Final Drainage Report

Eagleview Subdivision
El Paso County, Colorado

Prepared for:
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Project #: 196288000

PCD Filing No.: SF-2242

Prepared: April 19, 2024

Kimley»Horn

CERTIFICATION

DESIGN 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 master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparation of this report.

SIGNATURE (Affix Seal): ____
Brice Hammersland, P.E.
Colorado P.E. No. 56012 Date

OWNER/DEVELOPER'S STATEMENT

I, the developer, have read and will comply with all of the requirements specified in this Drainage Report and Plan.

____
PT Eagleview LLC

____
Authorized Signature Date

____
Joseph W. DesJardin

____
Director of Entitlements

____
Address:
1864 Woodmoor Drive
Monument, CO 80132

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.

____ ______________________
Josh Palmer, P.E. Date
County Engineer/ ECM Administrator

Conditions:

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INTRODUCTION

PURPOSE AND SCOPE OF STUDY

The purpose of this Final Drainage Report (FDR) is to provide the hydrologic and hydraulic calculations and to document the drainage design methodology in support of the proposed Eagleview Subdivision ("the Project") for PT Eagleview LLC. The Project is located within the jurisdictional limits of El Paso County ("the County"). Therefore, the hydrologic and hydraulic design is based on the County's criteria which is described in further detail within the report.

LOCATION

The Project is located approximately 4 miles northwest of Falcon, Colorado within Section 26, Township 12 South, Range 65 West of the 6th Principal Meridian, County of El Paso, State of Colorado ("the Site"). The Site comprises two parcels of land which are bound by Stapleton Estates Filing No. 1 on the west and south, Paint Brush Hills Filing No. 14 (PCD File No. SF2024) to the east, and the Rodgwick Subdivision and MFY Farm Subdivision to the north. A vicinity map has been provided in the **Appendix A** of this report.

The Site is currently owned by PT Eagleview LLC and will be developed by PT Eagleview LLC.

DESCRIPTION OF PROPERTY

The Site is approximately 121 acres consisting of undeveloped land with native vegetation and is classified as "Open Space" per Table 5-4 of the Drainage Criteria Manual of El Paso County. Vegetation within the site is characterized primarily by prairie grasses along with some area of scrub brush and a limited occurrence of small oaks. The Site does not currently provide water quality or detention for the Project area. The existing land use is undeveloped vacant land. There are no existing irrigation ditches on the Site.

The existing topography consists of slopes ranging from 1% to 20%. The west tributary of the Falcon drainage basin runs from the northwest corner of the site to the southeast corner of the Site.

According to NRCS soil mapping data, USCS Type B soils are the primary soil type within the site, indicating high levels of permeability. Soils present at the Site consist mainly of "Pring coarse sandy loam" which represent a moderate hazard for erosion. **Appendix B** contains detailed NRCS soil data.

The development of this site will include 38, 2 ½ acre single family lots, roadway improvements to the site will include mowing, clearing and grubbing, weed control, paved access road construction, roadway grading, one full spectrum detention pond, two water quality ponds, roadside ditches, culverts, drainage swales, native seeding and a proposed channel to convey flows to the detention pond and water quality ponds.

A Topographic field survey was completed for the Project by Rampart Surveys dated June 24th, 2008 and is the basis for design for the drainage improvements.

DRAINAGE BASINS

MAJOR BASIN DESCRIPTIONS

The Project is located within the West Tributary of the Falcon Drainage Basin. The watershed is generally located in the north central portion of El Paso County. The watershed contains three streams and has an overall area of approximately 10.6 square miles at the confluence of Black Squirrel Creek. The headwaters of the watershed are made up of ponderosa pine forest, grassland on undeveloped land, and 2-to-5-acre rural residential lots. There is no FEMA mapped floodplain on the project site. Refer to **Appendix A** for the Flood Insurance Rate Map (FIRM) number 08041C05350G effective date, December 7, 2018.

EXISTING SUB-BASIN DESCRIPTIONS

Historically the runoff from the Site drains into the West Tributary reach of the Falcon drainage basin. The West Tributary reach bisects the Site from north to south. The Site is located in upper portion of the Falcon drainage basin. The Site was divided into 4 onsite subbasins B1 – B4 and 8 offsite basins OB1 – OB8. Onsite and offsite flows generally flow from north to south overland over vacant and developed land to the West Tributary reach. The off-site basins draining to the site generally encompass rural land with pockets of residential development. Below is a description of the existing sub-basins.

Sub-Basin B1
The on-site sub-basin consists of an area of 5.55 acres, located in the southwest corner of the property. Drainage flows overland from the northwest to the southeast into the West Tributary. The curve number for this basin is 61.00. Runoff during the 5-year and 100-year events are 3.0 cfs and 8.5 cfs respectively.

Sub-Basin B2
The on-site sub-basin consists of an area of 41.43 acres, located on the west side of the property. Drainage flows overland from the northwest to the southeast into the West Tributary. The curve number for this basin is 60.68. Runoff during the 5-year and 100-year events are 15.4 cfs and 48.5 cfs respectively.

Sub-Basin B3
The on-site sub-basin consists of an area of 59.54 acres, located in the central portion of the property. Drainage flows overland from the northwest to the southeast into the West Tributary reach. The curve number for this basin is 60.90. Runoff during the 5-year and 100-year events are 36.4 cfs and 110.0 cfs respectively.

Sub-Basin B4
The on-site sub-basin consists of an area of 14.68 acres, located in the northeast portion of the property. Drainage flows overland from the north to the south into the West Tributary reach. The curve number for this basin is 61.00. Runoff during the 5-year and 100-year events are 5.4 cfs and 18.2 cfs respectively.

Sub-Basin OB1
The off-site sub-basin consists of an area of 10.37 acres, located on the southwest corner of the property. Drainage flows overland from the west to the east onto the property and continues to the southeast and outfalls along the south property line into the West Tributary reach at design

point J1. The curve number for this basin is 63.76. Runoff during the 5-year and 100-year events are 7.1 cfs and 18.8 cfs respectively.

Sub-Basin OB2
The off-site sub-basin consists of an area of 28.06 acres, located on the west side of the property. Drainage flows overland from the west to the east onto the property. Flows enter the site in a well-defined natural channel and continue to the southeast as channelized flow. Where the flows ultimately outfall along the south property line into the West Tributary reach at design point J2. The curve number for this basin is 64.16. Runoff during the 5-year and 100-year events are 20.6 cfs and 52.7 cfs respectively.

Sub-basin OB3
The off-site sub-basin consists of an area of 43.44 acres, located on the west of the property. Drainage flows overland from the northwest to the southeast and enters the site as channelized flow and continue to the southeast as channelized flow. Where the flows ultimately outfall at the south property line into the West Tributary reach at design point J2. The curve number for this basin is 63.62. Runoff during the 5-year and 100-year events are 25.3 cfs and 67.1 cfs respectively.

Sub-basin OB4
The off-site sub-basin consists of an area of 10.50 acres, located on the west side of the property. Drainage flows overland from the northwest to the southeast and enters the site as channelized flow and continues to the southeast as channelized flow. Where the flows ultimately outfall at the south property line into the West Tributary reach at design point J2. The curve number for this basin is 64.71. Runoff during the 5-year and 100-year events are 7.5 cfs and 18.9 cfs respectively.

Sub-basin OB5
The off-site sub-basin consists of an area of 143.82 acres, located on the northwest side of the property. Drainage flows overland from the northwest to the southeast and enters the site as channelized flow and continues to the southeast as channelized flow. Where the flows ultimately outfall into the West Tributary reach on-site at design point J4. The curve number for this basin is 59.98. Runoff during the 5-year and 100-year events are 36.8 cfs and 106.9 cfs respectively.

Sub-basin OB6
The off-site sub-basin consists of an area of 118.40 acres, located north side of the property. Drainage flows overland from the north to the south and enters the site as channelized flow and continues to the south where it outfalls into the West Tributary on-site at design point J4. The curve number for this basin is 61.77. Runoff during the 5-year and 100-year events are 40.8 cfs and 113.2 cfs respectively.

Sub-Basin OB7
The off-site sub-basin consists of an area of 421.20 acres, located on the north side of the property. Drainage flows overland from the north to the south and enters the site as channelized flow within the West Tributary reach. The curve number for this basin is 61.07. Runoff during the 5-year and 100-year events are 101.4 cfs and 284.2 cfs respectively.

Sub-Basin OB8
The offsite sub-basin consists of an area of 33.07 acres, located northeast of the property. Drainage flows overland from the north to the south and enters onto the site as shallow concentrated flow as there is no well-defined natural drainage channel in this area of the site. Flows then continue to the south in a more defined natural channel and outfall into the West

Tributary reach on-site at design point J3. The curve number for this basin is 64.89. Runoff during the 5-year and 100-year events are 19.5 cfs and 51.6 cfs respectively.

Refer to **Appendix E** for the Existing Drainage Conditions Map.

PROPOSED SUB-BASIN DESCRIPTIONS

For the proposed condition, stormwater will generally maintain historic flow patterns from north to south. The proposed roadways will alter some of the existing flow paths. The roadway ditches will capture runoff from the roadways and direct flows back to the existing flow paths, which will ultimately outfall to existing natural drainage channels, full spectrum detention pond, or water quality ponds. The proposed project has been divided into 14 on-site sub-basins. The off-site basins are fully developed and no changes to the upstream basins are anticipated.

Sub-Basin PB1

The on-site sub-basin consists of 2 residential lots at the southwest corner of the property. The sub-basin has an area of 4.25 acres. The curve number for the sub-basin is 64.35. Runoff during the 5-year and 100-year events are 3.0 cfs and 7.7 cfs respectively. Runoff from this basin will travel across the lots and outfall to the south as it has done historically at design point P1.

Sub-Basin PB2

The on-site sub-basin consists of 1 residential lot at the southwest corner of the property. The sub-basin has an area of 1.08 acres. The curve number for the sub-basin is 65.38. Runoff during the 5-year and 100-year events are 1.0 cfs and 2.4 cfs respectively. Runoff from this basin will travel across the lot and outfall to the south as it has done historically at design point P1. Flows from this sub-basin are not required to be conveyed to a water quality facility according to Appendix I Section 1.7.1.B of El Paso County’s Engineering Construction Manual (ECM). The sub-basin is identified as a large lot single family area with an impervious cover under 20 percent under Section 1.7.1.B, number 5. In addition to a small portion of roadway flows that are not required to be conveyed to a water quality facility according to Appendix I Section 1.7.1.C.1.

Sub-Basin PB3

The on-site sub-basin consists of portions of 2 residential lots and the half street of the proposed local roadway at the southwest corner of the property. The sub-basin has an area of 1.38 acres. The curve number for the sub-basin is 67.68. Runoff during the 5-year and 100-year events are 1.5 cfs and 3.3 cfs respectively. Runoff from this basin will travel across the lots and be conveyed to Culvert 1 through a roadside ditch. Flows will then be conveyed through basin PB15 via a natural channel and outfall into Water Quality Pond 1 before out falling into the West Tributary reach at design point P2.

Sub-Basin PB4

The on-site sub-basin consists of 4 residential lots and the half streets of the proposed local roadway at the southwest corner of the property. The sub-basin has an area of 10.54 acres. The curve number for the sub-basin is 64.84. Runoff during the 5-year and 100-year events are 12.6 cfs and 30.2 cfs respectively. Runoff from this basin will travel across the lots and be conveyed by a natural channel to Culvert 2. Where flows will then be conveyed through basin PB15 via a natural channel and outfall into Water Quality Pond 1 before out falling into the West Tributary reach at design point P2.

Sub-Basin PB5

The on-site sub-basin consists of 2 residential lots and the half street of the proposed local roadways at the west side of the property. The sub-basin has an area of 6.18 acres. The curve number for the sub-basin is 64.70. Runoff during the 5-year and 100-year events are 4.2 cfs and 10.4 cfs respectively. Runoff from this basin will travel across the lots and be conveyed by a natural channel to Culvert 7. Where flows will then be conveyed through basin PB4 and PB15 via a natural channel, Culvert 2, and outfall into Water Quality Pond 1 before out falling into the West Tributary reach at design point P2.

Sub-Basin PB6

The on-site sub-basin consists of 3 residential lots and the half street of the proposed local roadway near the central portion of the property. The sub-basin has an area of 11.09 acres. The curve number for the sub-basin is 65.33. Runoff during the 5-year and 100-year events are 8.6 cfs and 20.7 cfs respectively. Runoff from this basin will travel across the lots and roadside ditches to Culvert 3. Where flows will then be conveyed through basin PB15 via a natural channel and outfall into Water Quality Pond 1 before out falling into the West Tributary reach at design point P2.

Sub-Basin PB7

The on-site sub-basin consists of 3 residential lots and portions of the proposed local roadways near the central portion of the property. The sub-basin has an area of 3.46 acres. The curve number for the sub-basin is 66.22. Runoff during the 5-year and 100-year events are 3.2 cfs and 7.4 cfs respectively. Runoff from this basin will travel across the lots and roadside ditches to Culvert 4. Runoff will then be conveyed through a roadside ditch to Culvert 3. From there the runoff will be conveyed through basin PB15 via a natural channel and outfall into Water Quality Pond 1 before out falling into the West Tributary reach.

Sub-Basin PB8A

The on-site sub-basin consists of 2 residential lots, a large natural drainage channel and Pond 3 near the northwest corner of the property. The sub-basin has an area of 7.60 acres. The curve number for the sub-basin is 64.63. Runoff during the 5-year and 100-year events are 8.3 cfs and 20.3 cfs respectively. Runoff from this basin will travel across the lots and into the natural channel that outfall into Pond 3. Offsite sub-basin OB5 also discharges onto the property and is conveyed to Pond 3 through sub-basin PB8A via the natural channel and rock chutes.

Sub-Basin PB8B

The on-site sub-basin consists of 4 residential lots and a large natural drainage channel. The sub-basin has an area of 5.79 acres. The curve number for the sub-basin is 64.00. Runoff during the 5-year and 100-year events are 6.1 cfs and 15.2 cfs respectively. Runoff from this basin will travel across the lots and into the natural channel that outfalls into the main natural channel.

Sub-Basin PB9

The on-site sub-basin consists of 4 residential lots, a large natural drainage channel and a portion of the sub regional Pond 1 near the northern portion of the property. The sub-basin has an area of 12.80 acres. The curve number for the sub-basin is 64.39. Runoff during the 5-year and 100-year events are 9.8 cfs and 24.8 cfs respectively. Runoff from this basin will travel across the lots and into the natural channel.

Sub-Basin PB10

The on-site sub-basin consists of 4 residential lots near the northern portion of the property. The sub-basin has an area of 8.47 acres. The curve number for the sub-basin is 64.00. Runoff during the 5-year and 100-year events are 5.6 cfs and 14.4 cfs respectively. Runoff from this basin will travel across the lots and into the West Tributary reach .

Sub-Basin PB11

The on-site sub-basin consists of 6 residential lots and portions of the proposed local roadways near the northeast portion of the property. The sub-basin has an area of 17.56 acres. The curve number for the sub-basin is 65.20. Runoff during the 5-year and 100-year events are 13.6 cfs and 33.2 cfs respectively. Runoff from this basin will travel across the lots utilize roadside ditches and natural drainage channels to convey flows to Culvert 6. From there the runoff will be conveyed through basin PB14 via a natural channel and outfall into Water Quality Pond 2 before out falling into the West Tributary reach.

Sub-Basin PB13

The on-site sub-basin consists of a portion of the proposed local roadways near the east portion of the property. The sub-basin has an area of 4.02 acres. The curve number for the sub-basin is 65.12. Runoff during the 5-year and 100-year events are 4.9 cfs and 11.7 cfs respectively. Runoff from this basin will sheet flow into the West Tributary reach. From there the runoff will be conveyed to Culvert 8 and through basin PB14 via the West Tributary reach and outfall to design point P3. Flows from this sub-basin are not required to be conveyed to a water quality facility according to Appendix I Section 1.7.1.B of El Paso County's Engineering Construction Manual (ECM). The sub-basin is identified as a large lot single family area with an impervious cover under 20 percent under Section 1.7.1.B, number 5. In addition to a small portion of roadway flows that are not required to be conveyed to a water quality facility according to Appendix I Section 1.7.1.C.1.

Sub-Basin PB14

The on-site sub-basin consists of 4 residential lots a portion of the proposed local roadways near the southeast portion of the property. The sub-basin has an area of 17.28 acres. The curve number for the sub-basin is 63.64. Runoff during the 5-year and 100-year events are 18.9 cfs and 46.3 cfs respectively. Runoff from this basin will sheet flow into the West Tributary reach and outfall to design point P3. Flows from this sub-basin are not required to be conveyed to a water quality facility according to Appendix I Section 1.7.1.B of El Paso County's Engineering Construction Manual (ECM). The sub-basin is identified as a large lot single family area with an impervious cover under 20 percent under Section 1.7.1.B, number 5. In addition to a small portion of roadway flows that are not required to be conveyed to a water quality facility according to Appendix I Section 1.7.1.C.1.

Sub-Basin PB15

The on-site sub-basin consists of 5 residential lots and portions of the proposed local roadways near the northeast portion of the property. The sub-basin has an area of 9.63 acres. The curve number for the sub-basin is 61.65. Runoff during the 5-year and 100-year events are 11.0 cfs and 26.3 cfs respectively. Runoff from this basin will travel across the lots utilize roadside ditches and natural drainage channels to convey flows to Water Quality Pond 1 out falling into the West Tributary reach at design point P2.

Sub-Basins OB1 – OB8

The offsite sub basins are fully built out per the DBPS and are anticipated to maintain historic flows and drainage patterns.

DRAINAGE DESIGN CRITERIA

please touch on the differences between the approved preliminary drainage report which identified the regional pond concept and the new proposed concept.

DEVELOPMENT CRITERIA REFERENCE

The proposed storm facilities are designed to [illegible]ty “Engineering Criteria Manual”, Volumes 1 and 2 and the City of Colorado Springs May 2014 Drainage Criteria Manual, Volume 1, (“the DCM”).

Site drainage is not significantly impacted by such constraints as utilities or existing development.

A Falcon Drainage Basin Planning Study prepared by Matrix Design Group, September 2015 (DBPS) was completed and includes the Eagleview subdivision. This planning study was used for reference to assist with drainage design for the proposed subdivision. A DBPS Amendment to the Falcon DBPS (Dated March 8, 2024) was completed and approved through the Drainage Board on March 27, 2024 which proposed alternatives to the onsite detention location and improvements required along each reach of the tributary. The new location of the detention pond is located off of the West Tributary reach. The proposed detention pond still provides water quality for onsite and offsite areas draining to it and also provides attenuation for the 100-yr storm event. As part West Tributary reach analysis, stream improvements were identified and conceptually designed for the entire reach. Refer to **Appendix D** for excerpts from the DBPS.

HYDROLOGIC CRITERIA

The 5-year and 100-year design storm events were used in determining rainfall and runoff for the proposed drainage analysis per the Engineering Manual. The model utilizes the NRCS Type II rainfall distribution, the cumulative depth for the 5-year storm 2.7 inches and the cumulative depth for the 100-year storm is 4.6 inches. Per the DCM both Frontal and Thunderstorms were evaluated to determine the higher design flow. The comparative analysis between the two storms shows that the Frontal Storm produces a significantly higher flow rates therefore, this storm was used for the drainage design. The rainfall distribution for the Frontal Storm was selected as the dominant storm-type for this project. See **Table 1** below for the rainfall values.

Table 1: ***Colorado Springs Rainfall Depths***

	Duration (HRS)	
Storm Event	**1 HR**	**24 HR**
5 Year	1.5	2.7
100 Year	2.52	4.6

It should be noted that the DBPS used a slightly lower cumulative depth for the 5-yr (2.6 inches) and used the same cumulative depth for the 100-year of (4.6 inches) because the DBPS used an aerial reduction of 2% to the rainfall depths as the Falcon Watershed is slightly larger than 10 square miles. This aerial reduction was not applied to the rainfall depths for this Site as the drainage area analyzed was smaller and didn't require an aerial reduction. Refer to Tables 6-2 and 6-4 in Chapter 6 of the DCM for the frontal rainfall distribution curve and Colorado Springs rainfall depths data for the 5-year and 100-year design storm events utilized for the project. The project model was compared to the DBPS model, and it generally reflects lower flows for the project site area. This is mainly due to using the Type II rainfall distribution curve versus the Type IIa rainfall distribution curve that the DBPS model used. Design point JWT080 in the DBPS model and design points J4 and P7 in the project models were used as critical points to compare the existing and proposed condition models.

Design runoff was calculated using the NRCS curve number method as established in the DCM. This aligns with what was completed in the Falcon Drainage Basin Planning Study (DBPS). The NRCS curve number method was used for existing conditions and proposed conditions due to the on-site and off-site basins containing more than 130 acres. Existing and future land uses were obtained from the County GIS department. Where possible, runoff curve numbers established in the DBPS were utilized since these were more conservative than equivalents found in the DCM. For all other areas, curve numbers were developed by using Table 6-10 (ARCII) in the DCM. The CN values calculated for basins in this analysis align closely with those found in the DBPS, with a weighted average of 61.5. **Table 2** below shows all CN values utilized for this report and their source. Calculations for the composite curve numbers are included in the **Appendix B**.

A combination of aerial imagery and available public GIS data were used to calculate weighted impervious values. However, the DBPS was found to underestimate imperviousness of the basins; the impervious values in the DBPS ranged between 1% and 4% with most basins having an impervious value of 2%. Calculations for impervious values are included in the **Appendix B**.

Table 2: ***CN Values***

		Soil Type			
Cover Description	**% Imp**	**A**	**B**	**C**	**D**
Open Space	---	39	61	74	80
Gravel	---	76	85	89	91

		Soil Type			
Cover Description	**% Imp**	**A**	**B**	**C**	**D**
Paved	---	98	98	98	98
5 Acre Rural Residential (Woods Landuse) *	---	33	58	73	80
5 Acre Rural Residential (Rangeland Landuse) *	---	40	62	75	81
½ Acre Residential*	25	55	71	81	86
2 ½ Acre Rural Residential*	11	45	64	76	81

*Values from the Falcon Drainage Basin Planning Study (DBPS) completed in 2015.

The Manning's n values used to calculate the channelized flow regime for the time of concentration were developed by comparison with the DBPS HEC-HMS and HEC-RAS models and through physical confirmation at the site. The Manning's n values used to calculate the overland flow regime for the time of concentration were taken from Table 6-11 in the DCM and can be found in **Table 3** below.

Table 3: Manning's n Roughness Coefficients

Surface Description	n Value
Short Grass Prairie	0.15
Woods – Light underbrush	0.4

The time of concentration was calculated following the guidance provided in TR-55 by summing the travel time for overland flow, sheet flow, and channelized flow segments along the longest flow path and a factor of 0.6 was then applied to generate the lag time, per Ch. 6 Section 4.6 of the DCM. The longest flow paths were manually delineated to match the drainage patterns in each sub basin based on existing topography. Time of concentration calculations for each basin can be found in **Appendix B**.

Routing of the stormwater runoff and modeling of drainageways for the project site, was done using the NRCS Curve Number Method as required by El Paso County. Routing of channelized flow was based on the Muskingum-Cunge method for all reaches for the existing and proposed model. This aligned with the methodology completed in the DBPS models.

Small existing channels onsite were modeled with a typical section using FlowMaster that has the following characteristics: a longitudinal slope of 0.025, side slopes of 1.3 (H:V), a Manning's n value of 0.030, and a normal depth of 2 feet. Similarly, proposed roadside ditches were modeled in FlowMaster with a typical section that has the following characteristics: a
:V), a Manning's n value of 0.030, and a normal
or the typical channel and typical ditch are
e the FlowMaster worksheet in **Appendix C** for

Describe the roadside ditch permissible velocity parameters and the source as indicated in the previous review 1 comment. Describe the mitigation being used (TRM) when it exceeds the permissible velocity.

further details on the typical channel and typical ditch. The larger main tributary channel was modeled based on an averaging of cross sections within the DBPS HEC-RAS model for the subject reaches. The longest of these, R-PB13, has the following characteristics: a longitudinal slope of 0.02, side slopes of 3:1 (H:V), and a Manning's n value of 0.03.

There are no additional provisions selected or deviations from the criteria.

HYDRAULIC CRITERIA

Applicable design methods were utilized to size the proposed detention pond, water quality ponds, culverts, drainage channels, erosion protection, which include the use of Mile High Flood Districts UD-Detention spreadsheet, UD-Culvert spreadsheet, and FlowMaster. The Site is providing one full spectrum detention pond which will include water quality capture volume (WQCV), excess urban runoff volume (EURV), and 100-year detention per the DBPS. The site is also providing two additional water quality ponds. The Site is not significantly increasing the imperviousness of the Site and the Project is maintaining the historic drainage patterns as much as possible and not significantly increasing developed flows. Proposed drainage features on-site have been analyzed and sized for the Major Storm, 100-year design storm event.

DETENTION AND WATER QUALITY POND

Which pond? Pond 3?

The full spectrum detention pond design was completed utilizing Mile High Flood District's UD-Detention spreadsheet to design the pond outlet structure. The UD-detention spreadsheet in **Appendix C** was designed for the total area onsite and offsite draining to the Pond. The pond was designed to reduce the peak flow by ~10% to reach the pre vs post ratio of 0.9. Once the design of the pond was completed in UD-detention the stage storage curve and stage discharge curve from the spreadsheet was then input into HEC-HMS and run. The peak storage and peak outflow results from UD-detention spreadsheet compared to the HEC-HMS results were negligible. Therefore, verifying the detention Pond 3 was sized adequately for the 100-yr storm event.

100-yr?

The water quality capture volume for Pond 3 was determined using an empirical formula based on percent impervious. Refer to **Appendix C** for calculations.

As previously mentioned, a full spectrum detention pond and two water quality ponds are being proposed for the site. The full spectrum detention pond is a non-jurisdictional detention pond which has been designed for WQCV, EURV, and 100-year detention. The detention pond has been designed per the DBPS Amendment and restricts flow to be less than the historic flow leaving the site to 561 cfs. Maintenance of the detention Pond 3 and water quality ponds will be through Eagleview Metro District. Water quality ponds 1 and 2 will provide water quality control volumes of 0.13 ac-ft and 0.05 ac-ft, respectively. Flows in excess of the water quality control volume will be routed through the spillways of the water quality ponds.

Clarify where this is. Within the channel? Because Table 4 on the next page shows the flows leaving the pond to be 97cfs.

Provide forebay sizing calcs too for all ponds.

Unresolved Review 1 comment:
Per DCMv2 – Chap 4.2, trickle channel should at a minimum provide capacity equal to twice the release capacity at the upstream forebay outlet. Provide these calcs in the drainage report and revise plans as needed.

Table 4: Pond Summary Table

Pond	Proposed Volume (ac-ft)	100-yr Inflow (Developed) [cfs]	Flow Exiting Pond (Developed) [cfs]	Flow Ratio (Developed vs Historic)	100-yr Flows Detained
Pond 3	2.8 ac-ft	109	97	0.89	Yes
WQP1	0.13 ac-ft	181	181	-	No
WQP2	0.05 ac-ft	82	82	-	No

HEC-HMS results and UD-detention Pond calculations are provided in **Appendix B** and **Appendix C**.

The detention Pond 3 has two rock chutes proposed with a downstream stilling basin to dissipate the energy of the flow being conveyed into the pond through the rock chutes. The stilling basin for each rock chute will have dual purpose. The first purpose will be to assist in dissipating the energy before out falling into the pond bottom and second purpose is to serve as a forebay structure. The concrete line trickle channels will convey flows to the outlet structure micro pool. The outlet structure is designed to provide full spectrum characteristics. The 100-year storm volume will be released via 1-42” RCP. An emergency spillway is proposed and designed to convey the 100-year flow with a depth of 1’. The emergency spillway has been designed to provide a minimum of 1’ of freeboard. A 15’ wide access road is proposed from top of the pond to the bottom of the pond for maintenance. The pond reduces proposed flows at the outfall below historic levels relative to the existing conditions analysis results.

Water Quality Pond 1 has two rock chutes proposed with a downstream stilling basin for each to dissipate the energy of the flow being conveyed into the water quality pond through the rock chutes. The stilling basin for each rock chute will have dual purpose. The first purpose will be to assist in dissipating the energy before out falling into the pond bottom and second purpose is to serve as a forebay structure. The concrete line trickle channel will convey flows to the outlet structure micro pool. The outlet structure is designed to provide water quality treatment only. The water quality flows will be released through a 24” RCP. Once a volume greater than the water quality volume is reached the flows will be conveyed through a combination of the outlet structure and spillway. The spillway has been designed to convey the 100-year flow of 181 cfs. The spillway has been designed to provide a minimum of 1’ of freeboard. A 15” wide access road is proposed to the bottom of the pond for maintenance.

Water Quality Pond 2 has one rock chute proposed with a downstream stilling basin to dissipate the energy of the flow being conveyed into the water quality pond through the rock chute. The stilling basin for each rock chute will have dual purpose. The first purpose will be to assist in dissipating the energy before out falling into the pond bottom and second purpose is to serve as a forebay structure. The concrete line trickle channel will convey flows to the outlet structure micro pool. The outlet structure is designed to provide water quality treatment only. The water quality flows will be released through a 18” RCP. Once a volume greater than the water quality volume is reached the flows will be conveyed through a combination of the outlet structure and spillway. The spillway has been designed to convey the 100-year flow of 82 cfs. The spillway has been designed to provide a minimum of 1’ of freeboard. A 15” wide access road is proposed to the bottom of the pond for maintenance.

CULVERT SIZING

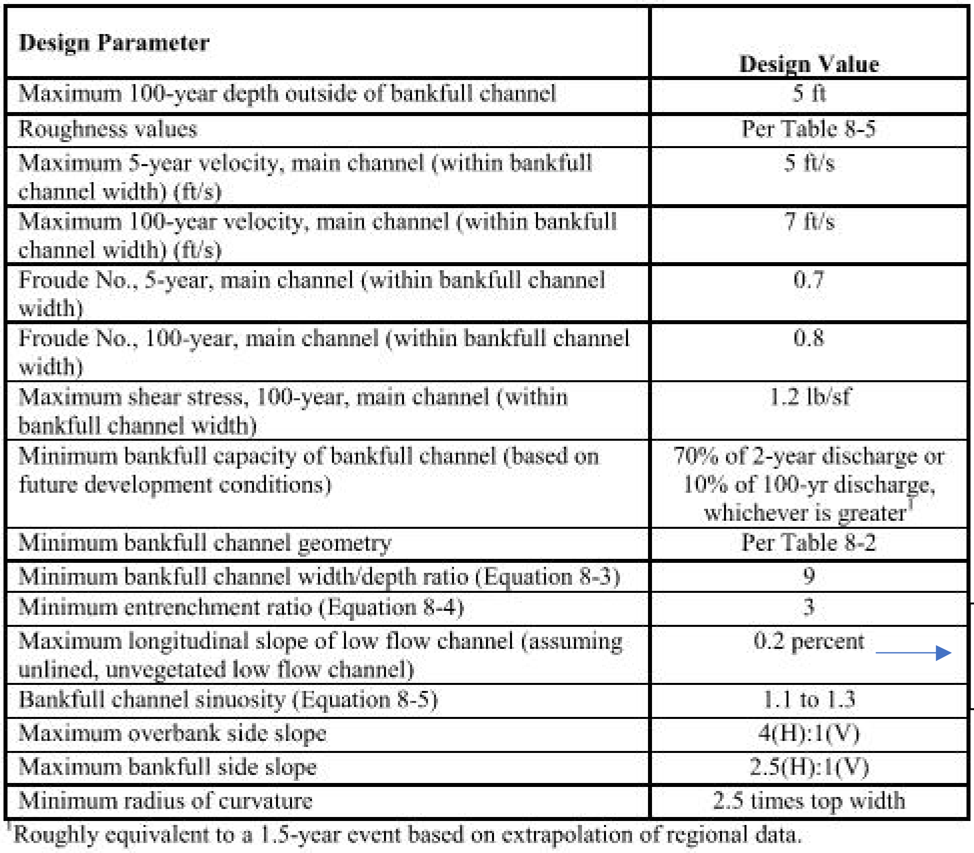
The proposed culverts for the site were designed utilizing Mile High Flood Districts UD-Culvert spreadsheet. Refer to **Appendix C** for culvert sizing and erosion protection calculations.

CHANNEL STABILIZATION

The Falcon Drainage Basin Study identifies the need for channel stabilization improvements with the Site. In particular, the DBPS calls for the construction of 24 small drop structures within the Eagleview Subdivision. A DBPS Amendment to the Falcon DBPS (Dated March 8, 2024) was completed and approved through the Drainage Board on March 27, 2024 which proposed alternatives to the onsite detention location and improvements required along each reach of the tributary. The proposed improvements represent the Amended improvements associated with the DBPS Amendment. See **Appendix E** for check structure and riffle drop locations based on hydraulic analysis of the site.

The channel stabilization was analyzed as part of this report. The larger main tributary channel was modeled in HEC-RAS to analyze the reach for stability. As the DBPS identified this reach for channel improvement. Refer to the HEC-RAS results and exhibits in **Appendix C**. Based on the HEC-RAS modeling results proposed amendments to the identified drainage features in the DBPS have been analyzed using the following hydraulic design parameters, in **Table 5**, consistent with the Mile High Flood Districts, Urban Drainage and Flood Control District Drainage Criteria Manuals (UDFCDCM), (Volumes 1,2, and 3), prepared by Wright-McLaughlin Engineers, June 2001, with the latest revisions.

Table 5: Hydraulic Design Parameters for Natural Channels



Design Parameter	Design Value
Maximum 100-year depth outside of bankfull channel	5 ft
Roughness values	Per Table 8-5
Maximum 5-year velocity, main channel (within bankfull channel width) (ft/s)	5 ft/s
Maximum 100-year velocity, main channel (within bankfull channel width) (ft/s)	7 ft/s
Froude No., 5-year, main channel (within bankfull channel width)	0.7
Froude No., 100-year, main channel (within bankfull channel width)	0.8
Maximum shear stress, 100-year, main channel (within bankfull channel width)	1.2 lb/sf
Minimum bankfull capacity of bankfull channel (based on future development conditions)	70% of 2-year discharge or 10% of 100-yr discharge, whichever is greater[1]
Minimum bankfull channel geometry	Per Table 8-2
Minimum bankfull channel width/depth ratio (Equation 8-3)	9
Minimum entrenchment ratio (Equation 8-4)	3
Maximum longitudinal slope of low flow channel (assuming unlined, unvegetated low flow channel)	0.2 percent
Bankfull channel sinuosity (Equation 8-5)	1.1 to 1.3
Maximum overbank side slope	4(H):1(V)
Maximum bankfull side slope	2.5(H):1(V)
Minimum radius of curvature	2.5 times top width

[1] Roughly equivalent to a 1.5-year event based on extrapolation of regional data.

Revised to 0.4% based on Falcon DBPS recommendations.

As part of this hydraulic analysis the DBPS model was updated to represent the existing conditions of the channel more accurately. These updates included adding and removing cross-sections to better represent existing conditions. Manning's n adjustments we also done based on visual inspection. The velocity and Froude from the HEC-RAS modeling, of the Falcon DBPS, did not appear to match the channel stability of Falcon Creek as seen in the field. The reaches appear to function with more stability than the results of the DBPS imply in the initial DBPS HEC-RAS models. Additional field investigation was completed in an effort to evaluate Manning's n based on existing channel and vegetation conditions. Pictures were taken at each HEC-RAS cross section identified in the DBPS to assess vegetation type, height, and flow resistance. Engineering judgement was used to revise the Manning's n by considering flow depth relative to vegetation type. As a result of this evaluation, Manning's n values in the RWT092 and RWT054 reach were increased to be closer to 0.1 for the channel bottom and 0.045 for the channel slopes based on the following factors:

- Vegetation is comprised mostly of willows and cattails about 4 to 6 feet in height.
- Flow depths are 4-feet or less.
- Willows and cattails are known to be highly resistant to flow until they are submerged.

Where flow depths are unable to submerge the vegetation, a Manning's n roughness of 0.08 to 0.1 is an acceptable range hydraulic modeling in areas with this type of vegetation.

A HEC-RAS model was completed for the existing conditions, using flow rates determined based on hydrologic analyses completed as a part of the Eagleview Subdivision PDR and the results of that study are presented therein. A abbreviated overview of the existing results from revised HEC-RAS modeling is provided in **Table 6**.

Table 6: HEC-RAS Results Comparison Between Existing and Proposed Conditions

		Revised Falcon DBPS HEC-RAS Cross Sections (Existing Condition)				HEC-RAS Cross Sections (Proposed Condition)	
		DBPS		Eagleview		Eagleview	
	Cross Section	Input	Output	Input	Output	Input	Output
		100-yr Flow (cfs)	Froude No.	100-yr Flow (cfs)	Froude No.	100-yr Flow (cfs)	Froude No.
Offsite	41218.78	480	0.74	285	0.57	285	0.57
Eagleview Onsite	40884.05	480	0.97	285	0.40	285	0.40
	40418.78	480	0.91	285	0.49	285	0.49
	40018.78	740	1.01	375	0.38	375	0.38
	39618.78[1]	740	1.04	375	0.56	375	0.57
				478	0.29	478	0.28
	39218.78	740	1.15	478	0.51	478	0.52

	38818.78	740	1.03	478	0.55	480	0.39
	38418.78[2]	740	1.07	478	0.75	480	0.56
	38018.78[3]	740	1.06	502	0.82	502	0.57
	37618.78[4]	740	1.04	502	0.87	502	0.77
Offsite	37218.78	740	0.93	502	0.82	502	0.82

[1] DBPS cross section 39618.78 corresponds to existing and proposed Eagleview cross sections 39666 and 39542

[2] DBPS and existing Eagleview cross section 38418.78 corresponds to proposed Eagleview cross section 38437

[3] DBPS and existing Eagleview cross section 38018.78 corresponds to proposed Eagleview cross section 38001

[4] DBPS and existing Eagleview cross section 37618.78 corresponds to proposed Eagleview cross section 37609

As shown in **Table 6**, there are sections of the reaches that are not in compliance with the hydraulic criteria in existing condition which will be improved, and comply with criteria, in the proposed condition. The proposed improvements that were modeled are described in detail in the following section of the report. Note that cross section 37218.78, the downstream offsite cross section, is not meeting criteria in the existing condition and the hydraulic results remain identical in the proposed condition. Full hydraulic results, including results for proposed design cross sections not present in the DBPS, are provided in **Appendix C**.

To mitigate the velocities and Froude numbers within the existing reaches, proposed improvements are proposed to provide a stable, natural channel through the Site. Through a combination of riffle drops, concrete check structures, and improved vegetation, the proposed improvements meet the design criteria for velocity and Froude. See **Appendix C** for proposed HEC-RAS results. The proposed improvements are based on the principle found in the El Paso County's Drainage Criteria Manual (DCM). Per Section 2.2.1 of the DCM "A stable channel reaches "equilibrium" over many years. Therefore, channel modifications should be minimal." A summary of the proposed improvements are included below.

RWT094

- A combination of natural riprap riffle drops, coir matting and channel grading will be shown south of the proposed road (South Arroya Lane) due to the width of the channel in this section, approximately DBPS stations 37+600 to 38+800.
- Concrete check structures north of South Arroya Lane to the confluence of RWT094 with RWT080 and RWT092, approximately DBPS stations 38+800 to 39+600. Check structures are proposed to be installed at grade in the existing channel to minimize disturbance and protect the channel by maintaining a three-foot maximum drop and a 0% longitudinal slope between structures.

RWT094 is located south the confluence with RWT080 and RWT092 and flows south to the southern property line and beyond. The portion of RWT094 within the Eagleview property is approximately bounded by DBPS stations 37+600 to 39+600. It is divided into two sections, split by the proposed South Arroya Lane. The section north of the proposed roadway (approximately DBPS stations 37+600 to 38+800) has a narrower cross section and more closely resembles the cross section of reach RWT092 to the north. A total of five check structures are proposed in the northern section of this reach.

South of the proposed South Arroya Lane, the channel becomes much wider with shallower slopes (approximately DBPS stations 38+800 to 39+600). A total of four constructed riffles are proposed within this section of the reach. The drop heights of the constructed riffles range from 2.3 feet to 3 feet with 3% to 4% slopes. The channel sections outside of the riffles within this reach use the DBPS recommended stable channel slope of 0.40% to reduce the potential of erosion. For the riffle portion of the RWT094 reach, the 2-year flow of 77.5 cfs at design point P3 was used as the basis to size the low flow portion of the channel in this reach that will be regraded. This results in a 22 foot wide low flow channel. The Falcon DBPS states, “The crest width for a natural channel drop structure is the channel width associated with the low flow (bankfull) event as defined in the DCM update Section 3.1.1.1”. Thus riprap protection is provided for only the low flow portion of the riffle. A full analysis of the riffle drop structures in included in **Appendix C.**

RWT092

- Check structures are proposed to be installed at grade in the existing channel to minimize disturbance and protect the channel by maintaining a three-foot maximum drop and a 0% longitudinal slope between structures.

RWT092 is located between RWT054 and the sub regional detention pond SR1, approximately DBPS stations 39+600 to 40+150. A total of four check structures are proposed within this reach. The reach ends at the confluence with another smaller channel from the west.

RWT054

- Check structures are proposed to be installed at grade in the existing channel to minimize disturbance and protect the channel by maintaining a three-foot maximum drop and a 0% longitudinal slope between structures.

RWT054 is located north of reach RWT092, approximately DBPS stations 40+150 to 41+000. A total of one check structure is proposed within this reach at approximately 40+300. Due to the denser vegetation, including fully grown willows, cattails, and ponderosa trees within the low flow channel, no improvements are proposed north of structure at 40+300. A discussion and justification of the Manning’s n was previously provided.

RWT080

- A full spectrum detention facility is proposed along this reach. Design details are included within this report.

RWT080 is located west of RWT092. Based on the extent of existing vegetation on this reach, willow plantings are proposed as a channel improvement. During the 100 YR event, RWT080 experiences relatively low flow depths of approximately 1 foot, making willow plantings an ideal natural and less invasive solution for channel stability. A maintenance agreement with the County would be required to maintain the vegetation along the channel to maintain the channel.

The construction of the 11.03 AC-FT (100 YR) Sub Regional Pond (SR-1) will be completed by the County at a later date. A 2.8 AC-FT full spectrum detention basin is proposed on the RWT080 reach in the northwest corner of the Eagleview site.

discuss maintenance access for the channel.

Please provide a section in the narrative for channel maintenance. Per previous conversation with staff the District will maintain and manage the grasses, wetlands, and other vegetation etc. to ensure the channel performs as stated in this report. The County would maintain the proposed structures within the channel. Also, please submit a channel maintenance agreement for review by staff.

Pond C was designed and constructed
4. Pond C was recently upgraded to

include water quality and increased emergency spillway flows with Paint Brush Hills Filing No 14 in the 2021 time frame.

The new spillway associated with redesigned Detention Pond C, discharges stormwater runoff straight to the west via a 3:1 rip-rap slope at the property line. The rate, form and path of runoff does not match historic and should not have been approved by the County. Nonetheless, we recommend an additional 107 CY of 12” rip-rap be placed
rap toe protection will allow the spillway runoff to turn 90 d
flow path. Also, a 18,048 SF easement is warranted on L
in the path of the emergency spillway.

Please revise this statement as indicated in the previous review comment. The existing conditions drainage report for PBH 12 shows the path matches the path of the spillway. Additionally, per the PBH 14 report the pond is releasing below historic flows.

DRAINAGE FACILITY DESIGN

GENERAL CONCEPT

The Eagleview subdivision is a low-density residential development with 2 ½ acre lot sizes. The proposed drainage patterns will match the historic patterns as much as possible and not significantly increasing developed flows. To maintain historic flows, one detention pond (Pond 3) is being proposed and will capture and control a portion of the onsite and upstream offsite flows as outlined in the DBPS Amendment. The runoff from the proposed roads will be treated before releasing it into the West Tributary reach or on to the downstream properties at the historic discharge points.

Provided in the **Appendix B** are hydrologic calculations utilizing the NRCS/HEC-HMS method for the proposed conditions. Provided in **Appendix C** are the calculations for the proposed detention pond, water quality ponds, culvert, and channels. As previously mentioned, the existing and proposed drainage maps can be found in **Appendix E**.

SPECIFIC DETAILS

The existing site is undeveloped land consisting of mostly grassland. The existing conditions of the Site have flows being conveyed from the northwest to the southeast and discharging into the West Tributary reach of the Falcon drainage basin. The site is undeveloped and runoff conditions for the Site were modeled within this study using HEC-HMS. The proposed development looks to preserve the natural drainageways and drainage patterns as much as possible. Culverts have been sized using UD-Culvert and the calculations can be found in **Appendix C**..

The results from the HEC-HMS model for existing conditions show 578 cfs leaving the project site for the 100-year storm event and for the proposed conditions 561 cfs is leaving the project site at the south side. It is not anticipated that the development will negatively impact the drainageways and related facilities downstream of the development.

A Proposed Drainage Conditions Map is included **Appendix E** of this report for reference.

The U.S. Army Corps of Engineers (USACE) provided an approved jurisdictional determination (AJD) for the wetlands present within the Eagleview site. The USACE AJD found that the wetlands within the site were isolated and not Waters of the U.S. (WOTUS); therefore impacts to these wetlands will not require permitting under Section 404 of the Clean Water Act. Furthermore, the wetlands onsite are unregulated and shall not incur any additional permitting requirements beyond the scope of El Paso County.

The Site will disturb more than 1 acre and will require a Colorado Discharge Permit System

Updates/comments on this page were request with Review 1 but not resolved.

(CDPS) General Permit for Stormwater Discharge Associated with Construction Activities from the Colorado Department of Public Health and Environment (CDPHE). The proposed detention pond will be non-jurisdictional and will therefore require the submission of a Non-Jurisdictional Water Impoundment Structure application form as a part of the platting process.

EXISTING MAJOR DRAINAGE CHANNELS

The DBPS has identified that stream improvements are need on the West Tributary reach specific to the project Site. The design of the identified improvements are included within this report. The design meets the goals from the DBPS but also minimizes the on-site stream mitigation measures needed to the West Tributary reach.

THE FOUR STEP PROCESS

The Project was designed in accordance with the four-step process to minimize adverse impacts of urbanization, as outlined in the El Paso County Engineering Manual for BMP selection as noted below:

Step 1. Employ Runoff Reduction Practices – The project is proposing a low-density residential development that will be designed to minimize the impact to the current existing terrain. The Site's proposed paved roadways will increase the Site's impervious area, however, roadside ditches and channels will be constructed to slow down the runoff velocity and reduce runoff peaks. The detention pond and two water quality ponds will be used to capture stormwater, provide water quality treatment, and maintain flows discharging off site at or below historic levels.

Step 2. Implement BMPs That Provide a Water Quality Capture Volume with Slow Release – Permanent water quality measures and detention facilities will be necessary for the Project. Temporary water quality and erosion control measures will be provided during construction to prevent sediment laden water from discharging from the Site. Water quality measures are being used for all stormwater that contacts roadways, excluding 0.97 acres which cannot practicably be treated. Per ECM Appendix I Section 1.7.C.A., 20% of the development site or less than 1 acre can be excluded from providing water quality. As mentioned, 0.97 acres of impervious area will not be able to be treated which is less than 1 acre of the overall site. Per ECM Appendix I Section 1.7.1.B, in development areas of low-density housing, water quality is required for all roads, but is not required for the entirety of the large-lots. Due to the Project consisting of single family large-lots, lot imperviousness shall be limited to 10 percent or less. Refer to **Appendix E** for PBMP Tributary Areas map.

Revise to: "7.1.C.1"

Revise to: "7.1.B.5"

Step 3 Stabilize Drainageways– Stabilizing proposed roadside ditches, swales, and channels by designing them with slopes that control the flow rates. Placement of riprap upstream and downstream of culverts to help reduce erosion of the roadside ditches. Check dams will be used in areas with steeper grades to slow the runoff. We anticipate this will minimize erosion. Existing drainage ways will be graded to reduce the velocity of the water to minimize erosion.

Step 4. Implement Site Specific and Other Source Control BMPs – The erosion control construction BMPs of the Project were designed to reduce contamination. Source control BMPs include the use of vehicle tracking control, culvert protection, stockpile management, and stabilized staging areas.

Also mention WQ exclusions for stream stabilization

Please identify in the narrative that a reduction of 25% is allowed for 2.5 acre and greater lots per criteria

DRAINAGE FEES AND REIMBURSABLE

FEES

The project is within the Falcon Drainage Basin (CHWS1400) which is a part of the El Paso County Drainage Basin Fee Program, which is based on the total amount of impervious acres for the Site. Based on impervious calculations in the Appendix, there are 16.95 impervious acres for the proposed project. Current rates are for the 2022 calendar year. See the detailed breakdown below.

- Drainage Fee/Acre = $34,117 x 121.2 acres x 13.86% x 75% Imp = $429,831
- Bridge Fee/Acre = $4,687 x 121.2 acres x 13.86% Imp = $78,734

Total = $508,565

IMPROVEMENTS AND REIMBURSABLE COSTS

The Falcon Drainage Basin Study identifies two types improvements for the Site, County Costs or Developer Costs. Items identified as Developer Costs (those incurred by the Developer) are eligible for reimbursement. County Costs are not eligible for reimbursement. A DBPS Amendment to the Falcon DBPS (Dated March 8, 2024) was completed and approved through the Drainage Board on March 27, 2024 and amended the type of three reaches from a County Cost to a Developer Cost and thus making them reimbursable. A summary of the changes from the DBPS amendment are provided below:

Reach/Feature	Description	Type of Cost	Reimbursable	Amended
RWT094	South of SR1	Developer Cost	Yes	
SR1	Sub-Regional Pond	County Cost	No	Yes (Drainage Easement is Reimbursable)
RWT080	Northwest of SR1	County Cost	No	Yes
RWT092	Northeast of SR1	County Cost	No	Yes

Once construction of the reimbursable facilities is completed, procedures for Drainage Improvement Credits and Reimbursements outlined in Chapter 3 of the Drainage Criteria Manual will be in effect.

A summary of the anticipated construction costs for the reaches/ features in the DBPS Amendment are provided in a table below:

Include a cost estimate for each PBMP with line items for all components (ex: riprap, road base, forebay, trickle channel, outlet structure, outlet pipe, spillway, etc). Input the total value into the FAE form under “Permanent Pond/BMP (provide engineer’s estimate)” in Section 1. The total should not include grading, which is a separate line item in Section 1: “Earthwork.” The cost estimate should include labor costs (as a separate line item or added into the cost of each component).

please identify that the falcon drainage basin fee is expected to increase due to the conversion of County costs to Developer reimburseable costs.

DBPS Reach	**PROPOSED COST (2023) W/ 35% Contingency**	**Comments**
RWT-094	$469,342.00	
RWT-080	$46,778.00	
RWT-092	$200,367.00	
RWT-054	$61,700.00	
Sub Regional Detention Pond (SR1)	$773,776.00	Drainage Easement Only
Total:	**$1,822,785.00**	

Following the Drainage reimbursement request application approval, the Drainage Fees will be as follows based on DBPS cost estimates:

- Drainage Fees= $429,831
- Improvement Costs= $1,822,785
- Reimbursement Credit= $1,392,954

Please revise this value once a determination for the easement value has been made.

Fees are deferred at plat recordation due to reimbursement expenses being greater than the required drainage fees.

SUMMARY

This report has been prepared in accordance with El Paso County stormwater criteria. It outlines the Site design for the 5-year and 100-year storm events drainage system. The drainage design presented within this report conforms to the criteria presented in the MANUAL Additionally, the Site runoff and storm drain facilities will not adversely affect the downstream and surrounding developments.

Please briefly discuss the drainage and waterquality of the off-site improvements of Burgess and Raygor. Contact the stormwater engineer, Glenn Reese regarding any possible exclusions for water quality

REFERENCES

1. City of Colorado Springs “Drainage Criteria Manual (DCM) Volume 1”, dated May 2014

2. El Paso County “Engineering Criteria Manual” Volumes 1 & 2, dated October 31, 2018

3. Natural Resources Conservation Service, Web Soil Survey, dated October 5, 2021.

4. Urban Drainage and Flood Control District Drainage Criteria Manuals (UDFCDCM), (Volumes 1, 2 and 3), prepared by Wright-McLaughlin Engineers, June 2001, with latest revisions.

5. Flood Insurance Rate Map, El Paso County, Colorado and Incorporated Areas, Map Number 08041C0507F and 08041C0530F, Effective Date March 17, 1997, prepared by the Federal Emergency Management Agency (FEMA).

6. Falcon Drainage Basin Planning Study Selected Plan Report (DBPS), prepared by Matrix Design Group, September 2015. PCD File No. MP132.

7. Paintbrush Hills Fil. 14 FDR. (PCD File No. SF2024)

8. Eagleview Subdivision Preliminary Drainage Report (PDR), prepared by Kimley-Horn, October 28, 2022. PCD File No. SP216

APPENDIX

APPENDIX A: FIGURES

NOTES TO USERS

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

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

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

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

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 13. The **horizontal datum** was NAD83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the **North American Vertical Datum of 1988 (NAVD88)**. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, MD 20910-3282

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

Base Map information shown on this FIRM was provided in digital format by El Paso County, Colorado Springs Utilities, and Anderson Consulting Engineers, Inc. These data are current as of 2008.

This map reflects more detailed and up-to-date **stream channel configurations and floodplain delineations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map. The profile baselines depicted on this map represent the hydraulic modeling baselines that match the flood profiles and Floodway Data Tables if applicable, in the FIS report. As a result, the profile baselines may deviate significantly from the new base map channel representation and may appear outside of the floodplain.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

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

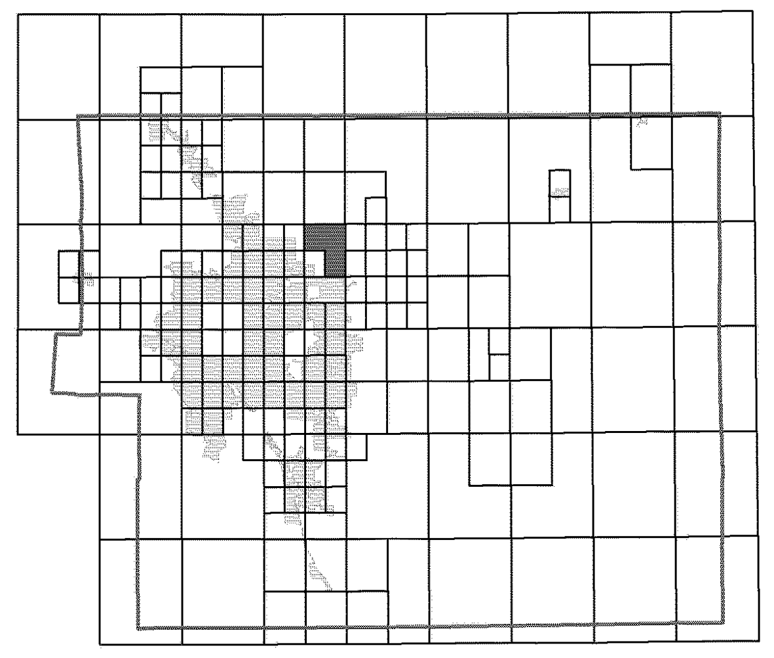
Contact **FEMA Map Service Center** (MSC) via the FEMA Map Information eXchange (FMIX) 1-877-336-2627 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. The MSC may also be reached by Fax at 1-800-358-9620 and its website at http://www.msc.fema.gov/.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.

El Paso County Vertical Datum Offset Table

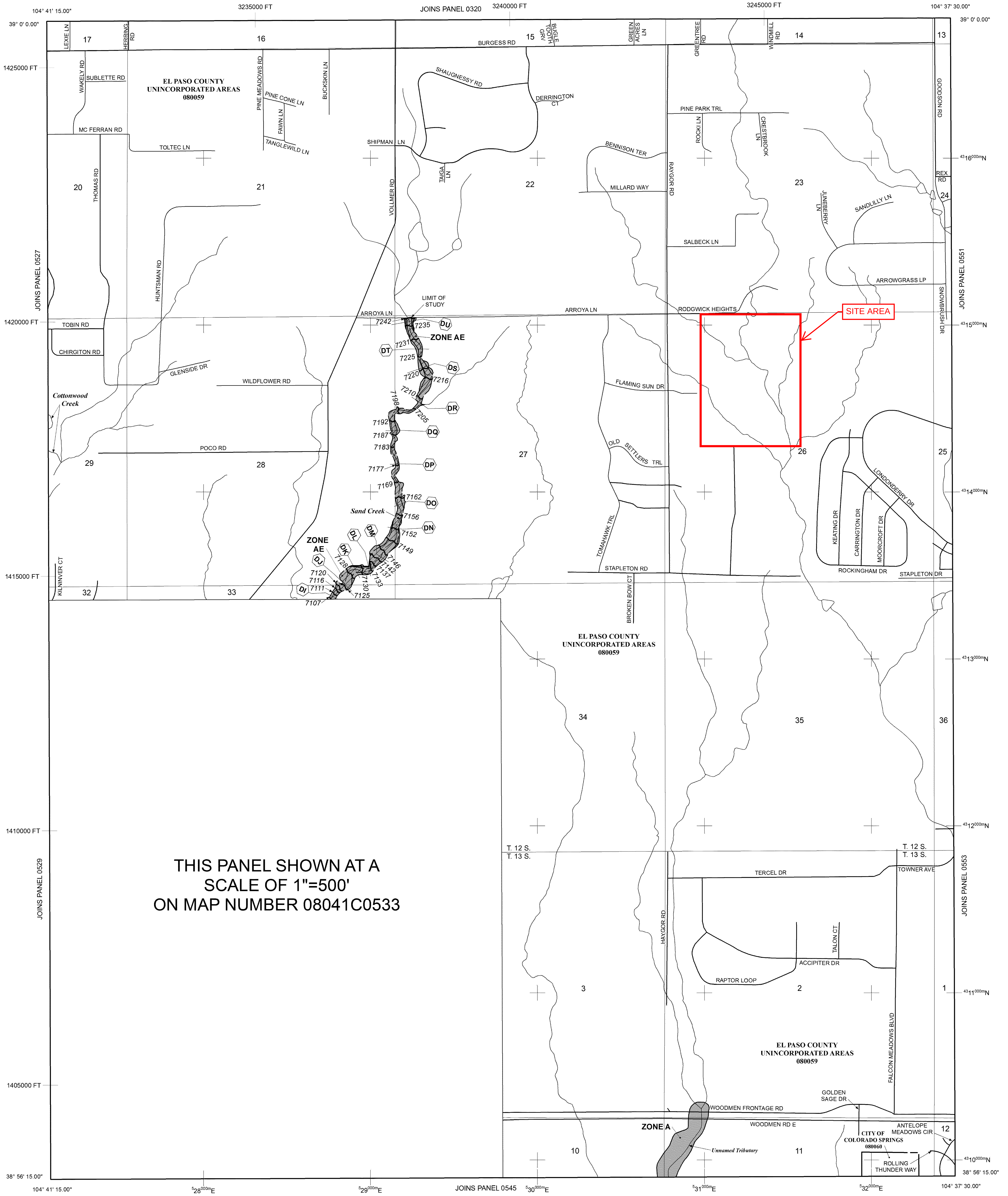
Flooding Source	Vertical Datum Offset (ft)
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION	

Panel Location Map



This Digital Flood Insurance Rate Map (DFIRM) was produced through a Cooperating Technical Partner (CTP) agreement between the State of Colorado Water Conservation Board (CWCB) and the Federal Emergency Management Agency (FEMA).

Additional Flood Hazard information and resources are available from local communities and the Colorado Water Conservation Board.


JOINS PANEL 0320
JOINS PANEL 0527
JOINS PANEL 0529
JOINS PANEL 0551
JOINS PANEL 0553
JOINS PANEL 0545
104° 41' 15.00"
39° 0' 0.00"
104° 37' 30.00"
38° 56' 15.00"
3235000 FT
3240000 FT
3245000 FT
1425000 FT
1420000 FT
1415000 FT
1410000 FT
1405000 FT
4316000mN
4315000mN
4314000mN
4313000mN
4312000mN
4311000mN
4310000mN
528000mE
529000mE
530000mE
531000mE
532000mE
EL PASO COUNTY
UNINCORPORATED AREAS
080059
CITY OF
COLORADO SPRINGS
080060
SITE AREA
ZONE AE
ZONE A
LIMIT OF
STUDY
Sand Creek
Cottonwood
Creek
Unnamed Tributary
T. 12 S.
T. 13 S.
THIS PANEL SHOWN AT A
SCALE OF 1"=500'
ON MAP NUMBER 08041C0533
ARROYA LN
RODGWICK HEIGHTS
STAPLETON RD
STAPLETON DR
WOODMEN FRONTAGE RD
WOODMEN RD E
BURGESS RD
VOLLMER RD
RAYGOR RD
SNOWBRUSH DR
GOODSON RD
TOBIN RD
CHIRGITON RD
WILDFLOWER RD
GLENSIDE DR
POCO RD
FLAMING SUN DR
OLD SETTLERS TRL
TOMAHAWK TRL
BROKEN BOW CT
ROCKINGHAM DR
LONDONDERRY DR
KEATING DR
CARRINGTON DR
MOORCROFT DR
ARROWGRASS LP
SALBECK LN
MILLARD WAY
SANDLILLY LN
JUNEBERRY LN
BENNISON TER
PINE PARK TRL
SHAUGHNESSY RD
DERRINGTON CT
SHIPMAN LN
TAIGA LN
MC FERRAN RD
TOLTEC LN
SUBLETTE RD
WAKELY RD
THOMAS RD
HUNTSMAN RD
PINE MEADOWS RD
PINE CONE LN
FAWN LN
TANGLEWILD LN
BUCKSKIN LN
LEXIE LN
HERRING RD
KLINNER CT
TERCEL DR
TOWNER AVE
HAYGOR RD
TALON CT
ACCIPITER DR
RAPTOR LOOP
FALCON MEADOWS BLVD
GOLDEN SAGE DR
ANTELOPE MEADOWS CIR
ROLLING THUNDER WAY
REX RD
7242
7235
7231
7225
7220
7216
7210
7205
7198
7192
7187
7183
7177
7169
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7156
7152
7149
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11
12

NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 12 SOUTH, RANGE 65 WEST, AND TOWNSHIP 13 SOUTH, RANGE 65 WEST.

LEGEND

▨ SPECIAL FLOOD HAZARD AREAS (SFHAS) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

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

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area Formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

▨ FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

▨ OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

☐ OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

▨ COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

▨ OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

———	Floodplain boundary
— — —	Floodway boundary
—— ——	Zone D Boundary
●●●●●●●●●●●●	CBRS and OPA boundary
▨	Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
~~ 513 ~~	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

A——A	Cross section line
23- - - -23	Transect line
97° 07' 30.00" 32° 22' 30.00"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
4275000mN	1000-meter Universal Transverse Mercator grid ticks, zone 13
6000000 FT	5000-foot grid ticks: Colorado State Plane coordinate system, central zone (FIPSZONE 0502), Lambert Conformal Conic Projection
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
● M1.5	River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
MARCH 17, 1997

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
DECEMBER 7, 2018 - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

For community map revision history prior to countywide mapping, refer to the Community Map History Table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'

500	0	1000	2000	FEET
300	0	300	600	METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0535G

FIRM
FLOOD INSURANCE RATE MAP
EL PASO COUNTY, COLORADO
AND INCORPORATED AREAS

PANEL 535 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

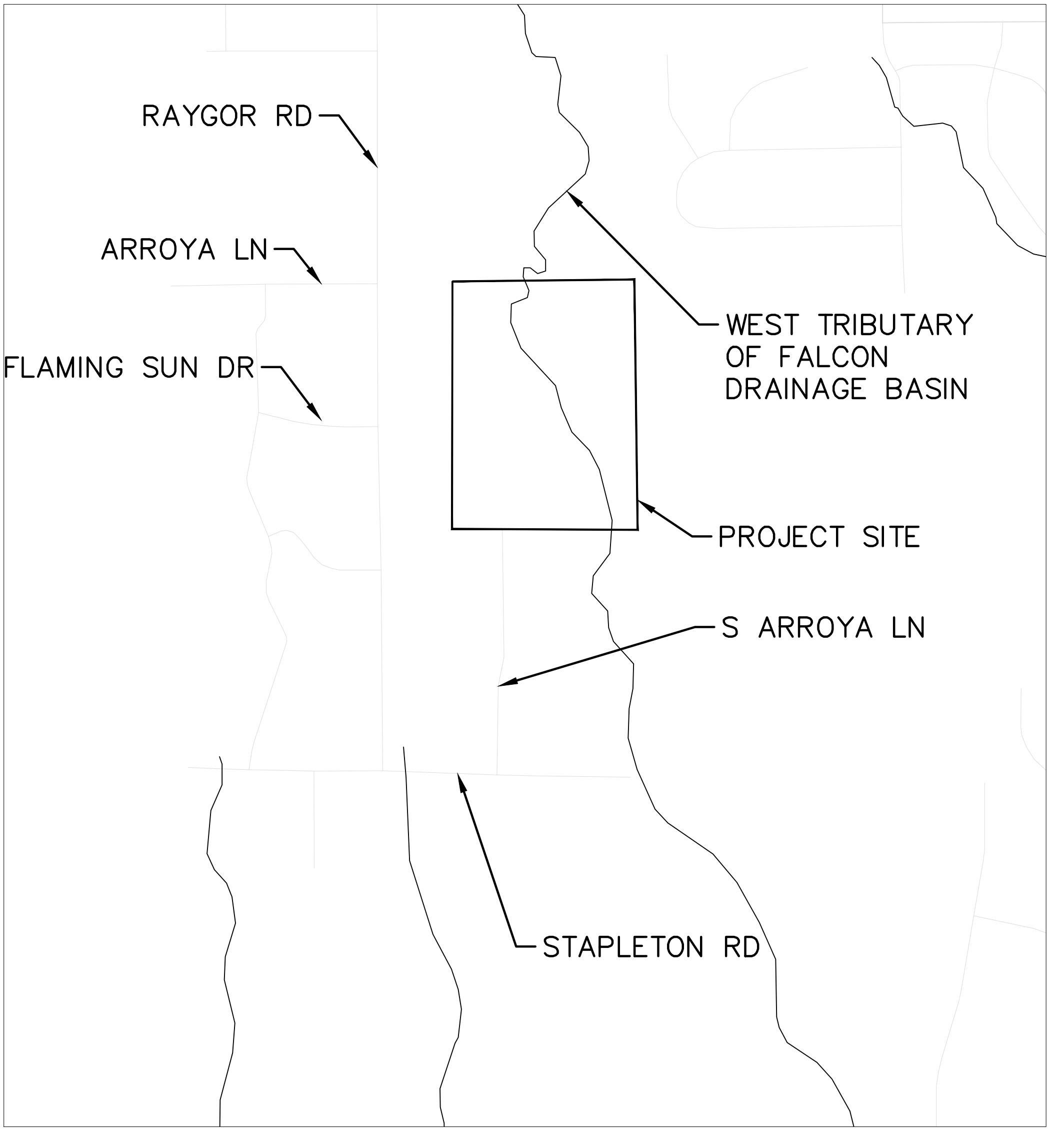
COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	080060	0535	G
EL PASO COUNTY	080059	0535	G

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

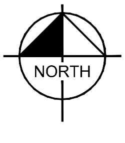
**MAP NUMBER
08041C0535G**

**MAP REVISED
DECEMBER 7, 2018**

Federal Emergency Management Agency


RAYGOR RD
ARROYA LN
FLAMING SUN DR
WEST TRIBUTARY OF FALCON DRAINAGE BASIN
PROJECT SITE
S ARROYA LN
STAPLETON RD

VICINITY MAP
1"=1,000'



APPENDIX B: HYDROLOGY

United States
Department of
Agriculture

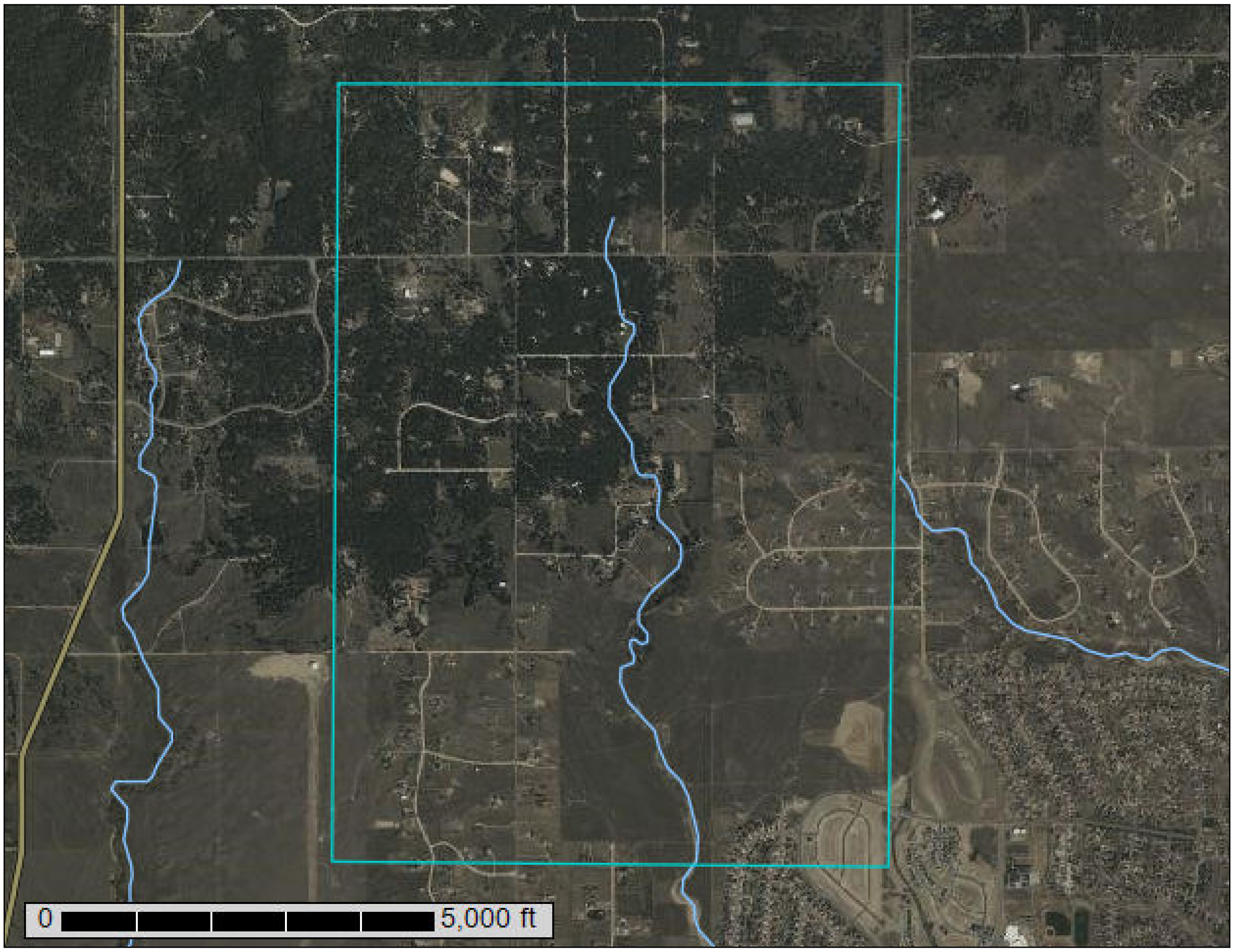
Natural
Resources
Conservation
Service

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

Eagleview



October 5, 2021

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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      40—Kettle gravelly loamy sand, 3 to 8 percent slopes.............................. 14
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How Soil Surveys Are Made

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

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

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

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

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

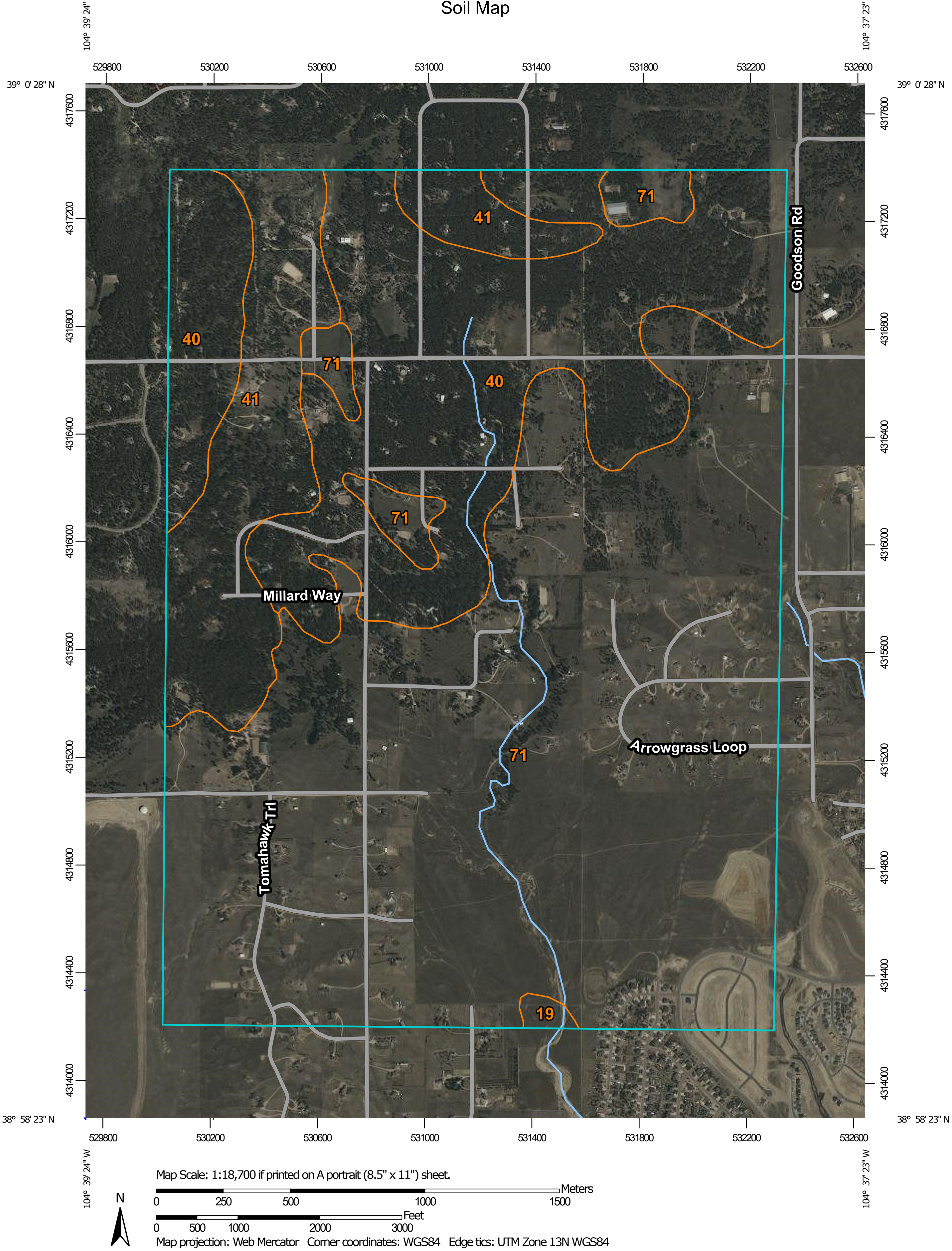
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree 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.

Soil Map


104° 39' 24" W
104° 37' 23" W
39° 0' 28" N
38° 58' 23" N
529800
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531400
531800
532200
532600
4317600
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4315200
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4314400
4314000
40
41
71
19
Goodson Rd
Millard Way
Arrowgrass Loop
Tomahawk Trl
N
0
250
500
1000
1500
Meters
0
500
1000
2000
3000
Feet

Map Scale: 1:18,700 if printed on A portrait (8.5" x 11") sheet.

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.

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

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

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

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

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

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

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

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	5.2	0.3%
40	Kettle gravelly loamy sand, 3 to 8 percent slopes	506.7	28.0%
41	Kettle gravelly loamy sand, 8 to 40 percent slopes	205.0	11.3%
71	Pring coarse sandy loam, 3 to 8 percent slopes	1,092.9	60.4%
Totals for Area of Interest		**1,809.9**	**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

19—Columbine gravelly sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 367p
Elevation: 6,500 to 7,300 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 46 to 50 degrees F
Frost-free period: 125 to 145 days
Farmland classification: Not prime farmland

Map Unit Composition

Columbine and similar soils: 97 percent
Minor components: 3 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Columbine

Setting

Landform: Flood plains, fan terraces, fans
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

A - 0 to 14 inches: gravelly sandy loam
C - 14 to 60 inches: very gravelly loamy sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Very 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
Available water supply, 0 to 60 inches: Very low (about 2.5 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: R049XY214CO - Gravelly Foothill
Hydric soil rating: No

Minor Components

Fluvaquentic haplaquolls

Percent of map unit: 1 percent
Landform: Swales
Hydric soil rating: Yes

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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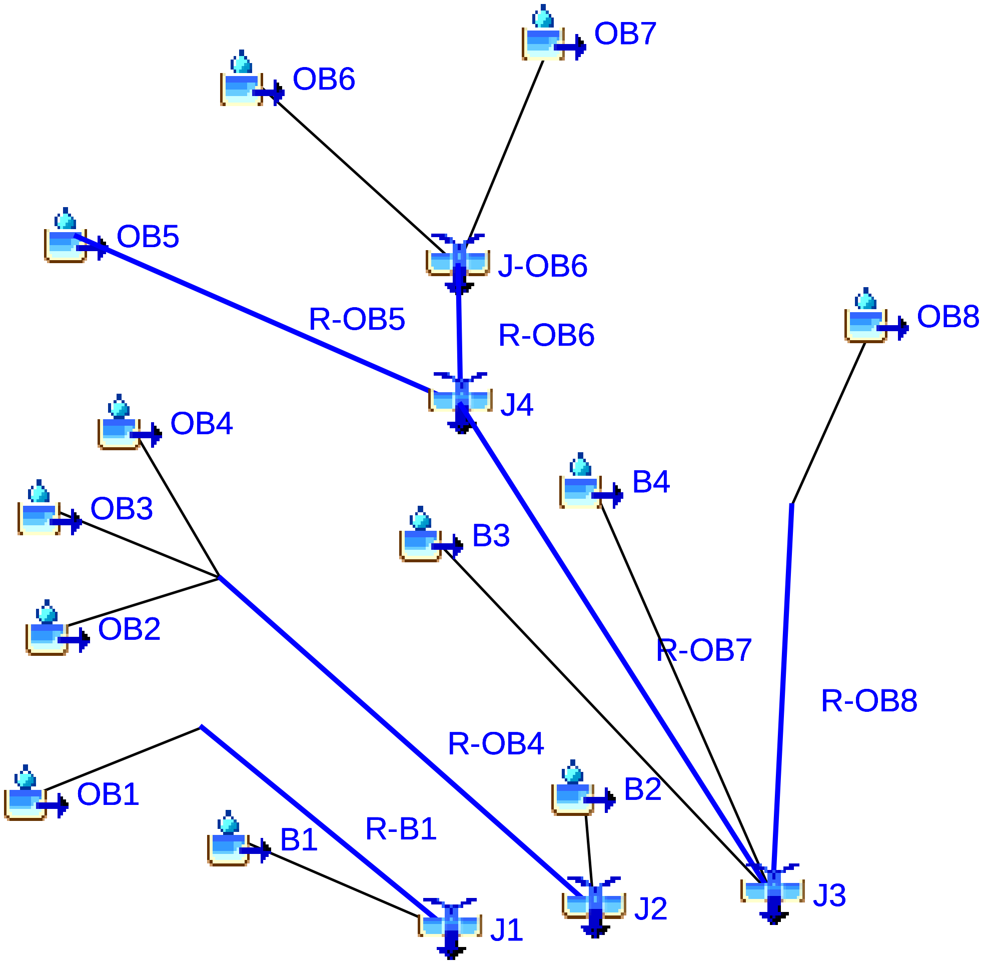
HEC-HMS

Project : Eagleview_Subdivision

Basin Model : Eagleview_Existing

Mar 11 13:21:39 MST 2022


OB7
OB6
OB5
J-OB6
R-OB5
R-OB6
OB8
J4
OB4
B4
OB3
B3
OB2
R-OB7
R-OB8
R-OB4
B2
OB1
R-B1
B1
J3
J2
J1

El Paso County Chapter 5: Table 5-2 SCS 24-hr Type II Distribution for TR-20 Input

Hour	Minutes			
	15	30	45	60
1	0.002	0.005	0.008	0.01
2	0.014	0.017	0.020	0.02
3	0.026	0.029	0.032	0.04
4	0.038	0.041	0.044	0.05
5	0.052	0.056	0.060	0.06
6	0.068	0.072	0.076	0.08
7	0.085	0.090	0.095	0.1
8	0.105	0.110	0.115	0.12
9	0.126	0.133	0.140	0.15
10	0.155	0.163	0.172	0.18
11	0.191	0.203	0.218	0.24
12	0.257	0.283	0.387	0.66
13	0.707	0.735	0.758	0.78
14	0.791	0.804	0.815	0.83
15	0.834	0.842	0.849	0.86
16	0.863	0.869	0.875	0.88
17	0.887	0.893	0.898	0.9
18	0.908	0.913	0.918	0.92
19	0.926	0.930	0.934	0.94
20	0.942	0.946	0.950	0.95
21	0.956	0.959	0.962	0.97
22	0.968	0.971	0.974	0.98
23	0.980	0.983	0.986	0.99
24	0.992	0.995	0.998	1

Table 6-2. 24hr Rainfall Depths for Colorado Springs

Return Period	Depths
2-yr	2.1
5-yr	2.7
10-yr	3.2
25-yr	3.6
50-yr	4.2
100-yr	4.6

Design Strom Hyetograph Table

	Time (mins)	Fraction of 1-hr Rainfall Depth	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
	0	0	0	0	0	0	0	0
	15	0.002	0.0042	0.0054	0.0064	0.0072	0.0084	0.0092
	30	0.005	0.0105	0.0135	0.016	0.018	0.021	0.023
	45	0.008	0.0168	0.0216	0.0256	0.0288	0.0336	0.0368
1	60	0.011	0.0231	0.0297	0.0352	0.0396	0.0462	0.0506
	75	0.014	0.0294	0.0378	0.0448	0.0504	0.0588	0.0644
	90	0.017	0.0357	0.0459	0.0544	0.0612	0.0714	0.0782
	105	0.02	0.042	0.054	0.064	0.072	0.084	0.092
2	120	0.023	0.0483	0.0621	0.0736	0.0828	0.0966	0.1058
	135	0.026	0.0546	0.0702	0.0832	0.0936	0.1092	0.1196
	150	0.029	0.0609	0.0783	0.0928	0.1044	0.1218	0.1334
	165	0.032	0.0672	0.0864	0.1024	0.1152	0.1344	0.1472
3	180	0.035	0.0735	0.0945	0.112	0.126	0.147	0.161
	195	0.038	0.0798	0.1026	0.1216	0.1368	0.1596	0.1748
	210	0.041	0.0861	0.1107	0.1312	0.1476	0.1722	0.1886
	225	0.044	0.0924	0.1188	0.1408	0.1584	0.1848	0.2024
4	240	0.048	0.1008	0.1296	0.1536	0.1728	0.2016	0.2208
	255	0.052	0.1092	0.1404	0.1664	0.1872	0.2184	0.2392
	270	0.056	0.1176	0.1512	0.1792	0.2016	0.2352	0.2576
	285	0.06	0.126	0.162	0.192	0.216	0.252	0.276
5	300	0.0604	0.12684	0.16308	0.19328	0.21744	0.25368	0.27784
	315	0.068	0.1428	0.1836	0.2176	0.2448	0.2856	0.3128
	330	0.072	0.1512	0.1944	0.2304	0.2592	0.3024	0.3312
	345	0.076	0.1596	0.2052	0.2432	0.2736	0.3192	0.3496
6	360	0.08	0.168	0.216	0.256	0.288	0.336	0.368
	375	0.085	0.1785	0.2295	0.272	0.306	0.357	0.391
	390	0.09	0.189	0.243	0.288	0.324	0.378	0.414
	405	0.095	0.1995	0.2565	0.304	0.342	0.399	0.437
7	420	0.1	0.21	0.27	0.32	0.36	0.42	0.46
	435	0.105	0.2205	0.2835	0.336	0.378	0.441	0.483
	450	0.11	0.231	0.297	0.352	0.396	0.462	0.506
	465	0.115	0.2415	0.3105	0.368	0.414	0.483	0.529
8	480	0.12	0.252	0.324	0.384	0.432	0.504	0.552
	495	0.126	0.2646	0.3402	0.4032	0.4536	0.5292	0.5796
	510	0.133	0.2793	0.3591	0.4256	0.4788	0.5586	0.6118
	525	0.14	0.294	0.378	0.448	0.504	0.588	0.644
9	540	0.147	0.3087	0.3969	0.4704	0.5292	0.6174	0.6762
	555	0.155	0.3255	0.4185	0.496	0.558	0.651	0.713
	570	0.163	0.3423	0.4401	0.5216	0.5868	0.6846	0.7498
	585	0.172	0.3612	0.4644	0.5504	0.6192	0.7224	0.7912
10	600	0.181	0.3801	0.4887	0.5792	0.6516	0.7602	0.8326
	615	0.191	0.4011	0.5157	0.6112	0.6876	0.8022	0.8786
	630	0.203	0.4263	0.5481	0.6496	0.7308	0.8526	0.9338
	645	0.218	0.4578	0.5886	0.6976	0.7848	0.9156	1.0028
11	660	0.236	0.4956	0.6372	0.7552	0.8496	0.9912	1.0856
	675	0.257	0.5397	0.6939	0.8224	0.9252	1.0794	1.1822
	690	0.283	0.5943	0.7641	0.9056	1.0188	1.1886	1.3018
	705	0.387	0.8127	1.0449	1.2384	1.3932	1.6254	1.7802
12	720	0.663	1.3923	1.7901	2.1216	2.3868	2.7846	3.0498
	735	0.707	1.4847	1.9089	2.2624	2.5452	2.9694	3.2522
	750	0.735	1.5435	1.9845	2.352	2.646	3.087	3.381
	765	0.758	1.5918	2.0466	2.4256	2.7288	3.1836	3.4868
13	780	0.776	1.6296	2.0952	2.4832	2.7936	3.2592	3.5696
	795	0.791	1.6611	2.1357	2.5312	2.8476	3.3222	3.6386
	810	0.804	1.6884	2.1708	2.5728	2.8944	3.3768	3.6984
	825	0.815	1.7115	2.2005	2.608	2.934	3.423	3.749

14	840	0.825	1.7325	2.2275	2.64	2.97	3.465	3.795
	855	0.834	1.7514	2.2518	2.6688	3.0024	3.5028	3.8364
	870	0.842	1.7682	2.2734	2.6944	3.0312	3.5364	3.8732
	885	0.849	1.7829	2.2923	2.7168	3.0564	3.5658	3.9054
15	900	0.856	1.7976	2.3112	2.7392	3.0816	3.5952	3.9376
	915	0.863	1.8123	2.3301	2.7616	3.1068	3.6246	3.9698
	930	0.869	1.8249	2.3463	2.7808	3.1284	3.6498	3.9974
	945	0.875	1.8375	2.3625	2.8	3.15	3.675	4.025
16	960	0.881	1.8501	2.3787	2.8192	3.1716	3.7002	4.0526
	975	0.887	1.8627	2.3949	2.8384	3.1932	3.7254	4.0802
	990	0.893	1.8753	2.4111	2.8576	3.2148	3.7506	4.1078
	1005	0.898	1.8858	2.4246	2.8736	3.2328	3.7716	4.1308
17	1020	0.903	1.8963	2.4381	2.8896	3.2508	3.7926	4.1538
	1035	0.908	1.9068	2.4516	2.9056	3.2688	3.8136	4.1768
	1050	0.913	1.9173	2.4651	2.9216	3.2868	3.8346	4.1998
	1065	0.918	1.9278	2.4786	2.9376	3.3048	3.8556	4.2228
18	1080	0.922	1.9362	2.4894	2.9504	3.3192	3.8724	4.2412
	1095	0.926	1.9446	2.5002	2.9632	3.3336	3.8892	4.2596
	1110	0.93	1.953	2.511	2.976	3.348	3.906	4.278
	1125	0.934	1.9614	2.5218	2.9888	3.3624	3.9228	4.2964
19	1140	0.938	1.9698	2.5326	3.0016	3.3768	3.9396	4.3148
	1155	0.942	1.9782	2.5434	3.0144	3.3912	3.9564	4.3332
	1170	0.946	1.9866	2.5542	3.0272	3.4056	3.9732	4.3516
	1185	0.95	1.995	2.565	3.04	3.42	3.99	4.37
20	1200	0.953	2.0013	2.5731	3.0496	3.4308	4.0026	4.3838
	1215	0.956	2.0076	2.5812	3.0592	3.4416	4.0152	4.3976
	1230	0.959	2.0139	2.5893	3.0688	3.4524	4.0278	4.4114
	1245	0.962	2.0202	2.5974	3.0784	3.4632	4.0404	4.4252
21	1260	0.965	2.0265	2.6055	3.088	3.474	4.053	4.439
	1275	0.968	2.0328	2.6136	3.0976	3.4848	4.0656	4.4528
	1290	0.971	2.0391	2.6217	3.1072	3.4956	4.0782	4.4666
	1305	0.974	2.0454	2.6298	3.1168	3.5064	4.0908	4.4804
22	1320	0.977	2.0517	2.6379	3.1264	3.5172	4.1034	4.4942
	1335	0.98	2.058	2.646	3.136	3.528	4.116	4.508
	1350	0.983	2.0643	2.6541	3.1456	3.5388	4.1286	4.5218
	1365	0.986	2.0706	2.6622	3.1552	3.5496	4.1412	4.5356
23	1380	0.989	2.0769	2.6703	3.1648	3.5604	4.1538	4.5494
	1395	0.992	2.0832	2.6784	3.1744	3.5712	4.1664	4.5632
	1410	0.995	2.0895	2.6865	3.184	3.582	4.179	4.577
	1425	0.998	2.0958	2.6946	3.1936	3.5928	4.1916	4.5908
24	1440	1	2.1	2.7	3.2	3.6	4.2	4.6

IMPERVIOUS FACTOR CALCULATION TABLE - EXISTING CONDITIONS

	Basin	Area (Acre)	Open Space (2%)	Buildings (100%)	Paved Roadway (100%)	Gravel Roadway (80%)	Total % Check	Weighted Impervious
Onsite	B1	5.55	93%	0%	0%	6%	99%	7%
	B2	41.43	100%	0%	0%	0%	100%	2%
	B3	59.54	100%	0%	0%	0%	100%	2%
	B4	14.68	100%	0%	0%	0%	100%	2%
Offsite	OB1	10.37	93%	2%	4%	2%	100%	9%
	OB2	28.06	90%	3%	3%	5%	100%	11%
	OB3	43.44	92%	2%	2%	4%	100%	9%
	OB4	10.50	87%	4%	5%	4%	100%	13%
	OB5	143.82	94%	2%	1%	3%	100%	7%
	OB6	118.40	93%	1%	2%	4%	100%	8%
	OB7	421.43	93%	2%	1%	4%	100%	8%
	OB8	33.08	93%	2%	1%	5%	100%	8%
Total		930.30						10.6%

Kimley»Horn

Pre Runoff Analysis
Time of Concentration

Project Information

Project Name: Eagleview
KHA Project #: 196288000
Designed by: DCM Date: 3/17/2022
Revised by: Date:
Checked by: BAH Date: 3/17/2022

Minimum Time of Concentration 5.0 minutes
2YR-24HR Rainfall, P2 2.10

Pre-Development

Drainage Area: OB1

		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Cross Sectional Area of Flow, A (ft^2)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)	Lag Time (min)
SHEET	T1 SHEET FLOW	300.00	0.073	0.15	2.10						17.35	
SHALLOW CONCENTRATED	T2 SHALLOW CONCENTRATED FLOW	1118.00	0.038			U				3.14	5.93	
							Pre-Development Time of Concentration, OB1				23.28	13.97

Pre-Development

Drainage Area: OB2

		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Cross Sectional Area of Flow, A (ft^2)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)	Lag Time (min)
SHEET	T1 SHEET FLOW	300.00	0.063	0.15	2.10						18.41	
SHALLOW CONCENTRATED	T2 SHALLOW CONCENTRATED FLOW	554.00	0.046			U				3.45	2.67	
CHANNEL	T2 CHANNEL FLOW	841.00	0.029	0.05		U	9.50	6.60	1.44	6.45	2.17	
							Pre-Development Time of Concentration, OB2				23.26	13.95

Pre-Development

Drainage Area: OB3

		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Cross Sectional Area of Flow, A (ft^2)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)	Lag Time (min)
SHEET	T1 SHEET FLOW	300.00	0.074	0.15	2.10						17.26	
SHALLOW CONCENTRATED	T2 SHALLOW CONCENTRATED FLOW	2436.00	0.034			U				2.97	13.65	
							Pre-Development Time of Concentration, OB3				30.91	18.55

Pre-Development

Drainage Area: OB4

		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Cross Sectional Area of Flow, A (ft^2)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)	Lag Time (min)
SHEET	T1 SHEET FLOW	300.00	0.042	0.15	2.10						21.65	
SHALLOW CONCENTRATED	T2 SHALLOW CONCENTRATED FLOW	783.00	0.038			U				3.16	4.13	
CHANNEL	T2 CHANNEL FLOW	577.00	0.028	0.05		U	9.50	6.60	1.44	6.36	1.51	
							Pre-Development Time of Concentration, OB4				27.29	16.38

Pre-Development

Drainage Area: OB5

		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Cross Sectional Area of Flow, A (ft^2)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)	Lag Time (min)
SHEET	T1 SHEET FLOW	300.00	0.037	0.40	2.10						49.91	
SHALLOW CONCENTRATED	T2 SHALLOW CONCENTRATED FLOW	3838.00	0.033			U				2.93	21.83	
CHANNEL	T2 CHANNEL FLOW	1407.00	0.024	0.04		U	9.50	6.60	1.44	7.36	3.19	
							Pre-Development Time of Concentration, OB5				74.93	44.96

Pre-Development

Drainage Area: OB6

		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Cross Sectional Area of Flow, A (ft^2)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)	Lag Time (min)
SHEET	T1 SHEET FLOW	300.00	0.064	0.40	2.10						40.09	
SHALLOW CONCENTRATED	T2 SHALLOW CONCENTRATED FLOW	2569.00	0.038			U				3.14	13.62	
CHANNEL	T2 CHANNEL FLOW	2110.00	0.027	0.04		U	9.50	6.60	1.44	7.73	4.55	
							Pre-Development Time of Concentration, OB6				58.25	34.95

Pre-Development

Drainage Area: OB7

		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Cross Sectional Area of Flow, A (ft^2)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)	Lag Time (min)
SHEET	T1 SHEET FLOW	300.00	0.028	0.40	2.10						55.80	
SHALLOW CONCENTRATED	T2 SHALLOW CONCENTRATED FLOW	2068.00	0.036			U				3.06	11.26	
CHANNEL	T3 CHANNEL FLOW	6198.00	0.03	0.04		U	12.00	22.00	0.55	4.09	25.29	
							Pre-Development Time of Concentration, OB7				92.35	55.41

Pre-Development

Drainage Area: OB8

		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Cross Sectional Area of Flow, A (ft^2)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)	Lag Time (min)
SHEET	T1 SHEET FLOW	300.00	0.029	0.15	2.10						25.10	
SHALLOW CONCENTRATED	T2 SHALLOW CONCENTRATED FLOW	1117.00	0.043			U				3.34	5.57	
CHANNEL	T2 CHANNEL FLOW	762.00	0.033	0.03		U	9.50	6.60	1.44	11.43	1.11	
							Pre-Development Time of Concentration, OB8				31.78	19.07

Pre-Development

Drainage Area: B1

		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Cross Sectional Area of Flow, A (ft^2)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)	Lag Time (min)
SHEET	T1 SHEET FLOW	300.00	0.027	0.15	2.10						25.83	
SHALLOW CONCENTRATED	T2 SHALLOW CONCENTRATED FLOW	368.00	0.033			U				2.91	2.11	
CHANNEL	T2 CHANNEL FLOW	210.00	0.034	0.03		U	9.50	6.60	1.44	11.68	0.30	
							Pre-Development Time of Concentration, B1				28.24	16.94

Pre-Development

Drainage Area: B2

		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Cross Sectional Area of Flow, A (ft^2)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)	Lag Time (min)
SHEET	T1 SHEET FLOW	300.00	0.022	0.15	2.10						28.04	
SHALLOW CONCENTRATED	T2 SHALLOW CONCENTRATED FLOW	737.00	0.025			U				2.55	4.82	
CHANNEL	T3 CHANNEL FLOW	1086.00	0.02	0.03		U	9.50	6.60	1.44	9.18	1.97	
							Pre-Development Time of Concentration, B2				34.83	20.90

Pre-Development

Drainage Area: B3

		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Cross Sectional Area of Flow, A (ft^2)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)	Lag Time (min)
CHANNEL	T3 CHANNEL FLOW	2985.00	0.02	0.03		U	14.00	34.00	0.41	3.58	13.88	
							Pre-Development Time of Concentration, B3				13.88	8.33

Kimley»Horn

Pre Runoff Analysis
Time of Concentration

Project Information

Project Name: Eagleview
KHA Project #: 196288000
Designed by: DCM Date: 3/17/2022
Revised by: Date:
Checked by: BAH Date: 3/17/2022

Minimum Time of Concentration 5.0 minutes
2YR-24HR Rainfall, P2 2.10

Pre-Development

Drainage Area: B4

		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Cross Sectional Area of Flow, A (ft^2)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)	Lag Time (min)
SHEET	T1 SHEET FLOW	300.00	0.020	0.15	2.10						29.13	
SHALLOW CONCENTRATED	T2 SHALLOW CONCENTRATED FLOW	181.00	0.044			U				3.37	0.90	
CHANNEL	T2 CHANNEL FLOW	1548.00	0.033	0.03		U	9.50	6.60	1.44	11.50	2.24	
							Pre-Development Time of Concentration, B4				32.27	19.36

Kimley»Horn

Pre Runoff Analysis

Composite CN

Project Name: Eagleview
KHA Project #: 196288000
Designed by: DCM Date: 3/17/2022
Revised by: Date:
Revised by: Date:
Checked by: BAH Date: 3/17/2022

Pre-Development

Drainage Area: *OB1*

COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
RESIDENTIAL	RR-5 (Rangeland Landuse)	B	62.00	9.79	--
IMPERVIOUS	Paved; curbs and storm sewers (excluding right-of-way)	B	98.00	0.38	--
IMPERVIOUS	Gravel (including right of way)	B	85.00	0.20	--
CUTSOM					
COMPOSITE SCS CURVE NUMBER - OB1		**63.76**		10.37	0.569

Pre-Development

Drainage Area: *OB2*

COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
RESIDENTIAL	RR-5 (Rangeland Landuse)	B	62.00	25.92	--
IMPERVIOUS	Paved; curbs and storm sewers (excluding right-of-way)	B	98.00	0.86	--
IMPERVIOUS	Gravel (including right of way)	B	85.00	1.28	--
CUTSOM					
COMPOSITE SCS CURVE NUMBER - OB2		**64.16**		28.06	0.559

Pre-Development

Drainage Area: *OB3*

COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
RESIDENTIAL	RR-5 (Rangeland Landuse)	B	62.00	40.88	--
IMPERVIOUS	Paved; curbs and storm sewers (excluding right-of-way)	B	98.00	0.89	--
IMPERVIOUS	Gravel (including right of way)	B	85.00	1.67	--
CUTSOM					
COMPOSITE SCS CURVE NUMBER - OB3		**63.62**		43.44	0.572

Pre-Development

Drainage Area: *OB4*

COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
RESIDENTIAL	RR-5 (Rangeland Landuse)	B	62.00	9.55	0.00
IMPERVIOUS	Paved; curbs and storm sewers (excluding right-of-way)	B	98.00	0.52	0.55
IMPERVIOUS	Gravel (including right of way)	B	85.00	0.43	9.95
CUTSOM					
COMPOSITE SCS CURVE NUMBER - OB4		**64.71**		10.50	0.545

Pre-Development

Drainage Area: *OB5*

COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
RESIDENTIAL	RR-5 (Rangeland Landuse)	B	62.00	28.58	--
RESIDENTIAL	RR-5 (Woods Landuse)	B	58.00	109.48	--
IMPERVIOUS	Paved; curbs and storm sewers (excluding right-of-way)	B	98.00	1.12	--
IMPERVIOUS	Gravel (including right of way)	B	85.00	4.64	--
CUTSOM					
COMPOSITE SCS CURVE NUMBER - OB5		**59.98**		143.82	0.667

Pre-Development

Drainage Area: *OB6*

COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
RESIDENTIAL	RR-5 (Rangeland Landuse)	B	62.00	60.64	--
RESIDENTIAL	RR-5 (Woods Landuse)	B	58.00	51.19	--
IMPERVIOUS	Paved; curbs and storm sewers (excluding right-of-way)	B	98.00	2.04	--
IMPERVIOUS	Gravel (including right of way)	B	85.00	4.53	--
CUTSOM					
COMPOSITE SCS CURVE NUMBER - OB6		**61.77**		118.40	0.619

Kimley»Horn

Pre Runoff Analysis

Composite CN

Project Name: Eagleview
KHA Project #: 196288000
Designed by: DCM Date: 3/17/2022
Revised by: Date:
Revised by: Date:
Checked by: BAH Date: 3/17/2022

Pre-Development

Drainage Area: *OB7*

COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
RESIDENTIAL	RR-5 (Rangeland Landuse)	B	62.00	122.08	--
RESIDENTIAL	RR-5 (Woods Landuse)	B	58.00	259.48	--
RESIDENTIAL	2.5 acre	B	64.00	16.02	--
IMPERVIOUS	Paved; curbs and storm sewers (excluding right-of-way)	B	98.00	5.46	--
IMPERVIOUS	Gravel (including right of way)	B	85.00	18.17	--
CUTSOM					
COMPOSITE SCS CURVE NUMBER - OB7		**61.07**		421.20	0.637

Pre-Development

Drainage Area: *OB8*

COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
RESIDENTIAL	RR-5 (Rangeland Landuse)	B	62.00	8.71	--
RESIDENTIAL	2.5 acre	B	64.00	21.76	--
RESIDENTIAL	1/2 acre (25% imp.)	B	71.00	0.79	--
IMPERVIOUS	Paved; curbs and storm sewers (excluding right-of-way)	B	98.00	0.24	--
IMPERVIOUS	Gravel (including right of way)	B	85.00	1.57	--
CUTSOM					
COMPOSITE SCS CURVE NUMBER - OB8		**64.89**		33.07	0.541

Pre-Development

Drainage Area: *B1*

COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
OPEN_SPACE	Good condition (grass cover >75%)	B	61.00	5.55	--
CUTSOM					
COMPOSITE SCS CURVE NUMBER - B1		**61.00**		5.55	0.639

Pre-Development

Drainage Area: *B2*

COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
OPEN_SPACE	Good condition (grass cover >75%)	A	39.00	0.61	--
OPEN_SPACE	Good condition (grass cover >75%)	B	61.00	40.82	--
CUTSOM					
COMPOSITE SCS CURVE NUMBER - B2		**60.68**		41.43	0.648

Pre-Development

Drainage Area: *B3*

COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
OPEN_SPACE	Good condition (grass cover >75%)	A	39.00	0.28	--
OPEN_SPACE	Good condition (grass cover >75%)	B	61.00	59.27	--
CUTSOM					
COMPOSITE SCS CURVE NUMBER - B3		**60.90**		59.54	0.642

Pre-Development

Drainage Area: *B4*

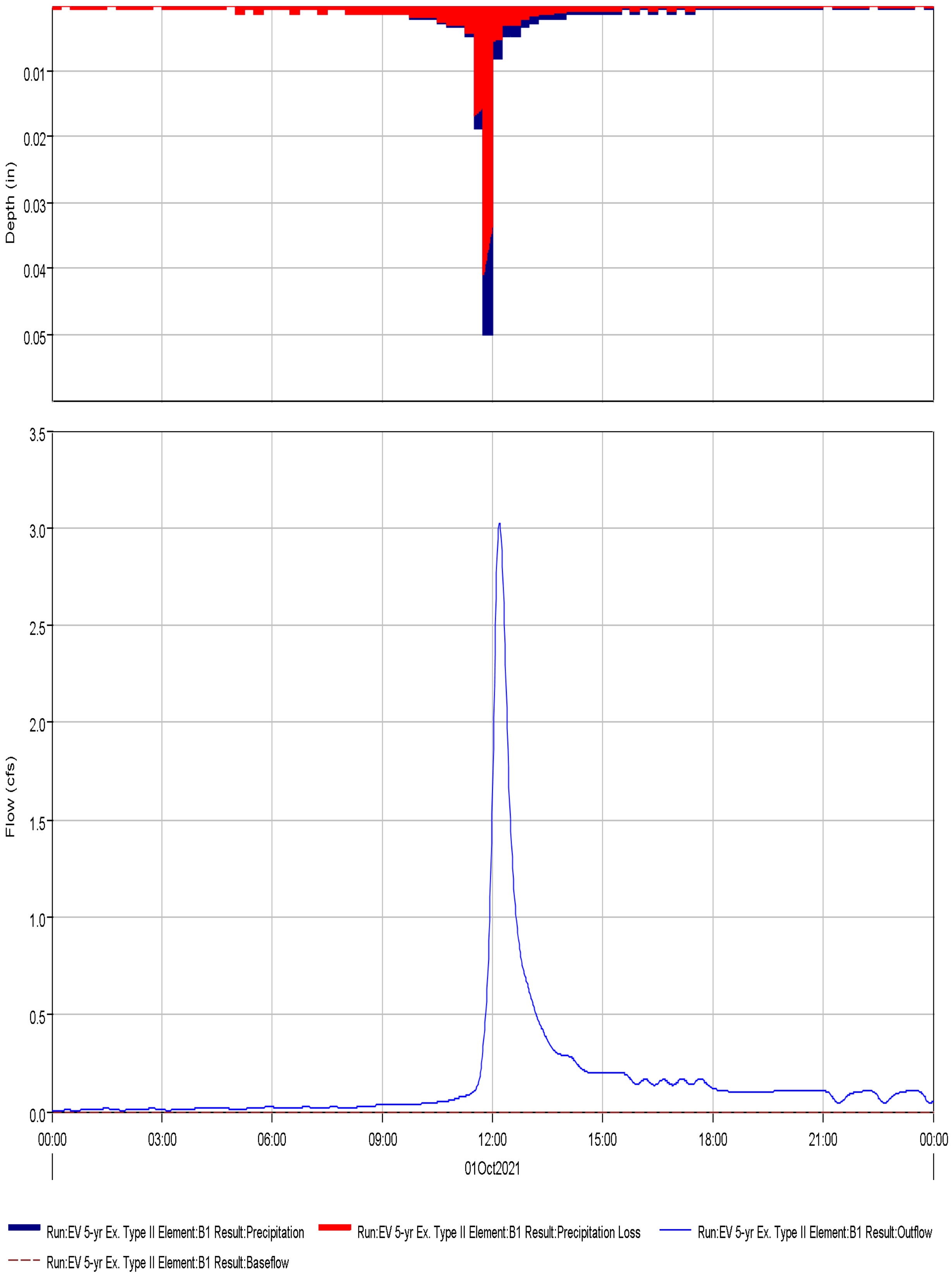
COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
OPEN_SPACE	Good condition (grass cover >75%)	B	61.00	14.68	--
CUTSOM					
COMPOSITE SCS CURVE NUMBER - B4		**61.00**		14.68	0.639

Project: Eagleview_Subdivision Simulation Run: EV 5-yr Ex. Type II

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Existing
End of Run:	02Oct2021, 00:00	Meteorologic Model:	5-yr Type II
Compute Time:	11Mar2022, 14:50:40	Control Specifications:	24-hr Storm

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
B1	0.0091800	3.0	01Oct2021, 12:11	0.3
B2	0.0647266	15.4	01Oct2021, 12:16	1.8
B3	0.0930359	36.4	01Oct2021, 12:04	2.7
B4	0.0229422	5.8	01Oct2021, 12:14	0.7
J1	0.0253831	10.1	01Oct2021, 12:11	1.0
J2	0.1928516	67.5	01Oct2021, 12:15	7.3
J3	1.2354980	183.1	01Oct2021, 12:47	42.8
J4	1.0678500	169.2	01Oct2021, 12:46	37.4
J-OB6	0.8431300	132.4	01Oct2021, 12:45	30.1
OB1	0.0162031	7.1	01Oct2021, 12:08	0.7
OB2	0.0438438	20.6	01Oct2021, 12:08	1.9
OB3	0.0678750	25.3	01Oct2021, 12:13	2.8
OB4	0.0164062	7.5	01Oct2021, 12:10	0.8
OB5	0.2247200	36.8	01Oct2021, 12:42	7.4
OB6	0.1850100	40.8	01Oct2021, 12:30	6.8
OB7	0.6581200	101.4	01Oct2021, 12:53	23.3
OB8	0.0516699	19.5	01Oct2021, 12:13	2.1
R-B1	0.0162031	7.1	01Oct2021, 12:11	0.7
R-OB4	0.1281250	52.2	01Oct2021, 12:14	5.4
R-OB5	0.2247200	36.8	01Oct2021, 12:45	7.4
R-OB6	0.8431300	132.4	01Oct2021, 12:46	30.0
R-OB7	1.0678500	169.2	01Oct2021, 12:49	37.3
R-OB8	0.0516699	19.4	01Oct2021, 12:17	2.1

Subbasin "B1" Results for Run "EV 5-yr Ex. Type II"



Project: Eagleview_Subdivision
Simulation Run: EV 5-yr Ex. Type II Subbasin: B1

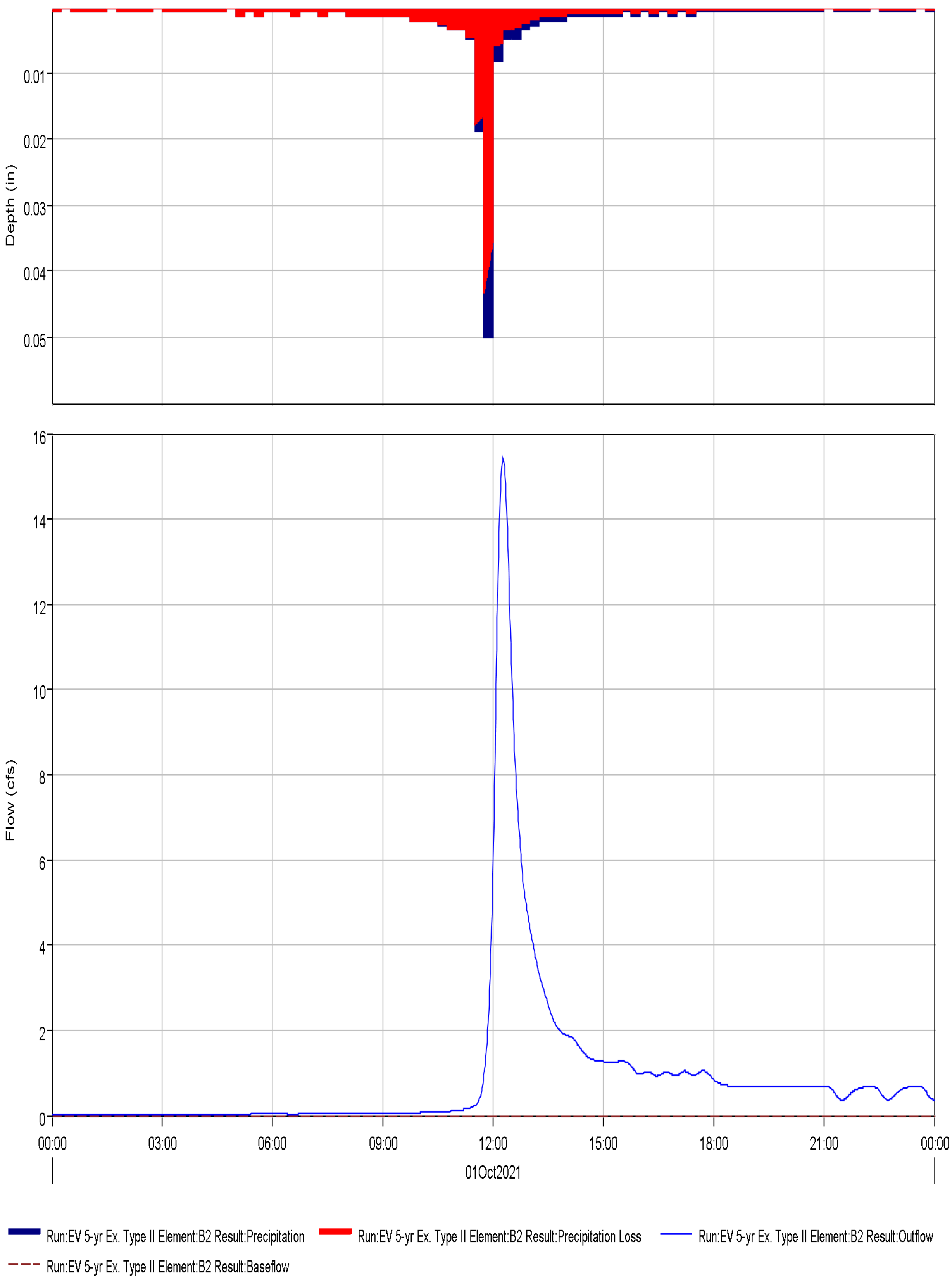
Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Existing
End of Run:	02Oct2021, 00:00	Meteorologic Model:	5-yr Type II
Compute Time:	11Mar2022, 14:50:40	Control Specifications:	24-hr Storm

Volume Units: AC-FT

Computed Results

Peak Discharge :	3.0 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:11
Total Precipitation :	1.3 (AC-FT)	Total Direct Runoff :	0.3 (AC-FT)
Total Loss :	1.0 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	0.3 (AC-FT)	Discharge :	0.3 (AC-FT)

Subbasin "B2" Results for Run "EV 5-yr Ex. Type II"



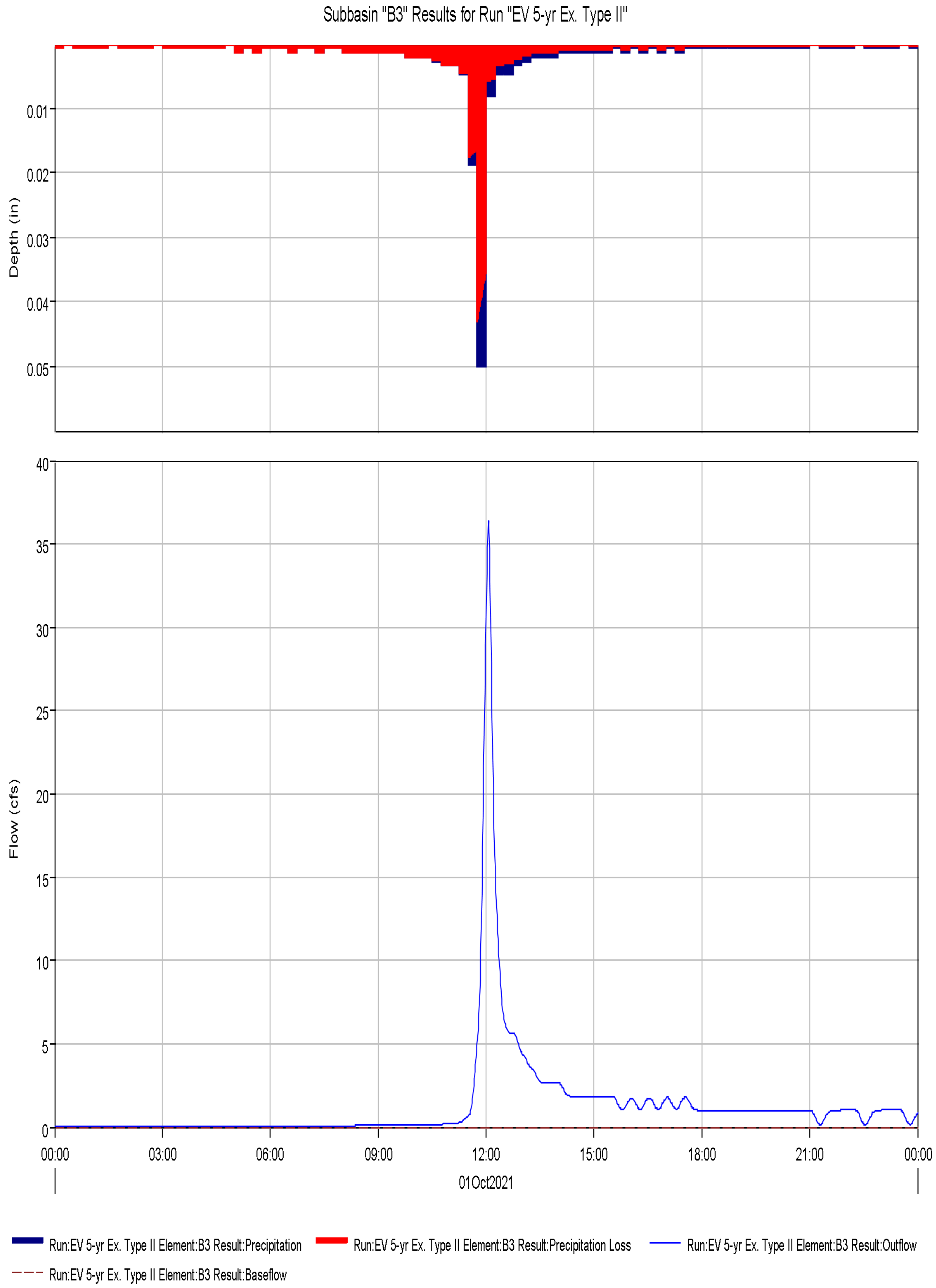
Project: Eagleview_Subdivision
Simulation Run: EV 5-yr Ex. Type II Subbasin: B2

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Existing
End of Run:	02Oct2021, 00:00	Meteorologic Model:	5-yr Type II
Compute Time:	11Mar2022, 14:50:40	Control Specifications:	24-hr Storm

Volume Units: AC-FT

Computed Results

Peak Discharge :	15.4 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:16
Total Precipitation :	9.3 (AC-FT)	Total Direct Runoff :	1.8 (AC-FT)
Total Loss :	7.5 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	1.9 (AC-FT)	Discharge :	1.8 (AC-FT)


Subbasin "B3" Results for Run "EV 5-yr Ex. Type II"
Depth (in)
0.01
0.02
0.03
0.04
0.05
Flow (cfs)
0
5
10
15
20
25
30
35
40
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
00:00
01Oct2021
Run:EV 5-yr Ex. Type II Element:B3 Result:Precipitation
Run:EV 5-yr Ex. Type II Element:B3 Result:Precipitation Loss
Run:EV 5-yr Ex. Type II Element:B3 Result:Outflow
Run:EV 5-yr Ex. Type II Element:B3 Result:Baseflow

Project: Eagleview_Subdivision
Simulation Run: EV 5-yr Ex. Type II Subbasin: B3

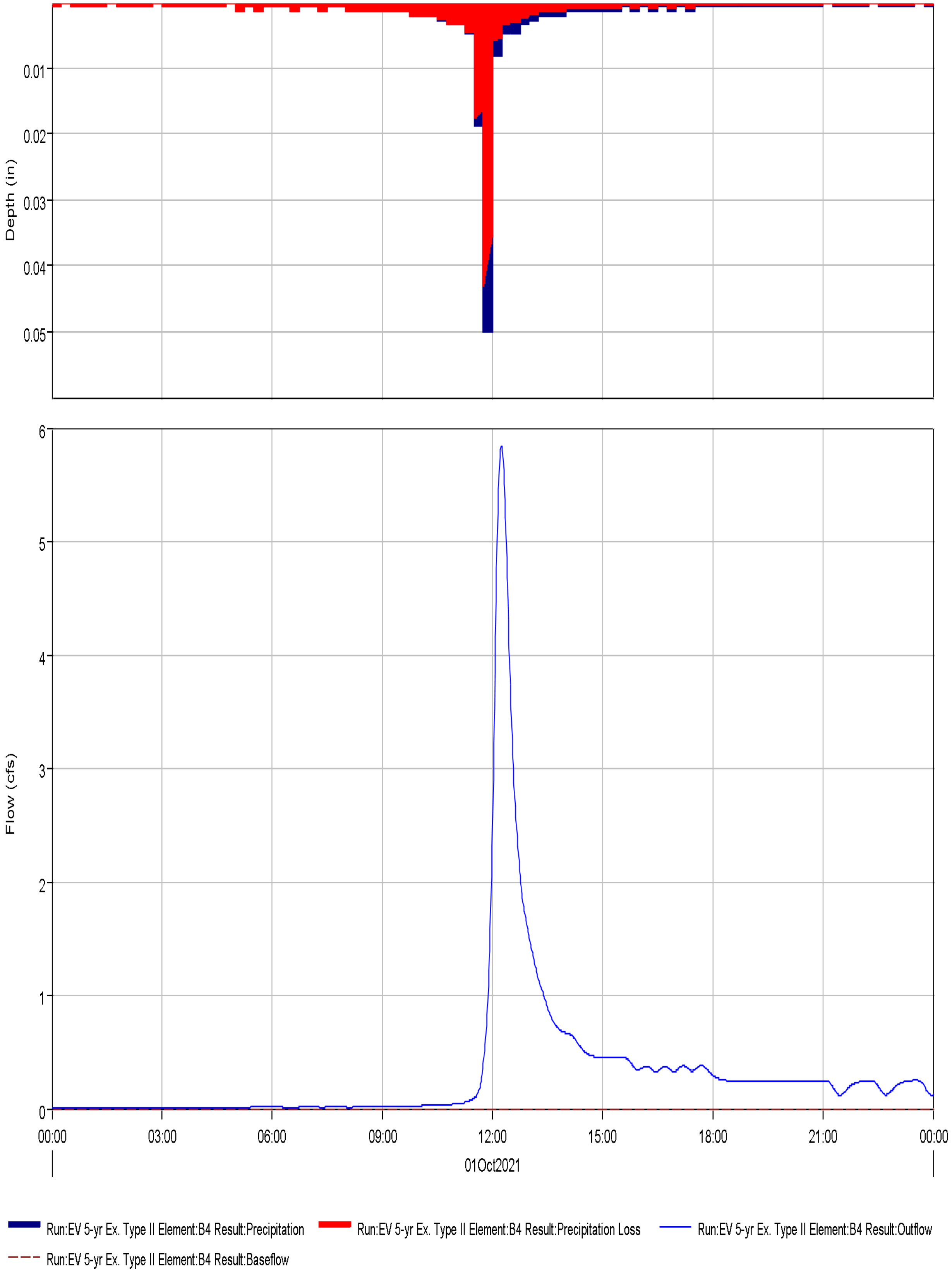
Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Existing
End of Run:	02Oct2021, 00:00	Meteorologic Model:	5-yr Type II
Compute Time:	11Mar2022, 14:50:40	Control Specifications:	24-hr Storm

Volume Units: AC-FT

Computed Results

Peak Discharge :	36.4 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:04
Total Precipitation :	13.4 (AC-FT)	Total Direct Runoff :	2.7 (AC-FT)
Total Loss :	10.7 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	2.7 (AC-FT)	Discharge :	2.7 (AC-FT)

Subbasin "B4" Results for Run "EV 5-yr Ex. Type II"



Project: Eagleview_Subdivision
Simulation Run: EV 5-yr Ex. Type II Subbasin: B4

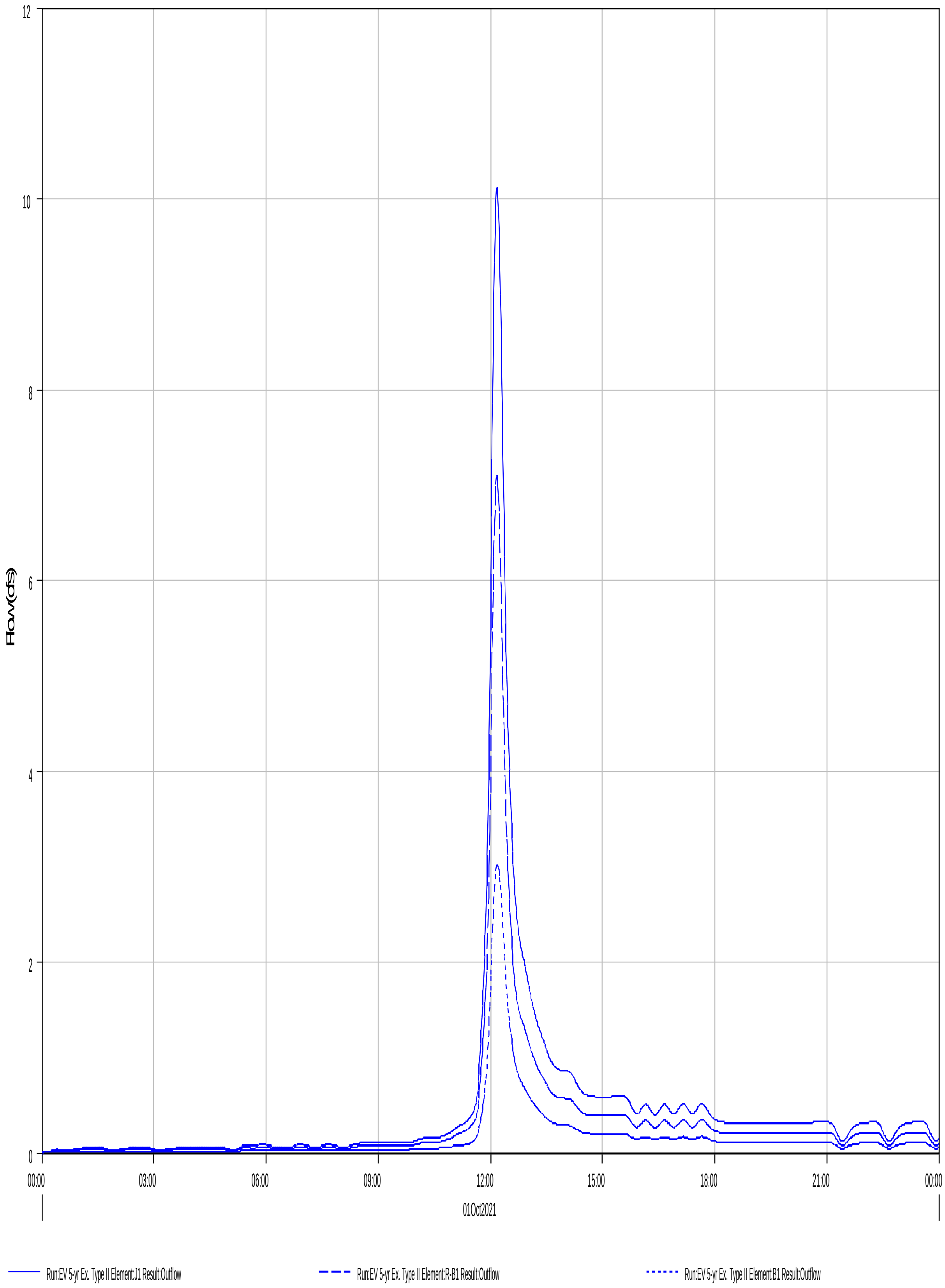
Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Existing
End of Run:	02Oct2021, 00:00	Meteorologic Model:	5-yr Type II
Compute Time:	11Mar2022, 14:50:40	Control Specifications:	24-hr Storm

Volume Units: AC-FT

Computed Results

Peak Discharge :	5.8 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:14
Total Precipitation :	3.3 (AC-FT)	Total Direct Runoff :	0.7 (AC-FT)
Total Loss :	2.6 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	0.7 (AC-FT)	Discharge :	0.7 (AC-FT)

Junction "J1" Results for Run "EV 5-yr Ex. Type II"



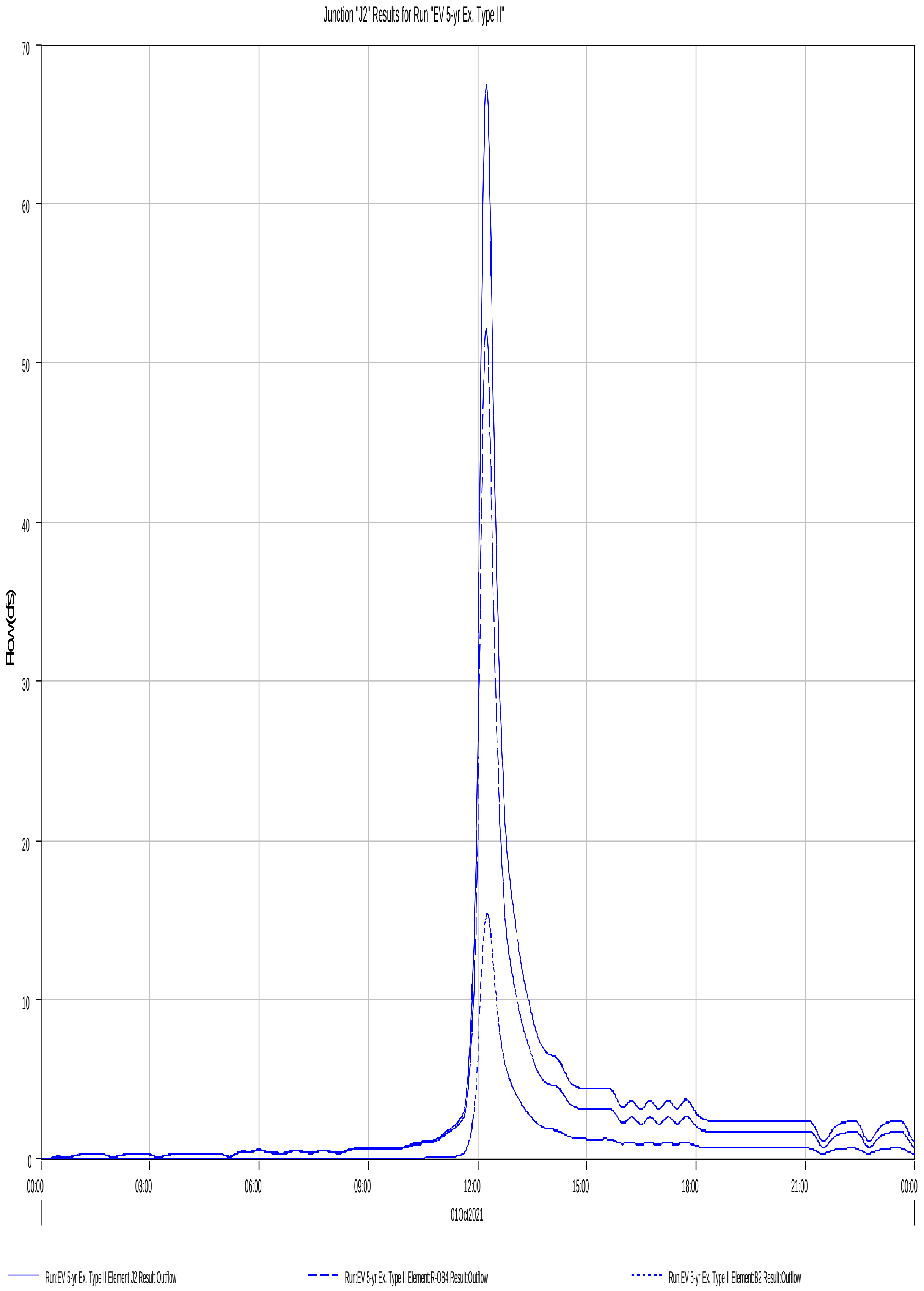
Project: Eagleview_Subdivision
Simulation Run: EV 5-yr Ex. Type II Junction: J1

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Existing
End of Run:	02Oct2021, 00:00	Meteorologic Model:	5-yr Type II
Compute Time:	11Mar2022, 14:50:40	Control Specifications:	24-hr Storm

Volume Units: AC-FT

Computed Results

Peak Outflow :	10.1 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 12:11
Total Outflow :	1.0 (AC-FT)		


Junction "J2" Results for Run "EV 5-yr Ex. Type II"
Flow (cfs)
70
60
50
40
30
20
10
0
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
00:00
01Oct2021
Run:EV 5-yr Ex. Type II Element:J2 Result:Outflow
Run:EV 5-yr Ex. Type II Element:R-OB4 Result:Outflow
Run:EV 5-yr Ex. Type II Element:B2 Result:Outflow

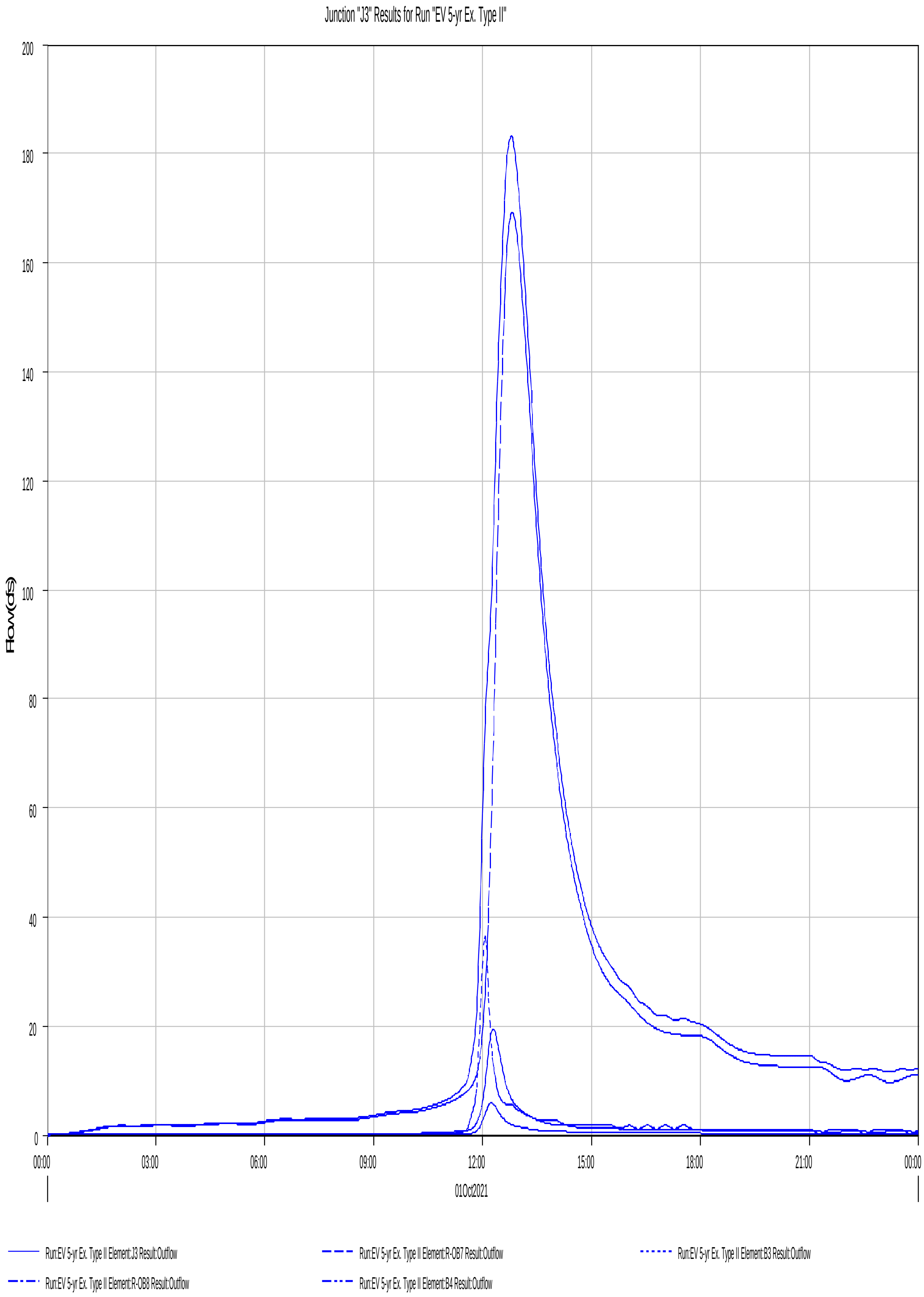
Project: Eagleview_Subdivision
Simulation Run: EV 5-yr Ex. Type II Junction: J2

Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview_Existing
End of Run: 02Oct2021, 00:00 Meteorologic Model: 5-yr Type II
Compute Time: 11Mar2022, 14:50:40 Control Specifications: 24-hr Storm

Volume Units: AC-FT

Computed Results

Peak Outflow : 67.5 (CFS) Date/Time of Peak Outflow : 01Oct2021, 12:15
Total Outflow : 7.3 (AC-FT)


Junction "J3" Results for Run "EV 5-yr Ex. Type II"
Flow (cfs)
200
180
160
140
120
100
80
60
40
20
0
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
00:00
01Oct2021
Run:EV 5-yr Ex. Type II Element:J3 Result:Outflow
Run:EV 5-yr Ex. Type II Element:R-OB7 Result:Outflow
Run:EV 5-yr Ex. Type II Element:B3 Result:Outflow
Run:EV 5-yr Ex. Type II Element:R-OB8 Result:Outflow
Run:EV 5-yr Ex. Type II Element:B4 Result:Outflow

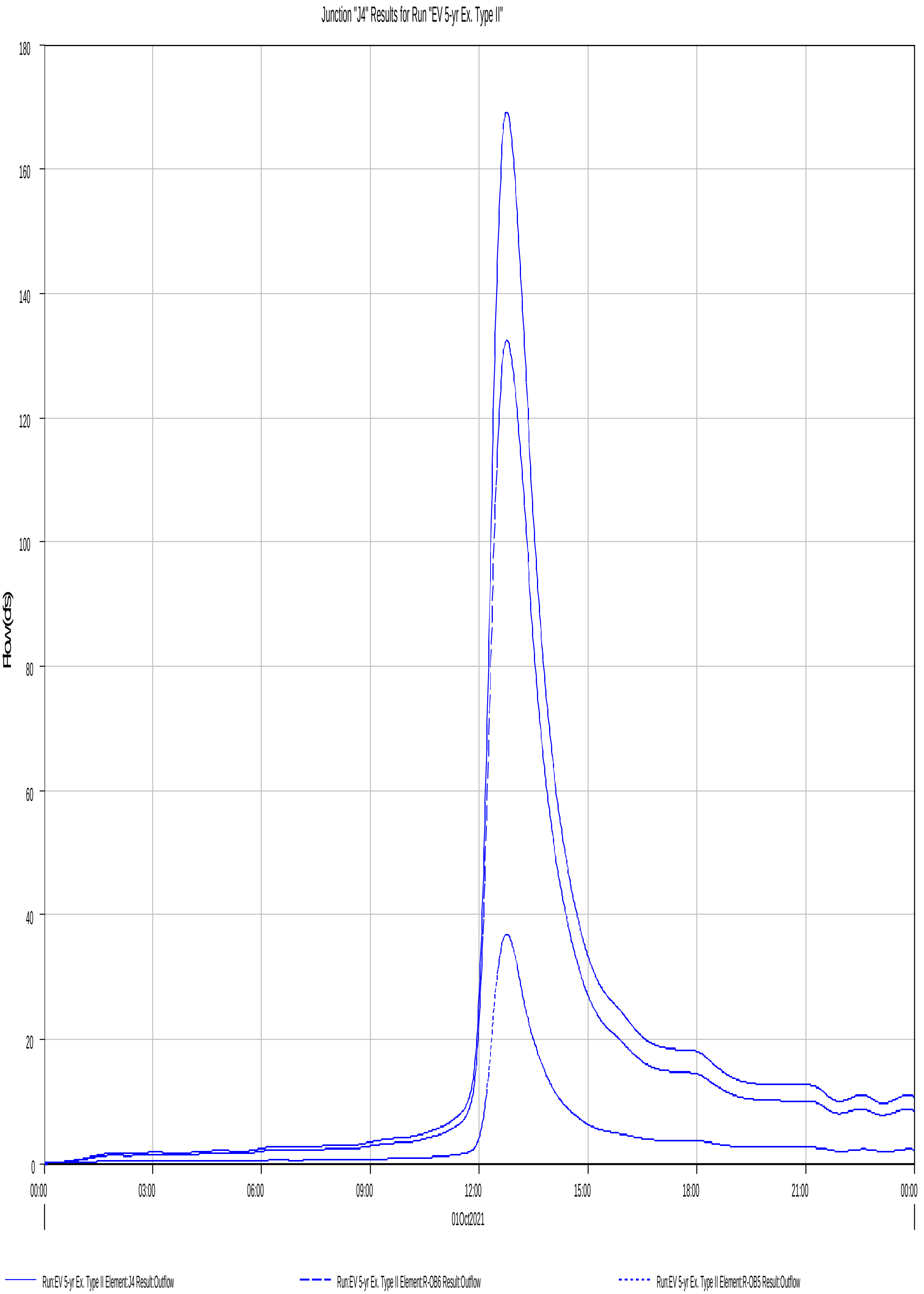
Project: Eagleview_Subdivision
Simulation Run: EV 5-yr Ex. Type II Junction: J3

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Existing
End of Run:	02Oct2021, 00:00	Meteorologic Model:	5-yr Type II
Compute Time:	11Mar2022, 14:50:40	Control Specifications:	24-hr Storm

Volume Units: AC-FT

Computed Results

Peak Outflow :	183.1 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 12:47
Total Outflow :	42.8 (AC-FT)		



Junction "J4" Results for Run "EV 5-yr Ex. Type II"
Flow(cfs)
180
160
140
120
100
80
60
40
20
0
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
00:00
01Oct2021
Run:EV 5-yr Ex. Type II Element:J4 Result:Outflow
Run:EV 5-yr Ex. Type II Element:R-OB6 Result:Outflow
Run:EV 5-yr Ex. Type II Element:R-OB5 Result:Outflow

Project: Eagleview_Subdivision
Simulation Run: EV 5-yr Ex. Type II Junction: J4

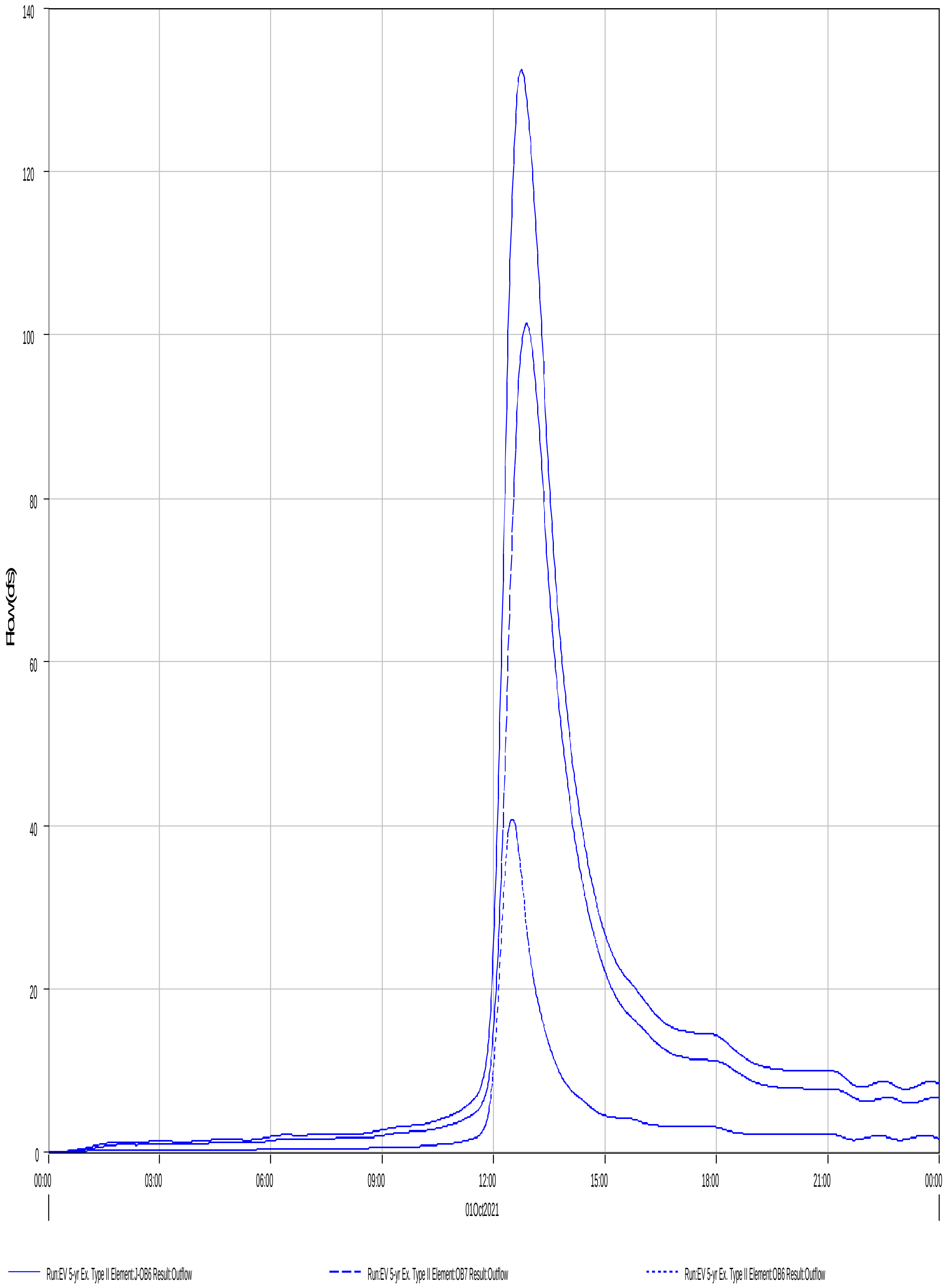
Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Existing
End of Run:	02Oct2021, 00:00	Meteorologic Model:	5-yr Type II
Compute Time:	11Mar2022, 14:50:40	Control Specifications:	24-hr Storm

Volume Units: AC-FT

Computed Results

Peak Outflow :	169.2 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 12:46
Total Outflow :	37.4 (AC-FT)		

Junction "J-OB6" Results for Run "EV 5-yr Ex. Type II"



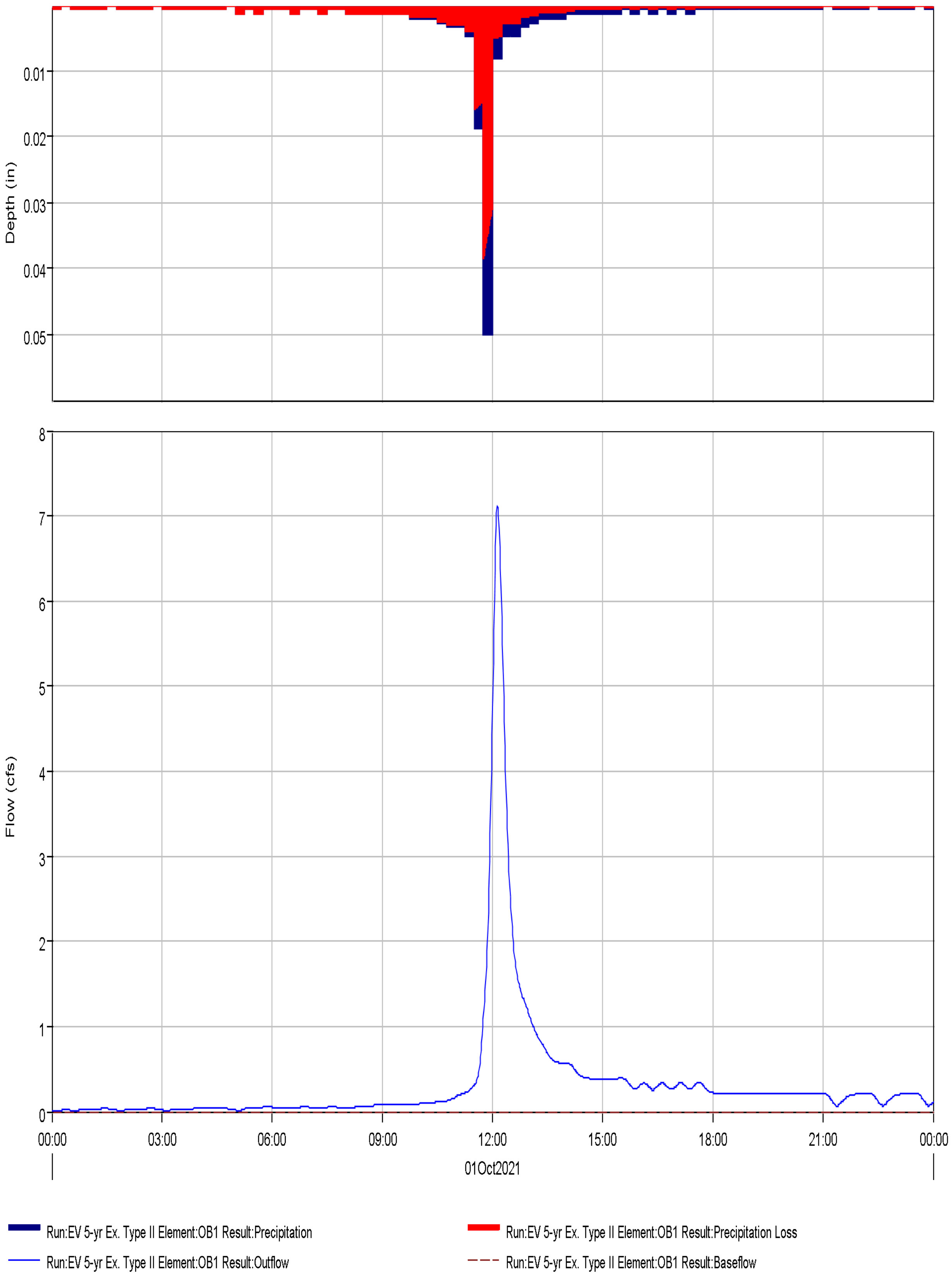
Project: Eagleview_Subdivision
Simulation Run: EV 5-yr Ex. Type II Junction: J-OB6

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Existing
End of Run:	02Oct2021, 00:00	Meteorologic Model:	5-yr Type II
Compute Time:	11Mar2022, 14:50:40	Control Specifications:	24-hr Storm

Volume Units: AC-FT

Computed Results

Peak Outflow :	132.4 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 12:45
Total Outflow :	30.1 (AC-FT)		


Subbasin "OB1" Results for Run "EV 5-yr Ex. Type II"

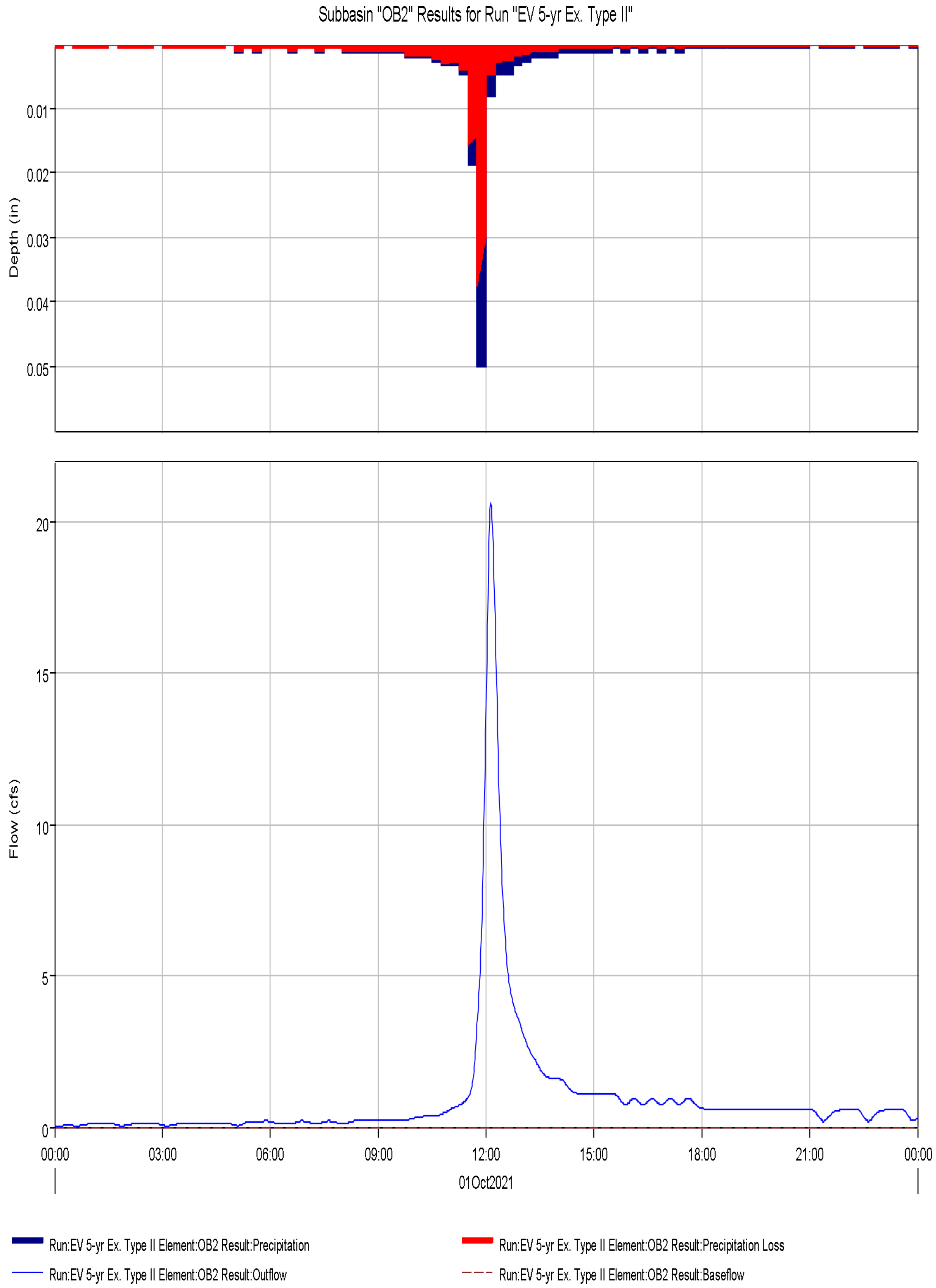
Project: Eagleview_Subdivision
Simulation Run: EV 5-yr Ex. Type II Subbasin: OB1

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Existing
End of Run:	02Oct2021, 00:00	Meteorologic Model:	5-yr Type II
Compute Time:	11Mar2022, 14:50:40	Control Specifications:	24-hr Storm

Volume Units: AC-FT

Computed Results

Peak Discharge :	7.1 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:08
Total Precipitation :	2.3 (AC-FT)	Total Direct Runoff :	0.7 (AC-FT)
Total Loss :	1.7 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	0.7 (AC-FT)	Discharge :	0.7 (AC-FT)


Subbasin "OB2" Results for Run "EV 5-yr Ex. Type II"
Depth (in)
0.01
0.02
0.03
0.04
0.05
Flow (cfs)
20
15
10
5
0
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
00:00
01Oct2021
Run:EV 5-yr Ex. Type II Element:OB2 Result:Precipitation
Run:EV 5-yr Ex. Type II Element:OB2 Result:Precipitation Loss
Run:EV 5-yr Ex. Type II Element:OB2 Result:Outflow
Run:EV 5-yr Ex. Type II Element:OB2 Result:Baseflow

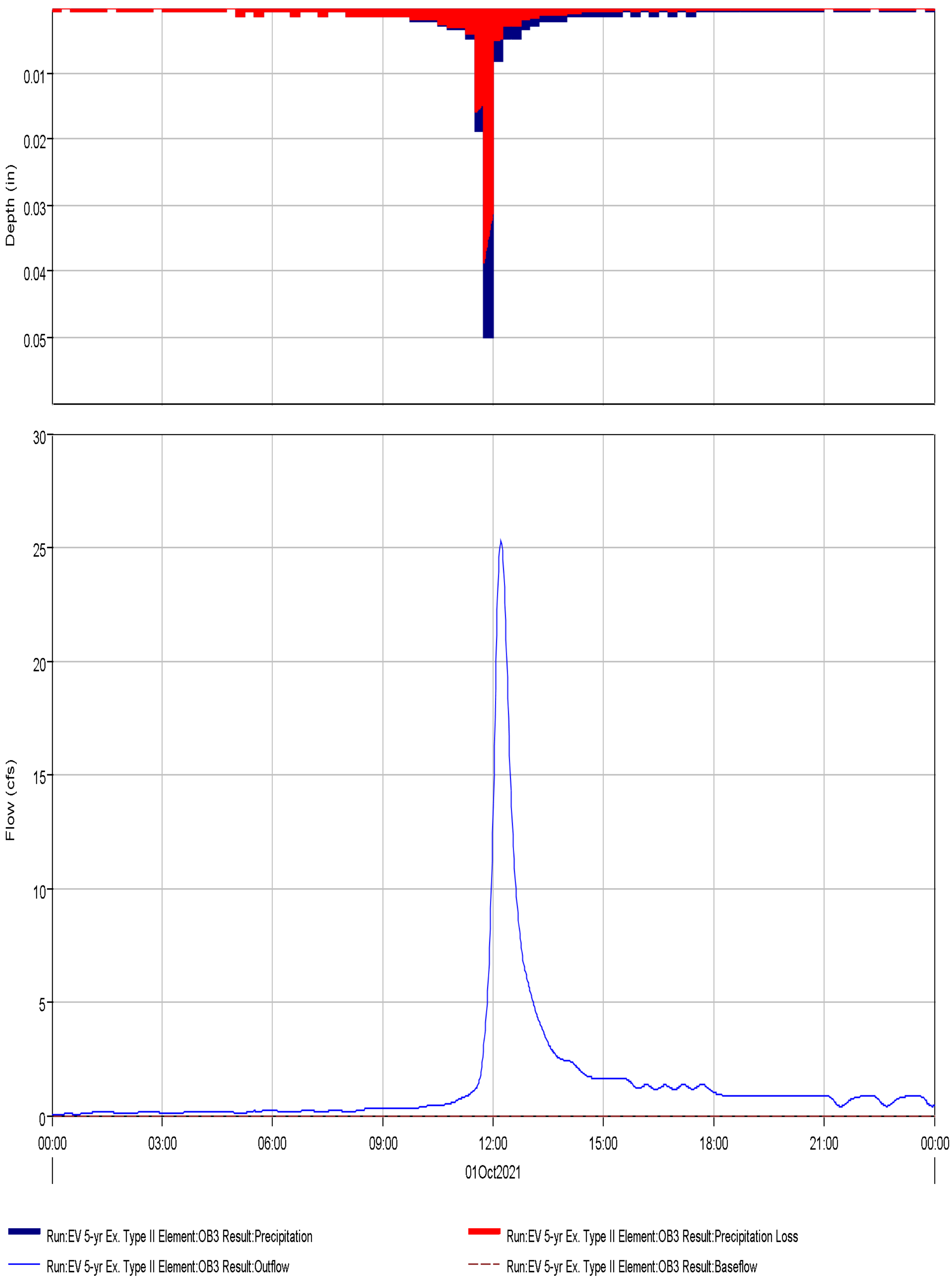
Project: Eagleview_Subdivision
Simulation Run: EV 5-yr Ex. Type II Subbasin: OB2

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Existing
End of Run:	02Oct2021, 00:00	Meteorologic Model:	5-yr Type II
Compute Time:	11Mar2022, 14:50:40	Control Specifications:	24-hr Storm

Volume Units: AC-FT

Computed Results

Peak Discharge :	20.6 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:08
Total Precipitation :	6.3 (AC-FT)	Total Direct Runoff :	1.9 (AC-FT)
Total Loss :	4.4 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	1.9 (AC-FT)	Discharge :	1.9 (AC-FT)



Subbasin "OB3" Results for Run "EV 5-yr Ex. Type II"

Project: Eagleview_Subdivision
Simulation Run: EV 5-yr Ex. Type II Subbasin: OB3

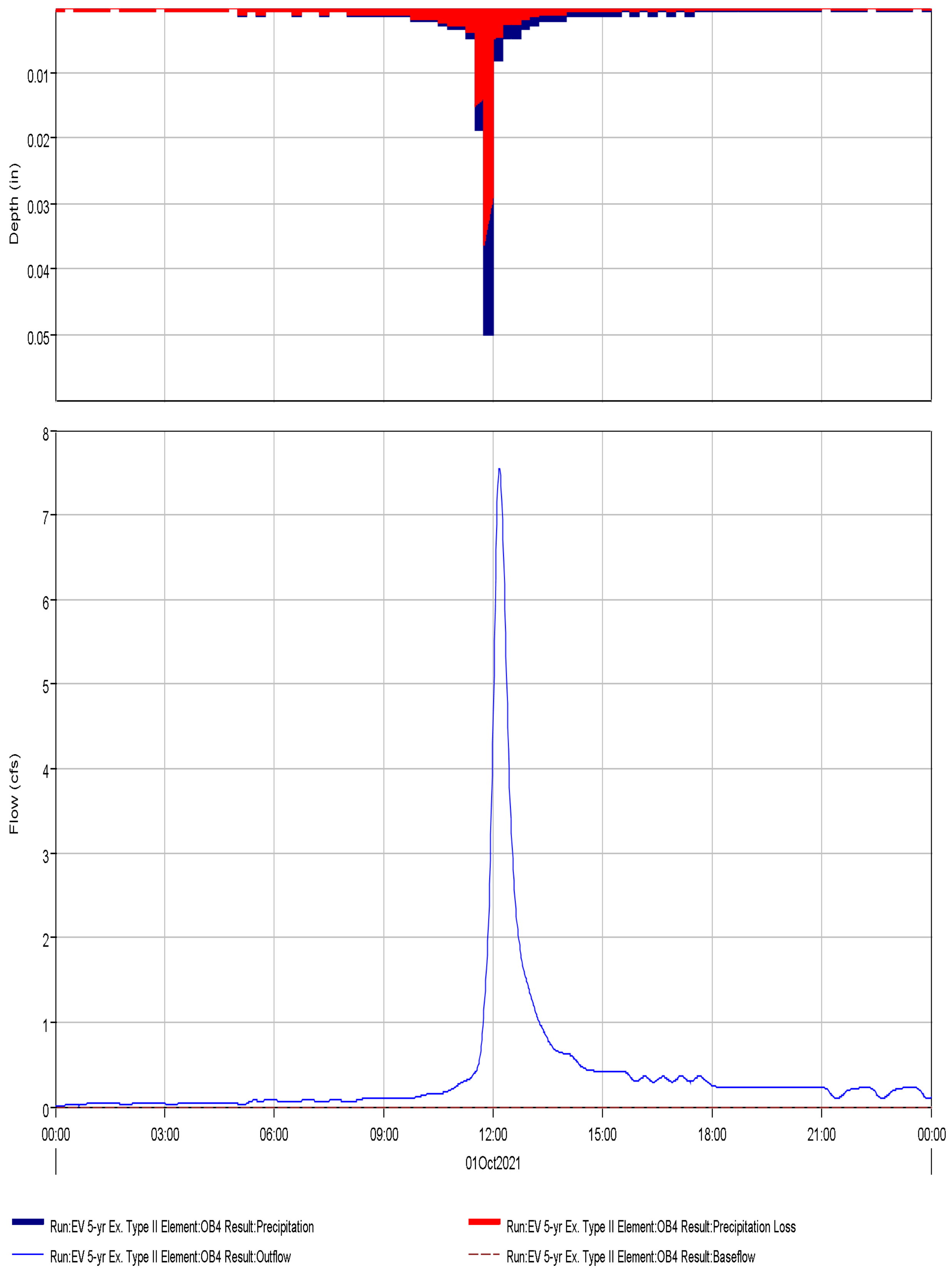
Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Existing
End of Run:	02Oct2021, 00:00	Meteorologic Model:	5-yr Type II
Compute Time:	11Mar2022, 14:50:40	Control Specifications:	24-hr Storm

Volume Units: AC-FT

Computed Results

Peak Discharge :	25.3 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:13
Total Precipitation :	9.8 (AC-FT)	Total Direct Runoff :	2.8 (AC-FT)
Total Loss :	7.0 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	2.8 (AC-FT)	Discharge :	2.8 (AC-FT)

Subbasin "OB4" Results for Run "EV 5-yr Ex. Type II"



Project: Eagleview_Subdivision
Simulation Run: EV 5-yr Ex. Type II Subbasin: OB4

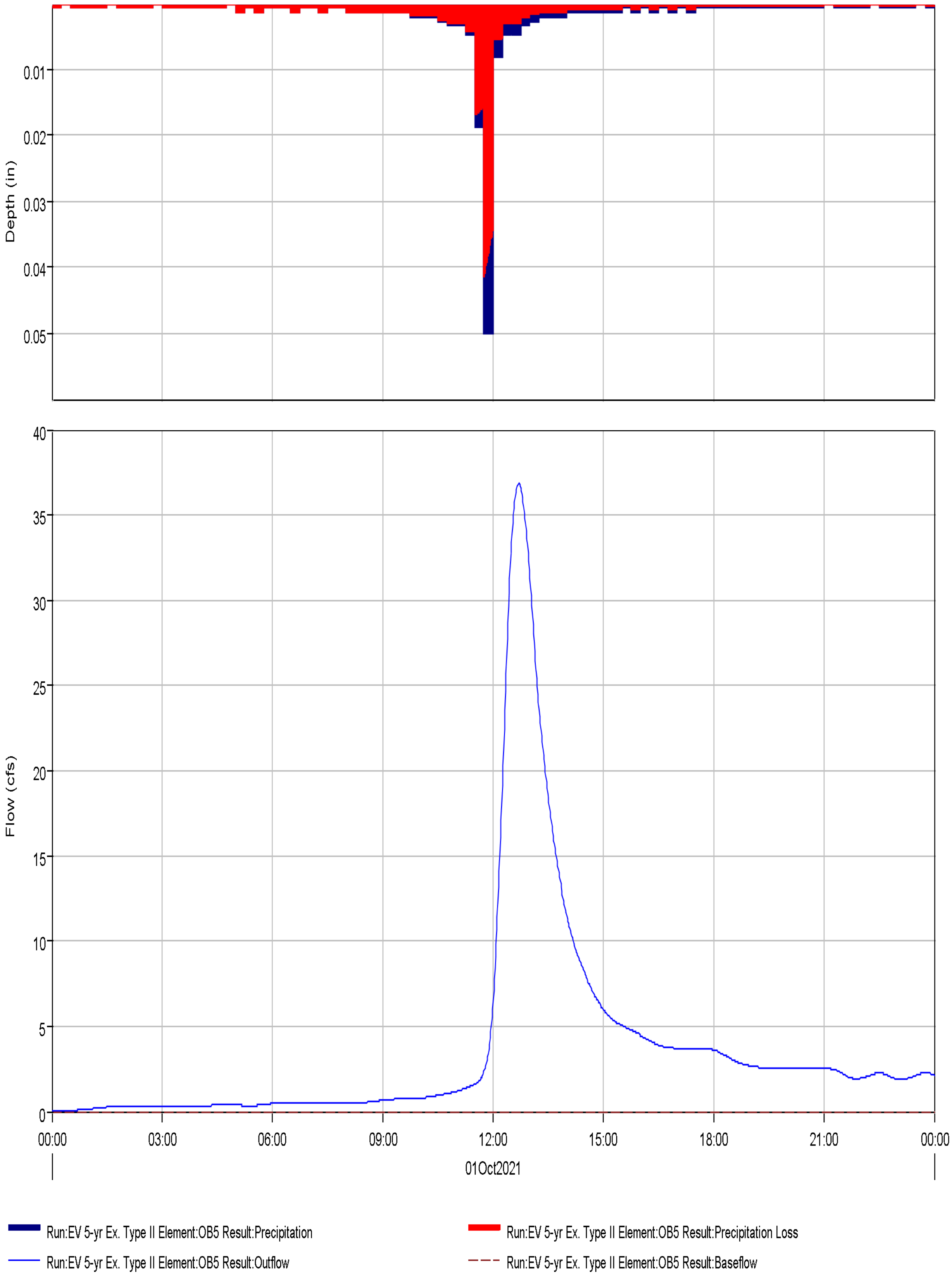
Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Existing
End of Run:	02Oct2021, 00:00	Meteorologic Model:	5-yr Type II
Compute Time:	11Mar2022, 14:50:40	Control Specifications:	24-hr Storm

Volume Units: AC-FT

Computed Results

Peak Discharge :	7.5 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:10
Total Precipitation :	2.4 (AC-FT)	Total Direct Runoff :	0.8 (AC-FT)
Total Loss :	1.6 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	0.8 (AC-FT)	Discharge :	0.8 (AC-FT)

Subbasin "OB5" Results for Run "EV 5-yr Ex. Type II"



Project: Eagleview_Subdivision
Simulation Run: EV 5-yr Ex. Type II Subbasin: OB5

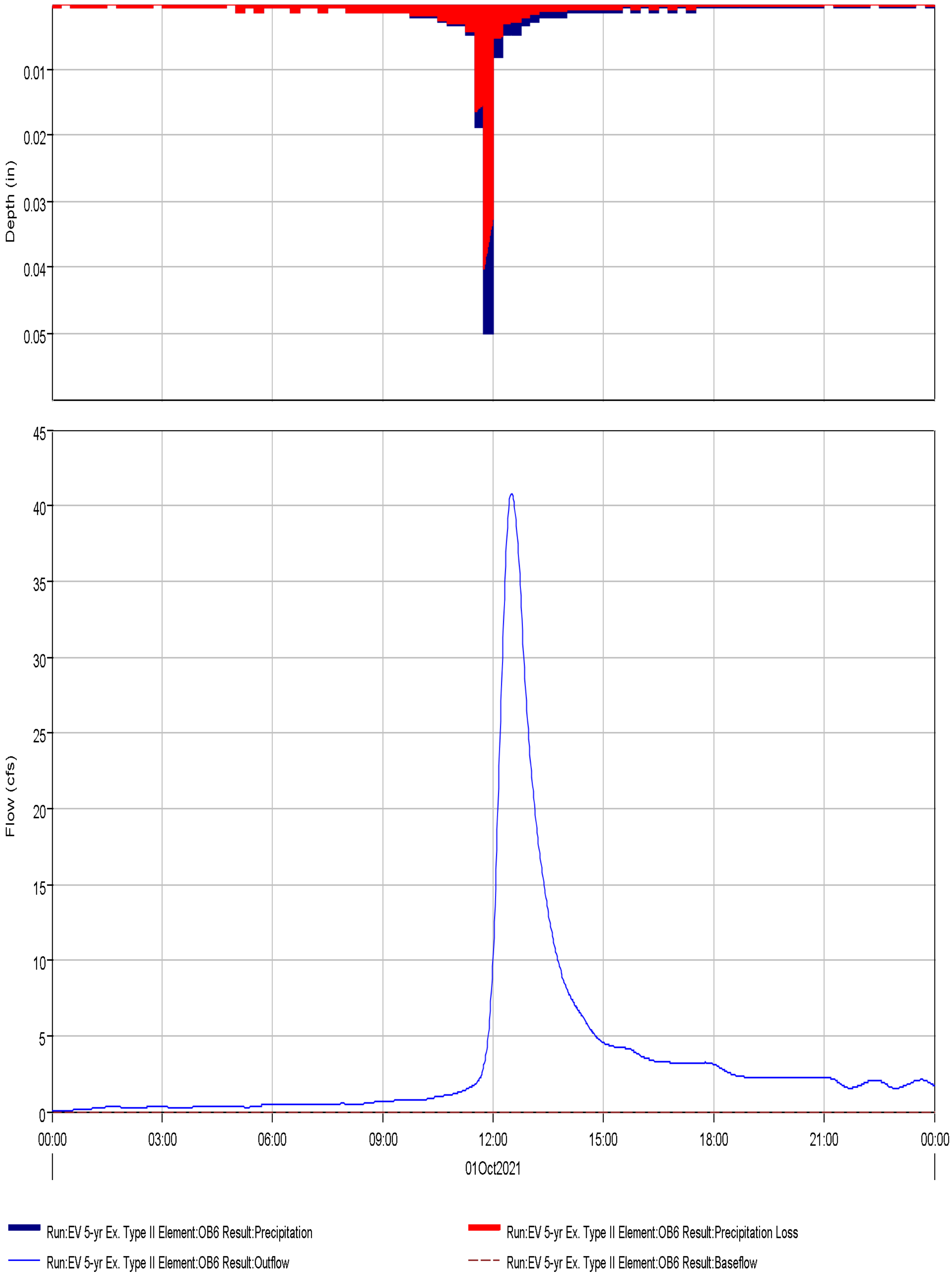
Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Existing
End of Run:	02Oct2021, 00:00	Meteorologic Model:	5-yr Type II
Compute Time:	11Mar2022, 14:50:40	Control Specifications:	24-hr Storm

Volume Units: AC-FT

Computed Results

Peak Discharge :	36.8 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:42
Total Precipitation :	32.4 (AC-FT)	Total Direct Runoff :	7.4 (AC-FT)
Total Loss :	24.8 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	7.6 (AC-FT)	Discharge :	7.4 (AC-FT)

Subbasin "OB6" Results for Run "EV 5-yr Ex. Type II"



Project: Eagleview_Subdivision
Simulation Run: EV 5-yr Ex. Type II Subbasin: OB6

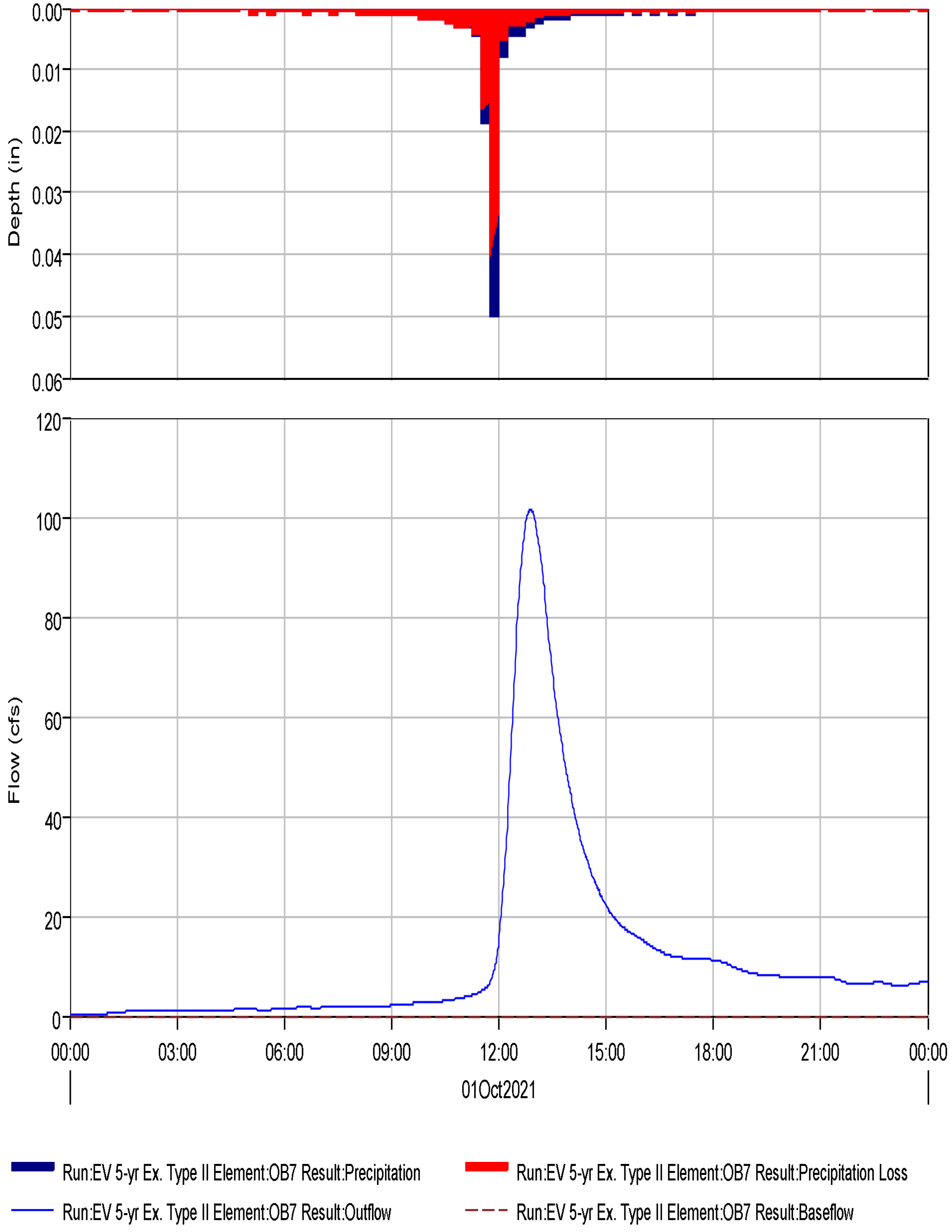
Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Existing
End of Run:	02Oct2021, 00:00	Meteorologic Model:	5-yr Type II
Compute Time:	11Mar2022, 14:50:40	Control Specifications:	24-hr Storm

Volume Units: AC-FT

Computed Results

Peak Discharge :	40.8 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:30
Total Precipitation :	26.6 (AC-FT)	Total Direct Runoff :	6.8 (AC-FT)
Total Loss :	19.8 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	6.9 (AC-FT)	Discharge :	6.8 (AC-FT)

Subbasin "OB7" Results for Run "EV 5-yr Ex. Type II"



Project: Eagleview_Subdivision
Simulation Run: EV 5-yr Ex. Type II Subbasin: OB7

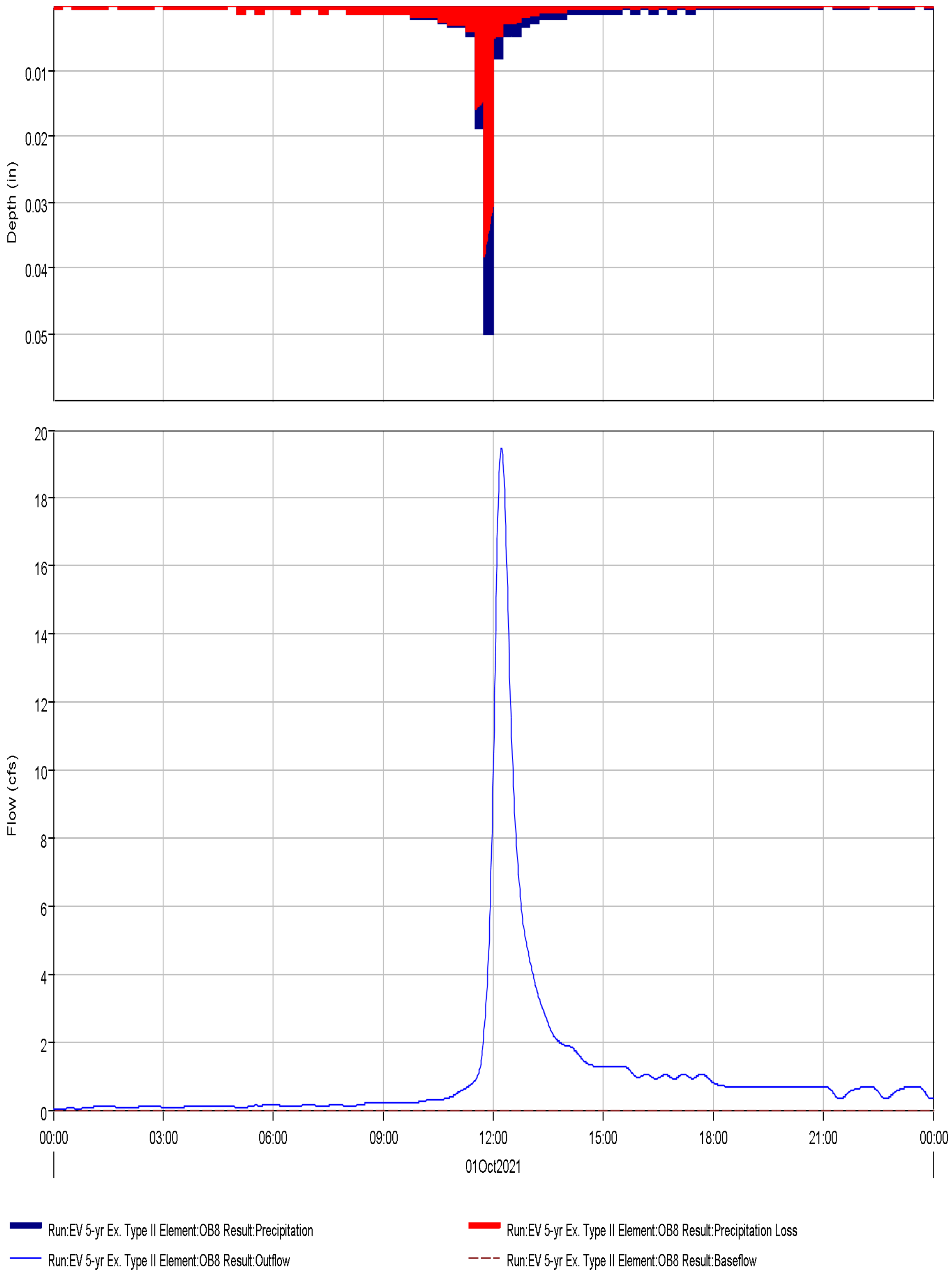
Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Existing
End of Run:	02Oct2021, 00:00	Meteorologic Model:	5-yr Type II
Compute Time:	11Mar2022, 14:50:40	Control Specifications:	24-hr Storm

Volume Units: AC-FT

Computed Results

Peak Discharge :	101.4 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:53
Total Precipitation :	94.8 (AC-FT)	Total Direct Runoff :	23.3 (AC-FT)
Total Loss :	70.9 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	23.9 (AC-FT)	Discharge :	23.3 (AC-FT)

Subbasin "OB8" Results for Run "EV 5-yr Ex. Type II"



Project: Eagleview_Subdivision
Simulation Run: EV 5-yr Ex. Type II Subbasin: OB8

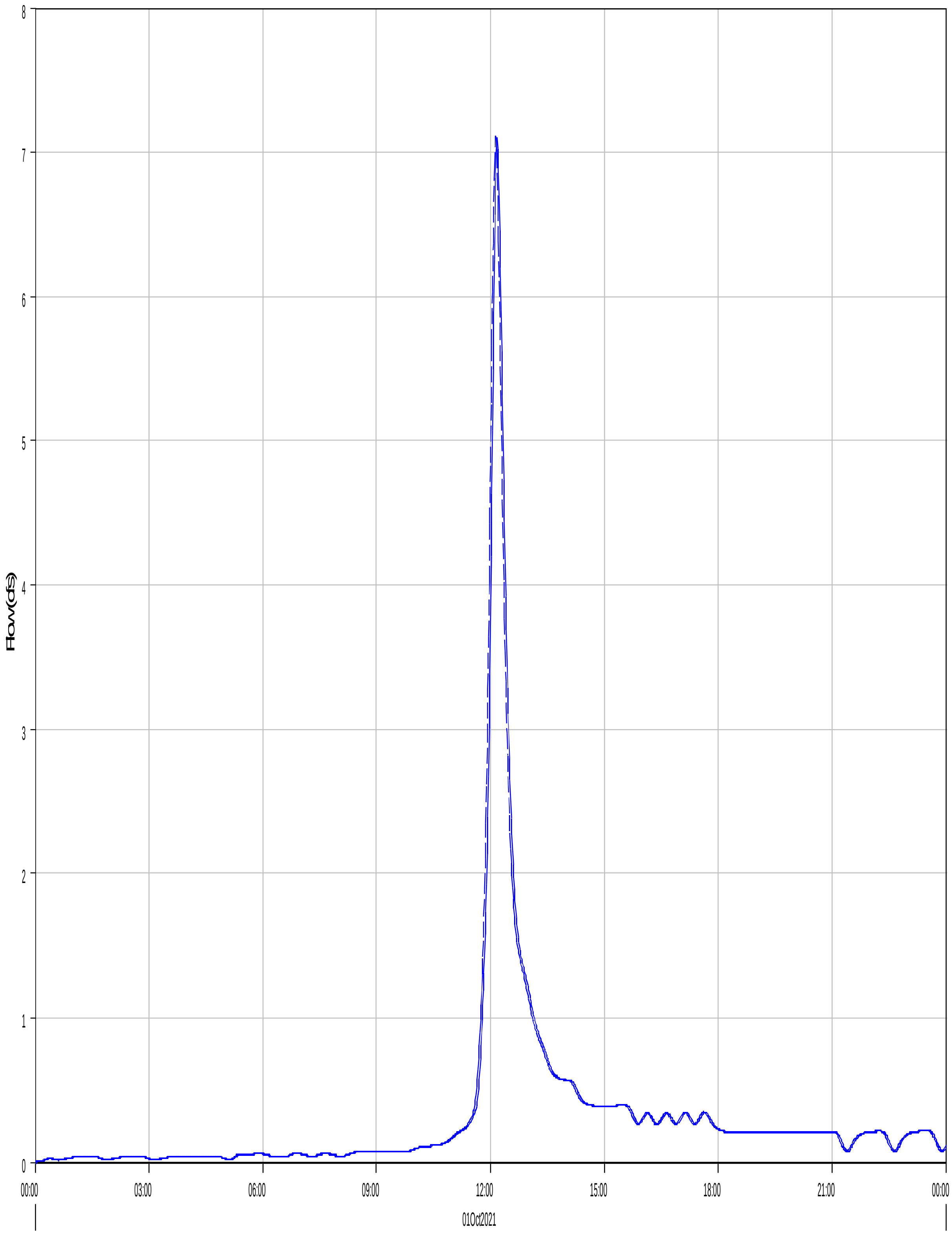
Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Existing
End of Run:	02Oct2021, 00:00	Meteorologic Model:	5-yr Type II
Compute Time:	11Mar2022, 14:50:40	Control Specifications:	24-hr Storm

Volume Units: AC-FT

Computed Results

Peak Discharge :	19.5 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:13
Total Precipitation :	7.4 (AC-FT)	Total Direct Runoff :	2.1 (AC-FT)
Total Loss :	5.3 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	2.2 (AC-FT)	Discharge :	2.1 (AC-FT)

Reach "R-B1" Results for Run "EV 5-yr Ex. Type II"



Run:EV 5-yr Ex. Type II Element:R-B1 Result:Outflow

Run:EV 5-yr Ex. Type II Element:R-B1 Result:Combined Inflow

Project: Eagleview_Subdivision

Simulation Run: EV 5-yr Ex. Type II Reach: R-B1

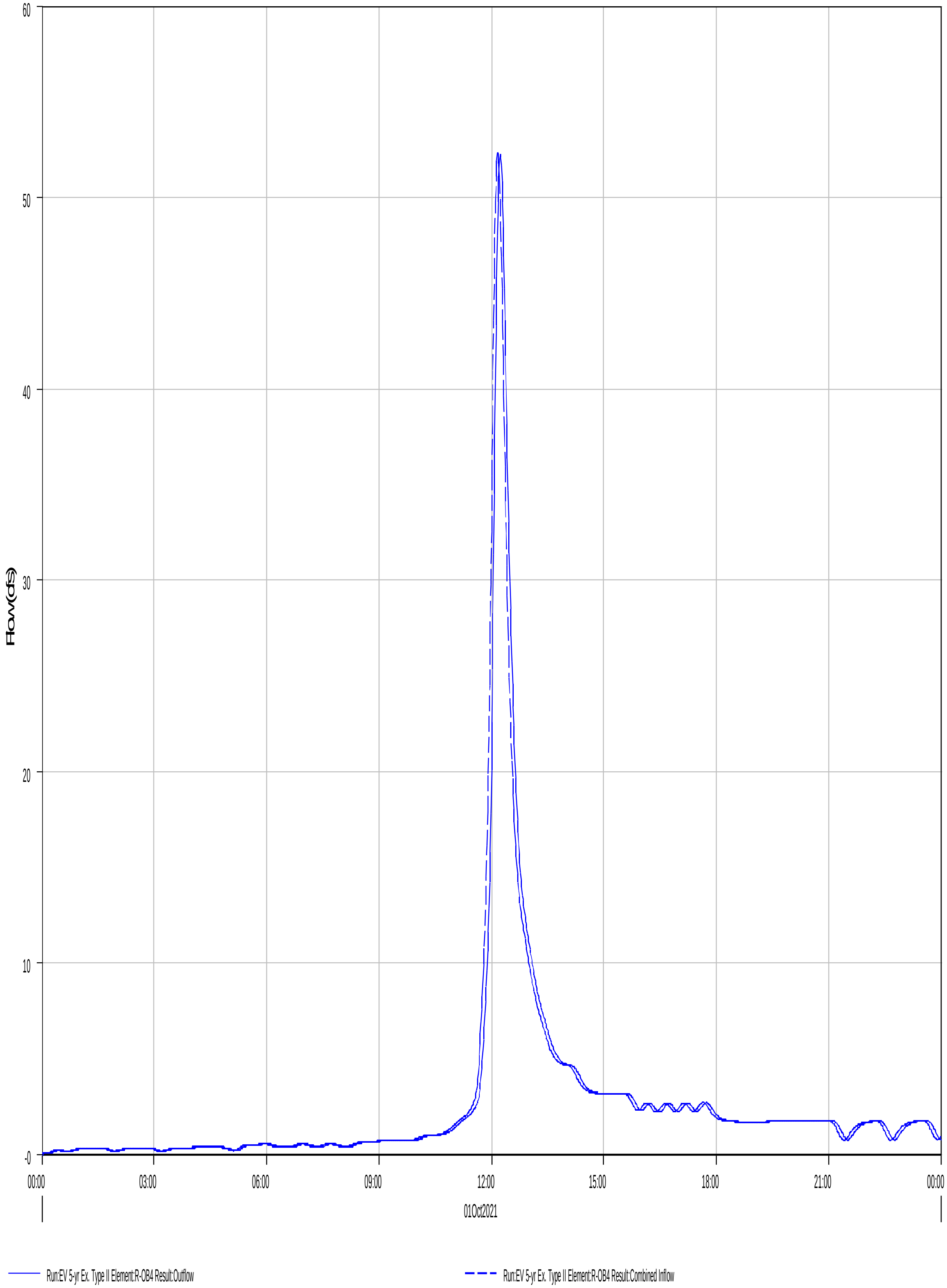
Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Existing
End of Run:	02Oct2021, 00:00	Meteorologic Model:	5-yr Type II
Compute Time:	11Mar2022, 14:50:40	Control Specifications:	24-hr Storm

Volume Units: AC-FT

Computed Results

Peak Inflow :	7.1 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 12:08
Peak Outflow :	7.1 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 12:11
Total Inflow :	0.7 (AC-FT)	Total Outflow :	0.7 (AC-FT)

Reach "R-OB4" Results for Run "EV 5-yr Ex. Type II"



Project: Eagleview_Subdivision
Simulation Run: EV 5-yr Ex. Type II Reach: R-OB4

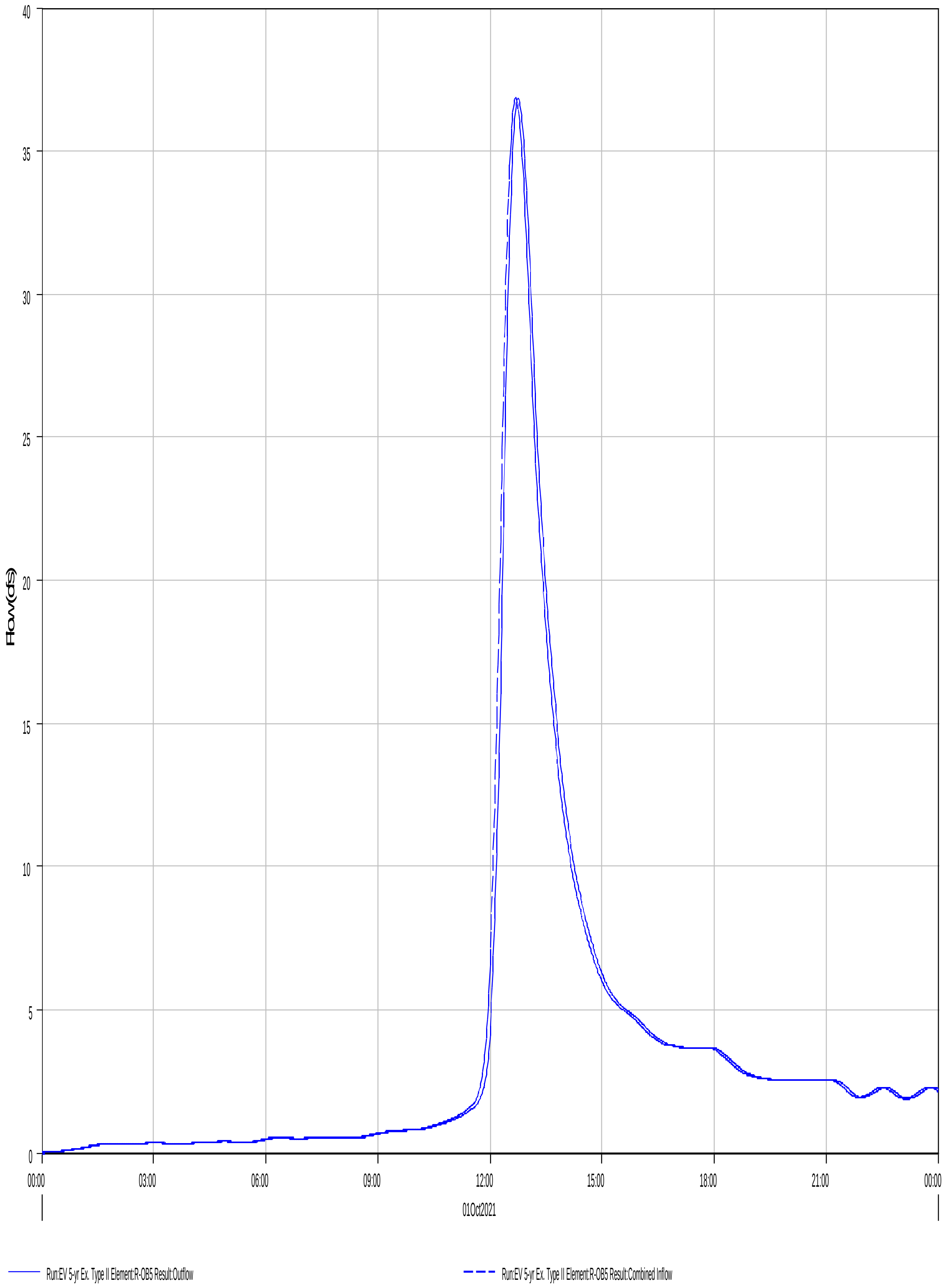
Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Existing
End of Run:	02Oct2021, 00:00	Meteorologic Model:	5-yr Type II
Compute Time:	11Mar2022, 14:50:40	Control Specifications:	24-hr Storm

Volume Units: AC-FT

Computed Results

Peak Inflow :	52.3 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 12:10
Peak Outflow :	52.2 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 12:14
Total Inflow :	5.4 (AC-FT)	Total Outflow :	5.4 (AC-FT)

Reach "R-OB5" Results for Run "EV 5-yr Ex. Type II"



Project: Eagleview_Subdivision
Simulation Run: EV 5-yr Ex. Type II Reach: R-OB5

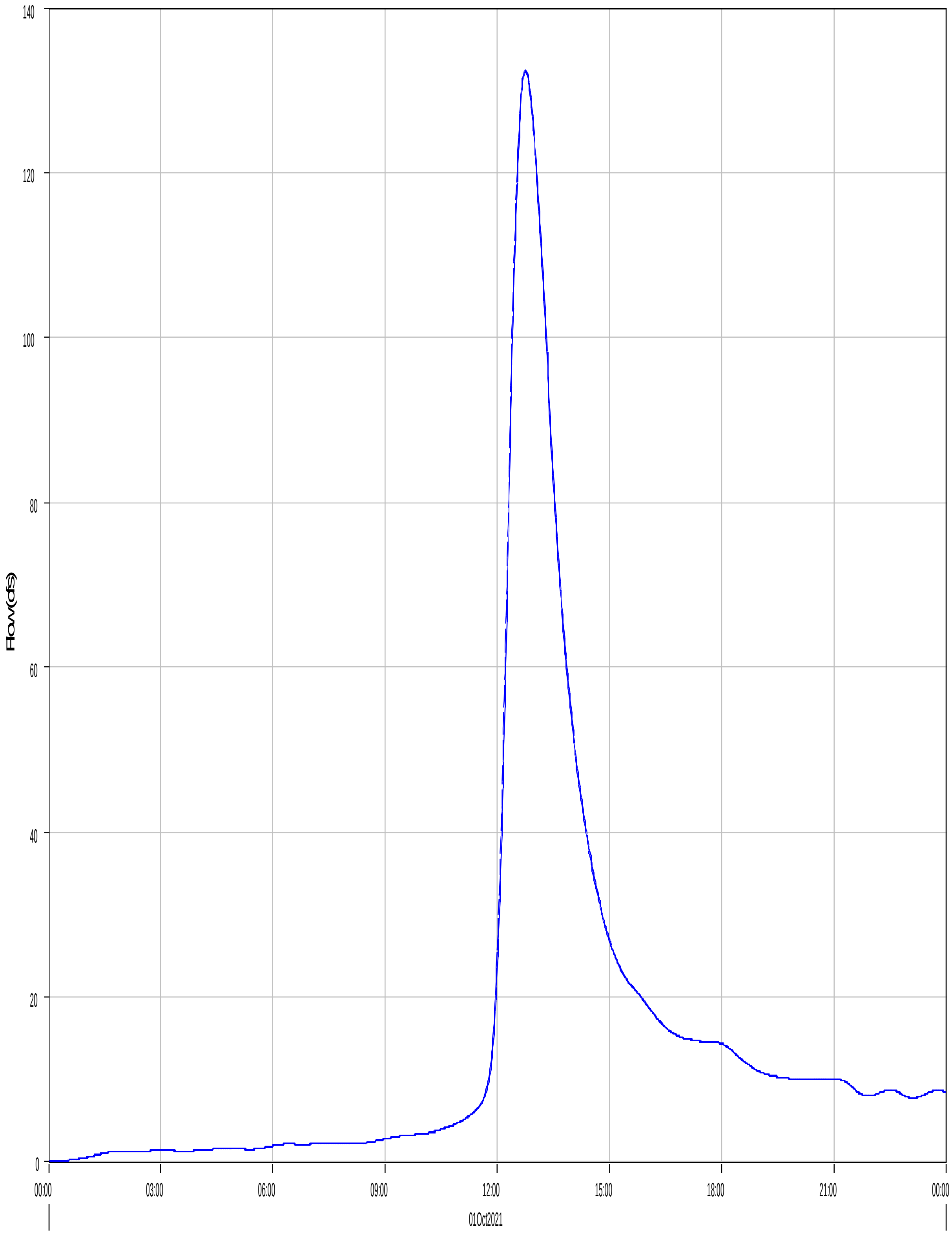
Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Existing
End of Run:	02Oct2021, 00:00	Meteorologic Model:	5-yr Type II
Compute Time:	11Mar2022, 14:50:40	Control Specifications:	24-hr Storm

Volume Units: AC-FT

Computed Results

Peak Inflow :	36.8 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 12:42
Peak Outflow :	36.8 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 12:45
Total Inflow :	7.4 (AC-FT)	Total Outflow :	7.4 (AC-FT)

Reach "R-OB6" Results for Run "EV 5-yr Ex. Type II"



Run:EV 5-yr Ex. Type II Element:R-OB6 Result:Outflow

Run:EV 5-yr Ex. Type II Element:R-OB6 Result:Combined Inflow

Project: Eagleview_Subdivision
Simulation Run: EV 5-yr Ex. Type II Reach: R-OB6

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 11Mar2022, 14:50:40

Basin Model: Eagleview_Existing
Meteorologic Model: 5-yr Type II
Control Specifications: 24-hr Storm

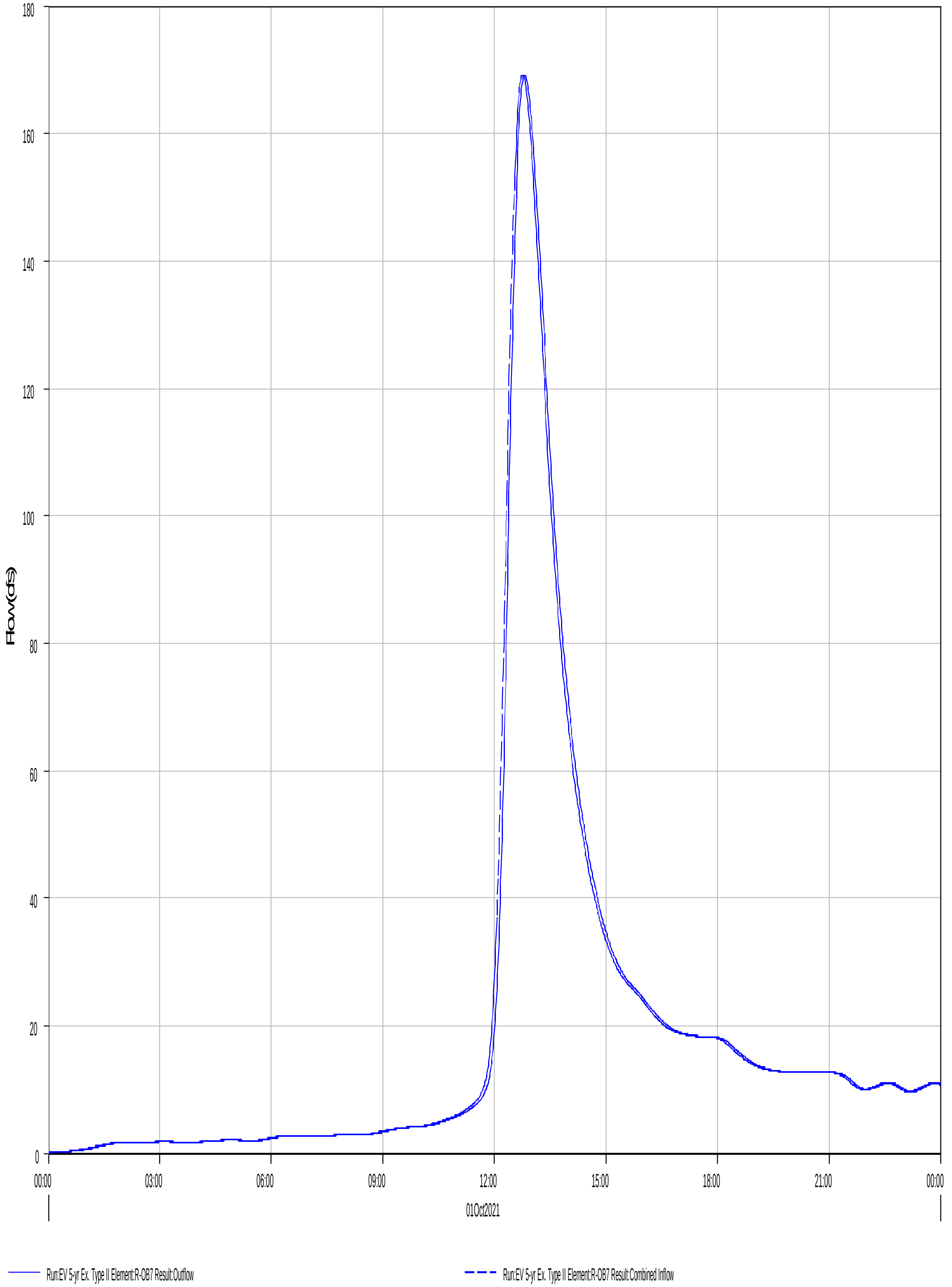
Volume Units: AC-FT

Computed Results

Peak Inflow : 132.4 (CFS)
Peak Outflow : 132.4 (CFS)
Total Inflow : 30.1 (AC-FT)

Date/Time of Peak Inflow : 01Oct2021, 12:45
Date/Time of Peak Outflow : 01Oct2021, 12:46
Total Outflow : 30.0 (AC-FT)

Reach "R-OB7" Results for Run "EV 5-yr Ex. Type II"



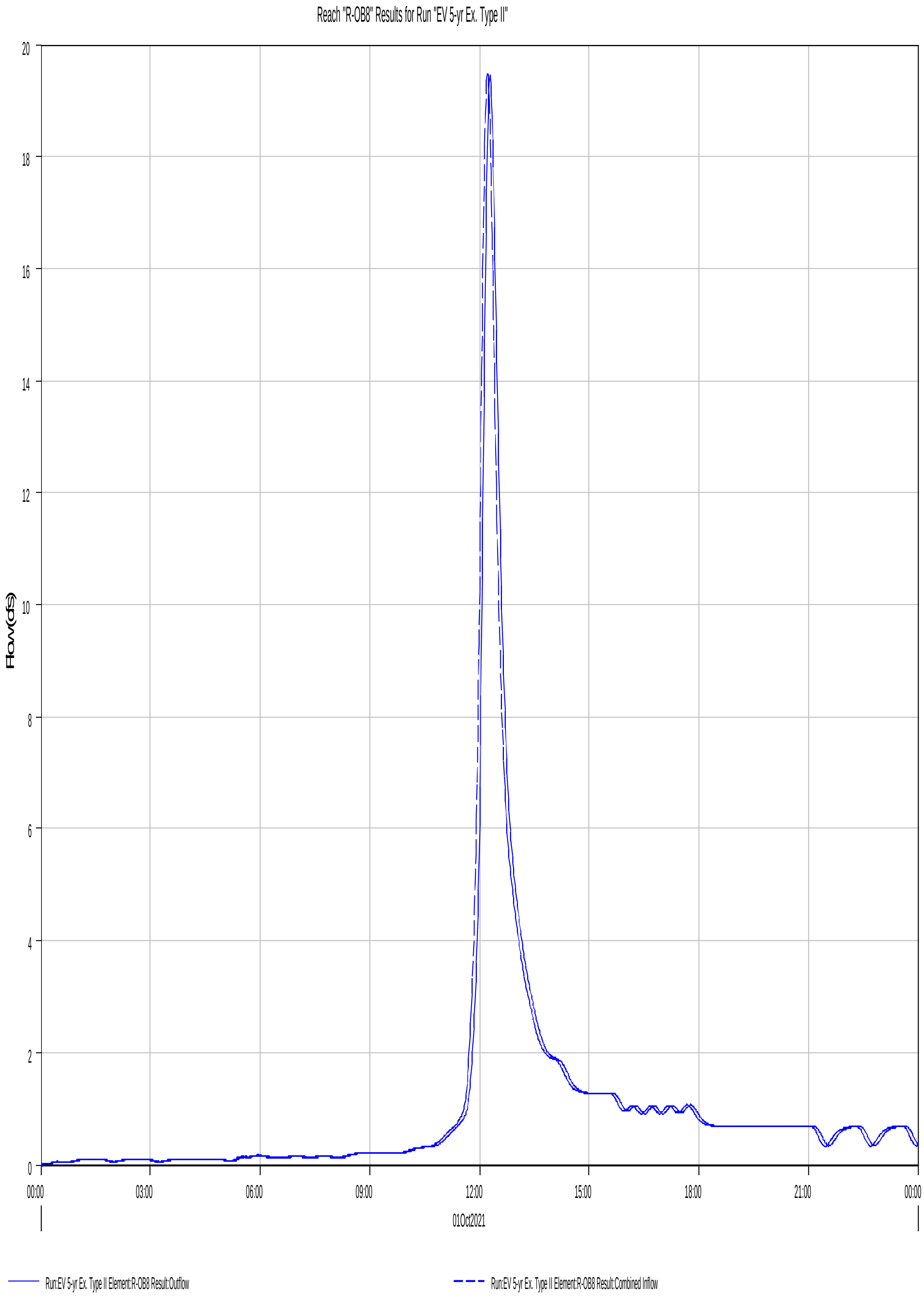
Project: Eagleview_Subdivision
Simulation Run: EV 5-yr Ex. Type II Reach: R-OB7

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Existing
End of Run:	02Oct2021, 00:00	Meteorologic Model:	5-yr Type II
Compute Time:	11Mar2022, 14:50:40	Control Specifications:	24-hr Storm

Volume Units: AC-FT

Computed Results

Peak Inflow :	169.2 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 12:46
Peak Outflow :	169.2 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 12:49
Total Inflow :	37.4 (AC-FT)	Total Outflow :	37.3 (AC-FT)



Reach "R-OB8" Results for Run "EV 5-yr Ex. Type II"
Flow (cfs)
20
18
16
14
12
10
8
6
4
2
0
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
00:00
01Oct2021
Run:EV 5-yr Ex. Type II Element:R-OB8 Result:Outflow
Run:EV 5-yr Ex. Type II Element:R-OB8 Result:Combined Inflow

Project: Eagleview_Subdivision
Simulation Run: EV 5-yr Ex. Type II Reach: R-OB8

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Existing
End of Run:	02Oct2021, 00:00	Meteorologic Model:	5-yr Type II
Compute Time:	11Mar2022, 14:50:40	Control Specifications:	24-hr Storm

Volume Units: AC-FT

Computed Results

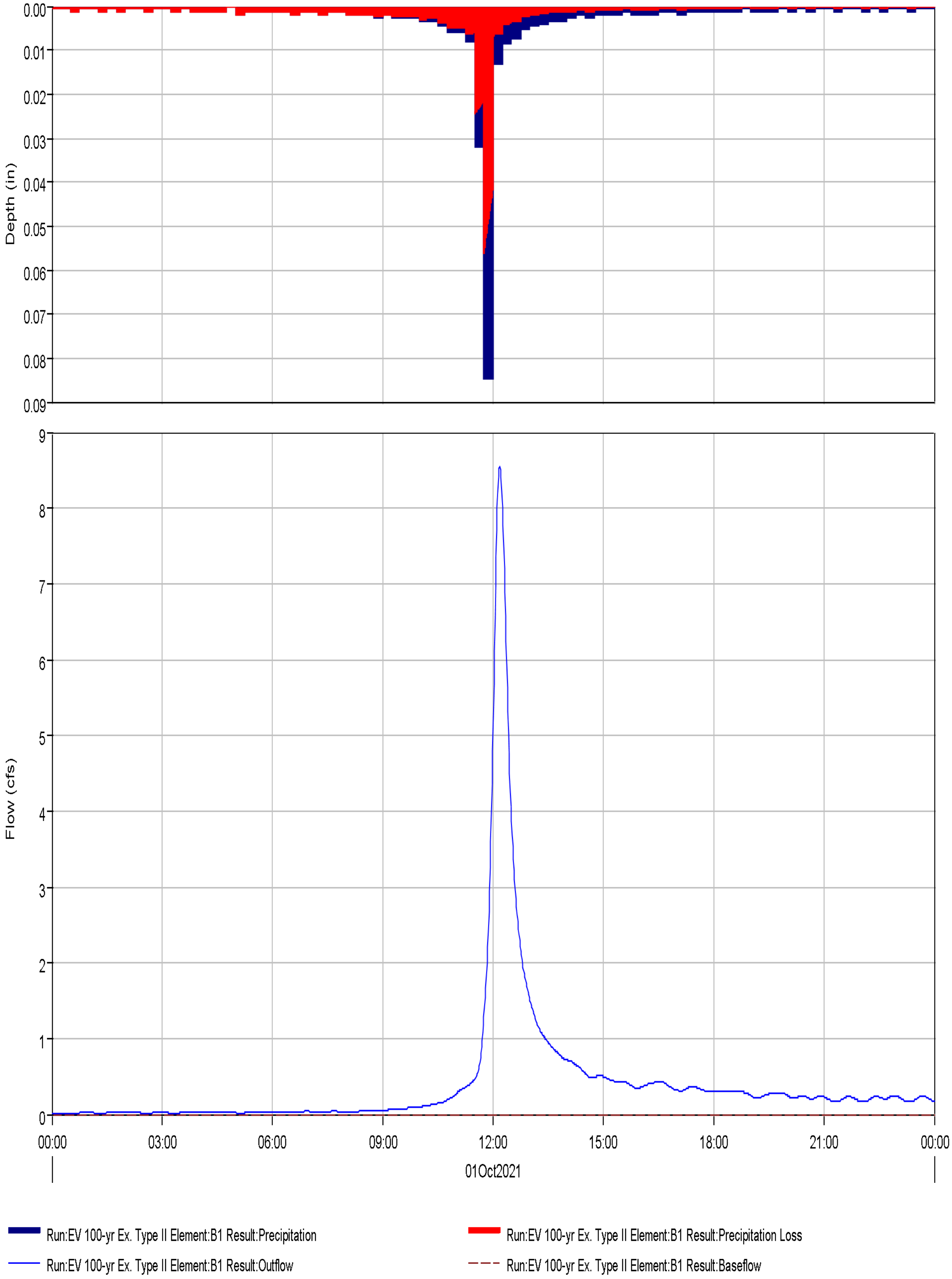
Peak Inflow :	19.5 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 12:13
Peak Outflow :	19.4 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 12:17
Total Inflow :	2.1 (AC-FT)	Total Outflow :	2.1 (AC-FT)

Project: Eagleview_Subdivision Simulation Run: EV 100-yr Ex. Type II

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Existing
End of Run:	02Oct2021, 00:00	Meteorologic Model:	100-yr Type II
Compute Time:	11Mar2022, 10:12:01	Control Specifications:	24-hr Storm

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
B1	0.0091800	8.5	01Oct2021, 12:11	0.8
B2	0.0647266	48.5	01Oct2021, 12:15	5.3
B3	0.0930359	110.0	01Oct2021, 12:04	7.8
B4	0.0229422	18.2	01Oct2021, 12:13	1.9
J1	0.0253831	27.3	01Oct2021, 12:10	2.5
J2	0.1928516	183.8	01Oct2021, 12:13	18.8
J3	1.2354980	515.5	01Oct2021, 12:44	112.7
J4	1.0678500	478.0	01Oct2021, 12:44	97.8
J-OB6	0.8431300	371.3	01Oct2021, 12:43	78.1
OB1	0.0162031	18.8	01Oct2021, 12:08	1.7
OB2	0.0438438	52.7	01Oct2021, 12:08	4.7
OB3	0.0678750	67.1	01Oct2021, 12:12	6.9
OB4	0.0164062	18.9	01Oct2021, 12:10	1.8
OB5	0.2247200	106.9	01Oct2021, 12:40	19.7
OB6	0.1850100	113.2	01Oct2021, 12:29	17.5
OB7	0.6581200	284.2	01Oct2021, 12:52	60.6
OB8	0.0516699	51.6	01Oct2021, 12:13	5.4
R-B1	0.0162031	18.7	01Oct2021, 12:10	1.7
R-OB4	0.1281250	135.8	01Oct2021, 12:13	13.4
R-OB5	0.2247200	106.8	01Oct2021, 12:43	19.7
R-OB6	0.8431300	371.3	01Oct2021, 12:44	78.1
R-OB7	1.0678500	477.9	01Oct2021, 12:46	97.7
R-OB8	0.0516699	51.5	01Oct2021, 12:16	5.4

Subbasin "B1" Results for Run "EV 100-yr Ex. Type II"



Project: Eagleview_Subdivision

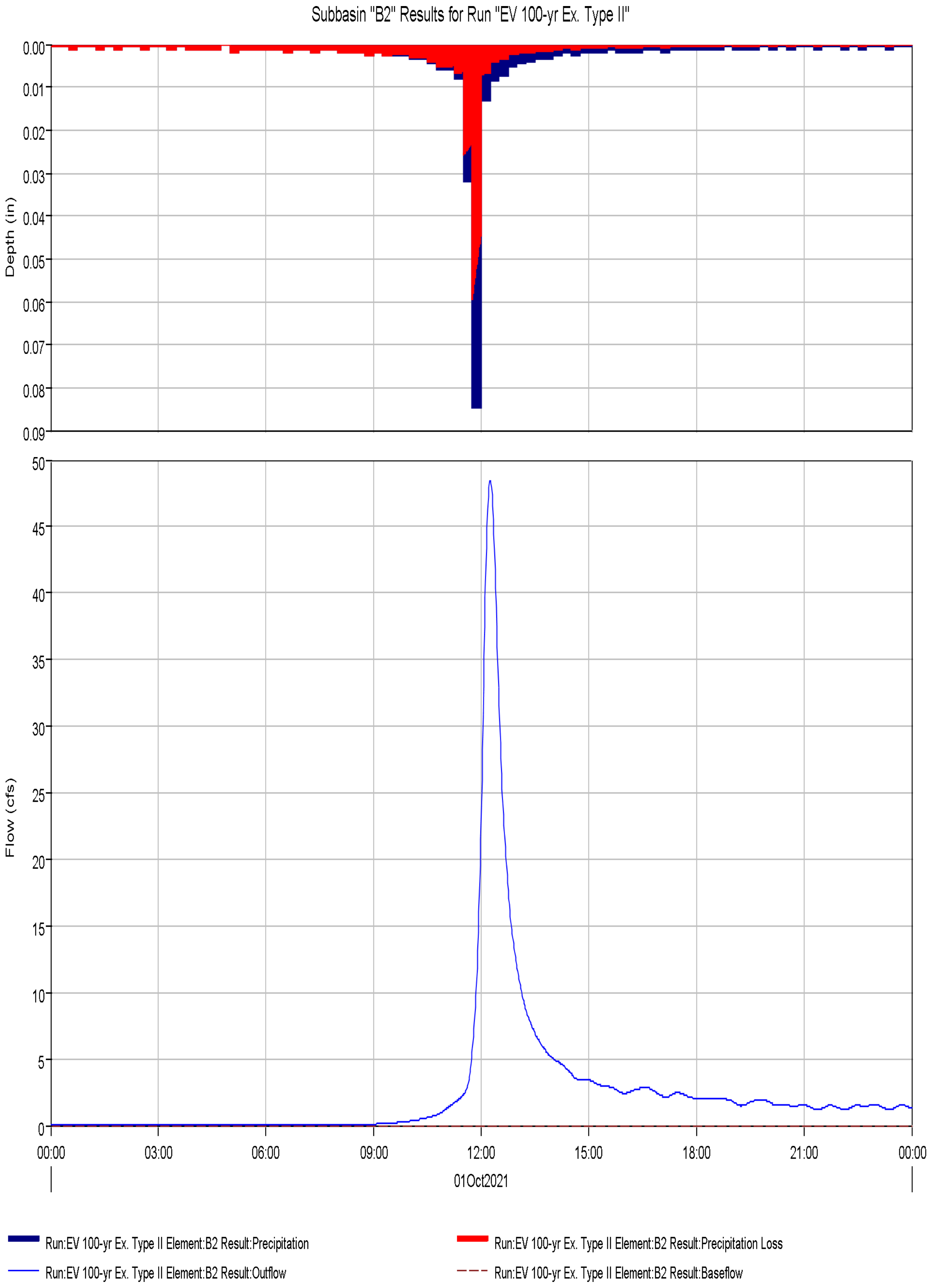
Simulation Run: EV 100-yr Ex. Type II Subbasin: B1

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Existing
End of Run:	02Oct2021, 00:00	Meteorologic Model:	100-yr Type II
Compute Time:	11Mar2022, 10:12:01	Control Specifications:	24-hr Storm

Volume Units: AC-FT

Computed Results

Peak Discharge :	8.5 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:11
Total Precipitation :	2.3 (AC-FT)	Total Direct Runoff :	0.8 (AC-FT)
Total Loss :	1.4 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	0.8 (AC-FT)	Discharge :	0.8 (AC-FT)



Subbasin "B2" Results for Run "EV 100-yr Ex. Type II"

Project: Eagleview_Subdivision

Simulation Run: EV 100-yr Ex. Type II Subbasin: B2

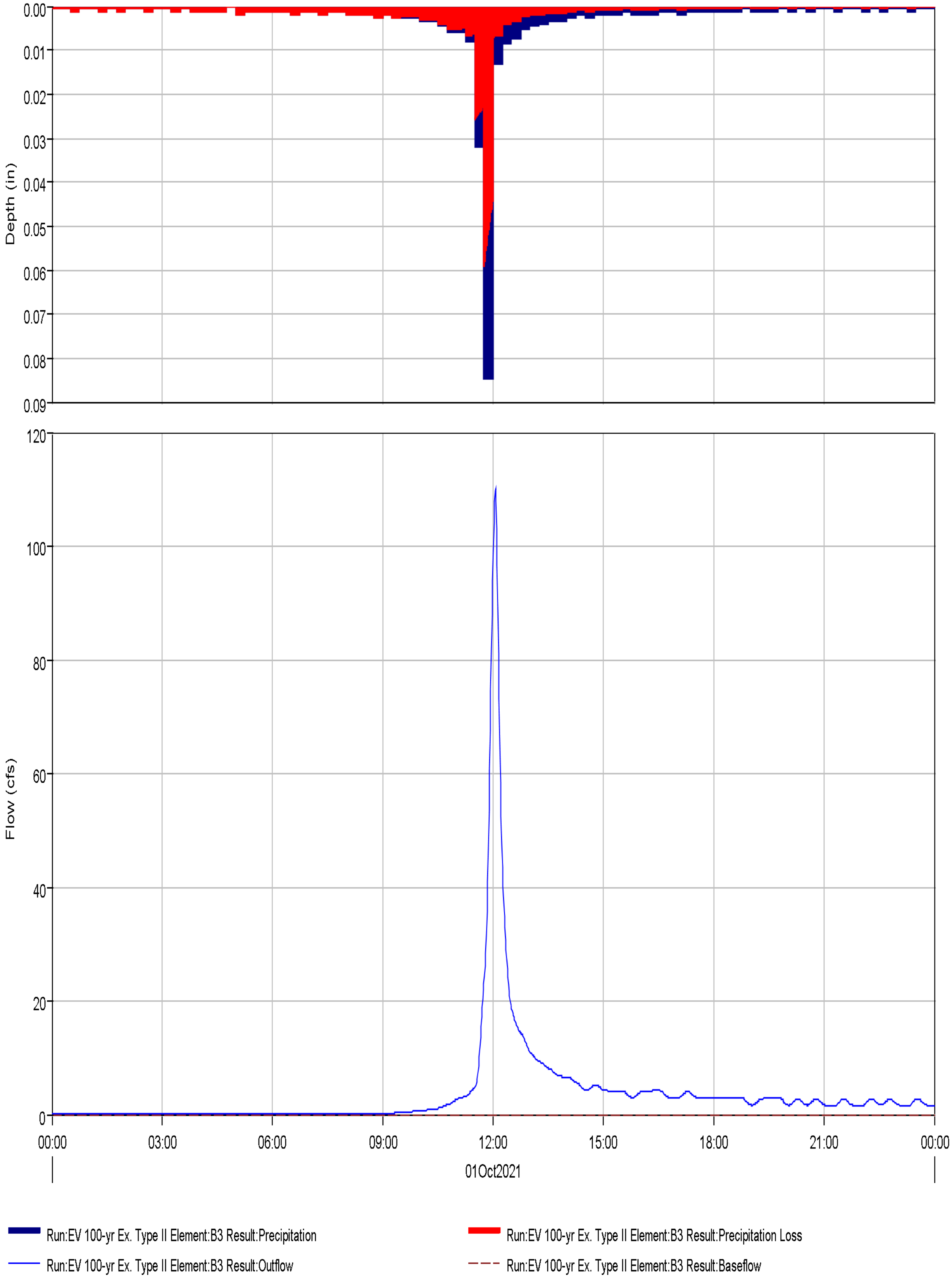
Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Existing
End of Run:	02Oct2021, 00:00	Meteorologic Model:	100-yr Type II
Compute Time:	11Mar2022, 10:12:01	Control Specifications:	24-hr Storm

Volume Units: AC-FT

Computed Results

Peak Discharge :	48.5 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:15
Total Precipitation :	15.9 (AC-FT)	Total Direct Runoff :	5.3 (AC-FT)
Total Loss :	10.5 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	5.4 (AC-FT)	Discharge :	5.3 (AC-FT)

Subbasin "B3" Results for Run "EV 100-yr Ex. Type II"



Project: Eagleview_Subdivision
Simulation Run: EV 100-yr Ex. Type II Subbasin: B3

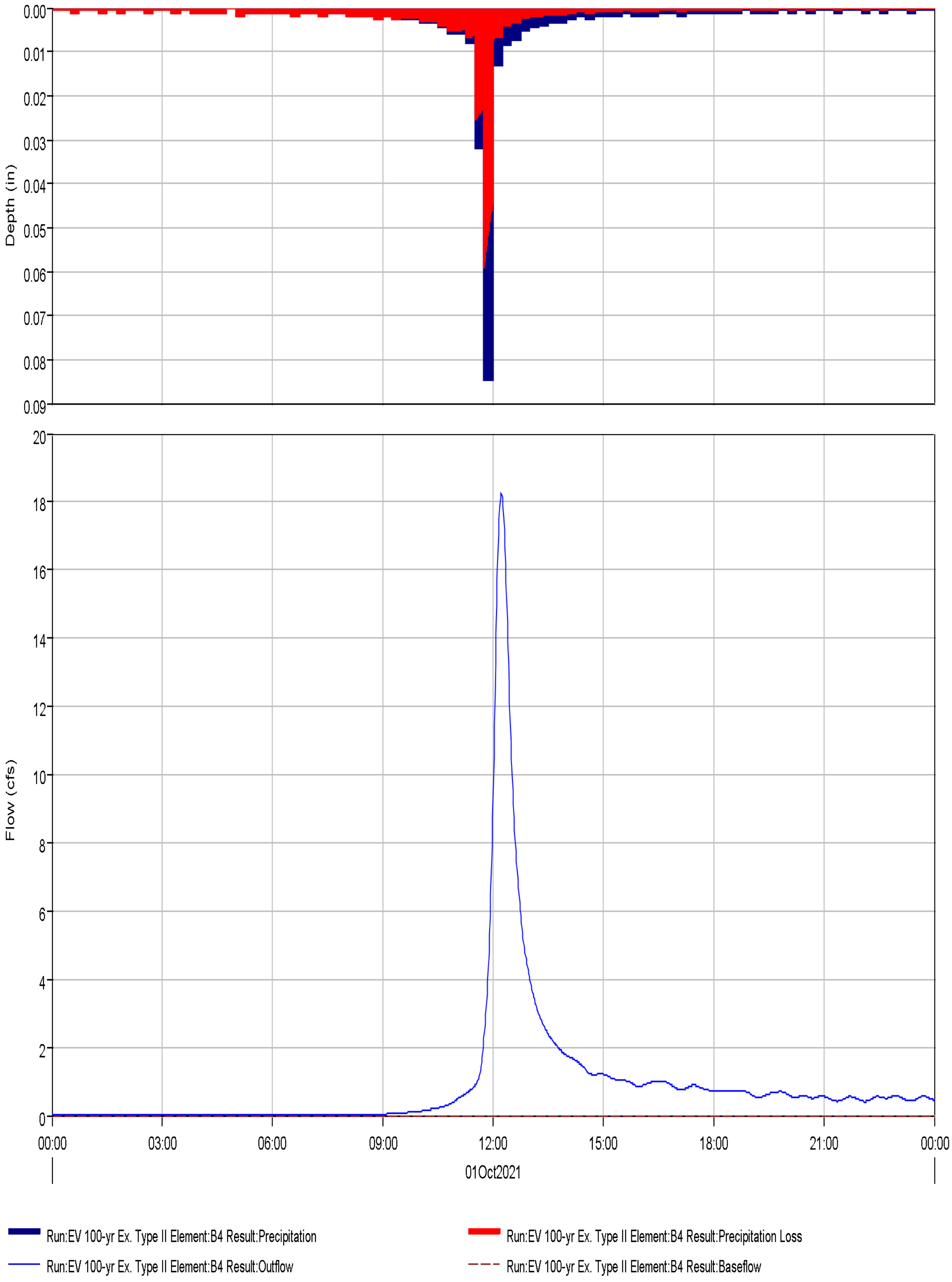
Start of Run: 01Oct2021, 00:00
Basin Model: Eagleview_Existing
End of Run: 02Oct2021, 00:00
Meteorologic Model: 100-yr Type II
Compute Time: 11Mar2022, 10:12:01
Control Specifications: 24-hr Storm

Volume Units: AC-FT

Computed Results

Peak Discharge : 110.0 (CFS)
Date/Time of Peak Discharge : 01Oct2021, 12:04
Total Precipitation : 22.8 (AC-FT)
Total Direct Runoff : 7.8 (AC-FT)
Total Loss : 15.0 (AC-FT)
Total Baseflow : 0.0 (AC-FT)
Total Excess : 7.8 (AC-FT)
Discharge : 7.8 (AC-FT)

Subbasin "B4" Results for Run "EV 100-yr Ex. Type II"



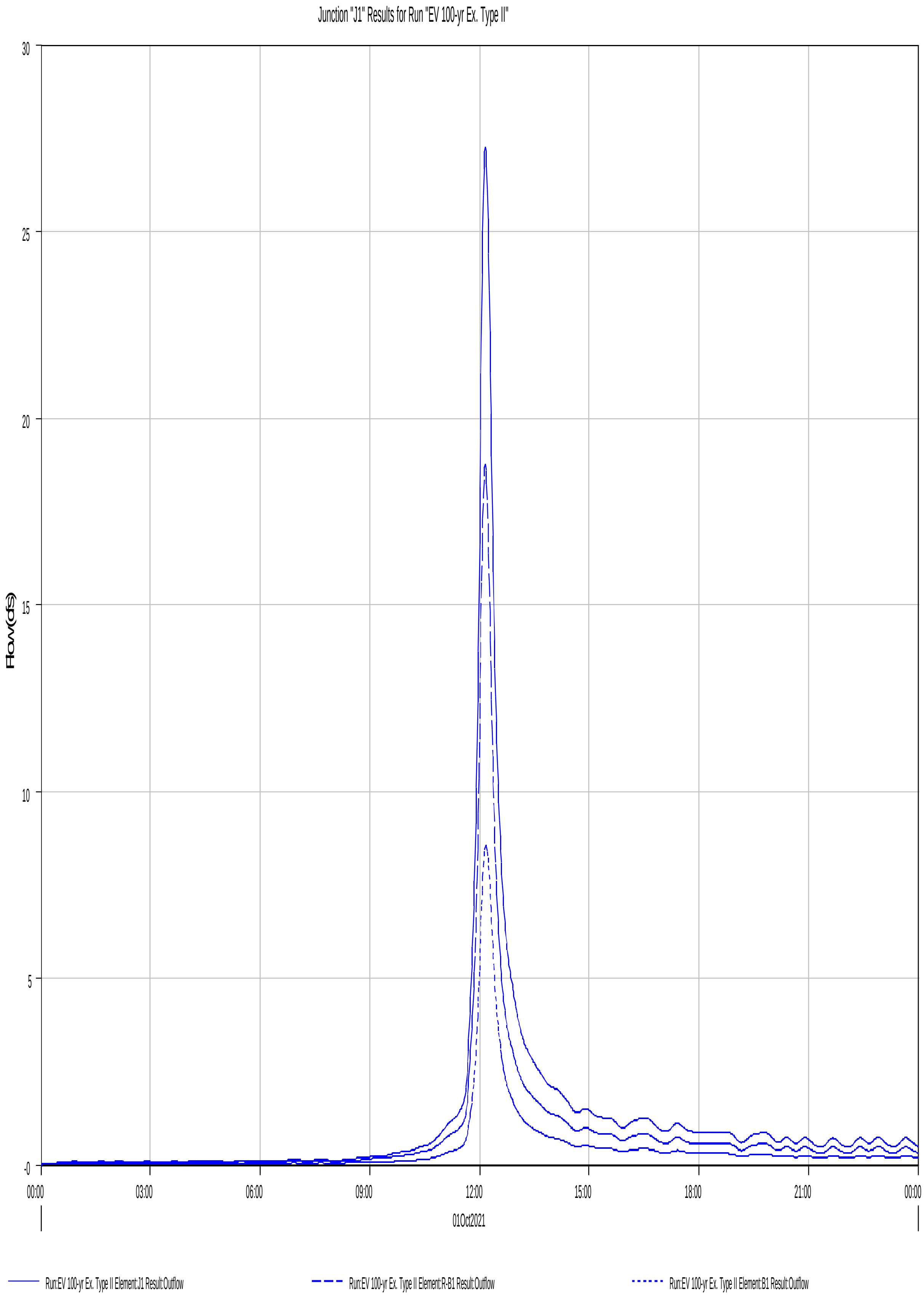
Project: Eagleview_Subdivision
Simulation Run: EV 100-yr Ex. Type II Subbasin: B4

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Existing
End of Run:	02Oct2021, 00:00	Meteorologic Model:	100-yr Type II
Compute Time:	11Mar2022, 10:12:01	Control Specifications:	24-hr Storm

Volume Units: AC-FT

Computed Results

Peak Discharge :	18.2 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:13
Total Precipitation :	5.6 (AC-FT)	Total Direct Runoff :	1.9 (AC-FT)
Total Loss :	3.7 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	1.9 (AC-FT)	Discharge :	1.9 (AC-FT)


Junction "J1" Results for Run "EV 100-yr Ex. Type II"
Flow (cfs)
30
25
20
15
10
5
-0
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
00:00
01Oct2021
Run:EV 100-yr Ex. Type II Element:J1 Result:Outflow
Run:EV 100-yr Ex. Type II Element:R-B1 Result:Outflow
Run:EV 100-yr Ex. Type II Element:B1 Result:Outflow

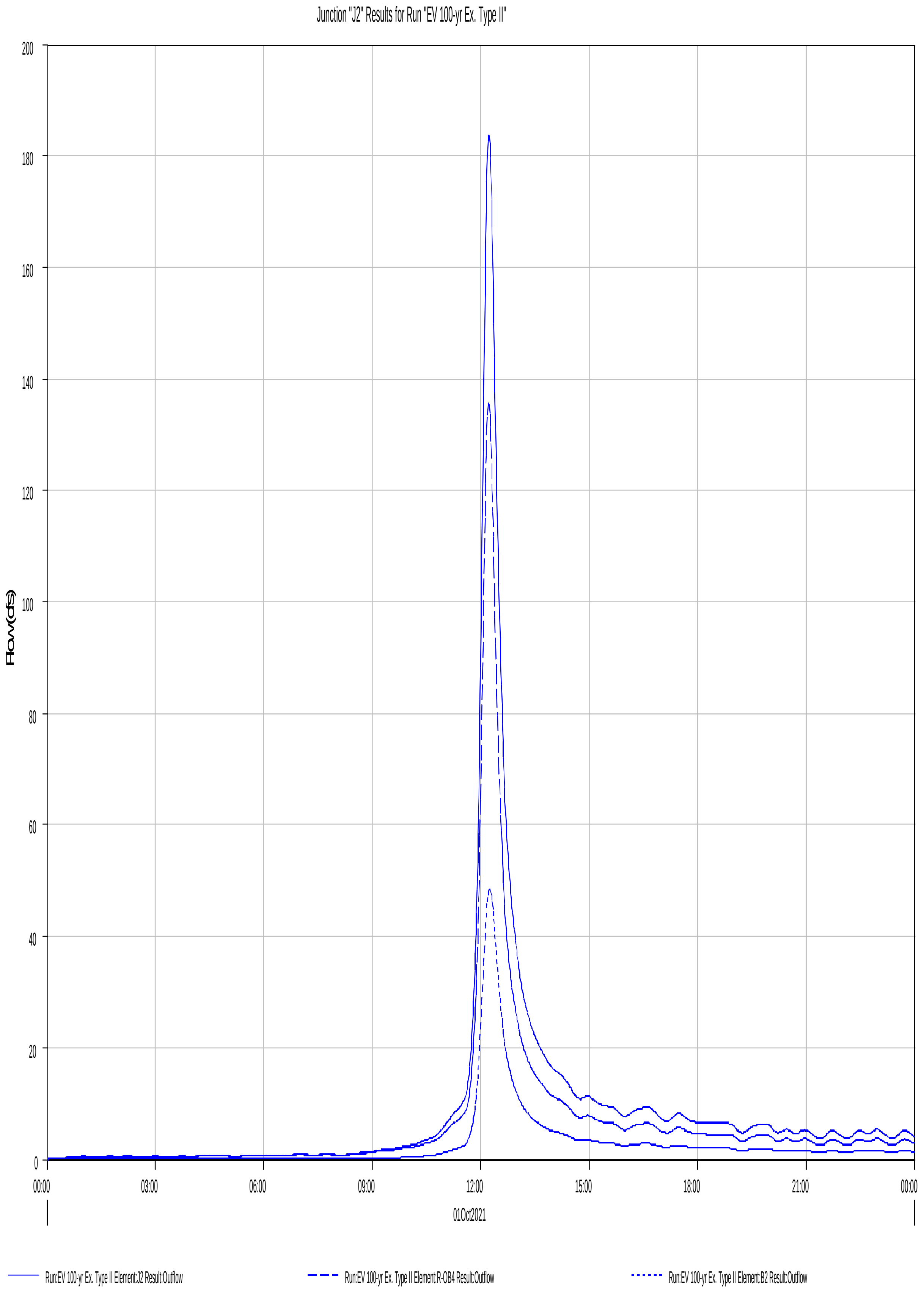
Project: Eagleview_Subdivision
Simulation Run: EV 100-yr Ex. Type II Junction: J1

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Existing
End of Run:	02Oct2021, 00:00	Meteorologic Model:	100-yr Type II
Compute Time:	11Mar2022, 10:12:01	Control Specifications:	24-hr Storm

Volume Units: AC-FT

Computed Results

Peak Outflow :	27.3 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 12:10
Total Outflow :	2.5 (AC-FT)		



Junction "J2" Results for Run "EV 100-yr Ex. Type II"

Project: Eagleview_Subdivision
Simulation Run: EV 100-yr Ex. Type II Junction: J2

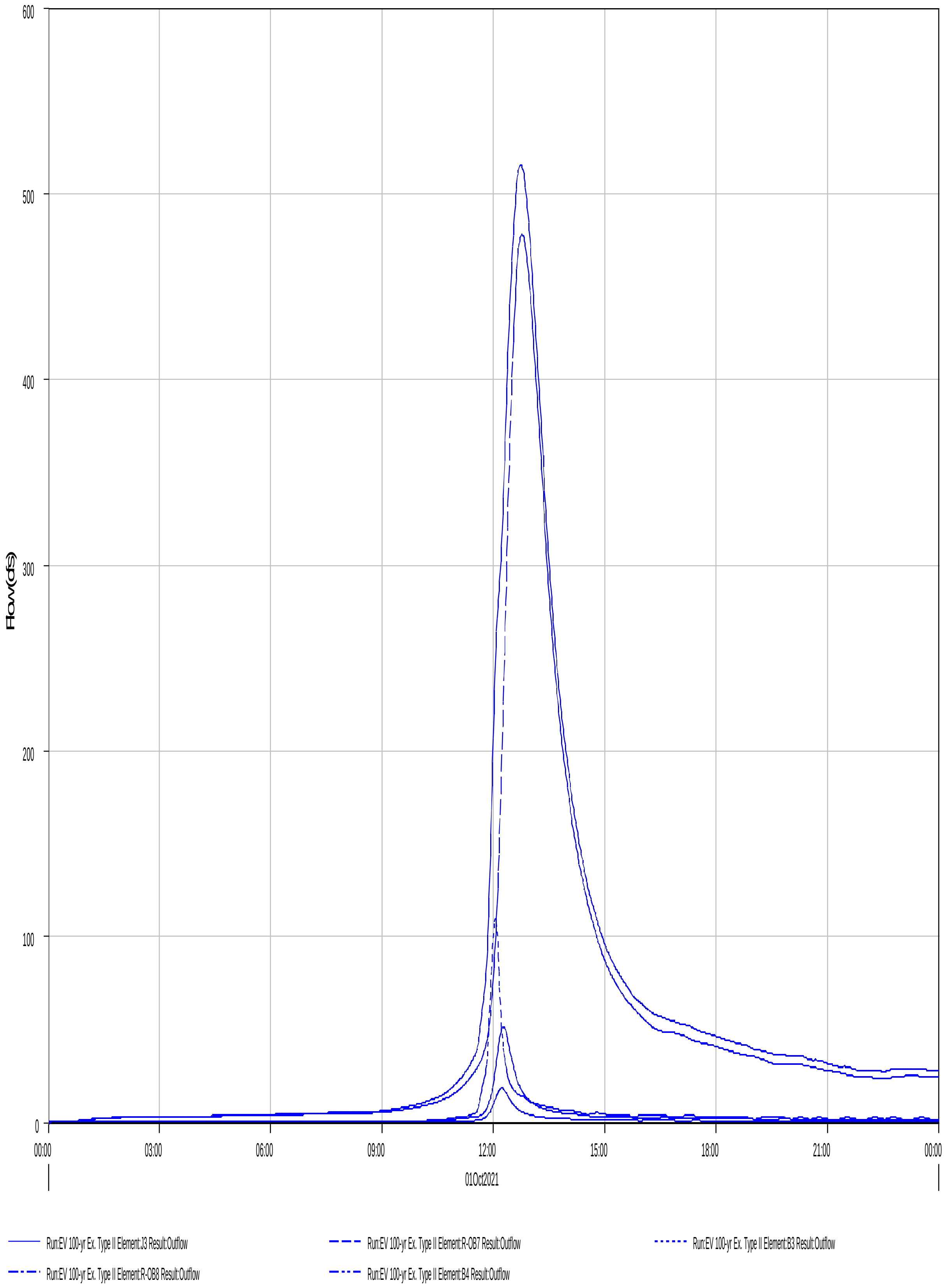
Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Existing
End of Run:	02Oct2021, 00:00	Meteorologic Model:	100-yr Type II
Compute Time:	11Mar2022, 10:12:01	Control Specifications:	24-hr Storm

Volume Units: AC-FT

Computed Results

Peak Outflow :	183.8 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 12:13
Total Outflow :	18.8 (AC-FT)		

Junction "J3" Results for Run "EV 100-yr Ex. Type II"



Project: Eagleview_Subdivision
Simulation Run: EV 100-yr Ex. Type II Junction: J3

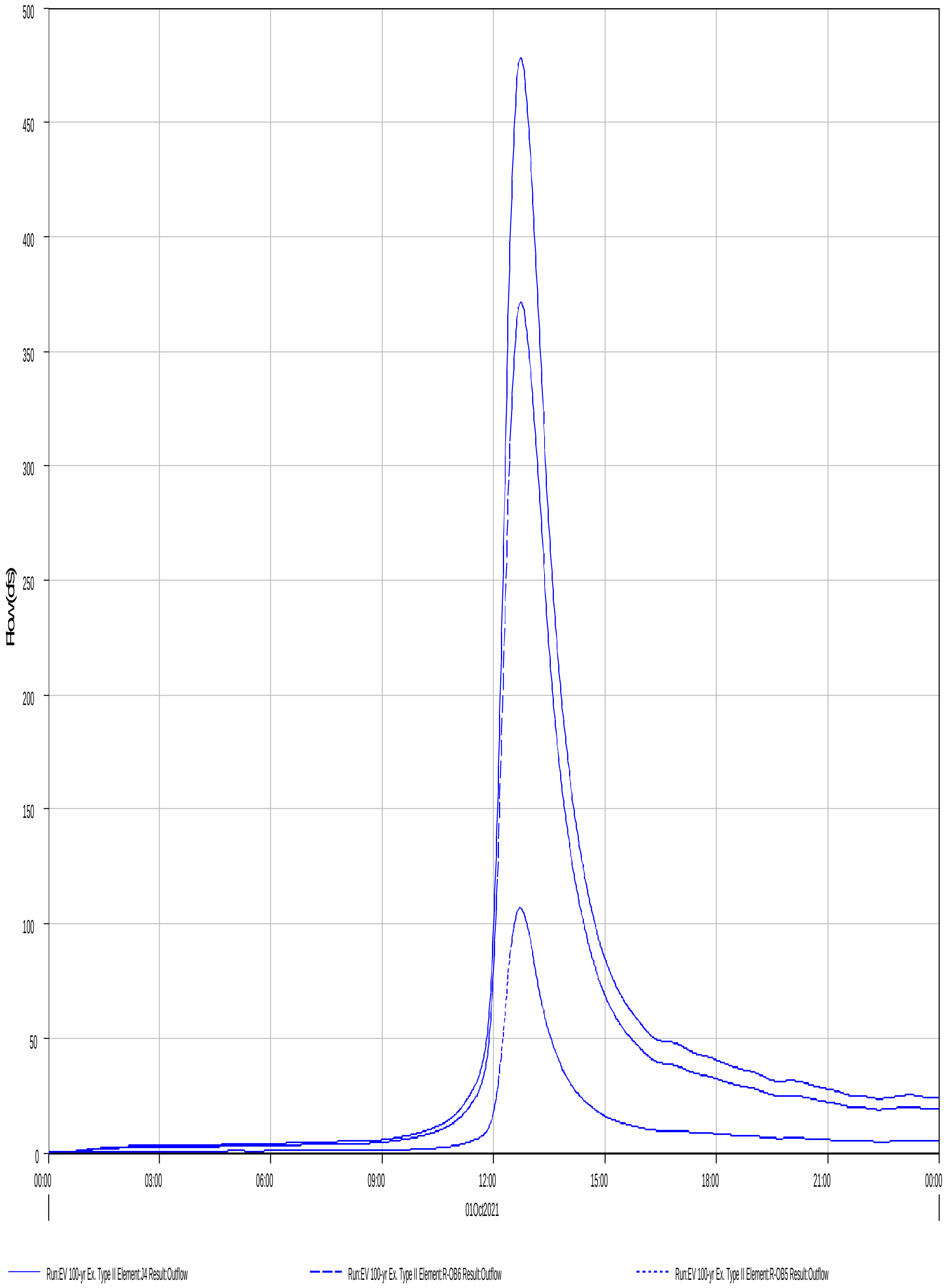
Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Existing
End of Run:	02Oct2021, 00:00	Meteorologic Model:	100-yr Type II
Compute Time:	11Mar2022, 10:12:01	Control Specifications:	24-hr Storm

Volume Units: AC-FT

Computed Results

Peak Outflow :	515.5 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 12:44
Total Outflow :	112.7 (AC-FT)		

Junction "J4" Results for Run "EV 100-yr Ex. Type II"



Project: Eagleview_Subdivision

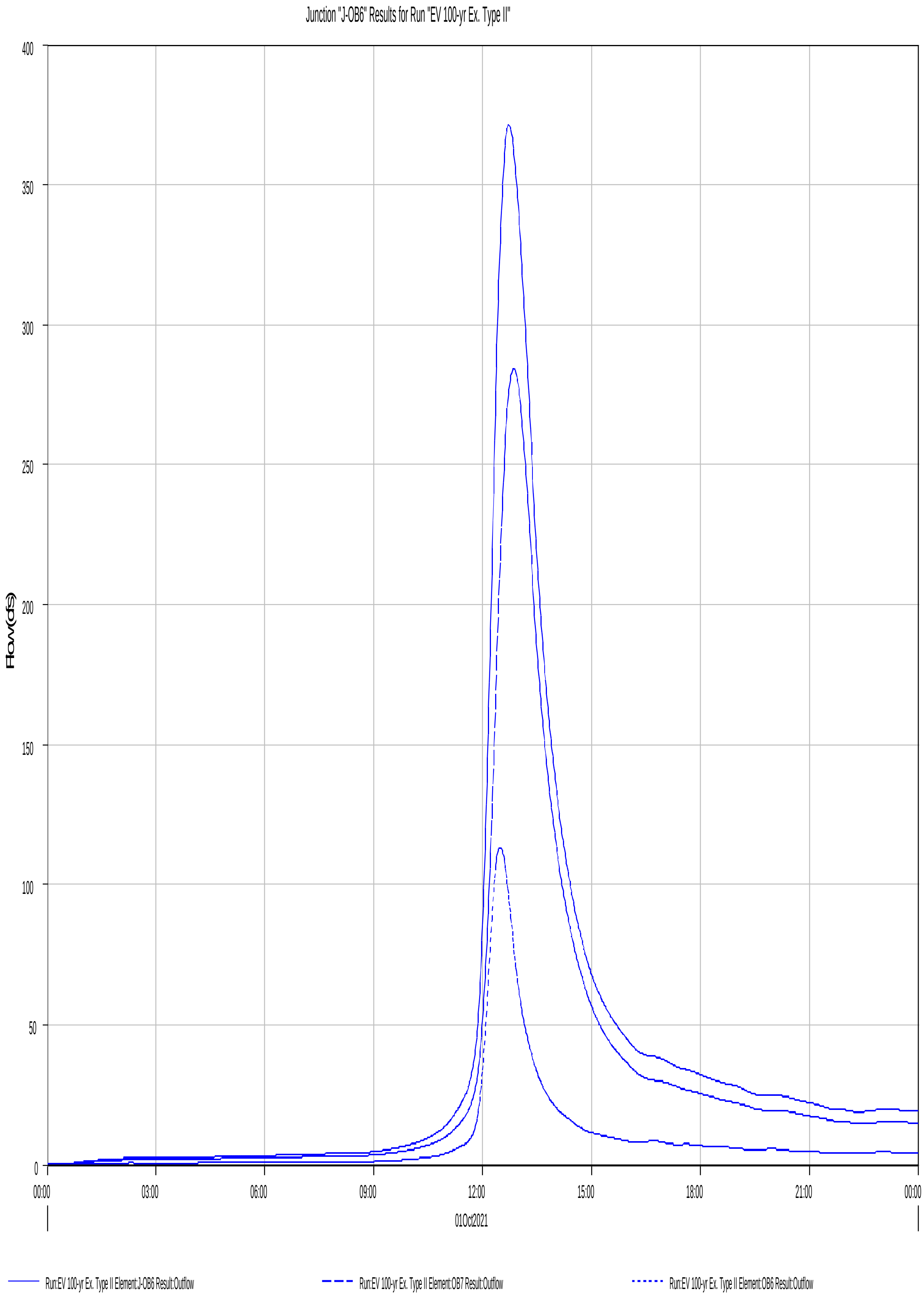
Simulation Run: EV 100-yr Ex. Type II Junction: J4

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Existing
End of Run:	02Oct2021, 00:00	Meteorologic Model:	100-yr Type II
Compute Time:	11Mar2022, 10:12:01	Control Specifications:	24-hr Storm

Volume Units: IN

Computed Results

Peak Outflow :	478.0 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 12:44
Total Outflow :	1.72 (IN)		


Junction "J-OB6" Results for Run "EV 100-yr Ex. Type II"

Project: Eagleview_Subdivision
Simulation Run: EV 100-yr Ex. Type II Junction: J-OB6

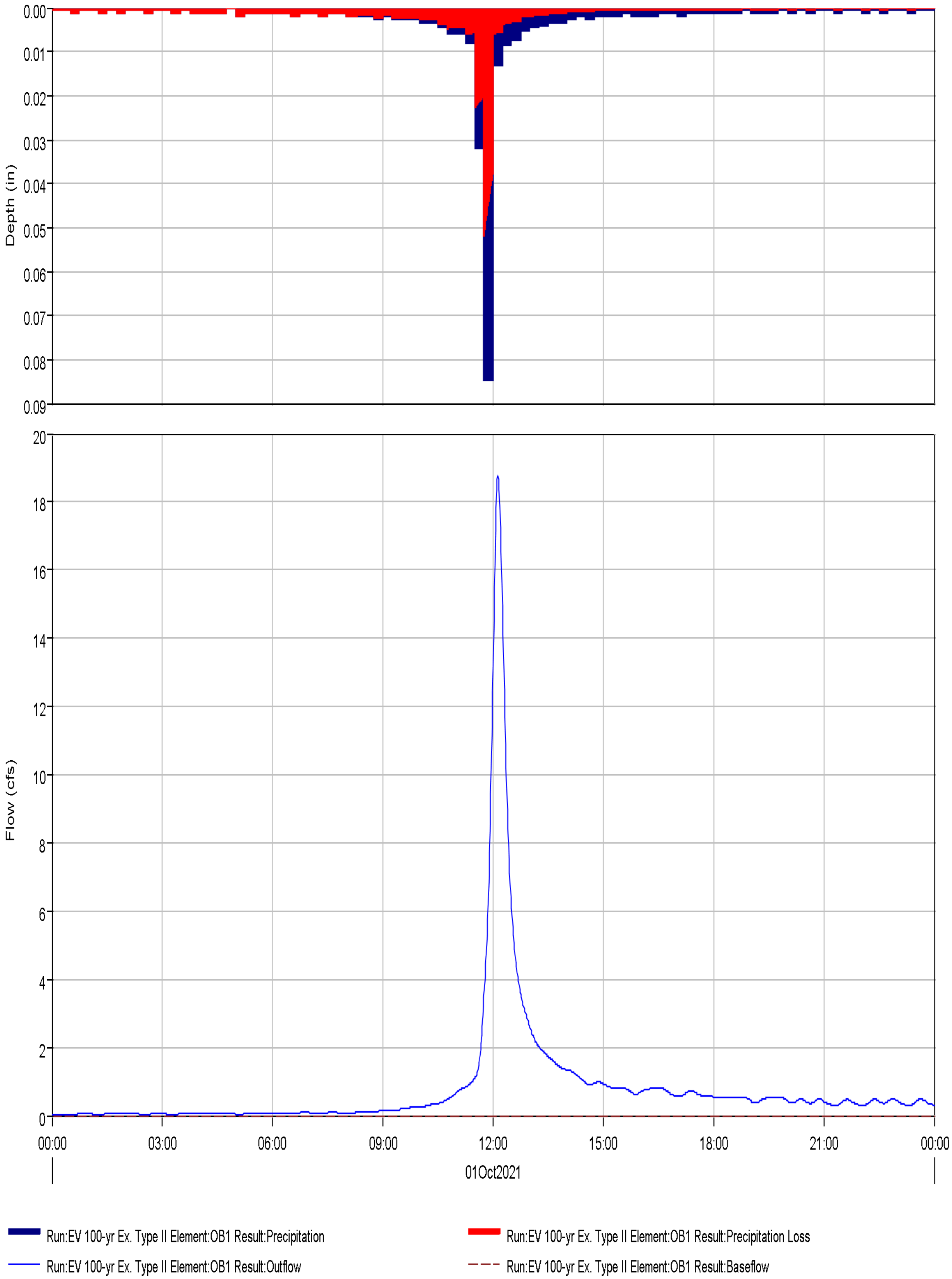
Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Existing
End of Run:	02Oct2021, 00:00	Meteorologic Model:	100-yr Type II
Compute Time:	11Mar2022, 10:12:01	Control Specifications:	24-hr Storm

Volume Units: AC-FT

Computed Results

Peak Outflow :	371.3 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 12:43
Total Outflow :	78.1 (AC-FT)		

Subbasin "OB1" Results for Run "EV 100-yr Ex. Type II"



Project: Eagleview_Subdivision
Simulation Run: EV 100-yr Ex. Type II Subbasin: OB1

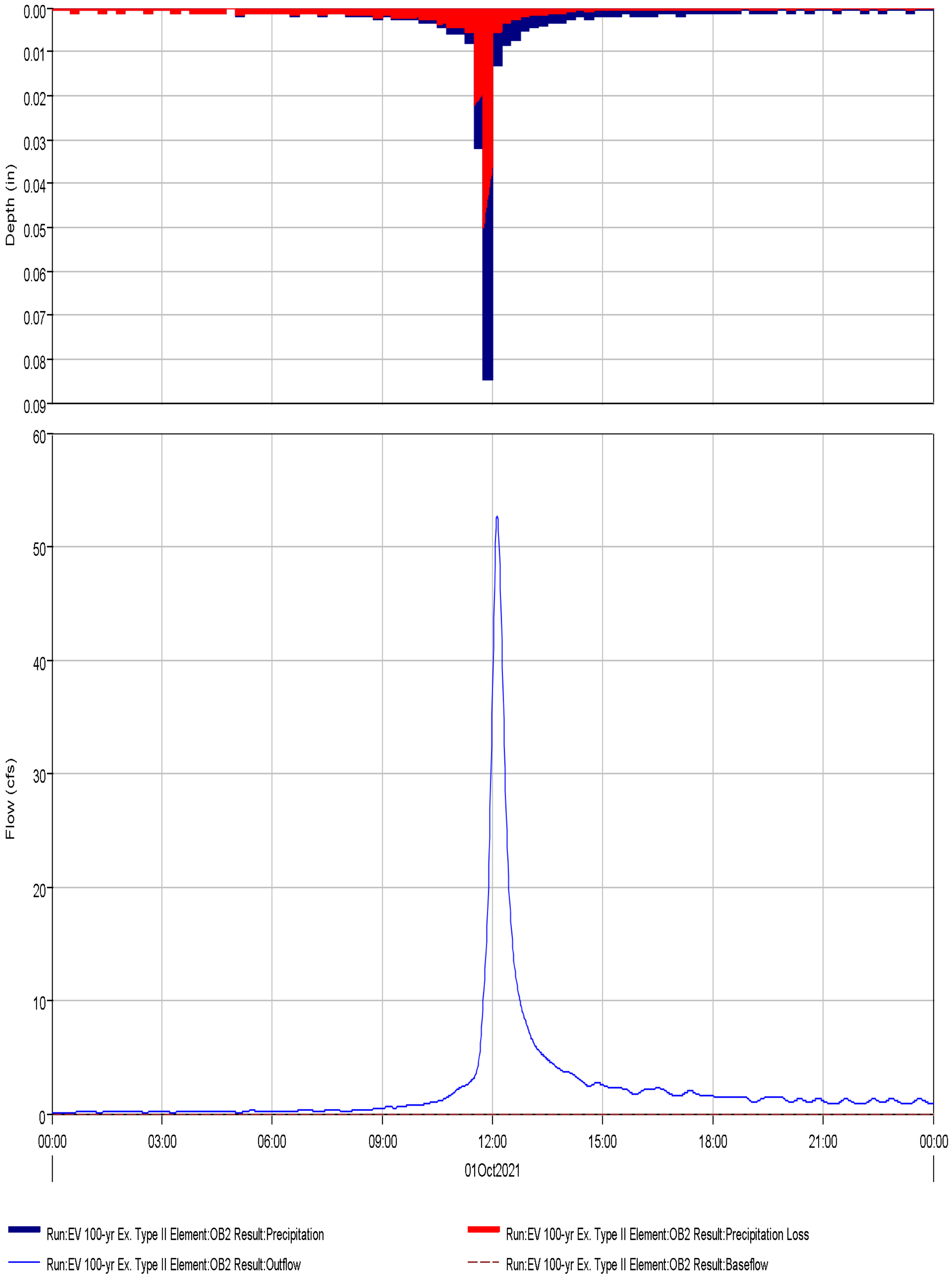
Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Existing
End of Run:	02Oct2021, 00:00	Meteorologic Model:	100-yr Type II
Compute Time:	11Mar2022, 10:12:01	Control Specifications:	24-hr Storm

Volume Units: AC-FT

Computed Results

Peak Discharge :	18.8 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:08
Total Precipitation :	4.0 (AC-FT)	Total Direct Runoff :	1.7 (AC-FT)
Total Loss :	2.3 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	1.7 (AC-FT)	Discharge :	1.7 (AC-FT)

Subbasin "OB2" Results for Run "EV 100-yr Ex. Type II"



Project: Eagleview_Subdivision
Simulation Run: EV 100-yr Ex. Type II Subbasin: OB2

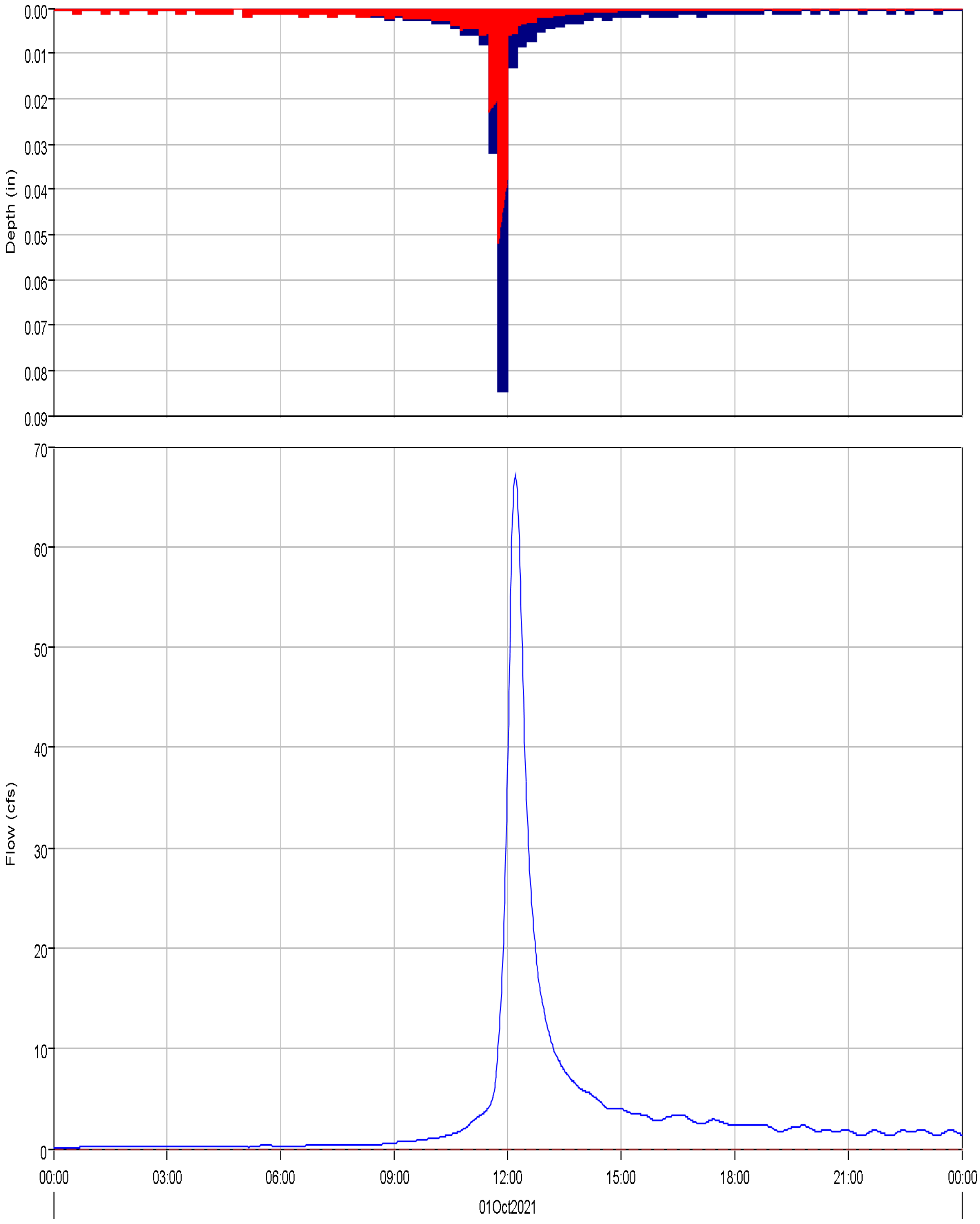
Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Existing
End of Run:	02Oct2021, 00:00	Meteorologic Model:	100-yr Type II
Compute Time:	11Mar2022, 10:12:01	Control Specifications:	24-hr Storm

Volume Units: AC-FT

Computed Results

Peak Discharge :	52.7 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:08
Total Precipitation :	10.8 (AC-FT)	Total Direct Runoff :	4.7 (AC-FT)
Total Loss :	6.0 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	4.7 (AC-FT)	Discharge :	4.7 (AC-FT)

Subbasin "OB3" Results for Run "EV 100-yr Ex. Type II"



🟦 Run:EV 100-yr Ex. Type II Element:OB3 Result:Precipitation

🟥 Run:EV 100-yr Ex. Type II Element:OB3 Result:Precipitation Loss

— Run:EV 100-yr Ex. Type II Element:OB3 Result:Outflow

-- Run:EV 100-yr Ex. Type II Element:OB3 Result:Baseflow

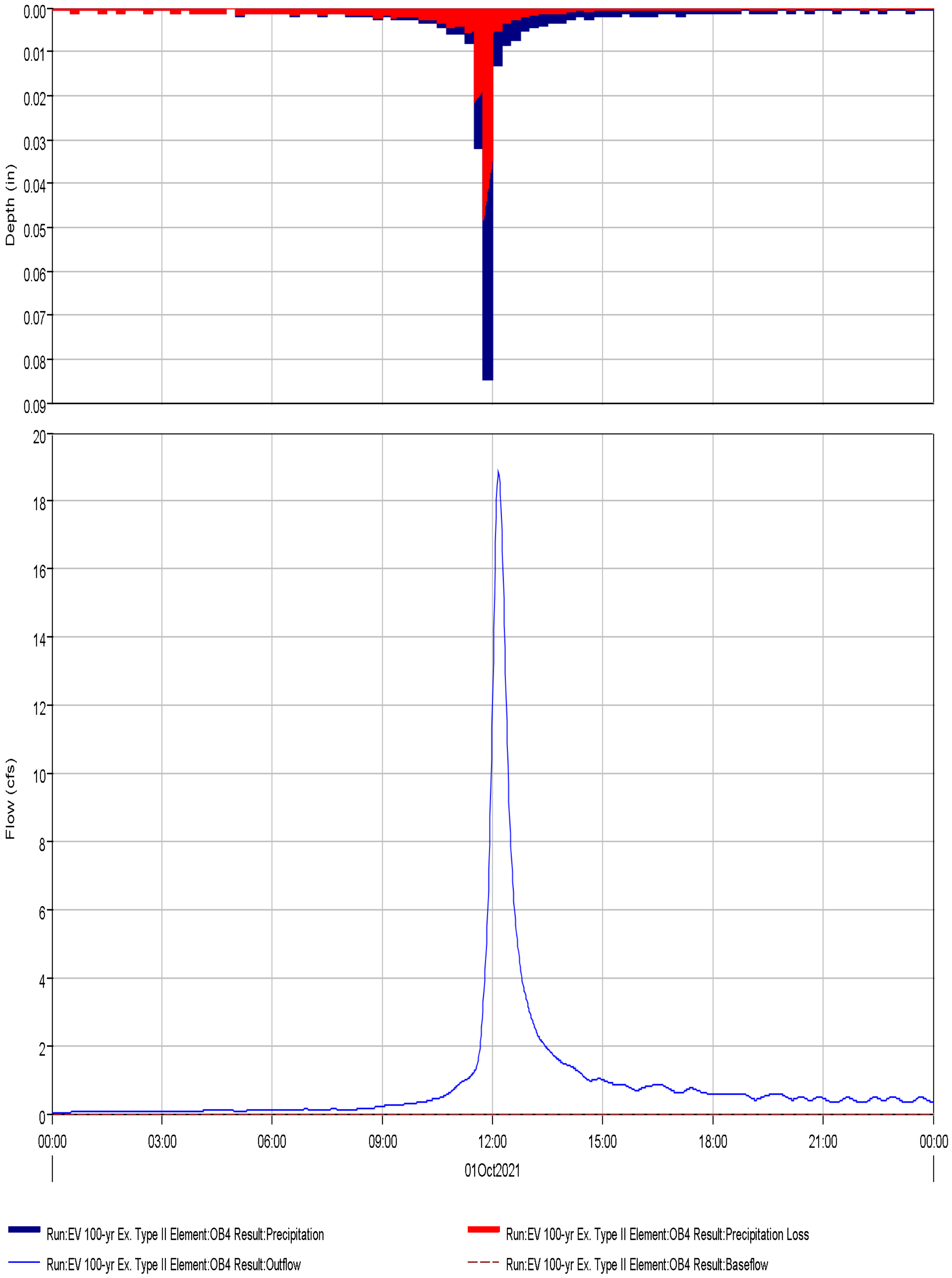
Project: Eagleview_Subdivision
Simulation Run: EV 100-yr Ex. Type II Subbasin: OB3

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Existing
End of Run:	02Oct2021, 00:00	Meteorologic Model:	100-yr Type II
Compute Time:	11Mar2022, 10:12:01	Control Specifications:	24-hr Storm

Volume Units: AC-FT

Computed Results

Peak Discharge :	67.1 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:12
Total Precipitation :	16.7 (AC-FT)	Total Direct Runoff :	6.9 (AC-FT)
Total Loss :	9.7 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	7.0 (AC-FT)	Discharge :	6.9 (AC-FT)



Subbasin "OB4" Results for Run "EV 100-yr Ex. Type II"

Project: Eagleview_Subdivision

Simulation Run: EV 100-yr Ex. Type II Subbasin: OB4

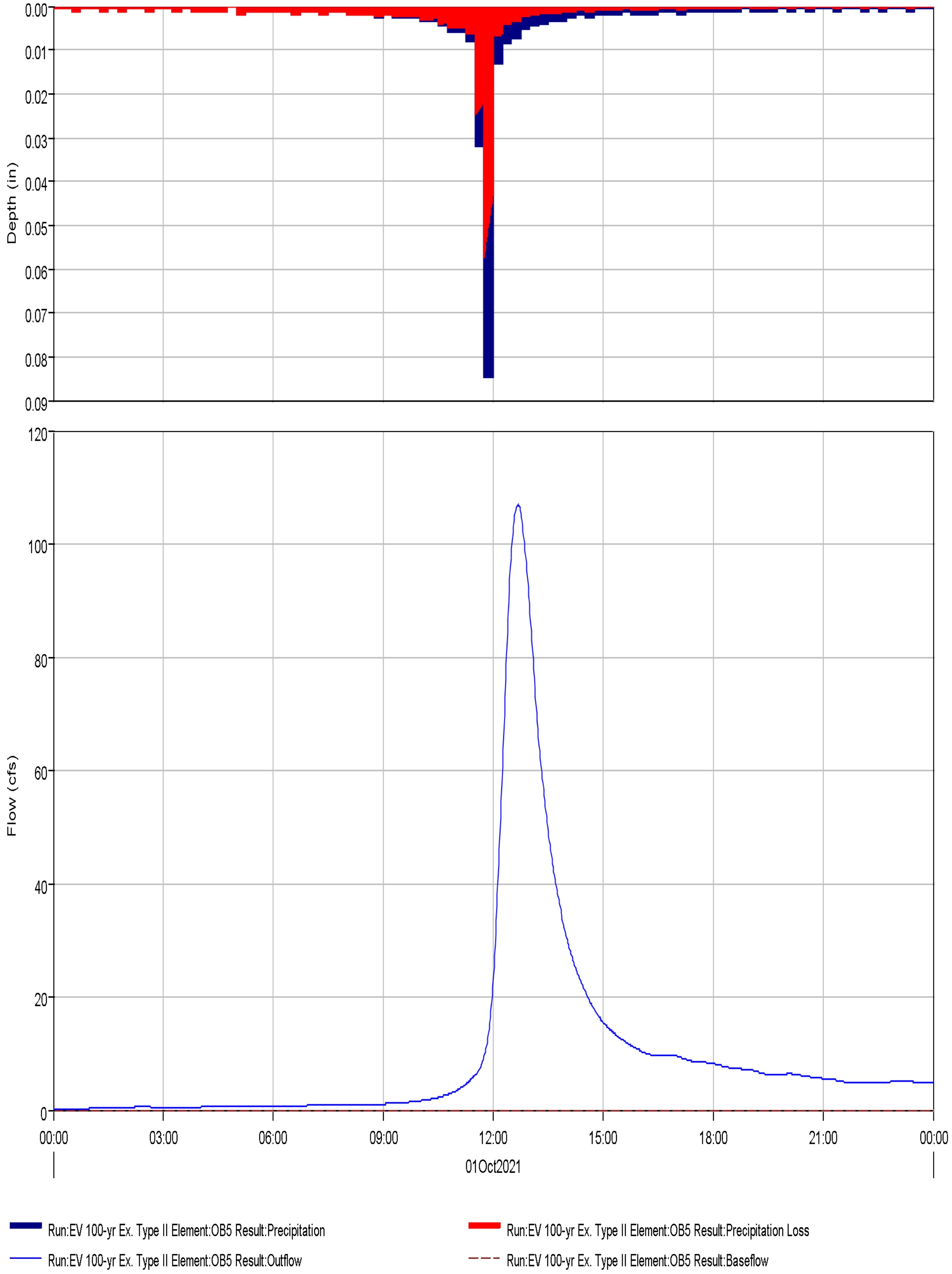
Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Existing
End of Run:	02Oct2021, 00:00	Meteorologic Model:	100-yr Type II
Compute Time:	11Mar2022, 10:12:01	Control Specifications:	24-hr Storm

Volume Units: AC-FT

Computed Results

Peak Discharge :	18.9 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:10
Total Precipitation :	4.0 (AC-FT)	Total Direct Runoff :	1.8 (AC-FT)
Total Loss :	2.2 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	1.8 (AC-FT)	Discharge :	1.8 (AC-FT)

Subbasin "OB5" Results for Run "EV 100-yr Ex. Type II"



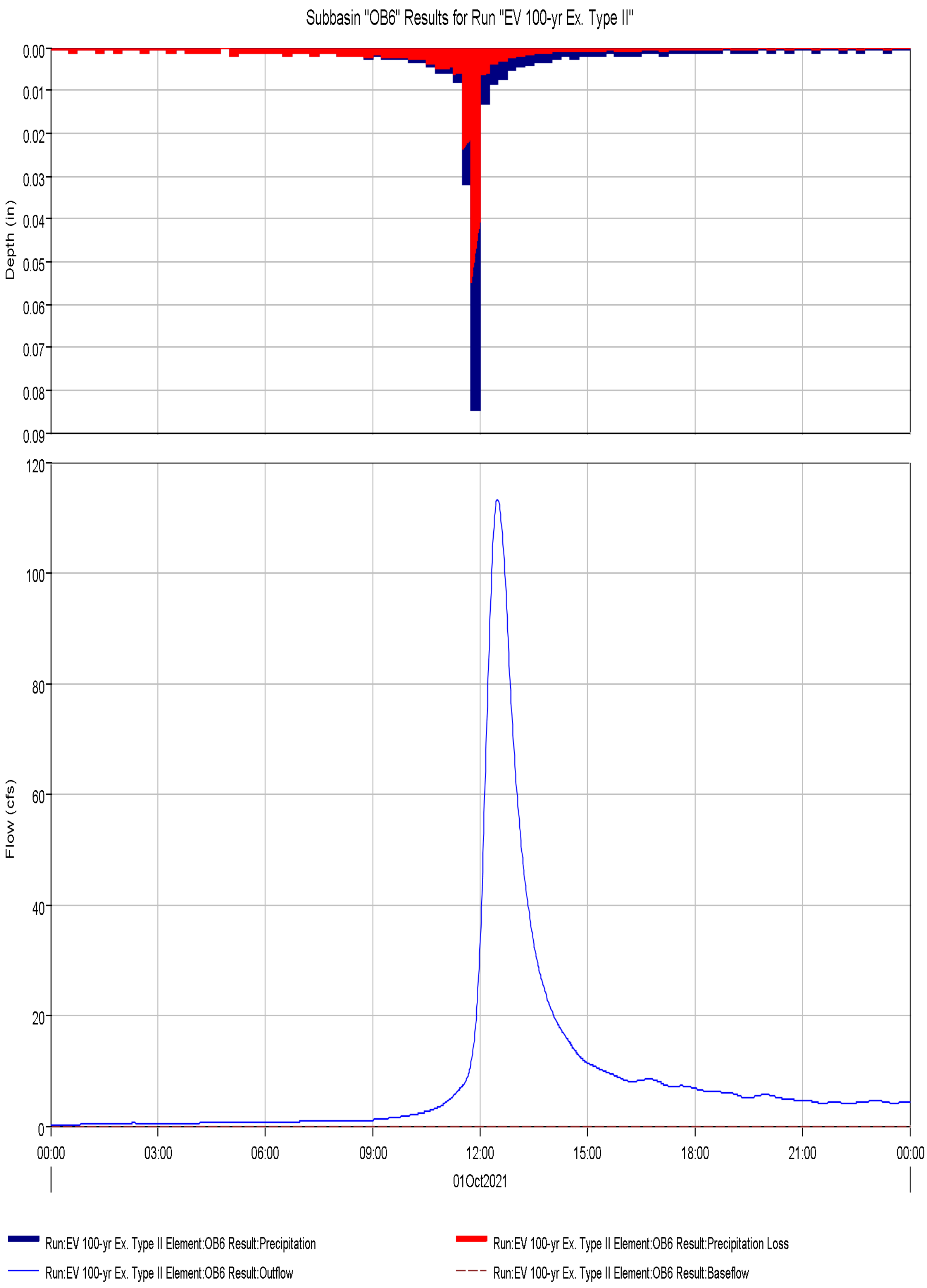
Project: Eagleview_Subdivision
Simulation Run: EV 100-yr Ex. Type II Subbasin: OB5

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Existing
End of Run:	02Oct2021, 00:00	Meteorologic Model:	100-yr Type II
Compute Time:	11Mar2022, 10:12:01	Control Specifications:	24-hr Storm

Volume Units: AC-FT

Computed Results

Peak Discharge :	106.9 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:40
Total Precipitation :	55.1 (AC-FT)	Total Direct Runoff :	19.7 (AC-FT)
Total Loss :	35.0 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	20.1 (AC-FT)	Discharge :	19.7 (AC-FT)


Subbasin "OB6" Results for Run "EV 100-yr Ex. Type II"
Depth (in)
0.00
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
Flow (cfs)
120
100
80
60
40
20
0
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
00:00
01Oct2021
Run:EV 100-yr Ex. Type II Element:OB6 Result:Precipitation
Run:EV 100-yr Ex. Type II Element:OB6 Result:Precipitation Loss
Run:EV 100-yr Ex. Type II Element:OB6 Result:Outflow
Run:EV 100-yr Ex. Type II Element:OB6 Result:Baseflow

Project: Eagleview_Subdivision
Simulation Run: EV 100-yr Ex. Type II Subbasin: OB6

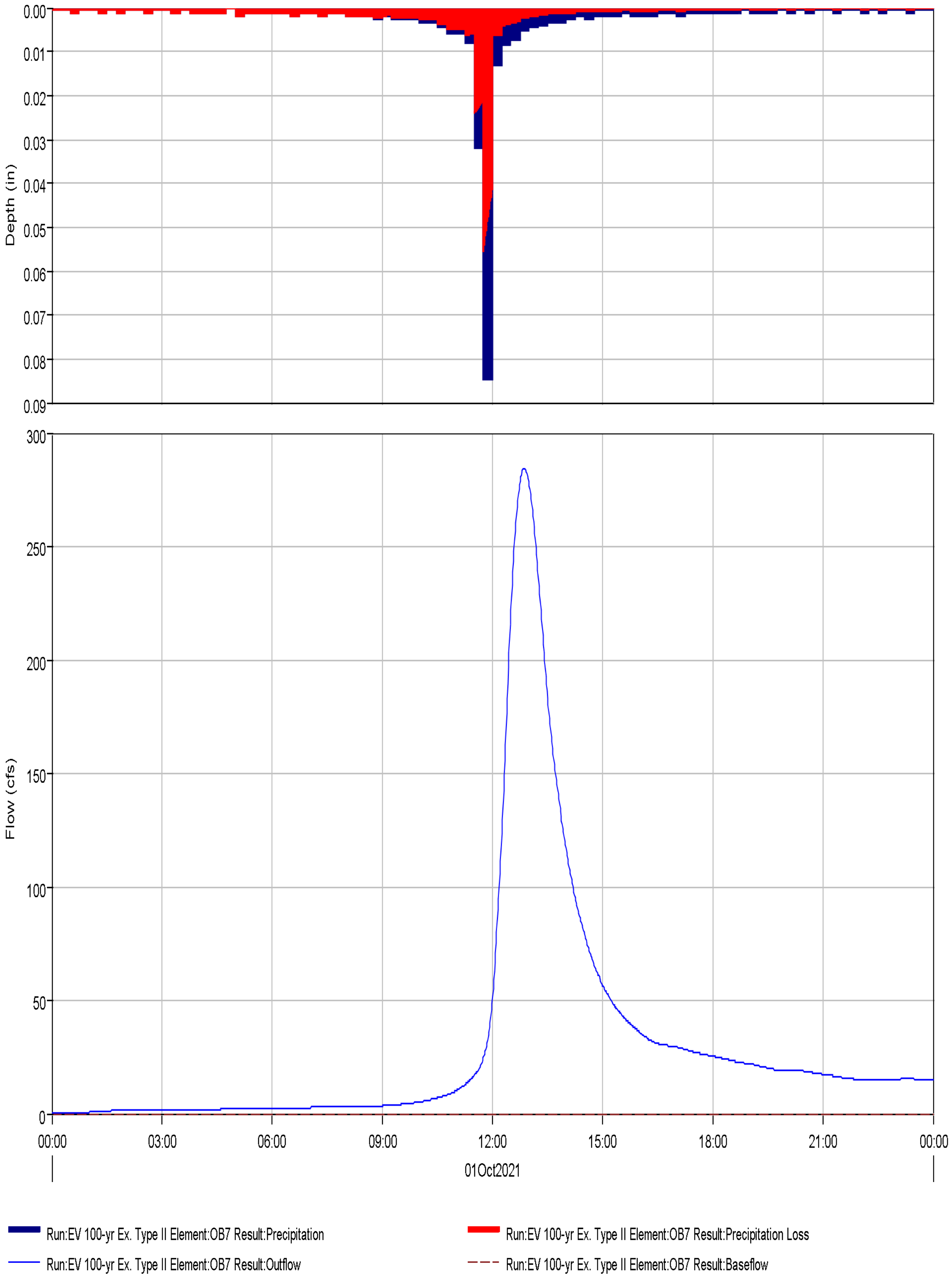
Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Existing
End of Run:	02Oct2021, 00:00	Meteorologic Model:	100-yr Type II
Compute Time:	11Mar2022, 10:12:01	Control Specifications:	24-hr Storm

Volume Units: AC-FT

Computed Results

Peak Discharge :	113.2 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:29
Total Precipitation :	45.4 (AC-FT)	Total Direct Runoff :	17.5 (AC-FT)
Total Loss :	27.6 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	17.8 (AC-FT)	Discharge :	17.5 (AC-FT)

Subbasin "OB7" Results for Run "EV 100-yr Ex. Type II"



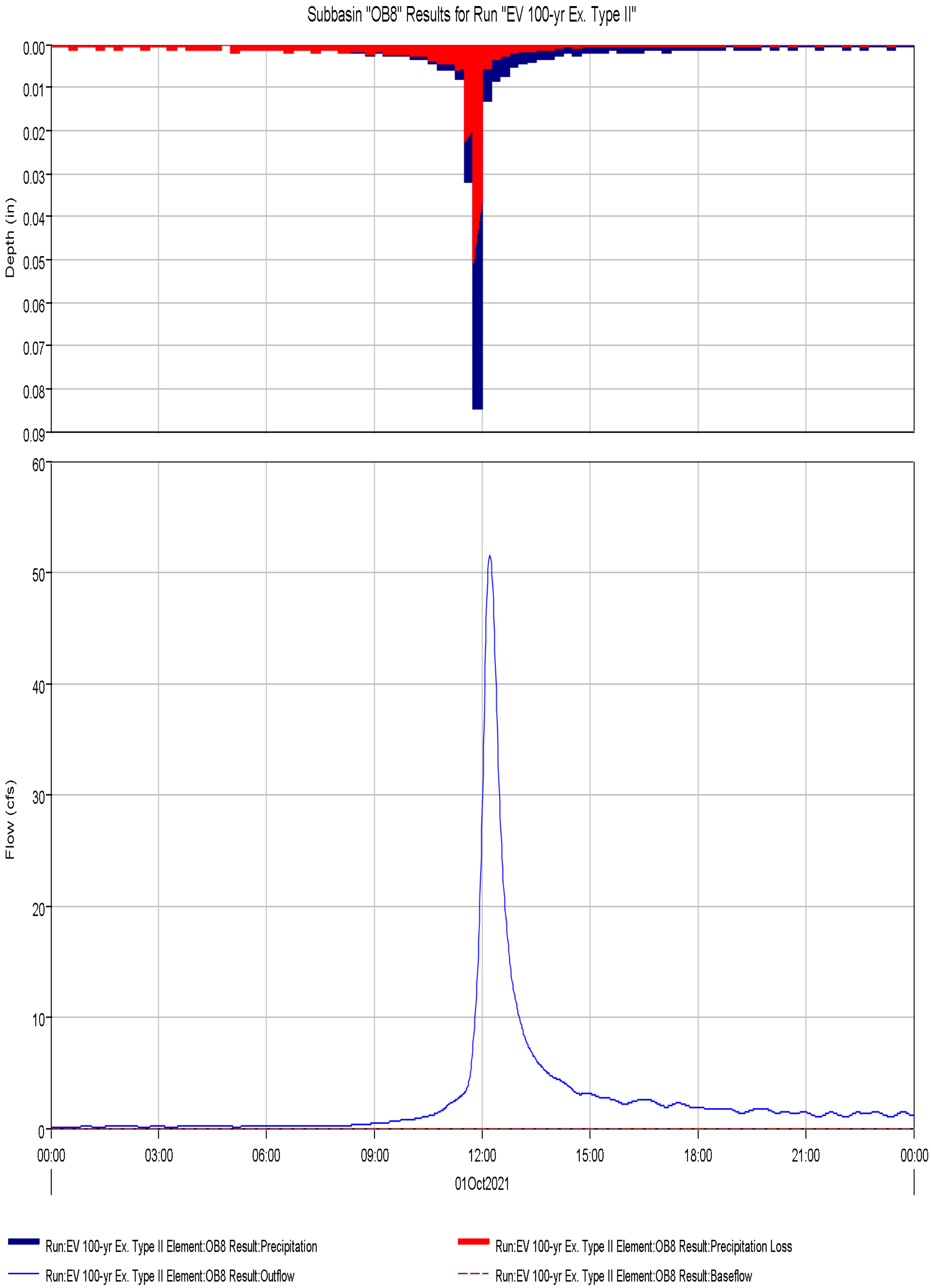
Project: Eagleview_Subdivision
Simulation Run: EV 100-yr Ex. Type II Subbasin: OB7

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Existing
End of Run:	02Oct2021, 00:00	Meteorologic Model:	100-yr Type II
Compute Time:	11Mar2022, 10:12:01	Control Specifications:	24-hr Storm

Volume Units: AC-FT

Computed Results

Peak Discharge :	284.2 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:52
Total Precipitation :	161.5 (AC-FT)	Total Direct Runoff :	60.6 (AC-FT)
Total Loss :	99.5 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	62.0 (AC-FT)	Discharge :	60.6 (AC-FT)


Subbasin "OB8" Results for Run "EV 100-yr Ex. Type II"
Depth (in)
0.00
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
Flow (cfs)
60
50
40
30
20
10
0
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
00:00
01Oct2021
Run:EV 100-yr Ex. Type II Element:OB8 Result:Precipitation
Run:EV 100-yr Ex. Type II Element:OB8 Result:Precipitation Loss
Run:EV 100-yr Ex. Type II Element:OB8 Result:Outflow
Run:EV 100-yr Ex. Type II Element:OB8 Result:Baseflow

Project: Eagleview_Subdivision
Simulation Run: EV 100-yr Ex. Type II Subbasin: OB8

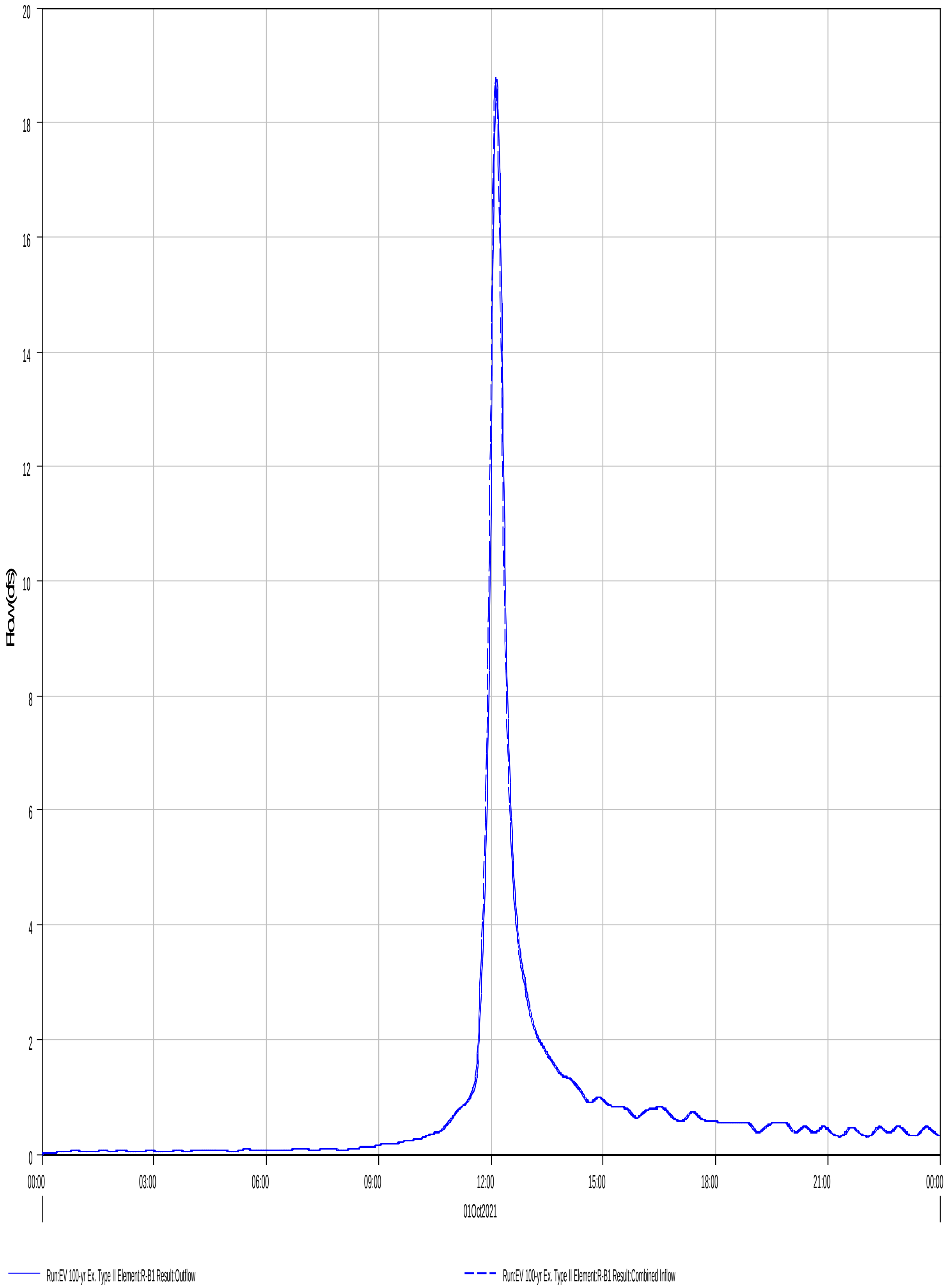
Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Existing
End of Run:	02Oct2021, 00:00	Meteorologic Model:	100-yr Type II
Compute Time:	11Mar2022, 10:12:01	Control Specifications:	24-hr Storm

Volume Units: AC-FT

Computed Results

Peak Discharge :	51.6 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:13
Total Precipitation :	12.7 (AC-FT)	Total Direct Runoff :	5.4 (AC-FT)
Total Loss :	7.3 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	5.4 (AC-FT)	Discharge :	5.4 (AC-FT)

Reach "R-B1" Results for Run "EV 100-yr Ex. Type II"



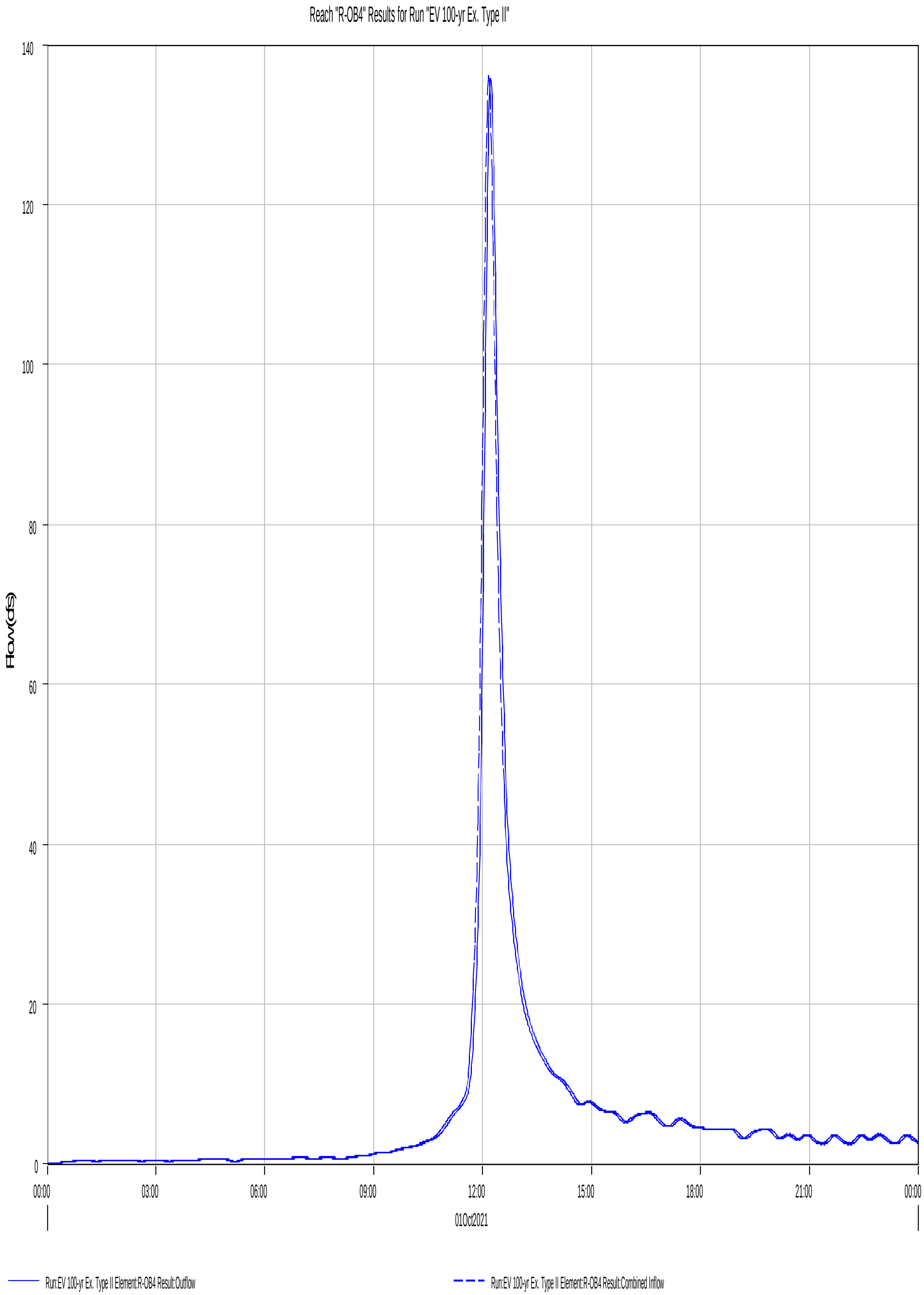
Project: Eagleview_Subdivision
Simulation Run: EV 100-yr Ex. Type II Reach: R-B1

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Existing
End of Run:	02Oct2021, 00:00	Meteorologic Model:	100-yr Type II
Compute Time:	11Mar2022, 10:12:01	Control Specifications:	24-hr Storm

Volume Units: AC-FT

Computed Results

Peak Inflow :	18.8 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 12:08
Peak Outflow :	18.7 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 12:10
Total Inflow :	1.7 (AC-FT)	Total Outflow :	1.7 (AC-FT)


Reach "R-OB4" Results for Run "EV 100-yr Ex. Type II"
Flow (cfs)
140
120
100
80
60
40
20
0
00:00
03:00
06:00
09:00
12:00
15:00
18:00
21:00
00:00
01Oct2021
Run:EV 100-yr Ex. Type II Element:R-OB4 Result:Outflow
Run:EV 100-yr Ex. Type II Element:R-OB4 Result:Combined Inflow

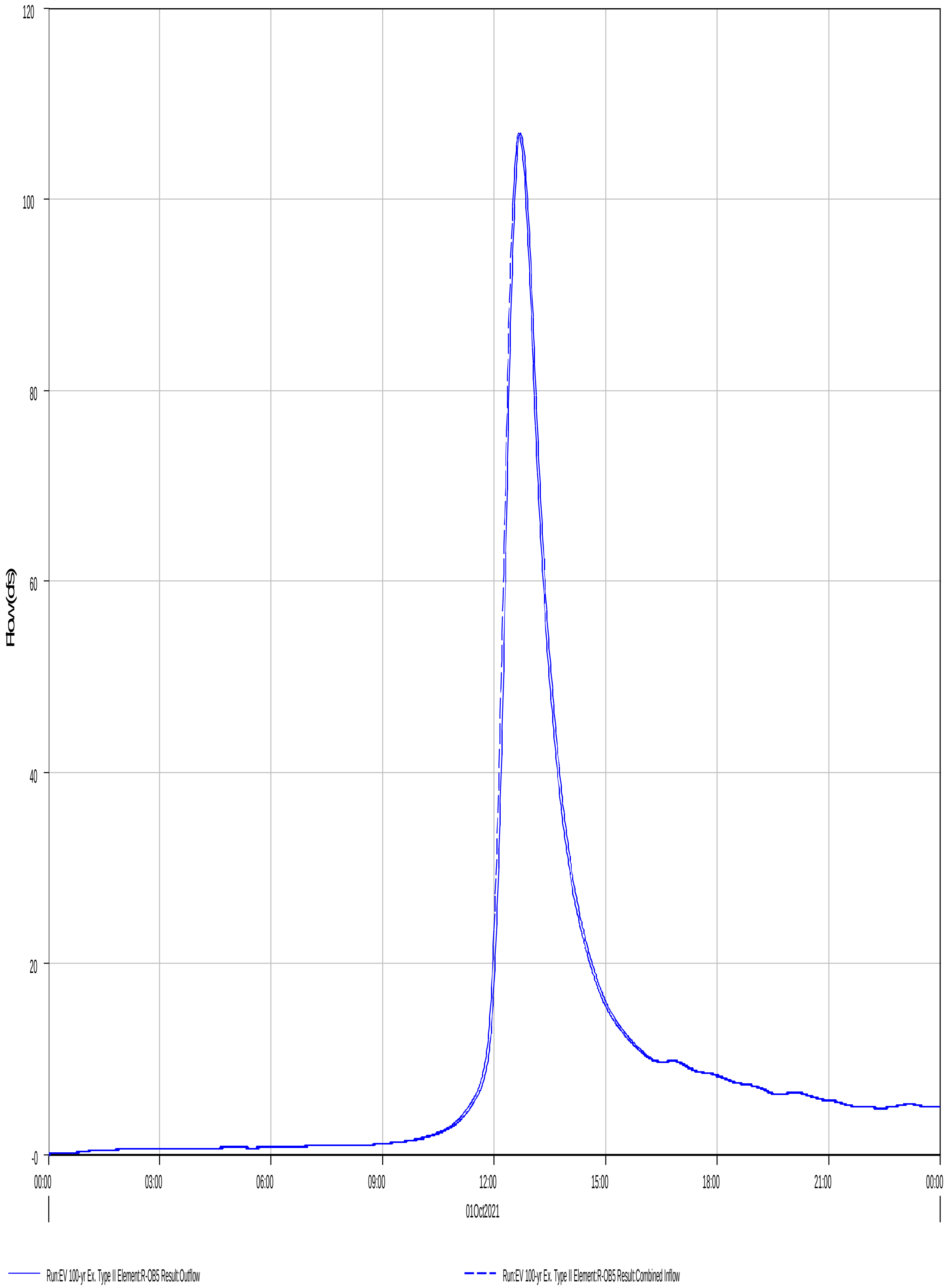
Project: Eagleview_Subdivision
Simulation Run: EV 100-yr Ex. Type II Reach: R-OB4

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Existing
End of Run:	02Oct2021, 00:00	Meteorologic Model:	100-yr Type II
Compute Time:	11Mar2022, 10:12:01	Control Specifications:	24-hr Storm

Volume Units: AC-FT

Computed Results

Peak Inflow :	136.1 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 12:10
Peak Outflow :	135.8 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 12:13
Total Inflow :	13.5 (AC-FT)	Total Outflow :	13.4 (AC-FT)



Reach "R-OB5" Results for Run "EV 100-yr Ex. Type II"

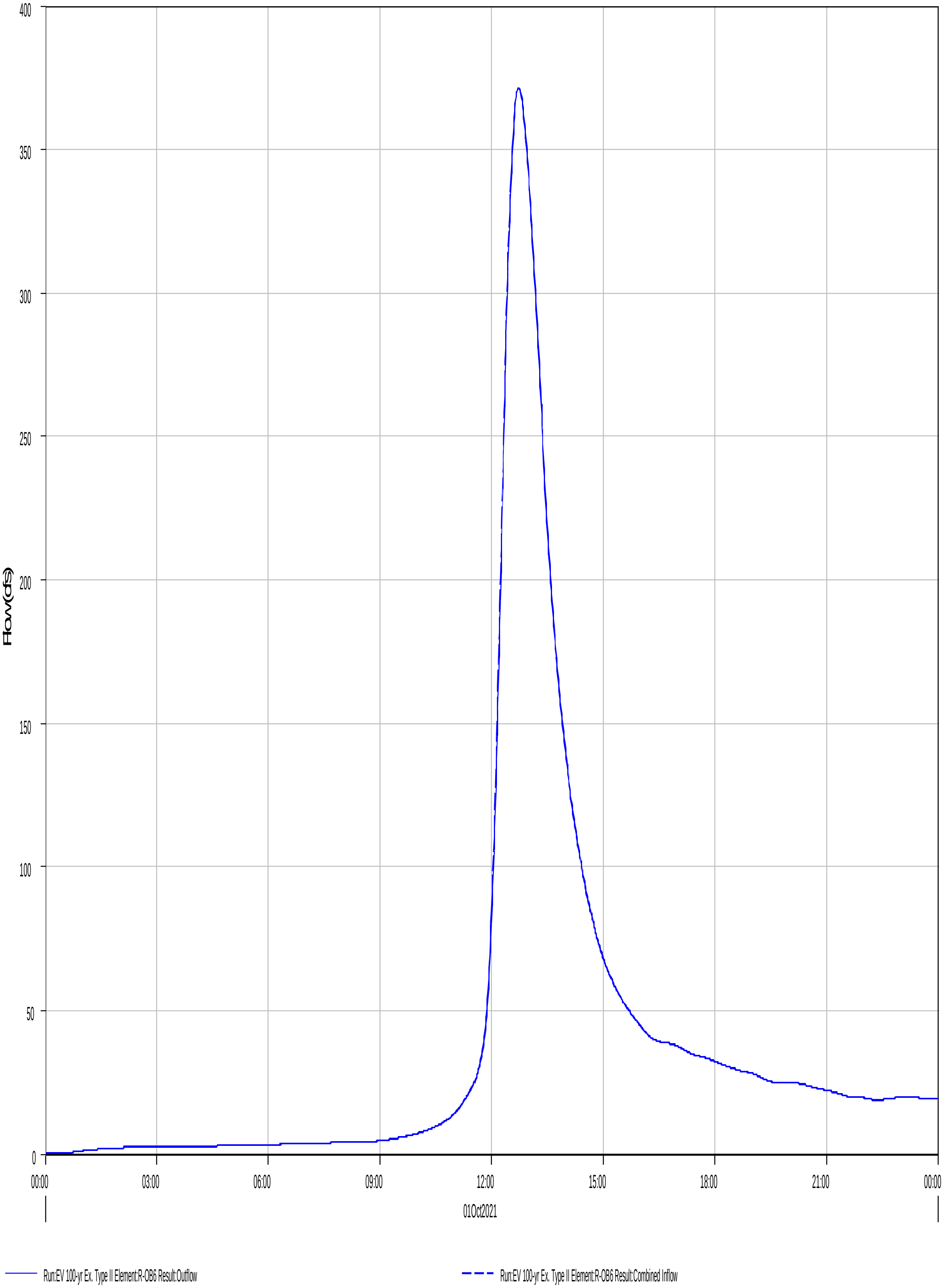
Project: Eagleview_Subdivision
Simulation Run: EV 100-yr Ex. Type II Reach: R-OB5

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Existing
End of Run:	02Oct2021, 00:00	Meteorologic Model:	100-yr Type II
Compute Time:	11Mar2022, 10:12:01	Control Specifications:	24-hr Storm

Volume Units: AC-FT

Computed Results

Peak Inflow :	106.9 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 12:40
Peak Outflow :	106.8 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 12:43
Total Inflow :	19.7 (AC-FT)	Total Outflow :	19.7 (AC-FT)



Reach "R-OB6" Results for Run "EV 100-yr Ex. Type II"

Project: Eagleview_Subdivision
Simulation Run: EV 100-yr Ex. Type II Reach: R-OB6

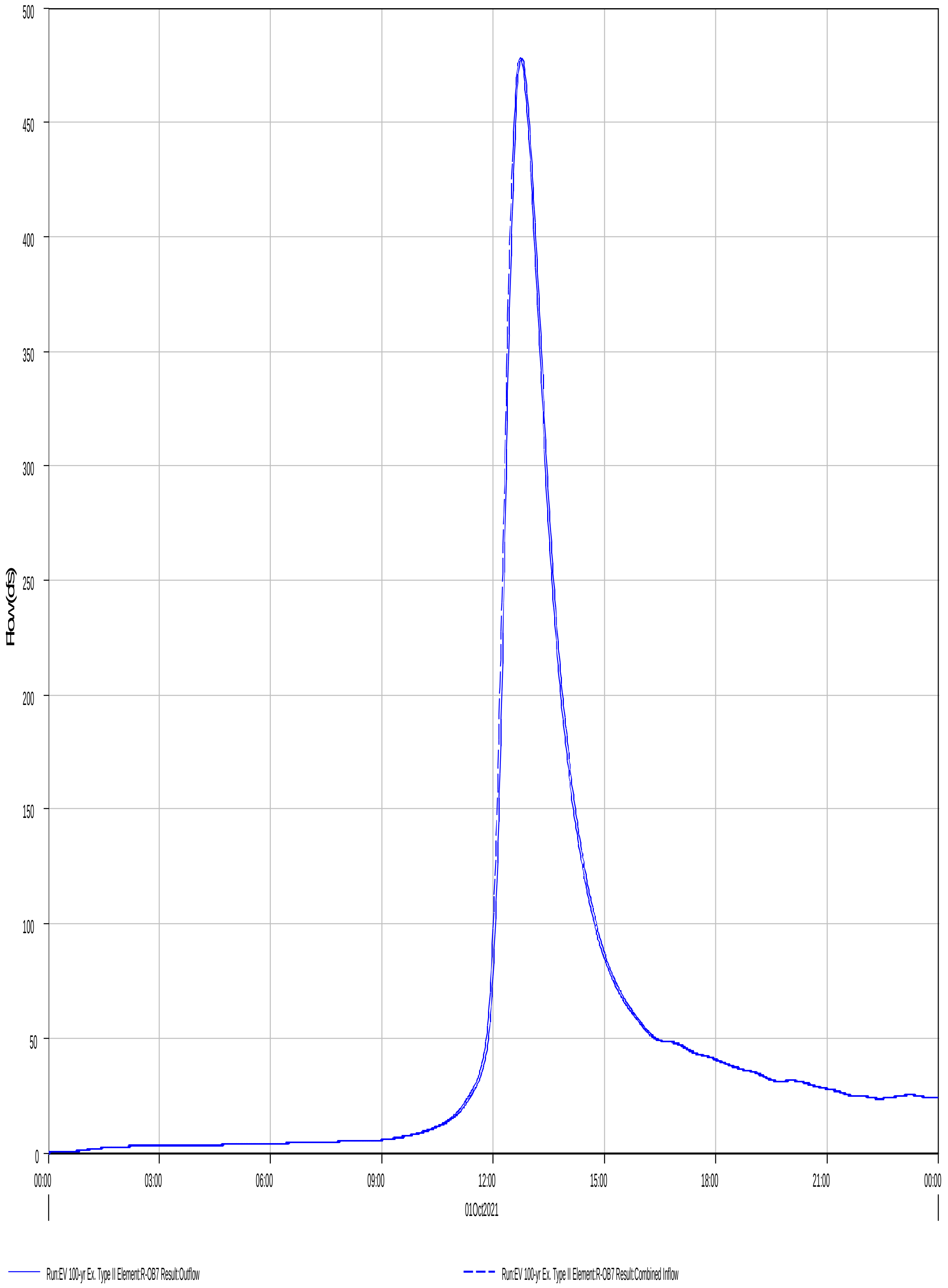
Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Existing
End of Run:	02Oct2021, 00:00	Meteorologic Model:	100-yr Type II
Compute Time:	11Mar2022, 10:12:01	Control Specifications:	24-hr Storm

Volume Units: AC-FT

Computed Results

Peak Inflow :	371.3 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 12:43
Peak Outflow :	371.3 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 12:44
Total Inflow :	78.1 (AC-FT)	Total Outflow :	78.1 (AC-FT)

Reach "R-OB7" Results for Run "EV 100-yr Ex. Type II"



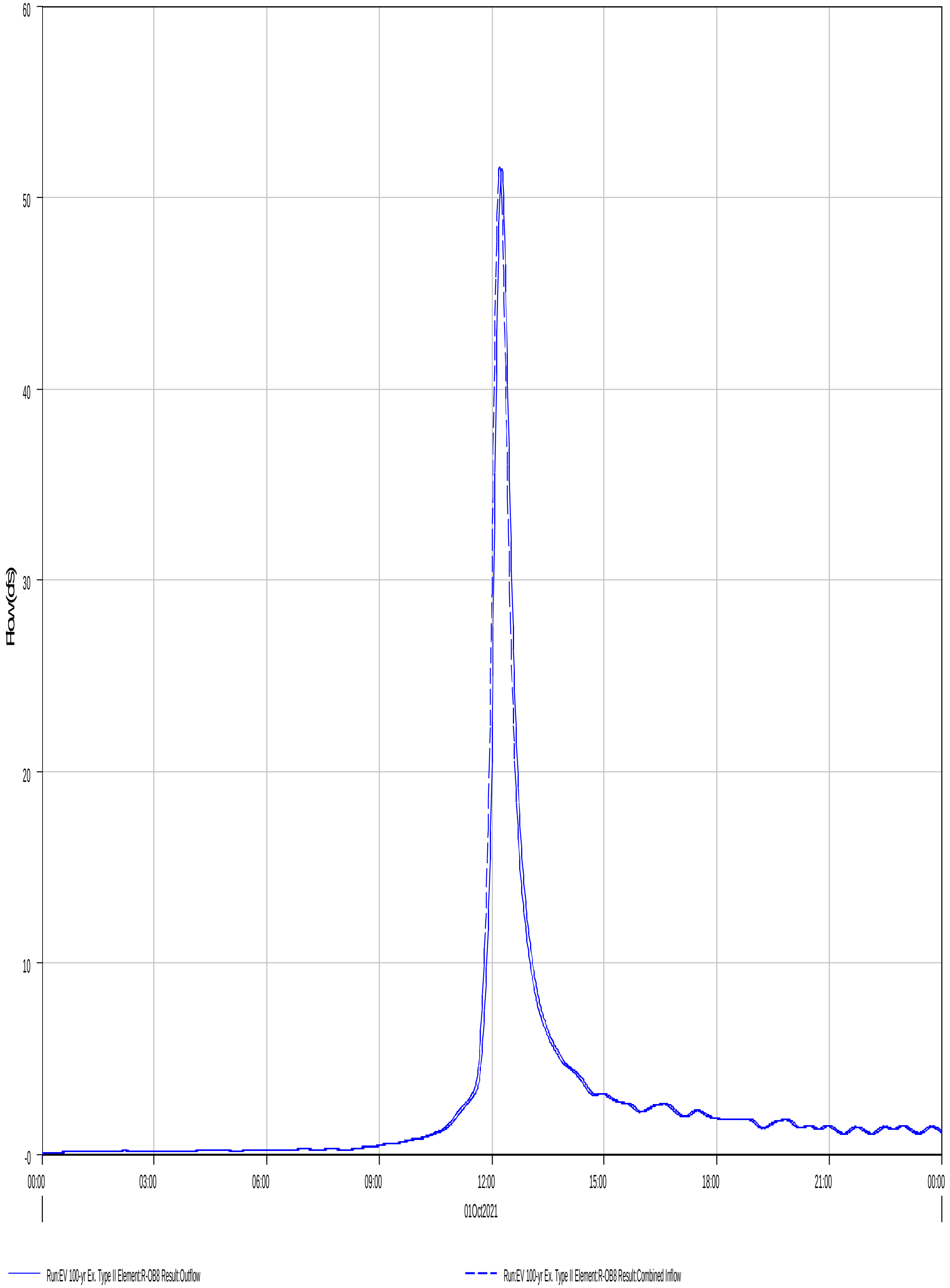
Project: Eagleview_Subdivision
Simulation Run: EV 100-yr Ex. Type II Reach: R-OB7

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Existing
End of Run:	02Oct2021, 00:00	Meteorologic Model:	100-yr Type II
Compute Time:	11Mar2022, 10:12:01	Control Specifications:	24-hr Storm

Volume Units: AC-FT

Computed Results

Peak Inflow :	478.0 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 12:44
Peak Outflow :	477.9 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 12:46
Total Inflow :	97.8 (AC-FT)	Total Outflow :	97.7 (AC-FT)



Reach "R-OB8" Results for Run "EV 100-yr Ex. Type II"

Project: Eagleview_Subdivision
Simulation Run: EV 100-yr Ex. Type II Reach: R-OB8

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 11Mar2022, 10:12:01

Basin Model: Eagleview_Existing
Meteorologic Model: 100-yr Type II
Control Specifications: 24-hr Storm

Volume Units: AC-FT

Computed Results

Peak Inflow : 51.6 (CFS)
Peak Outflow : 51.5 (CFS)
Total Inflow : 5.4 (AC-FT)

Date/Time of Peak Inflow : 01Oct2021, 12:13
Date/Time of Peak Outflow : 01Oct2021, 12:16
Total Outflow : 5.4 (AC-FT)

HEC-HMS

Project : Eagleview_Subdivision

Basin Model : Eagleview_Proposed

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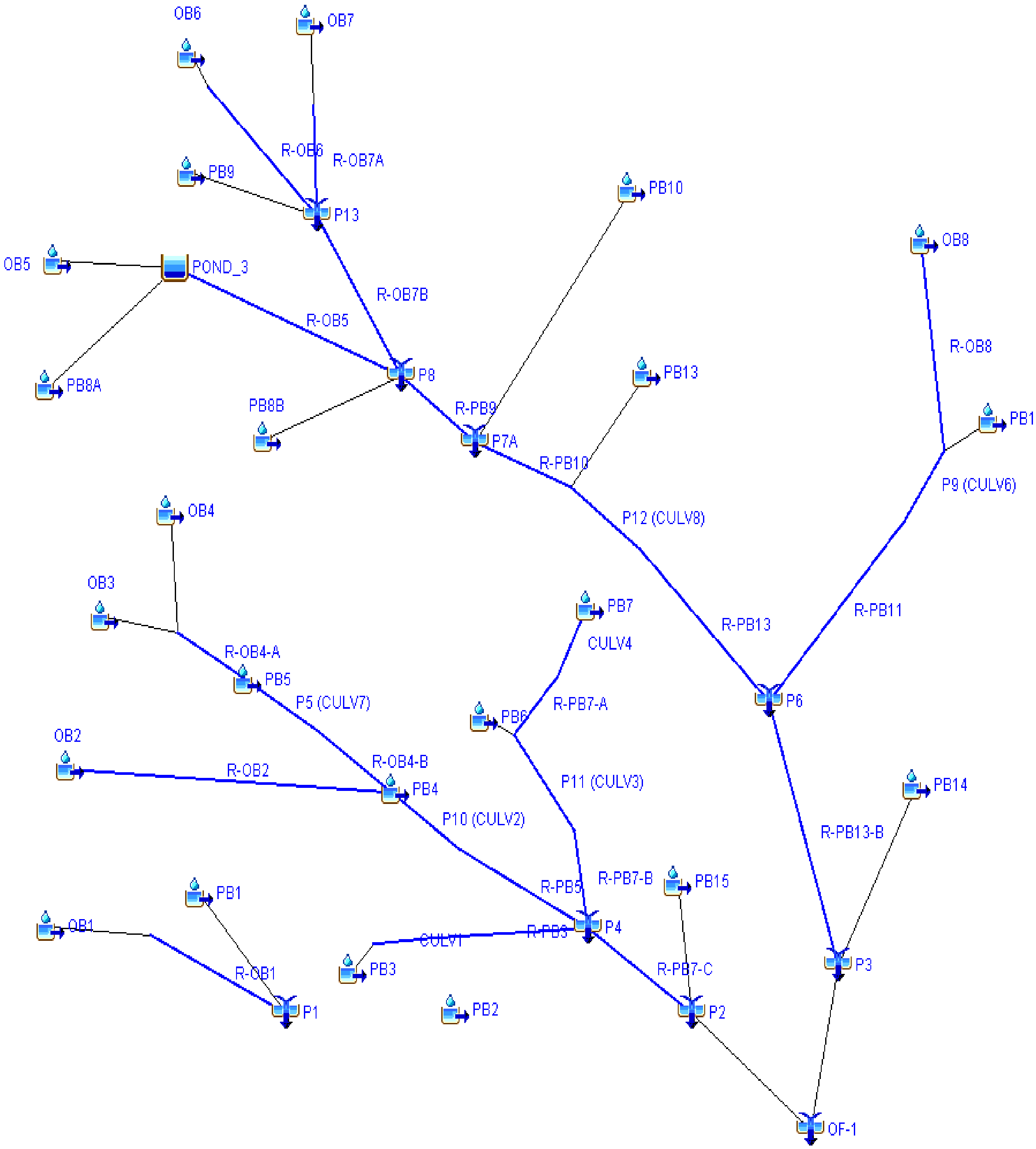
OB6
OB7
R-OB6
R-OB7A
PB9
P13
PB10
OB8
OB5
POND_3
R-OB7B
R-OB5
R-OB8
PB8A
P8
PB13
PB8B
R-PB9
PB11
P7A
R-PB10
P9 (CULV6)
P12 (CULV8)
OB4
OB3
PB7
R-PB11
R-PB13
CULV4
R-OB4-A
PB5
P5 (CULV7)
R-PB7-A
PB6
P6
OB2
R-OB4-B
R-OB2
PB4
P11 (CULV3)
PB14
P10 (CULV2)
R-PB13-B
R-PB5
R-PB7-B
PB15
PB1
OB1
CULV1
R-PB3
P4
R-OB1
R-PB7-C
P3
PB3
PB2
P1
P2
OF-1

IMPERVIOUS FACTOR CALCULATION TABLE - PROPOSED CONDITIONS

	Basin	Area (Acre)	Open Space (2%)	2.5 Acre Lot (11%)	Buildings (90%)	Paved Roadway (100%)	Gravel Roadway (80%)	Total % Check	Weighted Impervious
Onsite	PB1	4.25	0%	99%	0%	1%	0%	100%	12%
	PB2	1.08	0%	94%	0%	6%	0%	100%	16%
	PB3	1.38	0%	85%	0%	15%	0%	100%	24%
	PB4	10.54	0%	97%	0%	3%	0%	100%	14%
	PB5	6.18	0%	97%	0%	3%	0%	100%	13%
	PB6	11.09	0%	95%	0%	5%	0%	100%	16%
	PB7	3.46	0%	91%	0%	9%	0%	100%	19%
	PB8A	7.60	0%	98%	0%	3%	0%	100%	13%
	PB8B	5.79	0%	100%	0%	0%	0%	100%	11%
	PB9	12.80	0%	98%	0%	2%	0%	100%	12%
	PB10	8.47	0%	100%	0%	0%	0%	100%	11%
	PB11	17.56	0%	96%	0%	4%	0%	100%	15%
	PB13	4.02	0%	96%	0%	4%	0%	100%	15%
	PB14	17.28	0%	97%	0%	3%	0%	100%	13%
	PB15	9.63	0%	93%	0%	7%	0%	100%	17%
Offsite	OB1	10.37	93%	0%	2%	4%	2%	100%	9%
	OB2	28.06	90%	0%	3%	3%	5%	100%	11%
	OB3	43.44	92%	0%	2%	2%	4%	100%	9%
	OB4	10.50	87%	0%	4%	5%	4%	100%	13%
	OB5	143.82	94%	0%	2%	1%	3%	100%	7%
	OB6	118.40	92%	0%	1%	2%	5%	100%	9%
	OB7	421.43	93%	0%	2%	1%	4%	100%	8%
	OB8	33.08	93%	0%	2%	1%	5%	100%	8%
Total		930.25							12.2%

Kimley»Horn

Post Runoff Analysis
Time of Concentration

Project Information

Project Name: Eagleview
KHA Project #: 196288000
Designed by: DCM Date: 4/16/2024
Revised by: Date:
Checked by: BAH Date: 4/16/2024

Minimum Time of Concentration 5.0 minutes
2YR-24HR Rainfall, P2 2.10

Post-Development

Drainage Area: OB1

		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Cross Sectional Area of Flow, A (ft^2)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)	Lag Time (min)
SHEET	T1 SHEET FLOW	300.00	0.073	0.15	2.10						17.35	
SHALLOW CONCENTRATED	T2 SHALLOW CONCENTRATED FLOW	1118.00	0.038			U				3.14	5.93	
							Post-Development Time of Concentration, OB1				23.28	13.97

Post-Development

Drainage Area: OB2

		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Cross Sectional Area of Flow, A (ft^2)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)	Lag Time (min)
SHEET	T1 SHEET FLOW	300.00	0.063	0.15	2.10						18.41	
SHALLOW CONCENTRATED	T2 SHALLOW CONCENTRATED FLOW	554.00	0.046			U				3.45	2.67	
CHANNEL	T2 CHANNEL FLOW	841.00	0.029	0.05		U	9.50	6.60	1.44	6.45	2.17	
							Post-Development Time of Concentration, OB2				23.26	13.95

Post-Development

Drainage Area: OB3

		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Cross Sectional Area of Flow, A (ft^2)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)	Lag Time (min)
SHEET	T1 SHEET FLOW	300.00	0.074	0.15	2.10						17.26	
SHALLOW CONCENTRATED	T2 SHALLOW CONCENTRATED FLOW	2436.00	0.034			U				2.97	13.65	
							Post-Development Time of Concentration, OB3				30.91	18.55

Post-Development

Drainage Area: OB4

		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Cross Sectional Area of Flow, A (ft^2)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)	Lag Time (min)
SHEET	T1 SHEET FLOW	300.00	0.042	0.15	2.10						21.65	
SHALLOW CONCENTRATED	T2 SHALLOW CONCENTRATED FLOW	783.00	0.038			U				3.16	4.13	
CHANNEL	T2 CHANNEL FLOW	577.00	0.028	0.05		U	9.50	6.60	1.44	6.36	1.51	
							Post-Development Time of Concentration, OB4				27.29	16.38

Post-Development

Drainage Area: OB5

		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Cross Sectional Area of Flow, A (ft^2)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)	Lag Time (min)
SHEET	T1 SHEET FLOW	300.00	0.037	0.40	2.10						49.91	
SHALLOW CONCENTRATED	T2 SHALLOW CONCENTRATED FLOW	3838.00	0.033			U				2.93	21.83	
CHANNEL	T2 CHANNEL FLOW	1407.00	0.024	0.04		U	9.50	6.60	1.44	7.36	3.19	
							Post-Development Time of Concentration, OB5				74.93	44.96

Post-Development

Drainage Area: OB6

		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Cross Sectional Area of Flow, A (ft^2)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)	Lag Time (min)
SHEET	T1 SHEET FLOW	300.00	0.064	0.40	2.10						40.09	
SHALLOW CONCENTRATED	T2 SHALLOW CONCENTRATED FLOW	2569.00	0.038			U				3.14	13.62	
CHANNEL	T2 CHANNEL FLOW	2110.00	0.027	0.04		U	9.50	6.60	1.44	7.73	4.55	
							Post-Development Time of Concentration, OB6				58.25	34.95

Post-Development

Drainage Area: OB7

		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Cross Sectional Area of Flow, A (ft^2)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)	Lag Time (min)
SHEET	T1 SHEET FLOW	300.00	0.028	0.40	2.10						55.80	
SHALLOW CONCENTRATED	T2 SHALLOW CONCENTRATED FLOW	2068.00	0.036			U				3.06	11.26	
CHANNEL	T3 CHANNEL FLOW	6198.00	0.03	0.04		U	12.00	22.00	0.55	4.09	25.29	
							Post-Development Time of Concentration, OB7				92.35	55.41

Post-Development

Drainage Area: OB8

		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Cross Sectional Area of Flow, A (ft^2)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)	Lag Time (min)
SHEET	T1 SHEET FLOW	300.00	0.029	0.15	2.10						25.10	
SHALLOW CONCENTRATED	T2 SHALLOW CONCENTRATED FLOW	1117.00	0.043			U				3.34	5.57	
CHANNEL	T2 CHANNEL FLOW	762.00	0.033	0.03		U	9.50	6.60	1.44	11.43	1.11	
							Post-Development Time of Concentration, OB8				31.78	19.07

Post-Development

Drainage Area: PB1

		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Cross Sectional Area of Flow, A (ft^2)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)	Lag Time (min)
SHEET	T1 SHEET FLOW	300.00	0.033	0.15	2.10						23.84	
SHALLOW CONCENTRATED	T2 SHALLOW CONCENTRATED FLOW	400.00	0.041			U				3.27	2.04	
							Post-Development Time of Concentration, PB1				25.88	15.53

Post-Development

Drainage Area: PB2

		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Cross Sectional Area of Flow, A (ft^2)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)	Lag Time (min)
SHEET	T1 SHEET FLOW	227.00	0.033	0.15	2.10						19.07	
							Post-Development Time of Concentration, PB2				19.07	11.44

Post-Development

Drainage Area: PB3

		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Cross Sectional Area of Flow, A (ft^2)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)	Lag Time (min)
SHEET	T3 SHEET FLOW	313.00	0.05	0.15	2.10						21.59	
CHANNEL	T3 CHANNEL FLOW	315.00	0.02	0.03		U	9.00	12.40	0.73	6.08	0.86	
							Post-Development Time of Concentration, PB3				22.46	13.47

Post-Development

Drainage Area: PB4

		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Cross Sectional Area of Flow, A (ft^2)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)	Lag Time (min)
MINIMUM TC	T2 MINIMUM TC FLOW										5.00	
							Post-Development Time of Concentration, PB4				5.00	3.00

Kimley»Horn

Post Runoff Analysis
Time of Concentration

Project Information

Project Name: Eagleview
KHA Project #: 196288000
Designed by: DCM Date: 4/16/2024
Revised by: Date:
Checked by: BAH Date: 4/16/2024

Minimum Time of Concentration 5.0 minutes
2YR-24HR Rainfall, P2 2.10

Post-Development

Drainage Area: PB5

		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Cross Sectional Area of Flow, A (ft^2)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)	Lag Time (min)
SHEET	T1 SHEET FLOW	300.00	0.021	0.15	2.10						28.56	
SHALLOW CONCENTRATED	T2 SHALLOW CONCENTRATED FLOW	292.00	0.024			U				2.50	1.95	
CHANNEL	T2 CHANNEL FLOW	44.00	0.032	0.03		U	9.50	6.60	1.44	11.33	0.06	
							Post-Development Time of Concentration, PB5				30.58	18.35

Post-Development

Drainage Area: PB6

		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Cross Sectional Area of Flow, A (ft^2)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)	Lag Time (min)
SHEET	T1 SHEET FLOW	300.00	0.034	0.15	2.10						23.56	
SHALLOW CONCENTRATED	T2 SHALLOW CONCENTRATED FLOW	650.00	0.036			U				3.06	3.54	
CHANNEL	T2 CHANNEL FLOW	66.00	0.001	0.03		U	9.00	12.40	0.73	1.27	0.87	
							Post-Development Time of Concentration, PB6				27.96	16.78

Post-Development

Drainage Area: PB7

		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Cross Sectional Area of Flow, A (ft^2)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)	Lag Time (min)
SHEET	T1 SHEET FLOW	300.00	0.043	0.15	2.10						21.44	
SHALLOW CONCENTRATED	T2 SHALLOW CONCENTRATED FLOW	235.00	0.051			U				3.64	1.08	
CHANNEL	T2 CHANNEL FLOW	539.00	0.035	0.03		U	9.00	12.40	0.73	7.50	1.20	
							Post-Development Time of Concentration, PB7				23.72	14.23

Post-Development

Drainage Area: PB8A

		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Cross Sectional Area of Flow, A (ft^2)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)	Lag Time (min)
SHEET	T1 SHEET FLOW	100.00	0.090	0.15	2.10						6.63	
SHALLOW CONCENTRATED	T2 SHALLOW CONCENTRATED FLOW	100.00	0.030			U				2.79	0.60	
CHANNEL	T2 CHANNEL FLOW	572.00	0.090	0.03		U	14.00	34.00	0.41	8.24	1.16	
							Post-Development Time of Concentration, PB8A				8.38	5.03

Post-Development

Drainage Area: PB8B

		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Cross Sectional Area of Flow, A (ft^2)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)	Lag Time (min)
SHEET	T1 SHEET FLOW	30.00	0.040	0.15	2.10						3.50	
SHALLOW CONCENTRATED	T2 SHALLOW CONCENTRATED FLOW	250.00	0.080			U				4.56	0.91	
CHANNEL	T2 CHANNEL FLOW	780.00	0.029	0.03		U	14.00	34.00	0.41	4.68	2.78	
							Post-Development Time of Concentration, PB8B				7.19	4.31

Post-Development

Drainage Area: PB9

		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Cross Sectional Area of Flow, A (ft^2)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)	Lag Time (min)
SHEET	T1 SHEET FLOW	300.00	0.060	0.15	2.10						18.77	
SHALLOW CONCENTRATED	T2 SHALLOW CONCENTRATED FLOW	171.00	0.072			U				4.33	0.66	
CHANNEL	T2 CHANNEL FLOW	873.00	0.028	0.03		U	14.00	34.00	0.41	4.60	3.16	
							Post-Development Time of Concentration, PB9				22.59	13.56

Post-Development

Drainage Area: PB10

		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Cross Sectional Area of Flow, A (ft^2)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)	Lag Time (min)
SHEET	T1 SHEET FLOW	300.00	0.035	0.15	2.10						23.29	
SHALLOW CONCENTRATED	T2 SHALLOW CONCENTRATED FLOW	395.00	0.034			U				2.97	2.21	
CHANNEL	T2 CHANNEL FLOW	771.00	0.042	0.03		U	14.00	34.00	0.41	5.63	2.28	
							Post-Development Time of Concentration, PB10				27.78	16.67

Post-Development

Drainage Area: PB11

		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Cross Sectional Area of Flow, A (ft^2)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)	Lag Time (min)
SHEET	T1 SHEET FLOW	300.00	0.031	0.15	2.10						24.44	
CHANNEL	T2 CHANNEL FLOW	1252.00	0.025	0.03		U	9.50	6.60	1.44	10.01	2.08	
							Post-Development Time of Concentration, PB11				26.53	15.92

Post-Development

Drainage Area: PB13

		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Cross Sectional Area of Flow, A (ft^2)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)	Lag Time (min)
CHANNEL	T2 CHANNEL FLOW	316.00	0.018	0.03		U	14.00	34.00	0.41	3.64	1.45	
MINIMUM TC	T2 MINIMUM TC FLOW										5.00	
							Post-Development Time of Concentration, PB13				5.00	3.00

Post-Development

Drainage Area: PB14

		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Cross Sectional Area of Flow, A (ft^2)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)	Lag Time (min)
SHEET	T1 SHEET FLOW	40.00	0.085	0.013	2.10						0.46	
CHANNEL	T2 CHANNEL FLOW	244.00	0.060	0.03		U	9.00	12.40	0.73	9.82	0.41	
CHANNEL	T2 CHANNEL FLOW	1123.00	0.014	0.03		U	14.00	34.00	0.41	3.25	5.76	
							Post-Development Time of Concentration, PB14				6.63	3.98

Post-Development

Drainage Area: PB15

		Flow Length, L (ft)	Slope, s (ft/ft)	Manning's Roughness Coefficient, n	Two-year, 24-hr rainfall, P2 (in)	Paved or Unpaved	Cross Sectional Area of Flow, A (ft^2)	Wetted Perimeter, pw (ft)	Hydraulic radius, r (ft)	Average Velocity, V (ft/s)**	Travel Time, Tt (min)	Lag Time (min)
MINIMUM TC	T2 MINIMUM TC FLOW										5.00	
							Post-Development Time of Concentration, PB15				5.00	3.00

Kimley»Horn

Post Runoff Analysis

Composite CN

Project Name: Eagleview
KHA Project #: 196288000
Designed by: DCM Date: 4/18/2024
Revised by: Date:
Revised by: Date:
Checked by: BAH Date: 4/16/2024

Post-Development					
Drainage Area: OB1					
COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
RESIDENTIAL	RR-5 (Rangeland Landuse)	B	62.00	9.79	--
IMPERVIOUS	Paved; curbs and storm sewers (excluding right-of-way)	B	98.00	0.38	--
IMPERVIOUS	Gravel (including right of way)	B	85.00	0.20	--
CUTSOM					
COMPOSITE SCS CURVE NUMBER - OB1		63.76		10.37	0.569

Post-Development					
Drainage Area: OB2					
COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
RESIDENTIAL	RR-5 (Rangeland Landuse)	B	62.00	25.92	--
IMPERVIOUS	Paved; curbs and storm sewers (excluding right-of-way)	B	98.00	0.86	--
IMPERVIOUS	Gravel (including right of way)	B	85.00	1.28	--
CUTSOM					
COMPOSITE SCS CURVE NUMBER - OB2		64.16		28.06	0.559

Post-Development					
Drainage Area: OB3					
COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
RESIDENTIAL	RR-5 (Rangeland Landuse)	B	62.00	40.88	--
IMPERVIOUS	Paved; curbs and storm sewers (excluding right-of-way)	B	98.00	0.89	--
IMPERVIOUS	Gravel (including right of way)	B	85.00	1.67	--
CUTSOM					
COMPOSITE SCS CURVE NUMBER - OB3		63.62		43.44	0.572

Post-Development					
Drainage Area: OB4					
COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
RESIDENTIAL	RR-5 (Rangeland Landuse)	B	62.00	9.55	--
IMPERVIOUS	Paved; curbs and storm sewers (excluding right-of-way)	B	98.00	0.52	--
IMPERVIOUS	Gravel (including right of way)	B	85.00	0.43	--
CUTSOM					
COMPOSITE SCS CURVE NUMBER - OB4		64.71		10.50	0.545

Post-Development					
Drainage Area: OB5					
COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
RESIDENTIAL	RR-5 (Rangeland Landuse)	B	62.00	28.58	--
RESIDENTIAL	RR-5 (Woods Landuse)	B	58.00	109.48	--
IMPERVIOUS	Paved; curbs and storm sewers (excluding right-of-way)	B	98.00	1.12	--
IMPERVIOUS	Gravel (including right of way)	B	85.00	4.64	--
CUTSOM					
COMPOSITE SCS CURVE NUMBER - OB5		59.98		143.82	0.667

Post-Development					
Drainage Area: OB6					
COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
RESIDENTIAL	RR-5 (Rangeland Landuse)	B	62.00	60.64	--
RESIDENTIAL	RR-5 (Woods Landuse)	B	58.00	51.19	--
IMPERVIOUS	Paved; curbs and storm sewers (excluding right-of-way)	B	98.00	2.04	--
IMPERVIOUS	Gravel (including right of way)	B	85.00	4.53	--
CUTSOM					
COMPOSITE SCS CURVE NUMBER - OB6		61.77		118.40	0.619

Kimley»Horn

Post Runoff Analysis

Composite CN

Project Name: Eagleview
KHA Project #: 196288000
Designed by: DCM Date: 4/18/2024
Revised by: Date:
Revised by: Date:
Checked by: BAH Date: 4/16/2024

Post-Development

Drainage Area: OB7

COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
RESIDENTIAL	RR-5 (Rangeland Landuse)	B	62.00	122.08	--
RESIDENTIAL	RR-5 (Woods Landuse)	B	58.00	259.48	--
RESIDENTIAL	2.5 acre	B	64.00	16.02	--
IMPERVIOUS	Paved; curbs and storm sewers (excluding right-of-way)	B	98.00	5.46	--
IMPERVIOUS	Gravel (including right of way)	B	85.00	18.17	--
CUTSOM					
COMPOSITE SCS CURVE NUMBER - OB7		61.07		421.20	0.637

Post-Development

Drainage Area: OB8

COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
RESIDENTIAL	RR-5 (Rangeland Landuse)	B	62.00	8.71	--
RESIDENTIAL	2.5 acre	B	64.00	21.76	--
RESIDENTIAL	1/2 acre (25% imp.)	B	71.00	0.79	--
IMPERVIOUS	Paved; curbs and storm sewers (excluding right-of-way)	B	98.00	0.24	--
IMPERVIOUS	Gravel (including right of way)	B	85.00	1.57	--
CUTSOM					
COMPOSITE SCS CURVE NUMBER - OB8		64.89		33.07	0.541

Post-Development

Drainage Area: PB1

COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
RESIDENTIAL	2.5 acre	B	64.00	4.19	--
IMPERVIOUS	Paved; open ditches (including right-of-way)	B	89.00	0.06	--
CUTSOM					
COMPOSITE SCS CURVE NUMBER - PB1		64.35		4.25	0.554

Post-Development

Drainage Area: PB2

COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
RESIDENTIAL	2.5 acre	B	64.00	1.02	--
IMPERVIOUS	Paved; open ditches (including right-of-way)	B	89.00	0.06	--
CUTSOM					
COMPOSITE SCS CURVE NUMBER - PB2		65.38		1.08	0.530

Post-Development

Drainage Area: PB3

COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
RESIDENTIAL	2.5 acre	B	64.00	1.18	--
IMPERVIOUS	Paved; open ditches (including right-of-way)	B	89.00	0.20	--
CUTSOM					
COMPOSITE SCS CURVE NUMBER - PB3		67.68		1.38	0.478

Post-Development

Drainage Area: PB4

COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
RESIDENTIAL	2.5 acre	B	64.00	10.18	--
IMPERVIOUS	Paved; open ditches (including right-of-way)	B	89.00	0.35	--
CUTSOM					
COMPOSITE SCS CURVE NUMBER - PB4		64.84		10.54	0.542

Post-Development

Drainage Area: PB5

COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
RESIDENTIAL	2.5 acre	B	64.00	6.01	--
IMPERVIOUS	Paved; open ditches (including right-of-way)	B	89.00	0.17	--
CUTSOM					
COMPOSITE SCS CURVE NUMBER - PB5		64.70		6.18	0.546

Kimley»Horn

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Checked by: BAH Date: 4/16/2024

Post-Development

Drainage Area: PB6

COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
RESIDENTIAL	2.5 acre	B	64.00	10.50	--
IMPERVIOUS	Paved; open ditches (including right-of-way)	B	89.00	0.59	--
CUTSOM					
COMPOSITE SCS CURVE NUMBER - PB6		65.33		11.09	0.531

Post-Development

Drainage Area: PB7

COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
RESIDENTIAL	2.5 acre	B	64.00	3.15	--
IMPERVIOUS	Paved; open ditches (including right-of-way)	B	89.00	0.31	--
CUTSOM					
COMPOSITE SCS CURVE NUMBER - PB7		66.22		3.46	0.510

Post-Development

Drainage Area: PB8A

COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
RESIDENTIAL	2.5 acre	B	64.00	7.41	--
IMPERVIOUS	Paved; open ditches (including right-of-way)	B	89.00	0.19	--
CUTSOM					
COMPOSITE SCS CURVE NUMBER - PB8A		64.63		7.60	0.547

Post-Development

Drainage Area: PB8B

COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
RESIDENTIAL	2.5 acre	B	64.00	5.79	--
IMPERVIOUS	Paved; open ditches (including right-of-way)	B	89.00	0.00	--
CUTSOM					
COMPOSITE SCS CURVE NUMBER - PB8B		64.00		5.79	0.563

Post-Development

Drainage Area: PB9

COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
RESIDENTIAL	2.5 acre	B	64.00	12.60	--
IMPERVIOUS	Paved; open ditches (including right-of-way)	B	89.00	0.20	--
CUTSOM					
COMPOSITE SCS CURVE NUMBER - PB9		64.39		12.80	0.553

Post-Development

Drainage Area: PB10

COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
RESIDENTIAL	2.5 acre	B	64.00	8.47	--
IMPERVIOUS	Paved; open ditches (including right-of-way)	B	89.00	0.00	--
CUTSOM					
COMPOSITE SCS CURVE NUMBER - PB10		64.00		8.47	0.563

Post-Development

Drainage Area: PB11

COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
RESIDENTIAL	2.5 acre	B	64.00	16.72	--
IMPERVIOUS	Paved; open ditches (including right-of-way)	B	89.00	0.84	--
CUTSOM					
COMPOSITE SCS CURVE NUMBER - PB11		65.20		17.56	0.534

Kimley»Horn

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Composite CN

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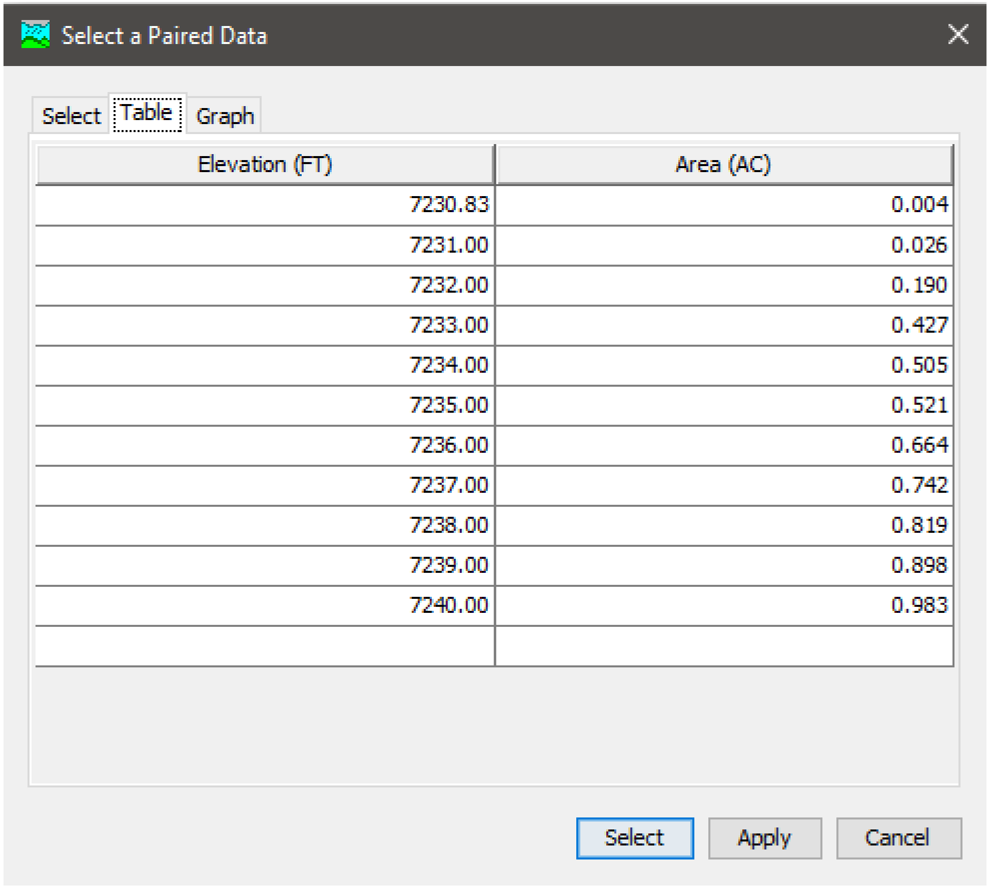
KHA Project #: 196288000
Designed by: DCM Date: 4/18/2024
Revised by: Date:
Revised by: Date:
Checked by: BAH Date: 4/16/2024

Post-Development					
Drainage Area: PB13					
COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
RESIDENTIAL	2.5 acre	B	64.00	3.84	--
IMPERVIOUS	Paved; open ditches (including right-of-way)	B	89.00	0.18	--
CUTSOM					
COMPOSITE SCS CURVE NUMBER - PB13		65.12		4.02	0.536

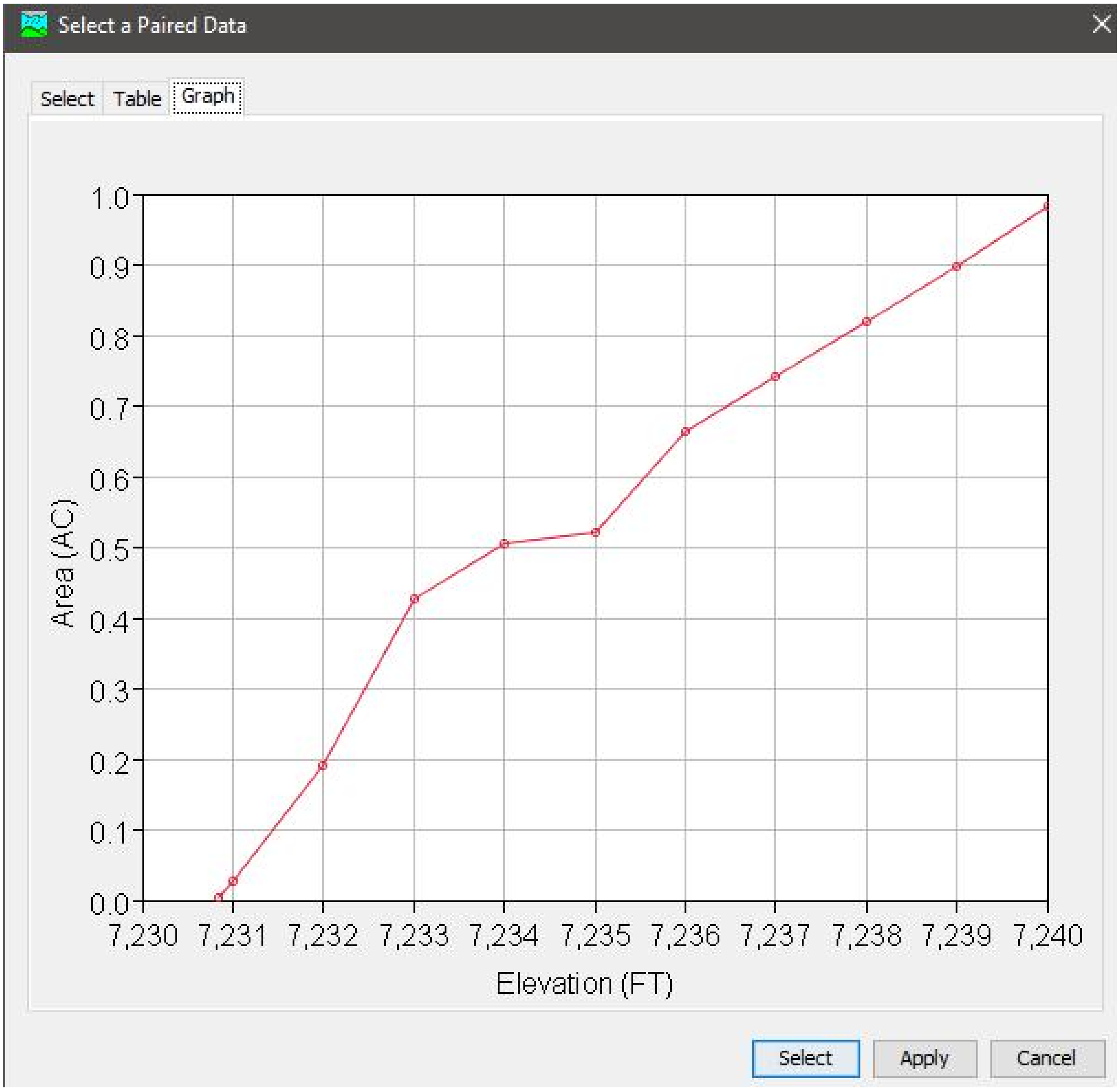
Post-Development					
Drainage Area: PB14					
COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
RESIDENTIAL	2.5 acre	A	45.00	0.28	--
RESIDENTIAL	2.5 acre	B	64.00	16.54	--
IMPERVIOUS	Paved; open ditches (including right-of-way)	B	89.00	0.46	--
CUTSOM					
COMPOSITE SCS CURVE NUMBER - PB14		63.64		17.28	0.571

Post-Development					
Drainage Area: PB15					
COVER DESCRIPTION	HYDROLOGIC CONDITION OR COVER TYPE	HYDROLOGIC SOIL GROUP	SCS CURVE NUMBER (CN)	AREA, A (ac.)	INITIAL ABSTRACTION, IA
RESIDENTIAL	2.5 acre	A	45.00	0.61	--
RESIDENTIAL	2.5 acre	B	64.00	8.38	--
IMPERVIOUS	Paved; open ditches (including right-of-way)	B	89.00	0.65	--
CUTSOM					
COMPOSITE SCS CURVE NUMBER - PB15		61.65		9.63	0.622

Pond 3 Stage Area Curve


Select a Paired Data
Select
Table
Graph
Select
Apply
Cancel

Elevation (FT)	Area (AC)
7230.83	0.004
7231.00	0.026
7232.00	0.190
7233.00	0.427
7234.00	0.505
7235.00	0.521
7236.00	0.664
7237.00	0.742
7238.00	0.819
7239.00	0.898
7240.00	0.983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Select
Table
Graph
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0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
Area (AC)
7,230
7,231
7,232
7,233
7,234
7,235
7,236
7,237
7,238
7,239
7,240
Elevation (FT)
Select
Apply
Cancel

DETENTION BASIN OUTLET STRUCTURE DE

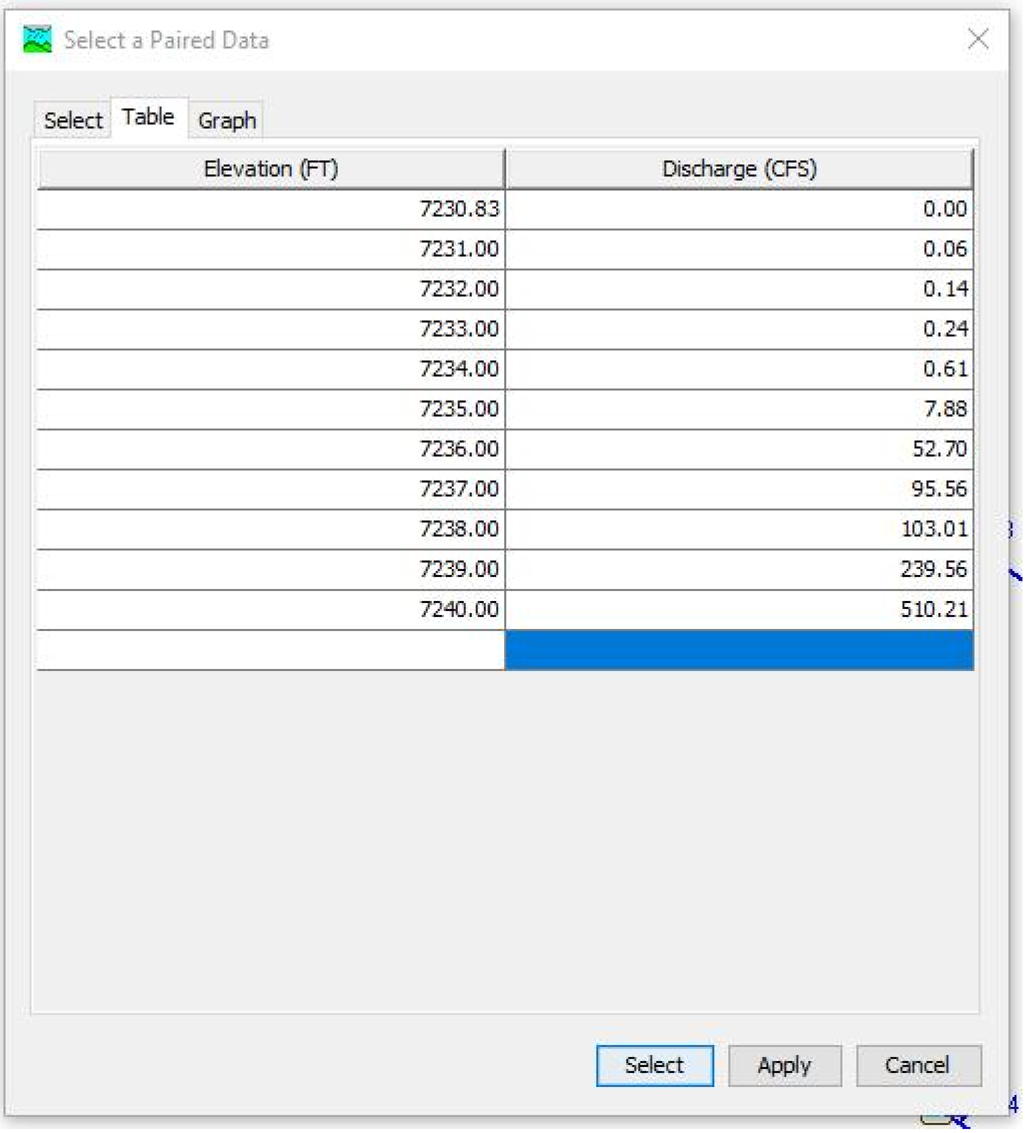
MHFD-Detention, Version 4.04 (February 2021)

Summary Stage-Area-Volume-Discharge Relationships

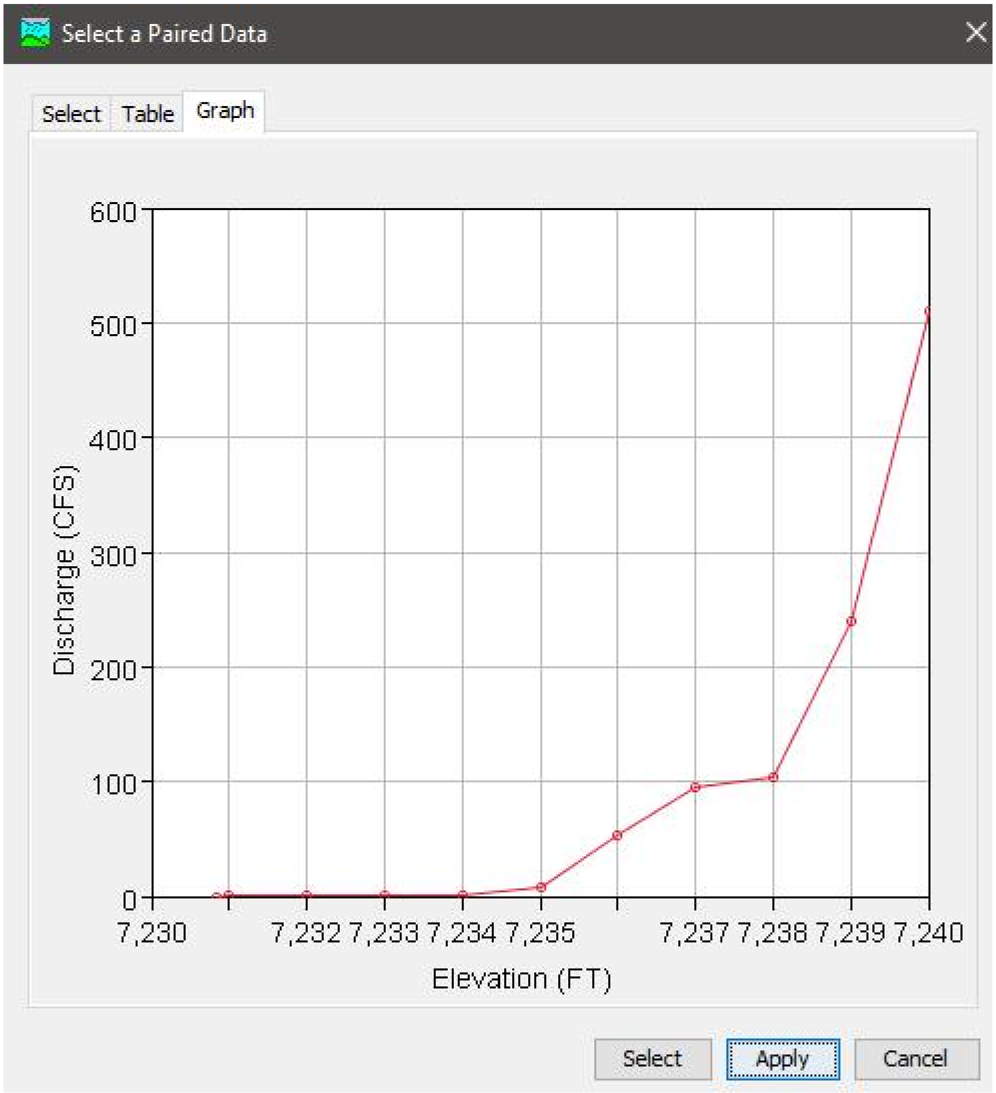
The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the ta

The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confi

Stage - Storage Description	Stage [ft]	Area [ft^2]	Area [acres]	Volume [ft^3]	Volume [ac-ft]
7230.83	0.00	162	0.004	0	0.000
7231	1.17	1,148	0.026	704	0.016
7232	2.17	8,283	0.190	5,419	0.124
7233	3.17	18,607	0.427	18,864	0.433
7234	4.17	21,993	0.505	39,164	0.899
7235	5.17	22,691	0.521	61,506	1.412
7236	6.17	28,920	0.664	87,311	2.004
7237	7.17	32,308	0.742	117,925	2.707
7238	8.17	35,680	0.819	151,919	3.488
7239	9.17	39,108	0.898	189,313	4.346
7240	10.17	42,799	0.983	230,267	5.286


Select a Paired Data
Select
Table
Graph
Select
Apply
Cancel

Elevation (FT)	Discharge (CFS)
7230.83	0.00
7231.00	0.06
7232.00	0.14
7233.00	0.24
7234.00	0.61
7235.00	7.88
7236.00	52.70
7237.00	95.56
7238.00	103.01
7239.00	239.56
7240.00	510.21



Select a Paired Data
Select
Table
Graph
600
500
400
300
200
100
0
Discharge (CFS)
7,230
7,232
7,233
7,234
7,235
7,237
7,238
7,239
7,240
Elevation (FT)
Select
Apply
Cancel

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

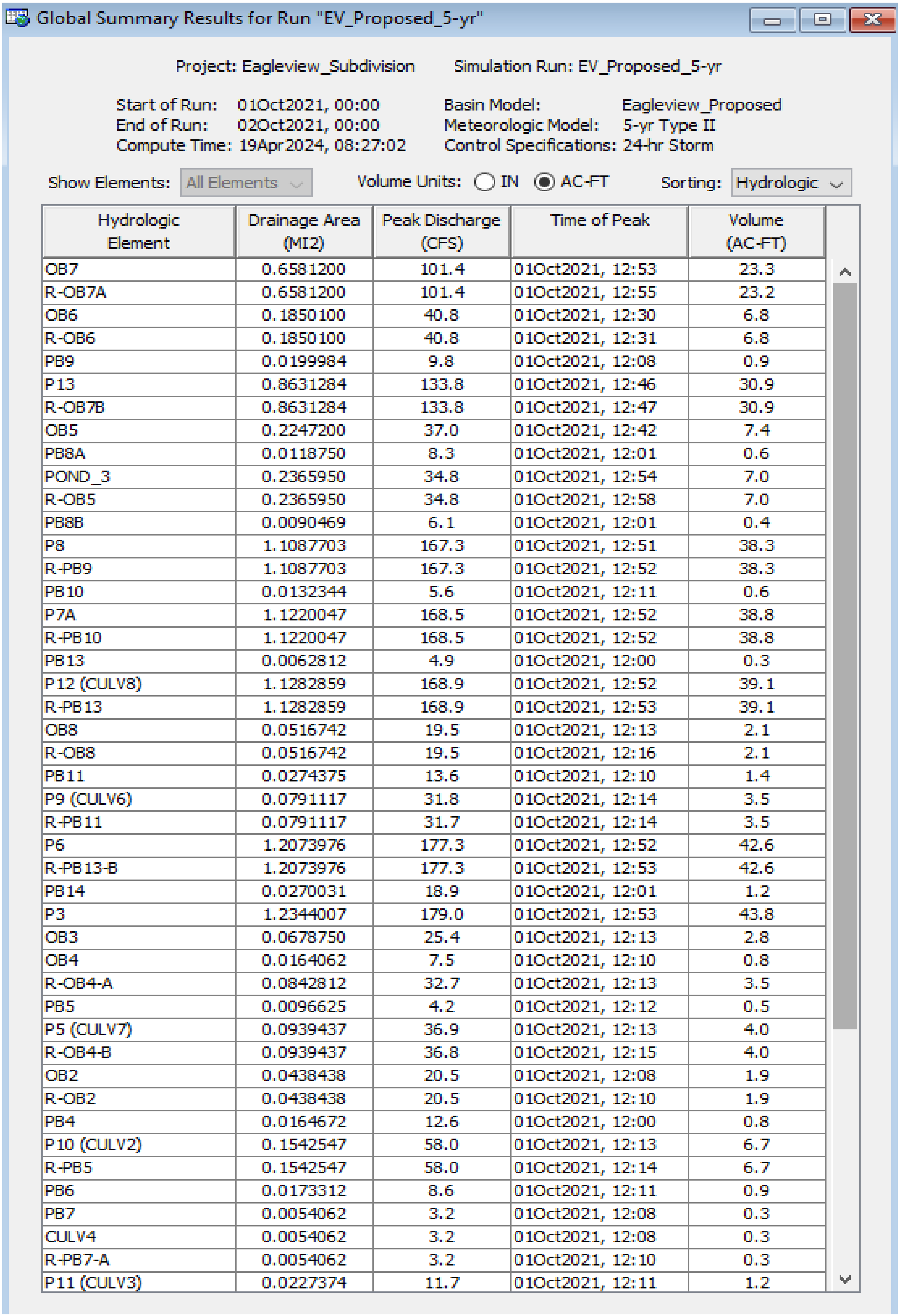
Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.
The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

Stage - Storage Description	Stage [ft]	Area [ft^2]	Area [acres]	Volume [ft^3]	Volume [ac-ft]	Total Outflow [cfs]
7230.83	0.00	162	0.004	0	0.000	0.00
7231	1.17	1,148	0.026	704	0.016	0.06
7232	2.17	8,283	0.190	5,419	0.124	0.14
7233	3.17	18,607	0.427	18,864	0.433	0.24
7234	4.17	21,993	0.505	39,164	0.899	0.61
7235	5.17	22,691	0.521	61,506	1.412	7.88
7236	6.17	28,920	0.664	87,311	2.004	52.70
7237	7.17	32,308	0.742	117,925	2.707	95.56
7238	8.17	35,680	0.819	151,919	3.488	103.01
7239	9.17	39,108	0.898	189,313	4.346	239.56
7240	10.17	42,799	0.983	230,267	5.286	510.21

For best results, include the stages of all grade slope changes (e.g. ISV and Floor) from the S-A-V table on Sheet 'Basin'.

Also include the inverts of all outlets (e.g. vertical orifice, overflow grate, and spillway, where applicable).



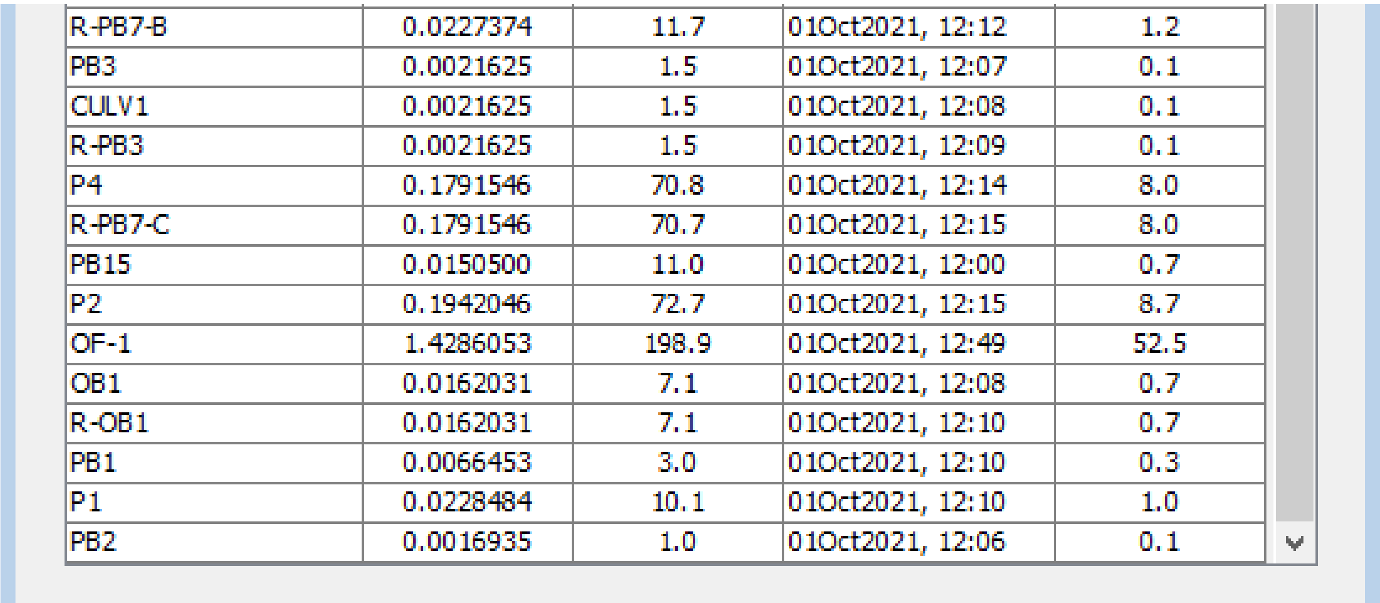
Global Summary Results for Run "EV_Proposed_5-yr"

Project: Eagleview_Subdivision   Simulation Run: EV_Proposed_5-yr

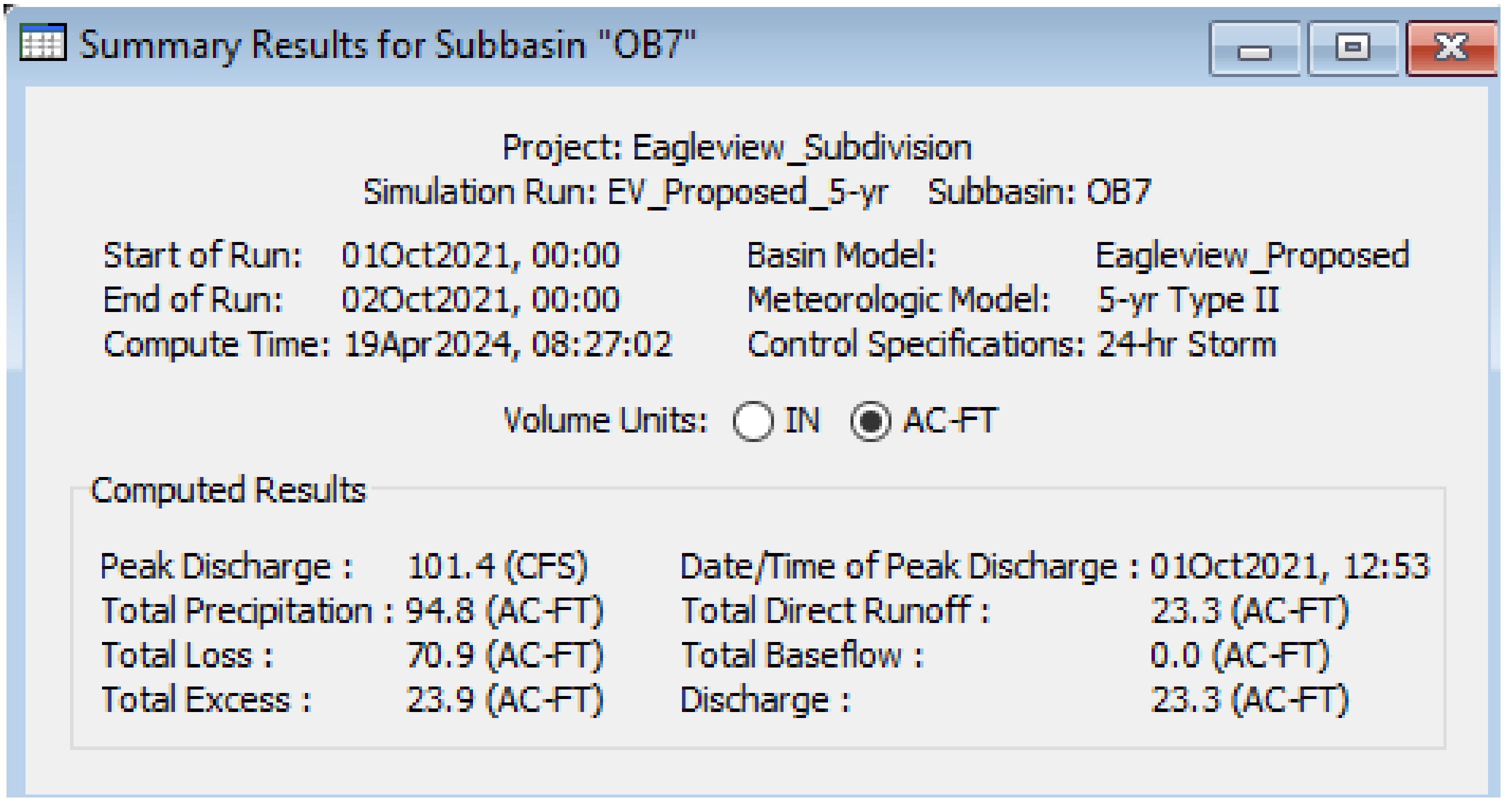
Start of Run: 01Oct2021, 00:00   Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00   Meteorologic Model: 5-yr Type II
Compute Time: 19Apr2024, 08:27:02   Control Specifications: 24-hr Storm

Show Elements: All Elements   Volume Units: ○ IN ● AC-FT   Sorting: Hydrologic

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
OB7	0.6581200	101.4	01Oct2021, 12:53	23.3
R-OB7A	0.6581200	101.4	01Oct2021, 12:55	23.2
OB6	0.1850100	40.8	01Oct2021, 12:30	6.8
R-OB6	0.1850100	40.8	01Oct2021, 12:31	6.8
PB9	0.0199984	9.8	01Oct2021, 12:08	0.9
P13	0.8631284	133.8	01Oct2021, 12:46	30.9
R-OB7B	0.8631284	133.8	01Oct2021, 12:47	30.9
OB5	0.2247200	37.0	01Oct2021, 12:42	7.4
PB8A	0.0118750	8.3	01Oct2021, 12:01	0.6
POND_3	0.2365950	34.8	01Oct2021, 12:54	7.0
R-OB5	0.2365950	34.8	01Oct2021, 12:58	7.0
PB8B	0.0090469	6.1	01Oct2021, 12:01	0.4
P8	1.1087703	167.3	01Oct2021, 12:51	38.3
R-PB9	1.1087703	167.3	01Oct2021, 12:52	38.3
PB10	0.0132344	5.6	01Oct2021, 12:11	0.6
P7A	1.1220047	168.5	01Oct2021, 12:52	38.8
R-PB10	1.1220047	168.5	01Oct2021, 12:52	38.8
PB13	0.0062812	4.9	01Oct2021, 12:00	0.3
P12 (CULV8)	1.1282859	168.9	01Oct2021, 12:52	39.1
R-PB13	1.1282859	168.9	01Oct2021, 12:53	39.1
OB8	0.0516742	19.5	01Oct2021, 12:13	2.1
R-OB8	0.0516742	19.5	01Oct2021, 12:16	2.1
PB11	0.0274375	13.6	01Oct2021, 12:10	1.4
P9 (CULV6)	0.0791117	31.8	01Oct2021, 12:14	3.5
R-PB11	0.0791117	31.7	01Oct2021, 12:14	3.5
P6	1.2073976	177.3	01Oct2021, 12:52	42.6
R-PB13-B	1.2073976	177.3	01Oct2021, 12:53	42.6
PB14	0.0270031	18.9	01Oct2021, 12:01	1.2
P3	1.2344007	179.0	01Oct2021, 12:53	43.8
OB3	0.0678750	25.4	01Oct2021, 12:13	2.8
OB4	0.0164062	7.5	01Oct2021, 12:10	0.8
R-OB4-A	0.0842812	32.7	01Oct2021, 12:13	3.5
PB5	0.0096625	4.2	01Oct2021, 12:12	0.5
P5 (CULV7)	0.0939437	36.9	01Oct2021, 12:13	4.0
R-OB4-B	0.0939437	36.8	01Oct2021, 12:15	4.0
OB2	0.0438438	20.5	01Oct2021, 12:08	1.9
R-OB2	0.0438438	20.5	01Oct2021, 12:10	1.9
PB4	0.0164672	12.6	01Oct2021, 12:00	0.8
P10 (CULV2)	0.1542547	58.0	01Oct2021, 12:13	6.7
R-PB5	0.1542547	58.0	01Oct2021, 12:14	6.7
PB6	0.0173312	8.6	01Oct2021, 12:11	0.9
PB7	0.0054062	3.2	01Oct2021, 12:08	0.3
CULV4	0.0054062	3.2	01Oct2021, 12:08	0.3
R-PB7-A	0.0054062	3.2	01Oct2021, 12:10	0.3
P11 (CULV3)	0.0227374	11.7	01Oct2021, 12:11	1.2



R-PB7-B	0.0227374	11.7	01Oct2021, 12:12	1.2
PB3	0.0021625	1.5	01Oct2021, 12:07	0.1
CULV1	0.0021625	1.5	01Oct2021, 12:08	0.1
R-PB3	0.0021625	1.5	01Oct2021, 12:09	0.1
P4	0.1791546	70.8	01Oct2021, 12:14	8.0
R-PB7-C	0.1791546	70.7	01Oct2021, 12:15	8.0
PB15	0.0150500	11.0	01Oct2021, 12:00	0.7
P2	0.1942046	72.7	01Oct2021, 12:15	8.7
OF-1	1.4286053	198.9	01Oct2021, 12:49	52.5
OB1	0.0162031	7.1	01Oct2021, 12:08	0.7
R-OB1	0.0162031	7.1	01Oct2021, 12:10	0.7
PB1	0.0066453	3.0	01Oct2021, 12:10	0.3
P1	0.0228484	10.1	01Oct2021, 12:10	1.0
PB2	0.0016935	1.0	01Oct2021, 12:06	0.1



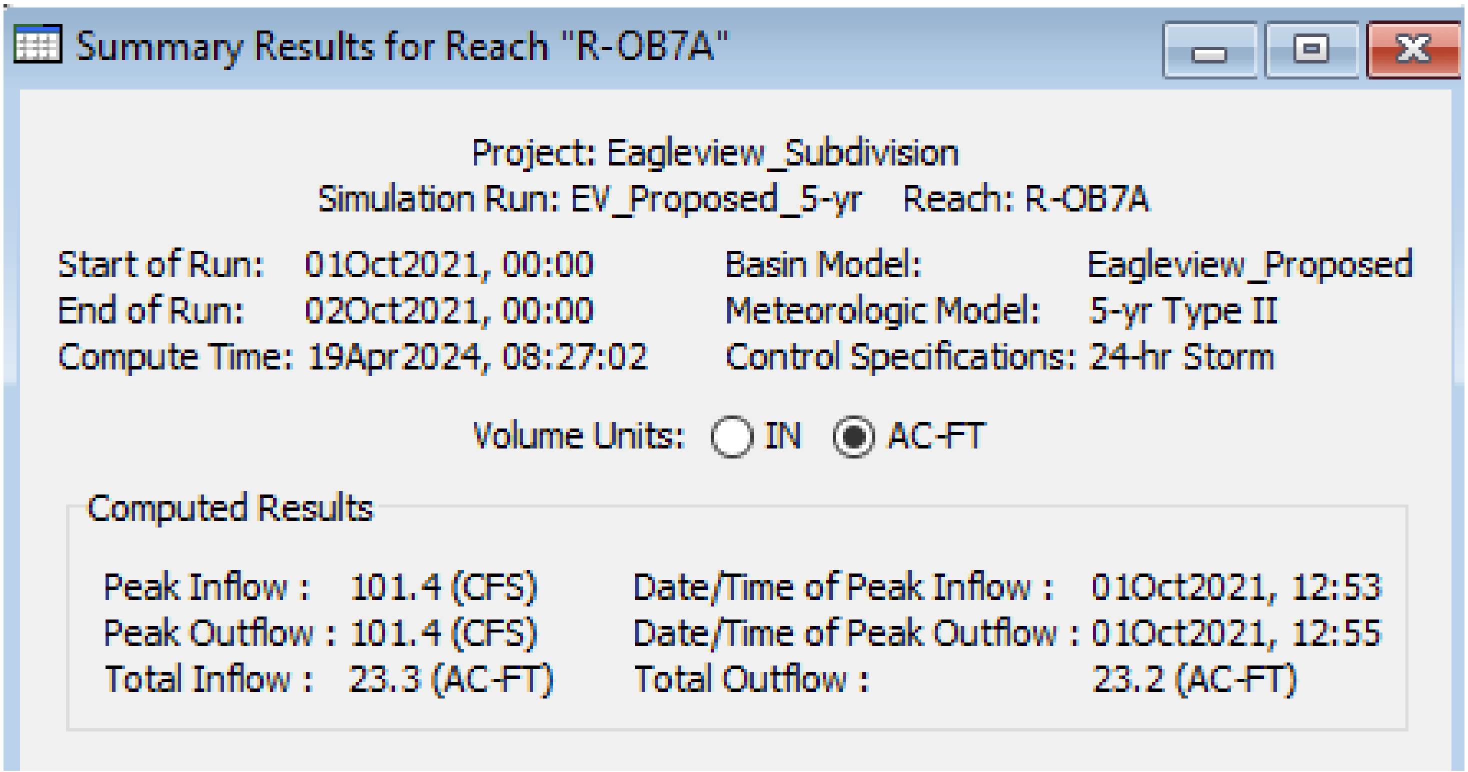
Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_5-yr   Subbasin: OB7

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 08:27:02
Basin Model: Eagleview_Proposed
Meteorologic Model: 5-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Discharge : 101.4 (CFS)
Total Precipitation : 94.8 (AC-FT)
Total Loss : 70.9 (AC-FT)
Total Excess : 23.9 (AC-FT)
Date/Time of Peak Discharge : 01Oct2021, 12:53
Total Direct Runoff : 23.3 (AC-FT)
Total Baseflow : 0.0 (AC-FT)
Discharge : 23.3 (AC-FT)



Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_5-yr   Reach: R-OB7A

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 08:27:02

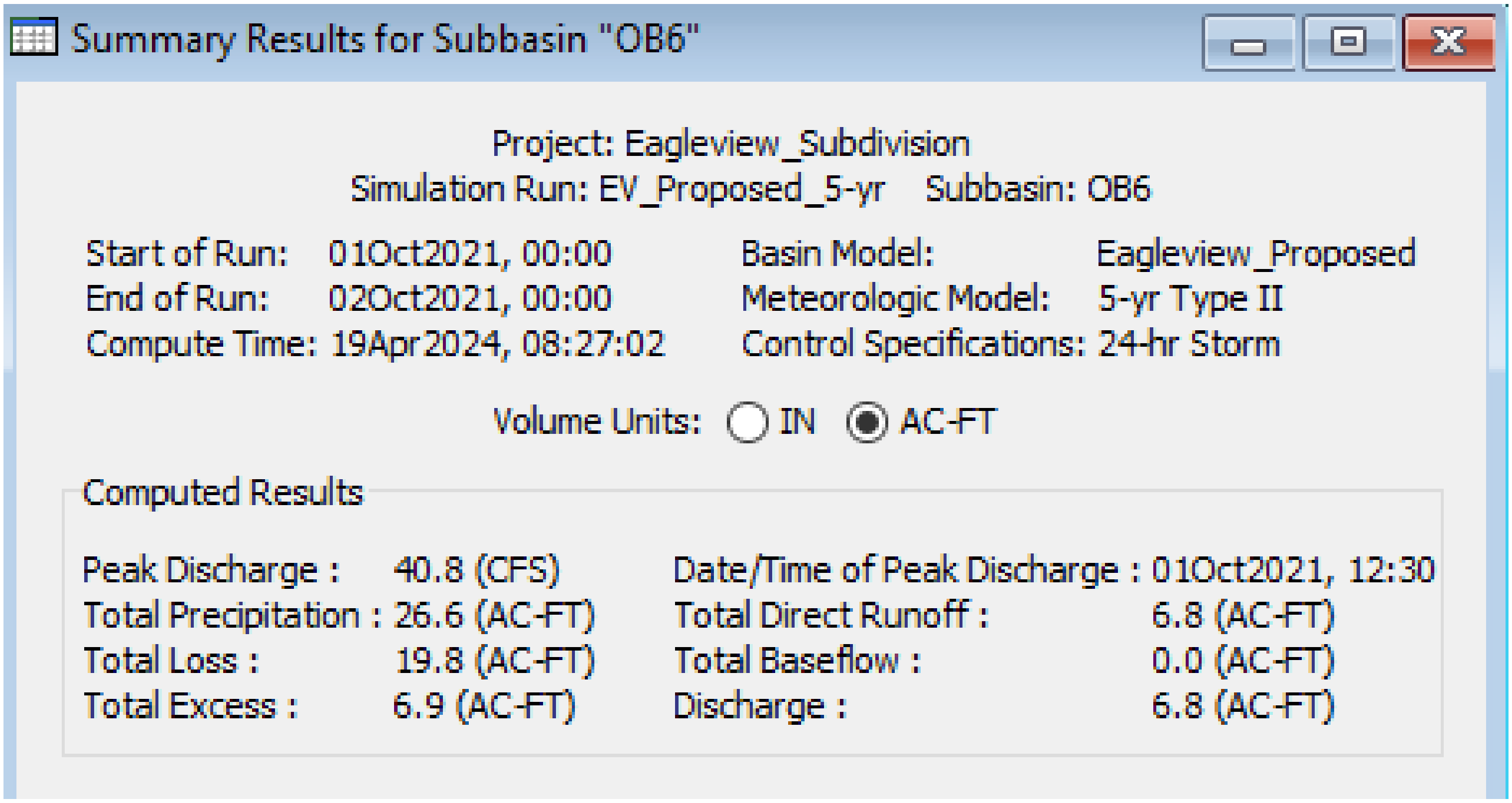
Basin Model: Eagleview_Proposed
Meteorologic Model: 5-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Inflow : 101.4 (CFS)
Peak Outflow : 101.4 (CFS)
Total Inflow : 23.3 (AC-FT)

Date/Time of Peak Inflow : 01Oct2021, 12:53
Date/Time of Peak Outflow : 01Oct2021, 12:55
Total Outflow : 23.2 (AC-FT)



Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_5-yr Subbasin: OB6

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 08:27:02

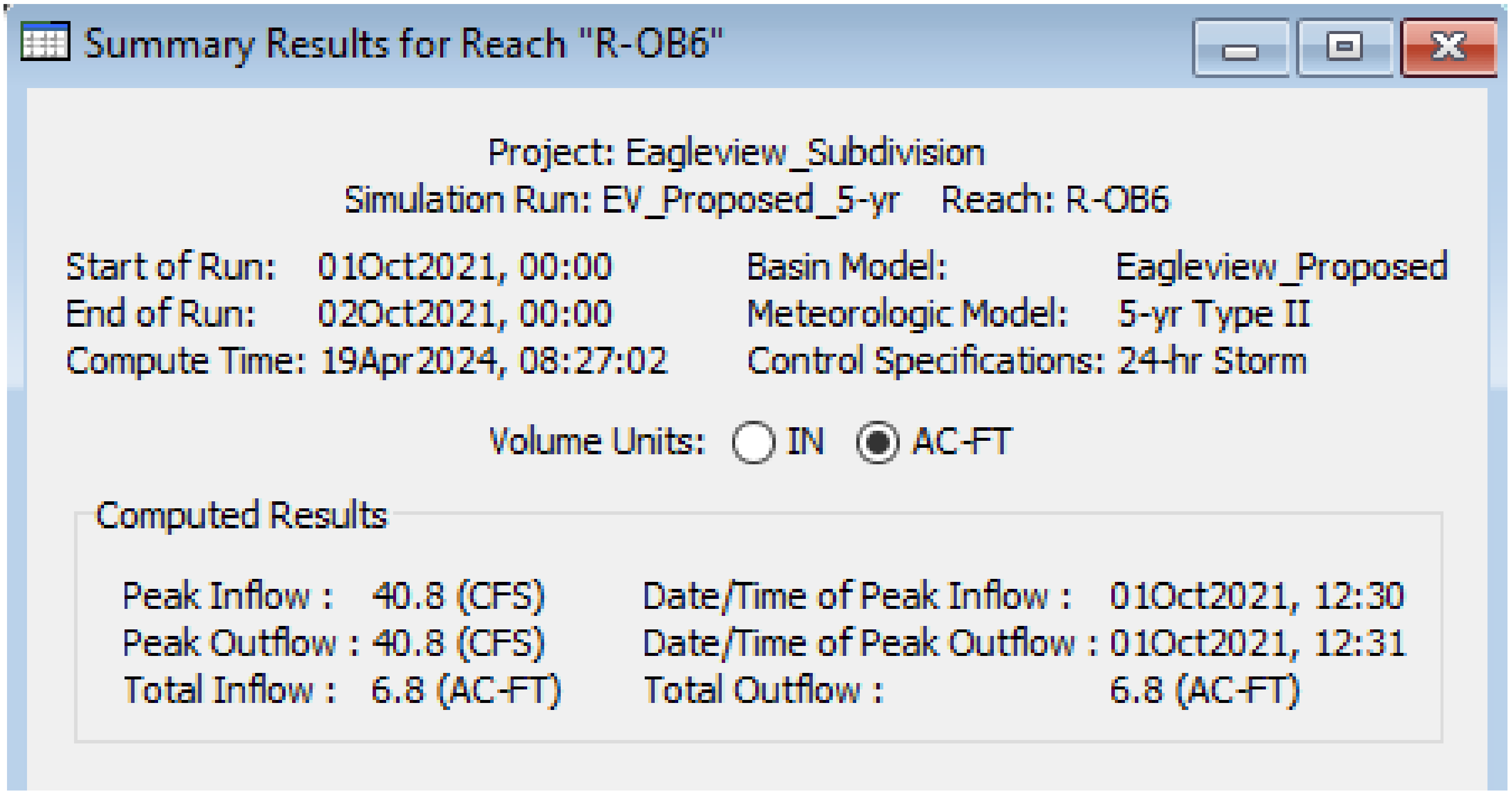
Basin Model: Eagleview_Proposed
Meteorologic Model: 5-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Discharge : 40.8 (CFS)
Total Precipitation : 26.6 (AC-FT)
Total Loss : 19.8 (AC-FT)
Total Excess : 6.9 (AC-FT)

Date/Time of Peak Discharge : 01Oct2021, 12:30
Total Direct Runoff : 6.8 (AC-FT)
Total Baseflow : 0.0 (AC-FT)
Discharge : 6.8 (AC-FT)



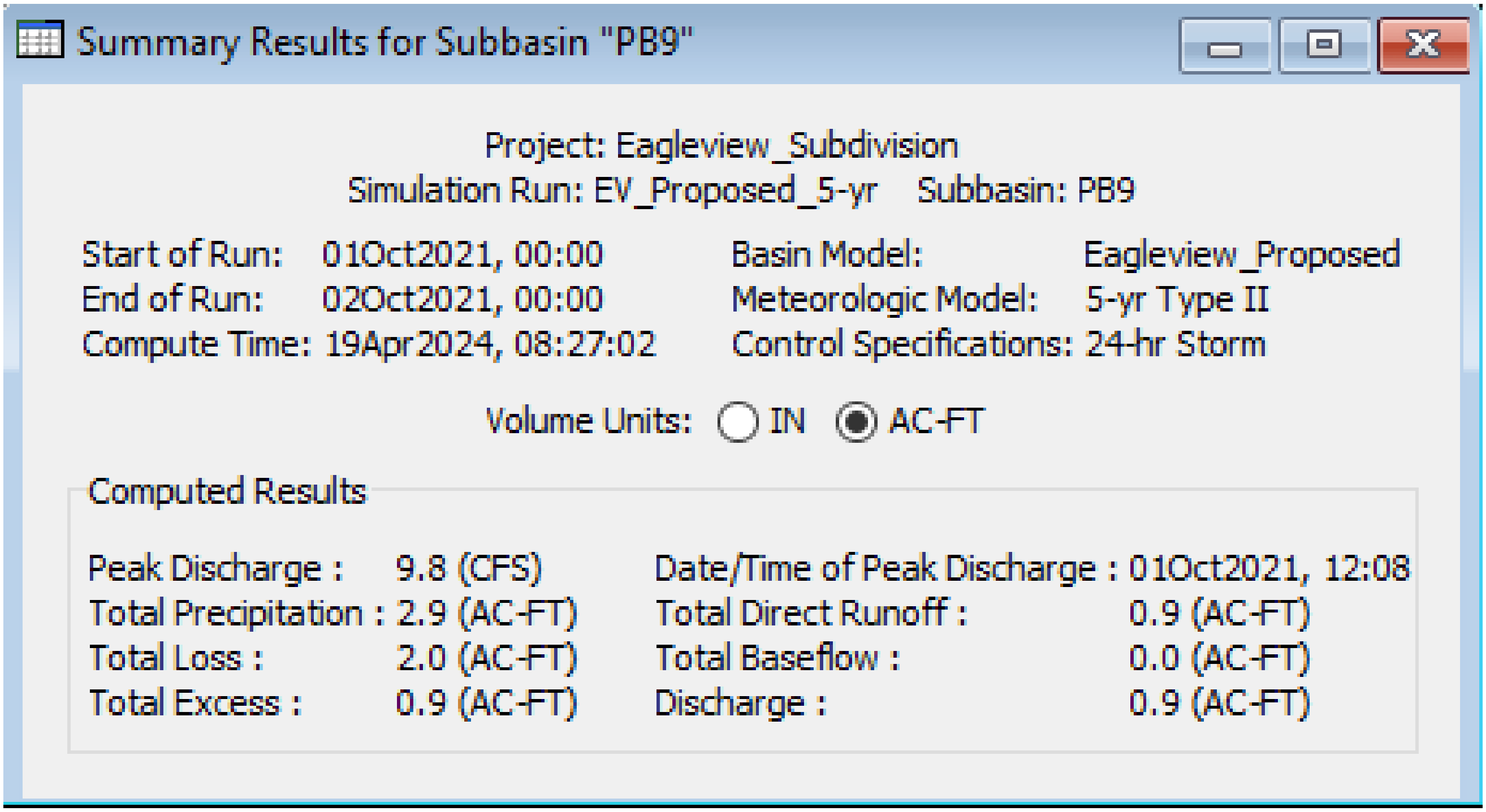
Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_5-yr Reach: R-OB6

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Proposed
End of Run:	02Oct2021, 00:00	Meteorologic Model:	5-yr Type II
Compute Time:	19Apr2024, 08:27:02	Control Specifications:	24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Inflow :	40.8 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 12:30
Peak Outflow :	40.8 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 12:31
Total Inflow :	6.8 (AC-FT)	Total Outflow :	6.8 (AC-FT)



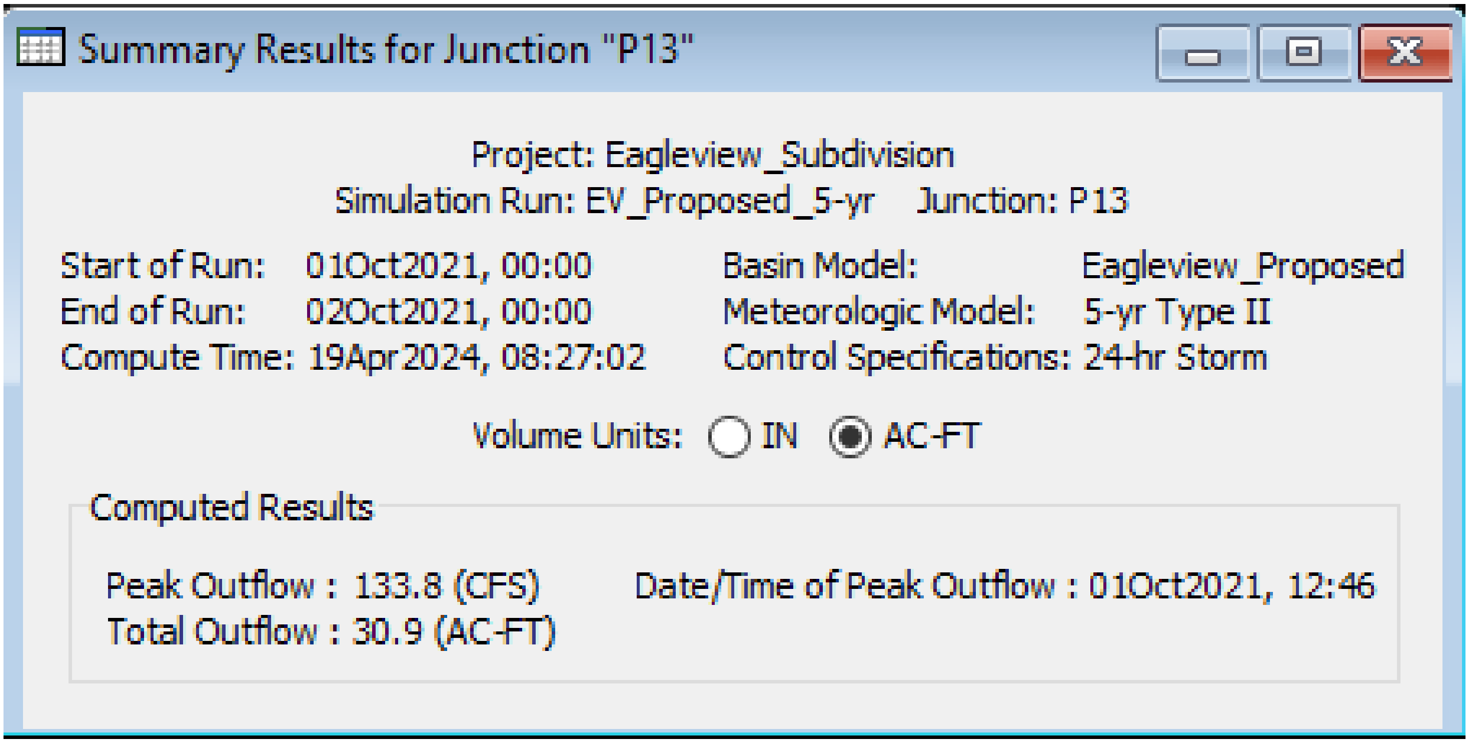
Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_5-yr   Subbasin: PB9

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Proposed
End of Run:	02Oct2021, 00:00	Meteorologic Model:	5-yr Type II
Compute Time:	19Apr2024, 08:27:02	Control Specifications:	24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Discharge :	9.8 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:08
Total Precipitation :	2.9 (AC-FT)	Total Direct Runoff :	0.9 (AC-FT)
Total Loss :	2.0 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	0.9 (AC-FT)	Discharge :	0.9 (AC-FT)



Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_5-yr Junction: P13

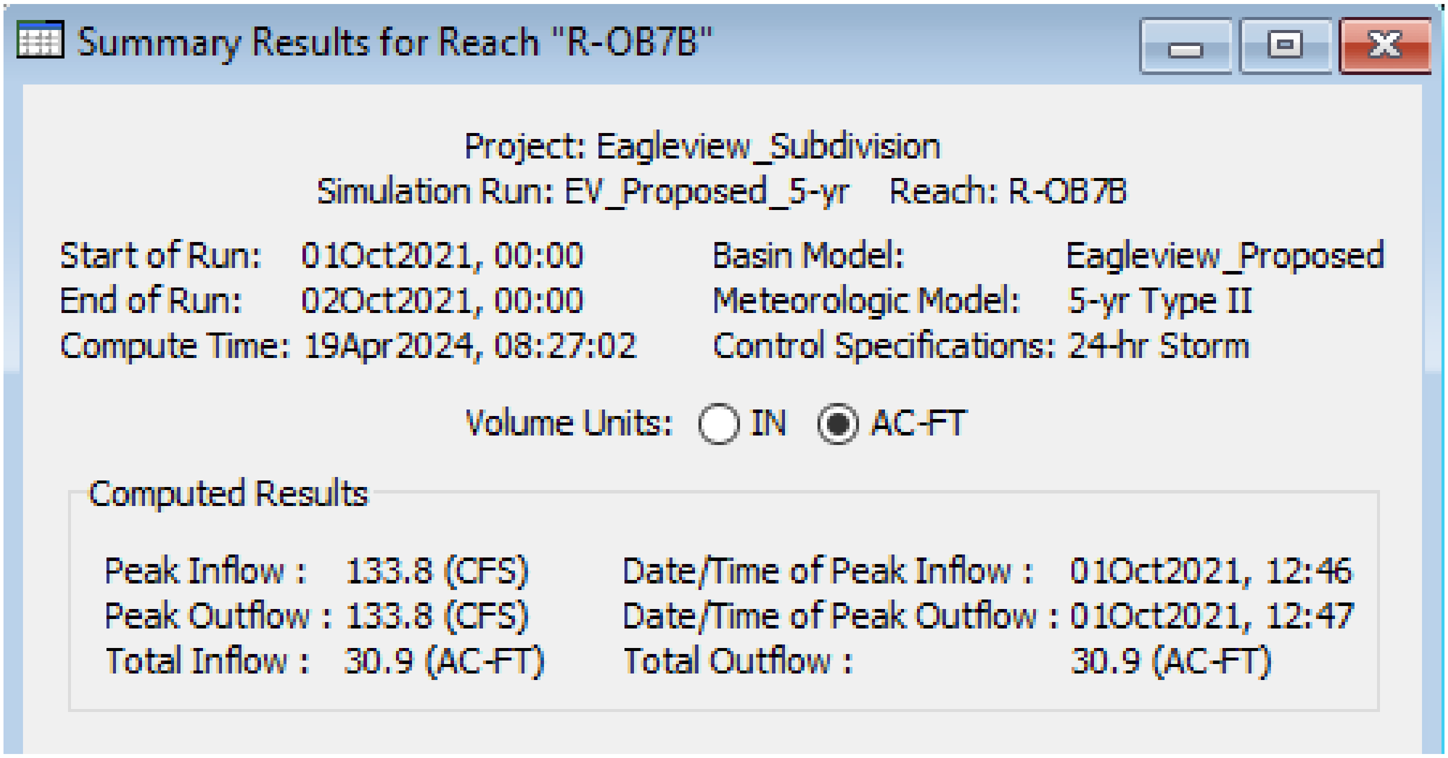
Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 08:27:02

Basin Model: Eagleview_Proposed
Meteorologic Model: 5-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Outflow : 133.8 (CFS)
Date/Time of Peak Outflow : 01Oct2021, 12:46
Total Outflow : 30.9 (AC-FT)


Summary Results for Reach "R-OB7B"

Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_5-yr Reach: R-OB7B

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 08:27:02

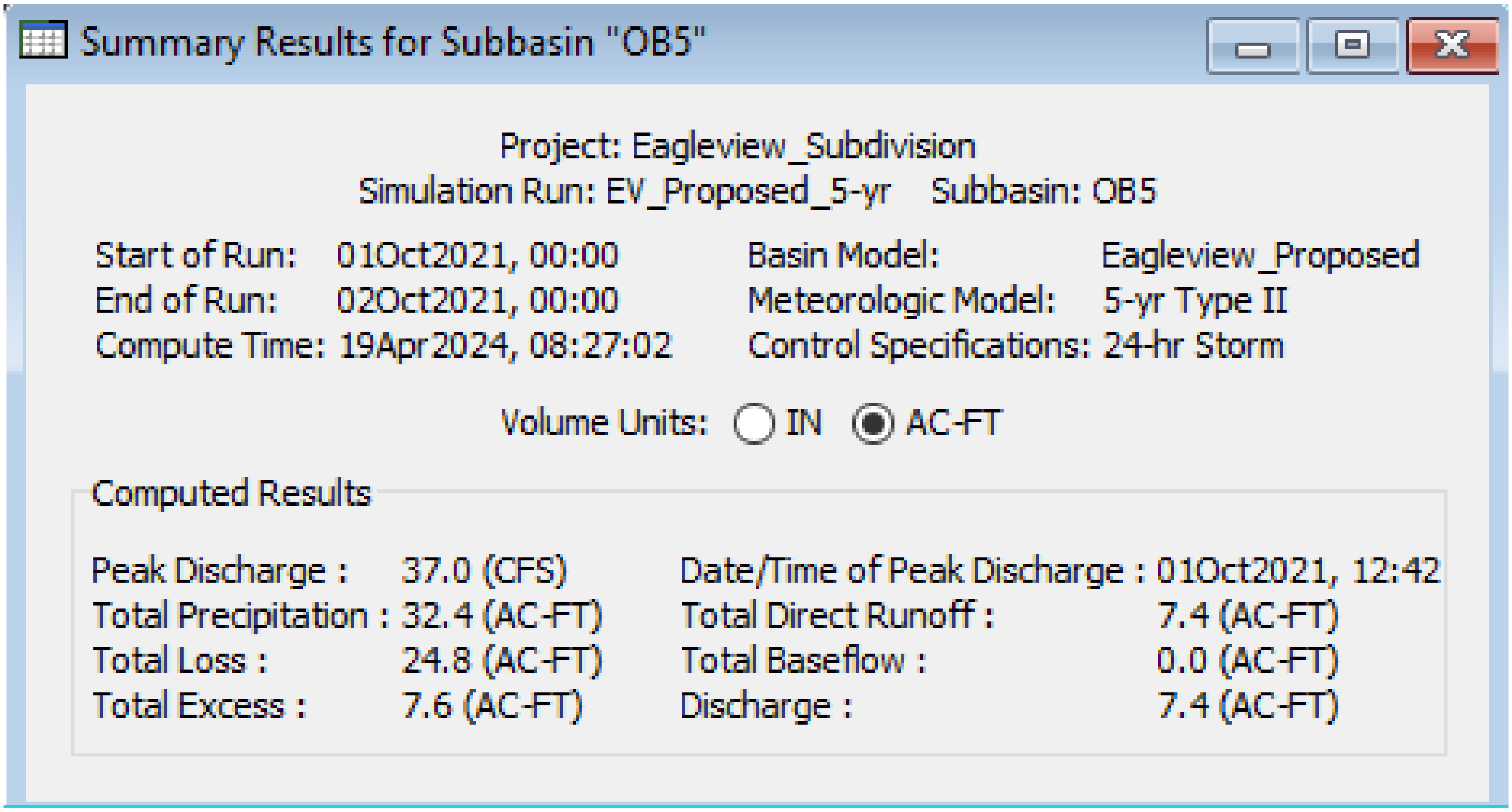
Basin Model: Eagleview_Proposed
Meteorologic Model: 5-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Inflow : 133.8 (CFS)
Peak Outflow : 133.8 (CFS)
Total Inflow : 30.9 (AC-FT)

Date/Time of Peak Inflow : 01Oct2021, 12:46
Date/Time of Peak Outflow : 01Oct2021, 12:47
Total Outflow : 30.9 (AC-FT)


Summary Results for Subbasin "OB5"

Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_5-yr Subbasin: OB5

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 08:27:02

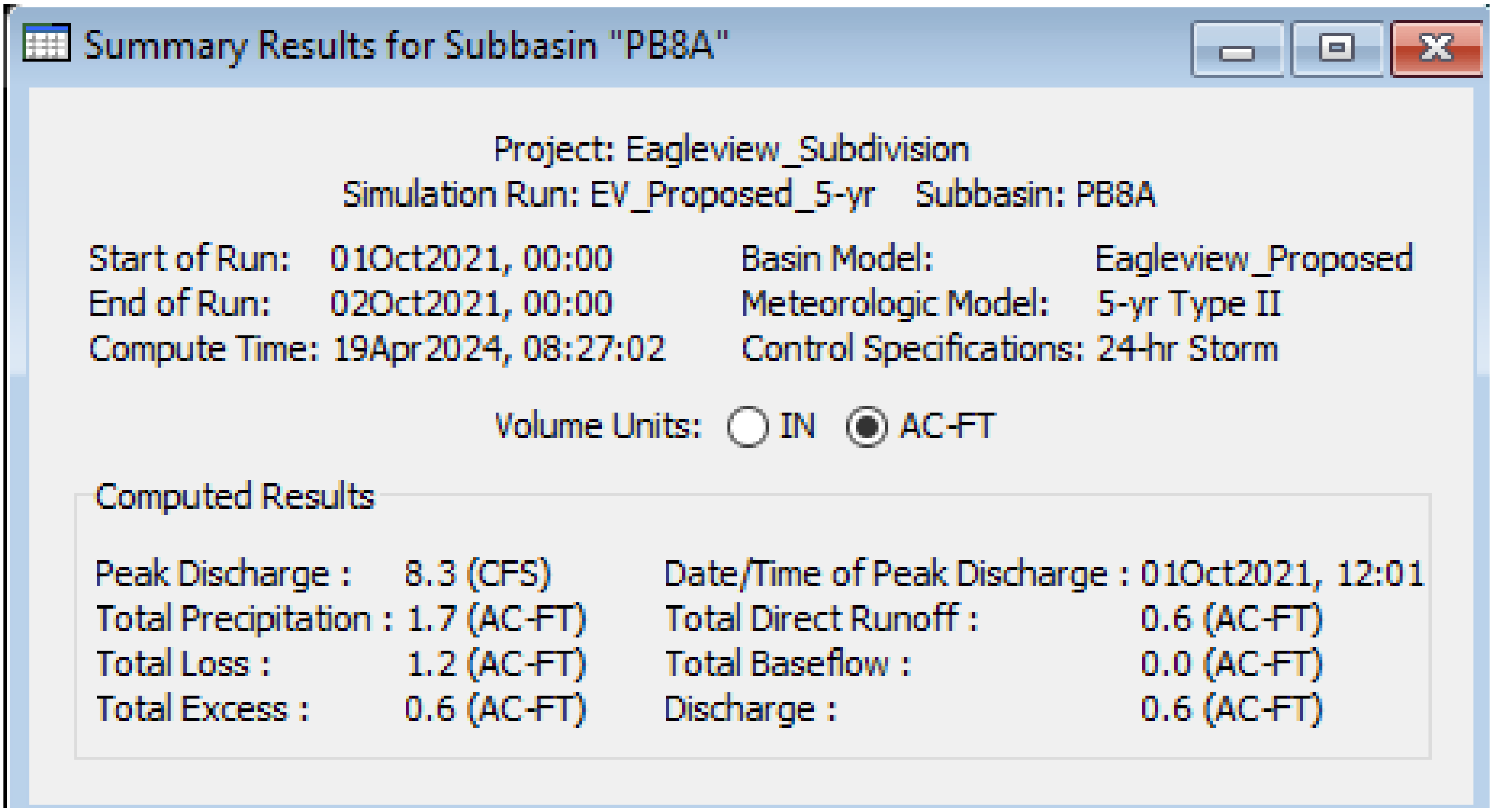
Basin Model: Eagleview_Proposed
Meteorologic Model: 5-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Discharge : 37.0 (CFS)
Total Precipitation : 32.4 (AC-FT)
Total Loss : 24.8 (AC-FT)
Total Excess : 7.6 (AC-FT)

Date/Time of Peak Discharge : 01Oct2021, 12:42
Total Direct Runoff : 7.4 (AC-FT)
Total Baseflow : 0.0 (AC-FT)
Discharge : 7.4 (AC-FT)



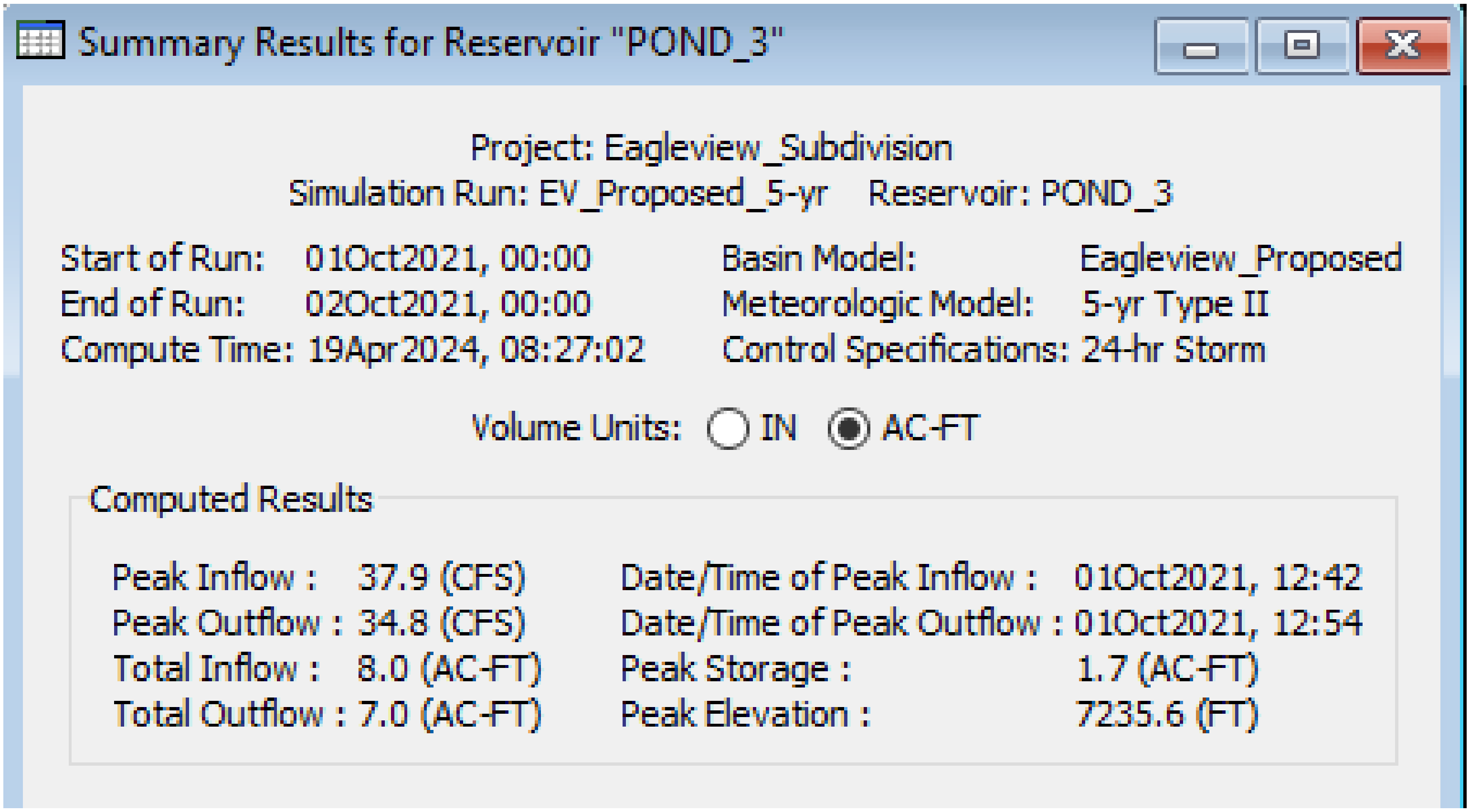
Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_5-yr Subbasin: PB8A

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Proposed
End of Run:	02Oct2021, 00:00	Meteorologic Model:	5-yr Type II
Compute Time:	19Apr2024, 08:27:02	Control Specifications:	24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Discharge :	8.3 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:01
Total Precipitation :	1.7 (AC-FT)	Total Direct Runoff :	0.6 (AC-FT)
Total Loss :	1.2 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	0.6 (AC-FT)	Discharge :	0.6 (AC-FT)



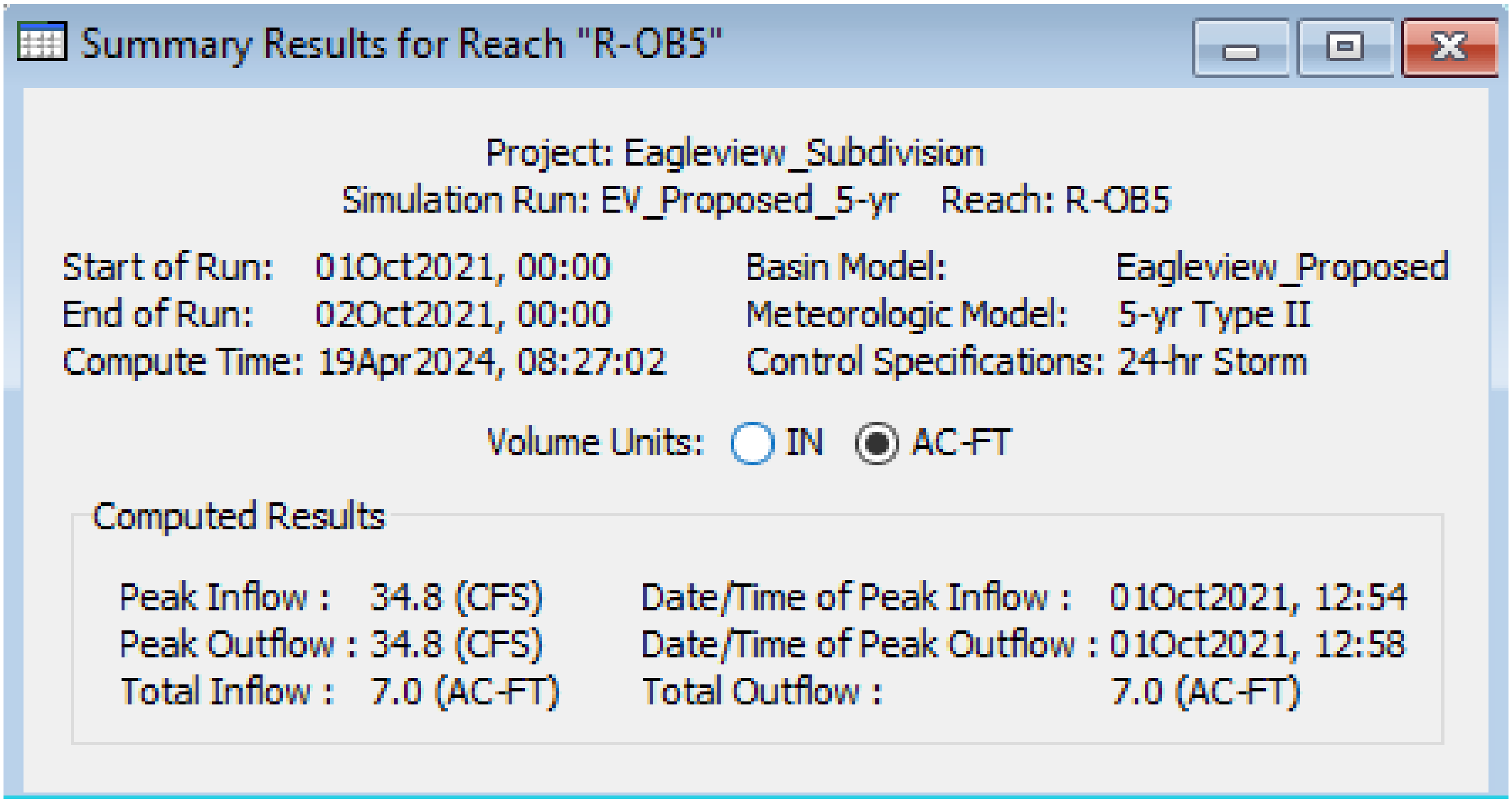
Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_5-yr   Reservoir: POND_3

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Proposed
End of Run:	02Oct2021, 00:00	Meteorologic Model:	5-yr Type II
Compute Time:	19Apr2024, 08:27:02	Control Specifications:	24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Inflow :	37.9 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 12:42
Peak Outflow :	34.8 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 12:54
Total Inflow :	8.0 (AC-FT)	Peak Storage :	1.7 (AC-FT)
Total Outflow :	7.0 (AC-FT)	Peak Elevation :	7235.6 (FT)



Summary Results for Reach "R-OB5"

Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_5-yr Reach: R-OB5

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 08:27:02

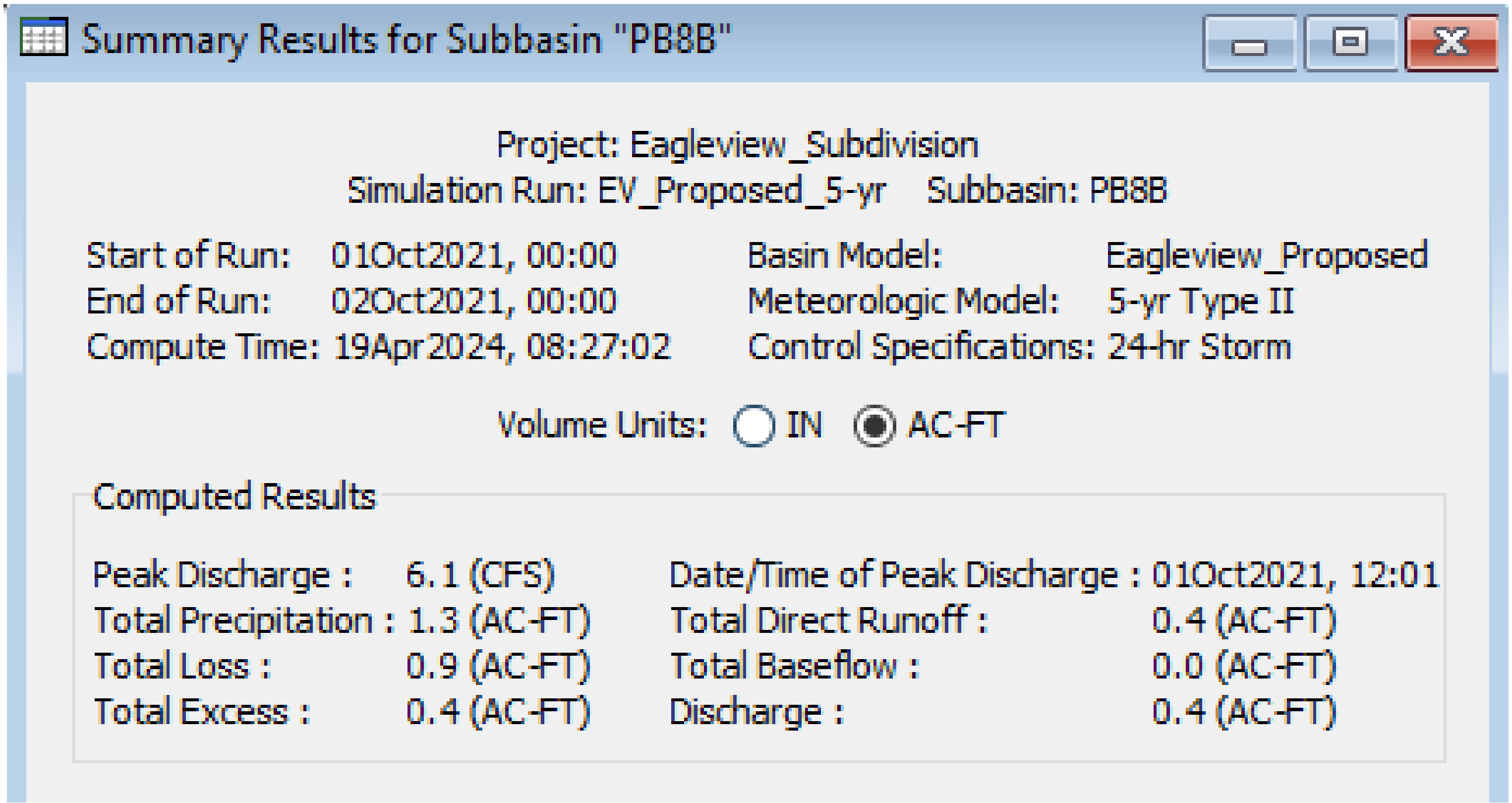
Basin Model: Eagleview_Proposed
Meteorologic Model: 5-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Inflow : 34.8 (CFS)
Peak Outflow : 34.8 (CFS)
Total Inflow : 7.0 (AC-FT)

Date/Time of Peak Inflow : 01Oct2021, 12:54
Date/Time of Peak Outflow : 01Oct2021, 12:58
Total Outflow : 7.0 (AC-FT)



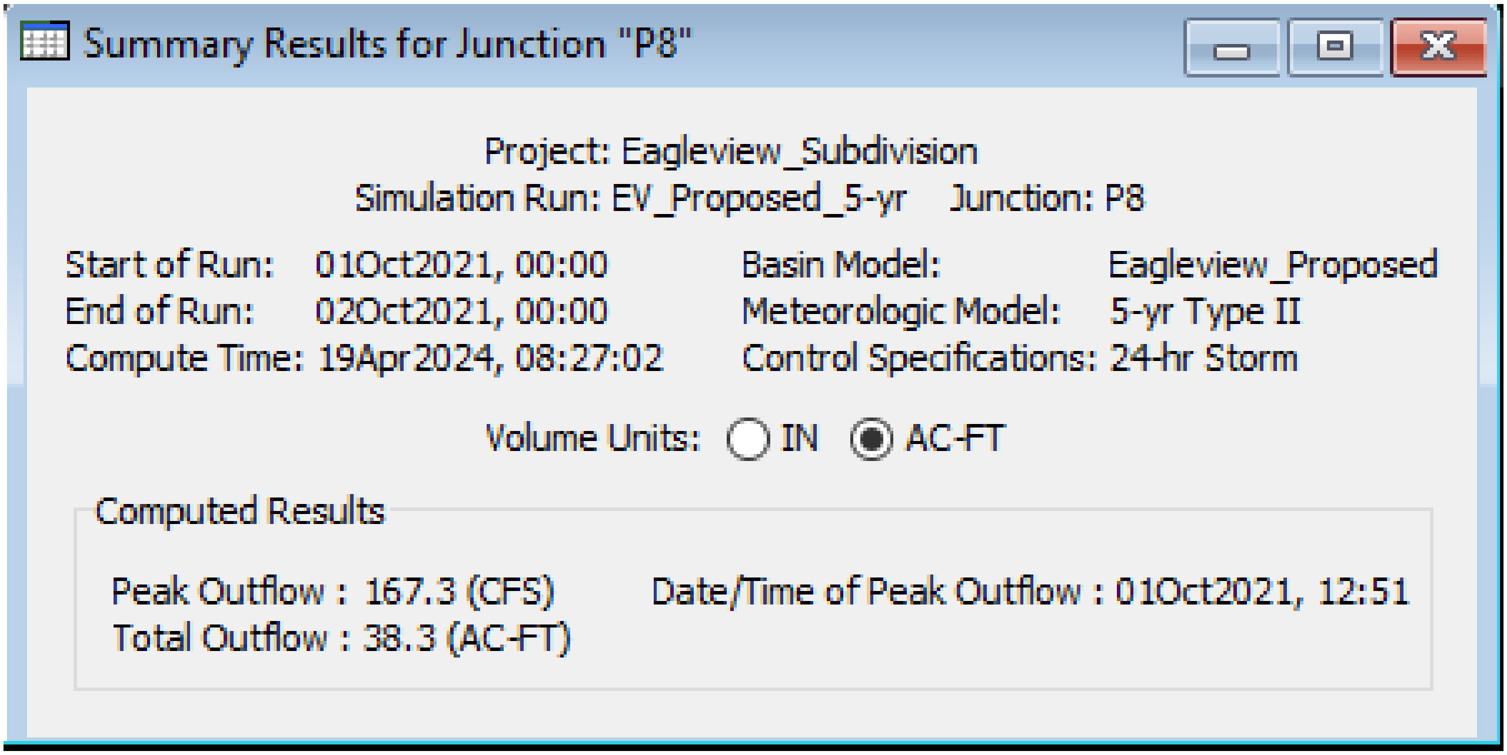
Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_5-yr Subbasin: PB8B

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Proposed
End of Run:	02Oct2021, 00:00	Meteorologic Model:	5-yr Type II
Compute Time:	19Apr2024, 08:27:02	Control Specifications:	24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Discharge :	6.1 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:01
Total Precipitation :	1.3 (AC-FT)	Total Direct Runoff :	0.4 (AC-FT)
Total Loss :	0.9 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	0.4 (AC-FT)	Discharge :	0.4 (AC-FT)


Summary Results for Junction "P8"

Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_5-yr   Junction: P8

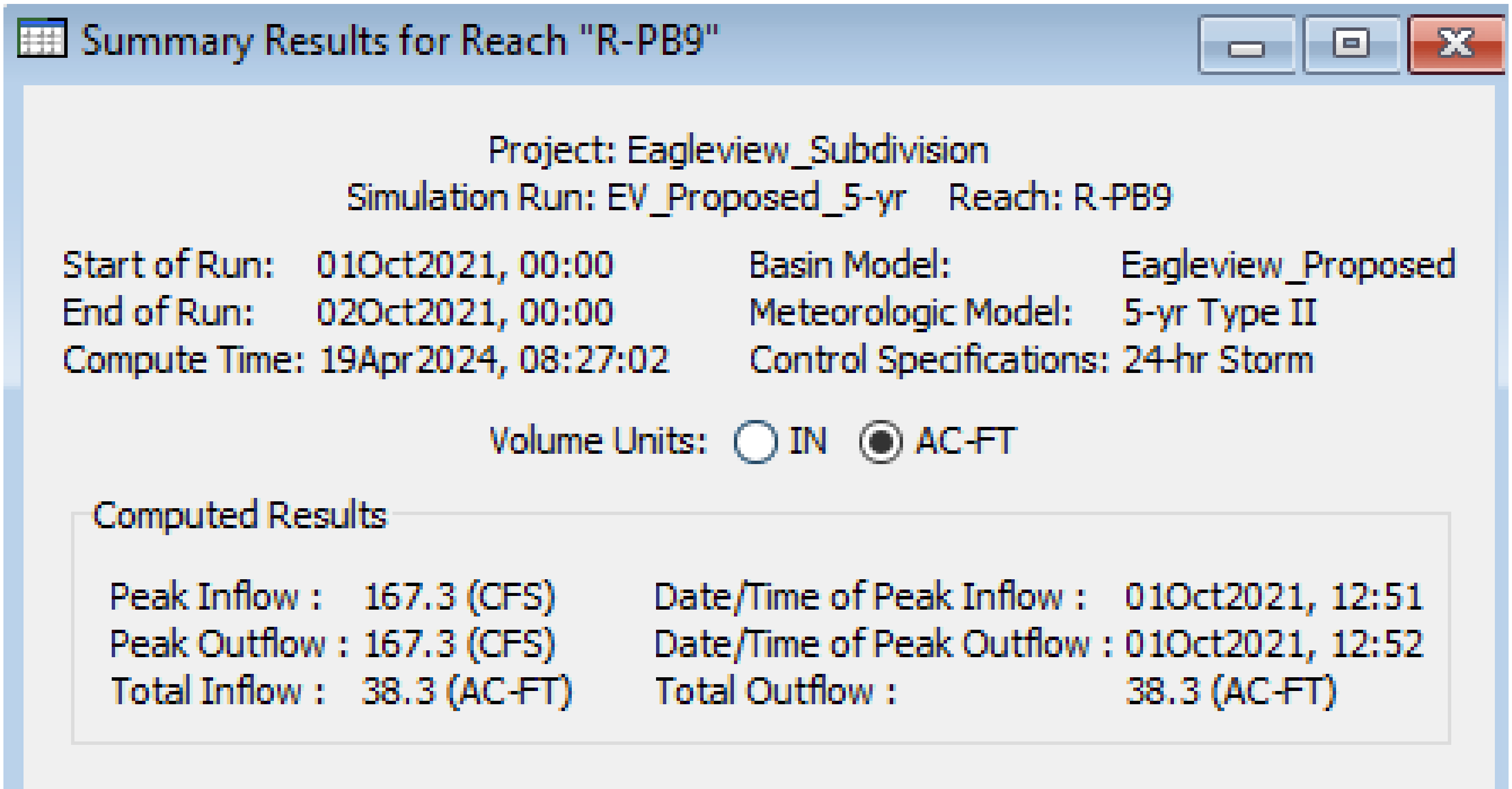
Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 08:27:02

Basin Model: Eagleview_Proposed
Meteorologic Model: 5-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Outflow : 167.3 (CFS)
Total Outflow : 38.3 (AC-FT)
Date/Time of Peak Outflow : 01Oct2021, 12:51



Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_5-yr Reach: R-PB9

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 08:27:02

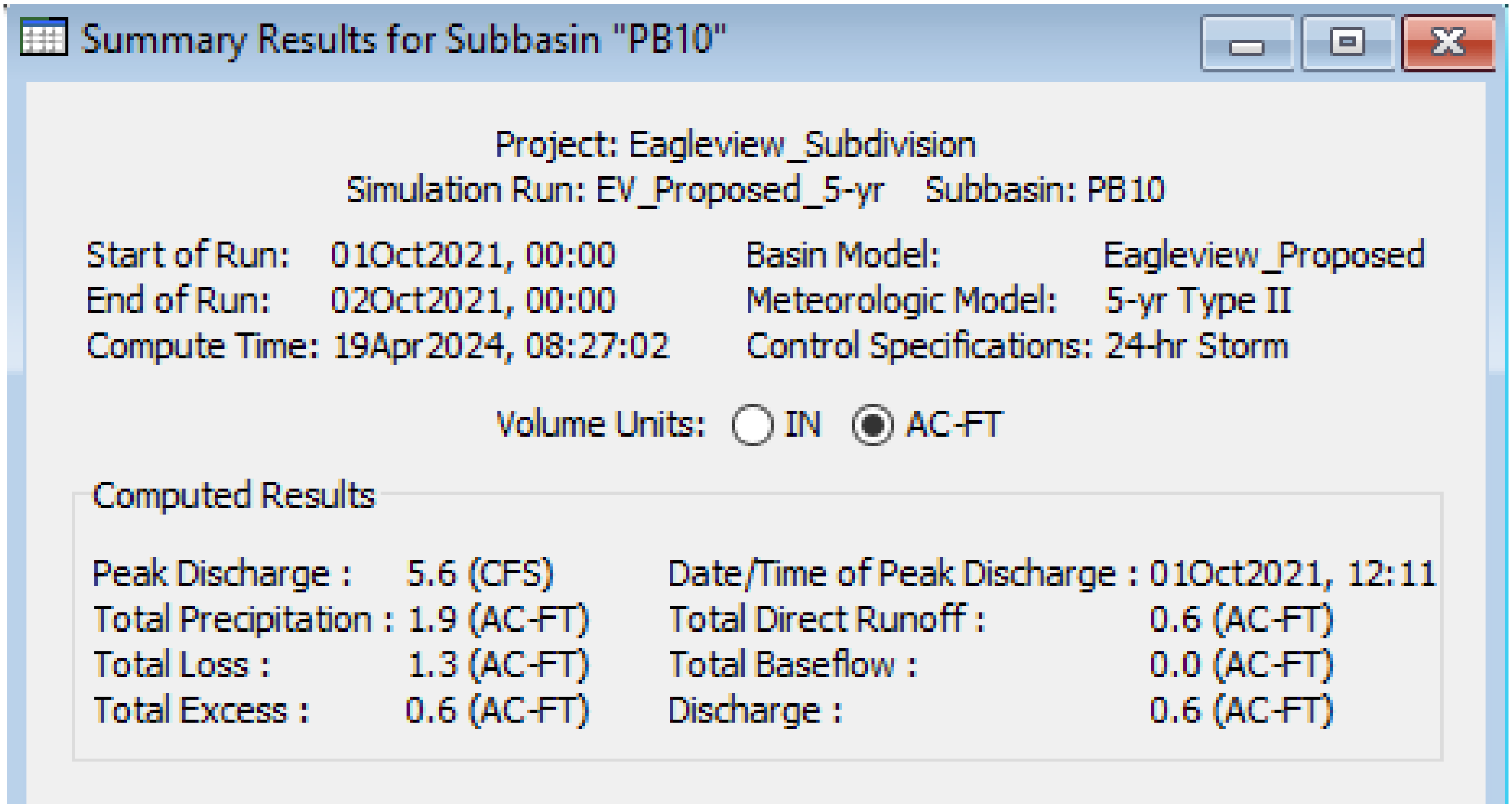
Basin Model: Eagleview_Proposed
Meteorologic Model: 5-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Inflow : 167.3 (CFS)
Peak Outflow : 167.3 (CFS)
Total Inflow : 38.3 (AC-FT)

Date/Time of Peak Inflow : 01Oct2021, 12:51
Date/Time of Peak Outflow : 01Oct2021, 12:52
Total Outflow : 38.3 (AC-FT)



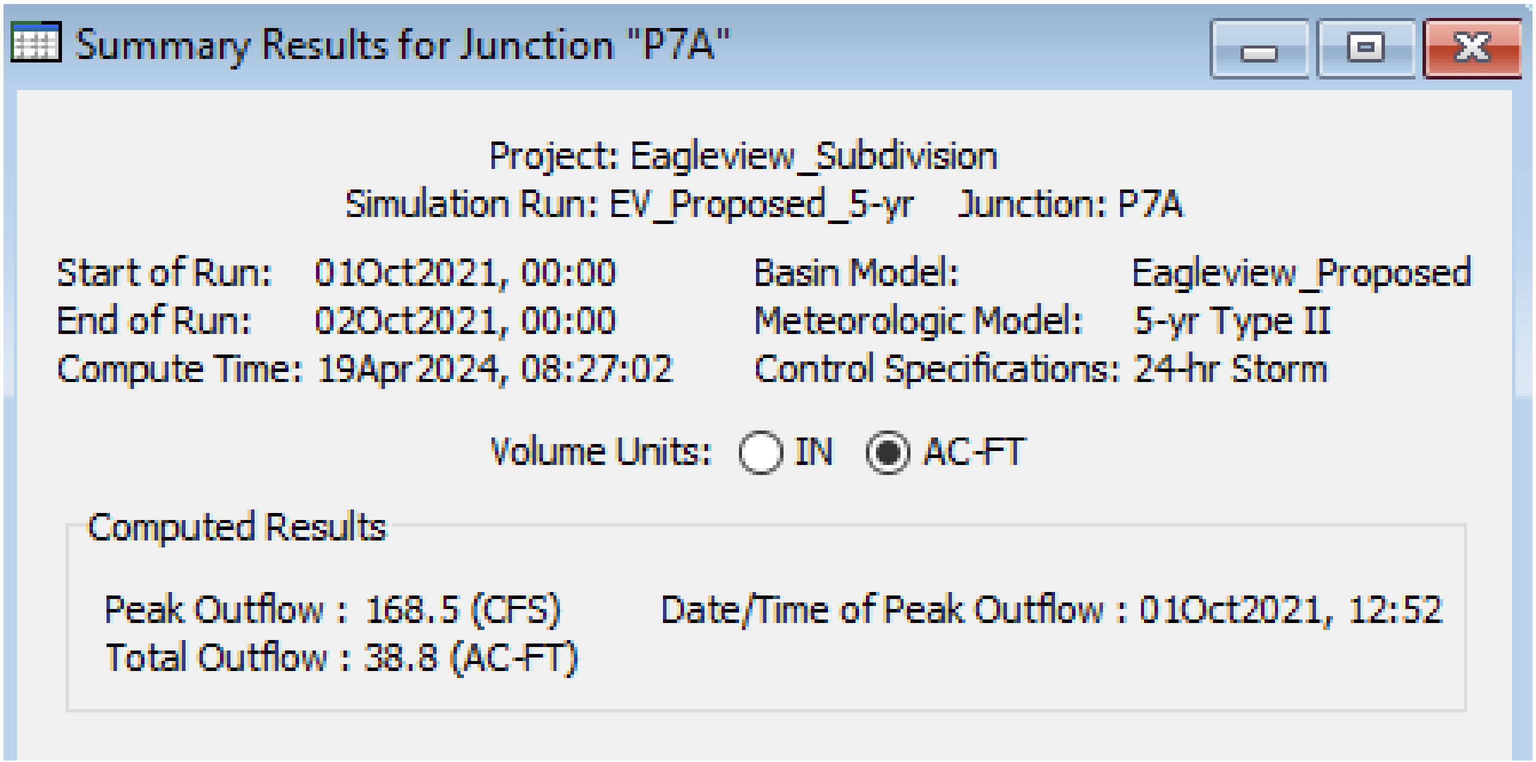
Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_5-yr Subbasin: PB10

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Proposed
End of Run:	02Oct2021, 00:00	Meteorologic Model:	5-yr Type II
Compute Time:	19Apr2024, 08:27:02	Control Specifications:	24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Discharge :	5.6 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:11
Total Precipitation :	1.9 (AC-FT)	Total Direct Runoff :	0.6 (AC-FT)
Total Loss :	1.3 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	0.6 (AC-FT)	Discharge :	0.6 (AC-FT)



Summary Results for Junction "P7A"

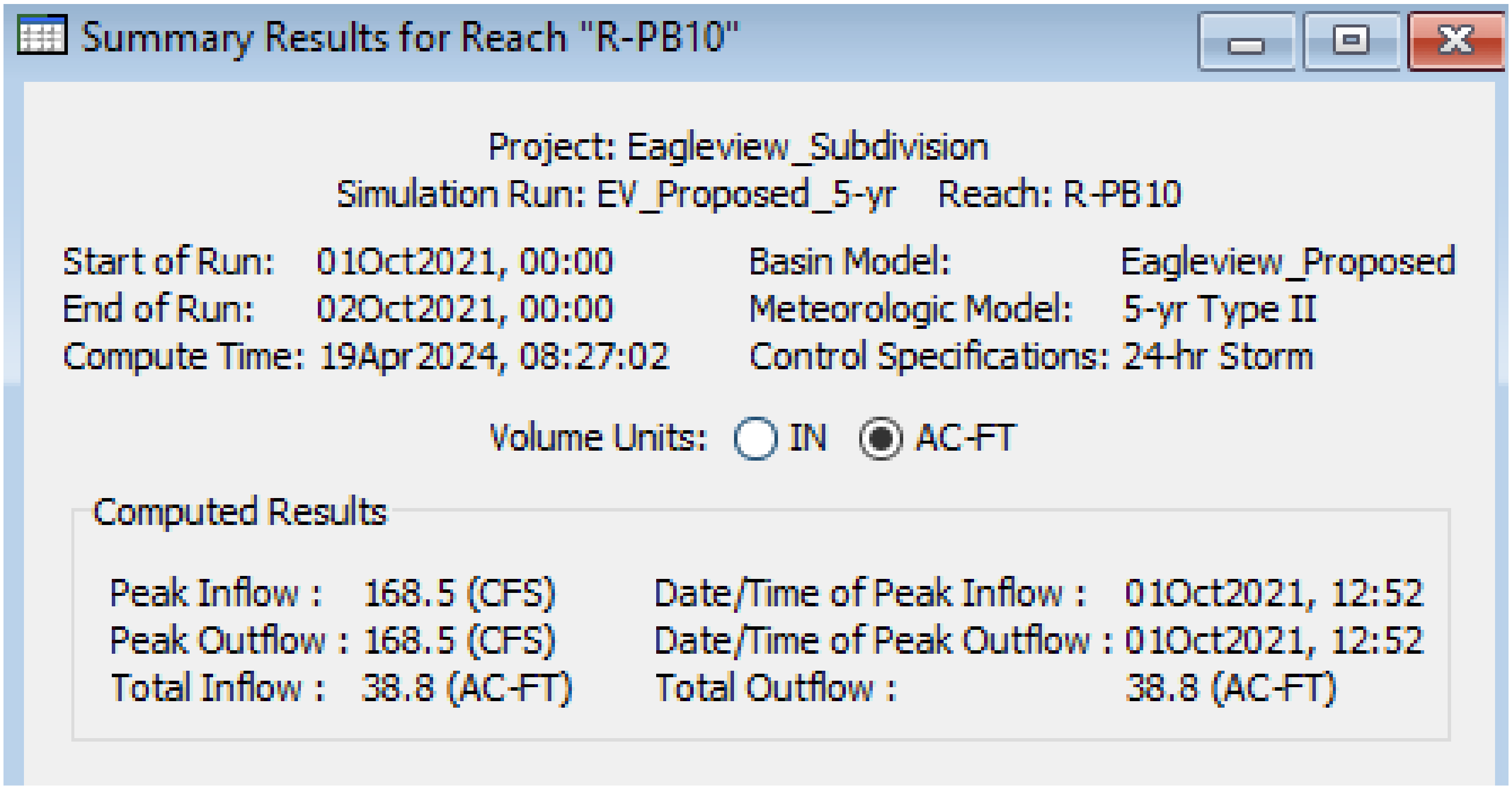
Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_5-yr Junction: P7A

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Proposed
End of Run:	02Oct2021, 00:00	Meteorologic Model:	5-yr Type II
Compute Time:	19Apr2024, 08:27:02	Control Specifications:	24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Outflow : 168.5 (CFS) Date/Time of Peak Outflow : 01Oct2021, 12:52
Total Outflow : 38.8 (AC-FT)



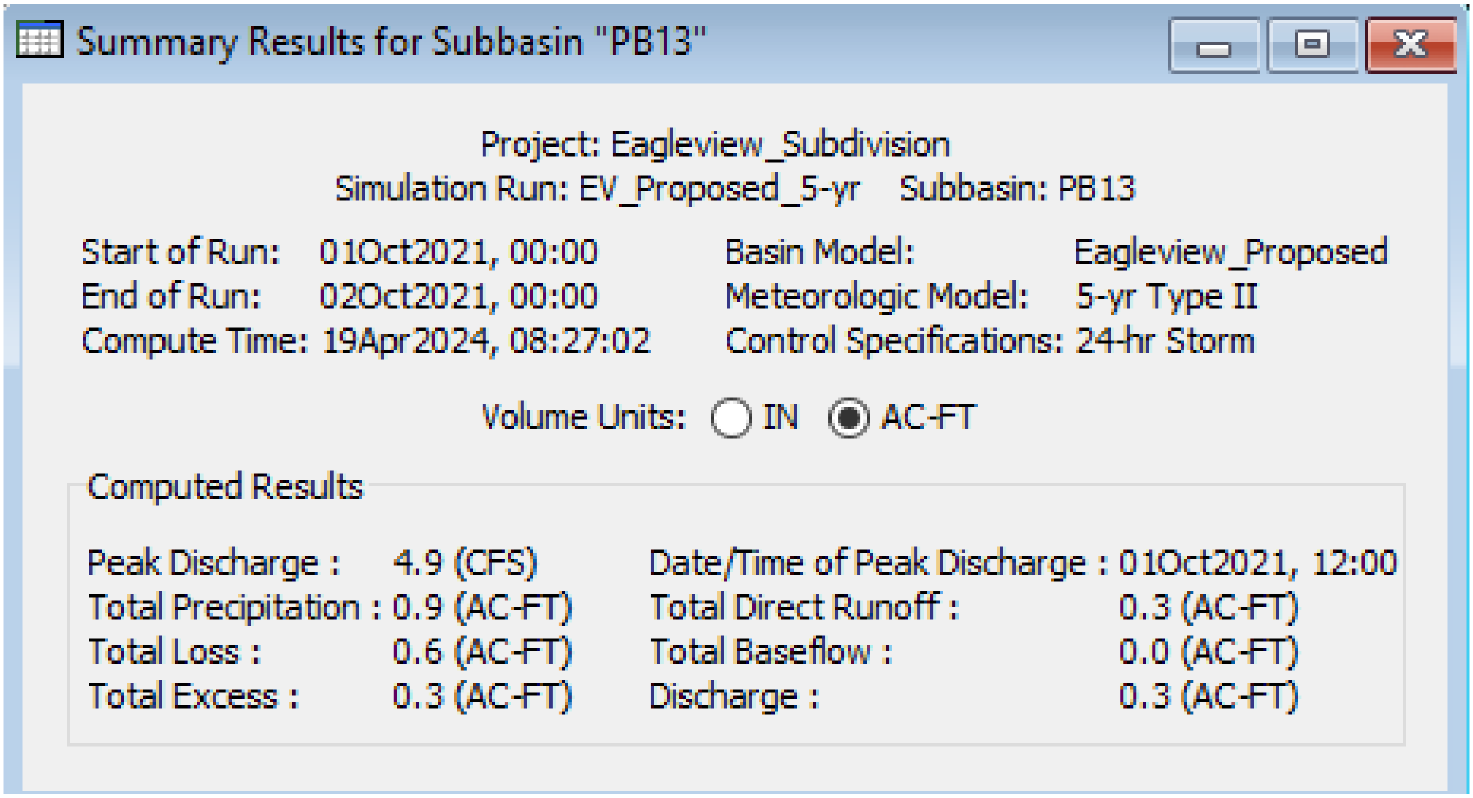
Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_5-yr   Reach: R-PB10

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Proposed
End of Run:	02Oct2021, 00:00	Meteorologic Model:	5-yr Type II
Compute Time:	19Apr2024, 08:27:02	Control Specifications:	24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Inflow :	168.5 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 12:52
Peak Outflow :	168.5 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 12:52
Total Inflow :	38.8 (AC-FT)	Total Outflow :	38.8 (AC-FT)



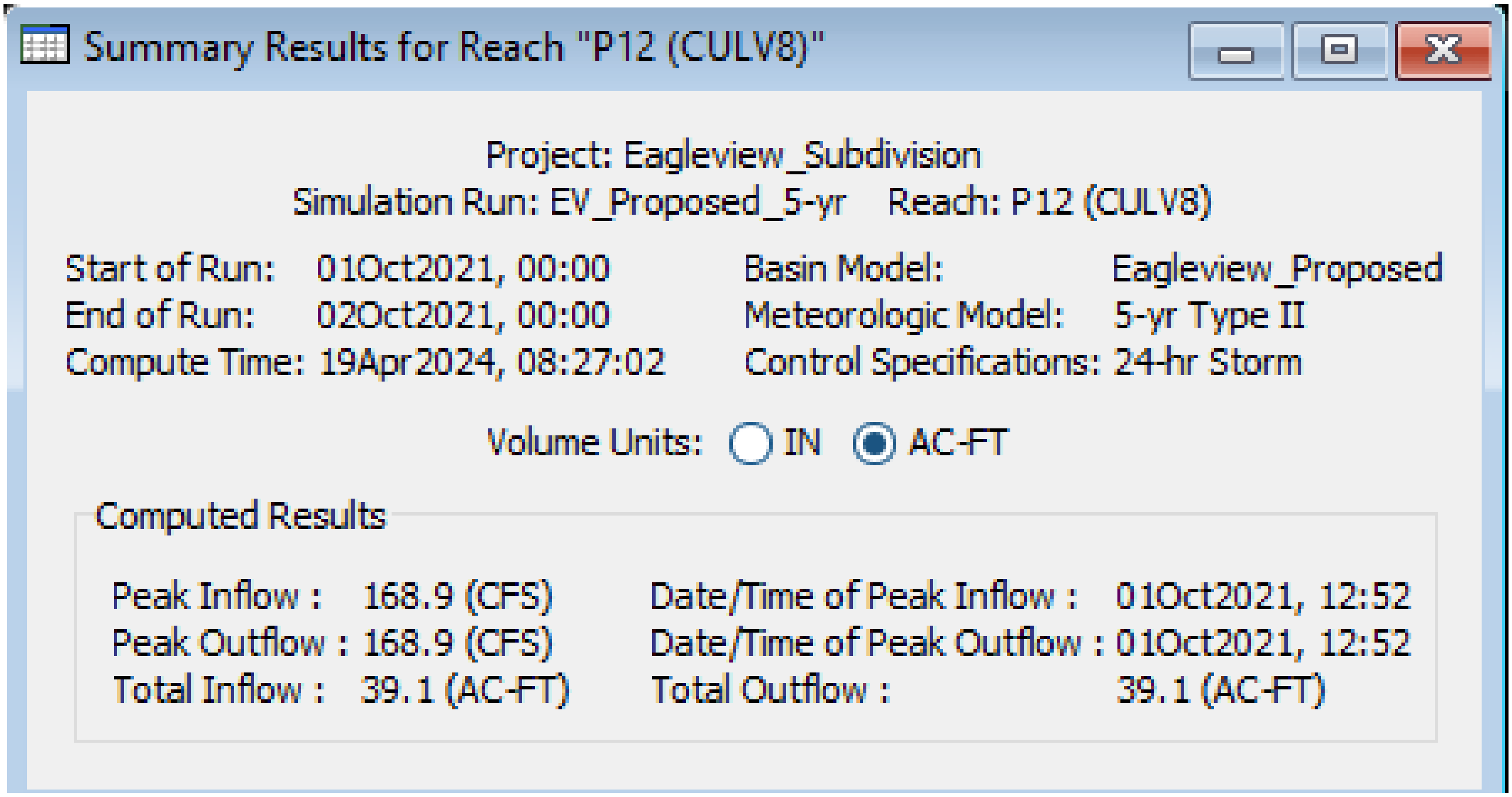
Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_5-yr Subbasin: PB13

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 08:27:02
Basin Model: Eagleview_Proposed
Meteorologic Model: 5-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Discharge : 4.9 (CFS)
Total Precipitation : 0.9 (AC-FT)
Total Loss : 0.6 (AC-FT)
Total Excess : 0.3 (AC-FT)
Date/Time of Peak Discharge : 01Oct2021, 12:00
Total Direct Runoff : 0.3 (AC-FT)
Total Baseflow : 0.0 (AC-FT)
Discharge : 0.3 (AC-FT)



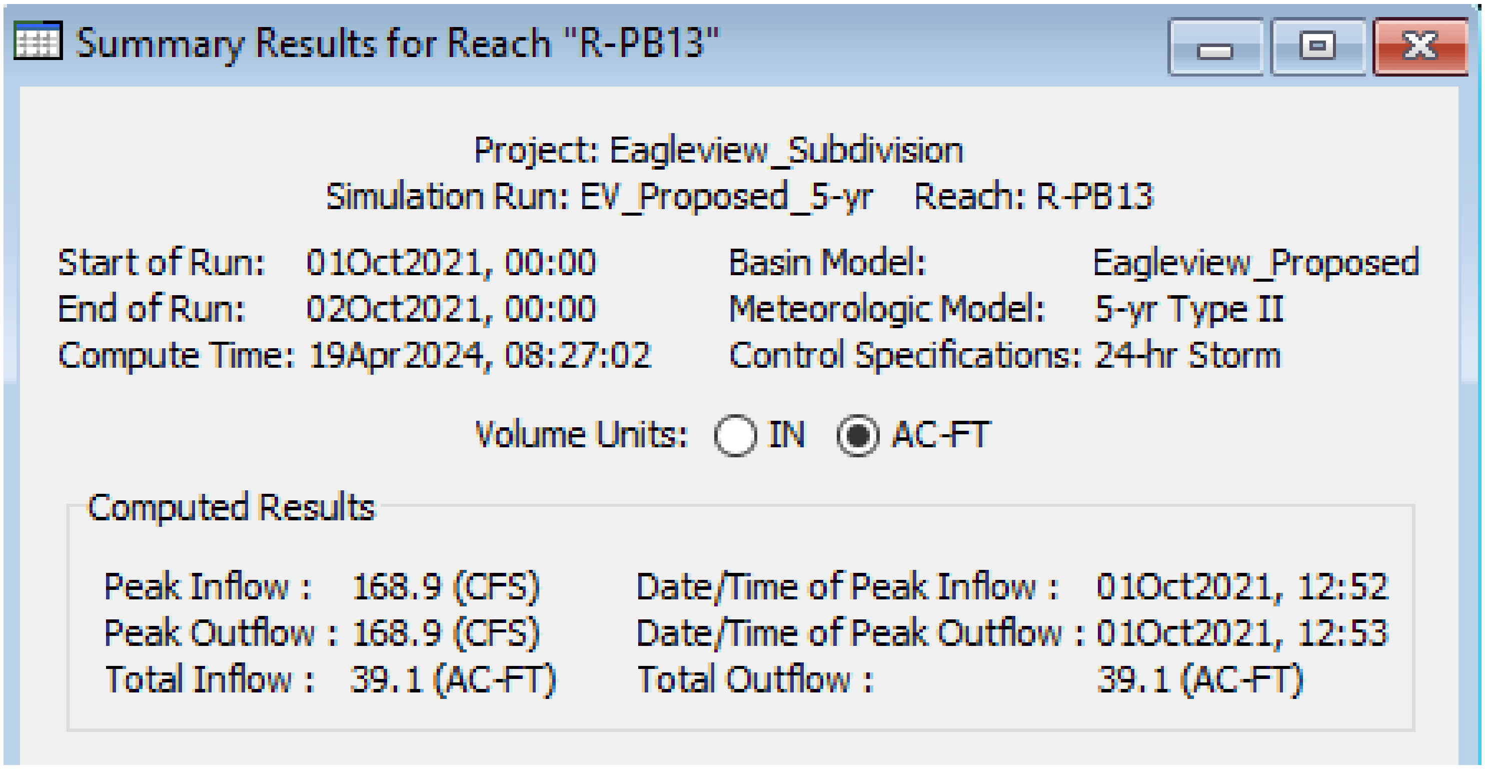
Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_5-yr   Reach: P12 (CULV8)

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Proposed
End of Run:	02Oct2021, 00:00	Meteorologic Model:	5-yr Type II
Compute Time:	19Apr2024, 08:27:02	Control Specifications:	24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Inflow :	168.9 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 12:52
Peak Outflow :	168.9 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 12:52
Total Inflow :	39.1 (AC-FT)	Total Outflow :	39.1 (AC-FT)


Summary Results for Reach "R-PB13"

Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_5-yr Reach: R-PB13

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 08:27:02

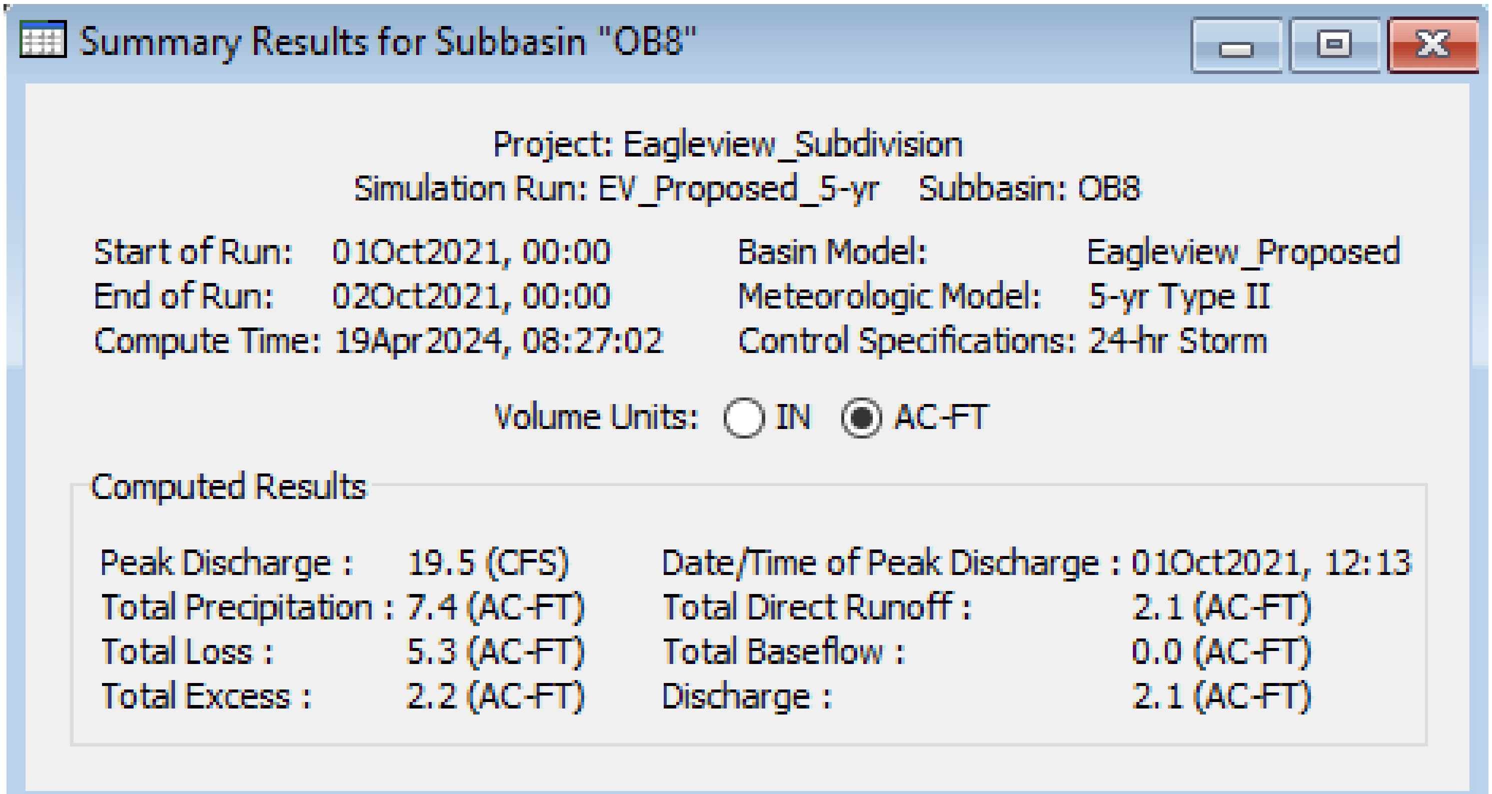
Basin Model: Eagleview_Proposed
Meteorologic Model: 5-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Inflow : 168.9 (CFS)
Peak Outflow : 168.9 (CFS)
Total Inflow : 39.1 (AC-FT)

Date/Time of Peak Inflow : 01Oct2021, 12:52
Date/Time of Peak Outflow : 01Oct2021, 12:53
Total Outflow : 39.1 (AC-FT)



Summary Results for Subbasin "OB8"

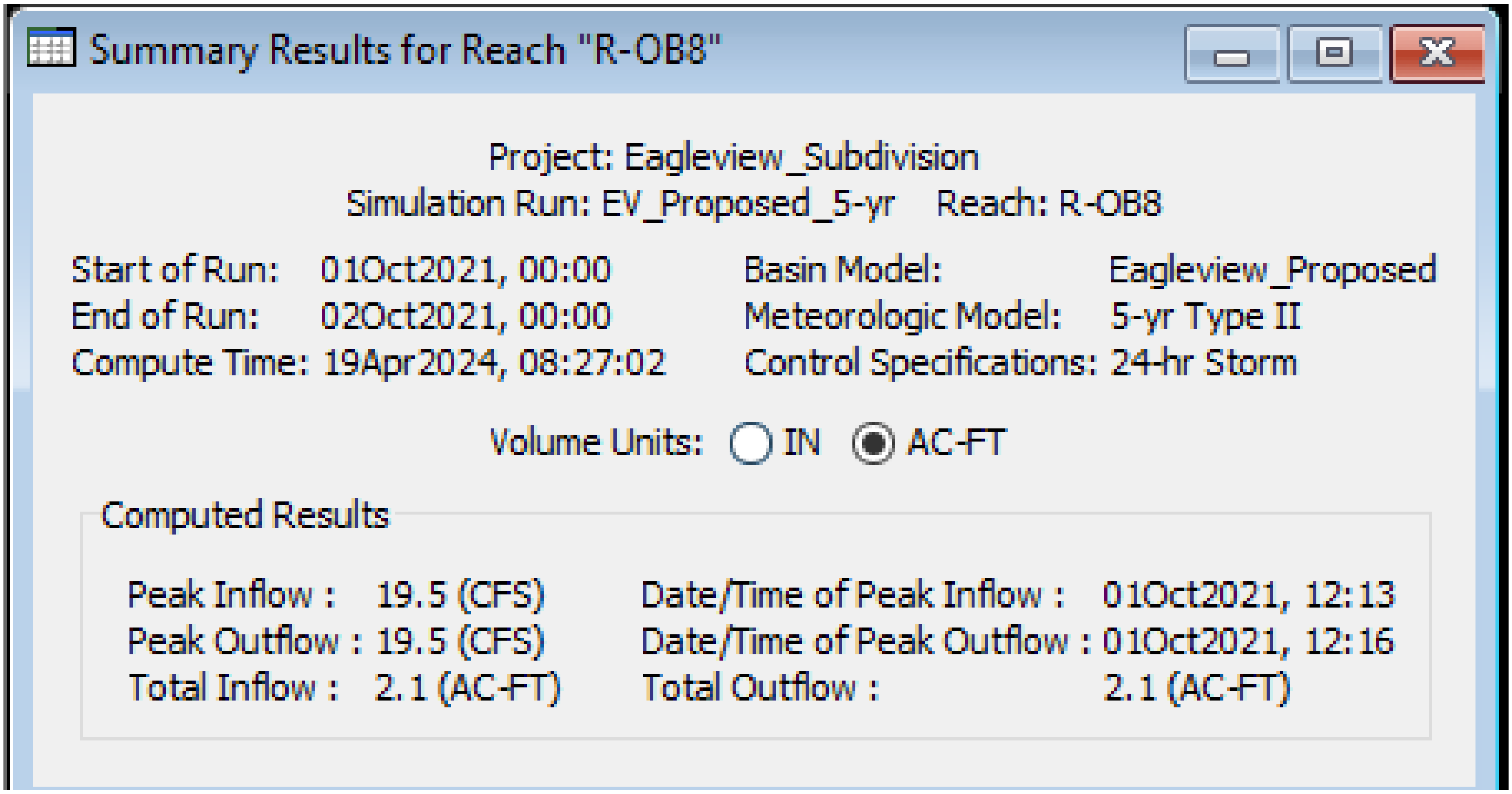
Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_5-yr   Subbasin: OB8

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Proposed
End of Run:	02Oct2021, 00:00	Meteorologic Model:	5-yr Type II
Compute Time:	19Apr2024, 08:27:02	Control Specifications:	24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Discharge :	19.5 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:13
Total Precipitation :	7.4 (AC-FT)	Total Direct Runoff :	2.1 (AC-FT)
Total Loss :	5.3 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	2.2 (AC-FT)	Discharge :	2.1 (AC-FT)



Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_5-yr Reach: R-OB8

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 08:27:02

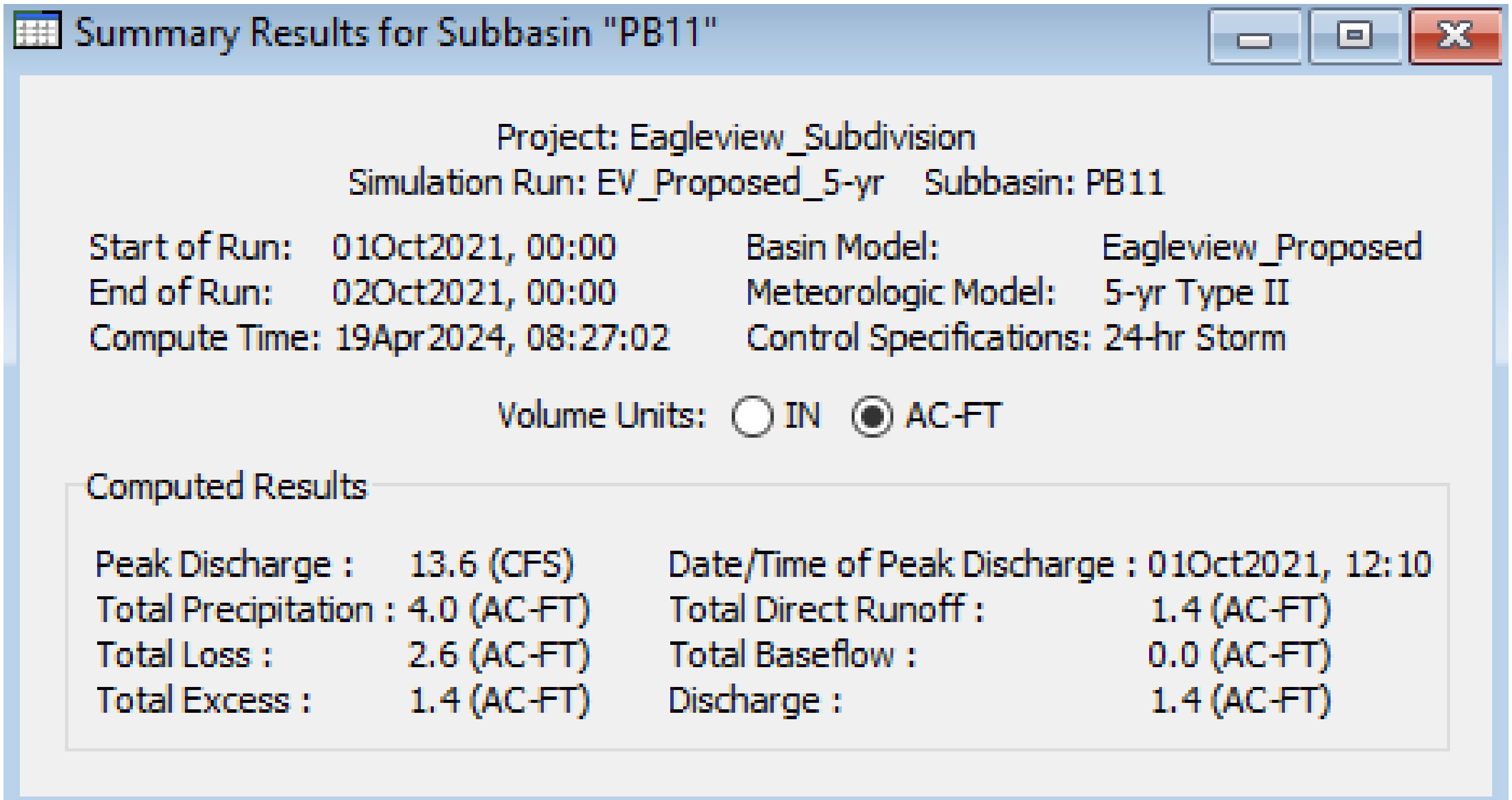
Basin Model: Eagleview_Proposed
Meteorologic Model: 5-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Inflow : 19.5 (CFS)
Peak Outflow : 19.5 (CFS)
Total Inflow : 2.1 (AC-FT)

Date/Time of Peak Inflow : 01Oct2021, 12:13
Date/Time of Peak Outflow : 01Oct2021, 12:16
Total Outflow : 2.1 (AC-FT)



Summary Results for Subbasin "PB11"

Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_5-yr Subbasin: PB11

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 08:27:02

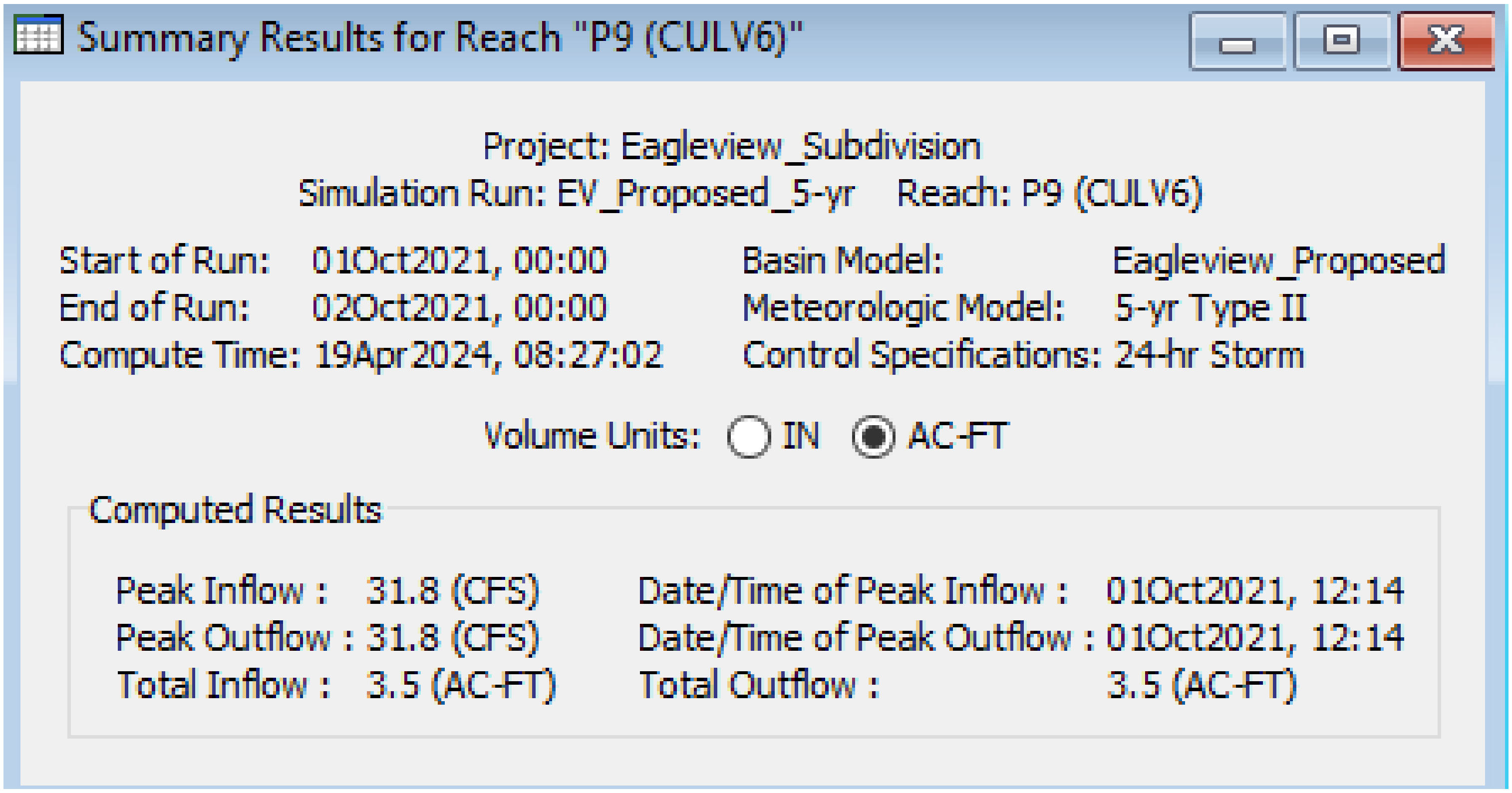
Basin Model: Eagleview_Proposed
Meteorologic Model: 5-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Discharge : 13.6 (CFS)
Total Precipitation : 4.0 (AC-FT)
Total Loss : 2.6 (AC-FT)
Total Excess : 1.4 (AC-FT)

Date/Time of Peak Discharge : 01Oct2021, 12:10
Total Direct Runoff : 1.4 (AC-FT)
Total Baseflow : 0.0 (AC-FT)
Discharge : 1.4 (AC-FT)



Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_5-yr Reach: P9 (CULV6)

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 08:27:02

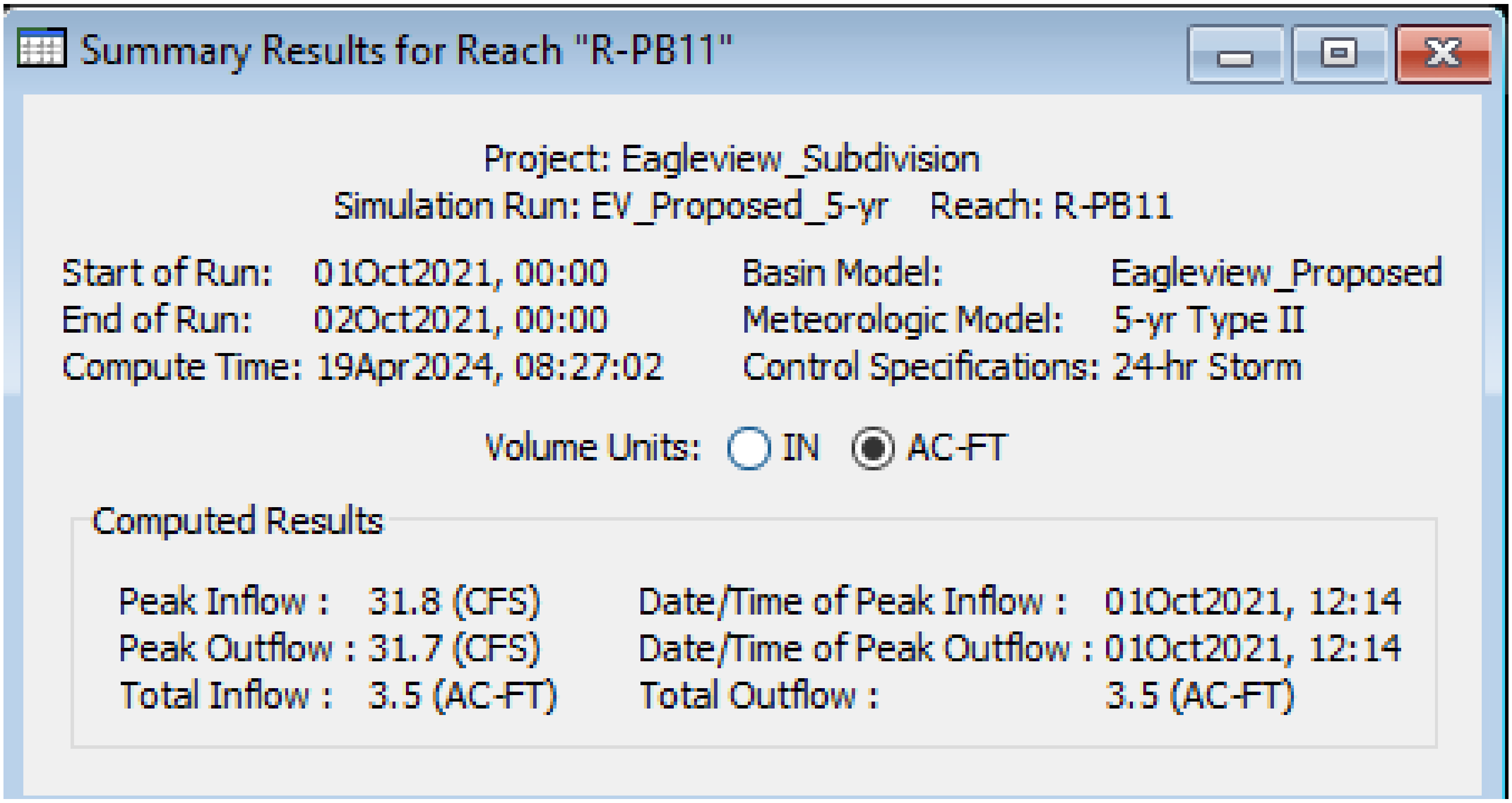
Basin Model: Eagleview_Proposed
Meteorologic Model: 5-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Inflow : 31.8 (CFS)
Peak Outflow : 31.8 (CFS)
Total Inflow : 3.5 (AC-FT)

Date/Time of Peak Inflow : 01Oct2021, 12:14
Date/Time of Peak Outflow : 01Oct2021, 12:14
Total Outflow : 3.5 (AC-FT)



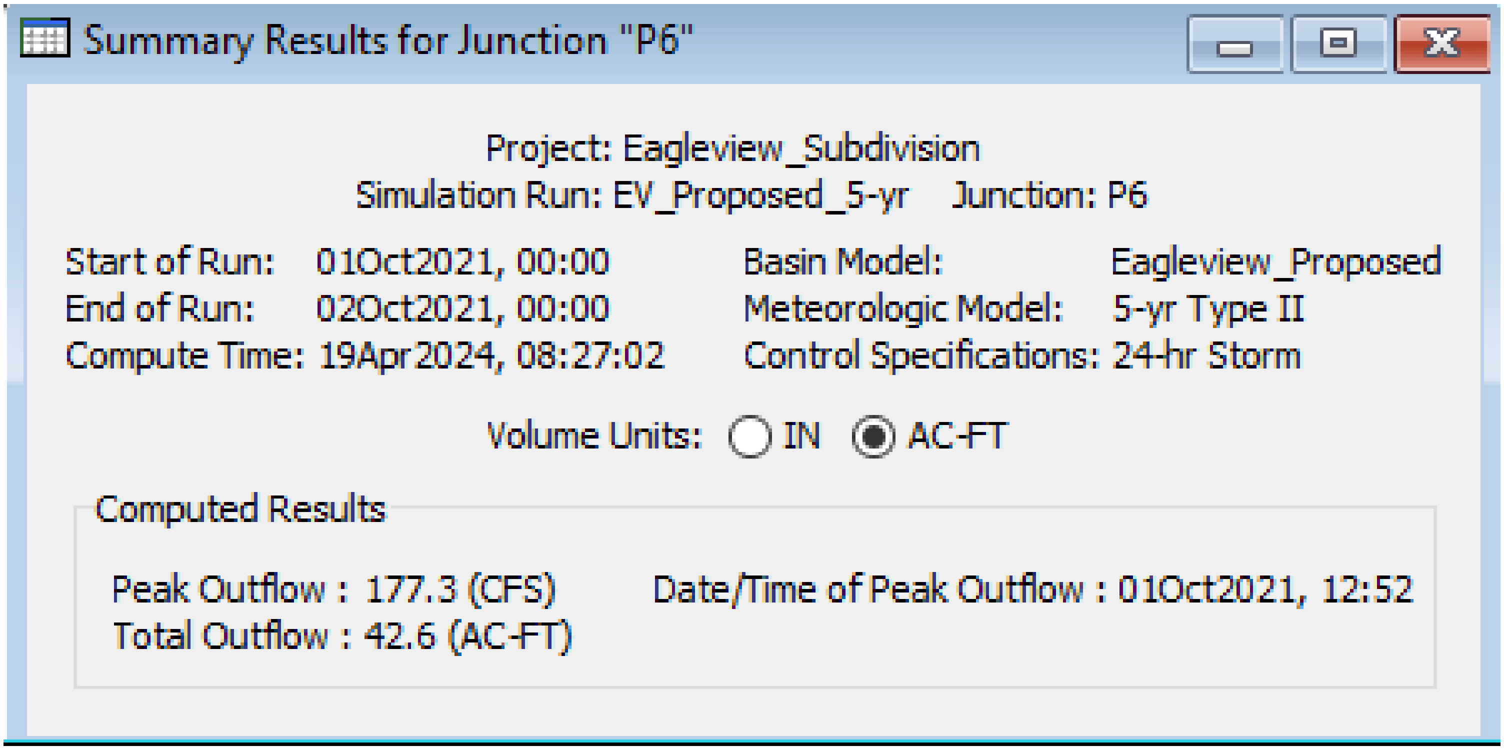
Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_5-yr   Reach: R-PB11

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Proposed
End of Run:	02Oct2021, 00:00	Meteorologic Model:	5-yr Type II
Compute Time:	19Apr2024, 08:27:02	Control Specifications:	24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Inflow :	31.8 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 12:14
Peak Outflow :	31.7 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 12:14
Total Inflow :	3.5 (AC-FT)	Total Outflow :	3.5 (AC-FT)


Summary Results for Junction "P6"

Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_5-yr   Junction: P6

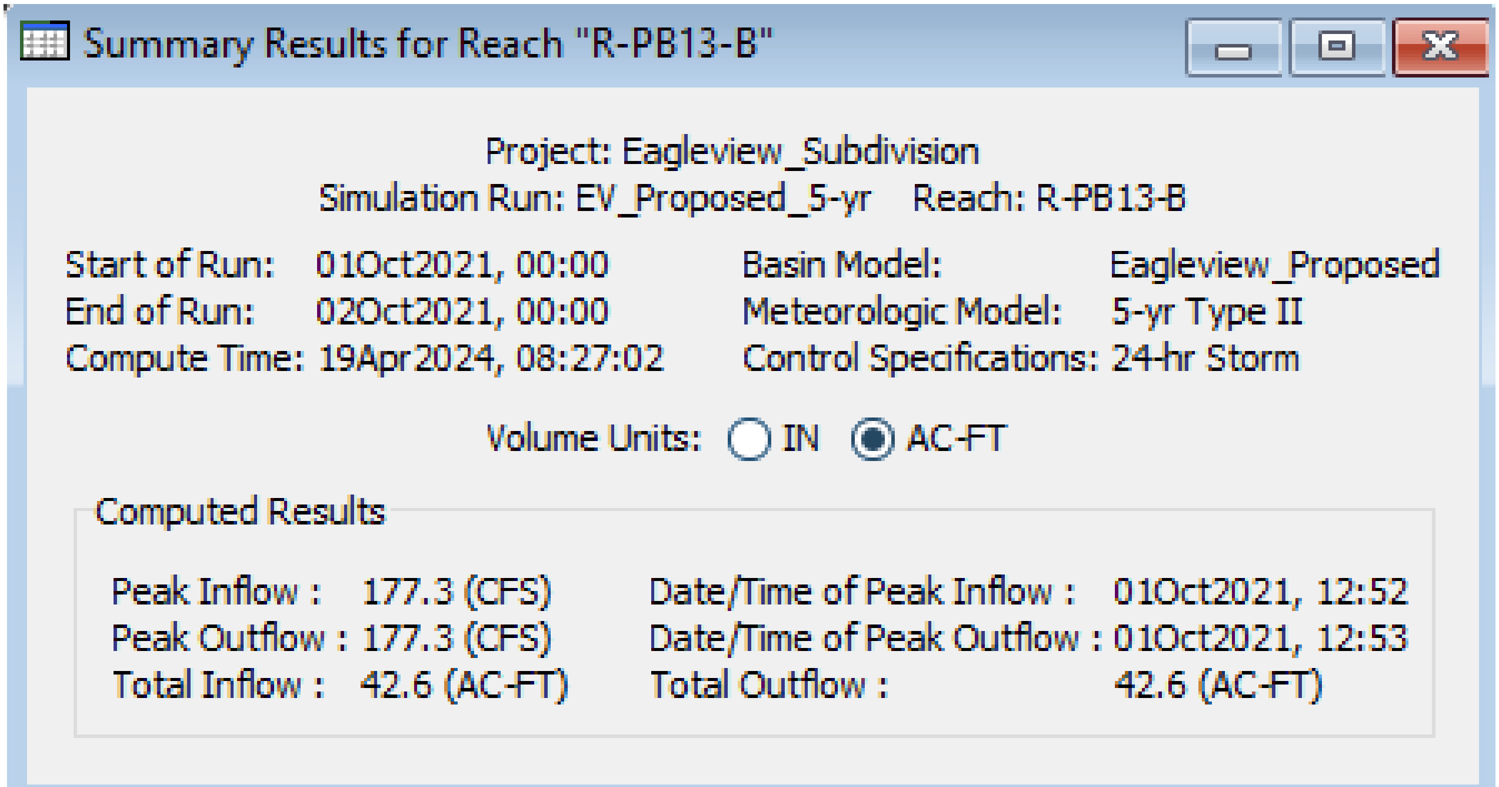
Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 08:27:02

Basin Model: Eagleview_Proposed
Meteorologic Model: 5-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Outflow : 177.3 (CFS)
Total Outflow : 42.6 (AC-FT)
Date/Time of Peak Outflow : 01Oct2021, 12:52



Summary Results for Reach "R-PB13-B"

Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_5-yr Reach: R-PB13-B

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 08:27:02

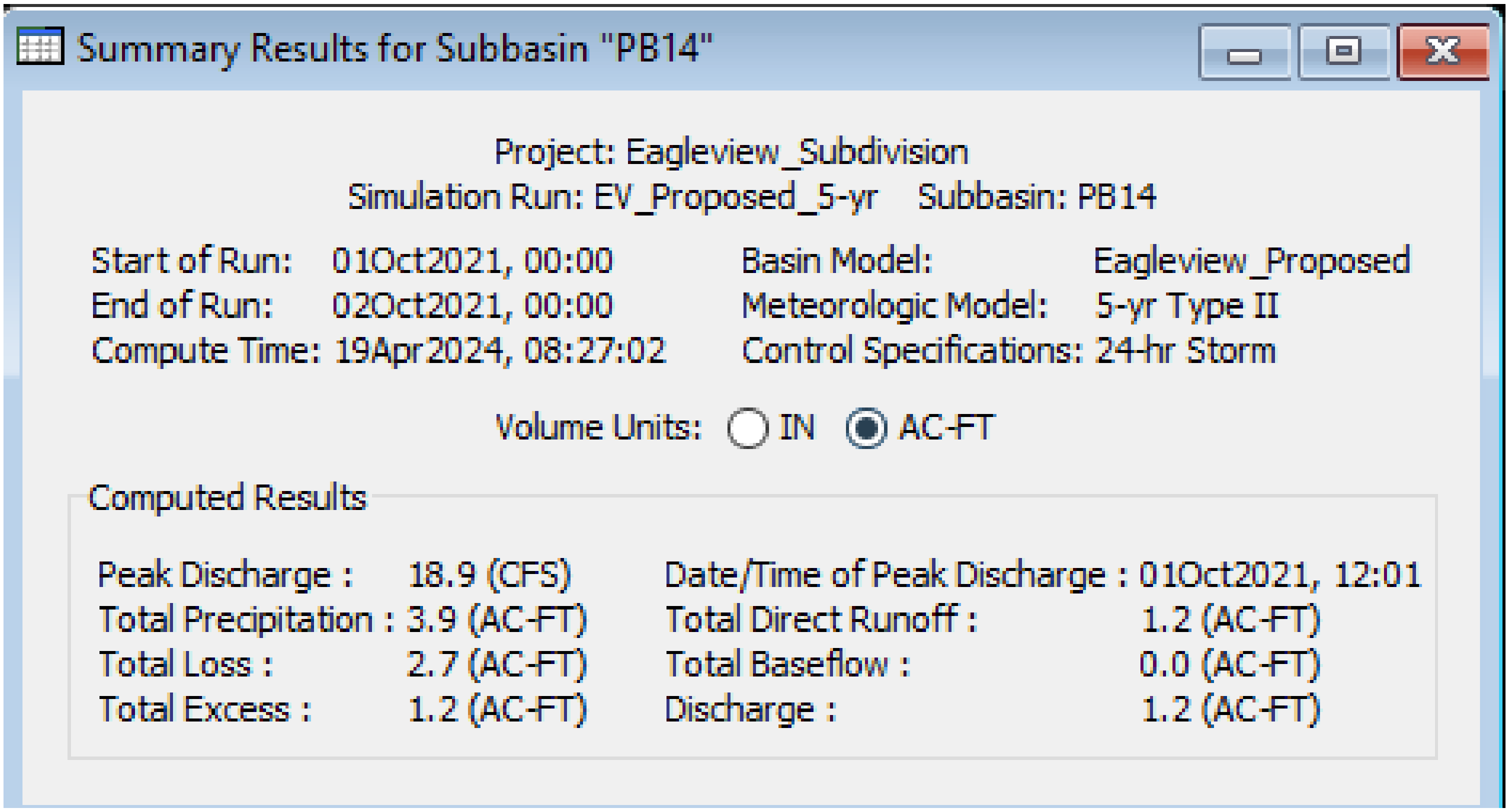
Basin Model: Eagleview_Proposed
Meteorologic Model: 5-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Inflow : 177.3 (CFS)
Peak Outflow : 177.3 (CFS)
Total Inflow : 42.6 (AC-FT)

Date/Time of Peak Inflow : 01Oct2021, 12:52
Date/Time of Peak Outflow : 01Oct2021, 12:53
Total Outflow : 42.6 (AC-FT)



Summary Results for Subbasin "PB14"

Project: Eagleview_Subdivision

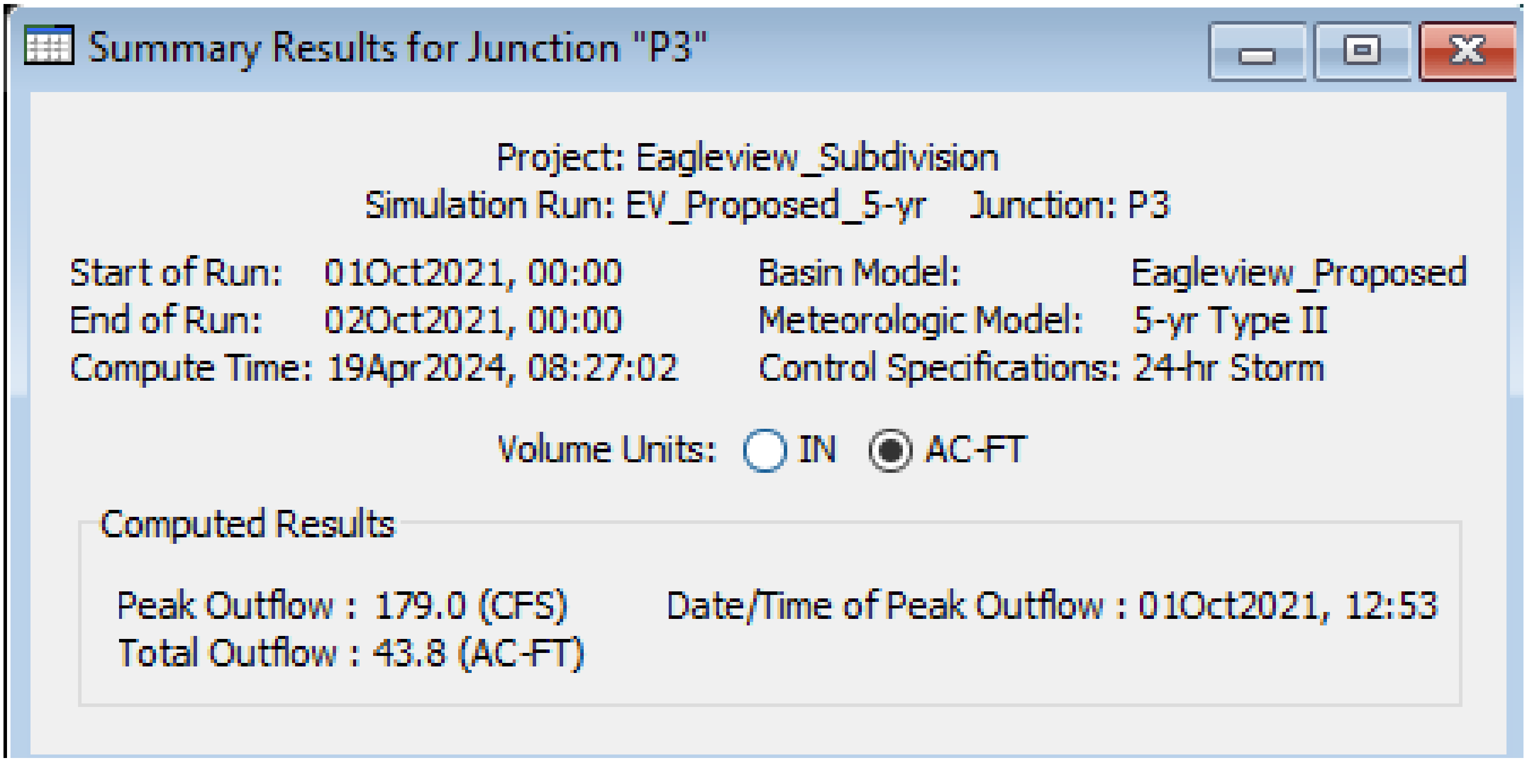
Simulation Run: EV_Proposed_5-yr Subbasin: PB14

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Proposed
End of Run:	02Oct2021, 00:00	Meteorologic Model:	5-yr Type II
Compute Time:	19Apr2024, 08:27:02	Control Specifications:	24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Discharge :	18.9 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:01
Total Precipitation :	3.9 (AC-FT)	Total Direct Runoff :	1.2 (AC-FT)
Total Loss :	2.7 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	1.2 (AC-FT)	Discharge :	1.2 (AC-FT)



Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_5-yr Junction: P3

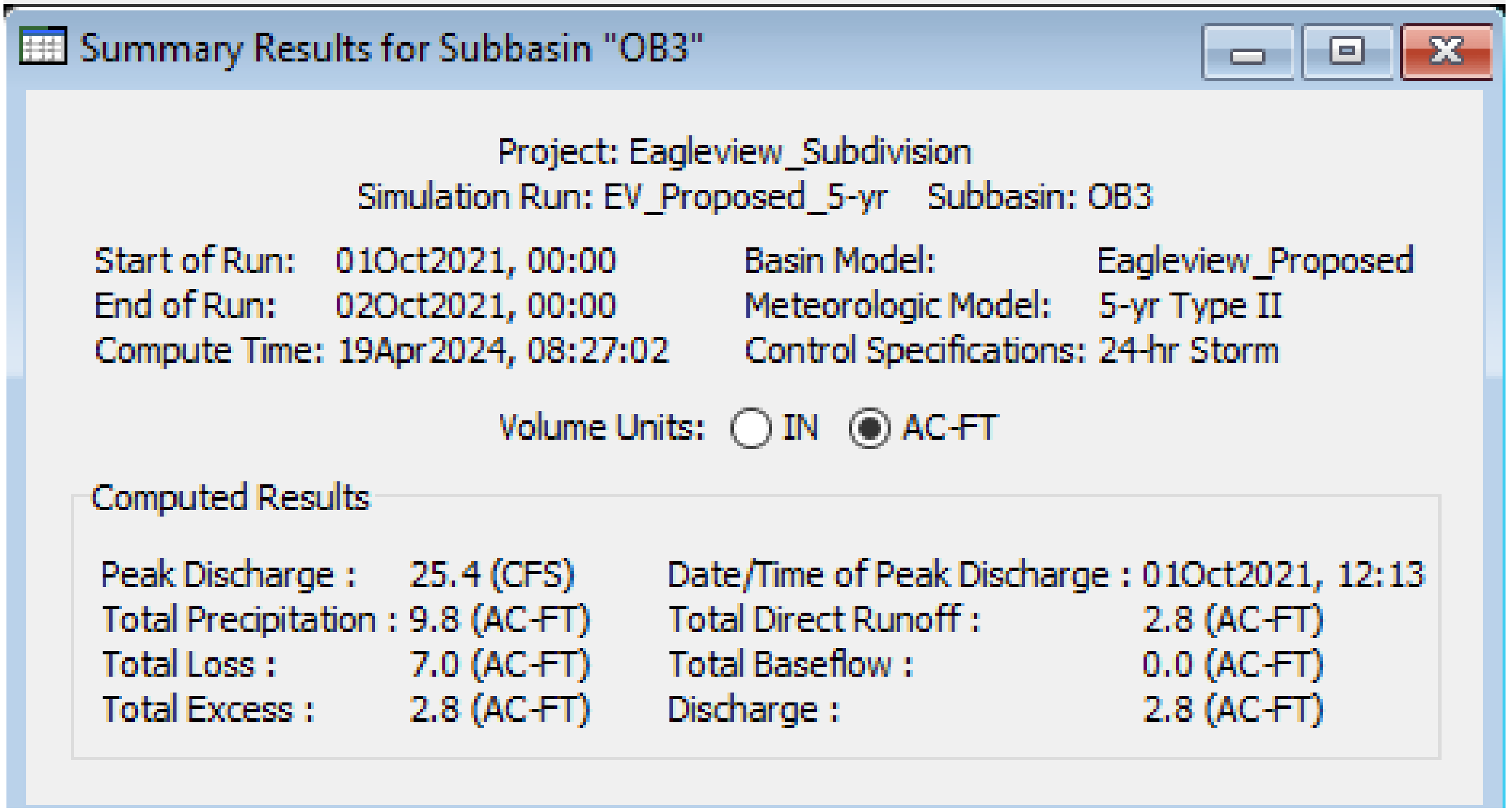
Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 08:27:02

Basin Model: Eagleview_Proposed
Meteorologic Model: 5-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Outflow : 179.0 (CFS)
Total Outflow : 43.8 (AC-FT)
Date/Time of Peak Outflow : 01Oct2021, 12:53



Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_5-yr Subbasin: OB3

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 08:27:02

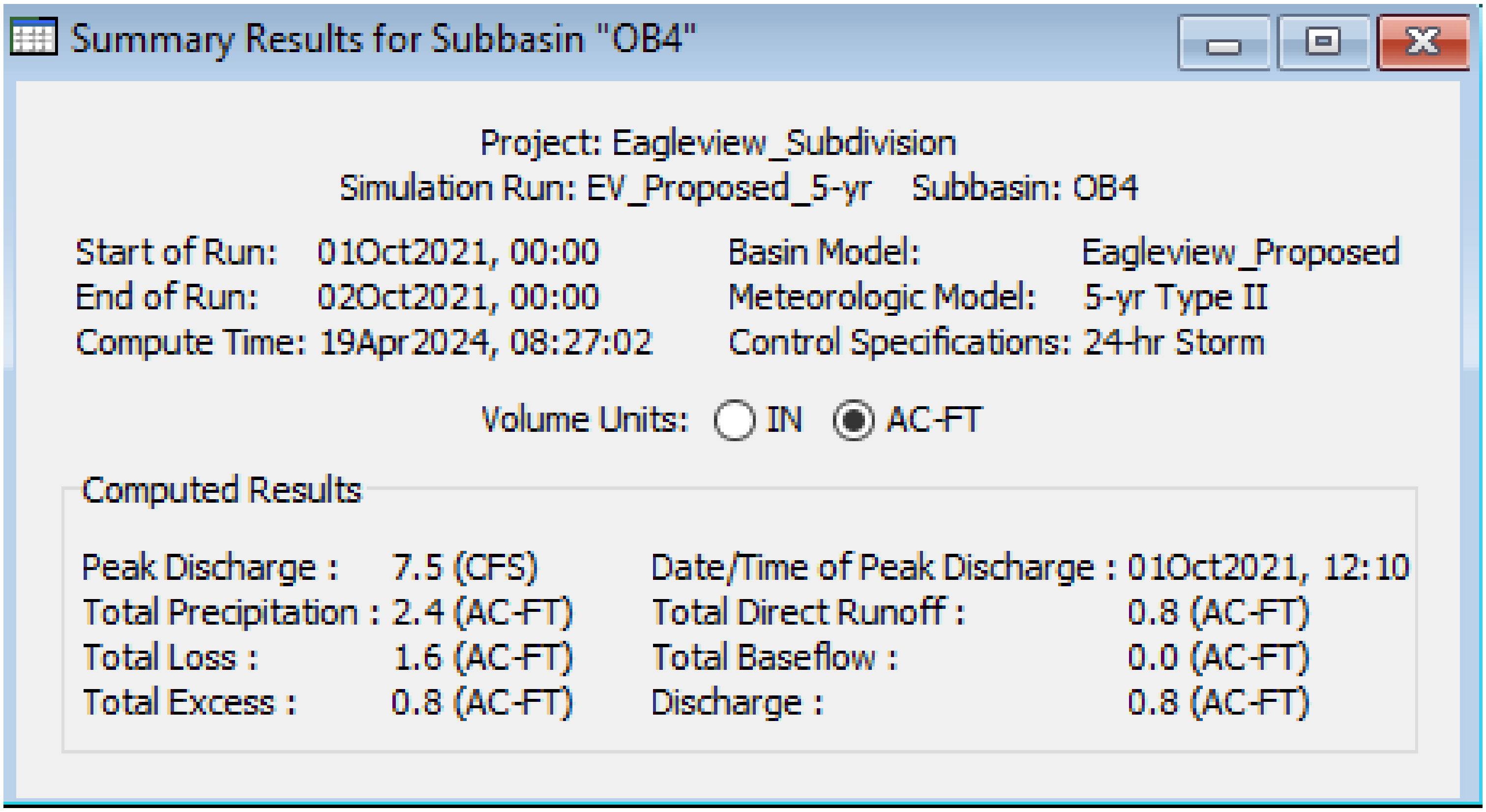
Basin Model: Eagleview_Proposed
Meteorologic Model: 5-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Discharge : 25.4 (CFS)
Total Precipitation : 9.8 (AC-FT)
Total Loss : 7.0 (AC-FT)
Total Excess : 2.8 (AC-FT)

Date/Time of Peak Discharge : 01Oct2021, 12:13
Total Direct Runoff : 2.8 (AC-FT)
Total Baseflow : 0.0 (AC-FT)
Discharge : 2.8 (AC-FT)



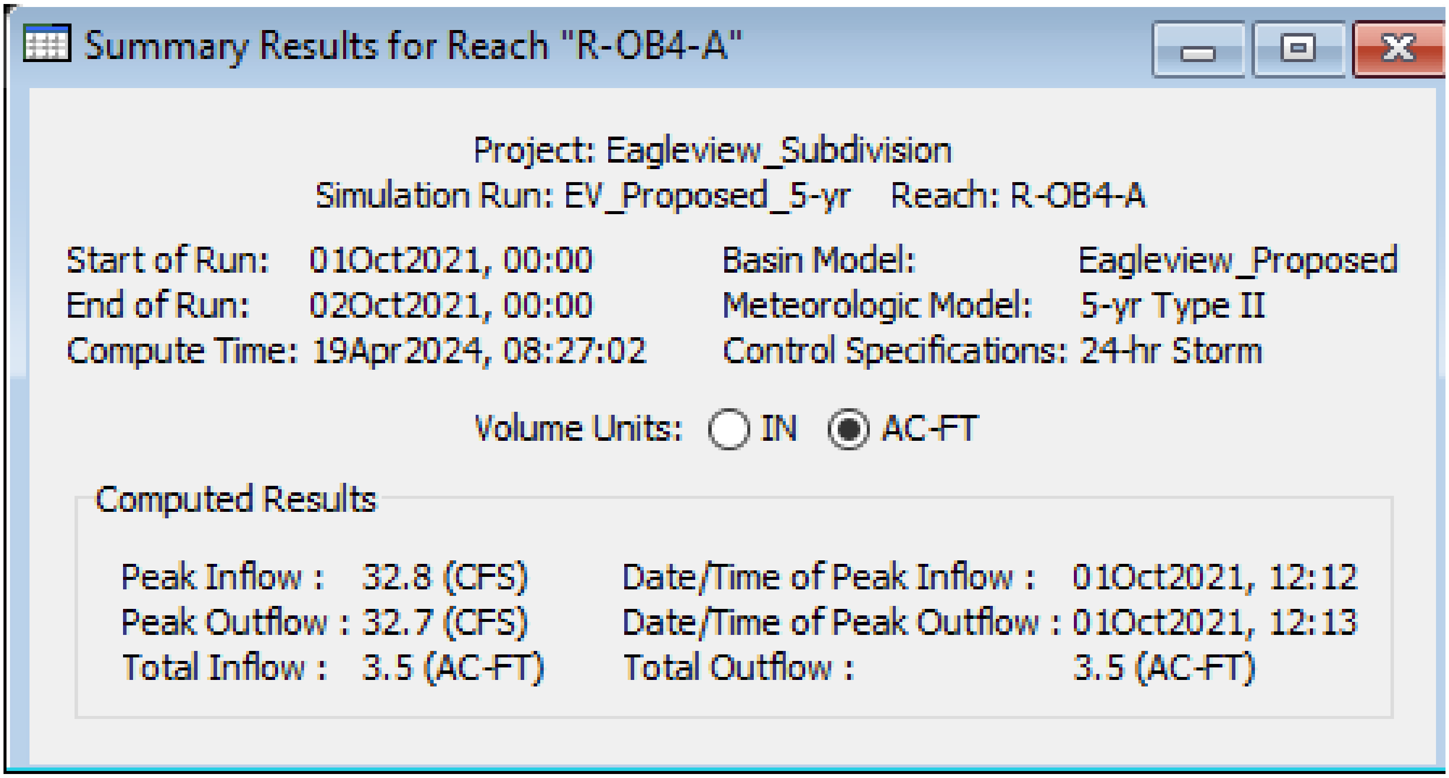
Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_5-yr Subbasin: OB4

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Proposed
End of Run:	02Oct2021, 00:00	Meteorologic Model:	5-yr Type II
Compute Time:	19Apr2024, 08:27:02	Control Specifications:	24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Discharge :	7.5 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:10
Total Precipitation :	2.4 (AC-FT)	Total Direct Runoff :	0.8 (AC-FT)
Total Loss :	1.6 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	0.8 (AC-FT)	Discharge :	0.8 (AC-FT)



Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_5-yr Reach: R-OB4-A

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 08:27:02

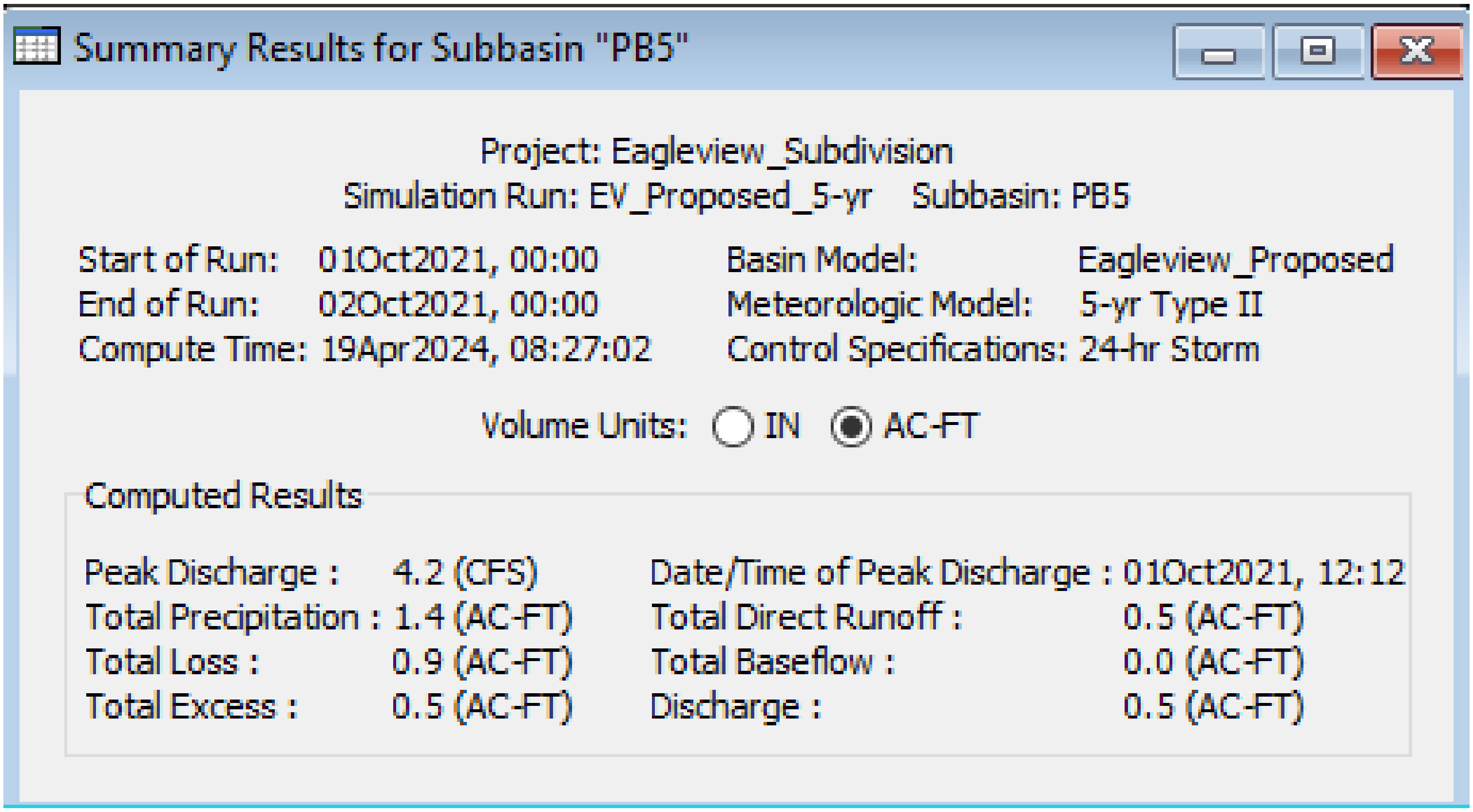
Basin Model: Eagleview_Proposed
Meteorologic Model: 5-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Inflow : 32.8 (CFS)
Peak Outflow : 32.7 (CFS)
Total Inflow : 3.5 (AC-FT)

Date/Time of Peak Inflow : 01Oct2021, 12:12
Date/Time of Peak Outflow : 01Oct2021, 12:13
Total Outflow : 3.5 (AC-FT)



Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_5-yr Subbasin: PB5

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 08:27:02

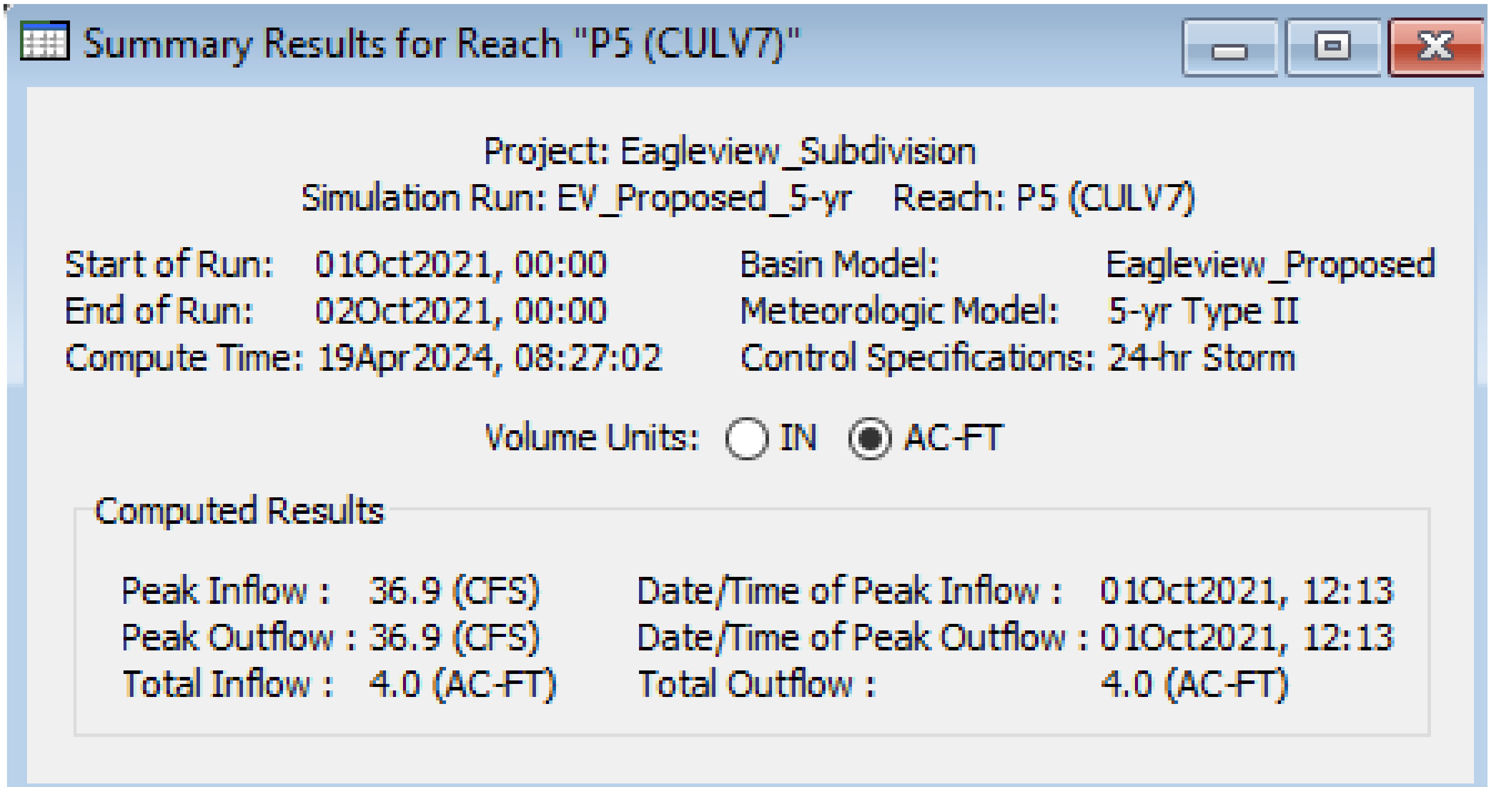
Basin Model: Eagleview_Proposed
Meteorologic Model: 5-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Discharge : 4.2 (CFS)
Total Precipitation : 1.4 (AC-FT)
Total Loss : 0.9 (AC-FT)
Total Excess : 0.5 (AC-FT)

Date/Time of Peak Discharge : 01Oct2021, 12:12
Total Direct Runoff : 0.5 (AC-FT)
Total Baseflow : 0.0 (AC-FT)
Discharge : 0.5 (AC-FT)



Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_5-yr Reach: P5 (CULV7)

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 08:27:02

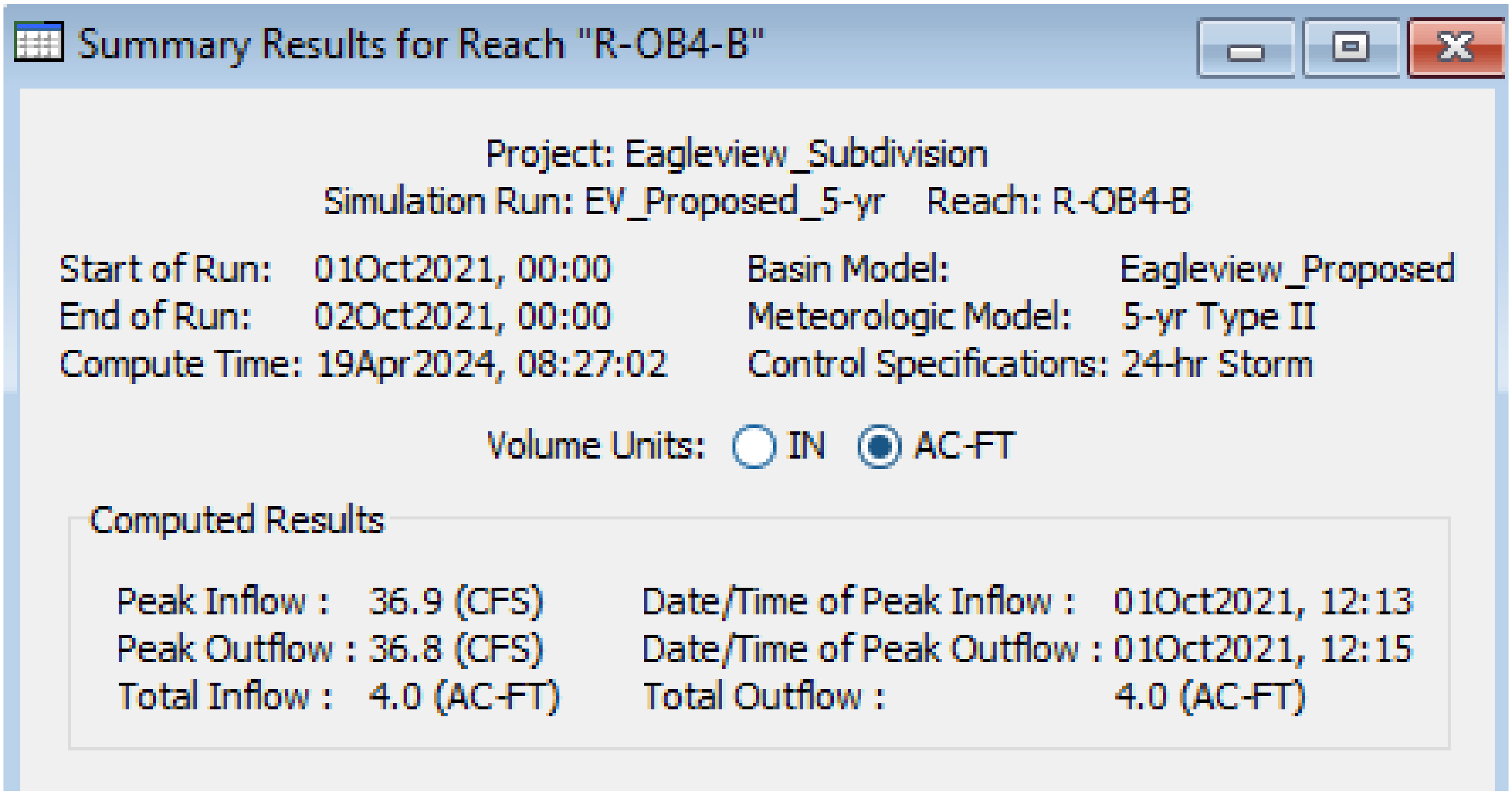
Basin Model: Eagleview_Proposed
Meteorologic Model: 5-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Inflow : 36.9 (CFS)
Peak Outflow : 36.9 (CFS)
Total Inflow : 4.0 (AC-FT)

Date/Time of Peak Inflow : 01Oct2021, 12:13
Date/Time of Peak Outflow : 01Oct2021, 12:13
Total Outflow : 4.0 (AC-FT)



Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_5-yr   Reach: R-OB4-B

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 08:27:02

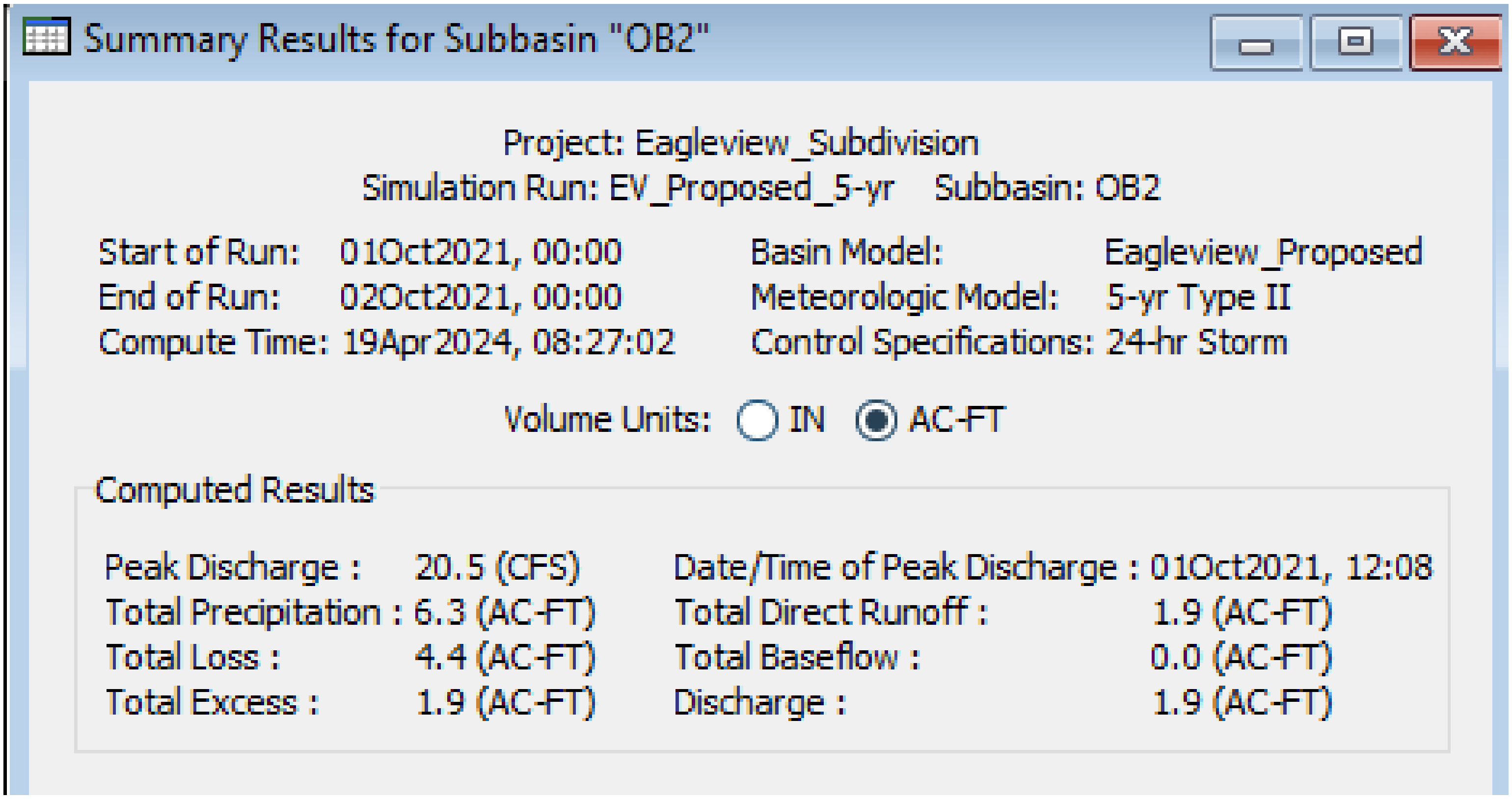
Basin Model: Eagleview_Proposed
Meteorologic Model: 5-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Inflow : 36.9 (CFS)
Peak Outflow : 36.8 (CFS)
Total Inflow : 4.0 (AC-FT)

Date/Time of Peak Inflow : 01Oct2021, 12:13
Date/Time of Peak Outflow : 01Oct2021, 12:15
Total Outflow : 4.0 (AC-FT)


Summary Results for Subbasin "OB2"

Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_5-yr Subbasin: OB2

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 08:27:02

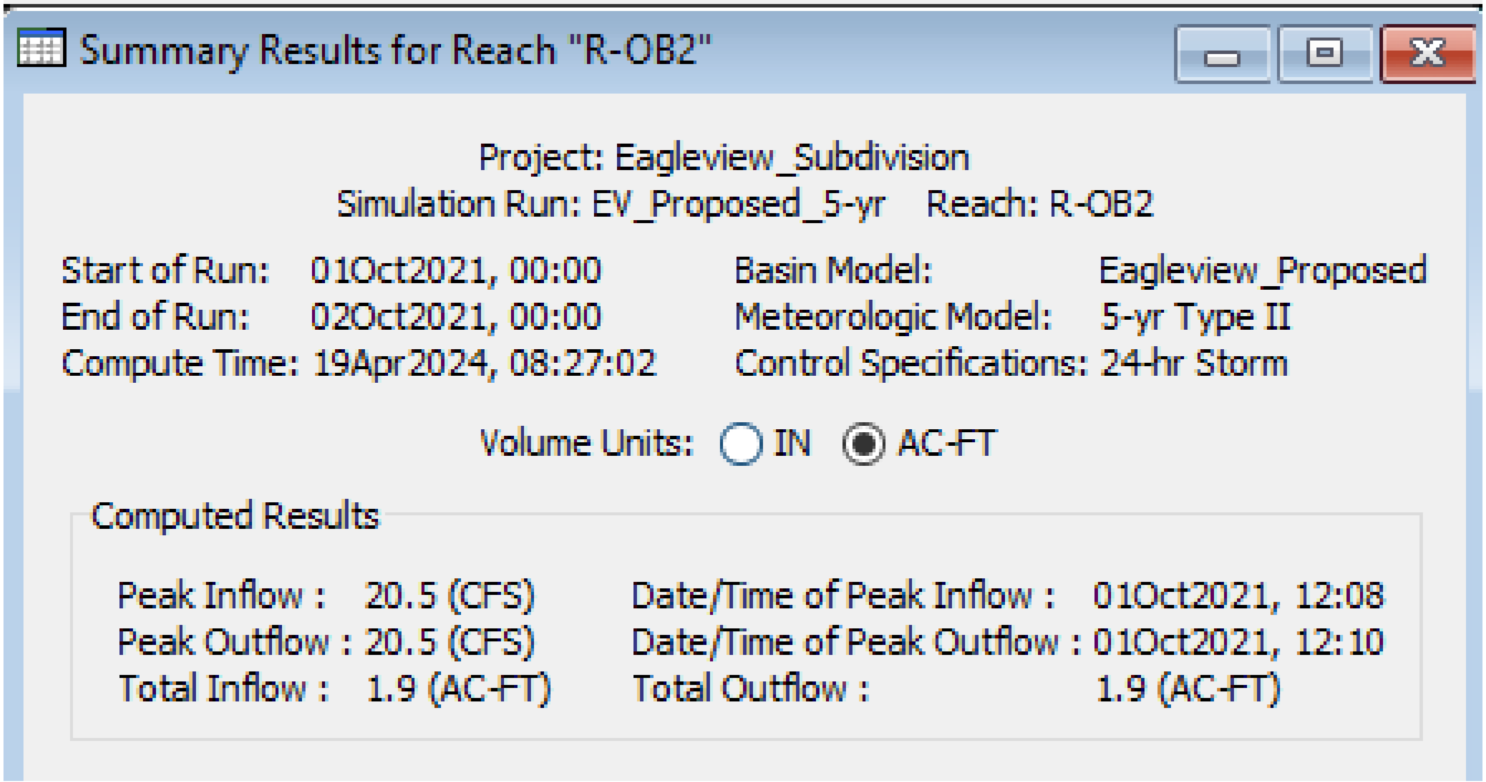
Basin Model: Eagleview_Proposed
Meteorologic Model: 5-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Discharge : 20.5 (CFS)
Total Precipitation : 6.3 (AC-FT)
Total Loss : 4.4 (AC-FT)
Total Excess : 1.9 (AC-FT)

Date/Time of Peak Discharge : 01Oct2021, 12:08
Total Direct Runoff : 1.9 (AC-FT)
Total Baseflow : 0.0 (AC-FT)
Discharge : 1.9 (AC-FT)



Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_5-yr Reach: R-OB2

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 08:27:02

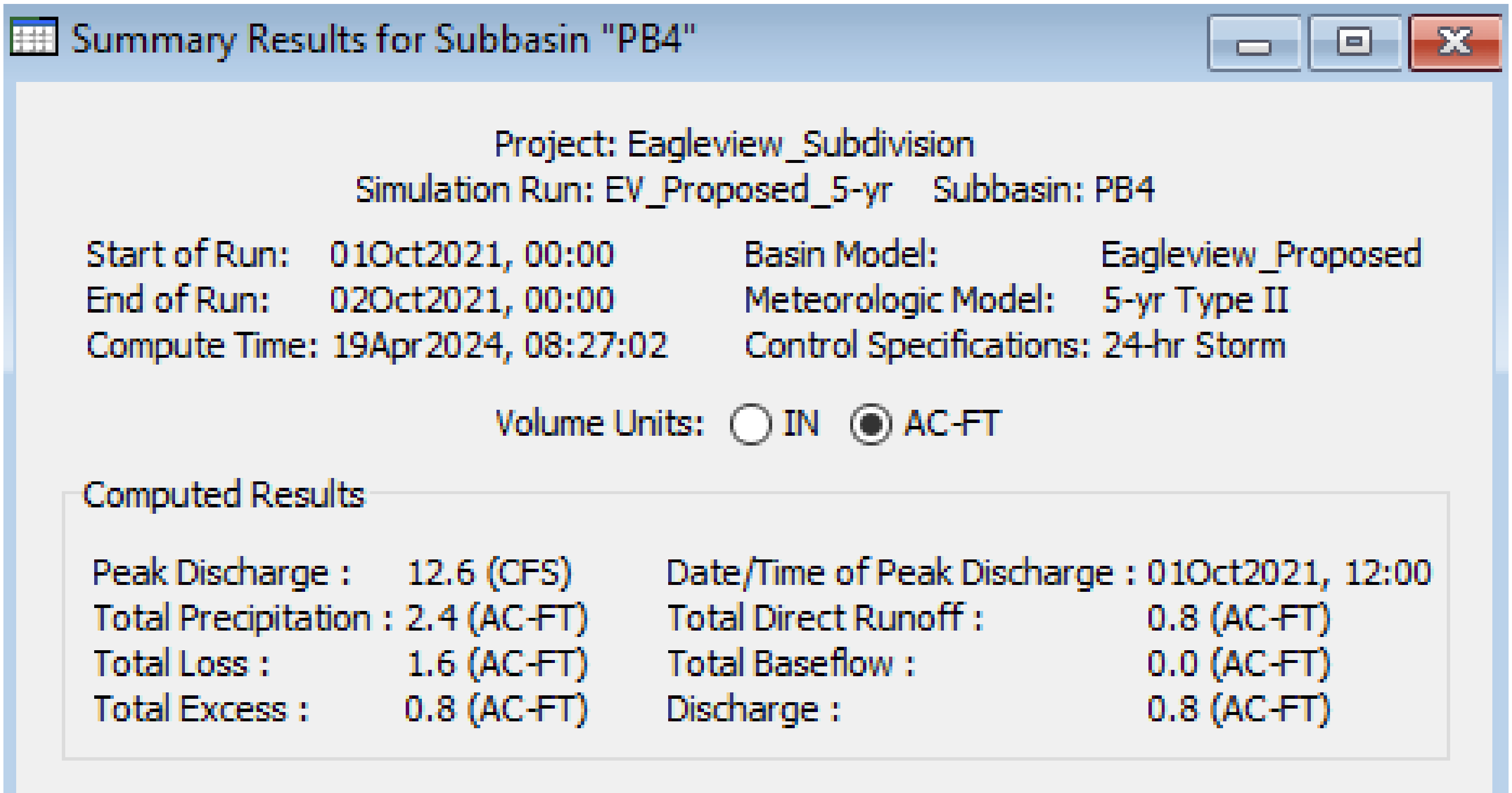
Basin Model: Eagleview_Proposed
Meteorologic Model: 5-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Inflow : 20.5 (CFS)
Peak Outflow : 20.5 (CFS)
Total Inflow : 1.9 (AC-FT)

Date/Time of Peak Inflow : 01Oct2021, 12:08
Date/Time of Peak Outflow : 01Oct2021, 12:10
Total Outflow : 1.9 (AC-FT)



Summary Results for Subbasin "PB4"

Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_5-yr Subbasin: PB4

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 08:27:02

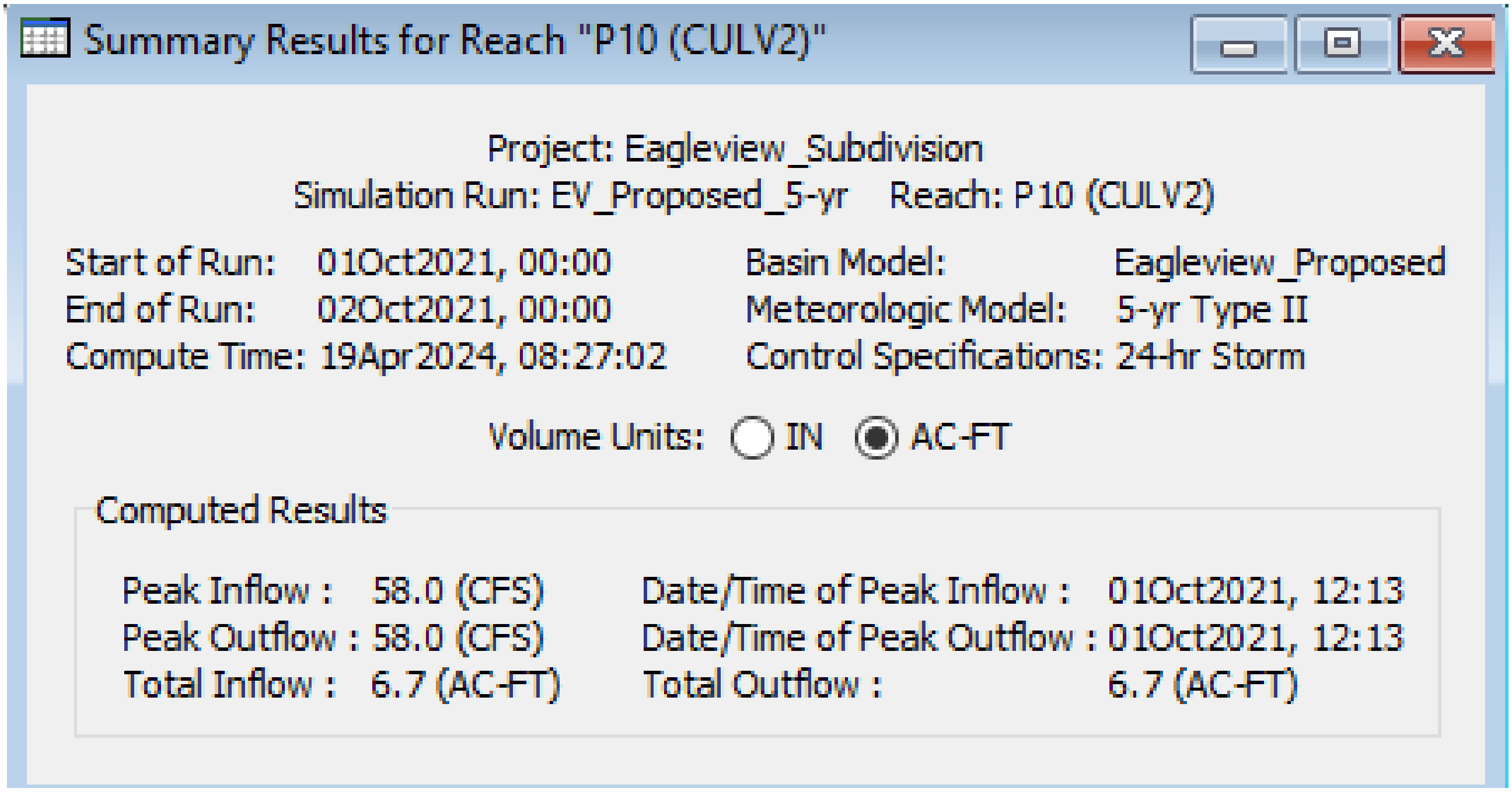
Basin Model: Eagleview_Proposed
Meteorologic Model: 5-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Discharge : 12.6 (CFS)
Total Precipitation : 2.4 (AC-FT)
Total Loss : 1.6 (AC-FT)
Total Excess : 0.8 (AC-FT)

Date/Time of Peak Discharge : 01Oct2021, 12:00
Total Direct Runoff : 0.8 (AC-FT)
Total Baseflow : 0.0 (AC-FT)
Discharge : 0.8 (AC-FT)



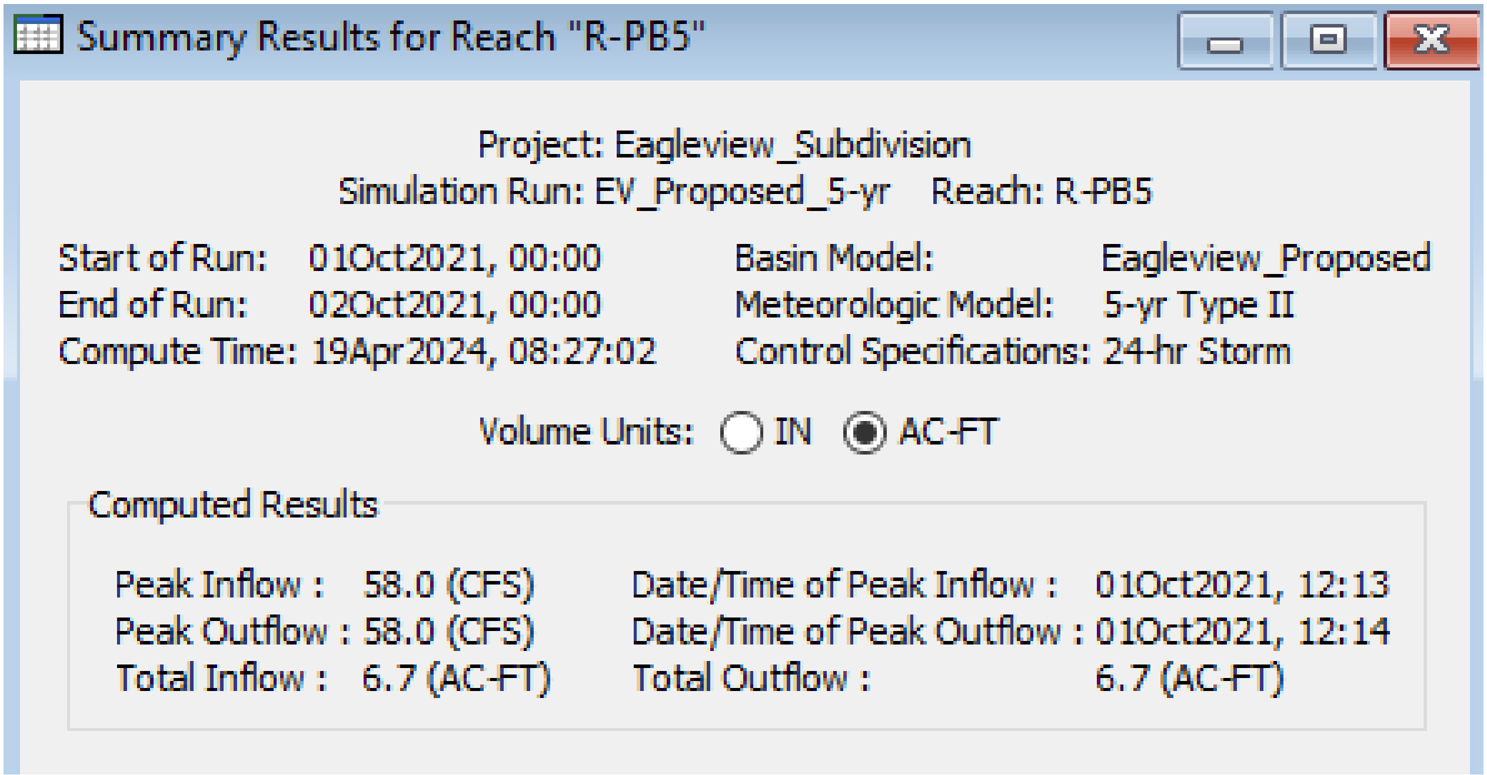
Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_5-yr   Reach: P10 (CULV2)

Start of Run: 01Oct2021, 00:00   Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00   Meteorologic Model: 5-yr Type II
Compute Time: 19Apr2024, 08:27:02   Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Inflow : 58.0 (CFS)   Date/Time of Peak Inflow : 01Oct2021, 12:13
Peak Outflow : 58.0 (CFS)   Date/Time of Peak Outflow : 01Oct2021, 12:13
Total Inflow : 6.7 (AC-FT)   Total Outflow : 6.7 (AC-FT)


Summary Results for Reach "R-PB5"

Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_5-yr   Reach: R-PB5

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 08:27:02

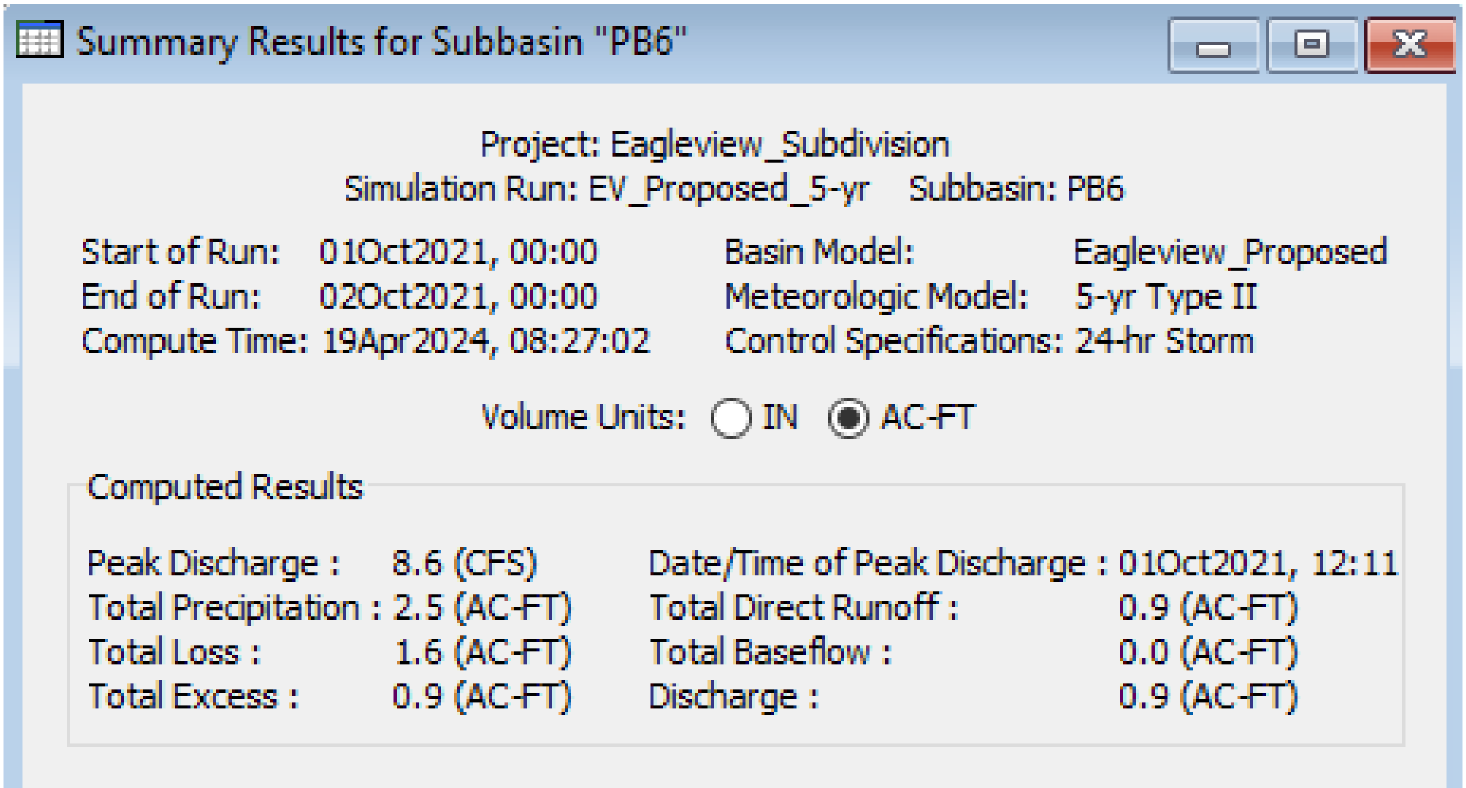
Basin Model: Eagleview_Proposed
Meteorologic Model: 5-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Inflow : 58.0 (CFS)
Peak Outflow : 58.0 (CFS)
Total Inflow : 6.7 (AC-FT)

Date/Time of Peak Inflow : 01Oct2021, 12:13
Date/Time of Peak Outflow : 01Oct2021, 12:14
Total Outflow : 6.7 (AC-FT)



Summary Results for Subbasin "PB6"

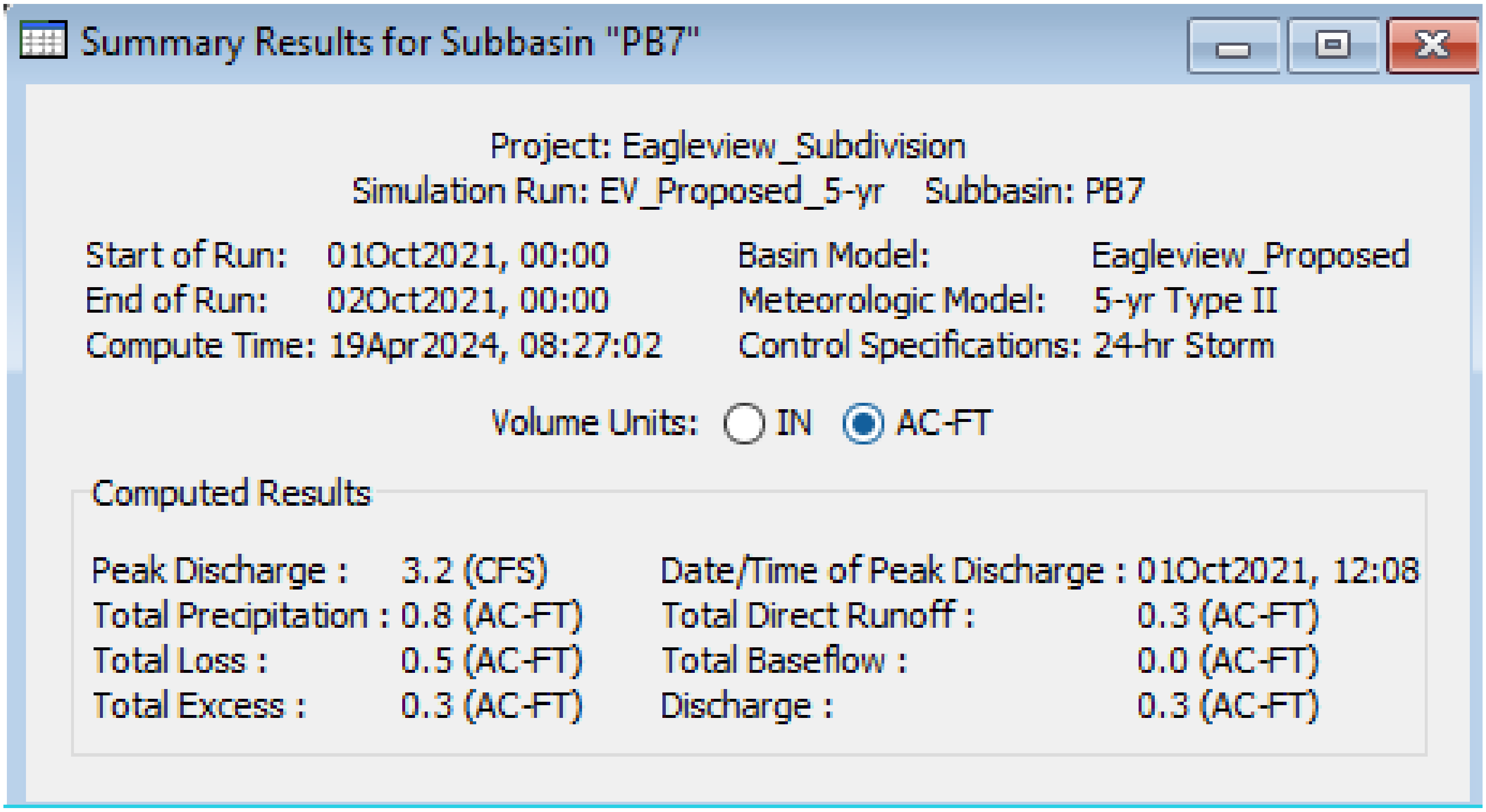
Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_5-yr   Subbasin: PB6

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Proposed
End of Run:	02Oct2021, 00:00	Meteorologic Model:	5-yr Type II
Compute Time:	19Apr2024, 08:27:02	Control Specifications:	24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Discharge :	8.6 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:11
Total Precipitation :	2.5 (AC-FT)	Total Direct Runoff :	0.9 (AC-FT)
Total Loss :	1.6 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	0.9 (AC-FT)	Discharge :	0.9 (AC-FT)



Summary Results for Subbasin "PB7"

Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_5-yr   Subbasin: PB7

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 08:27:02

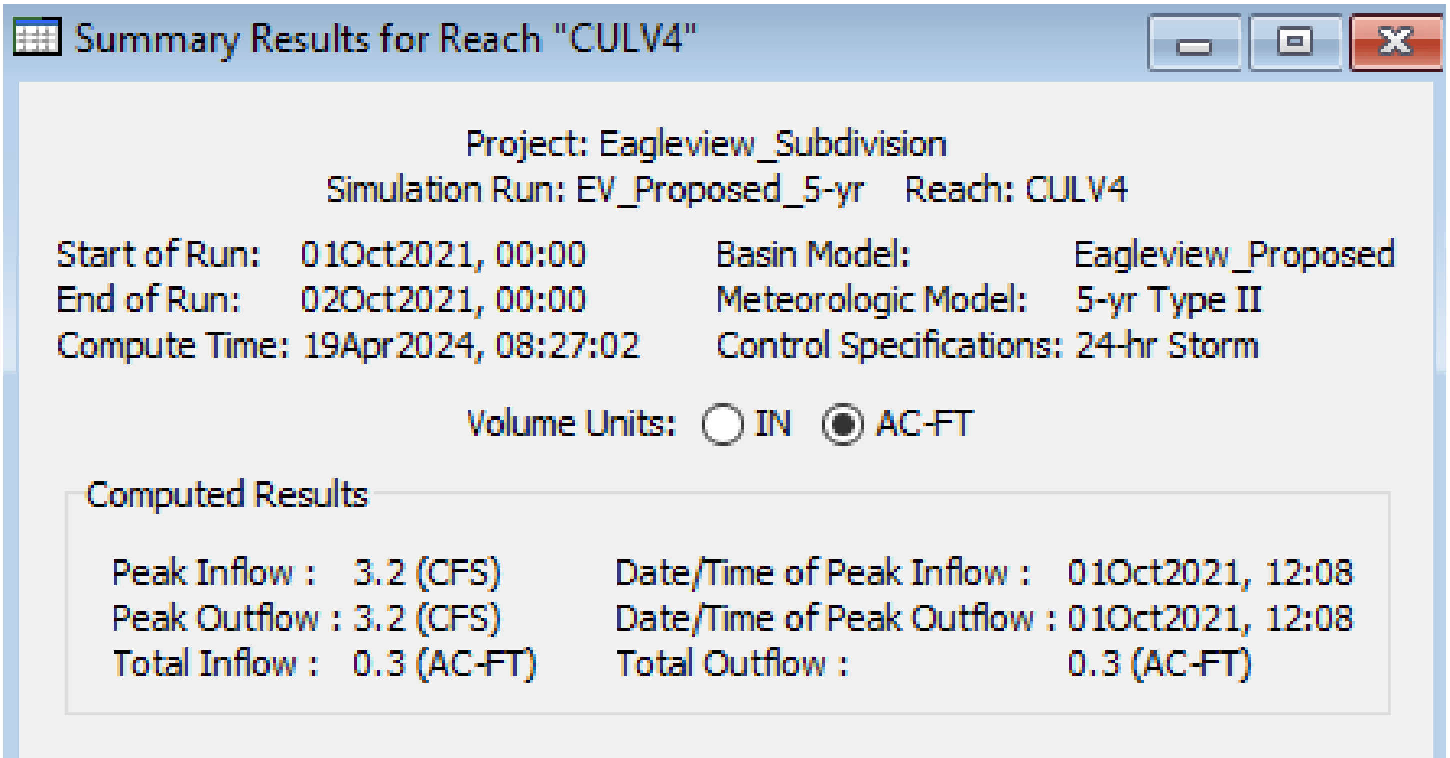
Basin Model: Eagleview_Proposed
Meteorologic Model: 5-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Discharge : 3.2 (CFS)
Total Precipitation : 0.8 (AC-FT)
Total Loss : 0.5 (AC-FT)
Total Excess : 0.3 (AC-FT)

Date/Time of Peak Discharge : 01Oct2021, 12:08
Total Direct Runoff : 0.3 (AC-FT)
Total Baseflow : 0.0 (AC-FT)
Discharge : 0.3 (AC-FT)



Summary Results for Reach "CULV4"

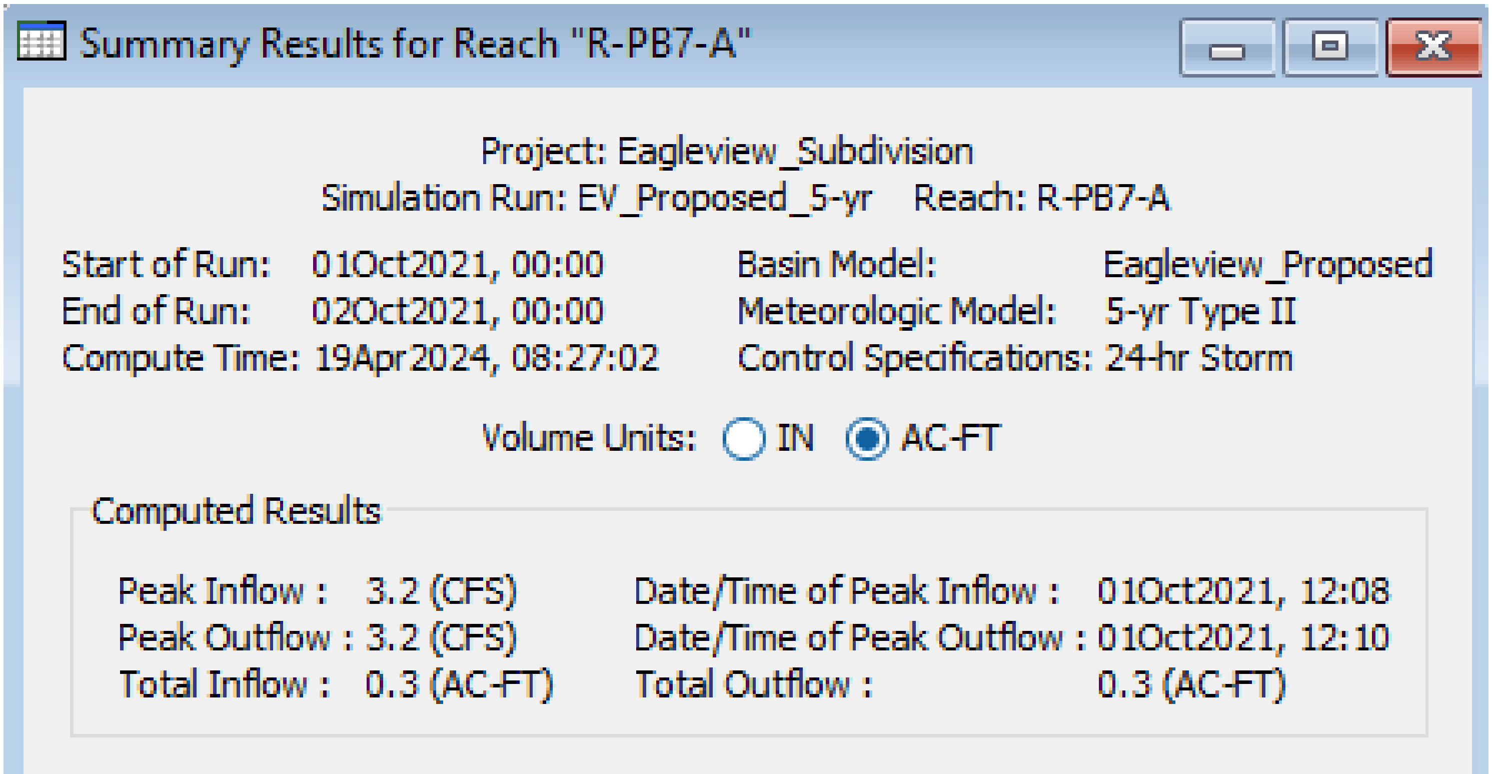
Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_5-yr Reach: CULV4

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Proposed
End of Run:	02Oct2021, 00:00	Meteorologic Model:	5-yr Type II
Compute Time:	19Apr2024, 08:27:02	Control Specifications:	24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Inflow :	3.2 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 12:08
Peak Outflow :	3.2 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 12:08
Total Inflow :	0.3 (AC-FT)	Total Outflow :	0.3 (AC-FT)



Summary Results for Reach "R-PB7-A"

Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_5-yr Reach: R-PB7-A

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 08:27:02

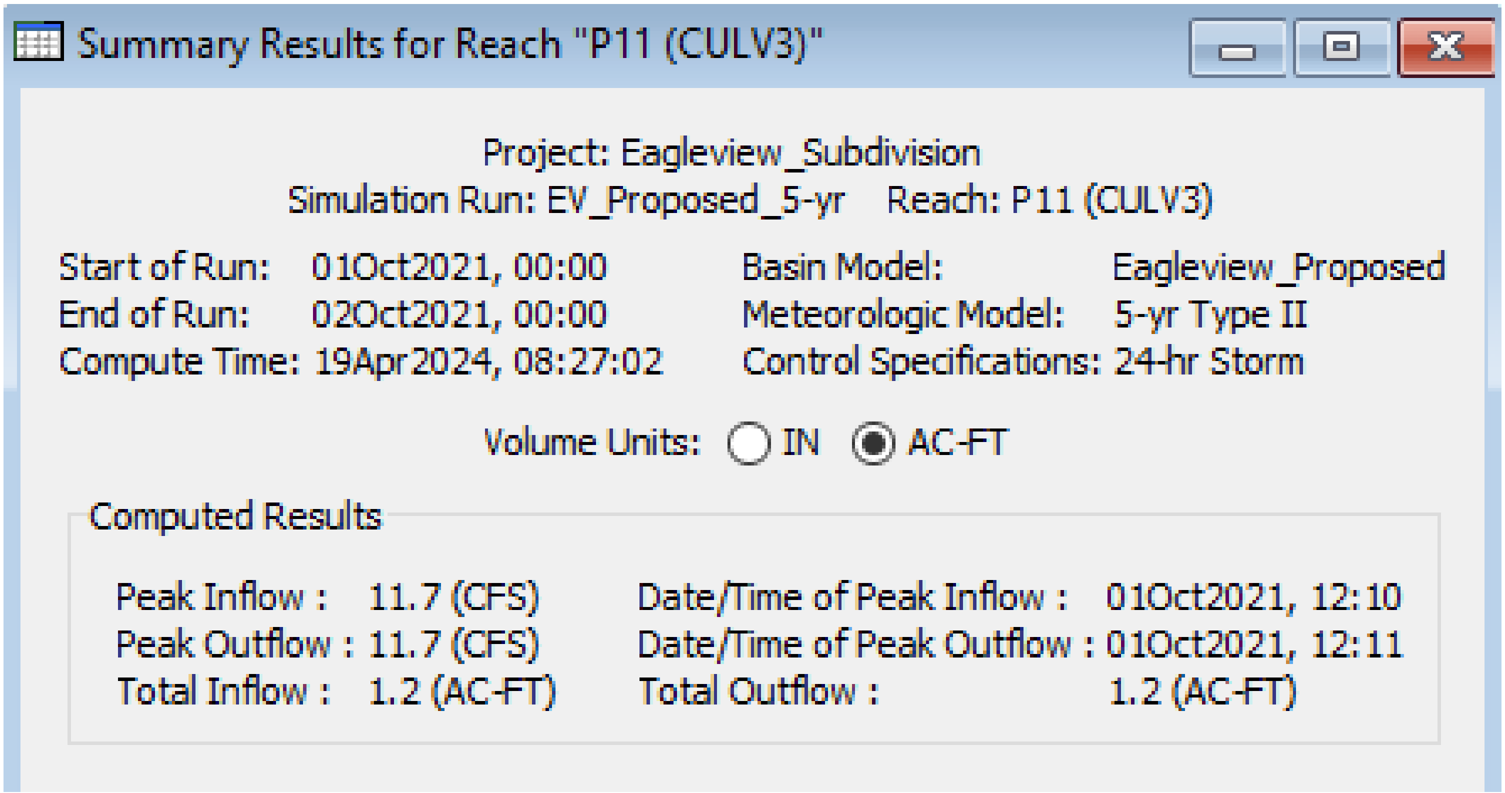
Basin Model: Eagleview_Proposed
Meteorologic Model: 5-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Inflow : 3.2 (CFS)
Peak Outflow : 3.2 (CFS)
Total Inflow : 0.3 (AC-FT)

Date/Time of Peak Inflow : 01Oct2021, 12:08
Date/Time of Peak Outflow : 01Oct2021, 12:10
Total Outflow : 0.3 (AC-FT)



Summary Results for Reach "P11 (CULV3)"

Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_5-yr   Reach: P11 (CULV3)

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 08:27:02

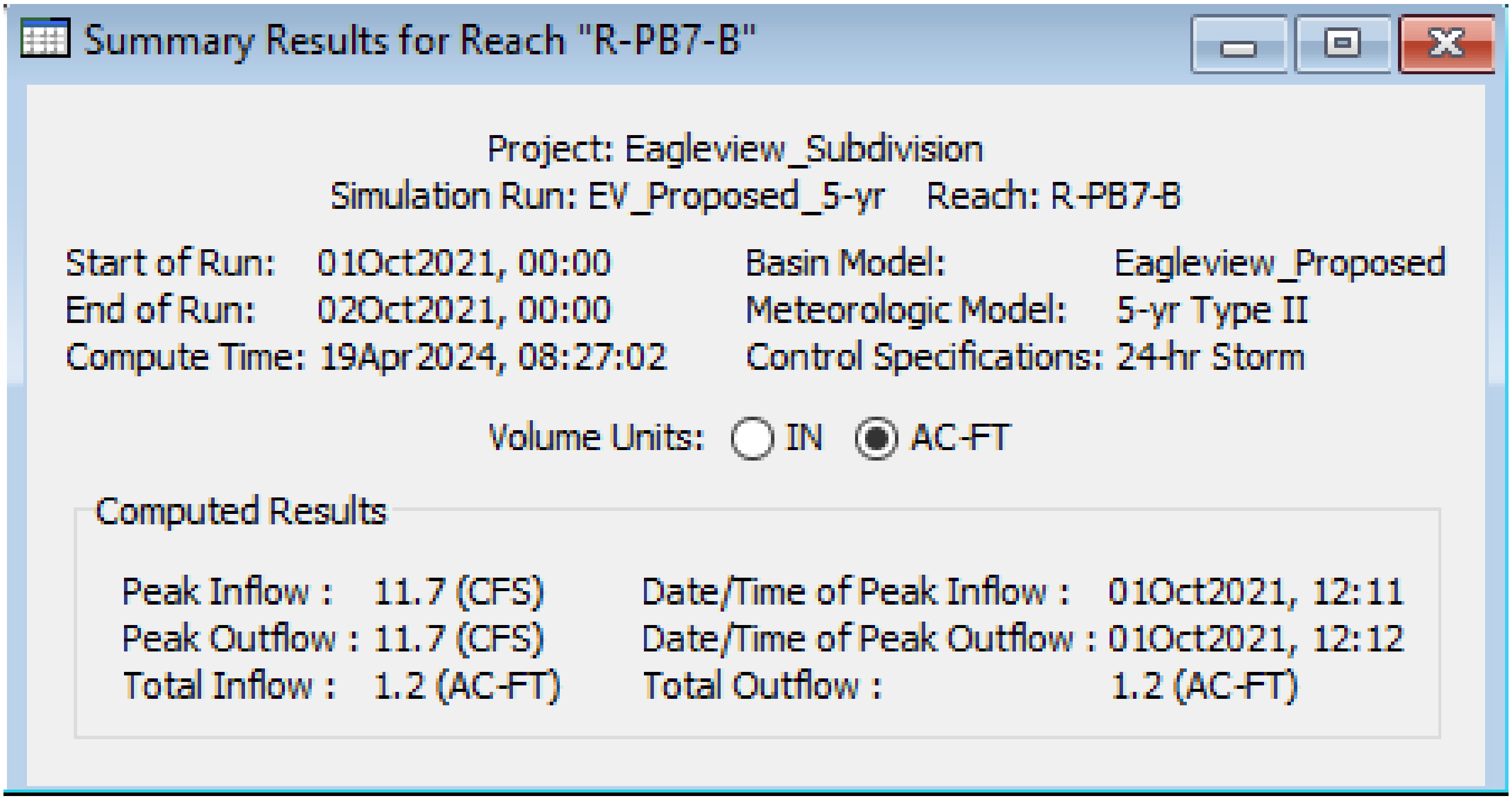
Basin Model: Eagleview_Proposed
Meteorologic Model: 5-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Inflow : 11.7 (CFS)
Peak Outflow : 11.7 (CFS)
Total Inflow : 1.2 (AC-FT)

Date/Time of Peak Inflow : 01Oct2021, 12:10
Date/Time of Peak Outflow : 01Oct2021, 12:11
Total Outflow : 1.2 (AC-FT)



Summary Results for Reach "R-PB7-B"

Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_5-yr Reach: R-PB7-B

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 08:27:02

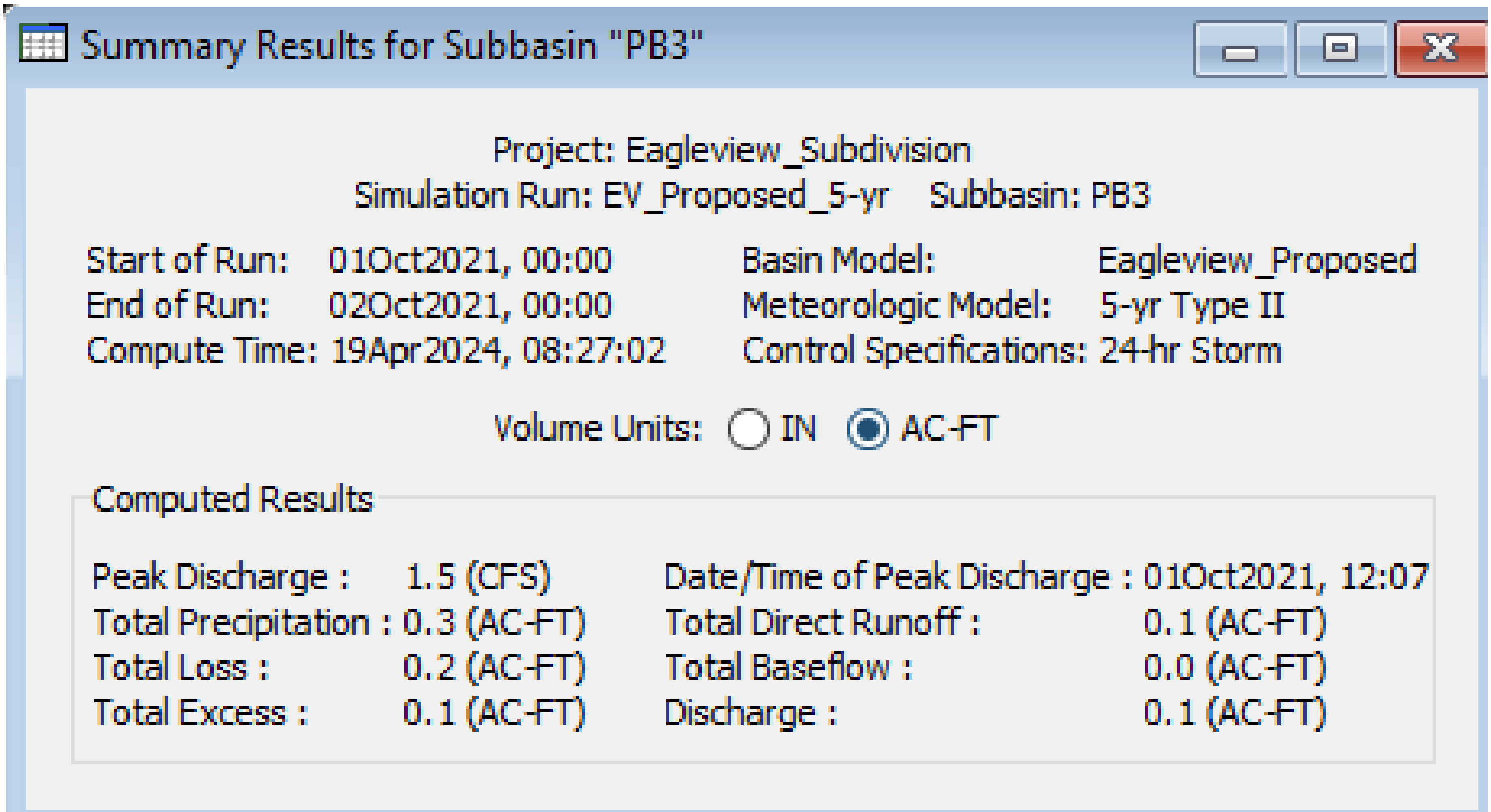
Basin Model: Eagleview_Proposed
Meteorologic Model: 5-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Inflow : 11.7 (CFS)
Peak Outflow : 11.7 (CFS)
Total Inflow : 1.2 (AC-FT)

Date/Time of Peak Inflow : 01Oct2021, 12:11
Date/Time of Peak Outflow : 01Oct2021, 12:12
Total Outflow : 1.2 (AC-FT)



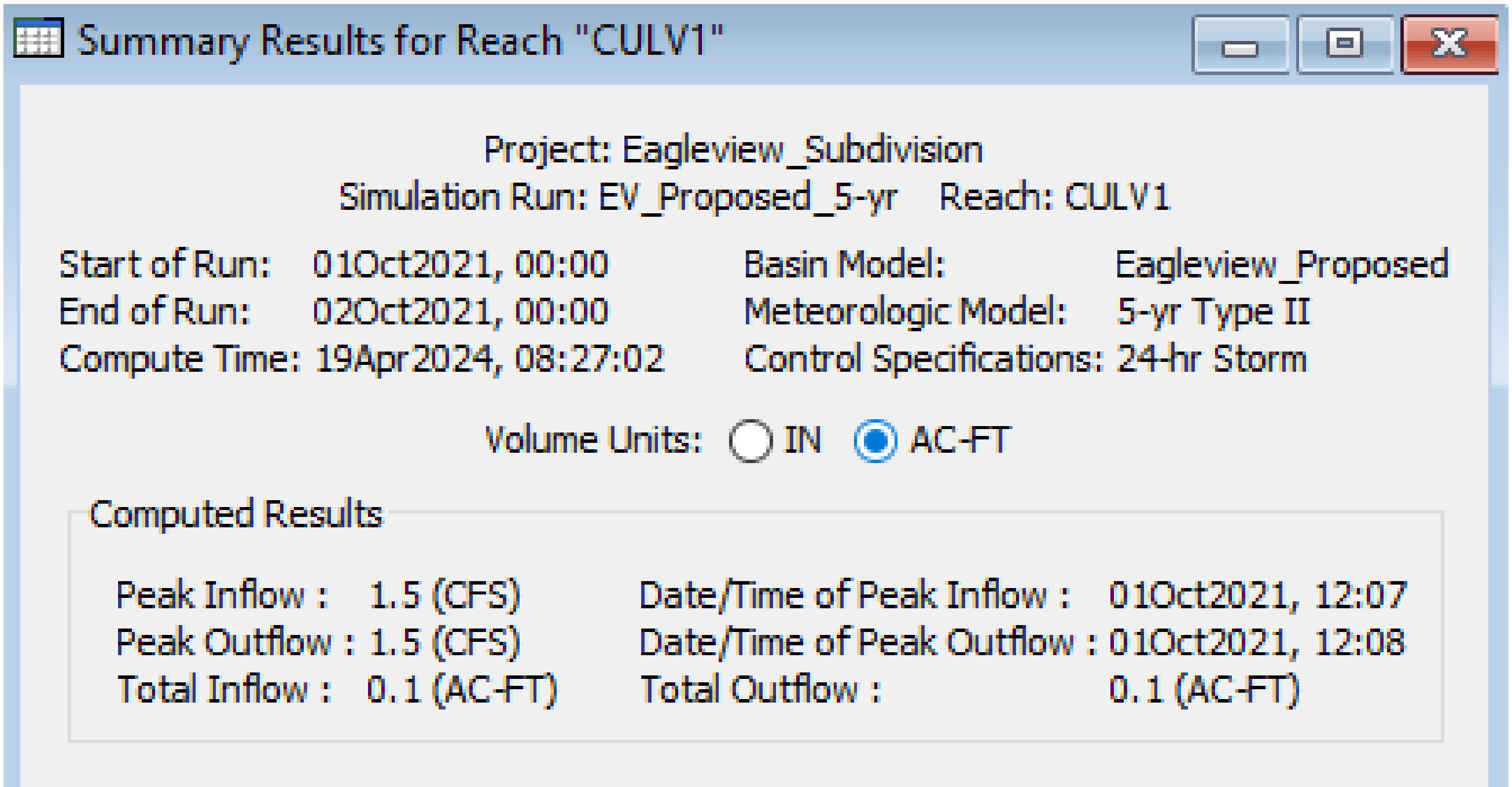
Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_5-yr   Subbasin: PB3

Start of Run: 01Oct2021, 00:00   Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00   Meteorologic Model: 5-yr Type II
Compute Time: 19Apr2024, 08:27:02   Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Discharge : 1.5 (CFS)   Date/Time of Peak Discharge : 01Oct2021, 12:07
Total Precipitation : 0.3 (AC-FT)   Total Direct Runoff : 0.1 (AC-FT)
Total Loss : 0.2 (AC-FT)   Total Baseflow : 0.0 (AC-FT)
Total Excess : 0.1 (AC-FT)   Discharge : 0.1 (AC-FT)



Summary Results for Reach "CULV1"

Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_5-yr   Reach: CULV1

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 08:27:02

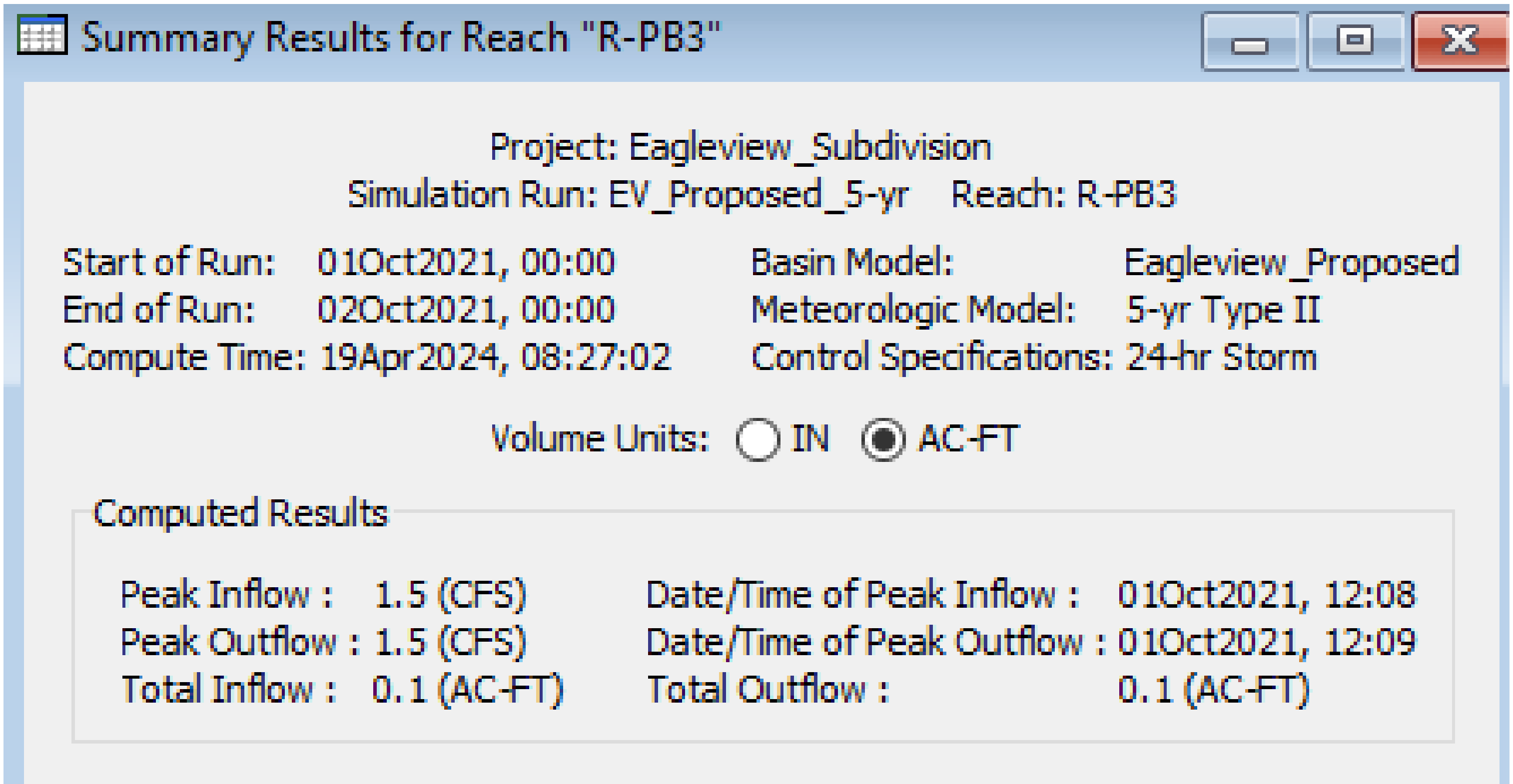
Basin Model: Eagleview_Proposed
Meteorologic Model: 5-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Inflow : 1.5 (CFS)
Peak Outflow : 1.5 (CFS)
Total Inflow : 0.1 (AC-FT)

Date/Time of Peak Inflow : 01Oct2021, 12:07
Date/Time of Peak Outflow : 01Oct2021, 12:08
Total Outflow : 0.1 (AC-FT)



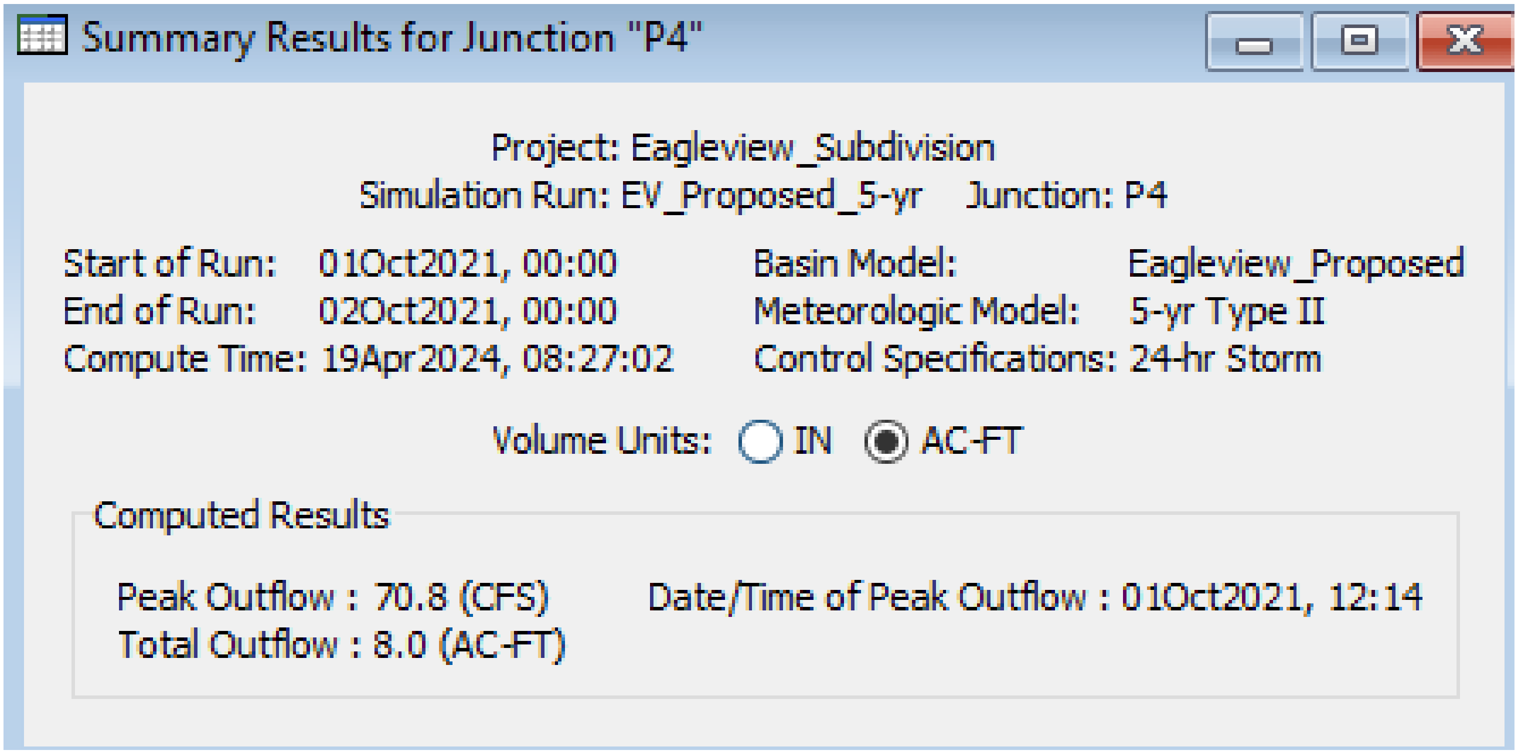
Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_5-yr   Reach: R-PB3

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Proposed
End of Run:	02Oct2021, 00:00	Meteorologic Model:	5-yr Type II
Compute Time:	19Apr2024, 08:27:02	Control Specifications:	24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Inflow :	1.5 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 12:08
Peak Outflow :	1.5 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 12:09
Total Inflow :	0.1 (AC-FT)	Total Outflow :	0.1 (AC-FT)



Summary Results for Junction "P4"

Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_5-yr Junction: P4

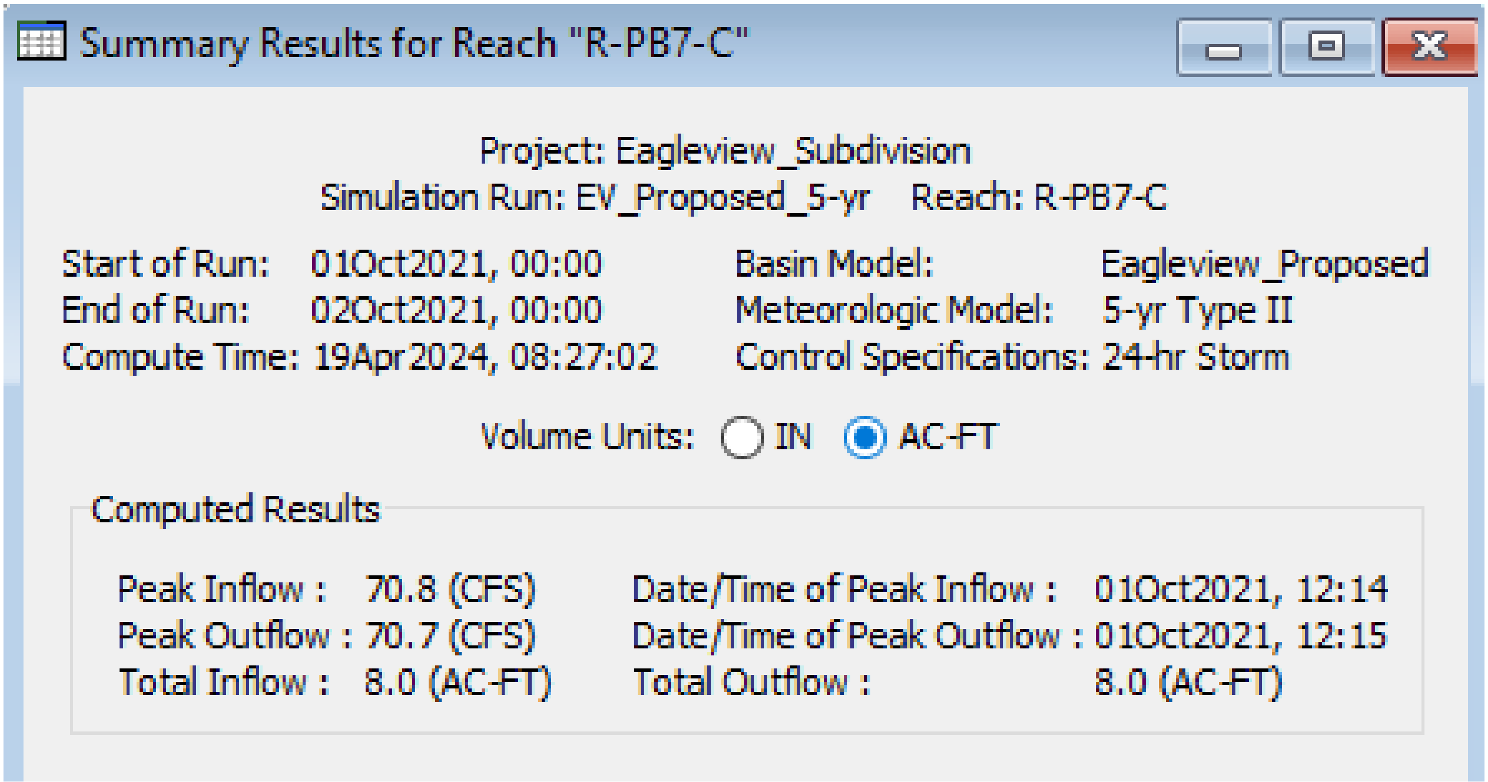
Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 08:27:02

Basin Model: Eagleview_Proposed
Meteorologic Model: 5-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Outflow : 70.8 (CFS)
Date/Time of Peak Outflow : 01Oct2021, 12:14
Total Outflow : 8.0 (AC-FT)



Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_5-yr Reach: R-PB7-C

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 08:27:02

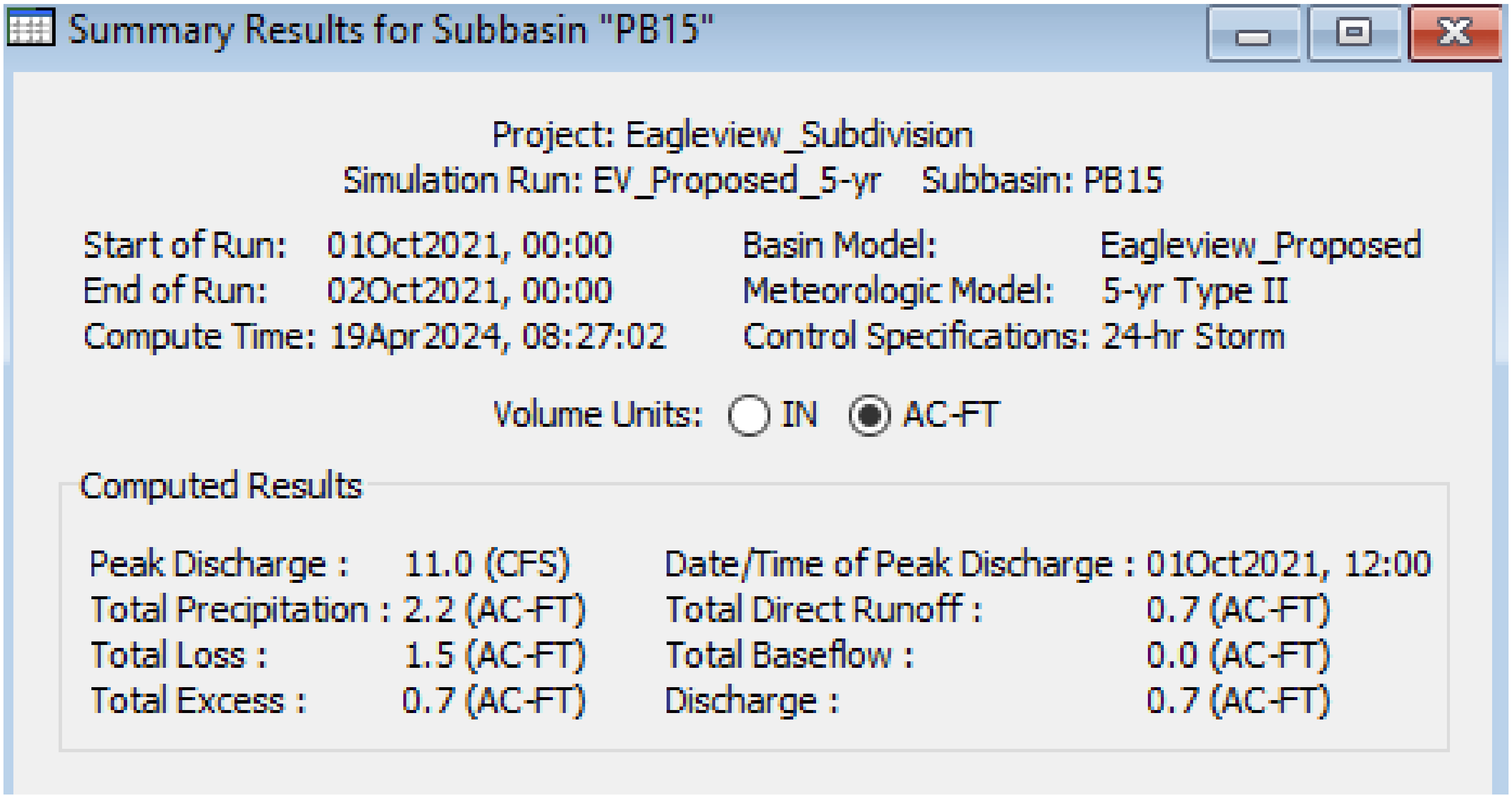
Basin Model: Eagleview_Proposed
Meteorologic Model: 5-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Inflow : 70.8 (CFS)
Peak Outflow : 70.7 (CFS)
Total Inflow : 8.0 (AC-FT)

Date/Time of Peak Inflow : 01Oct2021, 12:14
Date/Time of Peak Outflow : 01Oct2021, 12:15
Total Outflow : 8.0 (AC-FT)



Summary Results for Subbasin "PB15"

Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_5-yr   Subbasin: PB15

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 08:27:02

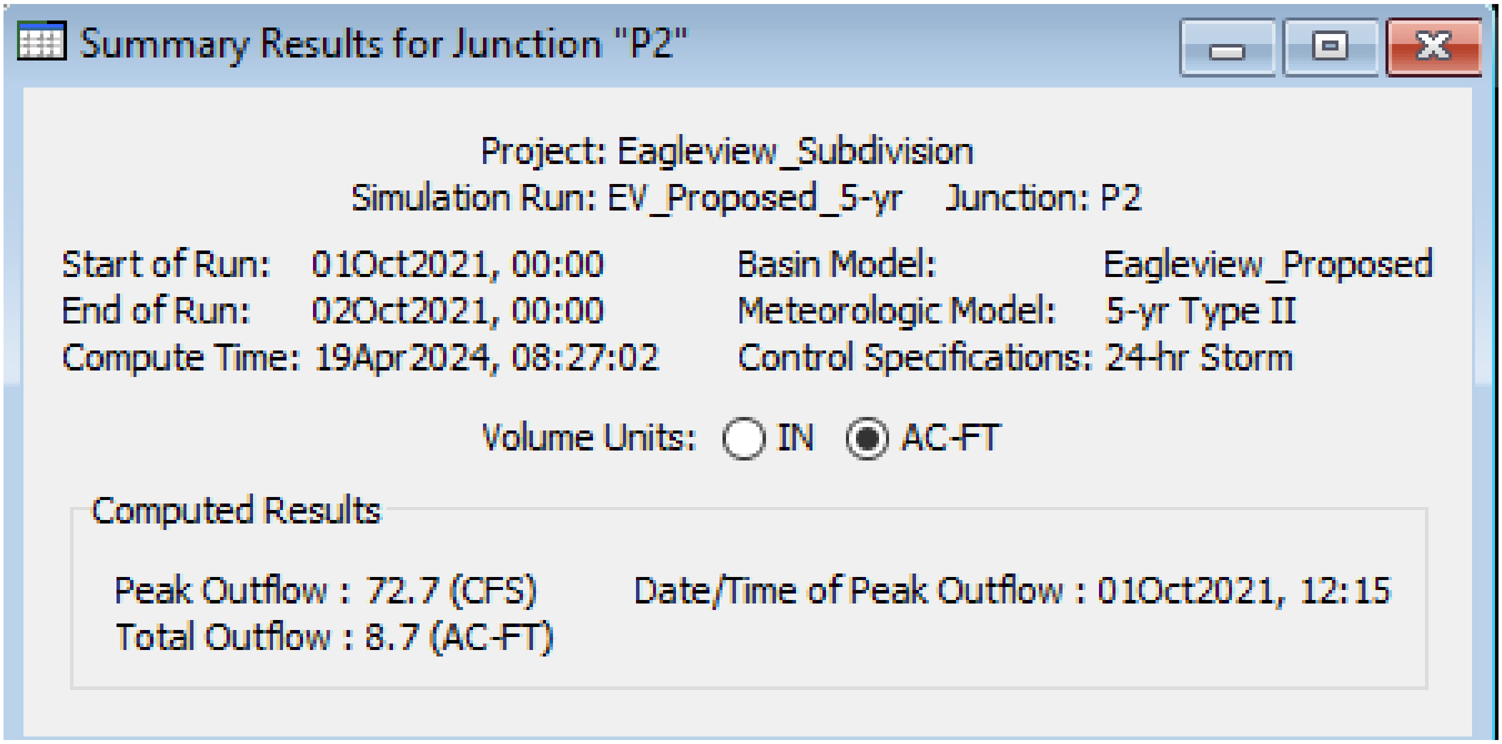
Basin Model: Eagleview_Proposed
Meteorologic Model: 5-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Discharge : 11.0 (CFS)
Total Precipitation : 2.2 (AC-FT)
Total Loss : 1.5 (AC-FT)
Total Excess : 0.7 (AC-FT)

Date/Time of Peak Discharge : 01Oct2021, 12:00
Total Direct Runoff : 0.7 (AC-FT)
Total Baseflow : 0.0 (AC-FT)
Discharge : 0.7 (AC-FT)



Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_5-yr Junction: P2

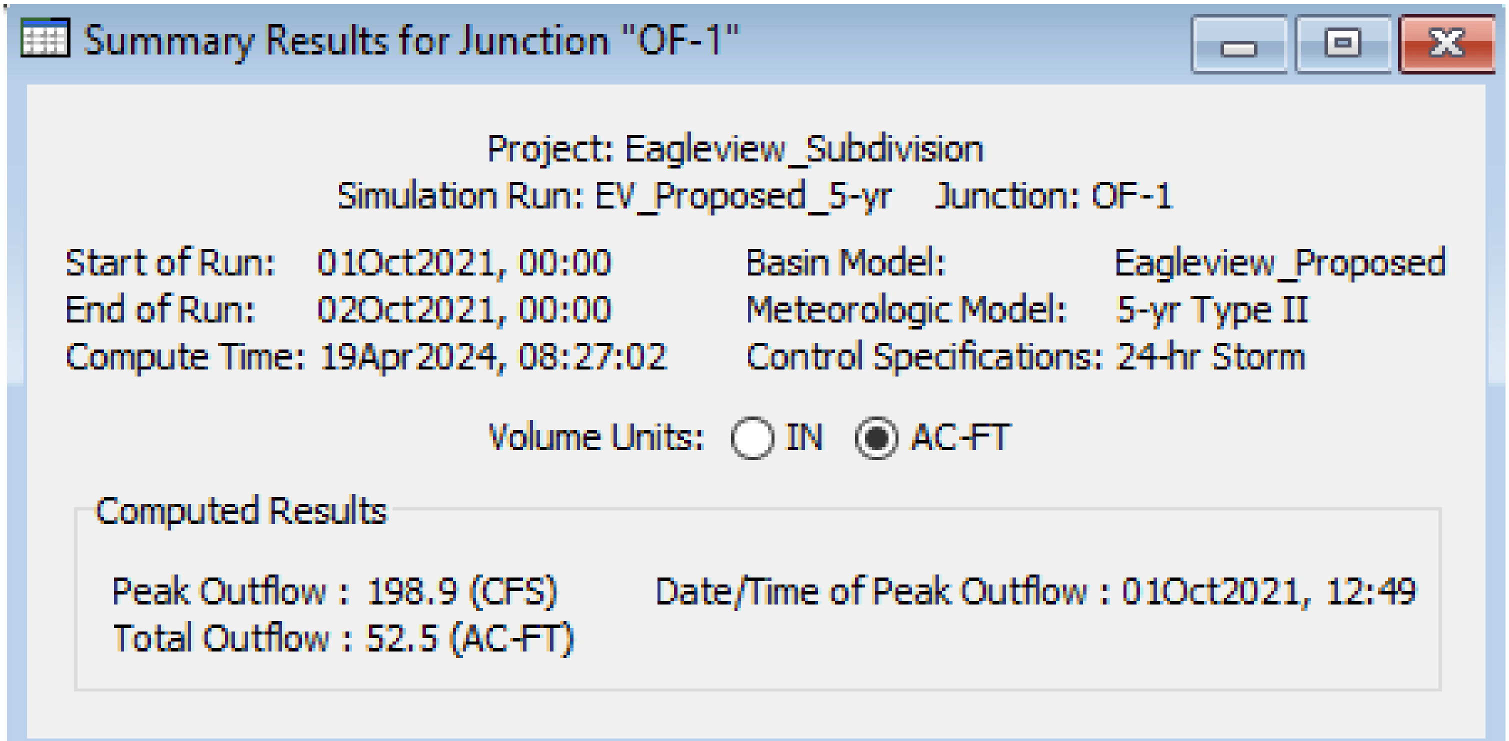
Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 08:27:02

Basin Model: Eagleview_Proposed
Meteorologic Model: 5-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Outflow : 72.7 (CFS)
Date/Time of Peak Outflow : 01Oct2021, 12:15
Total Outflow : 8.7 (AC-FT)



Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_5-yr Junction: OF-1

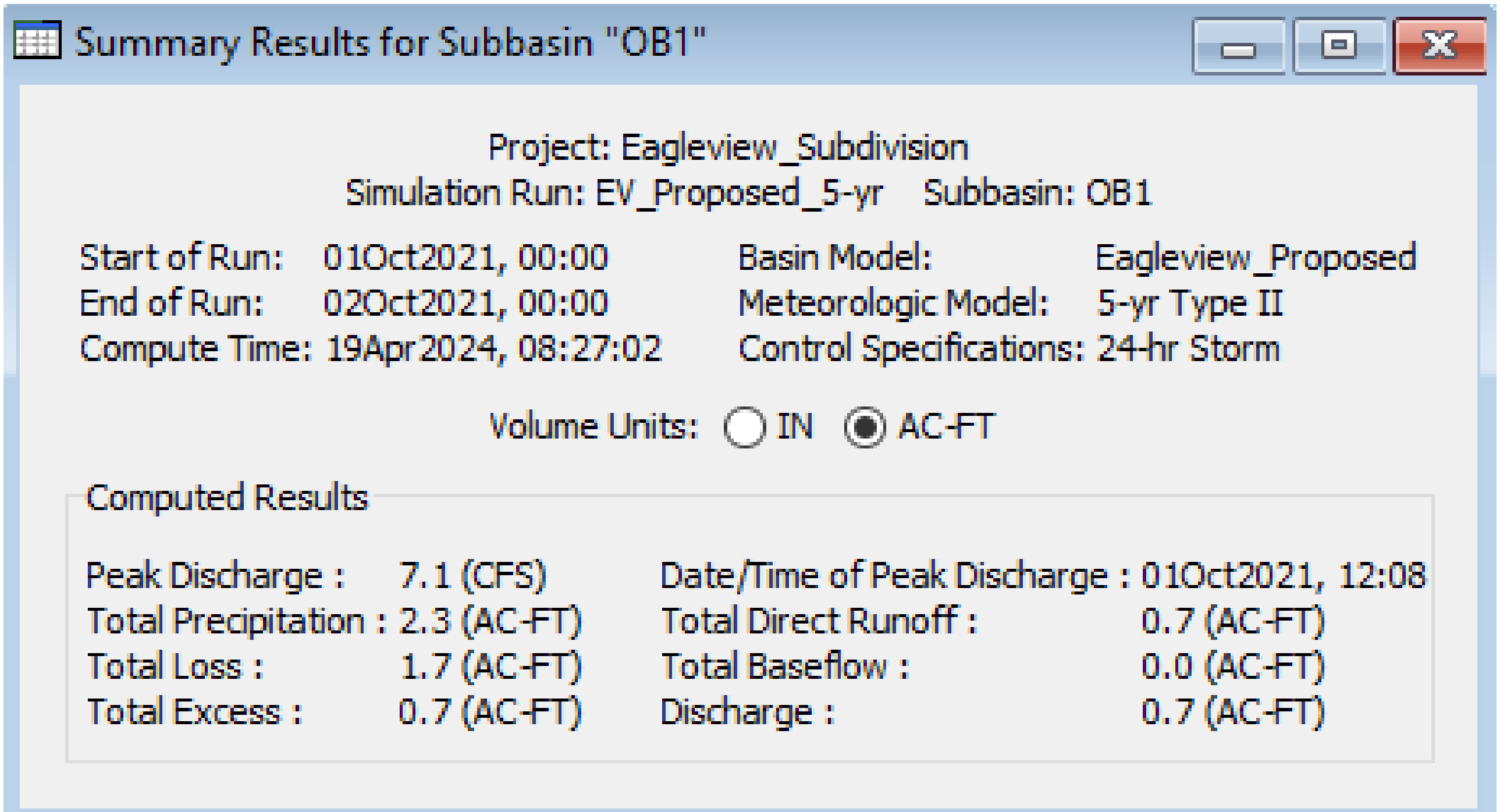
Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 08:27:02

Basin Model: Eagleview_Proposed
Meteorologic Model: 5-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Outflow : 198.9 (CFS)
Total Outflow : 52.5 (AC-FT)
Date/Time of Peak Outflow : 01Oct2021, 12:49



Summary Results for Subbasin "OB1"

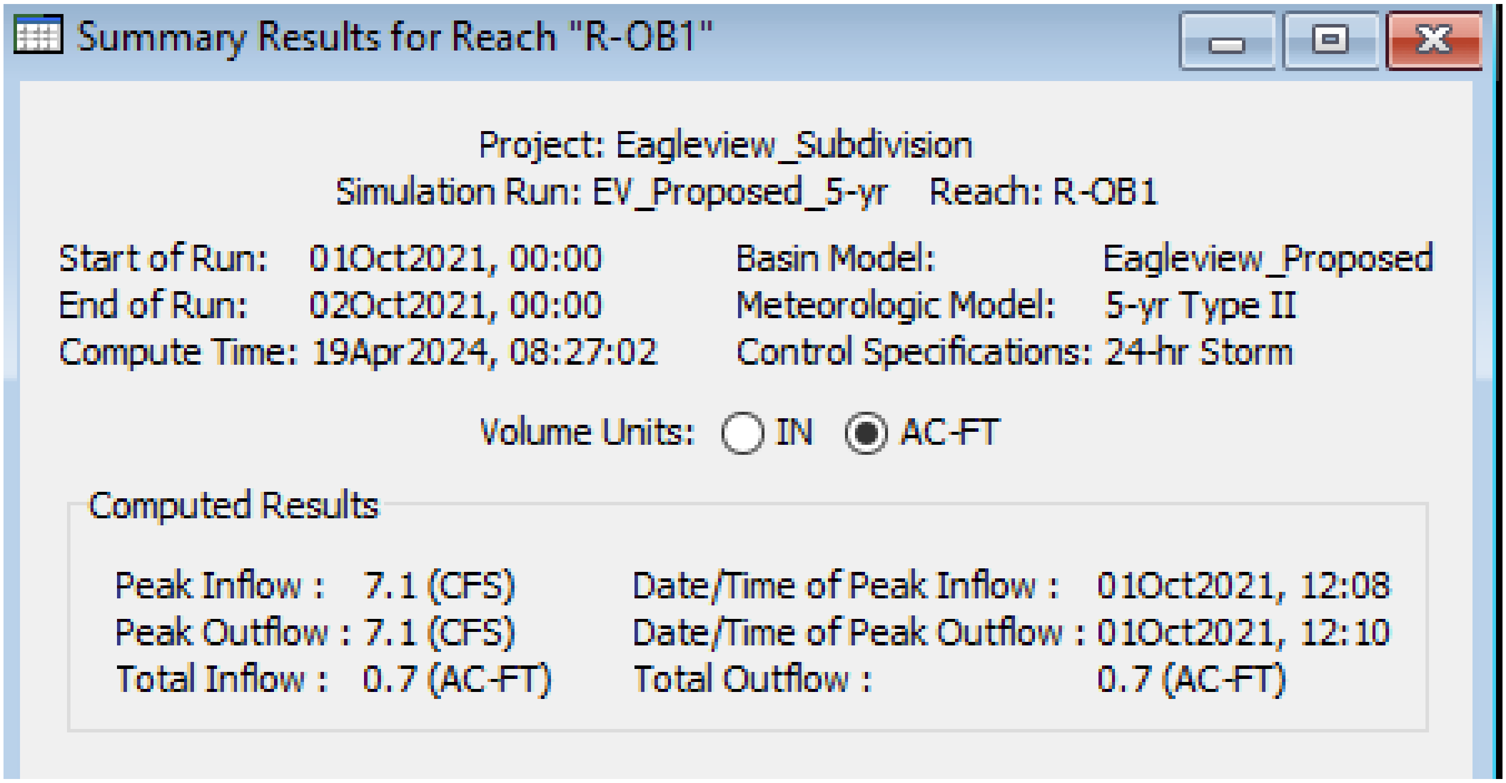
Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_5-yr   Subbasin: OB1

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Proposed
End of Run:	02Oct2021, 00:00	Meteorologic Model:	5-yr Type II
Compute Time:	19Apr2024, 08:27:02	Control Specifications:	24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Discharge :	7.1 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:08
Total Precipitation :	2.3 (AC-FT)	Total Direct Runoff :	0.7 (AC-FT)
Total Loss :	1.7 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	0.7 (AC-FT)	Discharge :	0.7 (AC-FT)



Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_5-yr Reach: R-OB1

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 08:27:02

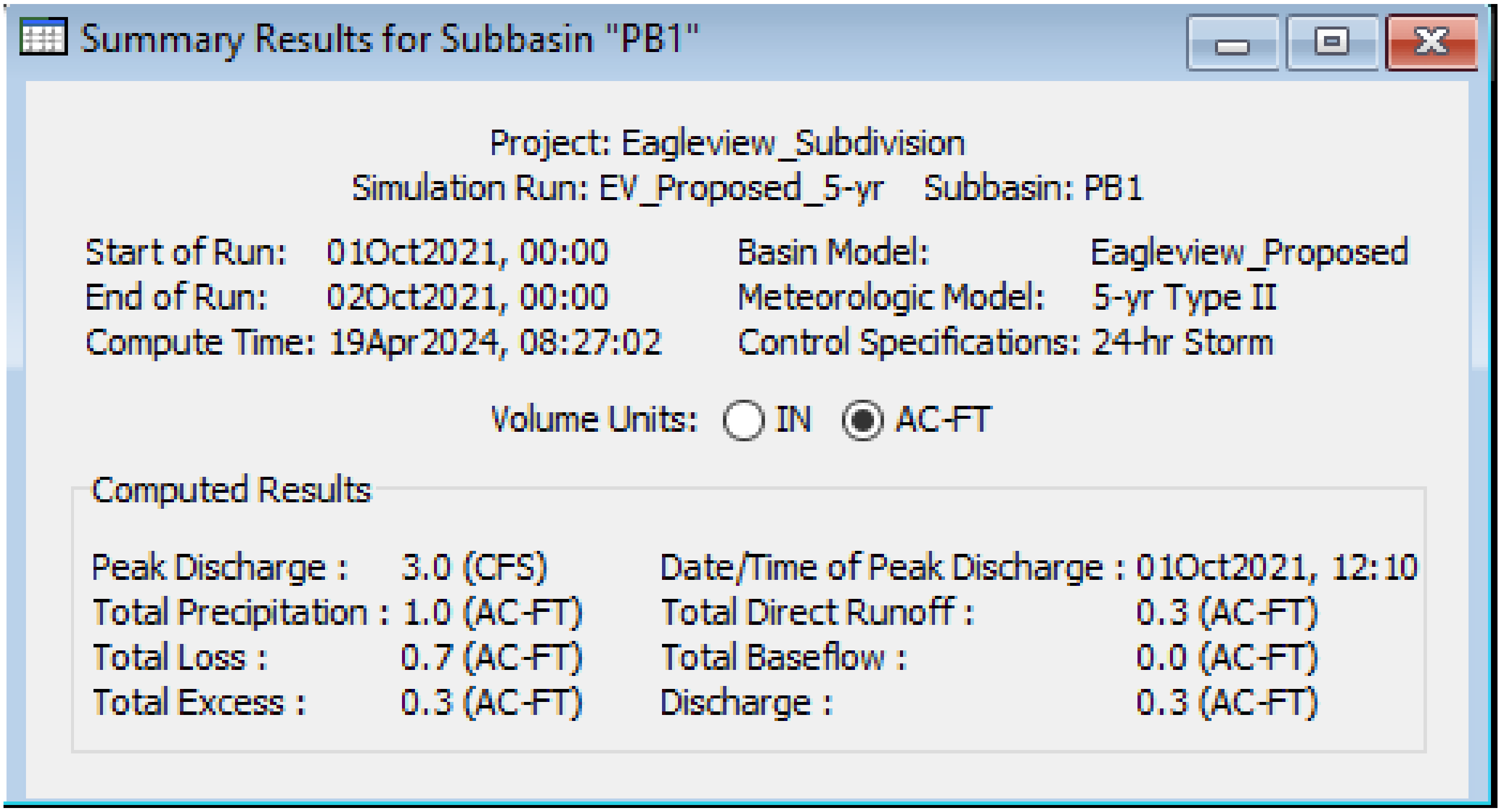
Basin Model: Eagleview_Proposed
Meteorologic Model: 5-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Inflow : 7.1 (CFS)
Peak Outflow : 7.1 (CFS)
Total Inflow : 0.7 (AC-FT)

Date/Time of Peak Inflow : 01Oct2021, 12:08
Date/Time of Peak Outflow : 01Oct2021, 12:10
Total Outflow : 0.7 (AC-FT)



Summary Results for Subbasin "PB1"

Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_5-yr Subbasin: PB1

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 08:27:02

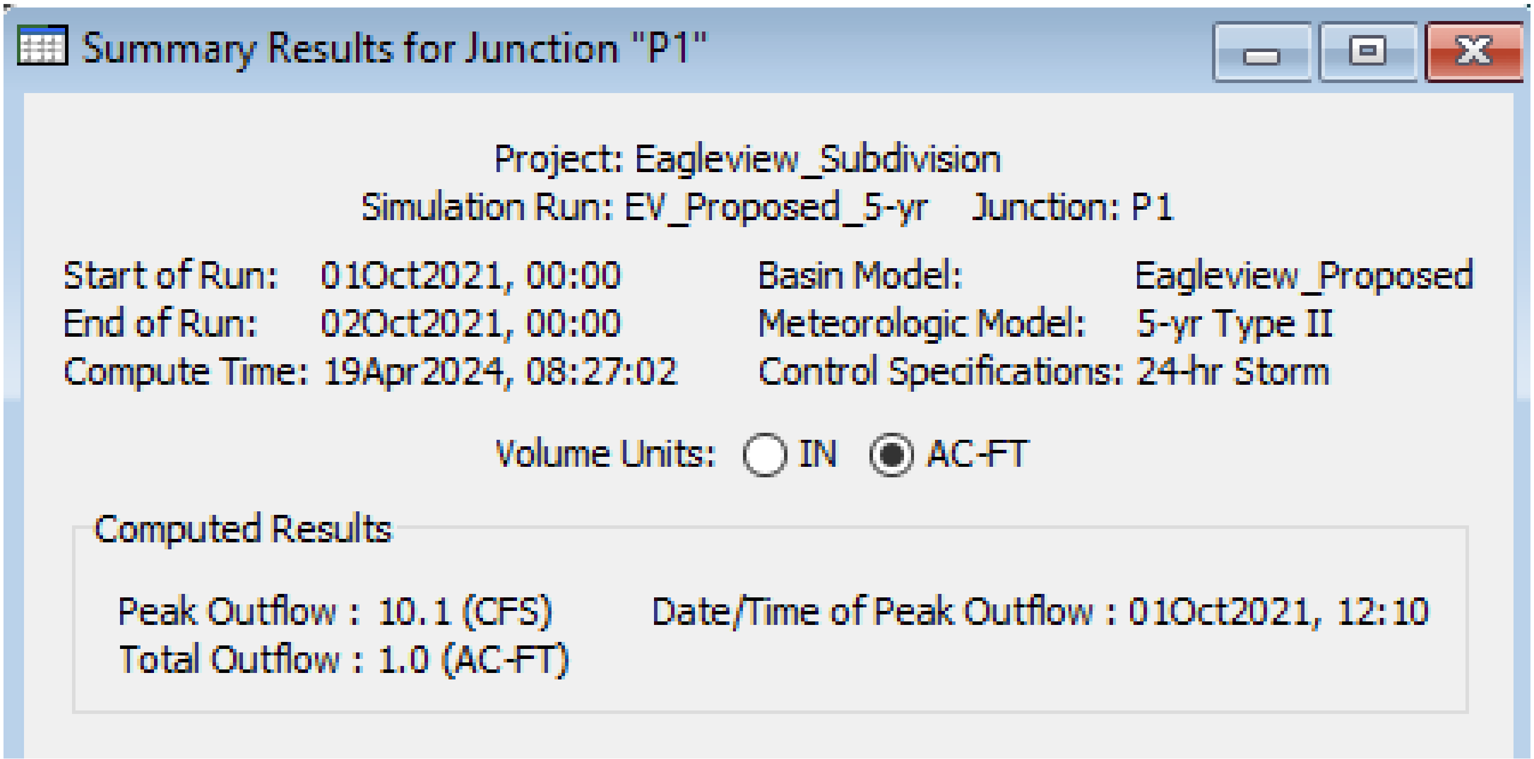
Basin Model: Eagleview_Proposed
Meteorologic Model: 5-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Discharge : 3.0 (CFS)
Total Precipitation : 1.0 (AC-FT)
Total Loss : 0.7 (AC-FT)
Total Excess : 0.3 (AC-FT)

Date/Time of Peak Discharge : 01Oct2021, 12:10
Total Direct Runoff : 0.3 (AC-FT)
Total Baseflow : 0.0 (AC-FT)
Discharge : 0.3 (AC-FT)



Summary Results for Junction "P1"

Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_5-yr Junction: P1

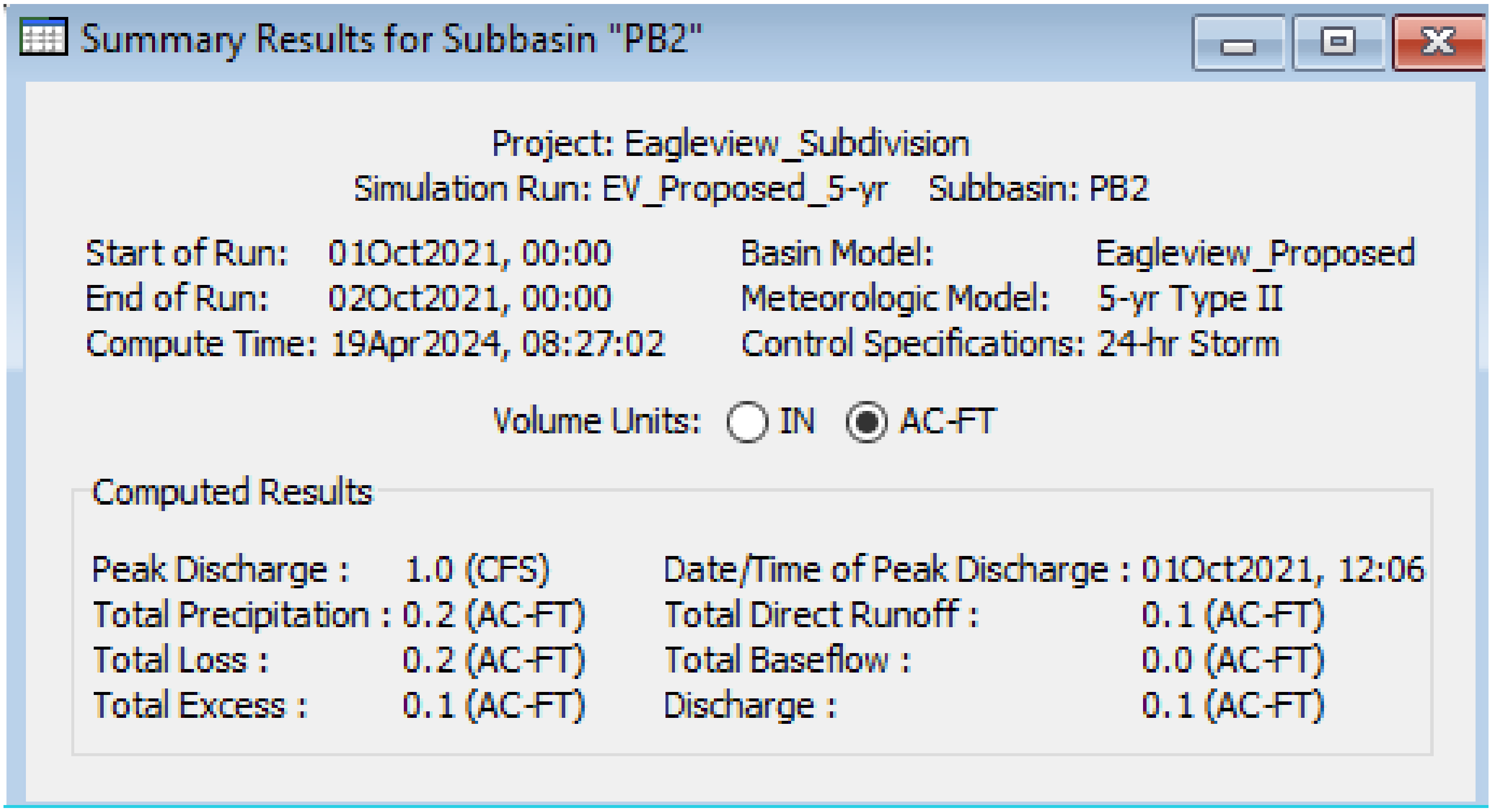
Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 08:27:02

Basin Model: Eagleview_Proposed
Meteorologic Model: 5-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Outflow : 10.1 (CFS)
Date/Time of Peak Outflow : 01Oct2021, 12:10
Total Outflow : 1.0 (AC-FT)


Summary Results for Subbasin "PB2"

Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_5-yr   Subbasin: PB2

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 08:27:02

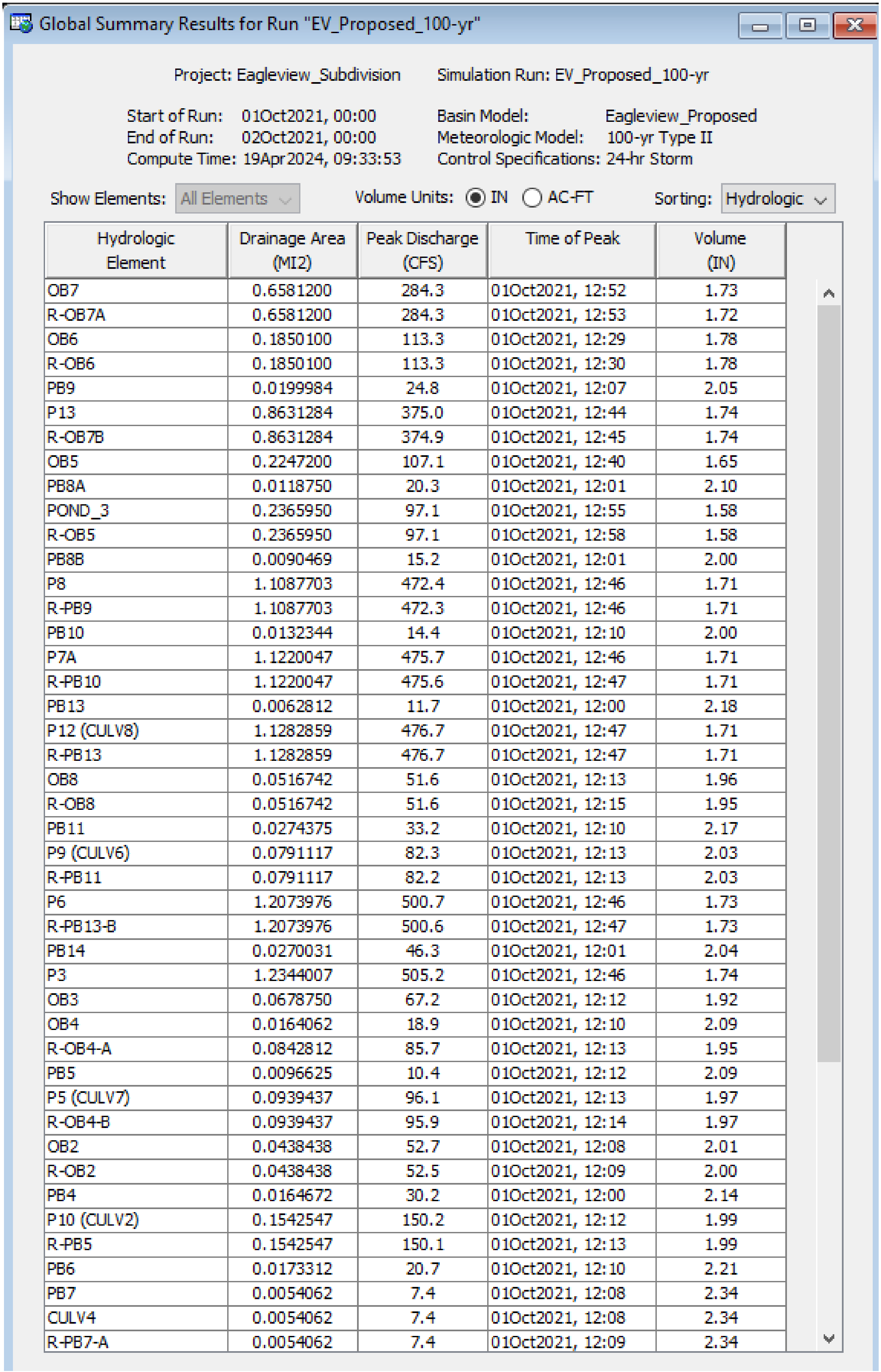
Basin Model: Eagleview_Proposed
Meteorologic Model: 5-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Discharge : 1.0 (CFS)
Total Precipitation : 0.2 (AC-FT)
Total Loss : 0.2 (AC-FT)
Total Excess : 0.1 (AC-FT)

Date/Time of Peak Discharge : 01Oct2021, 12:06
Total Direct Runoff : 0.1 (AC-FT)
Total Baseflow : 0.0 (AC-FT)
Discharge : 0.1 (AC-FT)



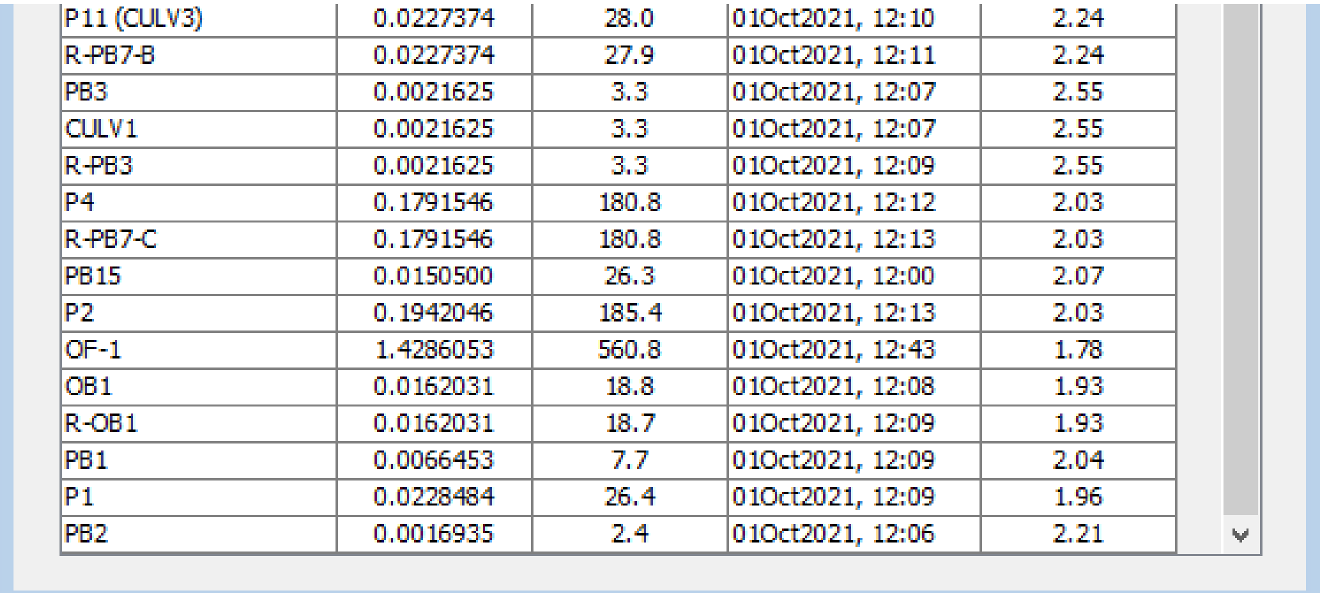
Project: Eagleview_Subdivision Simulation Run: EV_Proposed_100-yr

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 09:33:53

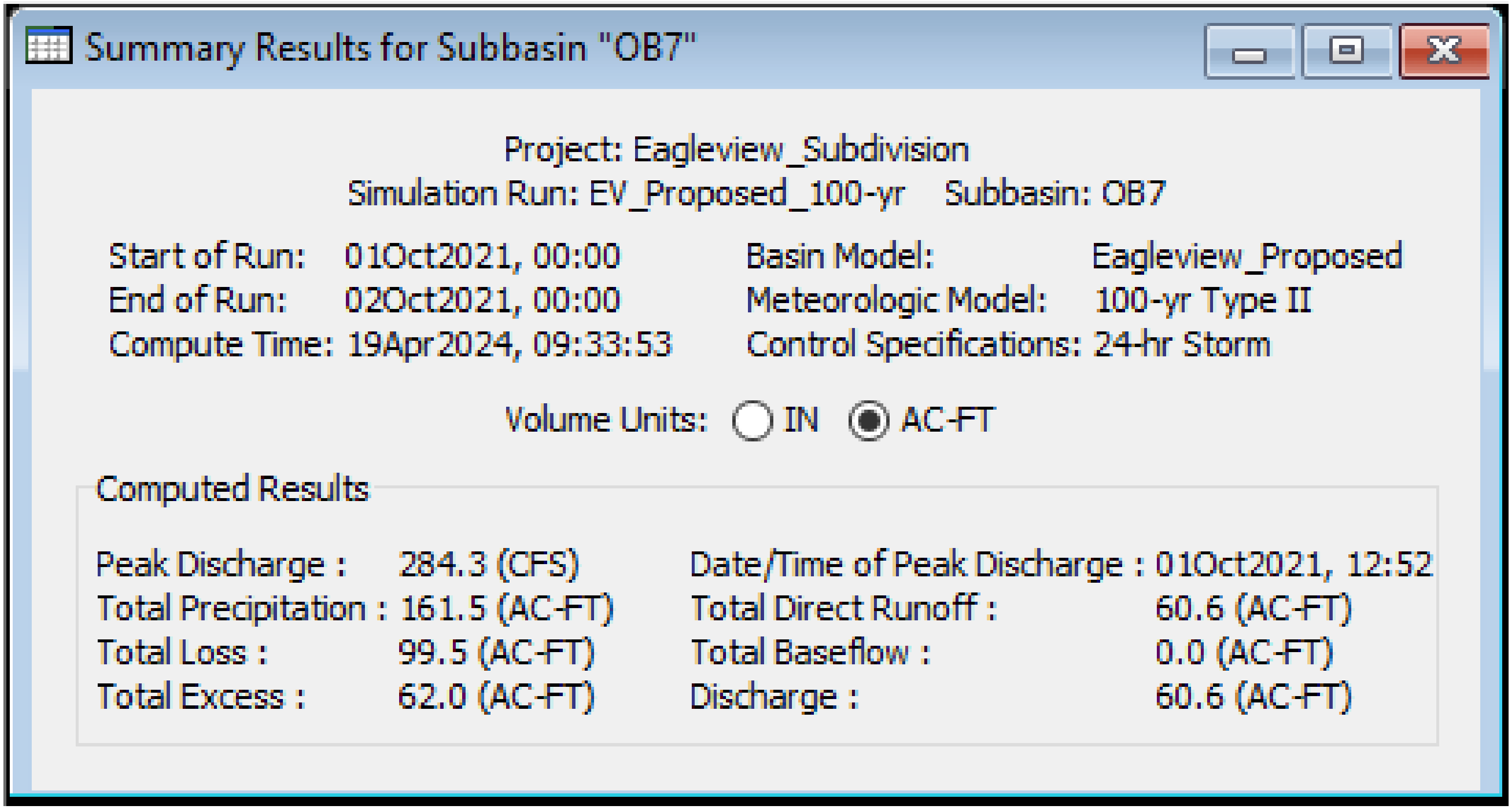
Basin Model: Eagleview_Proposed
Meteorologic Model: 100-yr Type II
Control Specifications: 24-hr Storm

Show Elements: All Elements
Volume Units: ● IN ○ AC-FT
Sorting: Hydrologic

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
OB7	0.6581200	284.3	01Oct2021, 12:52	1.73
R-OB7A	0.6581200	284.3	01Oct2021, 12:53	1.72
OB6	0.1850100	113.3	01Oct2021, 12:29	1.78
R-OB6	0.1850100	113.3	01Oct2021, 12:30	1.78
PB9	0.0199984	24.8	01Oct2021, 12:07	2.05
P13	0.8631284	375.0	01Oct2021, 12:44	1.74
R-OB7B	0.8631284	374.9	01Oct2021, 12:45	1.74
OB5	0.2247200	107.1	01Oct2021, 12:40	1.65
PB8A	0.0118750	20.3	01Oct2021, 12:01	2.10
POND_3	0.2365950	97.1	01Oct2021, 12:55	1.58
R-OB5	0.2365950	97.1	01Oct2021, 12:58	1.58
PB8B	0.0090469	15.2	01Oct2021, 12:01	2.00
P8	1.1087703	472.4	01Oct2021, 12:46	1.71
R-PB9	1.1087703	472.3	01Oct2021, 12:46	1.71
PB10	0.0132344	14.4	01Oct2021, 12:10	2.00
P7A	1.1220047	475.7	01Oct2021, 12:46	1.71
R-PB10	1.1220047	475.6	01Oct2021, 12:47	1.71
PB13	0.0062812	11.7	01Oct2021, 12:00	2.18
P12 (CULV8)	1.1282859	476.7	01Oct2021, 12:47	1.71
R-PB13	1.1282859	476.7	01Oct2021, 12:47	1.71
OB8	0.0516742	51.6	01Oct2021, 12:13	1.96
R-OB8	0.0516742	51.6	01Oct2021, 12:15	1.95
PB11	0.0274375	33.2	01Oct2021, 12:10	2.17
P9 (CULV6)	0.0791117	82.3	01Oct2021, 12:13	2.03
R-PB11	0.0791117	82.2	01Oct2021, 12:13	2.03
P6	1.2073976	500.7	01Oct2021, 12:46	1.73
R-PB13-B	1.2073976	500.6	01Oct2021, 12:47	1.73
PB14	0.0270031	46.3	01Oct2021, 12:01	2.04
P3	1.2344007	505.2	01Oct2021, 12:46	1.74
OB3	0.0678750	67.2	01Oct2021, 12:12	1.92
OB4	0.0164062	18.9	01Oct2021, 12:10	2.09
R-OB4-A	0.0842812	85.7	01Oct2021, 12:13	1.95
PB5	0.0096625	10.4	01Oct2021, 12:12	2.09
P5 (CULV7)	0.0939437	96.1	01Oct2021, 12:13	1.97
R-OB4-B	0.0939437	95.9	01Oct2021, 12:14	1.97
OB2	0.0438438	52.7	01Oct2021, 12:08	2.01
R-OB2	0.0438438	52.5	01Oct2021, 12:09	2.00
PB4	0.0164672	30.2	01Oct2021, 12:00	2.14
P10 (CULV2)	0.1542547	150.2	01Oct2021, 12:12	1.99
R-PB5	0.1542547	150.1	01Oct2021, 12:13	1.99
PB6	0.0173312	20.7	01Oct2021, 12:10	2.21
PB7	0.0054062	7.4	01Oct2021, 12:08	2.34
CULV4	0.0054062	7.4	01Oct2021, 12:08	2.34
R-PB7-A	0.0054062	7.4	01Oct2021, 12:09	2.34



P11 (CULV3)	0.0227374	28.0	01Oct2021, 12:10	2.24
R-PB7-B	0.0227374	27.9	01Oct2021, 12:11	2.24
PB3	0.0021625	3.3	01Oct2021, 12:07	2.55
CULV1	0.0021625	3.3	01Oct2021, 12:07	2.55
R-PB3	0.0021625	3.3	01Oct2021, 12:09	2.55
P4	0.1791546	180.8	01Oct2021, 12:12	2.03
R-PB7-C	0.1791546	180.8	01Oct2021, 12:13	2.03
PB15	0.0150500	26.3	01Oct2021, 12:00	2.07
P2	0.1942046	185.4	01Oct2021, 12:13	2.03
OF-1	1.4286053	560.8	01Oct2021, 12:43	1.78
OB1	0.0162031	18.8	01Oct2021, 12:08	1.93
R-OB1	0.0162031	18.7	01Oct2021, 12:09	1.93
PB1	0.0066453	7.7	01Oct2021, 12:09	2.04
P1	0.0228484	26.4	01Oct2021, 12:09	1.96
PB2	0.0016935	2.4	01Oct2021, 12:06	2.21



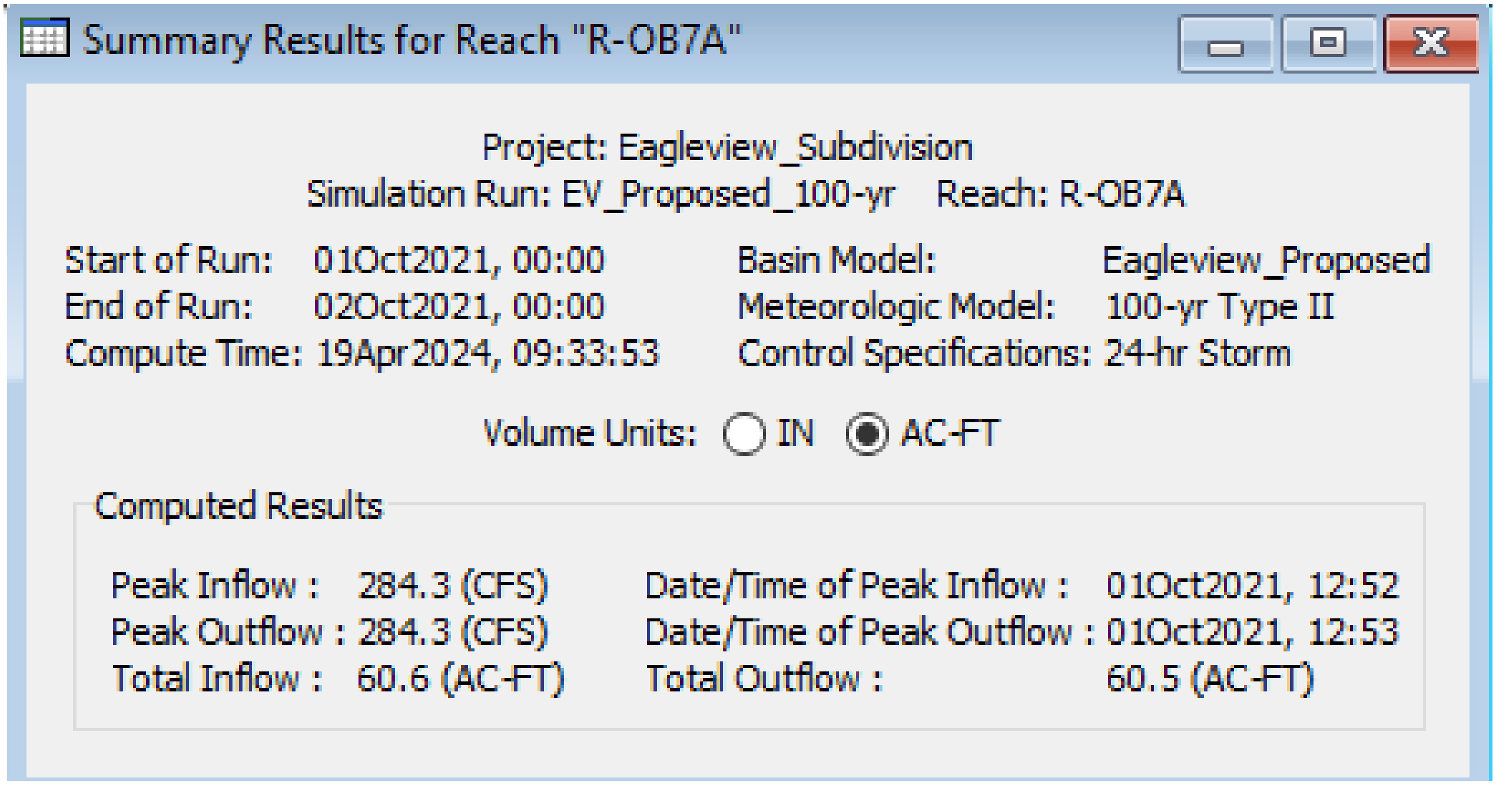
Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_100-yr   Subbasin: OB7

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Proposed
End of Run:	02Oct2021, 00:00	Meteorologic Model:	100-yr Type II
Compute Time:	19Apr2024, 09:33:53	Control Specifications:	24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Discharge :	284.3 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:52
Total Precipitation :	161.5 (AC-FT)	Total Direct Runoff :	60.6 (AC-FT)
Total Loss :	99.5 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	62.0 (AC-FT)	Discharge :	60.6 (AC-FT)



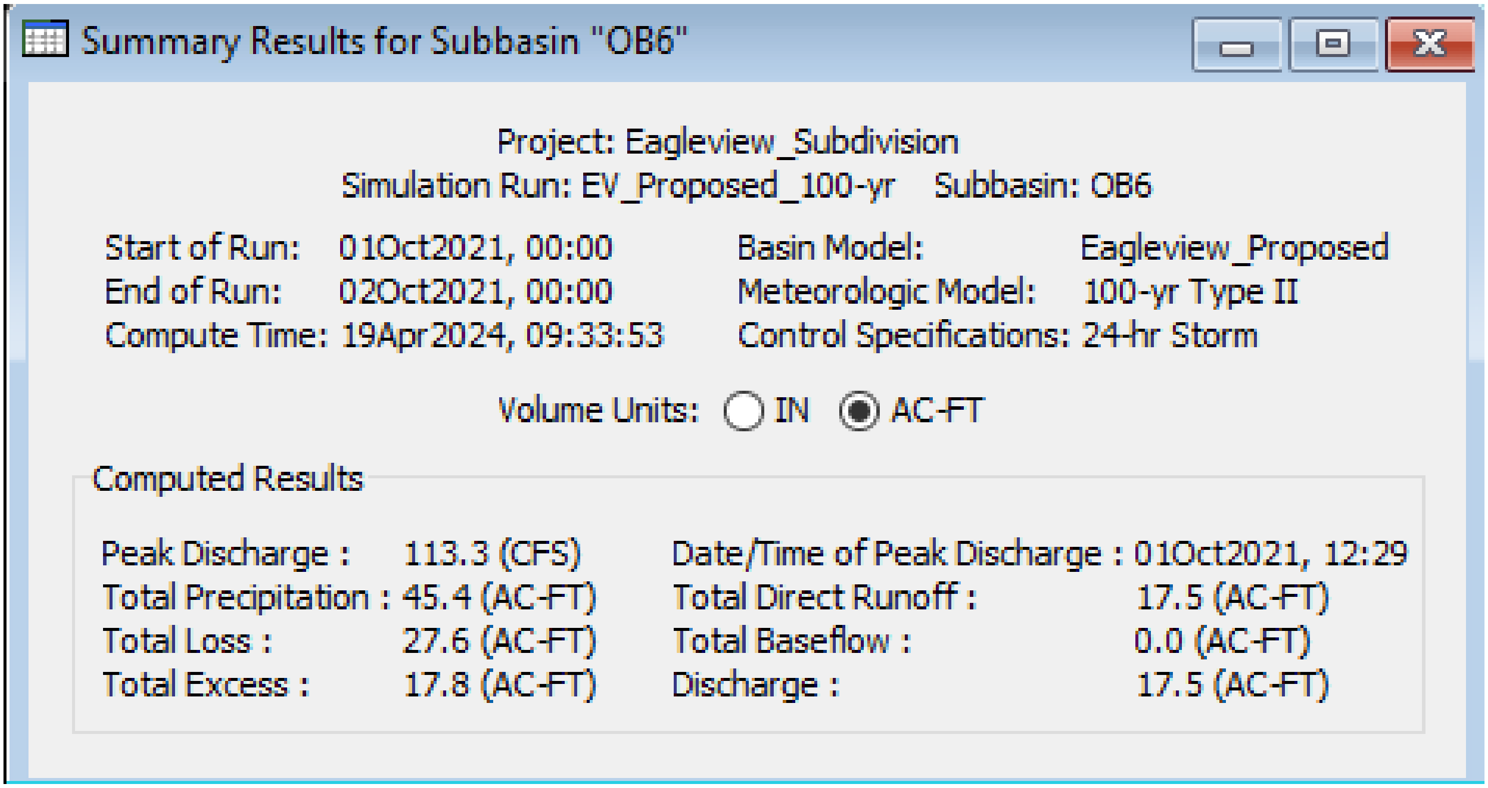
Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_100-yr   Reach: R-OB7A

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Proposed
End of Run:	02Oct2021, 00:00	Meteorologic Model:	100-yr Type II
Compute Time:	19Apr2024, 09:33:53	Control Specifications:	24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Inflow :	284.3 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 12:52
Peak Outflow :	284.3 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 12:53
Total Inflow :	60.6 (AC-FT)	Total Outflow :	60.5 (AC-FT)


Summary Results for Subbasin "OB6"

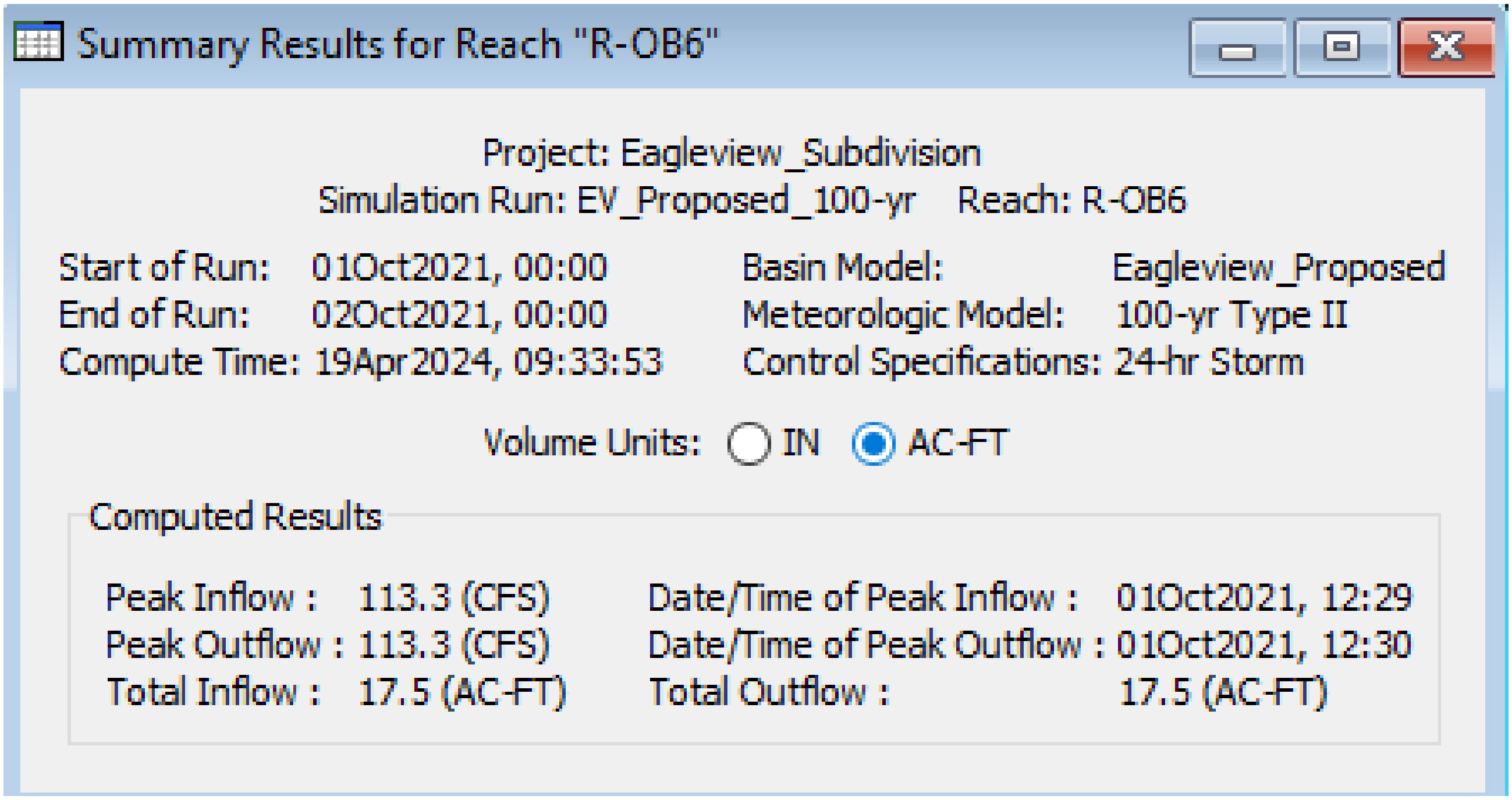
Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_100-yr   Subbasin: OB6

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Proposed
End of Run:	02Oct2021, 00:00	Meteorologic Model:	100-yr Type II
Compute Time:	19Apr2024, 09:33:53	Control Specifications:	24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Discharge :	113.3 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:29
Total Precipitation :	45.4 (AC-FT)	Total Direct Runoff :	17.5 (AC-FT)
Total Loss :	27.6 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	17.8 (AC-FT)	Discharge :	17.5 (AC-FT)


Summary Results for Reach "R-OB6"

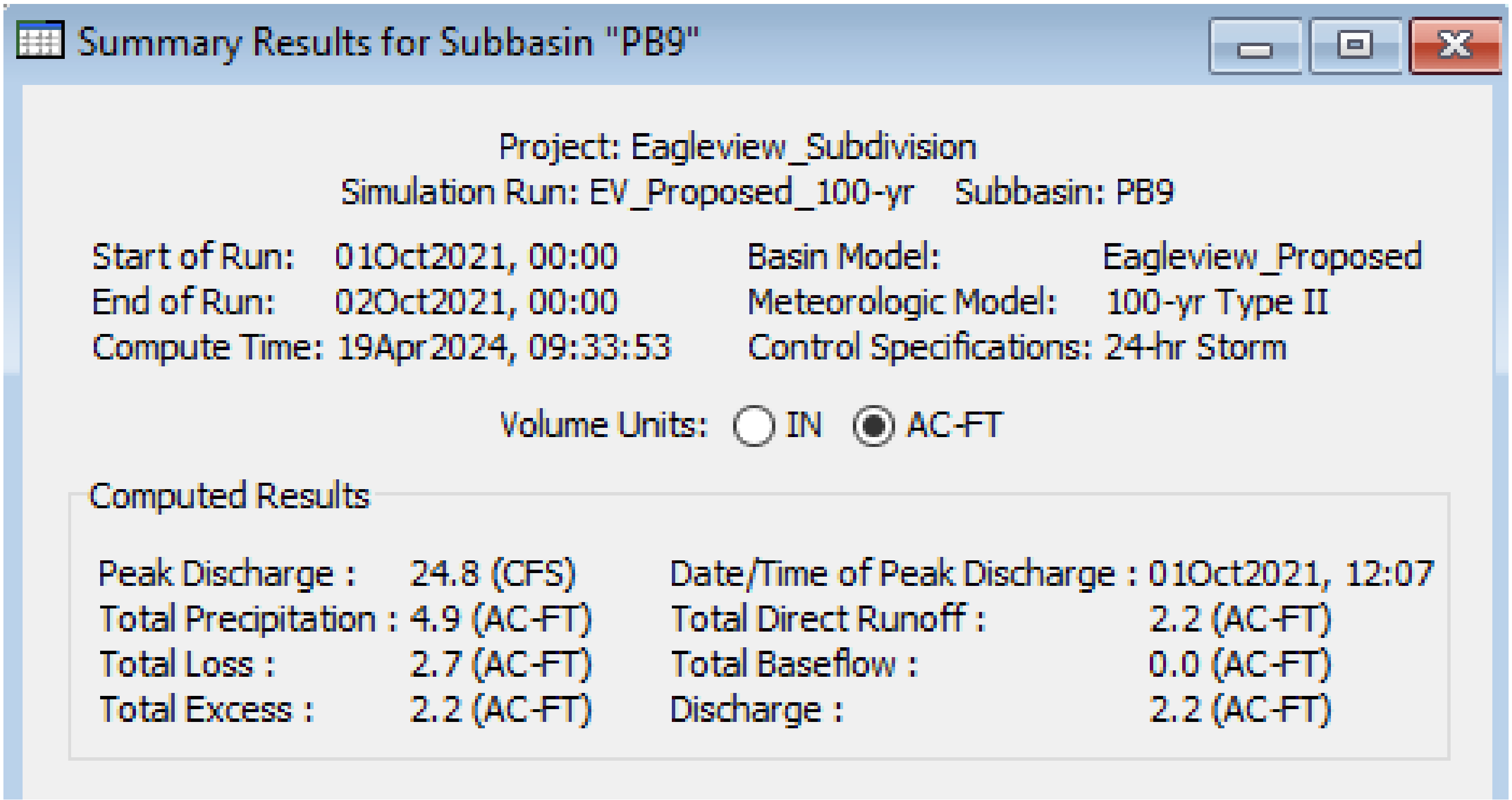
Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_100-yr Reach: R-OB6

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Proposed
End of Run:	02Oct2021, 00:00	Meteorologic Model:	100-yr Type II
Compute Time:	19Apr2024, 09:33:53	Control Specifications:	24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Inflow :	113.3 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 12:29
Peak Outflow :	113.3 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 12:30
Total Inflow :	17.5 (AC-FT)	Total Outflow :	17.5 (AC-FT)


Summary Results for Subbasin "PB9"

Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_100-yr   Subbasin: PB9

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 09:33:53

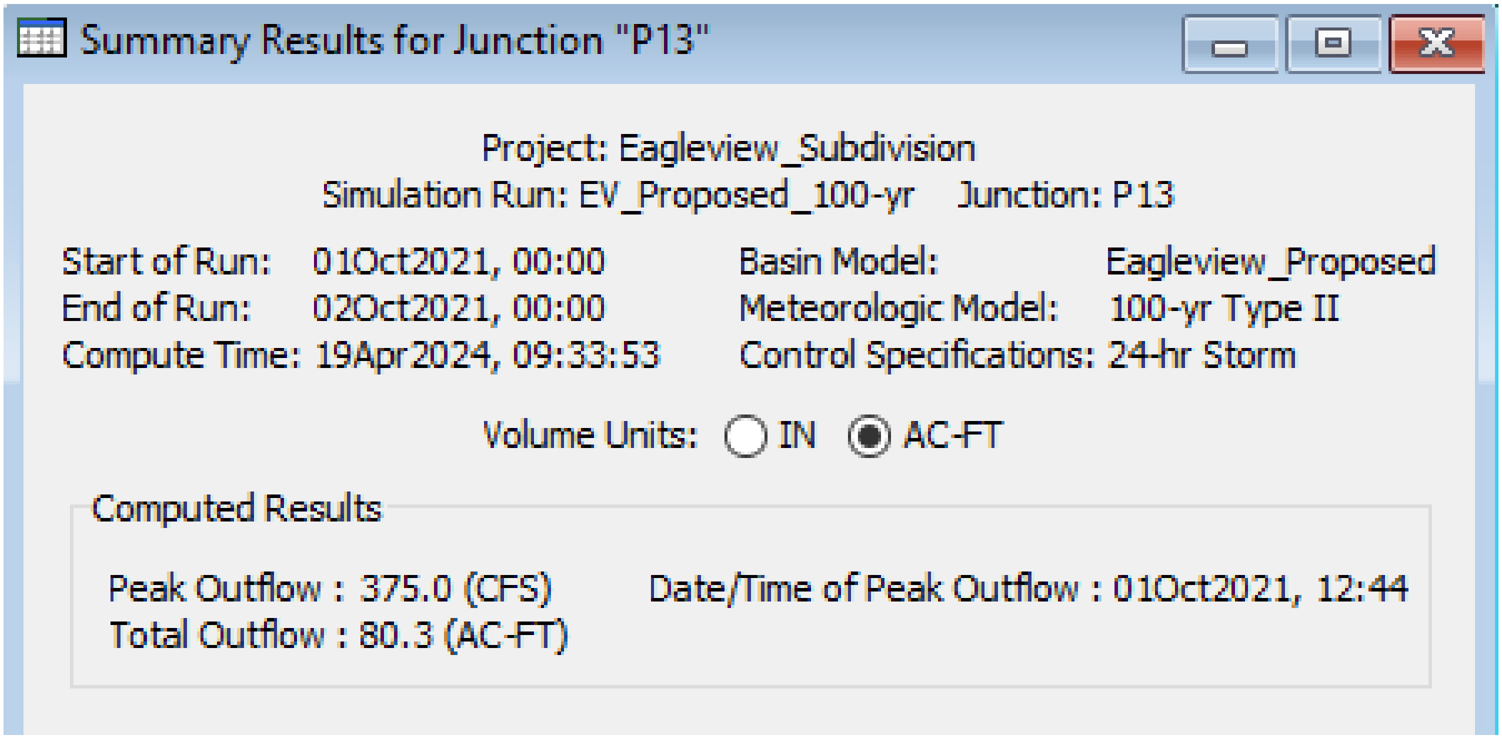
Basin Model: Eagleview_Proposed
Meteorologic Model: 100-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Discharge : 24.8 (CFS)
Total Precipitation : 4.9 (AC-FT)
Total Loss : 2.7 (AC-FT)
Total Excess : 2.2 (AC-FT)

Date/Time of Peak Discharge : 01Oct2021, 12:07
Total Direct Runoff : 2.2 (AC-FT)
Total Baseflow : 0.0 (AC-FT)
Discharge : 2.2 (AC-FT)



Summary Results for Junction "P13"

Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_100-yr Junction: P13

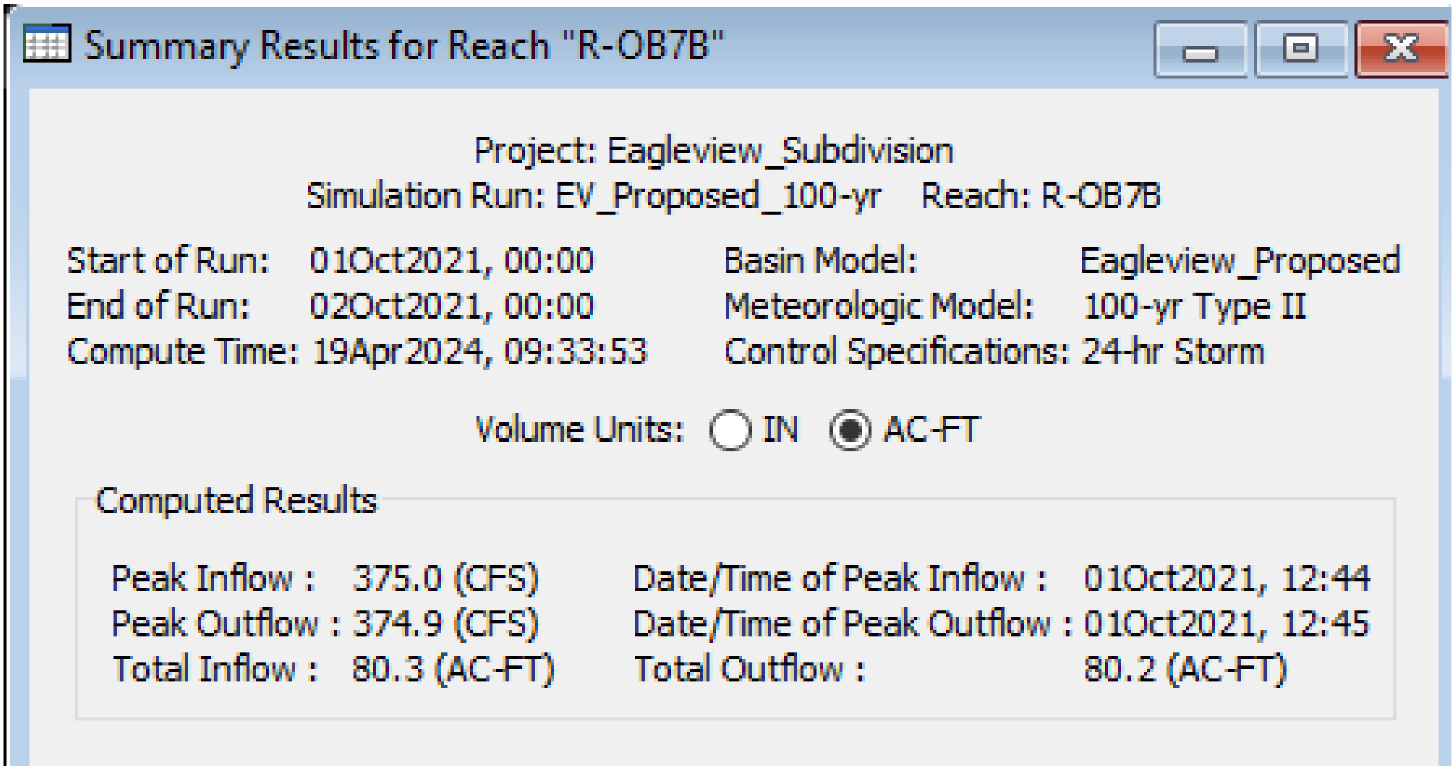
Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 09:33:53

Basin Model: Eagleview_Proposed
Meteorologic Model: 100-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Outflow : 375.0 (CFS)
Total Outflow : 80.3 (AC-FT)
Date/Time of Peak Outflow : 01Oct2021, 12:44



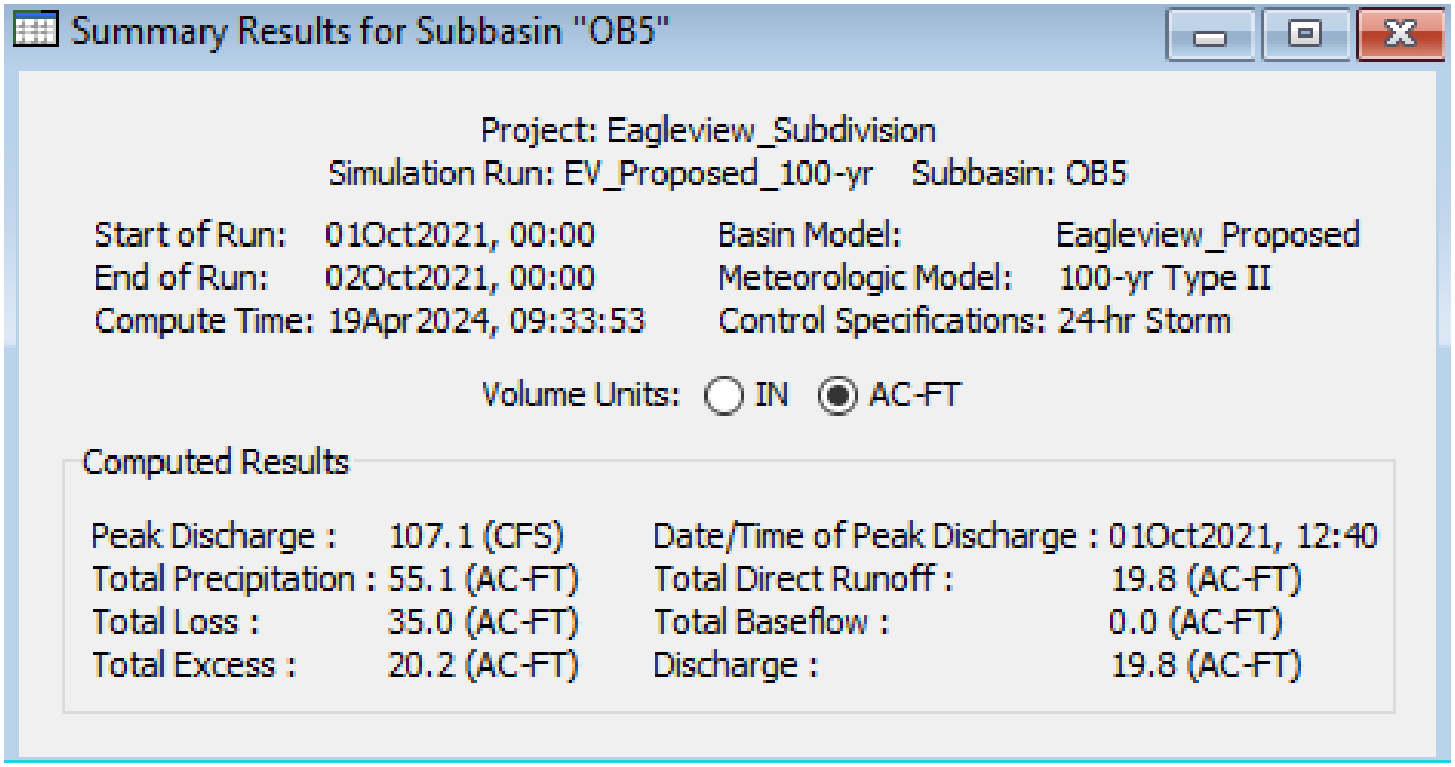
Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_100-yr   Reach: R-OB7B

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Proposed
End of Run:	02Oct2021, 00:00	Meteorologic Model:	100-yr Type II
Compute Time:	19Apr2024, 09:33:53	Control Specifications:	24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Inflow :	375.0 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 12:44
Peak Outflow :	374.9 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 12:45
Total Inflow :	80.3 (AC-FT)	Total Outflow :	80.2 (AC-FT)



Summary Results for Subbasin "OB5"

Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_100-yr Subbasin: OB5

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 09:33:53

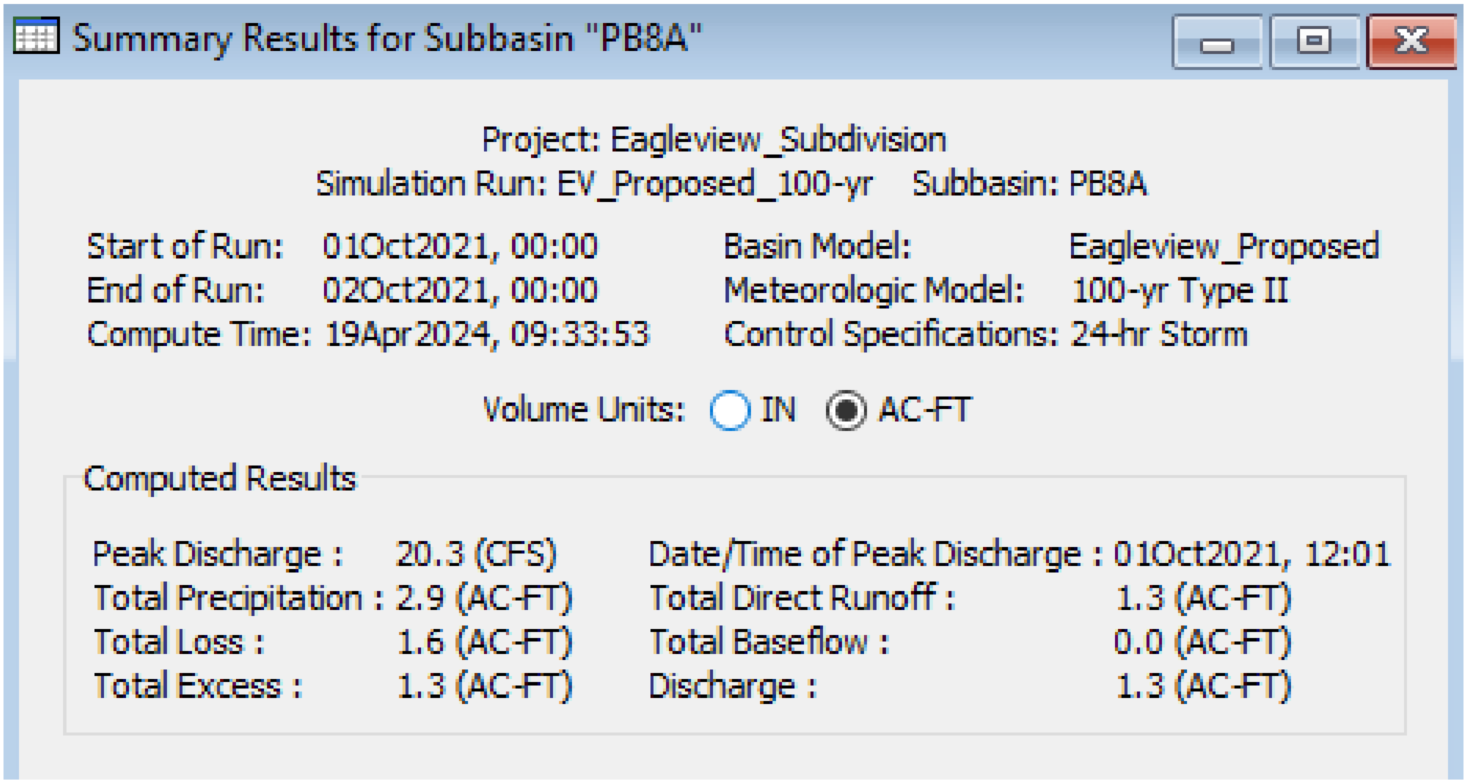
Basin Model: Eagleview_Proposed
Meteorologic Model: 100-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Discharge : 107.1 (CFS)
Total Precipitation : 55.1 (AC-FT)
Total Loss : 35.0 (AC-FT)
Total Excess : 20.2 (AC-FT)

Date/Time of Peak Discharge : 01Oct2021, 12:40
Total Direct Runoff : 19.8 (AC-FT)
Total Baseflow : 0.0 (AC-FT)
Discharge : 19.8 (AC-FT)


Summary Results for Subbasin "PB8A"

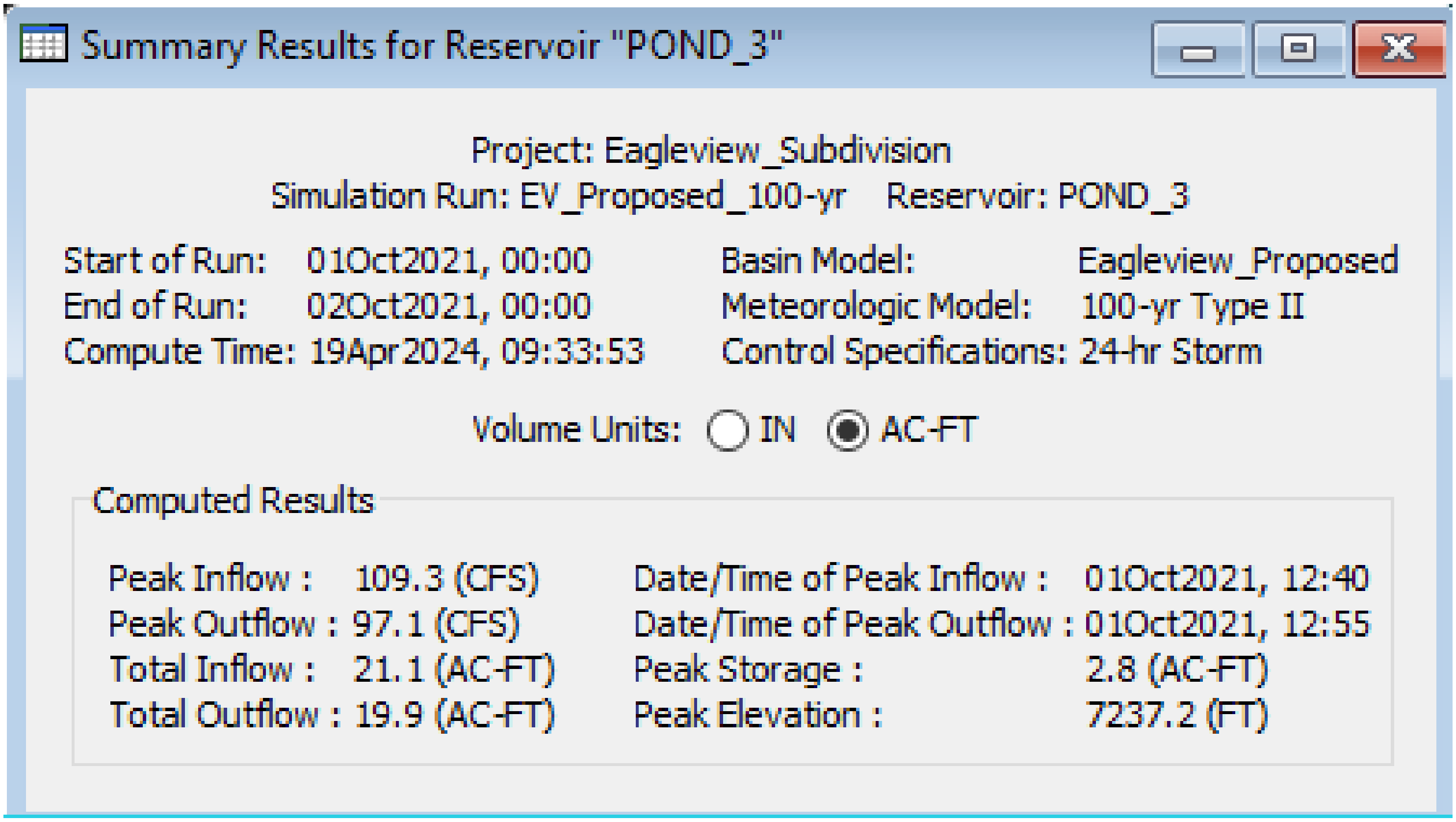
Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_100-yr Subbasin: PB8A

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Proposed
End of Run:	02Oct2021, 00:00	Meteorologic Model:	100-yr Type II
Compute Time:	19Apr2024, 09:33:53	Control Specifications:	24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Discharge :	20.3 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:01
Total Precipitation :	2.9 (AC-FT)	Total Direct Runoff :	1.3 (AC-FT)
Total Loss :	1.6 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	1.3 (AC-FT)	Discharge :	1.3 (AC-FT)



Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_100-yr Reservoir: POND_3

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 09:33:53

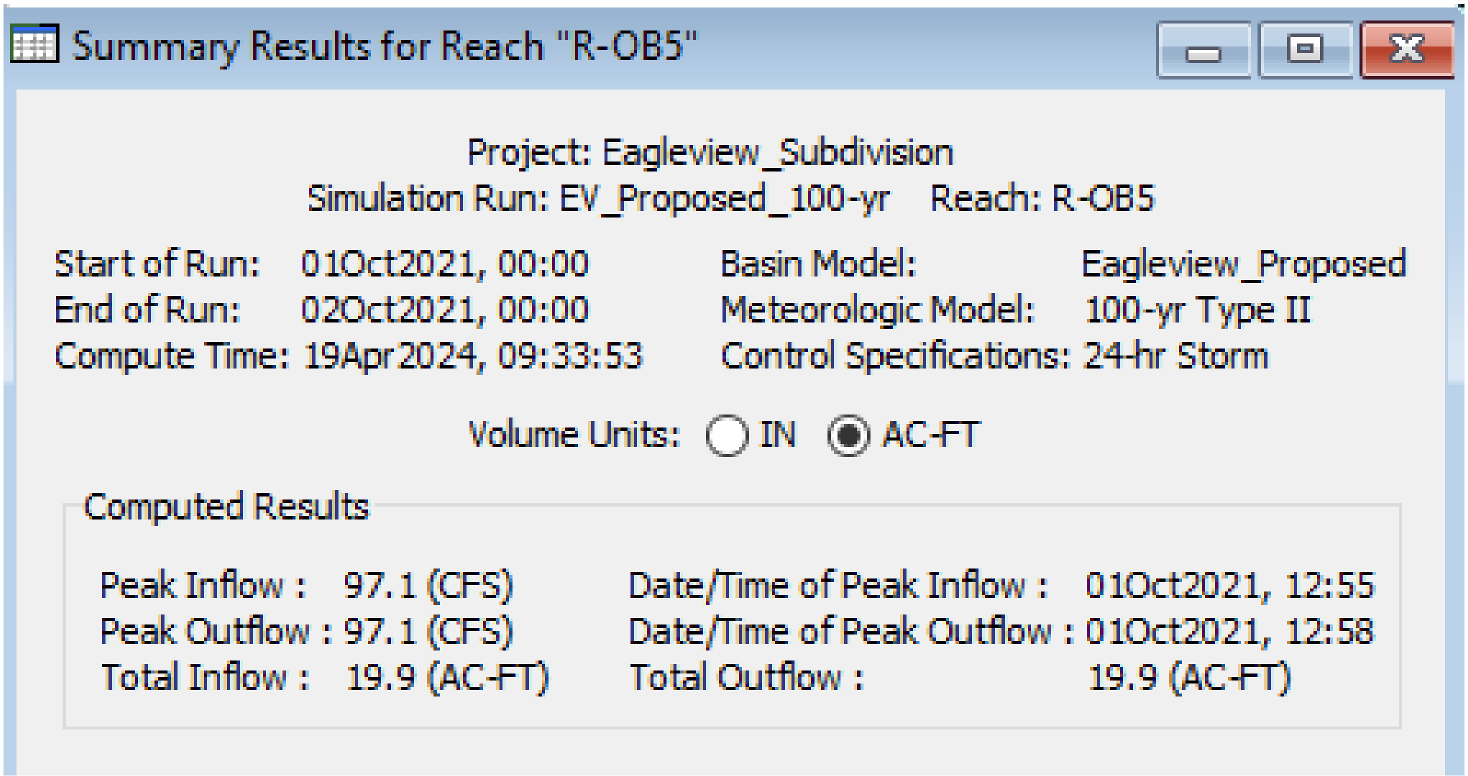
Basin Model: Eagleview_Proposed
Meteorologic Model: 100-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Inflow : 109.3 (CFS)
Peak Outflow : 97.1 (CFS)
Total Inflow : 21.1 (AC-FT)
Total Outflow : 19.9 (AC-FT)

Date/Time of Peak Inflow : 01Oct2021, 12:40
Date/Time of Peak Outflow : 01Oct2021, 12:55
Peak Storage : 2.8 (AC-FT)
Peak Elevation : 7237.2 (FT)



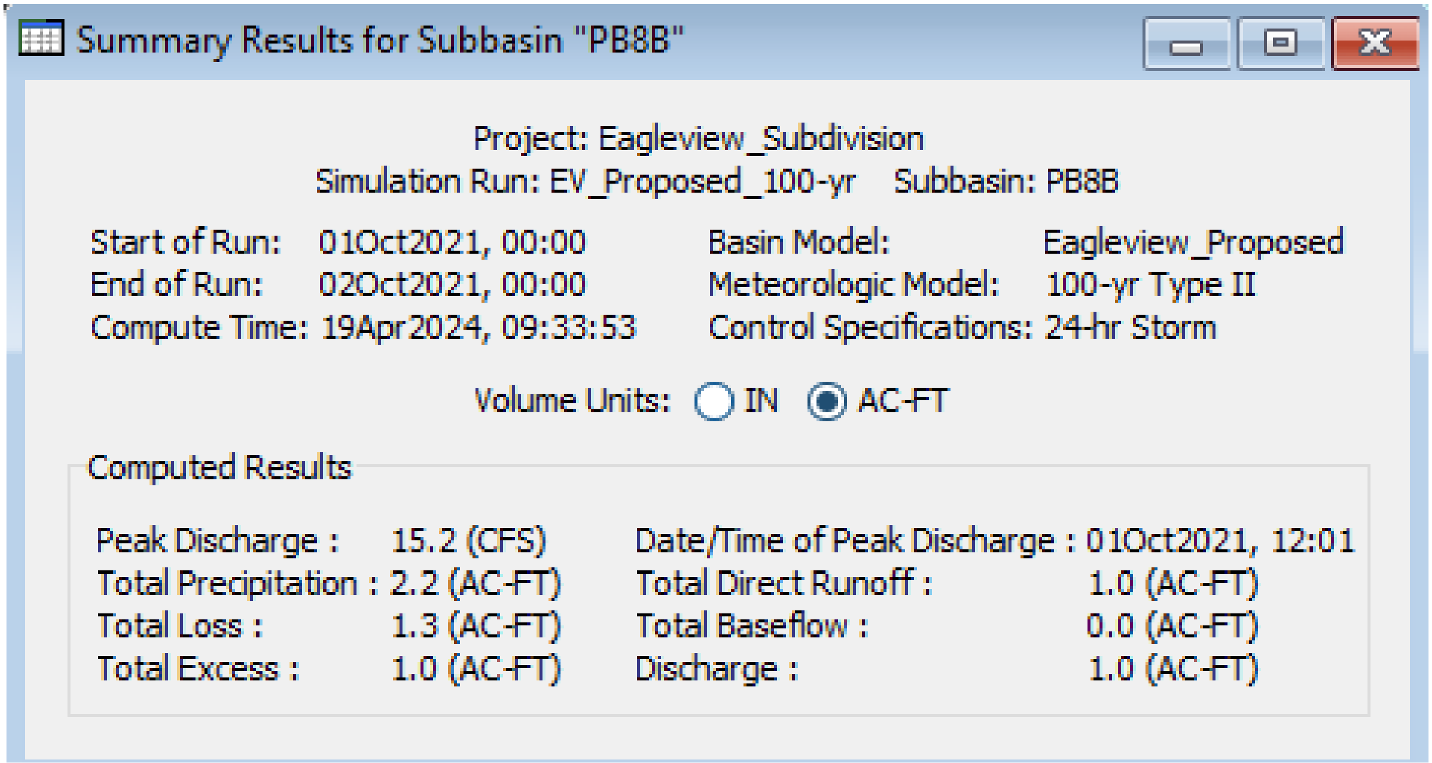
Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_100-yr   Reach: R-OB5

Start of Run: 01Oct2021, 00:00   Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00   Meteorologic Model: 100-yr Type II
Compute Time: 19Apr2024, 09:33:53   Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Inflow : 97.1 (CFS)   Date/Time of Peak Inflow : 01Oct2021, 12:55
Peak Outflow : 97.1 (CFS)   Date/Time of Peak Outflow : 01Oct2021, 12:58
Total Inflow : 19.9 (AC-FT)   Total Outflow : 19.9 (AC-FT)



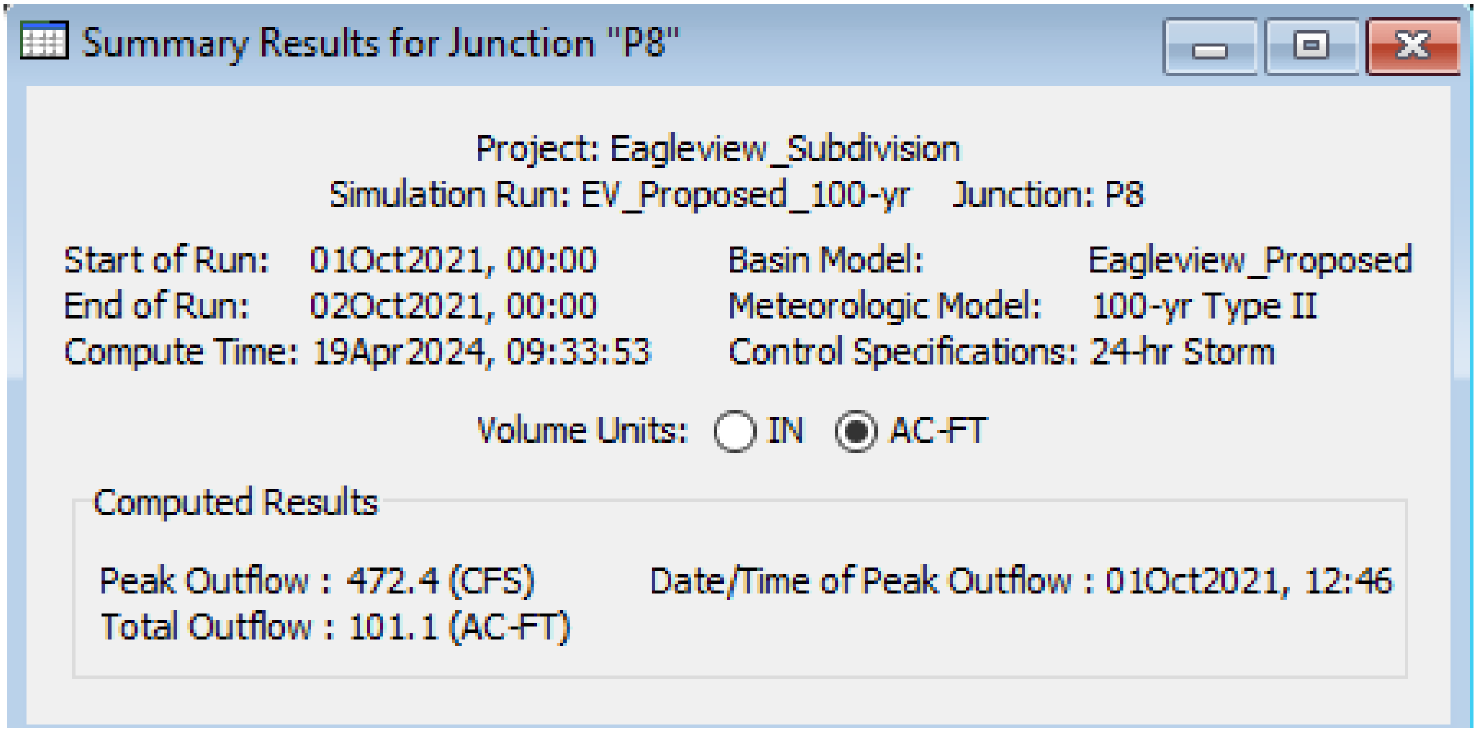
Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_100-yr Subbasin: PB8B

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Proposed
End of Run:	02Oct2021, 00:00	Meteorologic Model:	100-yr Type II
Compute Time:	19Apr2024, 09:33:53	Control Specifications:	24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Discharge :	15.2 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:01
Total Precipitation :	2.2 (AC-FT)	Total Direct Runoff :	1.0 (AC-FT)
Total Loss :	1.3 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	1.0 (AC-FT)	Discharge :	1.0 (AC-FT)



Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_100-yr Junction: P8

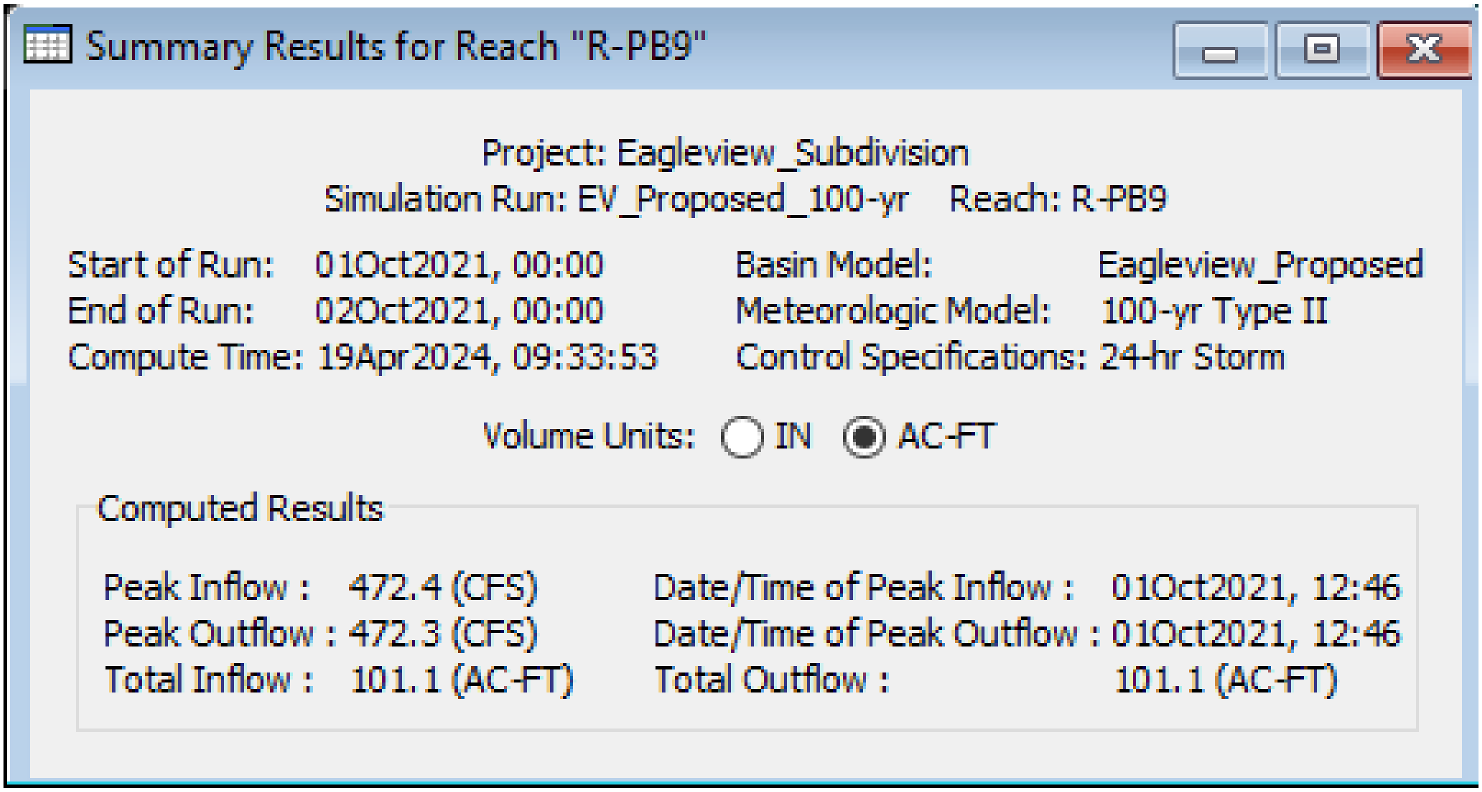
Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 09:33:53

Basin Model: Eagleview_Proposed
Meteorologic Model: 100-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Outflow : 472.4 (CFS)
Date/Time of Peak Outflow : 01Oct2021, 12:46
Total Outflow : 101.1 (AC-FT)



Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_100-yr Reach: R-PB9

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 09:33:53

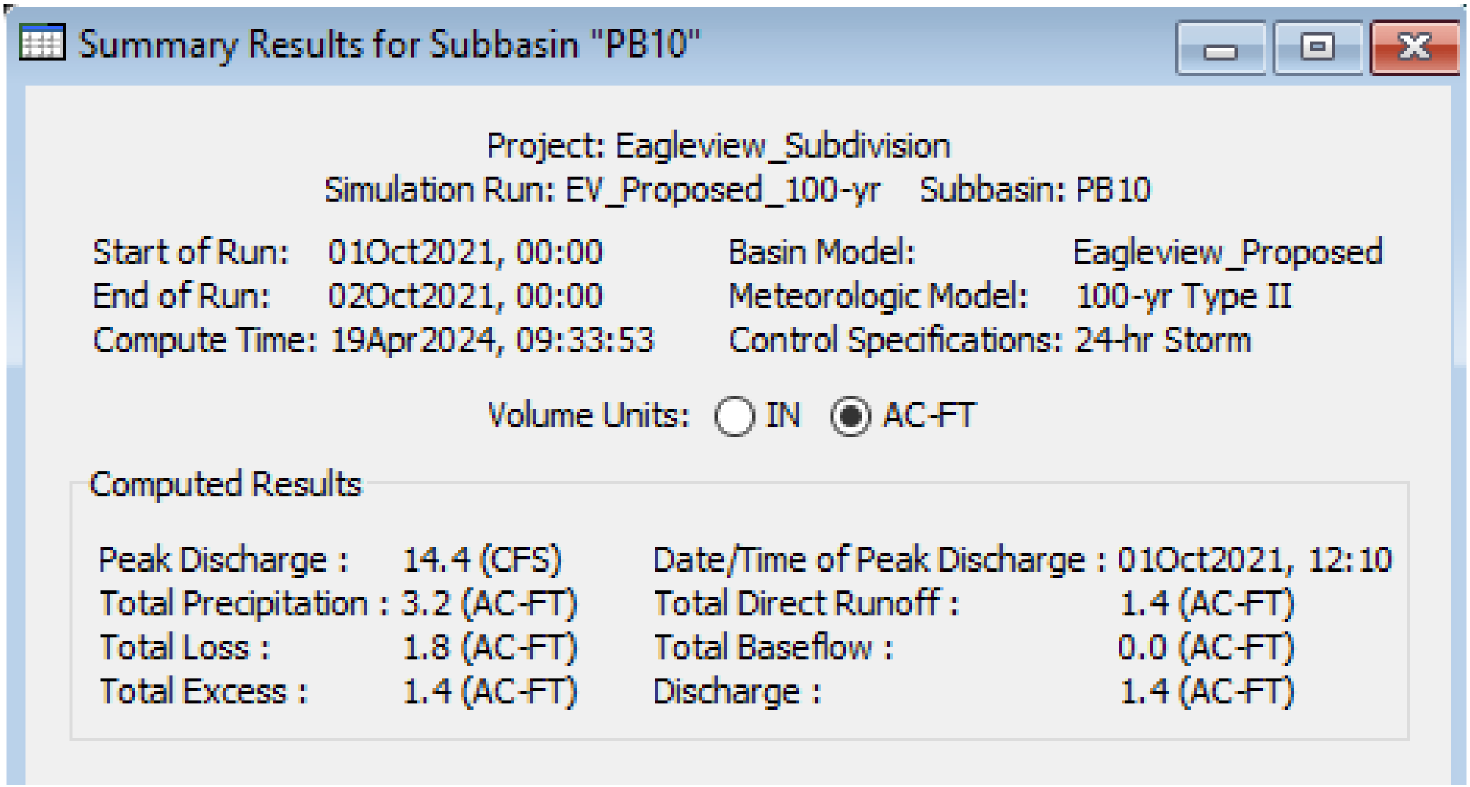
Basin Model: Eagleview_Proposed
Meteorologic Model: 100-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Inflow : 472.4 (CFS)
Peak Outflow : 472.3 (CFS)
Total Inflow : 101.1 (AC-FT)

Date/Time of Peak Inflow : 01Oct2021, 12:46
Date/Time of Peak Outflow : 01Oct2021, 12:46
Total Outflow : 101.1 (AC-FT)



Summary Results for Subbasin "PB10"

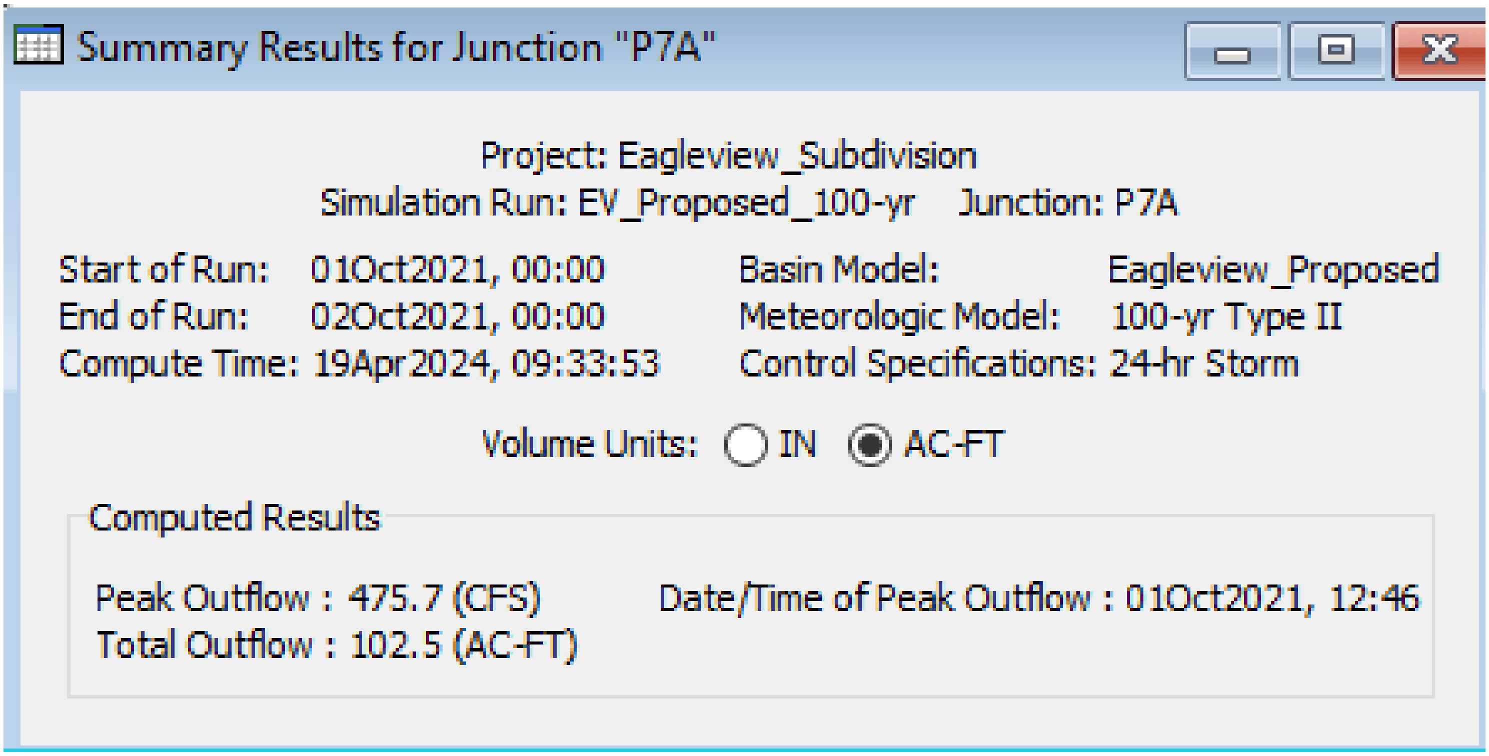
Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_100-yr   Subbasin: PB10

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 09:33:53
Basin Model: Eagleview_Proposed
Meteorologic Model: 100-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Discharge :	14.4 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:10
Total Precipitation :	3.2 (AC-FT)	Total Direct Runoff :	1.4 (AC-FT)
Total Loss :	1.8 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	1.4 (AC-FT)	Discharge :	1.4 (AC-FT)



Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_100-yr Junction: P7A

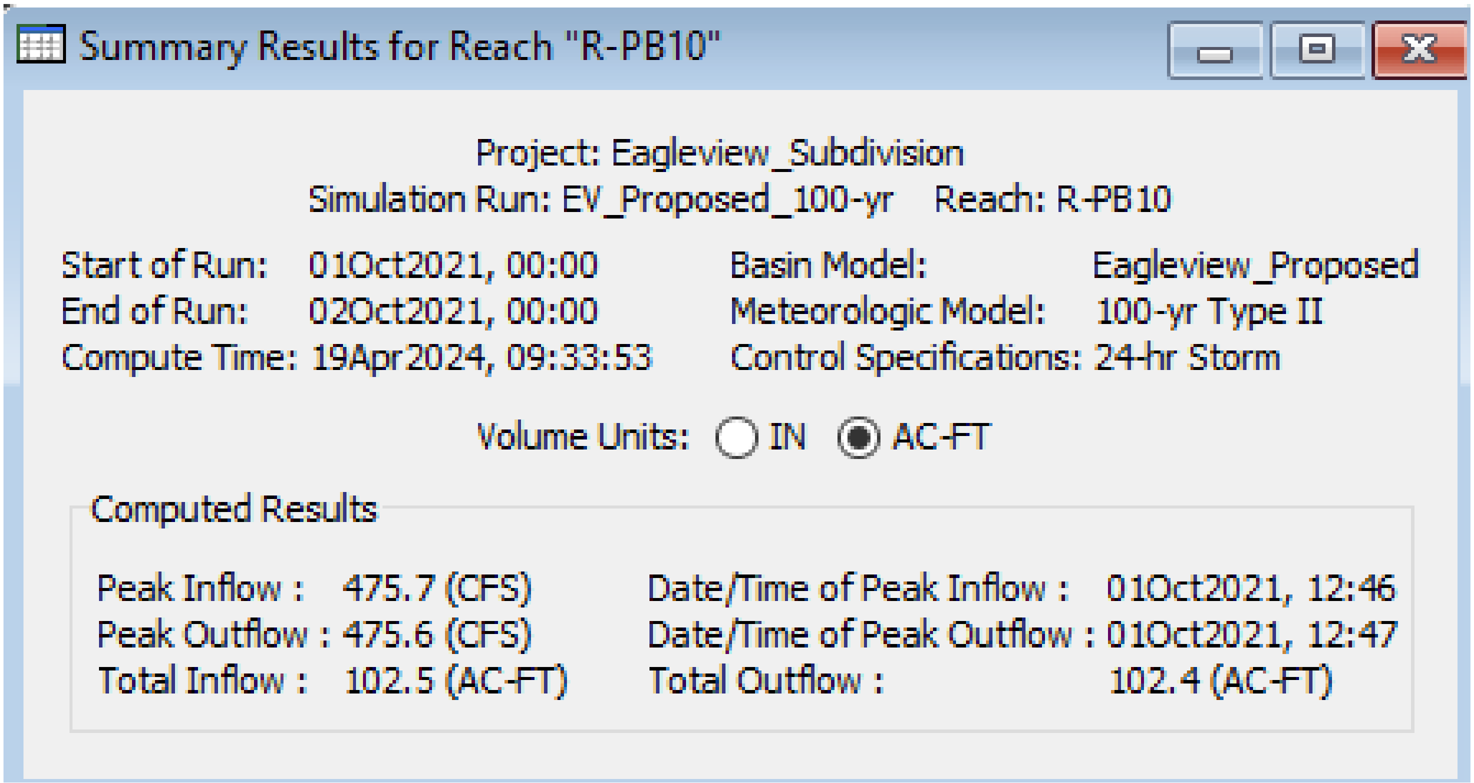
Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 09:33:53

Basin Model: Eagleview_Proposed
Meteorologic Model: 100-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Outflow : 475.7 (CFS)
Total Outflow : 102.5 (AC-FT)
Date/Time of Peak Outflow : 01Oct2021, 12:46



Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_100-yr Reach: R-PB10

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 09:33:53

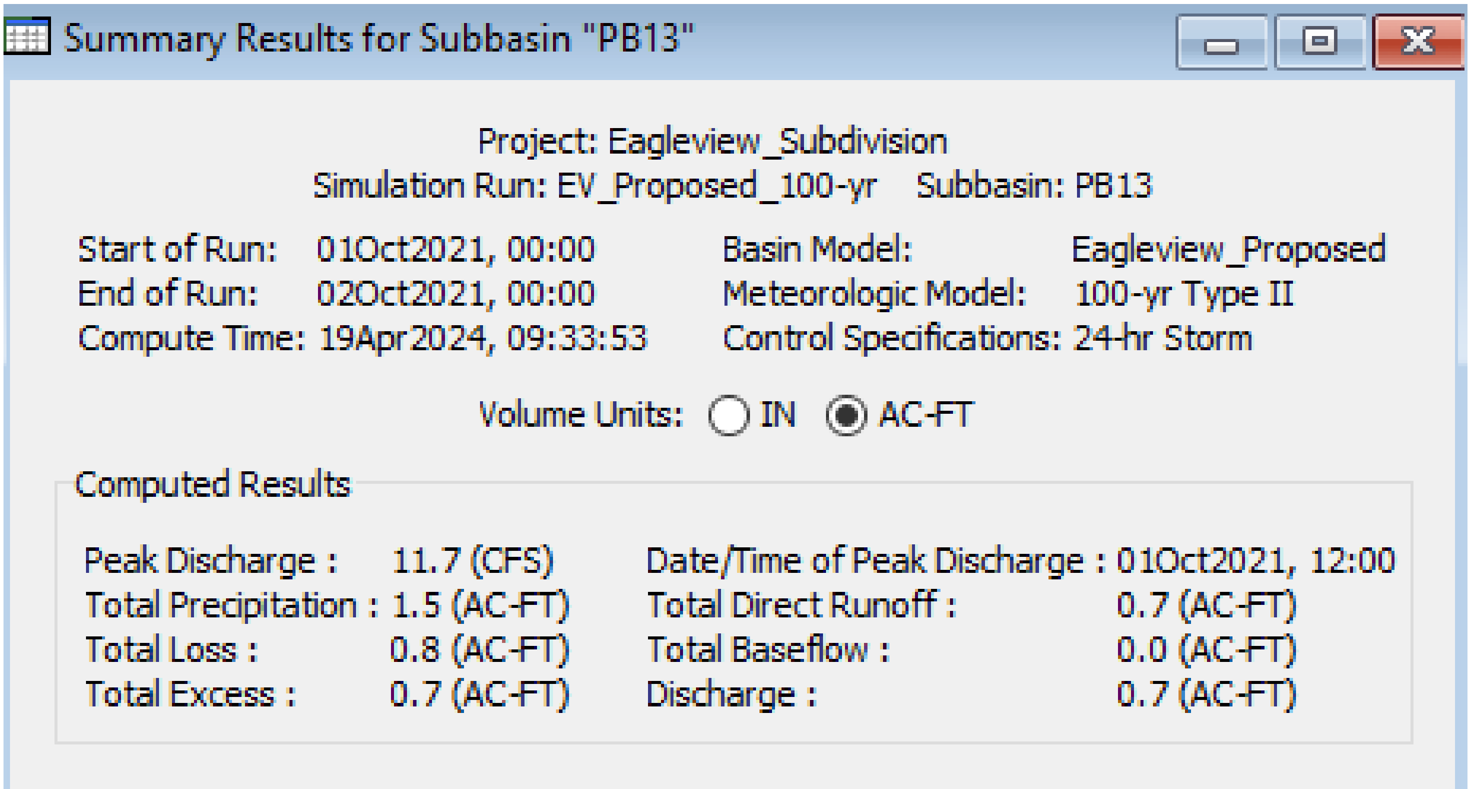
Basin Model: Eagleview_Proposed
Meteorologic Model: 100-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Inflow : 475.7 (CFS)
Peak Outflow : 475.6 (CFS)
Total Inflow : 102.5 (AC-FT)

Date/Time of Peak Inflow : 01Oct2021, 12:46
Date/Time of Peak Outflow : 01Oct2021, 12:47
Total Outflow : 102.4 (AC-FT)



Summary Results for Subbasin "PB13"

Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_100-yr Subbasin: PB13

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 09:33:53

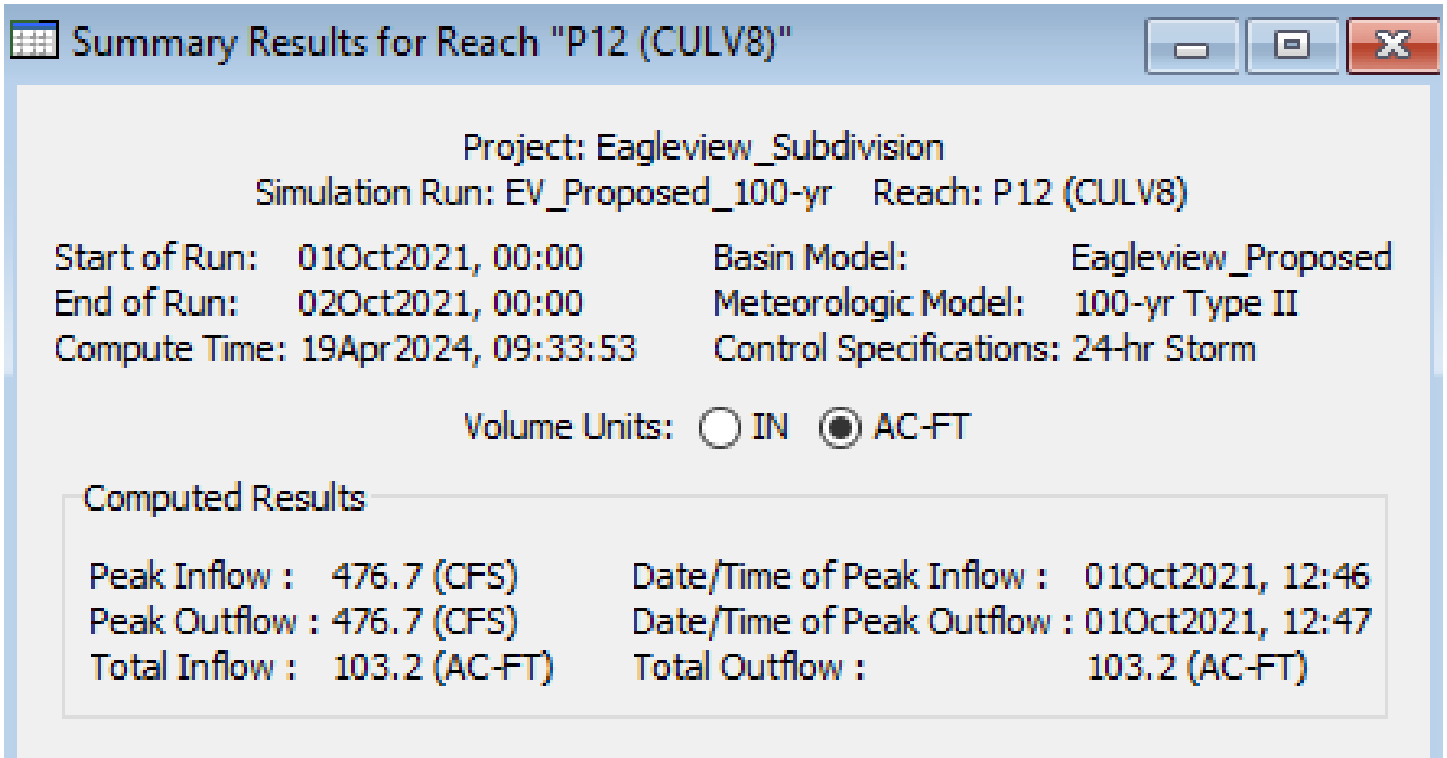
Basin Model: Eagleview_Proposed
Meteorologic Model: 100-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Discharge : 11.7 (CFS)
Total Precipitation : 1.5 (AC-FT)
Total Loss : 0.8 (AC-FT)
Total Excess : 0.7 (AC-FT)

Date/Time of Peak Discharge : 01Oct2021, 12:00
Total Direct Runoff : 0.7 (AC-FT)
Total Baseflow : 0.0 (AC-FT)
Discharge : 0.7 (AC-FT)



Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_100-yr Reach: P12 (CULV8)

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 09:33:53

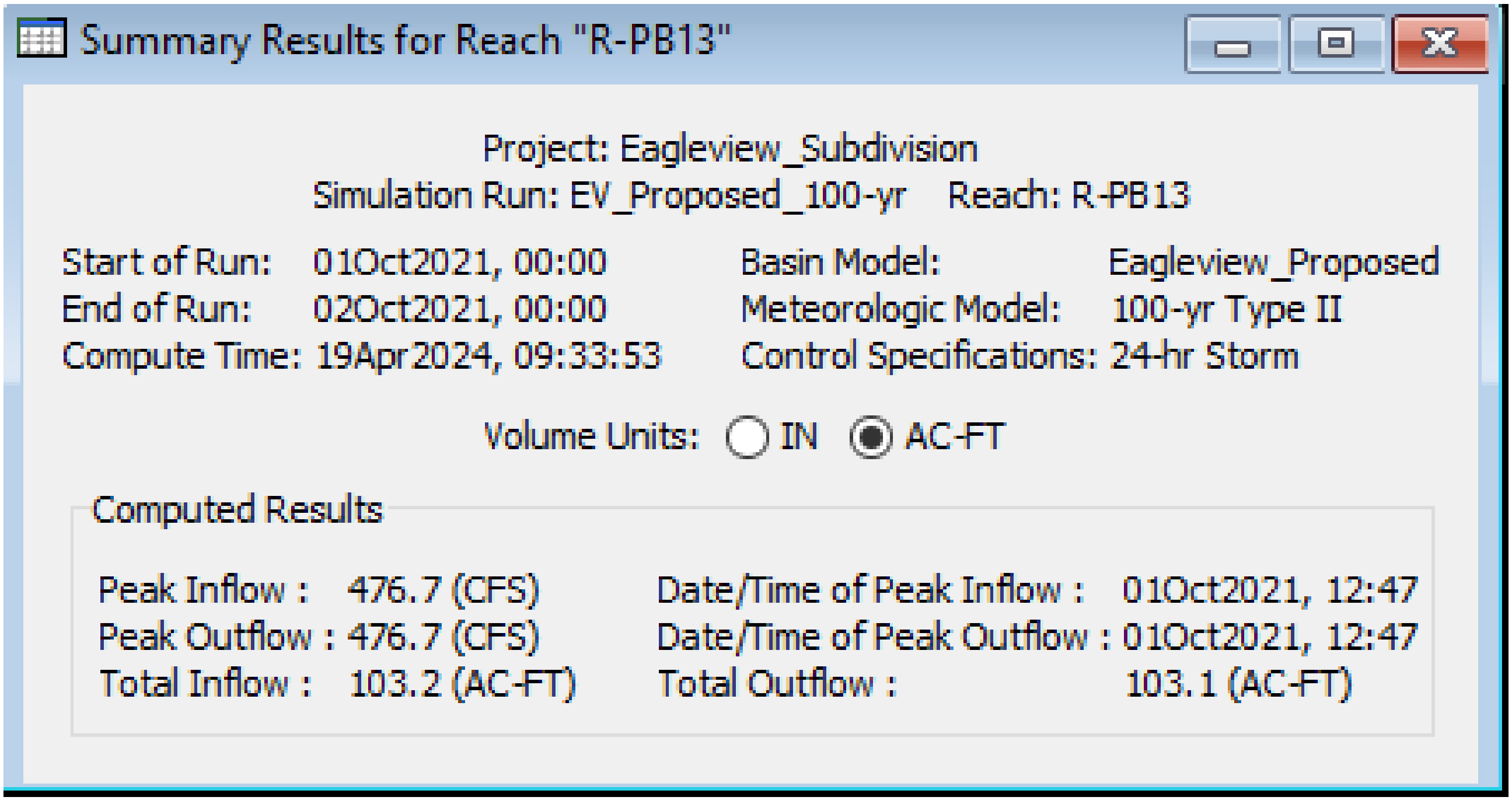
Basin Model: Eagleview_Proposed
Meteorologic Model: 100-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Inflow : 476.7 (CFS)
Peak Outflow : 476.7 (CFS)
Total Inflow : 103.2 (AC-FT)

Date/Time of Peak Inflow : 01Oct2021, 12:46
Date/Time of Peak Outflow : 01Oct2021, 12:47
Total Outflow : 103.2 (AC-FT)


Summary Results for Reach "R-PB13"

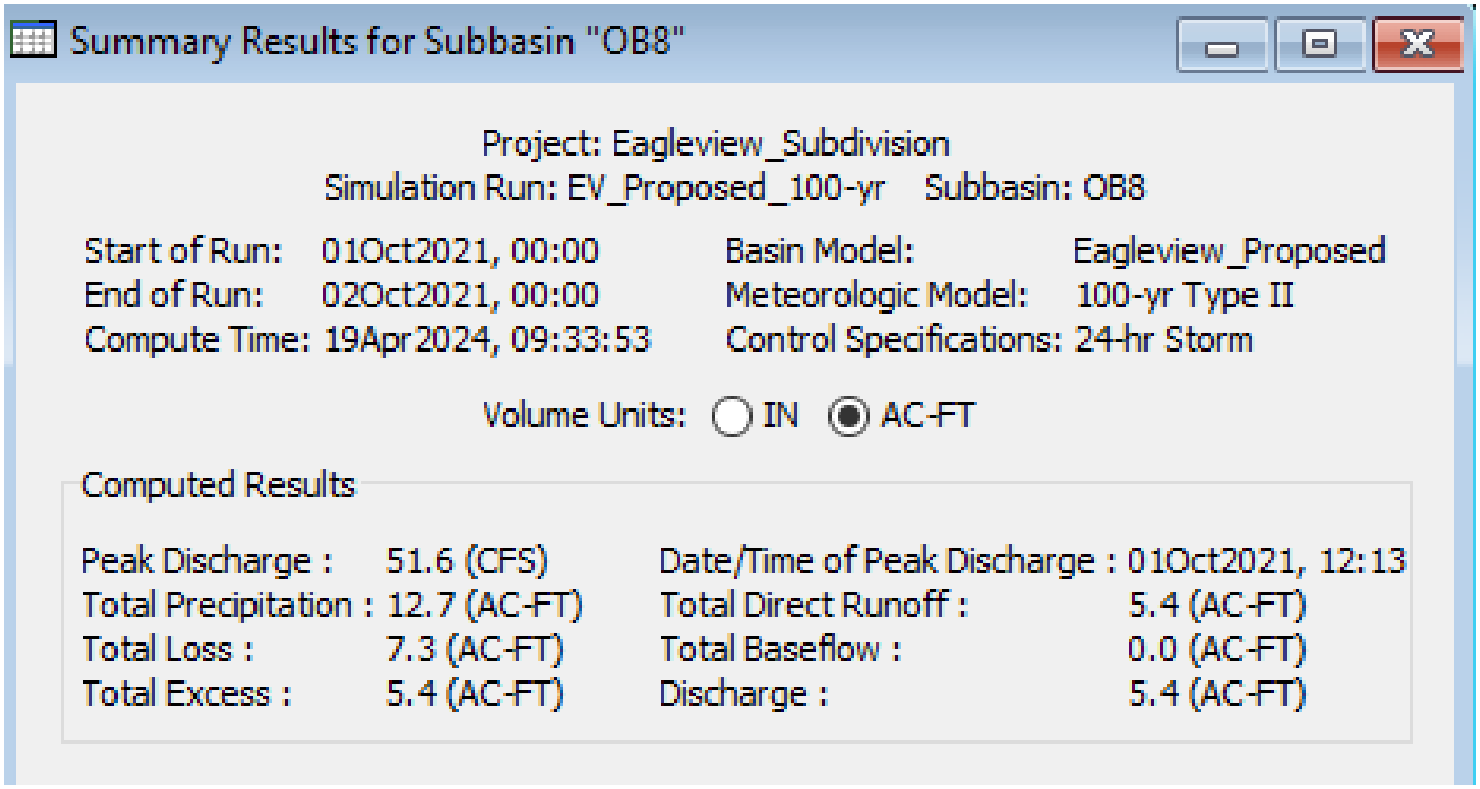
Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_100-yr   Reach: R-PB13

Start of Run: 01Oct2021, 00:00   Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00   Meteorologic Model: 100-yr Type II
Compute Time: 19Apr2024, 09:33:53   Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Inflow : 476.7 (CFS)   Date/Time of Peak Inflow : 01Oct2021, 12:47
Peak Outflow : 476.7 (CFS)   Date/Time of Peak Outflow : 01Oct2021, 12:47
Total Inflow : 103.2 (AC-FT)   Total Outflow : 103.1 (AC-FT)



Summary Results for Subbasin "OB8"

Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_100-yr Subbasin: OB8

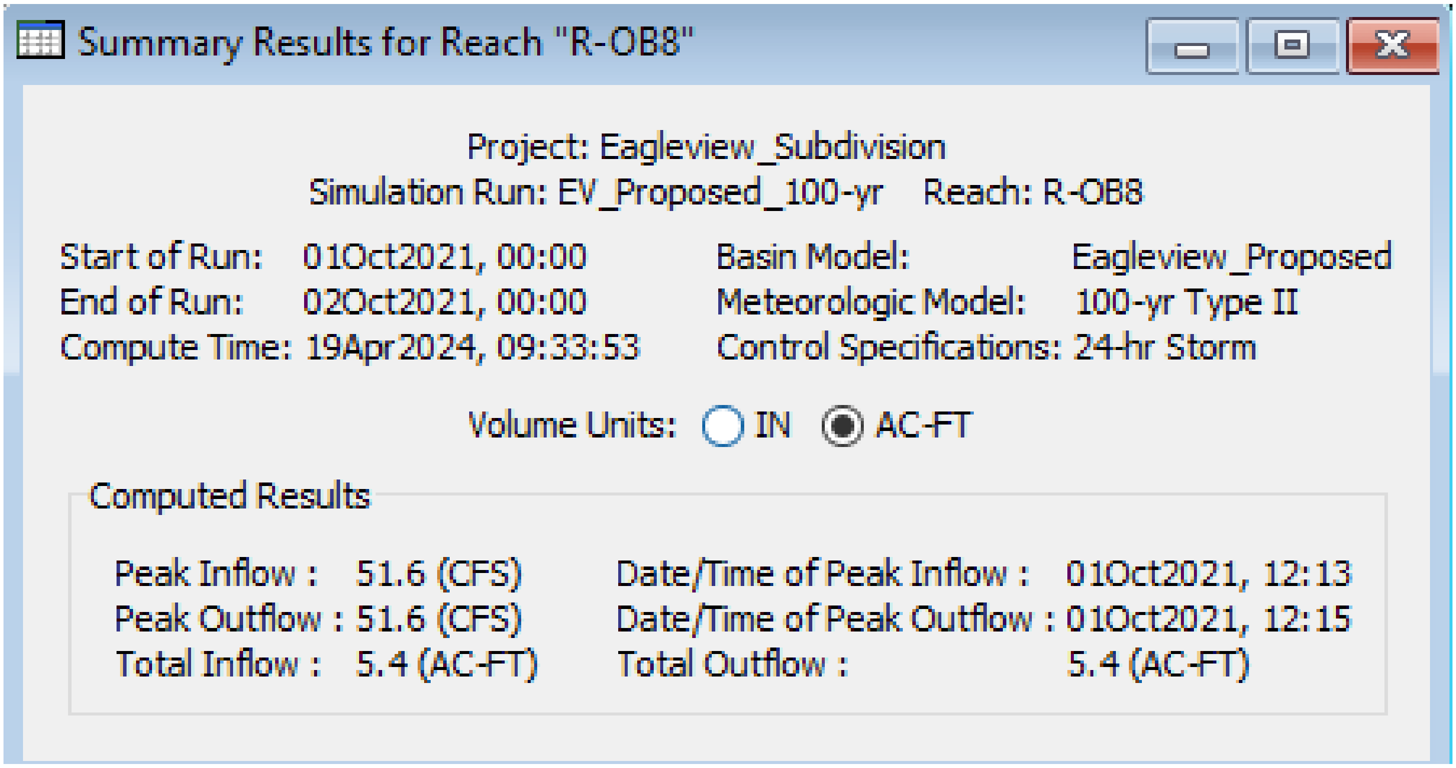
Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 09:33:53

Basin Model: Eagleview_Proposed
Meteorologic Model: 100-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Discharge :	51.6 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:13
Total Precipitation :	12.7 (AC-FT)	Total Direct Runoff :	5.4 (AC-FT)
Total Loss :	7.3 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	5.4 (AC-FT)	Discharge :	5.4 (AC-FT)



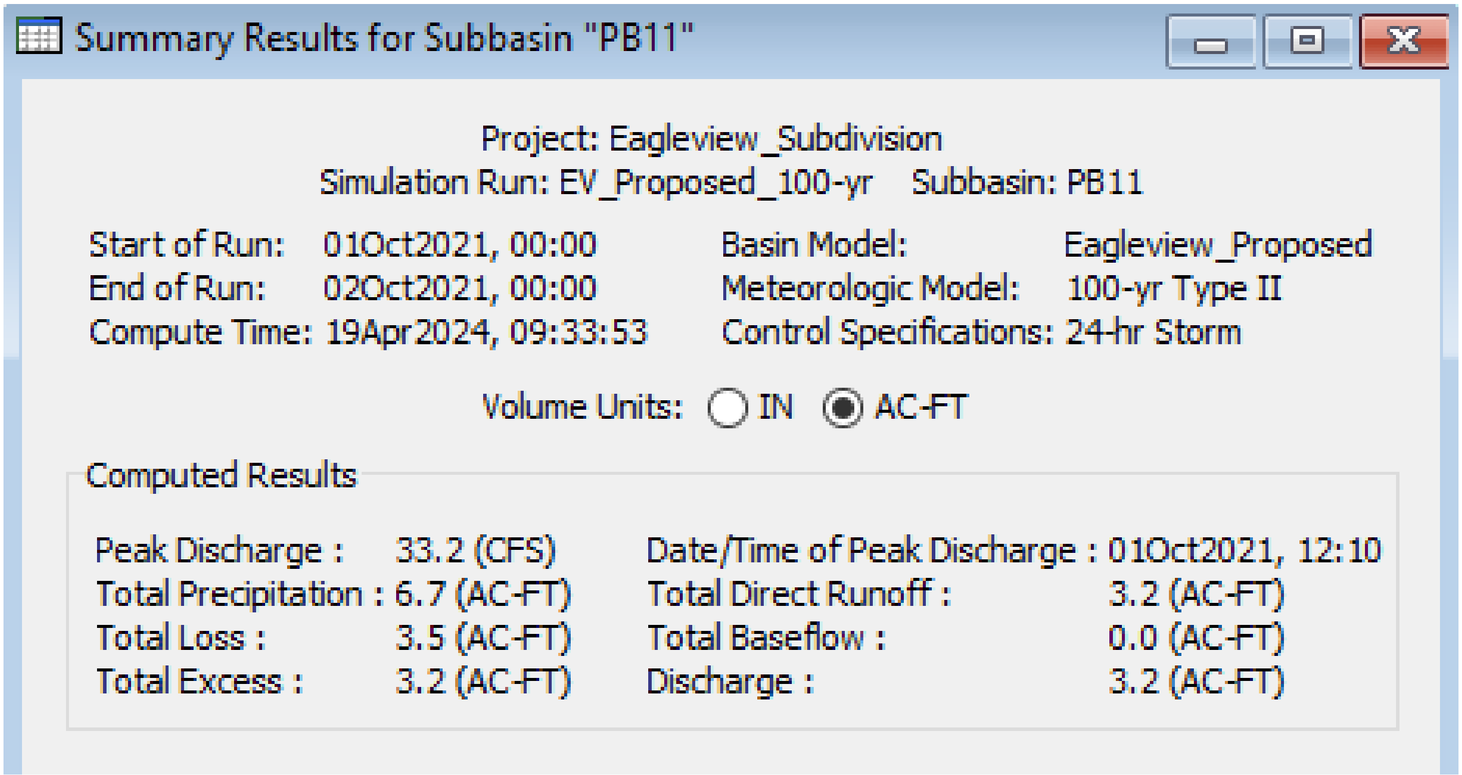
Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_100-yr   Reach: R-OB8

Start of Run: 01Oct2021, 00:00   Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00   Meteorologic Model: 100-yr Type II
Compute Time: 19Apr2024, 09:33:53   Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Inflow : 51.6 (CFS)   Date/Time of Peak Inflow : 01Oct2021, 12:13
Peak Outflow : 51.6 (CFS)   Date/Time of Peak Outflow : 01Oct2021, 12:15
Total Inflow : 5.4 (AC-FT)   Total Outflow : 5.4 (AC-FT)



Summary Results for Subbasin "PB11"

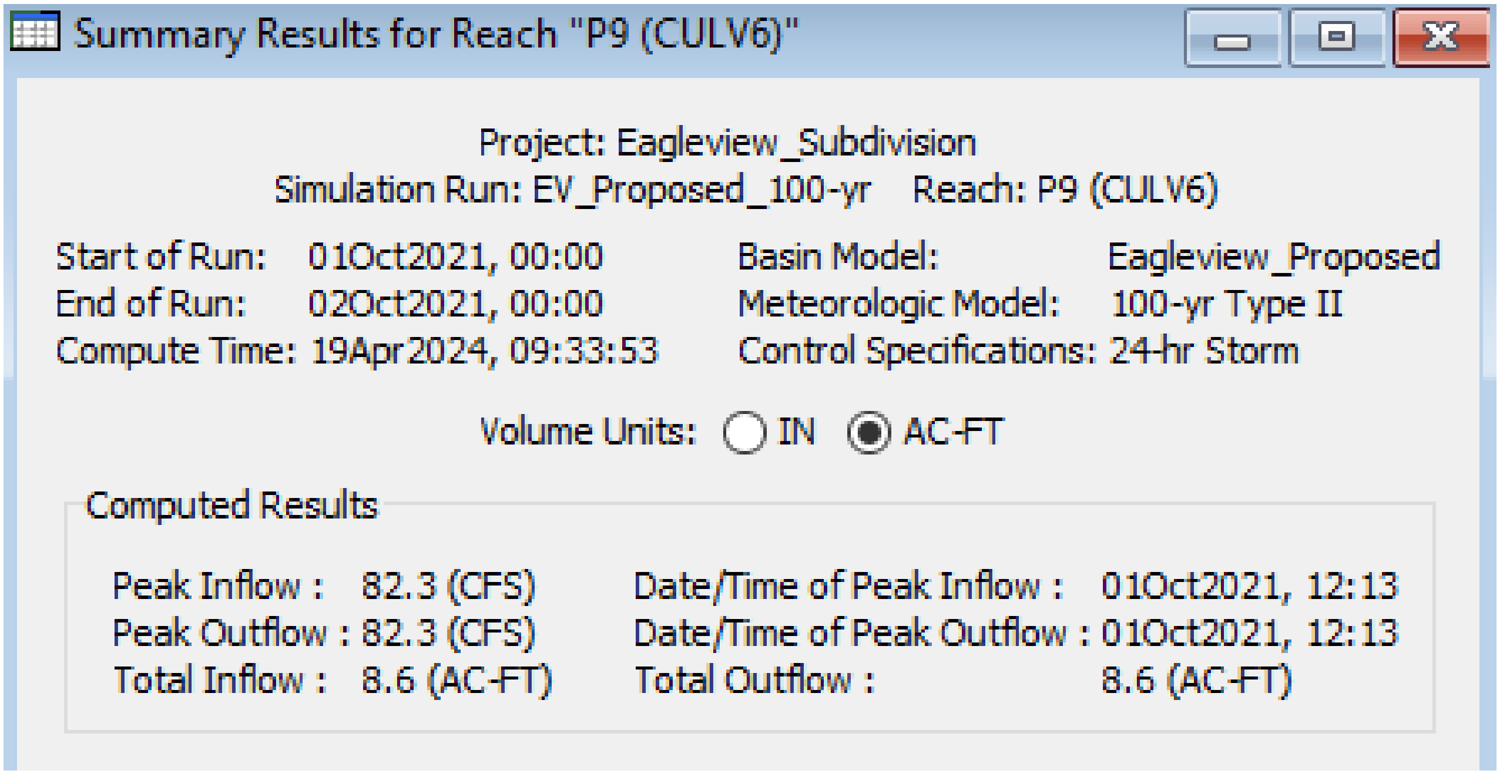
Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_100-yr   Subbasin: PB11

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Proposed
End of Run:	02Oct2021, 00:00	Meteorologic Model:	100-yr Type II
Compute Time:	19Apr2024, 09:33:53	Control Specifications:	24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Discharge :	33.2 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:10
Total Precipitation :	6.7 (AC-FT)	Total Direct Runoff :	3.2 (AC-FT)
Total Loss :	3.5 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	3.2 (AC-FT)	Discharge :	3.2 (AC-FT)



Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_100-yr   Reach: P9 (CULV6)

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 09:33:53

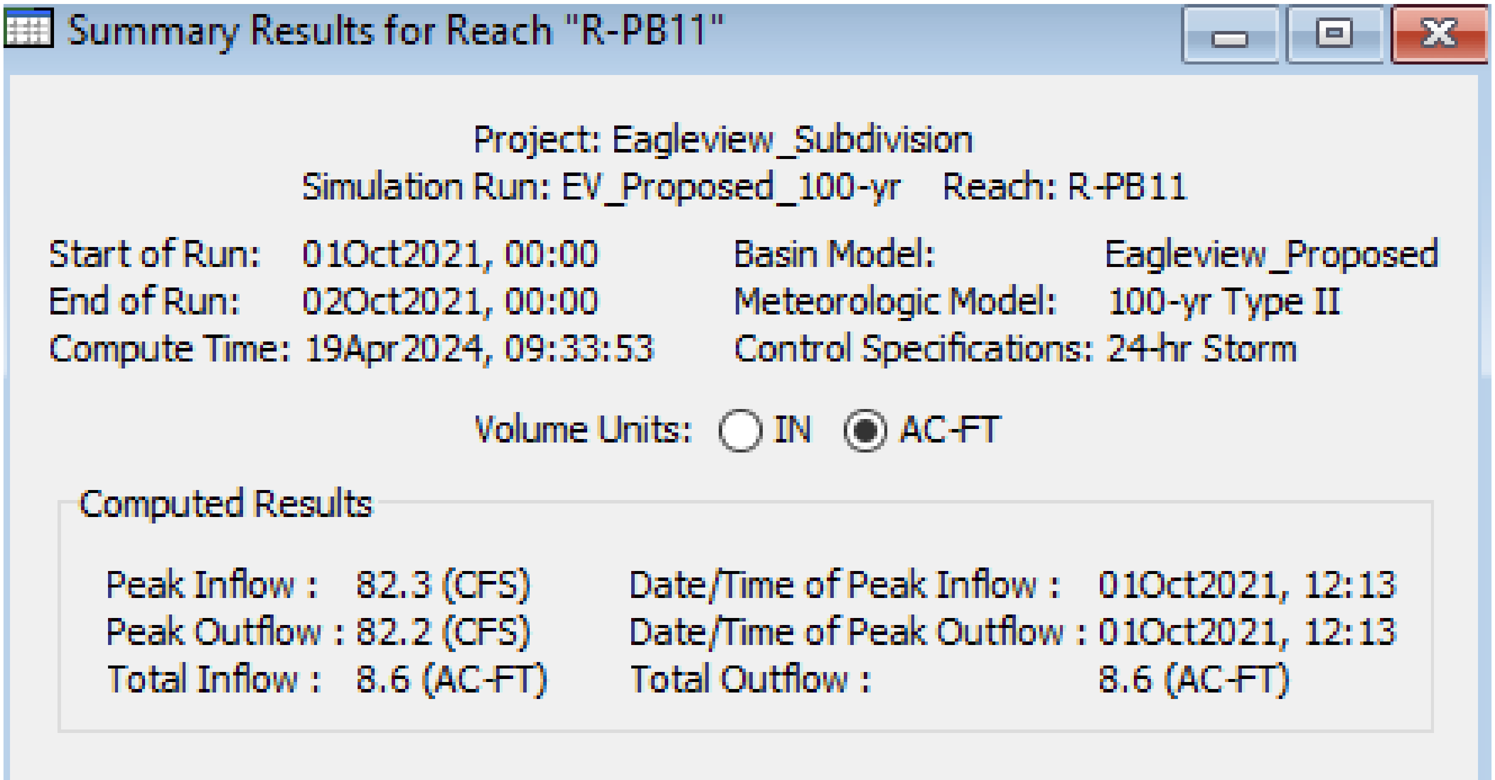
Basin Model: Eagleview_Proposed
Meteorologic Model: 100-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Inflow : 82.3 (CFS)
Peak Outflow : 82.3 (CFS)
Total Inflow : 8.6 (AC-FT)

Date/Time of Peak Inflow : 01Oct2021, 12:13
Date/Time of Peak Outflow : 01Oct2021, 12:13
Total Outflow : 8.6 (AC-FT)


Summary Results for Reach "R-PB11"

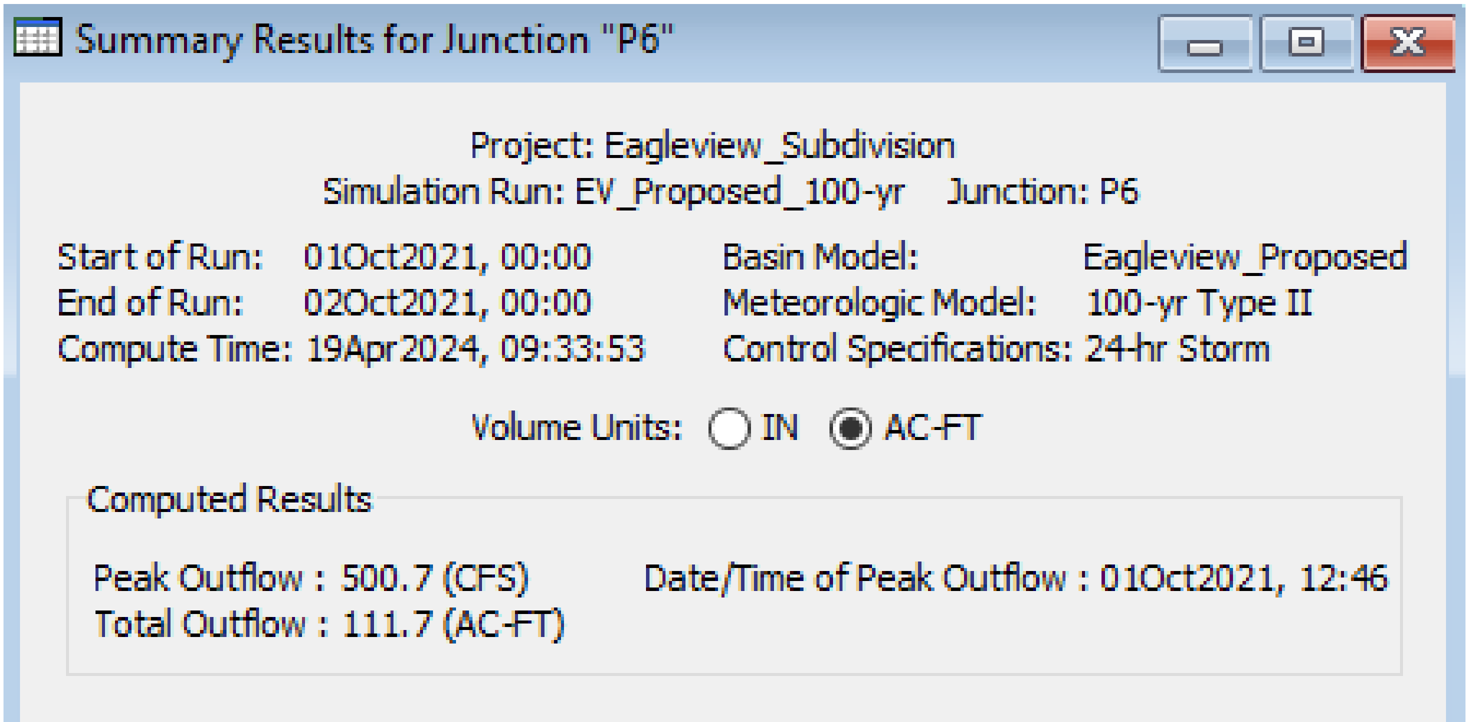
Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_100-yr   Reach: R-PB11

Start of Run: 01Oct2021, 00:00   Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00   Meteorologic Model: 100-yr Type II
Compute Time: 19Apr2024, 09:33:53   Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Inflow : 82.3 (CFS)   Date/Time of Peak Inflow : 01Oct2021, 12:13
Peak Outflow : 82.2 (CFS)   Date/Time of Peak Outflow : 01Oct2021, 12:13
Total Inflow : 8.6 (AC-FT)   Total Outflow : 8.6 (AC-FT)



Summary Results for Junction "P6"

Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_100-yr Junction: P6

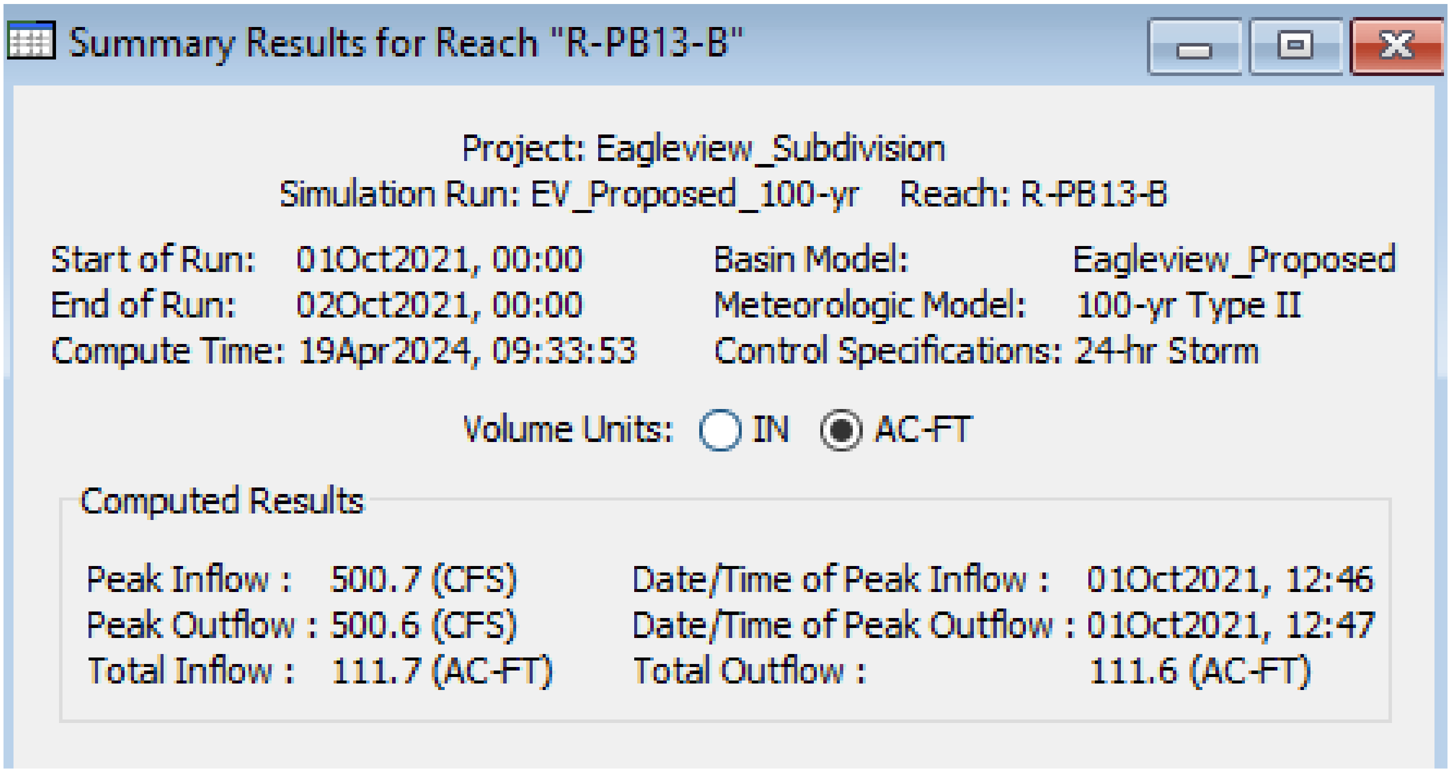
Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 09:33:53

Basin Model: Eagleview_Proposed
Meteorologic Model: 100-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Outflow : 500.7 (CFS)
Date/Time of Peak Outflow : 01Oct2021, 12:46
Total Outflow : 111.7 (AC-FT)


Summary Results for Reach "R-PB13-B"

Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_100-yr Reach: R-PB13-B

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 09:33:53

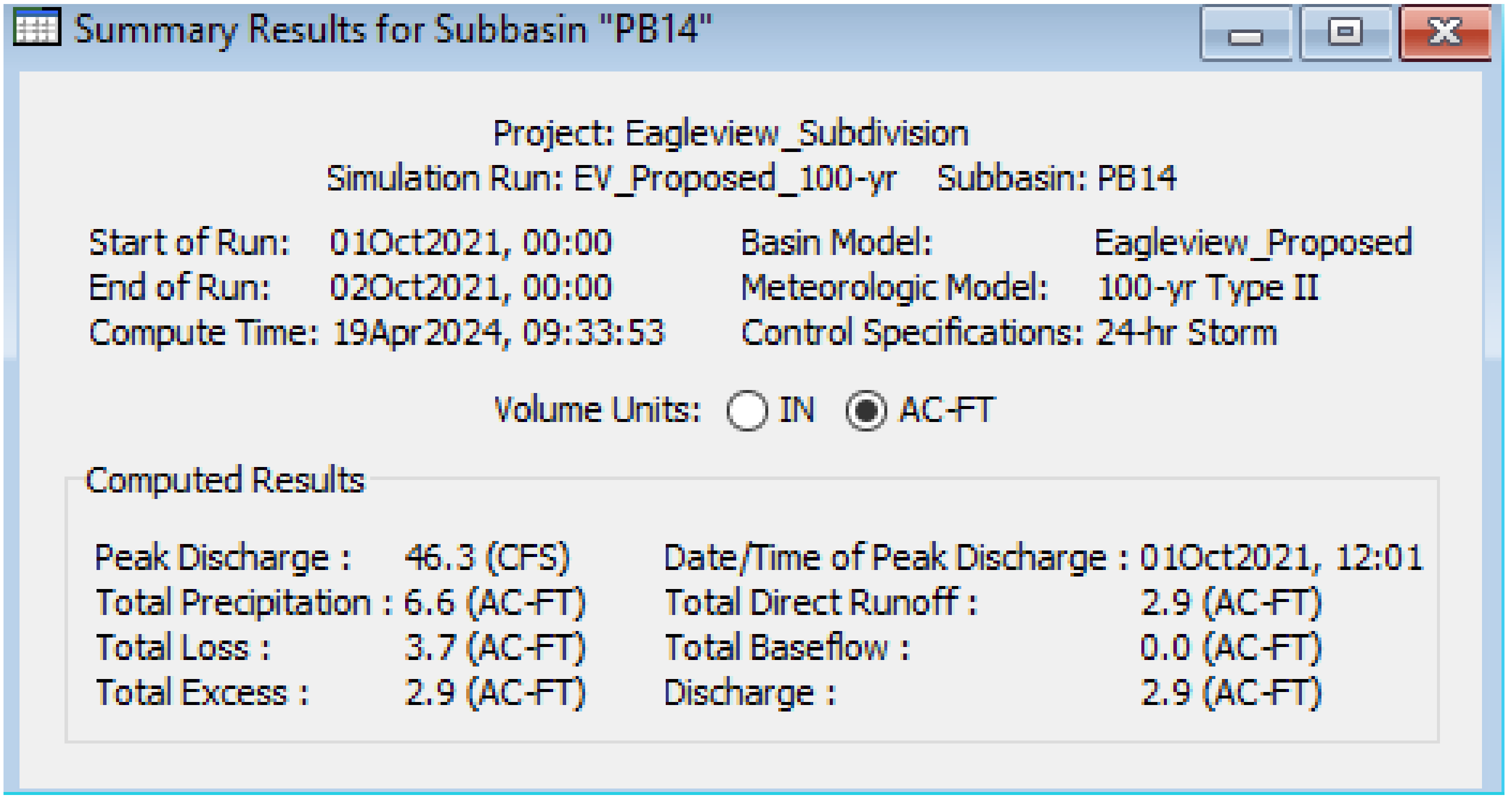
Basin Model: Eagleview_Proposed
Meteorologic Model: 100-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Inflow : 500.7 (CFS)
Peak Outflow : 500.6 (CFS)
Total Inflow : 111.7 (AC-FT)

Date/Time of Peak Inflow : 01Oct2021, 12:46
Date/Time of Peak Outflow : 01Oct2021, 12:47
Total Outflow : 111.6 (AC-FT)



Summary Results for Subbasin "PB14"

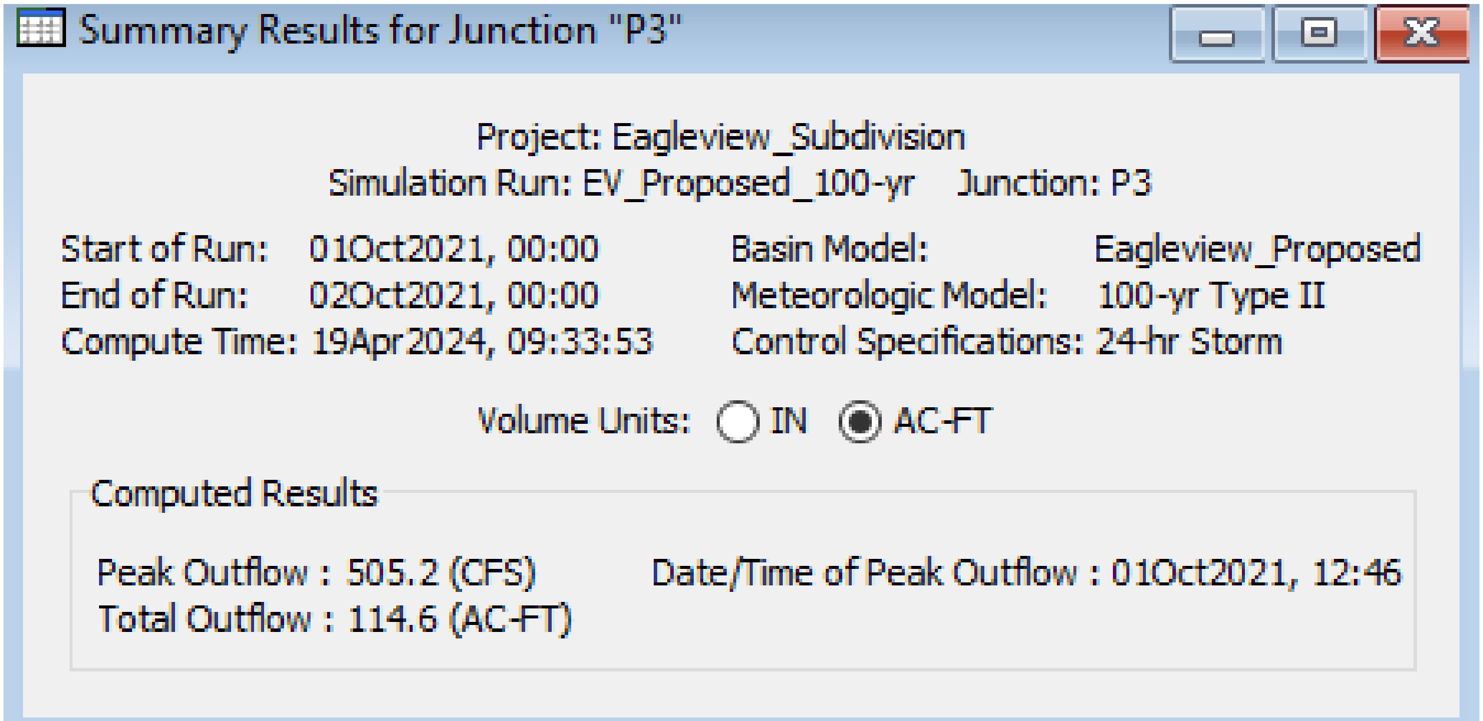
Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_100-yr   Subbasin: PB14

Start of Run: 01Oct2021, 00:00   Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00   Meteorologic Model: 100-yr Type II
Compute Time: 19Apr2024, 09:33:53   Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Discharge : 46.3 (CFS)   Date/Time of Peak Discharge : 01Oct2021, 12:01
Total Precipitation : 6.6 (AC-FT)   Total Direct Runoff : 2.9 (AC-FT)
Total Loss : 3.7 (AC-FT)   Total Baseflow : 0.0 (AC-FT)
Total Excess : 2.9 (AC-FT)   Discharge : 2.9 (AC-FT)



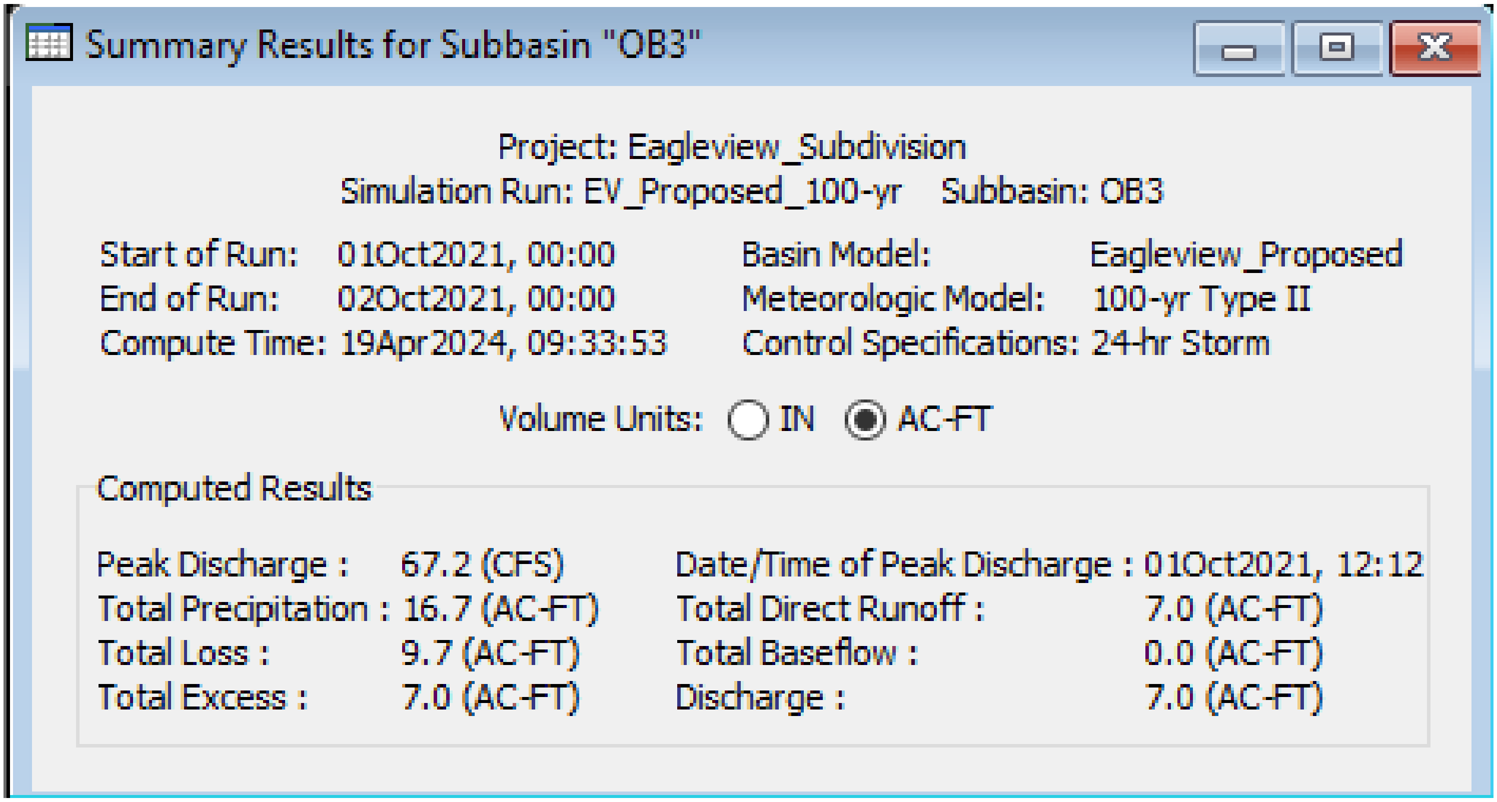
Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_100-yr Junction: P3

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Proposed
End of Run:	02Oct2021, 00:00	Meteorologic Model:	100-yr Type II
Compute Time:	19Apr2024, 09:33:53	Control Specifications:	24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Outflow : 505.2 (CFS)
Date/Time of Peak Outflow : 01Oct2021, 12:46
Total Outflow : 114.6 (AC-FT)


Summary Results for Subbasin "OB3"

Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_100-yr Subbasin: OB3

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 09:33:53

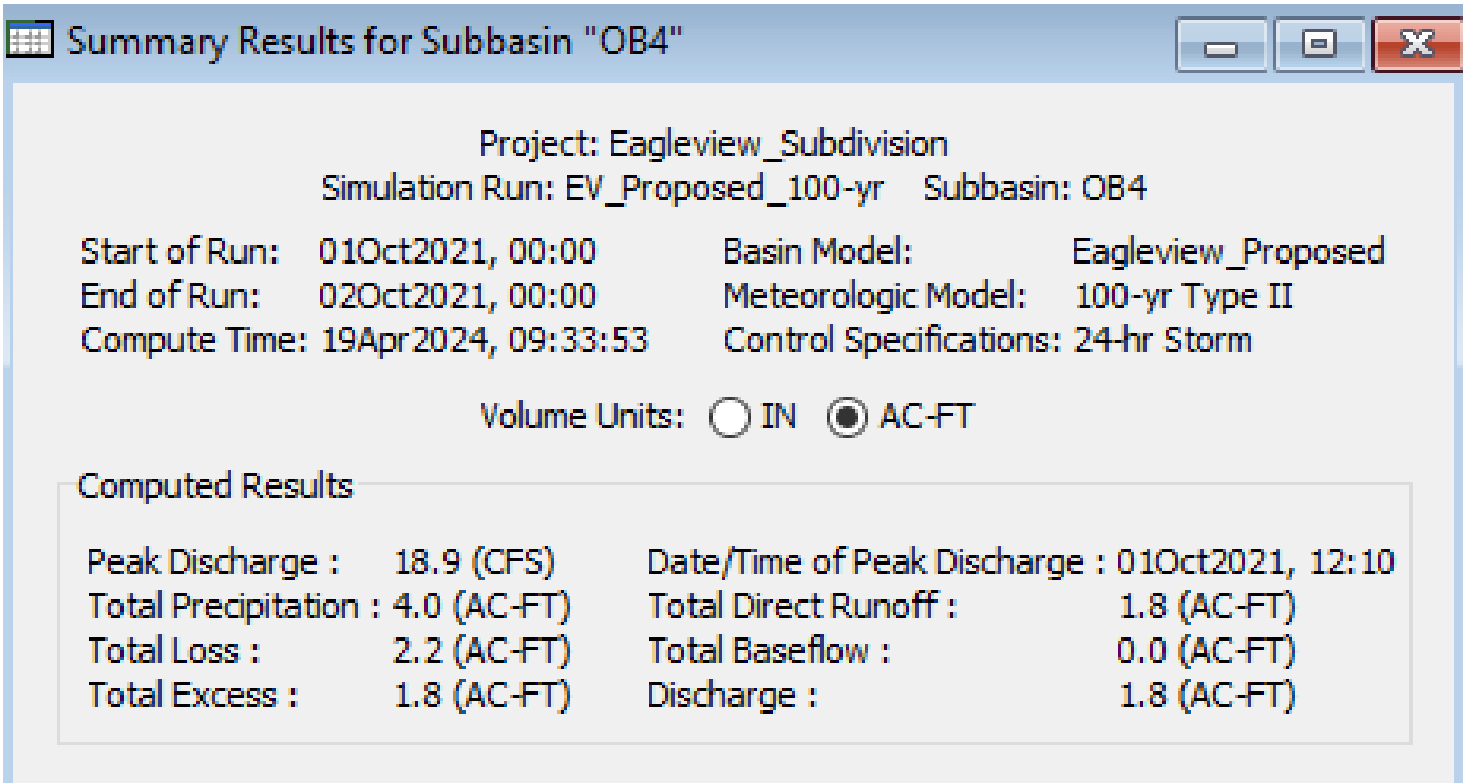
Basin Model: Eagleview_Proposed
Meteorologic Model: 100-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Discharge : 67.2 (CFS)
Total Precipitation : 16.7 (AC-FT)
Total Loss : 9.7 (AC-FT)
Total Excess : 7.0 (AC-FT)

Date/Time of Peak Discharge : 01Oct2021, 12:12
Total Direct Runoff : 7.0 (AC-FT)
Total Baseflow : 0.0 (AC-FT)
Discharge : 7.0 (AC-FT)



Summary Results for Subbasin "OB4"

Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_100-yr Subbasin: OB4

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 09:33:53

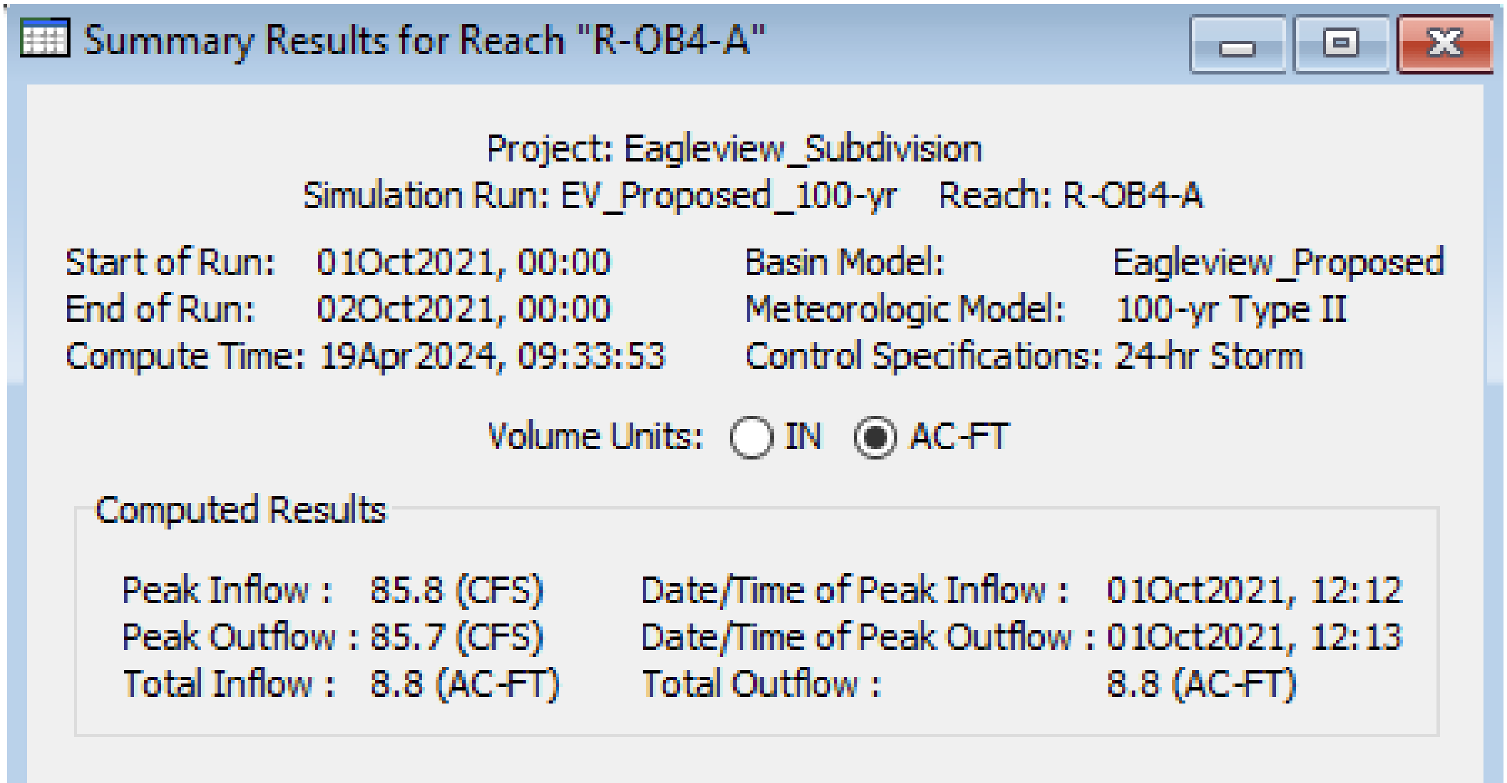
Basin Model: Eagleview_Proposed
Meteorologic Model: 100-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Discharge : 18.9 (CFS)
Total Precipitation : 4.0 (AC-FT)
Total Loss : 2.2 (AC-FT)
Total Excess : 1.8 (AC-FT)

Date/Time of Peak Discharge : 01Oct2021, 12:10
Total Direct Runoff : 1.8 (AC-FT)
Total Baseflow : 0.0 (AC-FT)
Discharge : 1.8 (AC-FT)


Summary Results for Reach "R-OB4-A"

Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_100-yr Reach: R-OB4-A

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 09:33:53

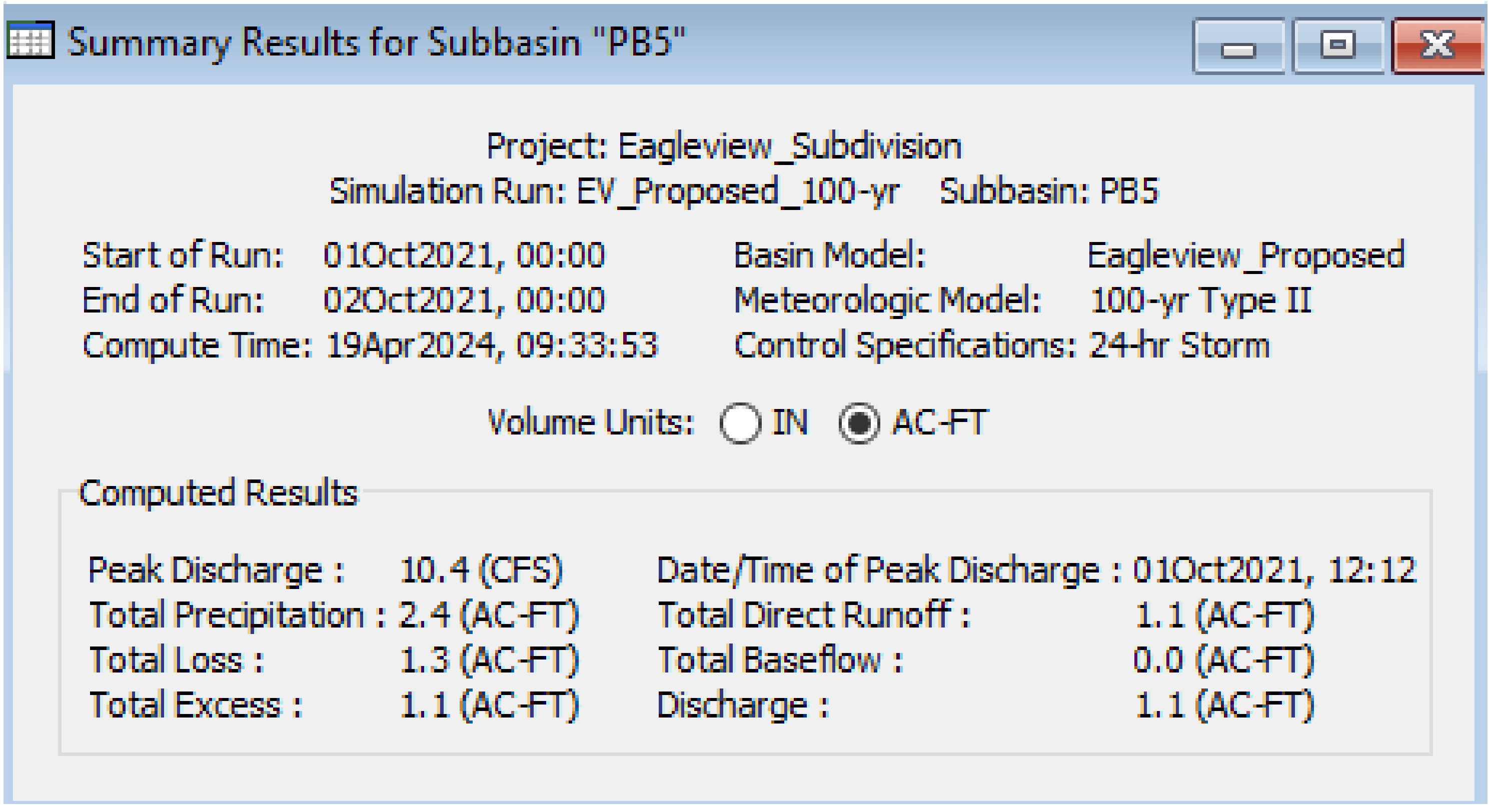
Basin Model: Eagleview_Proposed
Meteorologic Model: 100-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Inflow : 85.8 (CFS)
Peak Outflow : 85.7 (CFS)
Total Inflow : 8.8 (AC-FT)

Date/Time of Peak Inflow : 01Oct2021, 12:12
Date/Time of Peak Outflow : 01Oct2021, 12:13
Total Outflow : 8.8 (AC-FT)



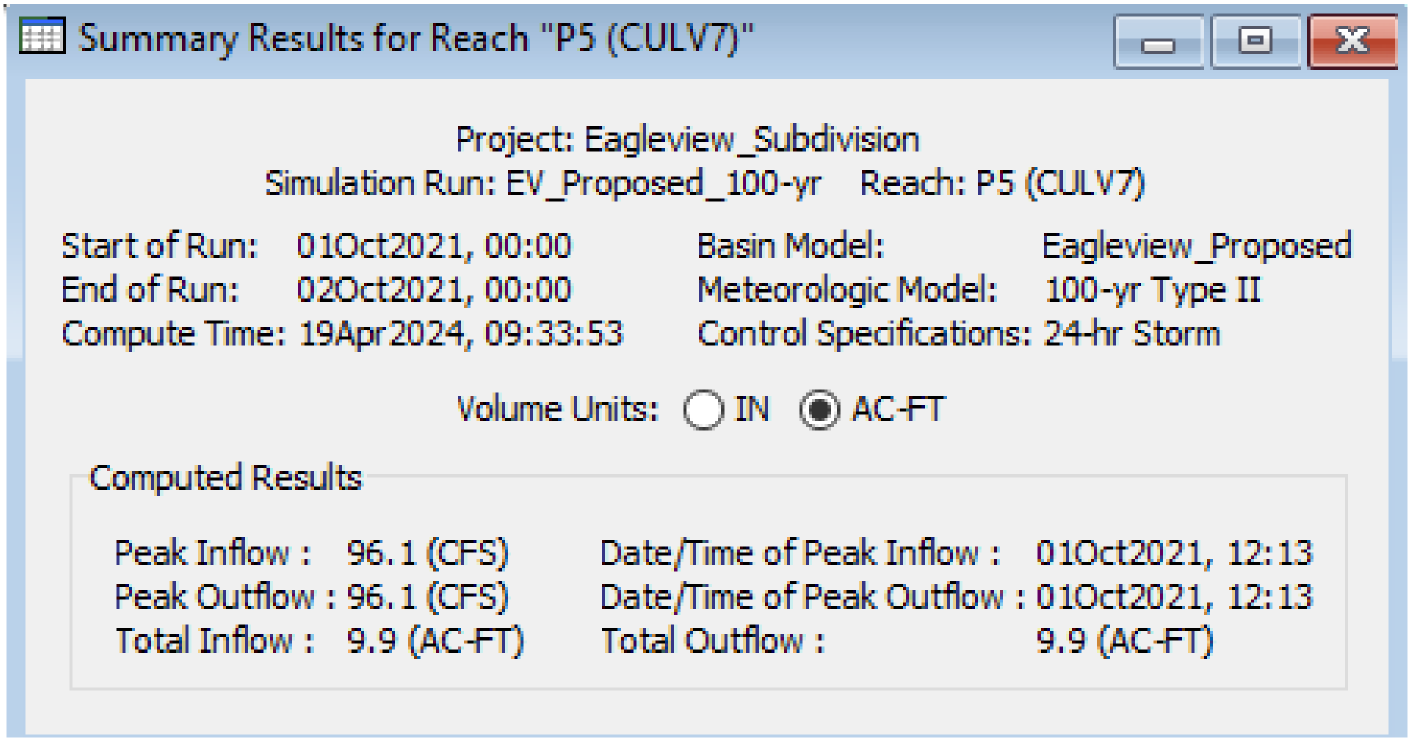
Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_100-yr Subbasin: PB5

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Proposed
End of Run:	02Oct2021, 00:00	Meteorologic Model:	100-yr Type II
Compute Time:	19Apr2024, 09:33:53	Control Specifications:	24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Discharge :	10.4 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:12
Total Precipitation :	2.4 (AC-FT)	Total Direct Runoff :	1.1 (AC-FT)
Total Loss :	1.3 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	1.1 (AC-FT)	Discharge :	1.1 (AC-FT)



Summary Results for Reach "P5 (CULV7)"

Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_100-yr   Reach: P5 (CULV7)

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 09:33:53

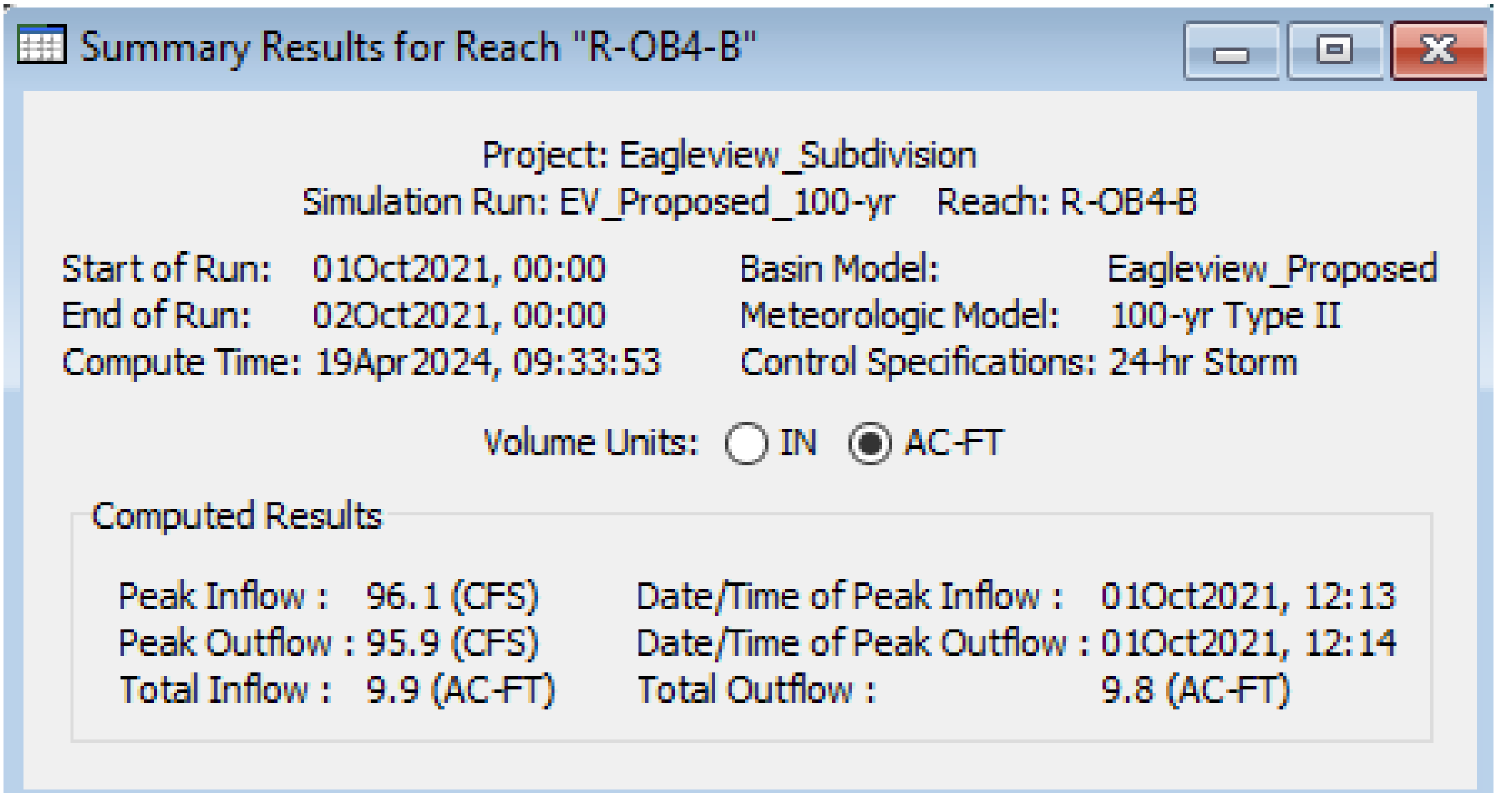
Basin Model: Eagleview_Proposed
Meteorologic Model: 100-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Inflow : 96.1 (CFS)
Peak Outflow : 96.1 (CFS)
Total Inflow : 9.9 (AC-FT)

Date/Time of Peak Inflow : 01Oct2021, 12:13
Date/Time of Peak Outflow : 01Oct2021, 12:13
Total Outflow : 9.9 (AC-FT)



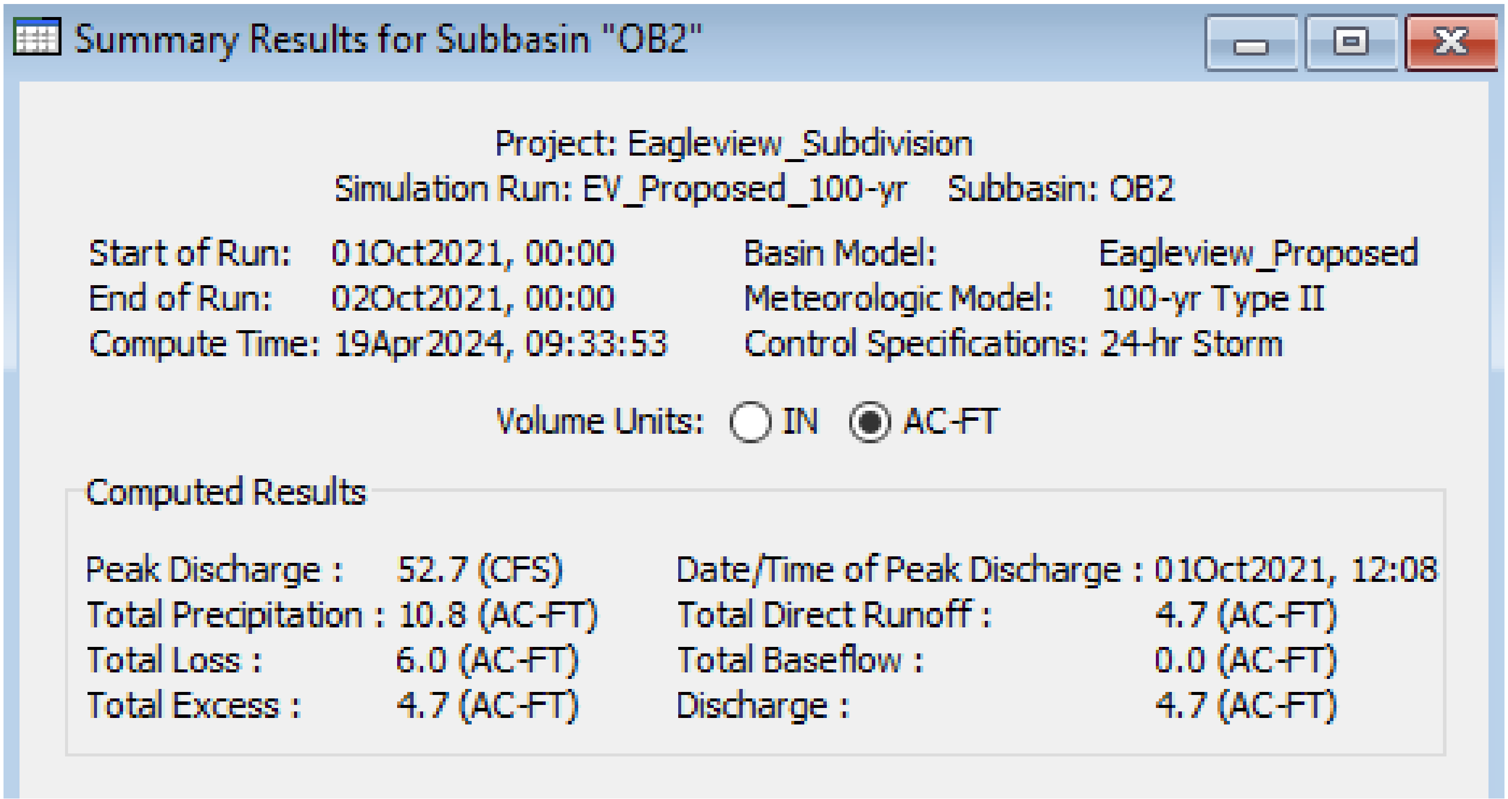
Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_100-yr Reach: R-OB4-B

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Proposed
End of Run:	02Oct2021, 00:00	Meteorologic Model:	100-yr Type II
Compute Time:	19Apr2024, 09:33:53	Control Specifications:	24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Inflow :	96.1 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 12:13
Peak Outflow :	95.9 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 12:14
Total Inflow :	9.9 (AC-FT)	Total Outflow :	9.8 (AC-FT)


Summary Results for Subbasin "OB2"

Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_100-yr Subbasin: OB2

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 09:33:53

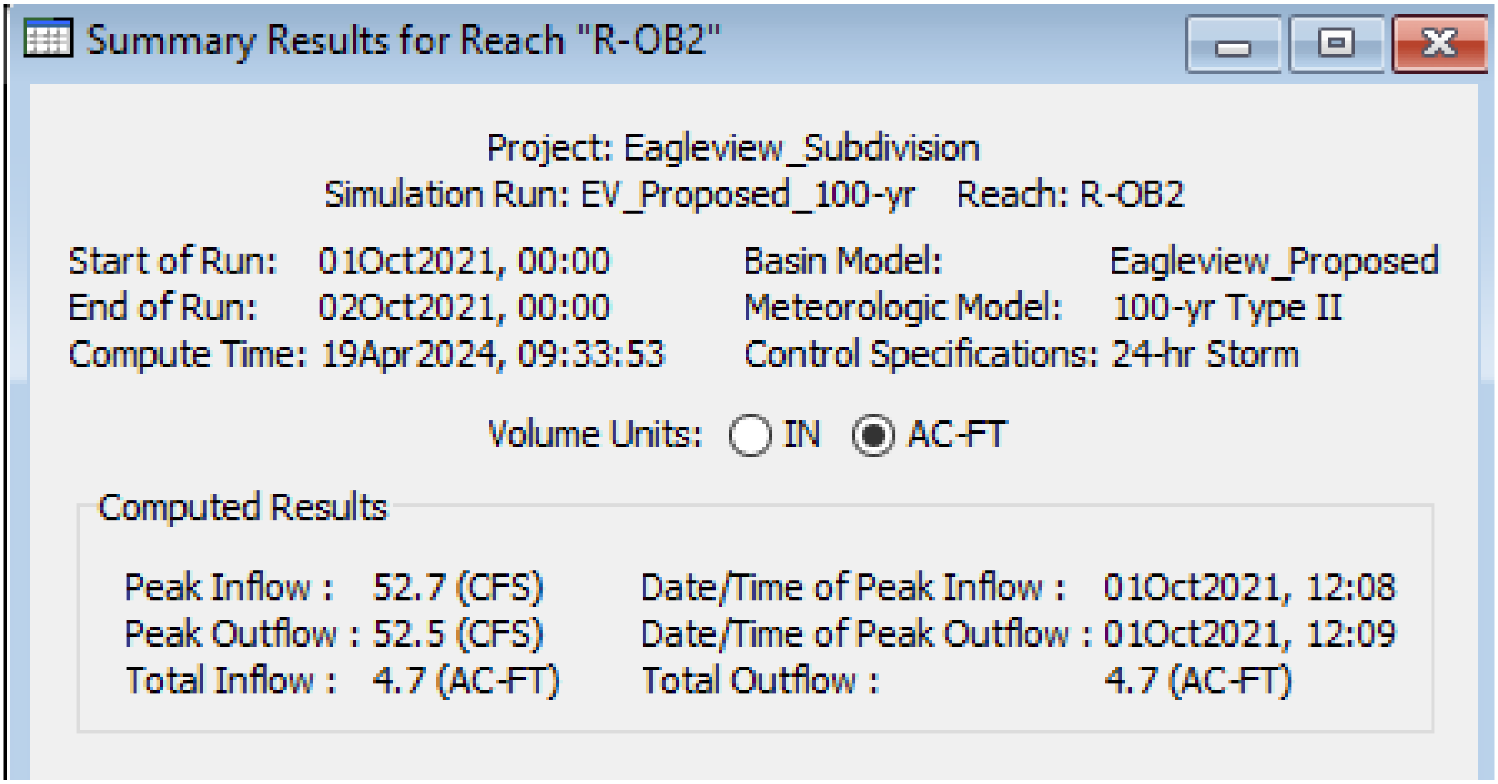
Basin Model: Eagleview_Proposed
Meteorologic Model: 100-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Discharge : 52.7 (CFS)
Total Precipitation : 10.8 (AC-FT)
Total Loss : 6.0 (AC-FT)
Total Excess : 4.7 (AC-FT)

Date/Time of Peak Discharge : 01Oct2021, 12:08
Total Direct Runoff : 4.7 (AC-FT)
Total Baseflow : 0.0 (AC-FT)
Discharge : 4.7 (AC-FT)



Summary Results for Reach "R-OB2"

Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_100-yr Reach: R-OB2

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 09:33:53

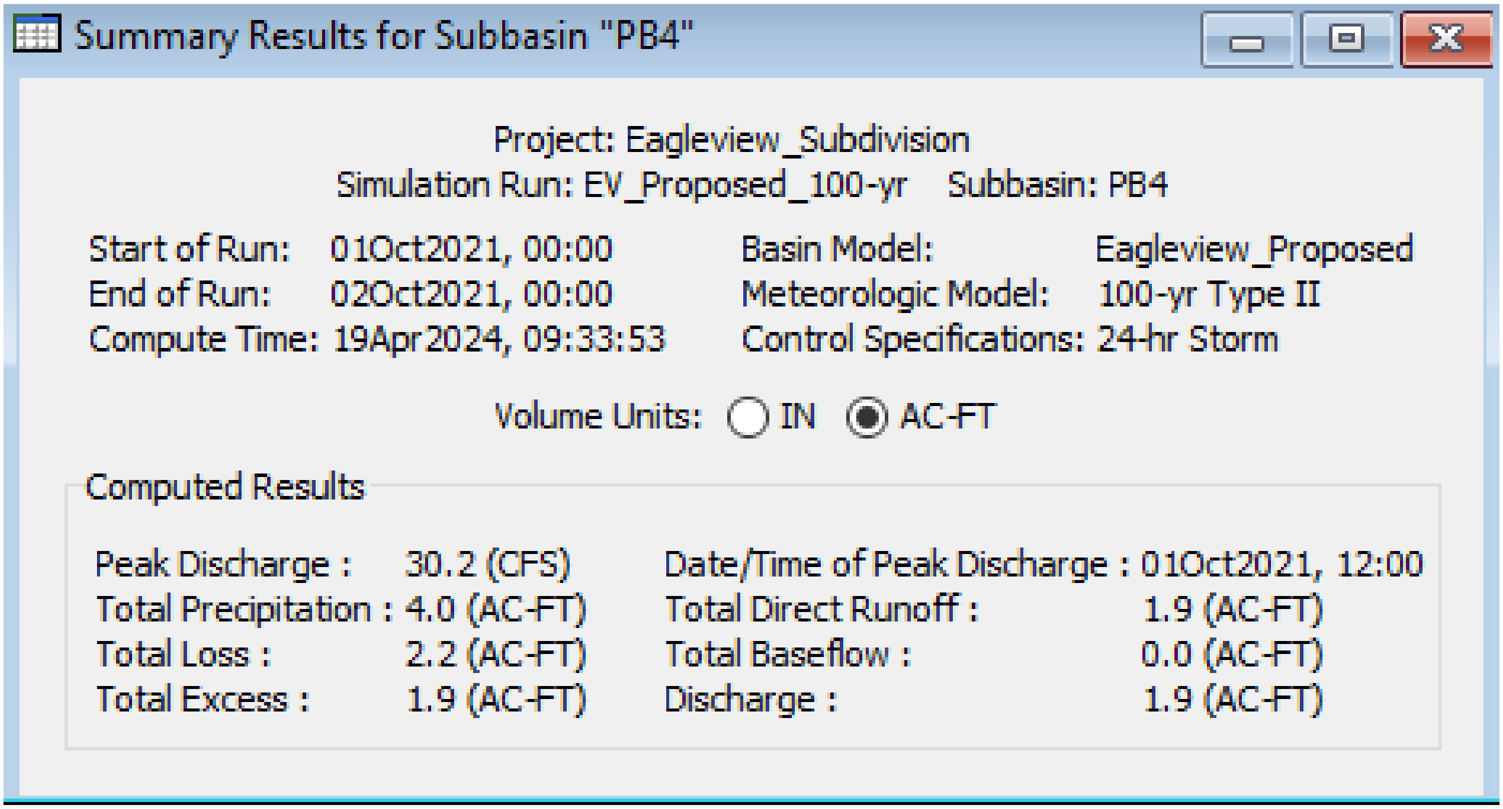
Basin Model: Eagleview_Proposed
Meteorologic Model: 100-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Inflow : 52.7 (CFS)
Peak Outflow : 52.5 (CFS)
Total Inflow : 4.7 (AC-FT)

Date/Time of Peak Inflow : 01Oct2021, 12:08
Date/Time of Peak Outflow : 01Oct2021, 12:09
Total Outflow : 4.7 (AC-FT)


Summary Results for Subbasin "PB4"

Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_100-yr   Subbasin: PB4

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 09:33:53

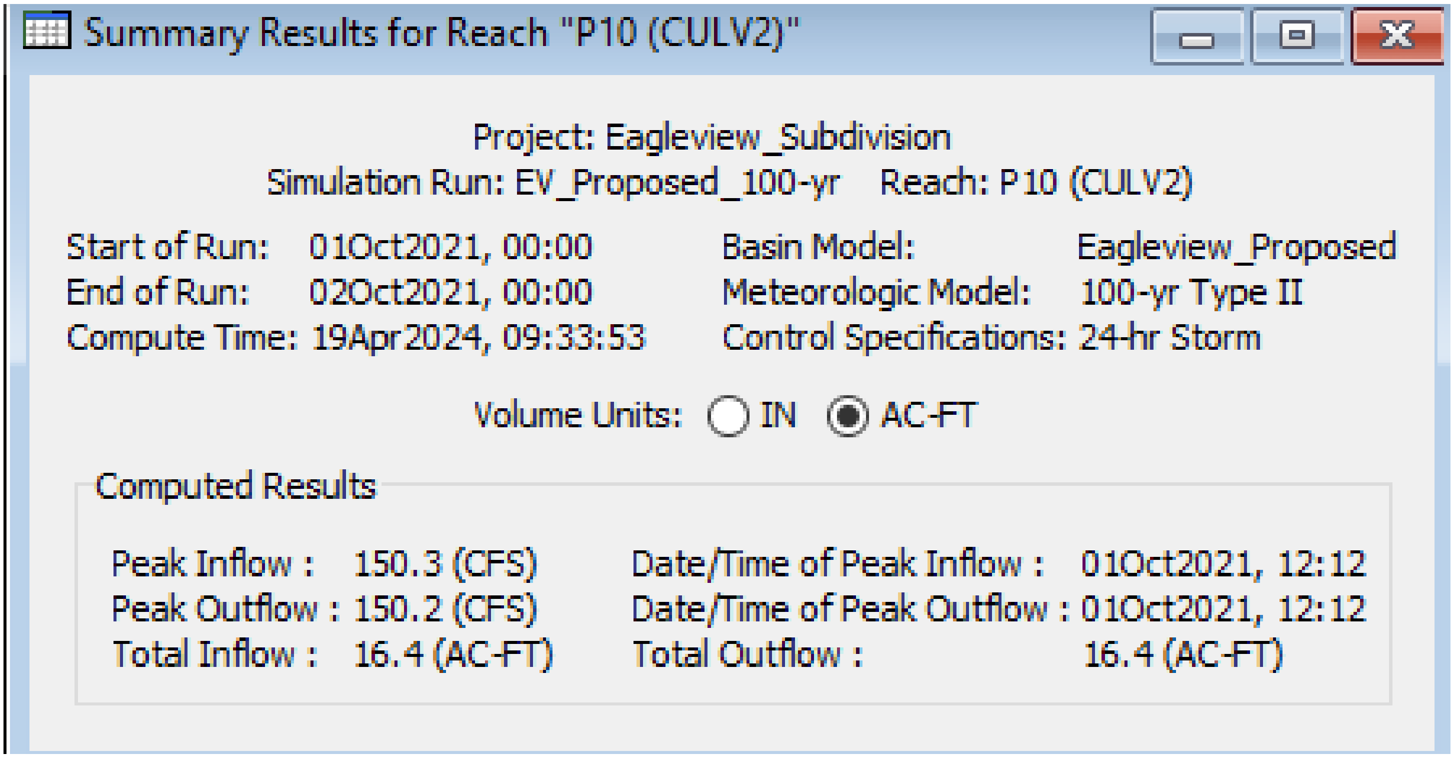
Basin Model: Eagleview_Proposed
Meteorologic Model: 100-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Discharge : 30.2 (CFS)
Total Precipitation : 4.0 (AC-FT)
Total Loss : 2.2 (AC-FT)
Total Excess : 1.9 (AC-FT)

Date/Time of Peak Discharge : 01Oct2021, 12:00
Total Direct Runoff : 1.9 (AC-FT)
Total Baseflow : 0.0 (AC-FT)
Discharge : 1.9 (AC-FT)



Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_100-yr Reach: P10 (CULV2)

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 09:33:53

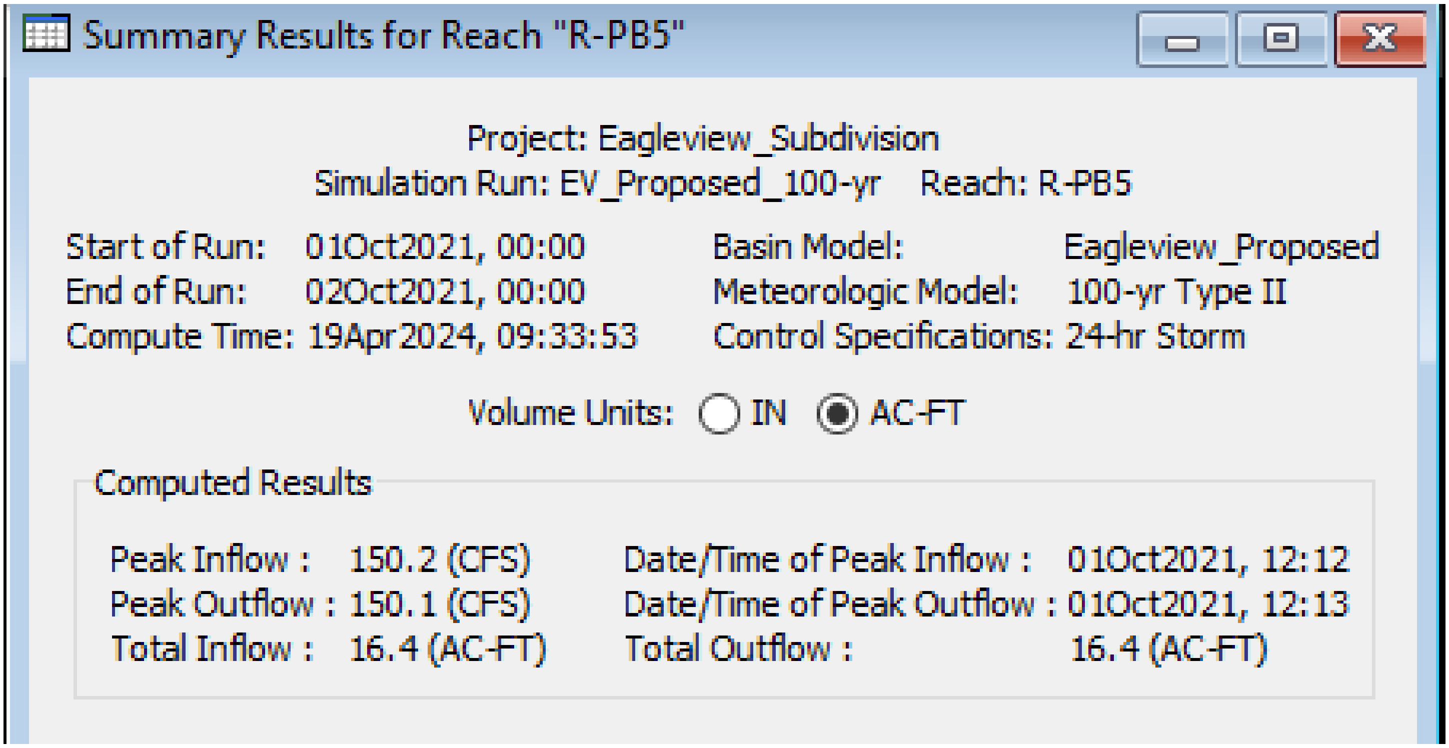
Basin Model: Eagleview_Proposed
Meteorologic Model: 100-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Inflow : 150.3 (CFS)
Peak Outflow : 150.2 (CFS)
Total Inflow : 16.4 (AC-FT)

Date/Time of Peak Inflow : 01Oct2021, 12:12
Date/Time of Peak Outflow : 01Oct2021, 12:12
Total Outflow : 16.4 (AC-FT)



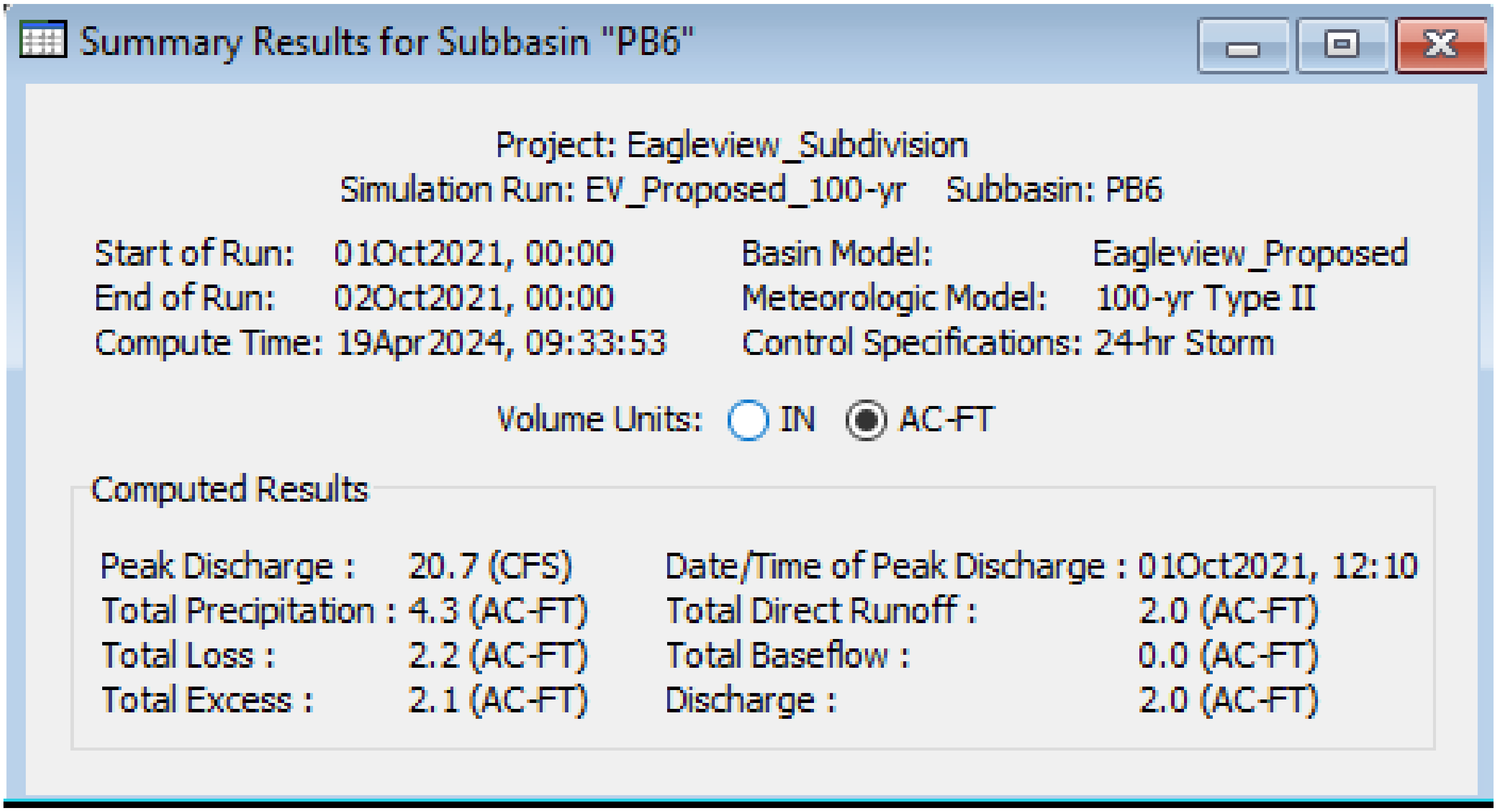
Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_100-yr   Reach: R-PB5

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Proposed
End of Run:	02Oct2021, 00:00	Meteorologic Model:	100-yr Type II
Compute Time:	19Apr2024, 09:33:53	Control Specifications:	24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Inflow :	150.2 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 12:12
Peak Outflow :	150.1 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 12:13
Total Inflow :	16.4 (AC-FT)	Total Outflow :	16.4 (AC-FT)



Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_100-yr Subbasin: PB6

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 09:33:53

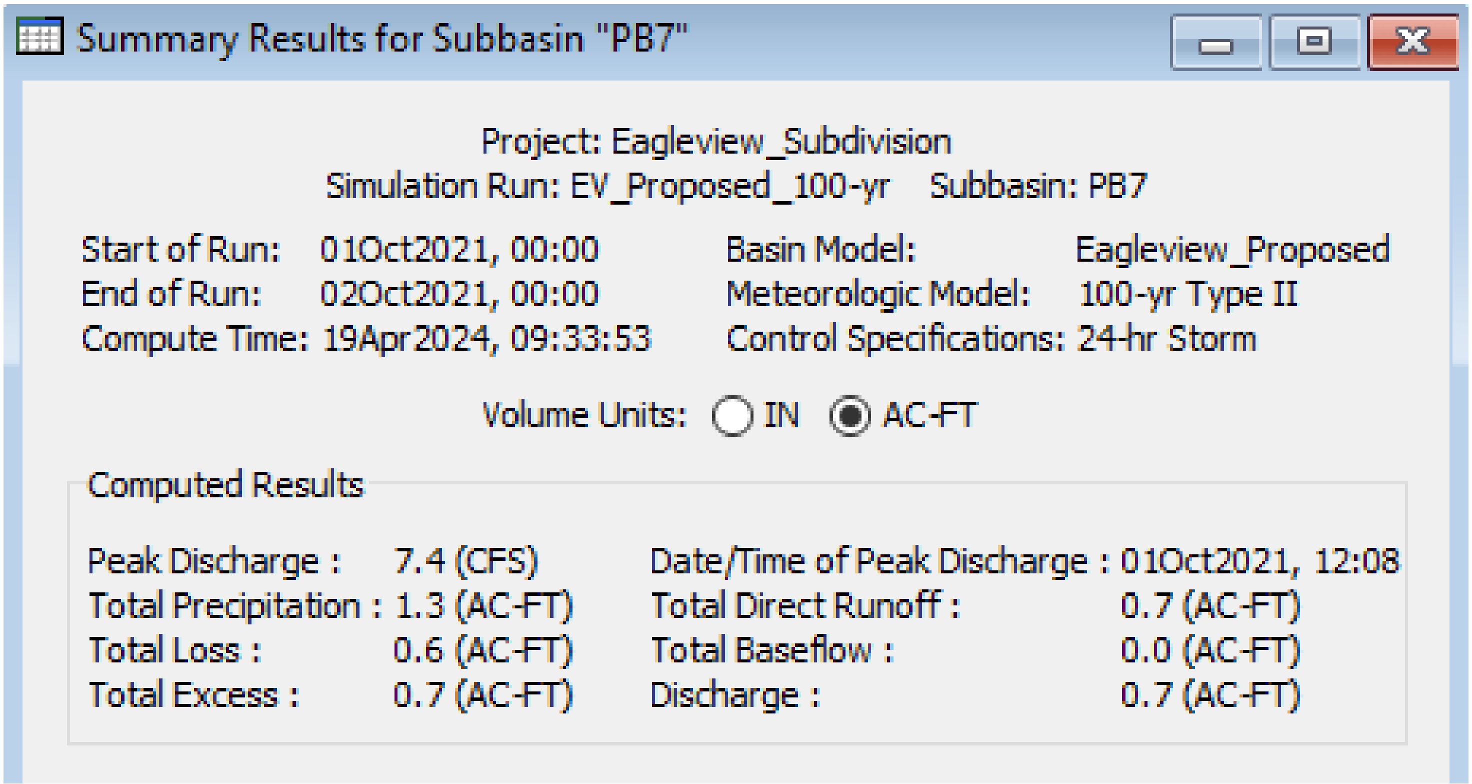
Basin Model: Eagleview_Proposed
Meteorologic Model: 100-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Discharge : 20.7 (CFS)
Total Precipitation : 4.3 (AC-FT)
Total Loss : 2.2 (AC-FT)
Total Excess : 2.1 (AC-FT)

Date/Time of Peak Discharge : 01Oct2021, 12:10
Total Direct Runoff : 2.0 (AC-FT)
Total Baseflow : 0.0 (AC-FT)
Discharge : 2.0 (AC-FT)



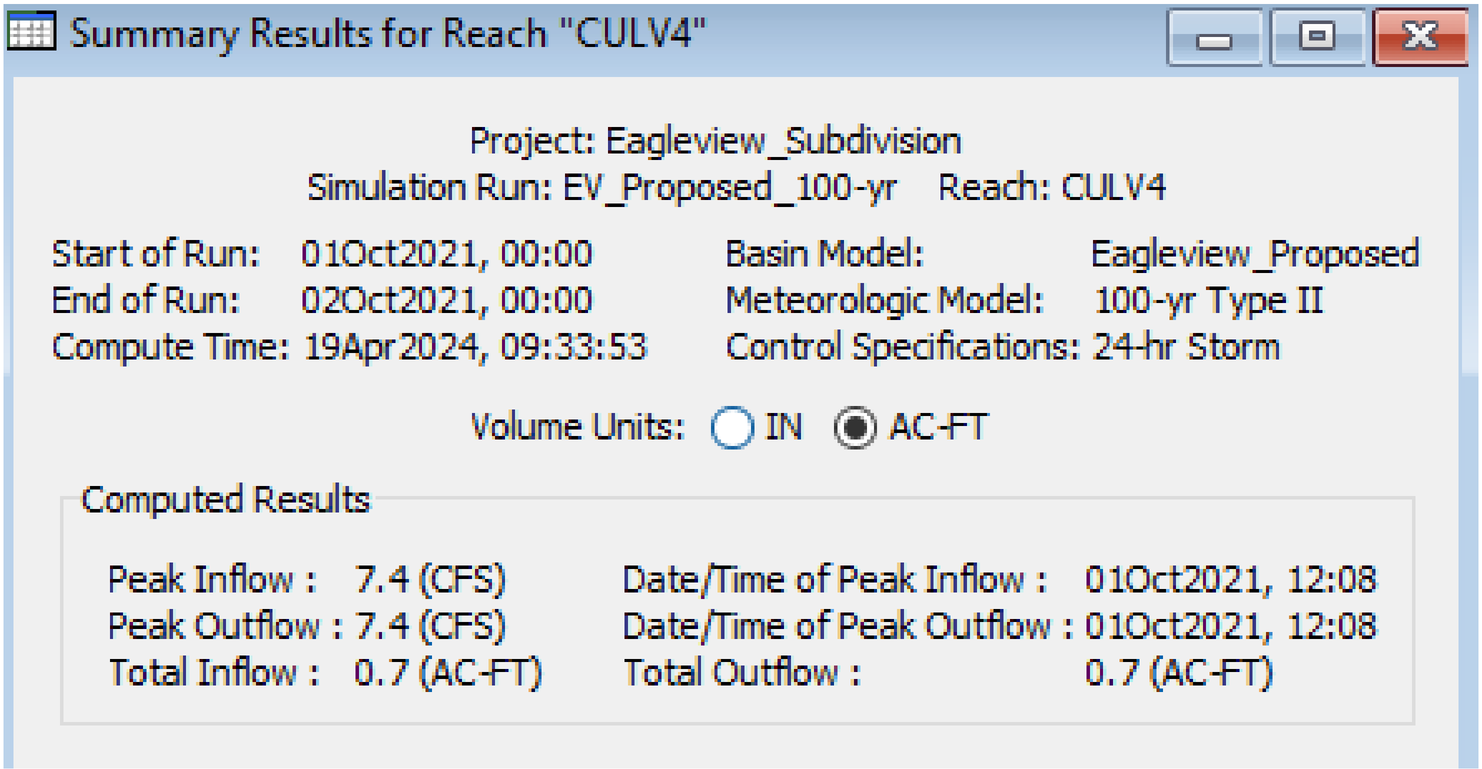
Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_100-yr Subbasin: PB7

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Proposed
End of Run:	02Oct2021, 00:00	Meteorologic Model:	100-yr Type II
Compute Time:	19Apr2024, 09:33:53	Control Specifications:	24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Discharge :	7.4 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:08
Total Precipitation :	1.3 (AC-FT)	Total Direct Runoff :	0.7 (AC-FT)
Total Loss :	0.6 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	0.7 (AC-FT)	Discharge :	0.7 (AC-FT)



Summary Results for Reach "CULV4"

Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_100-yr   Reach: CULV4

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 09:33:53

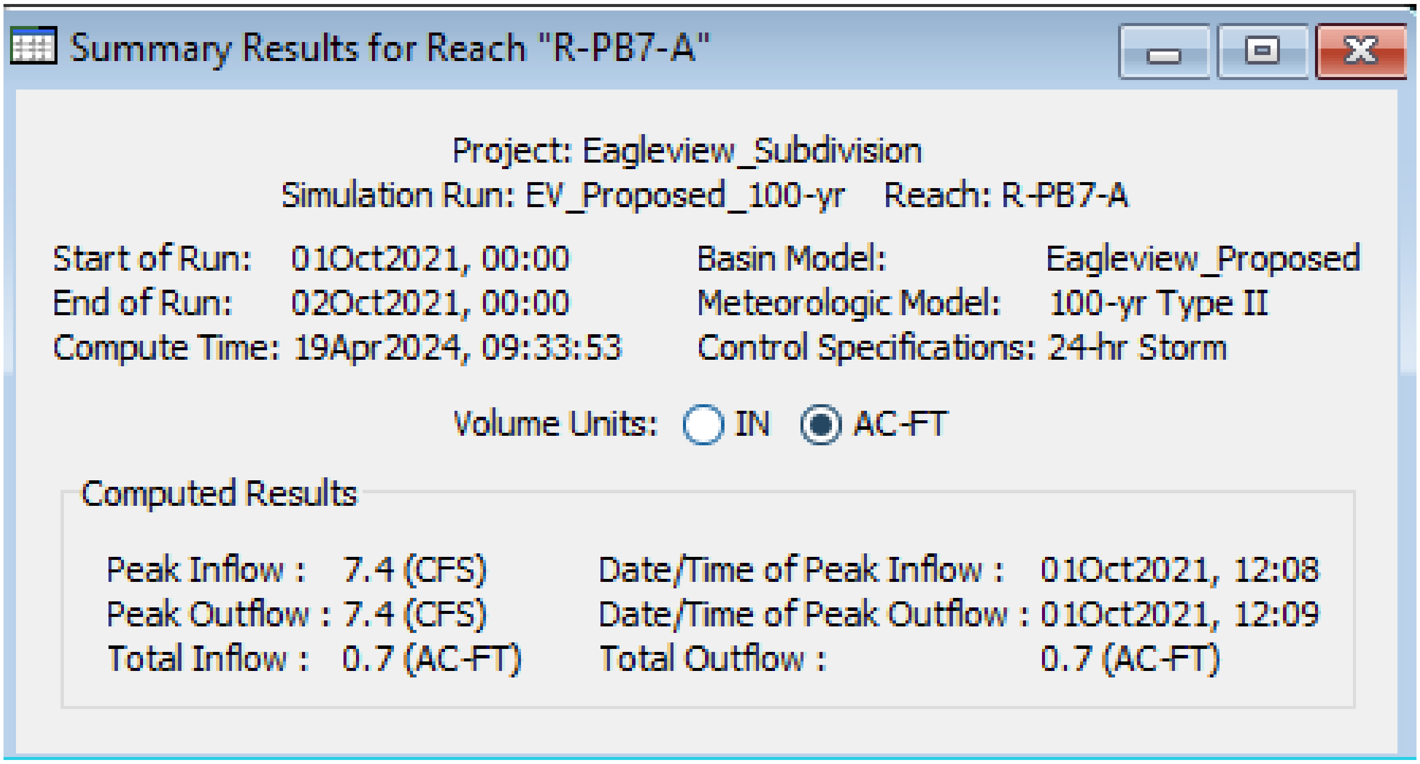
Basin Model: Eagleview_Proposed
Meteorologic Model: 100-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Inflow : 7.4 (CFS)
Peak Outflow : 7.4 (CFS)
Total Inflow : 0.7 (AC-FT)

Date/Time of Peak Inflow : 01Oct2021, 12:08
Date/Time of Peak Outflow : 01Oct2021, 12:08
Total Outflow : 0.7 (AC-FT)



Summary Results for Reach "R-PB7-A"

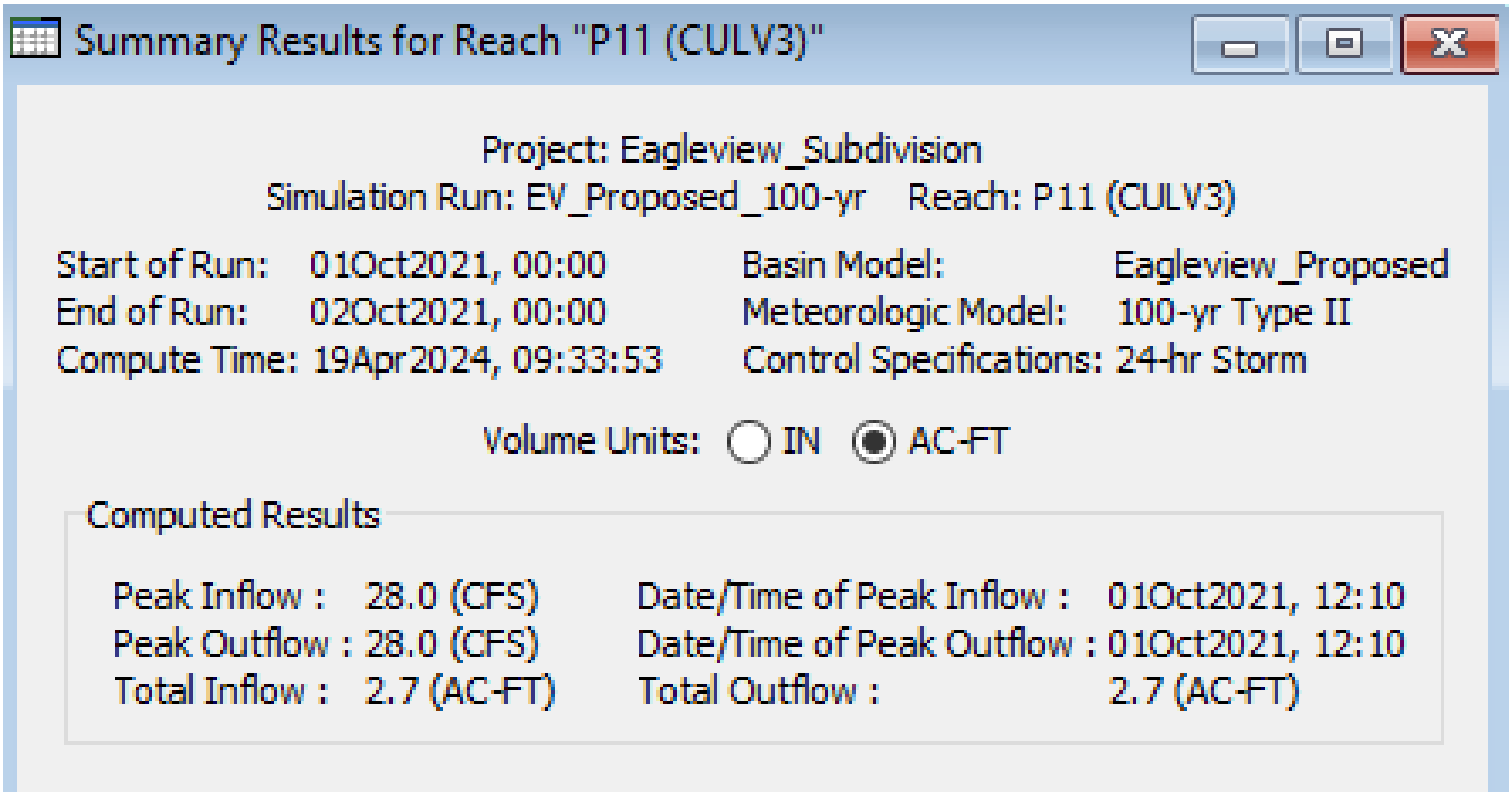
Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_100-yr Reach: R-PB7-A

Start of Run: 01Oct2021, 00:00 Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00 Meteorologic Model: 100-yr Type II
Compute Time: 19Apr2024, 09:33:53 Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Inflow : 7.4 (CFS) Date/Time of Peak Inflow : 01Oct2021, 12:08
Peak Outflow : 7.4 (CFS) Date/Time of Peak Outflow : 01Oct2021, 12:09
Total Inflow : 0.7 (AC-FT) Total Outflow : 0.7 (AC-FT)



Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_100-yr Reach: P11 (CULV3)

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 09:33:53

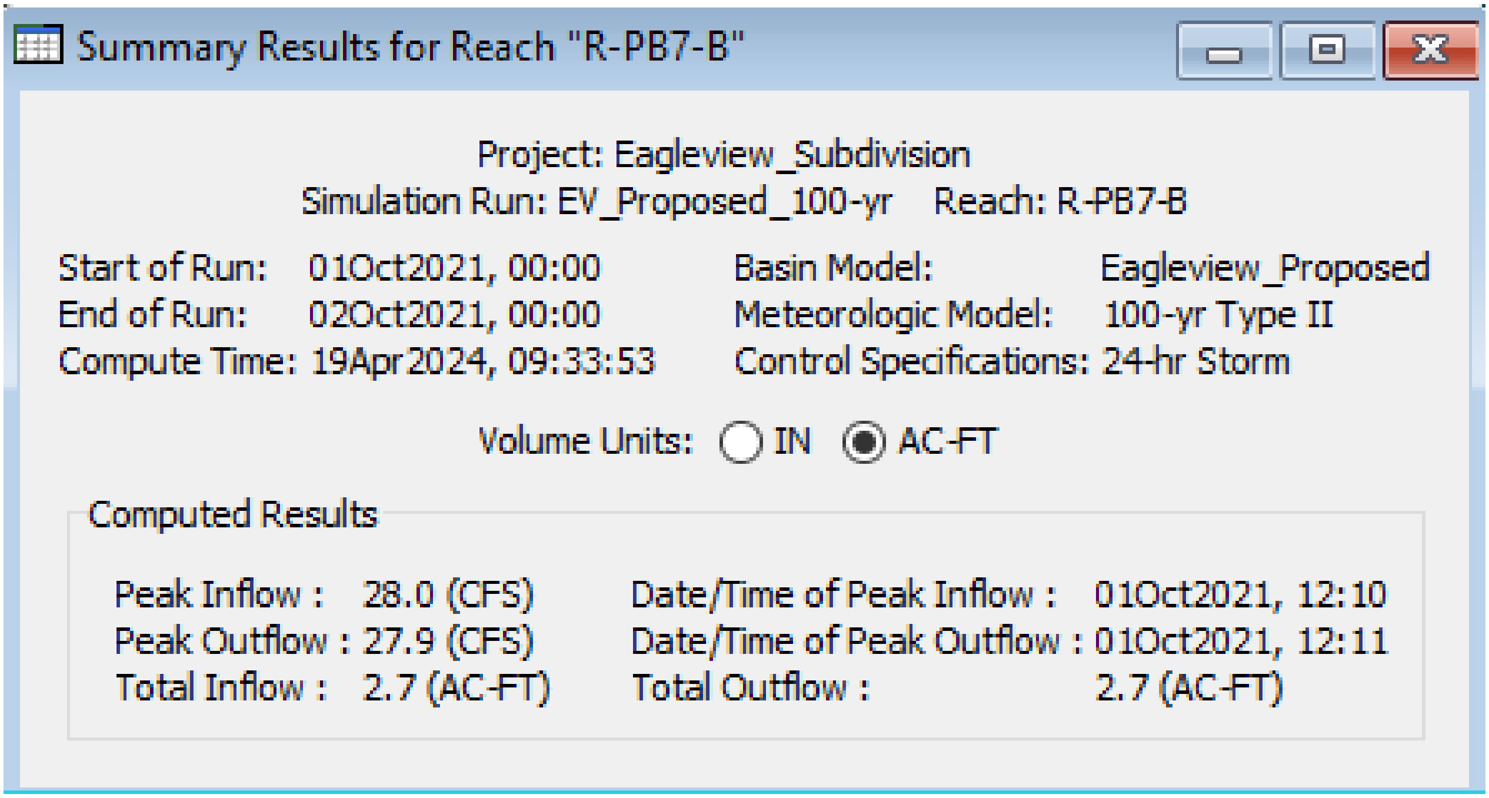
Basin Model: Eagleview_Proposed
Meteorologic Model: 100-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Inflow : 28.0 (CFS)
Peak Outflow : 28.0 (CFS)
Total Inflow : 2.7 (AC-FT)

Date/Time of Peak Inflow : 01Oct2021, 12:10
Date/Time of Peak Outflow : 01Oct2021, 12:10
Total Outflow : 2.7 (AC-FT)



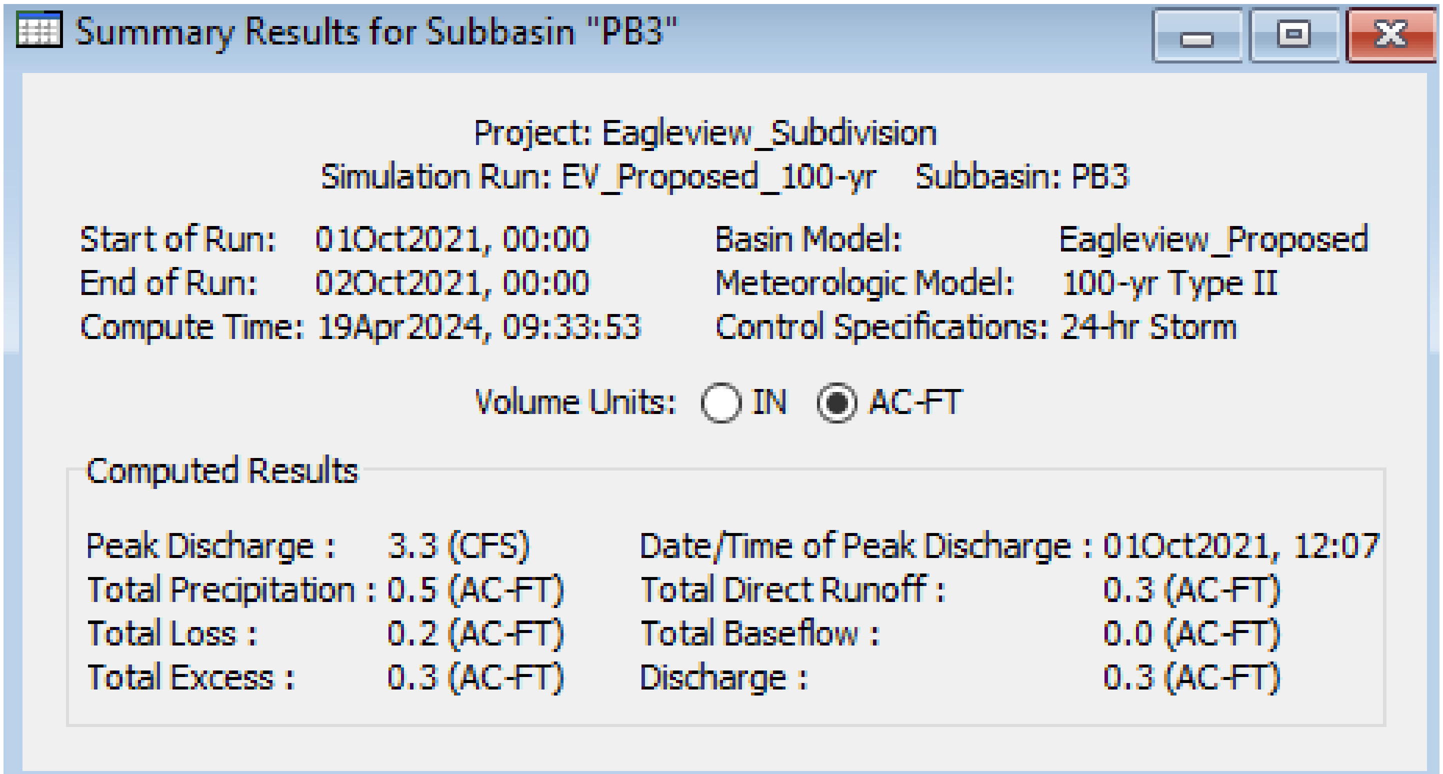
Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_100-yr   Reach: R-PB7-B

Start of Run: 01Oct2021, 00:00   Basin Model: Eagleview_Proposed
End of Run: 02Oct2021, 00:00   Meteorologic Model: 100-yr Type II
Compute Time: 19Apr2024, 09:33:53   Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Inflow : 28.0 (CFS)   Date/Time of Peak Inflow : 01Oct2021, 12:10
Peak Outflow : 27.9 (CFS)   Date/Time of Peak Outflow : 01Oct2021, 12:11
Total Inflow : 2.7 (AC-FT)   Total Outflow : 2.7 (AC-FT)


Summary Results for Subbasin "PB3"

Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_100-yr Subbasin: PB3

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 09:33:53

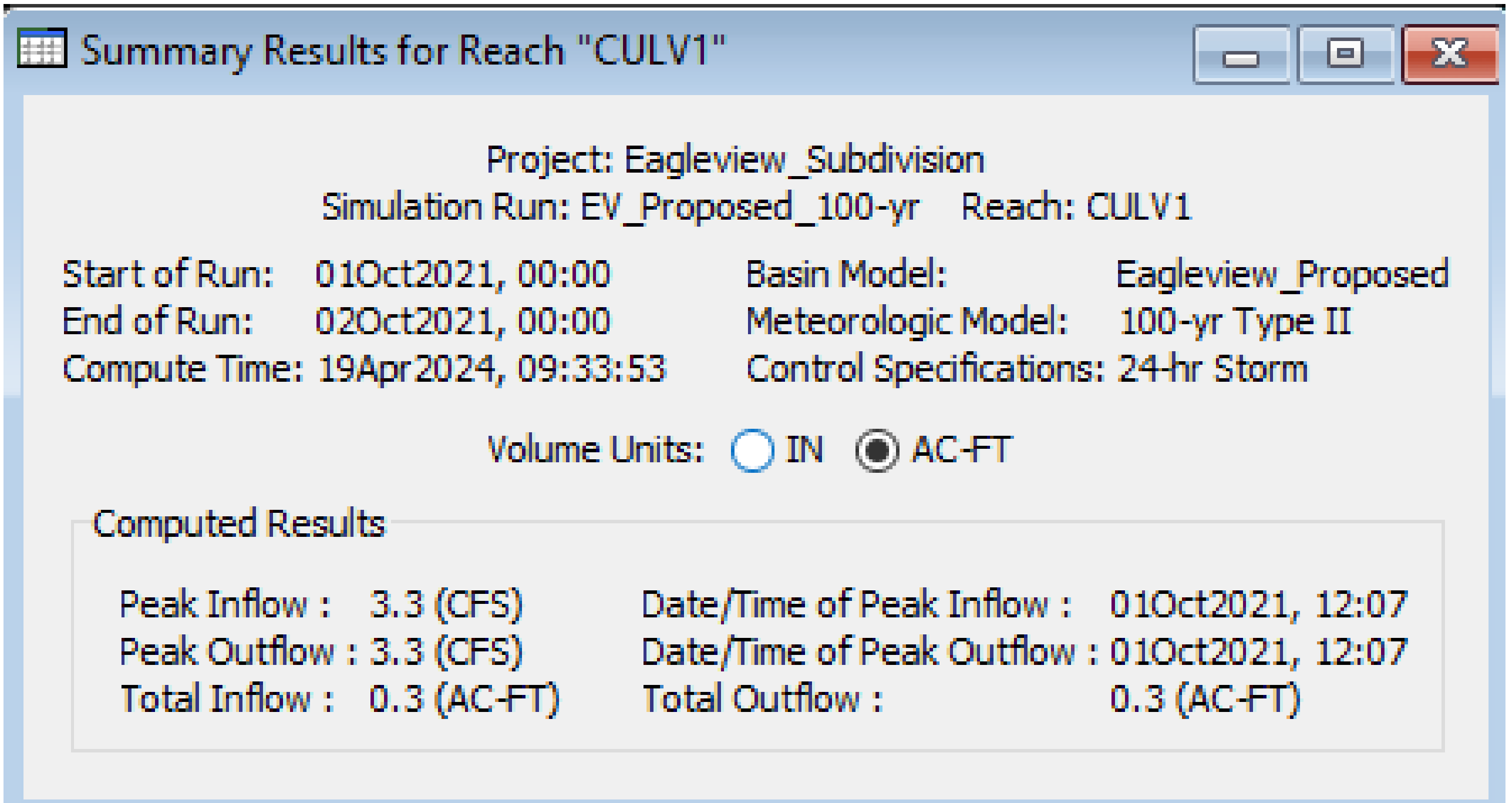
Basin Model: Eagleview_Proposed
Meteorologic Model: 100-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Discharge : 3.3 (CFS)
Total Precipitation : 0.5 (AC-FT)
Total Loss : 0.2 (AC-FT)
Total Excess : 0.3 (AC-FT)

Date/Time of Peak Discharge : 01Oct2021, 12:07
Total Direct Runoff : 0.3 (AC-FT)
Total Baseflow : 0.0 (AC-FT)
Discharge : 0.3 (AC-FT)



Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_100-yr Reach: CULV1

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 09:33:53

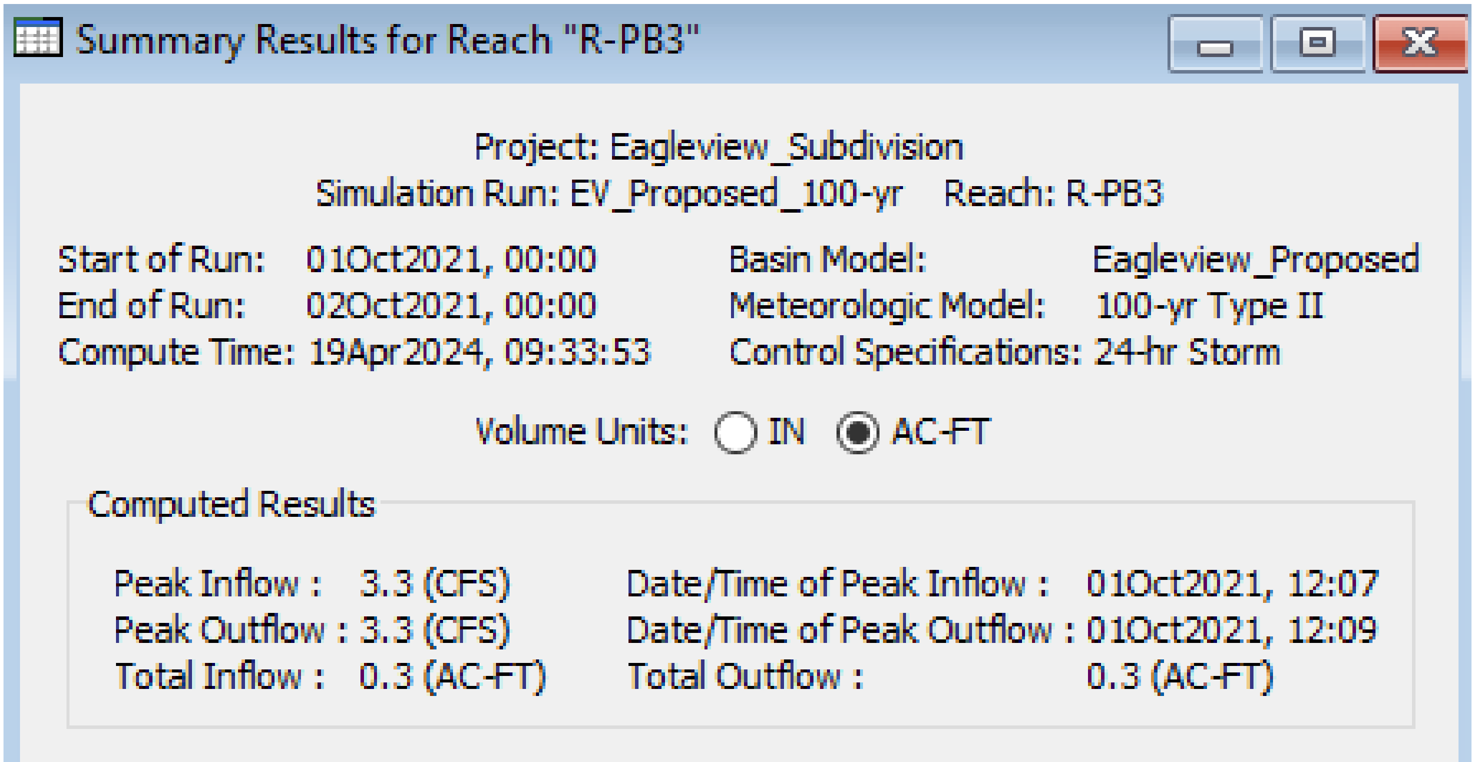
Basin Model: Eagleview_Proposed
Meteorologic Model: 100-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Inflow : 3.3 (CFS)
Peak Outflow : 3.3 (CFS)
Total Inflow : 0.3 (AC-FT)

Date/Time of Peak Inflow : 01Oct2021, 12:07
Date/Time of Peak Outflow : 01Oct2021, 12:07
Total Outflow : 0.3 (AC-FT)



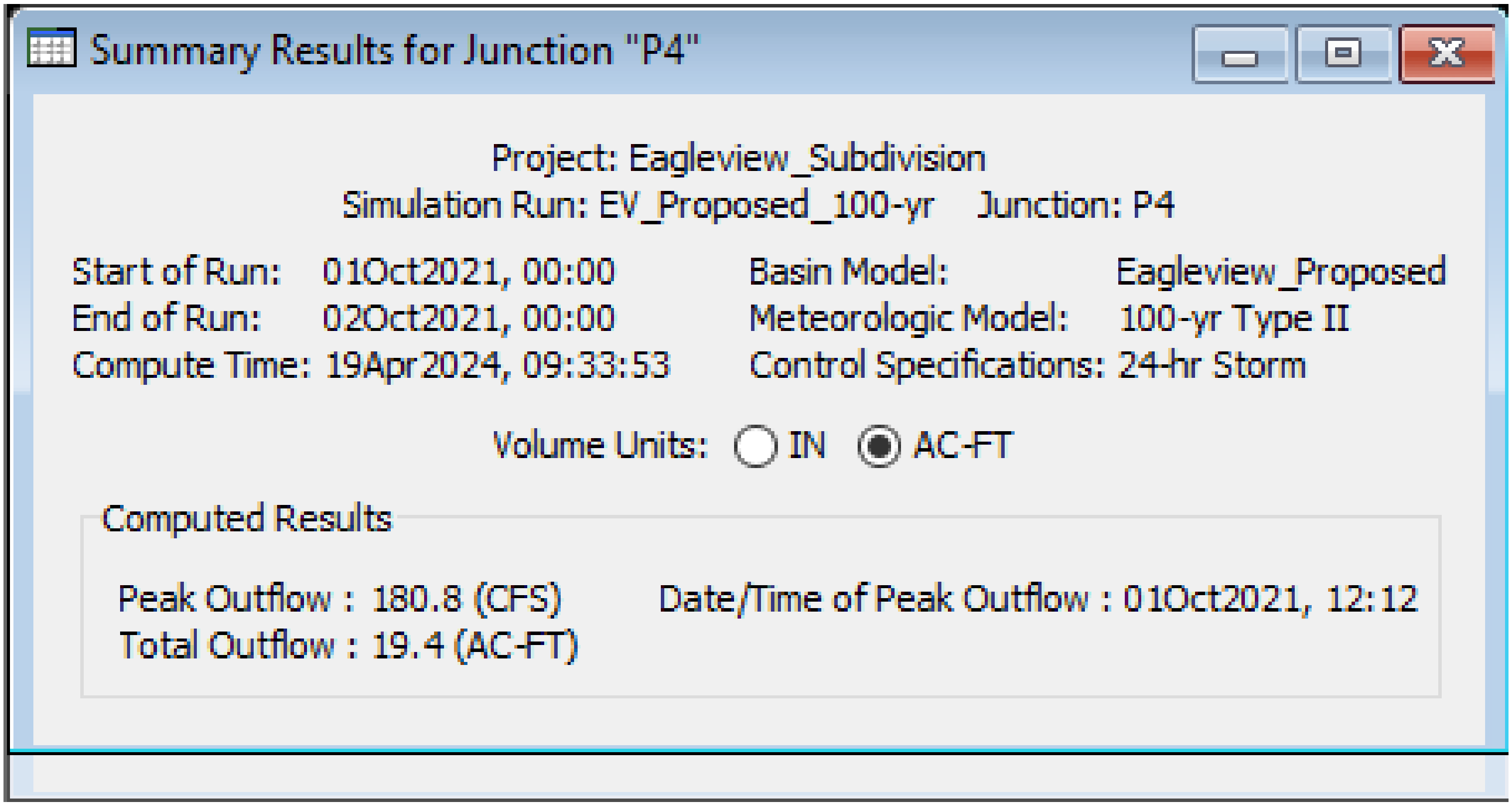
Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_100-yr Reach: R-PB3

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Proposed
End of Run:	02Oct2021, 00:00	Meteorologic Model:	100-yr Type II
Compute Time:	19Apr2024, 09:33:53	Control Specifications:	24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Inflow :	3.3 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 12:07
Peak Outflow :	3.3 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 12:09
Total Inflow :	0.3 (AC-FT)	Total Outflow :	0.3 (AC-FT)



Summary Results for Junction "P4"

Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_100-yr Junction: P4

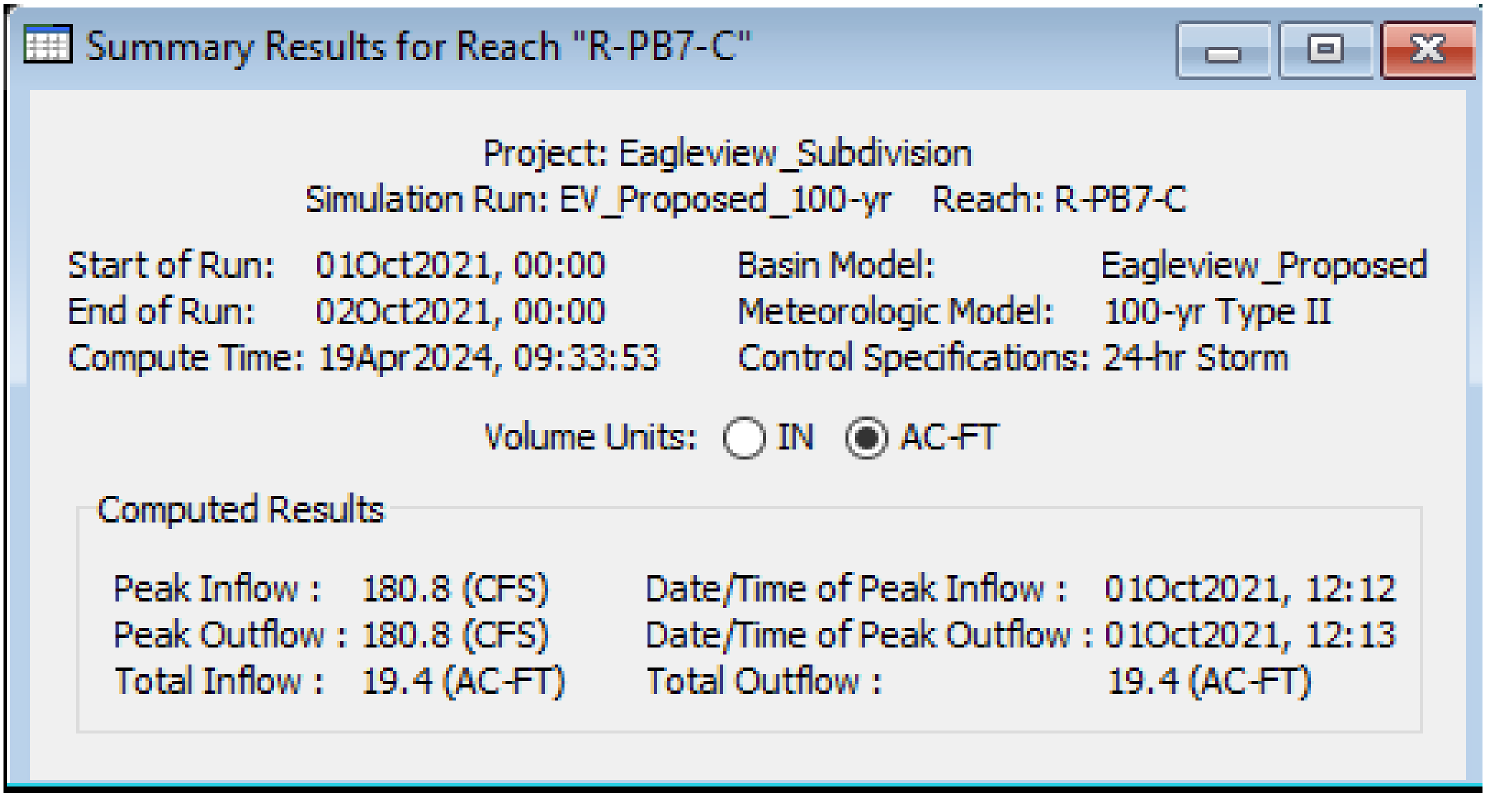
Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 09:33:53

Basin Model: Eagleview_Proposed
Meteorologic Model: 100-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Outflow : 180.8 (CFS)
Total Outflow : 19.4 (AC-FT)
Date/Time of Peak Outflow : 01Oct2021, 12:12



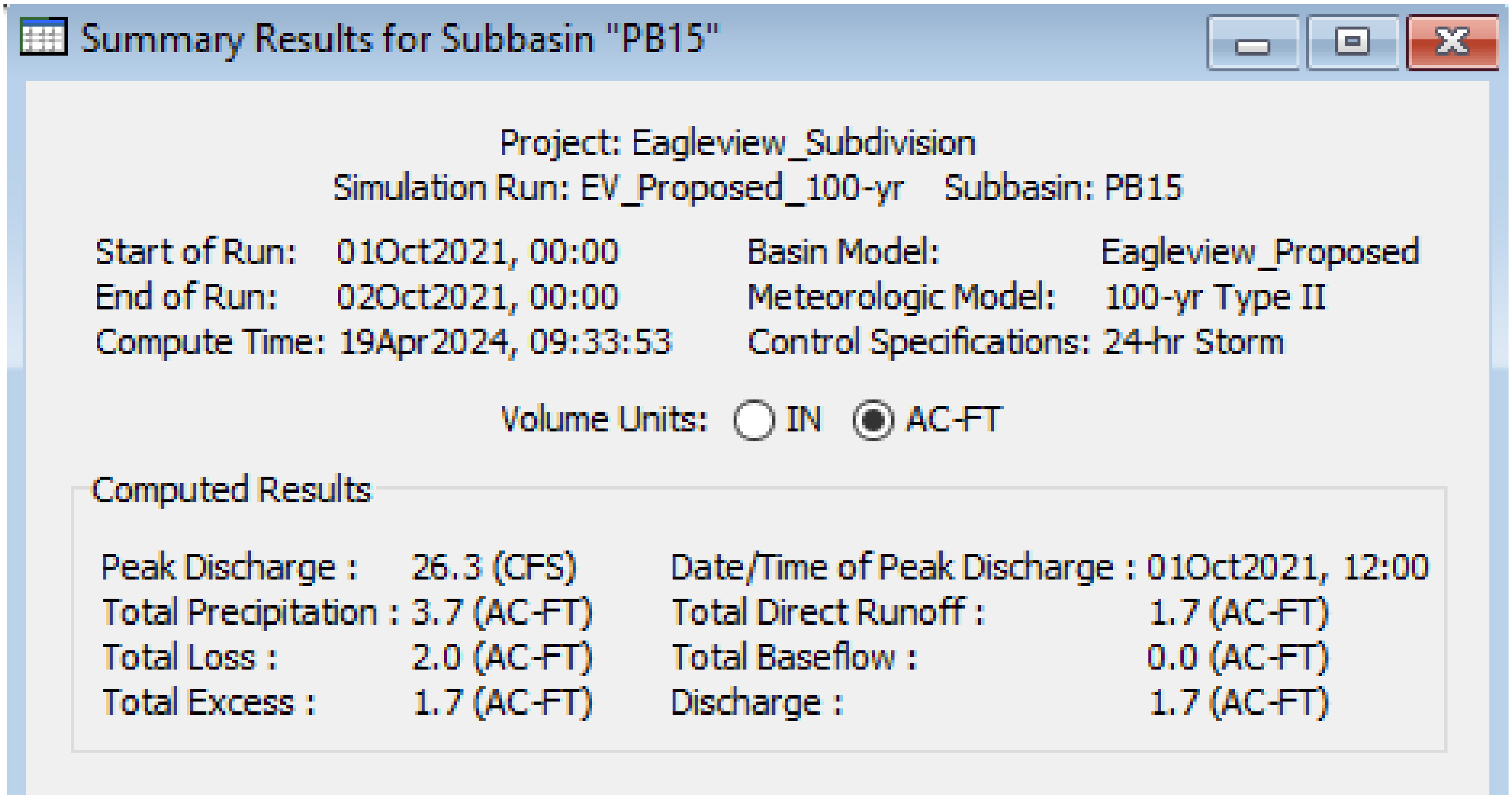
Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_100-yr Reach: R-PB7-C

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Proposed
End of Run:	02Oct2021, 00:00	Meteorologic Model:	100-yr Type II
Compute Time:	19Apr2024, 09:33:53	Control Specifications:	24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Inflow :	180.8 (CFS)	Date/Time of Peak Inflow :	01Oct2021, 12:12
Peak Outflow :	180.8 (CFS)	Date/Time of Peak Outflow :	01Oct2021, 12:13
Total Inflow :	19.4 (AC-FT)	Total Outflow :	19.4 (AC-FT)


Summary Results for Subbasin "PB15"

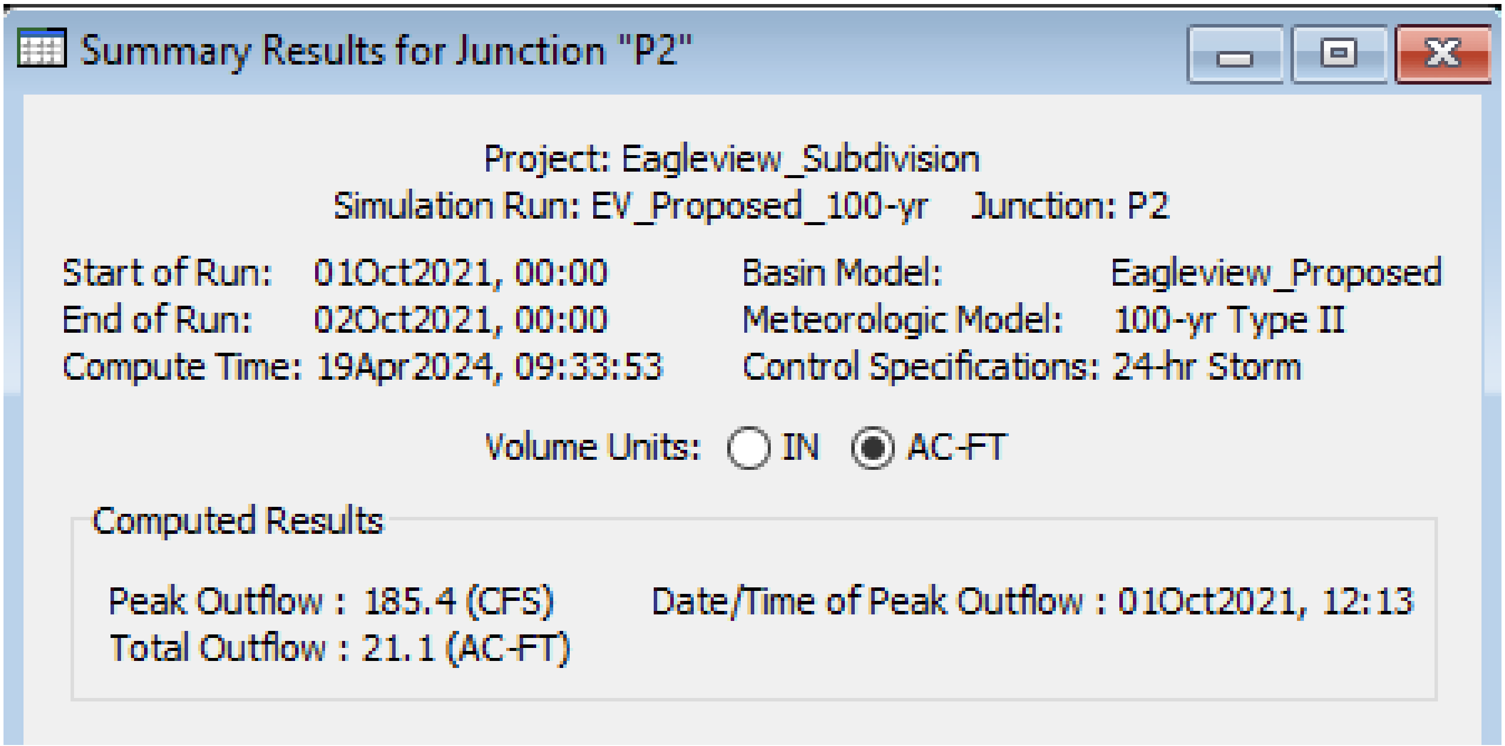
Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_100-yr Subbasin: PB15

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Proposed
End of Run:	02Oct2021, 00:00	Meteorologic Model:	100-yr Type II
Compute Time:	19Apr2024, 09:33:53	Control Specifications:	24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Discharge :	26.3 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:00
Total Precipitation :	3.7 (AC-FT)	Total Direct Runoff :	1.7 (AC-FT)
Total Loss :	2.0 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	1.7 (AC-FT)	Discharge :	1.7 (AC-FT)



Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_100-yr   Junction: P2

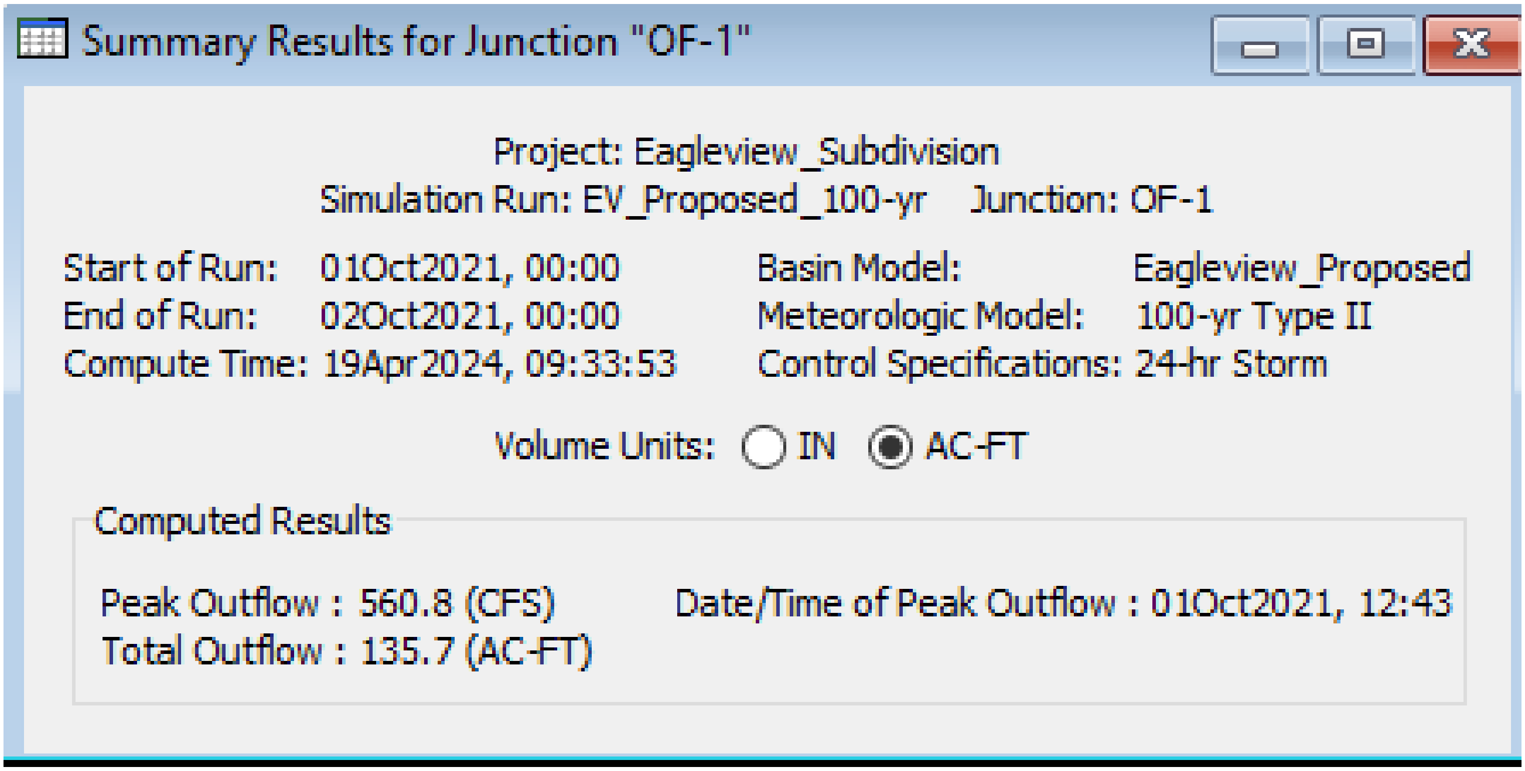
Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 09:33:53

Basin Model: Eagleview_Proposed
Meteorologic Model: 100-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Outflow : 185.4 (CFS)   Date/Time of Peak Outflow : 01Oct2021, 12:13
Total Outflow : 21.1 (AC-FT)



Summary Results for Junction "OF-1"

Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_100-yr   Junction: OF-1

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 09:33:53

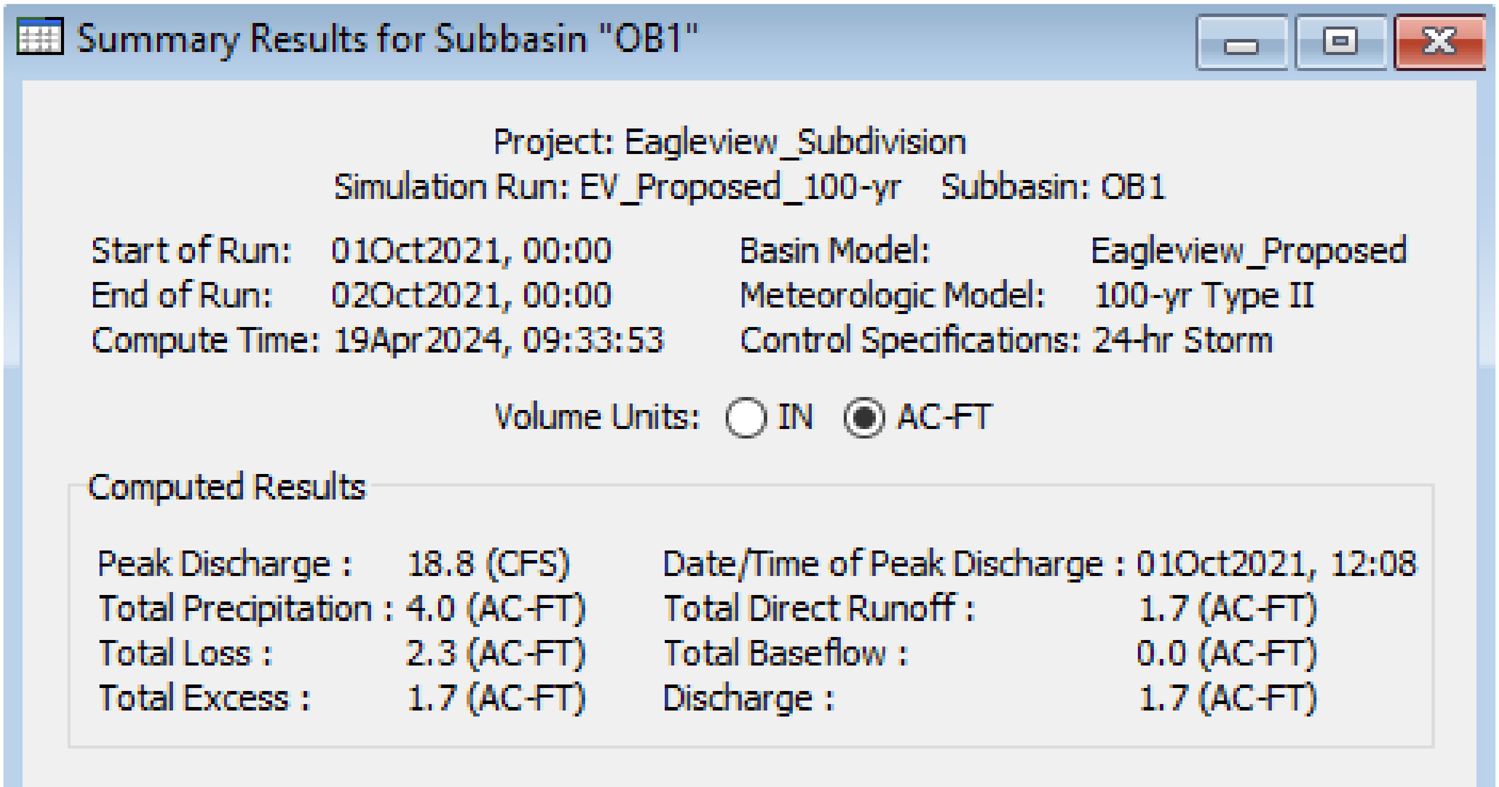
Basin Model: Eagleview_Proposed
Meteorologic Model: 100-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Outflow : 560.8 (CFS)
Total Outflow : 135.7 (AC-FT)

Date/Time of Peak Outflow : 01Oct2021, 12:43


Summary Results for Subbasin "OB1"

Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_100-yr Subbasin: OB1

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 09:33:53

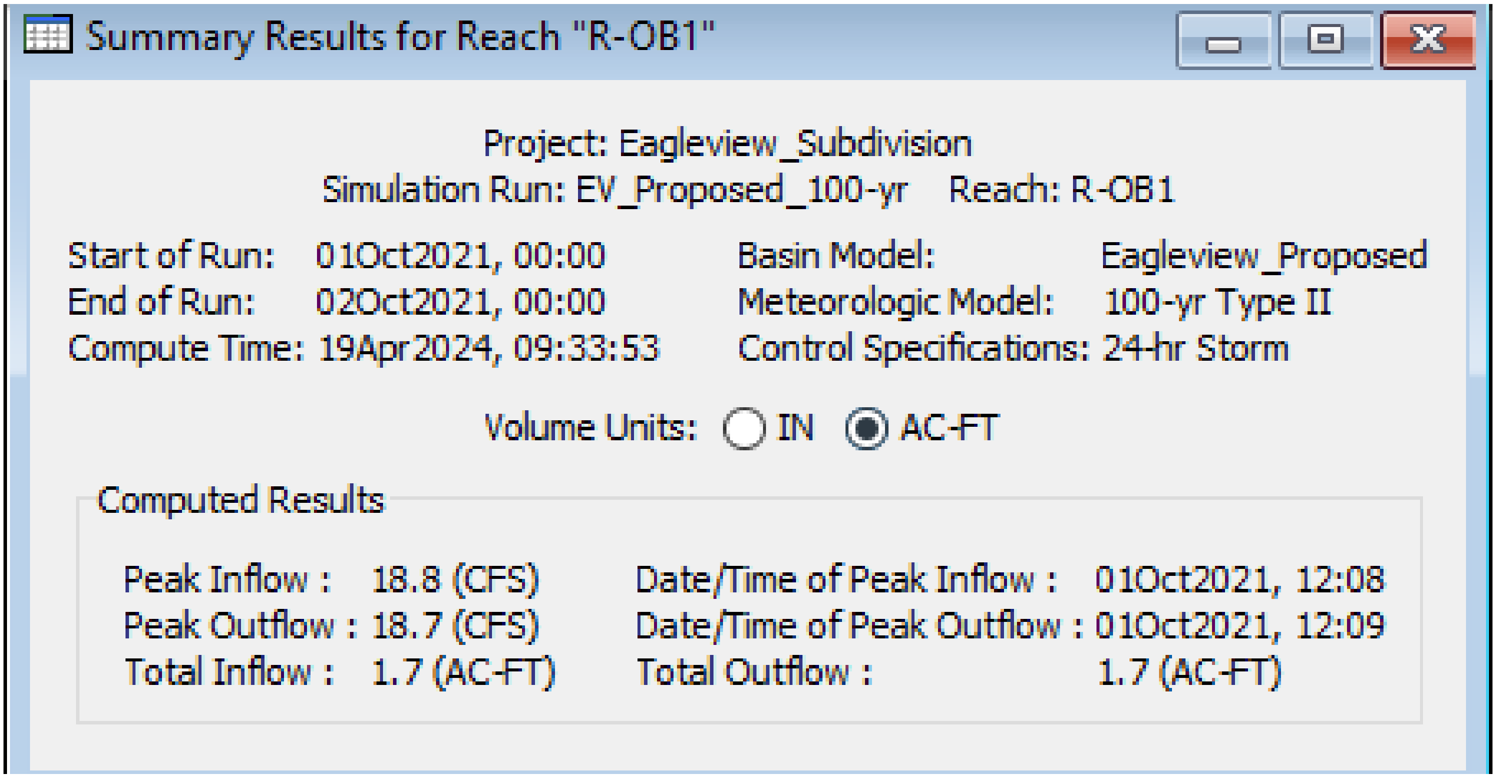
Basin Model: Eagleview_Proposed
Meteorologic Model: 100-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Discharge : 18.8 (CFS)
Total Precipitation : 4.0 (AC-FT)
Total Loss : 2.3 (AC-FT)
Total Excess : 1.7 (AC-FT)

Date/Time of Peak Discharge : 01Oct2021, 12:08
Total Direct Runoff : 1.7 (AC-FT)
Total Baseflow : 0.0 (AC-FT)
Discharge : 1.7 (AC-FT)


Summary Results for Reach "R-OB1"

Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_100-yr   Reach: R-OB1

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 09:33:53

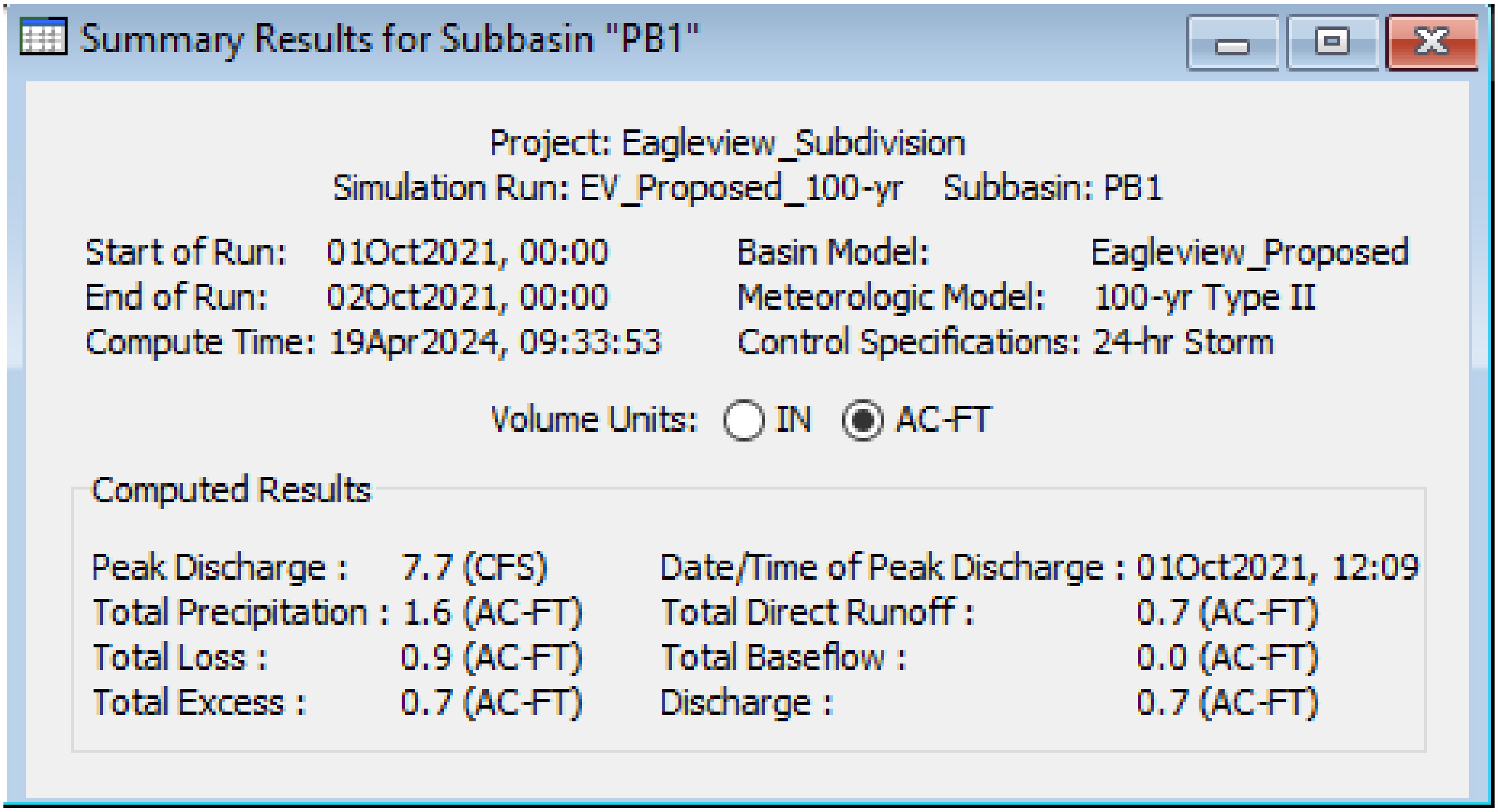
Basin Model: Eagleview_Proposed
Meteorologic Model: 100-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Inflow : 18.8 (CFS)
Peak Outflow : 18.7 (CFS)
Total Inflow : 1.7 (AC-FT)

Date/Time of Peak Inflow : 01Oct2021, 12:08
Date/Time of Peak Outflow : 01Oct2021, 12:09
Total Outflow : 1.7 (AC-FT)



Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_100-yr Subbasin: PB1

Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 09:33:53

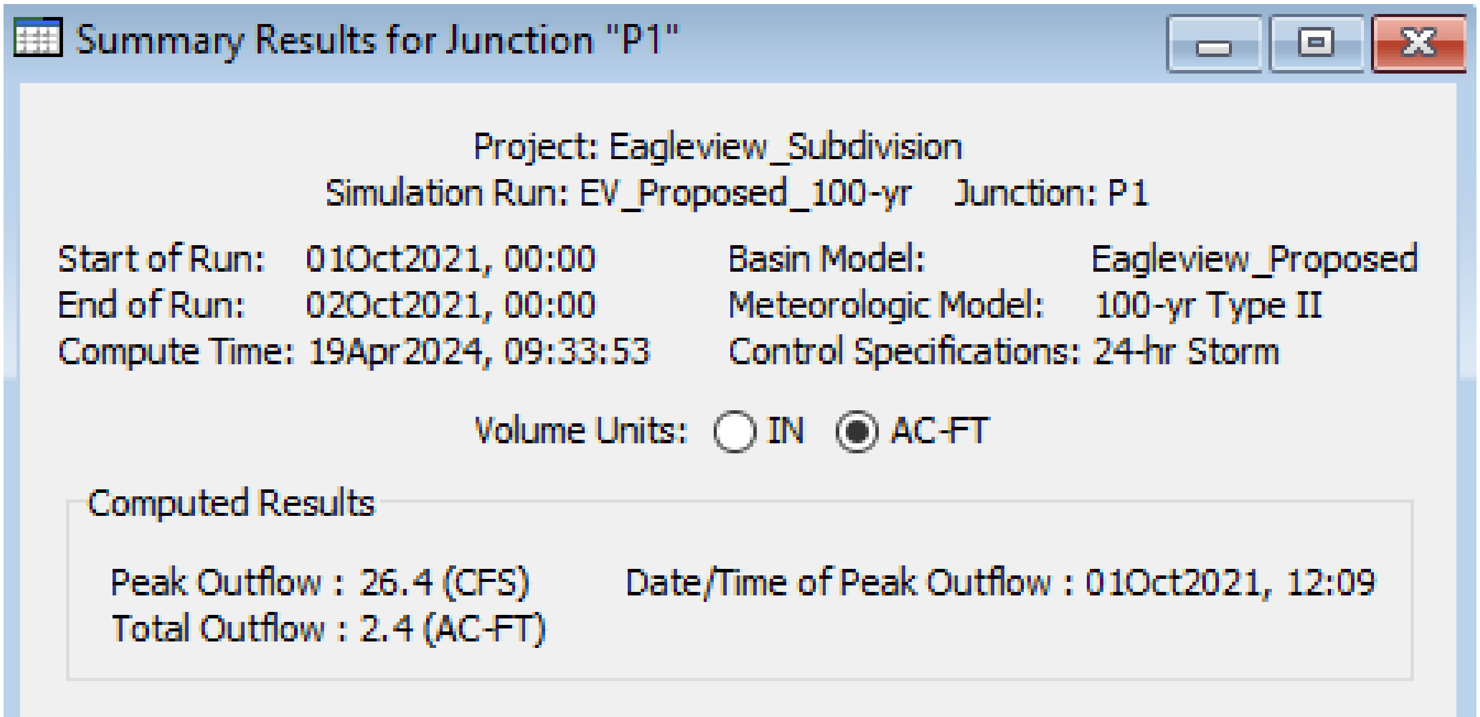
Basin Model: Eagleview_Proposed
Meteorologic Model: 100-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Discharge : 7.7 (CFS)
Total Precipitation : 1.6 (AC-FT)
Total Loss : 0.9 (AC-FT)
Total Excess : 0.7 (AC-FT)

Date/Time of Peak Discharge : 01Oct2021, 12:09
Total Direct Runoff : 0.7 (AC-FT)
Total Baseflow : 0.0 (AC-FT)
Discharge : 0.7 (AC-FT)



Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_100-yr Junction: P1

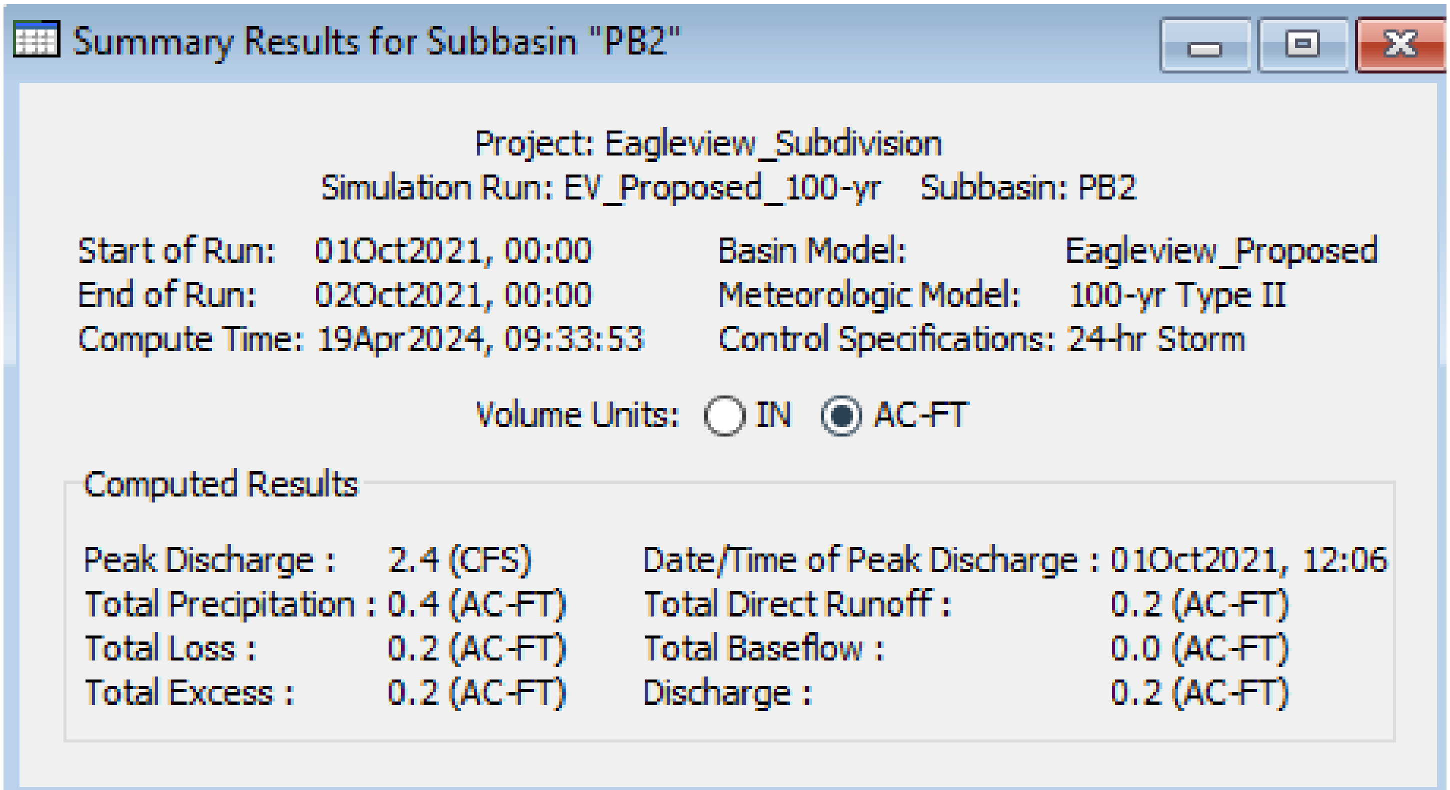
Start of Run: 01Oct2021, 00:00
End of Run: 02Oct2021, 00:00
Compute Time: 19Apr2024, 09:33:53

Basin Model: Eagleview_Proposed
Meteorologic Model: 100-yr Type II
Control Specifications: 24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Outflow : 26.4 (CFS)
Date/Time of Peak Outflow : 01Oct2021, 12:09
Total Outflow : 2.4 (AC-FT)


Summary Results for Subbasin "PB2"

Project: Eagleview_Subdivision
Simulation Run: EV_Proposed_100-yr Subbasin: PB2

Start of Run:	01Oct2021, 00:00	Basin Model:	Eagleview_Proposed
End of Run:	02Oct2021, 00:00	Meteorologic Model:	100-yr Type II
Compute Time:	19Apr2024, 09:33:53	Control Specifications:	24-hr Storm

Volume Units: ○ IN ● AC-FT

Computed Results

Peak Discharge :	2.4 (CFS)	Date/Time of Peak Discharge :	01Oct2021, 12:06
Total Precipitation :	0.4 (AC-FT)	Total Direct Runoff :	0.2 (AC-FT)
Total Loss :	0.2 (AC-FT)	Total Baseflow :	0.0 (AC-FT)
Total Excess :	0.2 (AC-FT)	Discharge :	0.2 (AC-FT)

Worksheet for R-B1 (Tri)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.030	
Channel Slope	0.031	ft/ft
Left Side Slope	1.300	H:V
Right Side Slope	1.300	H:V
Discharge	18.80	cfs

Results

Normal Depth	18.3	in
Flow Area	3.0	ft²
Wetted Perimeter	5.0	ft
Hydraulic Radius	7.2	in
Top Width	3.96	ft
Critical Depth	20.0	in
Critical Slope	0.019	ft/ft
Velocity	6.23	ft/s
Velocity Head	0.60	ft
Specific Energy	2.13	ft
Froude Number	1.258	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.0	in
Length	0.0	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.0	in
Profile Description	N/A	
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	18.3	in
Critical Depth	20.0	in
Channel Slope	0.031	ft/ft
Critical Slope	0.019	ft/ft

Worksheet for R-OB4 (Tri)

Project Description

Friction Method	Manning Formula	
Solve For	Normal Depth	

Input Data

Roughness Coefficient	0.030	
Channel Slope	0.020	ft/ft
Left Side Slope	1.300	H:V
Right Side Slope	1.300	H:V
Discharge	136.10	cfs

Results

Normal Depth	41.7	in
Flow Area	15.7	ft²
Wetted Perimeter	11.4	ft
Hydraulic Radius	16.5	in
Top Width	9.03	ft
Critical Depth	44.2	in
Critical Slope	0.015	ft/ft
Velocity	8.67	ft/s
Velocity Head	1.17	ft
Specific Energy	4.64	ft
Froude Number	1.160	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.0	in
Length	0.0	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.0	in
Profile Description	N/A	
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	41.7	in
Critical Depth	44.2	in
Channel Slope	0.020	ft/ft
Critical Slope	0.015	ft/ft

Worksheet for R-OB5 (Trap)

Project Description

Friction Method	Manning Formula	
Solve For	Normal Depth	

Input Data

Roughness Coefficient	0.030	
Channel Slope	0.020	ft/ft
Left Side Slope	3.000	H:V
Right Side Slope	3.000	H:V
Bottom Width	15.00	ft
Discharge	106.90	cfs

Results

Normal Depth	11.6	in
Flow Area	17.4	ft²
Wetted Perimeter	21.1	ft
Hydraulic Radius	9.9	in
Top Width	20.82	ft
Critical Depth	13.0	in
Critical Slope	0.014	ft/ft
Velocity	6.15	ft/s
Velocity Head	0.59	ft
Specific Energy	1.56	ft
Froude Number	1.187	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.0	in
Length	0.0	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.0	in
Profile Description	N/A	
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	11.6	in
Critical Depth	13.0	in
Channel Slope	0.020	ft/ft
Critical Slope	0.014	ft/ft

Worksheet for R-OB6 (Trap)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.030
Channel Slope	0.020 ft/ft
Left Side Slope	3.000 H:V
Right Side Slope	3.000 H:V
Bottom Width	15.00 ft
Discharge	371.30 cfs

Results

Normal Depth	23.4 in
Flow Area	40.7 ft²
Wetted Perimeter	27.3 ft
Hydraulic Radius	17.9 in
Top Width	26.70 ft
Critical Depth	27.3 in
Critical Slope	0.011 ft/ft
Velocity	9.13 ft/s
Velocity Head	1.30 ft
Specific Energy	3.25 ft
Froude Number	1.304
Flow Type	Supercritical

GVF Input Data

Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	23.4 in
Critical Depth	27.3 in
Channel Slope	0.020 ft/ft
Critical Slope	0.011 ft/ft

Worksheet for R-OB7 (Trap)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.030
Channel Slope	0.020 ft/ft
Left Side Slope	3.000 H:V
Right Side Slope	3.000 H:V
Bottom Width	15.00 ft
Discharge	478.00 cfs

Results

Normal Depth	26.8 in
Flow Area	48.6 ft²
Wetted Perimeter	29.1 ft
Hydraulic Radius	20.0 in
Top Width	28.42 ft
Critical Depth	31.6 in
Critical Slope	0.011 ft/ft
Velocity	9.84 ft/s
Velocity Head	1.51 ft
Specific Energy	3.74 ft
Froude Number	1.328
Flow Type	Supercritical

GVF Input Data

Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	26.8 in
Critical Depth	31.6 in
Channel Slope	0.020 ft/ft
Critical Slope	0.011 ft/ft

Worksheet for R-OB8 (Tri)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.030
Channel Slope	0.033 ft/ft
Left Side Slope	1.300 H:V
Right Side Slope	1.300 H:V
Discharge	51.60 cfs

Results

Normal Depth	26.4 in
Flow Area	6.3 ft²
Wetted Perimeter	7.2 ft
Hydraulic Radius	10.5 in
Top Width	5.72 ft
Critical Depth	30.0 in
Critical Slope	0.017 ft/ft
Velocity	8.21 ft/s
Velocity Head	1.05 ft
Specific Energy	3.25 ft
Froude Number	1.380
Flow Type	Supercritical

GVF Input Data

Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data

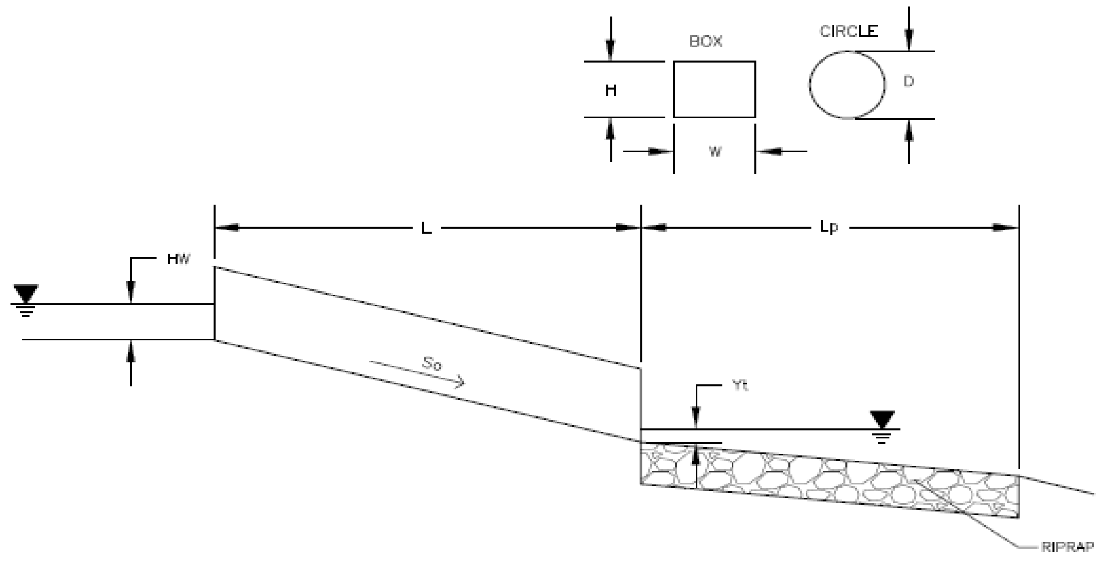
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	26.4 in
Critical Depth	30.0 in
Channel Slope	0.033 ft/ft
Critical Slope	0.017 ft/ft

APPENDIX C: HYDRAULICS

DETERMINATION OF CULVERT HEADWATER AND OUTLET PROTECTION

MHFD-Culvert, Version 4.00 (May 2020)

Project: **Eagleview**
ID: **EXISTING Culvert - Arroya Lane**



Soil Type:
Choose One:
● Sandy
○ Non-Sandy

Supercritical Flow! Using Adjusted Diameter to calculate protection type.

Design Information:

Design Discharge	Q =	106.9	cfs

Circular Culvert:

Barrel Diameter in Inches	D =	48	inches
Inlet Edge Type (Choose from pull-down list)		Square Edge Projecting	

OR:

Box Culvert:

		OR	
Barrel Height (Rise) in Feet	H (Rise) =		ft
Barrel Width (Span) in Feet	W (Span) =		ft
Inlet Edge Type (Choose from pull-down list)			
Number of Barrels	# Barrels =	1	
Inlet Elevation	Elev IN =	7267.4	ft
Outlet Elevation **OR** Slope	Elev OUT =	7265.7	ft
Culvert Length	L =	61.5	ft
Manning's Roughness	n =	0.012	
Bend Loss Coefficient	k_b =	0	
Exit Loss Coefficient	k_x =	1	
Tailwater Surface Elevation	$Y_{t,\ Elevation}$ =		ft
Max Allowable Channel Velocity	V =	5	ft/s

Calculated Results:

Culvert Cross Sectional Area Available	A =	12.57	ft^2
Culvert Normal Depth	Y_n =	1.79	ft
Culvert Critical Depth	Y_c =	3.13	ft
Froude Number	Fr =	2.96	**Supercritical!**
Entrance Loss Coefficient	k_e =	0.20	
Friction Loss Coefficient	k_f =	0.26	
Sum of All Loss Coefficients	k_s =	1.46	ft

Headwater:

Inlet Control Headwater	HW_I =	5.58	ft
Outlet Control Headwater	HW_O =	3.50	ft
Design Headwater Elevation	**HW =**	**7272.98**	**ft**
Headwater/Diameter OR Headwater/Rise Ratio	**HW/D =**	**1.39**	

Outlet Protection:

Flow/(Diameter^2.5)	Q/D^2.5 =	3.34	$ft^{0.5}/s$
Tailwater Surface Height	Y_t =	1.60	ft
Tailwater/Diameter	Yt/D =	0.40	
Expansion Factor	1/(2*tan(Θ)) =	4.08	
Flow Area at Max Channel Velocity	A_t =	21.38	ft^2
Width of Equivalent Conduit for Multiple Barrels	W_{eq} =	-	ft
Length of Riprap Protection	**L_p =**	**39**	**ft**
Width of Riprap Protection at Downstream End	**T =**	**14**	**ft**
Adjusted Diameter for Supercritical Flow	Da =	2.89	ft
Minimum Theoretical Riprap Size	d_{50} min=	12	in
Nominal Riprap Size	d_{50} nominal=	18	in
MHFD Riprap Type	**Type =**	**H**	

Culvert Summary Table

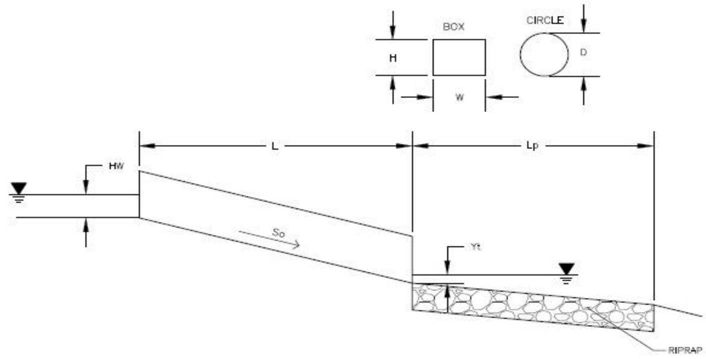
Culvert	Design Point	Pipe Size (in)	Barrels (No.)	Design Discharge Q100 (cfs)	Low Tailwater Basin Bottom Width -W (ft)	Low Tailwater Basin Length - L (ft)	Low Tailwater Basin Top Width (ft)	Headwater Depth	Upstream Invert	HW/D	HGL (Upstream Ponding Depth Elevation)	Culvert Normal Depth [HGL in Culvert] (ft)
(Ex.) Arroya Ln	OB5	48	1	106.9	11	24	23	5.58	7267.4	1.40	7272.98	1.79
1	PB3	18	1	3.3	4	15	16	1	7207.85	0.67	7208.85	0.56
2	P10	36	3	150.2	26	20	38	4	7205.31	1.33	7209.31	2.41
3	P11	24	2	28	12	15	24	2.13	7204.44	1.07	7206.57	1.08
4	PB7	18	1	7.4	4	15	16	1.71	7210.32	1.14	7212.03	0.94
5	N/A	18	1	0.9	4	15	16	0.48	7232.7	0.32	7233.18	0.36
6	P9	36	2	87.8	16	20	28	3.26	7214.87	1.09	7218.13	1.73
7	P5	36	2	96.1	16	20	28	3.82	7230.29	1.27	7234.11	1.35
8	P12	66	2	474.8	22	32	34	7.7	7201.96	1.40	7209.66	4.04
Det Pond 3	N/A	42	1	101	11	24	23	N/A	7230.04	N/A	N/A	3.5
*WQ Pond 1	N/A	24	1	19.3	4	15	16	N/A	7192	N/A	N/A	2
*WQ Pond 2	N/A	18	1	7.6	4	15	16	N/A	7199.39	N/A	N/A	0.98

*The water quality ponds are designed to release the 2-year flow.

DETERMINATION OF CULVERT HEADWATER AND OUTLET PROTECTION

MHFD-Culvert, Version 4.00 (May 2020)

Project: Eagleview
ID: Culvert 1



Soil Type:
Choose One:
● Sandy
○ Non-Sandy

Supercritical Flow! Using Adjusted Diameter to calculate protection type.

Design Information:

Design Discharge	Q =	3.3	cfs

Circular Culvert:

Barrel Diameter in Inches	D =	18	inches
Inlet Edge Type (Choose from pull-down list)	Square Edge with Headwall		

OR:

Box Culvert: OR

Barrel Height (Rise) in Feet	H (Rise) =		ft
Barrel Width (Span) in Feet	W (Span) =		ft
Inlet Edge Type (Choose from pull-down list)			

Number of Barrels	# Barrels =	1	
Inlet Elevation	Elev IN =	7207.85	ft
Outlet Elevation OR Slope	Elev OUT =	7207.09	ft
Culvert Length	L =	79.8	ft
Manning's Roughness	n =	0.012	
Bend Loss Coefficient	k_b =	0	
Exit Loss Coefficient	k_x =	1	
Tailwater Surface Elevation	$Y_{t,\ Elevation}$ =		ft
Max Allowable Channel Velocity	V =	5	ft/s

Calculated Results:

Culvert Cross Sectional Area Available	A =	1.77	ft^2
Culvert Normal Depth	Y_n =	0.56	ft
Culvert Critical Depth	Y_c =	0.69	ft
Froude Number	Fr =	1.50	Supercritical!
Entrance Loss Coefficient	k_e =	0.50	
Friction Loss Coefficient	k_f =	1.23	
Sum of All Loss Coefficients	k_s =	2.73	ft

Headwater:

Inlet Control Headwater	HW_I =	1.00	ft
Outlet Control Headwater	HW_O =	N/A	ft
Design Headwater Elevation	HW =	N/A	ft
Headwater/Diameter OR Headwater/Rise Ratio	HW/D =	N/A	

Outlet Control Headwater Approximation Method Inaccurate for Low Flow - Backwater Calculations Required

Outlet Protection:

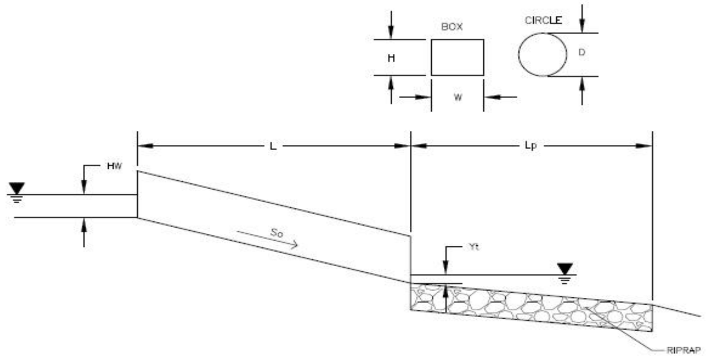
Flow/(Diameter^2.5)	Q/D^2.5 =	1.20	$ft^{0.5}/s$
Tailwater Surface Height	Y_t =	0.60	ft
Tailwater/Diameter	Yt/D =	0.40	
Expansion Factor	1/(2*tan(Θ)) =	6.51	
Flow Area at Max Channel Velocity	A_t =	0.66	ft^2
Width of Equivalent Conduit for Multiple Barrels	W_{eq} =	-	ft
Length of Riprap Protection	L_p =	5	ft
Width of Riprap Protection at Downstream End	T =	3	ft

Adjusted Diameter for Supercritical Flow	Da =	1.03	ft
Minimum Theoretical Riprap Size	d_{50} min=	2	in
Nominal Riprap Size	d_{50} nominal=	6	in
MHFD Riprap Type	Type =	VL	

DETERMINATION OF CULVERT HEADWATER AND OUTLET PROTECTION

MHFD-Culvert, Version 4.00 (May 2020)

Project: Eagleview
ID: Culvert 2



Soil Type:
Choose One:
● Sandy
○ Non-Sandy

Design Information:

Design Discharge	Q =	150.2	cfs
Circular Culvert:			
Barrel Diameter in Inches	D =	36	inches
Inlet Edge Type (Choose from pull-down list)		Square Edge with Headwall	
OR:			
Box Culvert:		OR	
Barrel Height (Rise) in Feet	H (Rise) =		ft
Barrel Width (Span) in Feet	W (Span) =		ft
Inlet Edge Type (Choose from pull-down list)			
Number of Barrels	# Barrels =	3	
Inlet Elevation	Elev IN =	7205.35	ft
Outlet Elevation OR Slope	Elev OUT =	7204.97	ft
Culvert Length	L =	76.5	ft
Manning's Roughness	n =	0.012	
Bend Loss Coefficient	k_b =	0	
Exit Loss Coefficient	k_x =	1	
Tailwater Surface Elevation	$Y_{t,\ Elevation}$ =		ft
Max Allowable Channel Velocity	V =	5	ft/s

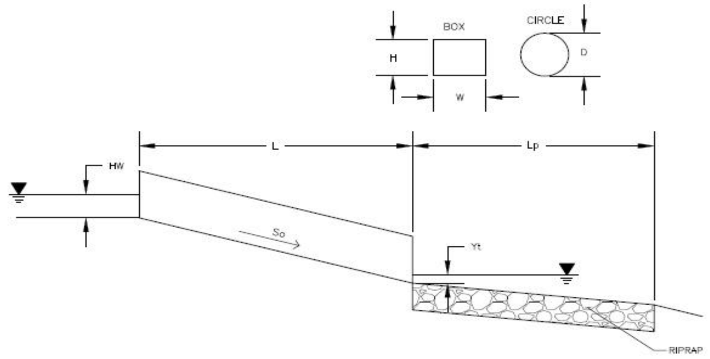
Calculated Results:

Culvert Cross Sectional Area Available	A =	7.07	ft^2
Culvert Normal Depth	Y_n =	2.41	ft
Culvert Critical Depth	Y_c =	2.30	ft
Froude Number	Fr =	0.91	
Entrance Loss Coefficient	k_e =	0.50	
Friction Loss Coefficient	k_f =	0.47	
Sum of All Loss Coefficients	k_s =	1.97	ft
Headwater:			
Inlet Control Headwater	HW_I =	4.00	ft
Outlet Control Headwater	HW_O =	3.81	ft
Design Headwater Elevation	HW =	7209.35	ft
Headwater/Diameter OR Headwater/Rise Ratio	HW/D =	1.33	
Outlet Protection:			
Flow/(Diameter^2.5)	Q/D^2.5 =	3.21	$ft^{0.5}/s$
Tailwater Surface Height	Y_t =	1.20	ft
Tailwater/Diameter	Yt/D =	0.40	
Expansion Factor	1/(2*tan(Θ)) =	4.20	
Flow Area at Max Channel Velocity	A_t =	30.04	ft^2
Width of Equivalent Conduit for Multiple Barrels	W_{eq} =	9.00	ft
Length of Riprap Protection	L_p =	30	ft
Width of Riprap Protection at Downstream End	T =	17	ft
Adjusted Diameter for Supercritical Flow	Da =	-	ft
Minimum Theoretical Riprap Size	d_{50} min=	8	in
Nominal Riprap Size	d_{50} nominal=	9	in
MHFD Riprap Type	Type =	L	

DETERMINATION OF CULVERT HEADWATER AND OUTLET PROTECTION

MHFD-Culvert, Version 4.00 (May 2020)

Project: Eagleview
ID: Culvert 3



Soil Type:
Choose One:
● Sandy
○ Non-Sandy

Supercritical Flow! Using Adjusted Diameter to calculate protection type.

Design Information:

Design Discharge	Q =	28	cfs

Circular Culvert:

Barrel Diameter in Inches	D =	24	inches
Inlet Edge Type (Choose from pull-down list)		Square Edge with Headwall	

OR:

Box Culvert:

		OR	
Barrel Height (Rise) in Feet	H (Rise) =		ft
Barrel Width (Span) in Feet	W (Span) =		ft
Inlet Edge Type (Choose from pull-down list)			
Number of Barrels	# Barrels =	2	
Inlet Elevation	Elev IN =	7204.5	ft
Outlet Elevation OR Slope	Elev OUT =	7203.49	ft
Culvert Length	L =	100.6	ft
Manning's Roughness	n =	0.012	
Bend Loss Coefficient	k_b =	0	
Exit Loss Coefficient	k_x =	1	
Tailwater Surface Elevation	$Y_{t,\ Elevation}$ =		ft
Max Allowable Channel Velocity	V =	5	ft/s

Calculated Results:

Culvert Cross Sectional Area Available	A =	3.14	ft^2
Culvert Normal Depth	Y_n =	1.08	ft
Culvert Critical Depth	Y_c =	1.35	ft
Froude Number	Fr =	1.53	Supercritical!
Entrance Loss Coefficient	k_e =	0.50	
Friction Loss Coefficient	k_f =	1.06	
Sum of All Loss Coefficients	k_s =	2.56	ft

Headwater:

Inlet Control Headwater	HW_I =	2.13	ft
Outlet Control Headwater	HW_O =	N/A	ft
Design Headwater Elevation	HW =	7206.63	ft
Headwater/Diameter OR Headwater/Rise Ratio	HW/D =	1.07	

Outlet Control Headwater Approximation Method Inaccurate for Low Flow - Backwater Calculations Required

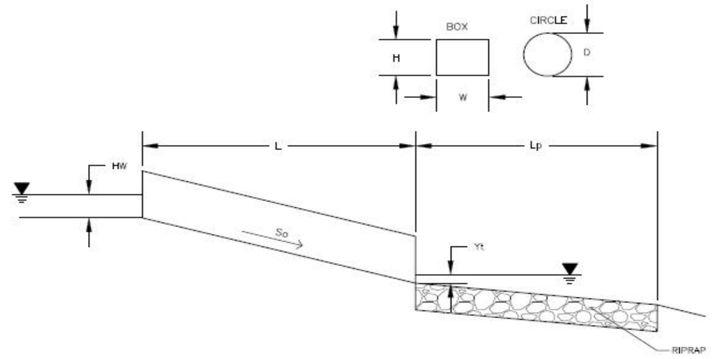
Outlet Protection:

Flow/(Diameter^2.5)	Q/D^2.5 =	2.47	$ft^{0.5}/s$
Tailwater Surface Height	Y_t =	0.80	ft
Tailwater/Diameter	Yt/D =	0.40	
Expansion Factor	1/(2*tan(Θ)) =	5.10	
Flow Area at Max Channel Velocity	A_t =	5.60	ft^2
Width of Equivalent Conduit for Multiple Barrels	W_{eq} =	4.00	ft
Length of Riprap Protection	L_p =	16	ft
Width of Riprap Protection at Downstream End	T =	8	ft
Adjusted Diameter for Supercritical Flow	Da =	1.54	ft
Minimum Theoretical Riprap Size	d_{50} min=	4	in
Nominal Riprap Size	d_{50} nominal=	6	in
MHFD Riprap Type	Type =	VL	

DETERMINATION OF CULVERT HEADWATER AND OUTLET PROTECTION

MHFD-Culvert, Version 4.00 (May 2020)

Project: Eagleview
ID: Culvert 4



Soil Type:
Choose One:
● Sandy
○ Non-Sandy

Supercritical Flow! Using Adjusted Diameter to calculate protection type.

Design Information:

Design Discharge	Q =	7.4	cfs

Circular Culvert:

Barrel Diameter in Inches	D =	18	inches
Inlet Edge Type (Choose from pull-down list)	Square Edge with Headwall		

OR:

Box Culvert:

		OR	
Barrel Height (Rise) in Feet	H (Rise) =		ft
Barrel Width (Span) in Feet	W (Span) =		ft
Inlet Edge Type (Choose from pull-down list)			
Number of Barrels	# Barrels =	1	
Inlet Elevation	Elev IN =	7210.32	ft
Outlet Elevation OR Slope	Elev OUT =	7209.67	ft
Culvert Length	L =	78.9	ft
Manning's Roughness	n =	0.012	
Bend Loss Coefficient	k_b =	0	
Exit Loss Coefficient	k_x =	1	
Tailwater Surface Elevation	$Y_{t,\ Elevation}$ =		ft
Max Allowable Channel Velocity	V =	5	ft/s

Calculated Results:

Culvert Cross Sectional Area Available	A =	1.77	ft^2
Culvert Normal Depth	Y_n =	0.94	ft
Culvert Critical Depth	Y_c =	1.05	ft
Froude Number	Fr =	1.25	Supercritical!
Entrance Loss Coefficient	k_e =	0.50	
Friction Loss Coefficient	k_f =	1.22	
Sum of All Loss Coefficients	k_s =	2.72	ft

Headwater:

Inlet Control Headwater	HW_I =	1.71	ft
Outlet Control Headwater	HW_O =	1.37	ft
Design Headwater Elevation	HW =	7212.03	ft
Headwater/Diameter OR Headwater/Rise Ratio	HW/D =	1.14	

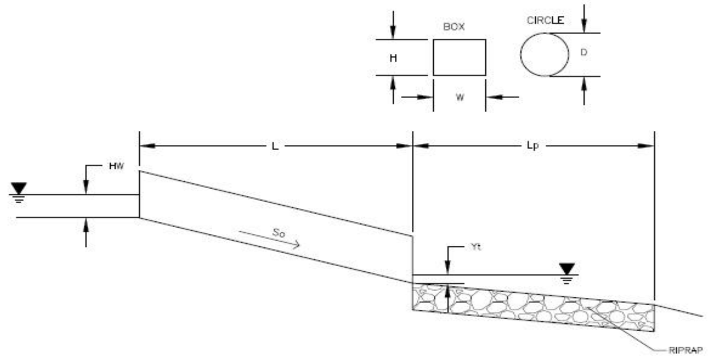
Outlet Protection:

Flow/(Diameter^2.5)	Q/D^2.5 =	2.69	$ft^{0.5}/s$
Tailwater Surface Height	Y_t =	0.60	ft
Tailwater/Diameter	Yt/D =	0.40	
Expansion Factor	1/(2*tan(Θ)) =	4.81	
Flow Area at Max Channel Velocity	A_t =	1.48	ft^2
Width of Equivalent Conduit for Multiple Barrels	W_{eq} =	-	ft
Length of Riprap Protection	L_p =	5	ft
Width of Riprap Protection at Downstream End	T =	3	ft
Adjusted Diameter for Supercritical Flow	Da =	1.22	ft
Minimum Theoretical Riprap Size	d_{50} min=	4	in
Nominal Riprap Size	d_{50} nominal=	6	in
MHFD Riprap Type	Type =	VL	

DETERMINATION OF CULVERT HEADWATER AND OUTLET PROTECTION

MHFD-Culvert, Version 4.00 (May 2020)

Project: Eagleview
ID: Culvert 5



Soil Type:
Choose One:
● Sandy
○ Non-Sandy

Supercritical Flow! Using Adjusted Diameter to calculate protection type.

Design Information:

Design Discharge	Q =	0.9	cfs
Circular Culvert:			
Barrel Diameter in Inches	D =	18	inches
Inlet Edge Type (Choose from pull-down list)		Square Edge with Headwall	
OR:			
Box Culvert:		OR	
Barrel Height (Rise) in Feet	H (Rise) =		ft
Barrel Width (Span) in Feet	W (Span) =		ft
Inlet Edge Type (Choose from pull-down list)			
Number of Barrels	# Barrels =	1	
Inlet Elevation	Elev IN =	7232.7	ft
Outlet Elevation OR Slope	Elev OUT =	7231.3	ft
Culvert Length	L =	70.2	ft
Manning's Roughness	n =	0.012	
Bend Loss Coefficient	k_b =	0	
Exit Loss Coefficient	k_x =	1	
Tailwater Surface Elevation	$Y_{t,\ Elevation}$ =		ft
Max Allowable Channel Velocity	V =	5	ft/s

Calculated Results:

Culvert Cross Sectional Area Available	A =	1.77	ft^2
Culvert Normal Depth	Y_n =	0.24	ft
Culvert Critical Depth	Y_c =	0.35	ft
Froude Number	Fr =	2.12	Supercritical!
Entrance Loss Coefficient	k_e =	0.50	
Friction Loss Coefficient	k_f =	1.08	
Sum of All Loss Coefficients	k_s =	2.58	ft
Headwater:			
Inlet Control Headwater	HW_I =	0.48	ft
Outlet Control Headwater	HW_O =	N/A	ft
Design Headwater Elevation	HW =	N/A	ft
Headwater/Diameter OR Headwater/Rise Ratio	HW/D =	N/A	

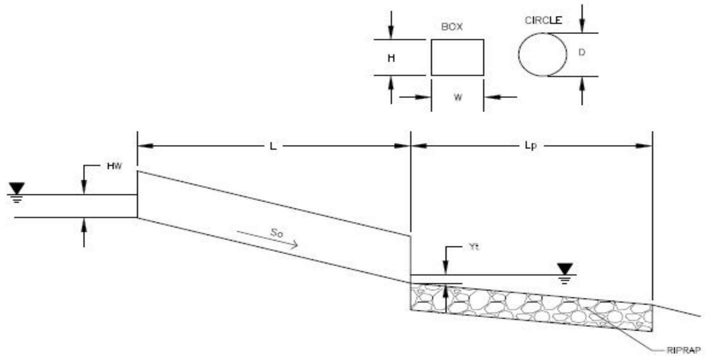
Outlet Control Headwater Approximation Method Inaccurate for Low Flow - Backwater Calculations Required

Outlet Protection:			
Flow/(Diameter^2.5)	Q/D^2.5 =	0.33	$ft^{0.5}/s$
Tailwater Surface Height	Y_t =	0.60	ft
Tailwater/Diameter	Yt/D =	0.40	
Expansion Factor	1/(2*tan(Θ)) =	6.70	
Flow Area at Max Channel Velocity	A_t =	0.18	ft^2
Width of Equivalent Conduit for Multiple Barrels	W_{eq} =	-	ft
Length of Riprap Protection	L_p =	5	ft
Width of Riprap Protection at Downstream End	T =	3	ft
Adjusted Diameter for Supercritical Flow	Da =	0.87	ft
Minimum Theoretical Riprap Size	d_{50} min=	0	in
Nominal Riprap Size	d_{50} nominal=	6	in
MHFD Riprap Type	Type =	VL	

DETERMINATION OF CULVERT HEADWATER AND OUTLET PROTECTION

MHFD-Culvert, Version 4.00 (May 2020)

Project: Eagleview
ID: Culvert 6



Soil Type:
Choose One:
● Sandy
○ Non-Sandy

Supercritical Flow! Using Adjusted Diameter to calculate protection type.

Design Information:

Design Discharge	Q =	87.8	cfs
Circular Culvert:			
Barrel Diameter in Inches	D =	36	inches
Inlet Edge Type (Choose from pull-down list)		Square Edge with Headwall	
OR:			
Box Culvert:		OR	
Barrel Height (Rise) in Feet	H (Rise) =		ft
Barrel Width (Span) in Feet	W (Span) =		ft
Inlet Edge Type (Choose from pull-down list)			
Number of Barrels	# Barrels =	2	
Inlet Elevation	Elev IN =	7214.87	ft
Outlet Elevation OR Slope	Elev OUT =	7214.25	ft
Culvert Length	L =	83.3	ft
Manning's Roughness	n =	0.012	
Bend Loss Coefficient	k_b =	0	
Exit Loss Coefficient	k_x =	1	
Tailwater Surface Elevation	$Y_{t,\ Elevation}$ =		ft
Max Allowable Channel Velocity	V =	5	ft/s

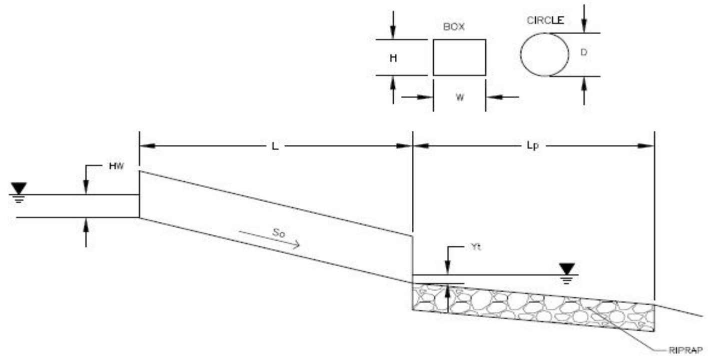
Calculated Results:

Culvert Cross Sectional Area Available	A =	7.07	ft^2
Culvert Normal Depth	Y_n =	1.85	ft
Culvert Critical Depth	Y_c =	2.16	ft
Froude Number	Fr =	1.35	Supercritical!
Entrance Loss Coefficient	k_e =	0.50	
Friction Loss Coefficient	k_f =	0.51	
Sum of All Loss Coefficients	k_s =	2.01	ft
Headwater:			
Inlet Control Headwater	HW_I =	3.55	ft
Outlet Control Headwater	HW_O =	3.16	ft
Design Headwater Elevation	HW =	7218.42	ft
Headwater/Diameter OR Headwater/Rise Ratio	HW/D =	1.18	
Outlet Protection:			
Flow/(Diameter^2.5)	Q/D^2.5 =	2.82	$ft^{0.5}/s$
Tailwater Surface Height	Y_t =	1.20	ft
Tailwater/Diameter	Yt/D =	0.40	
Expansion Factor	1/(2*tan(Θ)) =	4.63	
Flow Area at Max Channel Velocity	A_t =	17.56	ft^2
Width of Equivalent Conduit for Multiple Barrels	W_{eq} =	6.00	ft
Length of Riprap Protection	L_p =	30	ft
Width of Riprap Protection at Downstream End	T =	13	ft
Adjusted Diameter for Supercritical Flow	Da =	2.43	ft
Minimum Theoretical Riprap Size	d_{50} min=	7	in
Nominal Riprap Size	d_{50} nominal=	9	in
MHFD Riprap Type	Type =	L	

DETERMINATION OF CULVERT HEADWATER AND OUTLET PROTECTION

MHFD-Culvert, Version 4.00 (May 2020)

Project: Eagleview
ID: Culvert 7



Soil Type:
Choose One:
● Sandy
○ Non-Sandy

Supercritical Flow! Using Adjusted Diameter to calculate protection type.

Design Information:

Design Discharge	Q =	96.1	cfs
Circular Culvert:			
Barrel Diameter in Inches	D =	36	inches
Inlet Edge Type (Choose from pull-down list)		Square Edge with Headwall	
OR:			
Box Culvert:		OR	
Barrel Height (Rise) in Feet	H (Rise) =		ft
Barrel Width (Span) in Feet	W (Span) =		ft
Inlet Edge Type (Choose from pull-down list)			
Number of Barrels	# Barrels =	2	
Inlet Elevation	Elev IN =	7230.29	ft
Outlet Elevation OR Slope	Elev OUT =	7228.38	ft
Culvert Length	L =	76.4	ft
Manning's Roughness	n =	0.012	
Bend Loss Coefficient	k_b =	0	
Exit Loss Coefficient	k_x =	1	
Tailwater Surface Elevation	$Y_{t,\ Elevation}$ =		ft
Max Allowable Channel Velocity	V =	5	ft/s

Calculated Results:

Culvert Cross Sectional Area Available	A =	7.07	ft^2
Culvert Normal Depth	Y_n =	1.35	ft
Culvert Critical Depth	Y_c =	2.26	ft
Froude Number	Fr =	2.68	Supercritical!
Entrance Loss Coefficient	k_e =	0.50	
Friction Loss Coefficient	k_f =	0.47	
Sum of All Loss Coefficients	k_s =	1.97	ft
Headwater:			
Inlet Control Headwater	HW_I =	3.82	ft
Outlet Control Headwater	HW_O =	N/A	ft
Design Headwater Elevation	HW =	7234.11	ft
Headwater/Diameter OR Headwater/Rise Ratio	HW/D =	1.27	

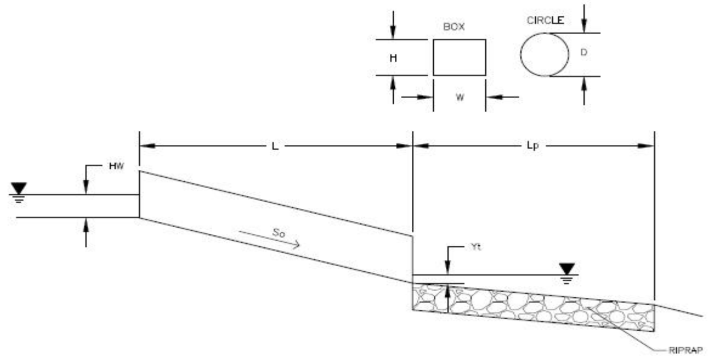
Outlet Control Headwater Approximation Method Inaccurate for Low Flow - Backwater Calculations Required

Outlet Protection:			
Flow/(Diameter^2.5)	Q/D^2.5 =	3.08	$ft^{0.5}/s$
Tailwater Surface Height	Y_t =	1.20	ft
Tailwater/Diameter	Yt/D =	0.40	
Expansion Factor	1/(2*tan(Θ)) =	4.31	
Flow Area at Max Channel Velocity	A_t =	19.22	ft^2
Width of Equivalent Conduit for Multiple Barrels	W_{eq} =	6.00	ft
Length of Riprap Protection	L_p =	30	ft
Width of Riprap Protection at Downstream End	T =	13	ft
Adjusted Diameter for Supercritical Flow	Da =	2.18	ft
Minimum Theoretical Riprap Size	d_{50} min=	8	in
Nominal Riprap Size	d_{50} nominal=	9	in
MHFD Riprap Type	Type =	L	

DETERMINATION OF CULVERT HEADWATER AND OUTLET PROTECTION

MHFD-Culvert, Version 4.00 (May 2020)

Project: Eagleview
ID: Culvert 8



Soil Type:
Choose One:
● Sandy
○ Non-Sandy

Supercritical Flow! Using Adjusted Diameter to calculate protection type.

Design Information:

Design Discharge	Q =	474.8	cfs

Circular Culvert:

Barrel Diameter in Inches	D =	66	inches
Inlet Edge Type (Choose from pull-down list)		Square Edge with Headwall	

OR:
Box Culvert:

		OR	
Barrel Height (Rise) in Feet	H (Rise) =		ft
Barrel Width (Span) in Feet	W (Span) =		ft
Inlet Edge Type (Choose from pull-down list)			
Number of Barrels	# Barrels =	2	
Inlet Elevation	Elev IN =	7201.96	ft
Outlet Elevation OR Slope	Elev OUT =	7201.48	ft
Culvert Length	L =	97	ft
Manning's Roughness	n =	0.012	
Bend Loss Coefficient	k_b =	0	
Exit Loss Coefficient	k_x =	1	
Tailwater Surface Elevation	$Y_{t,\ Elevation}$ =		ft
Max Allowable Channel Velocity	V =	5	ft/s

Calculated Results:

Culvert Cross Sectional Area Available	A =	23.76	ft^2
Culvert Normal Depth	Y_n =	4.18	ft
Culvert Critical Depth	Y_c =	4.30	ft
Froude Number	Fr =	1.06	Supercritical!
Entrance Loss Coefficient	k_e =	0.50	
Friction Loss Coefficient	k_f =	0.26	
Sum of All Loss Coefficients	k_s =	1.76	ft

Headwater:

Inlet Control Headwater	HW_I =	7.63	ft
Outlet Control Headwater	HW_O =	7.16	ft
Design Headwater Elevation	HW =	7209.59	ft
Headwater/Diameter OR Headwater/Rise Ratio	HW/D =	1.39	

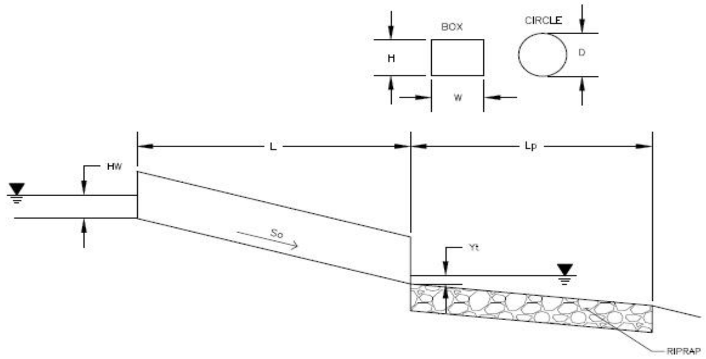
Outlet Protection:

Flow/(Diameter^2.5)	Q/D^2.5 =	3.35	$ft^{0.5}/s$
Tailwater Surface Height	Y_t =	2.20	ft
Tailwater/Diameter	Yt/D =	0.40	
Expansion Factor	1/(2*tan(Θ)) =	4.08	
Flow Area at Max Channel Velocity	A_t =	94.96	ft^2
Width of Equivalent Conduit for Multiple Barrels	W_{eq} =	11.00	ft
Length of Riprap Protection	L_p =	55	ft
Width of Riprap Protection at Downstream End	T =	25	ft
Adjusted Diameter for Supercritical Flow	Da =	4.84	ft
Minimum Theoretical Riprap Size	d_{50} min=	16	in
Nominal Riprap Size	d_{50} nominal=	18	in
MHFD Riprap Type	Type =	H	

DETERMINATION OF CULVERT HEADWATER AND OUTLET PROTECTION

MHFD-Culvert, Version 4.00 (May 2020)

Project: Eagleview
ID: Pond #3 Outfall Culvert 42-inch



Soil Type:
Choose One:
● Sandy
○ Non-Sandy

Design Information:

Design Discharge	Q =	101	cfs

Circular Culvert:

Barrel Diameter in Inches	D =	42	inches
Inlet Edge Type (Choose from pull-down list)		Square Edge with Headwall	

OR:

Box Culvert: OR

Barrel Height (Rise) in Feet	H (Rise) =		ft
Barrel Width (Span) in Feet	W (Span) =		ft
Inlet Edge Type (Choose from pull-down list)			
Number of Barrels	# Barrels =	1	
Inlet Elevation	Elev IN =	7230.34	ft
Outlet Elevation OR Slope	Elev OUT =	7230.04	ft
Culvert Length	L =	61	ft
Manning's Roughness	n =	0.012	
Bend Loss Coefficient	k_b =	0	
Exit Loss Coefficient	k_x =	1	
Tailwater Surface Elevation	$Y_{t,\ Elevation}$ =		ft
Max Allowable Channel Velocity	V =	5	ft/s

Calculated Results:

Culvert Cross Sectional Area Available	A =	9.62	ft^2
Culvert Normal Depth	Y_n =	3.50	ft
Culvert Critical Depth	Y_c =	3.08	ft
Froude Number	Fr =	-	Pressure flow!
Entrance Loss Coefficient	k_e =	0.50	
Friction Loss Coefficient	k_f =	0.30	
Sum of All Loss Coefficients	k_s =	1.80	ft

Headwater:

Inlet Control Headwater	HW_I =	6.68	ft
Outlet Control Headwater	HW_O =	6.08	ft
Design Headwater Elevation	HW =	7237.02	ft
Headwater/Diameter OR Headwater/Rise Ratio	HW/D =	1.91	HW/D > 1.5!

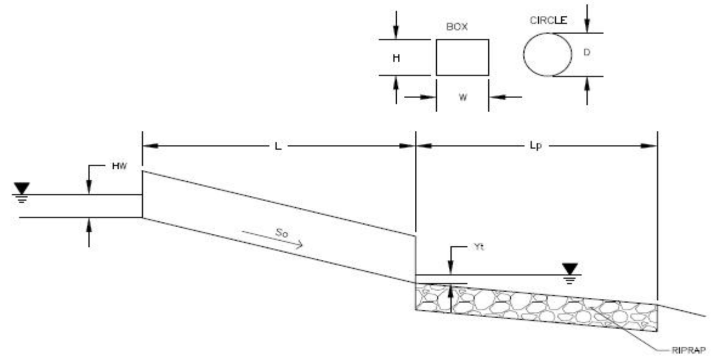
Outlet Protection:

Flow/(Diameter^2.5)	Q/D^2.5 =	4.41	$ft^{0.5}/s$
Tailwater Surface Height	Y_t =	1.40	ft
Tailwater/Diameter	Yt/D =	0.40	
Expansion Factor	1/(2*tan(Θ)) =	3.06	
Flow Area at Max Channel Velocity	A_t =	20.20	ft^2
Width of Equivalent Conduit for Multiple Barrels	W_{eq} =	-	ft
Length of Riprap Protection	L_p =	34	ft
Width of Riprap Protection at Downstream End	T =	15	ft
Adjusted Diameter for Supercritical Flow	Da =	-	ft
Minimum Theoretical Riprap Size	d_{50} min=	13	in
Nominal Riprap Size	d_{50} nominal=	18	in
MHFD Riprap Type	Type =	H	

DETERMINATION OF CULVERT HEADWATER AND OUTLET PROTECTION

MHFD-Culvert, Version 4.00 (May 2020)

Project: Eagleview
ID: Water Quality Pond 1 Outfall



Soil Type:
Choose One:
● Sandy
○ Non-Sandy

Design Information:

Design Discharge	Q =	19.3	cfs

Circular Culvert:

Barrel Diameter in Inches	D =	24	inches
Inlet Edge Type (Choose from pull-down list)		Grooved Edge Projecting	

OR:

Box Culvert:

		OR	
Barrel Height (Rise) in Feet	H (Rise) =		ft
Barrel Width (Span) in Feet	W (Span) =		ft
Inlet Edge Type (Choose from pull-down list)			
Number of Barrels	# Barrels =	1	
Inlet Elevation	Elev IN =	7192	ft
Outlet Elevation OR Slope	Elev OUT =	7191.74	ft
Culvert Length	L =	52	ft
Manning's Roughness	n =	0.012	
Bend Loss Coefficient	k_b =	0	
Exit Loss Coefficient	k_x =	1	
Tailwater Surface Elevation	$Y_{t,\ Elevation}$ =		ft
Max Allowable Channel Velocity	V =	5	ft/s

Calculated Results:

Culvert Cross Sectional Area Available	A =	3.14	ft^2
Culvert Normal Depth	Y_n =	2.00	ft
Culvert Critical Depth	Y_c =	1.58	ft
Froude Number	Fr =	-	Pressure flow!
Entrance Loss Coefficient	k_e =	0.20	
Friction Loss Coefficient	k_f =	0.55	
Sum of All Loss Coefficients	k_s =	1.75	ft

Headwater:

Inlet Control Headwater	HW_I =	2.57	ft
Outlet Control Headwater	HW_O =	2.55	ft
Design Headwater Elevation	HW =	7194.57	ft
Headwater/Diameter OR Headwater/Rise Ratio	HW/D =	1.29	

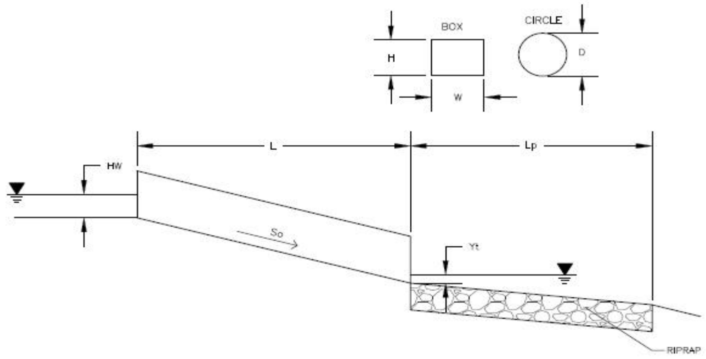
Outlet Protection:

Flow/(Diameter^2.5)	Q/D^2.5 =	3.41	$ft^{0.5}/s$
Tailwater Surface Height	Y_t =	0.80	ft
Tailwater/Diameter	Yt/D =	0.40	
Expansion Factor	1/(2*tan(Θ)) =	4.02	
Flow Area at Max Channel Velocity	A_t =	3.86	ft^2
Width of Equivalent Conduit for Multiple Barrels	W_{eq} =	-	ft
Length of Riprap Protection	L_p =	12	ft
Width of Riprap Protection at Downstream End	T =	5	ft
Adjusted Diameter for Supercritical Flow	Da =	-	ft
Minimum Theoretical Riprap Size	d_{50} min=	6	in
Nominal Riprap Size	d_{50} nominal=	6	in
MHFD Riprap Type	Type =	VL	

DETERMINATION OF CULVERT HEADWATER AND OUTLET PROTECTION

MHFD-Culvert, Version 4.00 (May 2020)

Project: Eagleview
ID: Water Quality Pond 2 Outfall



Soil Type:
Choose One:
● Sandy
○ Non-Sandy

Design Information:

Design Discharge	Q =	7.6	cfs

Circular Culvert:

Barrel Diameter in Inches	D =	18	inches
Inlet Edge Type (Choose from pull-down list)		Grooved Edge Projecting	

OR:

Box Culvert:

		OR	
Barrel Height (Rise) in Feet	H (Rise) =		ft
Barrel Width (Span) in Feet	W (Span) =		ft
Inlet Edge Type (Choose from pull-down list)			

Number of Barrels	# Barrels =	1	
Inlet Elevation	Elev IN =	7199.39	ft
Outlet Elevation OR Slope	Elev OUT =	7199	ft
Culvert Length	L =	78.5	ft
Manning's Roughness	n =	0.012	
Bend Loss Coefficient	k_b =	0	
Exit Loss Coefficient	k_x =	1	
Tailwater Surface Elevation	$Y_{t,\ Elevation}$ =		ft
Max Allowable Channel Velocity	V =	5	ft/s

Calculated Results:

Culvert Cross Sectional Area Available	A =	1.77	ft^2
Culvert Normal Depth	Y_n =	1.16	ft
Culvert Critical Depth	Y_c =	1.07	ft
Froude Number	Fr =	0.84	
Entrance Loss Coefficient	k_e =	0.20	
Friction Loss Coefficient	k_f =	1.21	
Sum of All Loss Coefficients	k_s =	2.41	ft

Headwater:

Inlet Control Headwater	HW_I =	1.62	ft
Outlet Control Headwater	HW_O =	1.59	ft
Design Headwater Elevation	HW =	7201.01	ft
Headwater/Diameter OR Headwater/Rise Ratio	HW/D =	1.08	

Outlet Protection:

Flow/(Diameter^2.5)	Q/D^2.5 =	2.76	$ft^{0.5}/s$
Tailwater Surface Height	Y_t =	0.60	ft
Tailwater/Diameter	Yt/D =	0.40	
Expansion Factor	1/(2*tan(Θ)) =	4.71	
Flow Area at Max Channel Velocity	A_t =	1.52	ft^2
Width of Equivalent Conduit for Multiple Barrels	W_{eq} =	-	ft
Length of Riprap Protection	L_p =	5	ft
Width of Riprap Protection at Downstream End	T =	3	ft

Adjusted Diameter for Supercritical Flow	Da =	-	ft
Minimum Theoretical Riprap Size	d_{50} min=	3	in
Nominal Riprap Size	d_{50} nominal=	6	in
MHFD Riprap Type	Type =	VL	

DRIVEWAY CULVERT SIZING TABLE

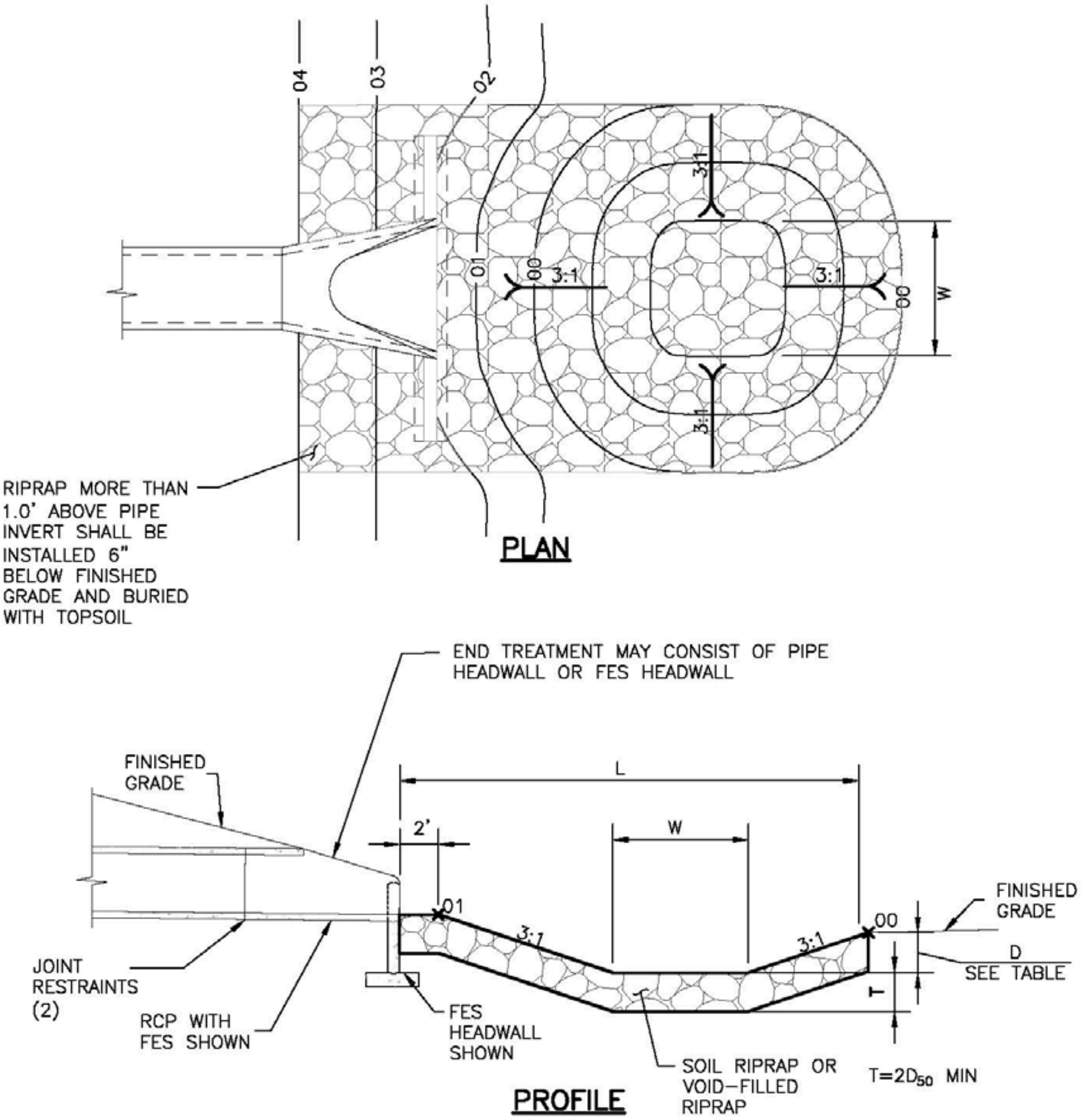
Lot	Basin Located in	100 yr. Flow (cfs)	Culvert size (in)	Anticipated Driveway Location	Notes
1	PB3	<8	18	North side of lot	Cross roadside ditch
1	PB1	<8	18	East side of lot	Cross roadside ditch
2	PB3	<8	18	Northeast side of lot	Cross roadside ditch
3	PB4	<8	18	East side of lot	Cross roadside ditch
4	PB4	<8	18	South side of lot	Cross roadside ditch
5	PB4	<8	18	Southwest side of lot	Cross roadside ditch. If culvert is placed on the southwest side of the lot, the driveway would cross a drainage way that would require an additional 3-36" RCPs to be built.
5	PB6	<8	18	Southeast side of lot	Cross roadside ditch
6	PB6	15.9	24	East side of lot	Cross roadside ditch
6	PB6	<8	18	North side of lot	Cross roadside ditch
7	PB6	<8	18	Northeast side of lot	Cross roadside ditch
8	PB6	<8	18	North side of lot	Cross roadside ditch
9	PB6	<8	N/A	Northwest side of lot	Sheet flows off road and through Lot 9
10	PB4	<8	18	Southeast side of lot	Cross roadside ditch
11	PB5	<8	18	Southeast side of lot	Cross roadside ditch
12	PB5	<8	18	South side of lot	Cross roadside ditch
13	PB7	<8	18	South side of lot	Cross roadside ditch
14	PB7	<8	18	Southwest side of lot	Cross roadside ditch
15	PB7	<8	18	Southwest side of lot	Cross roadside ditch
16	PB15	<8	18	West side of lot	Cross roadside ditch
16	PB15	<8	18	South side of lot	Cross roadside ditch
17	PB15	<8	18	West side of lot	Cross roadside ditch
18	PB15	<8	18	North side of lot	Cross roadside ditch
19	PB15	<8	N/A	Northeast side of lot	Sheet flows off road and through Lot 19. If culvert is placed on the northeast side of the lot, the driveway would cross a drainage way that would require an additional 2-24" RCPs to be built.
19	PB15	<8	18	Northwest side of lot	Cross roadside ditch
20	PB15	<8	N/A	Northwest side of lot south of intersection	Sheet flows off road and through Lot 20
21	PB10	<8	18	East side of lot	Cross roadside ditch
22	PB10	<8	18	East side of lot	Cross roadside ditch
23	PB10	<8	18	Southeast side of lot	Cross roadside ditch
24	PB10	<8	18	South side of lot	Cross roadside ditch
25	PB11	<8	18	Southwest side of lot	Cross roadside ditch
26	PB11	<8	18	Southwest side of lot	Cross roadside ditch
27	PB11	<8	18	West side of lot	Cross roadside ditch
28	PB11	<8	18	West side of lot	Cross roadside ditch
29	PB11	8.2	24	West side of lot	Cross roadside ditch
30	PB11	9.0	24	West side of lot	Cross roadside ditch
30	PB11	<8	18	South side of lot	Cross roadside ditch. Culvert would need to be placed east of the Culvert 6 crossing underneath Acequia Ct.
31	PB14	<8	18	North side of lot	Shared Lot 31 and 32 driveway
32	PB14	<8	18	North side of lot	Shared Lot 31 and 32 driveway
33	PB14	<8	18	North side of lot	Cross roadside ditch
34	PB14	<8	18	North side of lot	Cross roadside ditch. Culvert would need to be placed east of the Culvert 6 crossing underneath Acequia Ct.
34	PB14	<8	18	Northwest side of lot	Cross roadside ditch. If culvert is placed on the northwest side of the lot, the driveway would cross a drainage way that would require an additional culvert that would be larger than an 18" RCP to be built.
35	PB8	<8	18	North side of lot	Cross roadside ditch
36	PB9	<8	18	Northwest side of lot	Sheet flows off road and through Lot 36
37	PB9	<8	18	Northwest side of lot	Sheet flows off road and through Lot 37
38	PB9	<8	18	West side of lot	Cross roadside ditch
38*	PB9	120.9	2 - 42"	Inside of lot culvert	Culvert crossing natural Channel section A in Lot 38

*Culvert sizing is based on flows in roadside ditch. If driveways cross natural channels, an engineering site plan would be required.

Generic Driveway Culvert Sizing Table*

Culvert Diameter (in)	# of Barrels	Allowable Flow (cfs)
18	1	8
24	1	18
30	1	30
36	1	45
42	1	70
48	1	100
42	2	150

*See Generic Driveway Culvert Sizing calculations for Hw/D and culvert slope assumptions for each culvert size.


04
03
02
01
00
3:1
3:1
3:1
3:1
00
W
RIPRAP MORE THAN 1.0' ABOVE PIPE INVERT SHALL BE INSTALLED 6" BELOW FINISHED GRADE AND BURIED WITH TOPSOIL
PLAN
END TREATMENT MAY CONSIST OF PIPE HEADWALL OR FES HEADWALL
FINISHED GRADE
L
2'
W
01
3:1
3:1
00
FINISHED GRADE
D
SEE TABLE
T
JOINT RESTRAINTS (2)
RCP WITH FES SHOWN
FES HEADWALL SHOWN
SOIL RIPRAP OR VOID-FILLED RIPRAP
T=2D50 MIN
PROFILE

PIPE SIZE OR BOX HEIGHT	D	W*	L
18" – 24"	1'–0"	4'	15'
30" – 36"	1'–6"	6'	20'
42" – 48"	2'–0"	7'	24'
54" – 60"	2'–6"	8'	28'
66" – 72"	3'–0"	9'	32'

* IF OUTLET PIPE IS A BOX CULVERT WITH A WIDTH GREATER THAN W, THEN W = CULVERT WIDTH

Figure 9-37. Low tailwater riprap basin

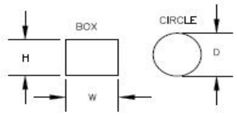
Eagleview Low Tailwater Basin Summary Table

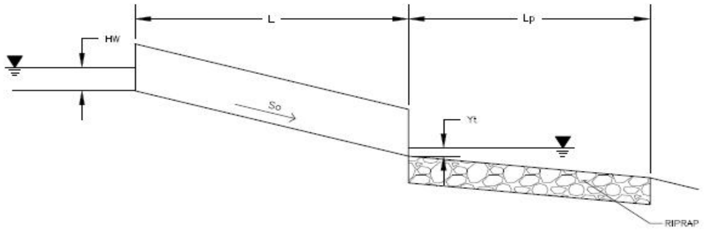
Culvert	Pipe Size (in)	Barrels (No.)	Bottom Width -W (ft)	Length - L (ft)	Top Width (ft)	Tailwater Basin Depth - D (ft)	D50 (in)	RipRap Thickness - [2*D50] (ft)	MHFD Riprap Type	Vol (ft^3)	Vol (yd^3)
(Ex.) Arroya Ln	48	1	11	24	23	2	18	3	H	1656	61.33
1	18	1	4	15	16	1	6	1	VL	240	8.89
2	36	3	26	20	38	1.5	9	1.5	L	1140	42.22
3	24	2	12	15	24	1	6	1	VL	360	13.33
4	18	1	4	15	16	1	6	1	VL	240	8.89
5	18	1	4	15	16	1	6	1	VL	240	8.89
6	36	2	16	20	28	1.5	9	1.5	L	840	31.11
7	36	2	16	20	28	1.5	9	1.5	L	840	31.11
8	66	2	22	32	34	3	18	3	H	3264	120.89
Pond 3 Outfall	42	1	11	24	23	2	18	3	H	1656	61.33
WQ Pond 1	24	1	4	15	16	1	6	1	VL	240	8.89
WQ Pond 2	18	1	4	15	16	1	6	1	VL	240	8.89
Total			**115**	**176**	**223**					**8820**	**327**

DETERMINATION OF CULVERT HEADWATER AND OUTLET PROTECTION

MHFD-Culvert, Version 4.00 (May 2020)

Project: Eagleview
ID: Generic Driveway Culvert 18-inch





Soil Type:
Choose One:
● Sandy
○ Non-Sandy

Supercritical Flow! Using Adjusted Diameter to calculate protection type.

Design Information:

Design Discharge	Q =	8	cfs

Circular Culvert:

Barrel Diameter in Inches	D =	18	inches
Inlet Edge Type (Choose from pull-down list)		Square Edge with Headwall	

OR:

Box Culvert:

		OR	
Barrel Height (Rise) in Feet	H (Rise) =		ft
Barrel Width (Span) in Feet	W (Span) =		ft
Inlet Edge Type (Choose from pull-down list)			

Number of Barrels	# Barrels =	1	
Inlet Elevation	Elev IN =	7222.1	ft
Outlet Elevation OR Slope	Elev OUT =	7222	ft
Culvert Length	L =	10	ft
Manning's Roughness	n =	0.012	
Bend Loss Coefficient	k_b =	0	
Exit Loss Coefficient	k_x =	1	
Tailwater Surface Elevation	$Y_{t,\ Elevation}$ =		ft
Max Allowable Channel Velocity	V =	5	ft/s

Calculated Results:

Culvert Cross Sectional Area Available	A =	1.77	ft^2
Culvert Normal Depth	Y_n =	0.93	ft
Culvert Critical Depth	Y_c =	1.10	ft
Froude Number	Fr =	1.39	Supercritical!
Entrance Loss Coefficient	k_e =	0.50	
Friction Loss Coefficient	k_f =	0.15	
Sum of All Loss Coefficients	k_s =	1.65	ft

Headwater:

Inlet Control Headwater	HW_I =	1.82	ft
Outlet Control Headwater	HW_O =	1.72	ft
Design Headwater Elevation	HW =	7223.92	ft
Headwater/Diameter OR Headwater/Rise Ratio	HW/D =	1.21	

Outlet Protection:

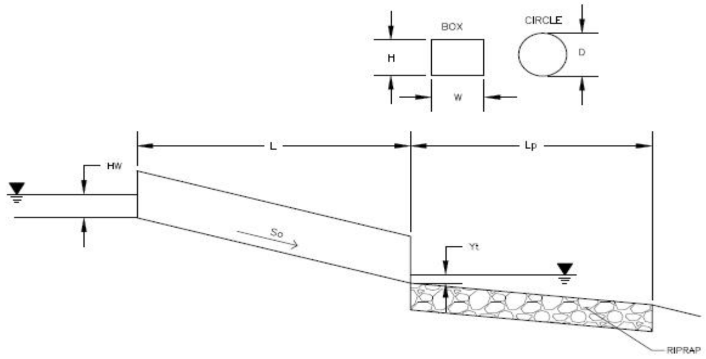
Flow/(Diameter^2.5)	Q/D^2.5 =	2.90	ft$^{0.5}$/s
Tailwater Surface Height	Y_t =	0.60	ft
Tailwater/Diameter	Yt/D =	0.40	
Expansion Factor	1/(2*tan(Θ)) =	4.51	
Flow Area at Max Channel Velocity	A_t =	1.60	ft^2
Width of Equivalent Conduit for Multiple Barrels	W_{eq} =	-	ft
Length of Riprap Protection	L_p =	6	ft
Width of Riprap Protection at Downstream End	T =	3	ft

Adjusted Diameter for Supercritical Flow	Da =	1.21	ft
Minimum Theoretical Riprap Size	d_{50} min=	4	in
Nominal Riprap Size	d_{50} nominal=	6	in
MHFD Riprap Type	Type =	VL	

DETERMINATION OF CULVERT HEADWATER AND OUTLET PROTECTION

MHFD-Culvert, Version 4.00 (May 2020)

Project: Eagleview
ID: Generic Driveway Culvert 24-inch



Soil Type:
Choose One:
● Sandy
○ Non-Sandy

Supercritical Flow! Using Adjusted Diameter to calculate protection type.

Design Information:

Design Discharge	Q =	18	cfs
Circular Culvert:			
Barrel Diameter in Inches	D =	24	inches
Inlet Edge Type (Choose from pull-down list)	Square Edge with Headwall		
OR:			
Box Culvert:		OR	
Barrel Height (Rise) in Feet	H (Rise) =		ft
Barrel Width (Span) in Feet	W (Span) =		ft
Inlet Edge Type (Choose from pull-down list)			
Number of Barrels	# Barrels =	1	
Inlet Elevation	Elev IN =	7222.1	ft
Outlet Elevation OR Slope	Elev OUT =	7222	ft
Culvert Length	L =	10	ft
Manning's Roughness	n =	0.012	
Bend Loss Coefficient	k_b =	0	
Exit Loss Coefficient	k_x =	1	
Tailwater Surface Elevation	$Y_{t,\ Elevation}$ =		ft
Max Allowable Channel Velocity	V =	5	ft/s

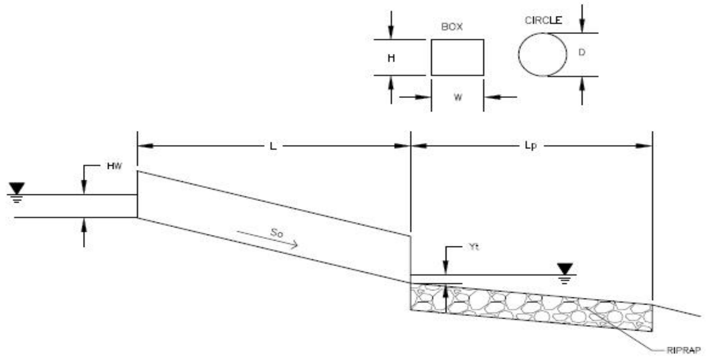
Calculated Results:

Culvert Cross Sectional Area Available	A =	3.14	ft^2
Culvert Normal Depth	Y_n =	1.27	ft
Culvert Critical Depth	Y_c =	1.53	ft
Froude Number	Fr =	1.44	Supercritical!
Entrance Loss Coefficient	k_e =	0.50	
Friction Loss Coefficient	k_f =	0.11	
Sum of All Loss Coefficients	k_s =	1.61	ft
Headwater:			
Inlet Control Headwater	HW_I =	2.64	ft
Outlet Control Headwater	HW_O =	2.48	ft
Design Headwater Elevation	HW =	7224.74	ft
Headwater/Diameter OR Headwater/Rise Ratio	HW/D =	1.32	
Outlet Protection:			
Flow/(Diameter^2.5)	Q/D^2.5 =	3.18	$ft^{0.5}/s$
Tailwater Surface Height	Y_t =	0.80	ft
Tailwater/Diameter	Yt/D =	0.40	
Expansion Factor	1/(2*tan(Θ)) =	4.22	
Flow Area at Max Channel Velocity	A_t =	3.60	ft^2
Width of Equivalent Conduit for Multiple Barrels	W_{eq} =	-	ft
Length of Riprap Protection	L_p =	11	ft
Width of Riprap Protection at Downstream End	T =	5	ft
Adjusted Diameter for Supercritical Flow	Da =	1.64	ft
Minimum Theoretical Riprap Size	d_{50} min=	6	in
Nominal Riprap Size	d_{50} nominal=	6	in
MHFD Riprap Type	Type =	VL	

DETERMINATION OF CULVERT HEADWATER AND OUTLET PROTECTION

MHFD-Culvert, Version 4.00 (May 2020)

Project: Eagleview
ID: Generic Driveway Culvert 30-inch



Soil Type:
Choose One:
● Sandy
○ Non-Sandy

Supercritical Flow! Using Adjusted Diameter to calculate protection type.

Design Information:

Design Discharge	Q =	30	cfs

Circular Culvert:

Barrel Diameter in Inches	D =	30	inches
Inlet Edge Type (Choose from pull-down list)		Square Edge with Headwall	

OR:

Box Culvert:

		OR	
Barrel Height (Rise) in Feet	H (Rise) =		ft
Barrel Width (Span) in Feet	W (Span) =		ft
Inlet Edge Type (Choose from pull-down list)			

Number of Barrels	# Barrels =	1	
Inlet Elevation	Elev IN =	7222.1	ft
Outlet Elevation OR Slope	Elev OUT =	7222	ft
Culvert Length	L =	10	ft
Manning's Roughness	n =	0.012	
Bend Loss Coefficient	k_b =	0	
Exit Loss Coefficient	k_x =	1	
Tailwater Surface Elevation	$Y_{t,\ Elevation}$ =		ft
Max Allowable Channel Velocity	V =	5	ft/s

Calculated Results:

Culvert Cross Sectional Area Available	A =	4.91	ft^2
Culvert Normal Depth	Y_n =	1.50	ft
Culvert Critical Depth	Y_c =	1.87	ft
Froude Number	Fr =	1.53	Supercritical!
Entrance Loss Coefficient	k_e =	0.50	
Friction Loss Coefficient	k_f =	0.08	
Sum of All Loss Coefficients	k_s =	1.58	ft

Headwater:

Inlet Control Headwater	HW_I =	3.15	ft
Outlet Control Headwater	HW_O =	3.00	ft
Design Headwater Elevation	HW =	7225.25	ft
Headwater/Diameter OR Headwater/Rise Ratio	HW/D =	1.26	

Outlet Protection:

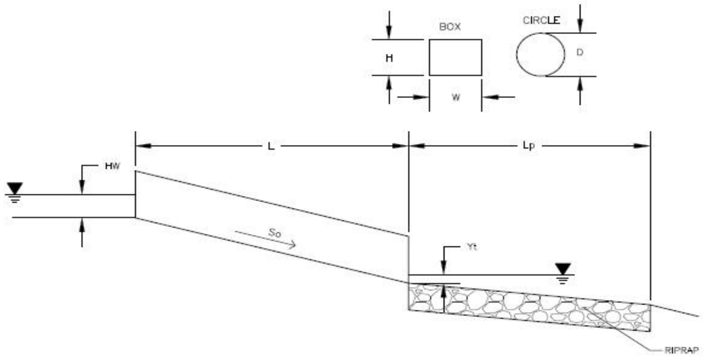
Flow/(Diameter^2.5)	Q/D^2.5 =	3.04	$ft^{0.5}/s$
Tailwater Surface Height	Y_t =	1.00	ft
Tailwater/Diameter	Yt/D =	0.40	
Expansion Factor	1/(2*tan(Θ)) =	4.35	
Flow Area at Max Channel Velocity	A_t =	6.00	ft^2
Width of Equivalent Conduit for Multiple Barrels	W_{eq} =	-	ft
Length of Riprap Protection	L_p =	16	ft
Width of Riprap Protection at Downstream End	T =	7	ft

Adjusted Diameter for Supercritical Flow	Da =	2.00	ft
Minimum Theoretical Riprap Size	d_{50} min=	7	in
Nominal Riprap Size	d_{50} nominal=	9	in
MHFD Riprap Type	Type =	L	

DETERMINATION OF CULVERT HEADWATER AND OUTLET PROTECTION

MHFD-Culvert, Version 4.00 (May 2020)

Project: Eagleview
ID: Generic Driveway Culvert 36-inch



Soil Type:
Choose One:
● Sandy
○ Non-Sandy

Supercritical Flow! Using Adjusted Diameter to calculate protection type.

Design Information:

Design Discharge	Q =	45	cfs

Circular Culvert:

Barrel Diameter in Inches	D =	36	inches
Inlet Edge Type (Choose from pull-down list)		Square Edge with Headwall	

OR:

Box Culvert:

		OR	
Barrel Height (Rise) in Feet	H (Rise) =		ft
Barrel Width (Span) in Feet	W (Span) =		ft
Inlet Edge Type (Choose from pull-down list)			

Number of Barrels	# Barrels =	1	
Inlet Elevation	Elev IN =	7222.1	ft
Outlet Elevation OR Slope	Elev OUT =	7222	ft
Culvert Length	L =	10	ft
Manning's Roughness	n =	0.012	
Bend Loss Coefficient	k_b =	0	
Exit Loss Coefficient	k_x =	1	
Tailwater Surface Elevation	$Y_{t,\ Elevation}$ =		ft
Max Allowable Channel Velocity	V =	5	ft/s

Calculated Results:

Culvert Cross Sectional Area Available	A =	7.07	ft^2
Culvert Normal Depth	Y_n =	1.71	ft
Culvert Critical Depth	Y_c =	2.19	ft
Froude Number	Fr =	1.61	Supercritical!
Entrance Loss Coefficient	k_e =	0.50	
Friction Loss Coefficient	k_f =	0.06	
Sum of All Loss Coefficients	k_s =	1.56	ft

Headwater:

Inlet Control Headwater	HW_I =	3.62	ft
Outlet Control Headwater	HW_O =	3.48	ft
Design Headwater Elevation	HW =	7225.72	ft
Headwater/Diameter OR Headwater/Rise Ratio	HW/D =	1.21	

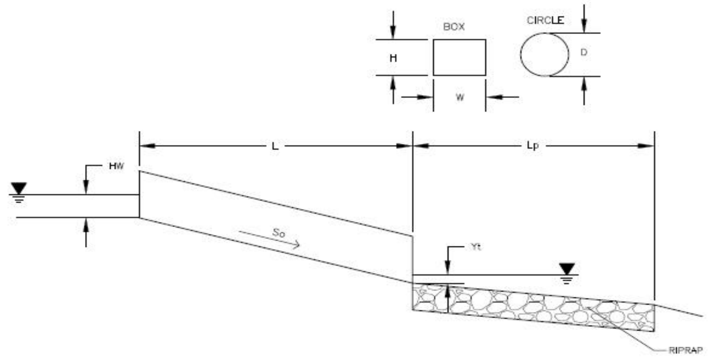
Outlet Protection:

Flow/(Diameter^2.5)	Q/D^2.5 =	2.89	$ft^{0.5}/s$
Tailwater Surface Height	Y_t =	1.20	ft
Tailwater/Diameter	Yt/D =	0.40	
Expansion Factor	1/(2*tan(Θ)) =	4.54	
Flow Area at Max Channel Velocity	A_t =	9.00	ft^2
Width of Equivalent Conduit for Multiple Barrels	W_{eq} =	-	ft
Length of Riprap Protection	L_p =	21	ft
Width of Riprap Protection at Downstream End	T =	8	ft
Adjusted Diameter for Supercritical Flow	Da =	2.36	ft
Minimum Theoretical Riprap Size	d_{50} min=	8	in
Nominal Riprap Size	d_{50} nominal=	9	in
MHFD Riprap Type	Type =	L	

DETERMINATION OF CULVERT HEADWATER AND OUTLET PROTECTION

MHFD-Culvert, Version 4.00 (May 2020)

Project: Eagleview
ID: Generic Driveway Culvert 42-inch



Soil Type:
Choose One:
● Sandy
○ Non-Sandy

Supercritical Flow! Using Adjusted Diameter to calculate protection type.

Design Information:

Design Discharge	Q =	70	cfs

Circular Culvert:

Barrel Diameter in Inches	D =	42	inches
Inlet Edge Type (Choose from pull-down list)	Square Edge with Headwall		

OR:

Box Culvert:

OR

Barrel Height (Rise) in Feet	H (Rise) =		ft
Barrel Width (Span) in Feet	W (Span) =		ft
Inlet Edge Type (Choose from pull-down list)			

Number of Barrels	# Barrels =	1	
Inlet Elevation	Elev IN =	7222.1	ft
Outlet Elevation OR Slope	Elev OUT =	7222	ft
Culvert Length	L =	10	ft
Manning's Roughness	n =	0.012	
Bend Loss Coefficient	k_b =	0	
Exit Loss Coefficient	k_x =	1	
Tailwater Surface Elevation	$Y_{t,\ Elevation}$ =		ft
Max Allowable Channel Velocity	V =	5	ft/s

Calculated Results:

Culvert Cross Sectional Area Available	A =	9.62	ft^2
Culvert Normal Depth	Y_n =	2.04	ft
Culvert Critical Depth	Y_c =	2.62	ft
Froude Number	Fr =	1.64	Supercritical!
Entrance Loss Coefficient	k_e =	0.50	
Friction Loss Coefficient	k_f =	0.05	
Sum of All Loss Coefficients	k_s =	1.55	ft

Headwater:

Inlet Control Headwater	HW_I =	4.44	ft
Outlet Control Headwater	HW_O =	4.23	ft
Design Headwater Elevation	HW =	7226.54	ft
Headwater/Diameter OR Headwater/Rise Ratio	HW/D =	1.27	

Outlet Protection:

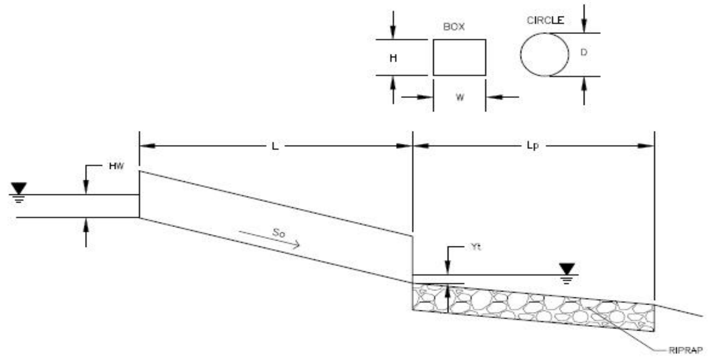
Flow/(Diameter^2.5)	Q/D^2.5 =	3.05	$ft^{0.5}/s$
Tailwater Surface Height	Y_t =	1.40	ft
Tailwater/Diameter	Yt/D =	0.40	
Expansion Factor	1/(2*tan(Θ)) =	4.33	
Flow Area at Max Channel Velocity	A_t =	14.00	ft^2
Width of Equivalent Conduit for Multiple Barrels	W_{eq} =	-	ft
Length of Riprap Protection	L_p =	29	ft
Width of Riprap Protection at Downstream End	T =	11	ft

Adjusted Diameter for Supercritical Flow	Da =	2.77	ft
Minimum Theoretical Riprap Size	d_{50} min=	10	in
Nominal Riprap Size	d_{50} nominal=	12	in
MHFD Riprap Type	Type =	M	

DETERMINATION OF CULVERT HEADWATER AND OUTLET PROTECTION

MHFD-Culvert, Version 4.00 (May 2020)

Project: Eagleview
ID: Generic Driveway Culvert 48-inch



Soil Type:
Choose One:
● Sandy
○ Non-Sandy

Supercritical Flow! Using Adjusted Diameter to calculate protection type.

Design Information:

Design Discharge	Q =	100	cfs

Circular Culvert:

Barrel Diameter in Inches	D =	48	inches
Inlet Edge Type (Choose from pull-down list)		Square Edge with Headwall	

OR:

Box Culvert:

		OR	
Barrel Height (Rise) in Feet	H (Rise) =		ft
Barrel Width (Span) in Feet	W (Span) =		ft
Inlet Edge Type (Choose from pull-down list)			

Number of Barrels	# Barrels =	1	
Inlet Elevation	Elev IN =	7222.1	ft
Outlet Elevation OR Slope	Elev OUT =	7222	ft
Culvert Length	L =	10	ft
Manning's Roughness	n =	0.012	
Bend Loss Coefficient	k_b =	0	
Exit Loss Coefficient	k_x =	1	
Tailwater Surface Elevation	$Y_{t,\ Elevation}$ =		ft
Max Allowable Channel Velocity	V =	5	ft/s

Calculated Results:

Culvert Cross Sectional Area Available	A =	12.57	ft^2
Culvert Normal Depth	Y_n =	2.33	ft
Culvert Critical Depth	Y_c =	3.03	ft
Froude Number	Fr =	1.67	Supercritical!
Entrance Loss Coefficient	k_e =	0.50	
Friction Loss Coefficient	k_f =	0.04	
Sum of All Loss Coefficients	k_s =	1.54	ft

Headwater:

Inlet Control Headwater	HW_I =	5.18	ft
Outlet Control Headwater	HW_O =	4.93	ft
Design Headwater Elevation	HW =	7227.28	ft
Headwater/Diameter OR Headwater/Rise Ratio	HW/D =	1.30	

Outlet Protection:

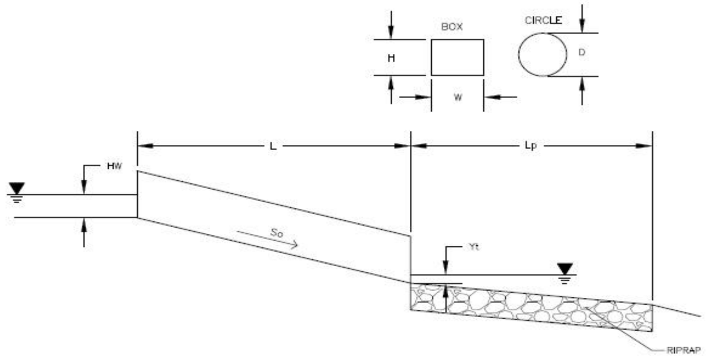
Flow/(Diameter^2.5)	Q/D^2.5 =	3.13	$ft^{0.5}/s$
Tailwater Surface Height	Y_t =	1.60	ft
Tailwater/Diameter	Yt/D =	0.40	
Expansion Factor	1/(2*tan(Θ)) =	4.27	
Flow Area at Max Channel Velocity	A_t =	20.00	ft^2
Width of Equivalent Conduit for Multiple Barrels	W_{eq} =	-	ft
Length of Riprap Protection	L_p =	37	ft
Width of Riprap Protection at Downstream End	T =	13	ft

Adjusted Diameter for Supercritical Flow	Da =	3.16	ft
Minimum Theoretical Riprap Size	d_{50} min=	11	in
Nominal Riprap Size	d_{50} nominal=	12	in
MHFD Riprap Type	Type =	M	

DETERMINATION OF CULVERT HEADWATER AND OUTLET PROTECTION

MHFD-Culvert, Version 4.00 (May 2020)

Project: Eagleview
ID: Generic Driveway Culvert Double 42-inch



Soil Type:
Choose One:
● Sandy
○ Non-Sandy

Supercritical Flow! Using Adjusted Diameter to calculate protection type.

Design Information:

Design Discharge	Q =	150	cfs

Circular Culvert:

Barrel Diameter in Inches	D =	42	inches
Inlet Edge Type (Choose from pull-down list)	Square Edge with Headwall		

OR:

Box Culvert:

		OR	
Barrel Height (Rise) in Feet	H (Rise) =		ft
Barrel Width (Span) in Feet	W (Span) =		ft
Inlet Edge Type (Choose from pull-down list)			
Number of Barrels	# Barrels =	2	
Inlet Elevation	Elev IN =	7222.1	ft
Outlet Elevation OR Slope	Elev OUT =	7222	ft
Culvert Length	L =	10	ft
Manning's Roughness	n =	0.012	
Bend Loss Coefficient	k_b =	0	
Exit Loss Coefficient	k_x =	1	
Tailwater Surface Elevation	$Y_{t,\ Elevation}$ =		ft
Max Allowable Channel Velocity	V =	5	ft/s

Calculated Results:

Culvert Cross Sectional Area Available	A =	9.62	ft^2
Culvert Normal Depth	Y_n =	2.04	ft
Culvert Critical Depth	Y_c =	2.62	ft
Froude Number	Fr =	1.64	Supercritical!
Entrance Loss Coefficient	k_e =	0.50	
Friction Loss Coefficient	k_f =	0.05	
Sum of All Loss Coefficients	k_s =	1.55	ft

Headwater:

Inlet Control Headwater	HW_I =	4.44	ft
Outlet Control Headwater	HW_O =	4.23	ft
Design Headwater Elevation	HW =	7226.54	ft
Headwater/Diameter OR Headwater/Rise Ratio	HW/D =	1.27	

Outlet Protection:

Flow/(Diameter^2.5)	Q/D^2.5 =	3.27	$ft^{0.5}/s$
Tailwater Surface Height	Y_t =	1.40	ft
Tailwater/Diameter	Yt/D =	0.40	
Expansion Factor	1/(2*tan(Θ)) =	4.14	
Flow Area at Max Channel Velocity	A_t =	30.00	ft^2
Width of Equivalent Conduit for Multiple Barrels	W_{eq} =	7.00	ft
Length of Riprap Protection	L_p =	29	ft
Width of Riprap Protection at Downstream End	T =	15	ft
Adjusted Diameter for Supercritical Flow	Da =	2.77	ft
Minimum Theoretical Riprap Size	d_{50} min=	10	in
Nominal Riprap Size	d_{50} nominal=	12	in
MHFD Riprap Type	Type =	M	

EXISTING CHANNEL FLOWS SUMMARY				
Reach/Channel ID	Contributing Basins	Tributary Areas (ac)	Flows (cfs)	Slope (%)
CHNL A	(7%B3) + OB6	122.6	120.9	5.65
CHNL B	(7%B3) + (100%OB5)	148.0	114.6	5.98
CHNL C	(4%B3) + (62%OB5)	91.6	70.7	8.54
CHNL D	(9%B3) + (1%OB7)	9.6	12.7	3.32
CHNL E	(70%B4) + OB8	43.3	64.3	2.57
CHNL F	(7%B2) + OB4	13.4	22.3	2.05
CHNL G	(86%B4) + OB8	45.7	67.3	2.29
CHNL H	(11%B2) + OB4 + OB3 + OB2	86.6	144.0	2.45
CHNL I	(17%B2) + OB4 + OB3 + OB2	89.0	146.9	2.22
CHNL J	(40%B2)	16.6	19.4	1.25
CHNL K	(27%B2) + OB4 + OB3 + OB2	93.2	151.8	2.46
CHNL L	(16%B1) + OB1	11.3	20.2	3.87
CHNL M	(34%B2) + OB4 + OB3 + OB2	96.1	155.2	4.54
CHNL O	(65%B2)	26.9	31.5	3.26
CHNL P	(7%B3)	4.2	7.7	7.65

Worksheet for EX CHNL A

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	5.560 %
Discharge	120.90 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	7,239.40
0+61	7,236.49
1+07	7,231.74
1+84	7,246.00
2+04	7,246.60

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 7,239.40)	(2+04, 7,246.60)	0.040

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	17.9 in
Roughness Coefficient	0.040
Elevation	7,233.23 ft
Elevation Range	7,231.7 to 7,246.6 ft
Flow Area	16.9 ft²
Wetted Perimeter	22.9 ft
Hydraulic Radius	8.9 in
Top Width	22.68 ft
Normal Depth	17.9 in
Critical Depth	20.8 in
Critical Slope	2.476 %
Velocity	7.16 ft/s
Velocity Head	0.80 ft
Specific Energy	2.29 ft
Froude Number	1.461
Flow Type	Supercritical

Worksheet for EX CHNL A

GVF Input Data

Downstream Depth	0.0	in
Length	0.0	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.0	in
Profile Description	N/A	
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	17.9	in
Critical Depth	20.8	in
Channel Slope	5.560	%
Critical Slope	2.476	%

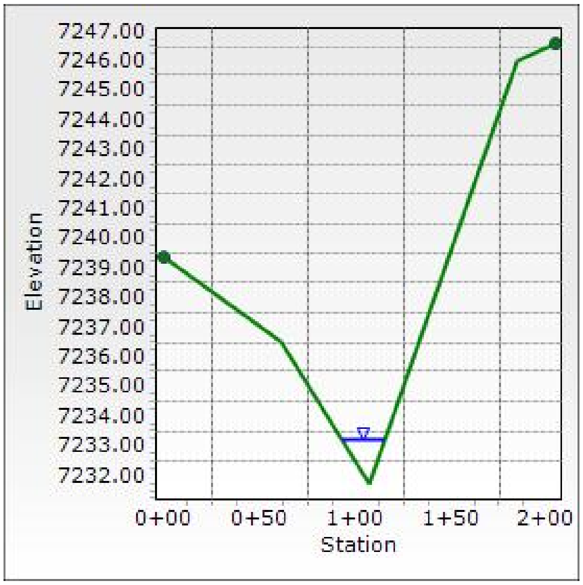
Cross Section for EX CHNL A

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	5.560 %
Normal Depth	17.9 in
Discharge	120.90 cfs



Worksheet for EX CHNL B

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	5.980 %
Discharge	114.60 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	7,249.10
0+38	7,248.00
0+78	7,243.32
0+95	7,240.83
1+48	7,247.55
1+79	7,249.28

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 7,249.10)	(1+79, 7,249.28)	0.040

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	17.4 in
Roughness Coefficient	0.040
Elevation	7,242.28 ft
Elevation Range	7,240.8 to 7,249.3 ft
Flow Area	15.7 ft²
Wetted Perimeter	21.8 ft
Hydraulic Radius	8.6 in
Top Width	21.60 ft
Normal Depth	17.4 in
Critical Depth	20.6 in
Critical Slope	2.484 %
Velocity	7.30 ft/s
Velocity Head	0.83 ft
Specific Energy	2.28 ft
Froude Number	1.509

Worksheet for EX CHNL B

Results

Flow Type	Supercritical

GVF Input Data

Downstream Depth	0.0	in
Length	0.0	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.0	in
Profile Description	N/A	
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	17.4	in
Critical Depth	20.6	in
Channel Slope	5.980	%
Critical Slope	2.484	%

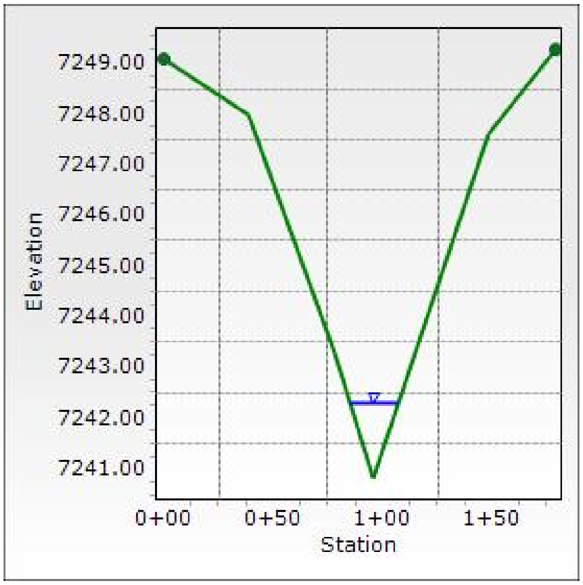
Cross Section for EX CHNL B

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	5.980 %
Normal Depth	17.4 in
Discharge	114.60 cfs



Worksheet for EX CHNL C

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	8.540 %
Discharge	70.70 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+07	7,248.79
0+81	7,244.00
1+03	7,237.94
1+22	7,246.00
1+63	7,250.20

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+07, 7,248.79)	(1+63, 7,250.20)	0.040

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	19.3 in
Roughness Coefficient	0.040
Elevation	7,239.54 ft
Elevation Range	7,237.9 to 7,250.2 ft
Flow Area	7.8 ft²
Wetted Perimeter	10.3 ft
Hydraulic Radius	9.1 in
Top Width	9.74 ft
Normal Depth	19.3 in
Critical Depth	24.3 in
Critical Slope	2.497 %
Velocity	9.05 ft/s
Velocity Head	1.27 ft
Specific Energy	2.88 ft
Froude Number	1.780
Flow Type	Supercritical

Worksheet for EX CHNL C

GVF Input Data

Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	19.3 in
Critical Depth	24.3 in
Channel Slope	8.540 %
Critical Slope	2.497 %

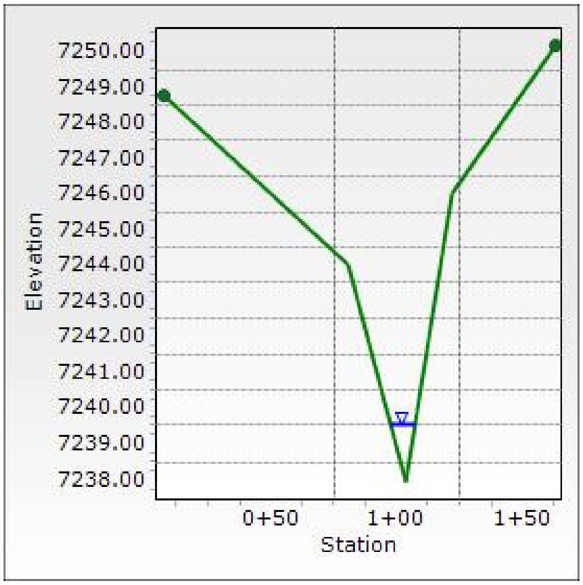
Cross Section for EX CHNL C

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	8.540 %
Normal Depth	19.3 in
Discharge	70.70 cfs



Worksheet for EX CHNL D

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	3.320 %
Discharge	12.70 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	7,237.14
0+22	7,237.45
0+78	7,235.70
0+84	7,235.20
0+98	7,236.20
1+12	7,236.63
1+58	7,239.52
1+69	7,239.77

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 7,237.14)	(1+69, 7,239.77)	0.040

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	7.0 in
Roughness Coefficient	0.040
Elevation	7,235.78 ft
Elevation Range	7,235.2 to 7,239.8 ft
Flow Area	4.5 ft²
Wetted Perimeter	16.9 ft
Hydraulic Radius	3.2 in
Top Width	16.86 ft
Normal Depth	7.0 in
Critical Depth	6.9 in
Critical Slope	3.641 %
Velocity	2.81 ft/s
Velocity Head	0.12 ft

Worksheet for EX CHNL D

Results

Specific Energy	0.71	ft
Froude Number	0.956	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.0	in
Length	0.0	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.0	in
Profile Description	N/A	
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	7.0	in
Critical Depth	6.9	in
Channel Slope	3.320	%
Critical Slope	3.641	%

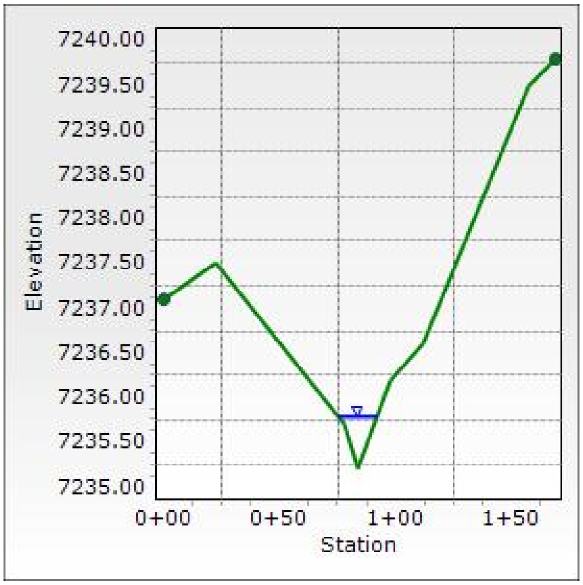
Cross Section for EX CHNL D

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	3.320 %
Normal Depth	7.0 in
Discharge	12.70 cfs



Worksheet for EX CHNL E

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	2.570 %
Discharge	64.30 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	7,229.28
0+45	7,228.39
0+96	7,224.00
1+37	7,222.21
1+52	7,221.75
1+73	7,222.00
2+07	7,224.35
2+62	7,225.92

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 7,229.28)	(2+62, 7,225.92)	0.040

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	7.9 in
Roughness Coefficient	0.040
Elevation	7,222.41 ft
Elevation Range	7,221.8 to 7,229.3 ft
Flow Area	19.3 ft²
Wetted Perimeter	46.5 ft
Hydraulic Radius	5.0 in
Top Width	46.45 ft
Normal Depth	7.9 in
Critical Depth	7.6 in
Critical Slope	3.175 %
Velocity	3.32 ft/s
Velocity Head	0.17 ft

Worksheet for EX CHNL E

Results

Specific Energy	0.83 ft
Froude Number	0.908
Flow Type	Subcritical

GVF Input Data

Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	7.9 in
Critical Depth	7.6 in
Channel Slope	2.570 %
Critical Slope	3.175 %

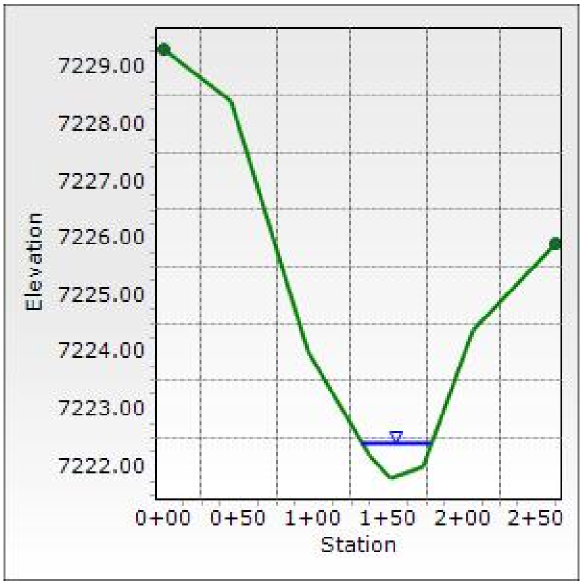
Cross Section for EX CHNL E

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	2.570 %
Normal Depth	7.9 in
Discharge	64.30 cfs



Worksheet for EX CHNL F

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	2.050 %
Discharge	22.30 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+04	7,238.00
0+58	7,237.06
1+10	7,237.86
1+28	7,238.35

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+04, 7,238.00)	(1+28, 7,238.35)	0.040

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	5.2 in
Roughness Coefficient	0.040
Elevation	7,237.50 ft
Elevation Range	7,237.1 to 7,238.4 ft
Flow Area	11.6 ft²
Wetted Perimeter	53.3 ft
Hydraulic Radius	2.6 in
Top Width	53.27 ft
Normal Depth	5.2 in
Critical Depth	4.6 in
Critical Slope	4.045 %
Velocity	1.92 ft/s
Velocity Head	0.06 ft
Specific Energy	0.49 ft
Froude Number	0.727
Flow Type	Subcritical

Worksheet for EX CHNL F

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	5.2 in
Critical Depth	4.6 in
Channel Slope	2.050 %
Critical Slope	4.045 %

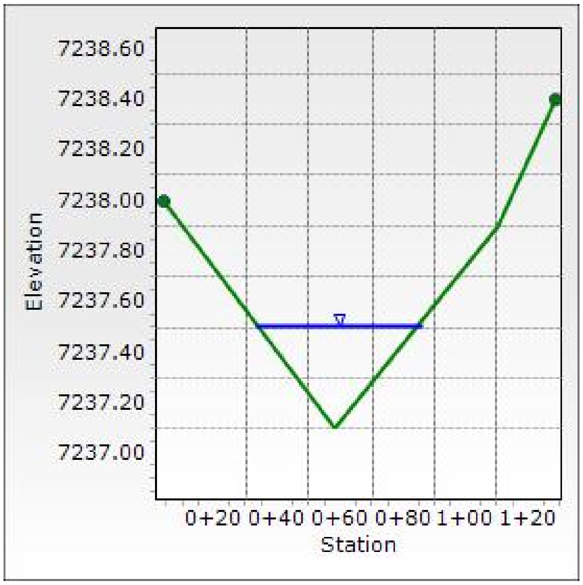
Cross Section for EX CHNL F

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	2.050 %
Normal Depth	5.2 in
Discharge	22.30 cfs



Worksheet for EX CHNL G

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	2.290 %
Discharge	67.30 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	7,215.15
0+58	7,209.92
0+75	7,209.09
0+88	7,210.43
1+14	7,211.58

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 7,215.15)	(1+14, 7,211.58)	0.040

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	12.9 in
Roughness Coefficient	0.040
Elevation	7,210.16 ft
Elevation Range	7,209.1 to 7,215.2 ft
Flow Area	17.5 ft²
Wetted Perimeter	30.8 ft
Hydraulic Radius	6.8 in
Top Width	30.70 ft
Normal Depth	12.9 in
Critical Depth	12.3 in
Critical Slope	2.871 %
Velocity	3.85 ft/s
Velocity Head	0.23 ft
Specific Energy	1.30 ft
Froude Number	0.901
Flow Type	Subcritical

Worksheet for EX CHNL G

GVF Input Data

Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	12.9 in
Critical Depth	12.3 in
Channel Slope	2.290 %
Critical Slope	2.871 %

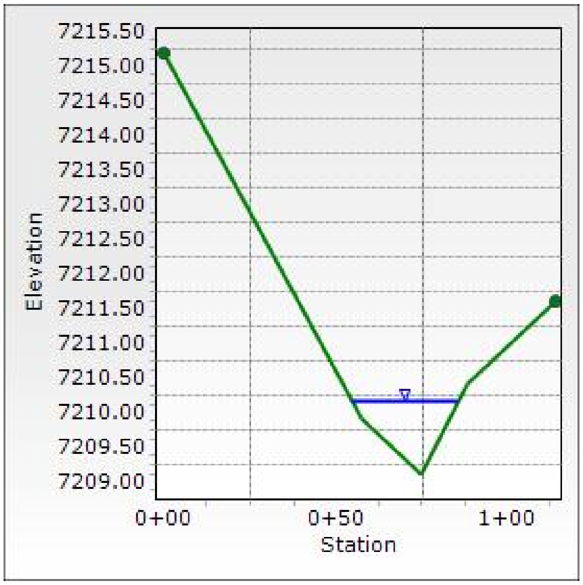
Cross Section for EX CHNL G

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	2.290 %
Normal Depth	12.9 in
Discharge	67.30 cfs



Worksheet for EX CHNL H

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	2.450	%
Discharge	144.00	cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	7,224.47
0+19	7,224.03
0+31	7,222.38
0+48	7,224.36
0+60	7,224.54

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 7,224.47)	(0+60, 7,224.54)	0.040

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	22.6	in
Roughness Coefficient	0.040	
Elevation	7,224.26	ft
Elevation Range	7,222.4 to 7,224.5	ft
Flow Area	29.7	ft²
Wetted Perimeter	38.9	ft
Hydraulic Radius	9.2	in
Top Width	38.64	ft
Normal Depth	22.6	in
Critical Depth	22.4	in
Critical Slope	2.566	%
Velocity	4.86	ft/s
Velocity Head	0.37	ft
Specific Energy	2.25	ft
Froude Number	0.977	
Flow Type	Subcritical	

Worksheet for EX CHNL H

GVF Input Data

Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	22.6 in
Critical Depth	22.4 in
Channel Slope	2.450 %
Critical Slope	2.566 %

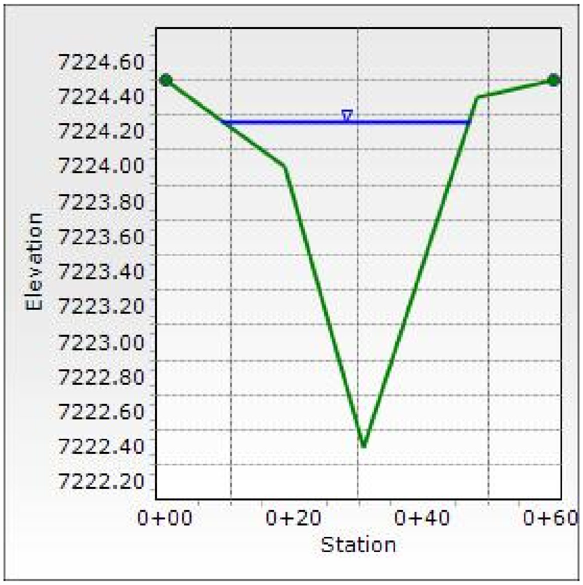
Cross Section for EX CHNL H

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	2.450 %
Normal Depth	22.6 in
Discharge	144.00 cfs



Worksheet for EX CHNL I

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	2.220 %
Discharge	146.90 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	7,218.31
0+47	7,218.50
0+86	7,216.59
1+59	7,221.00
1+71	7,221.35

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 7,218.31)	(1+71, 7,221.35)	0.040

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	16.4 in
Roughness Coefficient	0.040
Elevation	7,217.96 ft
Elevation Range	7,216.6 to 7,221.4 ft
Flow Area	34.2 ft²
Wetted Perimeter	50.2 ft
Hydraulic Radius	8.2 in
Top Width	50.08 ft
Normal Depth	16.4 in
Critical Depth	15.8 in
Critical Slope	2.683 %
Velocity	4.29 ft/s
Velocity Head	0.29 ft
Specific Energy	1.65 ft
Froude Number	0.915
Flow Type	Subcritical

Worksheet for EX CHNL I

GVF Input Data

Downstream Depth	0.0	in
Length	0.0	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.0	in
Profile Description	N/A	
Profile Headloss	0.00	ft
Downstream Velocity	0.00	ft/s
Upstream Velocity	0.00	ft/s
Normal Depth	16.4	in
Critical Depth	15.8	in
Channel Slope	2.220	%
Critical Slope	2.683	%

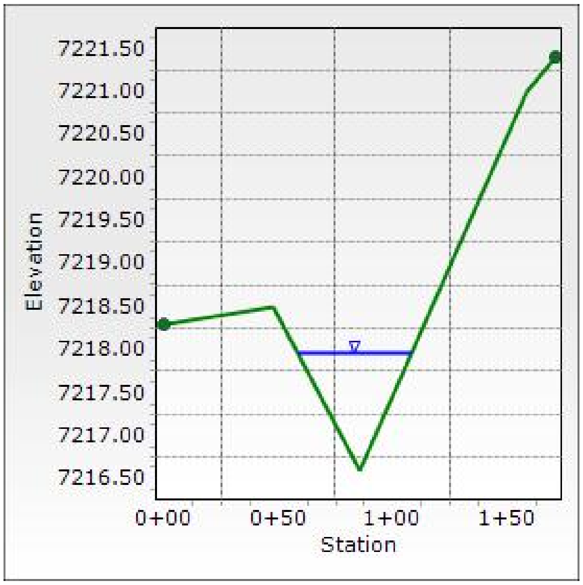
Cross Section for EX CHNL I

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	2.220 %
Normal Depth	16.4 in
Discharge	146.90 cfs



Worksheet for EX CHNL L

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	3.870 %
Discharge	20.20 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	7,226.12
0+53	7,222.85
0+74	7,221.57
1+55	7,223.80

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 7,226.12)	(1+55, 7,223.80)	0.040

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	6.1 in
Roughness Coefficient	0.040
Elevation	7,222.08 ft
Elevation Range	7,221.6 to 7,226.1 ft
Flow Area	6.9 ft²
Wetted Perimeter	26.8 ft
Hydraulic Radius	3.1 in
Top Width	26.79 ft
Normal Depth	6.1 in
Critical Depth	6.2 in
Critical Slope	3.664 %
Velocity	2.94 ft/s
Velocity Head	0.13 ft
Specific Energy	0.65 ft
Froude Number	1.026
Flow Type	Supercritical

Worksheet for EX CHNL L

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	6.1 in
Critical Depth	6.2 in
Channel Slope	3.870 %
Critical Slope	3.664 %

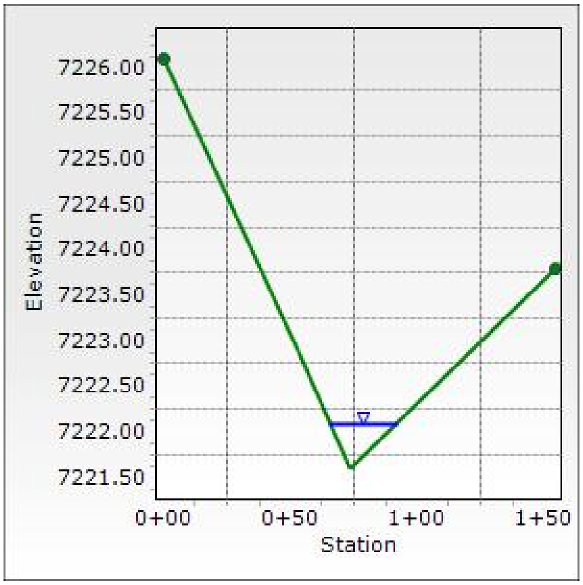
Cross Section for EX CHNL L

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	3.870 %
Normal Depth	6.1 in
Discharge	20.20 cfs



Worksheet for EX CHNL M

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	4.540 %
Discharge	155.20 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	7,203.94
0+72	7,201.87
1+11	7,198.36
1+38	7,202.50
2+08	7,202.04

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 7,203.94)	(2+08, 7,202.04)	0.040

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	19.3 in
Roughness Coefficient	0.040
Elevation	7,199.97 ft
Elevation Range	7,198.4 to 7,203.9 ft
Flow Area	22.8 ft²
Wetted Perimeter	28.6 ft
Hydraulic Radius	9.6 in
Top Width	28.37 ft
Normal Depth	19.3 in
Critical Depth	21.7 in
Critical Slope	2.434 %
Velocity	6.81 ft/s
Velocity Head	0.72 ft
Specific Energy	2.33 ft
Froude Number	1.339
Flow Type	Supercritical

Worksheet for EX CHNL M

GVF Input Data

Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	19.3 in
Critical Depth	21.7 in
Channel Slope	4.540 %
Critical Slope	2.434 %

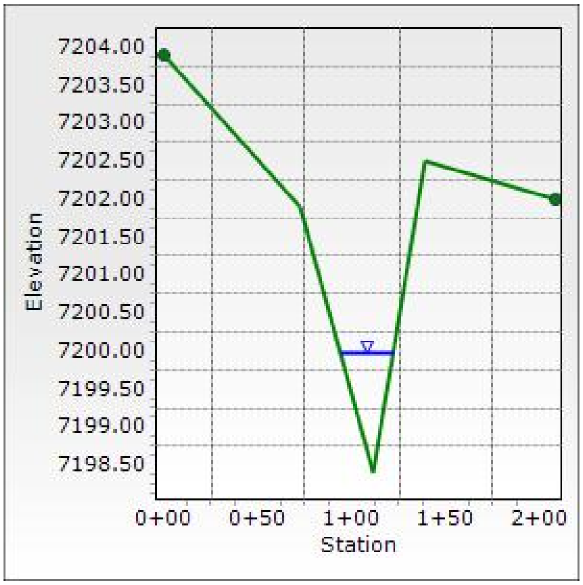
Cross Section for EX CHNL M

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	4.540 %
Normal Depth	19.3 in
Discharge	155.20 cfs



Worksheet for EX CHNL O

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	3.260 %
Discharge	31.50 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	7,195.73
0+70	7,196.09
1+00	7,192.99
1+30	7,195.99
1+83	7,197.86

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 7,195.73)	(1+83, 7,197.86)	0.040

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	10.8 in
Roughness Coefficient	0.040
Elevation	7,193.89 ft
Elevation Range	7,193.0 to 7,197.9 ft
Flow Area	8.0 ft²
Wetted Perimeter	17.9 ft
Hydraulic Radius	5.4 in
Top Width	17.79 ft
Normal Depth	10.8 in
Critical Depth	11.0 in
Critical Slope	3.049 %
Velocity	3.93 ft/s
Velocity Head	0.24 ft
Specific Energy	1.14 ft
Froude Number	1.032
Flow Type	Supercritical

Worksheet for EX CHNL O

GVF Input Data

Downstream Depth	0.0	in
Length	0.0	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.0	in
Profile Description	N/A	
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	10.8	in
Critical Depth	11.0	in
Channel Slope	3.260	%
Critical Slope	3.049	%

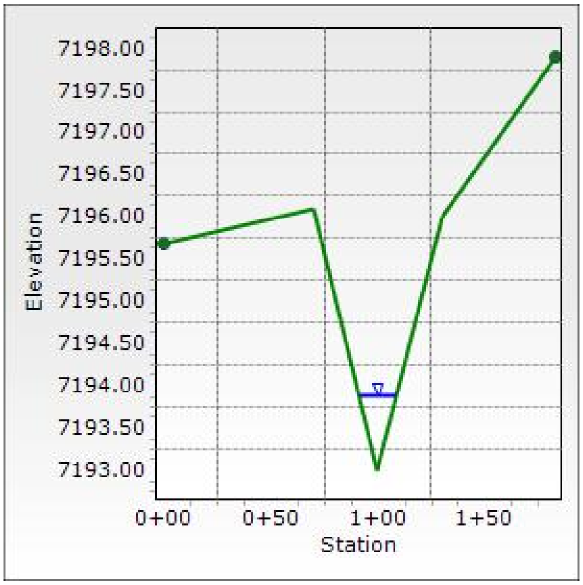
Cross Section for EX CHNL O

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	3.260 %
Normal Depth	10.8 in
Discharge	31.50 cfs



Worksheet for EX CHNL P

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	7.650 %
Discharge	7.70 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	7,199.37
0+28	7,199.01
0+88	7,193.89
1+16	7,198.17
1+63	7,198.52

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 7,199.37)	(1+63, 7,198.52)	0.040

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	5.6 in
Roughness Coefficient	0.040
Elevation	7,194.36 ft
Elevation Range	7,193.9 to 7,199.4 ft
Flow Area	2.0 ft²
Wetted Perimeter	8.6 ft
Hydraulic Radius	2.8 in
Top Width	8.53 ft
Normal Depth	5.6 in
Critical Depth	6.4 in
Critical Slope	3.649 %
Velocity	3.87 ft/s
Velocity Head	0.23 ft
Specific Energy	0.70 ft
Froude Number	1.414
Flow Type	Supercritical

Worksheet for EX CHNL P

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	5.6 in
Critical Depth	6.4 in
Channel Slope	7.650 %
Critical Slope	3.649 %

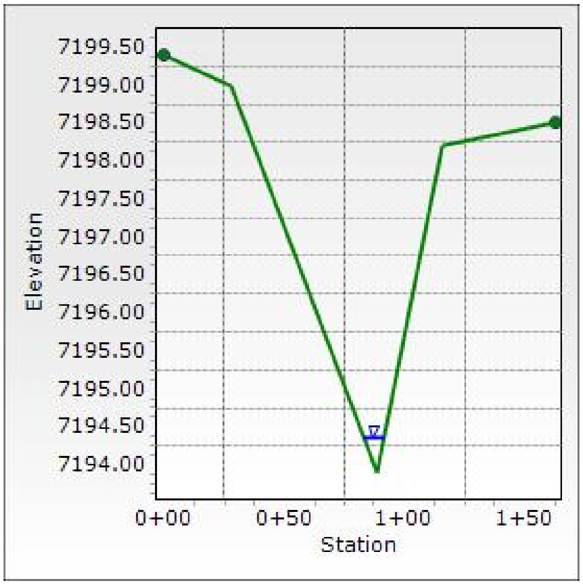
Cross Section for EX CHNL P

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	7.650 %
Normal Depth	5.6 in
Discharge	7.70 cfs



Worksheet for EX CHNL J

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	1.250 %
Discharge	19.40 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	7,205.29
1+14	7,202.00
1+30	7,201.92
2+31	7,203.75

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 7,205.29)	(2+31, 7,203.75)	0.040

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	4.8 in
Roughness Coefficient	0.040
Elevation	7,202.32 ft
Elevation Range	7,201.9 to 7,205.3 ft
Flow Area	12.0 ft²
Wetted Perimeter	49.2 ft
Hydraulic Radius	2.9 in
Top Width	49.18 ft
Normal Depth	4.8 in
Critical Depth	3.7 in
Critical Slope	4.048 %
Velocity	1.62 ft/s
Velocity Head	0.04 ft
Specific Energy	0.44 ft
Froude Number	0.579
Flow Type	Subcritical

Worksheet for EX CHNL J

GVF Input Data

Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	4.8 in
Critical Depth	3.7 in
Channel Slope	1.250 %
Critical Slope	4.048 %

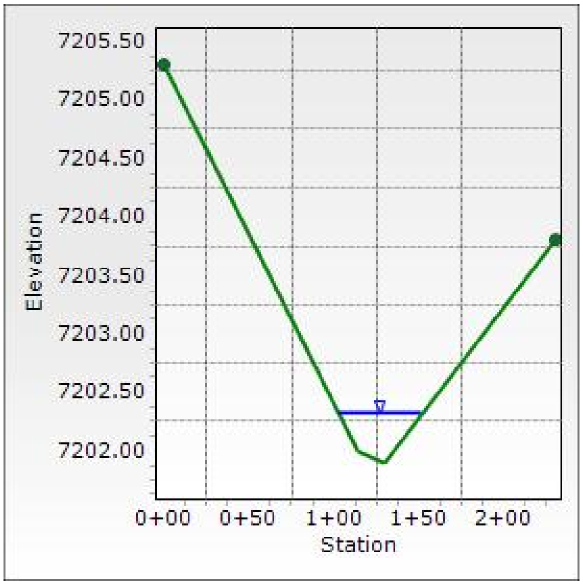
Cross Section for EX CHNL J

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	1.250 %
Normal Depth	4.8 in
Discharge	19.40 cfs



Worksheet for EX CHNL K

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	2.460 %
Discharge	151.80 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	7,212.20
0+95	7,210.70
1+38	7,211.30
1+68	7,210.90
2+11	7,211.97

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 7,212.20)	(2+11, 7,211.97)	0.040

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	8.8 in
Roughness Coefficient	0.040
Elevation	7,211.43 ft
Elevation Range	7,210.7 to 7,212.2 ft
Flow Area	51.2 ft²
Wetted Perimeter	140.8 ft
Hydraulic Radius	4.4 in
Top Width	140.76 ft
Normal Depth	8.8 in
Critical Depth	8.4 in
Critical Slope	3.352 %
Velocity	2.97 ft/s
Velocity Head	0.14 ft
Specific Energy	0.87 ft
Froude Number	0.868
Flow Type	Subcritical

Worksheet for EX CHNL K

GVF Input Data

Downstream Depth	0.0	in
Length	0.0	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.0	in
Profile Description	N/A	
Profile Headloss	0.00	ft
Downstream Velocity	0.00	ft/s
Upstream Velocity	0.00	ft/s
Normal Depth	8.8	in
Critical Depth	8.4	in
Channel Slope	2.460	%
Critical Slope	3.352	%

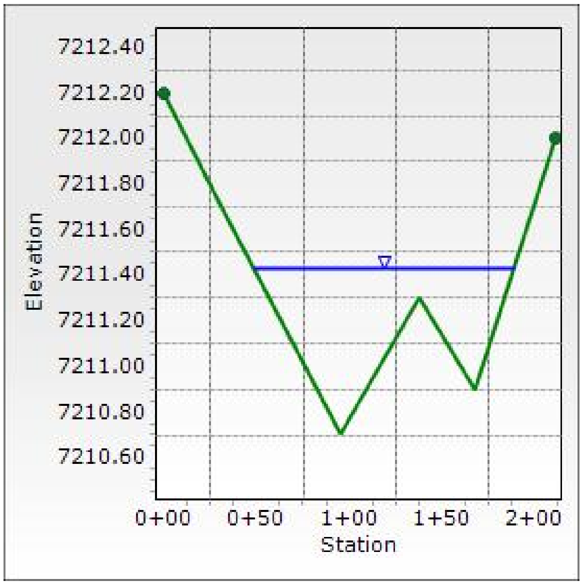
Cross Section for EX CHNL K

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	2.460 %
Normal Depth	8.8 in
Discharge	151.80 cfs



PROPOSED CHANNEL FLOWS SUMMARY					
Reach/Channel ID	Contributing Basins	Tributary Areas (ac)	Flows (cfs)	Slope (%)	Lining
CHNL A	(30%PB9) + OB6	122.2	120.7	5.65	TRM
CHNL B	(34%PB8) + OB5	147.8	117.4	5.98	TRM
CHNL C	(20%PB8) + (2%OB5)	5.2	8.2	8.54	TRM
CHNL D	(47%PB10) + (1%OB7)	38.5	61.2	3.32	TRM
CHNL E	PB11 + OB8	49.2	81.4	2.57	TRM
CHNL F	(46%PB5) + OB4	13.3	23.7	2.05	-
CHNL G	(6%PB14) + PB11 + OB8	50.2	84.2	2.29	TRM
CHNL H	(20%PB4) + OB2 + OB3 + OB4	84.1	144.8	2.45	TRM
CHNL I	(45%PB4) + OB2 + OB3 + OB4	86.7	152.4	2.22	TRM
CHNL J	(7%PB15) + PB6 + PB7	15.2	29.9	1.25	-
CHNL K	(95%PB4) + OB2 + OB3 + OB4	92.0	167.5	2.46	-
CHNL L	(40%PB1) + OB1	12.1	21.9	3.87	TRM
CHNL M	(10%PB15) + OB2 + OB3 + OB4 + PB5 + PB4 + PB3	101.1	185.3	4.54	TRM
CHNL N	(50%PB15) + PB6 + PB7	19.4	41.3	0.50	-
CHNL O	(21%PB15)	2.0	5.5	3.26	TRM
CHNL P	(5%PB14)	0.9	2.3	7.65	TRM

Worksheet for PROP CHNL A

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	5.650 %
Discharge	120.70 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	7,239.40
0+61	7,236.49
1+07	7,231.74
1+84	7,246.00
2+04	7,246.60

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 7,239.40)	(2+04, 7,246.60)	0.040

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	17.8 in
Roughness Coefficient	0.040
Elevation	7,233.22 ft
Elevation Range	7,231.7 to 7,246.6 ft
Flow Area	16.8 ft²
Wetted Perimeter	22.8 ft
Hydraulic Radius	8.8 in
Top Width	22.60 ft
Normal Depth	17.8 in
Critical Depth	20.8 in
Critical Slope	2.476 %
Velocity	7.20 ft/s
Velocity Head	0.80 ft
Specific Energy	2.29 ft
Froude Number	1.472
Flow Type	Supercritical

Worksheet for PROP CHNL A

GVF Input Data

Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	17.8 in
Critical Depth	20.8 in
Channel Slope	5.650 %
Critical Slope	2.476 %

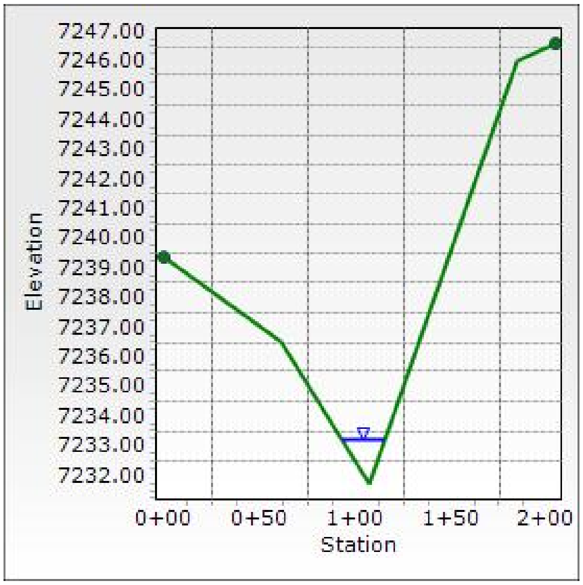
Cross Section for PROP CHNL A

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	5.650 %
Normal Depth	17.8 in
Discharge	120.70 cfs



Worksheet for PROP CHNL B

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	5.980	%
Discharge	117.40	cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	7,249.10
0+38	7,248.00
0+78	7,243.32
0+95	7,240.83
1+06	7,243.14
1+48	7,247.55
1+79	7,249.28

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 7,249.10)	(1+79, 7,249.28)	0.040

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	19.2	in
Roughness Coefficient	0.040	
Elevation	7,242.43	ft
Elevation Range	7,240.8 to 7,249.3	ft
Flow Area	15.1	ft²
Wetted Perimeter	19.2	ft
Hydraulic Radius	9.5	in
Top Width	18.94	ft
Normal Depth	19.2	in
Critical Depth	22.7	in
Critical Slope	2.420	%
Velocity	7.75	ft/s
Velocity Head	0.93	ft
Specific Energy	2.53	ft

Worksheet for PROP CHNL B

Results

Froude Number	1.528	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.0	in
Length	0.0	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.0	in
Profile Description	N/A	
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	19.2	in
Critical Depth	22.7	in
Channel Slope	5.980	%
Critical Slope	2.420	%

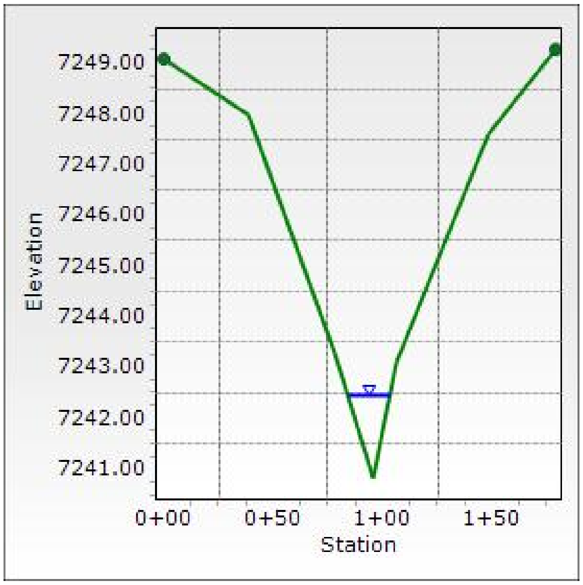
Cross Section for PROP CHNL B

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	5.980 %
Normal Depth	19.2 in
Discharge	117.40 cfs



Worksheet for PROP CHNL C

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	8.540 %
Discharge	8.20 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	7,248.79
0+77	7,244.26
0+98	7,243.56
1+16	7,244.42
1+79	7,250.54

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 7,248.79)	(1+79, 7,250.54)	0.040

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	3.8 in
Roughness Coefficient	0.040
Elevation	7,243.88 ft
Elevation Range	7,243.6 to 7,250.5 ft
Flow Area	2.6 ft²
Wetted Perimeter	16.1 ft
Hydraulic Radius	1.9 in
Top Width	16.05 ft
Normal Depth	3.8 in
Critical Depth	4.4 in
Critical Slope	4.108 %
Velocity	3.19 ft/s
Velocity Head	0.16 ft
Specific Energy	0.48 ft
Froude Number	1.407
Flow Type	Supercritical

Worksheet for PROP CHNL C

GVF Input Data

Downstream Depth	0.0	in
Length	0.0	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.0	in
Profile Description	N/A	
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	3.8	in
Critical Depth	4.4	in
Channel Slope	8.540	%
Critical Slope	4.108	%

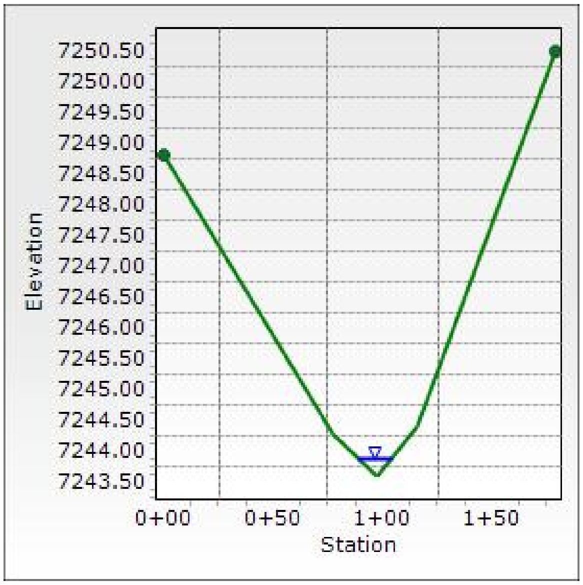
Cross Section for PROP CHNL C

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	8.540 %
Normal Depth	3.8 in
Discharge	8.20 cfs



Worksheet for PROP CHNL D

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	3.320 %
Discharge	61.20 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	7,237.14
0+22	7,237.45
0+78	7,235.70
0+84	7,235.20
0+98	7,236.20
1+12	7,236.63
1+58	7,239.52
1+69	7,239.77

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 7,237.14)	(1+69, 7,239.77)	0.040

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	12.1 in
Roughness Coefficient	0.040
Elevation	7,236.21 ft
Elevation Range	7,235.2 to 7,239.8 ft
Flow Area	15.8 ft²
Wetted Perimeter	36.3 ft
Hydraulic Radius	5.2 in
Top Width	36.22 ft
Normal Depth	12.1 in
Critical Depth	12.3 in
Critical Slope	3.076 %
Velocity	3.88 ft/s
Velocity Head	0.23 ft

Worksheet for PROP CHNL D

Results

Specific Energy	1.24	ft
Froude Number	1.038	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.0	in
Length	0.0	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.0	in
Profile Description	N/A	
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	12.1	in
Critical Depth	12.3	in
Channel Slope	3.320	%
Critical Slope	3.076	%

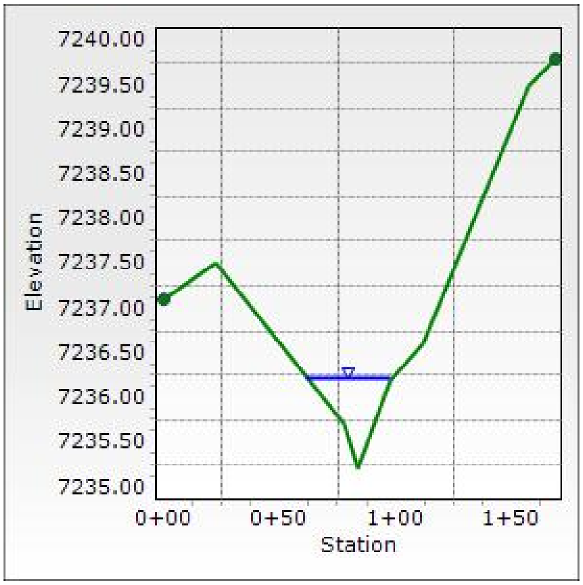
Cross Section for PROP CHNL D

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	3.320 %
Normal Depth	12.1 in
Discharge	61.20 cfs



Worksheet for PROP CHNL E

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	2.570 %
Discharge	81.40 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	7,229.28
0+45	7,228.39
0+96	7,224.00
1+37	7,222.21
1+52	7,221.75
1+73	7,222.00
2+07	7,224.35
2+62	7,225.92

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 7,229.28)	(2+62, 7,225.92)	0.040

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	8.8 in
Roughness Coefficient	0.040
Elevation	7,222.48 ft
Elevation Range	7,221.8 to 7,229.3 ft
Flow Area	22.8 ft²
Wetted Perimeter	49.2 ft
Hydraulic Radius	5.6 in
Top Width	49.15 ft
Normal Depth	8.8 in
Critical Depth	8.5 in
Critical Slope	3.053 %
Velocity	3.57 ft/s
Velocity Head	0.20 ft

Worksheet for PROP CHNL E

Results

Specific Energy	0.93	ft
Froude Number	0.924	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.0	in
Length	0.0	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.0	in
Profile Description	N/A	
Profile Headloss	0.00	ft
Downstream Velocity	0.00	ft/s
Upstream Velocity	0.00	ft/s
Normal Depth	8.8	in
Critical Depth	8.5	in
Channel Slope	2.570	%
Critical Slope	3.053	%

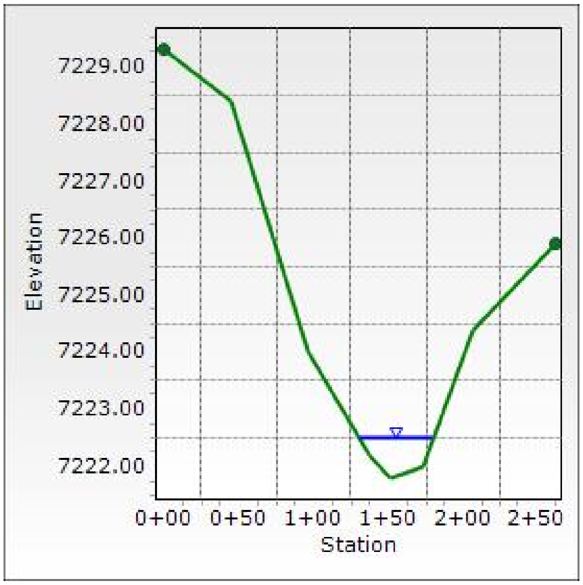
Cross Section for PROP CHNL E

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	2.570 %
Normal Depth	8.8 in
Discharge	81.40 cfs



Worksheet for PROP CHNL F

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	2.050 %
Discharge	23.70 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+04	7,238.00
0+58	7,237.06
1+10	7,237.86
1+28	7,238.35

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+04, 7,238.00)	(1+28, 7,238.35)	0.040

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	5.3 in
Roughness Coefficient	0.040
Elevation	7,237.51 ft
Elevation Range	7,237.1 to 7,238.4 ft
Flow Area	12.1 ft²
Wetted Perimeter	54.5 ft
Hydraulic Radius	2.7 in
Top Width	54.50 ft
Normal Depth	5.3 in
Critical Depth	4.7 in
Critical Slope	4.013 %
Velocity	1.95 ft/s
Velocity Head	0.06 ft
Specific Energy	0.50 ft
Froude Number	0.730
Flow Type	Subcritical

Worksheet for PROP CHNL F

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	5.3 in
Critical Depth	4.7 in
Channel Slope	2.050 %
Critical Slope	4.013 %

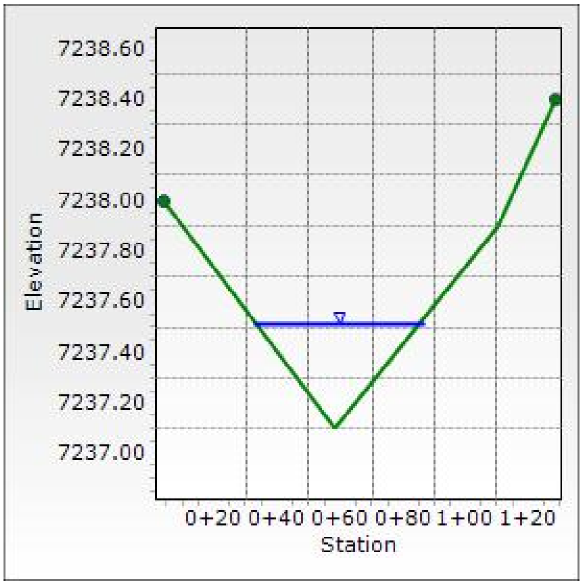
Cross Section for PROP CHNL F

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	2.050 %
Normal Depth	5.3 in
Discharge	23.70 cfs



Worksheet for PROP CHNL G

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	2.290 %
Discharge	84.20 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	7,215.15
0+58	7,209.92
0+75	7,209.09
0+88	7,210.43
1+14	7,211.58

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 7,215.15)	(1+14, 7,211.58)	0.040

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	14.0 in
Roughness Coefficient	0.040
Elevation	7,210.26 ft
Elevation Range	7,209.1 to 7,215.2 ft
Flow Area	20.5 ft²
Wetted Perimeter	32.8 ft
Hydraulic Radius	7.5 in
Top Width	32.71 ft
Normal Depth	14.0 in
Critical Depth	13.5 in
Critical Slope	2.772 %
Velocity	4.11 ft/s
Velocity Head	0.26 ft
Specific Energy	1.43 ft
Froude Number	0.915
Flow Type	Subcritical

Worksheet for PROP CHNL G

GVF Input Data

Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	14.0 in
Critical Depth	13.5 in
Channel Slope	2.290 %
Critical Slope	2.772 %

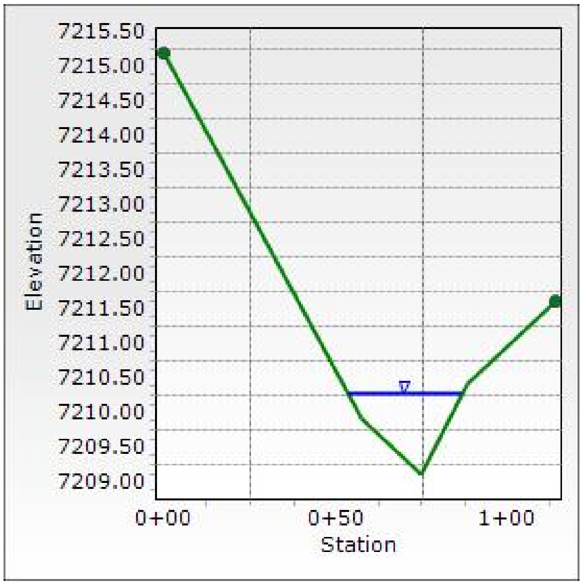
Cross Section for PROP CHNL G

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	2.290 %
Normal Depth	14.0 in
Discharge	84.20 cfs



Worksheet for PROP CHNL H

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	2.450 %
Discharge	144.80 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	7,224.50
0+19	7,224.00
0+31	7,222.40
0+48	7,224.40
0+53	7,224.66

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 7,224.50)	(0+53, 7,224.66)	0.040

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	22.7 in
Roughness Coefficient	0.040
Elevation	7,224.29 ft
Elevation Range	7,222.4 to 7,224.7 ft
Flow Area	29.9 ft²
Wetted Perimeter	39.4 ft
Hydraulic Radius	9.1 in
Top Width	39.15 ft
Normal Depth	22.7 in
Critical Depth	22.5 in
Critical Slope	2.571 %
Velocity	4.84 ft/s
Velocity Head	0.36 ft
Specific Energy	2.26 ft
Froude Number	0.976
Flow Type	Subcritical

Worksheet for PROP CHNL H

GVF Input Data

Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	22.7 in
Critical Depth	22.5 in
Channel Slope	2.450 %
Critical Slope	2.571 %

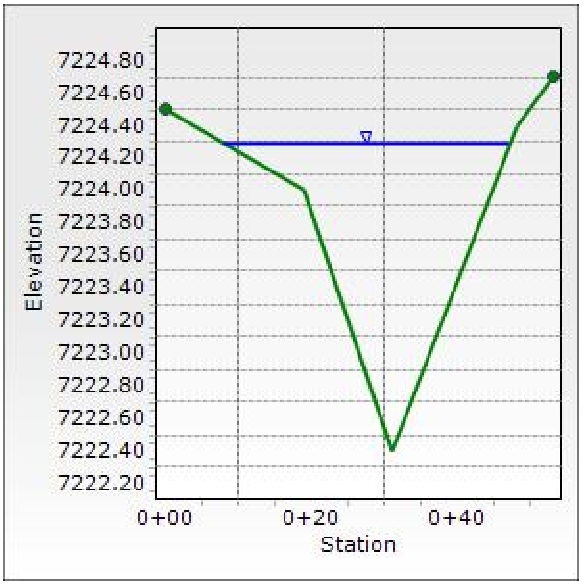
Cross Section for PROP CHNL H

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	2.450 %
Normal Depth	22.7 in
Discharge	144.80 cfs



Worksheet for PROP CHNL I

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	2.220 %
Discharge	152.40 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	7,218.31
0+47	7,218.50
0+86	7,216.59
1+59	7,221.00
1+71	7,221.35

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 7,218.31)	(1+71, 7,221.35)	0.040

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	16.6 in
Roughness Coefficient	0.040
Elevation	7,217.98 ft
Elevation Range	7,216.6 to 7,221.4 ft
Flow Area	35.2 ft²
Wetted Perimeter	50.9 ft
Hydraulic Radius	8.3 in
Top Width	50.78 ft
Normal Depth	16.6 in
Critical Depth	16.1 in
Critical Slope	2.670 %
Velocity	4.33 ft/s
Velocity Head	0.29 ft
Specific Energy	1.68 ft
Froude Number	0.917
Flow Type	Subcritical

Worksheet for PROP CHNL I

GVF Input Data

Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	16.6 in
Critical Depth	16.1 in
Channel Slope	2.220 %
Critical Slope	2.670 %

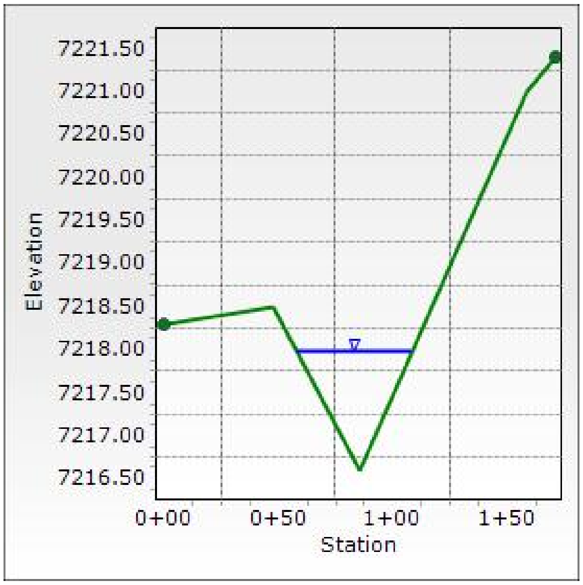
Cross Section for PROP CHNL I

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	2.220 %
Normal Depth	16.6 in
Discharge	152.40 cfs



Worksheet for PROP CHNL J

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	1.250 %
Discharge	29.90 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+24	7,204.53
1+22	7,201.99
2+31	7,203.75

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+24, 7,204.53)	(2+31, 7,203.75)	0.040

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	6.9 in
Roughness Coefficient	0.040
Elevation	7,202.56 ft
Elevation Range	7,202.0 to 7,204.5 ft
Flow Area	16.5 ft²
Wetted Perimeter	57.5 ft
Hydraulic Radius	3.4 in
Top Width	57.48 ft
Normal Depth	6.9 in
Critical Depth	5.6 in
Critical Slope	3.787 %
Velocity	1.81 ft/s
Velocity Head	0.05 ft
Specific Energy	0.63 ft
Froude Number	0.595
Flow Type	Subcritical

GVF Input Data

Worksheet for PROP CHNL J

GVF Input Data

Downstream Depth	0.0	in
Length	0.0	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.0	in
Profile Description	N/A	
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	6.9	in
Critical Depth	5.6	in
Channel Slope	1.250	%
Critical Slope	3.787	%

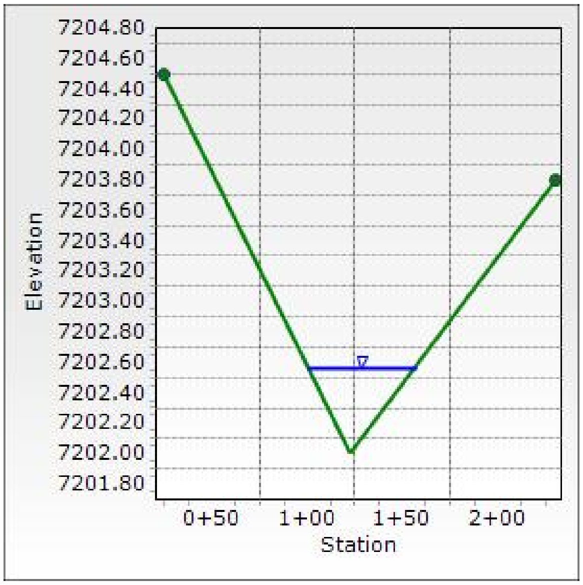
Cross Section for PROP CHNL J

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	1.250 %
Normal Depth	6.9 in
Discharge	29.90 cfs



Worksheet for PROP CHNL K

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	2.460 %
Discharge	167.50 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	7,212.20
0+96	7,210.71
1+60	7,211.35
1+65	7,210.93
1+72	7,210.90
1+75	7,211.02
1+83	7,213.46

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 7,212.20)	(1+83, 7,213.46)	0.040

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	8.9 in
Roughness Coefficient	0.040
Elevation	7,211.46 ft
Elevation Range	7,210.7 to 7,213.5 ft
Flow Area	52.4 ft²
Wetted Perimeter	128.9 ft
Hydraulic Radius	4.9 in
Top Width	128.77 ft
Normal Depth	8.9 in
Critical Depth	8.5 in
Critical Slope	3.224 %
Velocity	3.20 ft/s
Velocity Head	0.16 ft
Specific Energy	0.90 ft

Worksheet for PROP CHNL K

Results

Froude Number	0.883	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.0	in
Length	0.0	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.0	in
Profile Description	N/A	
Profile Headloss	0.00	ft
Downstream Velocity	0.00	ft/s
Upstream Velocity	0.00	ft/s
Normal Depth	8.9	in
Critical Depth	8.5	in
Channel Slope	2.460	%
Critical Slope	3.224	%

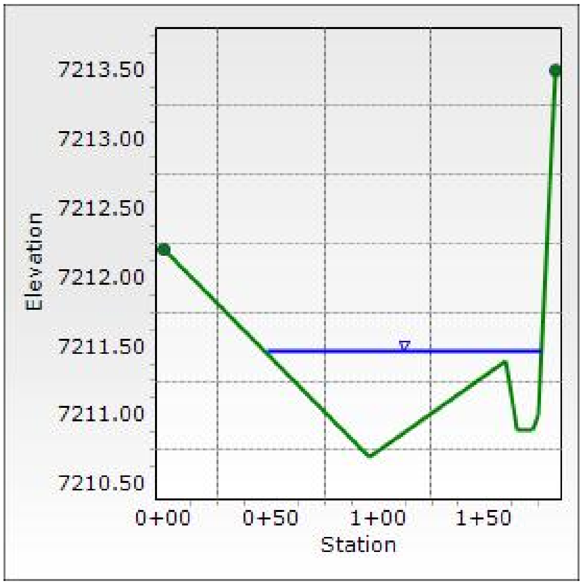
Cross Section for PROP CHNL K

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	2.460 %
Normal Depth	8.9 in
Discharge	167.50 cfs



Worksheet for PROP CHNL L

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	3.870 %
Discharge	21.90 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+12	7,226.00
0+53	7,222.85
0+74	7,221.57
1+55	7,223.80

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+12, 7,226.00)	(1+55, 7,223.80)	0.040

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	6.3 in
Roughness Coefficient	0.040
Elevation	7,222.10 ft
Elevation Range	7,221.6 to 7,226.0 ft
Flow Area	7.3 ft²
Wetted Perimeter	27.6 ft
Hydraulic Radius	3.2 in
Top Width	27.62 ft
Normal Depth	6.3 in
Critical Depth	6.4 in
Critical Slope	3.624 %
Velocity	3.00 ft/s
Velocity Head	0.14 ft
Specific Energy	0.67 ft
Froude Number	1.031
Flow Type	Supercritical

Worksheet for PROP CHNL L

GVF Input Data

Downstream Depth	0.0	in
Length	0.0	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.0	in
Profile Description	N/A	
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	6.3	in
Critical Depth	6.4	in
Channel Slope	3.870	%
Critical Slope	3.624	%

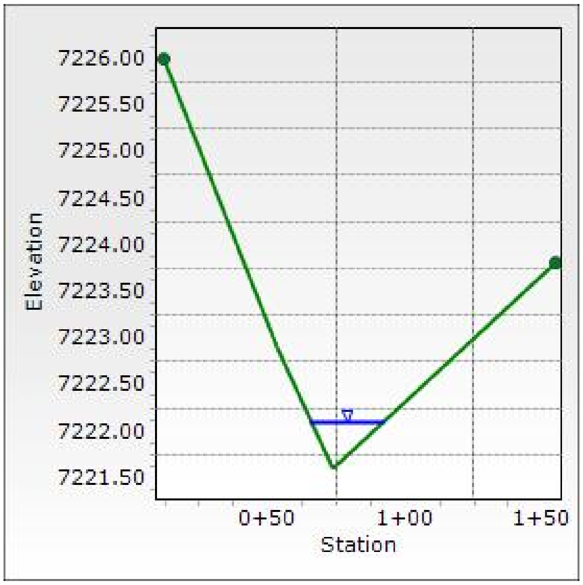
Cross Section for PROP CHNL L

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	3.870 %
Normal Depth	6.3 in
Discharge	21.90 cfs



Worksheet for PROP CHNL M

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	4.540	%
Discharge	185.30	cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	7,203.94
0+72	7,201.87
1+11	7,198.36
1+38	7,202.50
2+08	7,202.04

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 7,203.94)	(2+08, 7,202.04)	0.040

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	20.6	in
Roughness Coefficient	0.040	
Elevation	7,200.08	ft
Elevation Range	7,198.4 to 7,203.9	ft
Flow Area	26.0	ft²
Wetted Perimeter	30.5	ft
Hydraulic Radius	10.2	in
Top Width	30.32	ft
Normal Depth	20.6	in
Critical Depth	23.3	in
Critical Slope	2.377	%
Velocity	7.12	ft/s
Velocity Head	0.79	ft
Specific Energy	2.50	ft
Froude Number	1.355	
Flow Type	Supercritical	

Worksheet for PROP CHNL M

GVF Input Data

Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	20.6 in
Critical Depth	23.3 in
Channel Slope	4.540 %
Critical Slope	2.377 %

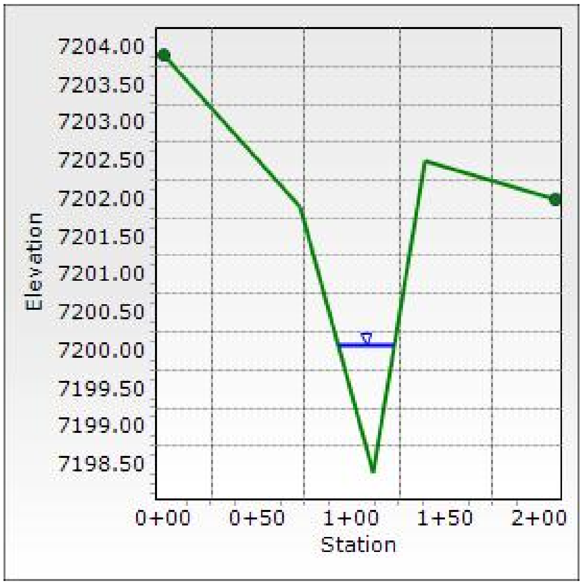
Cross Section for PROP CHNL M

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	4.540 %
Normal Depth	20.6 in
Discharge	185.30 cfs



Worksheet for PROP CHNL N

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.500 %
Discharge	41.30 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+03	7,201.34
0+15	7,198.34
0+21	7,198.34
0+33	7,201.34

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+03, 7,201.34)	(0+33, 7,201.34)	0.040

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	17.0 in
Roughness Coefficient	0.040
Elevation	7,199.75 ft
Elevation Range	7,198.3 to 7,201.3 ft
Flow Area	16.5 ft²
Wetted Perimeter	17.7 ft
Hydraulic Radius	11.2 in
Top Width	17.31 ft
Normal Depth	17.0 in
Critical Depth	11.0 in
Critical Slope	2.729 %
Velocity	2.51 ft/s
Velocity Head	0.10 ft
Specific Energy	1.51 ft
Froude Number	0.453
Flow Type	Subcritical

Worksheet for PROP CHNL N

GVF Input Data

Downstream Depth	0.0	in
Length	0.0	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.0	in
Profile Description	N/A	
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	17.0	in
Critical Depth	11.0	in
Channel Slope	0.500	%
Critical Slope	2.729	%

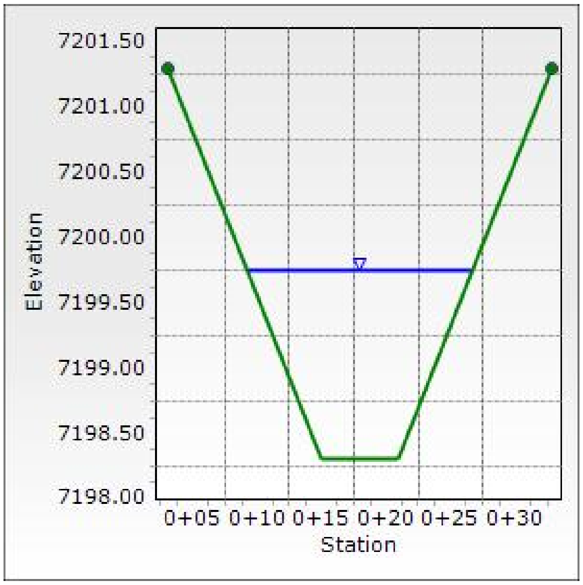
Cross Section for PROP CHNL N

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.500 %
Normal Depth	17.0 in
Discharge	41.30 cfs



Worksheet for PROP CHNL O

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	3.260 %
Discharge	5.50 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	7,195.73
0+70	7,196.09
1+00	7,192.99
1+30	7,195.99
1+83	7,197.86

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 7,195.73)	(1+83, 7,197.86)	0.040

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	5.6 in
Roughness Coefficient	0.040
Elevation	7,193.46 ft
Elevation Range	7,193.0 to 7,197.9 ft
Flow Area	2.2 ft²
Wetted Perimeter	9.3 ft
Hydraulic Radius	2.8 in
Top Width	9.25 ft
Normal Depth	5.6 in
Critical Depth	5.5 in
Critical Slope	3.848 %
Velocity	2.54 ft/s
Velocity Head	0.10 ft
Specific Energy	0.57 ft
Froude Number	0.924
Flow Type	Subcritical

Worksheet for PROP CHNL O

GVF Input Data

Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	5.6 in
Critical Depth	5.5 in
Channel Slope	3.260 %
Critical Slope	3.848 %

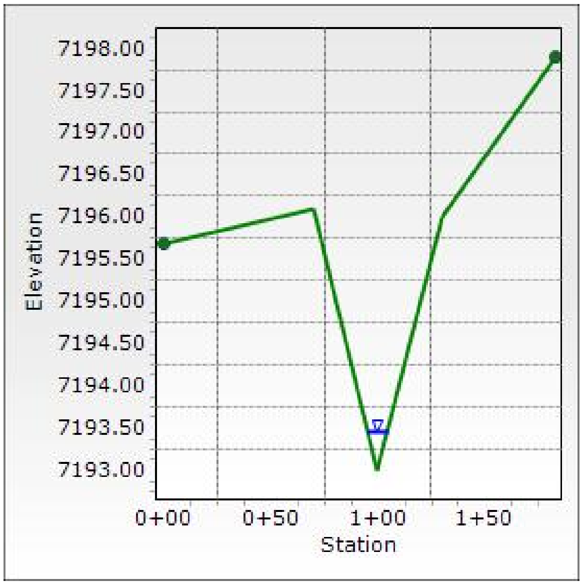
Cross Section for PROP CHNL O

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	3.260 %
Normal Depth	5.6 in
Discharge	5.50 cfs



Worksheet for PROP CHNL P

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	7.650	%
Discharge	2.30	cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	7,199.37
0+28	7,199.01
0+88	7,193.89
1+16	7,198.17
1+63	7,198.52

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 7,199.37)	(1+63, 7,198.52)	0.040

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	3.6	in
Roughness Coefficient	0.040	
Elevation	7,194.19	ft
Elevation Range	7,193.9 to 7,199.4 ft	
Flow Area	0.8	ft²
Wetted Perimeter	5.5	ft
Hydraulic Radius	1.8	in
Top Width	5.42	ft
Normal Depth	3.6	in
Critical Depth	4.0	in
Critical Slope	4.288	%
Velocity	2.86	ft/s
Velocity Head	0.13	ft
Specific Energy	0.42	ft
Froude Number	1.312	
Flow Type	Supercritical	

Worksheet for PROP CHNL P

GVF Input Data

Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	3.6 in
Critical Depth	4.0 in
Channel Slope	7.650 %
Critical Slope	4.288 %

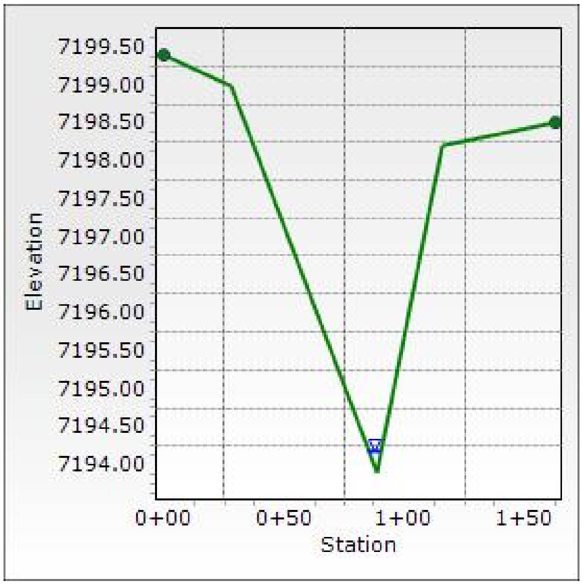
Cross Section for PROP CHNL P

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	7.650 %
Normal Depth	3.6 in
Discharge	2.30 cfs



ROADSIDE DITCH SUMMARY TABLE

Ditch #	ROADWAY	FROM STA	TO STA	PROPOSED SLOPE (%)	SIDE	SIDE SLOPE (L/R)	CHANNEL DEPTH (FT)	FRICTION FACTOR	BASIN	Q100 FLOW (CFS)	DITCH FLOW % OF BASIN	DITCH FLOW (CFS)	Q100 DEPTH (FT)	Q100 VELOCITY (FT/S)	Froude No. (Fr)	DITCH LINING
1	ARROYA COURT	80+36	84+06	2.62%	LEFT	4:1/4:1	2.5	0.04	5%OB5	107.1	5%	5.4	0.7	2.9	0.9	GRASS
2	S. ARROYA LANE	8+67	12+00	1.18%	LEFT	4:1/4:1	2.5	0.04	PB7 + 10%PB6	28.1	34%	12.6	1.2	2.6	0.6	GRASS
3	S. ARROYA LANE	8+67	12+00	1.18%	RIGHT	4:1/4:1	2.5	0.04	1%PB14	46.3	1%	0.5	0.3	1.2	0.5	GRASS
4	S. ARROYA LANE	15+88	20+00	2.69%	RIGHT	4:1/4:1	2.5	0.04	30%PB11	8.2	30%	2.5	0.5	2.4	0.8	GRASS
5	S. ARROYA LANE	20+00	24+28	2.16%	RIGHT	4:1/4:1	2.5	0.04	12%PB11	8.2	12%	1.0	0.4	1.8	0.7	GRASS
6	S. ARROYA LANE	20+00	24+28	2.16%	LEFT	4:1/4:1	2.5	0.04	5%PB10	24.8	5%	7.4	0.8	2.9	0.8	GRASS
7	ACEQUIA COURT	70+30	71+00	1.12%	LEFT	4:1/4:1	2.5	0.04	30%PB11	8.2	30%	2.5	0.6	1.7	0.6	GRASS
8	ACEQUIA COURT	71+60	75+44	1.00%	LEFT	4:1/4:1	2.5	0.04	5%PB11	8.2	5%	0.4	0.3	1.1	0.5	GRASS
9	ACEQUIA COURT	71+60	75+44	1.00%	RIGHT	4:1/4:1	2.5	0.04	10%PB14	46.3	10%	4.6	0.8	1.9	0.5	GRASS
10	FLAMING SUN DRIVE	24+40	26+88	1.84%	RIGHT	4:1/4:1	2.5	0.04	10%OB2	52.7	10%	5.3	0.7	2.5	0.7	GRASS
11	FLAMING SUN DRIVE	26+88	30+80	2.14%	LEFT	4:1/4:1	2.5	0.04	5% OB2 + 2%OB3	67.2	3%	2.2	0.5	2.1	0.7	GRASS
12	FLAMING SUN DRIVE	26+88	30+80	2.14%	RIGHT	4:1/4:1	2.5	0.04	10%OB2	52.7	10%	5.3	0.7	2.7	0.8	GRASS
13	FLAMING SUN DRIVE	34+00	35+90	1.10%	LEFT	4:1/4:1	2.5	0.04	20%PB5	10.4	20%	2.1	0.6	1.6	0.5	GRASS
14	FLAMING SUN DRIVE	34+00	35+90	1.10%	RIGHT	4:1/4:1	2.5	0.04	1%PB6	20.7	1%	0.2	0.2	0.9	0.5	GRASS
15	FLAMING SUN DRIVE	35+90	44+00	3.34%	LEFT	4:1/4:1	2.5	0.04	75%PB7	7.4	75%	5.6	0.7	3.2	1.0	GRASS/TRM
16	FLAMING SUN DRIVE	43+10	44+00	3.34%	RIGHT	4:1/4:1	2.5	0.04	8%PB6	20.7	8%	1.7	0.4	2.4	0.9	GRASS/TRM
17	CHAMITA TRAIL	60+00	63+78	2.18%	LEFT	4:1/4:1	2.5	0.04	15%PB15+1%PB14	46.3	15%	6.9	0.8	2.9	0.8	GRASS

please clarify if this is intended to be native grass. See comment in the narrative.

Design Data and Test Results

Excel PP5-12™

Specifications

A variety of test methods are utilized to determine performance and conformance values for Rolled Erosion Control Products (RECPs). Information within this document is presented to provide conformance values and recommended design values. Test results obtained for the Excel PP5-12 Turf Reinforcement Mat (TRM) and general design values are presented in Tables 1-4. For specific information detailing testing protocols, results and application of design values, refer to document number WE_EXCEL_PERF_GEN.

Table 1 - Bench Scale Testing / NTPEP

Test Method	Condition	Result
ASTM D7101 Bench Scale Rainfall and Rainsplash Test	2 in per hour	14.53
	4 in per hour	5.59
	6 in per hour	4.82
ASTM D7207 Bench Scale Shear Resistance Test	3.0 psf (145 PA)	0.5 in (12 mm)
ASTM D7322 Bench Scale Vegetation Establishment Test	Top Soil, Fescue, 21 Day Incubation	661 %
NTPEP Report Number	ECP-2016-03-008	

Table 3 - Recommended Design Values*

Design Value	Unvegetated	Vegetated
Typical RUSLE Cover Factor (C Factor)**	0.03	N/A
Maximum Slope Gradient (RUSLE)	1H : 1V	N/A
Max Allowable Velocity (0.5 in (12mm) soil loss)***	9.0 ft/s (2.7 m/s)	15.0 ft/s (4.6 m/s)
Max Allowable Shear Stress (0.5 in (12mm) soil loss)***	2.8 psf (134 PA)	12.0 psf (575 PA)
CF_{veg}/CF_{TRM}	N/A	0.26
C Factor value compliant with ASTM D6459. * Shear Stress and Velocity values compliant with ASTM D6460.		

Table 2 - Texas Transportation Institute (TTI) Results

Class	Test Condition	Result
A	< 3H:1 Clay Slope Test	N/A
B	< 3H:1 Sand Slope Test	N/A
C	> 3H:1 Clay Slope Test	N/A
D	> 3H:1 Sand Slope Test	N/A
E	2 psf Partially Vegetated Channel Test	Approved
F	4 psf Partially Vegetated Channel Test	Approved
G	6 psf Partially Vegetated Channel Test	Approved
H	8 psf Partially Vegetated Channel Test	Approved

Table 4 - HEC-15 Resistance to Flow Values

Design Value	Unvegetated
Manning's n @ Tau $_{lower}$ (0.7 psf (34 PA))	0.027
Manning's n @ Tau $_{mid}$ (1.4 psf (67 PA))	0.027
Manning's n @ Tau $_{upper}$ (2.8 psf (134 PA))	0.027

*Recommended Design Values are based on results of standardized industry full-scale testing and may not be applicable for all field conditions. For most accurate computation of field performance, consult Excel Erosion Design (EED) at www.westernexcelsior.com.

The information contained herein may represent product index data, performance ratings, bench scale testing or other material utility quantifications. Each representation may have unique utility and limitations. Every effort has been made to ensure accuracy, however, no warranty is claimed and no liability shall be assumed by Western Excelsior Corporation (WEC) or its affiliates regarding the completeness, accuracy or fitness of these values for any particular application or interpretation. While testing methods are provided for reference, values shown may be derived from interpolation or adjustment to be representative of intended use. For further information, please feel free to contact WEC.

ROCK CHUTE DETAILS

Rock Chute ID	Rock Chute Location	Contributing Basins	Q100 Flow (cfs)	Upstream Inlet Apron Length (ft)	Drop (ft) *(Inlet Apron to Outlet Apron)*	Chute Length (ft)	Downstream Outlet Apron Length (ft)	Chute Width (ft)	D50 (in)	Rock Chute Thickness (in)	Radius (ft)	Rock Chute Depth* (ft)	Top Chute Width** (ft)
1	PB8A	PB8A(60%), OB5	103	12.5	10	40	14	10	12	24	36	3.0	34
2	PB8A	PB8A (40%)	20	5	10	40	7	10	12	24	17	2.0	26
3	PB14	OB8, PB11, PB14 (10%)	96	12	7	28	16	10	18	36	27	3.0	34
4	PB15	PB6, PB7, PB15(55%)	43	10	6	24	13	14	12	24	21	2.0	30
5	PB15	OB2, OB3, OB4, PB3, PB4, PB5, PB15 (10%)	185	14	5	20	23	18	24	48	39	3.5	46

NOTES:

*: Rock Chute Depth accounts for 1' of freeboard.

**: Top Chute Width accounts for 1' of freeboard.

Rock Chute Design Data

(Version WI-July-2010, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

Project: *Eagleview North Rock Chute #1*
County: *El Paso*
Designer: *BAH*
Checked by:
Date: *April 15, 2024*
Date:

Input Geometry:

Upstream Channel

Bw = *5.0* ft.
Side slopes = *4.0* (m:1)
Velocity n-value = *0.035*
Bed slope = *0.0380* ft./ft.
Note: n value = a) velocity n from waterway program
or b) computed mannings n for channel

Chute

Bw = *10.0* ft.
Factor of safety = *1.20* (F_s) → ***1.2 Min***
Side slopes = *4.0* (m:1) → ***2.0:1 max.***
Bed slope (4:1) = *0.250* ft./ft. → ***3.0:1 max.***
Freeboard = *0.5* ft.
Outlet apron depth, d = *1.0* ft.

Downstream Channel

Bw = *10.0* ft.
Side slopes = *1.0* (m:1)
Velocity n-value = *0.035*
Bed slope = *0.0040* ft./ft.
Base flow = *0.0* cfs

Design Storm Data (Table 2, FOTG, WI-NRCS Grade Stabilization Structure No. 410):

Apron elev. --- Inlet =*103.0* ft. ------- Outlet *92.0* ft. --- (H_{drop} = 10 ft.)

Q_{high} = Runoff from design storm capacity from Table 2, FOTG Standard 410
Q_5 = Runofff from a 5-year,24-hour storm.

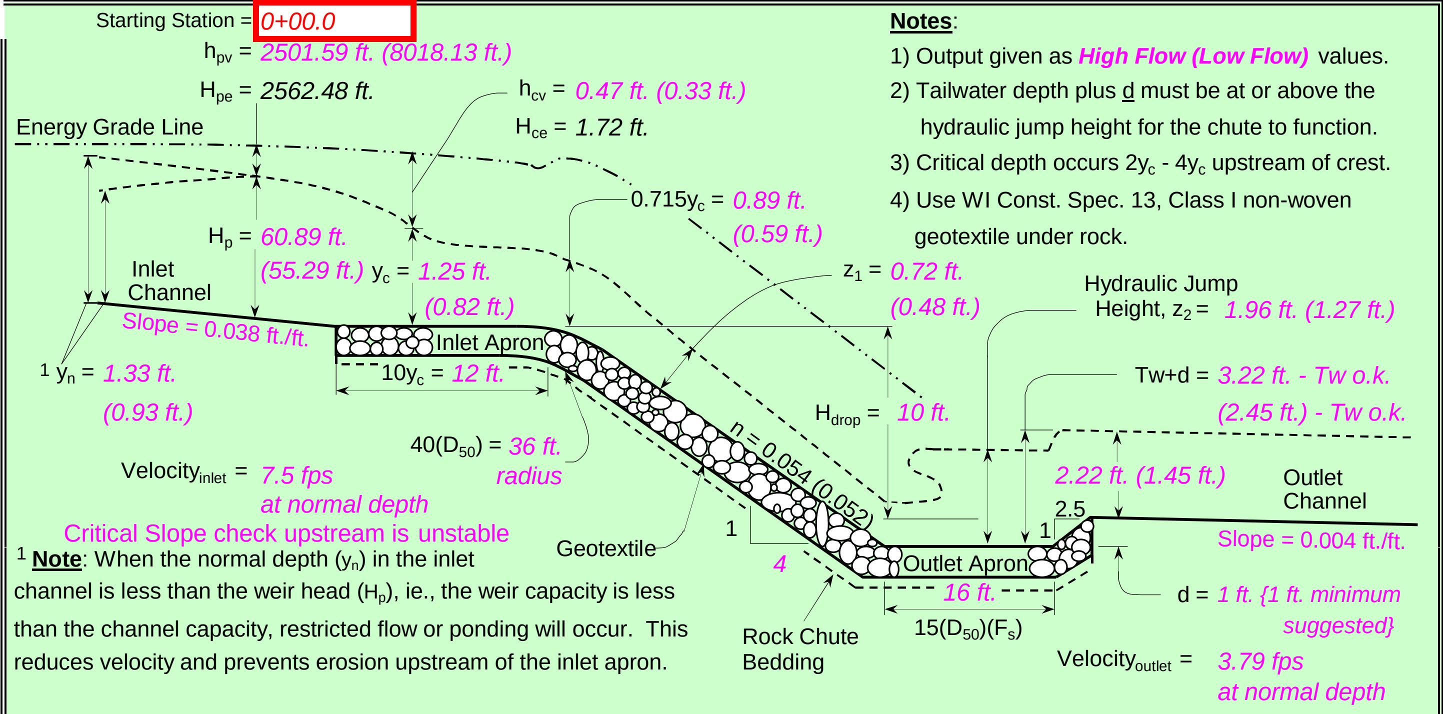
Q_{high}= *103.0* cfs High flow storm through chute → Tw (ft.) = *Program*
Q_5 = *50.0* cfs Low flow storm through chute → Tw (ft.) = *Program*

***Note**: The total required capacity is routed through the chute (principal spillway) or in combination with an auxiliary spillway.*

***Input tailwater (Tw)**:* 0.25 1.20

Profile and Cross Section (Output):

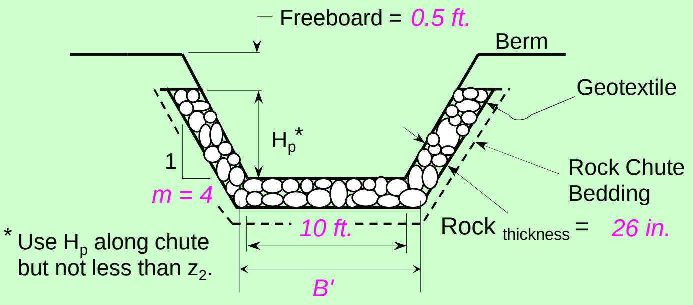
Notes:
1) Output given as ***High Flow (Low Flow)*** values.
2) Tailwater depth plus d must be at or above the hydraulic jump height for the chute to function.
3) Critical depth occurs $2y_c$ - $4y_c$ upstream of crest.
4) Use WI Const. Spec. 13, Class I non-woven geotextile under rock.


Starting Station = 0+00.0
h_{pv} = 2501.59 ft. (8018.13 ft.)
H_{pe} = 2562.48 ft.
h_{cv} = 0.47 ft. (0.33 ft.)
H_{ce} = 1.72 ft.
Energy Grade Line
0.715y_c = 0.89 ft.
(0.59 ft.)
H_p = 60.89 ft.
(55.29 ft.) y_c = 1.25 ft.
(0.82 ft.)
Inlet Channel
Slope = 0.038 ft./ft.
z_1 = 0.72 ft.
(0.48 ft.)
Hydraulic Jump Height, z_2 = 1.96 ft. (1.27 ft.)
Inlet Apron
^{1} y_n = 1.33 ft.
(0.93 ft.)
$10y_c$ = 12 ft.
Tw+d = 3.22 ft. - Tw o.k.
(2.45 ft.) - Tw o.k.
H_{drop} = 10 ft.
n = 0.054 (0.052)
$40(D_{50})$ = 36 ft.
radius
Velocity$_{inlet}$ = 7.5 fps
at normal depth
2.22 ft. (1.45 ft.)
Outlet Channel
2.5
1
1
4
Critical Slope check upstream is unstable
Geotextile
Outlet Apron
Slope = 0.004 ft./ft.
16 ft.
d = 1 ft. {1 ft. minimum suggested}
Rock Chute Bedding
$15(D_{50})(F_s)$
Velocity$_{outlet}$ = 3.79 fps
at normal depth

^{1} **Note**: When the normal depth (y_n) in the inlet channel is less than the weir head (H_p), ie., the weir capacity is less than the channel capacity, restricted flow or ponding will occur. This reduces velocity and prevents erosion upstream of the inlet apron.

Profile Along Centerline of Chute

Typical Cross Section


Freeboard = 0.5 ft.
Berm
Geotextile
H_p*
1
m = 4
Rock Chute Bedding
Rock thickness = 26 in.
10 ft.
B'

* Use H_p along chute but not less than z_2.

	7.93 cfs/ft.	Equivalent unit discharge
F_S =	*1.20*	Factor of safety (multiplier)
z_1 =	*0.72 ft.*	Normal depth in chute
n-value =	*0.054*	Manning's roughness coefficient
$D_{50}(F_s)$ =	*13 in.*	Minimum Design D50*
$2(D_{50})(F_s)$ =	*26 in.*	Rock chute thickness
Tw + d =	*3.22 ft.*	Tailwater above outlet apron
z_2 =	*1.96 ft.*	Hydraulic jump height
****** The outlet***	***will***	***function adequately***

High Flow Storm Information

Rock Chute Design - Plan Sheet

(Version WI-July-2010, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

Project:	Eagleview North Rock Chute #1	**County:**	El Paso
Designer:	BAH	**Checked by:**	
Date:	4/15/2024	**Date:**	

Minimum Design Values		***Enter Plan Values***
13.0 in.	D_{50} dia. =	in.
26.0 in.	$\text{Rock}_{\text{chute}}$ thickness =	in.
12 ft.	Inlet apron length =	ft.
16 ft.	Outlet apron length =	ft.
36 ft.	Radius =	0 ft.

Will bedding be used? Yes ----------

Rock Gradation Envelope

% Passing		*Diameter, in. (weight, lbs.)*
D_{100}	---------	0 - 0 (0 - 0)
D_{85}	---------	0 - 0 (0 - 0)
D_{50}	---------	0 - 0 (0 - 0)
D_{10}	---------	0 - 0 (0 - 0)

Depth (in.) = enter thickness

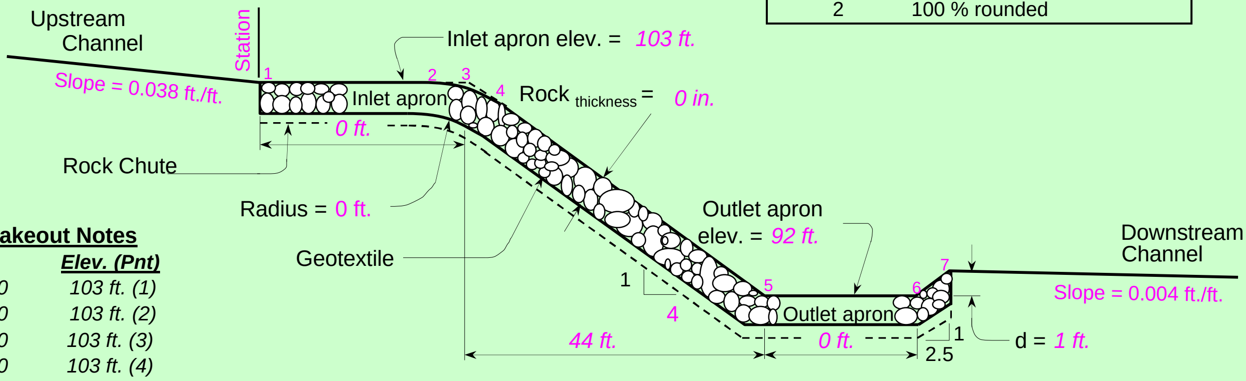
Quantities[a]

Rock =	0	yd^3
Geotextile (WCS-13)[b] =	140	yd^2
Bedding enter thickness in. =	#VALUE!	yd^3
Excavation =	0	yd^3
Earthfill =	0	yd^3
Seeding =	0.0	acres

Degree of angularity = 1

1	50% angular, 50% rounded
2	100 % rounded

Notes: [a] *Rock, bedding, and geotextile quantities are determined from the x-section below (neglect radius).*
[b] *Geotextile Class I (non-woven) shall be overlapped and anchored (18-in. min. along sides and 24-in. min. on the ends).*


Upstream Channel
Station
Slope = 0.038 ft./ft.
1
2
3
4
Inlet apron elev. = 103 ft.
Inlet apron
Rock thickness = 0 in.
0 ft.
Rock Chute
Radius = 0 ft.
Geotextile
Outlet apron elev. = 92 ft.
1
4
5
6
7
Outlet apron
44 ft.
0 ft.
1
2.5
d = 1 ft.
Downstream Channel
Slope = 0.004 ft./ft.

Profile Along Centerline of Rock Chute

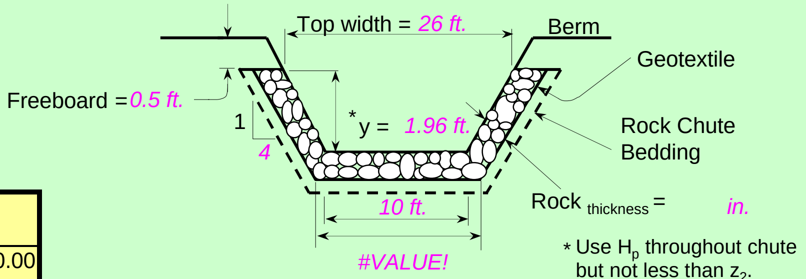
**** *Note*:** ***The outlet will function adequately***

Stakeout Notes

Sta.	*Elev. (Pnt)*
0+00.0	103 ft. (1)
0+00.0	103 ft. (2)
0+00.0	103 ft. (3)
0+00.0	103 ft. (4)
0+44.0	92 ft. (5)
0+44.0	92 ft. (6)
0+46.5	93 ft. (7)

Class I non-woven

Rock gradation envelope can be met with DOT Light riprap Gradation


Top width = 26 ft.
Berm
Geotextile
Freeboard = 0.5 ft.
1
4
*y = 1.96 ft.
Rock Chute Bedding
Rock thickness = in.
10 ft.
#VALUE!

* Use H_p throughout chute but not less than z_2.

Rock Chute Cross Section

Profile, Cross Sections, and Quantities

Rock Chute Cost Estimate

Unit	*Unit Cost*	*Cost*
Rock	$10.00 /$yd^3$	$0.00
Geotextile	$12.00/$yd^2$	$1,680.00
Bedding	$12.00 /$yd^3$	#VALUE!
Excavation	$12.00/$yd^3$	$0.00
Earthfill	$1.00 /$yd^3$	$0.00
Seeding	$2.00 /ac.	$0.00
	Total	**#VALUE!**

NRCS
Natural Resources Conservation Service
United States Department of Agriculture

Eagleview North Rock Chute #1

El Paso County

		Date
Designed	BAH	
Drawn		
Checked		
Approved		

File Name

Drawing Name

Sheet ___ of ___

Rock Chute Design - Cut/Paste Plan

(Version WI-July-2010, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

Project: Eagleview North Rock Chute #1
Designer: BAH
Date: 4/15/2024
County: El Paso
Checked by:
Date:

Design Values

D_{50} dia. = 0.0 in.
$\text{Rock}_{\text{chute}}$ thickness = 0.0 in.
Inlet apron length = 0 ft.
Outlet apron length = 0 ft.
Radius = 0 ft.
Will bedding be used? Yes

Rock Gradation Envelope

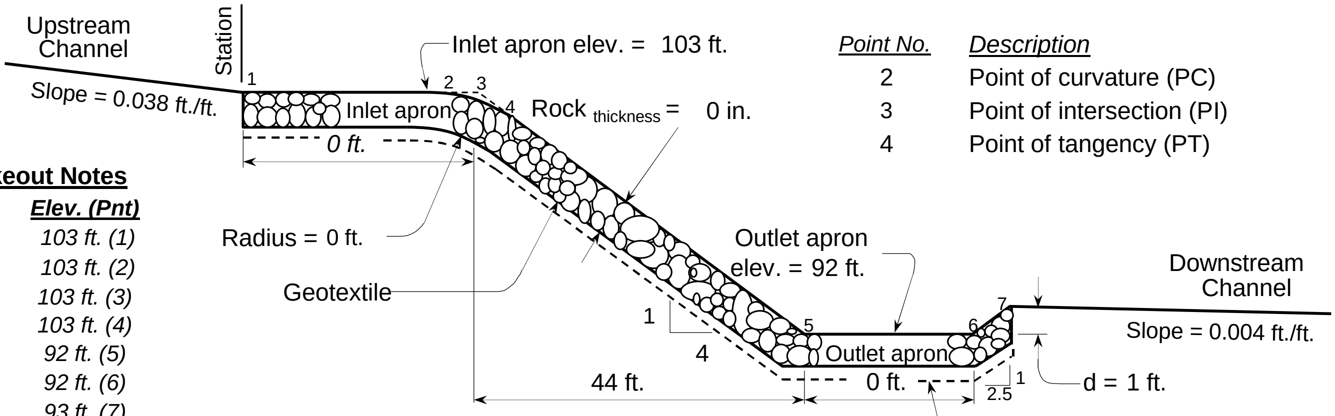
% Passing	*Diameter, in. (weight, lbs.)*
D_{100} ---------	0 - 0 (0 - 0)
D_{85} ---------	0 - 0 (0 - 0)
D_{50} ---------	0 - 0 (0 - 0)
D_{10} ---------	0 - 0 (0 - 0)

Coefficient of Uniformity, $(D_{60})/(D_{10}) < 1.7$

Quantities [a]

Rock = 0 yd^3
Geotextile (WCS-13)[b] = 140 yd^2
Bedding enter thickness in. = #VALUE! yd^3
Excavation = 0 yd^3
Earthfill = 0 yd^3
Seeding = 0.0 acres

Notes: [a] *Rock, bedding, and geotextile quantities are determined from x-section below (neglect radius).*
[b] *Geotextile Class I (Non-woven) shall be overlapped and anchored (18-in. minimum along sides and 24-in. minimum on the ends) --- quantity not included.*


Upstream Channel
Station
Slope = 0.038 ft./ft.
1
2
3
4
Inlet apron elev. = 103 ft.
Inlet apron
0 ft.
Rock thickness = 0 in.
Radius = 0 ft.
Geotextile
1
4
44 ft.
5
Outlet apron elev. = 92 ft.
Outlet apron
0 ft.
6
7
1
2.5
d = 1 ft.
Downstream Channel
Slope = 0.004 ft./ft.

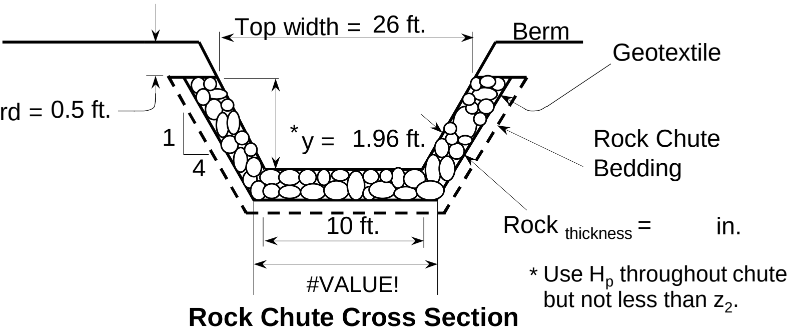
Point No.	*Description*
2	Point of curvature (PC)
3	Point of intersection (PI)
4	Point of tangency (PT)

Stakeout Notes

Sta.	***Elev. (Pnt)***
0+00.0	*103 ft. (1)*
0+00.0	*103 ft. (2)*
0+00.0	*103 ft. (3)*
0+00.0	*103 ft. (4)*
0+44.0	*92 ft. (5)*
0+44.0	*92 ft. (6)*
0+46.5	*93 ft. (7)*

Profile Along Centerline of Rock Chute

Rock Chute Bedding


Top width = 26 ft.
Berm
Geotextile
1
4
*y = 1.96 ft.
Rock Chute Bedding
10 ft.
Rock thickness = in.
#VALUE!

Freeboard = 0.5 ft.

* Use H_p throughout chute but not less than z_2.

Rock Chute Cross Section

Notes:
Rock gradation envelope can be met with
DOT Light riprap Gradation

Profile, Cross Sections, and Quantities

NRCS
Natural Resources Conservation Service
United States Department of Agriculture

Eagleview North Rock Chute #1

El Paso County

		Date
Designed	BAH	
Drawn		
Checked		
Approved		

File Name
Drawing Name
Sheet __ of __

Rock Chute Design Data

(Version WI-July-2010, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

Project: Eaglview - South Rock Chute #2
Designer: BAH
Date: April 15, 2024
County: El Paso
Checked by:
Date:

Input Geometry:

Upstream Channel	Chute		Downstream Channel
Bw = 5.0 ft.	Bw = 10.0 ft.		Bw = 10.0 ft.
Side slopes = 4.0 (m:1)	Factor of safety = 1.20 (F_s)	1.2 Min	Side slopes = 1.0 (m:1)
Velocity n-value = 0.035	Side slopes = 4.0 (m:1)	2.0:1 max.	Velocity n-value = 0.035
Bed slope = 0.0288 ft./ft.	Bed slope (4:1) = 0.250 ft./ft.	3.0:1 max.	Bed slope = 0.0040 ft./ft.
Note: n value = a) velocity n from waterway program	Freeboard = 0.5 ft.		
or b) computed mannings n for channel	Outlet apron depth, d = 1.0 ft.		Base flow = 0.0 cfs

Design Storm Data (Table 2, FOTG, WI-NRCS Grade Stabilization Structure No. 410):

Apron elev. --- Inlet =103.0 ft. ------- Outlet 92.0 ft. --- (H_{drop} = 10 ft.)

Note: The total required capacity is routed through the chute (principal spillway) or in combination with an auxiliary spillway.

Q_{high} = Runoff from design storm capacity from Table 2, FOTG Standard 410

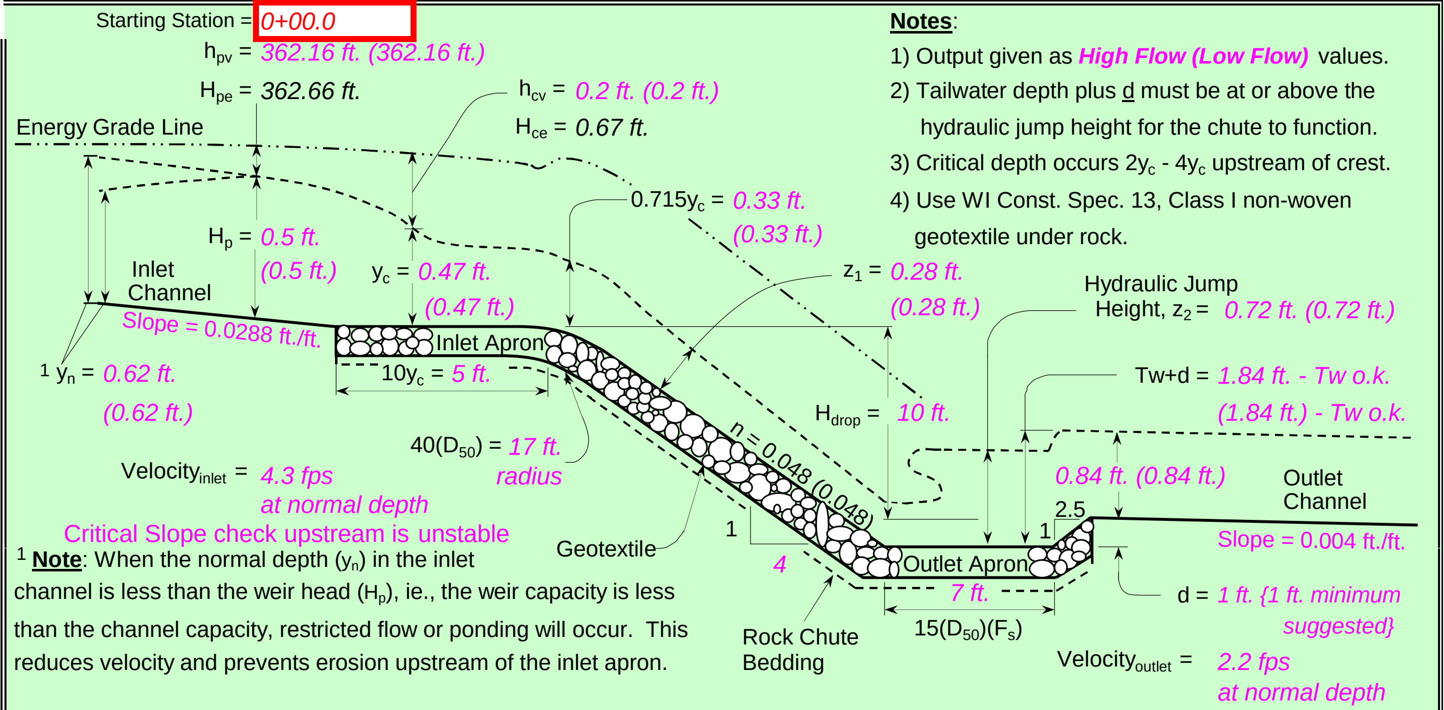
Q_5 = Runofff from a 5-year,24-hour storm.

Input tailwater (Tw): 0.25 1.20

Q_{high}= 20.0 cfs High flow storm through chute → Tw (ft.) = Program

Q_5 = 20.0 cfs Low flow storm through chute → Tw (ft.) = Program

Profile and Cross Section (Output):


Starting Station = 0+00.0
h_{pv} = 362.16 ft. (362.16 ft.)
H_{pe} = 362.66 ft.
h_{cv} = 0.2 ft. (0.2 ft.)
H_{ce} = 0.67 ft.
Energy Grade Line
$0.715y_c$ = 0.33 ft. (0.33 ft.)
H_p = 0.5 ft. (0.5 ft.)
Inlet Channel
y_c = 0.47 ft. (0.47 ft.)
z_1 = 0.28 ft. (0.28 ft.)
Hydraulic Jump Height, z_2 = 0.72 ft. (0.72 ft.)
Slope = 0.0288 ft./ft.
Inlet Apron
^{1} y_n = 0.62 ft. (0.62 ft.)
$10y_c$ = 5 ft.
Tw+d = 1.84 ft. - Tw o.k. (1.84 ft.) - Tw o.k.
H_{drop} = 10 ft.
n = 0.048 (0.048)
$40(D_{50})$ = 17 ft. radius
Velocity$_{inlet}$ = 4.3 fps at normal depth
0.84 ft. (0.84 ft.)
Outlet Channel
2.5
1
1
4
Critical Slope check upstream is unstable
Geotextile
Outlet Apron
7 ft.
Slope = 0.004 ft./ft.
d = 1 ft. {1 ft. minimum suggested}
$15(D_{50})(F_s)$
Rock Chute Bedding
Velocity$_{outlet}$ = 2.2 fps at normal depth

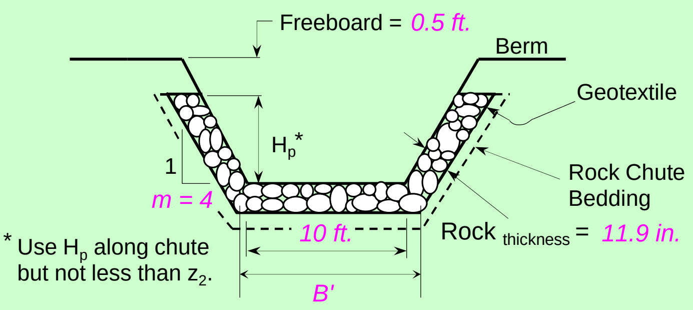
Notes:

1) Output given as ***High Flow (Low Flow)*** values.
2) Tailwater depth plus d must be at or above the hydraulic jump height for the chute to function.
3) Critical depth occurs $2y_c$ - $4y_c$ upstream of crest.
4) Use WI Const. Spec. 13, Class I non-woven geotextile under rock.

[1] **Note**: When the normal depth (y_n) in the inlet channel is less than the weir head (H_p), ie., the weir capacity is less than the channel capacity, restricted flow or ponding will occur. This reduces velocity and prevents erosion upstream of the inlet apron.

Profile Along Centerline of Chute

Typical Cross Section


Freeboard = 0.5 ft.
Berm
Geotextile
H_p*
1
m = 4
Rock Chute Bedding
10 ft.
Rock $_{thickness}$ = 11.9 in.
B'

* Use H_p along chute but not less than z_2.

	1.81 cfs/ft.	Equivalent unit discharge
F_S =	1.20	Factor of safety (multiplier)
z_1 =	0.28 ft.	Normal depth in chute
n-value =	0.048	Manning's roughness coefficient
$D_{50}(F_s)$ =	6 in.	Minimum Design D50*
$2(D_{50})(F_s)$ =	11.9 in.	Rock chute thickness
Tw + d =	1.84 ft.	Tailwater above outlet apron
z_2 =	0.72 ft.	Hydraulic jump height
***** The outlet***	***will***	***function adequately***

High Flow Storm Information

Rock Chute Design - Plan Sheet

(Version WI-July-2010, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

Project: Eaglview - South Rock Chute #2
Designer: BAH
Date: 4/15/2024
County: El Paso
Checked by:
Date:

Minimum Design Values		***Enter Plan Values***
6.0 in.	D_{50} dia. =	in.
11.9 in.	$\text{Rock}_{\text{chute}}$ thickness =	in.
5 ft.	Inlet apron length =	ft.
7 ft.	Outlet apron length =	ft.
17 ft.	Radius =	0 ft.

Will bedding be used? Yes ----------

Rock Gradation Envelope

% Passing		*Diameter, in. (weight, lbs.)*
D_{100}	---------	0 - 0 (0 - 0)
D_{85}	---------	0 - 0 (0 - 0)
D_{50}	---------	0 - 0 (0 - 0)
D_{10}	---------	0 - 0 (0 - 0)

Depth (in.) = enter thickness

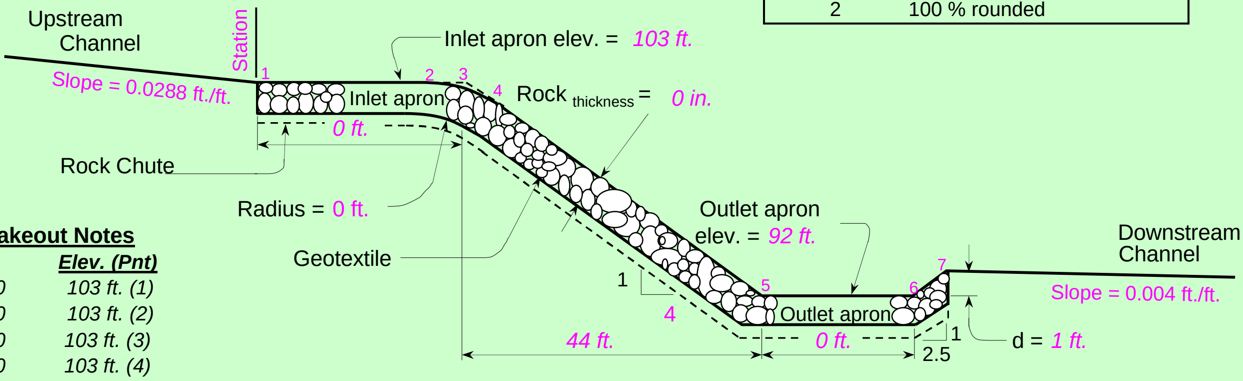
Quantities [a]

Rock =	0	yd^3
Geotextile (WCS-13)[b] =	86	yd^2
Bedding enter thickness in. =	#VALUE!	yd^3
Excavation =	0	yd^3
Earthfill =	0	yd^3
Seeding =	0.0	acres

Notes: [a] Rock, bedding, and geotextile quantities are determined from the x-section below (neglect radius).
[b] Geotextile Class I (non-woven) shall be overlapped and anchored (18-in. min. along sides and 24-in. min. on the ends).

Degree of angularity = 1

1	50% angular, 50% rounded
2	100 % rounded



Upstream Channel
Station
Slope = 0.0288 ft./ft.
1
2
3
4
Inlet apron elev. = 103 ft.
Inlet apron
Rock thickness = 0 in.
0 ft.
Rock Chute
Radius = 0 ft.
Geotextile
Outlet apron elev. = 92 ft.
1
4
5
6
7
Outlet apron
Downstream Channel
Slope = 0.004 ft./ft.
44 ft.
0 ft.
1
2.5
d = 1 ft.

Profile Along Centerline of Rock Chute

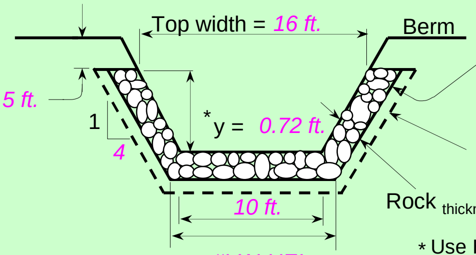
**** *Note*:** ***The outlet will function adequately***

Stakeout Notes

Sta.	***Elev. (Pnt)***
0+00.0	103 ft. (1)
0+00.0	103 ft. (2)
0+00.0	103 ft. (3)
0+00.0	103 ft. (4)
0+44.0	92 ft. (5)
0+44.0	92 ft. (6)
0+46.5	93 ft. (7)

Class I non-woven

Rock gradation envelope can be met with
DOT Light riprap Gradation



Top width = 16 ft.
Berm
Geotextile
Freeboard = 0.5 ft.
1
4
*y = 0.72 ft.
Rock Chute Bedding
10 ft.
Rock thickness = in.

#VALUE!

* Use H_p throughout chute but not less than z_2.

Rock Chute Cross Section

Rock Chute Cost Estimate

Unit	*Unit Cost*	*Cost*
Rock	$10.00 $/yd^3$	$0.00
Geotextile	$12.00 $/yd^2$	$1,032.00
Bedding	$12.00 $/yd^3$	#VALUE!
Excavation	$12.00 $/yd^3$	$0.00
Earthfill	$1.00 $/yd^3$	$0.00
Seeding	$2.00 /ac.	$0.00
	Total	**#VALUE!**

Profile, Cross Sections, and Quantities

NRCS
Natural Resources Conservation Service
United States Department of Agriculture

Eaglview - South Rock Chute #2

El Paso County

		Date
Designed	BAH	
Drawn		
Checked		
Approved		

File Name

Drawing Name

Sheet ___ of ___

Rock_Chute.xls
for construction plan

Rock Chute Design - Cut/Paste Plan

(Version WI-July-2010, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

Project: Eaglview - South Rock Chute #2
Designer: BAH
Date: 4/15/2024

County: El Paso
Checked by:
Date:

Design Values

D_{50} dia. = 0.0 in.
Rock$_{chute}$ thickness = 0.0 in.
Inlet apron length = 0 ft.
Outlet apron length = 0 ft.
Radius = 0 ft.
Will bedding be used? Yes

Rock Gradation Envelope

% Passing	*Diameter, in. (weight, lbs.)*
D_{100} ---------	0 - 0 (0 - 0)
D_{85} ---------	0 - 0 (0 - 0)
D_{50} ---------	0 - 0 (0 - 0)
D_{10} ---------	0 - 0 (0 - 0)

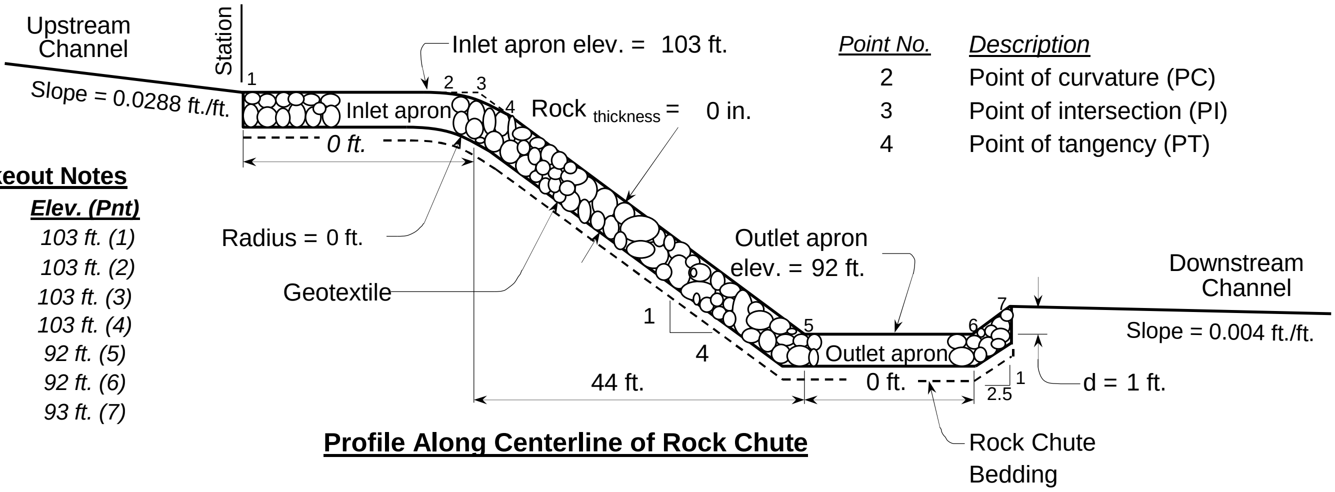
Coefficient of Uniformity, $(D_{60})/(D_{10}) < 1.7$

Quantities [a]

Rock = 0 yd^3
Geotextile (WCS-13)[b] = 86 yd^2
Bedding enter thickness in. = #VALUE! yd^3
Excavation = 0 yd^3
Earthfill = 0 yd^3
Seeding = 0.0 acres

Notes: [a] *Rock, bedding, and geotextile quantities are determined from x-section below (neglect radius).*

[b] *Geotextile Class I (Non-woven) shall be overlapped and anchored (18-in. minimum along sides and 24-in. minimum on the ends) --- quantity not included.*

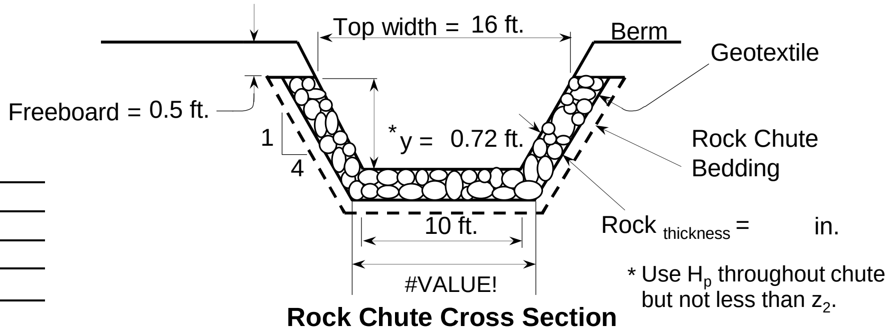

Upstream Channel
Station
Slope = 0.0288 ft./ft.
1
2
3
4
Inlet apron elev. = 103 ft.
Inlet apron
0 ft.
Rock thickness = 0 in.
Radius = 0 ft.
Geotextile
Outlet apron elev. = 92 ft.
1
4
44 ft.
5
6
7
Outlet apron
0 ft.
1
2.5
d = 1 ft.
Downstream Channel
Slope = 0.004 ft./ft.
Rock Chute Bedding

Point No.	*Description*
2	Point of curvature (PC)
3	Point of intersection (PI)
4	Point of tangency (PT)

Stakeout Notes

Sta.	***Elev. (Pnt)***
0+00.0	*103 ft. (1)*
0+00.0	*103 ft. (2)*
0+00.0	*103 ft. (3)*
0+00.0	*103 ft. (4)*
0+44.0	*92 ft. (5)*
0+44.0	*92 ft. (6)*
0+46.5	*93 ft. (7)*

Profile Along Centerline of Rock Chute


Top width = 16 ft.
Berm
Geotextile
Freeboard = 0.5 ft.
1
4
*y = 0.72 ft.
Rock Chute Bedding
10 ft.
Rock thickness = in.
#VALUE!

* Use H_p throughout chute but not less than z_2.

Rock Chute Cross Section

Notes:
Rock gradation envelope can be met with
DOT Light riprap Gradation

Profile, Cross Sections, and Quantities

NRCS
Natural Resources Conservation Service
United States Department of Agriculture

Eaglview - South Rock Chute #2

El Paso County

		Date
Designed	BAH	
Drawn		
Checked		
Approved		

File Name
Drawing Name
Sheet __ of __

Rock Chute Design Data

(Version WI-July-2010, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

Project: Eagleview - Rock Chute 3 (WQ 2)
County: El Paso
Designer: TOS
Checked by:
Date: April 18, 2024
Date:

Input Geometry:

Upstream Channel
Bw = 10.0 ft.
Side slopes = 4.0 (m:1)
Velocity n-value = 0.040
Bed slope = 0.0600 ft./ft.
Note: n value = a) velocity n from waterway program
or b) computed mannings n for channel

Chute
Bw = 10.0 ft.
Factor of safety = 1.60 (F_s) → 1.2 Min
Side slopes = 4.0 (m:1) → 2.0:1 max.
Bed slope (9.1:1) = 0.110 ft./ft → 3.0:1 max.
Freeboard = 1.0 ft.
Outlet apron depth, d = 1.0 ft.

Downstream Channel
Bw = 10.0 ft.
Side slopes = 4.0 (m:1)
Velocity n-value = 0.040
Bed slope = 0.0200 ft./ft.
Base flow = 0.0 cfs

Design Storm Data (Table 2, FOTG, WI-NRCS Grade Stabilization Structure No. 410):

Apron elev. --- Inlet = 7205.0 ft. ------- Outlet 7198.0 ft. --- (H_{drop} = 6 ft.)

Q_{high} = Runoff from design storm capacity from Table 2, FOTG Standard 410
Q_5 = Runofff from a 5-year,24-hour storm.

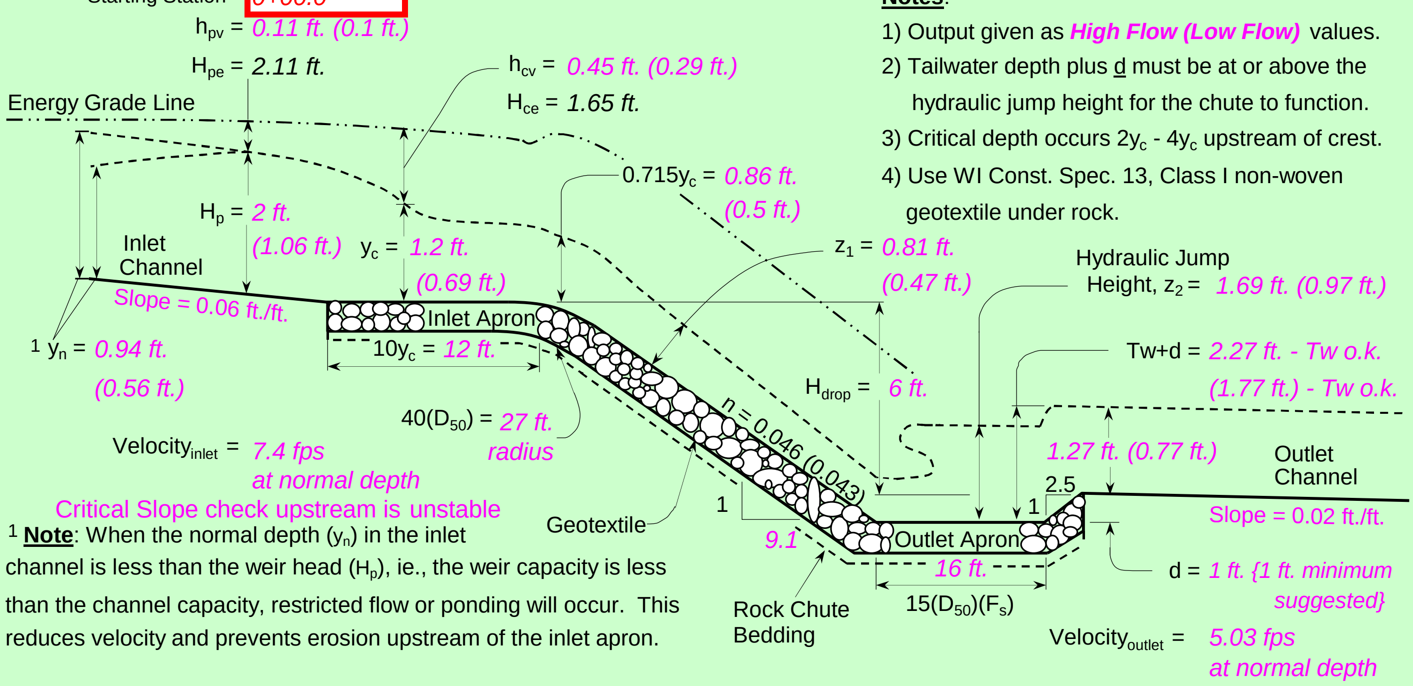
Q_{high} = 96.0 cfs High flow storm through chute → Tw (ft.) = Program
Q_5 = 38.0 cfs Low flow storm through chute → Tw (ft.) = Program

***Note**: The total required capacity is routed through the chute (principal spillway) or in combination with an auxiliary spillway.*

***Input tailwater (Tw)**:* 0.11 1.60

Profile and Cross Section (Output):

Starting Station = 0+00.0

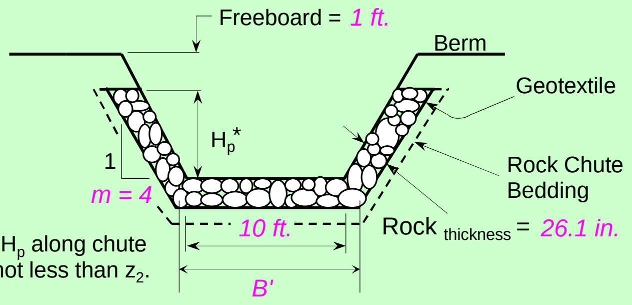

h_{pv} = 0.11 ft. (0.1 ft.)
H_{pe} = 2.11 ft.
h_{cv} = 0.45 ft. (0.29 ft.)
H_{ce} = 1.65 ft.
Energy Grade Line
0.715y_c = 0.86 ft. (0.5 ft.)
H_p = 2 ft. (1.06 ft.)
Inlet Channel
y_c = 1.2 ft. (0.69 ft.)
z_1 = 0.81 ft. (0.47 ft.)
Hydraulic Jump Height, z_2 = 1.69 ft. (0.97 ft.)
Slope = 0.06 ft./ft.
Inlet Apron
1 y_n = 0.94 ft. (0.56 ft.)
10y_c = 12 ft.
Tw+d = 2.27 ft. - Tw o.k. (1.77 ft.) - Tw o.k.
H_{drop} = 6 ft.
40(D_{50}) = 27 ft. radius
n = 0.046 (0.043)
Velocity$_{inlet}$ = 7.4 fps at normal depth
1.27 ft. (0.77 ft.)
Outlet Channel
2.5
1
1
9.1
Critical Slope check upstream is unstable
Geotextile
Outlet Apron
Slope = 0.02 ft./ft.
16 ft.
d = 1 ft. {1 ft. minimum suggested}
15(D_{50})(F_s)
Rock Chute Bedding
Velocity$_{outlet}$ = 5.03 fps at normal depth

Notes:
1) Output given as ***High Flow (Low Flow)*** values.
2) Tailwater depth plus d must be at or above the hydraulic jump height for the chute to function.
3) Critical depth occurs 2y_c - 4y_c upstream of crest.
4) Use WI Const. Spec. 13, Class I non-woven geotextile under rock.

[1] **Note**: When the normal depth (y_n) in the inlet channel is less than the weir head (H_p), ie., the weir capacity is less than the channel capacity, restricted flow or ponding will occur. This reduces velocity and prevents erosion upstream of the inlet apron.

Profile Along Centerline of Chute

Typical Cross Section


Freeboard = 1 ft.
Berm
Geotextile
H_p*
1
m = 4
Rock Chute Bedding
10 ft.
B'
Rock thickness = 26.1 in.

* Use H_p along chute but not less than z_2.

	7.46 cfs/ft.	Equivalent unit discharge
F_S =	1.60	Factor of safety (multiplier)
z_1 =	0.81 ft.	Normal depth in chute
n-value =	0.046	Manning's roughness coefficient
$D_{50}(F_s)$ =	13.1 in.	Minimum Design D50*
$2(D_{50})(F_s)$ =	26.1 in.	Rock chute thickness
Tw + d =	2.27 ft.	Tailwater above outlet apron
z_2 =	1.69 ft.	Hydraulic jump height
****** The outlet***	***will***	***function adequately***

High Flow Storm Information

Rock Chute Design - Plan Sheet

(Version WI-July-2010, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

Project: Eagleview - Rock Chute 3 (WQ 2)
Designer: TOS
Date: 4/18/2024
County: El Paso
Checked by:
Date:

Minimum Design Values		***Enter Plan Values***
13.1 in.	D_{50} dia. =	in.
26.1 in.	$Rock_{chute}$ thickness =	in.
12 ft.	Inlet apron length =	ft.
16 ft.	Outlet apron length =	ft.
27 ft.	Radius =	*0* ft.

Will bedding be used? *No*

Rock Gradation Envelope

% Passing		*Diameter, in. (weight, lbs.)*
D_{100}	---------	0 - 0 (0 - 0)
D_{85}	---------	0 - 0 (0 - 0)
D_{50}	---------	0 - 0 (0 - 0)
D_{10}	---------	0 - 0 (0 - 0)

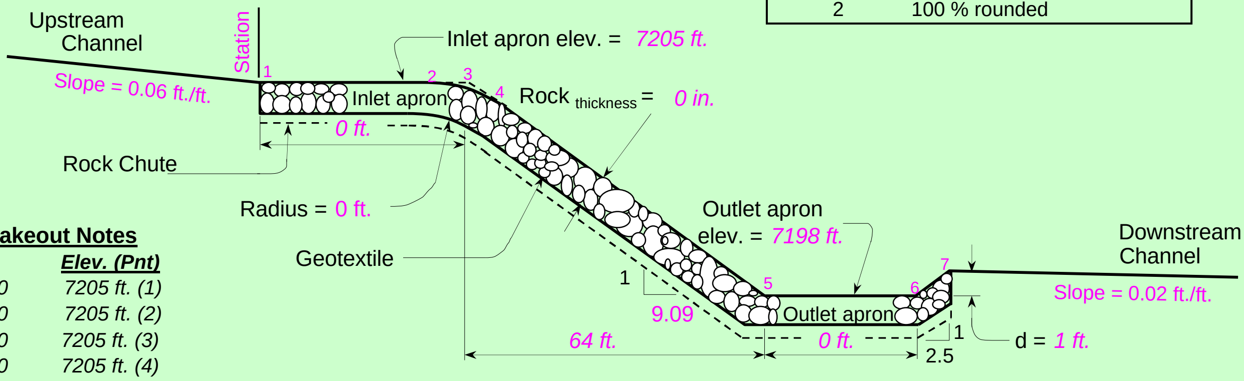
Quantities[a]

Rock = 0 yd^3
Geotextile (WCS-13)[b] = 197 yd^2
Bedding = 0 yd^3
Excavation = *0* yd^3
Earthfill = *0* yd^3
Seeding = *0.0* acres

Notes: [a] Rock, bedding, and geotextile quantities are determined from the x-section below (neglect radius).
[b] Geotextile Class I (non-woven) shall be overlapped and anchored (18-in. min. along sides and 24-in. min. on the ends).

Degree of angularity = 1

1	50% angular, 50% rounded
2	100 % rounded



Upstream Channel
Station
Slope = 0.06 ft./ft.
1
2
3
4
Inlet apron elev. = 7205 ft.
Inlet apron
Rock thickness = 0 in.
0 ft.
Rock Chute
Radius = 0 ft.
Geotextile
1
9.09
64 ft.
5
6
7
Outlet apron elev. = 7198 ft.
Outlet apron
0 ft.
1
2.5
d = 1 ft.
Downstream Channel
Slope = 0.02 ft./ft.

Profile Along Centerline of Rock Chute

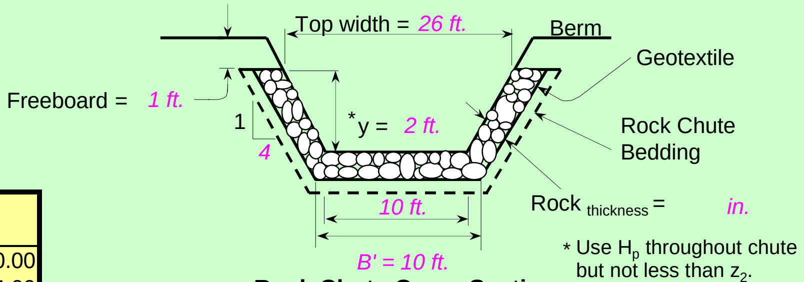
** ***Note***: ***The outlet will function adequately***

Stakeout Notes

Sta.	***Elev. (Pnt)***
0+00.0	*7205 ft. (1)*
0+00.0	*7205 ft. (2)*
0+00.0	*7205 ft. (3)*
0+00.0	*7205 ft. (4)*
0+63.6	*7198 ft. (5)*
0+63.6	*7198 ft. (6)*
0+66.1	*7199 ft. (7)*

Class I non-woven

Rock gradation envelope can be met with DOT Light riprap Gradation



Top width = 26 ft.
Berm
Geotextile
Freeboard = 1 ft.
1
4
*y = 2 ft.
Rock Chute Bedding
10 ft.
Rock thickness = in.
B' = 10 ft.

* Use H_p throughout chute but not less than z_2.

Rock Chute Cross Section

Profile, Cross Sections, and Quantities

Rock Chute Cost Estimate

Unit	*Unit Cost*	*Cost*
Rock	*$10.00* /$yd^3$	$0.00
Geotextile	*$12.00*/$yd^2$	$2,364.00
Bedding	*$12.00* /$yd^3$	$0.00
Excavation	*$12.00*/$yd^3$	$0.00
Earthfill	*$1.00* /$yd^3$	$0.00
Seeding	*$2.00* /ac.	$0.00
	Total	**$2,364.00**

NRCS
Natural Resources Conservation Service
United States Department of Agriculture

Eagleview - Rock Chute 3 (WQ 2)
El Paso County

		Date
Designed	TOS	
Drawn		
Checked		
Approved		

File Name
Drawing Name
Sheet ___ of ___

Rock_Chute.xls
for construction plan

Rock Chute Design - Cut/Paste Plan

(Version WI-July-2010, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

Project: Eagleview - Rock Chute 3 (WQ 2)
Designer: TOS
Date: 4/18/2024
County: El Paso
Checked by:
Date:

Design Values

D_{50} dia. = 0.0 in.
$\text{Rock}_{\text{chute}}$ thickness = 0.0 in.
Inlet apron length = 0 ft.
Outlet apron length = 0 ft.
Radius = 0 ft.
Will bedding be used? No

Rock Gradation Envelope

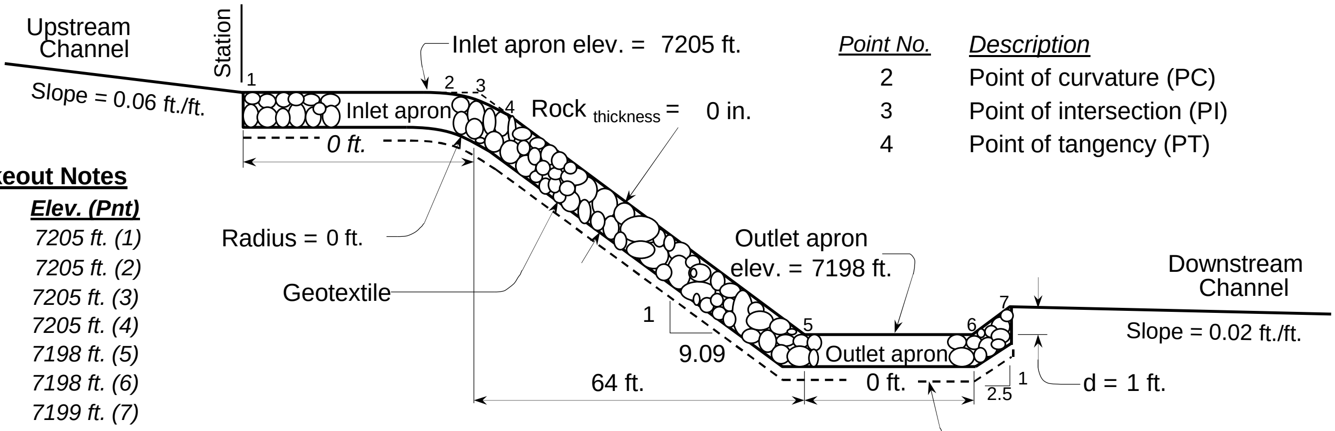
% Passing		*Diameter, in. (weight, lbs.)*
D_{100}	---------	0 - 0 (0 - 0)
D_{85}	---------	0 - 0 (0 - 0)
D_{50}	---------	0 - 0 (0 - 0)
D_{10}	---------	0 - 0 (0 - 0)

Coefficient of Uniformity, $(D_{60})/(D_{10}) < 1.7$

Quantities [a]

Rock = 0 yd^3
Geotextile (WCS-13)[b] = 197 yd^2
Bedding = 0 yd^3
Excavation = 0 yd^3
Earthfill = 0 yd^3
Seeding = 0.0 acres

Notes: [a] *Rock, bedding, and geotextile quantities are determined from x-section below (neglect radius).*
[b] *Geotextile Class I (Non-woven) shall be overlapped and anchored (18-in. minimum along sides and 24-in. minimum on the ends) --- quantity not included.*

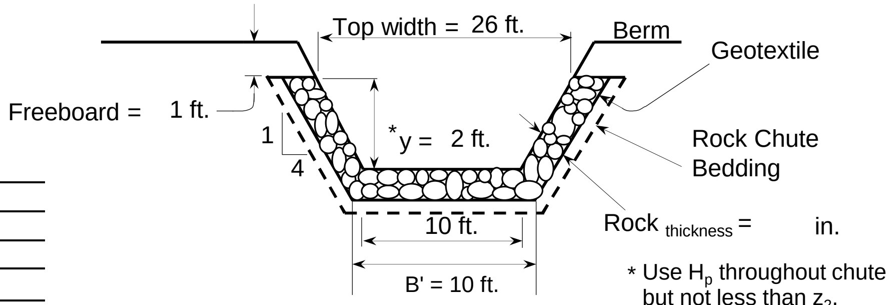

Upstream Channel
Station
Slope = 0.06 ft./ft.
1
2
3
4
Inlet apron elev. = 7205 ft.
Inlet apron
0 ft.
Rock thickness = 0 in.
Radius = 0 ft.
Geotextile
1
9.09
64 ft.
Outlet apron elev. = 7198 ft.
5
6
7
Outlet apron
0 ft.
1
2.5
d = 1 ft.
Downstream Channel
Slope = 0.02 ft./ft.
Rock Chute Bedding

Point No.	*Description*
2	Point of curvature (PC)
3	Point of intersection (PI)
4	Point of tangency (PT)

Stakeout Notes

Sta.	*Elev. (Pnt)*
0+00.0	*7205 ft. (1)*
0+00.0	*7205 ft. (2)*
0+00.0	*7205 ft. (3)*
0+00.0	*7205 ft. (4)*
0+63.6	*7198 ft. (5)*
0+63.6	*7198 ft. (6)*
0+66.1	*7199 ft. (7)*

Profile Along Centerline of Rock Chute


Top width = 26 ft.
Berm
Geotextile
Freeboard = 1 ft.
1
4
*y = 2 ft.
Rock Chute Bedding
Rock thickness = in.
10 ft.
B' = 10 ft.
* Use H_p throughout chute but not less than z_2.

Rock Chute Cross Section

Notes:
Rock gradation envelope can be met with
DOT Light riprap Gradation

Profile, Cross Sections, and Quantities

NRCS
Natural Resources Conservation Service
United States Department of Agriculture

Eagleview - Rock Chute 3 (WQ 2)

El Paso County

		Date
Designed	TOS	
Drawn		
Checked		
Approved		

File Name
Drawing Name
Sheet __ of __

Rock Chute Design Data

(Version WI-July-2010, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

Project: *Eagleview - Rock Chute 4 (WQ1-East)*
Designer: *TOS*
Date: *April 18, 2024*
County: *El Paso*
Checked by: ____________
Date: ____________

Input Geometry:

Upstream Channel
Bw = *14.0* ft.
Side slopes = *4.0* (m:1)
Velocity n-value = *0.040*
Bed slope = *0.0030* ft./ft.
Note: n value = a) velocity n from waterway program
or b) computed mannings n for channel

Chute
Bw = *14.0* ft.
Factor of safety = *1.60* (F_s) → ***1.2 Min***
Side slopes = *3.0* (m:1) → ***2.0:1 max.***
Bed slope (4:1) = *0.250* ft./ft → ***3.0:1 max.***
Freeboard = *1.0* ft.
Outlet apron depth, d = *1.0* ft.

Downstream Channel
Bw = *14.0* ft.
Side slopes = *4.0* (m:1)
Velocity n-value = *0.040*
Bed slope = *0.0050* ft./ft.
Base flow = *0.0* cfs

Design Storm Data (Table 2, FOTG, WI-NRCS Grade Stabilization Structure No. 410):

Apron elev. --- Inlet = *7198.0* ft. ------- Outlet *7192.0* ft. --- (H_{drop} = 5 ft.)

Q_{high} = Runoff from design storm capacity from Table 2, FOTG Standard 410
Q_5 = Runofff from a 5-year,24-hour storm.

__Note__: The total required capacity is routed through the chute (principal spillway) or in combination with an auxiliary spillway.

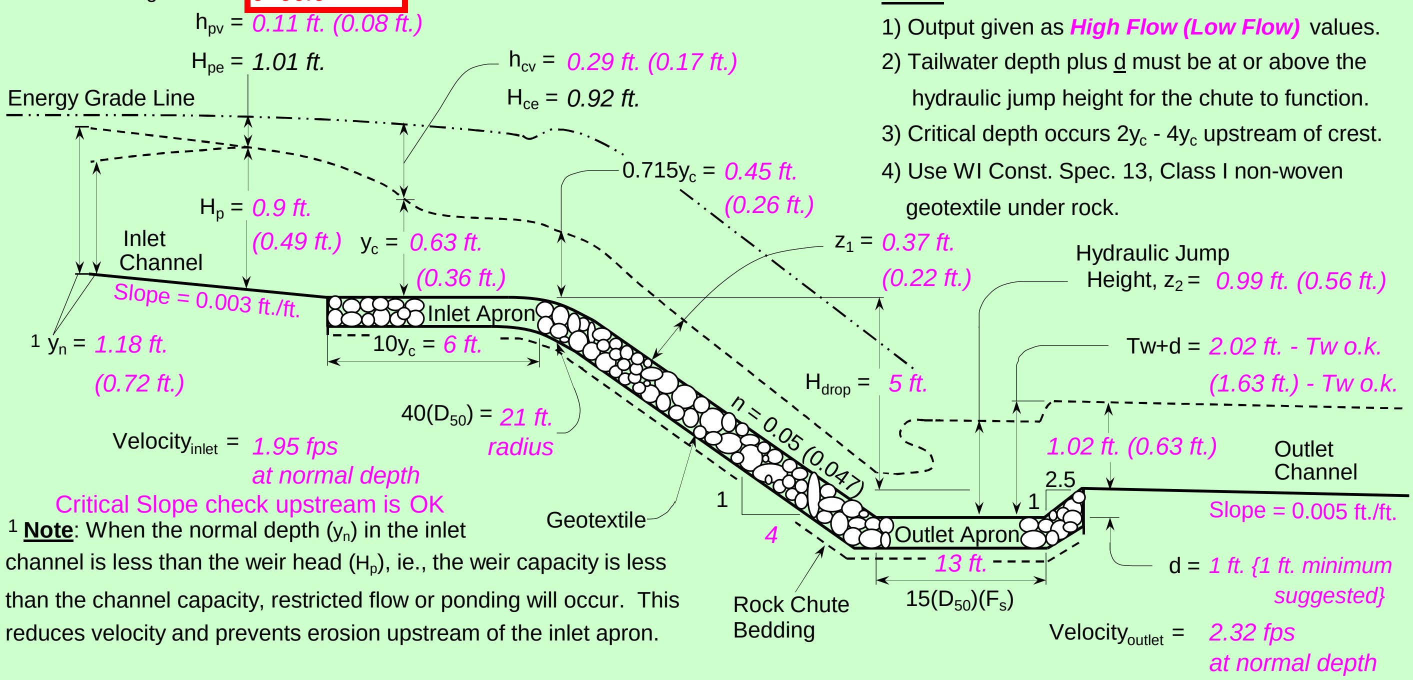
***Input tailwater (Tw)*:** 0.25 1.60

Q_{high} = *43.0* cfs High flow storm through chute → Tw (ft.) = *Program*
Q_5 = *18.0* cfs Low flow storm through chute → Tw (ft.) = *Program*

Profile and Cross Section (Output):

Starting Station = *0+00.0*

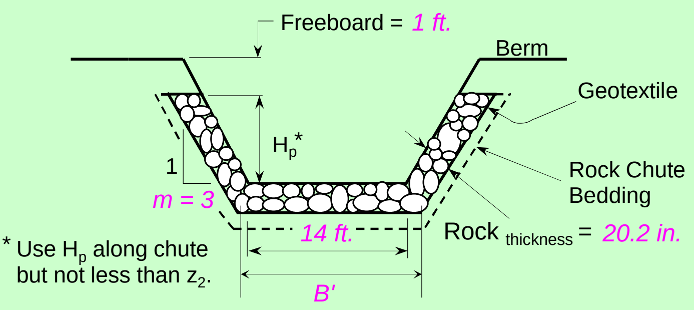
Notes:
1) Output given as ***High Flow (Low Flow)*** values.
2) Tailwater depth plus d must be at or above the hydraulic jump height for the chute to function.
3) Critical depth occurs $2y_c$ - $4y_c$ upstream of crest.
4) Use WI Const. Spec. 13, Class I non-woven geotextile under rock.


h_{pv} = 0.11 ft. (0.08 ft.)
H_{pe} = 1.01 ft.
h_{cv} = 0.29 ft. (0.17 ft.)
H_{ce} = 0.92 ft.
Energy Grade Line
0.715y_c = 0.45 ft. (0.26 ft.)
H_p = 0.9 ft. (0.49 ft.)
y_c = 0.63 ft. (0.36 ft.)
Inlet Channel
Slope = 0.003 ft./ft.
z_1 = 0.37 ft. (0.22 ft.)
Hydraulic Jump Height, z_2 = 0.99 ft. (0.56 ft.)
Inlet Apron
1 y_n = 1.18 ft. (0.72 ft.)
10y_c = 6 ft.
Tw+d = 2.02 ft. - Tw o.k. (1.63 ft.) - Tw o.k.
H_{drop} = 5 ft.
40(D_{50}) = 21 ft. radius
n = 0.05 (0.047)
Velocity$_{inlet}$ = 1.95 fps at normal depth
1.02 ft. (0.63 ft.)
Outlet Channel
2.5
1
Critical Slope check upstream is OK
Geotextile
1
4
Outlet Apron
Slope = 0.005 ft./ft.
13 ft.
d = 1 ft. {1 ft. minimum suggested}
15(D_{50})(F_s)
Rock Chute Bedding
Velocity$_{outlet}$ = 2.32 fps at normal depth

[1] **Note**: When the normal depth (y_n) in the inlet channel is less than the weir head (H_p), ie., the weir capacity is less than the channel capacity, restricted flow or ponding will occur. This reduces velocity and prevents erosion upstream of the inlet apron.

Profile Along Centerline of Chute

Typical Cross Section


Freeboard = 1 ft.
Berm
Geotextile
H_p*
1
m = 3
Rock Chute Bedding
14 ft.
Rock thickness = 20.2 in.
B'

* Use H_p along chute but not less than z_2.

	2.86 cfs/ft.	Equivalent unit discharge
F_S =	1.60	Factor of safety (multiplier)
z_1 =	0.37 ft.	Normal depth in chute
n-value =	0.05	Manning's roughness coefficient
$D_{50}(F_s)$ =	10.1 in.	Minimum Design D50*
$2(D_{50})(F_s)$ =	20.2 in.	Rock chute thickness
Tw + d =	2.02 ft.	Tailwater above outlet apron
z_2 =	0.99 ft.	Hydraulic jump height
****** The outlet***	***will***	***function adequately***

High Flow Storm Information

Rock Chute Design - Plan Sheet

(Version WI-July-2010, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

Project: Eagleview - Rock Chute 4 (WQ1-East)
County: El Paso
Designer: TOS
Checked by:
Date: 4/18/2024
Date:

Minimum Design Values		***Enter Plan Values***
10.1 in.	D_{50} dia. =	12.00 in.
20.2 in.	$Rock_{chute}$ thickness =	24.00 in.
6 ft.	Inlet apron length =	10.00 ft.
13 ft.	Outlet apron length =	13.00 ft.
21 ft.	Radius =	*33* ft.

Will bedding be used? *No*

Rock Gradation Envelope

% Passing		*Diameter, in. (weight, lbs.)*
D_{100}	---------	18 - 24 (413 - 978)
D_{85}	---------	16 - 22 (269 - 713)
D_{50}	---------	12 - 18 (122 - 413)
D_{10}	---------	10 - 16 (63 - 269)

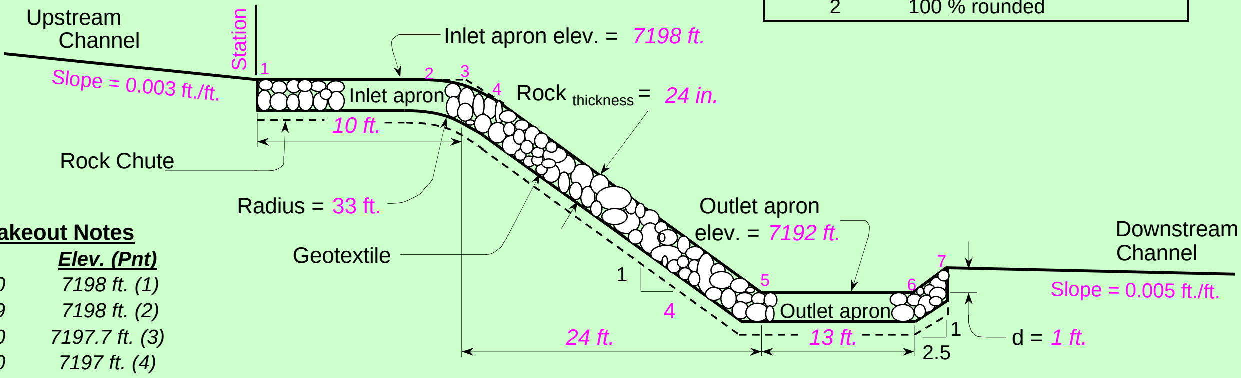
Quantities[a]

Rock = 101 yd^3
Geotextile (WCS-13)[b] = 188 yd^2
Bedding = 0 yd^3
Excavation = *0* yd^3
Earthfill = *0* yd^3
Seeding = *0.0* acres

Notes: [a] *Rock, bedding, and geotextile quantities are determined from the x-section below (neglect radius).*
[b] *Geotextile Class I (non-woven) shall be overlapped and anchored (18-in. min. along sides and 24-in. min. on the ends).*

Degree of angularity = 1

1	50% angular, 50% rounded
2	100 % rounded



Upstream Channel
Station
Slope = 0.003 ft./ft.
1
2
3
4
Inlet apron elev. = 7198 ft.
Inlet apron
Rock thickness = 24 in.
10 ft.
Rock Chute
Radius = 33 ft.
Geotextile
Outlet apron elev. = 7192 ft.
1
4
5
6
7
Outlet apron
24 ft.
13 ft.
1
2.5
d = 1 ft.
Downstream Channel
Slope = 0.005 ft./ft.

Profile Along Centerline of Rock Chute

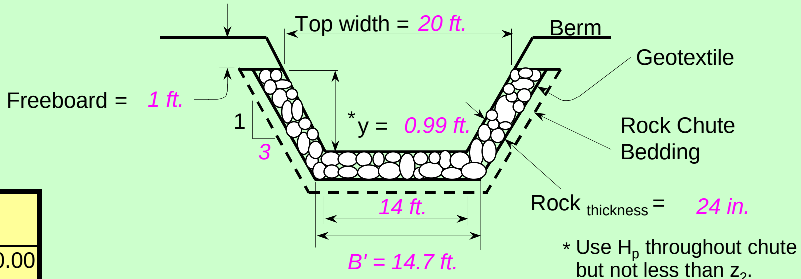
**** *Note*: *The outlet will function adequately***

Stakeout Notes

Sta.	***Elev. (Pnt)***
0+00.0	*7198 ft. (1)*
0+05.9	*7198 ft. (2)*
0+10.0	*7197.7 ft. (3)*
0+14.0	*7197 ft. (4)*
0+34.0	*7192 ft. (5)*
0+47.0	*7192 ft. (6)*
0+49.5	*7193 ft. (7)*

Class I non-woven

Rock gradation envelope can be met with DOT Extra Heavy riprap Gradation



Top width = 20 ft.
Berm
Geotextile
Freeboard = 1 ft.
1
3
*y = 0.99 ft.
Rock Chute Bedding
Rock thickness = 24 in.
14 ft.
B' = 14.7 ft.

* Use H_p throughout chute but not less than z_2.

Rock Chute Cross Section

Rock Chute Cost Estimate

Unit	*Unit Cost*		*Cost*
Rock	*$10.00*	/yd^3	$1,010.00
Geotextile	*$12.00*	/yd^2	$2,256.00
Bedding	*$12.00*	/yd^3	$0.00
Excavation	*$12.00*	/yd^3	$0.00
Earthfill	*$1.00*	/yd^3	$0.00
Seeding	*$2.00*	/ac.	$0.00
	Total		**$3,266.00**

Profile, Cross Sections, and Quantities

NRCS
Natural Resources Conservation Service
United States Department of Agriculture

Eagleview - Rock Chute 4 (WQ1-East)

El Paso County

		Date
Designed	TOS	
Drawn		
Checked		
Approved		

File Name

Drawing Name

Sheet ___ of ___

Rock_Chute.xls
for construction plan

Rock Chute Design - Cut/Paste Plan

(Version WI-July-2010, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

Project: Eagleview - Rock Chute 4 (WQ1-East)
Designer: TOS
Date: 4/18/2024

County: El Paso
Checked by:
Date:

Design Values

D_{50} dia. = 12.0 in.
$\text{Rock}_{\text{chute}}$ thickness = 24.0 in.
Inlet apron length = 10 ft.
Outlet apron length = 13 ft.
Radius = 33 ft.
Will bedding be used? No

Rock Gradation Envelope

% Passing	*Diameter, in. (weight, lbs.)*
D_{100} ---------	18 - 24 (413 - 978)
D_{85} ---------	16 - 22 (269 - 713)
D_{50} ---------	12 - 18 (122 - 413)
D_{10} ---------	10 - 16 (63 - 269)

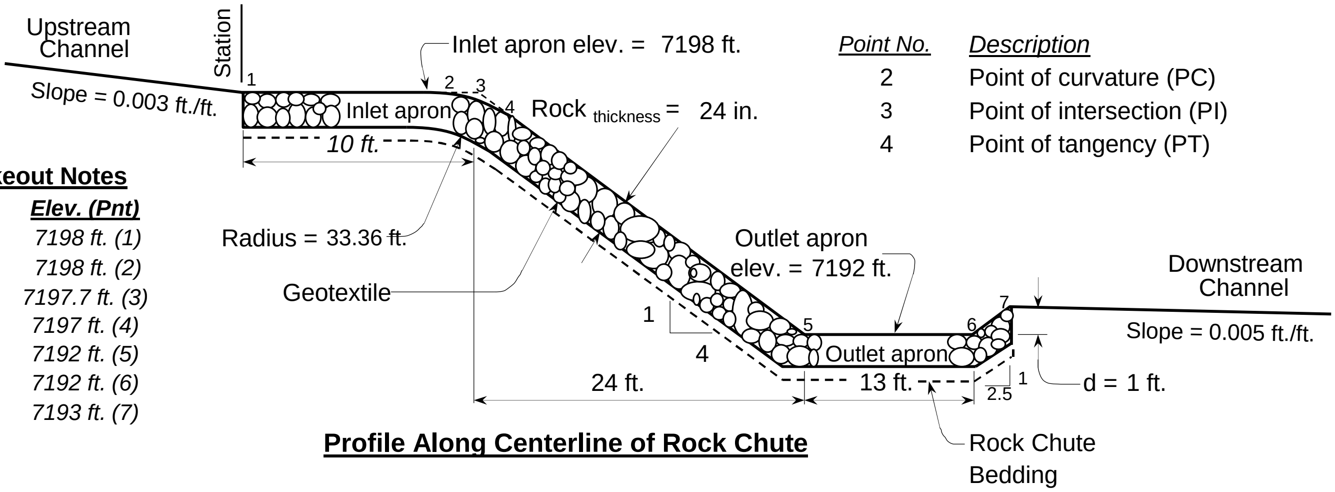
Coefficient of Uniformity, $(D_{60})/(D_{10}) < 1.7$

Quantities[a]

Rock = 101 yd^3
Geotextile (WCS-13)[b] = 188 yd^2
Bedding = 0 yd^3
Excavation = 0 yd^3
Earthfill = 0 yd^3
Seeding = 0.0 acres

Notes: [a] *Rock, bedding, and geotextile quantities are determined from x-section below (neglect radius).*

[b] *Geotextile Class I (Non-woven) shall be overlapped and anchored (18-in. minimum along sides and 24-in. minimum on the ends) ---* *quantity not included*.



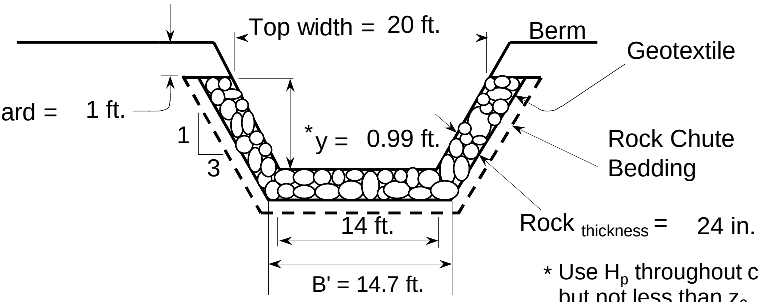
Upstream Channel
Station
Slope = 0.003 ft./ft.
1
2
3
4
Inlet apron elev. = 7198 ft.
Inlet apron
10 ft.
Rock thickness = 24 in.
Radius = 33.36 ft.
Geotextile
1
4
24 ft.
Outlet apron elev. = 7192 ft.
5
6
7
Outlet apron
13 ft.
1
2.5
d = 1 ft.
Downstream Channel
Slope = 0.005 ft./ft.
Rock Chute Bedding

Point No.	*Description*
2	Point of curvature (PC)
3	Point of intersection (PI)
4	Point of tangency (PT)

Stakeout Notes

Sta.	**Elev. (Pnt)**
0+00.0	*7198 ft. (1)*
0+05.9	*7198 ft. (2)*
0+10.0	*7197.7 ft. (3)*
0+14.0	*7197 ft. (4)*
0+34.0	*7192 ft. (5)*
0+47.0	*7192 ft. (6)*
0+49.5	*7193 ft. (7)*

Profile Along Centerline of Rock Chute



Top width = 20 ft.
Berm
Geotextile
Freeboard = 1 ft.
1
3
*y = 0.99 ft.
Rock Chute Bedding
14 ft.
Rock thickness = 24 in.
B' = 14.7 ft.

* Use H_p throughout chute but not less than z_2.

Rock Chute Cross Section

Notes:
Rock gradation envelope can be met with
DOT Extra Heavy riprap Gradation

Profile, Cross Sections, and Quantities

NRCS
Natural Resources Conservation Service
United States Department of Agriculture

Eagleview - Rock Chute 4 (WQ1-East)

El Paso County

		Date
Designed	TOS	
Drawn		
Checked		
Approved		

File Name
Drawing Name
Sheet __ of __

Rock Chute Design Data

(Version WI-July-2010, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

Project: Eagleview - Rock Chute 5 (WQ1-West)
Designer: TOS
Date: April 18, 2024
County: El Paso
Checked by:
Date:

Input Geometry:

Upstream Channel

Bw = 18.0 ft.
Side slopes = 4.0 (m:1)
Velocity n-value = 0.040
Bed slope = 0.0030 ft./ft.

Note: n value = a) velocity n from waterway program or b) computed mannings n for channel

Chute

Bw = 18.0 ft.
Factor of safety = 1.60 (F_s) 1.2 Min
Side slopes = 3.0 (m:1) → 2.0:1 max.
Bed slope (4:1) = 0.250 ft./ft → 3.0:1 max.
Freeboard = 1.0 ft.
Outlet apron depth, d = 1.0 ft.

Downstream Channel

Bw = 18.0 ft.
Side slopes = 4.0 (m:1)
Velocity n-value = 0.040
Bed slope = 0.0050 ft./ft.
Base flow = 0.0 cfs

Design Storm Data (Table 2, FOTG, WI-NRCS Grade Stabilization Structure No. 410):

Apron elev. --- Inlet = 7197.0 ft. ------- Outlet 7192.0 ft. --- (H_{drop} = 4 ft.)

Q_{high} = Runoff from design storm capacity from Table 2, FOTG Standard 410
Q_5 = Runofff from a 5-year,24-hour storm.

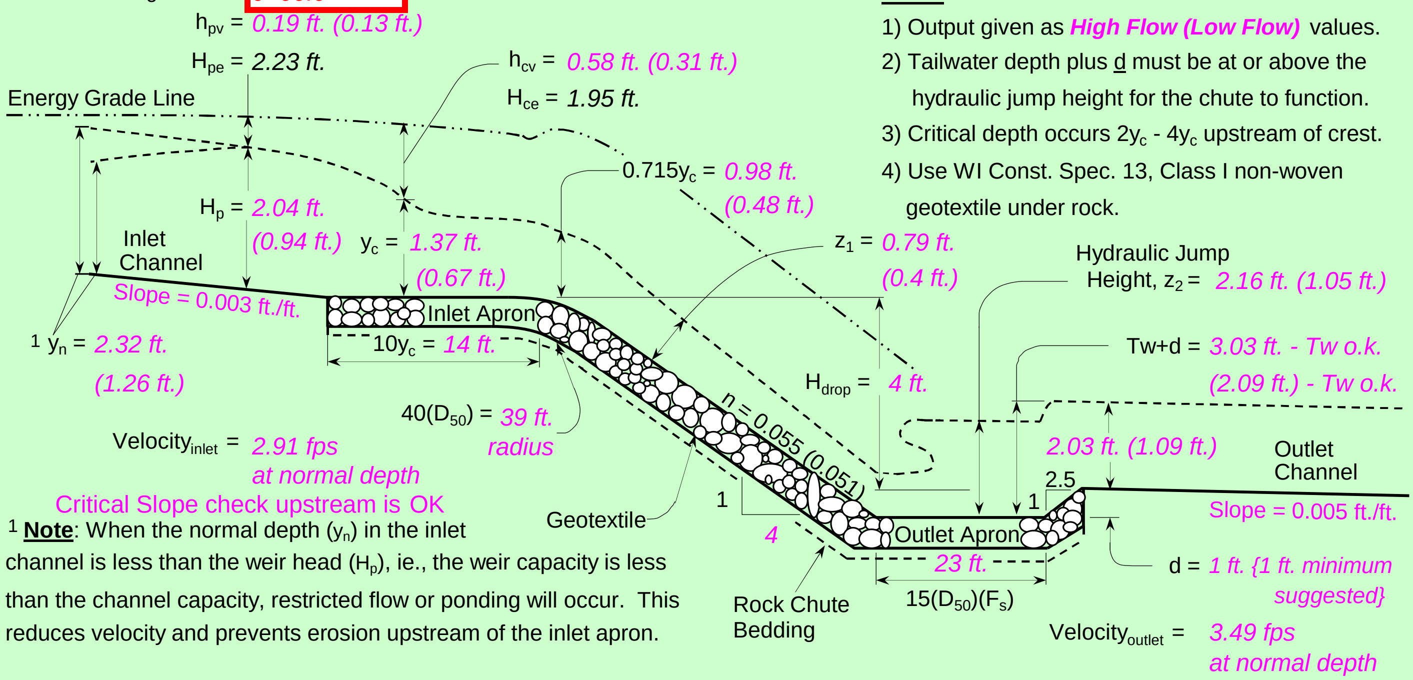
Q_{high} = 185.0 cfs High flow storm through chute → Tw (ft.) = Program
Q_5 = 60.0 cfs Low flow storm through chute → Tw (ft.) = Program

***Note**: The total required capacity is routed through the chute (principal spillway) or in combination with an auxiliary spillway.*

***Input tailwater (Tw)**:* 0.25 1.60

Profile and Cross Section (Output):

Starting Station = 0+00.0


h_{pv} = 0.19 ft. (0.13 ft.)
H_{pe} = 2.23 ft.
h_{cv} = 0.58 ft. (0.31 ft.)
H_{ce} = 1.95 ft.
Energy Grade Line
0.715y_c = 0.98 ft. (0.48 ft.)
H_p = 2.04 ft. (0.94 ft.)
y_c = 1.37 ft. (0.67 ft.)
Inlet Channel
Slope = 0.003 ft./ft.
Inlet Apron
1 y_n = 2.32 ft. (1.26 ft.)
10y_c = 14 ft.
40(D_{50}) = 39 ft. radius
Velocity$_{inlet}$ = 2.91 fps at normal depth
Critical Slope check upstream is OK
Geotextile
z$_1$ = 0.79 ft. (0.4 ft.)
H_{drop} = 4 ft.
n = 0.055 (0.051)
1
4
Hydraulic Jump Height, z_2 = 2.16 ft. (1.05 ft.)
Tw+d = 3.03 ft. - Tw o.k. (2.09 ft.) - Tw o.k.
2.03 ft. (1.09 ft.)
2.5
1
Outlet Channel
Slope = 0.005 ft./ft.
Outlet Apron
23 ft.
15(D_{50})(F_s)
d = 1 ft. {1 ft. minimum suggested}
Rock Chute Bedding
Velocity$_{outlet}$ = 3.49 fps at normal depth

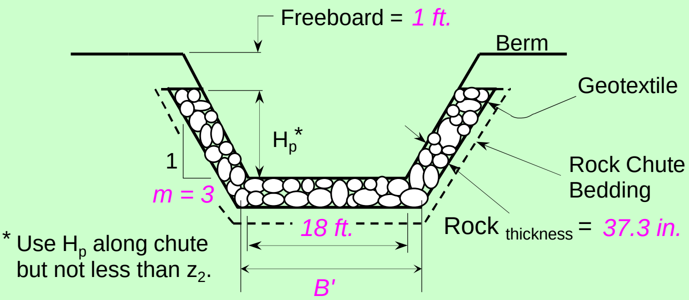
Notes:

1) Output given as ***High Flow (Low Flow)*** values.
2) Tailwater depth plus d must be at or above the hydraulic jump height for the chute to function.
3) Critical depth occurs 2y_c - 4y_c upstream of crest.
4) Use WI Const. Spec. 13, Class I non-woven geotextile under rock.

[1] **Note**: When the normal depth (y_n) in the inlet channel is less than the weir head (H_p), ie., the weir capacity is less than the channel capacity, restricted flow or ponding will occur. This reduces velocity and prevents erosion upstream of the inlet apron.

Profile Along Centerline of Chute

Typical Cross Section


Freeboard = 1 ft.
Berm
Geotextile
H_p*
1
m = 3
Rock Chute Bedding
18 ft.
B'
Rock thickness = 37.3 in.

* Use H_p along chute but not less than z_2.

	9.11 cfs/ft.	Equivalent unit discharge
F_S =	1.60	Factor of safety (multiplier)
z_1 =	0.79 ft.	Normal depth in chute
n-value =	0.055	Manning's roughness coefficient
$D_{50}(F_s)$ =	18.7 in.	Minimum Design D50*
$2(D_{50})(F_s)$ =	37.3 in.	Rock chute thickness
Tw + d =	3.03 ft.	Tailwater above outlet apron
z_2 =	2.16 ft.	Hydraulic jump height
***** The outlet***	***will***	***function adequately***

High Flow Storm Information

Rock Chute Design - Plan Sheet

(Version WI-July-2010, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

Project: Eagleview - Rock Chute 5 (WQ1-West)
County: El Paso
Designer: TOS
Checked by:
Date: 4/18/2024
Date:

Minimum Design Values		***Enter Plan Values***
18.7 in.	D_{50} dia. =	24.00 in.
37.3 in.	Rock_{chute} thickness =	48.00 in.
14 ft.	Inlet apron length =	14.00 ft.
23 ft.	Outlet apron length =	23.00 ft.
39 ft.	Radius =	*67* ft.

Will bedding be used? *No*

Rock Gradation Envelope

% Passing		*Diameter, in. (weight, lbs.)*
D_{100}	---------	36 - 48 (3302 - 7827)
D_{85}	---------	31 - 43 (2150 - 5706)
D_{50}	---------	24 - 36 (978 - 3302)
D_{10}	---------	19 - 31 (501 - 2150)

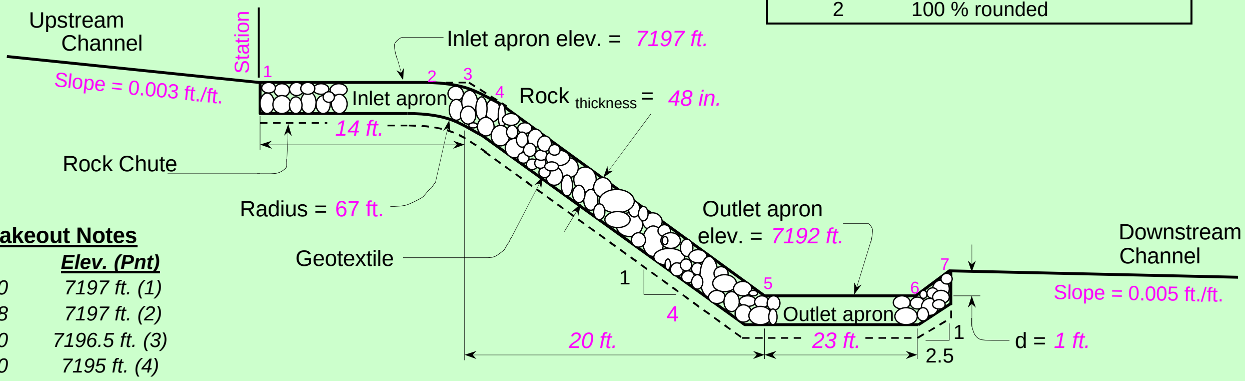
Quantities [a]

Rock = 402 yd^3
Geotextile (WCS-13)[b] = 390 yd^2
Bedding = 0 yd^3
Excavation = *0* yd^3
Earthfill = *0* yd^3
Seeding = *0.0* acres

Notes: [a] *Rock, bedding, and geotextile quantities are determined from the x-section below (neglect radius).*
[b] *Geotextile Class I (non-woven) shall be overlapped and anchored (18-in. min. along sides and 24-in. min. on the ends).*

Degree of angularity = 1

1	50% angular, 50% rounded
2	100 % rounded



Upstream Channel
Station
Slope = 0.003 ft./ft.
1
2
3
4
Inlet apron elev. = 7197 ft.
Inlet apron
Rock thickness = 48 in.
14 ft.
Rock Chute
Radius = 67 ft.
Geotextile
Outlet apron elev. = 7192 ft.
1
4
5
6
7
Outlet apron
Downstream Channel
Slope = 0.005 ft./ft.
20 ft.
23 ft.
1
2.5
d = 1 ft.

Profile Along Centerline of Rock Chute

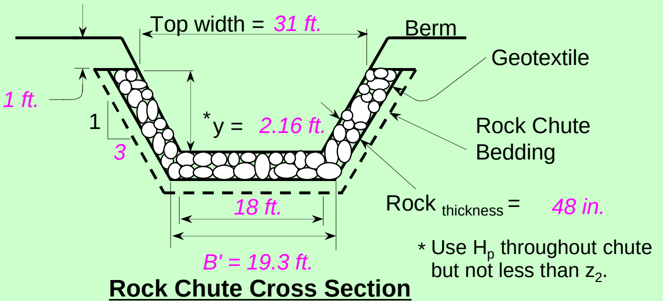
Stakeout Notes

Sta.	***Elev. (Pnt)***
0+00.0	*7197 ft. (1)*
0+05.8	*7197 ft. (2)*
0+14.0	*7196.5 ft. (3)*
0+22.0	*7195 ft. (4)*
0+34.0	*7192 ft. (5)*
0+57.0	*7192 ft. (6)*
0+59.5	*7193 ft. (7)*

*******Note*: *The outlet will function adequately***

Class I non-woven

Rock gradation envelope can be met with Gradation printed



Top width = 31 ft.
Berm
Geotextile
Freeboard = 1 ft.
1
3
*y = 2.16 ft.
Rock Chute Bedding
Rock thickness = 48 in.
18 ft.
B' = 19.3 ft.

* Use H_p throughout chute but not less than z_2.

Rock Chute Cross Section

Rock Chute Cost Estimate

Unit	*Unit Cost*		*Cost*
Rock	*$10.00*	/yd^3	$4,020.00
Geotextile	*$12.00*	/yd^2	$4,680.00
Bedding	*$12.00*	/yd^3	$0.00
Excavation	*$12.00*	/yd^3	$0.00
Earthfill	*$1.00*	/yd^3	$0.00
Seeding	*$2.00*	/ac.	$0.00
	Total		**$8,700.00**

Profile, Cross Sections, and Quantities

NRCS
Natural Resources Conservation Service
United States Department of Agriculture

Eagleview - Rock Chute 5 (WQ1-West)

El Paso County

		Date
Designed	TOS	
Drawn		
Checked		
Approved		

File Name
Drawing Name
Sheet ___ of ___

Rock_Chute.xls
for construction plan

Rock Chute Design - Cut/Paste Plan

(Version WI-July-2010, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

Project: Eagleview - Rock Chute 5 (WQ1-West)
Designer: TOS
Date: 4/18/2024
County: El Paso
Checked by:
Date:

Design Values

D_{50} dia. = 24.0 in.
$\text{Rock}_{\text{chute}}$ thickness = 48.0 in.
Inlet apron length = 14 ft.
Outlet apron length = 23 ft.
Radius = 67 ft.
Will bedding be used? No

Rock Gradation Envelope

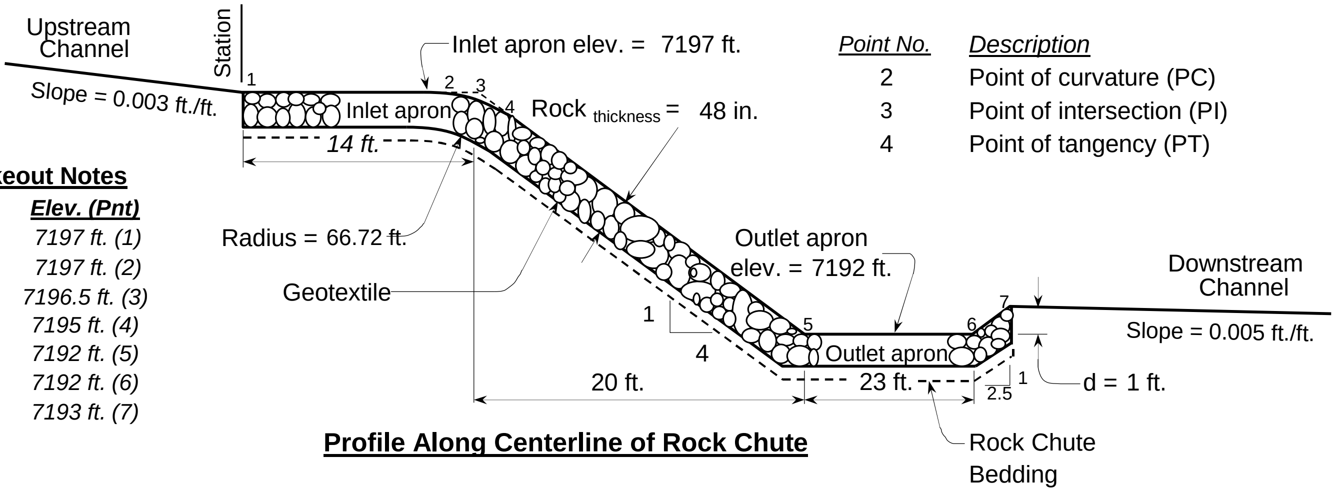
% Passing		*Diameter, in. (weight, lbs.)*
D_{100}	---------	36 - 48 (3302 - 7827)
D_{85}	---------	31 - 43 (2150 - 5706)
D_{50}	---------	24 - 36 (978 - 3302)
D_{10}	---------	19 - 31 (501 - 2150)

Coefficient of Uniformity, $(D_{60})/(D_{10}) < 1.7$

Quantities [a]

Rock = 402 yd^3
Geotextile (WCS-13)[b] = 390 yd^2
Bedding = 0 yd^3
Excavation = 0 yd^3
Earthfill = 0 yd^3
Seeding = 0.0 acres

***Notes*:** [a] *Rock, bedding, and geotextile quantities are determined from x-section below (neglect radius).*
[b] *Geotextile Class I (Non-woven) shall be overlapped and anchored (18-in. minimum along sides and 24-in. minimum on the ends) --- quantity not included.*

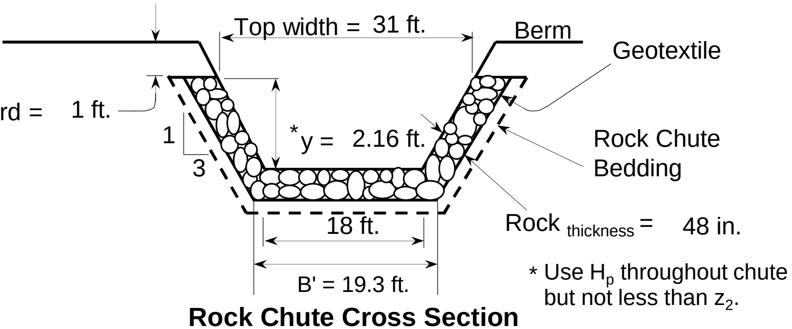

Upstream Channel
Station
Slope = 0.003 ft./ft.
1
2
3
4
Inlet apron elev. = 7197 ft.
Inlet apron
14 ft.
Rock thickness = 48 in.
Radius = 66.72 ft.
Geotextile
1
4
20 ft.
5
Outlet apron elev. = 7192 ft.
Outlet apron
23 ft.
6
7
1
2.5
d = 1 ft.
Downstream Channel
Slope = 0.005 ft./ft.
Rock Chute Bedding

Point No.	*Description*
2	Point of curvature (PC)
3	Point of intersection (PI)
4	Point of tangency (PT)

Stakeout Notes

Sta.	*Elev. (Pnt)*
0+00.0	*7197 ft. (1)*
0+05.8	*7197 ft. (2)*
0+14.0	*7196.5 ft. (3)*
0+22.0	*7195 ft. (4)*
0+34.0	*7192 ft. (5)*
0+57.0	*7192 ft. (6)*
0+59.5	*7193 ft. (7)*

Profile Along Centerline of Rock Chute


Top width = 31 ft.
Berm
Geotextile
Freeboard = 1 ft.
1
3
*y = 2.16 ft.
Rock Chute Bedding
18 ft.
Rock thickness = 48 in.
B' = 19.3 ft.

* Use H_p throughout chute but not less than z_2.

Rock Chute Cross Section

Notes:
Rock gradation envelope can be met with
Gradation printed

Profile, Cross Sections, and Quantities

NRCS
Natural Resources Conservation Service
United States Department of Agriculture

Eagleview - Rock Chute 5 (WQ1-West)

El Paso County

		Date
Designed	TOS	
Drawn		
Checked		
Approved		

File Name
Drawing Name
Sheet __ of __

possible for as much of the reach as possible to the maximum prudent values for the hydraulic parameters in the 100 year event. The designer should determine the return period where these parameters would be achieved and, with the owner and local jurisdiction, determine if the associated risks are acceptable.

On the other hand, if the recommendation to avoid floodplain filling is not followed and fill is proposed, this should only happen in floodplains where the maximum prudent values for the hydraulic parameters shown in Table 8-1 are not exceeded in the 100-year event.

Type B

Table 8-1. Maximum prudent values for natural channel hydraulic parameters

Design Parameter	**Non-Cohesive Soils or Poor Vegetation**	**Cohesive Soils and Vegetation**
Maximum flow velocity (average of section)	5 ft/s	7 ft/s
Maximum Froude number	0.6	0.8
Maximum tractive force (average of section)	0.60 lb/sf	1.0 lb/sf
Maximum depth outside bankfull channel	5 ft	5 ft

Stream Restoration Principle 8: Evaluate Hydraulics of Streams over a Range of Flows

Representative Design Tasks and Deliverables

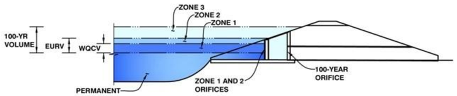
1. Document hydraulic analyses of the project reach following the guidance of Section 7.0.
   2. Describe how hydraulic performance of the project reach compares to maximum prudent values for the hydraulic parameters shown in Table 8-1 for several return periods (including 2-, 10-, and 100-year events at a minimum). Describe any locations in the reach where these parameters are exceeded and discuss efforts made to improve hydraulics.
3. Confirm that hydraulic parameters of Table 8-1 are satisfied in for the100-year event in all locations where fill is proposed in the floodplain.

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

Project: EAGLEVIEW

Basin ID: POND 3



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type = EDB
Watershed Area = 151.47 acres
Watershed Length = 5,000 ft
Watershed Length to Centroid = 2,500 ft
Watershed Slope = 0.006 ft/ft
Watershed Imperviousness = 8.20% percent
Percentage Hydrologic Soil Group A = 0.0% percent
Percentage Hydrologic Soil Group B = 100.0% percent
Percentage Hydrologic Soil Groups C/D = 0.0% percent
Target WQCV Drain Time = 40.0 hours
Location for 1-hr Rainfall Depths = User Input

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

Optional User Overrides

Water Quality Capture Volume (WQCV) = 0.713 acre-feet | acre-feet
Excess Urban Runoff Volume (EURV) = 1.149 acre-feet | acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) = 1.820 acre-feet | 1.19 inches
5-yr Runoff Volume (P1 = 1.5 in.) = 4.208 acre-feet | 1.50 inches
10-yr Runoff Volume (P1 = 1.75 in.) = 6.619 acre-feet | 1.75 inches
25-yr Runoff Volume (P1 = 2 in.) = 11.003 acre-feet | 2.00 inches
50-yr Runoff Volume (P1 = 2.25 in.) = 13.954 acre-feet | 2.25 inches
100-yr Runoff Volume (P1 = 2.52 in.) = 18.242 acre-feet | 2.52 inches
500-yr Runoff Volume (P1 = 3.14 in.) = 26.002 acre-feet | 3.14 inches
Approximate 2-yr Detention Volume = 0.718 acre-feet
Approximate 5-yr Detention Volume = 1.146 acre-feet
Approximate 10-yr Detention Volume = 2.607 acre-feet
Approximate 25-yr Detention Volume = 3.754 acre-feet
Approximate 50-yr Detention Volume = 3.902 acre-feet
Approximate 100-yr Detention Volume = 5.099 acre-feet

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) = 0.713 acre-feet
Zone 2 Volume (EURV - Zone 1) = 0.436 acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) = 3.950 acre-feet
Total Detention Basin Volume = 5.099 acre-feet
Initial Surcharge Volume (ISV) = user ft^3
Initial Surcharge Depth (ISD) = user ft
Total Available Detention Depth (H_{total}) = user ft
Depth of Trickle Channel (H_{TC}) = user ft
Slope of Trickle Channel (S_{TC}) = user ft/ft
Slopes of Main Basin Sides (S_{main}) = user H:V
Basin Length-to-Width Ratio ($R_{L/W}$) = user

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

Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	162	0.004		
7231	--	0.17	--	--	--	200	0.005	31	0.001
7232	--	1.17	--	--	--	1,148	0.026	704	0.016
7233	--	2.17	--	--	--	8,283	0.190	5,419	0.124
7234	--	3.17	--	--	--	18,607	0.427	18,864	0.433
7235	--	4.17	--	--	--	21,993	0.505	39,164	0.899
7236	--	5.17	--	--	--	22,691	0.521	61,506	1.412
7237	--	6.17	--	--	--	28,920	0.664	87,311	2.004
7238	--	7.17	--	--	--	32,308	0.742	117,925	2.707
7239	--	8.17	--	--	--	35,680	0.819	151,919	3.488
7240	--	9.17	--	--	--	39,108	0.898	189,313	4.346
7241	--	10.17	--	--	--	42,799	0.983	230,267	5.286
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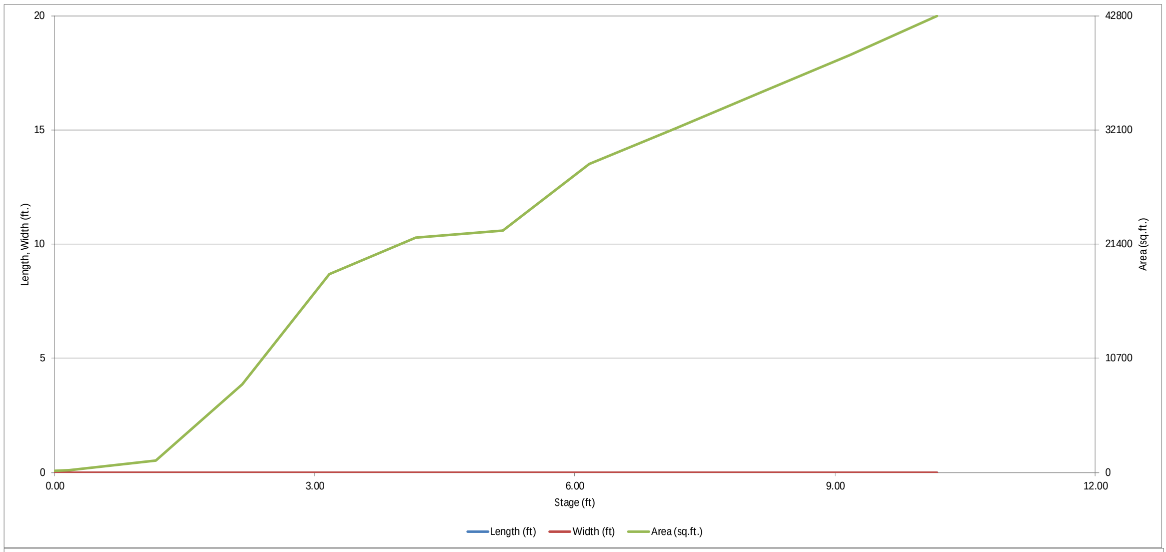
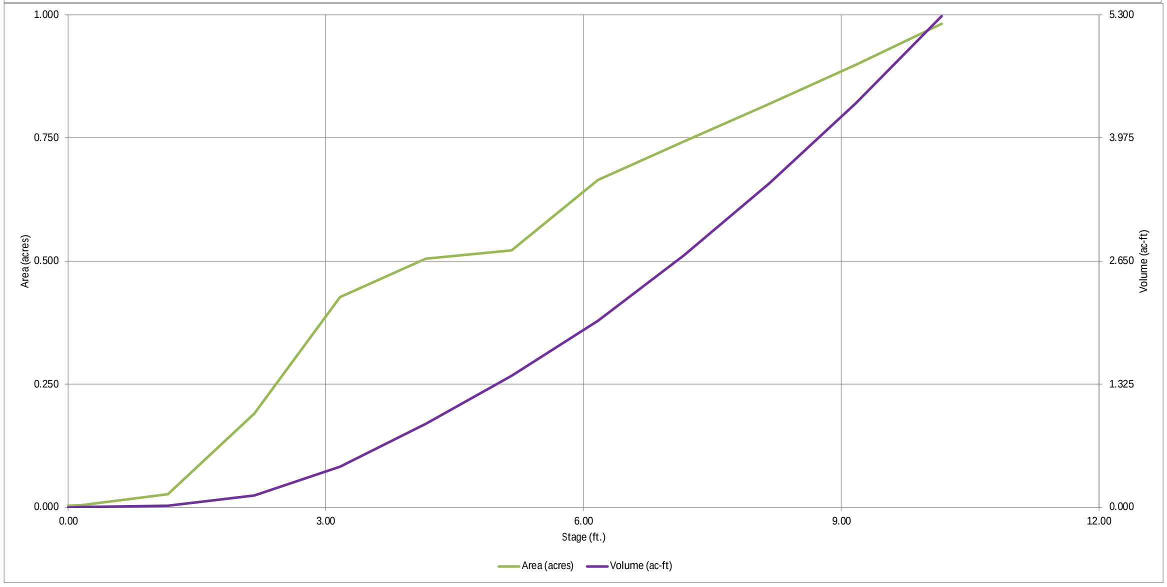
DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

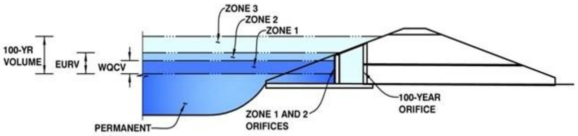




DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: EAGLEVIEW
Basin ID: POND 3



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.79	0.713	Orifice Plate
Zone 2 (EURV)	4.67	0.436	Rectangular Orifice
Zone 3 (100-year)	9.98	3.950	Weir&Pipe (Restrict)
Total (all zones)		5.099	

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

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

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

Calculated Parameters for Plate

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft^2
Depth at top of Zone using Orifice Plate =	3.79	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	inches	Elliptical Slot Area =	N/A	ft^2

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
✓ Stage of Orifice Centroid (ft)	0.00	0.63	1.26	1.89	2.52	3.15		
✓ Orifice Area (sq. inches)	1.00	1.00	1.00	1.20	1.20	1.20		

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

User Input: Vertical Orifice (Circular or Rectangular)

Calculated Parameters for Vertical Orifice

	Zone 2 Rectangular	Not Selected			Zone 2 Rectangular	Not Selected	
✓ Invert of Vertical Orifice =	4.00	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	0.39	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	4.67	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.15	N/A	feet
✓ Vertical Orifice Height =	3.50	N/A	inches				
✓ Vertical Orifice Width =	16.00		inches				

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

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
✓ Overflow Weir Front Edge Height, Ho =	4.80	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	5.30	N/A	feet
✓ Overflow Weir Front Edge Length =	15.00	N/A	feet	Overflow Weir Slope Length =	5.02	N/A	feet
✓ Overflow Weir Grate Slope =	10.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	6.57	N/A	
Horiz. Length of Weir Sides =	5.00	N/A	feet	Overflow Grate Open Area w/o Debris =	52.46	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	26.23	N/A	ft^2
Debris Clogging % =	50%	N/A	%				

6ft on Sht 35 of CDs

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

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected	
✓ Depth to Invert of Outlet Pipe =	0.49	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	7.99	N/A	ft^2
✓ Outlet Pipe Diameter =	42.00	N/A	inches	Outlet Orifice Centroid =	1.49	N/A	feet
✓ Restrictor Plate Height Above Pipe Invert =	32.50		inches	Half-Central Angle of Restrictor Plate on Pipe =	2.15	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Calculated Parameters for Spillway

✓ Spillway Invert Stage=	8.17	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.97	feet
✓ Spillway Crest Length =	40.00	feet	Stage at Top of Freeboard =	10.14	feet
✓ Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.98	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	5.26	acre-ft

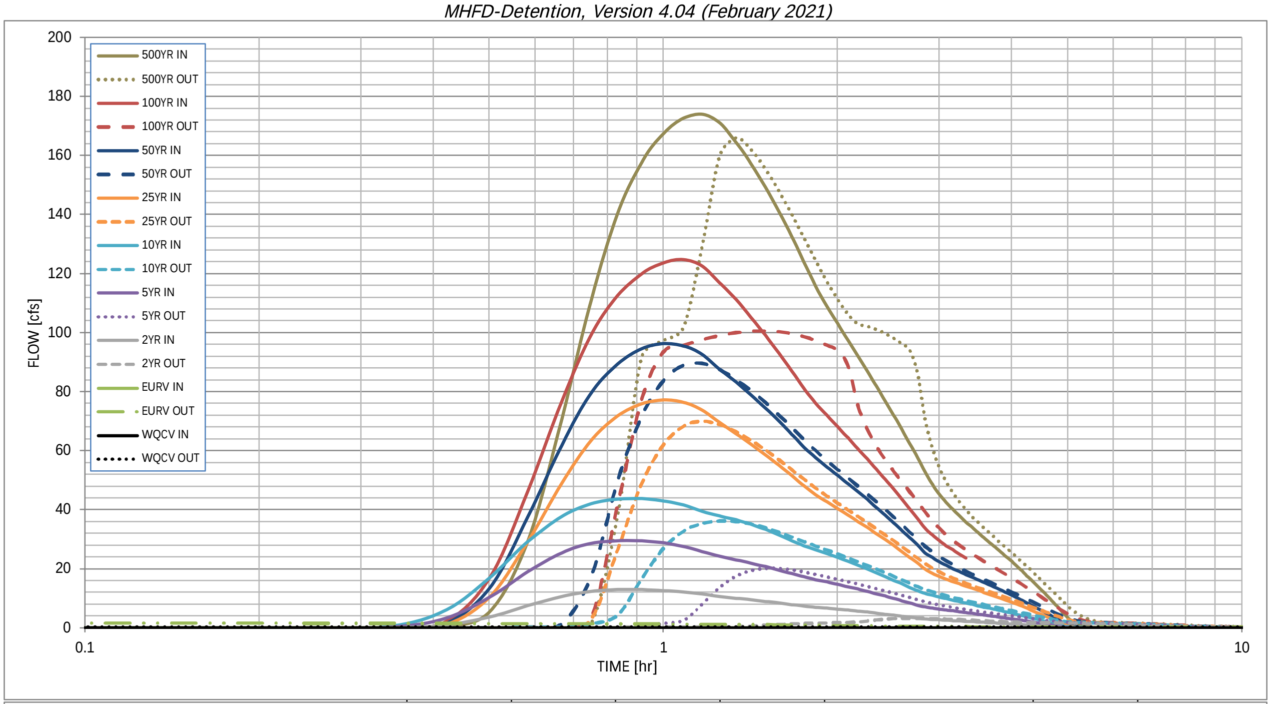
Routed Hydrograph Results

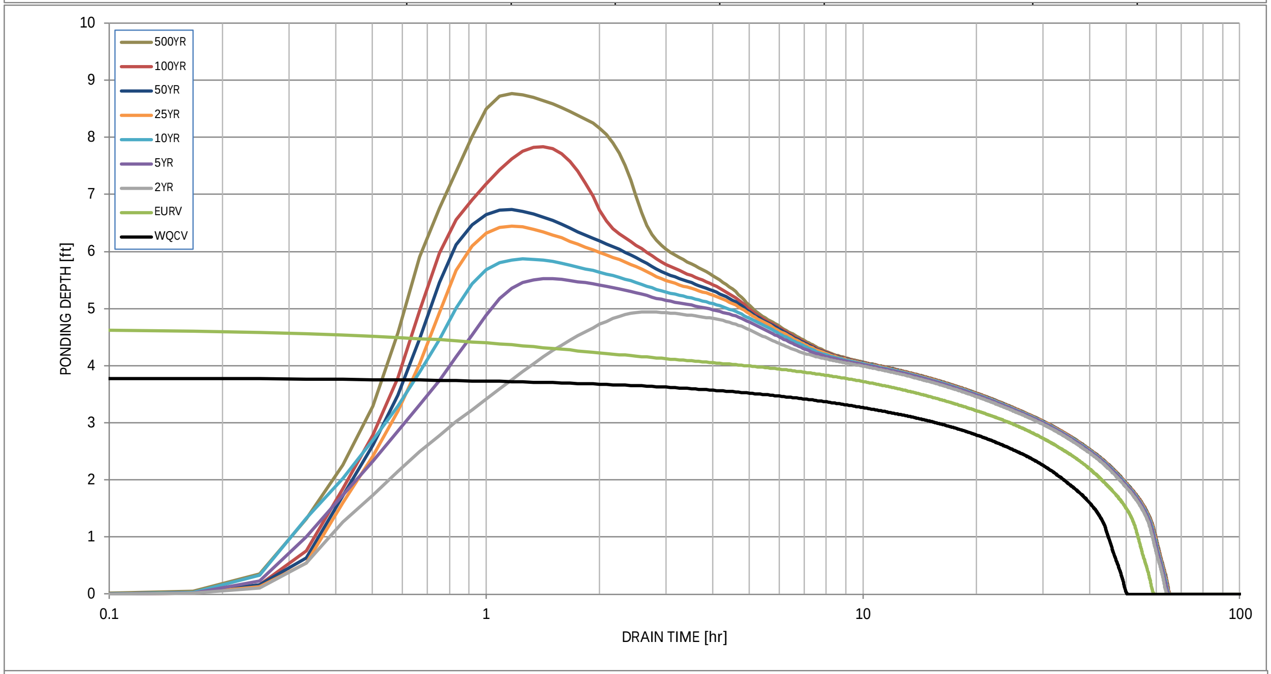
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

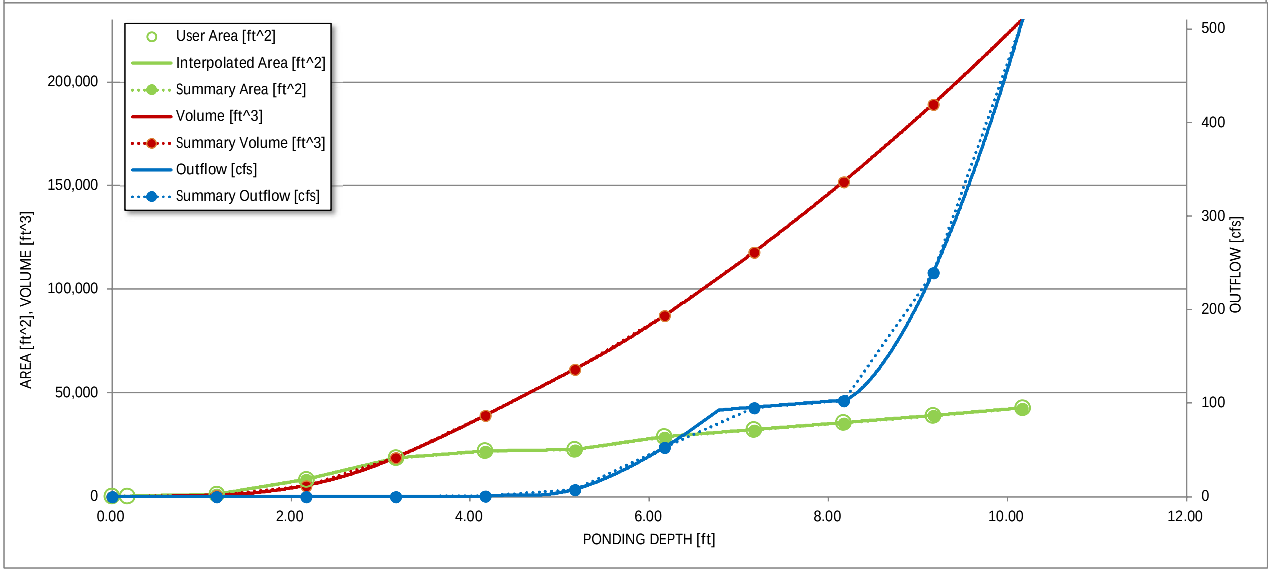
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
CUHP Runoff Volume (acre-ft) =	0.713	1.149	1.820	4.208	6.619	11.003	13.954	18.242	26.002
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	1.820	4.208	6.619	11.003	13.954	18.242	26.002
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	8.6	24.5	38.6	71.9	90.8	119.6	168.6
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.06	0.16	0.26	0.47	0.60	0.79	1.11
Peak Inflow Q (cfs) =	N/A	N/A	13.0	29.6	43.8	77.2	96.3	124.8	174.0
Peak Outflow Q (cfs) =	0.3	1.7	3.3	20.2	36.3	70.0	89.6	100.7	166.0
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.8	0.9	1.0	1.0	0.8	1.0
Structure Controlling Flow =	Plate	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	0.02	0.3	0.6	1.3	1.6	1.8	2.0
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	43	50	52	46	40	32	28	22	13
Time to Drain 99% of Inflow Volume (hours) =	46	54	57	54	52	48	45	42	37
Maximum Ponding Depth (ft) =	3.80	4.67	4.95	5.53	5.87	6.45	6.74	7.85	8.77
Area at Maximum Ponding Depth (acres) =	0.48	0.51	0.52	0.57	0.62	0.69	0.71	0.79	0.87
Maximum Volume Stored (acre-ft) =	0.718	1.154	1.293	1.603	1.812	2.193	2.388	3.221	3.993

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)







DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

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

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	0:15:00	0.00	0.00	0.02	0.03	0.04	0.03	0.04	0.03	0.06
	0:20:00	0.00	0.00	0.10	0.26	0.46	0.12	0.14	0.15	0.46
	0:25:00	0.00	0.00	0.94	3.05	5.62	0.92	1.20	1.80	5.54
	0:30:00	0.00	0.00	3.72	10.36	17.07	10.39	13.54	16.89	29.55
	0:35:00	0.00	0.00	7.59	19.09	29.24	29.39	37.71	46.58	70.85
	0:40:00	0.00	0.00	10.73	25.49	37.80	49.01	61.97	76.82	111.15
	0:45:00	0.00	0.00	12.45	28.65	42.04	63.58	79.64	99.34	140.41
	0:50:00	0.00	0.00	12.98	29.57	43.63	71.76	89.43	112.54	157.71
	0:55:00	0.00	0.00	12.98	29.52	43.83	75.98	94.59	120.02	167.64
	1:00:00	0.00	0.00	12.70	28.82	43.09	77.23	96.30	123.75	172.65
	1:05:00	0.00	0.00	12.21	27.59	41.61	76.46	95.60	124.79	174.04
	1:10:00	0.00	0.00	11.51	25.90	39.54	73.83	92.62	122.63	171.24
	1:15:00	0.00	0.00	10.73	24.34	37.95	69.64	87.71	117.10	164.61
	1:20:00	0.00	0.00	10.13	23.14	36.64	65.88	83.36	111.31	157.38
	1:25:00	0.00	0.00	9.57	21.97	35.11	62.22	78.96	105.27	149.40
	1:30:00	0.00	0.00	9.03	20.79	33.35	58.67	74.57	99.17	141.04
	1:35:00	0.00	0.00	8.48	19.60	31.46	55.08	70.08	93.07	132.52
	1:40:00	0.00	0.00	7.94	18.39	29.53	51.58	65.67	87.03	124.03
	1:45:00	0.00	0.00	7.45	17.31	27.88	48.11	61.30	81.12	115.87
	1:50:00	0.00	0.00	7.06	16.41	26.47	45.22	57.69	76.19	108.99
	1:55:00	0.00	0.00	6.72	15.58	25.16	42.74	54.57	72.01	103.05
	2:00:00	0.00	0.00	6.39	14.78	23.86	40.46	51.69	68.11	97.51
	2:05:00	0.00	0.00	6.06	13.98	22.59	38.28	48.92	64.40	92.23
	2:10:00	0.00	0.00	5.72	13.18	21.30	36.16	46.22	60.78	87.05
	2:15:00	0.00	0.00	5.38	12.38	20.01	34.07	43.55	57.24	81.95
	2:20:00	0.00	0.00	5.04	11.59	18.72	32.01	40.90	53.77	76.95
	2:25:00	0.00	0.00	4.70	10.80	17.45	29.96	38.29	50.39	72.08
	2:30:00	0.00	0.00	4.36	10.01	16.19	27.93	35.70	47.02	67.24
	2:35:00	0.00	0.00	4.03	9.23	14.95	25.90	33.12	43.66	62.43
	2:40:00	0.00	0.00	3.69	8.45	13.73	23.88	30.54	40.31	57.63
	2:45:00	0.00	0.00	3.36	7.69	12.54	21.87	27.98	36.97	52.89
	2:50:00	0.00	0.00	3.08	7.11	11.67	19.93	25.53	33.80	48.55
	2:55:00	0.00	0.00	2.91	6.73	11.03	18.56	23.81	31.47	45.27
	3:00:00	0.00	0.00	2.76	6.41	10.46	17.47	22.42	29.58	42.56
	3:05:00	0.00	0.00	2.64	6.10	9.92	16.54	21.21	27.92	40.15
	3:10:00	0.00	0.00	2.51	5.80	9.42	15.69	20.10	26.42	37.96
	3:15:00	0.00	0.00	2.39	5.51	8.92	14.92	19.10	25.03	35.94
	3:20:00	0.00	0.00	2.27	5.23	8.44	14.18	18.13	23.74	34.04
	3:25:00	0.00	0.00	2.15	4.95	7.98	13.46	17.20	22.52	32.27
	3:30:00	0.00	0.00	2.03	4.68	7.53	12.77	16.30	21.38	30.60
	3:35:00	0.00	0.00	1.92	4.41	7.09	12.08	15.42	20.25	28.96
	3:40:00	0.00	0.00	1.81	4.14	6.67	11.40	14.55	19.13	27.35
	3:45:00	0.00	0.00	1.69	3.88	6.25	10.72	13.69	18.01	25.73
	3:50:00	0.00	0.00	1.58	3.62	5.84	10.04	12.82	16.88	24.13
	3:55:00	0.00	0.00	1.47	3.36	5.42	9.37	11.96	15.76	22.52
	4:00:00	0.00	0.00	1.35	3.10	5.01	8.69	11.11	14.64	20.92
	4:05:00	0.00	0.00	1.24	2.84	4.61	8.02	10.25	13.52	19.31
	4:10:00	0.00	0.00	1.13	2.58	4.20	7.35	9.39	12.41	17.72
	4:15:00	0.00	0.00	1.02	2.33	3.79	6.67	8.54	11.29	16.12
	4:20:00	0.00	0.00	0.91	2.07	3.39	6.00	7.69	10.18	14.53
	4:25:00	0.00	0.00	0.80	1.82	2.99	5.33	6.84	9.07	12.94
	4:30:00	0.00	0.00	0.69	1.56	2.59	4.66	5.98	7.95	11.36
	4:35:00	0.00	0.00	0.58	1.30	2.18	3.99	5.13	6.84	9.77
	4:40:00	0.00	0.00	0.47	1.05	1.78	3.32	4.28	5.73	8.18
	4:45:00	0.00	0.00	0.36	0.79	1.38	2.65	3.43	4.61	6.59
	4:50:00	0.00	0.00	0.25	0.54	0.98	1.98	2.58	3.50	5.01
	4:55:00	0.00	0.00	0.15	0.32	0.65	1.33	1.75	2.42	3.51
	5:00:00	0.00	0.00	0.08	0.19	0.46	0.80	1.09	1.55	2.36
	5:05:00	0.00	0.00	0.05	0.14	0.36	0.50	0.72	1.03	1.63
	5:10:00	0.00	0.00	0.04	0.11	0.28	0.32	0.49	0.69	1.14
	5:15:00	0.00	0.00	0.03	0.09	0.23	0.21	0.33	0.45	0.78
	5:20:00	0.00	0.00	0.03	0.07	0.18	0.13	0.22	0.28	0.51
	5:25:00	0.00	0.00	0.02	0.05	0.13	0.09	0.15	0.16	0.32
	5:30:00	0.00	0.00	0.02	0.04	0.10	0.05	0.10	0.08	0.19
	5:35:00	0.00	0.00	0.01	0.03	0.07	0.04	0.07	0.05	0.12
	5:40:00	0.00	0.00	0.01	0.02	0.05	0.03	0.05	0.04	0.08
	5:45:00	0.00	0.00	0.01	0.02	0.03	0.02	0.04	0.03	0.06
	5:50:00	0.00	0.00	0.01	0.01	0.02	0.01	0.03	0.02	0.05
	5:55:00	0.00	0.00	0.00	0.01	0.02	0.01	0.02	0.02	0.04
	6:00:00	0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.01	0.03

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.
The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

Stage - Storage Description	Stage [ft]	Area [ft ^{2}]	Area [acres]	Volume [ft ^{3}]	Volume [ac-ft]	Total Outflow [cfs]
7230.83	0.00	162	0.004	0	0.000	0.00
7231	1.17	1,148	0.026	704	0.016	0.06
7232	2.17	8,283	0.190	5,419	0.124	0.14
7233	3.17	18,607	0.427	18,864	0.433	0.24
7234	4.17	21,993	0.505	39,164	0.899	0.61
7235	5.17	22,691	0.521	61,506	1.412	7.88
7236	6.17	28,920	0.664	87,311	2.004	52.70
7237	7.17	32,308	0.742	117,925	2.707	95.56
7238	8.17	35,680	0.819	151,919	3.488	103.01
7239	9.17	39,108	0.898	189,313	4.346	239.56
7240	10.17	42,799	0.983	230,267	5.286	510.21

For best results, include the stages of all grade slope changes (e.g. ISV and Floor) from the S-A-V table on Sheet 'Basin'.

Also include the inverts of all outlets (e.g. vertical orifice, overflow grate, and spillway, where applicable).

IMPERVIOUS FACTOR CALCULATION TABLE - PROPOSED CONDITIONS

		Imp %	2%	11%	90%	100%	80%		
	Basin	Area (Acre)	Open Space (2%)	2.5 Acre Lot (100%)	Buildings (100%)	Paved Roadway (100%)	Gravel Roadway (80%)	Total % Check	Weighted Impervious
Pond 3	PB8A	7.60	0%	98%	0%	3%	0%	100%	13%
	OB5	143.82	94%	0%	2%	1%	3%	100%	7%
Total		151.42							7.0%

Kimley»Horn

Project: Eagleview
Date: 4/15/2024

Emergency Overflow Weir Calculation - Onsite Full Spectrum Pond 3

Q (cfs) =	109	100-yr peak inflow (109 cfs)
C_{BCW} =	2.8	
Z =	4	
H =	0.97	
L (ft) =	37.64	(Proposing 40 feet)

$$Q = C_{BCW} L H^{1.5} + 2\left[\left({}^{2}/_{5}\right) C_{BCW} Z H^{2.5}\right]$$

rearrange to solve for length:

$$L = \frac{Q - \left({}^{4}/_{5}\right) C_{BCW} Z H^{2.5}}{C_{BCW} H^{1.5}}$$

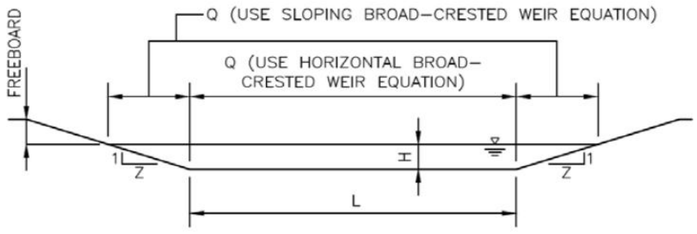
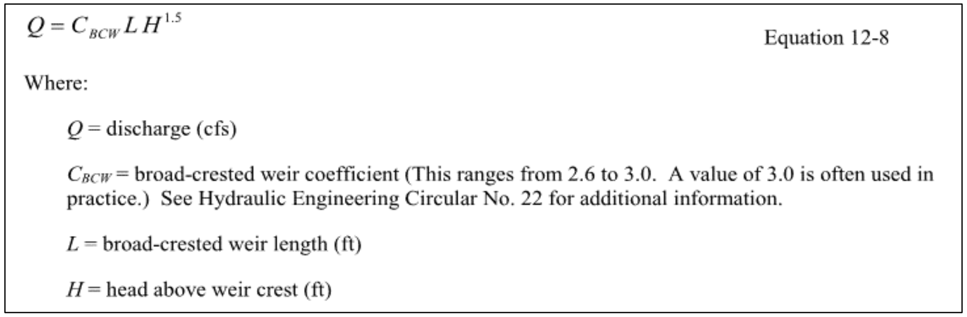

FREEBOARD
Q (USE SLOPING BROAD–CRESTED WEIR EQUATION)
Q (USE HORIZONTAL BROAD–CRESTED WEIR EQUATION)
H
1
Z
1
Z
L

Figure 12-20. Sloping broad-crest weir

Horizontal Broad Crested Weir Equation (from USDCM Eqn. 12-8)



$$Q = C_{BCW} L H^{1.5}$$ Equation 12-8

Where:

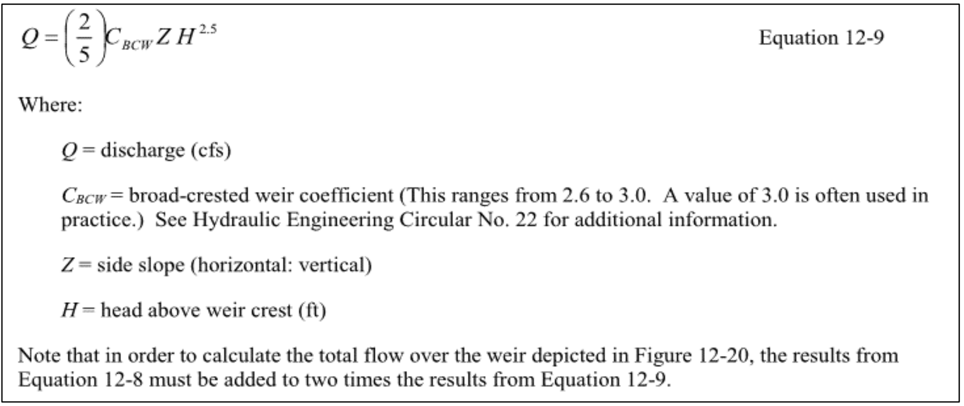
Q = discharge (cfs)

C_{BCW} = broad-crested weir coefficient (This ranges from 2.6 to 3.0. A value of 3.0 is often used in practice.) See Hydraulic Engineering Circular No. 22 for additional information.

L = broad-crested weir length (ft)

H = head above weir crest (ft)

Sloping Broad Crested Weir Equation (from USDCM Eqn. 12-9)



$$Q = \left(\frac{2}{5}\right) C_{BCW} Z H^{2.5}$$ Equation 12-9

Where:

Q = discharge (cfs)

C_{BCW} = broad-crested weir coefficient (This ranges from 2.6 to 3.0. A value of 3.0 is often used in practice.) See Hydraulic Engineering Circular No. 22 for additional information.

Z = side slope (horizontal: vertical)

H = head above weir crest (ft)

Note that in order to calculate the total flow over the weir depicted in Figure 12-20, the results from Equation 12-8 must be added to two times the results from Equation 12-9.

Kimley»Horn

2 North Nevada Avenue, Suite 900
Colorado Springs, Colorado 80903

Project:	Eagleview	Prepared By:	BH
Project Number:	196288000	Checked By:	BH
Date:	4/16/2024		

Water Quality Capture Volume

Water Quality Pond 1

Water Quality Capture Volume

UDFCD V3 Equation 3-1 WQ Watershed Inches = a*$(0.91i^3-1.19i^2+.78i)$

a_{12} = 0.8 (12-Hr Drain Time)
a_{24} = 0.9 (24-Hr Drain Time)
a_{40} = 1.0 (40-Hr Drain Time)

UDFCD V3 Equation 3-3 WQCV = (WQCV/12)*(Area)

WQCV Impervious (Site) =	100.0%	
a =	1.0	
WQ Watershed Inches (Site) =	0.60	
Area (Site) =	2.67	AC
WQ Capture Volume (Site) =	0.134	AC-FT
	5,815	FT^3

WQP1 Imperviousness

IMPERVIOUS FACTOR CALCULATION TABLE - PROPOSED CONDITIONS

		Imp %	2%	11%	90%	100%	80%		
	Basin	Area (Acre)	Open Space (2%)	2.5 Acre Lot (100%)	Buildings (100%)	Paved Roadway (100%)	Gravel Roadway (80%)	Total % Check	Weighted Impervious
WQF1	PB3	1.38	0%	85%	0%	15%	0%	100%	24%
	PB4	10.54	0%	97%	0%	3%	0%	100%	14%
	PB5	6.18	0%	97%	0%	3%	0%	100%	13%
	PB6	11.09	0%	95%	0%	5%	0%	100%	5%
	PB7	3.46	0%	91%	0%	9%	0%	100%	9%
	PB15*	5.58	0%	88%	0%	12%	0%	100%	12%
	OB2	28.06	90%	0%	3%	3%	5%	100%	11%
	OB3	43.44	92%	0%	2%	2%	4%	100%	9%
	OB4	10.50	87%	0%	4%	5%	4%	100%	13%
Total		120.24							10.3%

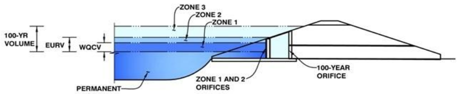
*Total area reduced based on portion tributary to WQP1

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

Project: Eagleview

Basin ID: Water Quality Pond 1



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type = EDB
Watershed Area = 120.24 acres
Watershed Length = 4,200 ft
Watershed Length to Centroid = 1,900 ft
Watershed Slope = 0.035 ft/ft
Watershed Imperviousness = 10.30% percent
Percentage Hydrologic Soil Group A = 0.0% percent
Percentage Hydrologic Soil Group B = 100.0% percent
Percentage Hydrologic Soil Groups C/D = 0.0% percent
Target WQCV Drain Time = 40.0 hours
Location for 1-hr Rainfall Depths = User Input

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

Optional User Overrides

Water Quality Capture Volume (WQCV) = 0.134 acre-feet | 0.134 acre-feet
Excess Urban Runoff Volume (EURV) = 1.167 acre-feet | acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) = 1.636 acre-feet | 1.19 inches
5-yr Runoff Volume (P1 = 1.5 in.) = 3.586 acre-feet | 1.50 inches
10-yr Runoff Volume (P1 = 1.75 in.) = 5.529 acre-feet | 1.75 inches
25-yr Runoff Volume (P1 = 2 in.) = 8.980 acre-feet | 2.00 inches
50-yr Runoff Volume (P1 = 2.25 in.) = 11.339 acre-feet | 2.25 inches
100-yr Runoff Volume (P1 = 2.52 in.) = 14.730 acre-feet | 2.52 inches
500-yr Runoff Volume (P1 = 3.14 in.) = 20.917 acre-feet | inches
Approximate 2-yr Detention Volume = 0.747 acre-feet
Approximate 5-yr Detention Volume = 1.169 acre-feet
Approximate 10-yr Detention Volume = 2.396 acre-feet
Approximate 25-yr Detention Volume = 3.330 acre-feet
Approximate 50-yr Detention Volume = 3.486 acre-feet
Approximate 100-yr Detention Volume = 4.498 acre-feet

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) = 0.134 acre-feet
Select Zone 2 Storage Volume (Optional) = acre-feet
Select Zone 3 Storage Volume (Optional) = acre-feet
Total Detention Basin Volume = 0.134 acre-feet

Total detention volume is less than 100-year volume.

Initial Surcharge Volume (ISV) = user ft^3
Initial Surcharge Depth (ISD) = user ft
Total Available Detention Depth (H_{total}) = user ft
Depth of Trickle Channel (H_{TC}) = user ft
Slope of Trickle Channel (S_{TC}) = user ft/ft
Slopes of Main Basin Sides (S_{main}) = user H:V
Basin Length-to-Width Ratio ($R_{L/W}$) = user

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

Depth Increment = 1.00 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	68	0.002		
7193	--	0.56	--	--	--	129	0.003	55	0.001
7194	--	1.56	--	--	--	1,995	0.046	1,117	0.026
7195	--	2.56	--	--	--	4,092	0.094	4,161	0.096
7196	--	3.56	--	--	--	6,566	0.151	9,490	0.218
7197	--	4.56	--	--	--	8,197	0.188	16,872	0.387
7198	--	5.56	--	--	--	9,882	0.227	25,911	0.595
7199	--	6.56	--	--	--	11,014	0.253	36,359	0.835
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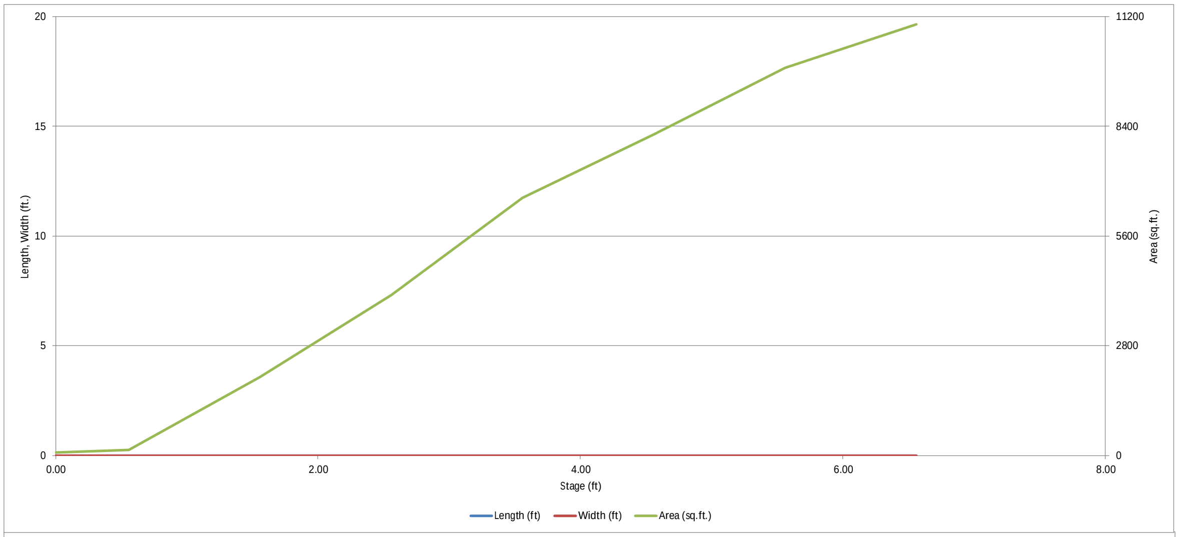
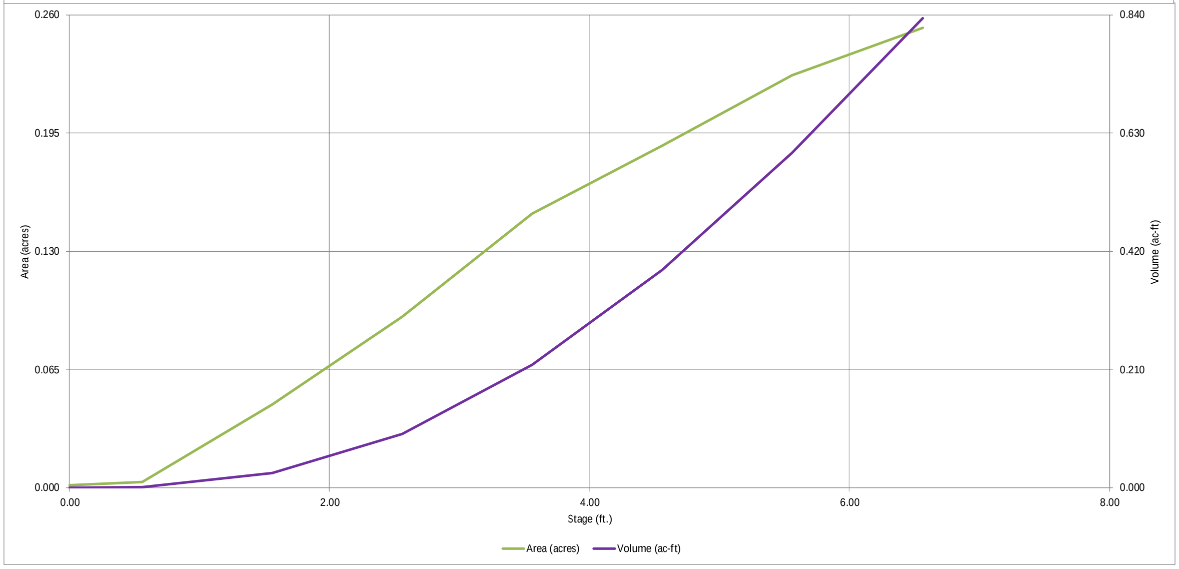
DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)





X = does not match details in CDs

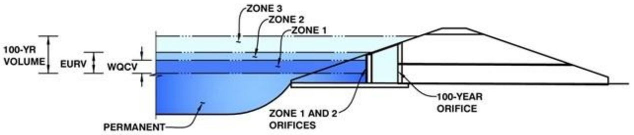
✓ = matches details in CDs

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: Eagleview

Basin ID: Water Quality Pond 1



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.93	0.134	Orifice Plate
Zone 2			Weir&Pipe (Circular)
Zone 3			
Total (all zones)		0.134	

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

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

Calculated Parameters for Underdrain

Underdrain Orifice Area =		ft^2
Underdrain Orifice Centroid =		feet

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

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	2.93	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	N/A	inches
Orifice Plate: Orifice Area per Row =	N/A	inches

Calculated Parameters for Plate

WQ Orifice Area per Row =	N/A	ft^2
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft^2

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
X Stage of Orifice Centroid (ft)	0.00	0.98	1.96					
X Orifice Area (sq. inches)	0.40	0.40	0.60					

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

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected	
Invert of Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =			inches

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected	
Vertical Orifice Area =			ft^2
Vertical Orifice Centroid =			feet

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

	Zone 2 Weir	Not Selected	
X Overflow Weir Front Edge Height, Ho =	3.00		ft (relative to basin bottom at Stage = 0 ft)
X Overflow Weir Front Edge Length =	5.00		feet
✓ Overflow Weir Grate Slope =	0.00		H:V
X Horiz. Length of Weir Sides =	5.00		feet
Overflow Grate Type =	Type C Grate		
Debris Clogging % =	50%		%

Calculated Parameters for Overflow Weir

	Zone 2 Weir	Not Selected	
Height of Grate Upper Edge, H_t =	3.00		feet
Overflow Weir Slope Length =	5.00		feet
Grate Open Area / 100-yr Orifice Area =	5.54		
Overflow Grate Open Area w/o Debris =	17.40		ft^2
Overflow Grate Open Area w/ Debris =	8.70		ft^2

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

	Zone 2 Circular	Not Selected	
? Depth to Invert of Outlet Pipe =	0.00		ft (distance below basin bottom at Stage = 0 ft)
✓ Circular Orifice Diameter =	24.00		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 2 Circular	Not Selected	
Outlet Orifice Area =	3.14		ft^2
Outlet Orifice Centroid =	1.00		feet
Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

X Spillway Invert Stage=	4.06	ft (relative to basin bottom at Stage = 0 ft)
✓ Spillway Crest Length =	35.00	feet
✓ Spillway End Slopes =	4.00	H:V
✓ Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

Spillway Design Flow Depth=	1.20	feet
Stage at Top of Freeboard =	6.26	feet
Basin Area at Top of Freeboard =	0.25	acres
Basin Volume at Top of Freeboard =	0.76	acre-ft

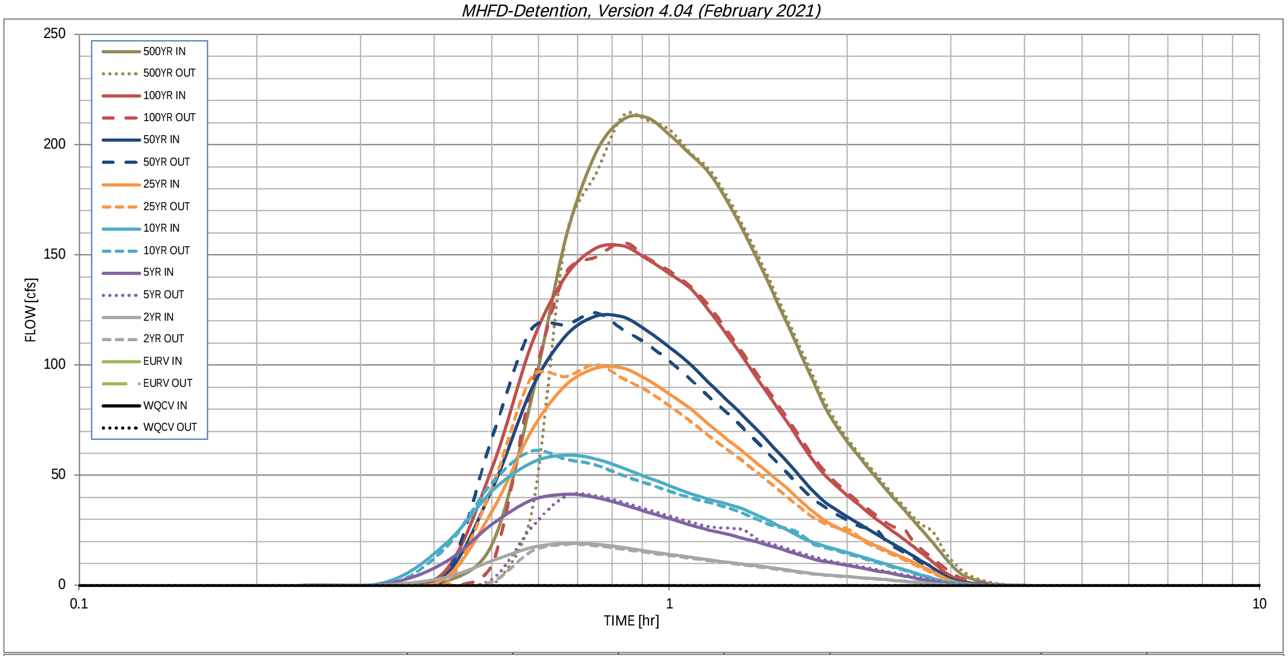
Routed Hydrograph Results

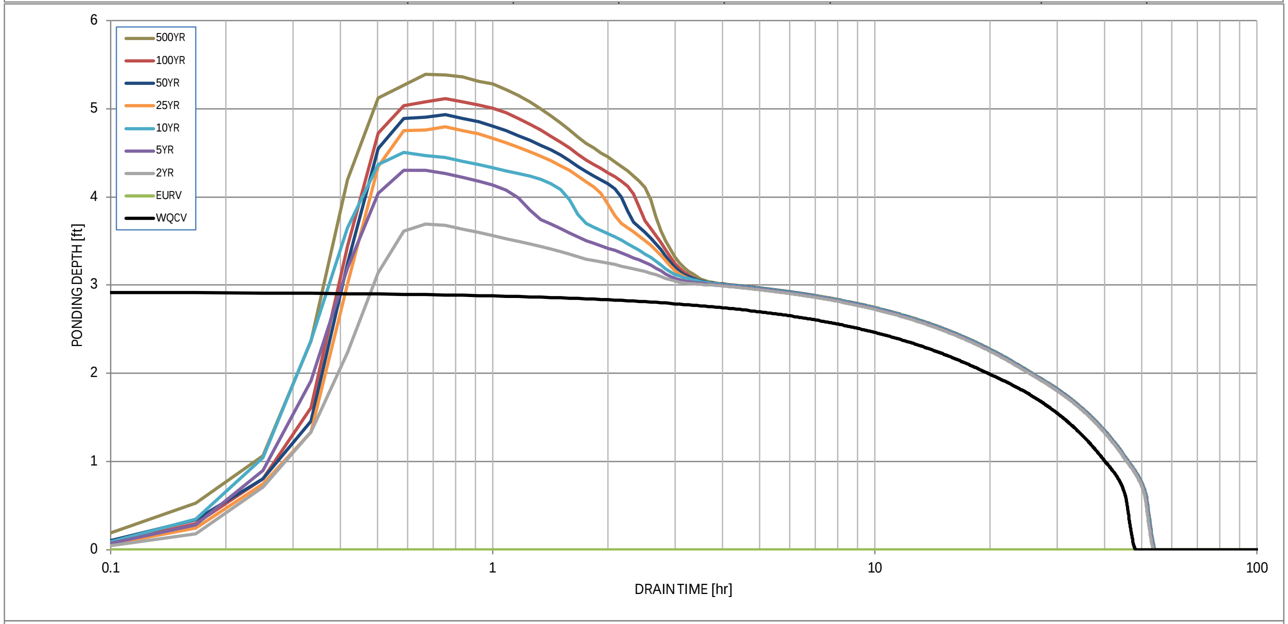
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

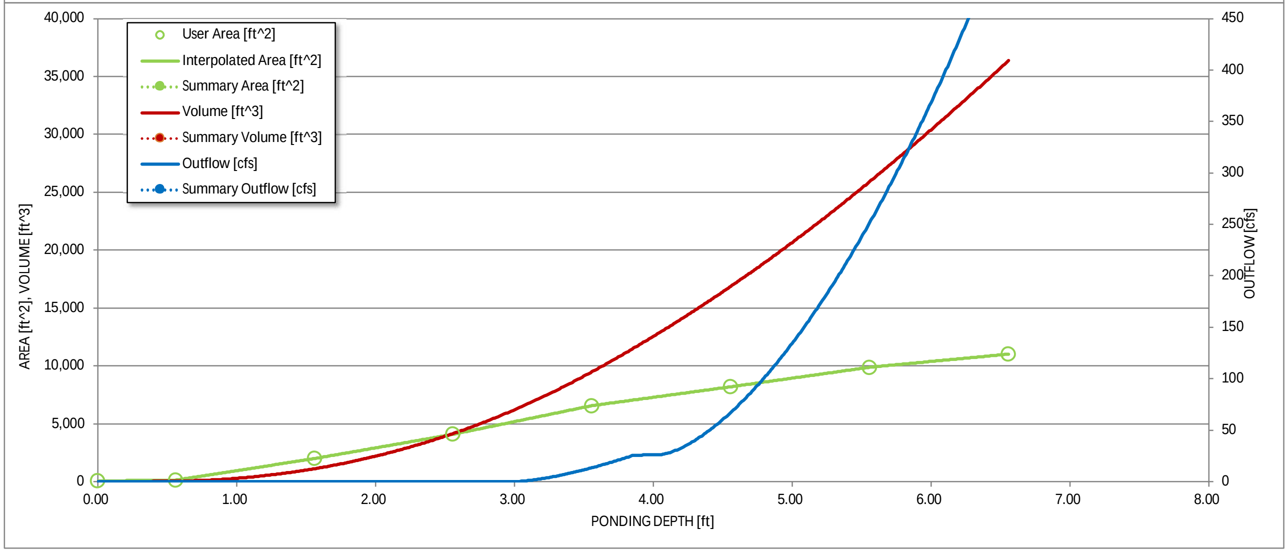
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
CUHP Runoff Volume (acre-ft) =	0.134	1.167	1.636	3.586	5.529	8.980	11.339	14.730	20.917
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	1.636	3.586	5.529	8.980	11.339	14.730	20.917
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	11.7	32.9	50.2	91.3	114.6	146.5	204.3
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.10	0.27	0.42	0.76	0.95	1.22	1.70
Peak Inflow Q (cfs) =	N/A	N/A	19.3	41.5	59.1	98.7	122.2	154.2	212.3
Peak Outflow Q (cfs) =	0.1	185.2	18.9	40.8	61.1	100.3	123.8	155.9	213.1
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.2	1.2	1.1	1.1	1.1	1.0
Structure Controlling Flow =	Plate	Plate	Overflow Weir 1	Spillway	Spillway	Spillway	Spillway	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	1.08	1.6	1.6	1.7	1.7	1.8	1.8
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	43	>120	26	11	3	2	2	1	1
Time to Drain 99% of Inflow Volume (hours) =	45	>120	40	31	24	15	10	4	3
Maximum Ponding Depth (ft) =	2.93	0.00	3.70	4.31	4.51	4.80	4.94	5.12	5.39
Area at Maximum Ponding Depth (acres) =	0.11	0.00	0.16	0.18	0.19	0.20	0.20	0.21	0.22
Maximum Volume Stored (acre-ft) =	0.134	0.000	0.238	0.340	0.376	0.432	0.462	0.497	0.557

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)







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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

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

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.04
	0:15:00	0.00	0.00	0.10	0.17	0.21	0.14	0.19	0.17	0.29
	0:20:00	0.00	0.00	0.46	1.09	1.86	0.49	0.59	0.63	1.83
	0:25:00	0.00	0.00	3.70	10.61	18.83	3.58	4.65	6.67	18.55
	0:30:00	0.00	0.00	11.33	27.76	42.86	33.70	43.64	53.11	84.74
	0:35:00	0.00	0.00	17.34	38.78	55.90	70.39	89.16	109.51	157.30
	0:40:00	0.00	0.00	19.27	41.48	59.12	90.92	113.26	140.23	196.11
	0:45:00	0.00	0.00	18.90	40.09	57.61	98.66	122.18	152.97	211.55
	0:50:00	0.00	0.00	17.34	36.80	53.36	98.63	121.86	154.15	212.29
	0:55:00	0.00	0.00	15.64	33.45	49.11	93.40	115.58	148.12	204.53
	1:00:00	0.00	0.00	14.28	30.51	45.42	86.89	108.09	141.52	195.94
	1:05:00	0.00	0.00	13.01	27.68	41.87	80.43	100.61	135.04	187.43
	1:10:00	0.00	0.00	11.81	25.34	39.20	73.19	92.07	124.98	174.79
	1:15:00	0.00	0.00	10.78	23.44	37.15	66.61	84.36	113.96	160.96
	1:20:00	0.00	0.00	9.83	21.54	34.70	60.65	77.09	103.35	146.83
	1:25:00	0.00	0.00	8.90	19.62	31.69	54.96	69.92	92.98	132.34
	1:30:00	0.00	0.00	8.00	17.69	28.48	49.39	62.87	83.22	118.53
	1:35:00	0.00	0.00	7.10	15.78	25.26	44.01	56.07	74.08	105.48
	1:40:00	0.00	0.00	6.23	13.83	22.15	38.71	49.37	65.19	92.88
	1:45:00	0.00	0.00	5.47	12.16	19.75	33.61	42.96	56.79	81.33
	1:50:00	0.00	0.00	4.96	10.98	18.03	29.71	38.14	50.36	72.47
	1:55:00	0.00	0.00	4.57	10.06	16.57	26.75	34.44	45.35	65.44
	2:00:00	0.00	0.00	4.21	9.22	15.16	24.30	31.35	41.06	59.38
	2:05:00	0.00	0.00	3.84	8.39	13.77	22.05	28.46	37.14	53.74
	2:10:00	0.00	0.00	3.47	7.56	12.38	19.96	25.74	33.47	48.38
	2:15:00	0.00	0.00	3.11	6.76	11.03	17.97	23.14	30.03	43.32
	2:20:00	0.00	0.00	2.75	5.97	9.73	16.05	20.65	26.79	38.58
	2:25:00	0.00	0.00	2.41	5.21	8.48	14.21	18.27	23.79	34.18
	2:30:00	0.00	0.00	2.07	4.47	7.29	12.41	15.95	20.85	29.92
	2:35:00	0.00	0.00	1.74	3.73	6.14	10.62	13.68	17.95	25.73
	2:40:00	0.00	0.00	1.41	3.01	5.03	8.85	11.43	15.05	21.58
	2:45:00	0.00	0.00	1.09	2.30	3.92	7.10	9.20	12.17	17.46
	2:50:00	0.00	0.00	0.77	1.60	2.84	5.35	6.98	9.30	13.36
	2:55:00	0.00	0.00	0.48	0.99	1.92	3.64	4.80	6.49	9.46
	3:00:00	0.00	0.00	0.28	0.63	1.38	2.23	3.04	4.20	6.38
	3:05:00	0.00	0.00	0.20	0.47	1.08	1.42	2.04	2.81	4.45
	3:10:00	0.00	0.00	0.15	0.37	0.86	0.93	1.40	1.90	3.12
	3:15:00	0.00	0.00	0.12	0.30	0.68	0.62	0.97	1.25	2.15
	3:20:00	0.00	0.00	0.10	0.23	0.54	0.41	0.67	0.80	1.45
	3:25:00	0.00	0.00	0.08	0.18	0.41	0.28	0.47	0.48	0.94
	3:30:00	0.00	0.00	0.06	0.14	0.31	0.19	0.32	0.26	0.58
	3:35:00	0.00	0.00	0.05	0.11	0.22	0.13	0.22	0.16	0.37
	3:40:00	0.00	0.00	0.04	0.08	0.16	0.09	0.16	0.12	0.27
	3:45:00	0.00	0.00	0.03	0.06	0.11	0.07	0.12	0.09	0.21
	3:50:00	0.00	0.00	0.02	0.04	0.08	0.05	0.09	0.07	0.16
	3:55:00	0.00	0.00	0.02	0.03	0.06	0.04	0.07	0.06	0.13
	4:00:00	0.00	0.00	0.01	0.02	0.04	0.03	0.05	0.04	0.09
	4:05:00	0.00	0.00	0.01	0.01	0.03	0.02	0.04	0.03	0.06
	4:10:00	0.00	0.00	0.01	0.01	0.02	0.01	0.02	0.02	0.04
	4:15:00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.02
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.

The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

Stage - Storage Description	Stage [ft]	Area [ft^2]	Area [acres]	Volume [ft^3]	Volume [ac-ft]	Total Outflow [cfs]

For best results, include the stages of all grade slope changes (e.g. ISV and Floor) from the S-A-V table on Sheet 'Basin'.

Also include the inverts of all outlets (e.g. vertical orifice, overflow grate, and spillway, where applicable).

Kimley»Horn

Project: Eagleview
Date: 4/15/2024

Emergency Overflow Weir Calculation - Water Quality Pond 1

Q (cfs) = 181 (100-yr peak inflow (181 cfs))
C_{BCW} = 2.8
Z = 4
H = 1.5

L (ft) = 30.39 (Proposing 35 feet)

$$Q = C_{BCW} L H^{1.5} + 2\left[\left(2/5\right) C_{BCW} Z H^{2.5}\right]$$

rearrange to solve for length:

$$L = \frac{Q - \left(4/5\right) C_{BCW} Z H^{2.5}}{C_{BCW} H^{1.5}}$$

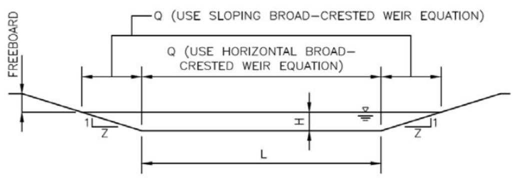
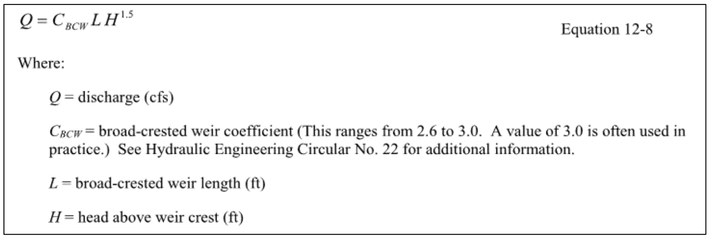

Q (USE SLOPING BROAD–CRESTED WEIR EQUATION)
Q (USE HORIZONTAL BROAD–CRESTED WEIR EQUATION)
FREEBOARD
1
Z
H
L
Z
1

Figure 12-20. Sloping broad-crest weir

Horizontal Broad Crested Weir Equation (from USDCM Eqn. 12-8)



$$Q = C_{BCW} L H^{1.5} \qquad \text{Equation 12-8}$$

Where:

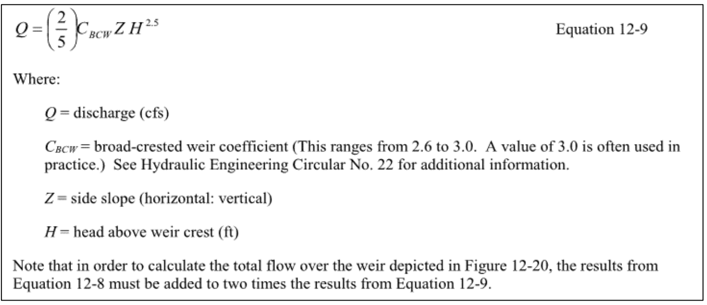
Q = discharge (cfs)

C_{BCW} = broad-crested weir coefficient (This ranges from 2.6 to 3.0. A value of 3.0 is often used in practice.) See Hydraulic Engineering Circular No. 22 for additional information.

L = broad-crested weir length (ft)

H = head above weir crest (ft)

Sloping Broad Crested Weir Equation (from USDCM Eqn. 12-9)



$$Q = \left(\frac{2}{5}\right) C_{BCW} Z H^{2.5} \qquad \text{Equation 12-9}$$

Where:

Q = discharge (cfs)

C_{BCW} = broad-crested weir coefficient (This ranges from 2.6 to 3.0. A value of 3.0 is often used in practice.) See Hydraulic Engineering Circular No. 22 for additional information.

Z = side slope (horizontal: vertical)

H = head above weir crest (ft)

Note that in order to calculate the total flow over the weir depicted in Figure 12-20, the results from Equation 12-8 must be added to two times the results from Equation 12-9.

Kimley»Horn

2 North Nevada Avenue, Suite 900
Colorado Springs, Colorado 80903

Project:	Eagleview	Prepared By:	BH
Project Number:	196288000	Checked By:	BH
Date:	4/16/2024		

Water Quality Capture Volume

Water Quality Pond 2

Water Quality Capture Volume

UDFCD V3 Equation 3-1 WQ Watershed Inches = $a*(0.91i^3-1.19i^2+.78i)$

$a_{12} = 0.8$ (12-Hr Drain Time)
$a_{24} = 0.9$ (24-Hr Drain Time)
$a_{40} = 1.0$ (40-Hr Drain Time)

UDFCD V3 Equation 3-3 WQCV = (WQCV/12)*(Area)

WQCV Impervious (Site) =	100.0%	
a =	1.0	
WQ Watershed Inches (Site) =	0.60	
Area (Site) =	1.03	AC
WQ Capture Volume (Site) =	0.052	AC-FT
	2,243	FT^3

IMPERVIOUS FACTOR CALCULATION TABLE - PROPOSED CONDITIONS

		Imp %	2%	11%	90%	100%	80%		
	Basin	Area (Acre)	Open Space (2%)	2.5 Acre Lot (100%)	Buildings (100%)	Paved Roadway (100%)	Gravel Roadway (80%)	Total % Check	Weighted Impervious
WQF2	PB11	21.08	0%	96%	0%	4%	0%	100%	14%
	PB14*	3.38	0%	92%	0%	8%	0%	100%	18%
	OB8	33.08	93%	0%	2%	1%	5%	100%	8%
Total		57.54							10.9%

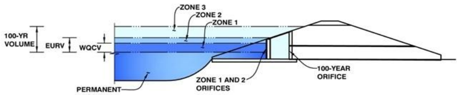
*Total area reduced based on portion tributary to WQP2

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

Project: Eagleview

Basin ID: Water Quality Pond 2



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	57.54	acres
Watershed Length =	3,600	ft
Watershed Length to Centroid =	2,000	ft
Watershed Slope =	0.039	ft/ft
Watershed Imperviousness =	10.90%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	100.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.052	acre-feet	0.052	acre-feet
Excess Urban Runoff Volume (EURV) =	0.594	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.812	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	1.753	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	2.687	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	4.336	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	5.467	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	7.089	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	10.053	acre-feet		inches
Approximate 2-yr Detention Volume =	0.382	acre-feet		
Approximate 5-yr Detention Volume =	0.595	acre-feet		
Approximate 10-yr Detention Volume =	1.191	acre-feet		
Approximate 25-yr Detention Volume =	1.640	acre-feet		
Approximate 50-yr Detention Volume =	1.720	acre-feet		
Approximate 100-yr Detention Volume =	2.211	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.052	acre-feet
Select Zone 2 Storage Volume (Optional) =		acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	0.052	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

Total detention volume is less than 100-year volume.

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

Depth Increment = 1.00 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	270	0.006		
7199	--	1.00	--	--	--	1,824	0.042	1,047	0.024
7200	--	2.00	--	--	--	2,873	0.066	3,395	0.078
7201	--	3.00	--	--	--	4,622	0.106	7,143	0.164
7202	--	4.00	--	--	--	4,897	0.112	11,902	0.273
7203	--	5.00	--	--	--	6,627	0.152		
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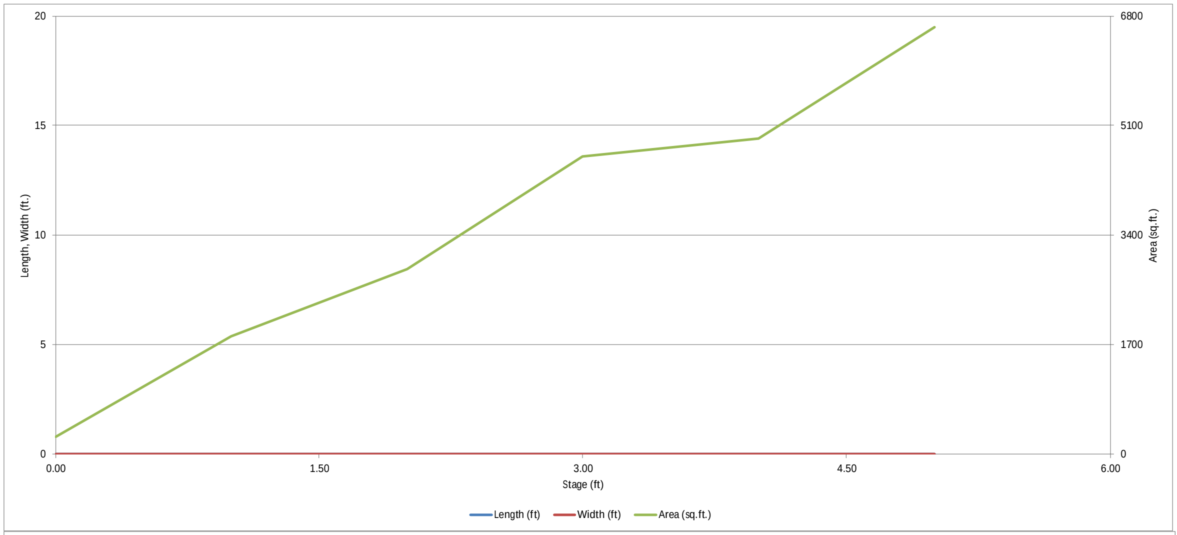
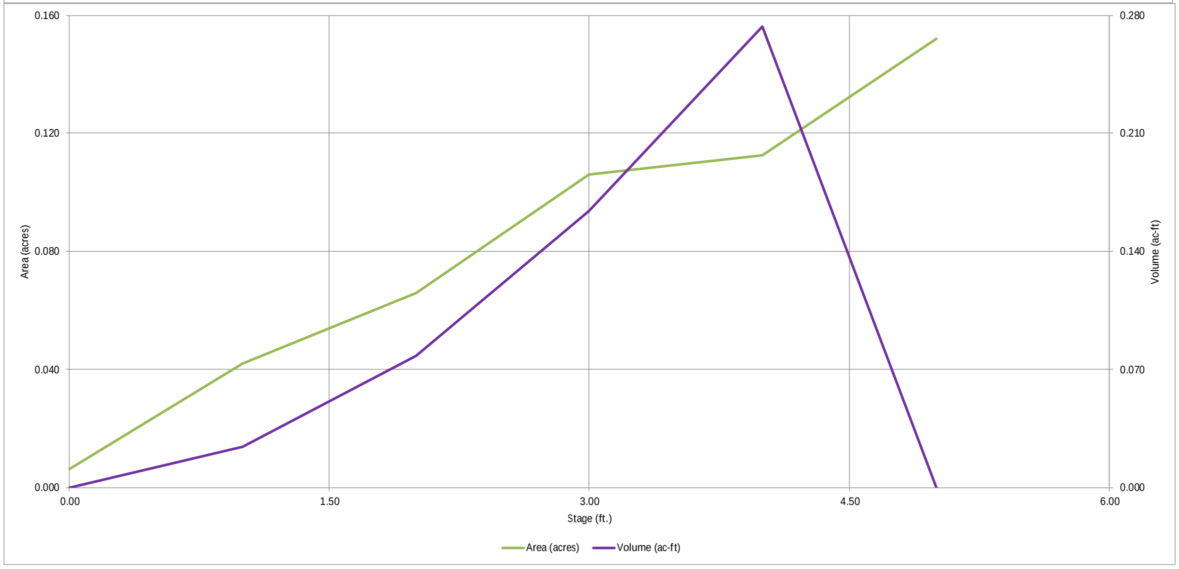
DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)





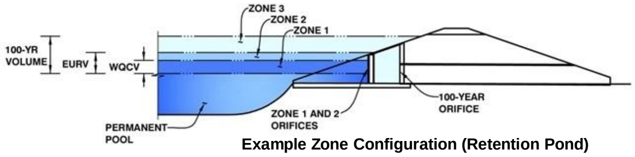
Please QC this page with the CD details as I have done for Pond 1. It looks like there is similiar discrepancies/errors for Pond 2.

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: Eagleview

Basin ID: Water Quality Pond 2



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.58	0.052	Orifice Plate
Zone 2			Weir&Pipe (Circular)
Zone 3			
Total (all zones)		0.052	

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

			Calculated Parameters for Underdrain		
Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

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

			Calculated Parameters for Plate		
Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft^2
Depth at top of Zone using Orifice Plate =	1.58	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	inches	Elliptical Slot Area =	N/A	ft^2

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.53	1.06					
Orifice Area (sq. inches)	0.30	0.30	0.30					

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

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected		Calculated Parameters for Vertical Orifice	Not Selected	Not Selected	
Invert of Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =			ft^2
Depth at top of Zone using Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =			feet
Vertical Orifice Diameter =			inches				

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

	Zone 2 Weir	Not Selected		Calculated Parameters for Overflow Weir	Zone 2 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	1.70		ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	1.70		feet
Overflow Weir Front Edge Length =	3.43		feet	Overflow Weir Slope Length =	2.79		feet
Overflow Weir Grate Slope =	0.00		H:V	Grate Open Area / 100-yr Orifice Area =	3.77		
Horiz. Length of Weir Sides =	2.79		feet	Overflow Grate Open Area w/o Debris =	6.66		ft^2
Overflow Grate Type =	Type C Grate			Overflow Grate Open Area w/ Debris =	3.33		ft^2
Debris Clogging % =	50%		%				

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

	Zone 2 Circular	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate	Zone 2 Circular	Not Selected	
Depth to Invert of Outlet Pipe =	0.00		ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	1.77		ft^2
Circular Orifice Diameter =	18.00		inches	Outlet Orifice Centroid =	0.75		feet
				Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

			Calculated Parameters for Spillway		
Spillway Invert Stage=	2.75	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.75	feet
Spillway Crest Length =	25.00	feet	Stage at Top of Freeboard =	4.50	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.00	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	#VALUE!	acre-ft

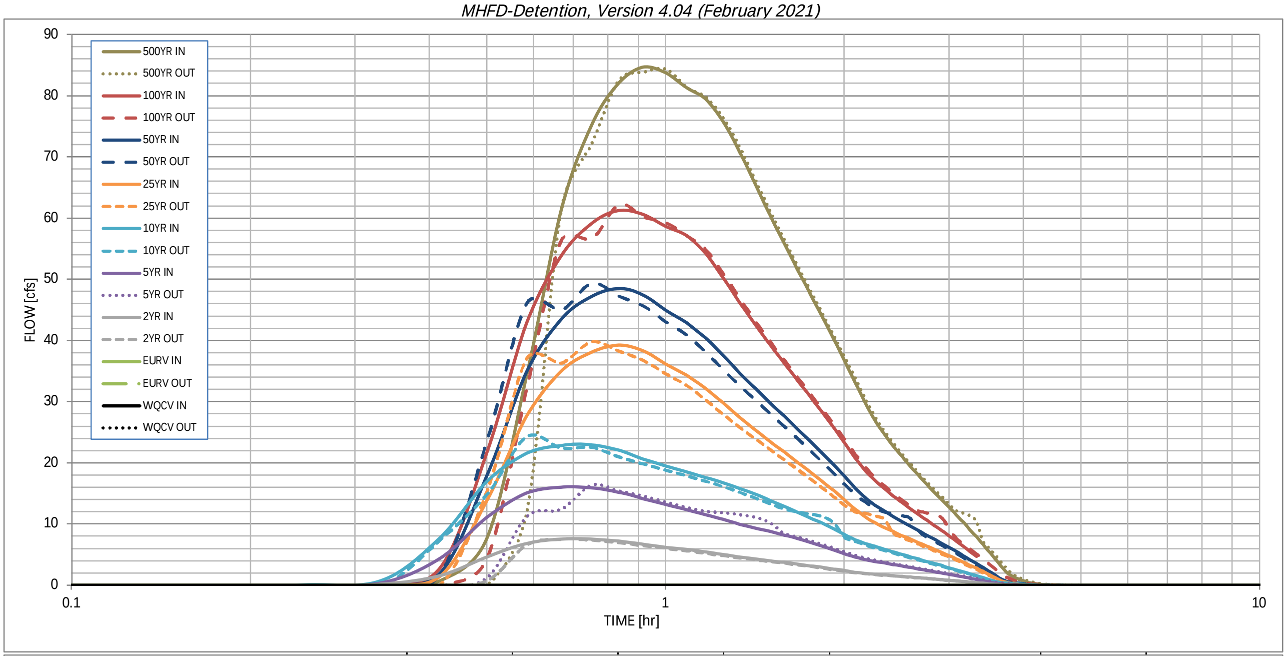
Routed Hydrograph Results

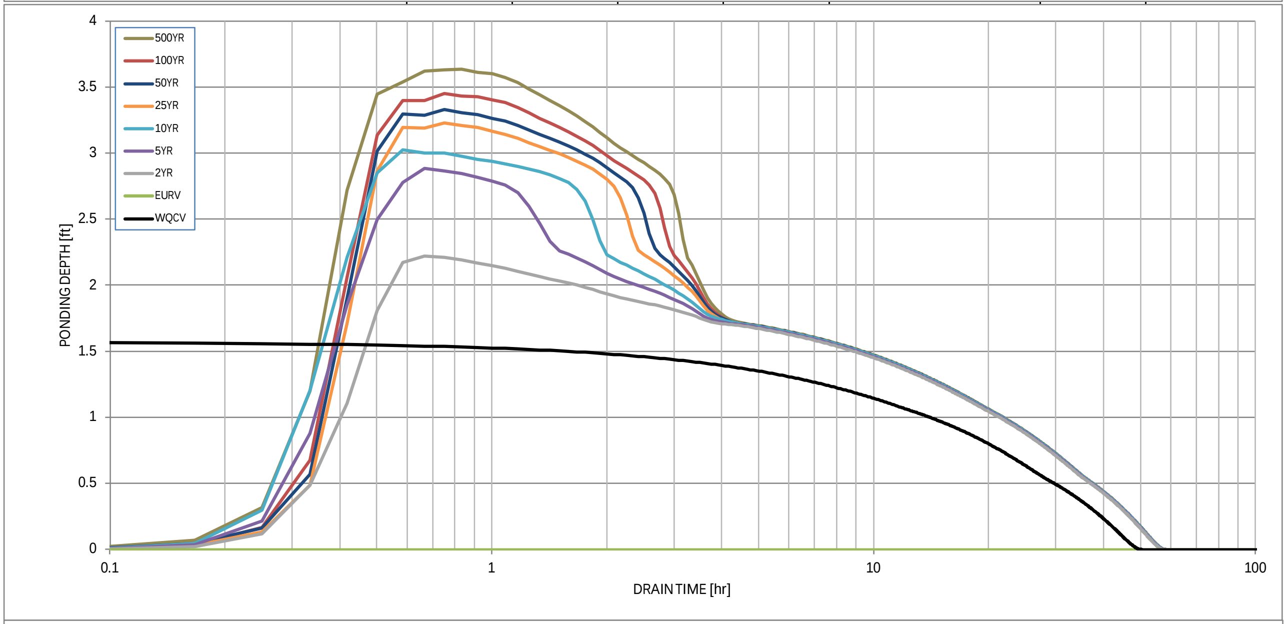
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

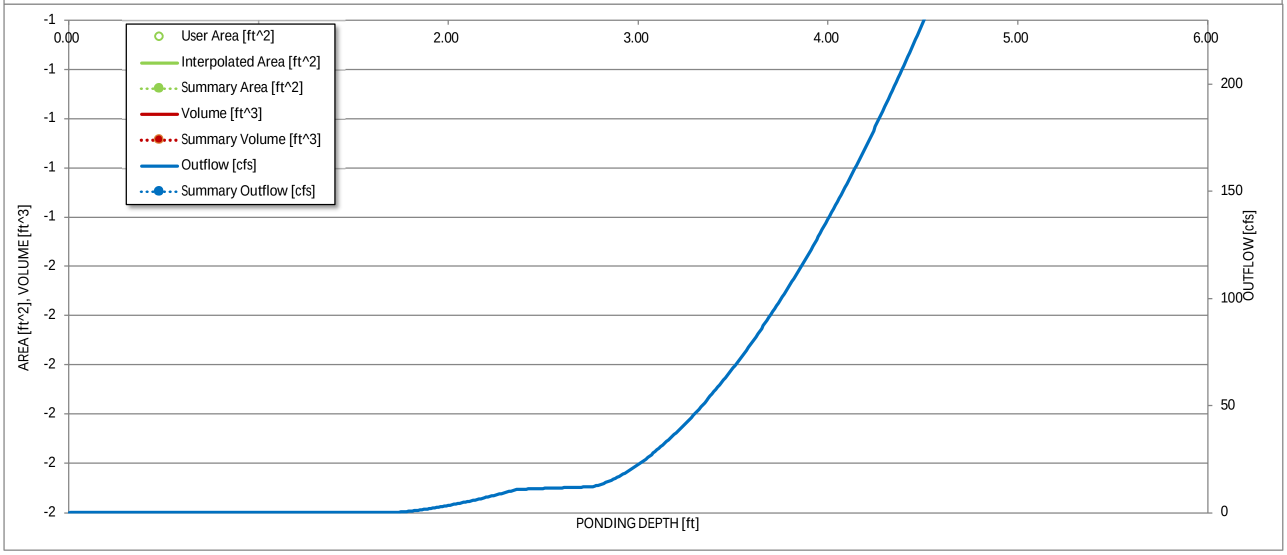
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
CUHP Runoff Volume (acre-ft) =	0.052	0.594	0.812	1.753	2.687	4.336	5.467	7.089	10.053
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.812	1.753	2.687	4.336	5.467	7.089	10.053
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	4.4	12.5	19.4	35.5	44.6	57.2	80.1
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.08	0.22	0.34	0.62	0.78	0.99	1.39
Peak Inflow Q (cfs) =	N/A	N/A	7.6	16.1	23.0	39.3	48.5	61.3	84.7
Peak Outflow Q (cfs) =	0.0	100.9	7.6	16.4	24.3	39.8	49.4	62.2	84.4
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.3	1.3	1.1	1.1	1.1	1.1
Structure Controlling Flow =	Plate	Spillway	Overflow Weir 1	Spillway	Spillway	Spillway	Spillway	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	2.30	1.13	1.9	1.9	2.0	2.0	2.1	2.2
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	42	0	21	7	3	2	2	1	1
Time to Drain 99% of Inflow Volume (hours) =	46	0	36	27	20	11	7	4	3
Maximum Ponding Depth (ft) =	1.58	4.01	2.22	2.89	3.03	3.23	3.33	3.45	3.64
Area at Maximum Ponding Depth (acres) =	0.06	0.00	0.07	0.10	0.11	0.11	0.11	0.11	0.11
Maximum Volume Stored (acre-ft) =	0.052	#VALUE!	0.093	0.152	0.166	0.187	0.199	0.212	0.232

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)







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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

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

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.02
	0:15:00	0.00	0.00	0.05	0.08	0.10	0.07	0.09	0.08	0.13
	0:20:00	0.00	0.00	0.21	0.50	0.83	0.22	0.26	0.30	0.81
	0:25:00	0.00	0.00	1.61	4.47	7.82	1.56	2.01	2.86	7.72
	0:30:00	0.00	0.00	4.67	11.14	16.97	13.89	17.94	21.74	34.21
	0:35:00	0.00	0.00	6.87	15.06	21.56	27.62	34.89	42.85	61.24
	0:40:00	0.00	0.00	7.57	16.08	22.90	34.97	43.49	53.81	75.28
	0:45:00	0.00	0.00	7.58	15.96	22.99	38.17	47.26	59.16	82.10
	0:50:00	0.00	0.00	7.23	15.26	22.10	39.26	48.54	61.28	84.68
	0:55:00	0.00	0.00	6.74	14.22	20.71	38.34	47.46	60.60	83.72
	1:00:00	0.00	0.00	6.26	13.21	19.56	36.19	44.97	58.67	81.35
	1:05:00	0.00	0.00	5.88	12.39	18.60	34.35	42.91	57.17	79.48
	1:10:00	0.00	0.00	5.48	11.60	17.68	32.22	40.44	54.29	75.84
	1:15:00	0.00	0.00	5.05	10.78	16.77	29.85	37.64	50.32	70.83
	1:20:00	0.00	0.00	4.65	10.02	15.85	27.43	34.70	46.21	65.43
	1:25:00	0.00	0.00	4.32	9.38	14.88	25.37	32.13	42.55	60.40
	1:30:00	0.00	0.00	4.03	8.80	13.90	23.51	29.80	39.28	55.84
	1:35:00	0.00	0.00	3.76	8.24	12.94	21.77	27.62	36.30	51.63
	1:40:00	0.00	0.00	3.50	7.65	11.99	20.13	25.56	33.54	47.71
	1:45:00	0.00	0.00	3.23	7.03	11.06	18.55	23.57	30.88	43.93
	1:50:00	0.00	0.00	2.97	6.41	10.16	17.01	21.62	28.29	40.28
	1:55:00	0.00	0.00	2.70	5.80	9.25	15.48	19.71	25.77	36.71
	2:00:00	0.00	0.00	2.43	5.20	8.32	13.98	17.83	23.31	33.25
	2:05:00	0.00	0.00	2.17	4.65	7.49	12.49	15.95	20.88	29.87
	2:10:00	0.00	0.00	1.97	4.25	6.88	11.21	14.35	18.80	27.00
	2:15:00	0.00	0.00	1.83	3.95	6.37	10.26	13.15	17.20	24.73
	2:20:00	0.00	0.00	1.70	3.68	5.92	9.47	12.14	15.84	22.78
	2:25:00	0.00	0.00	1.59	3.42	5.49	8.78	11.24	14.64	21.03
	2:30:00	0.00	0.00	1.47	3.17	5.08	8.15	10.42	13.54	19.43
	2:35:00	0.00	0.00	1.36	2.94	4.68	7.56	9.66	12.52	17.94
	2:40:00	0.00	0.00	1.26	2.70	4.30	6.99	8.93	11.56	16.55
	2:45:00	0.00	0.00	1.16	2.48	3.93	6.45	8.22	10.67	15.24
	2:50:00	0.00	0.00	1.05	2.25	3.58	5.92	7.54	9.81	14.00
	2:55:00	0.00	0.00	0.95	2.04	3.24	5.39	6.88	8.96	12.77
	3:00:00	0.00	0.00	0.86	1.82	2.90	4.87	6.22	8.11	11.56
	3:05:00	0.00	0.00	0.76	1.61	2.58	4.36	5.56	7.27	10.35
	3:10:00	0.00	0.00	0.66	1.40	2.25	3.84	4.91	6.42	9.15
	3:15:00	0.00	0.00	0.56	1.19	1.92	3.33	4.25	5.58	7.95
	3:20:00	0.00	0.00	0.46	0.98	1.60	2.82	3.60	4.74	6.75
	3:25:00	0.00	0.00	0.37	0.77	1.28	2.30	2.96	3.90	5.55
	3:30:00	0.00	0.00	0.27	0.57	0.97	1.79	2.31	3.07	4.36
	3:35:00	0.00	0.00	0.18	0.37	0.66	1.29	1.67	2.23	3.19
	3:40:00	0.00	0.00	0.11	0.23	0.47	0.80	1.06	1.45	2.13
	3:45:00	0.00	0.00	0.07	0.17	0.36	0.51	0.70	0.97	1.48
	3:50:00	0.00	0.00	0.05	0.13	0.29	0.34	0.48	0.66	1.05
	3:55:00	0.00	0.00	0.04	0.10	0.23	0.23	0.34	0.44	0.74
	4:00:00	0.00	0.00	0.04	0.08	0.19	0.15	0.24	0.29	0.50
	4:05:00	0.00	0.00	0.03	0.07	0.14	0.10	0.17	0.18	0.33
	4:10:00	0.00	0.00	0.02	0.05	0.11	0.07	0.12	0.10	0.21
	4:15:00	0.00	0.00	0.02	0.04	0.08	0.05	0.08	0.06	0.13
	4:20:00	0.00	0.00	0.01	0.03	0.06	0.04	0.06	0.04	0.10
	4:25:00	0.00	0.00	0.01	0.02	0.04	0.03	0.04	0.03	0.07
	4:30:00	0.00	0.00	0.01	0.02	0.03	0.02	0.03	0.03	0.06
	4:35:00	0.00	0.00	0.01	0.01	0.02	0.01	0.03	0.02	0.04
	4:40:00	0.00	0.00	0.01	0.01	0.02	0.01	0.02	0.02	0.03
	4:45:00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.02
	4:50:00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.02
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.

The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

Stage - Storage Description	Stage [ft]	Area [ft^2]	Area [acres]	Volume [ft^3]	Volume [ac-ft]	Total Outflow [cfs]

For best results, include the stages of all grade slope changes (e.g. ISV and Floor) from the S-A-V table on Sheet 'Basin'.

Also include the inverts of all outlets (e.g. vertical orifice, overflow grate, and spillway, where applicable).

Kimley»Horn

Project: Eagleview
Date: 4/19/2024

Emergency Overflow Weir Calculation - Water Quality Pond 2

Q (cfs) =	82	(100-yr peak inflow (82 cfs)
C_{BCW} =	2.8	
Z =	4	
H =	1.03	
L (ft) =	24.72	(Proposing 25 feet)

$$Q = C_{BCW} L H^{1.5} + 2\left[\left({}^{2}/_{5}\right) C_{BCW} Z H^{2.5}\right]$$

rearrange to solve for length:

$$L = \frac{Q - \left({}^{4}/_{5}\right) C_{BCW} Z H^{2.5}}{C_{BCW} H^{1.5}}$$

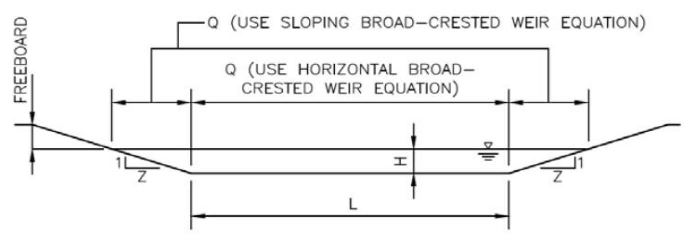
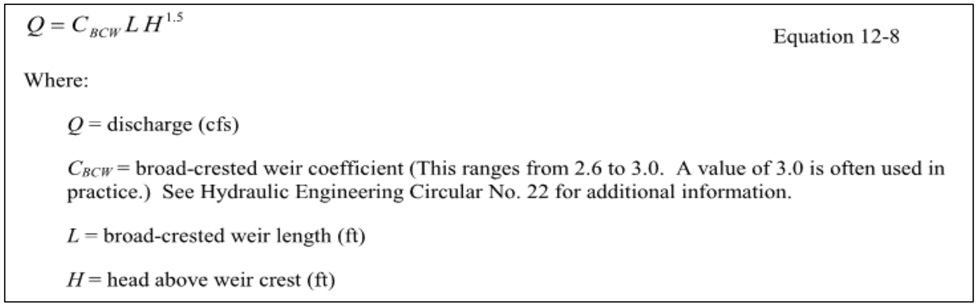

FREEBOARD
Q (USE SLOPING BROAD–CRESTED WEIR EQUATION)
Q (USE HORIZONTAL BROAD–CRESTED WEIR EQUATION)
1
Z
H
L
Z
1

Figure 12-20. Sloping broad-crest weir

Horizontal Broad Crested Weir Equation (from USDCM Eqn. 12-8)



$$Q = C_{BCW} L H^{1.5}$$ Equation 12-8

Where:

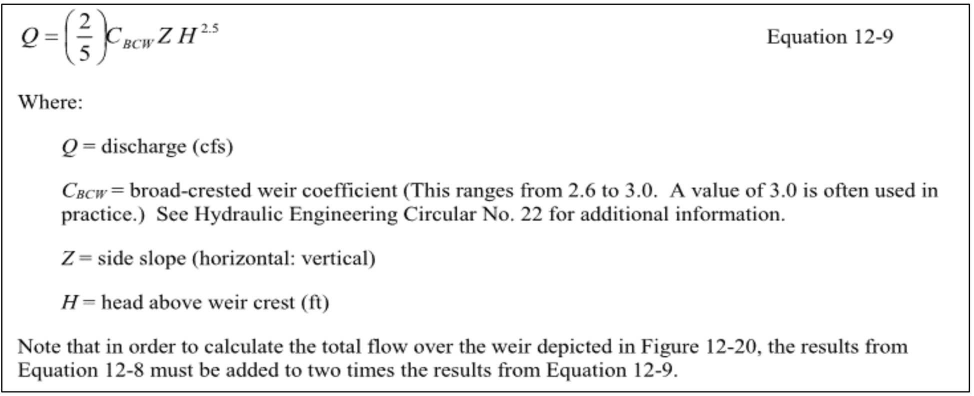
Q = discharge (cfs)

C_{BCW} = broad-crested weir coefficient (This ranges from 2.6 to 3.0. A value of 3.0 is often used in practice.) See Hydraulic Engineering Circular No. 22 for additional information.

L = broad-crested weir length (ft)

H = head above weir crest (ft)

Sloping Broad Crested Weir Equation (from USDCM Eqn. 12-9)



$$Q = \left(\frac{2}{5}\right) C_{BCW} Z H^{2.5}$$ Equation 12-9

Where:

Q = discharge (cfs)

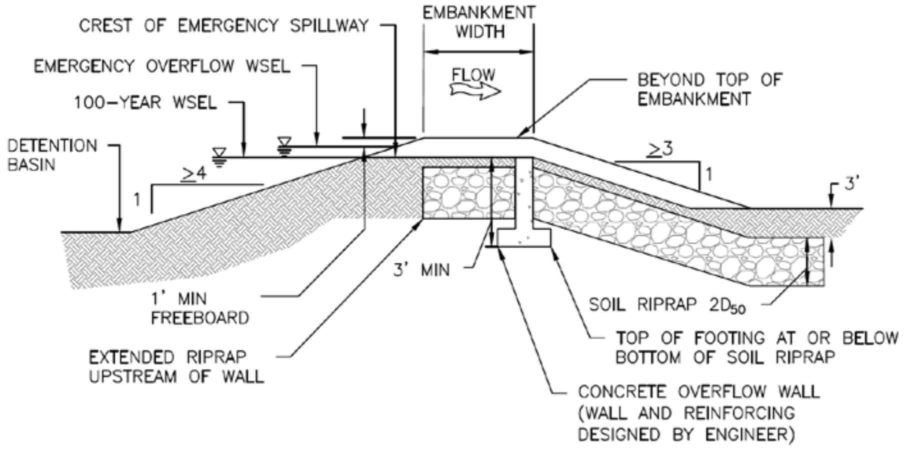
C_{BCW} = broad-crested weir coefficient (This ranges from 2.6 to 3.0. A value of 3.0 is often used in practice.) See Hydraulic Engineering Circular No. 22 for additional information.

Z = side slope (horizontal: vertical)

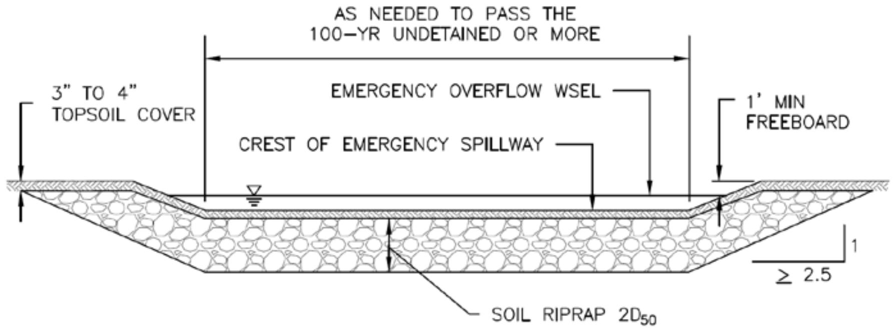
H = head above weir crest (ft)

Note that in order to calculate the total flow over the weir depicted in Figure 12-20, the results from Equation 12-8 must be added to two times the results from Equation 12-9.

Pond 3 Pond Spillway


CREST OF EMERGENCY SPILLWAY
EMBANKMENT WIDTH
EMERGENCY OVERFLOW WSEL
FLOW
BEYOND TOP OF EMBANKMENT
100–YEAR WSEL
DETENTION BASIN
≥4
1
≥3
1
3'
3' MIN
1' MIN FREEBOARD
SOIL RIPRAP 2D50
TOP OF FOOTING AT OR BELOW BOTTOM OF SOIL RIPRAP
EXTENDED RIPRAP UPSTREAM OF WALL
CONCRETE OVERFLOW WALL (WALL AND REINFORCING DESIGNED BY ENGINEER)

EMERGENCY SPILLWAY PROFILE


AS NEEDED TO PASS THE 100–YR UNDETAINED OR MORE
3" TO 4" TOPSOIL COVER
EMERGENCY OVERFLOW WSEL
CREST OF EMERGENCY SPILLWAY
1' MIN FREEBOARD
1
≥ 2.5
SOIL RIPRAP 2D50

EMERGENCY SPILLWAY SECTION AND SPILLWAY CHANNEL

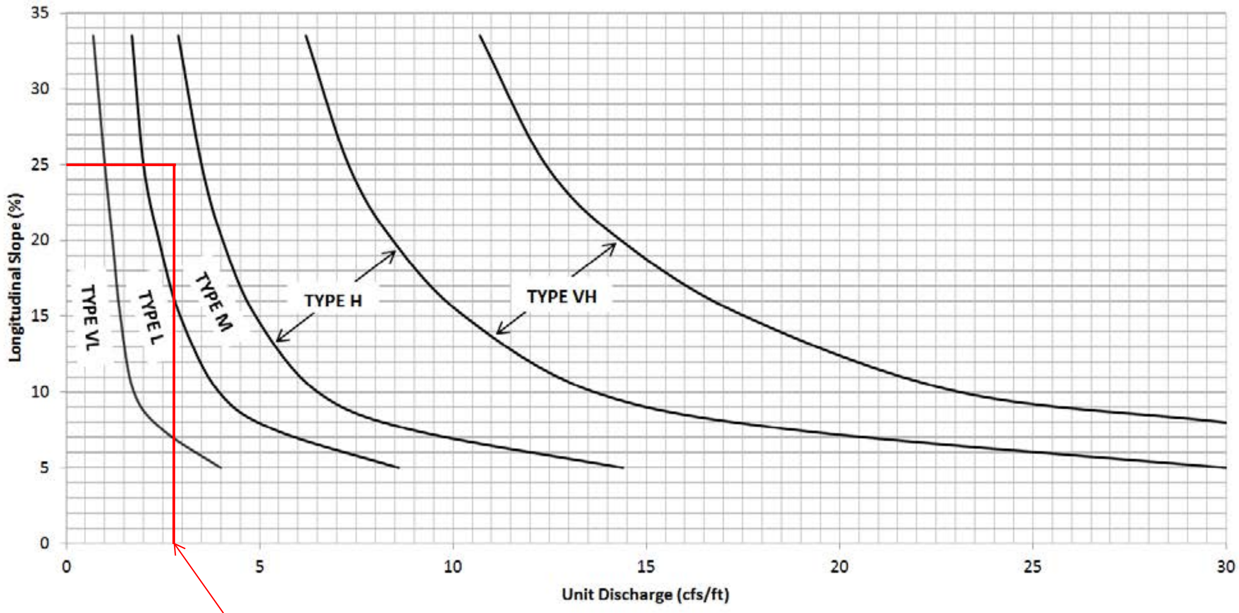
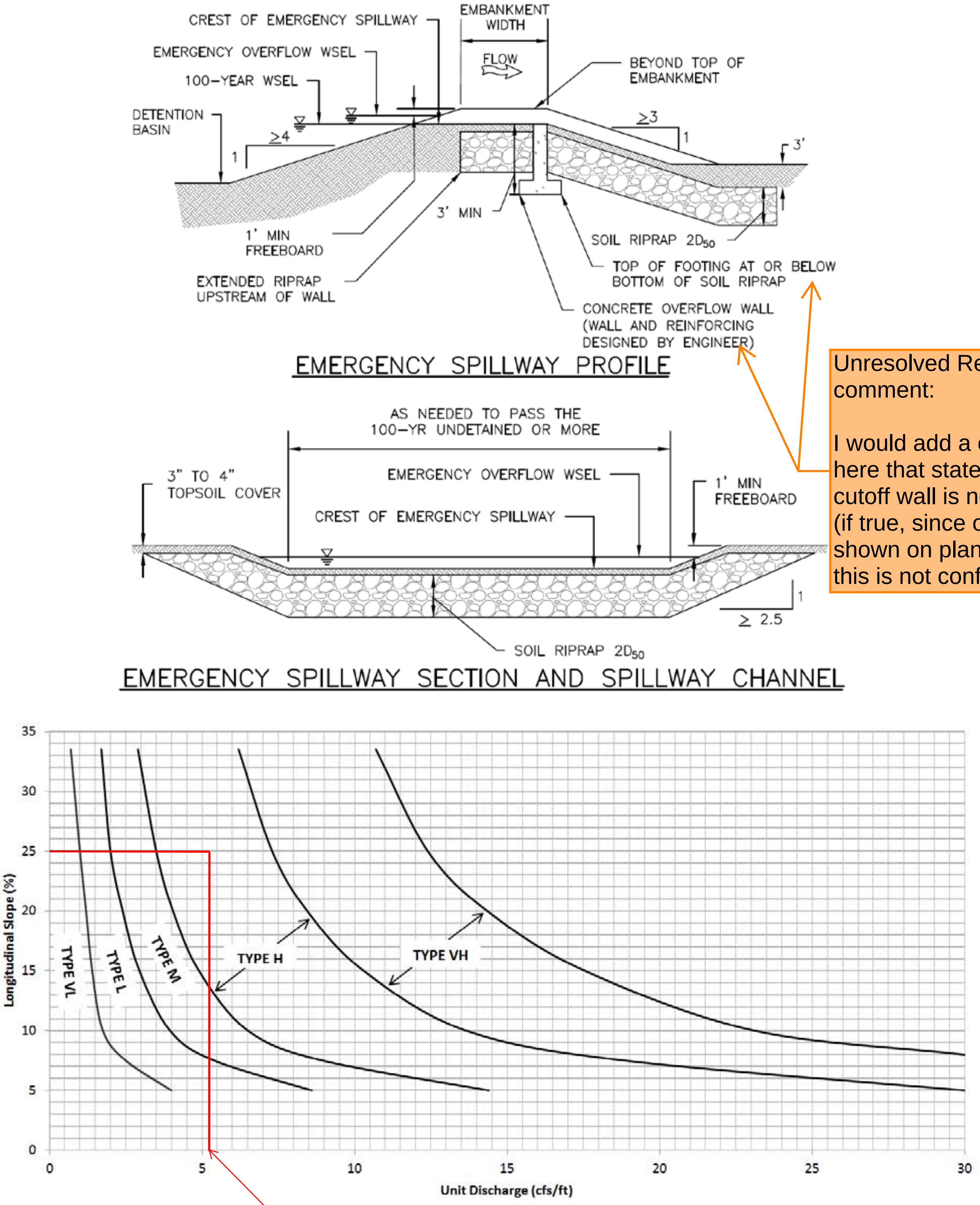


Figure 12-21. Embankment protection details and rock sizing chart (adapted from Arapahoe County)

109 cfs/40 ft = 2.73

WQP1 Spillway



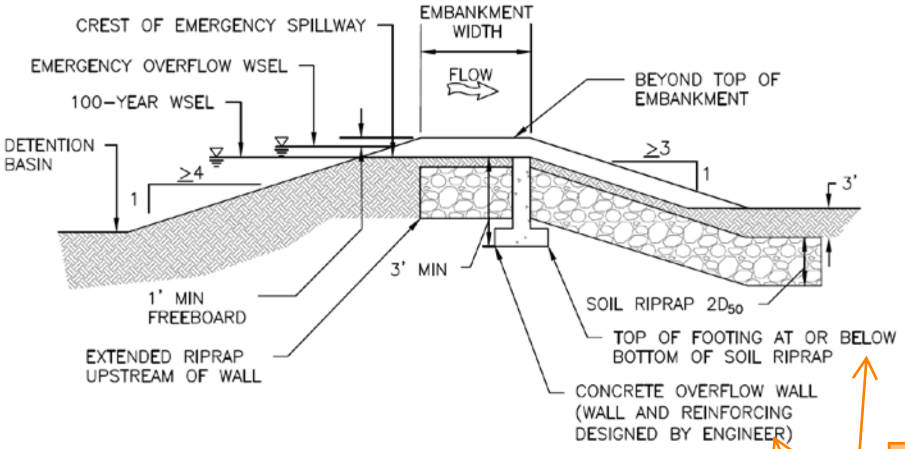
Unresolved Review 1 comment:

I would add a callout here that states that a cutoff wall is not needed (if true, since one isn't shown on plans), so that this is not confusing.

Figure 12-21. Embankment protection details and rock sizing chart (adapted from Arapahoe County)

181 cfs/35 ft = 5.17

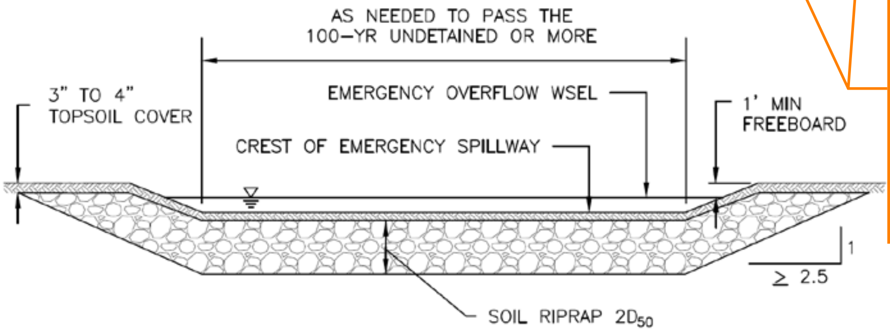
WQP2 Spillway


CREST OF EMERGENCY SPILLWAY
EMBANKMENT WIDTH
EMERGENCY OVERFLOW WSEL
FLOW
100-YEAR WSEL
BEYOND TOP OF EMBANKMENT
DETENTION BASIN
≥4
1
≥3
1
3'
3' MIN
1' MIN FREEBOARD
SOIL RIPRAP $2D_{50}$
TOP OF FOOTING AT OR BELOW BOTTOM OF SOIL RIPRAP
EXTENDED RIPRAP UPSTREAM OF WALL
CONCRETE OVERFLOW WALL (WALL AND REINFORCING DESIGNED BY ENGINEER)

EMERGENCY SPILLWAY PROFILE

Unresolved Review 1 comment:

I would add a callout here that states that a cutoff wall is not needed (if true, since one isn't shown on plans), so that this is not confusing.


AS NEEDED TO PASS THE 100-YR UNDETAINED OR MORE
3" TO 4" TOPSOIL COVER
EMERGENCY OVERFLOW WSEL
1' MIN FREEBOARD
CREST OF EMERGENCY SPILLWAY
1
≥ 2.5
SOIL RIPRAP $2D_{50}$

EMERGENCY SPILLWAY SECTION AND SPILLWAY CHANNEL

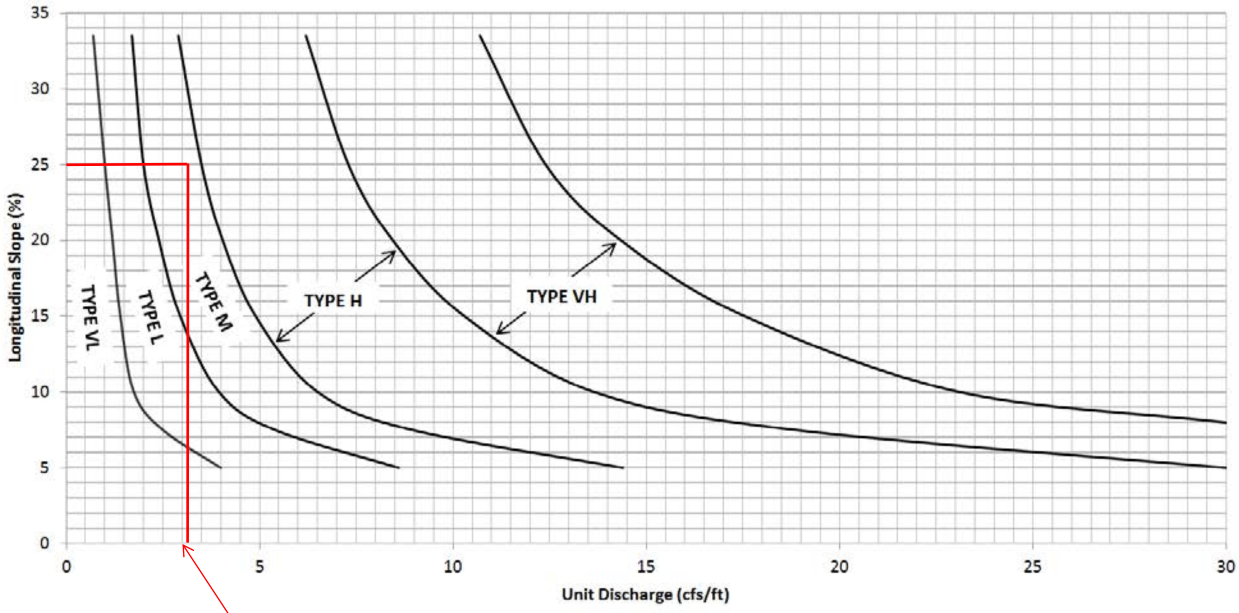
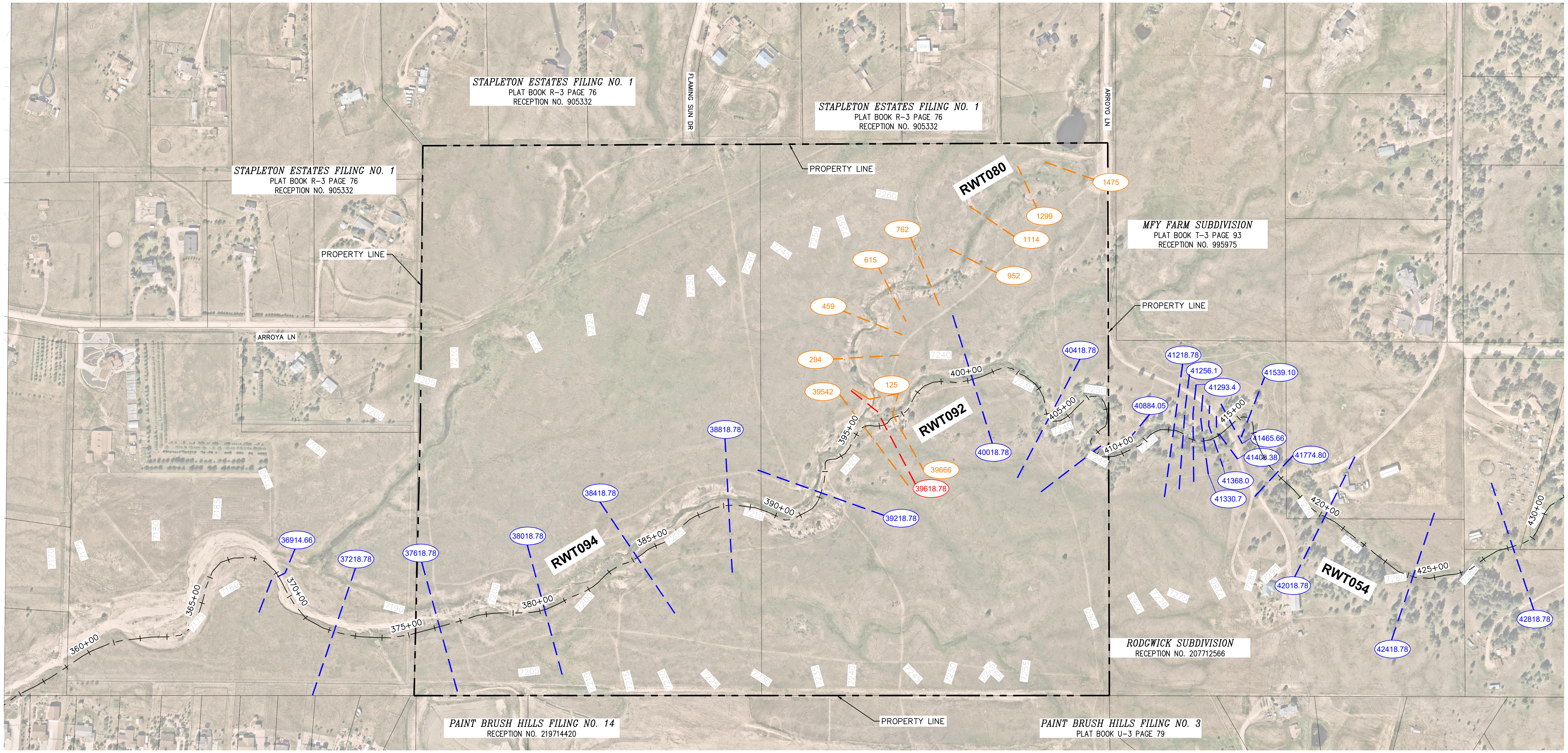


Figure 12-21. Embankment protection details and rock sizing chart (adapted from Arapahoe County)

82 cfs/25 ft = 3.28


STAPLETON ESTATES FILING NO. 1
PLAT BOOK R-3 PAGE 76
RECEPTION NO. 905332
FLAMING SUN DR
STAPLETON ESTATES FILING NO. 1
PLAT BOOK R-3 PAGE 76
RECEPTION NO. 905332
ARROYO LN
STAPLETON ESTATES FILING NO. 1
PLAT BOOK R-3 PAGE 76
RECEPTION NO. 905332
PROPERTY LINE
PROPERTY LINE
ARROYA LN
RWT080
1475
1299
1114
762
615
952
459
294
125
39542
39666
39618.78
RWT092
MFY FARM SUBDIVISION
PLAT BOOK T-3 PAGE 93
RECEPTION NO. 995975
PROPERTY LINE
40418.78
41218.78
41256.1
41293.4
41539.10
40884.05
41465.66
41405.38
41774.80
41368.0
41330.7
40018.78
39218.78
38818.78
38418.78
38018.78
37618.78
37218.78
36914.66
RWT094
RWT054
42018.78
42418.78
42818.78
360+00
365+00
370+00
375+00
380+00
385+00
390+00
395+00
400+00
405+00
410+00
415+00
420+00
425+00
430+00
RODGWICK SUBDIVISION
RECEPTION NO. 207712566
PAINT BRUSH HILLS FILING NO. 14
RECEPTION NO. 219714420
PROPERTY LINE
PAINT BRUSH HILLS FILING NO. 3
PLAT BOOK U-3 PAGE 79

GRAPHIC SCALE IN FEET
0 100 200 400

NORTH

LEGEND

—— - ——	PROPERTY LINE
———	LOT LINE
— — —	DBPS HEC-RAS CROSS SECTION
— — —	DBPS HEC-RAS CROSS SECTION (REMOVED)
— — —	NEW HEC-RAS CROSS SECTION
—— XXXX ——	EXISTING MAJOR CONTOUR
— — XXXX — —	EXISTING MINOR CONTOUR
XXXX.XX	HEC-RAS CROSS SECTION ID

NOTE:

PHOTOS NOT PROVIDED FOR CROSS SECTIONS 36914.66, 37218.78, 42018.78, 42418.78, AND 42818.78.

EAGLEVIEW HEC-RAS CROSS
SECTIONS EXHIBIT
10/12/2023

Kimley»Horn

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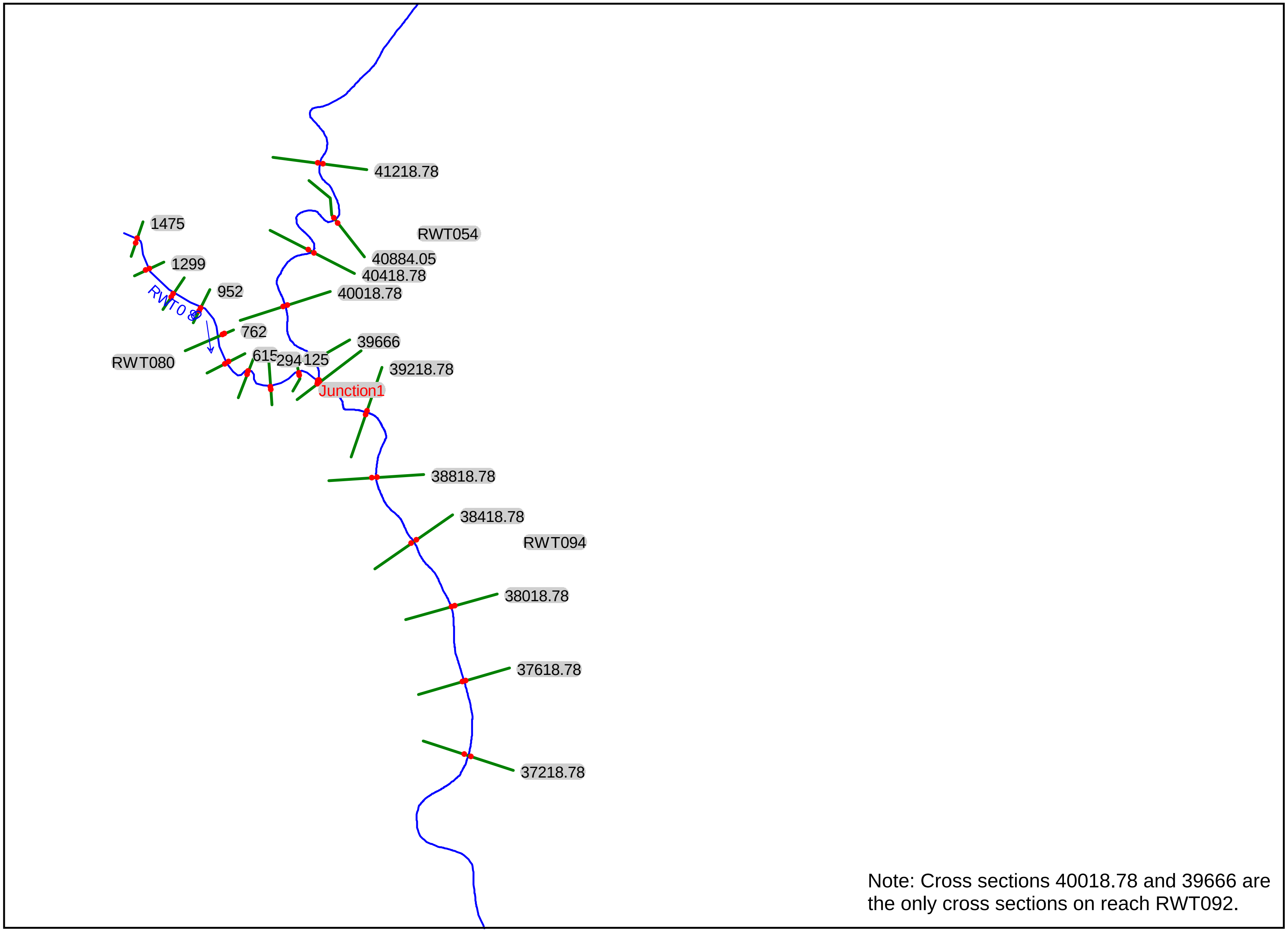
2 N NEVADA AVE, SUITE 900, COLORADO SPRINGS, CO 80903
PHONE: 719-453-0180

EXISTING CONDITIONS HEC-RAS RESULTS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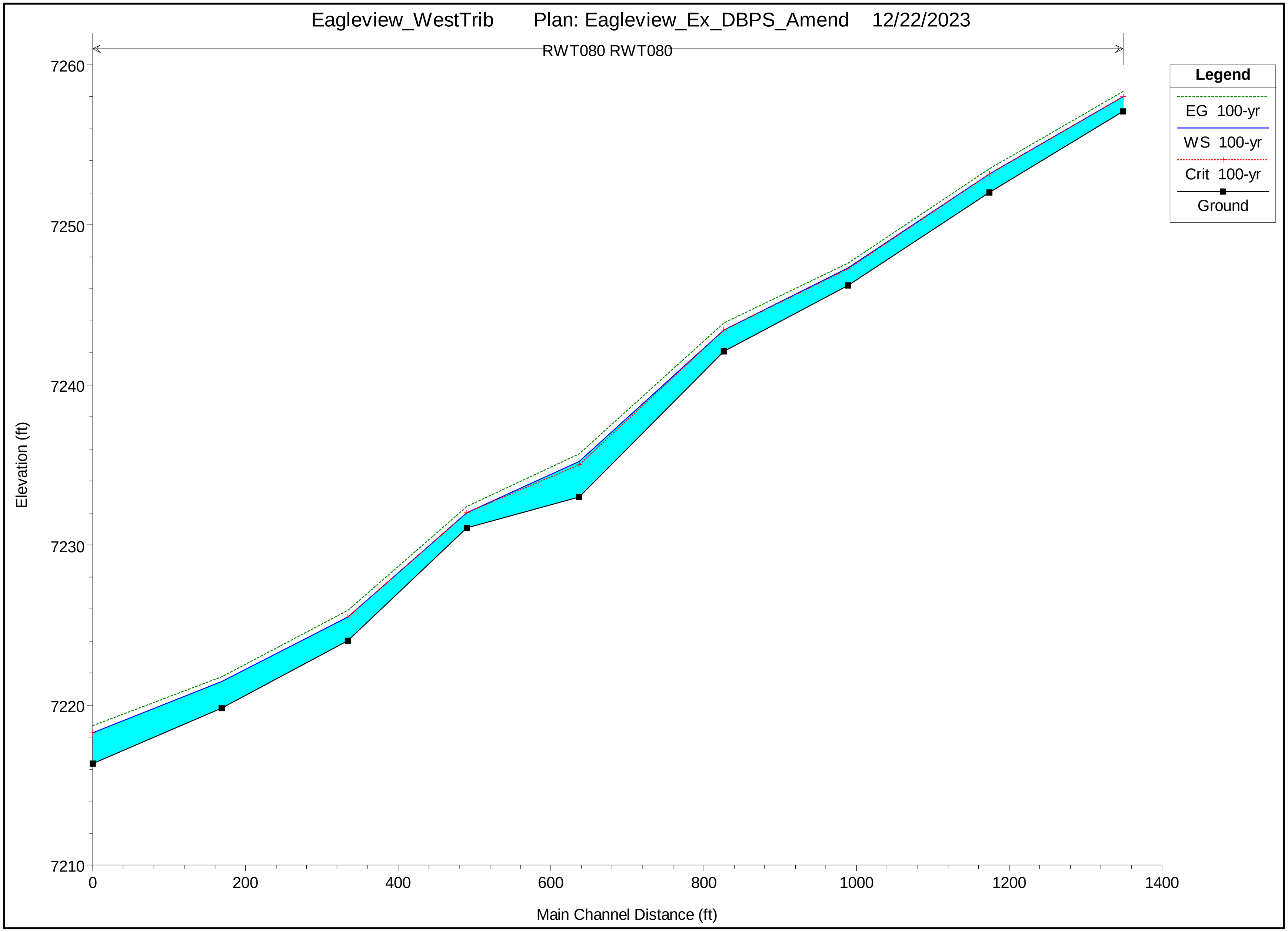
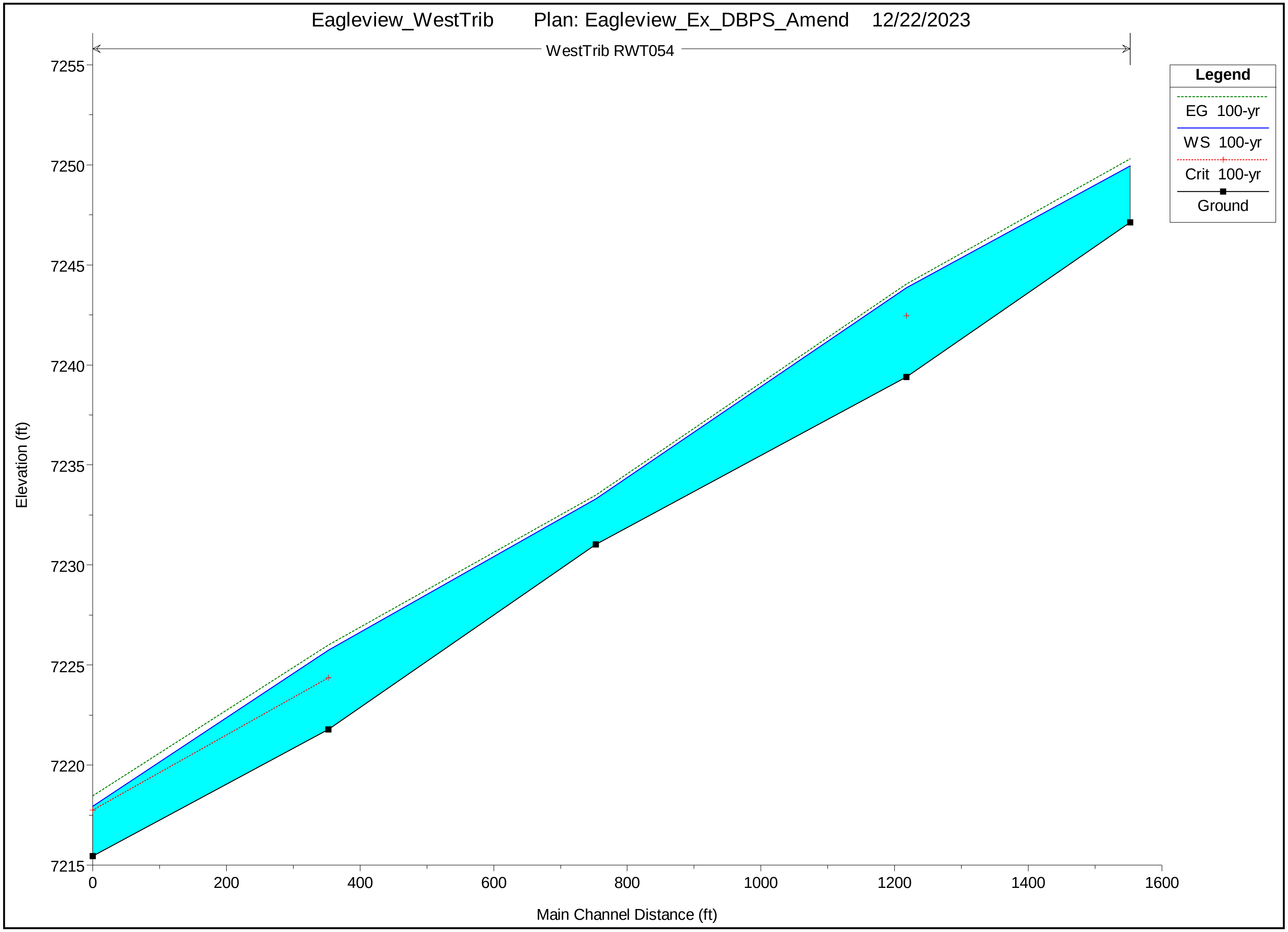
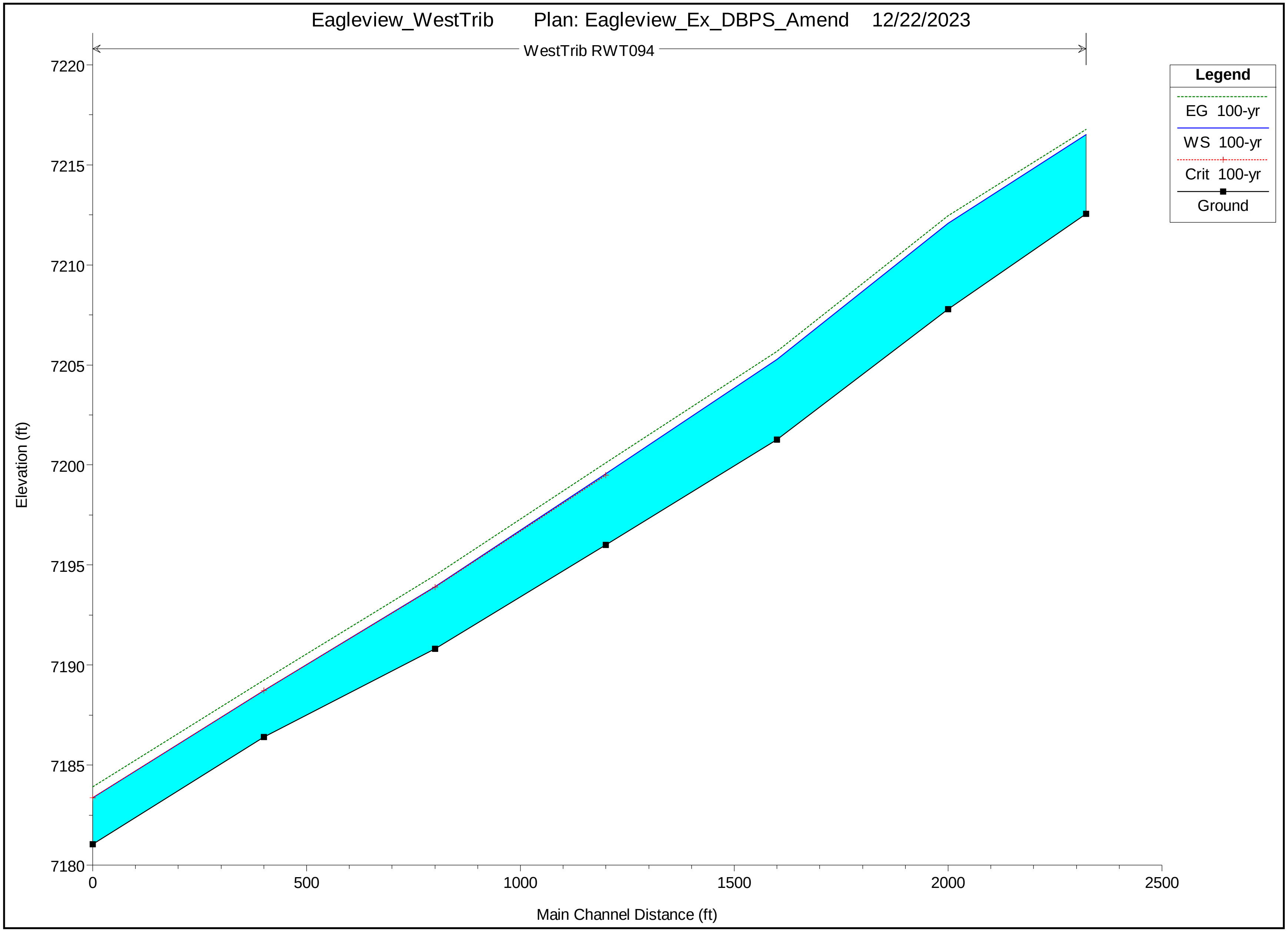
1475
RWT054
40884.05
1299
40418.78
952
40018.78
RWT080
762
39666
615
294
125
RWT080
39218.78
Junction1
38818.78
38418.78
RWT094
38018.78
37618.78
37218.78

Note: Cross sections 40018.78 and 39666 are the only cross sections on reach RWT092.


Eagleview_WestTrib Plan: Eagleview_Ex_DBPS_Amend 12/22/2023
RWT080 RWT080
Legend
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Elevation (ft)
7260
7250
7240
7230
7220
7210
0
200
400
600
800
1000
1200
1400
Main Channel Distance (ft)


Eagleview_WestTrib Plan: Eagleview_Ex_DBPS_Amend 12/22/2023
WestTrib RWT054
Legend
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Elevation (ft)
7255
7250
7245
7240
7235
7230
7225
7220
7215
0
200
400
600
800
1000
1200
1400
1600
Main Channel Distance (ft)

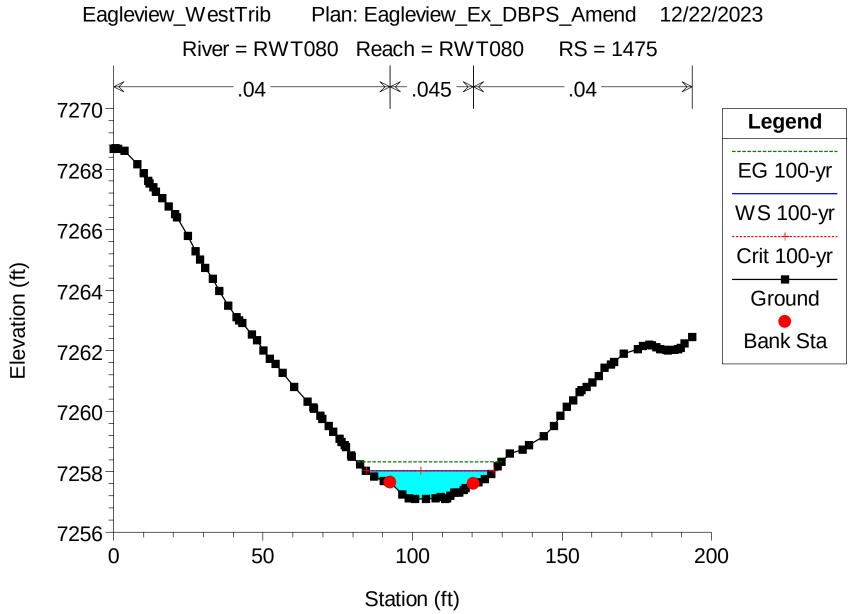

Eagleview_WestTrib Plan: Eagleview_Ex_DBPS_Amend 12/22/2023
WestTrib RWT094
Legend
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Elevation (ft)
7220
7215
7210
7205
7200
7195
7190
7185
7180
Main Channel Distance (ft)
0
500
1000
1500
2000
2500

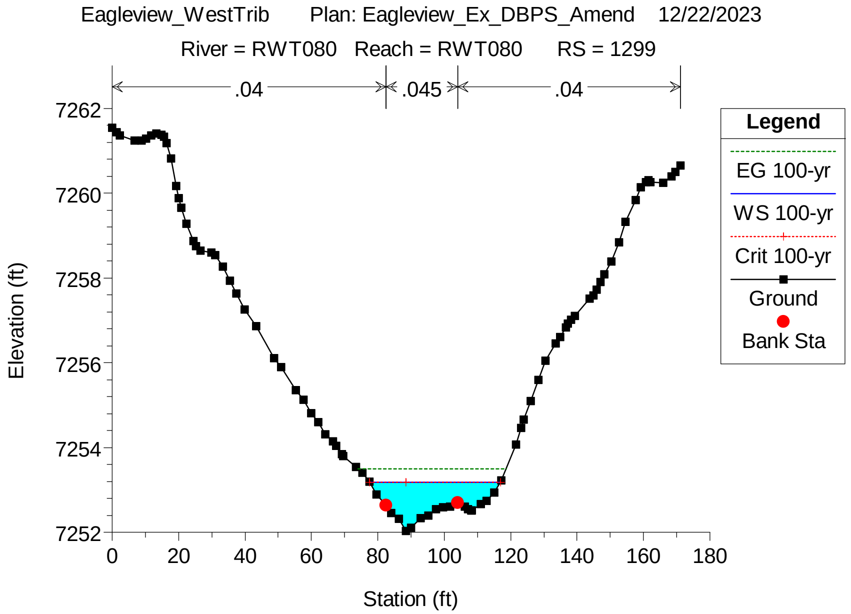
Cross section outside project area

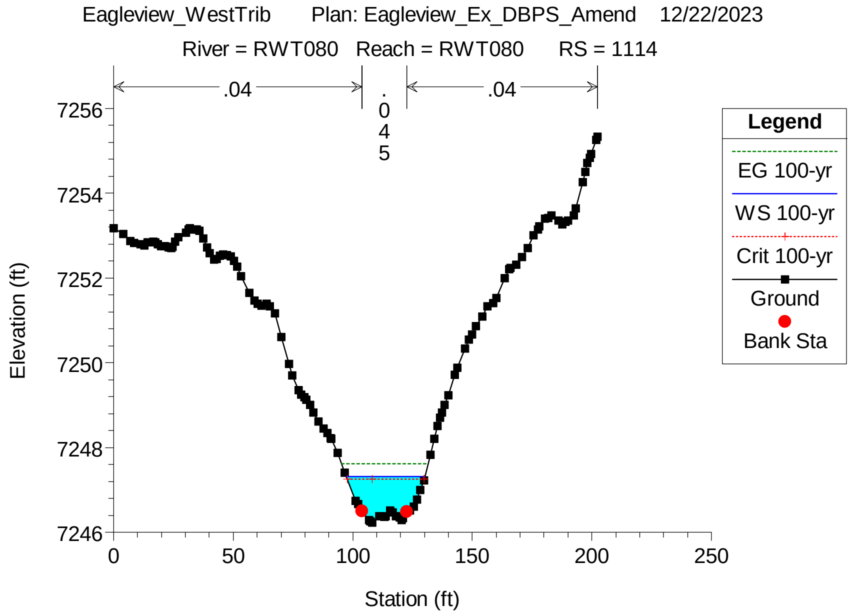
HEC-RAS Plan: Ex_DBPS_Amend Profile: 100-yr

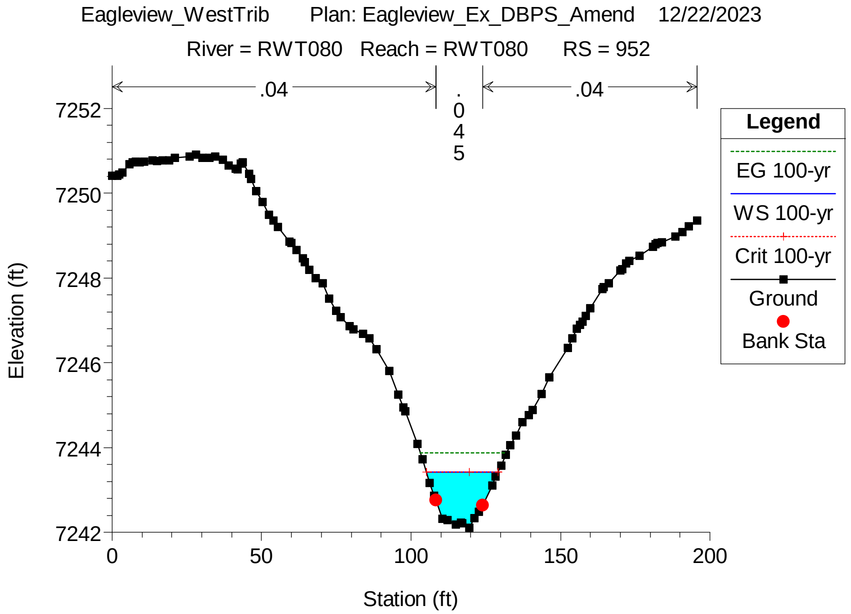
River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl	Shear Total
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)		(lb/sq ft)
WestTrib	RWT054	41218.78	100-yr	285.00	7247.13	7249.95		7250.31	0.018854	4.76	59.87	28.01	0.57	2.42
WestTrib	RWT054	40884.05	100-yr	285.00	7239.41	7243.85	7242.45	7244.04	0.018267	3.53	80.86	34.51	0.40	2.58
WestTrib	RWT054	40418.78	100-yr	285.00	7231.04	7233.30		7233.50	0.028680	3.77	83.64	59.72	0.49	2.49
WestTrib	RWT092	40018.78	100-yr	375.00	7221.79	7225.74	7224.36	7225.99	0.014303	3.94	93.70	33.92	0.38	2.36
WestTrib	RWT092	39666	100-yr	375.00	7215.46	7217.95	7217.76	7218.46	0.035530	4.70	69.87	52.16	0.56	2.94
WestTrib	RWT094	39542	100-yr	478.00	7212.56	7216.52		7216.77	0.008165	3.03	125.66	58.70	0.29	1.07
WestTrib	RWT094	39218.78	100-yr	478.00	7207.80	7212.07		7212.47	0.027829	4.90	95.16	57.21	0.51	2.82
WestTrib	RWT094	38818.78	100-yr	478.00	7201.28	7205.27		7205.69	0.011630	5.31	93.31	40.73	0.55	1.60
WestTrib	RWT094	38418.78	100-yr	478.00	7196.01	7199.55	7199.49	7200.10	0.016669	6.25	86.43	71.63	0.75	1.24
WestTrib	RWT094	38018.78	100-yr	502.00	7190.82	7193.92	7193.89	7194.49	0.012139	7.22	97.33	73.20	0.82	1.00
WestTrib	RWT094	37618.78	100-yr	502.00	7186.41	7188.73	7188.73	7189.24	0.014100	7.17	103.73	96.78	0.87	0.94
WestTrib	RWT094	37218.78	100-yr	502.00	7181.04	7183.38	7183.38	7183.92	0.009919	6.32	97.73	108.66	0.82	0.55
RWT080	RWT080	1475	100-yr	107.00	7257.10	7258.03	7258.03	7258.33	0.026387	4.53	25.34	42.71	0.91	0.98
RWT080	RWT080	1299	100-yr	107.00	7252.03	7253.19	7253.19	7253.50	0.029085	4.77	24.27	39.39	0.95	1.12
RWT080	RWT080	1114	100-yr	107.00	7246.23	7247.32	7247.26	7247.62	0.021513	4.67	24.82	33.00	0.85	1.01
RWT080	RWT080	952	100-yr	107.00	7242.11	7243.43	7243.43	7243.88	0.024629	5.56	20.70	24.06	0.93	1.31
RWT080	RWT080	762	100-yr	107.00	7233.00	7235.23	7235.02	7235.71	0.017553	5.57	19.47	14.63	0.80	1.38
RWT080	RWT080	615	100-yr	107.00	7231.06	7232.01	7232.01	7232.40	0.029365	5.04	21.79	28.83	0.97	1.38
RWT080	RWT080	459	100-yr	107.00	7224.03	7225.49	7225.49	7225.93	0.025019	5.34	20.86	26.59	0.92	1.21
RWT080	RWT080	294	100-yr	107.00	7219.80	7221.48		7221.76	0.010406	4.31	25.99	21.05	0.63	0.78
RWT080	RWT080	125	100-yr	107.00	7216.33	7218.26	7218.26	7218.72	0.037599	5.67	20.02	21.68	0.87	2.12

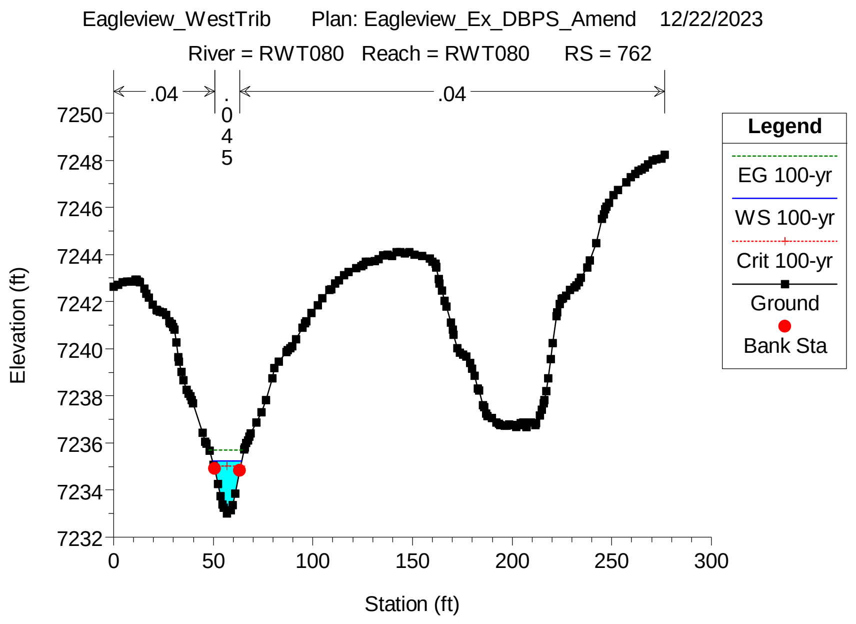
Cross section outside project area

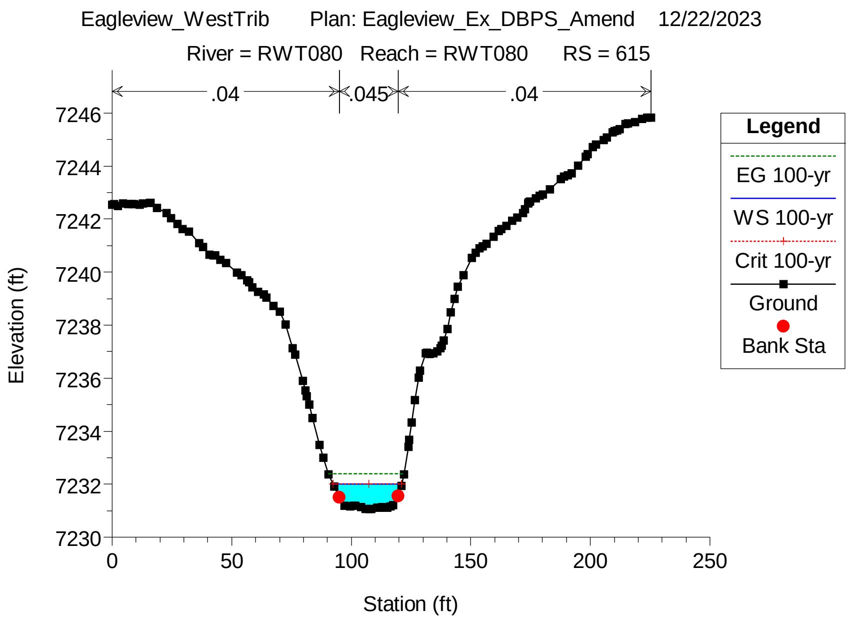

Eagleview_WestTrib Plan: Eagleview_Ex_DBPS_Amend 12/22/2023
River = RWT080 Reach = RWT080 RS = 1475
.04
.045
.04
Elevation (ft)
7270
7268
7266
7264
7262
7260
7258
7256
0
50
100
150
200
Station (ft)
Legend
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Bank Sta

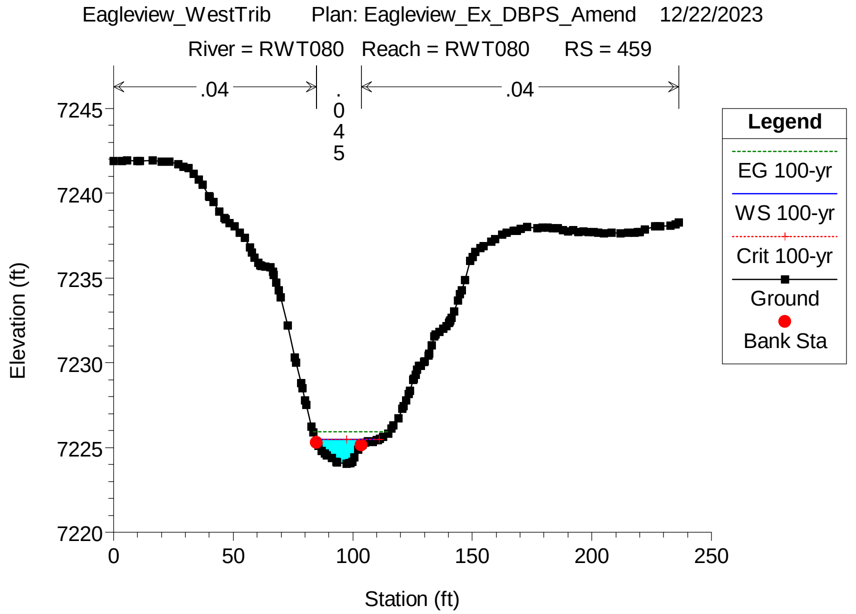

Eagleview_WestTrib Plan: Eagleview_Ex_DBPS_Amend 12/22/2023
River = RWT080 Reach = RWT080 RS = 1299
.04
.045
.04
Elevation (ft)
7262
7260
7258
7256
7254
7252
0
20
40
60
80
100
120
140
160
180
Station (ft)
Legend
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Bank Sta

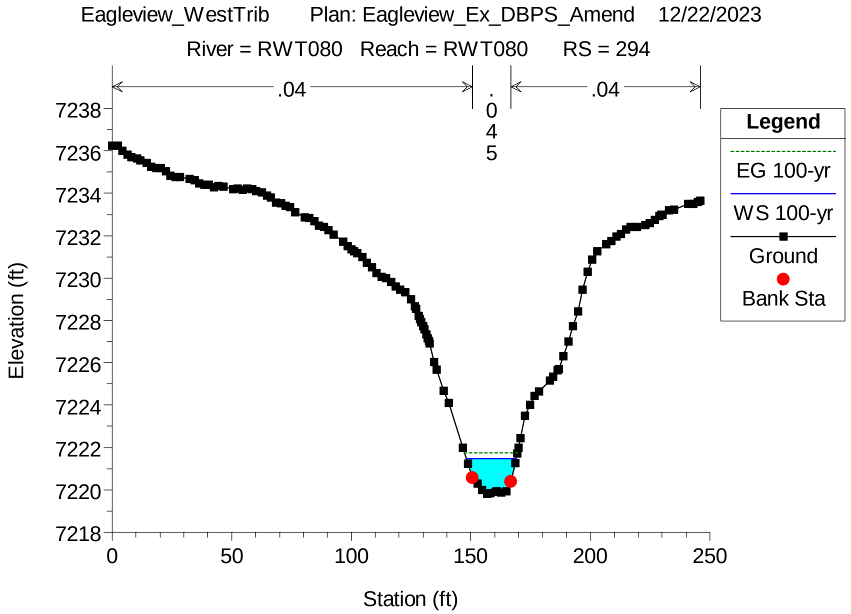

Eagleview_WestTrib Plan: Eagleview_Ex_DBPS_Amend 12/22/2023
River = RWT080 Reach = RWT080 RS = 1114
.04
.045
.04
Elevation (ft)
7256
7254
7252
7250
7248
7246
0
50
100
150
200
250
Station (ft)
Legend
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Bank Sta

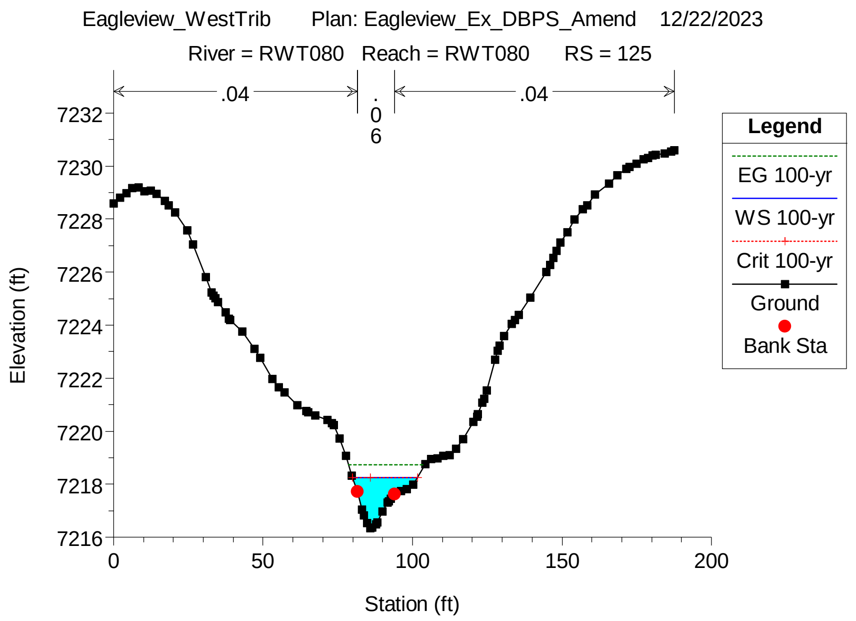

Eagleview_WestTrib Plan: Eagleview_Ex_DBPS_Amend 12/22/2023
River = RWT080 Reach = RWT080 RS = 952
.04
.045
.04
Elevation (ft)
7252
7250
7248
7246
7244
7242
0
50
100
150
200
Station (ft)
Legend
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Bank Sta

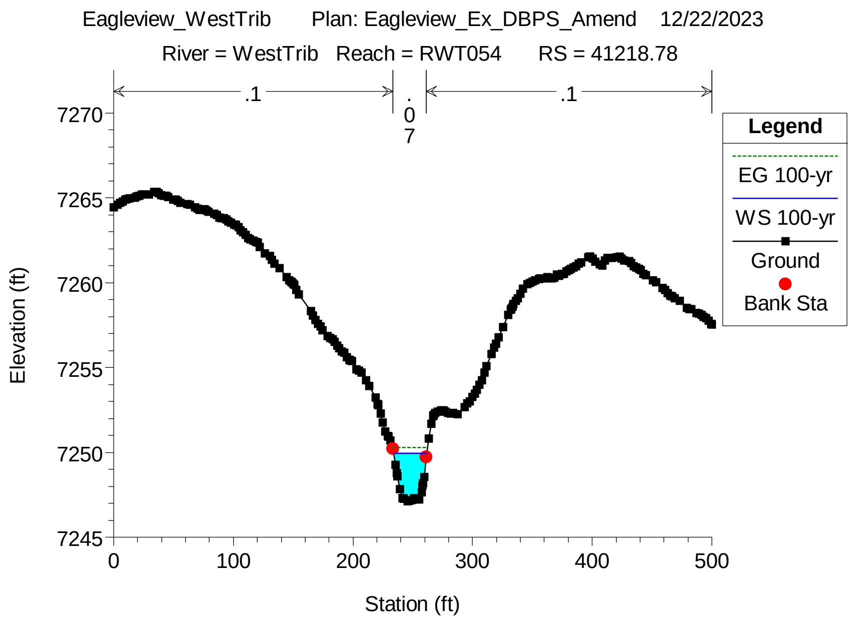

Eagleview_WestTrib Plan: Eagleview_Ex_DBPS_Amend 12/22/2023
River = RWT080 Reach = RWT080 RS = 762
.04
.045
.04
Elevation (ft)
7250
7248
7246
7244
7242
7240
7238
7236
7234
7232
Station (ft)
0
50
100
150
200
250
300
Legend
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Bank Sta

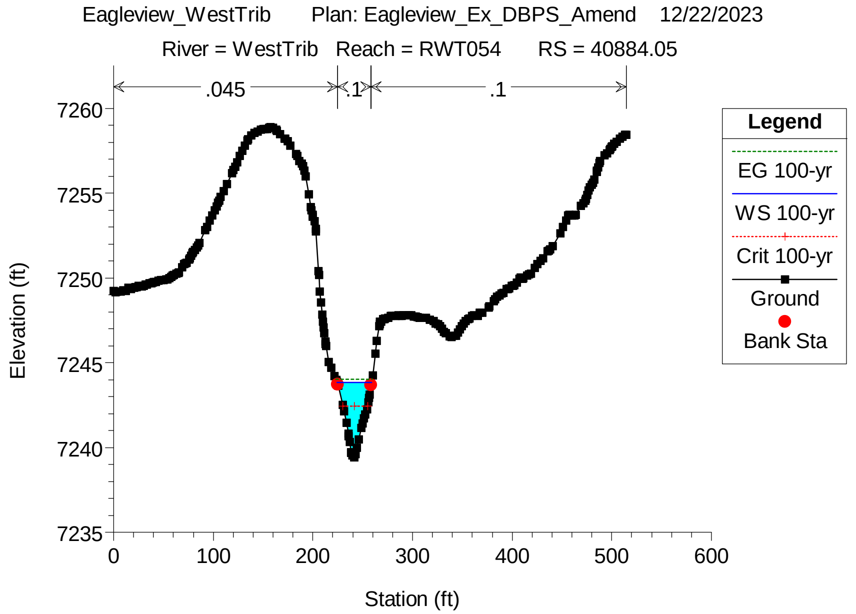

Eagleview_WestTrib Plan: Eagleview_Ex_DBPS_Amend 12/22/2023
River = RWT080 Reach = RWT080 RS = 615
.04
.045
.04
Elevation (ft)
7246
7244
7242
7240
7238
7236
7234
7232
7230
Station (ft)
0
50
100
150
200
250
Legend
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Bank Sta

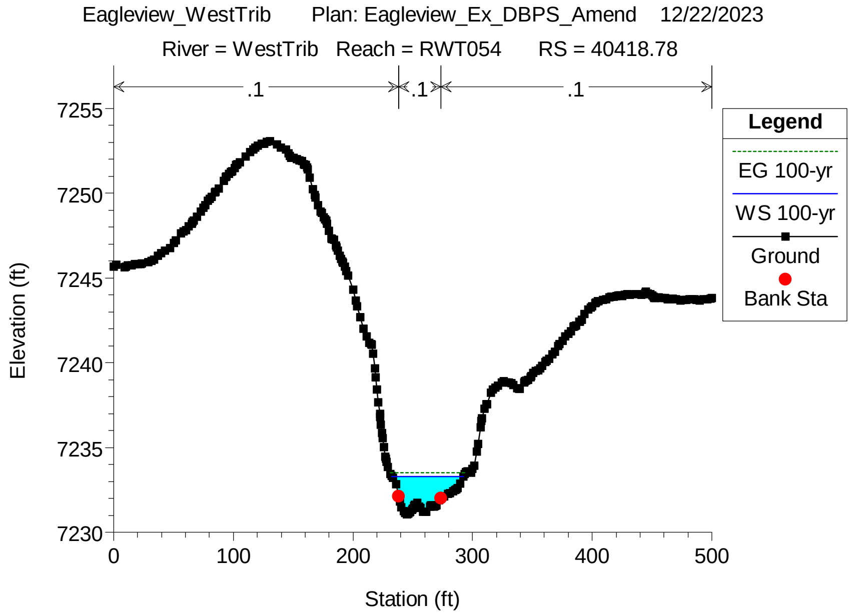

Eagleview_WestTrib Plan: Eagleview_Ex_DBPS_Amend 12/22/2023
River = RWT080 Reach = RWT080 RS = 459
.04
.045
.04
Elevation (ft)
7245
7240
7235
7230
7225
7220
Station (ft)
0
50
100
150
200
250
Legend
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Bank Sta

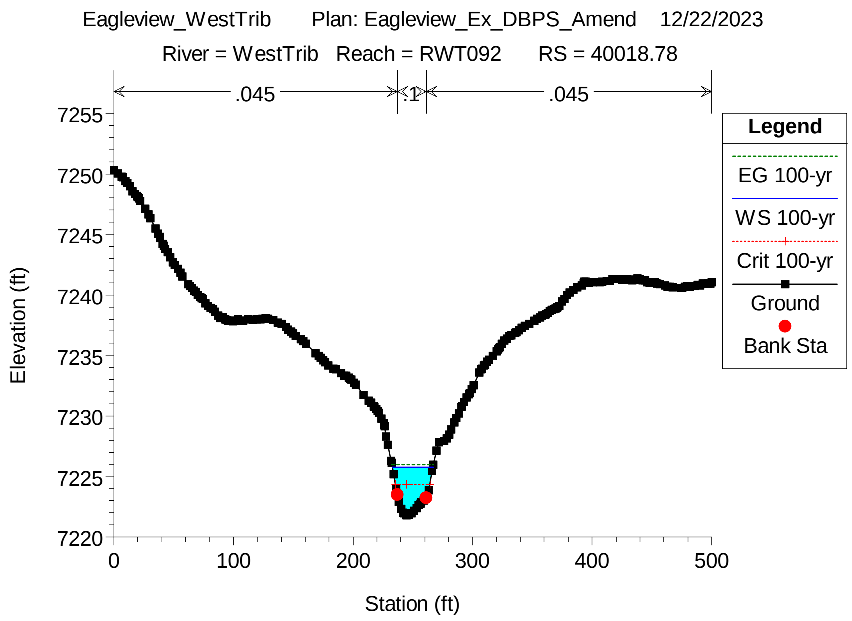

Eagleview_WestTrib Plan: Eagleview_Ex_DBPS_Amend 12/22/2023
River = RWT080 Reach = RWT080 RS = 294
.04
.045
.04
Elevation (ft)
7238
7236
7234
7232
7230
7228
7226
7224
7222
7220
7218
Station (ft)
0
50
100
150
200
250
Legend
EG 100-yr
WS 100-yr
Ground
Bank Sta

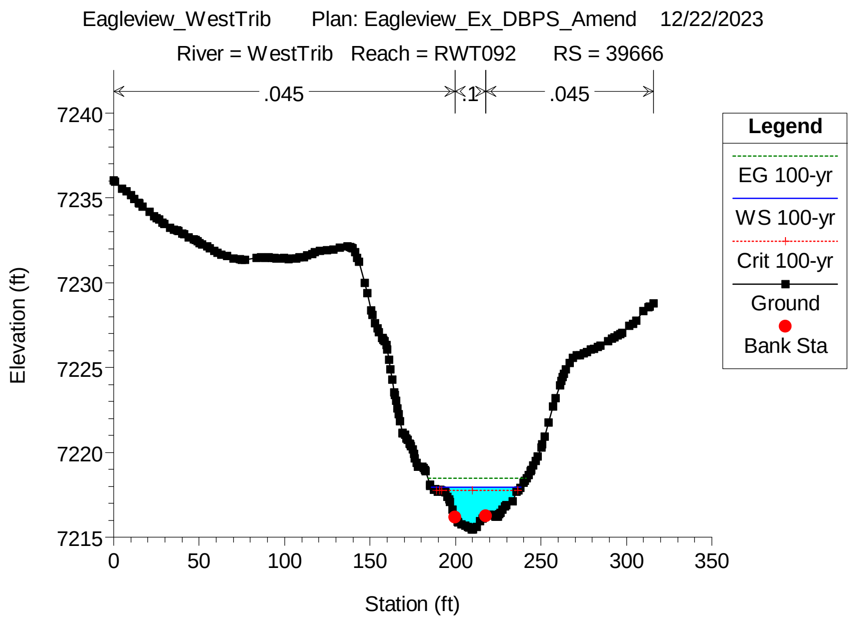

Eagleview_WestTrib Plan: Eagleview_Ex_DBPS_Amend 12/22/2023
River = RWT080 Reach = RWT080 RS = 125

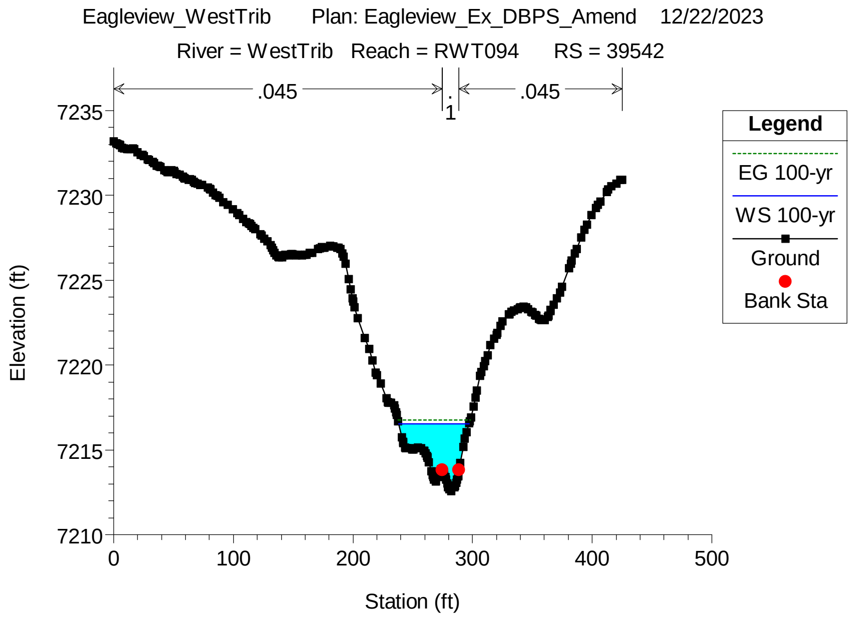

Eagleview_WestTrib Plan: Eagleview_Ex_DBPS_Amend 12/22/2023
River = WestTrib Reach = RWT054 RS = 41218.78

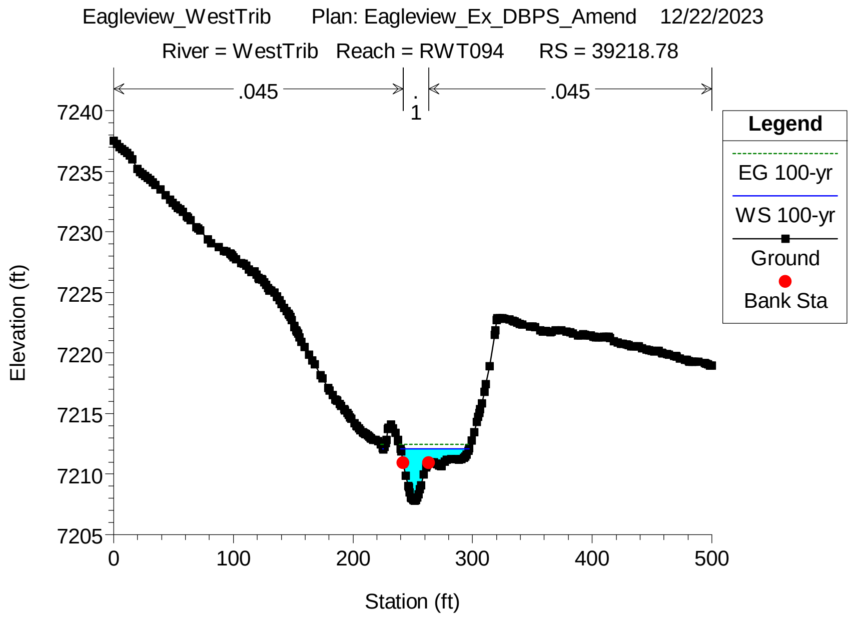

Eagleview_WestTrib Plan: Eagleview_Ex_DBPS_Amend 12/22/2023
River = WestTrib Reach = RWT054 RS = 40884.05

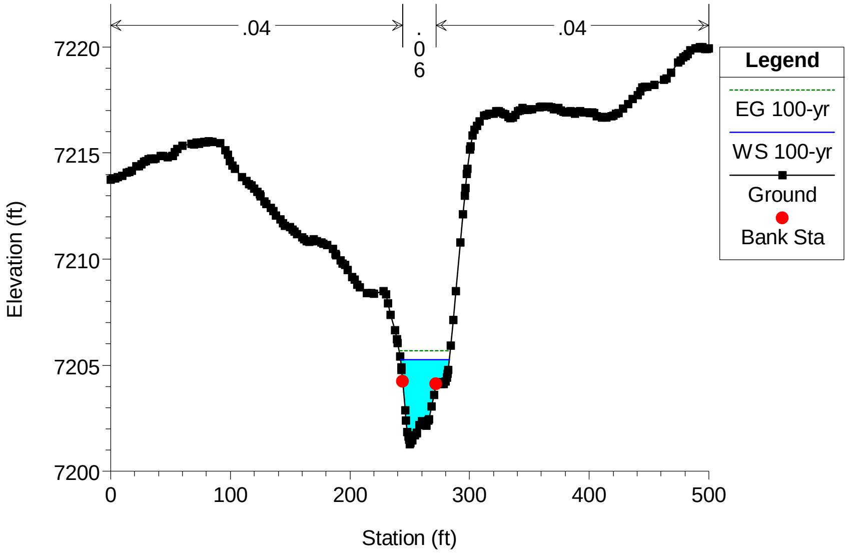

Eagleview_WestTrib Plan: Eagleview_Ex_DBPS_Amend 12/22/2023
River = WestTrib Reach = RWT054 RS = 40418.78


Eagleview_WestTrib Plan: Eagleview_Ex_DBPS_Amend 12/22/2023
River = WestTrib Reach = RWT092 RS = 40018.78
.045
.1
.045
Legend
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Bank Sta
Elevation (ft)
7255
7250
7245
7240
7235
7230
7225
7220
0
100
200
300
400
500
Station (ft)


Eagleview_WestTrib Plan: Eagleview_Ex_DBPS_Amend 12/22/2023
River = WestTrib Reach = RWT092 RS = 39666
.045
.1
.045
Legend
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Bank Sta
Elevation (ft)
7240
7235
7230
7225
7220
7215
0
50
100
150
200
250
300
350
Station (ft)

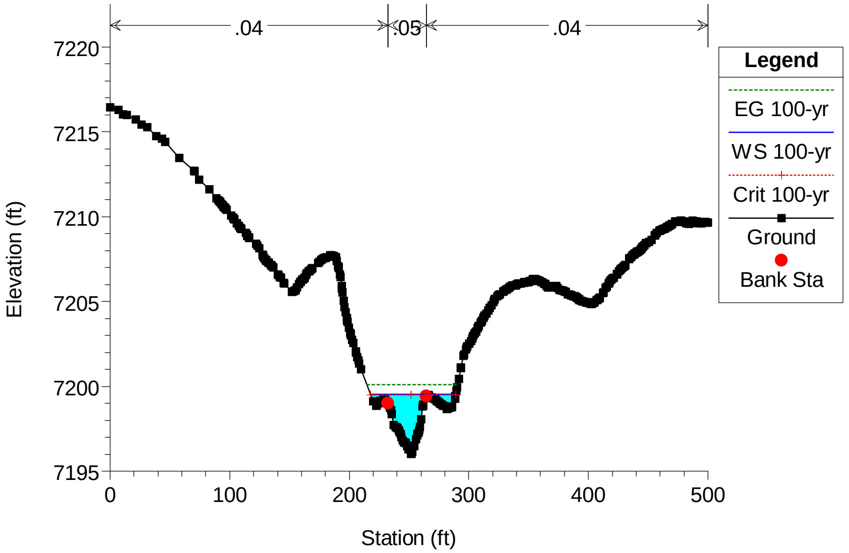

Eagleview_WestTrib Plan: Eagleview_Ex_DBPS_Amend 12/22/2023
River = WestTrib Reach = RWT094 RS = 39542
.045
.1
.045
Legend
EG 100-yr
WS 100-yr
Ground
Bank Sta
Elevation (ft)
7235
7230
7225
7220
7215
7210
0
100
200
300
400
500
Station (ft)


Eagleview_WestTrib Plan: Eagleview_Ex_DBPS_Amend 12/22/2023
River = WestTrib Reach = RWT094 RS = 39218.78
.045
.1
.045
Legend
EG 100-yr
WS 100-yr
Ground
Bank Sta
Elevation (ft)
7240
7235
7230
7225
7220
7215
7210
7205
0
100
200
300
400
500
Station (ft)



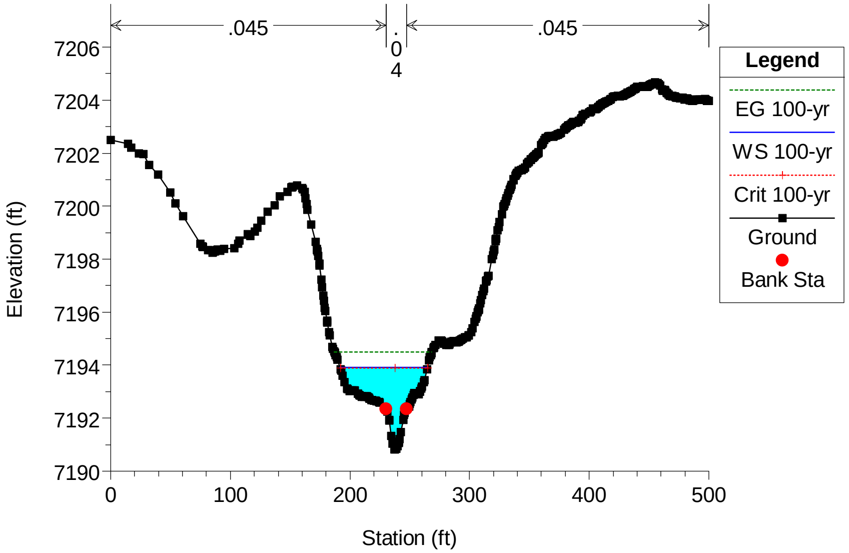
Eagleview_WestTrib Plan: Eagleview_Ex_DBPS_Amend 12/22/2023

River = WestTrib Reach = RWT094 RS = 38818.78



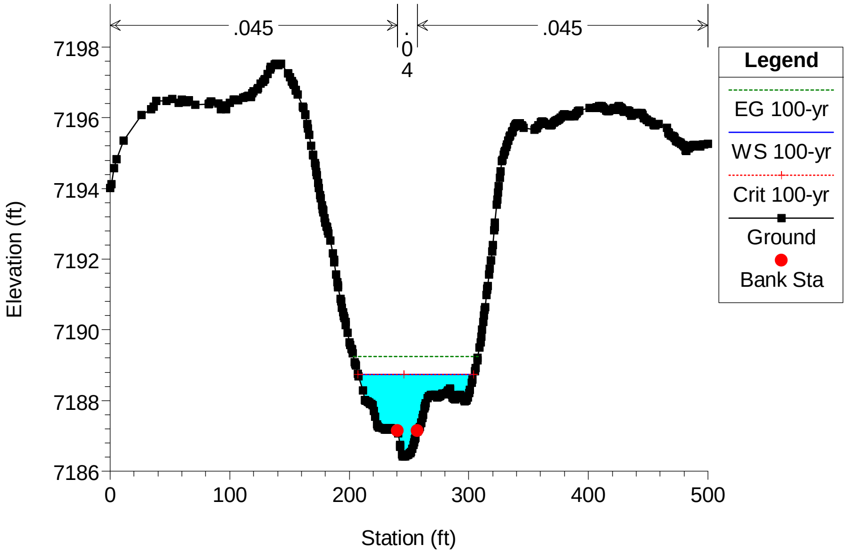
Eagleview_WestTrib Plan: Eagleview_Ex_DBPS_Amend 12/22/2023

River = WestTrib Reach = RWT094 RS = 38418.78



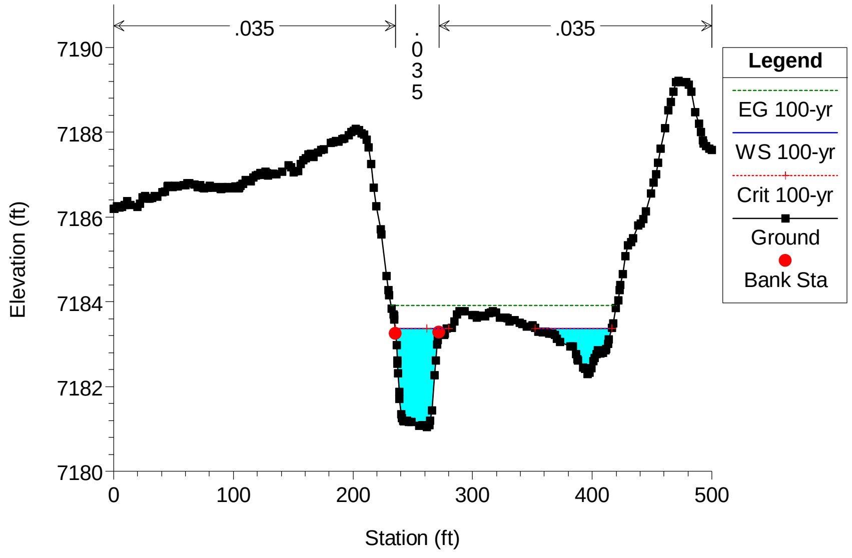
Eagleview_WestTrib Plan: Eagleview_Ex_DBPS_Amend 12/22/2023

River = WestTrib Reach = RWT094 RS = 38018.78



Eagleview_WestTrib Plan: Eagleview_Ex_DBPS_Amend 12/22/2023

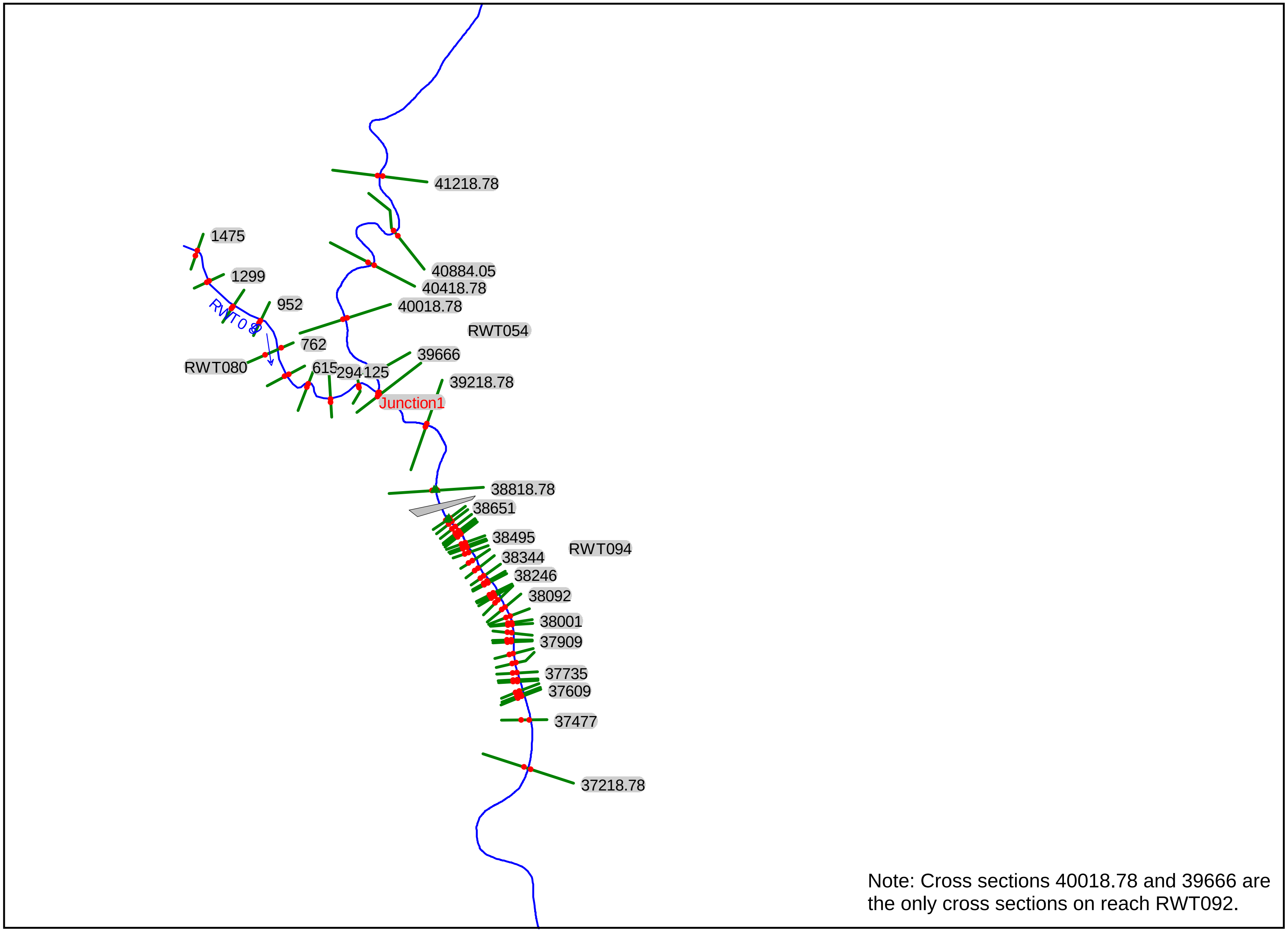
River = WestTrib Reach = RWT094 RS = 37618.78



Eagleview_WestTrib Plan: Eagleview_Ex_DBPS_Amend 12/22/2023

River = WestTrib Reach = RWT094 RS = 37218.78

PROPOSED CONDITIONS HEC-RAS RESULTS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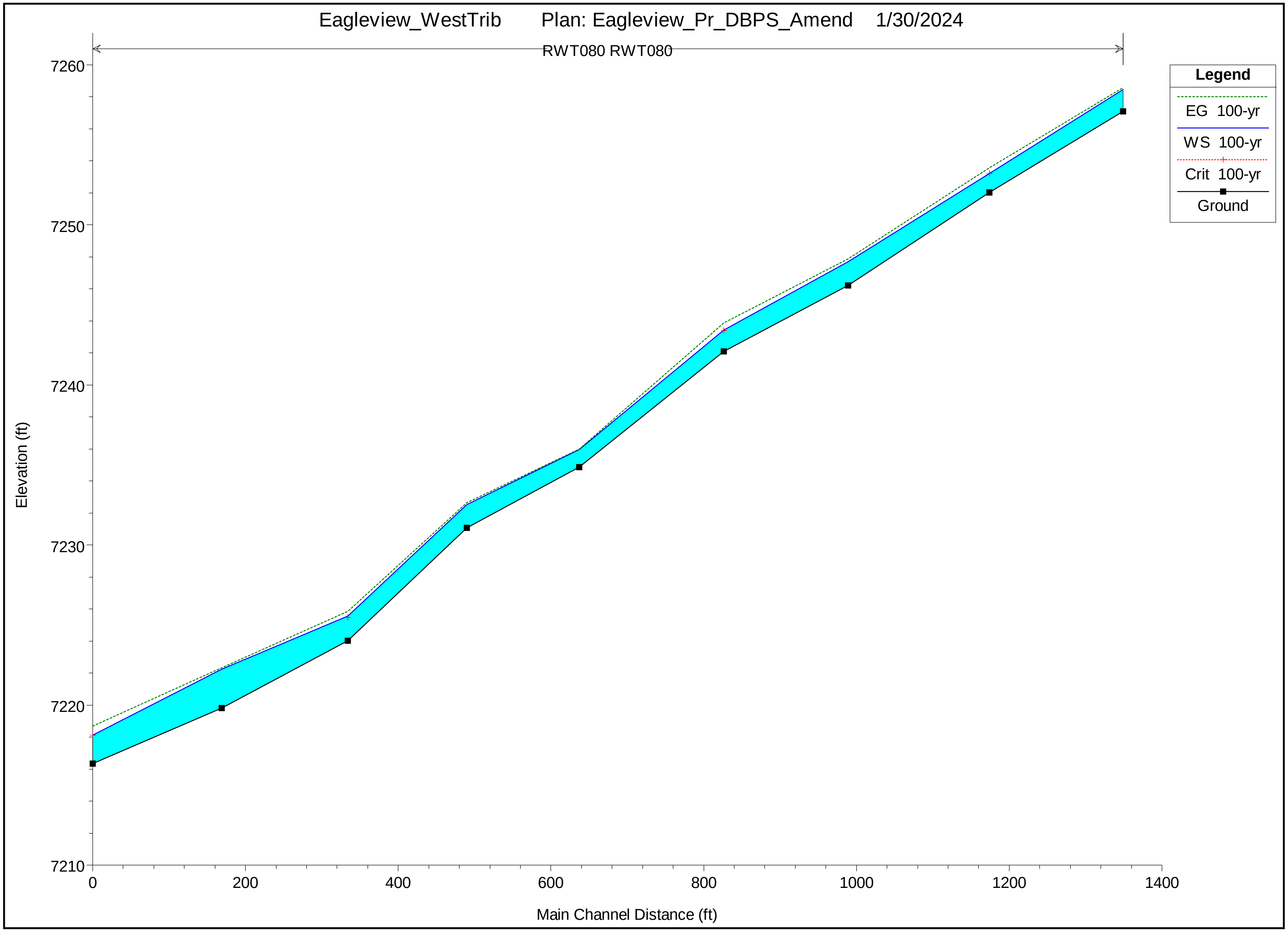
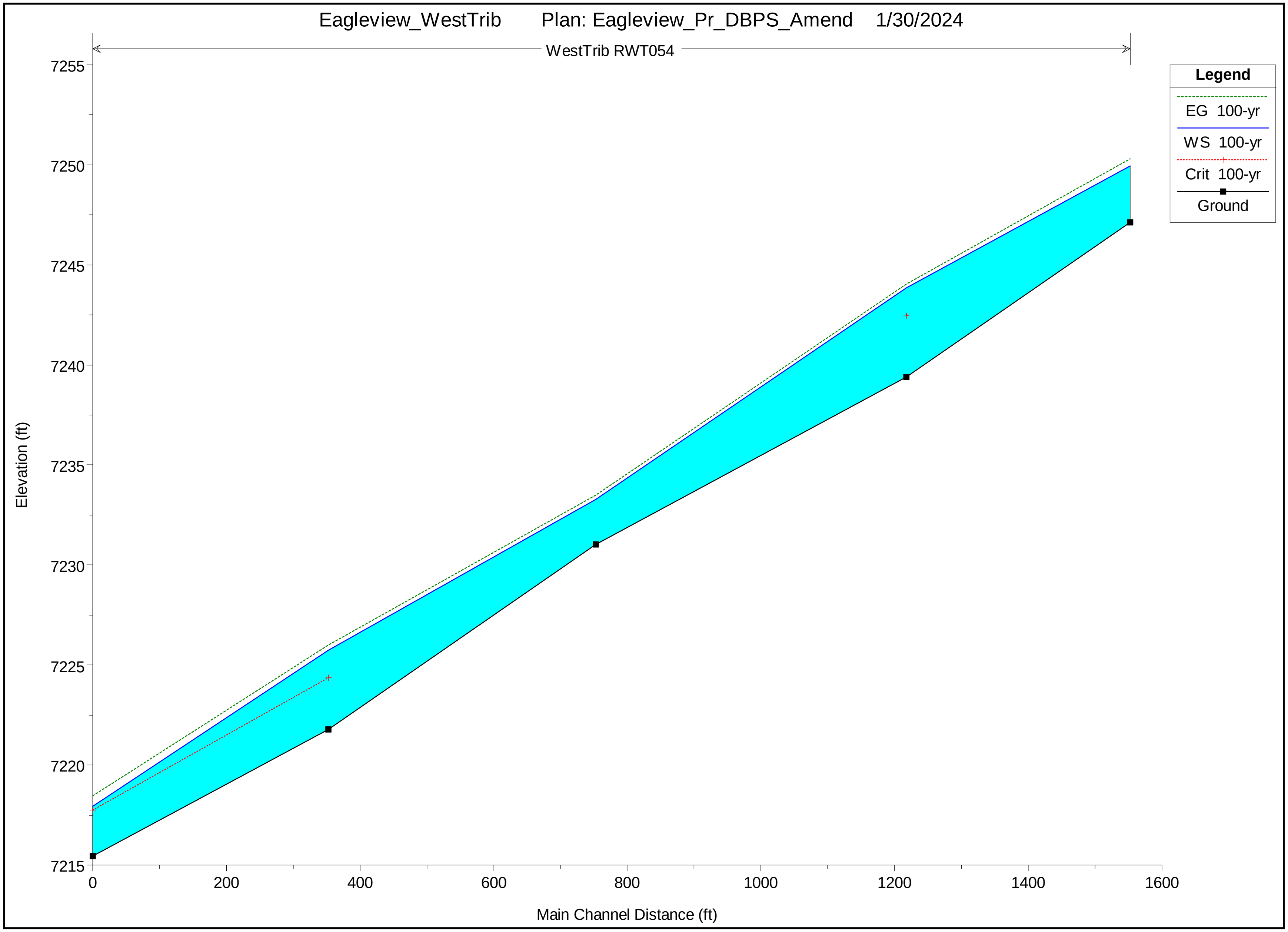
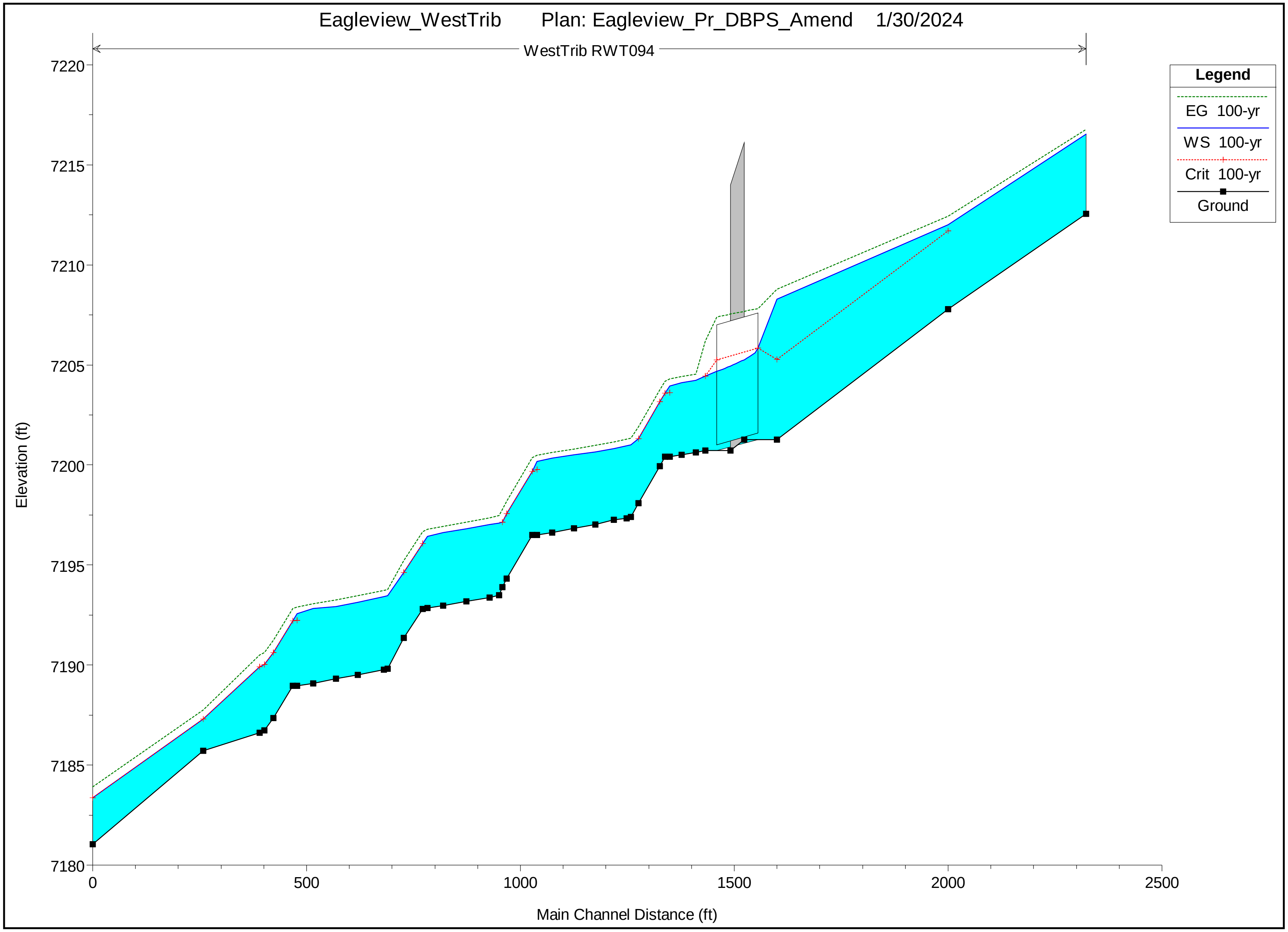
1475
1299
952
40884.05
40418.78
40018.78
RWT054
RWT080
762
RWT080
39666
615
294
125
39218.78
Junction1
38818.78
38651
38495
RWT094
38344
38246
38092
38001
37909
37735
37609
37477
37218.78

Note: Cross sections 40018.78 and 39666 are the only cross sections on reach RWT092.


Eagleview_WestTrib Plan: Eagleview_Pr_DBPS_Amend 1/30/2024
RWT080 RWT080
Legend
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Elevation (ft)
7260
7250
7240
7230
7220
7210
0
200
400
600
800
1000
1200
1400
Main Channel Distance (ft)


Eagleview_WestTrib Plan: Eagleview_Pr_DBPS_Amend 1/30/2024
WestTrib RWT054
Legend
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Elevation (ft)
7255
7250
7245
7240
7235
7230
7225
7220
7215
0
200
400
600
800
1000
1200
1400
1600
Main Channel Distance (ft)


Eagleview_WestTrib Plan: Eagleview_Pr_DBPS_Amend 1/30/2024
WestTrib RWT094
Legend
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Elevation (ft)
7220
7215
7210
7205
7200
7195
7190
7185
7180
0
500
1000
1500
2000
2500
Main Channel Distance (ft)

Cross section outside project area

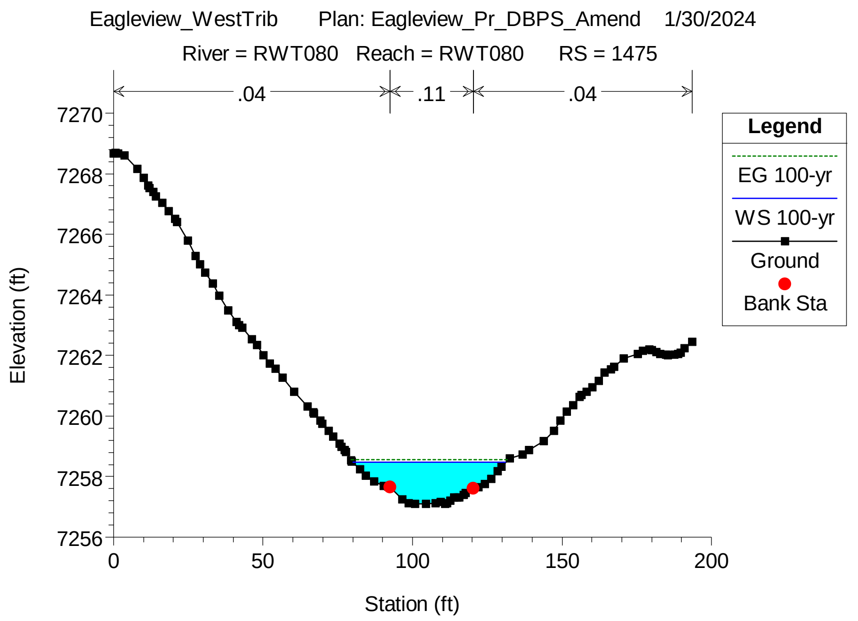
HEC-RAS Plan: Pr_DBPS_Amend Profile: 100-yr

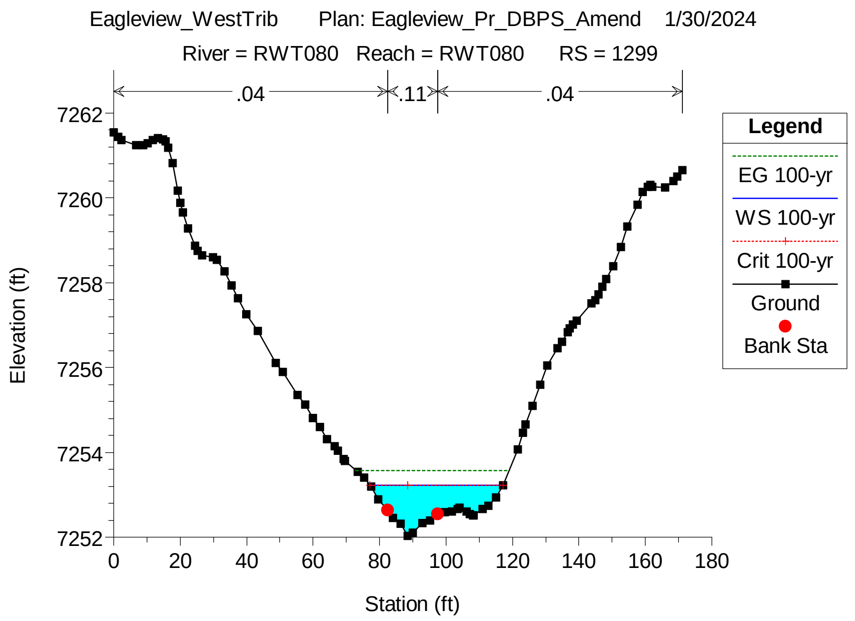
River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl	Shear Total
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)		(lb/sq ft)
WestTrib	RWT054	41218.78	100-yr	285.00	7247.13	7249.95		7250.30	0.018985	4.77	59.73	27.99	0.57	2.43
WestTrib	RWT054	40884.05	100-yr	285.00	7239.41	7243.85	7242.45	7244.05	0.018095	3.52	81.09	34.57	0.40	2.56
WestTrib	RWT054	40418.78	100-yr	285.00	7231.04	7233.29		7233.49	0.029142	3.79	83.18	59.58	0.49	2.52
WestTrib	RWT092	40018.78	100-yr	375.00	7221.79	7225.75	7224.36	7226.00	0.014143	3.92	94.03	33.96	0.38	2.34
WestTrib	RWT092	39666	100-yr	375.00	7215.46	7217.94	7217.76	7218.46	0.036273	4.73	69.39	52.02	0.57	2.99
WestTrib	RWT094	39542	100-yr	478.00	7212.56	7216.54		7216.78	0.007978	3.00	126.58	58.82	0.28	1.05
WestTrib	RWT094	39218.78	100-yr	478.00	7207.80	7212.02	7211.70	7212.44	0.029777	5.13	92.09	56.58	0.52	2.95
WestTrib	RWT094	38818.78	100-yr	480.00	7201.28	7208.28	7205.27	7208.78	0.004427	5.69	84.40	57.62	0.39	1.77
WestTrib	RWT094	38726		Culvert										
WestTrib	RWT094	38651	100-yr	480.00	7200.72	7204.46	7204.46	7206.19	0.012010	10.58	45.36	82.88	1.00	2.57
WestTrib	RWT094	38628	100-yr	480.00	7200.62	7204.23		7204.54	0.003752	5.14	125.43	89.65	0.54	0.33
WestTrib	RWT094	38596	100-yr	480.00	7200.50	7204.11		7204.42	0.003748	5.19	126.68	93.03	0.54	0.32
WestTrib	RWT094	38567	100-yr	480.00	7200.41	7203.95	7203.61	7204.29	0.005231	5.35	121.13	89.62	0.56	0.44
WestTrib	RWT094	38557	100-yr	480.00	7200.41	7203.59	7203.59	7204.20	0.010483	6.87	90.84	78.96	0.78	0.75
WestTrib	RWT094	38545	100-yr	480.00	7199.94	7203.17	7203.17	7203.75	0.009839	6.76	92.87	78.99	0.76	0.72
WestTrib	RWT094	38495	100-yr	480.00	7198.10	7201.31	7201.31	7201.91	0.010311	6.92	89.32	71.16	0.77	0.80
WestTrib	RWT094	38477	100-yr	480.00	7197.41	7201.01		7201.33	0.004722	5.19	119.77	74.49	0.54	0.47
WestTrib	RWT094	38467	100-yr	480.00	7197.34	7200.96		7201.28	0.004782	5.20	119.36	74.88	0.54	0.47
WestTrib	RWT094	38437	100-yr	480.00	7197.25	7200.82		7201.16	0.004035	5.33	116.60	75.41	0.56	0.39
WestTrib	RWT094	38394	100-yr	480.00	7197.03	7200.66		7200.98	0.003736	5.21	120.89	78.68	0.54	0.36
WestTrib	RWT094	38344	100-yr	480.00	7196.84	7200.51		7200.79	0.003332	4.95	127.51	81.24	0.51	0.32
WestTrib	RWT094	38293	100-yr	480.00	7196.62	7200.34		7200.63	0.003218	4.92	129.53	83.97	0.50	0.31
WestTrib	RWT094	38257	100-yr	502.00	7196.50	7200.18	7199.77	7200.49	0.004615	5.18	131.76	92.22	0.53	0.41
WestTrib	RWT094	38246	100-yr	502.00	7196.50	7199.68	7199.68	7200.37	0.011966	7.39	89.74	81.66	0.83	0.81
WestTrib	RWT094	38186	100-yr	502.00	7194.32	7197.58	7197.58	7198.18	0.010192	6.95	95.31	80.68	0.77	0.75
WestTrib	RWT094	38176	100-yr	502.00	7193.90	7197.15	7197.15	7197.78	0.010546	7.00	93.46	78.16	0.78	0.78
WestTrib	RWT094	38169	100-yr	502.00	7193.50	7197.11		7197.47	0.005551	5.54	120.58	86.18	0.58	0.48
WestTrib	RWT094	38146	100-yr	502.00	7193.38	7197.02		7197.35	0.003922	5.35	126.30	88.52	0.55	0.35
WestTrib	RWT094	38092	100-yr	502.00	7193.18	7196.82		7197.14	0.003729	5.23	128.16	85.21	0.54	0.35
WestTrib	RWT094	38038	100-yr	502.00	7192.97	7196.63		7196.94	0.003694	5.21	130.14	89.33	0.54	0.33
WestTrib	RWT094	38001	100-yr	502.00	7192.84	7196.43		7196.78	0.005331	5.49	125.19	92.62	0.57	0.45
WestTrib	RWT094	37990	100-yr	502.00	7192.81	7196.06	7196.06	7196.67	0.010335	6.93	95.15	81.54	0.77	0.75
WestTrib	RWT094	37946	100-yr	502.00	7191.35	7194.63	7194.63	7195.22	0.009868	6.88	97.36	84.27	0.76	0.71
WestTrib	RWT094	37909	100-yr	502.00	7189.81	7193.46		7193.77	0.004712	5.17	131.16	91.54	0.54	0.42
WestTrib	RWT094	37900	100-yr	502.00	7189.78	7193.42		7193.73	0.004722	5.20	130.51	90.17	0.54	0.42
WestTrib	RWT094	37838	100-yr	502.00	7189.50	7193.14		7193.46	0.003848	5.30	130.81	96.05	0.55	0.32
WestTrib	RWT094	37787	100-yr	502.00	7189.31	7192.93		7193.27	0.003980	5.37	130.55	100.92	0.56	0.32
WestTrib	RWT094	37735	100-yr	502.00	7189.09	7192.83		7193.06	0.002753	4.58	153.86	106.97	0.46	0.25
WestTrib	RWT094	37696	100-yr	502.00	7188.97	7192.57	7192.23	7192.91	0.005231	5.43	127.19	95.14	0.56	0.43
WestTrib	RWT094	37687	100-yr	502.00	7188.97	7192.22	7192.22	7192.82	0.010177	6.88	96.67	85.74	0.77	0.71
WestTrib	RWT094	37641	100-yr	502.00	7187.36	7190.62	7190.62	7191.24	0.010587	7.00	94.92	84.61	0.78	0.74
WestTrib	RWT094	37620	100-yr	502.00	7186.74	7190.03	7190.02	7190.62	0.009805	6.88	98.21	87.54	0.76	0.68
WestTrib	RWT094	37609	100-yr	502.00	7186.62	7189.90	7189.90	7190.50	0.010047	6.93	97.03	86.07	0.77	0.70
WestTrib	RWT094	37477	100-yr	502.00	7185.72	7187.30	7187.30	7187.75	0.012728	6.05	102.10	114.12	0.90	0.71
WestTrib	RWT094	37218.78	100-yr	502.00	7181.04	7183.38	7183.38	7183.92	0.009919	6.32	97.73	108.66	0.82	0.55
RWT080	RWT080	1475	100-yr	107.00	7257.10	7258.47		7258.56	0.017587	2.04	45.85	51.04	0.33	0.98

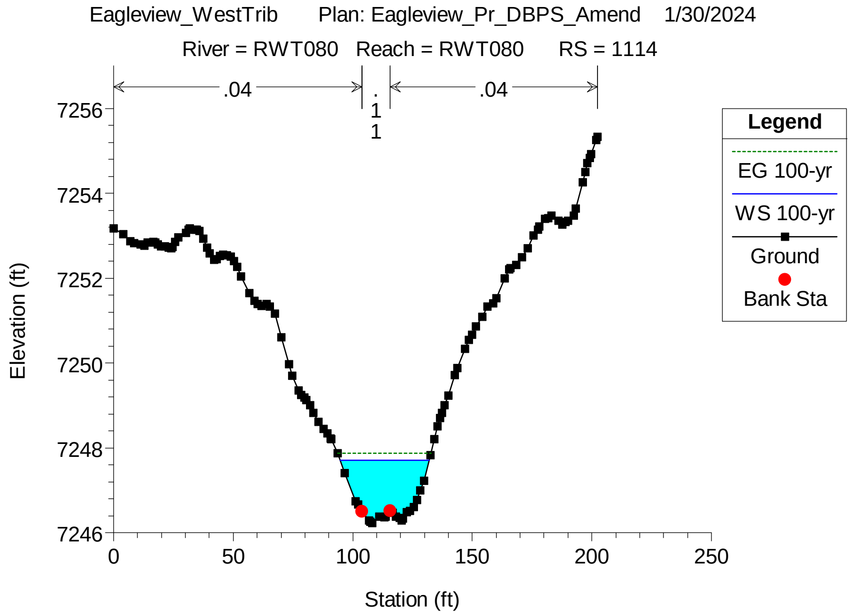
Cross sections outside project area

HEC-RAS Plan: Pr_DBPS_Amend Profile: 100-yr (Continued)

River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl	Shear Total
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)		(lb/sq ft)
RWT080	RWT080	1299	100-yr	107.00	7252.03	7253.22	7253.22	7253.58	0.054712	2.95	25.83	40.07	0.55	2.19
RWT080	RWT080	1114	100-yr	107.00	7246.23	7247.71		7247.87	0.010471	1.69	38.50	37.23	0.26	0.67
RWT080	RWT080	952	100-yr	107.00	7242.11	7243.44	7243.41	7243.86	0.109855	4.83	20.95	24.18	0.80	5.89
RWT080	RWT080	762	100-yr	107.00	7234.88	7235.95		7235.99	0.021254	1.61	66.34	89.57	0.33	0.98
RWT080	RWT080	615	100-yr	101.00	7231.06	7232.52		7232.64	0.024496	2.58	37.32	32.37	0.39	1.75
RWT080	RWT080	459	100-yr	101.00	7224.03	7225.56	7225.47	7225.87	0.096854	4.48	22.72	27.53	0.75	4.93
RWT080	RWT080	294	100-yr	101.00	7219.80	7222.24		7222.33	0.009024	2.17	43.13	24.39	0.26	0.96
RWT080	RWT080	125	100-yr	101.00	7216.33	7218.11	7218.11	7218.67	0.101209	5.36	17.41	17.26	0.79	6.20


Eagleview_WestTrib Plan: Eagleview_Pr_DBPS_Amend 1/30/2024
River = RWT080 Reach = RWT080 RS = 1475
.04
.11
.04
Legend
EG 100-yr
WS 100-yr
Ground
Bank Sta
Elevation (ft)
7270
7268
7266
7264
7262
7260
7258
7256
0
50
100
150
200
Station (ft)


Eagleview_WestTrib Plan: Eagleview_Pr_DBPS_Amend 1/30/2024
River = RWT080 Reach = RWT080 RS = 1299
.04
.11
.04
Legend
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Bank Sta
Elevation (ft)
7262
7260
7258
7256
7254
7252
0
20
40
60
80
100
120
140
160
180
Station (ft)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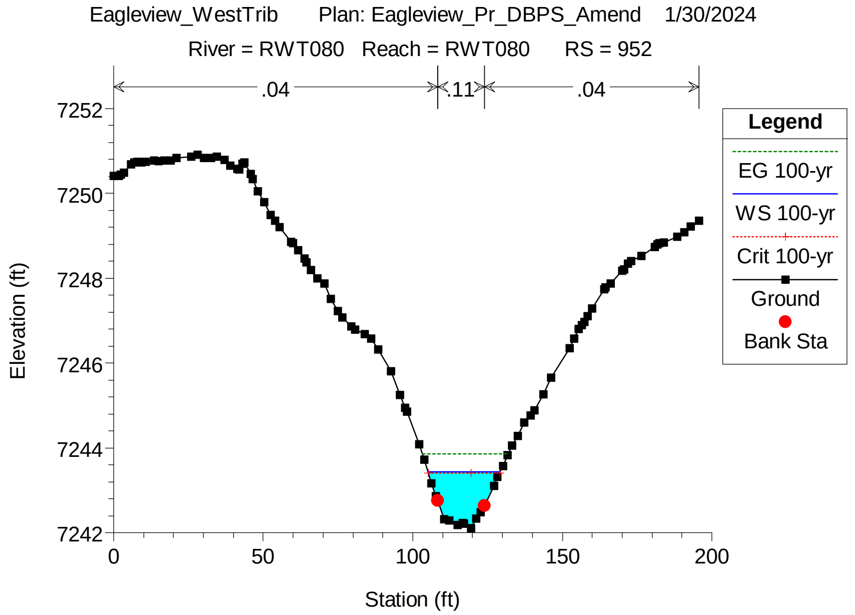
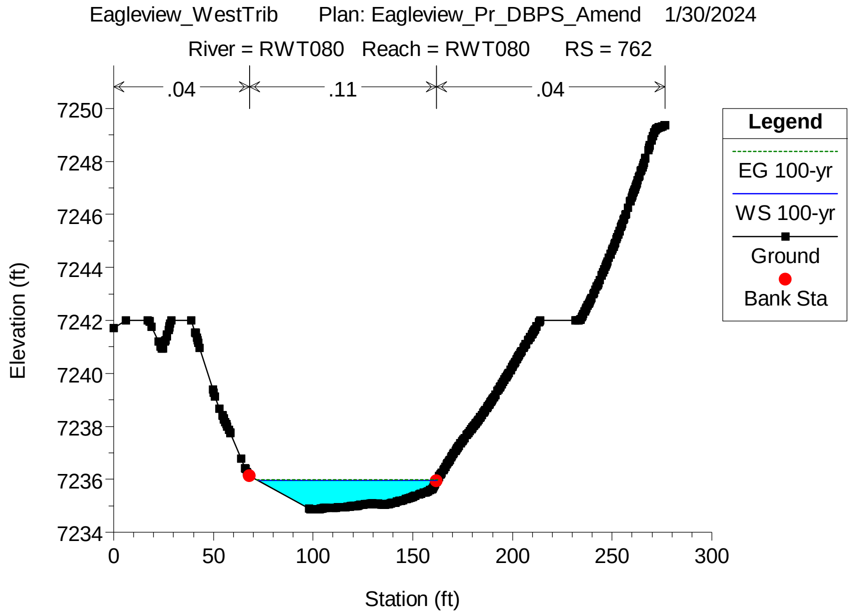
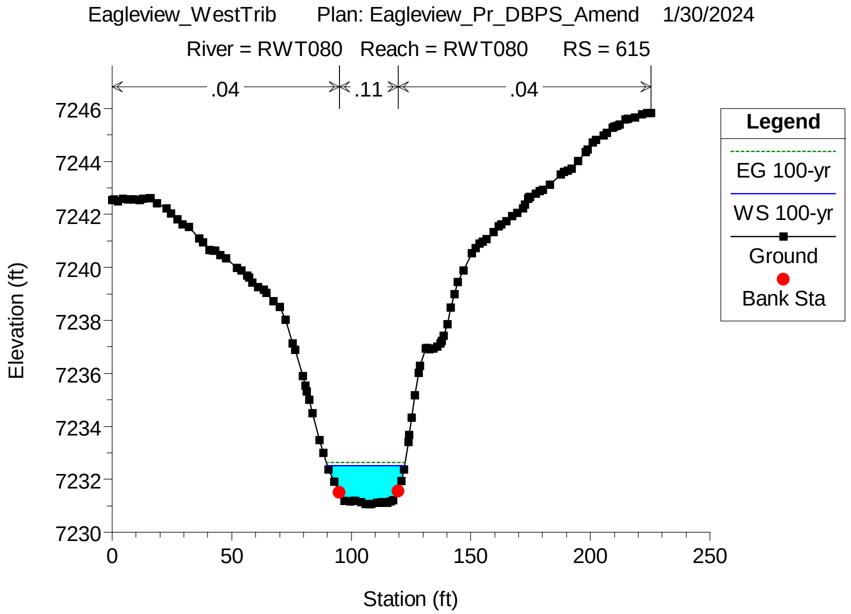
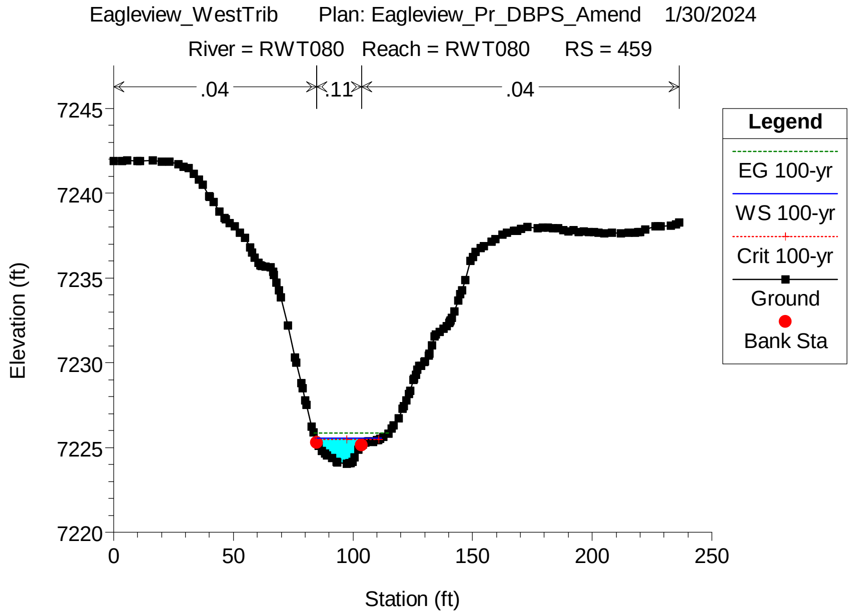
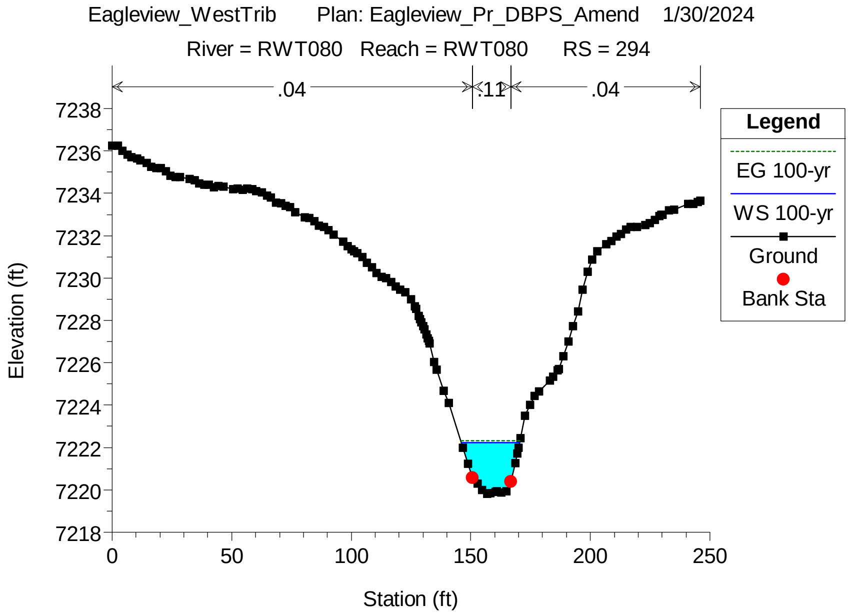
River = RWT080 Reach = RWT080 RS = 1114
.04
.11
.04
Legend
EG 100-yr
WS 100-yr
Ground
Bank Sta
Elevation (ft)
7256
7254
7252
7250
7248
7246
0
50
100
150
200
250
Station (ft)

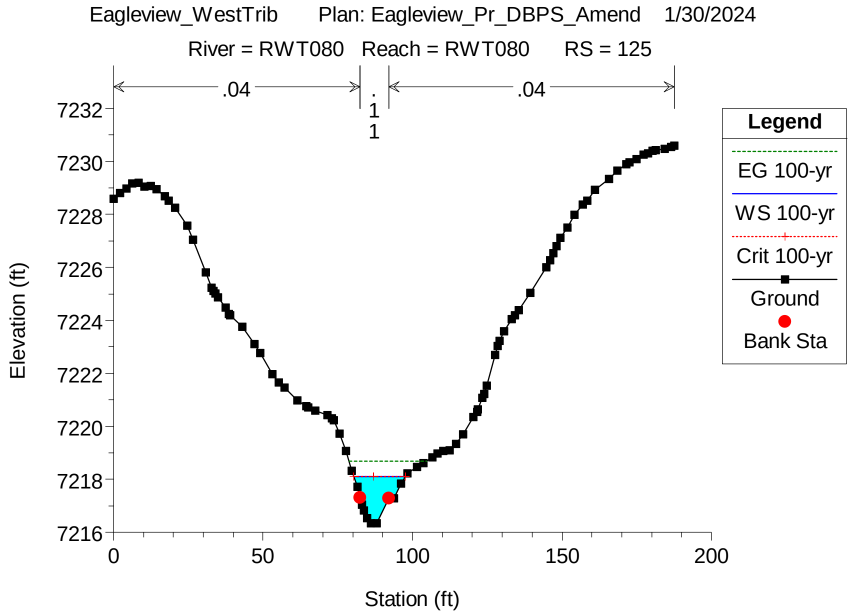

Eagleview_WestTrib Plan: Eagleview_Pr_DBPS_Amend 1/30/2024
River = RWT080 Reach = RWT080 RS = 952
.04
.11
.04
Legend
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Bank Sta
Elevation (ft)
7252
7250
7248
7246
7244
7242
0
50
100
150
200
Station (ft)

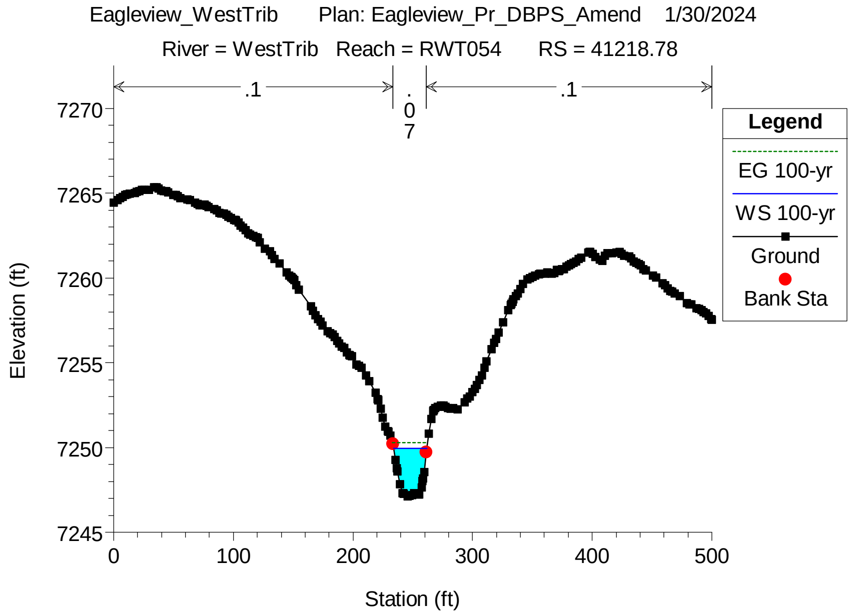

Eagleview_WestTrib Plan: Eagleview_Pr_DBPS_Amend 1/30/2024
River = RWT080 Reach = RWT080 RS = 762
.04
.11
.04
Legend
EG 100-yr
WS 100-yr
Ground
Bank Sta
Elevation (ft)
7234
7236
7238
7240
7242
7244
7246
7248
7250
Station (ft)
0
50
100
150
200
250
300

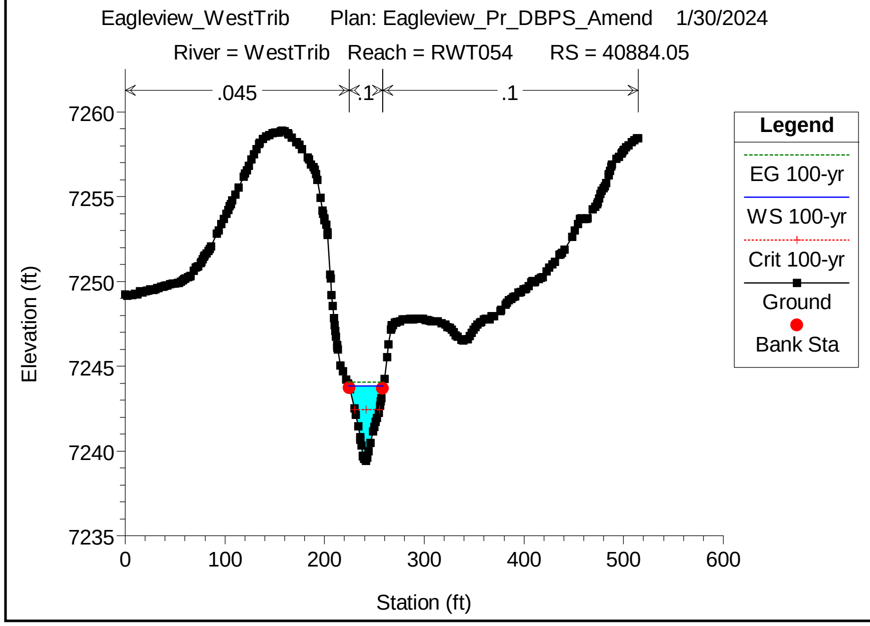

Eagleview_WestTrib Plan: Eagleview_Pr_DBPS_Amend 1/30/2024
River = RWT080 Reach = RWT080 RS = 615
.04
.11
.04
Legend
EG 100-yr
WS 100-yr
Ground
Bank Sta
Elevation (ft)
7230
7232
7234
7236
7238
7240
7242
7244
7246
Station (ft)
0
50
100
150
200
250

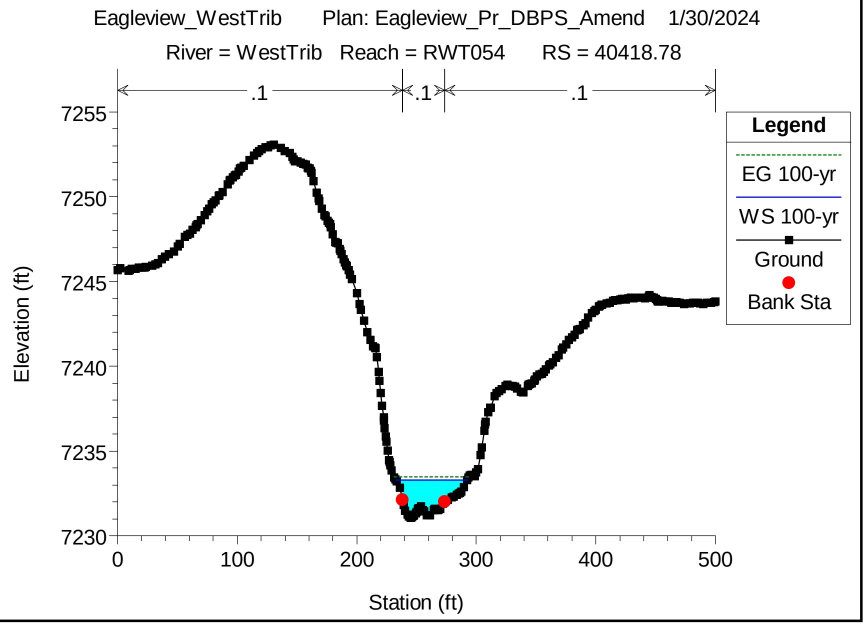

Eagleview_WestTrib Plan: Eagleview_Pr_DBPS_Amend 1/30/2024
River = RWT080 Reach = RWT080 RS = 459
.04
.11
.04
Legend
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Bank Sta
Elevation (ft)
7220
7225
7230
7235
7240
7245
Station (ft)
0
50
100
150
200
250


Eagleview_WestTrib Plan: Eagleview_Pr_DBPS_Amend 1/30/2024
River = RWT080 Reach = RWT080 RS = 294
.04
.11
.04
Legend
EG 100-yr
WS 100-yr
Ground
Bank Sta
Elevation (ft)
7218
7220
7222
7224
7226
7228
7230
7232
7234
7236
7238
Station (ft)
0
50
100
150
200
250


Eagleview_WestTrib Plan: Eagleview_Pr_DBPS_Amend 1/30/2024
River = RWT080 Reach = RWT080 RS = 125


Eagleview_WestTrib Plan: Eagleview_Pr_DBPS_Amend 1/30/2024
River = WestTrib Reach = RWT054 RS = 41218.78


Eagleview_WestTrib Plan: Eagleview_Pr_DBPS_Amend 1/30/2024
River = WestTrib Reach = RWT054 RS = 40884.05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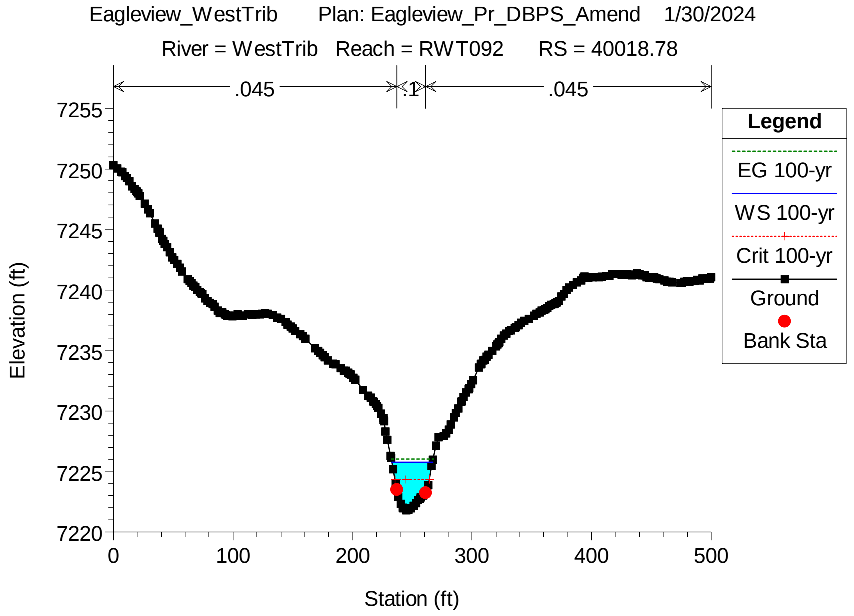
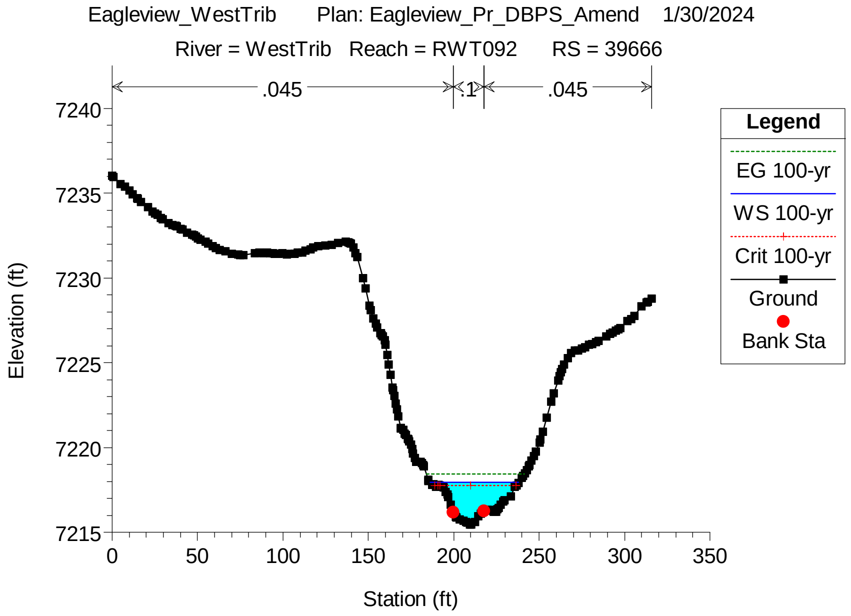
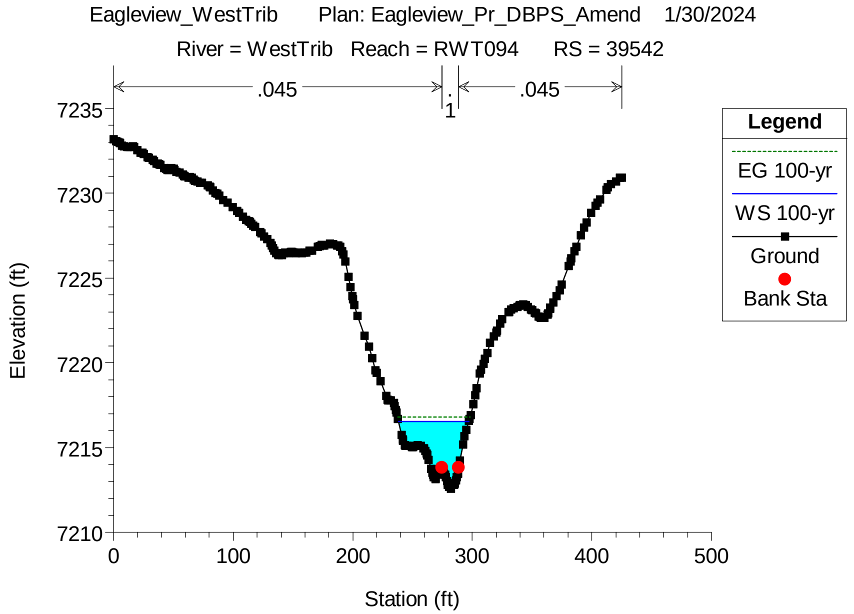
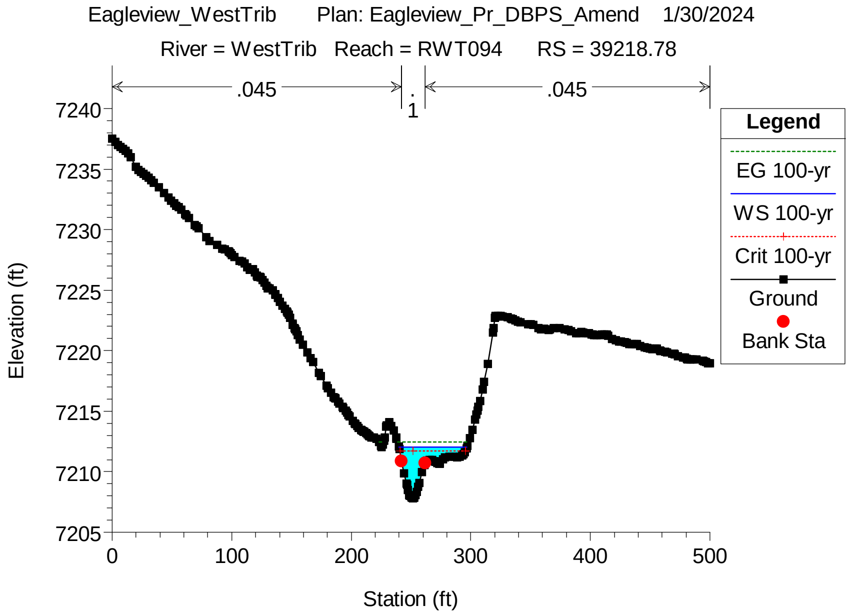
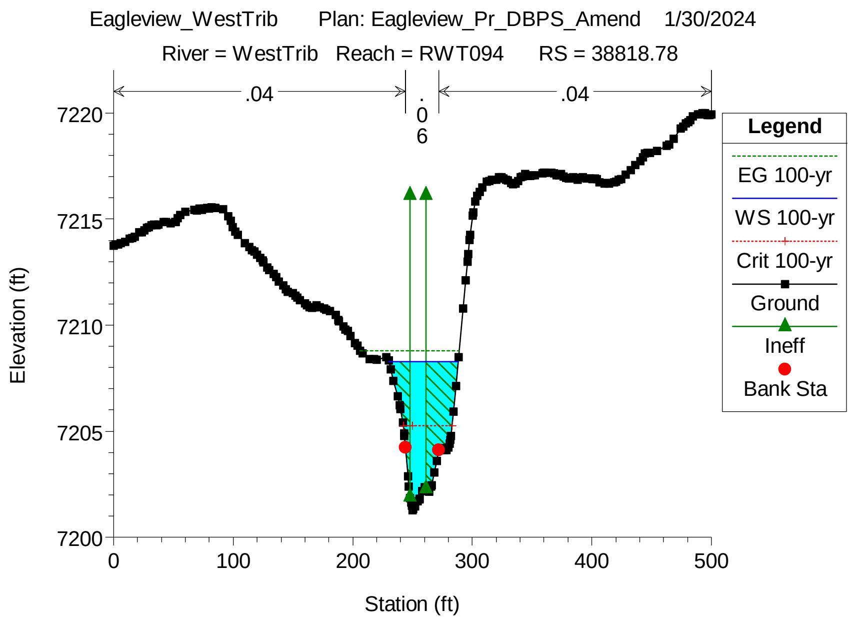
River = WestTrib Reach = RWT054 RS = 40418.78

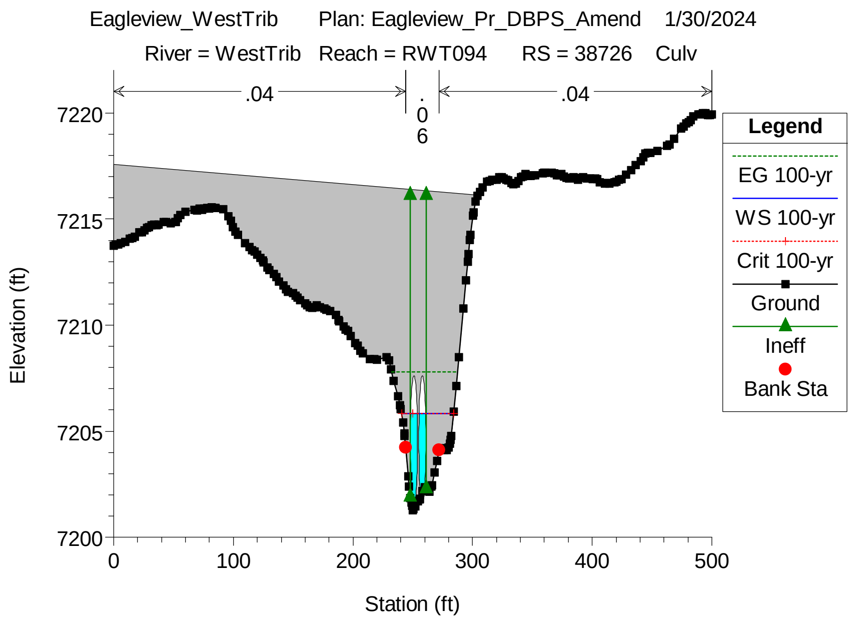

Eagleview_WestTrib Plan: Eagleview_Pr_DBPS_Amend 1/30/2024
River = WestTrib Reach = RWT092 RS = 40018.78
.045
.1
.045
Elevation (ft)
7220
7225
7230
7235
7240
7245
7250
7255
Station (ft)
0
100
200
300
400
500
Legend
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Bank Sta

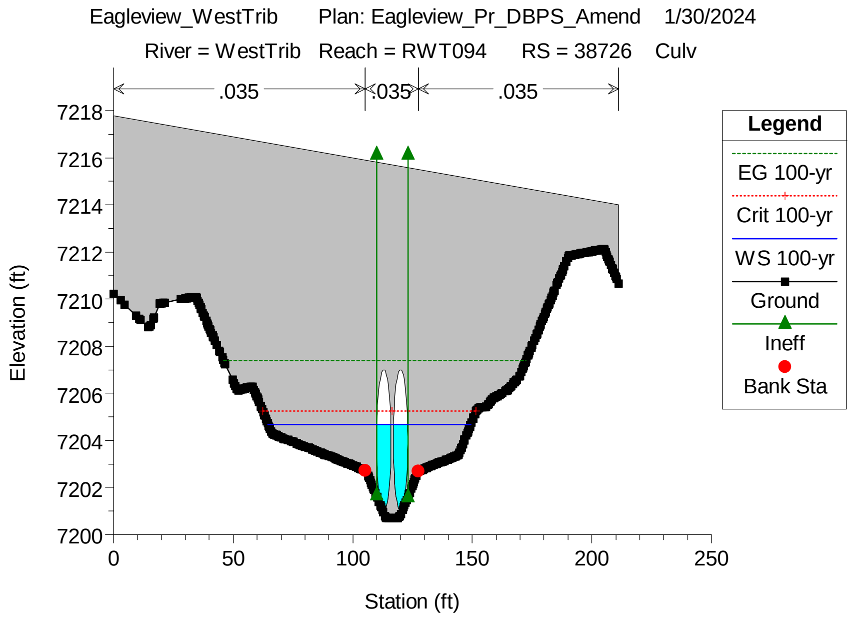

Eagleview_WestTrib Plan: Eagleview_Pr_DBPS_Amend 1/30/2024
River = WestTrib Reach = RWT092 RS = 39666
.045
.1
.045
Elevation (ft)
7215
7220
7225
7230
7235
7240
Station (ft)
0
50
100
150
200
250
300
350
Legend
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Bank Sta

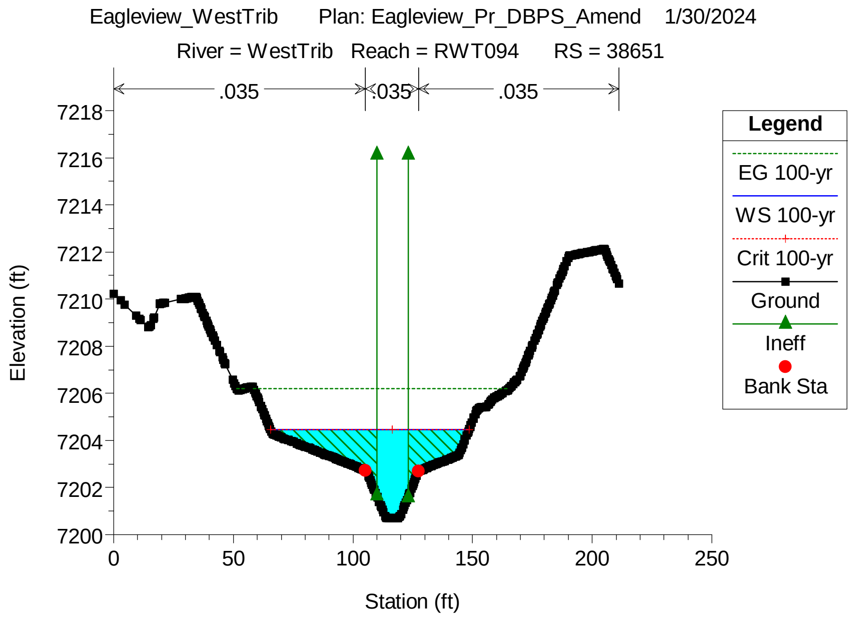

Eagleview_WestTrib Plan: Eagleview_Pr_DBPS_Amend 1/30/2024
River = WestTrib Reach = RWT094 RS = 39542
.045
.1
.045
Elevation (ft)
7210
7215
7220
7225
7230
7235
Station (ft)
0
100
200
300
400
500
Legend
EG 100-yr
WS 100-yr
Ground
Bank Sta

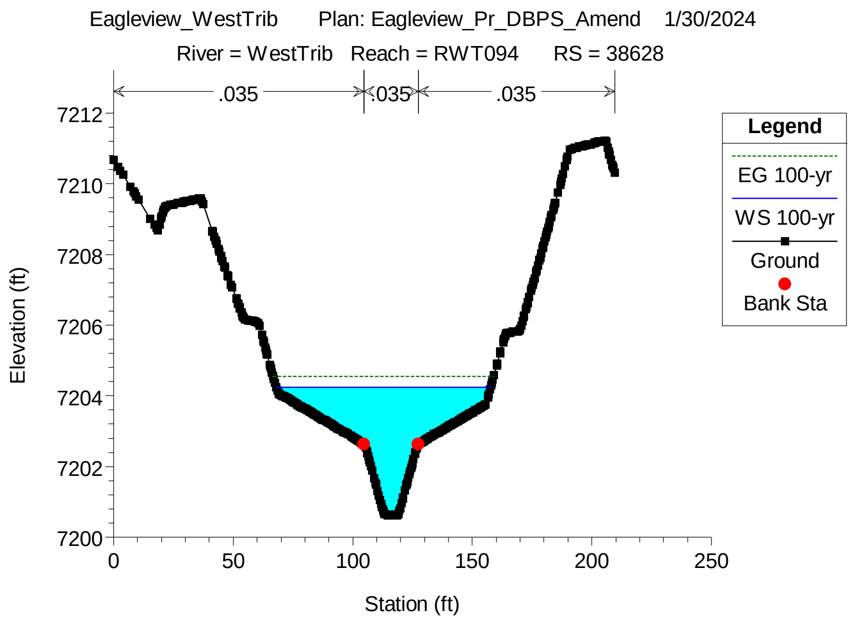

Eagleview_WestTrib Plan: Eagleview_Pr_DBPS_Amend 1/30/2024
River = WestTrib Reach = RWT094 RS = 39218.78
.045
.1
.045
Elevation (ft)
7205
7210
7215
7220
7225
7230
7235
7240
Station (ft)
0
100
200
300
400
500
Legend
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Bank Sta


Eagleview_WestTrib Plan: Eagleview_Pr_DBPS_Amend 1/30/2024
River = WestTrib Reach = RWT094 RS = 38818.78
.04
.
0
6
.04
7220
7215
7210
7205
7200
Elevation (ft)
0
100
200
300
400
500
Station (ft)
Legend
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Ineff
Bank Sta


Eagleview_WestTrib Plan: Eagleview_Pr_DBPS_Amend 1/30/2024
River = WestTrib Reach = RWT094 RS = 38726 Culv
.04
.
0
6
.04
7220
7215
7210
7205
7200
Elevation (ft)
0
100
200
300
400
500
Station (ft)
Legend
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Ineff
Bank Sta


Eagleview_WestTrib Plan: Eagleview_Pr_DBPS_Amend 1/30/2024
River = WestTrib Reach = RWT094 RS = 38726 Culv
.035
.035
.035
7218
7216
7214
7212
7210
7208
7206
7204
7202
7200
Elevation (ft)
0
50
100
150
200
250
Station (ft)
Legend
EG 100-yr
Crit 100-yr
WS 100-yr
Ground
Ineff
Bank Sta


Eagleview_WestTrib Plan: Eagleview_Pr_DBPS_Amend 1/30/2024
River = WestTrib Reach = RWT094 RS = 38651
.035
.035
.035
7218
7216
7214
7212
7210
7208
7206
7204
7202
7200
Elevation (ft)
0
50
100
150
200
250
Station (ft)
Legend
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Ineff
Bank Sta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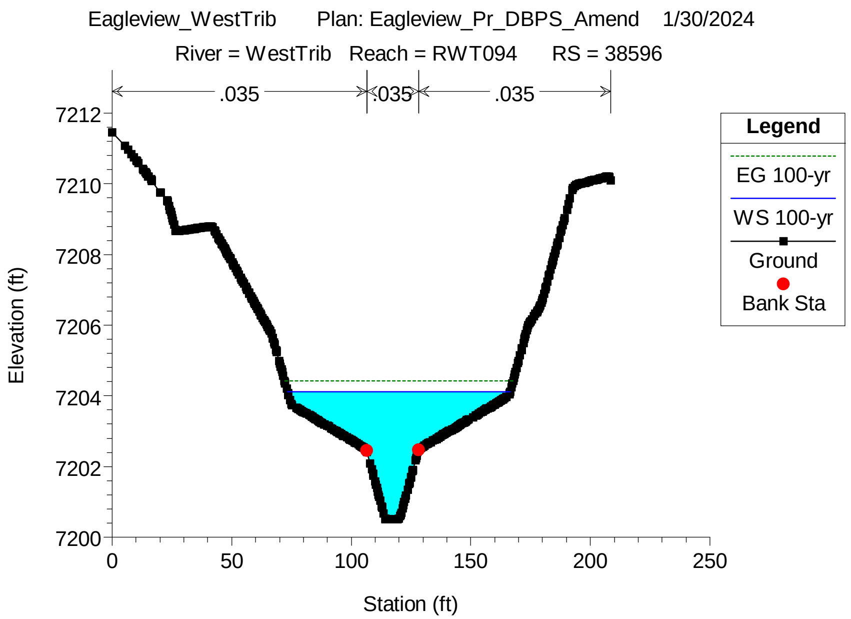
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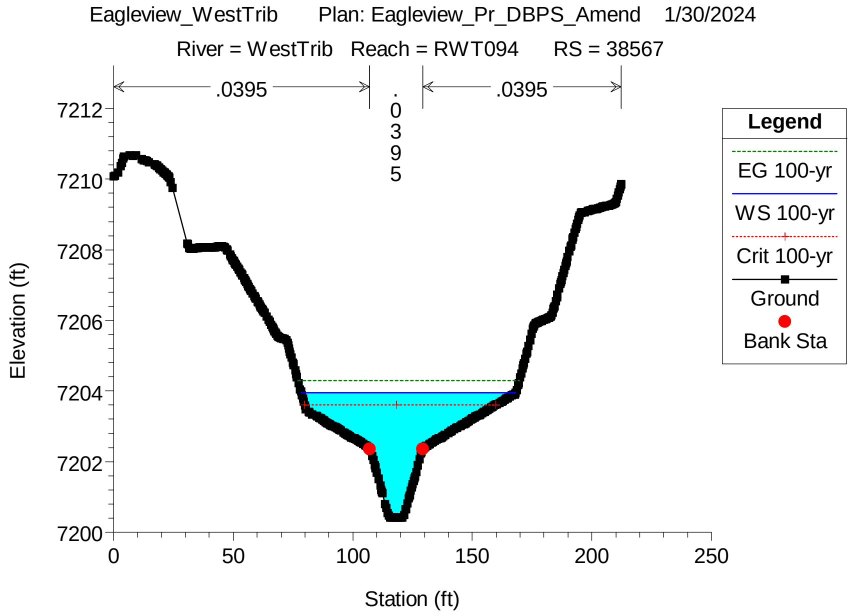
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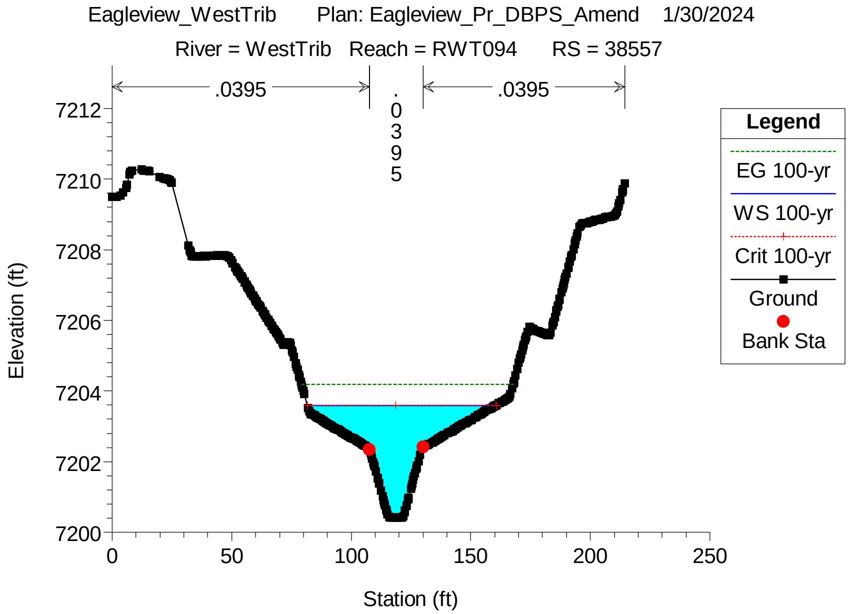
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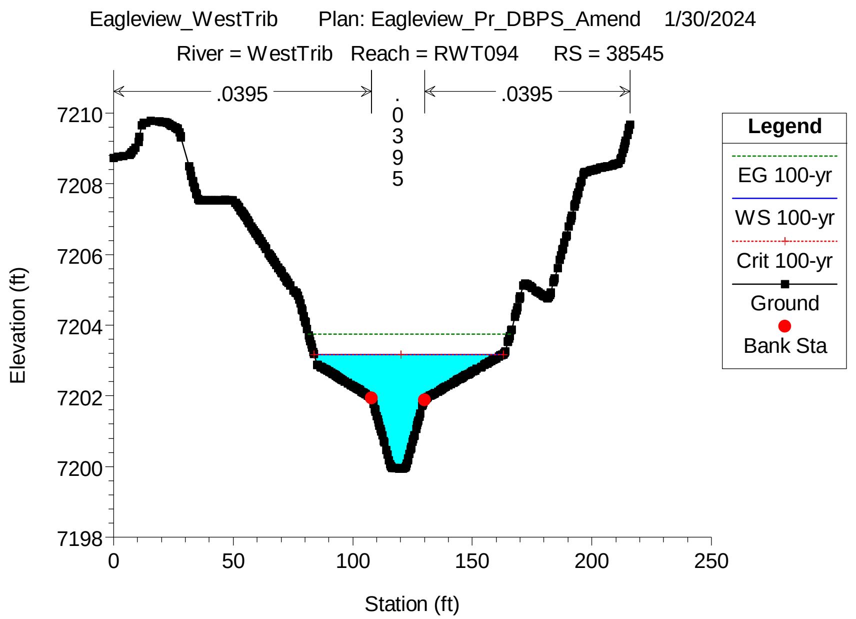
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.0395
Elevation (ft)
7210
7208
7206
7204
7202
7200
7198
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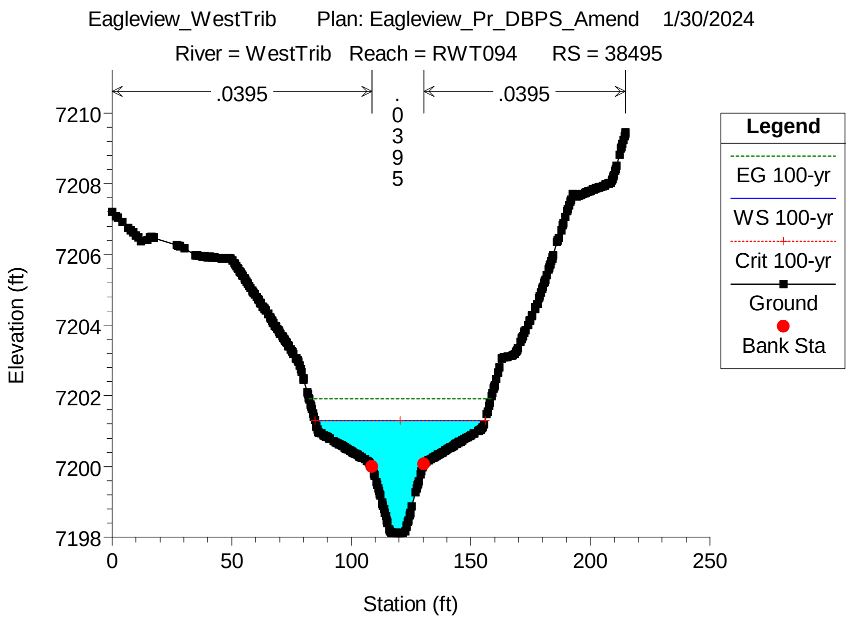
100
150
200
250
Station (ft)
Legend
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Bank Sta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7206
7204
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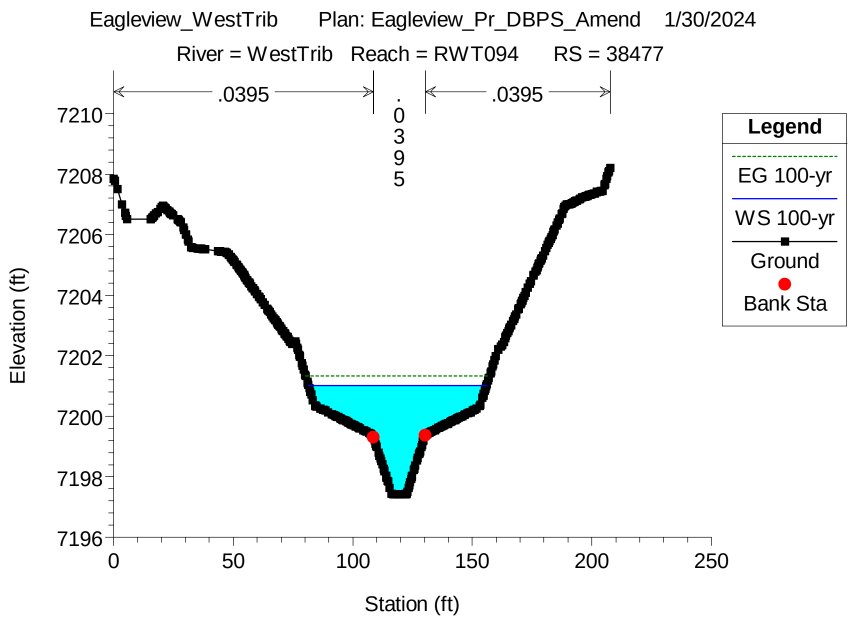
250
Station (ft)
Legend
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Bank Sta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.0395
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7210
7208
7206
7204
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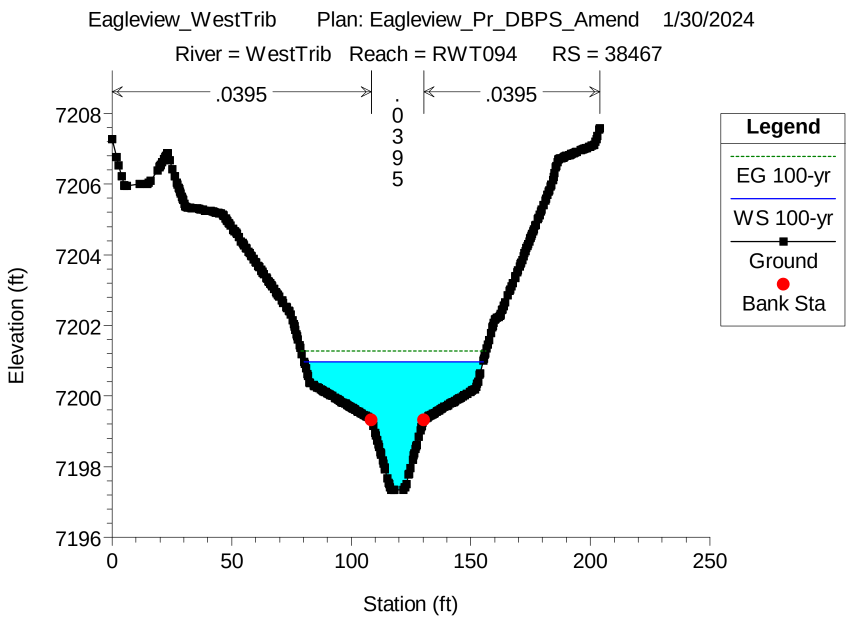
150
200
250
Station (ft)
Legend
EG 100-yr
WS 100-yr
Ground
Bank Sta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7206
7204
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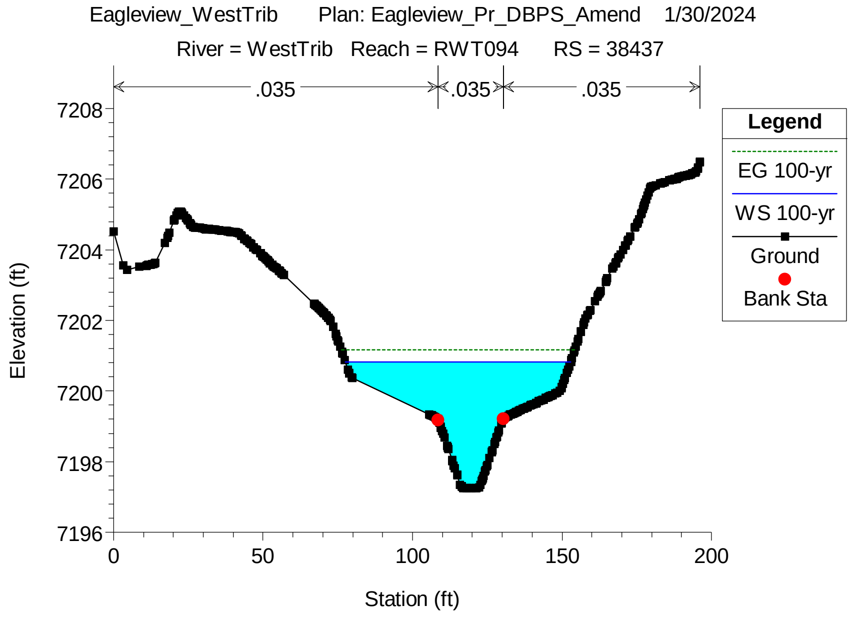
150
200
250
Station (ft)
Legend
EG 100-yr
WS 100-yr
Ground
Bank Sta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.035
.035
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EG 100-yr
WS 100-yr
Ground
Bank Sta
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7206
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7200
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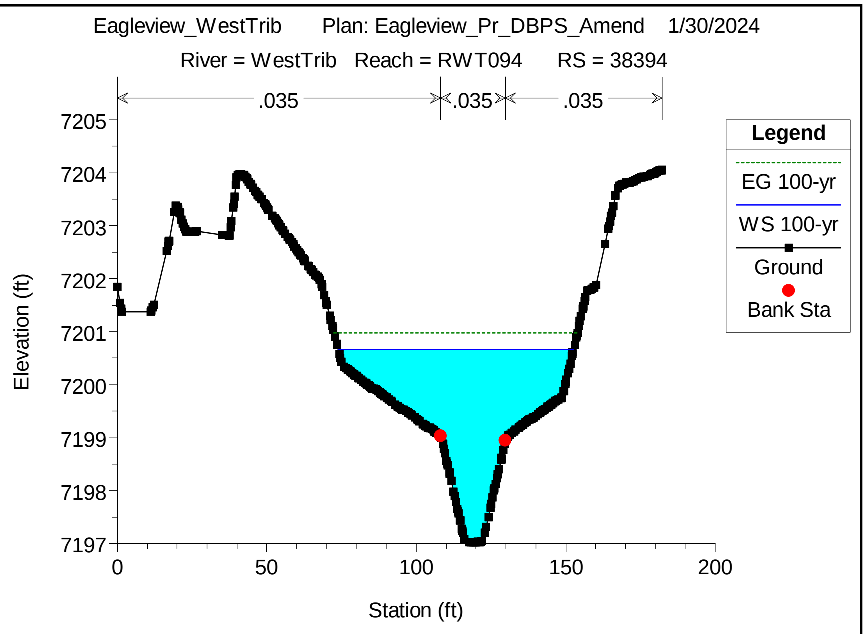
7196
0
50
100
150
200
Station (ft)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Legend
EG 100-yr
WS 100-yr
Ground
Bank Sta
Elevation (ft)
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7204
7203
7202
7201
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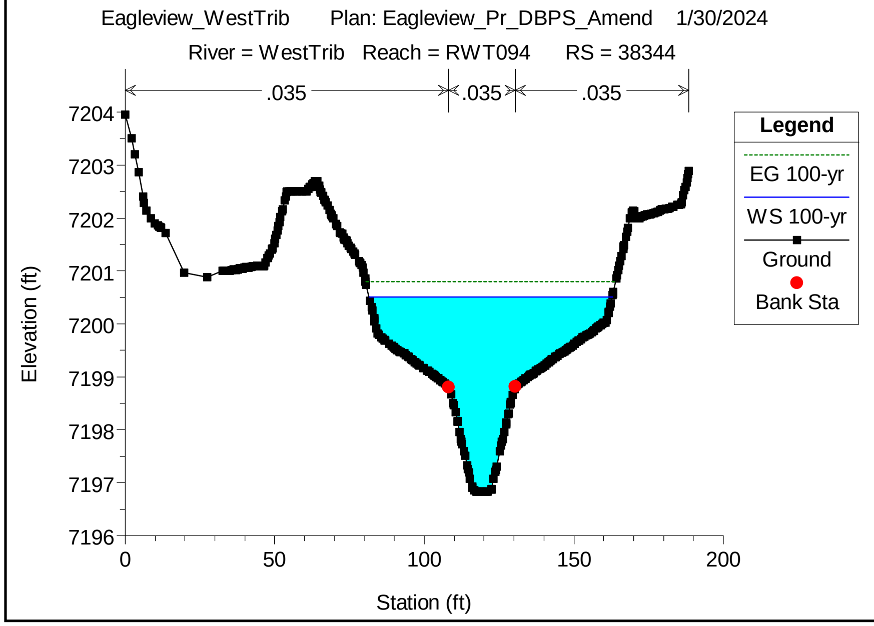
7199
7198
7197
0
50
100
150
200
Station (ft)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.035
.035
Legend
EG 100-yr
WS 100-yr
Ground
Bank Sta
Elevation (ft)
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7203
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7201
7200
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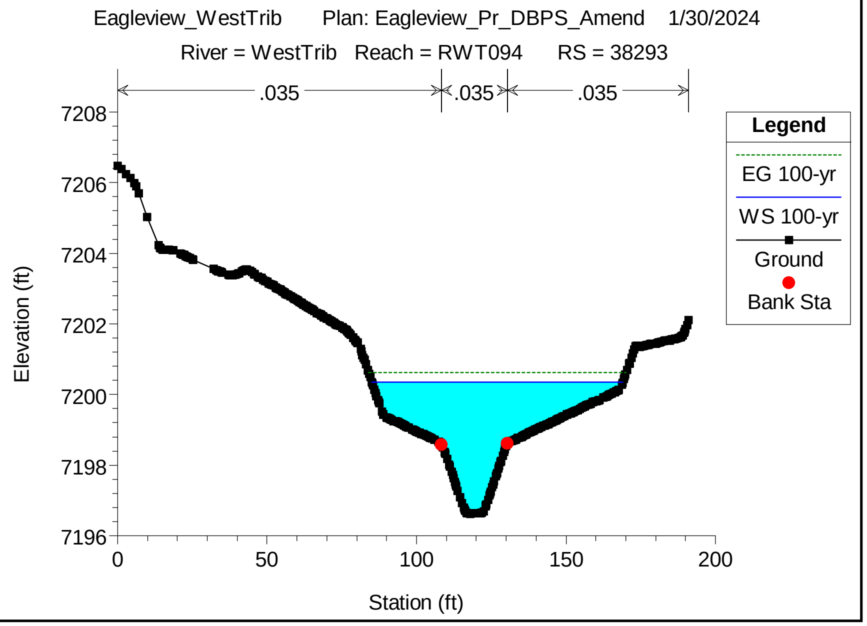
7198
7197
7196
0
50
100
150
200
Station (ft)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.035
.035
Legend
EG 100-yr
WS 100-yr
Ground
Bank Sta
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7206
7204
7202
7200
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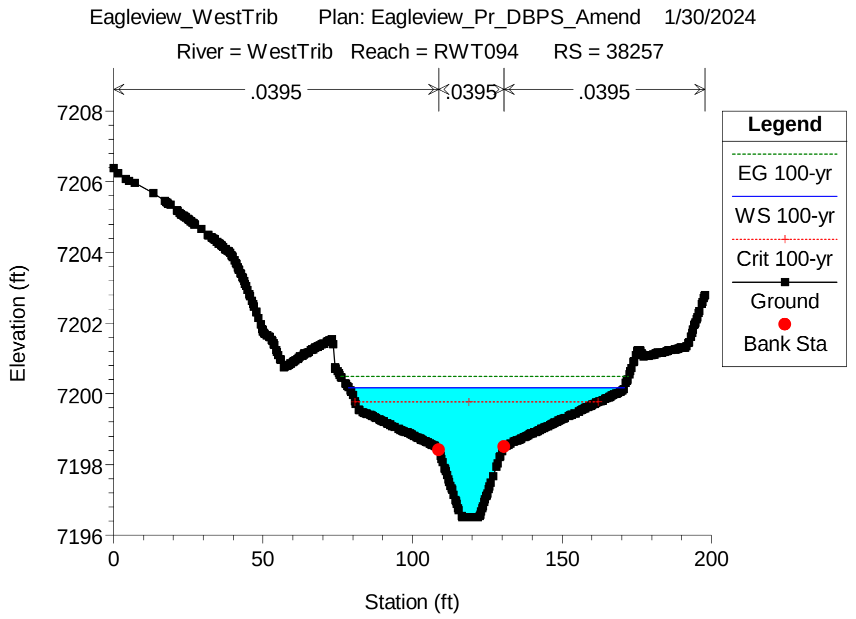
7196
0
50
100
150
200
Station (ft)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Elevation (ft)
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7202
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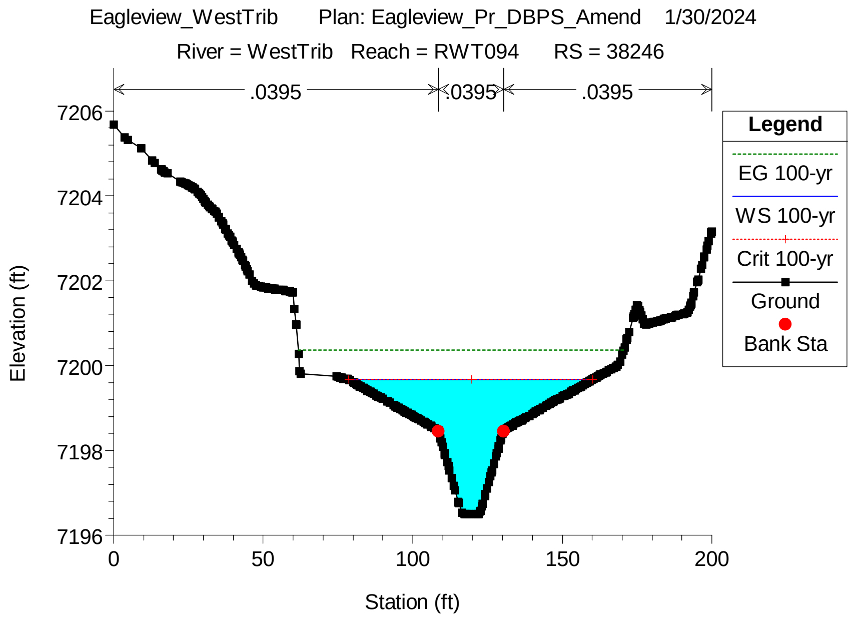
150
200
Station (ft)
Legend
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Bank Sta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Elevation (ft)
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7204
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100
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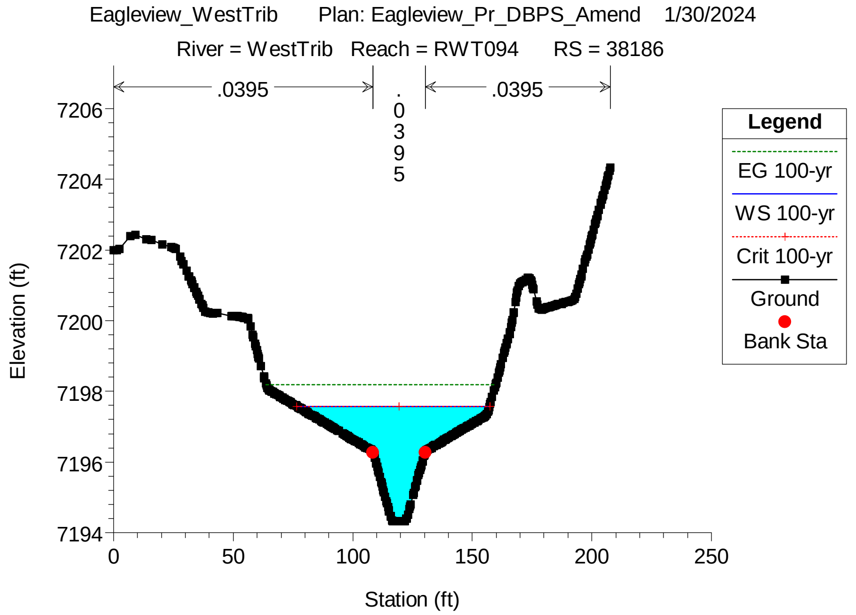
200
Station (ft)
Legend
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Bank Sta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.0395
Elevation (ft)
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7204
7202
7200
7198
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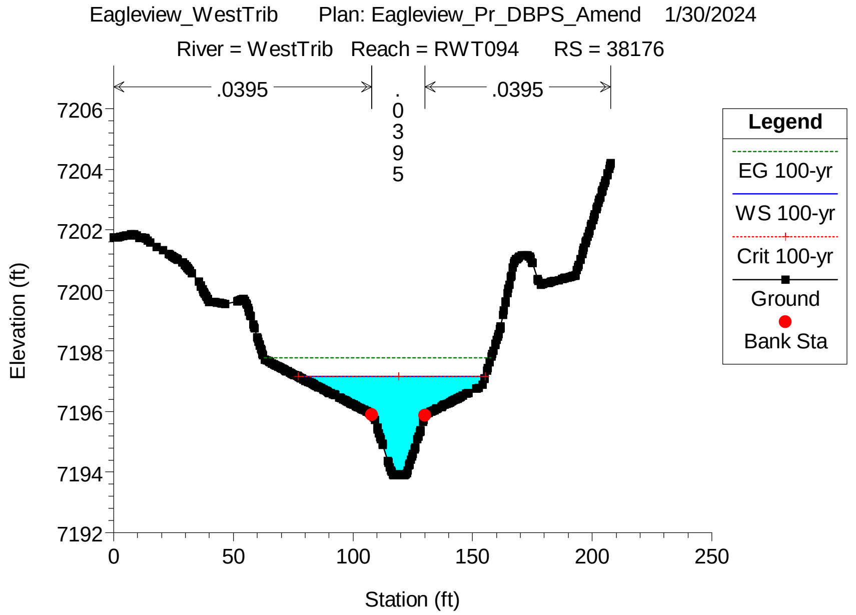
150
200
250
Station (ft)
Legend
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Bank Sta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.0395
Elevation (ft)
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7204
7202
7200
7198
7196
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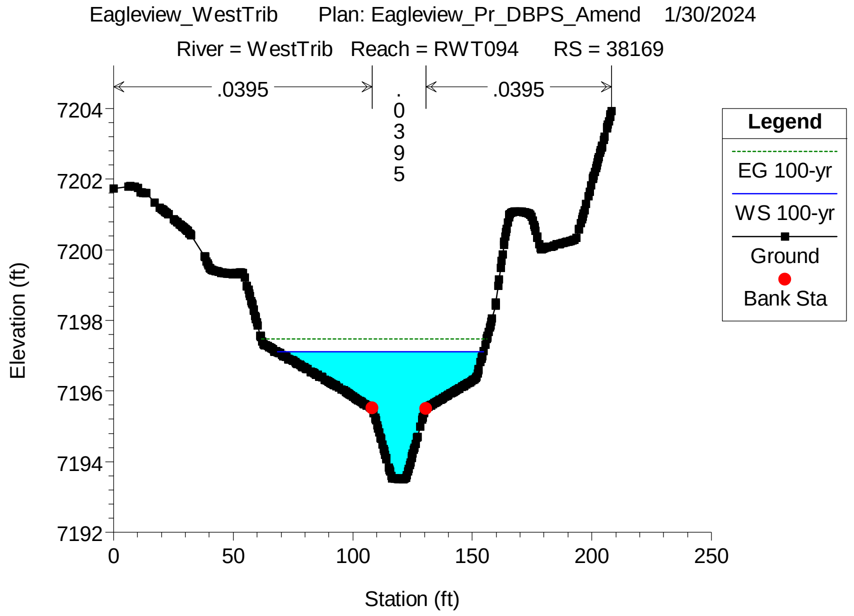
200
250
Station (ft)
Legend
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Bank Sta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7202
7200
7198
7196
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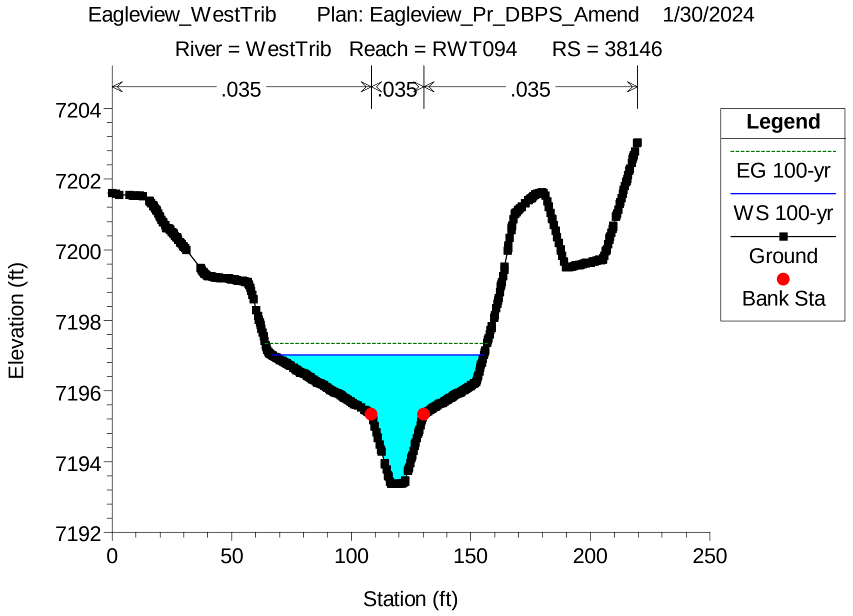
150
200
250
Station (ft)
Legend
EG 100-yr
WS 100-yr
Ground
Bank Sta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7202
7200
7198
7196
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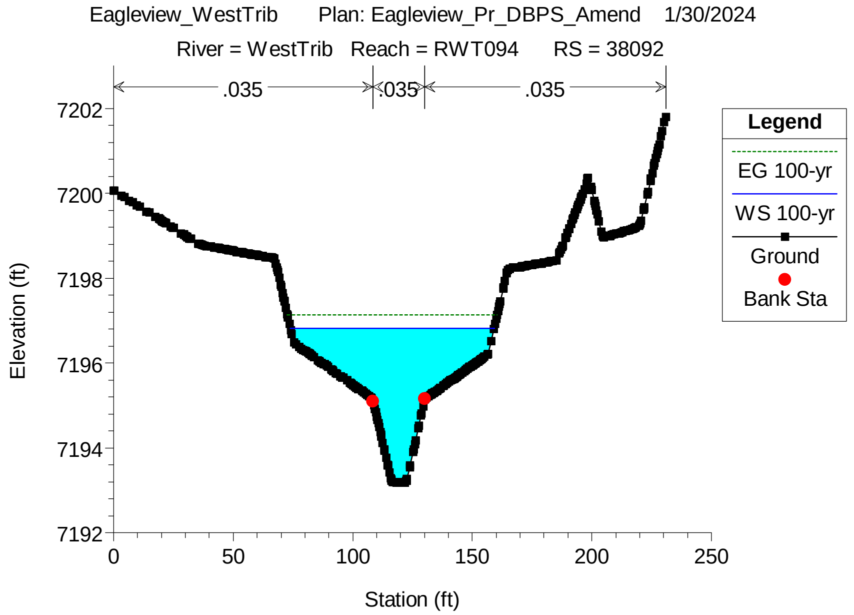
Station (ft)
Legend
EG 100-yr
WS 100-yr
Ground
Bank Sta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7200
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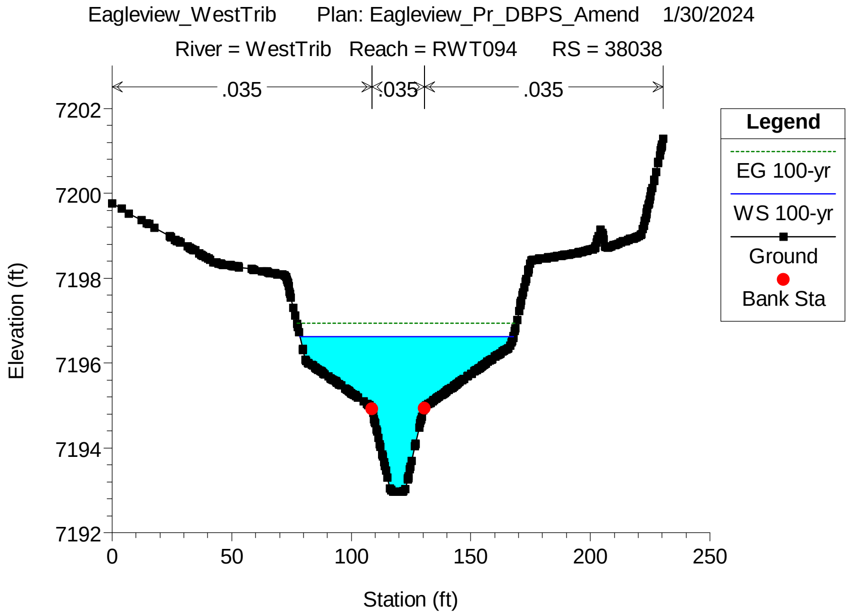
Station (ft)
Legend
EG 100-yr
WS 100-yr
Ground
Bank Sta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7196
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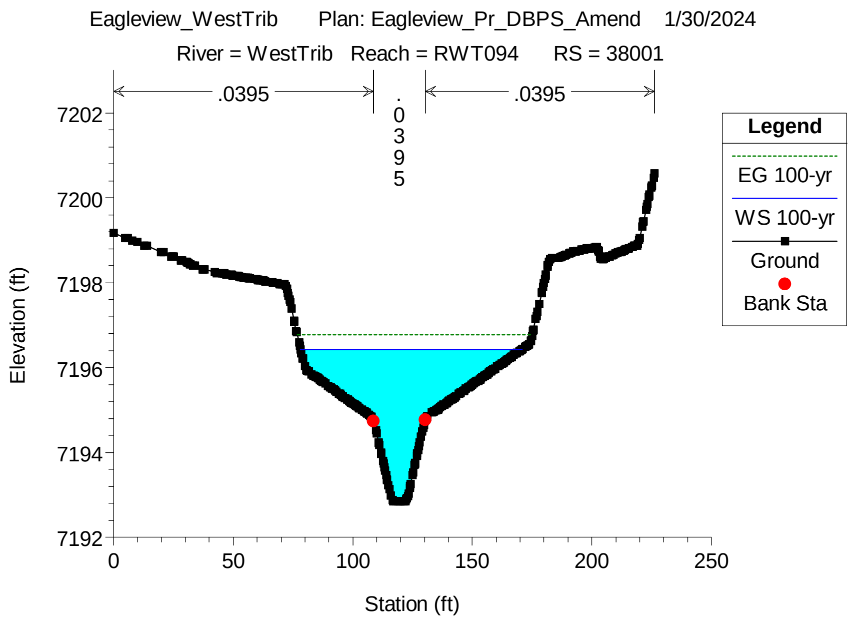
Station (ft)
Legend
EG 100-yr
WS 100-yr
Ground
Bank Sta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EG 100-yr
WS 100-yr
Ground
Bank Sta
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200
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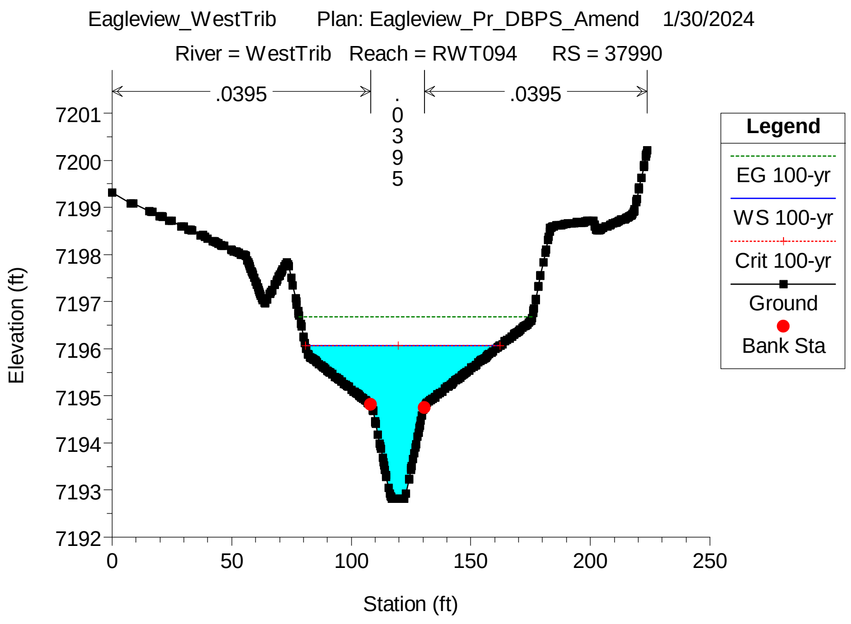
Station (ft)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WS 100-yr
Crit 100-yr
Ground
Bank Sta
Elevation (ft)
7201
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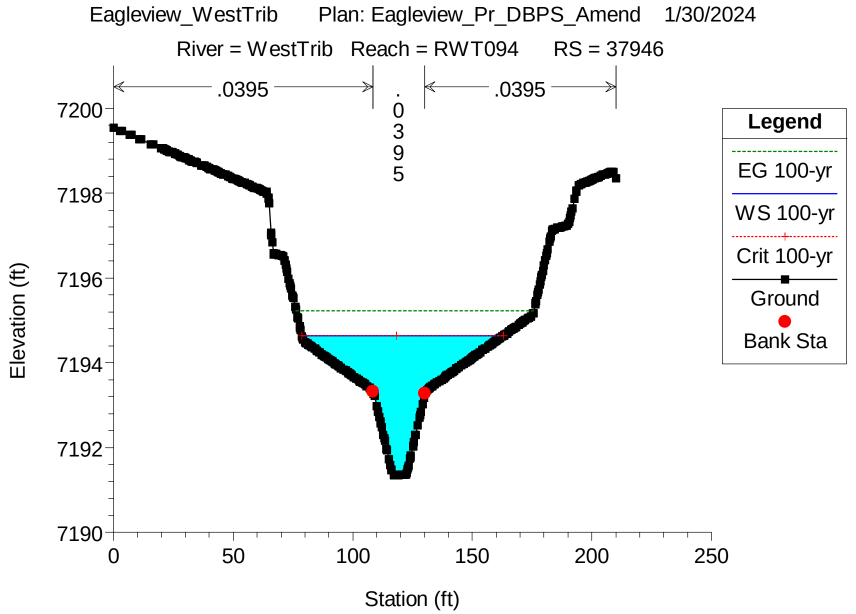
Station (ft)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Crit 100-yr
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Bank Sta
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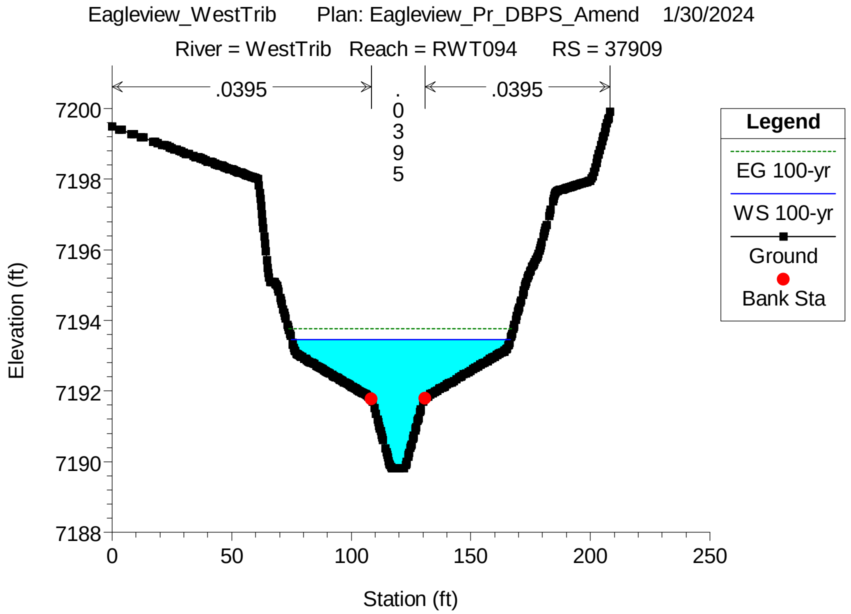
Station (ft)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WS 100-yr
Ground
Bank Sta
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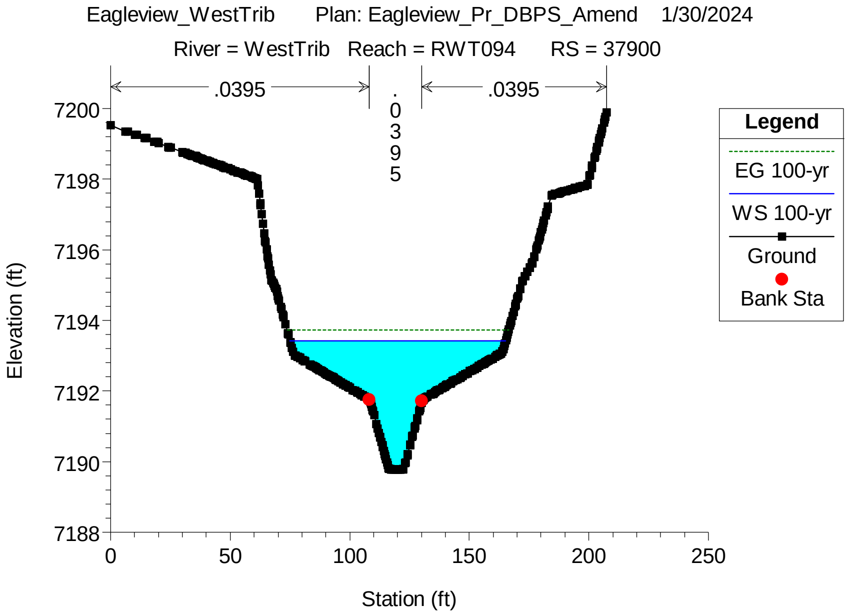
Station (ft)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WS 100-yr
Ground
Bank Sta
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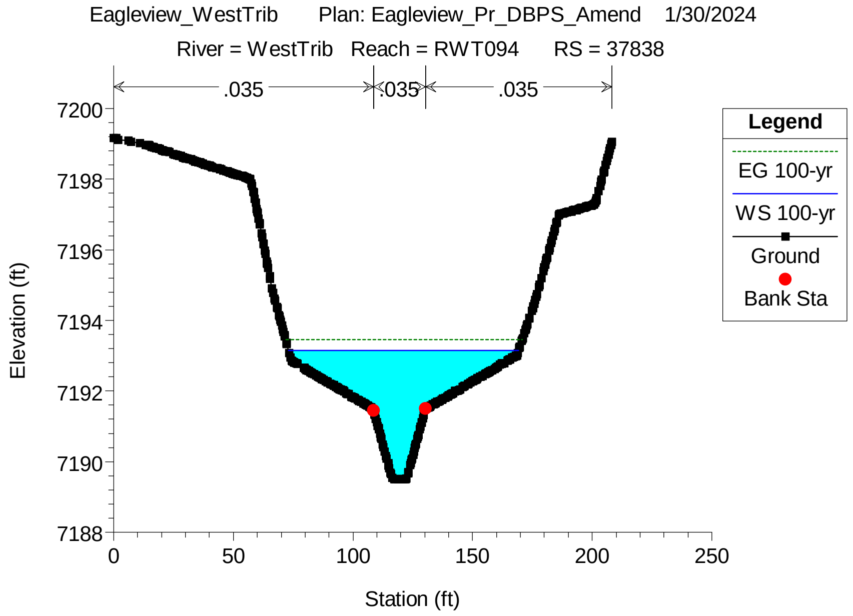
Station (ft)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Ground
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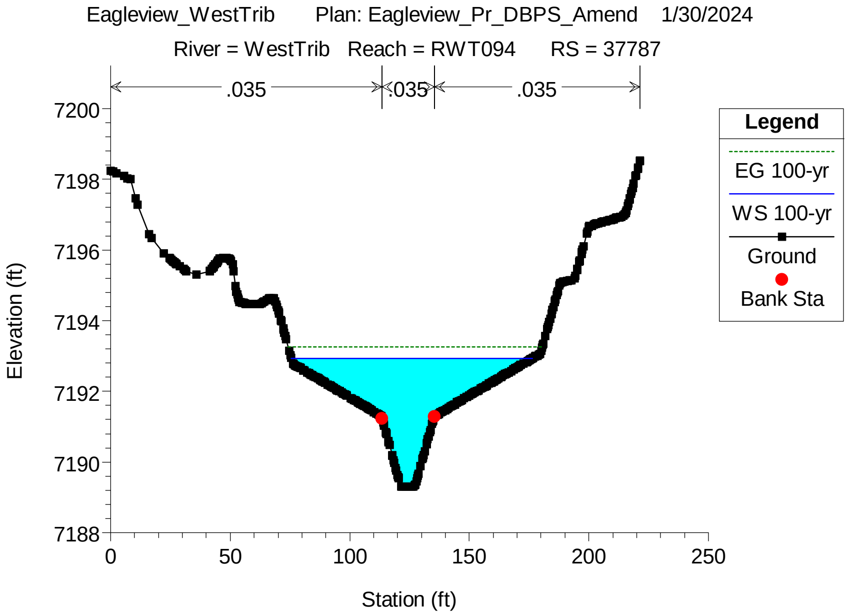
Station (ft)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Ground
Bank Sta
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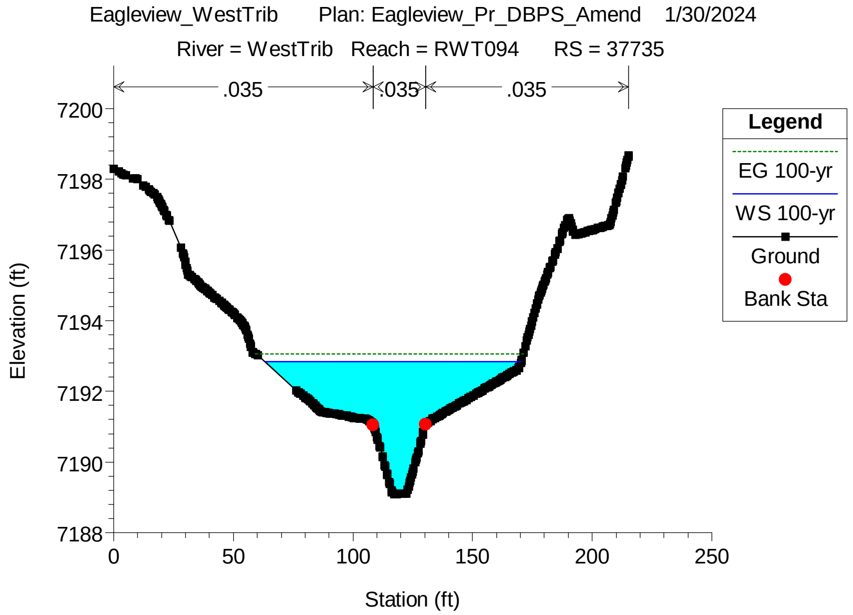
Station (ft)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WS 100-yr
Ground
Bank Sta
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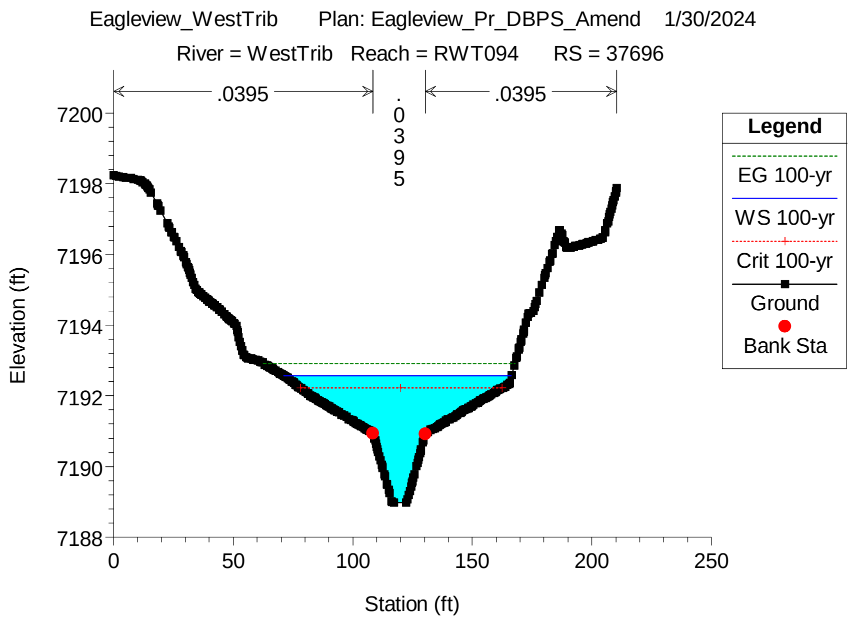
250
Station (ft)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.0395
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7192
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Station (ft)
Legend
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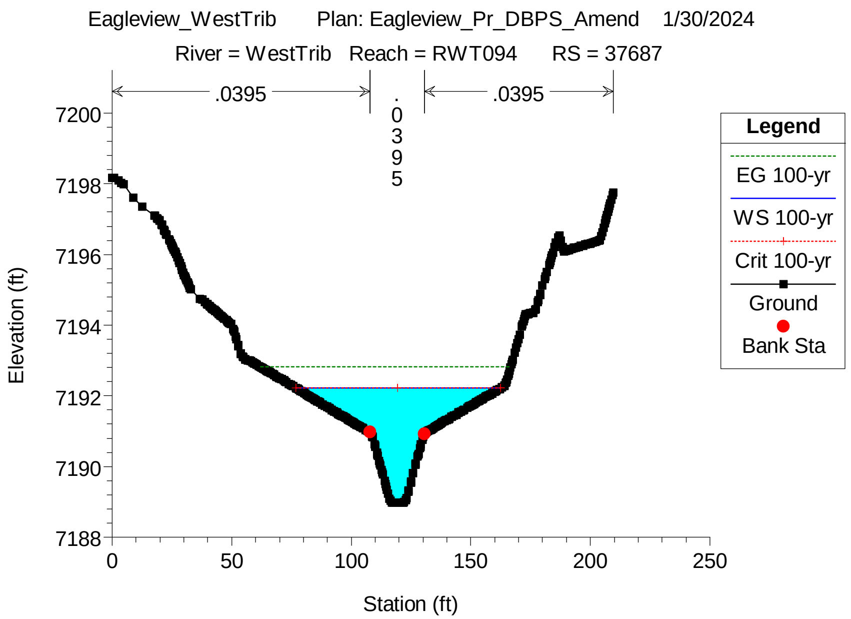
WS 100-yr
Crit 100-yr
Ground
Bank Sta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7198
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7192
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Legend
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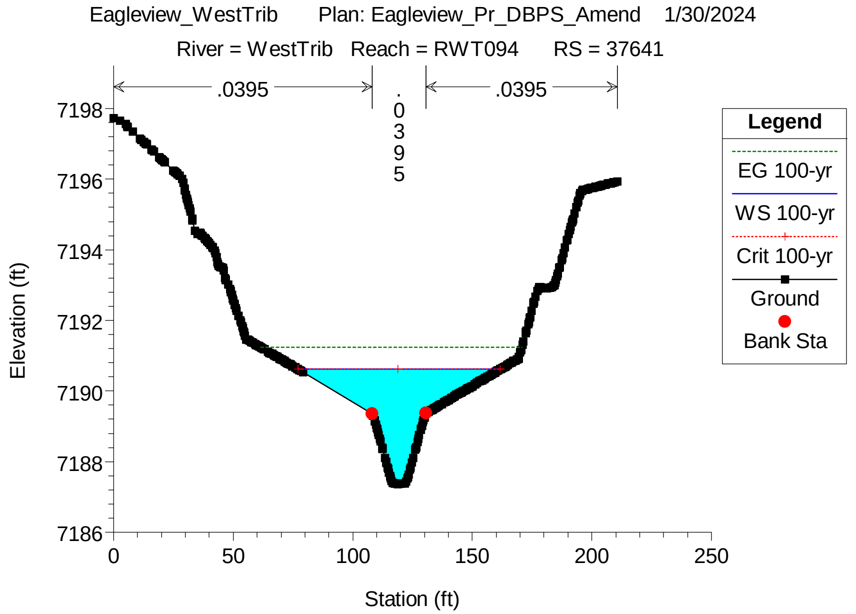
WS 100-yr
Crit 100-yr
Ground
Bank Sta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7196
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7192
7190
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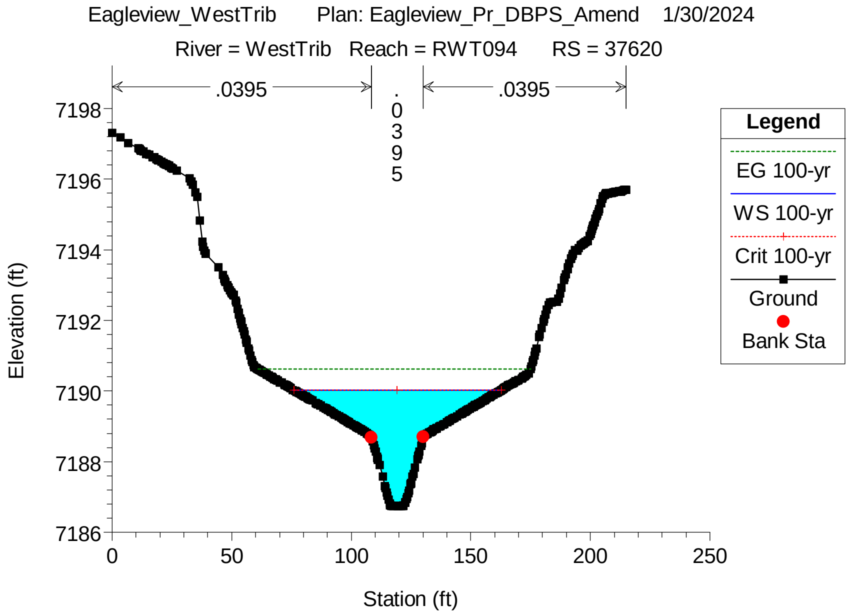
WS 100-yr
Crit 100-yr
Ground
Bank Sta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.0395
.0395
Elevation (ft)
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Station (ft)
Legend
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WS 100-yr
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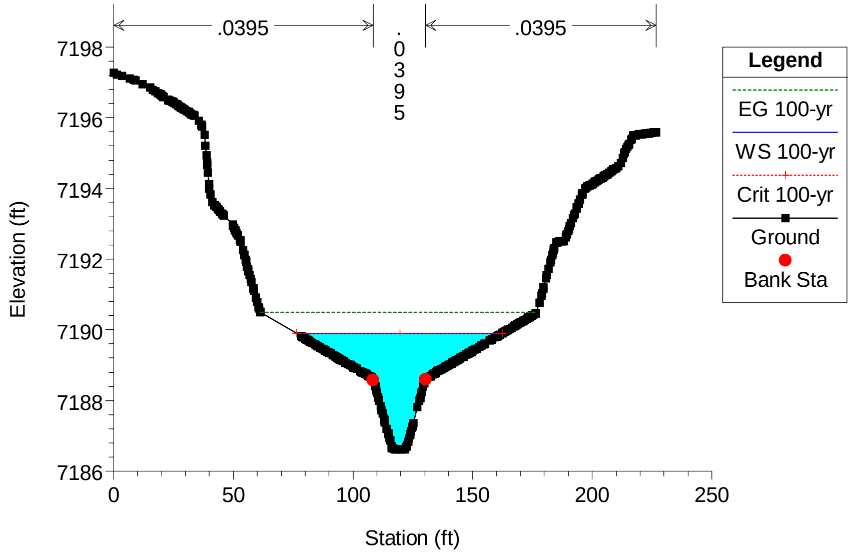
Bank Sta

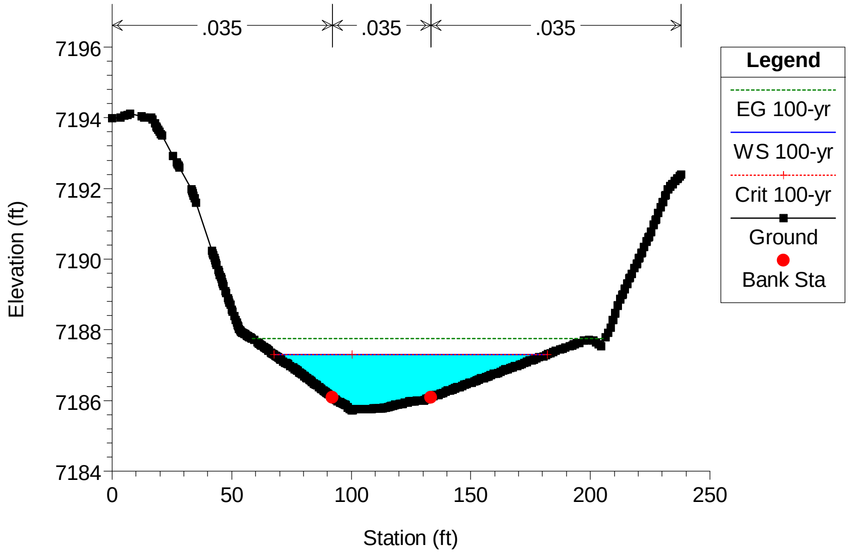
Eagleview_WestTrib Plan: Eagleview_Pr_DBPS_Amend 1/30/2024

River = WestTrib Reach = RWT094 RS = 37609



Eagleview_WestTrib Plan: Eagleview_Pr_DBPS_Amend 1/30/2024

River = WestTrib Reach = RWT094 RS = 37477



Eagleview_WestTrib Plan: Eagleview_Pr_DBPS_Amend 1/30/2024

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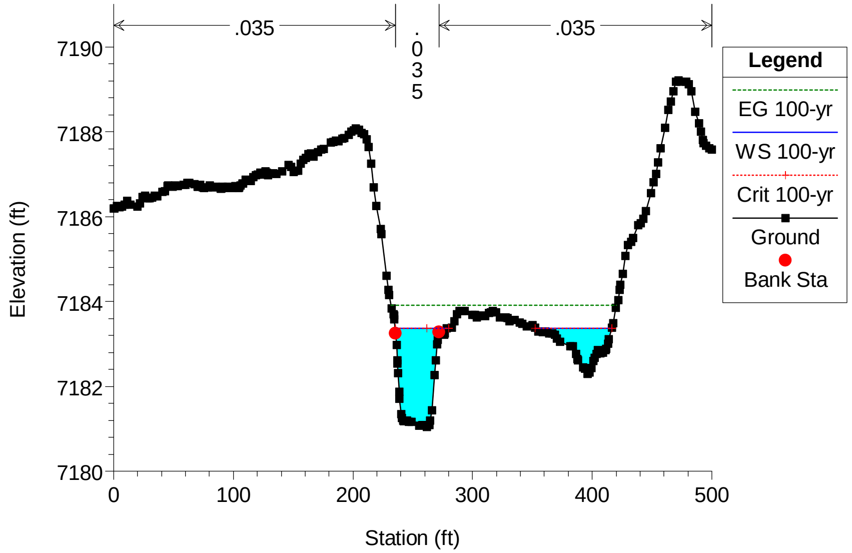

APPENDIX D: REFERENCES

Preliminary Drainage Report

Eagleview Subdivision
El Paso County, Colorado

Prepared for:
Joe DesJardin
PT Eagleview LLC
1864 Woodmoor Drive, Suite 100
Monument, CO 80132

Prepared by:
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Colorado Springs, Colorado 80903
(719) 453-0180
Contact: Brice Hammersland, P.E.

Project #: 196288000

PCD Filing No.: SP216

Prepared: October 28, 2022

is there a purpose to providing the preliminary drainage report?

Kimley»Horn

CERTIFICATION

DESIGN 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 master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparation of this report.

SIGNATURE (Affix Seal): ______________________ 10/28/2022
Brice Hammersland, P.E.
Colorado P.E. No. 56012
Date

56012
10/28/2022

OWNER/DEVELOPER'S STATEMENT

I, the developer, have read and will comply with all of the requirements specified in this Drainage Report and Plan.

____
PT Eagleview LLC

✓ Joseph W. DesJardin 10/28/2022
____
Authorized Signature Date

____
Joseph W. DesJardin

____
Director of Entitlements

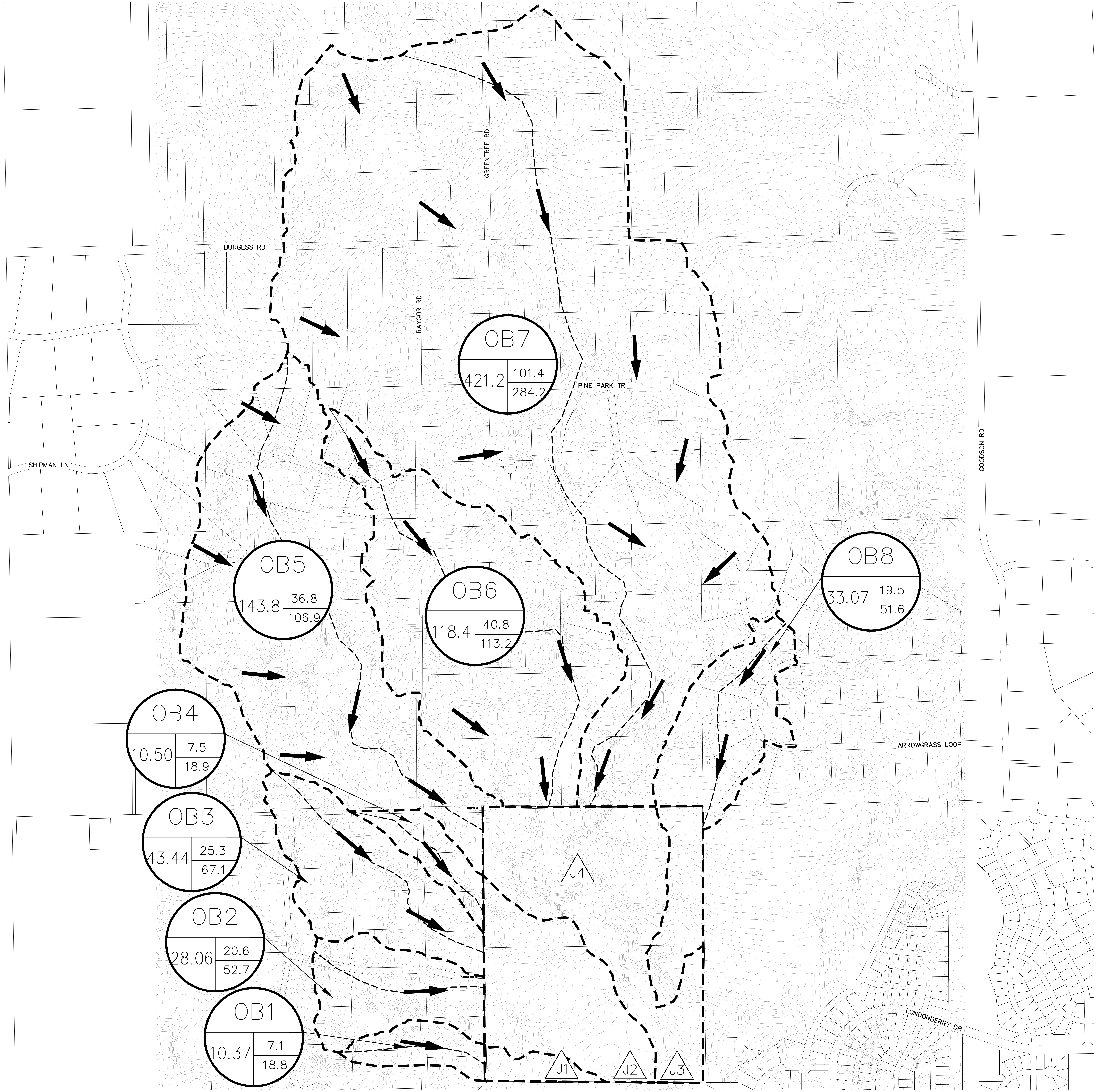
____
Address:
1864 Woodmoor Drive
Monument, CO 80132

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.

______________________ ______________________
Josh Palmer, P.E. Date
County Engineer/ ECM Administrator

Conditions:

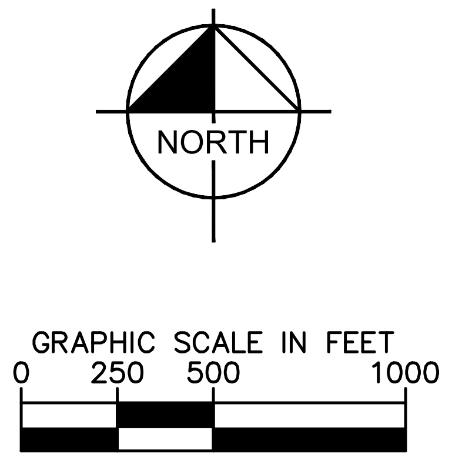

OB7
421.2
101.4
284.2
OB5
143.8
36.8
106.9
OB6
118.4
40.8
113.2
OB8
33.07
19.5
51.6
OB4
10.50
7.5
18.9
OB3
43.44
25.3
67.1
OB2
28.06
20.6
52.7
OB1
10.37
7.1
18.8
J1
J2
J3
J4
BURGESS RD
RAYGOR RD
GREENTREE RD
PINE PARK TR
SHIPMAN LN
GOODSON RD
ARROWGRASS LOOP
LONDONDERRY DR

LEGEND

- DRAINAGE BASIN AREAS
- A – HEC–HMS BASINS
- B – BASIN ACREAGE
- C – 5–YR RUNOFF
- D – 100–YR RUNOFF
- E0 DESIGN POINT
- EXISTING CONTOURS
- PROPERTY BOUNDARY
- FLOW ARROW
- FLOW PATH
- PARCEL LINE

HEC-HMS - EXISTING RUNOFF TABLE

DESIGN POINT	BASIN DESIGNATION	BASIN AREA (ACRES)	DIRECT 5-YR RUNOFF (CFS)	DIRECT 100-YR RUNOFF (CFS)	CUMULATIVE DIRECT 5-YR RUNOFF (CFS)	CUMULATIVE DIRECT 100-YR RUNOFF (CFS)
	B1	5.55	3.0	8.5	-	-
J1	OB1	10.37	7.1	18.8	10.1	27.3
	B2	41.43	15.4	48.5	-	-
	OB2	28.06	20.6	52.7	-	-
	OB3	43.44	25.3	67.1	-	-
J2	OB4	10.50	7.5	18.9	67.5	183.8
	OB5	143.82	36.8	106.9	-	-
	OB6	118.40	40.8	113.2	-	-
J4	OB7	421.43	101.4	284.2	169.2	478.0
	B3	59.54	36.4	110.0	-	-
	B4	14.68	5.4	18.2	-	-
J3	OB8	33.07	19.5	51.6	183.1	515.5


NORTH
GRAPHIC SCALE IN FEET
0
250
500
1000

NO.	REVISION	BY	DATE	APPR.

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2 North Nevada Avenue Suite 300
Colorado Springs, Colorado 80903 (719) 453–0180

DESIGNED BY: MK
DRAWN BY: RS
CHECKED BY: KK
DATE: 04/08/2022

EAGLEVIEW
EL PASO COUNTY, COLORADO
PRE DEVELOPMENT DRAINAGE MAP

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Kimley»Horn
Kimley-Horn and Associates, Inc.

PROJECT NO.
196288000

SHEET
1

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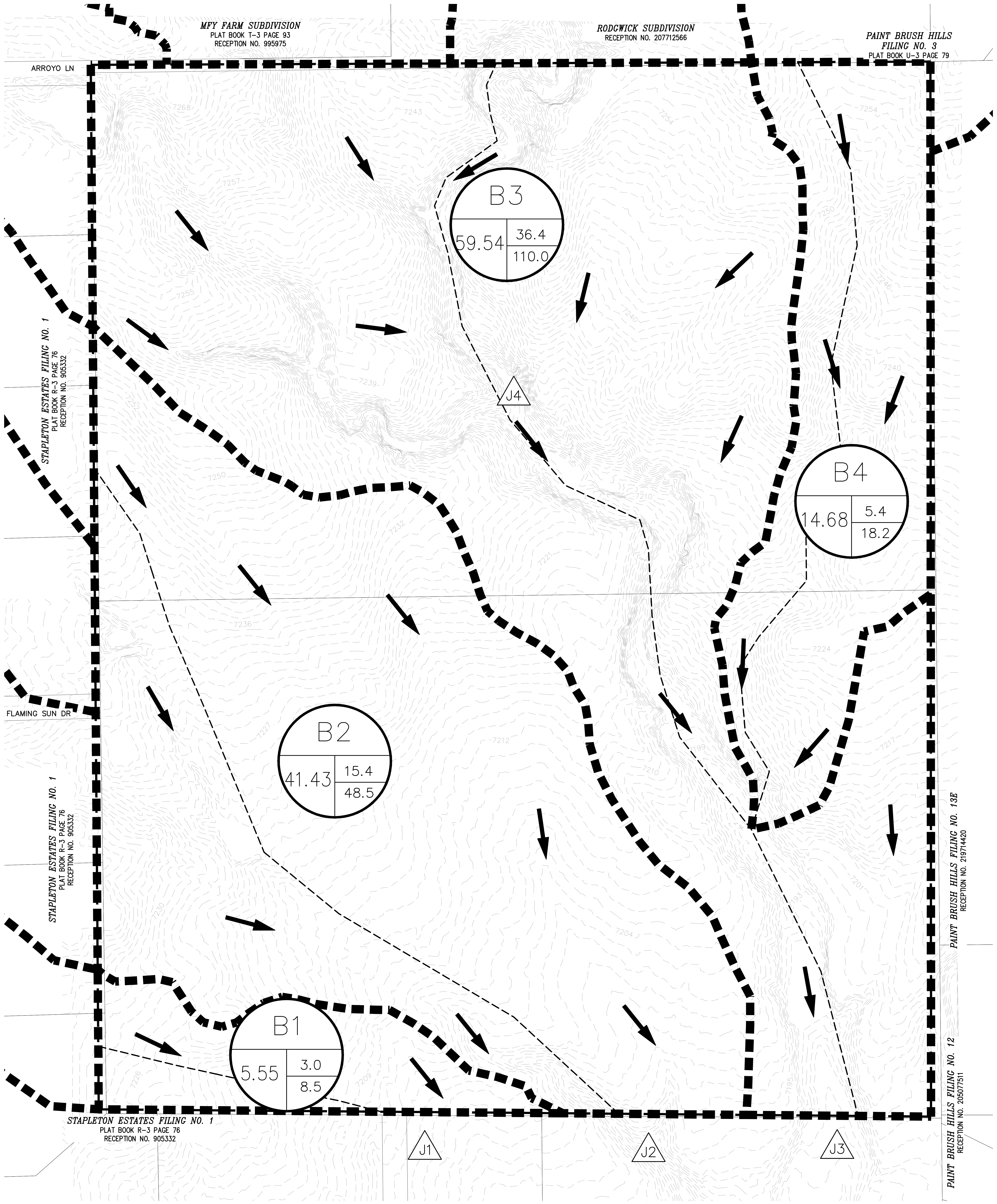
MFY FARM SUBDIVISION
PLAT BOOK T-3 PAGE 93
RECEPTION NO. 995975
RODGWICK SUBDIVISION
RECEPTION NO. 207712566
PAINT BRUSH HILLS
FILING NO. 3
PLAT BOOK U-3 PAGE 79
ARROYO LN
STAPLETON ESTATES FILING NO. 1
PLAT BOOK R-3 PAGE 76
RECEPTION NO. 905332
FLAMING SUN DR
STAPLETON ESTATES FILING NO. 1
PLAT BOOK R-3 PAGE 76
RECEPTION NO. 905332
PAINT BRUSH HILLS FILING NO. 13E
RECEPTION NO. 219714420
PAINT BRUSH HILLS FILING NO. 12
RECEPTION NO. 205077511
STAPLETON ESTATES FILING NO. 1
PLAT BOOK R-3 PAGE 76
RECEPTION NO. 905332
B3
59.54
36.4
110.0
J4
B4
14.68
5.4
18.2
B2
41.43
15.4
48.5
B1
5.55
3.0
8.5
J1
J2
J3

LEGEND

DRAINAGE BASIN AREAS

A – HEC–HMS BASINS
B – BASIN ACREAGE
C – 5–YR RUNOFF
D – 100–YR RUNOFF

E0 DESIGN POINT

EXISTING CONTOURS

PROPERTY BOUNDARY

FLOW ARROW

FLOW PATH

HEC-HMS - EXISTING RUNOFF TABLE

DESIGN POINT	BASIN DESIGNATION	BASIN AREA (ACRES)	DIRECT 5-YR RUNOFF (CFS)	DIRECT 100-YR RUNOFF (CFS)	CUMULATIVE DIRECT 5-YR RUNOFF (CFS)	CUMULATIVE DIRECT 100-YR RUNOFF (CFS)
	B1	5.55	3.0	8.5	-	-
J1	OB1	10.37	7.1	18.8	10.1	27.3
	B2	41.43	15.4	48.5	-	-
	OB2	28.06	20.6	52.7	-	-
	OB3	43.44	25.3	67.1	-	-
J2	OB4	10.50	7.5	18.9	67.5	183.8
	OB5	143.82	36.8	106.9	-	-
	OB6	118.40	40.8	113.2	-	-
J4	OB7	421.43	101.4	284.2	169.2	478.0
	B3	59.54	36.4	110.0	-	-
	B4	14.68	5.4	18.2	-	-
J3	OB8	33.07	19.5	51.6	183.1	515.5

NORTH

GRAPHIC SCALE IN FEET
0 75 150 300

NO. REVISION BY DATE APPR.

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EAGLEVIEW
EL PASO COUNTY, COLORADO
PRE DEVELOPMENT DRAINAGE MAP

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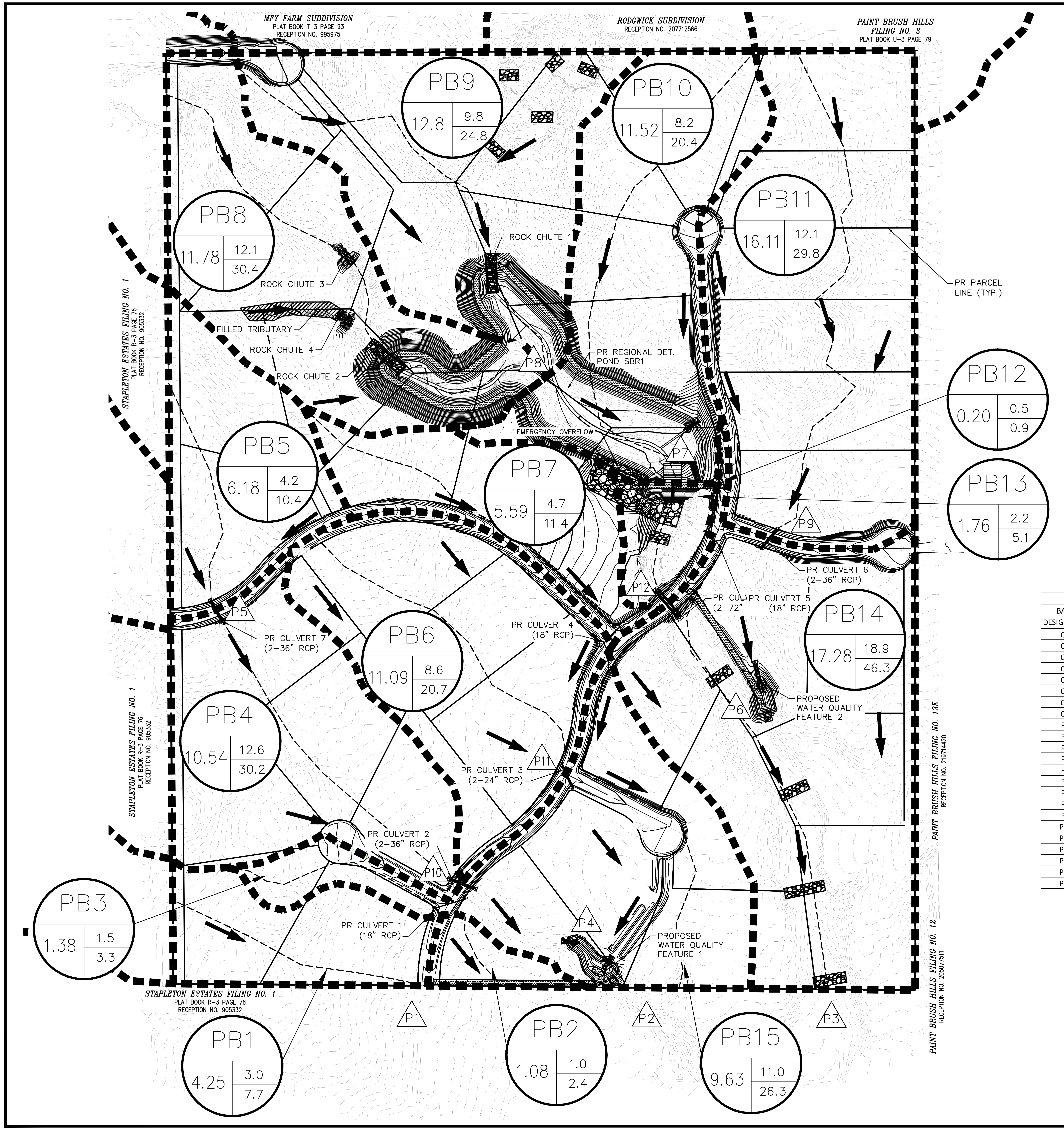

MFY FARM SUBDIVISION
PLAT BOOK T-3 PAGE 93
RECEPTION NO. 995975
RODGWICK SUBDIVISION
RECEPTION NO. 207712566
PAINT BRUSH HILLS FILING NO. 3
PLAT BOOK U-3 PAGE 79
PB9 12.8 9.8 24.8
PB10 11.52 8.2 20.4
PB11 16.11 12.1 29.8
PB8 11.78 12.1 30.4
PB12 0.20 0.5 0.9
PB13 1.76 2.2 5.1
PB5 6.18 4.2 10.4
PB7 5.59 4.7 11.4
PB6 11.09 8.6 20.7
PB14 17.28 18.9 46.3
PB4 10.54 12.6 30.2
PB3 1.38 1.5 3.3
PB1 4.25 3.0 7.7
PB2 1.08 1.0 2.4
PB15 9.63 11.0 26.3
ROCK CHUTE 1
ROCK CHUTE 2
ROCK CHUTE 3
ROCK CHUTE 4
FILLED TRIBUTARY
PR REGIONAL DET. POND SBR1
EMERGENCY OVERFLOW
PR PARCEL LINE (TYP.)
P1
P2
P3
P4
P5
P6
P7
P8
P9
P10
P11
P12
PR CULVERT 1 (18" RCP)
PR CULVERT 2 (2-36" RCP)
PR CULVERT 3 (2-24" RCP)
PR CULVERT 4 (18" RCP)
PR CULVERT 5 (18" RCP)
PR CULVERT 6 (2-36" RCP)
PR CULVERT 7 (2-36" RCP)
PR CULVERT 8 (2-72" RCP)
PROPOSED WATER QUALITY FEATURE 1
PROPOSED WATER QUALITY FEATURE 2
STAPLETON ESTATES FILING NO. 1
PLAT BOOK R-3 PAGE 76
RECEPTION NO. 905332
STAPLETON ESTATES FILING NO. 1
PLAT BOOK R-3 PAGE 76
RECEPTION NO. 905332
STAPLETON ESTATES FILING NO. 1
PLAT BOOK R-3 PAGE 76
RECEPTION NO. 905332
PAINT BRUSH HILLS FILING NO. 13E
RECEPTION NO. 219714420
PAINT BRUSH HILLS FILING NO. 12
RECEPTION NO. 205077511

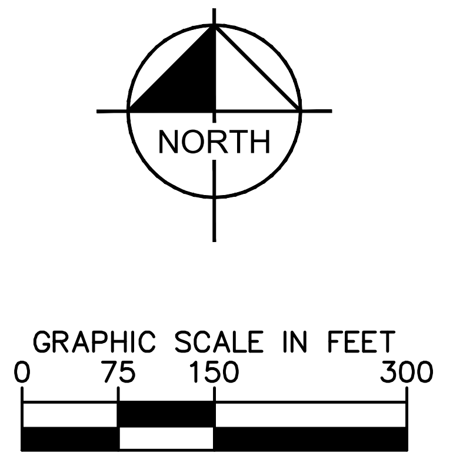
LEGEND

- DRAINAGE BASIN AREAS
- A – HEC-HMS BASINS
- B – BASIN ACREAGE
- C – 5-YR RUNOFF
- D – 100-YR RUNOFF
- E0 DESIGN POINT
- EXISTING CONTOURS
- PROPOSED CONTOURS
- PROPERTY BOUNDARY
- FLOW ARROW
- FLOW PATH
- DROP STRUCTURE

HEC-HMS - DEVELOPED RUNOFF BASIN TABLE			
BASIN DESIGNATION	BASIN AREA (ACRES)	DIRECT 5-YR RUNOFF (CFS)	DIRECT 100-YR RUNOFF (CFS)
OB1	10.37	7.1	18.8
OB2	28.06	20.6	52.7
OB3	43.44	25.3	67.1
OB4	10.50	7.5	18.9
OB5	143.82	36.8	106.9
OB6	118.40	42.1	114.9
OB7	421.43	101.4	284.3
OB8	33.07	19.0	51.0
PB1	4.25	3.0	7.7
PB2	1.08	1.0	2.4
PB3	1.38	1.5	3.3
PB4	10.54	12.6	30.2
PB5	6.18	4.2	10.4
PB6	11.09	8.6	20.7
PB7	5.59	4.7	11.4
PB8	11.78	12.1	30.4
PB9	12.80	9.8	24.8
PB10	11.52	8.2	20.4
PB11	16.11	12.1	29.8
PB12	0.20	0.5	0.9
PB13	1.76	2.2	5.1
PB14	17.28	18.9	46.3
PB15	9.63	11.0	26.3

HEC-HMS - DEVELOPED RUNOFF DESIGN POINT TABLE				
DESIGN POINT	TRIBUTARY BASINS	TRIBUTARY AREA (ACRES)	CUMULATIVE 5-YR FLOW (CFS)	CUMULATIVE 100-YR FLOW (CFS)
P1	OB1, PB1	14.62	10.1	26.4
P2	OB2, OB3, OB4, PB3, PB4, PB5, PB6, PB7, PB15	126.42	74.1	189.1
P3	OB5, OB6, OB7, OB8, PB8, PB9, PB10, PB11, PB12, PB13, PB14	787.97	131.8	437.7
P4	OB2, OB3, OB4, PB3, PB4, PB5, PB6, PB7	116.79	72.2	184.6
P5 (CULVERT 7)	OB3, OB4, PB5	60.12	36.8	95.9
P6	OB8, PB11, PB12	49.38	29.9	78.5
P7 (POND SR1)	OB5, OB6, OB7, PB8, PB9, PB10	719.49	131.7	420.1
P8	OB5, OB6, OB7, PB8, PB9, PB10	707.97	173.4	486.7
P9 (CULVERT 6)	OB8, PB11	49.18	29.8	78.4
P10 (CULVERT 2)	OB2, OB3, OB4, PB4, PB5	98.72	57.9	150.1
P11 (CULVERT 3)	PB6, PB7	16.68	13.2	31.9
P12 (CULVERT 8)	OB5, OB6, OB7, PB8, PB9, PB10, PB13	721.28	137.9	420.3

NOTES:
1. LOCATION OF DROP STRUCTURES IS APPROXIMATE AND WILL BE FINALIZED IN THE FINAL DRAINAGE REPORT.


NORTH
GRAPHIC SCALE IN FEET
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75
150
300

NO.	REVISION	BY	DATE	APPR.

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Colorado Springs, Colorado 80903 (719) 453-0180

DESIGNED BY: MK
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DATE: 04/08/2022

EAGLEVIEW
EL PASO COUNTY, COLORADO
POST DEVELOPMENT DRAINAGE MAP

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PROJECT NO.
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SHEET
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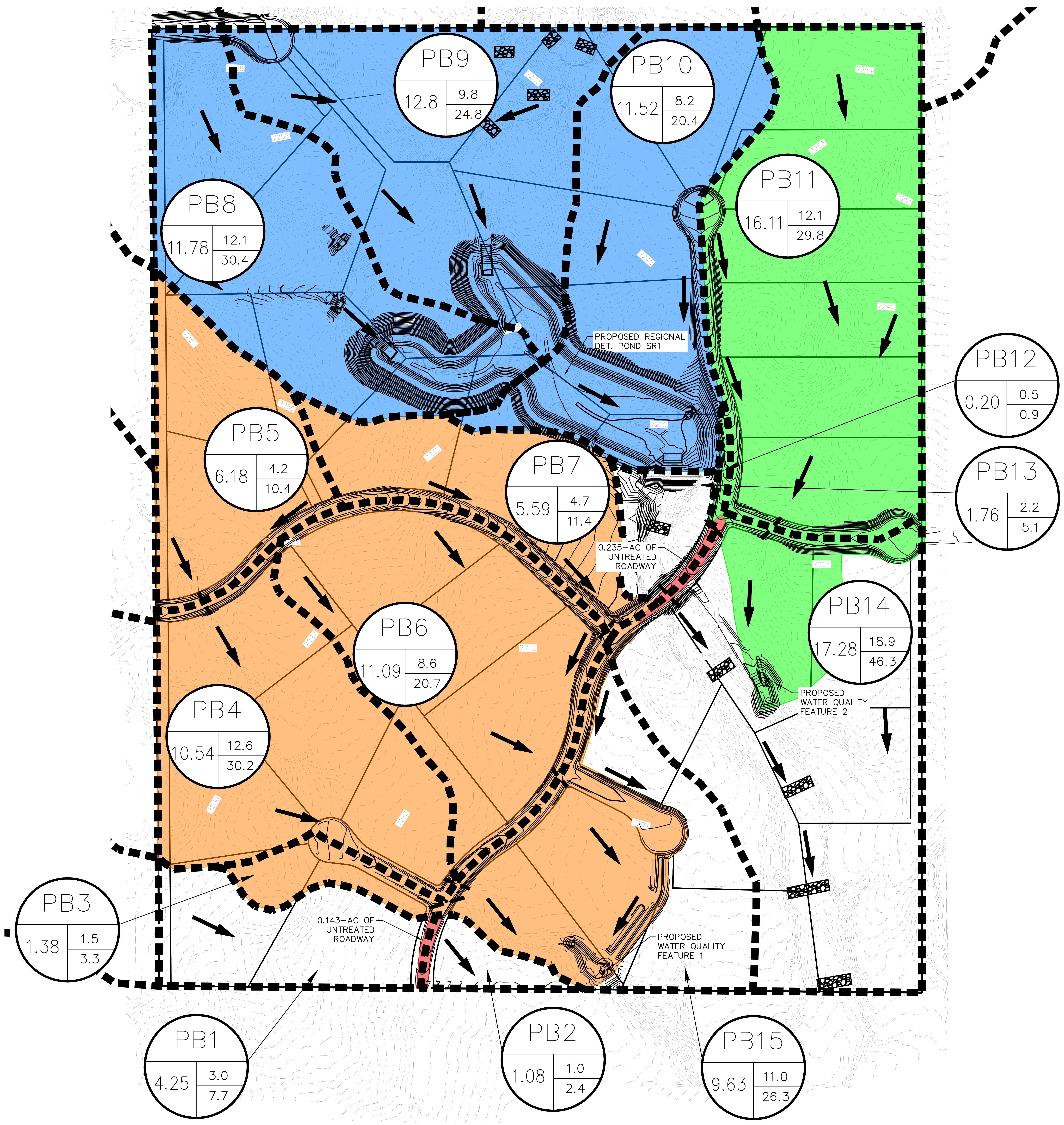
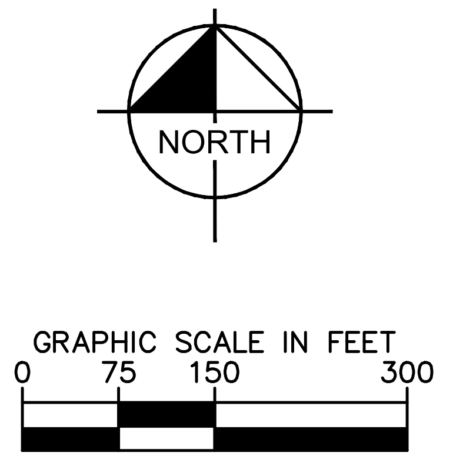

PB9
12.8
9.8
24.8
PB10
11.52
8.2
20.4
PB8
11.78
12.1
30.4
PB11
16.11
12.1
29.8
PROPOSED REGIONAL DET. POND SR1
PB12
0.20
0.5
0.9
PB5
6.18
4.2
10.4
PB7
5.59
4.7
11.4
PB13
1.76
2.2
5.1
0.235-AC OF UNTREATED ROADWAY
PB14
17.28
18.9
46.3
PB6
11.09
8.6
20.7
PROPOSED WATER QUALITY FEATURE 2
PB4
10.54
12.6
30.2
PB3
1.38
1.5
3.3
0.143-AC OF UNTREATED ROADWAY
PROPOSED WATER QUALITY FEATURE 1
PB1
4.25
3.0
7.7
PB2
1.08
1.0
2.4
PB15
9.63
11.0
26.3

LEGEND

- DRAINAGE BASIN AREAS
- A – HEC-HMS BASINS
- B – BASIN ACREAGE
- C – 5-YR RUNOFF
- D – 100-YR RUNOFF
- EXISTING CONTOURS
- PROPOSED CONTOURS
- PROPERTY BOUNDARY
- FLOW ARROW
- FLOW PATH
- 🟦 AREA TRIBUTARY TO SR1
- 🟧 AREA TRIBUTARY TO WQF1
- 🟩 AREA TRIBUTARY TO WQF2
- 🟥 ROADWAY AREA NOT TREATED

NOTES:
1. NON-ROADWAY AREAS NOT TREATED BY A PBMP ARE EXCLUDED BASED ON ECM APP I.7.1.B.5.
2. ROADWAY AREA NOT TREATED BY A PBMP TOTALS 0.39 ACRES AND IS EXCLUDED BASED ON ECM APP I.7.1.C.1.


NORTH
GRAPHIC SCALE IN FEET
0
75
150
300

NO.	REVISION	BY	DATE	APPR.

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DATE: 04/08/2022

EAGLEVIEW
EL PASO COUNTY, COLORADO
OVERVIEW MAP - PBMP TRIBUTARY AREAS

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SHEET
4

I.7. - POST-CONSTRUCTION STORMWATER MANAGEMENT

I.7.1. Post-Construction Stormwater Management Planning

[Replaces DCM2 Section 4.1, pages 4-1 through "Other BMPs" continued on 4-5]

A. **Overview.** This chapter contains requirements and procedures for the selection, installation, implementation and maintenance of permanent stormwater quality control measures that will remain in operation after construction for new development and significant redevelopment. All applicable development sites must have operational permanent stormwater quality control measures at the completion of the site, unless excluded from the requirements of an applicable development site as described in Section I.7.1.C. All permanent control measures for applicable development sites shall meet one of the "base design standards" described in Section 1.71.D.

In the case where permanent water quality control measures are part of future phasing, the permittee must have a mechanism to ensure that all control measures will be implemented, regardless of completion of future phases or site ownership. In such cases, temporary water quality control measures must be implemented as feasible and maintained until removed or modified. All temporary water quality control measure must meet one of the "base design standards" described in Section I.7.1.D.

A procedure is provided within the context of a flow chart and a four-step process that shall be followed for all applicable development sites. Detailed descriptions, sizing and design criteria, and design procedures for control measures are provided in the New Development BMP Factsheets found in Section 4.2 of the DCMV2.

It is recommended that discussions and collaboration regarding proposed BMPs occur early in each project between the developer's planner and engineer, County Stormwater and County Planning and Community Development staff.

The analysis of the requirements, exclusions and base design standards presented in this Section I.7 shall be incorporated into existing ECM Administrator submittals for review and acceptance including Preliminary/Final Drainage Reports and construction plans, or as otherwise specified by the ECM Administrator.

B. **Applicable Development Sites: Excluded Sites.** The following types of sites and associated land disturbances are excluded from the requirements of this Section 1.7. Although a site may qualify for an exclusion to Section 1.7 below, the site may still be considered an applicable construction activity subject to the requirements of an ESQCP or BESQCP.

1. **Pavement Management Sites.** Sites, or portions of sites, for the rehabilitation, maintenance, and reconstruction of roadway pavement, which includes roadway resurfacing, mill and overlay, white topping, black topping, curb and gutter replacement, concrete panel replacement, and pothole repair. The purpose of the site must be to provide additional years of service life and optimize service and safety. The site also must be limited to the repair and replacement of pavement in a manner that does not result in an increased impervious area, and the infrastructure must not substantially change. The types of sites covered under this exclusion include day-to-day maintenance activities, rehabilitation, and reconstruction of pavement. "Roadways" include roads and bridges that are improved, designed or ordinarily used for vehicular travel and contiguous areas or that are improved, designed or ordinarily used for pedestrian or bicycle traffic, drainage for the roadway, and/or parking along the roadway. Areas primarily used for parking or access to parking are not roadways.

2. **Excluded Roadway Redevelopment.** Redevelopment sites for existing roadways, when 1 of the following cri
    1) The site adds less than 1 acre of paved area per mile of roadway to an existing roadway, or
    2) The site does not add more than 8.25 feet of paved width at any location to the existing roadway.
3. **Excluded Existing Roadway Areas.** For redevelopment sites for existing roadways, only the area of the existing roadway is excluded from the requirements of an applicable development site when the site does not increase the width by 2 times or more, on average, of the original roadway area. The entire site is not excluded from being considered an applicable development site for this exclusion. The area of the site that is part of the added new roadway area is still an applicable development site.
4. **Aboveground and Underground Utilities.** Activities for installation or maintenance of underground utilities or infrastructure that does not permanently alter the terrain, ground cover, or drainage patterns from those present prior to the construction activity. This exclusion includes, but is not limited to, activities to install, replace, or maintain utilities under roadways or other paved areas that return the surface to the same condition.
5. **Large Lot Single Family Sites.** A single-family residential lot, or agricultural zoned lands, greater than or equal to 2.5 acres in size per dwelling and having a total lot impervious area of less than 10 percent. A total lot imperviousness greater than 10 percent is allowed when a study specific to the watershed and/or MS4 shows that expected soil and vegetation conditions are suitable for infiltration/filtration of the WQCV for a typical site, and the permittee accepts such study as applicable within its MS4 boundaries. The maximum total lot impervious covered under this exclusion shall be 20 percent.
6. **Non-Residential and Non-Commercial Infiltration Conditions.** This exclusion does not apply to residential or commercial sites for buildings. This exclusion applies to applicable development sites for which post-development surface conditions do not result in concentrated stormwater flow during the 80th percentile stormwater runoff event. In addition, post-development surface conditions must not be projected to result in a surface water discharge from the 80th percentile stormwater runoff events. Specifically, the 80th percentile event must be infiltrated and not discharged as concentrated flow. For this exclusion to apply, a study specific to the site, watershed and/or MS4 must be conducted. The study must show rainfall and soil conditions present within the project area, must include allowable slopes, surface conditions, and ratios of impervious area to pervious area, and the County must accept such study as applicable within its MS4 boundaries.
7. **Sites with Land Disturbance to Undeveloped Land that will Remain Undeveloped.** Sites with land disturbance to undeveloped land (land with no human-made structures such as buildings or pavement) that will remain undeveloped after the site. Typical examples of this type of site are trails, parks and open space without structures.
8. **Stream Stabilization Sites.** Construction activity that is solely for the purpose of stream stabilization.
9. **Trails.** Bike and pedestrian trails. Bike lanes for roadways are not included in this exclusion, unless attached to a roadway that qualifies under another exclusion in this section.
10. **Oil and Gas Exploration.** Facilities associated with oil and gas exploration, production, processing, or treatment operations, or transmission facilities, including activities necessary to prepare a site for drilling and for the movement and placement of drilling equipment, whether or not such field activities or operations may be considered to be an applicable construction activity.
11. **County Growth Areas.** The County may exclude the following when they occur within the county growth areas:

   a. Agricultural facilities and structures on agricultural zoned lands (e.g., barn, stables).
   b. Residential development site or larger common plans of development for which associated construction activities results in a land disturbance of less than or equal to 10 acres and have a proposed density of less than 1,000 people per square mile.
   c. Commercial or industrial development site or larger common plans of development for which associated construction activities results in a land disturbance of less than or equal to 10 acres.

C. **Base Design Standard Requirements.** The "base design standard" is the minimum design standard for new and redevelopment before applying any exclusions or alternative standards. The control measures for applicable development sites shall meet one of the following base design standards:

1. **Water Quality Capture Volume (WQCV) Standard.** The control measures is designed to provide treatment and/or infiltration of the WQCV and:
   a. 100% of the applicable development site is captured, except the County may exclude up to 20 percent, not to exceed 1 acre, of the applicable development site area when the County has determined that it is not practicable to capture runoff from portions of the site that will not drain towards control measures. In addition, the County must also determine that the implementation of a separate control measure for that portion of the site is not practicable (e.g., driveway access that drains directly to street).
   b. Evaluation of the minimum drain time shall be based on the pollutant removal mechanism and functionality of the control measure implemented. Consideration of drain time shall include maintaining vegetation necessary for operation of the control measure (e.g., wetland vegetation).
2. **Pollutant Removal Standard.** The control measures is designed to treat at a minimum the 80th percentile storm event. The control measures shall be designed to treat stormwater runoff in a manner expected to reduce the event mean concentration of total suspended solids (TSS) to a median value of 30 mg/L or less.

   100% of the applicable development site must be captured, except the County may exclude up to 20 percent not to exceed 1 acre of the applicable development site area when the County has determined that it is not practicable to capture runoff from portions of the site that will not drain towards control measures. In addition, the County must also determine that the implementation of a separate control measure for that portion of the site is not practicable (e.g., driveway access that drains directly to street).
3. **Runoff Reduction Standard.** The control measures is designed to infiltrate into the ground where site geology permits, evaporate, or evapotranspire a quantity of water equal to 60% of what the calculated WQCV would be if all impervious area for the applicable development site discharged without infiltration. This base design standard can be met through practices such as green infrastructure. "Green infrastructure" generally refers to control measures that use vegetation, soils, and natural processes or mimic natural processes to manage stormwater. Green infrastructure can be used in place of or in addition to low impact development principles.
4. **Applicable Development Site Draining to a Regional WQCV Control Measure.** The regional WQCV control measure must be designed to accept the drainage from the applicable development site. Stormwater from the site must not discharge to a water of the state before being discharged to the regional WQCV control measure. The regional WQCV control measure must meet the requirements of the WQCV in Part I.7.C.1.
5. **Applicable Development Site Draining to a Regional WQCV Facility.** The regional WQCV facility is

designed to accept drainage from the applicable development site. Stormwater from the site may discharge to a water of the state before being discharged to the regional WQCV facility. Before discharging to a water of the state, at least 20 percent of the upstream imperviousness of the applicable development site must be disconnected from the storm drainage system and drain through a receiving pervious area control measure comprising a footprint of at least 10 percent of the upstream disconnected impervious area of the applicable development site. The control measure must be designed in accordance with a design manual identified by the permittee. In addition, the stream channel between the discharge point of the applicable development site and the regional WQCV facility must be stabilized. The regional WQCV facility must meet the following requirements:

a. The regional WQCV facility must be implemented, functional, and maintained following good engineering, hydrologic and pollution control practices.
b. The regional WQCV facility must be designed and maintained for 100% WQCV for its entire drainage area.
c. The regional WQCV facility must have capacity to accommodate the drainage from the applicable development site.
d. The regional WQCV facility must be designed and built to comply with all assumptions for the development activities planned by the County within its drainage area, including the imperviousness of its drainage area and the applicable development site.
e. Evaluation of the minimum drain time shall be based on the pollutant removal mechanism and functionality of the facility. Consideration of drain time shall include maintaining vegetation necessary for operation of the facility (e.g., wetland vegetation).
f. The County shall require site plans and perform a site plan review consistent with the requirements of this ECM to ensure the regional WQCV facility and control measures for the applicable development site plans include:
    i. Design details for all structural control measures implemented to meet the requirements of Part I.E.4.
    ii. A narrative reference for all non-structural control measures for the site, if applicable. "Non-structural control measures" are control measures that are not structural control measures and include, but are not limited to, control measures that prevent or reduce pollutants being introduced to water or that prevent or reduce the generation of runoff or illicit discharges.
    iii. Documentation of operation and maintenance procedures to ensure the long term observation, maintenance, and operation of the control measures. The documentation shall include frequencies for routine inspections and maintenance activities.
    iv. Documentation regarding easements or other legal means for access of the control measure sites for operation, maintenance, and inspection of control measures.
    v. Confirmation that control measures meet the requirements of section I.7.C
    vi. Confirmation that site plans meet the requirements of County's site plan review and approval requirements
g. The regional WQCV facility must be subject to the County's authority consistent with requirements and actions for a Control Measure in accordance with a base design standard.
h. Regional Facilities must be designed and implemented with flood control or water quality as the primary use. Recreational ponds and reservoirs may not be considered Regional Facilities. Water

bodies listed by name in surface water quality classifications and standards regulations (5 CCR 1002-32 through 5 CCR 1002-38) may not be considered regional facilities.

6. **Constrained Redevelopment Sites Design Standard.** The constrained redevelopment sites standard applies to redevelopment sites meeting the following criteria:
   (a) The applicable redevelopment site is for a site that has greater than 75% impervious area, and
   (b) The County must determine that it is not practicable to meet any of the base design standards in section I.7.1.C (1), (2), or (3). The County's determination shall include an evaluation of the applicable redevelopment site's ability to install a control measure without reducing surface area covered with the structures.

   The control measures is designed to meet one of the following:

   (a) Provide treatment of the WQCV for the area captured. The captured area shall be 50% or more of the impervious area of the applicable redevelopment site. Evaluation of the minimum drain time shall be based on the pollutant removal mechanism and functionality of the control measure implemented,
   (b) The control measures is designed to provide for treatment of the 80th percentile storm event. The control measures shall be designed to treat stormwater runoff in a manner expected to reduce the event mean concentration of total suspended solids (TSS) to a median value of 30 mg/L or less.

       A minimum of 50% of the applicable development area including 50% or more of the impervious area of the applicable development area shall drain to the control measures. This standard does not require that 100% of the applicable redevelopment site area be directed to a control measures as long as the overall removal goal is met or exceeded (e.g., providing increased removal for a smaller area), or

   (c) Infiltrate, evaporate, or evapotranspirate, through practices such as green infrastructure, a quantity of water equal to 30% of what the calculated WQCV would be if all impervious area for the applicable redevelopment site discharged without infiltration.

I.7.2. BMP Selection

The selection of appropriate BMPs is based on the characteristics of the site and potential pollutants. The Four-Step Process provides a method of going through the selection process. Figure I.1 and Figure I.2 with annotations covers site-specific issues to be considered in selecting an effective BMP for each site.

A. **Four-Step Process.** The following four-step process is recommended for selecting structural BMPs in newly developing and redeveloping urban areas:

Step 1: Employ Runoff Reduction Practices

To reduce runoff peaks and volumes from urbanizing areas, employ a practice generally termed "minimizing directly connected impervious areas" (MDCIA). The principal behind MDCIA is twofold — to reduce impervious areas and to route runoff from impervious surfaces over grassy areas to slow down runoff and promote infiltration. The benefits are less runoff, less stormwater pollution, and less cost for drainage infrastructure. There are several approaches to reduce the effective imperviousness of a development site:

Reduced Pavement Area

Sometimes, creative site layout can reduce the extent of paved areas including parking, thereby saving on initial capital cost of pavement and then saving on pavement maintenance, repair, and replacement over time.

Porous Pavement

The use of modular block porous pavement or reinforced turf in low-traffic zones such as parking areas and low use service drives such as fire lanes can significantly reduce site imperviousness. This practice may reduce the extent and size of the downstream storm sewers and detention.

Grass Buffers

Draining impervious areas over grass buffers slows down runoff and encourages infiltration, in effect reducing the impact of the impervious area.

Grass Swales

The use of grass swales instead of storm sewers slows down runoff, promotes infiltration, and also reducing effective imperviousness. It also may reduce the size and cost of downstream storm sewers and detention.

Implementing these approaches on a new development site is discussed further in the DCM2 section titled Employing Runoff Reduction Techniques. This section provides a procedure for estimating a reduced imperviousness based on the use of grass buffers and swales. The latter three of the approaches for reducing imperviousness are structural BMPs and are described in detail in Section 4.2 of DCM2 (New Development BMP Factsheets):

- Grass Buffer.
- Grass Swale.
- Modular Block Porous Pavement (or Stabilized-Grass Porous Pavement).

Step 2: Stabilize Drainageways

Drainageway, natural and manmade, erosion can be a major source of sediment and associated constituents, such as phosphorus. Natural drainageways are often subject to bed and bank erosion when urbanizing areas increase the frequency, rate, and volume of runoff. Therefore, drainageways are required to be stabilized. One of three basic methods of stabilization may be selected.

Constructed Grass, Riprap, or Concrete-Lined Channel

These methods of channel stabilization have been in practice for some time. The water quality benefit associated with these channels is the reduction of severe bed and bank erosion that can occur in the absence of a stabilized channel. On the other hand, the hard-lined low flow channels that are often used do not offer much in the way of water quality enhancement or wetland habitat. The use of riprap or concrete lined flood conveyance channels is not recommended, unless hydraulic or physical conditions require such an alternative. Rock lined low-flow channels in many cases may be a better alternative.

Stabilized Natural Channel

> In practice, many natural drainageways in and adjacent to new developments are frequently left in an undisturbed condition. While this may be positive in terms of retaining desirable riparian vegetation and habitat, urban development may cause the channel to become destabilized. When degradation occurs in these drainageways, significant erosion, loss of riparian and aquatic habitat, and elevated levels of sediment and associated pollutants can result. Therefore, it is recommended that some level of stream stabilization always be considered. Small grade control structures sized for a 5-year or larger runoff event are often an effective means of establishing a mild slope for the baseflow channel and arresting stream degradation. Severe bends or cut banks may also need to be stabilized. Such efforts to stabilize a natural waterway also preserve and promote natural riparian vegetation which can provide paybacks in terms of enhanced aesthetics, habitat, and water quality.

One additional method of drainageway stabilization gives special attention to stormwater quality and is described in Section 4.2 (New Development BMP Factsheets):

- Constructed Wetland Channel.

Step 3: Provide Water Quality Capture Volume (WQCV)

All applicable development sites must have operational permanent stormwater quality control measures at the completion of construction. Designing structures that provide the WQCV is a common preferred approach in El Paso County. Other base design standards discussed earlier may be used if applicable, however. One or more of six types of water quality basins, each draining slowly to provide for long-term settling of sediment particles, may be selected. Information on selecting and configuring for a site one or more of the WQCV facilities listed below is provided in the Section 4.2 of the DCMV2. These six BMPs are also described in detail in the New Development BMP Factsheets found in the DCMV2 Section 4.2.

- Porous Pavement Detention.
- Porous Landscape Detention.
- Extended Detention Basin.
- Sand Filter Extended Detention Basin.
- Constructed Wetland Basin.
- Retention Pond.

Full Spectrum Detention is a newer approach to providing the WQCV. Details on the use, sizing, configuration and maintenance of Full Spectrum Detention structures are located in the DCMV1 update of 2014, sections of which are incorporated by reference into this ECM.

Step 4: Consider Need for Industrial and Commercial BMPs

If a new development or significant redevelopment activity is planned for an industrial or commercial site, the need for specialized BMPs must be considered. Two approaches are described in the New Development BMP Factsheets:

- Covering of Storage/Handling Areas
- Spill Containment and Control

Other Specialized BMPs may also be required

B. **Other Specialized BMPs.** The Technical Advisory Committee (TAC) selected the above structural BMPs after a comprehensive screening of known structural BMPs. The members of TAC included representatives from many County agencies and individuals from the development community. Final selection by TAC was based on the rev documentation on potential effectiveness in a semiarid climate, local applicability, maintenance considerations,

Development and evaluation of permanent BMPs are continuing processes. Better designs of the BMPs included in DCM2 and designs of new BMPs, including manufactured (proprietary) BMPs, will be developed and tested. To allow for this progress, additional BMPs will be considered on a case-by-case basis by County Stormwater Staff. Design and sizing details and results of independent testing of the BMP in conditions similar to those at the site will be submitted demonstrating that the BMP will meet or exceed the performance of approved BMPs for the site.

To promote improvement in stormwater protection, County Stormwater Staff may approve promising BMPs on an experimental basis. A performance monitoring program to be pre-approved by County Stormwater Staff and an agreement to replace the Experimental System with an approved system should it not function to the required level of performance, both at the owner's expense, will be required. A request to use an "experimental system" must be submitted to El Paso County in the form of a Request for a Deviation from these standards, submitted consistent with the criteria and process described Chapters 1 and 5, respectively. Design of any "experimental system" shall not commence until a Request for Deviation is submitted to and approved by the County.

C. **Guidance for Selecting and Locating WQCV Facilities.**

[The following section replaces DCM2 Section 4.1 pages 4-19 through 4-23]

Laying out WQCV facilities within a development site and watershed requires thought and planning. This planning and decision-making should occur during a master drainage planning process (Drainage Basin Planning Study or Master Development Drainage Plan) undertaken by local jurisdictions or a developer's engineer. Such plans, studies or other reports may depict a recommended approach for implementing WQCV on a watershed basis. Such reports may call for a few large regional WQCV facilities, smaller sub-regional facilities, or alternatively an onsite approach. It is always a good idea to find out if a master planning study has been completed that addresses water quality and to attempt to follow the Plan's recommendations.

If the master drainage planning process addresses water quality, the following provides supplemental information on the BMPs. If the existing master drainage planning process has not addressed water quality, or if a new master drainage process is underway, this will direct the water quality evaluation.

D. **Post-Construction Stormwater Quality Control Measure Selection Process.** The BMP selection process is illustrated in Figure I-1 and Figure I-2. These two figures shall be used for all projects except those that are strictly highway/roadway projects; that is, projects with no plans for building pad sites. Projects that are strictly highway/roadway projects are discussed in a separate section below.

The following process references the use of the permanent control measures (BMPs) and other practices outlined in DCM2 and this Appendix. The use of DCM2 BMPs will promote consistency between the City and County. These BMPs are commonly found in manuals and other literature from municipalities across the country, and they are the accepted best industry practices in stormwater quality control.

As described below, other control measures (which may be relatively new to the field of stormwater management) are acceptable if they can be shown to meet performance criteria provided in this Section 1.7. A Request for a Deviation from these standards submitted consistent with the criteria and process described

Chapters 1 and 5, respectively, must be submitted and approved by the County prior to the use of an permanent control measure not included in this ECM, DCMV1, DCMV2 and the DCMV1 Update of 2014.

The following items explain the decision points (i.e., the Boxes) in Figure I-1 and Figure I-2:

Box 1: For all sites, the possibility of incorporating runoff reduction practices must be investigated. Impervious area should be reduced to the maximum extent practicable, per DCM2. DCM2 also provides guidance for MDCIA by routing runoff to pervious areas. This is Step 1 in the Four-Step Process.

Box 2: All drainageways, ditches, and channels shall be stabilized with one of three methods included in Step 2, which include the use of appropriate methods for the type of drainageway as described in the DCM1. Drainageways include:

- Tributaries to creeks that have been left in a relatively natural state,
- Tributaries, channels, and drainageways that are graded or regraded and may include drop or check structures, side slope stabilization, and low-flow channels.
- Roadside ditches that are completely man-made and should only be used to convey runoff from roads and roadway right-of-ways (ROWs).

Box 3: It must be determined if the development and/or redevelopment disturbs an area of land that is 1 acre or larger (or planned to be 1 acre or larger) when all phases are complete.

Box 4: Sites tributary to sensitive waters should consider specialized BMPs to address the parameter of concern as shown in Table I-5. At this time, no special BMPs are required until the County develops an overall strategy to address the parameters of concern, probably if and when a Total Maximum Daily Load (TMDL) is determined.

Figure I-1. BMP Requirements Flowchart for New Development and Redevelopment Sites—For Selecting Post-Construction BMPs in Compliance with El Paso County's Stormwater NPDES Permit

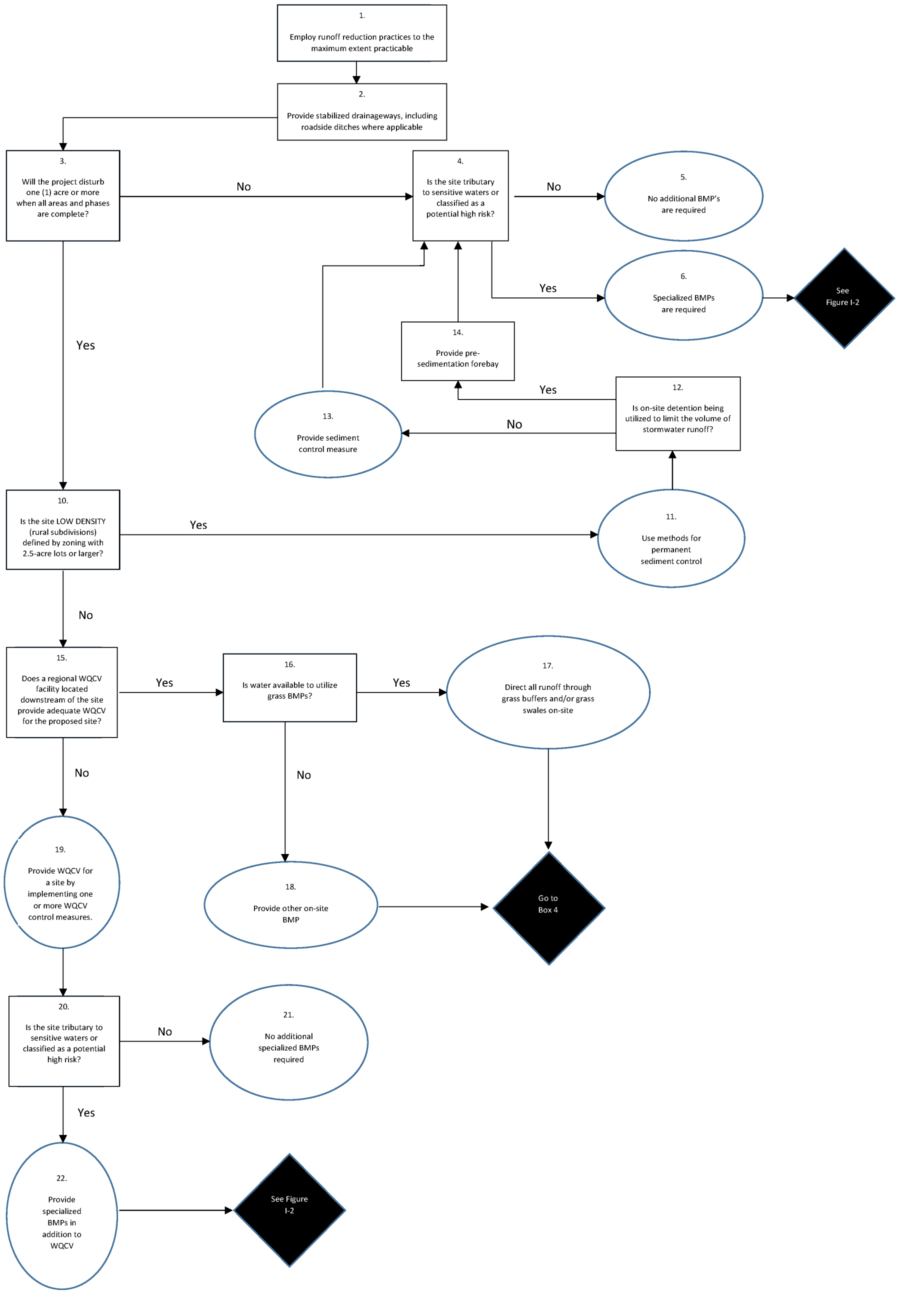

1.
Employ runoff reduction practices to the maximum extent practicable
2.
Provide stabilized drainageways, including roadside ditches where applicable
3.
Will the project disturb one (1) acre or more when all areas and phases are complete?
No
4.
Is the site tributary to sensitive waters or classified as a potential high risk?
No
5.
No additional BMP's are required
Yes
6.
Specialized BMPs are required
See Figure I-2
14.
Provide pre-sedimentation forebay
Yes
12.
Is on-site detention being utilized to limit the volume of stormwater runoff?
No
13.
Provide sediment control measure
Yes
10.
Is the site LOW DENSITY (rural subdivisions) defined by zoning with 2.5-acre lots or larger?
Yes
11.
Use methods for permanent sediment control
No
15.
Does a regional WQCV facility located downstream of the site provide adequate WQCV for the proposed site?
Yes
16.
Is water available to utilize grass BMPs?
Yes
17.
Direct all runoff through grass buffers and/or grass swales on-site
No
No
19.
Provide WQCV for a site by implementing one or more WQCV control measures.
18.
Provide other on-site BMP
Go to Box 4
20.
Is the site tributary to sensitive waters or classified as a potential high risk?
No
21.
No additional specialized BMPs required
Yes
22.
Provide specialized BMPs in addition to WQCV
See Figure I-2

Figure I-2. BMP Requirements Flowchart for New Development and Redevelopment Sites—For Selecting Post-Construction BMPs in Compliance with El Paso County's Stormwater NPDES Permit

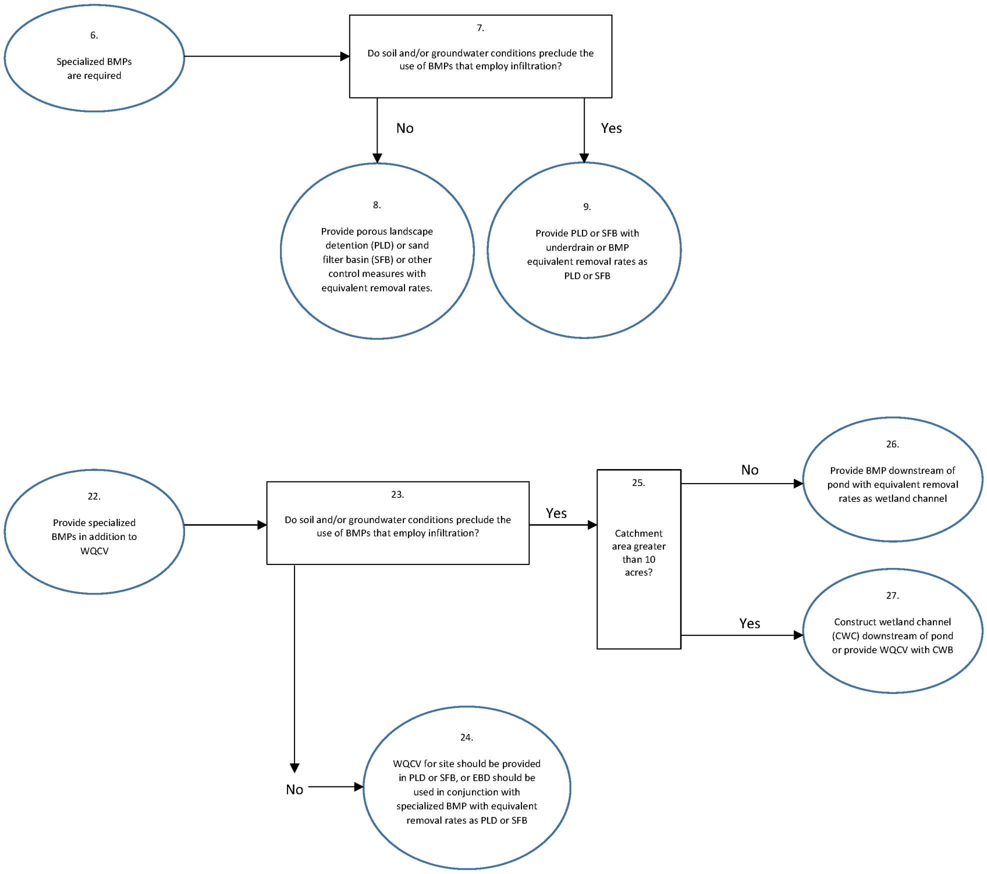

6.
Specialized BMPs are required
7.
Do soil and/or groundwater conditions preclude the use of BMPs that employ infiltration?
No
Yes
8.
Provide porous landscape detention (PLD) or sand filter basin (SFB) or other control measures with equivalent removal rates.
9.
Provide PLD or SFB with underdrain or BMP equivalent removal rates as PLD or SFB
22.
Provide specialized BMPs in addition to WQCV
23.
Do soil and/or groundwater conditions preclude the use of BMPs that employ infiltration?
Yes
25.
Catchment area greater than 10 acres?
No
26.
Provide BMP downstream of pond with equivalent removal rates as wetland channel
Yes
27.
Construct wetland channel (CWC) downstream of pond or provide WQCV with CWB
No
24.
WQCV for site should be provided in PLD or SFB, or EBD should be used in conjunction with specialized BMP with equivalent removal rates as PLD or SFB

Table I-4. Best Management Practices Abbreviations

Abbreviation	Best Management Practice
CWB	Constructed Wetlands Basin
CWC	Constructed Wetlands Channel - Sedimentation Facility
EDB	Extended Detention Basin - Sedimentation Facility
PLD	Porous Landscape Detention
RP	Retention Pond - Sedimentation Facility
SFB	Sand Filter Extended Detention Basin
WQCV	Water Quality Capture Volume
GB	Grass Buffer
GS	Grass Swale

MBP	Modular Block Porous Pavement
PPD	Porous Pavement Detention

Table I-5. El Paso County Sensitive[1]Waters

Stream and Segment	Parameter of Concern	Specialized BMPs Required
Fountain Creek and tributaries above Monument Creek	E. coli and Se	None at this time
Fountain Creek from Monument Creek to Highway 47	E. coli	None at this time
Monument Creek from National Forest to Fountain Creek	Se	None at this time
Willow Springs Pond #1 and #2	PCE	None at this time
[1] CDPHE 2006 303(d) list. Standard agreement forms for Private Detention Basins are in Appendix G. [This list may change in the future. The 303(d) list or equivalent in effect at the time of permitting will apply.]		

Potential high-risk sites must also incorporate specialized BMPs. High-risk sites are defined by two factors:

- Sites with land uses involving the potential for significant deposition of pollutants.
- Sites without practices to eliminate exposure of pollutants to stormwater.

Land uses involving the potential for significant deposition of pollutants include, but are not limited to:

- Vehicle maintenance facilities,
- Gas stations,
- Automobile salvage yards and junk yards,
- Commercial sites with high levels of "in and out" traffic such as fast-food restaurants and convenience stores.

Many industrial facilities are required to obtain coverage under an industrial stormwater permit; these facilities include automobile salvage yards. Practices to eliminate exposure of pollutants to stormwater may or may not be part of an industrial stormwater permit. These practices include coverage of material storage areas, berms around tanks, spill control plans, and other "good housekeeping" measures. For industrial sites where stormwater is not exposed to pollutants, structural BMPs, including detention ponds for water quality and other BMPs discussed below, may not be required.

Because stormwater pollutants are often transported with sediment, erosion protection and sediment control are necessary for stormwater quality protection. This is very important in the County because of the sandy soils in the region. In particular, discharges that may impact sensitive waters or that come from potentially high-risk sites should have a high level of sediment protection. Thus, in addition to the specialized BMPs, sediment control practices such as revegetation, grading to prevent steep side slopes, check dams, slope drains, and sediment basins should be employed where practical.

Box 5: No BMPs are required other than stabilized drainageways and possibly MDCIA.

Box 6: Specialized BMPs are required and therefore proceed to Box 7 on Table I-1.

Box 7: BMPs that employ infiltration include porous landscape detention and sand filter basins without underdrains. Certain conditions preclude the use of these types of BMPs, including close proximity of groundwater or relatively impervious soils to the bottom of the facility. Groundwater levels should be characterized during the season with the highest levels (often late Spring or early Summer). Impervious soils include bedrock as well as soil types C and D. The term "close proximity" means 5 feet or less. If there is less than 5 feet, a study of the hydraulic conductivity of the soils must be conducted to show that excessive groundwater mounding or direct groundwater contamination will not result from the use of BMPs that employ infiltration.

Box 8: If groundwater or relatively impervious soils are not within 5 feet of the surface, implement porous landscape detention (PLD) or a sand filter basin (SFB) from DCM2. Alternative BMPs can be used if shown to be equally effective as PLD or SFB (see discussion below).

Box 9: Implement PLDs or SFBs with underdrains, or implement a BMP with removal rates equivalent to PLDs or SFBs, including qualifying manufactured BMPs. Qualifying manufactured BMPs are those that have undergone independent tests to verify that the installation, flow volumes, and removal rates will work for the site under consideration.

Box 10: If the site disturbance is larger than one acre and is low density residential, then no WQCV may be required provided the site meets criteria presented in Section I.7.1. If WQCV is not required, the need for a permanent sediment control measure must still be evaluated. If the site is located near and will discharge to a sensitive water, then a "jump" to Box 4 is required for continued evaluation.

Box 11: Sediment is best controlled at the source. That is, rather than using structures to collect soil after it is suspended in stormwater, it is preferable to stabilize soil to prevent suspension from occurring. Sediment source controls must be implemented for all low-density developments and include (but are not limited to):

- Adequately established vegetation per DCM1 criteria,
- Side slopes that are 3 horizontal to 1 vertical or flatter or the use of benched side slopes when slopes are steeper than 3 horizontal to 1 vertical,
- The use of erosion control blankets to aid establishment of vegetation,
- Check dams,

- Slope drains.

Temporary irrigation and maintenance of vegetation until adequately established may be required.

Box 12: In low density (rural) subdivisions, a method for permanent sediment control must be provided. If a detention pond is used, the forebay is to be sized according to the criteria for Extended Detention Basins. If a detention pond/Extended Detention Pond is not required, a sediment basin as described in DCM2, page 3-32 may be used. It should be sized to collect 1,800 cubic feet per acre of disturbed area. Drainage area above a sediment basin can be reduced by use of vegetated swales, buffers, or contour berms.

Box 13: If there are no detention ponds, separate sediment control measure must be located to catch all runoff leaving the disturbed area of the site.

Box 14: In cases where a detention pond is already required for controlling the volume of runoff, a sediment basin can take the form of a forebay to this pond.

Box 15: Regional WQCV facilities may only be used if they meet the requirements of Section I.7.1.C.

Box 16: The site is required to direct all runoff through grass buffers and/or grass swales or provide a similar BMP. (Note that this is required in accordance with the CDPHE guidance manual to afford some protection to state waters in between the site and the downstream WQCV BMP.)

Box 17: Grass buffers require irrigation in almost all cases in the County; swales sometimes require irrigation.

Box 18: "Dry" alternatives may be used if they are shown to have equivalent removal rates as buffers and swales. All of the structural treatment BMPs in DCM2 (Section 4.2) have equivalent removal rates and may be used. The covering of storage/handling areas and spill containment and control are not structural treatment BMPs, and thus are not substitutes for grass buffers and swales.

Box 19: If there is no regional WQCV facility downstream with adequate capacity to provide the WQCV for the proposed site, then a WQCV control measure must be provided for the site. Examples of potentially acceptable control measures include Extended Detention Basin, Full Spectrum Detention Basin, Sand Filter Basin, Constructed Wetland Basin, or a Retention Pond. For all ponds, issues related to dam construction and potential groundwater infiltration must be considered. Retention Ponds must be considered in the context of additional issues including safety and health (e.g., drowning and mosquito/West Nile virus) and water rights. For all structures that may hold water for more than 72 hours with an exposed water surface, water storage rights must be obtained before a structure (e.g. retention pond) can be proposed for a site. See Sections 3.2.5.F and 3.3.7 of this ECM for additional information regarding water right and permanent stormwater quality control measures.

Box 20: Sites tributary to sensitive waters must meet the requirements as outlined in Table I-5, and potential high-risk sites must have specialized BMPs.

Box 21: No additional BMPs are required other than WQCV-based BMPs. Also, as always, drainageways must be stabilized and runoff should be reduced as much as possible (Boxes 1 and 2).

Box 22: When specialized BMPs are required, proceed to Box 23 on Figure I-2.

Box 23: Two situations apply, one where conditions preclude the installation of BMPS that employ infiltration, and one where they do not. (See Box 7.) If conditions preclude the installation of BMPS that employ infiltration then proceed to Box 25; otherwise proceed to Box 24.

Box 24: Where soil and groundwater conditions are not prohibitive (that is, groundwater or relatively impervious soils are not within 5 feet of the surface), implement PLD or SFB from DCM2. Alternative BMPs can be used if shown to be equally effective as PLD or SFB (see discussion below).

Box 25: Constructed wetlands (either channels or basins) are an effective BMP for sites with drainage areas greater than 10 acres.

Box 26: Provide a BMP downstream of the pond with equivalent removal rates as a wetland channel; this could be a qualifying manufactured BMP or other BMP that meets the criteria below.

Box 27: If the catchment area is greater than 10 acres, provide a constructed wetland channel (CWC) downstream of pond or provide WQCV with CWB.

E. **Projects that are Strictly Roadway Construction.** For projects that entail highway or other roadway construction, there are three basic questions for the applicant:

- Is the road urban or rural?
- That is, does the road have curb and gutter or does it utilize roadside ditches?
- For rural roads, do the ditches require "water turnouts"?
- Is the road a "hot spot" or does it discharge to sensitive waters?

For road construction projects, the applicant must determine if the roadway project is an applicable development site as defined in Section I.7.1.B. Excluded sites do not need to comply with the requirements of this Section I.7. If a roadway construction project is an applicable development site, then the owner must determine which base design standard is appropriate for the project and must design and implement water quality improvement with the project. Requirements for roadway projects included in the DCMV1 may be used provided they do not conflict with other provisions of this Section I.7.

Rural roads, i.e. those roads which utilize roadside ditches for conveyance of runoff from the roadway, do not have sufficient capacity in the roadside ditches to convey much more runoff than that which runs off the road itself. Rural roads (which by definition have roadside ditches) must be stabilized with one of three methods included in DCM2 on pages 4-3 and 4-4. These methods are described in DCMV1. "Water turnouts," which function as spillways which direct flow out of the ditches onto property adjacent to the ROW, are frequently required as a result. Design for the "water turnout" should ensure the turnout discharges into a "suitable outfall" as described in DCM1 along the roadway such as a natural swale. A drainage easement for this runoff must be acquired at these locations. A possible consequence of "water turnouts" is the loading of sediment onto private property. If "water turnouts" will be utilized for the ditches, sediment basins shall be used at these locations. However, there must be sufficient space in the ROW for both the structure itself and for maintenance access, or a specific drainage easement must be provided for the feature and access. Sediment basins can be designed in accordance with the guidelines in DCM2 in the section for construction BMPs. The basin shall be sized to collect 1,800 cubic feet of sediment per acre of drainage area of the roadway.

The term "high risk site" can be defined by traffic volume for a section of roadway. If the road will experience traffic volume of 30,000 average daily traffic (ADT) or more it is likely to contribute high levels of pollutants. For these situations, additional BMPs are required and selection must follow Boxes 6, 7, 8, and 9 in Figure 1b. Additional BMPs may also be required for discharge to sensitive waters. As described above for the general developments (with building pads), these additional requirements will depend on the TMDL process.

F. **Additional Guidelines for BMP Selection.** Additional Guidelines for selecting among the appropriate BMPs dete from Figure I-1 and Figure I-2. Figure I-3 (Figure ND-7 in DCM2) depicts a decision tree for selecting one of the si BMPs based on drainage catchment area and whether water is available to satisfy evapotranspiration requirem Porous pavement and porous landscape detention are generally suited for small drainage areas (i.e. much less acres); however, larger subwatersheds can be subdivided into individual drainage sub-catchment areas meeting criteria shown in Figure I-3 for these BMPs.

WQCV control measures and Regional WQCV control measures shall be located prior to the stormwater runoff being discharged to State Waters. When using a Regional WQCV facility for a site, the site may discharge to a water of the state before being discharged to the Regional WQCV facility; however, the conditions in Section I.7.1.C.5 shall be met.

Figure I-4 (Figure ND-8 in DCM2) provides an illustration of selection and location options for WQCV facilities based on the principles discussed above.

Figure I-6 (Table ND-1 in DCM2) indicates the BMP options for the four watershed areas shown in Figure I-4.

I.7.3. Incorporating WQCV into Stormwater Detention Structures

Wherever possible, it is recommended that WQCV facilities be incorporated into stormwater quantity detention facilities. This is relatively straightforward for an extended detention basin, constructed wetland basin, and a retention pond. When combined, the 2, 5, 10, and 100-year detention levels are provided above the WQCV and the outlet structure is designed to control two or three different releases. Stormwater quantity detention could be provided above the WQCV for porous pavement and landscape detention provided the drain times for the larger events are kept short.

The following approaches are to be implemented when incorporating WQCV into stormwater quantity detention facilities:

1. **Water Quality.** The full WQCV is to be provided according to the design procedures documented in the New Development BMP Factsheets.
2. **Minor Storm.** The full WQCV plus the full minor storm quantity detention volume is to be provided.
3. **100-Year Storm.** One-half the WQCV plus the full 100-year detention volume is to be provided.

For linear projects and projects with limited space available for permanent water quality control measures, WQCV may be included in the design of underground detention structures such as sand filter basins (SFB) and proprietary underground detention structures. These systems rely on appropriate soil conditions to infiltrate or evapotranspire the WQCV.

It is extremely important that high sediment loading and compaction of underlying soils in the area to be used for infiltration be controlled to the maximum extent practicable. These structures are best suited to being brought on line at the end of the construction phase where disturbed ground has been stabilized with pavement or vegetation.

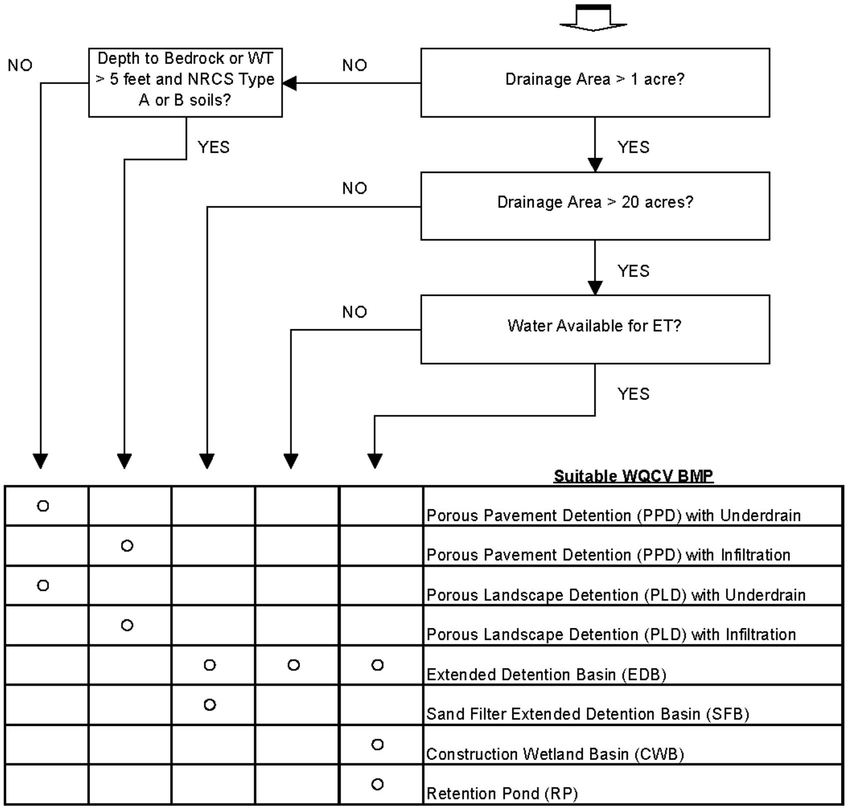
Any underground detention facilities proposed for use in the County must meet the good engineering, hydrologic and pollution control practices as defined in this Section I.7. The design of underground detention that incorporates WQCV shall not commence until a Request for Deviation is submitted for review and approved by the ECM Administrator. In addition to the approval criteria for a deviation request provide in Chapters 1 and 5 of this ECM, the owner or authorized agent must provide a structure-specific Operation and Maintenance (O&M)

Manual and maintenance agreement for the structures. The Operation and Maintenance Manual shall include specific procedures and equipment that will be used by the owner or authorized representative to operate and maintain the structures. A specification sheet or generic O&M manual provided by the vendor will not satisfy the O&M Manual requirement.

I.7.4. Separate Presedimentation Facilities

The design criteria shown in the New Development BMP Factsheets section shows presedimentation forebays at the upstream end of the extended detention basin, constructed wetland basin, and retention pond. The purpose of the forebay is to settle out coarse sediment and skim off floatables prior to the main body of the facility. An option to this approach is to install a separate facility upstream from the main WQCV facility. If this option is selected, the recommended size is at least 20 percent of the WQCV and the recommended drain time is 1 hour for the presedimentation forebay volume only. Using this approach, any requirement for sediment storage in the main facility may be reduced consistent with the storage capacity of the separated presedimentation forebay, and the forebay within the main facility may be eliminated.

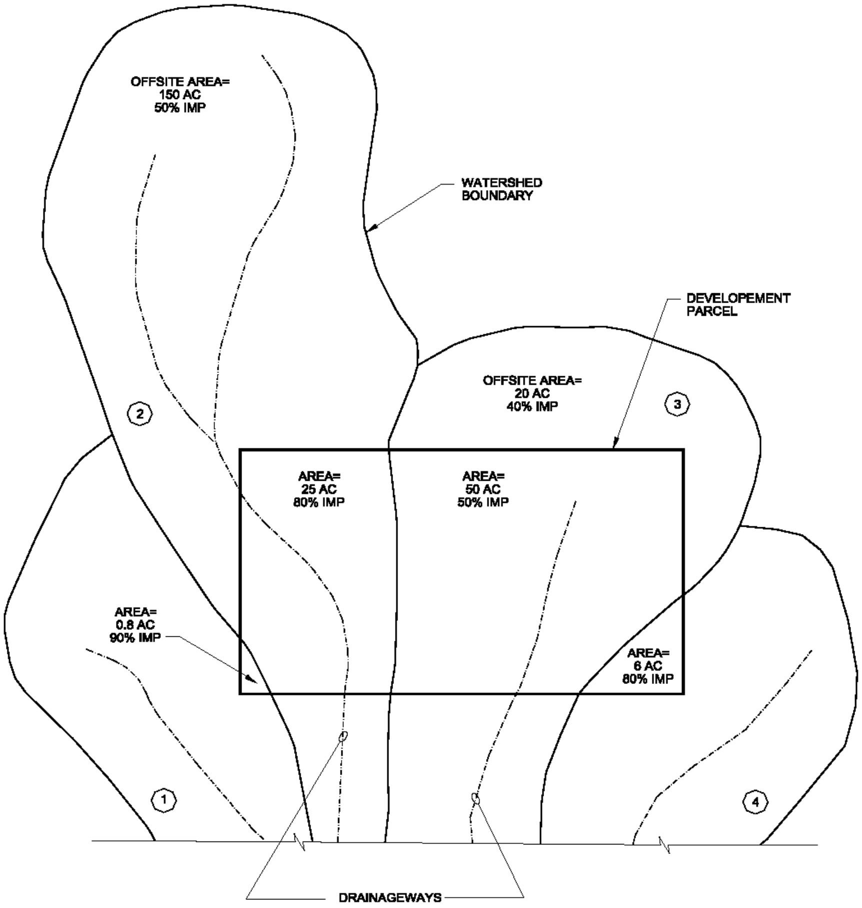
Figure I-3. Decision Tree for WQCV BMP Selection


Drainage Area > 1 acre?
NO
Depth to Bedrock or WT > 5 feet and NRCS Type A or B soils?
NO
YES
YES
Drainage Area > 20 acres?
NO
YES
Water Available for ET?
NO
YES

					Suitable WQCV BMP
○					Porous Pavement Detention (PPD) with Underdrain
	○				Porous Pavement Detention (PPD) with Infiltration
○					Porous Landscape Detention (PLD) with Underdrain
	○				Porous Landscape Detention (PLD) with Infiltration
		○	○	○	Extended Detention Basin (EDB)
		○			Sand Filter Extended Detention Basin (SFB)
				○	Construction Wetland Basin (CWB)
				○	Retention Pond (RP)

Note: Large drainage areas may be subdivided into areas < 20 acres for use of SFB or < 1 acre for use of PPD or PLD.

Figure I-4. Illustration of Selection and Location Options for WQCV Facilities


OFFSITE AREA=
150 AC
50% IMP
WATERSHED BOUNDARY
DEVELOPEMENT PARCEL
OFFSITE AREA=
20 AC
40% IMP
2
3
AREA=
25 AC
80% IMP
AREA=
50 AC
50% IMP
AREA=
0.8 AC
90% IMP
AREA=
6 AC
80% IMP
1
4
DRAINAGEWAYS

Note: For this example, sufficient make-up water exists for constructed wetlands and retention pond for the watershed areas > 50 acres through irrigation return flows.

Table I-7. Illustration of Selection and Location Options for WQCV Facilities for the Development Parcel on Figure I.4

Watershed Number	Onstream or Offstream	BMP Options	Minimum Number of BMP Installations	Average Drainage Area for Sizing each BMP, acre
1	Offstream	Porous Pavement Detention Porous Landscape Detention	1 1	0.8 0.8
2	Offstream	Porous Pavement Detention Porous Landscape Detention Extended Detention Basin Sand Filter Extended Detention Basin	24 24 2 2	1 1 12 12

3	Offstream	Porous Pavement Detention	49	1
		Porous Landscape Detention	49	1
		Extended Detention Basin	2	24
		Sand Filter Extended Detention Basin	3	16
	Onstream	Extended Detention Basin	1	70
		Constructed Wetland Basin	1	70
		Retention Pond	1	70
4	Offstream	Porous Pavement Detention	6	1
		Porous Landscape Detention	6	1
		Extended Detention Basin	1	6
		Sand Filter Extended Detention Basin	1	6

I.7.5. Structural BMP Effectiveness

Table I-7 (Table ND-2 in DCM2) indicates ranges of removal efficiencies reported in literature for a number of structural BMPs. Although combinations of nonstructural/structural BMPs can improve the overall water quality of the runoff, the effectiveness of several BMPs in their ability to reduce influent pollutant concentrations as a group are not directly additive. Table I-7 also shows a most probable range of removal efficiencies for structural BMPs.

I.7.6. Separation Distances

To reduce potential for surface and ground water contamination, permanent water quality BMPs will be located away from wells and Individual Sewage Disposal Systems (ISDS). Rules for separation distances and grouting depths for wells and BMPs will be based on distances between wells and "sources of contamination" in Colorado's Rules and Regulations for Water Well Construction, Pump Installation, and Monitoring and Observation Hole/Well Construction. Permanent BMPs and ISDS will be separated by the same distances specified between the components of the ISDS and "waterways" in the El Paso County ISDS regulations. Additional separation distance may be required when a permanent stormwater quality control measure is located near a water of the state and relies on a vegetated buffer strip as part of the strategy to address WQCV prior to discharge to waters of the state.

Table I-8. BMP Pollutant Removal Ranges for Stormwater Runoff and Most Probable Range for BMPs

Type of BMP	(1)	TSS	TP	TN	TZ	TPb	BOD	Bacteria

Grass Buffer	LRR: EPR	10-50 10-20	0-30 0-10	0-10 0-10	0-10 0-10	N/A N/A	N/A N/A	N/A N/A
Grass Swale	LRR: EPR	20-60 20-40	0-40 0-15	0-30 0-15	0-40 0-20	N/A N/A	N/A N/A	N/A N/A
Modular Block Porous Pavement	LRR: EPR	80-95 70-90	65 40-55	75-85 10-20	98 40-80	80 60-70	80 N/A	N/A N/A
Porous Pavement Detention	LRR: EPR	8-96 70-90	5-92 40-55	-130-85 10-20	10-98 40-80	60-80 60-70	60-80 N/A	N/A N/A
Porous Landscape Detention	LRR: EPR	8-96 70-90	5-92 40-55	-100-85 20-55	10-98 50-80	60-90 60-80	60-80 N/A	N/A N/A
Extended Detention Basin	LRR: EPR	50-70 55-75	10-20 45-55	10-20 10-20	30-60 30-60	75-90 55-80	N/A N/A	50-90 N/A
Constructed Wetland Basin	LRR: EPR	40-94 50-60	-4-90 40-80	21 20-50	-29-82 30-80	27-94 40-80	18 N/A	N/A N/A
Retention Pond	LRR: EPR	70-91 80-90	0-79 45-70	0-80 20-60	0-71 20-60	9-95 60-80	0-69 N/A	N/A N/A
Sand Filter Extended Detention	LRR: EPR	8-96 80-90	5-92 45-55	-129-84 35-55	10-98 50-80	60-80 60-80	60-80 60-80	N/A N/A
Constructed Wetland Channel*	LRR: EPR	20-60 30-50	0-40 20-40	0-30 10-30	0-40 20-40	N/A 20-40	N/A N/A	N/A N/A
Ref: Bell et al. (1996), Colorado (1990), Harper & Herr (1992), Lakatos & McNemer (1987), Schueler (1987), Southwest (1995), Strecker et al. (1990), USGS (1986), US EPA (1983), Veenhuis et al. (1989), Whipple and Hunter (1981), Urbonas (1997.								
(1) LRR Literature reported range, EPR—expected probable range of annual performance by DCM2 BMPs.								
N/A Insufficient data to make an assessment.								

* The EPR rates for a Constructed Wetland Channel assume the wetland surface area is equal or greater than 0.5% of the tributary total impervious area.

I.7.7. Operation and Maintenance of Best Management Practices

A. **Long-term Operation and Maintenance of Post-Construction Stormwater Management Structures.** The El Paso County Phase II MS4 Permit requires the County to ensure the long-term operation and maintenance of all post-construction stormwater management control measures constructed by an applicable development site. Part I E.4.a.vi of MS4 permit states:

"vi. Construction Inspection and Acceptance: The County must implement inspection and acceptance procedures to ensure that control measures are installed and implemented in accordance with the site plan and include the following:

(A) Confirmation that the completed control measure operates in accordance with the approved site plan.

(B) All applicable development sites must have operational permanent water quality control measures at the completion of the site. In the case where permanent water quality control measures are part of future phasing, the County must have a mechanism to ensure that all control measures will be implemented, regardless of completion of future phases or site ownership. In such cases, temporary water quality control measures must be implemented as feasible and maintained until removed or modified. All temporary water quality control measure must meet one of the design standards in Part I.E.4.a.iv.

For the purpose of this section, completion of a site or phase shall be determined by the issuance of a certificate of occupancy, use of the completed site area according to the site plan, payment marking the completion of a site control measure, the nature of the selected control measure or equivalent determination of completion as appropriate to the nature of the site."

For all structures approved by El Paso County which are not public improvements, the property owner or authorized agent shall be responsible for the operation and maintenance of all permanent stormwater quality control measures. All temporary control measures required during construction shall be removed after construction activity on the site has been completed and final stabilization of the site is achieved.

Prior to approval of a subdivision, issuance of a Certificate of Occupancy, or closure of the ESQCP for sites that did not go through the subdivision review process that have permanent post-construction stormwater quality control measures, a signed private maintenance agreement for permanent BMPs must be submitted to and recorded by the County. El Paso County uses these agreements as the primary mechanism to ensure the long-term operation and maintenance of post construction stormwater quality control measures. Agreement templates are found in Appendix G.

During construction a County Stormwater Inspector will inspect structures for conformance with approved construction plans and the SWMP. Once the structure has been accepted into the County Permanent Stormwater Quality Control Measure Inventory consistent with Chapter 5, control measures will be inspected at minimum once every five (5) years. All inspections will be conducted as described in Section I.5.

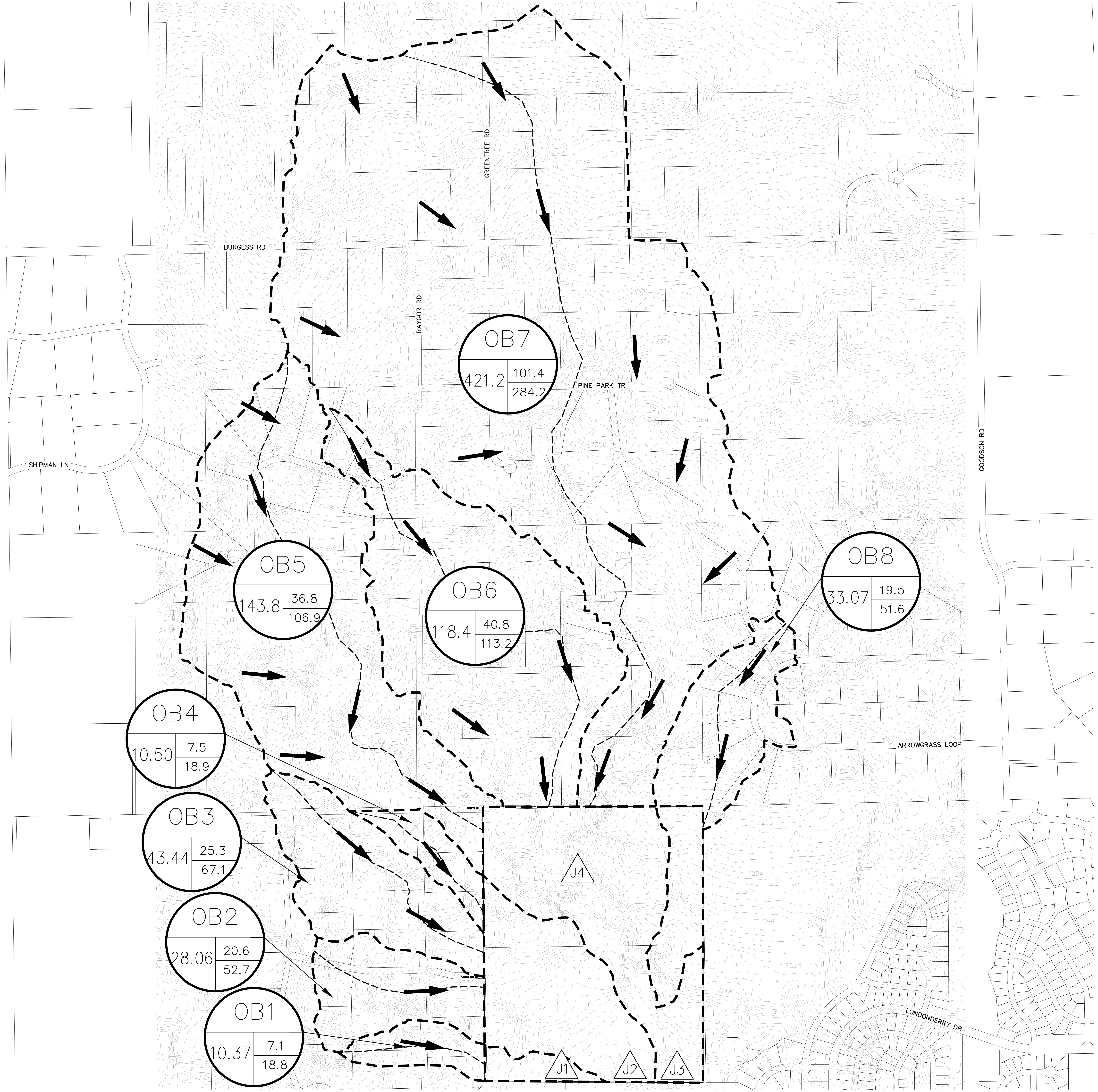
Confirmation that post-construction stormwater quality control measures operate according to approved plans occurs through the use of an inflow hydrograph routed through a basin model. This analysis and the resulting hydrograph shall be performed by the Engineer of Record for the owner or authorized agent of the applicable development site and provided with Final Drainage Report included in the development plan submitted to the County. If the ECM Administrator determines that significant changes to the approved plans are identified in the "as-built" drawings provided in conformance with Section 5.10.6, an additional inflow hydrograph based on the "as-built" changes shall be provided to the County to confirm that the changes made during construction did not negatively alter the effective operation of the control measure.

If during an inspection of a post-construction stormwater quality control structure it is determined and documented by a County Stormwater Inspector that any owner or authorized agent failed to adequately operate and maintain a permanent stormwater quality control measures or remove the temporary control measures, an enforcement action described in Section I.6 shall be pursued.

B. **Operation and Maintenance Manual.** A detailed Operation and Maintenance Manual covering inspections, operation and maintenance of permanent BMPs will be provided to the party who holds the Private Maintenance Agreement for Permanent BMPs. The Operation and Maintenance Manual will include specifics on frequency of inspections and maintenance; standards for vegetation or structures, such as species of vegetation, mowing height, revegetation of worn or eroded areas, cleaning methods; depth of sediment requiring removal; replacement frequencies; and other relevant topics.

(Res. No. 19-245 , 7-2-19)

APPENDIX E: DRAINAGE MAPS


BURGESS RD
GREENTREE RD
RAYGOR RD
PINE PARK TR
SHIPMAN LN
GOODSON RD
ARROWGRASS LOOP
LONDONDERRY DR
OB7
421.2
101.4
284.2
OB5
143.8
36.8
106.9
OB6
118.4
40.8
113.2
OB8
33.07
19.5
51.6
OB4
10.50
7.5
18.9
OB3
43.44
25.3
67.1
OB2
28.06
20.6
52.7
OB1
10.37
7.1
18.8
J4
J1
J2
J3
NORTH
GRAPHIC SCALE IN FEET
0
250
500
1000

LEGEND

▬ ▬ ▬ DRAINAGE BASIN AREAS

A – HEC–HMS BASINS
B – BASIN ACREAGE
C – 5–YR RUNOFF
D – 100–YR RUNOFF

△ E0 DESIGN POINT

– – – – – EXISTING CONTOURS

——·—·—— PROPERTY BOUNDARY

→ FLOW ARROW

------------ FLOW PATH

———— PARCEL LINE

HEC-HMS - EXISTING RUNOFF TABLE

DESIGN POINT	BASIN DESIGNATION	BASIN AREA (ACRES)	DIRECT 5-YR RUNOFF (CFS)	DIRECT 100-YR RUNOFF (CFS)	CUMULATIVE DIRECT 5-YR RUNOFF (CFS)	CUMULATIVE DIRECT 100-YR RUNOFF (CFS)
	B1	5.55	3.0	8.5	-	-
J1	OB1	10.37	7.1	18.8	10.1	27.3
	B2	41.43	15.4	48.5	-	-
	OB2	28.06	20.6	52.7	-	-
	OB3	43.44	25.3	67.1	-	-
J2	OB4	10.50	7.5	18.9	67.5	183.8
	OB5	143.82	36.8	106.9	-	-
	OB6	118.40	40.8	113.2	-	-
J4	OB7	421.43	101.4	284.2	169.2	478.0
	B3	59.54	36.4	110.0	-	-
	B4	14.68	5.4	18.2	-	-
J3	OB8	33.07	19.5	51.6	183.1	515.5

NO.	REVISION	BY	DATE	APPR.

Kimley»Horn

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DRAWN BY: RS
CHECKED BY: KK
DATE: 12/06/2022

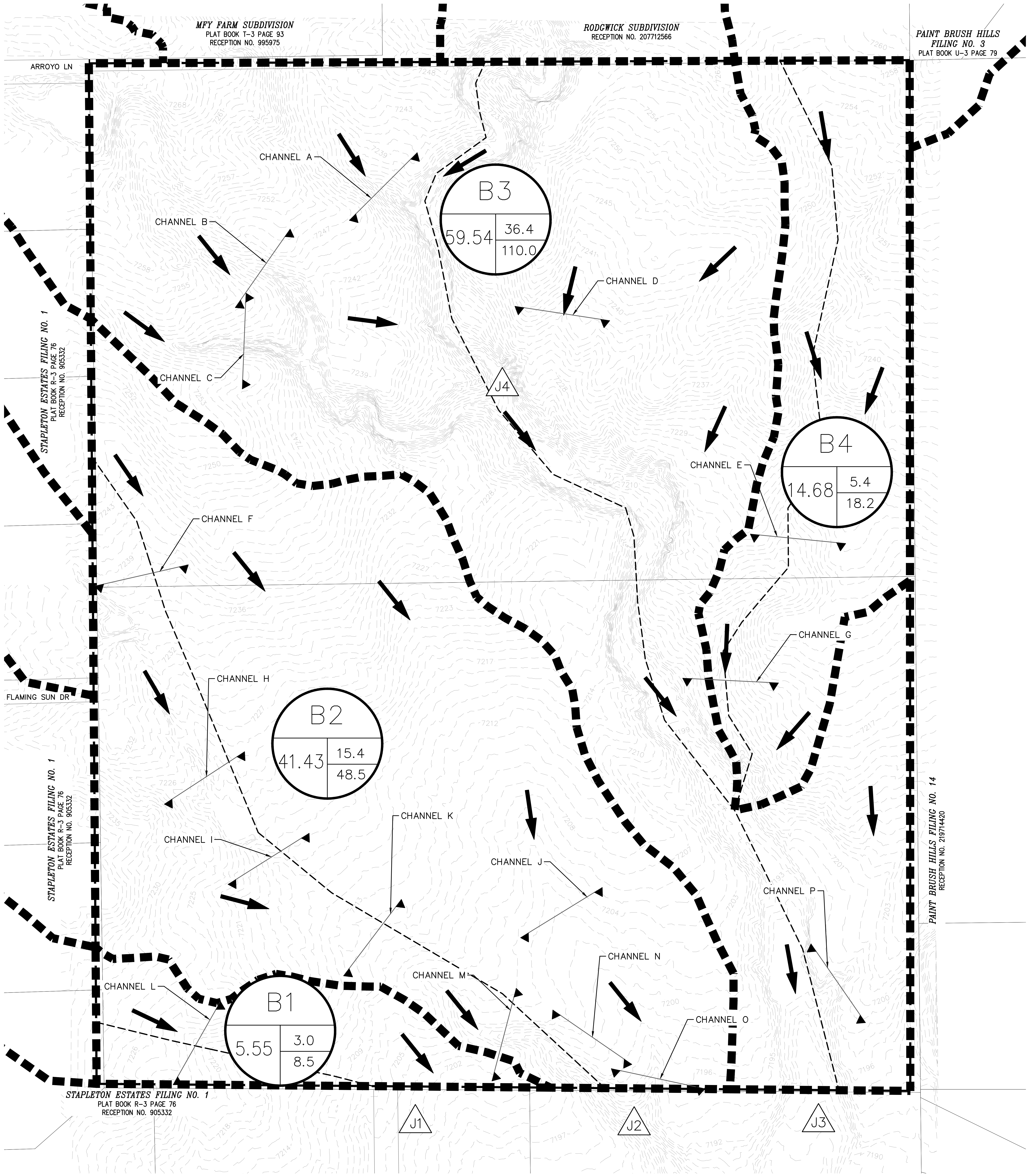
EAGLEVIEW
EL PASO COUNTY, COLORADO
PRE DEVELOPMENT DRAINAGE MAP

PRELIMINARY
FOR REVIEW ONLY
NOT FOR
CONSTRUCTION
Kimley»Horn
Kimley-Horn and Associates, Inc.

PROJECT NO.
196288000

SHEET
1

K:\COS_Civil\196288000_Eagleview\CADD\Exhibits\Drainage Analysis\196288000_EX_DRN.dwg Penneck, Jennifer 12/21/2022 2:56 PM


MFY FARM SUBDIVISION
PLAT BOOK T-3 PAGE 93
RECEPTION NO. 995975
RODGWICK SUBDIVISION
RECEPTION NO. 207712566
PAINT BRUSH HILLS FILING NO. 3
PLAT BOOK U-3 PAGE 79
ARROYO LN
CHANNEL A
CHANNEL B
CHANNEL C
CHANNEL D
CHANNEL E
CHANNEL F
CHANNEL G
CHANNEL H
CHANNEL I
CHANNEL J
CHANNEL K
CHANNEL L
CHANNEL M
CHANNEL N
CHANNEL O
CHANNEL P
B3
59.54
36.4
110.0
B4
14.68
5.4
18.2
B2
41.43
15.4
48.5
B1
5.55
3.0
8.5
J4
J1
J2
J3
STAPLETON ESTATES FILING NO. 1
PLAT BOOK R-3 PAGE 76
RECEPTION NO. 905332
FLAMING SUN DR
PAINT BRUSH HILLS FILING NO. 14
RECEPTION NO. 219714420

LEGEND

DRAINAGE BASIN AREAS

A – HEC–HMS BASINS
B – BASIN ACREAGE
C – 5–YR RUNOFF
D – 100–YR RUNOFF

DESIGN POINT

EXISTING CONTOURS

PROPERTY BOUNDARY

FLOW ARROW

FLOW PATH

EXISTING CHANNEL CROSS SECTIONS

HEC-HMS - EXISTING RUNOFF TABLE						
DESIGN POINT	BASIN DESIGNATION	BASIN AREA (ACRES)	DIRECT 5-YR RUNOFF (CFS)	DIRECT 100-YR RUNOFF (CFS)	CUMULATIVE DIRECT 5-YR RUNOFF (CFS)	CUMULATIVE DIRECT 100-YR RUNOFF (CFS)
	B1	5.55	3.0	8.5	-	-
J1	OB1	10.37	7.1	18.8	10.1	27.3
	B2	41.43	15.4	48.5	-	-
	OB2	28.06	20.6	52.7	-	-
	OB3	43.44	25.3	67.1	-	-
J2	OB4	10.50	7.5	18.9	67.5	183.8
	OB5	143.82	36.8	106.9	-	-
	OB6	118.40	40.8	113.2	-	-
J4	OB7	421.43	101.4	284.2	169.2	478.0
	B3	59.54	36.4	110.0	-	-
	B4	14.68	5.4	18.2	-	-
J3	OB8	33.07	19.5	51.6	183.1	515.5

NORTH

GRAPHIC SCALE IN FEET
0 75 150 300

NO. REVISION BY DATE APPR.

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Colorado Springs, Colorado 80903 (719) 453-0180

DESIGNED BY: MK
DRAWN BY: RS
CHECKED BY: KK
DATE: 12/06/2022

EAGLEVIEW
EL PASO COUNTY, COLORADO
PRE DEVELOPMENT DRAINAGE MAP

PRELIMINARY
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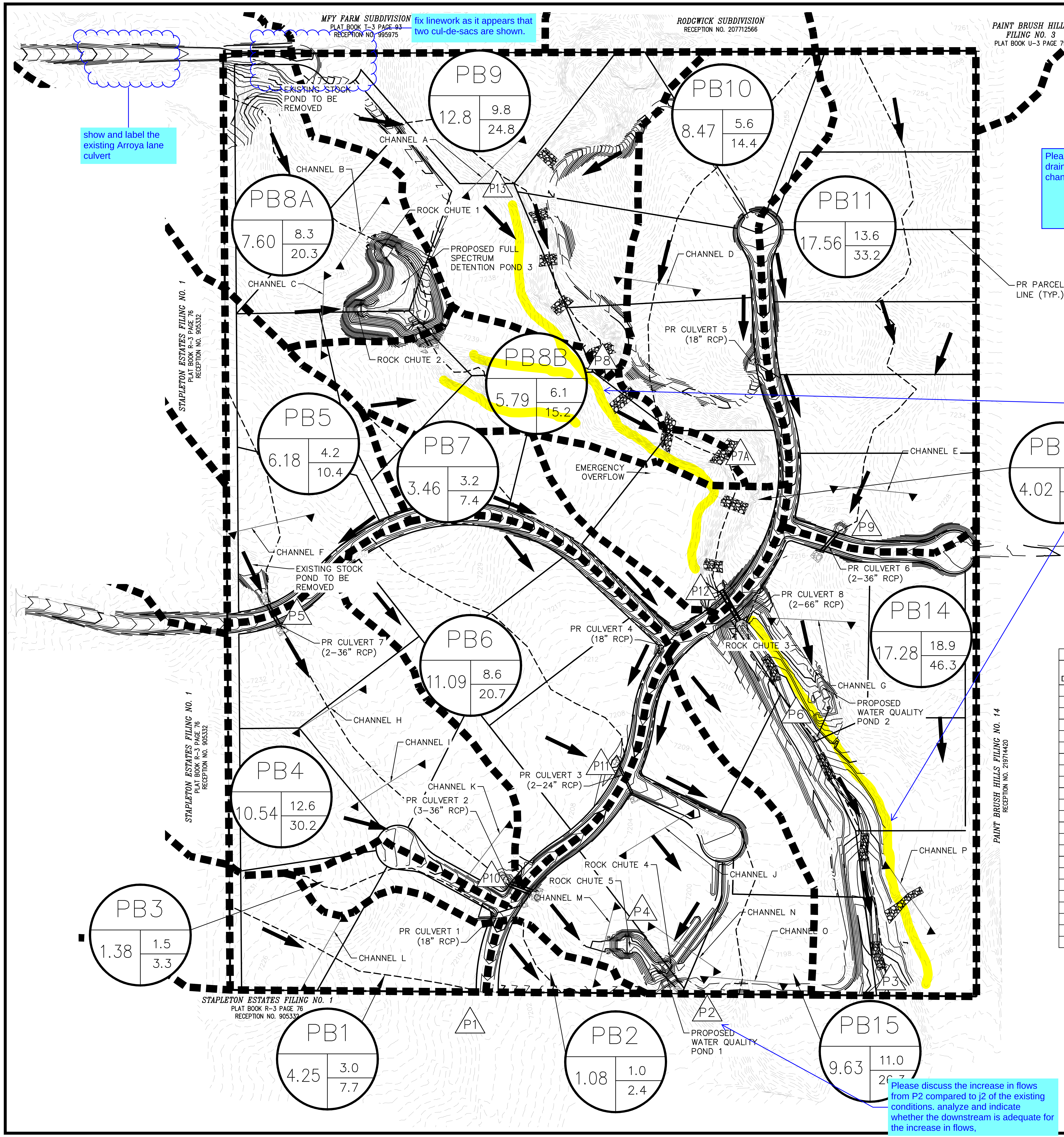
Kimley-Horn and Associates, Inc.

PROJECT NO.
196288000

SHEET
2

K:\COS_Civil\196288000_Eagleview\CADD\Exhibits\Drainage Analysis\196288000_EX_DRN.dwg Penneck, Jennifer 12/21/2022 3:15 PM


MFY FARM SUBDIVISION
PLAT BOOK T-3 PAGE 93
RECEPTION NO. 995975
RODGWICK SUBDIVISION
RECEPTION NO. 207712566
PAINT BRUSH HILLS
FILING NO. 3
PLAT BOOK U-3 PAGE 79
STAPLETON ESTATES FILING NO. 1
PLAT BOOK R-3 PAGE 76
RECEPTION NO. 905332
STAPLETON ESTATES FILING NO. 1
PLAT BOOK R-3 PAGE 76
RECEPTION NO. 905332
STAPLETON ESTATES FILING NO. 1
PLAT BOOK R-3 PAGE 76
RECEPTION NO. 905332
PAINT BRUSH HILLS FILING NO. 14
RECEPTION NO. 219714420
EXISTING STOCK POND TO BE REMOVED
CHANNEL A
CHANNEL B
ROCK CHUTE 1
PROPOSED FULL SPECTRUM DETENTION POND 3
CHANNEL C
ROCK CHUTE 2
CHANNEL D
PR CULVERT 5 (18" RCP)
PR PARCEL LINE (TYP.)
CHANNEL E
EMERGENCY OVERFLOW
CHANNEL F
EXISTING STOCK POND TO BE REMOVED
PR CULVERT 7 (2-36" RCP)
PR CULVERT 6 (2-36" RCP)
PR CULVERT 8 (2-66" RCP)
PR CULVERT 4 (18" RCP)
ROCK CHUTE 3
CHANNEL G
PROPOSED WATER QUALITY POND 2
CHANNEL H
CHANNEL I
CHANNEL K
PR CULVERT 2 (3-36" RCP)
PR CULVERT 3 (2-24" RCP)
ROCK CHUTE 4
ROCK CHUTE 5
CHANNEL M
CHANNEL J
CHANNEL N
CHANNEL O
CHANNEL P
PR CULVERT 1 (18" RCP)
CHANNEL L
PROPOSED WATER QUALITY POND 1
P1
P2
P3
P4
P5
P6
P7A
P8
P9
P10
P11
P12
P13
PB9 12.8 9.8 24.8
PB10 8.47 5.6 14.4
PB8A 7.60 8.3 20.3
PB11 17.56 13.6 33.2
PB8B 5.79 6.1 15.2
PB5 6.18 4.2 10.4
PB7 3.46 3.2 7.4
PB13 4.02 4.9 11.7
PB14 17.28 18.9 46.3
PB6 11.09 8.6 20.7
PB4 10.54 12.6 30.2
PB3 1.38 1.5 3.3
PB1 4.25 3.0 7.7
PB2 1.08 1.0 2.4
PB15 9.63 11.0 2

fix linework as it appears that two cul-de-sacs are shown.

show and label the existing Arroya lane culvert

Please show and label all the drainage easements needed for the channels and ponds

Maintenance access road is required along the channel on each side for channels 30' or more in top width (ECM3.3.3.K) Please update the CD's and plat accordingly.

Please discuss the increase in flows from P2 compared to j2 of the existing conditions. analyze and indicate whether the downstream is adequate for the increase in flows,

LEGEND

▬ ▬ ▬ DRAINAGE BASIN AREAS

A – HEC-HMS BASINS
B – BASIN ACREAGE
C – 5-YR RUNOFF
D – 100-YR RUNOFF

△ DESIGN POINT

– – – – EXISTING CONTOURS

—— PROPOSED CONTOURS

— · — PROPERTY BOUNDARY

→ FLOW ARROW

- - - - FLOW PATH

▼—▼ PROPOSED CHANNEL CROSS SECTIONS

▨ CONCRETE CHECK SRUCTURE (10)

▨ RIFFLE DROP STRUCTURE (5)

HEC-HMS - DEVELOPED RUNOFF BASIN TABLE			
BASIN DESIGNATION	BASIN AREA (ACRES)	DIRECT 5-YR RUNOFF (CFS)	DIRECT 100-YR RUNOFF (CFS)
OB1	10.37	7.1	18.8
OB2	28.06	20.5	52.7
OB3	43.44	25.4	67.2
OB4	10.50	7.5	18.9
OB5	143.82	37.0	107.1
OB6	118.41	40.8	113.3
OB7	421.20	101.4	284.3
OB8	33.07	19.5	51.6
PB1	4.25	3.0	7.7
PB2	1.08	1.0	2.4
PB3	1.38	1.5	3.3
PB4	10.54	12.6	30.2
PB5	6.18	4.2	10.4
PB6	11.09	8.6	20.7
PB7	3.46	3.2	7.4
PB8A	7.60	8.3	20.3
PB8B	5.79	6.1	15.2
PB9	12.80	9.8	24.8
PB10	8.47	5.6	14.4
PB11	17.56	13.6	33.2
PB13	4.02	4.9	11.7
PB14	17.28	18.9	46.3
PB15	9.63	11.0	26.3

HEC-HMS - DEVELOPED RUNOFF DESIGN POINT TABLE				
DESIGN POINT	TRIBUTARY BASINS	TRIBUTARY AREA (ACRES)	CUMULATIVE 5-YR FLOW (CFS)	CUMULATIVE 100-YR FLOW (CFS)
P1	OB1, PB1	14.62	10.1	26.4
P2	OB2, OB3, OB4, PB3, PB4, PB5, PB6, PB7, PB15	124.29	72.7	185.4
P3	OB5, OB6, OB7, OB8, PB8, PB9, PB10, PB11, PB12, PB13, PB14	790.02	179.0	505.2
P4	OB2, OB3, OB4, PB3, PB4, PB5, PB6, PB7	114.66	70.8	180.8
P5 (CULVERT 7)	OB3, OB4, PB5	60.12	36.9	96.1
P6	OB5, OB6, OB7, OB8, PB8A, PB8B, PB9, PB10, PB11, PB13	772.73	177.3	500.7
P7A	OB5, OB6, OB7, PB8A, PB8B, PB9, PB10	718.08	168.5	475.7
P8	OB5, OB6, OB7, PB8, PB9, PB10	709.61	167.3	472.4
P9 (CULVERT 6)	OB8, PB11	50.63	31.8	82.3
P10 (CULVERT 2)	OB2, OB3, OB4, PB4, PB5	98.72	58.0	150.2
P11 (CULVERT 3)	PB6, PB7	14.55	11.7	28
P12 (CULVERT 8)	OB5, OB6, OB7, PB8, PB9, PB10, PB13	722.10	168.9	476.7
P13	PB9, OB6, OB7	552.40	133.8	375.0

NORTH

GRAPHIC SCALE IN FEET
0 75 150 300

NO.	REVISION	BY	DATE	APPR.

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DESIGNED BY: MK
DRAWN BY: RS
CHECKED BY: KK
DATE: 12/06/2022

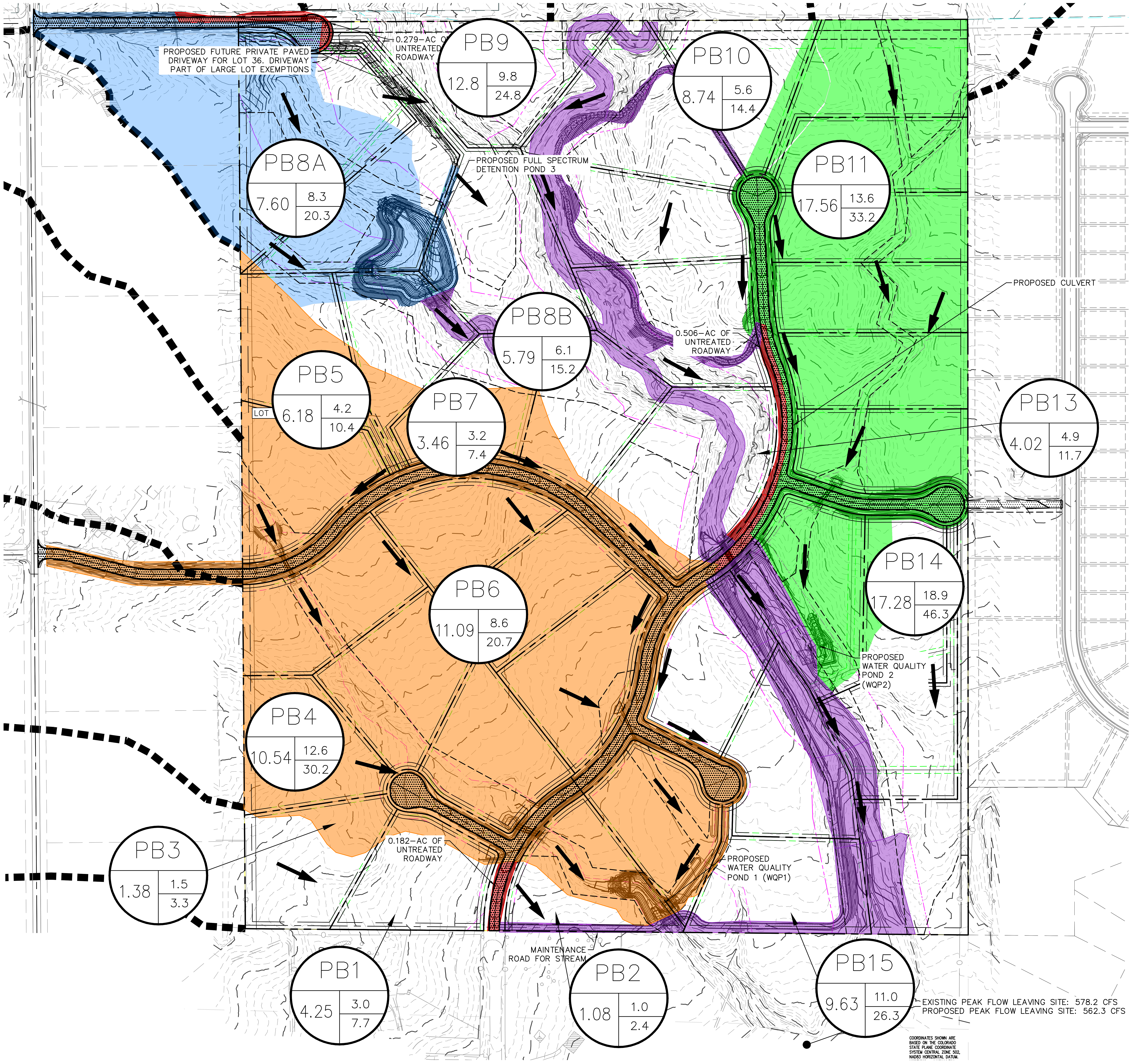
EAGLEVIEW
EL PASO COUNTY, COLORADO
POST DEVELOPMENT - DRAINAGE MAP

PRELIMINARY
FOR REVIEW ONLY
NOT FOR CONSTRUCTION
Kimley»Horn
Kimley-Horn and Associates, Inc.

PROJECT NO.
196288000

SHEET
3

K:\COS_Civil\196288000_Eagleview\CADD\Exhibits\Drainage Analysis\196288000_PR_DRN_UPDATED.dwg Morey, Doug 4/19/2024 11:37 AM


PROPOSED FUTURE PRIVATE PAVED
DRIVEWAY FOR LOT 36. DRIVEWAY
PART OF LARGE LOT EXEMPTIONS
0.279-AC OF
UNTREATED
ROADWAY
PB9
12.8
9.8
24.8
PB10
8.74
5.6
14.4
PB8A
7.60
8.3
20.3
PROPOSED FULL SPECTRUM
DETENTION POND 3
PB11
17.56
13.6
33.2
PROPOSED CULVERT
PB8B
5.79
6.1
15.2
0.506-AC OF
UNTREATED
ROADWAY
PB5
6.18
4.2
10.4
LOT
PB7
3.46
3.2
7.4
PB13
4.02
4.9
11.7
PB6
11.09
8.6
20.7
PB14
17.28
18.9
46.3
PROPOSED
WATER QUALITY
POND 2
(WQP2)
PB4
10.54
12.6
30.2
0.182-AC OF
UNTREATED
ROADWAY
PB3
1.38
1.5
3.3
PROPOSED
WATER QUALITY
POND 1 (WQP1)
MAINTENANCE
ROAD FOR STREAM
PB1
4.25
3.0
7.7
PB2
1.08
1.0
2.4
PB15
9.63
11.0
26.3
EXISTING PEAK FLOW LEAVING SITE: 578.2 CFS
PROPOSED PEAK FLOW LEAVING SITE: 562.3 CFS
COORDINATES SHOWN ARE BASED ON THE COLORADO STATE PLANE COORDINATE SYSTEM CENTRAL ZONE 502, NAD83 HORIZONTAL DATUM.

LEGEND

DRAINAGE BASIN AREAS

A
B | C
  | D

A – HEC–HMS BASINS
B – BASIN ACREAGE
C – 5–YR RUNOFF
D – 100–YR RUNOFF

EXISTING CONTOURS

PROPOSED CONTOURS

PROPERTY BOUNDARY

FLOW ARROW

FLOW PATH

AREA TRIBUTARY TO PROPOSED FULL SPECTRUM DETENTION BASIN

clarify that this is named Pond 3

AREA TRIBUTARY TO WQ POND 1

AREA TRIBUTARY TO WQ POND 2

ROADWAY AREA NOT TREATED (SEE NOTE 2)

STREAM STABILIZATION SITES NOT TREATED (SEE NOTE 3)

Unresolved Review 1 comment:
Delete duplicate or revise section if meaning to reference another section of Appendix I.

Revise to "B.5"

NOTES:

1. NON–ROADWAY AREAS NOT TREATED BY A PBMP ARE EXCLUDED BASED ON ECM APP I.7.1.B.7 AND I.7.1.B.7 DUE TO GRADING WITHIN A DEDICATED DRAINAGE EASEMENT TO PROVIDE A PATHWAY FOR THE EMERGENCY OVERFLOW FROM THE SUB–REGIONAL POND AND A MAINTENANCE ROAD FROM TO THE WATER QUALITY PONDS #1 AND #2. THE PORTION OF THE AREA NOT WITHIN THE DRAINAGE EASEMENT WILL BE PART OF A "LARGE LOT" 2.5 ACRES OR GREATER WITH AND IMPERVIOUS PERCENTAGE LESS THAN 10%
2. ROADWAY AREA NOT TREATED BY A PBMP TOTALS 0.967 ACRES AND IS EXCLUDED BASED ON ECM APP I.7.1.C.1.
3. AREAS DISTURBED THROUGH THE CONSTRUCTION OF DROP STRUCTURES ARE EXCLUDED BASED ON ECM APP I.7.1.B.8.

NORTH

GRAPHIC SCALE IN FEET
0 75 150 300

NO.	REVISION	BY	DATE	APPR.

Kimley»Horn

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EAGLEVIEW
EL PASO COUNTY, COLORADO
OVERVIEW MAP - PBMP TRIBUTARY AREAS

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