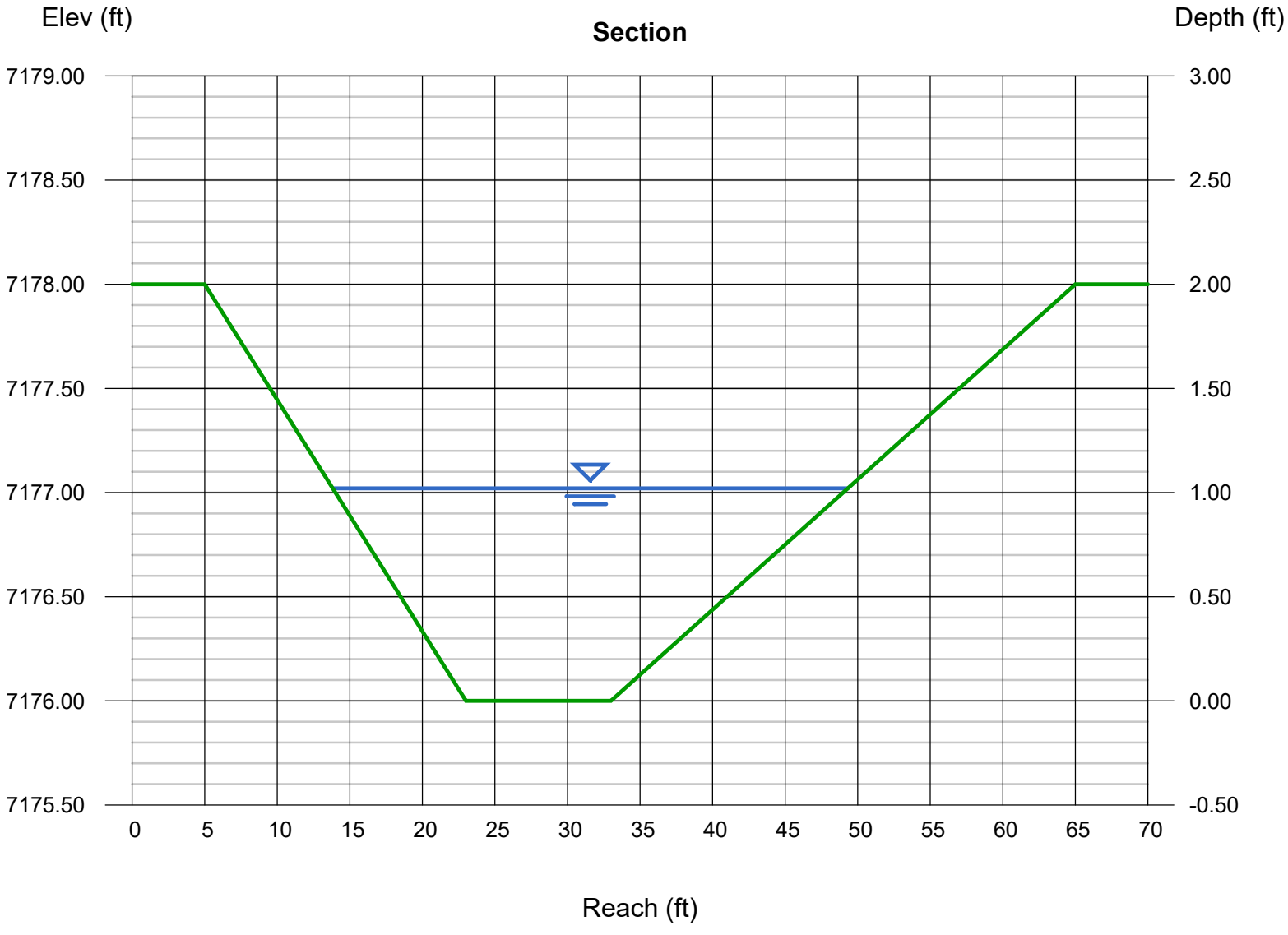
Bottom Width (ft)	= 10.00
Side Slopes (z:1)	= 9.00, 16.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 7176.00
Slope (%)	= 1.60
N-Value	= 0.040

Calculations

Compute by:	Known Q
Known Q (cfs)	= 80.70

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



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Jan 4 2023

Basin D - Swale Calculation - Reach (Q5)

Trapezoidal

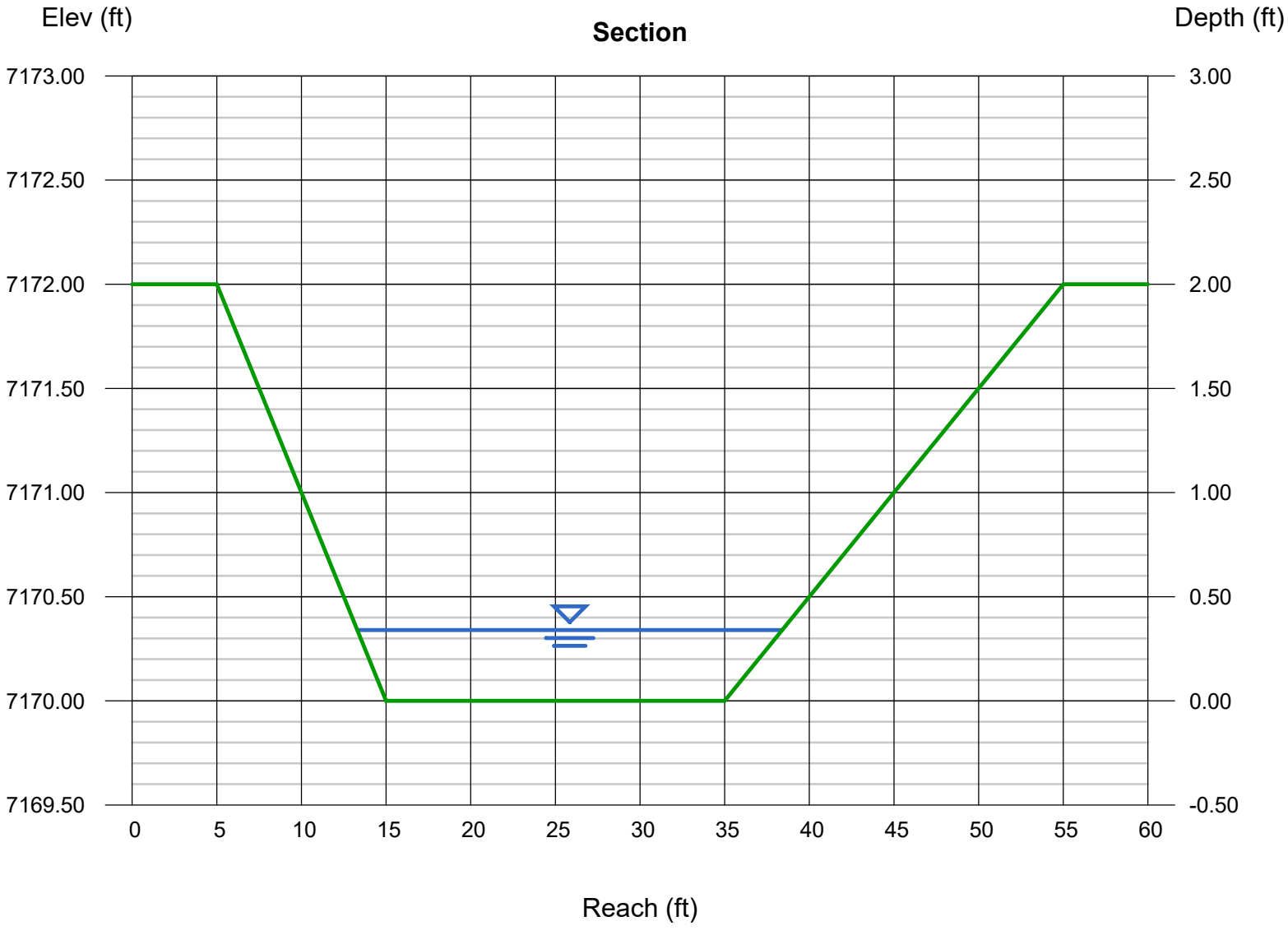
Bottom Width (ft)	= 20.00
Side Slopes (z:1)	= 5.00, 10.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 7170.00
Slope (%)	= 3.70
N-Value	= 0.040

Calculations

Compute by:	Known Q
Known Q (cfs)	= 24.40

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



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Jan 4 2023

Basin D - Swale Calculation - Reach (Q100)

Trapezoidal

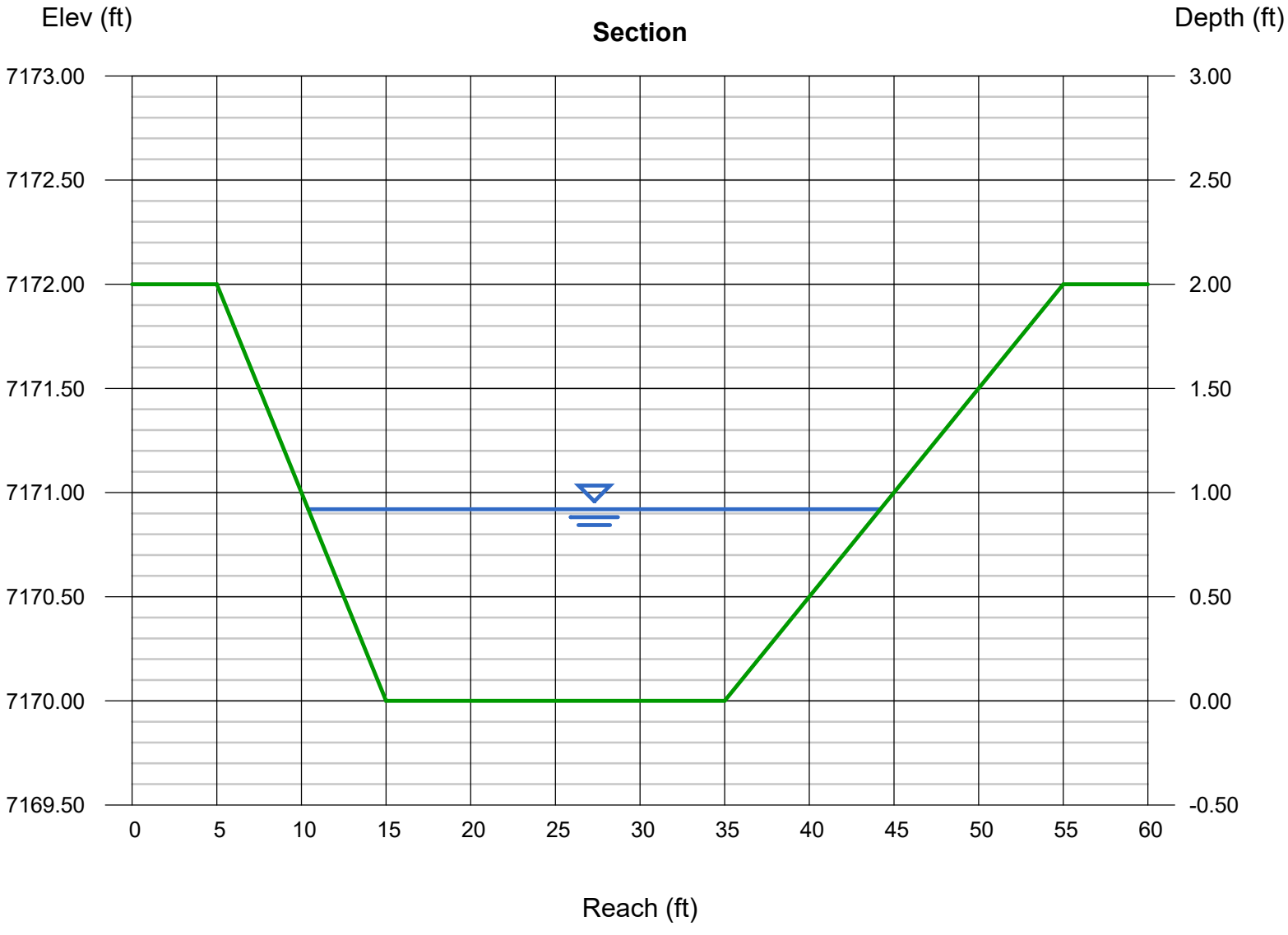
Bottom Width (ft)	= 20.00
Side Slopes (z:1)	= 5.00, 10.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 7170.00
Slope (%)	= 3.70
N-Value	= 0.040

Calculations

Compute by:	Known Q
Known Q (cfs)	= 142.60

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



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Dec 23 2022

Basin F2 Swale Calculation - Reach 1 (Q5)

Triangular

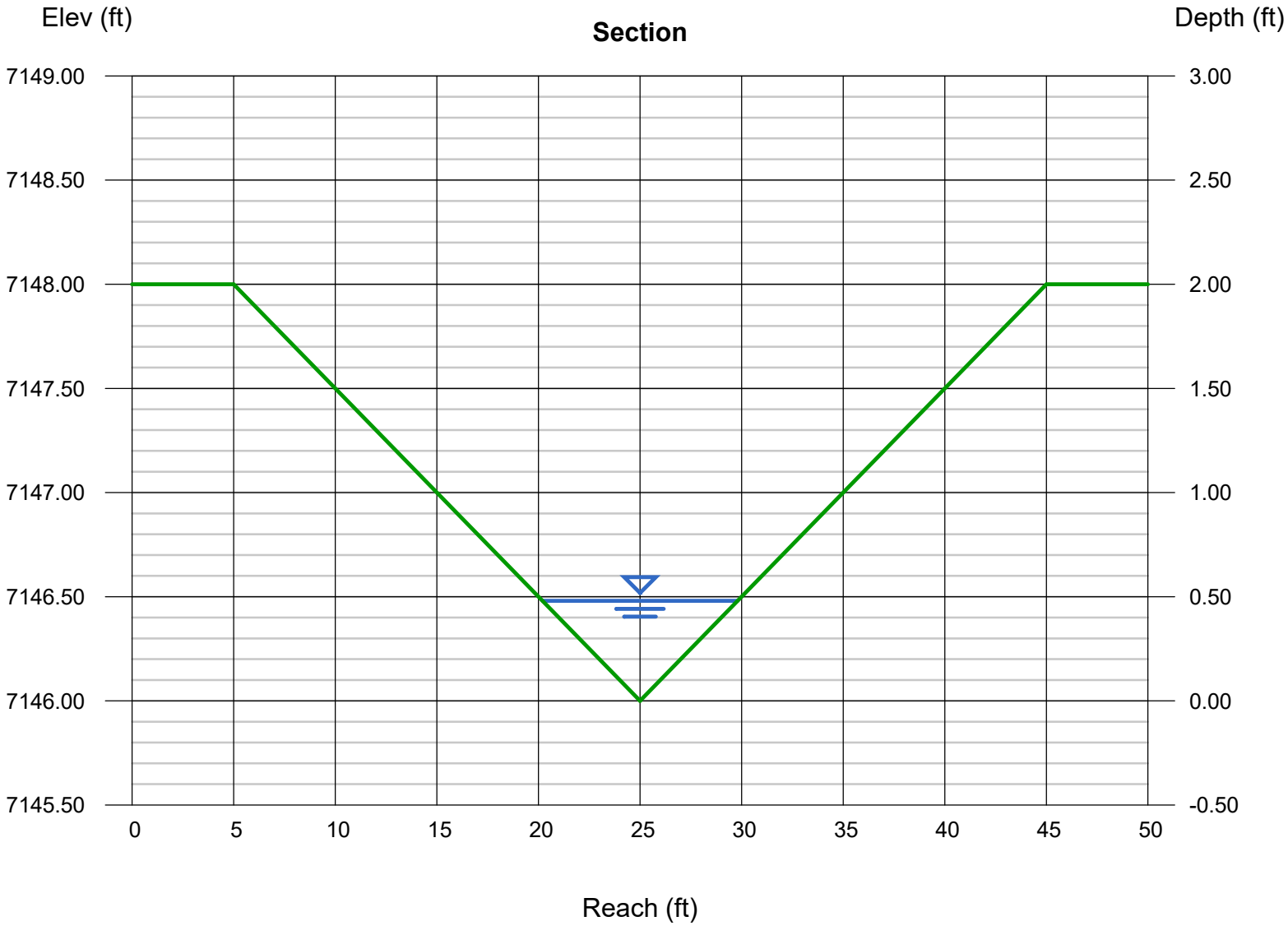
Side Slopes (z:1)	= 10.00, 10.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 7146.00
Slope (%)	= 3.80
N-Value	= 0.040

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

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Dec 23 2022

Basin F2 Swale Calculation - Reach 1 (Q100)

Triangular

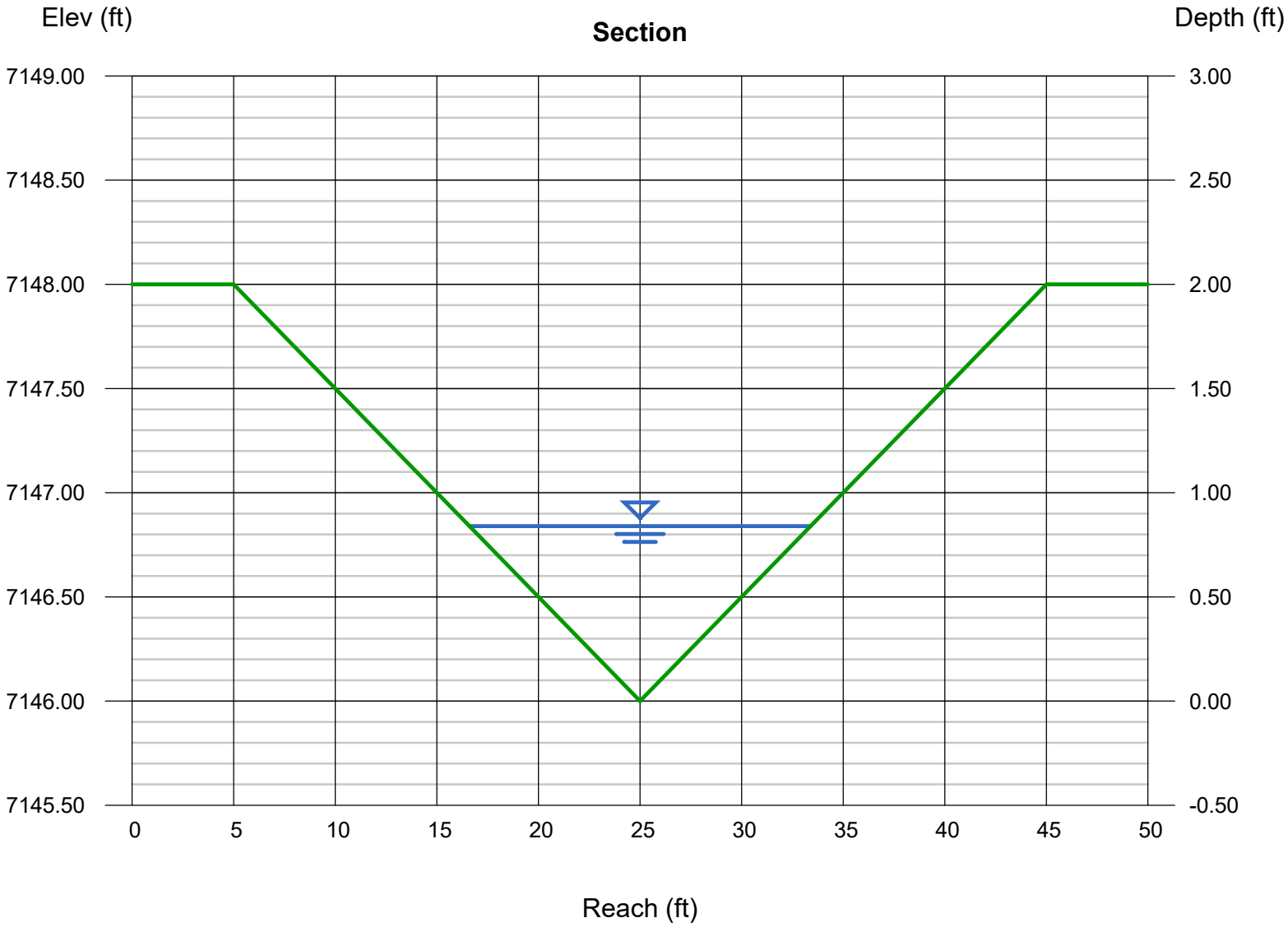
Side Slopes (z:1)	= 10.00, 10.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 7146.00
Slope (%)	= 3.80
N-Value	= 0.040

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

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Dec 23 2022

Basin F2 Swale Calculation - Reach 2 (Q5)

Triangular

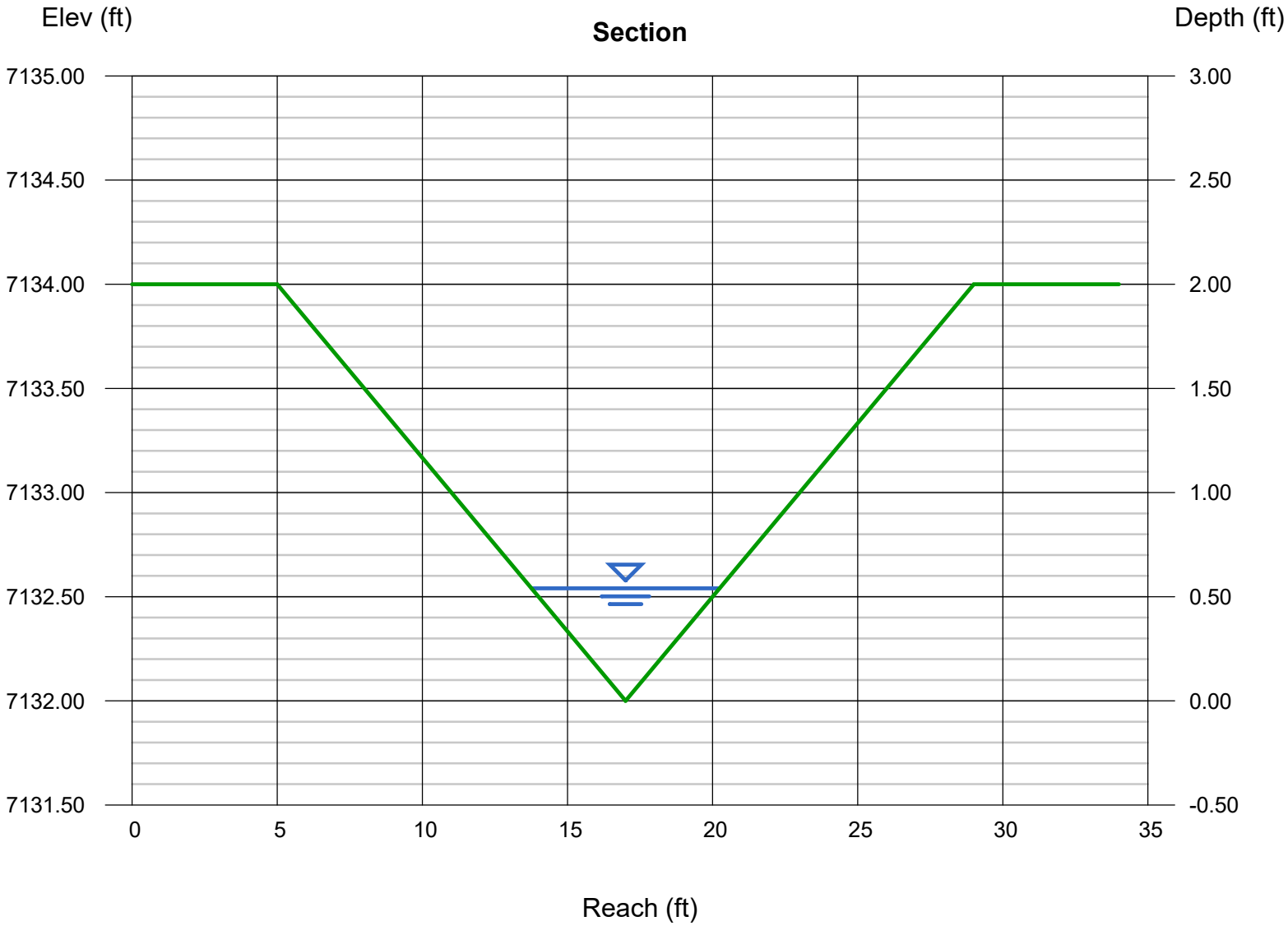
Side Slopes (z:1)	= 6.00, 6.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 7132.00
Slope (%)	= 5.70
N-Value	= 0.040

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

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Dec 23 2022

Basin F2 Swale Calculation - Reach 2 (Q100)

Triangular

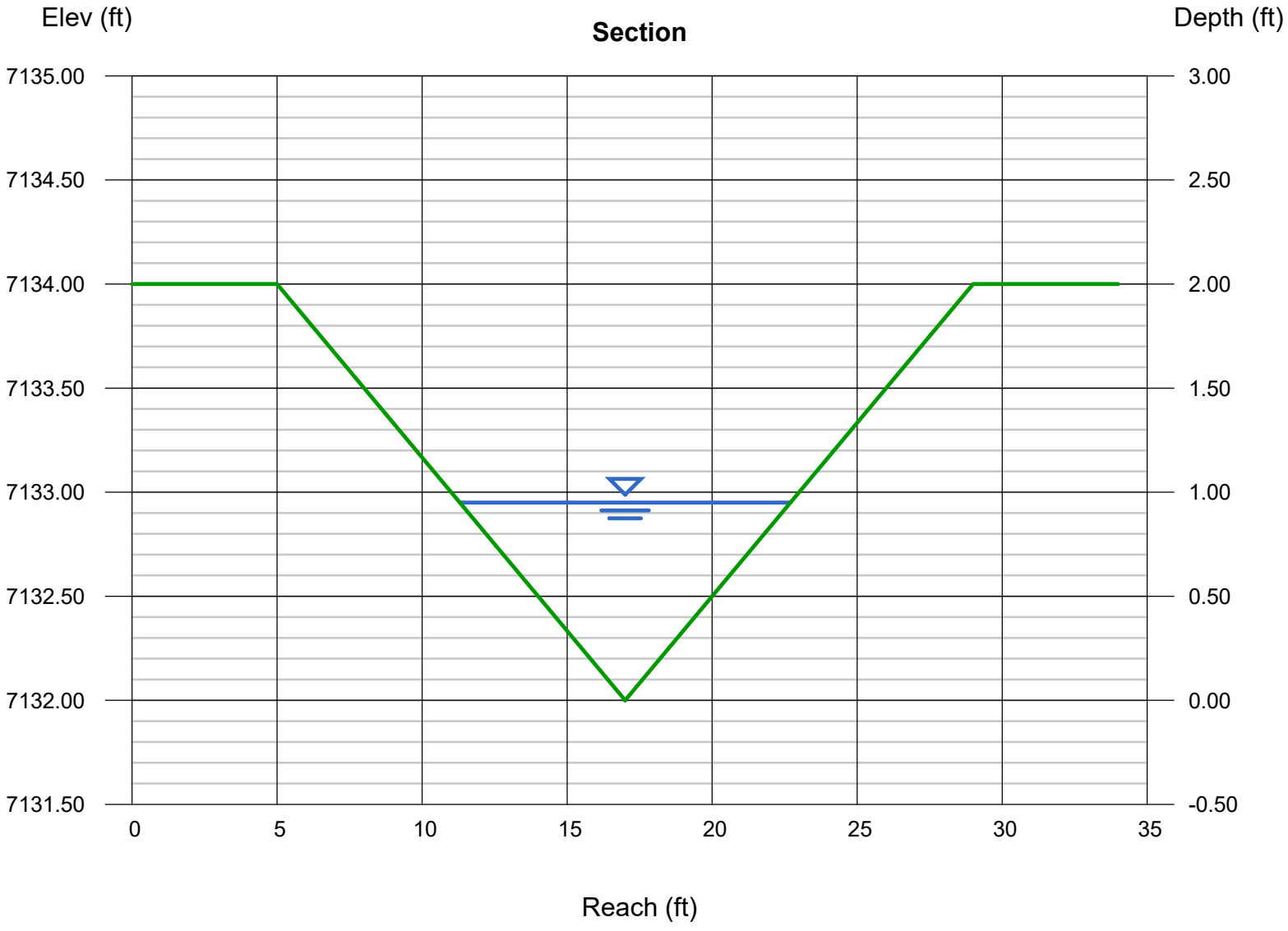
Side Slopes (z:1)	= 6.00, 6.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 7132.00
Slope (%)	= 5.70
N-Value	= 0.040

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

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Dec 23 2022

Basin J - Swale Calculation - Reach (Q5)

Triangular

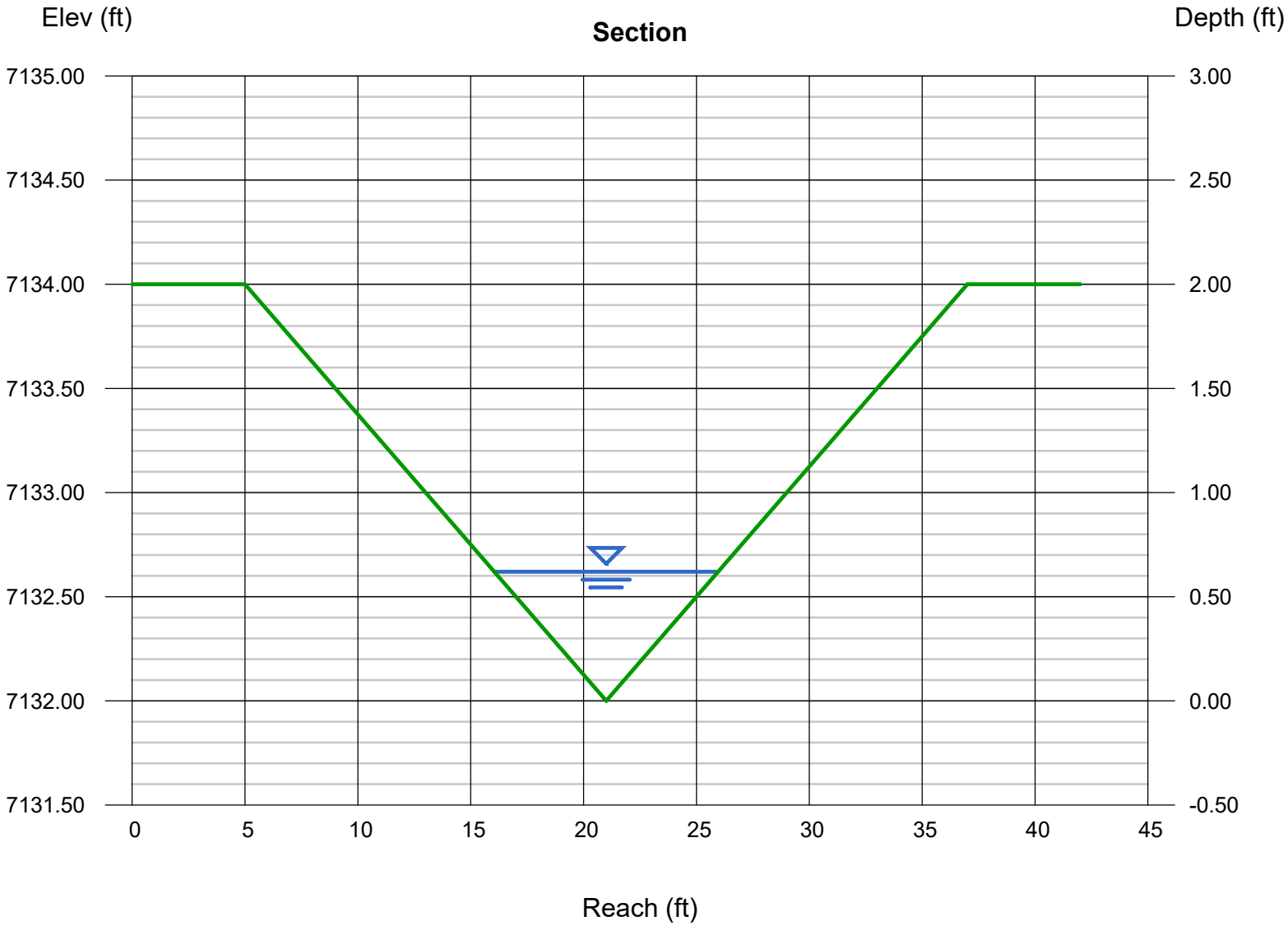
Side Slopes (z:1)	= 8.00, 8.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 7132.00
Slope (%)	= 4.80
N-Value	= 0.040

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

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Dec 23 2022

Basin J - Swale Calculation - Reach (Q100)

Triangular

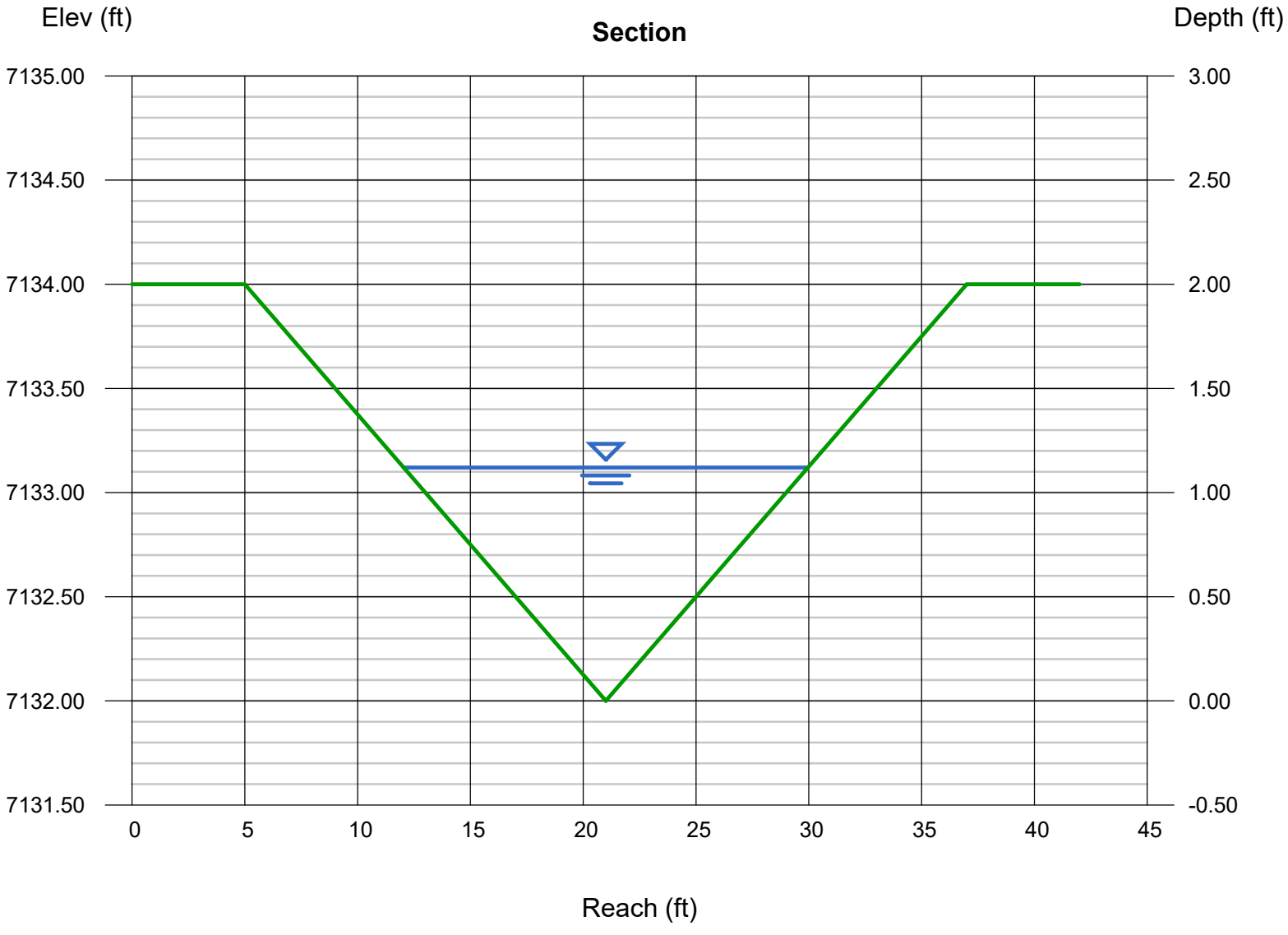
Side Slopes (z:1)	= 8.00, 8.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 7132.00
Slope (%)	= 4.80
N-Value	= 0.040

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



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Sep 5 2023

Design Point DP6A Channel

Triangular

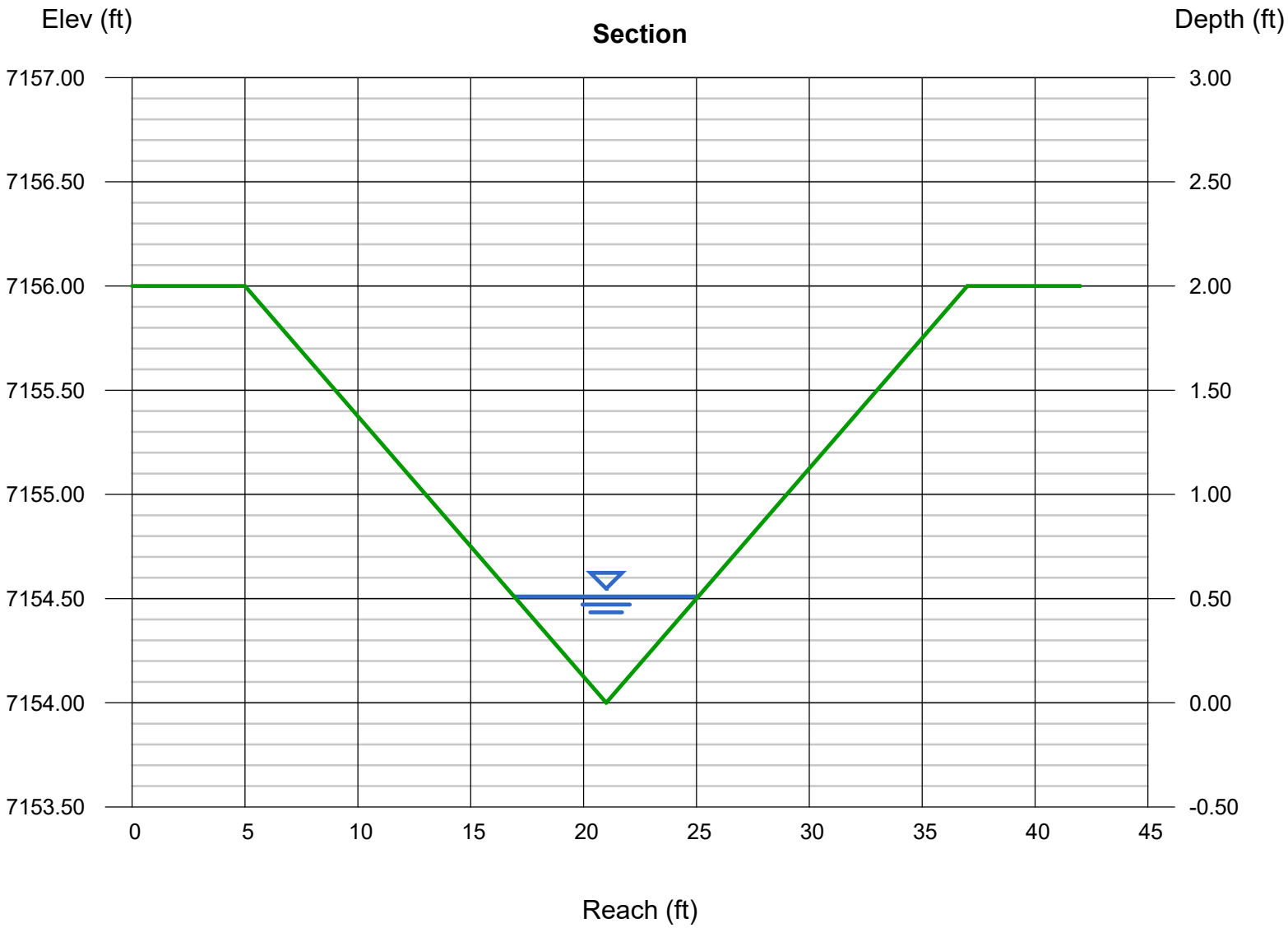
Side Slopes (z:1)	= 8.00, 8.00
Total Depth (ft)	= 2.00
Invert Elev (ft)	= 7154.00
Slope (%)	= 12.00
N-Value	= 0.034

Calculations

Compute by:	Known Q
Known Q (cfs)	= 12.00

Highlighted

Depth (ft)	= 0.51
Q (cfs)	= 12.00
Area (sqft)	= 2.08
Velocity (ft/s)	= 5.77
Wetted Perim (ft)	= 8.22
Crit Depth, Yc (ft)	= 0.68
Top Width (ft)	= 8.16
EGL (ft)	= 1.03



Rip Rap Sizing Calculations (Mild Slope)

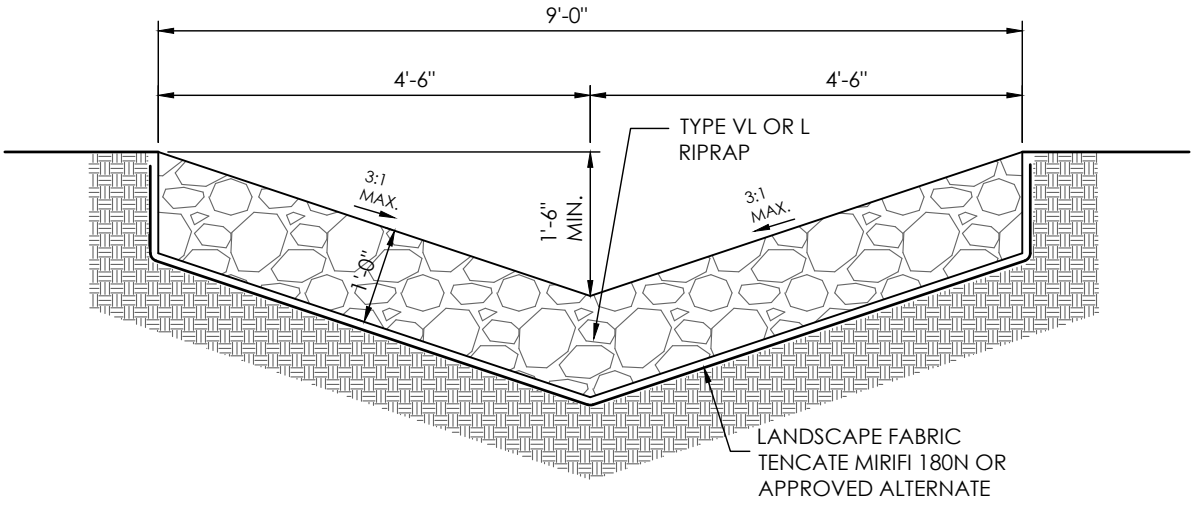
MHFC Eq 8-11 $d50 = (V*S^{0.17}/(4.5*(Gs-1)^{0.66})^2$

Channel Designation	Q100 (cfs)	V (ft/sec)	S (ft/ft)	Gs	d50 (ft)	d50 (in)	Note
Swale DP6A	12	5.77	0.12	2.6	0.43	5.2	Existing Type VL
Lot 9/10	28.3	5.23	0.25	2.6	0.45	5.4	Existing Type VL
Lot 11	55.1	5.49	0.06	2.6	0.31	3.7	Existing Type VL

Manning's n calculation for riprap

MHFC Eq 8-9 $n = 0.0395*D50^{(1/6)}$

Channel Designation	D (ft)		n
Typical	0.43	Existing Type VL	0.034



TYPICAL SWALE (TYPE "VL" OR "L")

SCALE 1" = 1.0'

Figure 13-12c. Emergency Spillway Protection

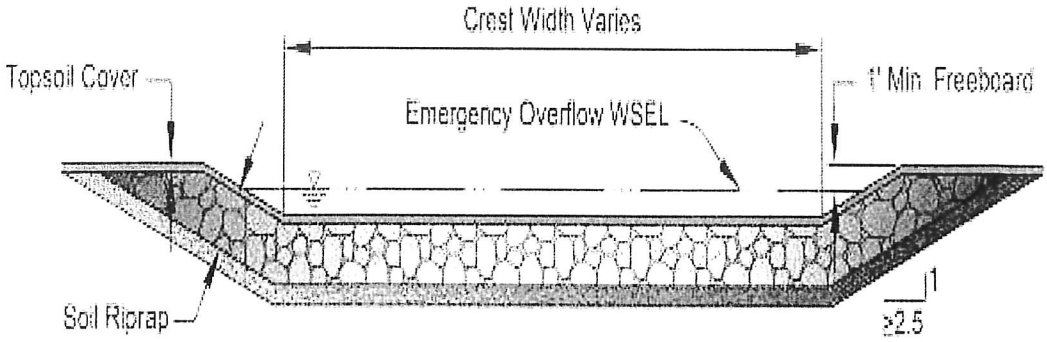
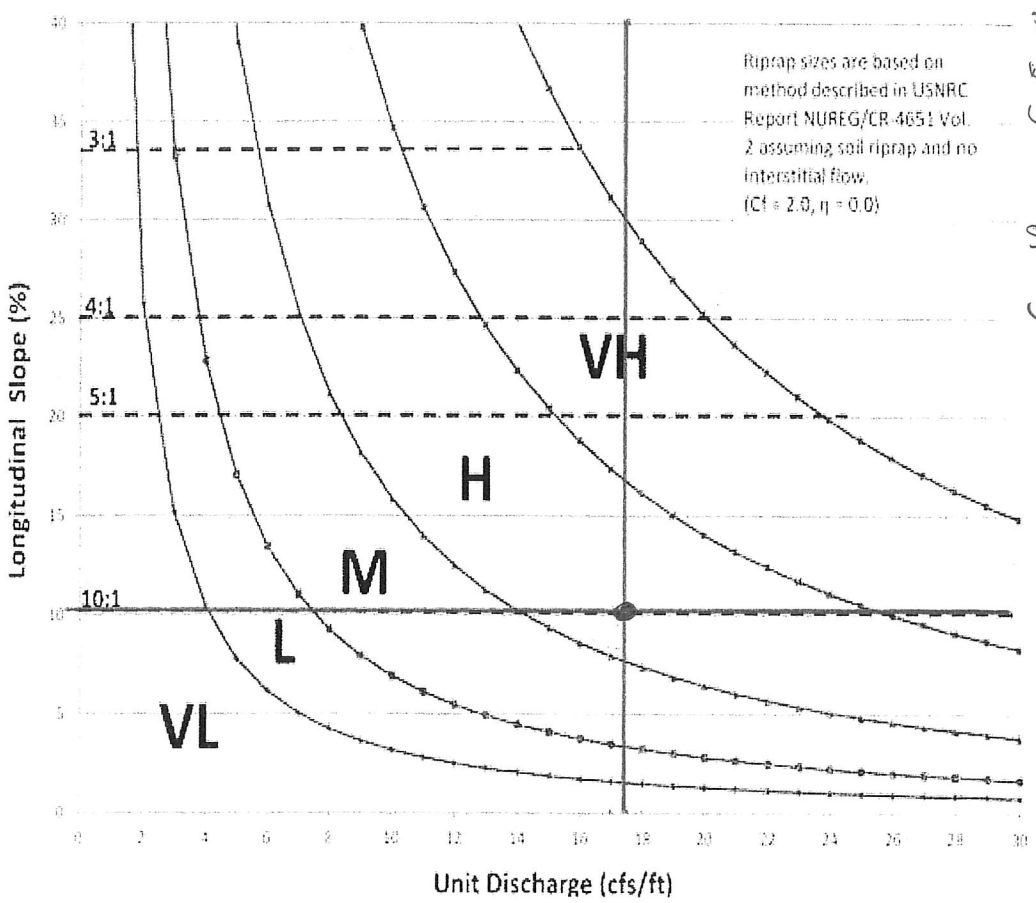


Figure 13-12d. Riprap Types for Emergency Spillway Protection



FLOW = 700 cfs
WIDTH = 40'
UNIT DISCHARGE = 17.5 cfs/ft.
SLOPE = 10:1
USE TYPE H

Figure 13-12c. Emergency Spillway Protection

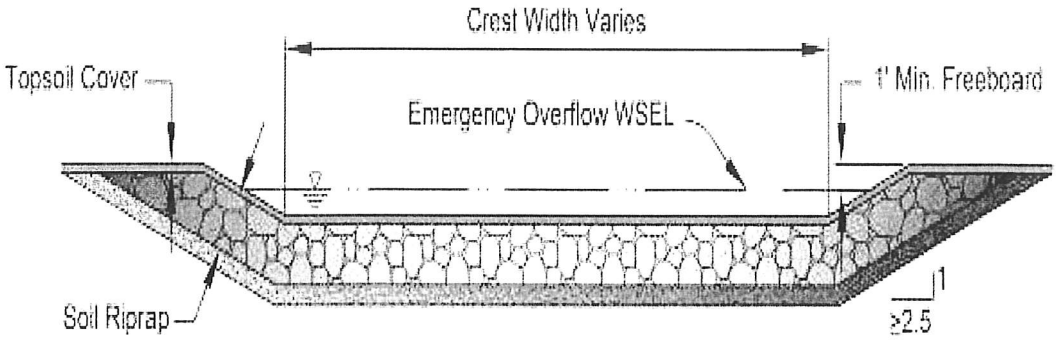
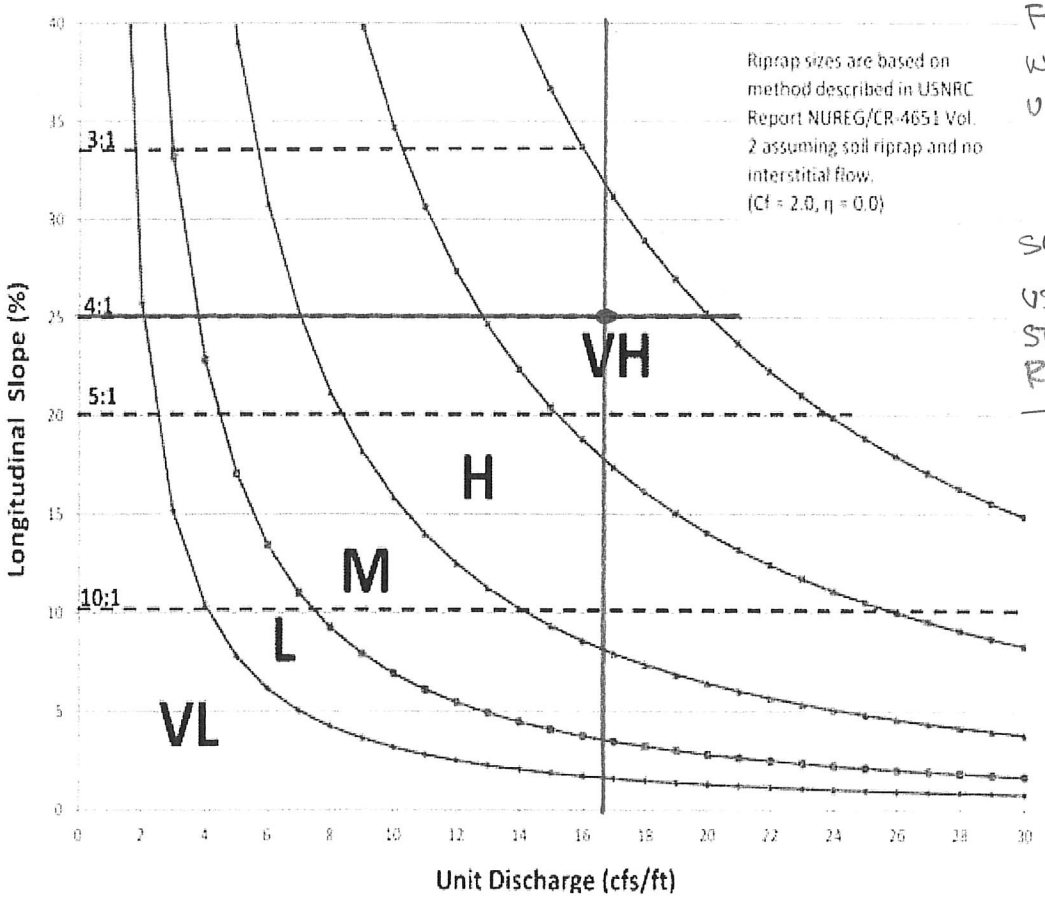


Figure 13-12d. Riprap Types for Emergency Spillway Protection



FLOW = 820 cfs
WIDTH = 50'
UNIT DISCHARGE
= 16.4
cfs/ft.
SLOPE = 4:1
USE TYPE VH
STEEP SLOPE
RIP RAP

TABLE 10-1

COMPOSITE ROUGHNESS COEFFICIENTS FOR UNLINED OPEN CHANNELS
(Reference: Chow, Ven Te, 1959; Open-Channel Hydraulics)

$$n = (n_o + n_1 + n_2 + n_3 + n_4)m \qquad (10\text{-}2)$$

	Channel Conditions	Value
Material Type n_o	Earth	0.020
	Fine Gravel	0.024
	Coarse Gravel	0.028
Degree of Irregularity n_1	Smooth	0.000
	Minor	0.005
	Moderate	0.010
	Severe	0.020
Variation of Channel Cross Section n_2	Gradual	0.000
	Alternating Occasionally	0.005
	Alternating Frequently	0.010 - 0.015
Relative Effect of Obstructions n_3	Negligible	0.000
	Minor	0.010 - 0.015
	Appreciable	0.020 - 0.030
	Severe	0.040 - 0.060
Vegetation n_4	Low	0.005 - 0.010
	Medium	0.010 - 0.025
	High	0.025 - 0.050
	Very High	0.050 - 0.100
Degree of Meandering m	Minor	1.000 - 1.200
	Appreciable	1.200 - 1.500
	Severe	1.500

0.005

GRASSES & CAT TAIL
OVERBANKS
WILLOW AREAS
1.15

GRASSED & CAT TAIL AREAS

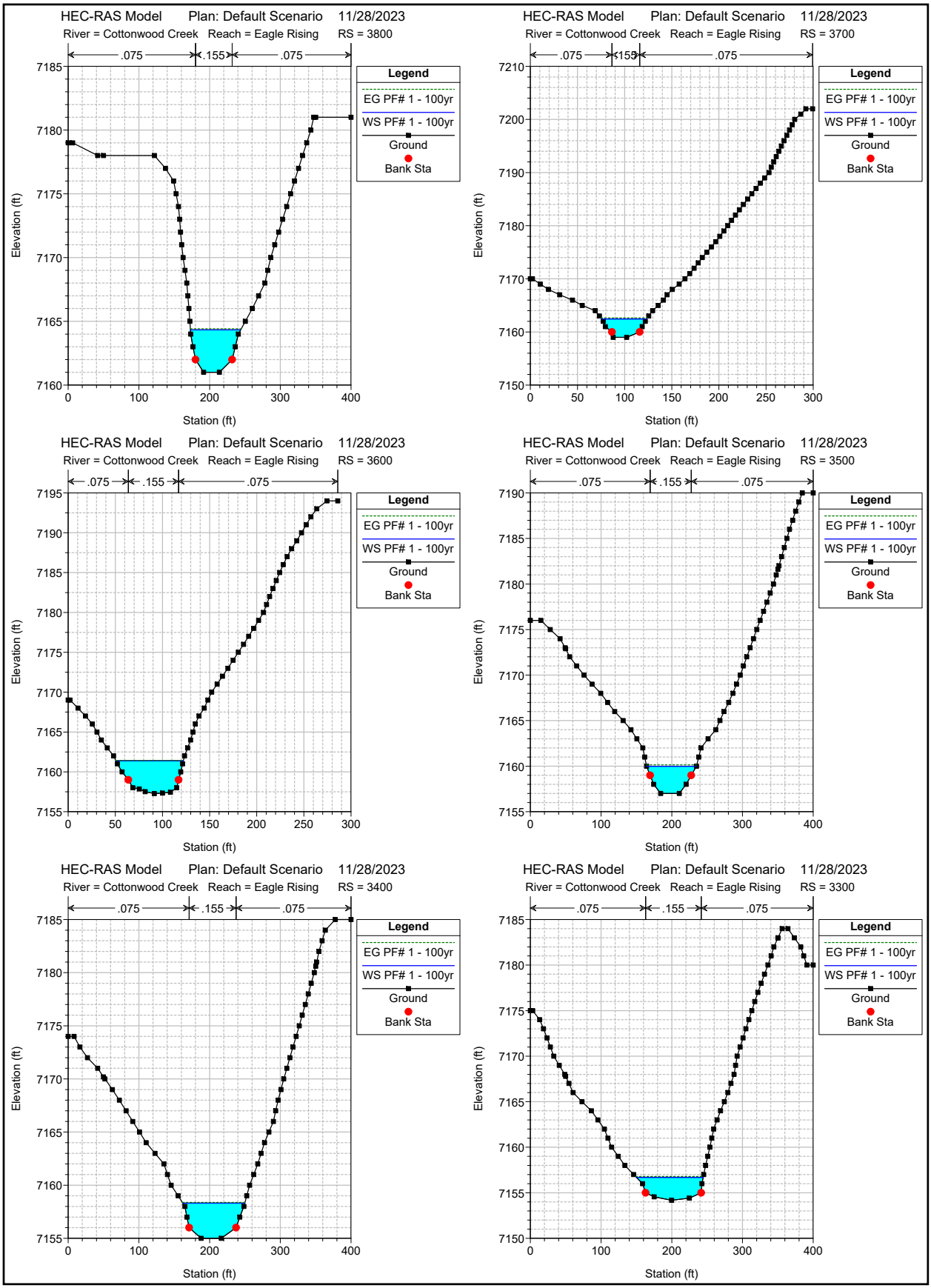
$n = (.020 + .005 + 0.005 + 0.005 + 0.025)1.15 = 0.069$

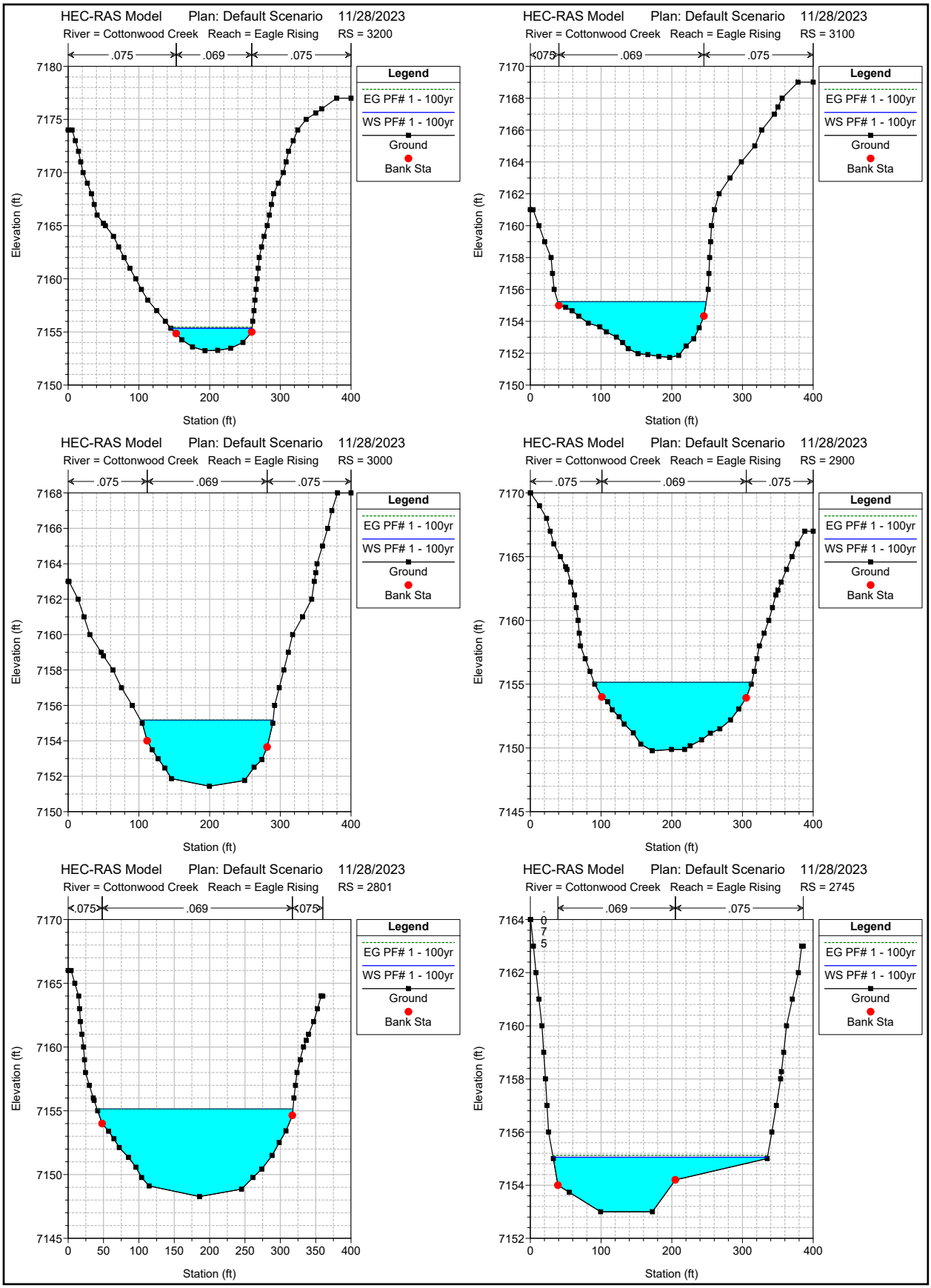
OVERBANKS

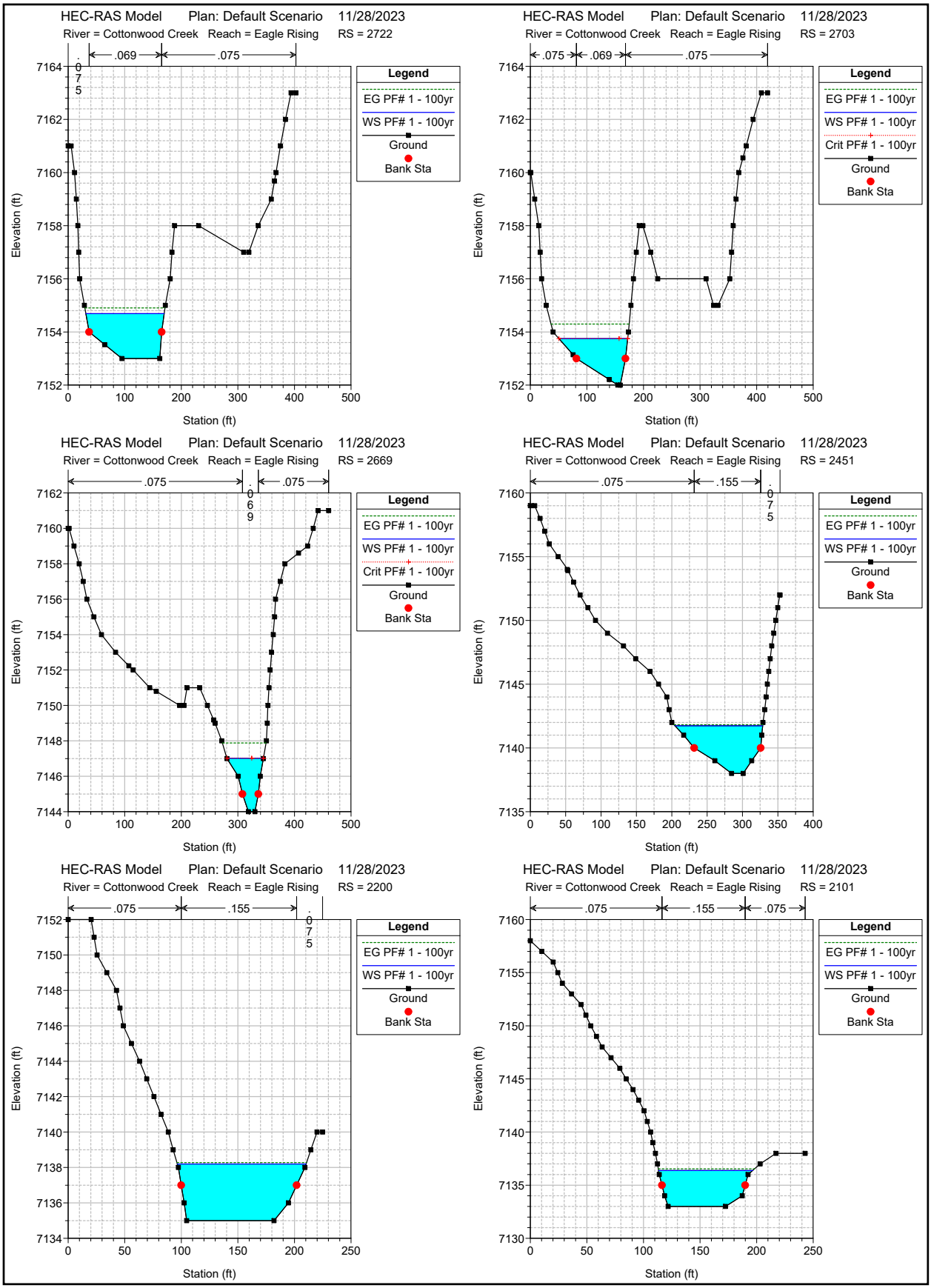
$n = (0.020 + 0.005 + 0.005 + 0.005 + 0.050)1.15 = 0.075$

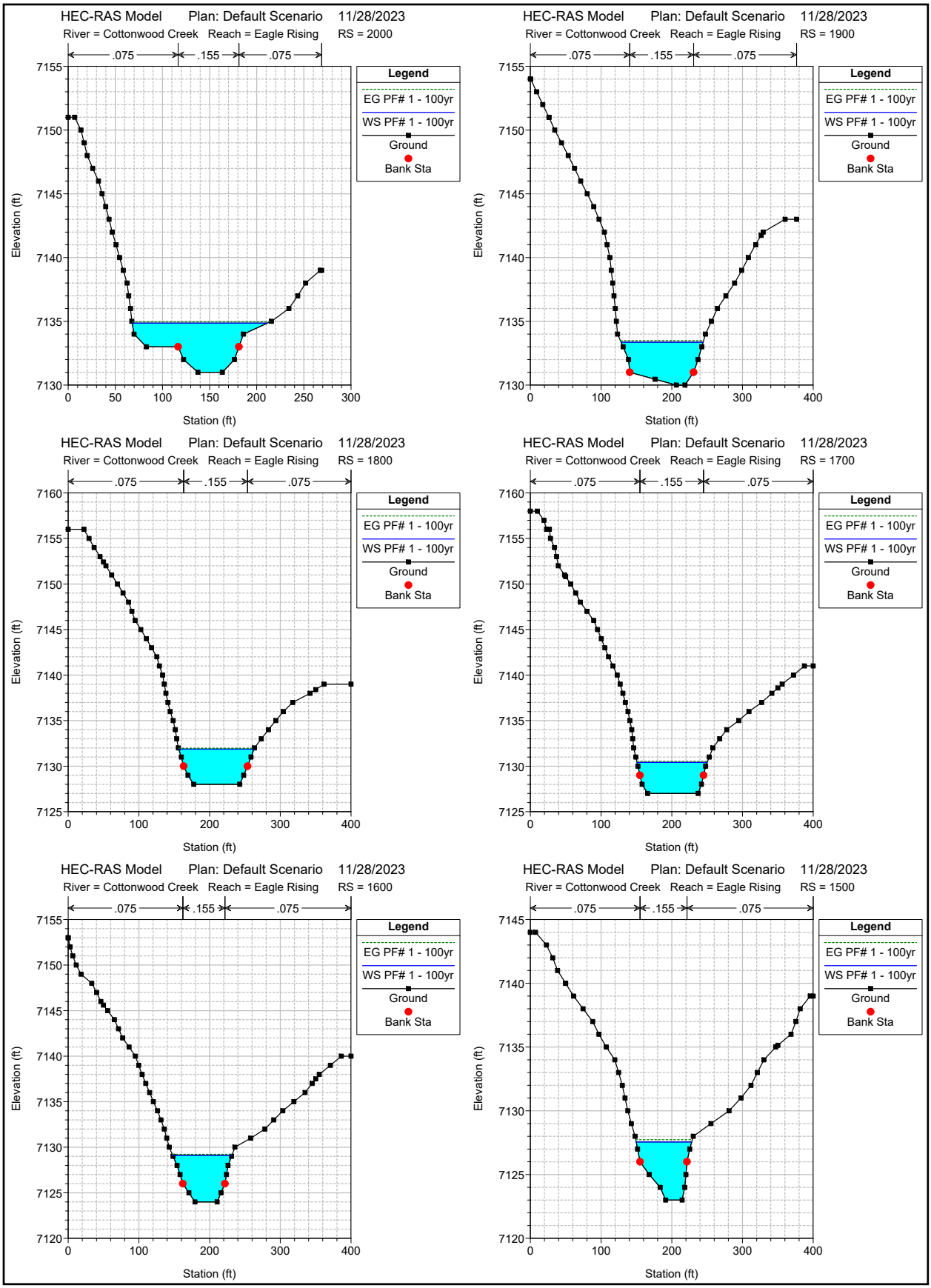
WILLOW AREAS

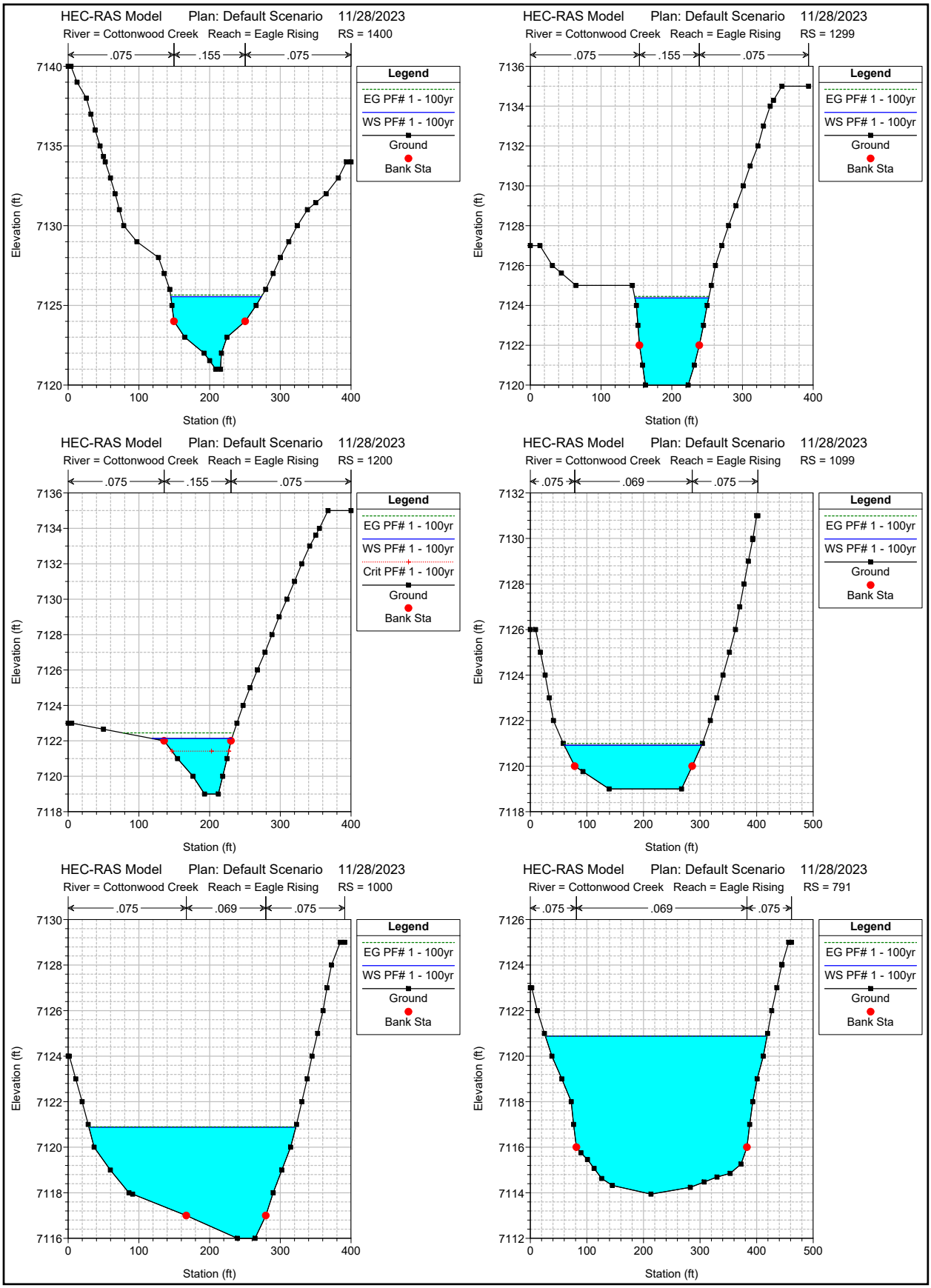
$n = (0.020 + 0.005 + 0.005 + 0.005 + 0.100)1.15 = 0.155$

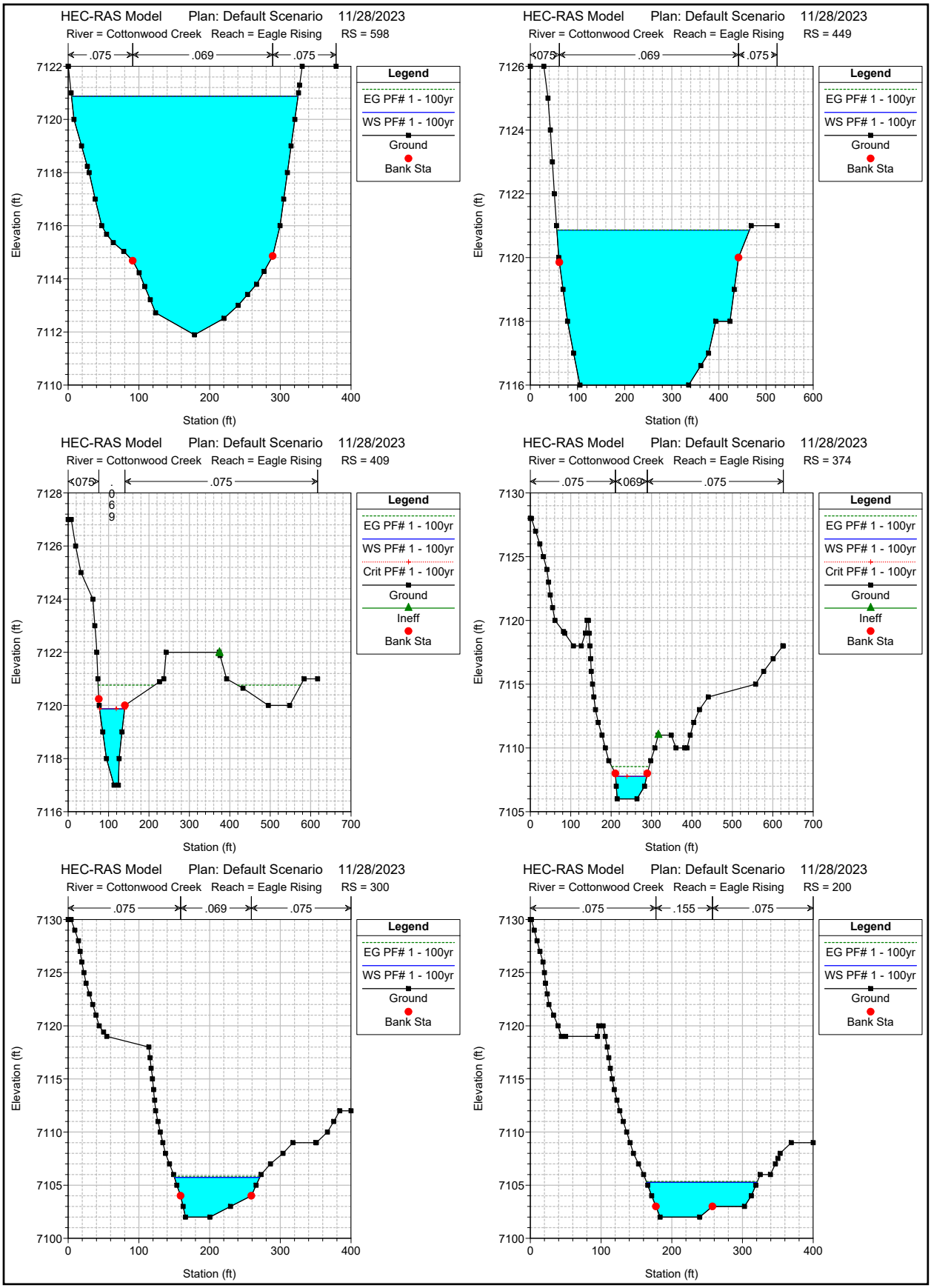

HEC-RAS Model Plan: Default Scenario 11/28/2023
River = Cottonwood Creek Reach = Eagle Rising RS = 3800
.075 .155 .075
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 11/28/2023
River = Cottonwood Creek Reach = Eagle Rising RS = 3700
.075 .155 .075
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 11/28/2023
River = Cottonwood Creek Reach = Eagle Rising RS = 3600
.075 .155 .075
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 11/28/2023
River = Cottonwood Creek Reach = Eagle Rising RS = 3500
.075 .155 .075
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 11/28/2023
River = Cottonwood Creek Reach = Eagle Rising RS = 3400
.075 .155 .075
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 11/28/2023
River = Cottonwood Creek Reach = Eagle Rising RS = 3300
.075 .155 .075
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)

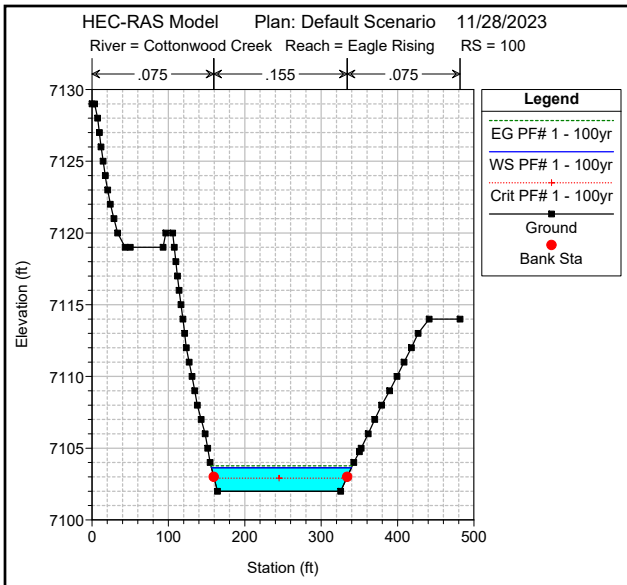

HEC-RAS Model Plan: Default Scenario 11/28/2023
River = Cottonwood Creek Reach = Eagle Rising RS = 3200
.075 .069 .075
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 11/28/2023
River = Cottonwood Creek Reach = Eagle Rising RS = 3100
.075 .069 .075
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 11/28/2023
River = Cottonwood Creek Reach = Eagle Rising RS = 3000
.075 .069 .075
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 11/28/2023
River = Cottonwood Creek Reach = Eagle Rising RS = 2900
.075 .069 .075
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 11/28/2023
River = Cottonwood Creek Reach = Eagle Rising RS = 2801
.075 .069 .075
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 11/28/2023
River = Cottonwood Creek Reach = Eagle Rising RS = 2745
.069 .075
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)


HEC-RAS Model Plan: Default Scenario 11/28/2023
River = Cottonwood Creek Reach = Eagle Rising RS = 2722
.075 .069 .075
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 11/28/2023
River = Cottonwood Creek Reach = Eagle Rising RS = 2703
.075 .069 .075
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Crit PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 11/28/2023
River = Cottonwood Creek Reach = Eagle Rising RS = 2669
.075 .069 .075
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Crit PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 11/28/2023
River = Cottonwood Creek Reach = Eagle Rising RS = 2451
.075 .155 .075
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 11/28/2023
River = Cottonwood Creek Reach = Eagle Rising RS = 2200
.075 .155 .075
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 11/28/2023
River = Cottonwood Creek Reach = Eagle Rising RS = 2101
.075 .155 .075
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)


HEC-RAS Model Plan: Default Scenario 11/28/2023
River = Cottonwood Creek Reach = Eagle Rising RS = 2000
.075 .155 .075
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 11/28/2023
River = Cottonwood Creek Reach = Eagle Rising RS = 1900
.075 .155 .075
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 11/28/2023
River = Cottonwood Creek Reach = Eagle Rising RS = 1800
.075 .155 .075
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 11/28/2023
River = Cottonwood Creek Reach = Eagle Rising RS = 1700
.075 .155 .075
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 11/28/2023
River = Cottonwood Creek Reach = Eagle Rising RS = 1600
.075 .155 .075
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 11/28/2023
River = Cottonwood Creek Reach = Eagle Rising RS = 1500
.075 .155 .075
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)


HEC-RAS Model Plan: Default Scenario 11/28/2023
River = Cottonwood Creek Reach = Eagle Rising RS = 1400
.075 .155 .075
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 11/28/2023
River = Cottonwood Creek Reach = Eagle Rising RS = 1299
.075 .155 .075
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 11/28/2023
River = Cottonwood Creek Reach = Eagle Rising RS = 1200
.075 .155 .075
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Crit PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 11/28/2023
River = Cottonwood Creek Reach = Eagle Rising RS = 1099
.075 .069 .075
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 11/28/2023
River = Cottonwood Creek Reach = Eagle Rising RS = 1000
.075 .069 .075
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 11/28/2023
River = Cottonwood Creek Reach = Eagle Rising RS = 791
.075 .069 .075
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)


HEC-RAS Model Plan: Default Scenario 11/28/2023
River = Cottonwood Creek Reach = Eagle Rising RS = 598
.075 .069 .075
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 11/28/2023
River = Cottonwood Creek Reach = Eagle Rising RS = 449
.075 .069 .075
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 11/28/2023
River = Cottonwood Creek Reach = Eagle Rising RS = 409
.075 .069 .075
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Crit PF# 1 - 100yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 11/28/2023
River = Cottonwood Creek Reach = Eagle Rising RS = 374
.075 .069 .075
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Crit PF# 1 - 100yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 11/28/2023
River = Cottonwood Creek Reach = Eagle Rising RS = 300
.075 .069 .075
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 11/28/2023
River = Cottonwood Creek Reach = Eagle Rising RS = 200
.075 .155 .075
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)

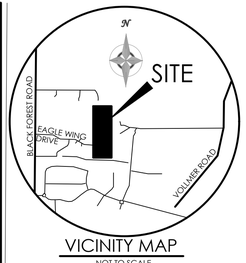

HEC-RAS Model Plan: Default Scenario 11/28/2023
River = Cottonwood Creek Reach = Eagle Rising RS = 100
.075
.155
.075
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Crit PF# 1 - 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
7130
7125
7120
7115
7110
7105
7100
0
100
200
300
400
500

LEGEND

PROPERTY LINE
EASEMENT LINE
LOT LINE

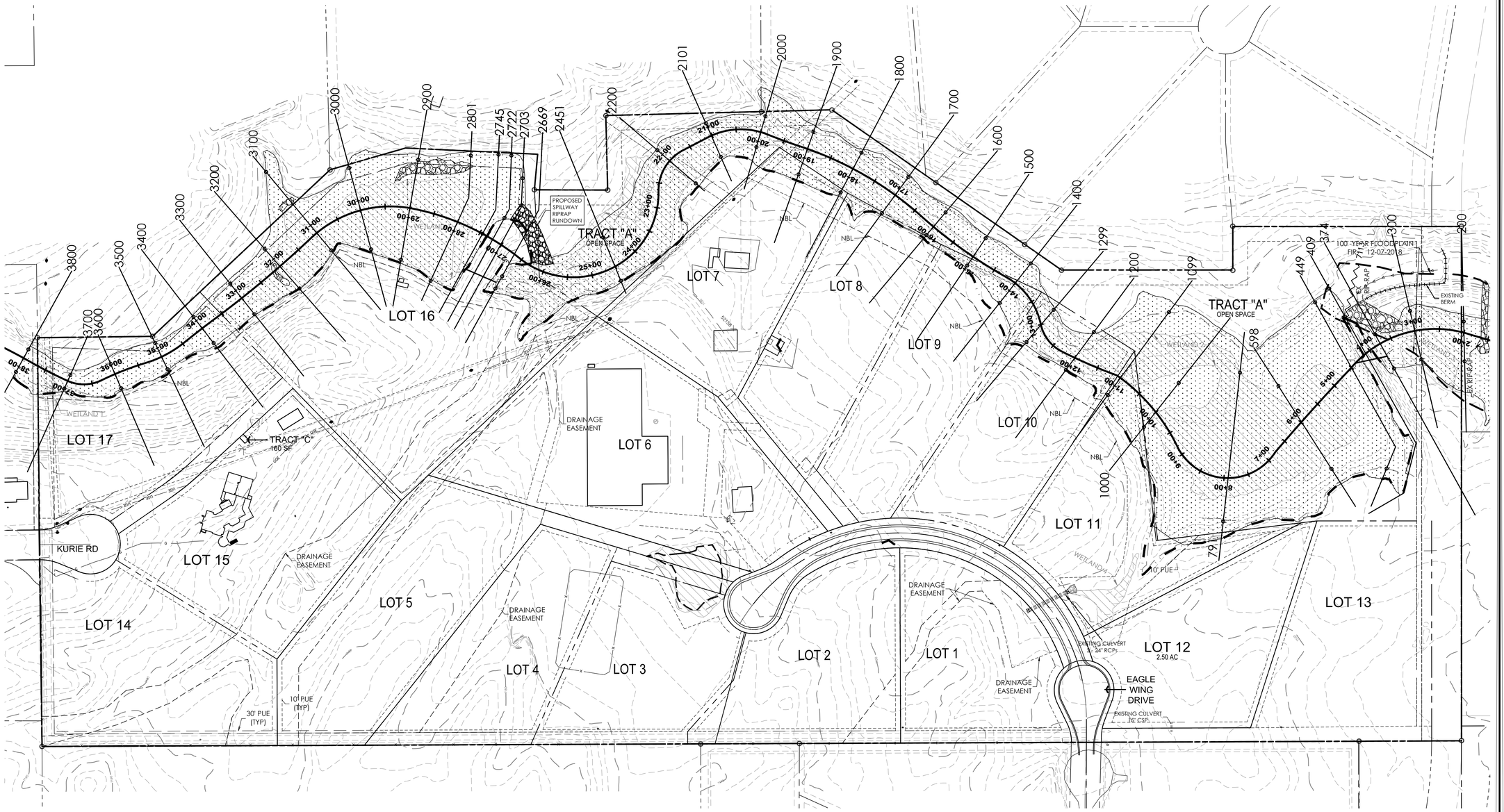
EXISTING
5985 INDEX CONTOUR
84 INTERMEDIATE CONTOUR

PROPOSED
5985 INDEX CONTOUR
84 INTERMEDIATE CONTOUR



VICINITY MAP
NOT TO SCALE

BENCHMARK



N

10 0 50 100 200
1" = 100' 1:200

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1903 lelaray street, suite 200 colorado springs co 80909 719.635.5736

REVISIONS

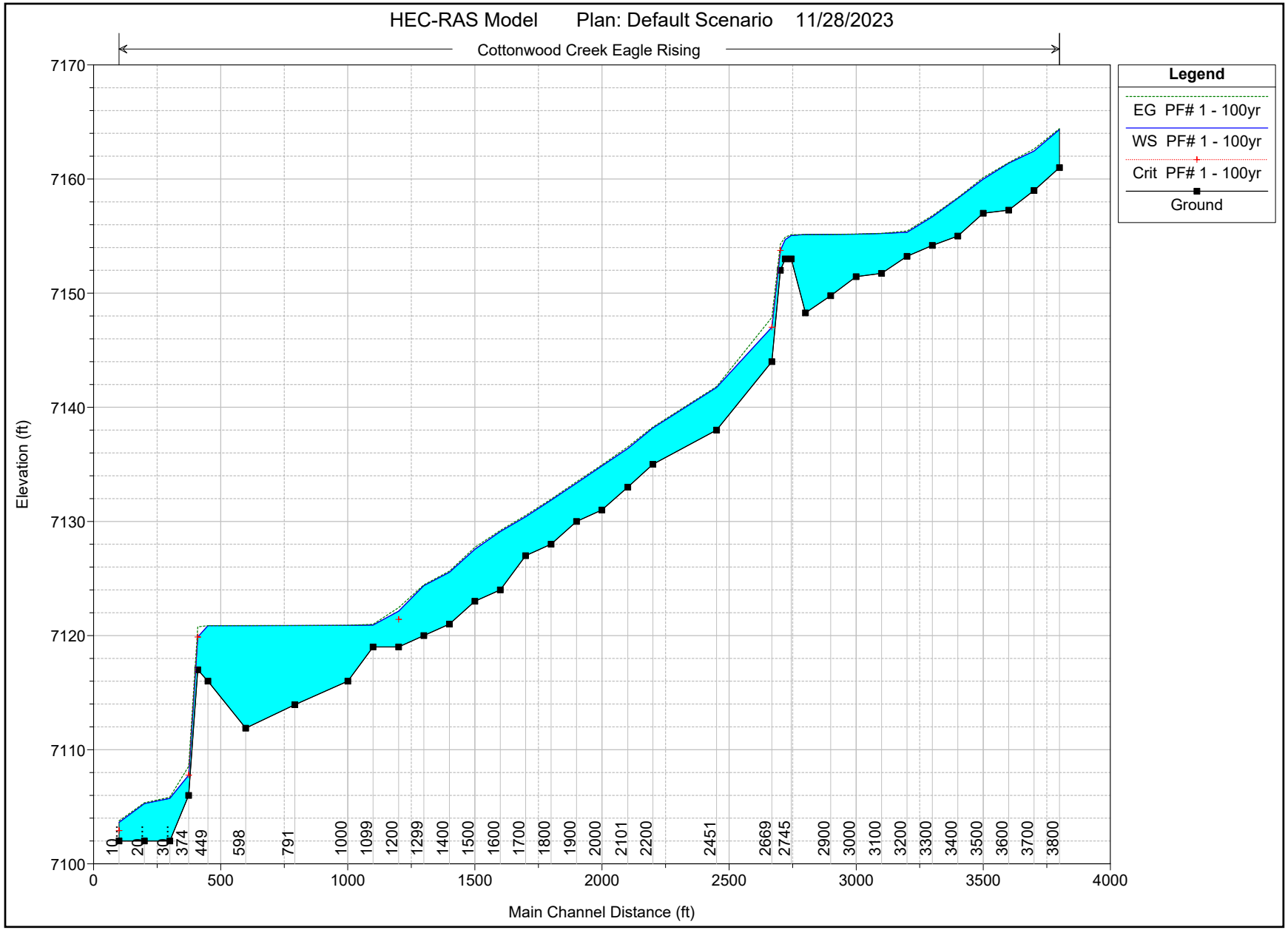
DESIGNED BY
DRAWN BY
CHECKED BY
AS-BUILTS BY
CHECKED BY

EAGLE RISING
FILING NO.1

PROPOSED
DRAINAGE MAP
HECRAS SECTIONS

MVE PROJECT 61145
MVE DRAWING DRN-MAP-HECRAS

JANUARY 3, 2024
SHEET 1 **OF** 1


HEC-RAS Model
Plan: Default Scenario
11/28/2023
Cottonwood Creek Eagle Rising
Legend
EG PF# 1 - 100yr
WS PF# 1 - 100yr
Crit PF# 1 - 100yr
Ground
Elevation (ft)
Main Channel Distance (ft)
7170
7160
7150
7140
7130
7120
7110
7100
0
500
1000
1500
2000
2500
3000
3500
4000
10
20
30
374
449
598
791
1000
1099
1200
1299
1400
1500
1600
1700
1800
1900
2000
2101
2200
2451
2669
2745
2900
3000
3100
3200
3300
3400
3500
3600
3700
3800

HEC-RAS Plan: Default Scenario River: Cottonwood Creek Reach: Eagle Rising Profile: PF# 1 - 100yr

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Max Chl Dpth	Hydr Depth C	Flow Area	Top Width	Vel Chnl	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft)	(ft)	(sq ft)	(ft)	(ft/s)	
Eagle Rising	3800	PF# 1 - 100yr	410.00	7161.00	7164.33		7164.42	0.012711	3.33	3.05	179.57	71.09	2.27	0.23
Eagle Rising	3700	PF# 1 - 100yr	410.00	7159.00	7162.45		7162.64	0.026309	3.45	3.20	118.96	48.11	3.34	0.33
Eagle Rising	3600	PF# 1 - 100yr	410.00	7157.27	7161.39		7161.44	0.006493	4.12	3.73	222.05	71.58	1.85	0.17
Eagle Rising	3500	PF# 1 - 100yr	470.00	7157.00	7159.99		7160.14	0.031700	2.99	2.51	151.54	70.40	3.14	0.35
Eagle Rising	3400	PF# 1 - 100yr	470.00	7155.00	7158.31		7158.38	0.010977	3.31	3.02	223.42	87.66	2.10	0.21
Eagle Rising	3300	PF# 1 - 100yr	470.00	7154.18	7156.69		7156.79	0.024985	2.51	2.21	183.95	94.39	2.57	0.30
Eagle Rising	3200	PF# 1 - 100yr	470.00	7153.23	7155.34		7155.45	0.008299	2.11	1.62	175.00	114.71	2.71	0.37
Eagle Rising	3100	PF# 1 - 100yr	470.00	7151.73	7155.23		7155.24	0.000754	3.50	2.25	463.81	209.88	1.02	0.12
Eagle Rising	3000	PF# 1 - 100yr	560.00	7151.44	7155.16		7155.18	0.000539	3.72	3.09	535.70	187.26	1.06	0.11
Eagle Rising	2900	PF# 1 - 100yr	560.00	7149.78	7155.14		7155.15	0.000168	5.36	3.94	814.41	222.89	0.69	0.06
Eagle Rising	2801	PF# 1 - 100yr	560.00	7148.27	7155.14		7155.14	0.000041	6.87	5.08	1372.09	277.02	0.41	0.03
Eagle Rising	2745	PF# 1 - 100yr	700.00	7153.00	7155.05		7155.13	0.005050	2.05	1.75	353.61	303.25	2.23	0.30
Eagle Rising	2722	PF# 1 - 100yr	700.00	7153.00	7154.69		7154.91	0.018323	1.69	1.45	189.71	138.50	3.74	0.55
Eagle Rising	2703	PF# 1 - 100yr	700.00	7152.00	7153.75	7153.75	7154.30	0.057231	1.75	1.27	123.44	121.53	6.05	0.95
Eagle Rising	2669	PF# 1 - 100yr	700.00	7144.00	7147.02	7147.02	7147.88	0.036000	3.01	2.72	105.69	64.40	7.94	0.85
Eagle Rising	2451	PF# 1 - 100yr	700.00	7138.00	7141.73		7141.82	0.015229	3.73	2.87	295.45	124.04	2.39	0.25
Eagle Rising	2200	PF# 1 - 100yr	700.00	7135.00	7138.19		7138.27	0.013177	3.19	2.98	310.59	113.77	2.27	0.23
Eagle Rising	2101	PF# 1 - 100yr	750.00	7133.00	7136.38		7136.54	0.023985	3.38	3.16	237.65	83.18	3.18	0.32
Eagle Rising	2000	PF# 1 - 100yr	750.00	7131.00	7134.86		7134.95	0.010763	3.86	3.39	317.91	143.59	2.24	0.21
Eagle Rising	1900	PF# 1 - 100yr	820.00	7130.00	7133.36		7133.48	0.020468	3.36	2.93	291.05	115.98	2.81	0.29
Eagle Rising	1800	PF# 1 - 100yr	820.00	7128.00	7131.87		7131.96	0.011762	3.86	3.60	339.50	106.37	2.43	0.23
Eagle Rising	1700	PF# 1 - 100yr	820.00	7127.00	7130.42		7130.53	0.017473	3.42	3.25	298.06	99.09	2.77	0.27
Eagle Rising	1600	PF# 1 - 100yr	820.00	7124.00	7129.11		7129.22	0.010166	5.11	4.64	309.26	83.90	2.68	0.22
Eagle Rising	1500	PF# 1 - 100yr	820.00	7123.00	7127.56		7127.73	0.023743	4.56	3.54	243.72	78.56	3.40	0.32
Eagle Rising	1400	PF# 1 - 100yr	820.00	7121.00	7125.55		7125.65	0.018124	4.55	2.92	315.34	128.16	2.63	0.27
Eagle Rising	1299	PF# 1 - 100yr	820.00	7120.00	7124.37		7124.45	0.008395	4.37	4.09	368.78	104.32	2.24	0.20
Eagle Rising	1200	PF# 1 - 100yr	820.00	7119.00	7122.13	7121.42	7122.45	0.093104	3.13	1.92	182.69	112.72	4.51	0.57
Eagle Rising	1099	PF# 1 - 100yr	820.00	7119.00	7120.92		7121.00	0.005259	1.92	1.73	374.74	242.74	2.25	0.30
Eagle Rising	1000	PF# 1 - 100yr	820.00	7116.00	7120.88		7120.90	0.000310	4.88	4.50	962.51	292.58	1.03	0.09
Eagle Rising	791	PF# 1 - 100yr	820.00	7113.94	7120.88		7120.88	0.000031	6.94	6.34	2092.44	391.78	0.41	0.03
Eagle Rising	598	PF# 1 - 100yr	820.00	7111.89	7120.87		7120.87	0.000027	8.98	7.93	2044.51	320.39	0.45	0.03
Eagle Rising	449	PF# 1 - 100yr	820.00	7116.00	7120.86		7120.87	0.000081	4.86	4.25	1625.56	408.60	0.51	0.04
Eagle Rising	409	PF# 1 - 100yr	820.00	7117.00	7119.87	7119.87	7120.77	0.059146	2.87	1.75	108.23	61.67	7.58	1.01
Eagle Rising	374	PF# 1 - 100yr	820.00	7106.00	7107.77	7107.77	7108.54	0.061974	1.77	1.52	116.40	76.79	7.04	1.01
Eagle Rising	300	PF# 1 - 100yr	820.00	7102.00	7105.74		7105.84	0.003267	3.74	3.08	326.32	120.64	2.60	0.26
Eagle Rising	200	PF# 1 - 100yr	820.00	7102.00	7105.28		7105.36	0.007656	3.28	3.13	390.62	156.13	1.79	0.18
Eagle Rising	100	PF# 1 - 100yr	820.00	7102.00	7103.63	7102.91	7103.77	0.049885	1.63	1.59	281.53	183.33	2.92	0.41

Table 2. Permissible Shear and Velocity for Selected Lining Materials[1]

Boundary Category	Boundary Type	Permissible Shear Stress (lb/sq ft)	Permissible Velocity (ft/sec)	Citation(s)
Soils	Fine colloidal sand	0.02 - 0.03	1.5	A
	Sandy loam (noncolloidal)	0.03 - 0.04	1.75	A
	Alluvial silt (noncolloidal)	0.045 - 0.05	2	A
	Silty loam (noncolloidal)	0.045 - 0.05	1.75 – 2.25	A
	Firm loam	0.075	2.5	A
	Fine gravels	0.075	2.5	A
	Stiff clay	0.26	3 – 4.5	A, F
	Alluvial silt (colloidal)	0.26	3.75	A
	Graded loam to cobbles	0.38	3.75	A
	Graded silts to cobbles	0.43	4	A
	Shales and hardpan	0.67	6	A
Gravel/Cobble	1-in.	0.33	2.5 – 5	A
	2-in.	0.67	3 – 6	A
	6-in.	2.0	4 – 7.5	A
	12-in.	4.0	5.5 – 12	A
Vegetation	Class A turf	3.7	6 – 8	E, N
	Class B turf	2.1	4 - 7	E, N
	Class C turf	1.0	3.5	E, N
	Long native grasses	1.2 – 1.7	4 – 6	G, H, L, N
	Short native and bunch grass	0.7 - 0.95	3 – 4	G, H, L, N
	Reed plantings	0.1-0.6	N/A	E, N
	Hardwood tree plantings	0.41-2.5	N/A	E, N
Temporary Degradable RECPs	Jute net	0.45	1 – 2.5	E, H, M
	Straw with net	1.5 – 1.65	1 – 3	E, H, M
	Coconut fiber with net	2.25	3 – 4	E, M
	Fiberglass roving	2.00	2.5 – 7	E, H, M
Non-Degradable RECPs	Unvegetated	3.00	5 – 7	E, G, M
	Partially established	4.0-6.0	7.5 – 15	E, G, M
	Fully vegetated	8.00	8 – 21	F, L, M
Riprap	6 – in. d_{50}	2.5	5 – 10	H
	9 – in. d_{50}	3.8	7 – 11	H
	12 – in. d_{50}	5.1	10 – 13	H
	18 – in. d_{50}	7.6	12 – 16	H
	24 – in. d_{50}	10.1	14 – 18	E
Soil Bioengineering	Wattles	0.2 – 1.0	3	C, I, J, N
	Reed fascine	0.6-1.25	5	E
	Coir roll	3 - 5	8	E, M, N
	Vegetated coir mat	4 - 8	9.5	E, M, N
	Live brush mattress (initial)	0.4 – 4.1	4	B, E, I
	Live brush mattress (grown)	3.90-8.2	12	B, C, E, I, N
	Brush layering (initial/grown)	0.4 – 6.25	12	E, I, N
	Live fascine	1.25-3.10	6 – 8	C, E, I, J
	Live willow stakes	2.10-3.10	3 – 10	E, N, O
Hard Surfacing	Gabions	10	14 – 19	D
	Concrete	12.5	>18	H

[1] Ranges of values generally reflect multiple sources of data or different testing conditions.

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USACE TR EL 97-8

Velocity, Froude Number & Shear Stress at Selected Channel Sections

Hydraulic Data from HEC-RAS Analysis, M.V.E., Inc.

Shear Stress $\tau = \gamma RS$

Froude No. $Fr = \frac{V}{\sqrt{gD}}$

τ = Shear Stress (Lbs/sf)

γ = Weight Density of Water (lb/cf) = 62.4

R = Hydraulic Radius = Area/Wetted Perimeter (ft)

S = Energy Grade Slope (ft/ft)

V = Channel Velocity (ft/sec)

D = Hydr Depth = Flow Area / Top Width

g = Accereration of gravity = 32.2 ft/sec^2

Channel Section	Q100 (cfs)	S Energy Slope (ft/ft)	Max Channel Depth (ft)	D Hydraulic (Ave) Depth (ft)	P Wetted Perimeter (ft)	R Hydraulic Radius R (ft)	A Flow Area (sf)	W Top Width (ft)	V Channel Velocity (ft/sec)	Fr Froude No.	τ Shear Stress (lbs/sf)	Notes:
3800	410	0.013	3.3	2.5	72	2.5	180	71	2.3	0.25	1.98	dense vegetation existing
3700	410	0.026	3.5	2.5	49	2.4	119	48	3.3	0.37	3.98	dense vegetation existing
3600	410	0.007	4.1	3.1	73	3.1	222	72	1.9	0.19	1.26	dense vegetation existing
3500	470	0.079	3.0	2.2	71	2.1	152	70	3.1	0.38	10.52	dense vegetation existing
3400	470	0.010	3.3	2.5	88	2.5	223	88	2.1	0.23	1.58	dense vegetation existing
3300	470	0.011	2.5	1.9	95	1.9	184	94	2.6	0.32	1.34	dense vegetation existing
3200	470	0.008	2.1	1.5	115	1.5	175	115	2.7	0.39	0.79	boulder check existing
3100	470	0.001	3.5	2.2	210	2.2	464	210	1.0	0.12	0.10	native grasses and pond existing
3000	560	0.001	3.7	2.9	188	2.9	536	187	1.1	0.11	0.10	native grasses and pond existing
2900	560	0.000	5.4	3.7	223	3.6	814	223	0.7	0.06	0.04	native grasses and pond existing
2801	560	0.000	6.9	5.0	278	4.9	1372	277	0.4	0.03	0.01	native grasses and pond existing
2745	700	0.005	2.1	1.2	303	1.2	354	303	2.2	0.36	0.37	native grasses and pond existing
2722	700	0.018	1.7	1.4	139	1.4	190	139	3.7	0.56	1.56	native grasses and pond existing
2703	700	0.057	1.8	1.0	122	1.0	123	122	6.1	1.06	3.62	spillway riprap proposed
2669	700	0.036	3.0	1.6	65	1.6	106	64	7.9	1.09	3.66	spillway riprap proposed
2451	700	0.015	3.7	2.4	125	2.4	295	124	2.4	0.27	2.25	dense vegetation existing
2200	700	0.013	3.2	2.7	115	2.7	311	114	2.3	0.24	2.23	dense vegetation existing
2101	750	0.024	3.4	2.9	84	2.8	238	83	3.2	0.33	4.22	dense vegetation existing
2000	750	0.011	3.9	2.2	144	2.2	318	144	2.2	0.27	1.48	dense vegetation existing
1900	820	0.020	3.4	2.5	117	2.5	291	116	2.8	0.31	3.19	dense vegetation existing
1800	820	0.012	3.9	3.2	107	3.2	340	106	2.4	0.24	2.33	dense vegetation existing
1700	820	0.018	3.4	3.0	100	3.0	298	99	2.8	0.28	3.26	dense vegetation existing
1600	820	0.010	5.1	3.7	85	3.6	309	84	2.7	0.25	2.33	dense vegetation existing
1500	820	0.026	4.6	3.1	80	3.1	244	79	3.4	0.34	5.01	dense vegetation existing
1400	820	0.035	4.6	2.5	129	2.4	315	128	2.6	0.30	5.34	dense vegetation existing
1299	820	0.005	4.4	3.5	105	3.5	369	104	2.2	0.21	1.19	dense vegetation existing
1200	820	0.036	3.1	1.6	113	1.6	183	113	4.5	0.62	3.64	dense vegetation existing
1099	820	0.005	1.9	1.5	243	1.5	375	243	2.3	0.32	0.51	native grass existing
1000	820	0.000	4.9	3.3	293	3.3	963	293	1.0	0.10	0.06	native grasses and pond existing
791	820	0.000	6.9	5.3	393	5.3	2092	392	0.4	0.03	0.01	native grasses and pond existing
598	820	0.000	9.0	6.4	321	6.4	2045	320	0.5	0.03	0.01	native grasses and pond existing
449	820	0.000	4.9	4.0	409	4.0	1626	409	0.5	0.05	0.02	native grasses and pond existing
409	820	0.059	2.9	1.8	62	1.7	108	62	7.6	1.01	6.42	spillway riprap
374	820	0.062	1.8	1.5	77	1.5	116	77	7.0	1.01	5.82	spillway riprap
300	820	0.003	3.7	2.7	121	2.7	326	121	2.6	0.28	0.55	dense vegetation existing
200	820	0.008	3.3	2.5	157	2.5	391	156	1.8	0.20	1.19	dense vegetation existing
100	820	0.050	1.6	1.5	184	1.5	282	183	2.9	0.42	4.77	dense vegetation existing

4. Report Maps

Reinstated Preliminary Plan
Access Exhibit
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

PRELIMINARY PLAN

EAGLE RISING

A PORTION OF THE EAST HALF (E 1/2) OF SECTION 29, TOWNSHIP 12 SOUTH, RANGE 65 WEST OF THE 6TH PRINCIPAL MERIDIAN, EL PASO COUNTY, COLORADO

DEVELOPMENT NOTES:

1. TRACT A - USE OPEN SPACE - TO BE OWNED AND MAINTAINED BY THE PROPERTY OWNERS ASSOCIATION.
2. AREAS WITHIN PLATTED DRAINAGE EASEMENTS AND TRACT A SHALL BE DRAINAGE AND DRAINAGE MAINTENANCE ACCESS EASEMENTS IN THEIR ENTIRETY GRANTED TO EL PASO COUNTY AND SHALL BE MAINTAINED BY THE PROPERTY OWNER OR THE PROPERTY OWNERS ASSOCIATION. NO BUILDINGS, BUILDING PERMITS, WELLS OR SEPTIC SYSTEMS SHALL BE ALLOWED WITHIN THESE EASEMENTS.
3. NO NON-MOTORIZED TRAILS OR TRAIL EASEMENTS ARE INCLUDED WITHIN THIS APPLICATION.
4. THE EAGLE WING VIEW EXTENSION SHALL BE OWNED AND MAINTAINED BY THE PROPERTY 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 OR EL PASO COUNTY APPROVED DEVIATIONS AND WAIVERS.
5. 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.
6. WASTE WATER TO BE INDIVIDUAL ON SITE SEPTIC SYSTEMS.
7. 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.
8. MAXIMUM BUILDING HEIGHT - 35'
9. BUILDING SETBACKS FOR FRONT, SIDE AND REAR YARDS - 25' UNLESS SHOWN OTHERWISE.
10. STANDARD DRAINAGE AND UTILITY EASEMENTS: FRONT - 15', SIDE - 10', REAR - 10' AND PERIMETER 30'.
11. THE PROPOSED METHOD OF GUARANTEEING FUNDS FOR PUBLIC IMPROVEMENTS SHALL BE APPROVED BY AND ACCEPTABLE TO THE EL PASO COUNTY ATTORNEY'S OFFICE AND THE ECM ADMINISTRATOR.
12. 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 3673 PG 917 OF THE EL PASO COUNTY PUBLIC RECORDS.
13. UTILITY LINES PROVIDING SERVICE TO EXISTING BUILDINGS AND FACILITIES MAY BE RELOCATED DEPENDING UPON FINAL UTILITY ENGINEERING PROVIDED BY INDIVIDUAL UTILITY COMPANIES.
14. TRACTS "C" AND "D" LAND AND WELL SHALL BE OWNED BY MYPAD, INC. AND / OR ASSIGNS AND SHALL BE MAINTAINED AND / OR REPLACED BY THE PROPERTY OWNERS ASSOCIATION IN ACCORDANCE WITH AGREEMENT OF RECORD.
15. WASTE WATER TREATMENT WILL BE PROVIDED VIA INDIVIDUAL ON-SITE SEPTIC SYSTEMS, DESIGNED, PERMITTED, CONSTRUCTED AND OPERATED PER THE EL PASO COUNTY HEALTH DEPARTMENT CODES AND REGULATIONS. ALL SEPTIC SYSTEMS TO BE DESIGNED BY A COLORADO REGISTERED PROFESSIONAL ENGINEER.
16. FUTURE BRIARGATE PARKWAY 60' ROW AND THE 20' ROW RESERVATION ADJOINING THE NORTHERLY ROW LINE OF BRIARGATE PKWY SHOWN ON PRELIMINARY PLAN LOT NO. 13 AND TRACT A ARE FUTURE ROWS FOR ACQUISITION CONTEMPLATED TO BE ACQUIRED BY EL PASO COUNTY AT A LATER DATE.

STANDARD PCD PRELIMINARY PLAN NOTES

1. THE FOLLOWING REPORTS HAVE BEEN SUBMITTED IN ASSOCIATION WITH THE PRELIMINARY PLAN FOR THIS SUBDIVISION AND ARE ON FILE AT THE COUNTY PLANNING & COMMUNITY DEVELOPMENT DEPARTMENT: TRANSPORTATION IMPACT STUDY; DRAINAGE REPORT; WATER RESOURCES REPORT; WASTEWATER DISPOSAL REPORT; GEOLOGY AND SOILS REPORT; FIRE PROTECTION REPORT; NATURAL FEATURES REPORT.
2. 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 IMPEDE THE FLOW OR RUNOFF SHALL NOT BE PLACED IN DRAINAGE EASEMENTS.
3. 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 PARKS AND WILDLIFE, COLORADO DEPARTMENT OF TRANSPORTATION, U.S. ARMY CORPS OF ENGINEERS AND THE U.S. FISH AND WILDLIFE SERVICE REGARDING THE ENDANGERED SPECIES ACT.
4. SEE PRELIMINARY PLAN SHEET 2 OF 2 FOR A DETAIL DESCRIPTION OF AND LOCATION OF SOILS AND GEOLOGIC HAZARDS WITHIN THE EAGLE RISING SUBDIVISION INCLUDING SPECIFIC LOTS AFFECTED.
5. MAILBOXES SHALL BE INSTALLED IN ACCORDANCE WITH EL PASO COUNTY AND US POSTAL SERVICE REGULATIONS.
6. 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 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.
7. SEE PRELIMINARY PLAN SHEET 2 OF 2 FOR A DETAIL DESCRIPTION OF AND LOCATION OF EXISTING GEOLOGIC HAZARDS AND LOCATIONS POTENTIALLY AFFECTING SPECIFIC LOTS WITHIN THE SUBDIVISION

DEVELOPMENT DATA -

SINGLE FAMILY RESIDENTIAL - 17 LOTS, 55.27 AC, 77.7%
OPEN SPACE (TRACT A) - 12.08 AC, 17%
MISC TRACTS (WELLS) - 0.02 AC, 0.03%
- WELL SITE NO. 1 (TRACT C) - 160 SF
- WELL SITE NO. 2 (TRACT D) - 900 SF

PUBLIC ROAD ROW - 2.11 AC, 3%
- COUNTY PROPOSED BRIARGATE (ASPHALT) - 1.43 AC
- KURIE ROAD CUL-DE-SAC (GRAVEL) - 0.34 AC
- EAGLE WING DRIVE CUL-DE-SAC (ASPHALT) - 0.34 AC

PRIVATE ROAD ROW (TRACT B) - EAGLE WING VIEW - 1.31 AC, 2% (GRAVEL)
TOTAL PROJECT - 17 LOTS, 70.79 AC, 100%

MIN LOT SIZE - 2.5 AC
AVE LOT SIZE - 3.25 AC
GROSS DENSITY - 1 LOT PER 4.16 AC
MAX BLDG HEIGHT - 35 FEET
EXISTING ZONING - RR2.5

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

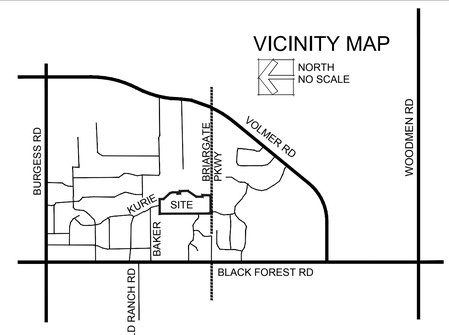
MYPAD, INC.
STEPHEN J. JACOBS, JR., PRESIDENT
PO BOX 2076
COLORADO SPRINGS, CO 80901-2976

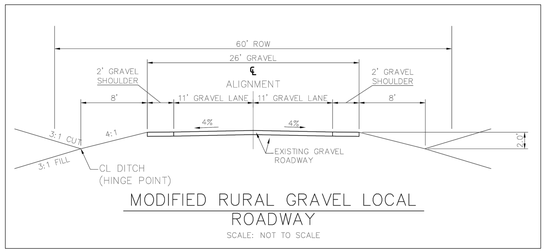
TYPICAL LINE SCHEDULE

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

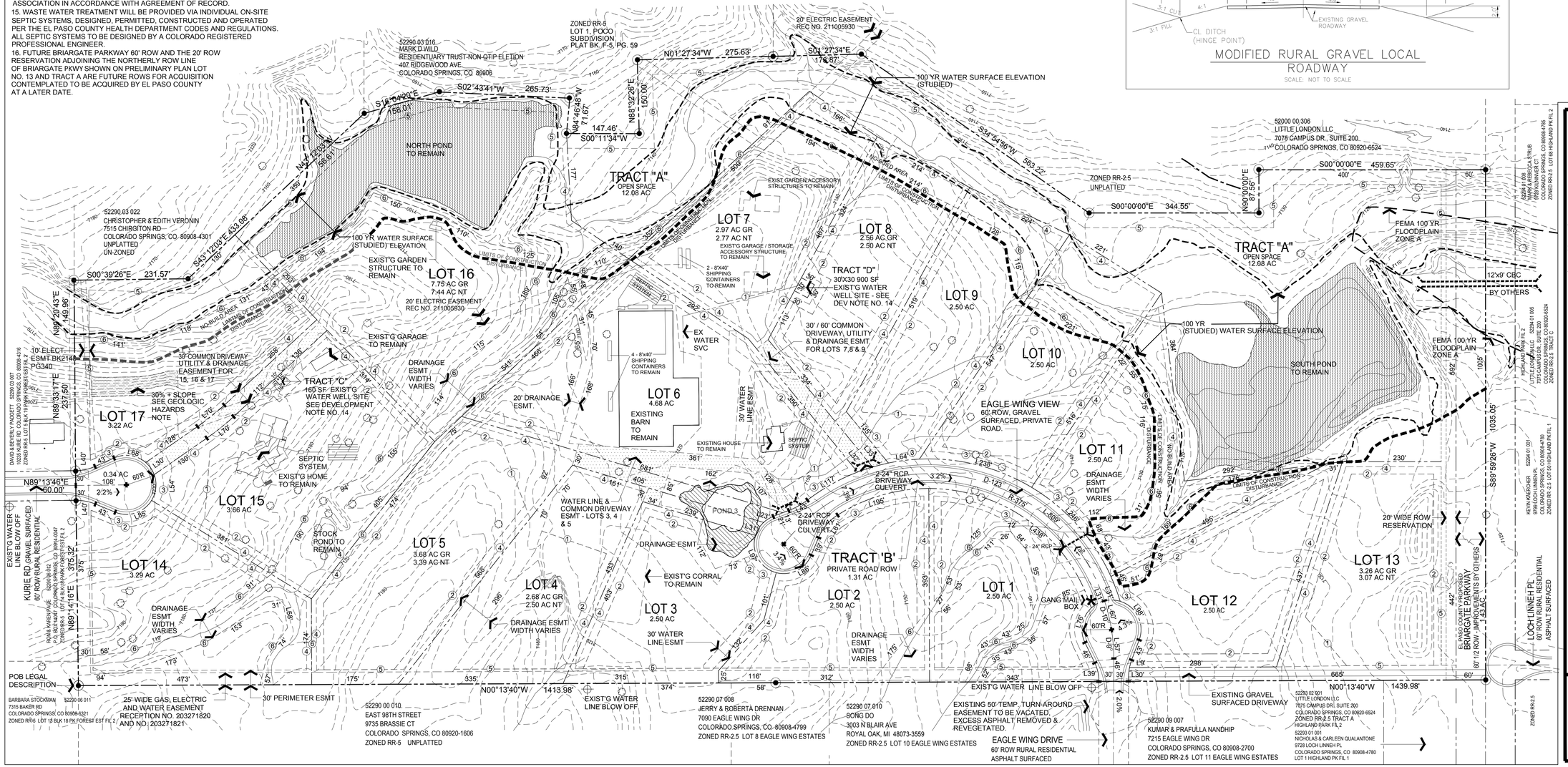
VICINITY MAP

NORTH
NO SCALE





MODIFIED RURAL GRAVEL LOCAL ROADWAY
SCALE: NOT TO SCALE



LRA
LAND RESOURCE ASSOCIATES
9736 MOUNTAIN RD.
CHIPITA PARK, CO 80809
719-684-2298

ISSUED FOR:
COUNTY REINSTATEMENT

project number

computer file

issue date
SEPTEMBER 05, 2023 V1.1

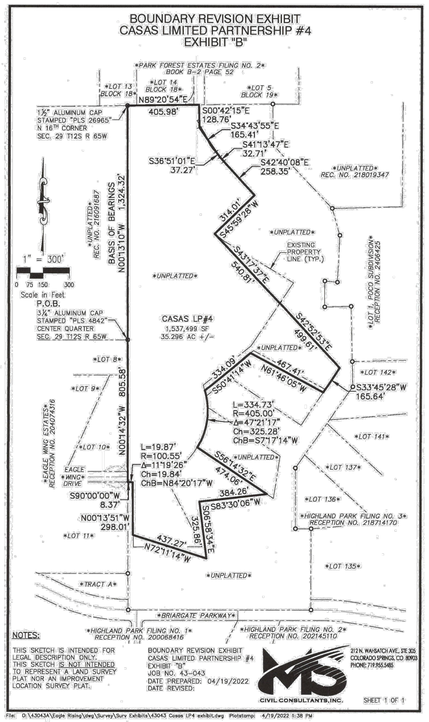
drawn by
DFJ

checked and revised by
DRG and WMT

revisions
DECEMBER 18, 2023 V1.5

sheet number
1 of two

PCD PROJECT NUMBER
SP205



CASAS LIMITED PARTNERSHIP #4
LEGAL DESCRIPTION

A PARCEL OF LAND IN THE SOUTHWEST QUARTER OF THE NORTHEAST QUARTER (SW1/4 NE1/4) AND THE NORTHWEST QUARTER OF THE SOUTHEAST QUARTER (NW1/4, SE1/4) SECTION 29, T12S, R65W, OF THE 6th P.M., EL PASO COUNTY, COLORADO, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

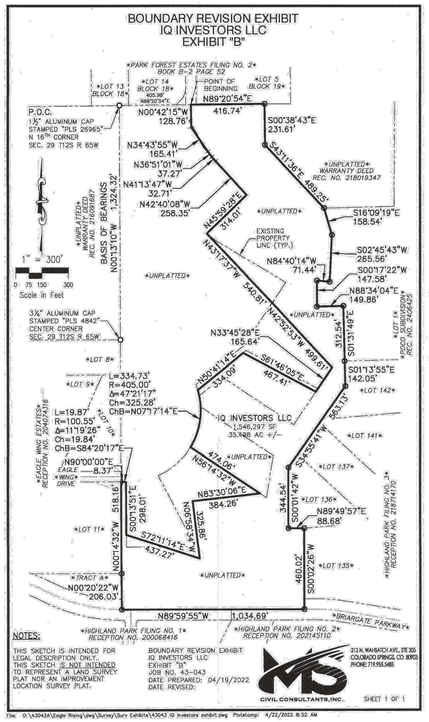
BEGINNING AT THE SOUTHEAST CORNER OF THAT PARCEL DESCRIBED BY WARRANTY DEED RECORDED UNDER RECEPTION NO. 216091687 OF THE RECORDS OF EL PASO COUNTY, COLORADO;
THENCE N00°13'10"W ALONG THE EAST LINE THEREOF, 1,324.32 FEET TO THE SOUTH LINE OF "PARK FOREST ESTATES FILING NO. 2" AS RECORDED IN BOOK B-2 AT PAGE 52 OF THE RECORDS OF EL PASO COUNTY, COLORADO;
THENCE N89°20'54"E ALONG THE SOUTH LINE THEREOF, 405.98 FEET;
THENCE S00°42'15"E A DISTANCE OF 128.76 FEET;
THENCE S34°43'55"E A DISTANCE OF 165.41 FEET;
THENCE S36°51'01"E A DISTANCE OF 37.27 FEET;
THENCE S41°13'47"E A DISTANCE OF 32.71 FEET;
THENCE S42°40'08"E A DISTANCE OF 258.35 FEET;
THENCE S45°59'28"W A DISTANCE OF 314.01 FEET;
THENCE S43°17'37"E A DISTANCE OF 540.81 FEET;
THENCE S42°52'53"E A DISTANCE OF 499.61 FEET;
THENCE S33°45'28"W A DISTANCE OF 165.64 FEET;
THENCE N61°46'05"W A DISTANCE OF 467.41 FEET;
THENCE S50°41'14"W A DISTANCE OF 334.09 FEET;
THENCE 334.73 FEET ON THE ARC OF A NON-TANGENT CURVE TO THE RIGHT, SAID CURVE HAVING A RADIUS OF 405.00 FEET, A CENTRAL ANGLE OF 47°21'17" THE CHORD OF 325.28 FEET WHICH BEARS S07°17'14"W;
THENCE S56°14'32"E, NON-TANGENT TO THE PREVIOUS COURSE, 474.06 FEET;
THENCE S83°30'06"W A DISTANCE OF 384.26 FEET;
THENCE S06°58'34"E A DISTANCE OF 325.86 FEET;
THENCE N72°11'14"W A DISTANCE OF 437.27 FEET;
THENCE N00°13'51"W A DISTANCE OF 298.01 FEET;
THENCE 19.87 FEET ON THE ARC OF A NON-TANGENT CURVE TO THE LEFT, SAID CURVE HAVING A RADIUS OF 100.55 FEET, A CENTRAL ANGLE OF 11°19'26" THE CHORD OF 19.84 FEET WHICH BEARS N84°20'17"W TO A POINT OF TANGENT;
THENCE S90°00'00"W A DISTANCE OF 8.37 FEET TO THE EAST LINE OF "EAGLE WING ESTATES" AS RECORDED UNDER RECEPTION NO. 204074316 OF THE RECORDS OF EL PASO COUNTY, COLORADO;
THENCE N00°14'32"W ALONG SAID EAST LINE, 805.58 FEET TO THE POINT OF BEGINNING.

SAID PARCEL CONTAINS A CALCULATED AREA OF 1,537,499 SQUARE FEET (35.296 ACRES, MORE OR LESS).

BASIS OF BEARINGS:
THE WEST LINE OF THE SOUTHWEST QUARTER OF THE NORTHEAST QUARTER (SW1/4 NE 1/4) SECTION 29, T12S, R65W, 6TH P.M., EL PASO COUNTY, COLORADO, BEING MONUMENTED ON THE SOUTH BY A FOUND 3 1/4" ALUMINUM CAP STAMPED "PLS 4842" AND ON THE NORTH BY A 1 1/2" ALUMINUM CAP STAMPED "PLS 26965", AND IS ASSUMED TO BEAR N00°13'10"W, A DISTANCE OF 1,324.32 FEET.

PRELIMINARY PLAN
EAGLE RISING

A PORTION OF THE EAST HALF (E 1/2) OF SECTION 29, TOWNSHIP 12 SOUTH, RANGE 65 WEST OF THE 6TH PRINCIPAL MERIDIAN, EL PASO COUNTY, COLORADO



IQ INVESTORS LLC
LEGAL DESCRIPTION

A PARCEL OF LAND IN THE SOUTHWEST QUARTER OF THE NORTHEAST QUARTER (SW1/4 NE1/4) AND THE WEST HALF OF THE SOUTHEAST QUARTER (W1/2, SE1/4) SECTION 29, T12S, R65W, OF THE 6th P.M., EL PASO COUNTY, COLORADO, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

COMMENCING AT THE NORTHEAST CORNER OF THAT PARCEL DESCRIBED BY WARRANTY DEED RECORDED UNDER RECEPTION NO. 216091687 OF THE RECORDS OF EL PASO COUNTY, COLORADO;
THENCE N89°20'54"E ALONG THE SOUTH LINE OF "PARK FOREST ESTATES FILING NO. 2" AS RECORDED IN BOOK B-2 AT PAGE 52 IN THE RECORDS OF EL PASO COUNTY, COLORADO, A DISTANCE OF 405.98 FEET TO THE POINT OF BEGINNING:

THENCE CONTINUING N89°20'54"E ALONG SAID SOUTH LINE A DISTANCE OF 416.74 FEET TO THE NORTHWEST CORNER OF THAT PARCEL DESCRIBED BY WARRANTY DEED RECORDED UNDER RECEPTION NO. 218019347 OF THE RECORDS OF EL PASO COUNTY, COLORADO;
THENCE ALONG THE WEST LINES THEREOF THE FOLLOWING TWO (2) COURSES:
1. THENCE S00°38'43"E A DISTANCE OF 231.61 FEET;
2. THENCE S43°11'36"E A DISTANCE OF 489.25 FEET TO THE NORTHWEST CORNER OF LOT 1, "POCO SUBDIVISION" AS RECORDED UNDER RECEPTION NO. 2406425 OF THE RECORDS OF EL PASO COUNTY, COLORADO;

THENCE ALONG THE WEST LINES THEREOF THE FOLLOWING SIX (6) COURSES:
1. THENCE S16°09'19"E A DISTANCE OF 158.54 FEET;
2. THENCE S02°45'43"W A DISTANCE OF 265.56 FEET;
3. THENCE N84°40'14"W A DISTANCE OF 71.44 FEET;
4. THENCE S00°17'22"W A DISTANCE OF 147.58 FEET;
5. THENCE N88°34'04"E A DISTANCE OF 149.86 FEET;
6. THENCE S01°31'49"E A DISTANCE OF 312.54 FEET TO THE NORTHWEST CORNER OF "HIGHLAND PARK FILING NO. 3" AS RECORDED UNDER RECEPTION NO. 218714170 OF THE RECORDS OF EL PASO COUNTY, COLORADO;

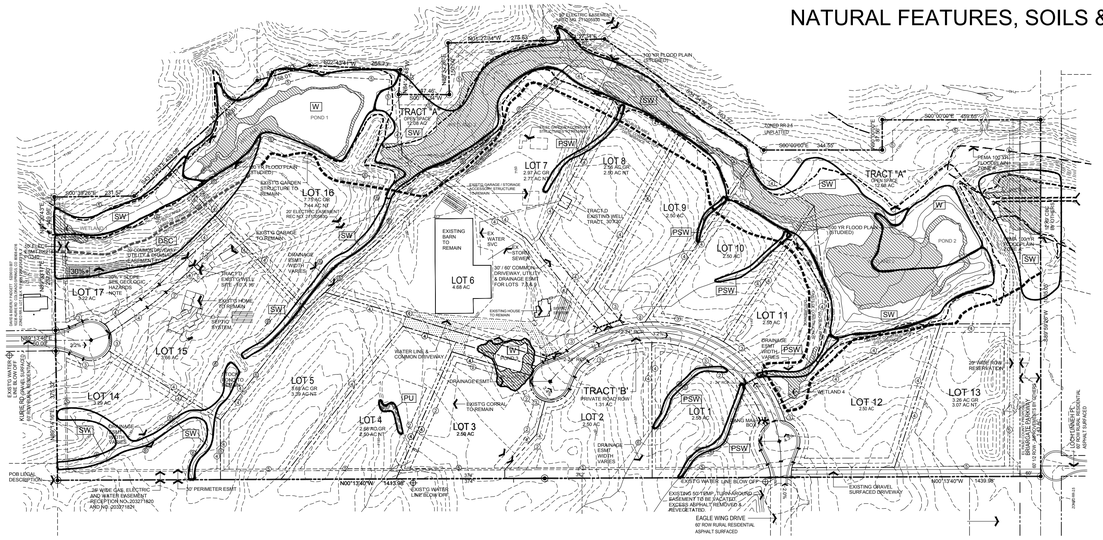
THENCE ALONG THE WEST LINES THEREOF THE FOLLOWING FIVE (5) COURSES:
1. THENCE S01°13'55"E A DISTANCE OF 142.05 FEET;
2. THENCE S34°55'41"W A DISTANCE OF 563.13 FEET;
3. THENCE S00°01'42"W A DISTANCE OF 344.54 FEET;
4. THENCE N89°49'57"E A DISTANCE OF 88.68 FEET;
5. THENCE S00°02'26"W A DISTANCE OF 460.02 FEET TO THE NORTH RIGHT-OF-WAY OF BRIARGATE PARKWAY AS SHOWN ON THE PLATS OF, "HIGHLAND PARK FILING NO. 2" AS RECORDED UNDER RECEPTION NO. 202145110 AND "HIGHLAND PARK FILING NO. 1" AS RECORDED UNDER RECEPTION NO. 200068416 OF THE RECORDS OF EL PASO COUNTY, COLORADO;

THENCE N89°59'55"W ALONG SAID RIGHT-OF-WAY LINE 1,034.69 FEET;
THENCE N00°20'22"W A DISTANCE OF 206.03 FEET TO THE SOUTHEAST CORNER OF LOT 11, "EAGLE WING ESTATES" AS RECORDED UNDER RECEPTION NO. 204074316 OF THE RECORDS OF EL PASO COUNTY, COLORADO;
THENCE N00°14'32"W ALONG THE EAST LINE THEREOF, 518.16 FEET;
THENCE N90°00'00"E A DISTANCE OF 8.37 FEET TO A POINT OF CURVE;
THENCE 19.87 FEET ON THE ARC OF A CURVE TO THE RIGHT, SAID CURVE HAVING A RADIUS OF 100.55 FEET, A CENTRAL ANGLE OF 11°19'26" THE CHORD OF 19.84 FEET WHICH BEARS S84°20'17"E;
THENCE S00°13'51"E A DISTANCE OF 298.01 FEET;
THENCE S72°11'14"E A DISTANCE OF 437.27 FEET;
THENCE N06°58'34"W A DISTANCE OF 325.86 FEET;
THENCE N83°30'06"E A DISTANCE OF 384.26 FEET;
THENCE N56°14'32"W A DISTANCE OF 474.06 FEET;
THENCE 334.73 FEET ON THE ARC OF A NON-TANGENT CURVE TO THE LEFT, SAID CURVE HAVING A RADIUS OF 405.00 FEET; A CENTRAL ANGLE OF 47°21'17" THE CHORD OF 325.28 FEET WHICH BEARS N07°17'14"E;
THENCE N50°41'14"E, NON-TANGENT TO THE PREVIOUS COURSE, 334.09 FEET;
THENCE S61°46'05"E A DISTANCE OF 467.41 FEET;
THENCE N33°45'28"E A DISTANCE OF 165.64 FEET;
THENCE N42°52'53"W A DISTANCE OF 499.61 FEET;
THENCE N43°17'37"W A DISTANCE OF 540.81 FEET;
THENCE N45°59'28"E A DISTANCE OF 314.01 FEET;
THENCE N42°40'08"W A DISTANCE OF 258.35 FEET;
THENCE N41°13'47"W A DISTANCE OF 32.71 FEET;
THENCE N36°51'01"W A DISTANCE OF 37.27 FEET;
THENCE N34°43'55"W A DISTANCE OF 165.41 FEET;
THENCE N00°42'15"W A DISTANCE OF 128.76 FEET TO THE POINT OF BEGINNING.

SAID PARCEL CONTAINS A CALCULATED AREA OF 1,546,297 SQUARE FEET (35.498 ACRES, MORE OR LESS).

BASIS OF BEARINGS:
THE WEST LINE OF THE SOUTHWEST QUARTER OF THE NORTHEAST QUARTER (SW1/4 NE 1/4) SECTION 29, T12S, R65W, 6TH P.M., EL PASO COUNTY, COLORADO, BEING MONUMENTED ON THE SOUTH BY A FOUND 3 1/4" ALUMINUM CAP STAMPED "PLS 4842" AND ON THE NORTH BY A 1 1/2" ALUMINUM CAP STAMPED "PLS 26965", AND IS ASSUMED TO BEAR N00°13'10"W, A DISTANCE OF 1,324.32 FEET.

NATURAL FEATURES, SOILS & GEOLOGIC HAZARDS PLAN



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

GEOLOGIC HAZARDS NOTE:

PORTIONS OF THE FOLLOWING LOTS AND TRACTS HAVE BEEN FOUND TO BE IMPACTED BY GEOLOGIC HAZARDS. SPECIFIC MITIGATION MEASURES, IF ANY, AND A MAP OF THE HAZARD AREAS 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 1/19/23 LOCATED IN THE EL PASO COUNTY PLANNING AND COMMUNITY DEVELOPMENT FILES.

- [W] PONDED WATER- PORTIONS OF LOTS 3, 4, 5, 6, 16 & TRACT A
- [SW] SEASONAL SHALLOW GROUNDWATER- PORTIONS OF LOTS 14, 15, 16, 17 & TRACT A
- [PSW] POTENTIALLY SEASONAL SHALLOW GROUNDWATER - PORTIONS OF LOTS 1, 7, 8, 9, 10, 11 & TRACT A
- [DSC] DOWNSLOPE CREEP - PORTIONS OF LOTS 16 & 17 WITH DSC AREAS REQUIRE AN ENGINEERED SITE PLAN IF THOSE AREAS ARE DISTURBED.
- [PU] POTENTIALLY UNSTABLE SLOPE - PORTIONS OF LOT 4
- [30%+] 30% PLUS SLOPE - PORTIONS OF LOT 17

AREAS WHERE SHALLOW BEDROCK MAY REQUIRE ENGINEERED SEPTIC SYSTEMS - PORTIONS OF LOTS 3, 5, 8, 12 & 14
AREAS WHERE SEPTIC SYSTEMS ARE NOT RECOMMENDED - PORTIONS OF LOTS 3, 6, 7, 8, 9, 10, 11, 14, 15, 16, & 17

LRA
LAND RESOURCE ASSOCIATES
9736 MOUNTAIN RD.
CHIPITA PARK, CO 80809
719-684-2298

NORTH

PARCEL NO.S 5229 00 034 & 5229 00 035
PLAN SCALE 1"=200'
CONT. INT. = 2'

ISSUED FOR:
COUNTY REINSTATEMENT

project number

computer file

issue date
September 05, 2023

drawn by
DFJ

checked and revised by
DRG and WMT

revisions
DECEMBER 18, 2023 V1.5

sheet number
2 of two

PCD PROJECT NUMBER
SP205

LEGEND

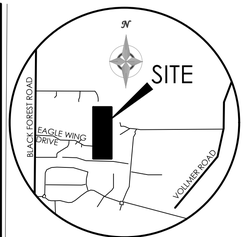
- PROPERTY LINE
- EASEMENT LINE
- NBL — NO BUILD LIMIT LINE
- LOT LINE

EXISTING

- 5985 — INDEX CONTOUR
- 84 — INTERMEDIATE CONTOUR

PROPOSED

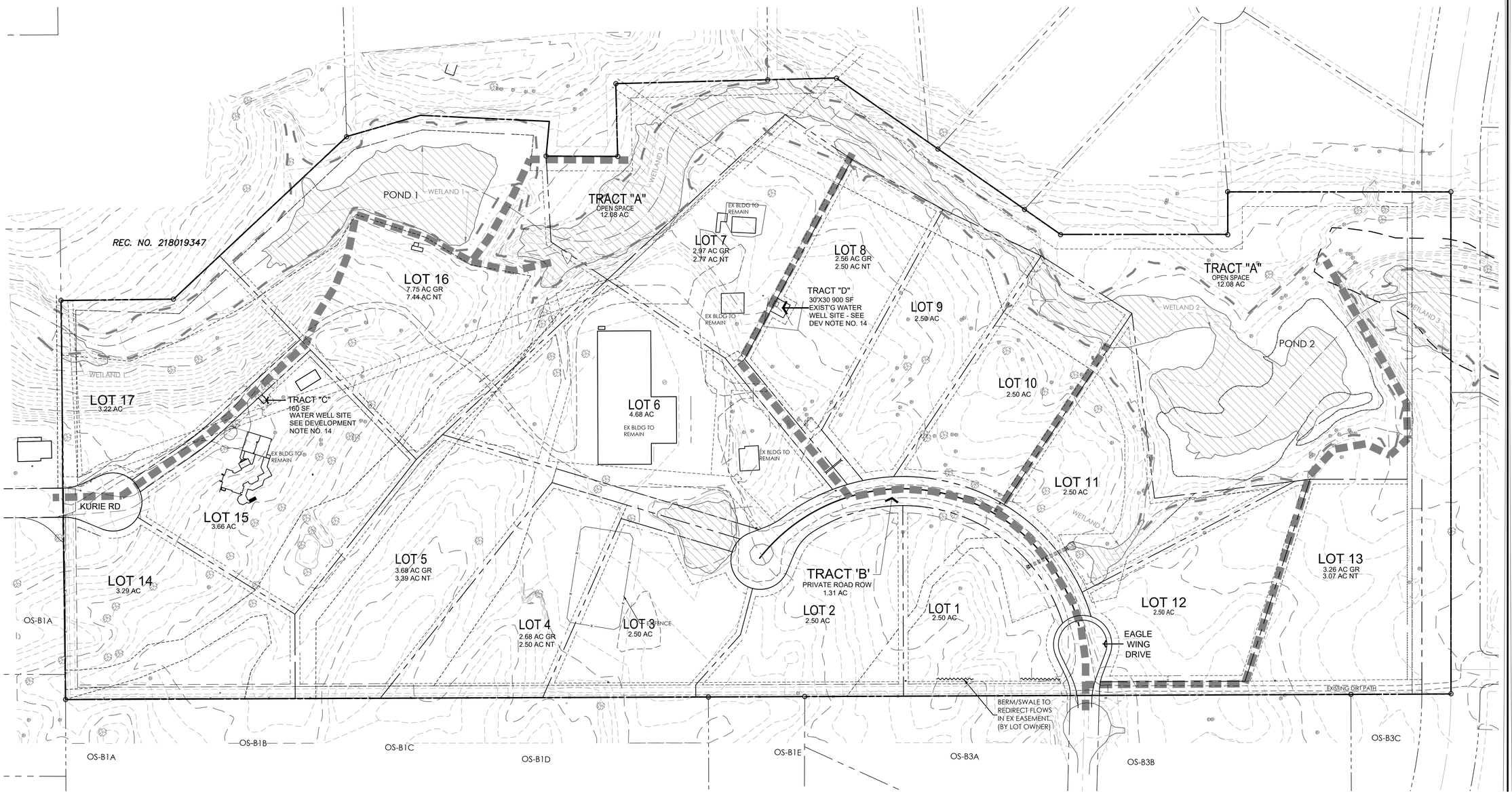
- 5985 — INDEX CONTOUR
- 84 — INTERMEDIATE CONTOUR
- 100 YEAR STORM WATER FLOOD LEVEL
- POSSIBLE ACCESS PATH



VICINITY MAP

NOT TO SCALE

BENCHMARK



N

10 0 50 100 200

1" = 100' 1:1,200

MVE, INC.
ENGINEERS, SURVEYORS
1903 lelaray 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 PLAN

CREEK ACCESS

EXHIBIT

MVE PROJECT 61145

MVE DRAWING DRN-MAP-DEV

DECEMBER 12, 2023

SHEET 1 OF 1

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

FEE BASIN OUTSIDE OF DRAINAGE BASIN

Existing Land Use - Cottonwood Creek	
Land Use	**% of Basin Area**
0-1.99 du/ac	4.2%
12.0-24.99 du/ac	1.3%
2.0-3.49 du/ac	2.0%
2.5 ACRE RURAL RESIDENTIAL	7.4%
25+ du/ac	0.2%
3.5-7.99 du/ac	19.6%
35 ACRE TRACT	1.3%
5 ACRE RURAL RESIDENTIAL	8.2%
8.0-11.99 du/ac	2.8%
CIVIC	3.7%
COMMERCIAL	5.3%
CONDO/TOWNHOME	1.3%
INDUSTRIAL	1.7%
NATURAL OPEN SPACE (FAIR CONDITION)	22.8%
NATURAL OPEN SPACE (POOR CONDITION)	0.2%
PARK/OPEN SPACE (FAIR CONDITION)	1.1%
PARK/OPEN SPACE (GOOD CONDITION)	0.9%
ROW	12.9%
WOODS (FAIR CONDITION)	2.9%

Existing 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	3.6%
25+ du/ac	0.0%
3.5-7.99 du/ac	29.4%
8.0-11.99 du/ac	2.6%
CIVIC	6.2%
COMMERCIAL	16.6%
CONDO/TOWNHOME	4.2%
INDUSTRIAL	4.2%
NATURAL OPEN SPACE (FAIR CONDITION)	3.1%
NATURAL OPEN SPACE (POOR CONDITION)	0.2%
PARK/OPEN SPACE (FAIR CONDITION)	5.4%
PARK/OPEN SPACE (GOOD CONDITION)	1.1%
ROW	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

Matrix DESIGN GROUP

COLORADO SPRINGS

FILE: G:\gis_projects\Cottonwood_Creek_DBPS_2017\activelayout\DBPS_Report\Figure_3_5_CottonwoodCreek_Land_Use_Existing_20190530.mxd, 5/30/2019, Drew_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

FEE BASIN OUTSIDE OF DRAINAGE BASIN

Future Development Planned

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:\gis_projects\Cottonwood_Creek_DBPS_2017\activelayout\DBPS_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.

FEE BASIN OUTSIDE OF DRAINAGE BASIN

FIGURE 4-7
DEFICIENCIES MAP
COTTONWOOD CREEK & SOUTH PINE CREEK DBPS
COLORADO SPRINGS, CO

0 1,000 2,000 3,000 Feet

Matrix DESIGN GROUP

COLORADO SPRINGS

NOTE: FIGURE MUST BE VIEWED IN COLOR

FILE: G:\pls_projects\Cottonwood_Creek_DBPS_2017\active\apps\DBPS_Report\Figure_4-7_CottonwoodCreek_Deficiencies.mxd, 4/11/2019, jeff_dents

LEGEND

- City Boundary
- Reach
- Fee Basin Outside DBPS
- Hydrologic Basin Boundary
- Major Subbasin Boundary
- Subbasin Boundary
- ←Subbasin ID
  ←2-yr & 100-yr Flows
- Detention
- Junction

Source:

Aerial Imagery; USDA FSA, NAIP 2015

0 1,000 2,000 3,000 Feet

MATCH LINE

INTERSTATE 25

FEE BASIN OUTSIDE OF DRAINAGE BASIN

CC OUTLET

FIGURE 3-12
HYDROLOGIC MODEL ELEMENTS
COTTONWOOD CREEK &
SOUTH PINE CREEK DBPS
COLORADO SPRINGS, CO

0 1,000 2,000 3,000 Feet

Matrix DESIGN GROUP

COLORADO SPRINGS

FILE:G:\gis_projects\Cottonwood_Creek_DBPS_2017\active\arcpy\DBPS_Report\Figure_3_12_CottonwoodCreek_Hydrology_Existing_20180626.mxd, 6/29/2018, jeff_dionis

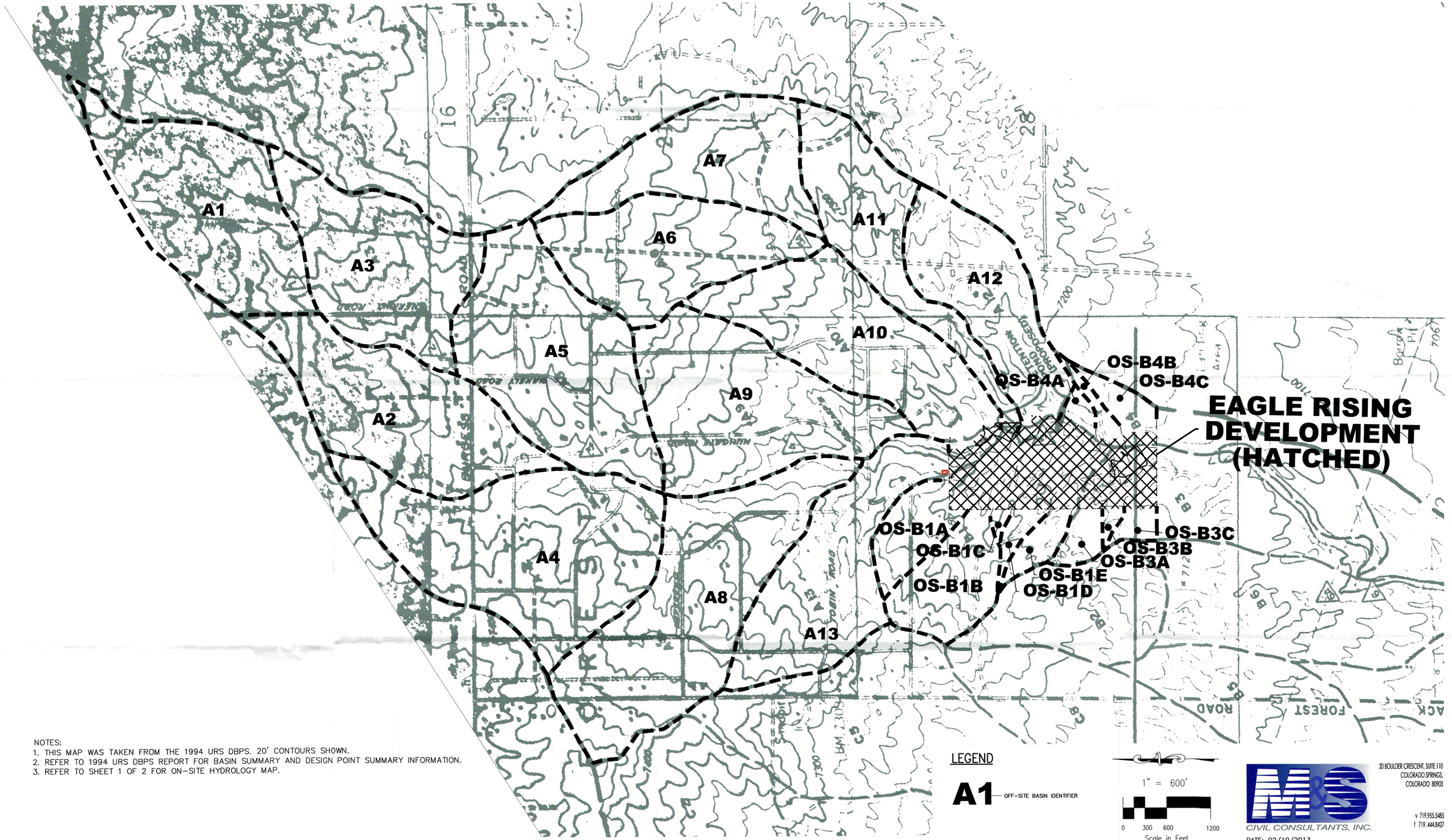
Cottonwood Creek Drainage Basin Planning Study

Future Model Results

Hydrologic Element	Drainage Area (sq mi)	Results 2-Year Peak Discharge (cfs)	5-Year Peak Discharge (cfs)	10-Year Peak Discharge (cfs)	25-Year Peak Discharge (cfs)	50-Year Peak Discharge (cfs)	100-Year Peak Discharge (cfs)
JRT010	0.09	5.7	7.5	8.7	9.8	11	13
JRT020	0.24	47	61	72	80	92	100
JRT030	0.42	61	81	95	110	120	130
JRT040	0.22	53	70	82	92	110	120
JRT052	0.64	110	150	180	200	230	250
JRT054	0.93	200	260	310	350	390	440
JRT060	0.29	190	260	300	340	380	420
JRT070	0.45	140	180	210	240	270	300
JRT082	0.74	310	400	470	530	600	660
JRT084	0.8	330	440	510	570	650	720
JRT090	0.14	69	90	110	120	140	150
JRT102	1.73	430	570	670	770	870	970
JRT104	1.87	490	650	760	870	990	1100
JRT106	2.12	580	770	900	1000	1200	1300
JRT108	0.49	220	290	330	370	430	470
JRT110	0.24	160	220	250	280	330	360
JRT120	0.49	220	290	330	370	430	470
JRT130	0.16	98	130	150	170	190	210
JRT140	0.28	98	130	150	170	190	210
JRT152	0.44	170	230	270	300	340	380
JRT154	0.66	250	330	390	440	510	570
JRT162	2.61	740	980	1100	1300	1500	1600
JRT164	3.27	950	1300	1500	1700	1900	2100
JRT166	3.41	990	1300	1500	1700	2000	2200
JSPC010	0.2	110	140	160	180	210	230
JSPC020	0.21	80	110	120	140	160	170
JSPC032	0.41	180	230	270	300	340	380
JSPC034	0.63	270	360	420	470	540	590
JSPC040	0.18	82	110	130	140	160	180
JSPC050	0.3	160	210	240	270	310	340
JSPC060	1.26	470	630	730	820	940	1000
JSPC070	0.1	38	50	59	66	76	83
JSPC080	0.24	230	310	360	400	460	510
JSPC090	0.1	69	91	110	120	140	150
JSPC102	1.36	520	690	810	900	1000	1100
JSPC106	1.61	80	90	96	110	110	120
JSPC114	0.42	77	90	100	110	120	130
JSPC120	0.29	190	260	300	330	380	420
JSPC130	0.51	370	490	570	640	730	810
JSPC140	0.1	45	59	69	77	88	97
JSPC152	0.61	410	530	630	700	800	890
JSPC154	2.93	560	730	850	960	1100	1200
JSPC156	3.19	760	1000	1200	1300	1500	1600
JSPC162	2.03	150	170	180	210	220	230
JSPC164	2.03	150	170	180	210	220	230
JSPC166	2.32	250	310	350	400	440	480
JSPC180	0.35	95	120	140	160	190	220
JSPC190	0.5	220	290	340	380	430	480
JSPC200	3.69	950	1300	1500	1700	1900	2100

Hydrologic Element	Drainage Area (sq mi)	Results 2-Year Peak Discharge (cfs)	5-Year Peak Discharge (cfs)	10-Year Peak Discharge (cfs)	25-Year Peak Discharge (cfs)	50-Year Peak Discharge (cfs)	100-Year Peak Discharge (cfs)
JUC010	0.23	2.4	3.5	8.2	25	37	51
JUC020	0.55	11	16	28	70	98	130
JUC030	0.76	12	21	38	95	140	180
JUC040	0.12	3.2	6.8	12	29	39	50
JUC052	0.88	13	26	46	110	160	220
JUC054	1.15	19	39	69	160	220	290
JUC060	1.38	27	54	95	210	290	380
JUC070	0.1	1.9	4.5	7.9	18	24	30
JUC082	1.48	28	58	100	230	310	410
JUC084	1.66	31	69	120	270	370	470
JUC090	0.24	1.8	8.1	18	47	66	87
JUC102	1.9	32	76	140	320	430	560
JUC104	2.24	37	95	170	400	540	700
JUC110	0.1	3.5	13	21	43	56	69
JUC122	2.24	37	95	170	400	540	700
JUC124	2.34	39	100	190	420	580	750
JUC126	2.63	48	120	210	470	630	820
JUC130	2.82	59	140	240	540	730	930
JUC140	3.05	76	180	290	620	830	1100
JUC150	3.14	77	180	300	630	830	1100
JUC160	3.24	78	180	300	640	850	1100
JUC165	0.22	15	27	36	59	71	84
JUC170	0.22	53	73	83	97	110	120
JUC180	0.33	100	140	160	200	220	240
JUC190	3.46	93	210	340	690	910	1100
JUC192	3.79	130	260	410	810	1000	1300
JUC194	3.93	150	280	420	830	1100	1300
JWR010	0.07	1.9	4	8.3	21	30	39
JWR020	0.05	0.7	3.8	7.4	17	23	30
JWR032	0.12	2.4	7.7	16	38	52	68
JWR034	0.34	91	120	140	200	230	270
JWR040	0.03	1	5.3	9.3	19	25	31
JWR050	0.09	2.9	8	15	34	45	57
JWR060	0.26	2.6	10	22	58	81	110
JWR070	0.1	10	16	24	43	54	65
JWR080	0.18	21	36	50	90	110	130
JWR092	0.12	3.4	12	21	48	66	83
JWR094	0.38	5.4	20	39	99	130	170
JWR096	0.56	26	54	89	190	240	310
JWR098	1.12	150	210	260	390	460	530
JWR100	0.19	100	130	150	180	200	230
JWR112	1.31	240	320	400	570	660	760
JWR114	1.52	310	410	510	730	860	990
JWR120	0.05	4.9	11	17	30	38	46
JWR130	0.21	68	90	110	160	190	220
JWR140	0.3	100	140	160	230	270	320
JWR150	0.15	69	90	110	120	140	160
JWR162	0.45	170	220	260	350	410	470
JWR164	1.97	460	610	750	1100	1300	1500
JWR166	2.05	360	510	610	860	1000	1400
JWR170	2.13	360	520	630	880	1000	1400

EAGLE RISING
HYDROLOGY MAP
(OFF-SITE)



NOTES:
1. THIS MAP WAS TAKEN FROM THE 1994 URS DBPS. 20' CONTOURS SHOWN.
2. REFER TO 1994 URS DBPS REPORT FOR BASIN SUMMARY AND DESIGN POINT SUMMARY INFORMATION.
3. REFER TO SHEET 1 OF 2 FOR ON-SITE HYDROLOGY MAP.

LEGEND

A1 — OFF-SITE BASIN IDENTIFIER

1" = 600'

0 300 600 1200
Scale in Feet

M&S CIVIL CONSULTANTS, INC.
20 BOULDER CRESCENT, SUITE 110
COLORADO SPRINGS, COLORADO 80903
v 719.955.5485
f 719.444.8427

DATE: 02/10/2013
REV. DATE: 08/04/2015

OFF-SITE DRAINAGE BASIN SUMMARY TABLE

DESIGN POINT	INCLUDED BASINS	AREA (AC)	Tc (MIN)	RUNOFF Q5	RUNOFF 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	RUNOFF Q100
	EX-A1	4.95	13.5	1.5	10.7
	EX-A2	1.74	12.1	0.5	3.9
	EX-B	4.35	12.7	1.9	10.4
	EX-C	1.66	11.9	0.5	3.8
	EX-D	7.10	13.1	3.3	16.9
	EX-E1	3.41	13.1	3.5	10.4
	EX-E2	7.77	16.3	4.7	18.6
	EX-F1	6.45	13.8	9.8	23.0
	EX-F2	2.02	13.5	0.6	4.4
	EX-G	2.98	14.1	1.0	6.5
	EX-H	4.10	13.8	2.2	10.0
	EX-I	1.64	12.3	1.1	4.4
	EX-J	2.42	11.7	1.3	6.3
	EX-K	2.65	10.8	0.9	6.3
	EX-L	2.14	12.4	0.7	4.8
	EX-M	4.10	14.9	1.4	8.8

ON-SITE DESIGN POINTS

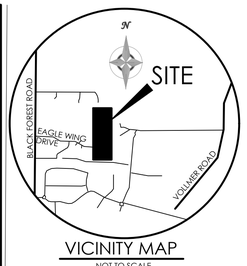
DESIGN POINT	INCLUDED BASINS	AREA (AC)	Tc (MIN)	RUNOFF Q5	RUNOFF Q100
DP6	OS-B1A, OS-B1B, EX-B, EX-C	71.87	22.3	22.0	134.1
DP6A	OS-B1C, EX-E1	5.25	17.9	3.6	12.6
DP6B	DP6, EX-D	78.97	19.1	23.5	141.5
DP6C	DP6A, DP6B	84.22	19.1	26.6	152.3
DP7	OS-B1D, EX-F1	12.48	20.4	9.7	30.2
DP8	EX-E2	7.77	16.3	4.7	18.6
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	RUNOFF 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

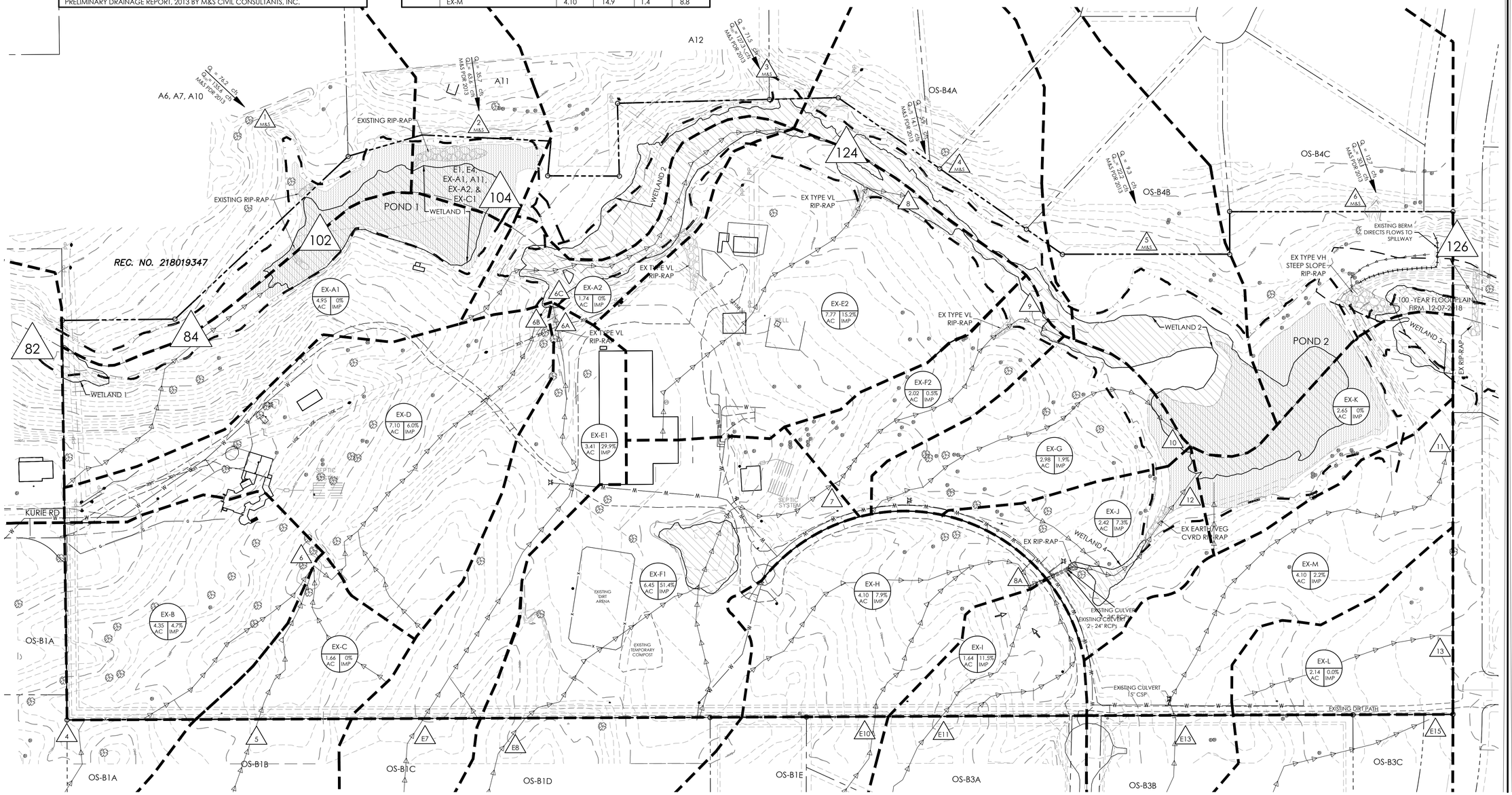
LEGEND

- PROPERTY LINE
- EASEMENT LINE
- LOT LINE
- EXISTING
- 5985 — INDEX CONTOUR
- 84 — INTERMEDIATE CONTOUR
- BASIN BOUNDARY
- TIME OF CONCENTRATION
- 100 YEAR STORM WATER FLOOD LEVEL
- Q = 19.0 cfs, Q100 = 60.0 cfs — GENERAL FLOW/DIRECTION
- 1.50% — SLOPE DIRECTION AND GRADE
- A1: 1.0 AC, 50% IMP — BASIN LABEL: AREA IN ACRES, PERCENT IMPERVIOUS
- 1 — DESIGN POINT
- 1 — COTTONWOOD CREEK DBPS DESIGN POINT
- 1 M&S — M&S DESIGN POINT



VICINITY MAP
NOT TO SCALE

BENCHMARK



N

10 0 50 100 200

1" = 100' 1:200

MVE, INC. ENGINEERS, SURVEYORS
1903 lelaray street, suite 200 colorado springs co 80909 719.635.5736

REVISIONS

DESIGNED BY
DRAWN BY
CHECKED BY
AS-BUILTS BY
CHECKED BY

EAGLE RISING
PRELIMARY PLAT

EXISTING (ON - SITE) DRAINAGE MAP

MVE PROJECT 61145
MVE DRAWING DRN-MAP-EX

JANUARY 3, 2024
SHEET 1 OF 1

OFF-SITE DRAINAGE BASIN SUMMARY TABLE

DESIGN POINT	INCLUDED BASINS	AREA (AC)	Tc (MIN)	RUNOFF Q5	RUNOFF 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	RUNOFF 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	RUNOFF 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	RUNOFF 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

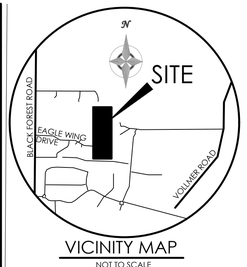
LEGEND

- PROPERTY LINE
- EASEMENT LINE
- NBL — NO BUILD LIMIT LINE
- LOT LINE

EXISTING
- 5985 — INDEX CONTOUR
- 84 — INTERMEDIATE CONTOUR

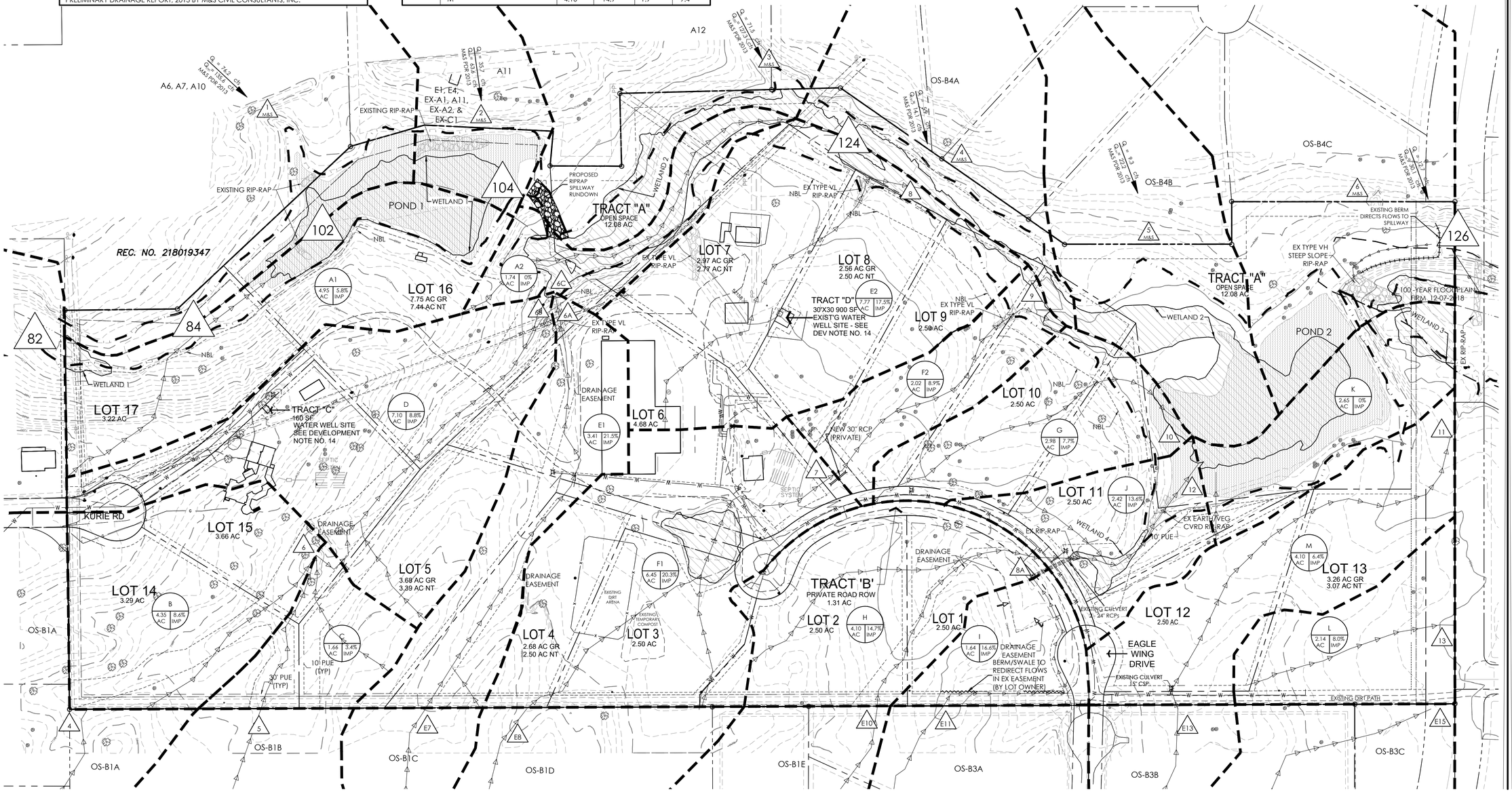
PROPOSED
- 5985 — INDEX CONTOUR
- 84 — INTERMEDIATE CONTOUR
- BASIN BOUNDARY
- TIME OF CONCENTRATION
- 100 YEAR STORM WATER FLOOD LEVEL
- GENERAL FLOW/DIRECTION
- SLOPE DIRECTION AND GRADE
- BASIN LABEL, AREA IN ACRES, PERCENT IMPERVIOUS
- DESIGN POINT
- COTTONWOOD CREEK DBPS DESIGN POINT
- M&S DESIGN POINT

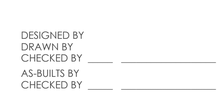
PROPOSED
- INDEX CONTOUR
- INTERMEDIATE CONTOUR
- NO BUILD LINE (NBL)
- EXISTING RIPRAP
- PROPOSED RIPRAP



VICINITY MAP
NOT TO SCALE

BENCHMARK





10 0 50 100 200
1" = 100' 1:1,200

MVE, INC. ENGINEERS, SURVEYORS
1903 lelaray 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

DEVELOPED
(ON - SITE)
DRAINAGE MAP

MVE PROJECT 61145
MVE DRAWING DRN-MAP-DEV

JANUARY 3, 2024
SHEET 1 OF 1