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Final Drainage Report

Greaves Pinery Subdivision

Project No. 61233

August 18, 2026

PCD File No.

Final Drainage Report

for

Greaves Pinery Subdivision

Project No. 61233

August 18, 2026

prepared for

Alan Greaves
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Colorado Springs, CO 80917

prepared by

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Statements and Acknowledgments

Engineer's Statement

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

David R. Gorman, P.E.
Colorado No. 31672
For and on Behalf of MVE, Inc.

Developer's Statement

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

_____ _____

Alan Greaves Date
Owner
3880 Inspiration Dr.
Colorado Springs, CO 80917

El Paso County

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

_____ _____

Joshua J. Palmer Date
County Engineer / ECM Administrator

Conditions:

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Final Drainage Report

The purpose of this Final Drainage Report is to identify drainage patterns and quantities within and affecting the proposed Greaves Pinery Subdivision site. The development project is a residential subdivision with 2.5± acre lots. The report will identify specific solutions to drainage concerns on-site and off-site resulting from the proposed project. The report and included maps present results of hydrologic and drainage facilities analyses. The report will discuss the recommended drainage improvements to the site and identify drainage requirements relative to the proposed project. This report has been prepared and submitted in accordance with the requirements of the El Paso County development approval process. An Appendix is included with this report with pertinent calculations and graphs used in the drainage analyses and design.

1 General Location and Description

1.1 Location

The proposed Greaves Pinery Subdivision site is located within the west half of the southeast quarter of Section 5, Township 12 South, Range 65 West of the 6th principal meridian in El Paso County, Colorado. The 9.093± acre site is situated directly to the east and north of Pinery Circle, which is a looped drive. Pinery Circle is connected to Swan Road by Pinery Drive. Swan Road is south of the site. Herring Road is east of the site, but there are no connecting roads from Herring Road to Pinery Circle. The land surrounding the site is described as RR-5 lots in all directions around the site. The existing site previously contained a single family residence that was destroyed in the Black Forest fire. The El Paso County Assessor's Schedule Number for the site is 5205400036 . A **Vicinity Map** is included in the **Appendix**. The entire site is located in El Paso County's in the Kettle Creek Drainage Basin.

1.2 Description of Property

The Greaves Pinery Subdivision site 9.093± acres and is zoned RR-5 (Residential Rural (5 Acres). There is a zone-change application being reviewed concurrently by El Paso County, requesting the zone be changed to Residential Rural 2.5 acre lots. The property is the former location of a single-family residence with an existing gravel driveway which was burned down in the Black Forest fire and the debris has been scraped and removed from the site. The proposed Greaves Pinery Subdivision includes 3 rural residential lots, gravel driveways, well and septic systems.

The ground cover, which is in fair condition, consists of native grasses. The tree coverage is sporadic throughout the site with the majority of them damaged or killed in the fire. On the north portion of the property, many trees still remain.

The existing site topography slopes to the south-west with grades that range from 6% to 40% and south-easterly with grades that range from 6% to 20%.

There are no major drainage ways in the Greaves Pinery Subdivision site. For the northern portion of the site, all storm runoff flows drain to the west and are routed to the west in an existing public 18” CSP culvert. The south-eastern portion of the site drains to the south east and flows are intercepted in an existing public 24” CSP culvert. The south-western portion of the site drains to the south-west, where flows are collected into an existing public 24” CSP culvert and conveyed to the south under

Pinery Circle. There is no storm drain system in the surrounding area. The flows from the site flow south-westerly and eventually enter Kettle Creek Drainage Basin.

According to the National Resource Conservation Service, there are two (2) soil types in the Greaves Pinery Subdivision site. Kettle gravelly loamy sand, 3 to 8% slopes (map unit 40) makes up about 42% of the soil on the site. The soil is deep and somewhat excessively drained. Permeability is rapid, surface runoff is slow, and the hazard of erosion is slight to moderate. Kettle gravelly loamy sand, 3 to 8% slopes is classified as being part of Hydrologic Soil Group B.

The other soil type located on the site is Kettle gravelly loamy sand, 8 to 40% slopes (map unit 41) which makes up 58% of the soil on the site. The soil is deep and well drained. Permeability is rapid, surface runoff is medium, and the hazard of erosion is moderate. Kettle gravelly loamy sand, 8 to 40% is classified as being part of Hydrologic Soil Group B.

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

2 Drainage Basins and Sub-Basins

2.1 Major Basin Descriptions

The Greaves Pinery Subdivision site is located in the Kettle Creek Drainage Basin (FOMO3000). No Drainage Basin Planning Studies are on file for this drainage basin.

The current Flood Insurance Studies of the region include Flood Insurance Rate Maps (FIRM), effective on December 7, 2018.[3] The proposed subdivision is included in two studies, the Community Panel Numbered 08041C0320 G and Community Panel Number 08041C0315 G of the Flood Insurance Rate Maps for the El Paso County. No part of the site is shown to be included in a 100-year flood hazard area as determined by FEMA. A portion of the current FEMA Flood Insurance Rate Maps with the site delineated is included in the **Appendix**.

2.2 Sub-Basin Description

The existing and developed drainage patterns of the Greaves Pinery Subdivision project are described by four (4) on-site drainage basins and ten (10) offsite basins. All of these basins are previously undisturbed or developed to a degree as described below. All existing basin delineations and data are depicted on the attached **Drainage Map**.

2.3 Drainage Design Criteria

This Final Drainage Report for Greaves Pinery Subdivision has been prepared according to the report guidelines presented in the latest edition of *El Paso County Drainage Criteria Manual* (DCM)[4]. The County has also adopted portions of the City of Colorado Springs Drainage Criteria Manual Volumes 1 and 2, especially concerning the calculation of rainfall runoff flow rates.[5] [6] The hydrologic analysis is based on a collection of data from the DCM, the NRCS Web Soil Survey[7], and existing topographic data by Polaris.

3.2 Previous Drainage Studies

No drainage reports were found for any of the surrounding developments.

1 WSS
2 OSD
3 FIRM
4 DCM Section 4.3 and Section 4.4
5 CS DCM Vol 1
6 CS DCM Vol 2
7 WSS

3.3 Hydrologic Criteria

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

3 Drainage Facility Design

3.1 General Concept

The intent of the drainage concept presented in this Final Drainage Report is to allow for the development of the three 2.5 acre lots while maintaining the existing drainage patterns on the site. The site will be in compliance with the County's Stormwater Management regulations without the need for permanent water quality treatment facilities. Major and minor storm flows will continue to be safely conveyed through the site and downstream.

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

3.2 Existing / Developed Drainage Patterns (Off-Site)

Offsite sub-basin **OS-A1** containing 11.75 ± acres lies to the east of Offsite basins OS-A2 and OS-C2. This sub-basin contains RR-5 lots with a single-family residences, detached garages, gravel, and a small portion of gravel-surfaced Pinery Circle. The majority of this sub-basin features moderate slopes of 4% to 6%, with steeper slopes of 20% to 25% along the north-eastern portion of the sub-basin. This sub-basin generates peak flow discharges of Q_5 = 3.4 cfs and Q_{100} = 21.8 cfs (existing/proposed flows). This runoff enters offsite sub-basin OS-A2 along the east and eventually combines with additional flows at Design Point 1 (DP-1).

Offsite sub-basin **OS-A2** containing 10.75 ± acres is located east of the site. This sub-basin contains RR-5 lots. This sub-basin features moderate slopes of 3% to 7% with steeper slopes of 18% at the north portion of the sub-basin. This sub-basin generates peak flow discharges of Q_5 = 3.1 cfs and Q_{100} = 19.9 cfs (existing/proposed flows). This runoff combines with runoff from onsite basin EX/PR A at design point 1, where there is an existing public 24" CSP culvert that routes flows under Pinery Circle.

Offsite sub-basin **OS-A3** containing 0.27 ± acres is located south of the site. This sub-basin contains a portion of the Pinery Circle right-of-way and a portion of the Pinery Circle gravel road. This sub-basin includes a public 18" CSP culvert which routes flows to the east. This culvert was installed under the driveway that led to the residence that was destroyed in the Black Forest fire. Runoff continues easterly in a roadside ditch and combines with flows from offsite sub-basin OS-A2. These flows are collected and routed to the south, under Pinery Circle, in a public 24" CSP culvert at design point 1 (DP-1). This sub-basin generates peak flow discharges of Q_5 = 0.3 cfs and Q_{100} = 0.9 cfs (existing/proposed flows).

Offsite sub-basin **OS-B1** containing 0.43 ± acres is located west and south of the site. This sub-basin contains a portion of the Pinery Circle right-of-way and a portion of the Pinery Circle gravel road. This sub-basin includes runoff from onsite sub-basin EX/PR B and this flow is routed to the south-west corner of the site and collected in a public 24" CSP culvert, draining to the south, at design

8 DCM

point 2 (DP-2). This sub-basin generates peak flow discharges of Q_5 = 0.5 cfs and Q_{100} = 1.7 cfs (existing/proposed flows).

Offsite sub-basin **OS-C1** containing 33.65 ± acres is located northeast of offsite basin OS-C2. This sub-basin contains RR-5 lots. This majority of this sub-basin features moderate slopes of 5% to 10% This sub-basin generates peak flow discharges of Q_5 = 10.0 cfs and Q_{100} = 63.5 cfs (existing/proposed flows). This runoff enters offsite sub-basin OS-C2 along the north and continues routing flows to the south-west.

Offsite sub-basin **OS-C2** containing 6.59 ± acres is located north-east of the site. This sub-basin contains RR5 lots. This sub-basin features mild slopes of 4% to 10%. This sub-basin generates peak flow discharges of Q_5 = 1.9 cfs and Q_{100} = 12.1 cfs (existing/proposed flows). This runoff enters on-site sub-basin C1 along the north-east property line combines with additional flows at Design Point 3 (DP-3).

Offsite sub-basin **OS-C3** containing 16.29 ± acres is located north of offsite basins OS-C5, OS-C4 and OS-C2. This sub-basin contains RR5 lots. The majority of this sub-basin features mild slopes of 5 – 10% with moderate slopes of 20% to 25% found at the northern portion of this sub-basin. This sub-basin generates peak flow discharges of Q_5 = 4.9 cfs and Q_{100} = 31.4 cfs (existing/proposed flows). This runoff enters offsite sub-basin OS-C4 and OS-C5 along the north and combines with additional flows at Design Point 4 (DP-4).

Offsite sub-basin **OS-C4** containing 0.98 ± acres is located north of the site. This sub-basin contains RR-5 lots. This sub-basin features moderate slopes of 10% to 20%. This sub-basin generates peak flow discharges of Q_5 = 0.4 cfs and Q_{100} = 2.4 cfs (existing/proposed flows). This runoff enters on-site sub-basin EX/PR C1 along the north property line and combines with additional flows at Design Point 4 (DP-4).

Offsite sub-basin **OS-C5** containing 1.63 ± acres is located north of the site. This sub-basin contains RR-5 lots. This sub-basin features moderate slopes of 7% to 20%. This sub-basin generates peak flow discharges of Q_5 = 0.7 cfs and Q_{100} = 4.2 cfs (existing/proposed flows). This runoff enters on-site sub-basin C2 along the north property line and combines with additional flows at Design Point 5 (DP-5).

Offsite sub-basin **OS-C6** containing 0.14 ± acres is located west of the site. This sub-basin contains a portion of the Pinery Circle right-of-way and a portion of the Pinery Circle gravel road. This sub-basin includes runoff from onsite sub-basin EX/PR C2 and combined flows from design point 4 (DP-4). Flows enter this offsite basin from the east and flows are directed toward an existing public 18” CSP culvert which is located in the Pinery Circle right-of-way. The existing, public 18” culvert conveys flows to the west at design point 5 (DP-5). This sub-basin generates peak flow discharges of Q_5 = 0.2 cfs and Q_{100} = 0.5 cfs (existing/proposed flows).

3.3 Existing Drainage Patterns (On-Site)

The existing onsite drainage patterns of the site are described by four sub-basins. The north portion of the site drains predominantly to the west, the south-east portion of the site drains to the south and the south-west portion of the site also drains to the south. All of the drainage patterns discussed above, drain to existing public CSP culverts which route flows under Pinery Circle. The drainage characteristics are discussed below in more detail.

Existing onsite sub-basin **EX-A** containing 1.83 ± acres located within the south-east portion of the site. This sub-basin contained a single family residence and driveway which was burned down in 2013 by the Black Forest fire. The debris left after the fire was removed and the site is undeveloped pasture/meadow. Sub-basin EX-A drains to the south and once flows reach the north side of the gravel road at Pinery Circle, flows are routed to the east and intercepted by a public 18” CSP culvert which routes flows to the east. This culvert was installed under the driveway that led to the residence that was destroyed in the Black Forest fire. Runoff continues easterly in a roadside ditch and combines with flows from offsite sub-basin OS-A2. These flows are collected and routed to the south, under Pinery Circle, in a public 24” CSP culvert at design point 1 (DP-1).This sub-basin generates peak flow discharges of Q_5 = 0.6 cfs and Q_{100} = 4.4 cfs (existing flows).

Existing onsite sub-basin **EX-B** containing 4.44 ± acres located within the west and central portion of the site. This sub-basin is undeveloped pasture/meadow. This sub-basin is the largest of the onsite sub-basins, with slopes ranging between 5% and 12%. This sub-basin generates peak flow discharges of Q_5 = 1.2 cfs and Q_{100} = 8.5 cfs (existing flows). The runoff from this sub-basin drains to the west and south into offsite basin B-1 (OS-B1).

Existing onsite sub-basin **EX-C1** containing 1.77 ± acres located within the northeast portion of the site. This sub-basin is undeveloped pasture/meadow and contains some ponderosa pines which were not destroyed in the Black Forest fire. This sub-basin features slopes ranging between 4% and 10%. This sub-basin accepts flows from two offsite basins, OS-C1 and OS-C2 and the combined flows are summarized at design point 3 (EX-DP-3), just to the north of this sub-basin. This sub-basin generates peak flow discharges of Q_5 = 0.5 cfs and Q_{100} = 3.9 cfs (existing flows). This runoff combines with flows at Existing Design Point 4 (EX-DP4).

Existing onsite sub-basin **EX-C2** containing 1.05 ± acres located within the northwest portion of the site. This sub-basin is undeveloped pasture/meadow and contains ponderosa pines. This sub-basin features slopes ranging between 4% and 20%. This sub-basin accepts all the flows summarized at design point 4 (DP-4), which include flows from OS-C1, OS-C2, OS-C3, OS-C4 and onsite basin EX-C1. This sub-basin generates peak flow discharges of Q_5 = 0.3 cfs and Q_{100} = 2.4 cfs (existing flows). The runoff from this sub-basin drains to the west into offsite basin OS-C6 (OS-C6).

3.4 Proposed Drainage Patterns (On-Site)

The proposed onsite drainage patterns of the site are described by four sub-basins. The four sub-basins are the same size as the four existing onsite sub-basins. Developed land use characteristics have been allocated to two of the proposed onsite sub-basins, assuming the addition of residences/outbuilding and driveways. The land use allocations are described in more detail below.

Proposed onsite sub-basin **PR-A** containing 1.83 ± acres located within the south-east portion of the site. This sub-basin contained a single family residence and driveway which was burned down in 2013 by the Black Forest fire. The debris left after the fire was removed and the site is undeveloped pasture/meadow. Sub-basin PR-A includes the assumption that one home, a couple of outbuildings and a driveway could be developed within this sub-basin. The land use values that were applied in this sub-basin were 5000 sf of roofs and 3200 sf of gravel, whereas the rest of the sub-basin will remain as pasture meadow. Sub-basin PR-A drains to the south and once flows reach the north side of the gravel road at Pinery Circle, flows are routed to the east and intercepted by an existing public 18” CSP culvert which routes flows to the east. This culvert was installed under the driveway that led to the residence that was destroyed in the Black Forest fire. If the entrance for a driveway to the new development remains the same, the existing culvert can remain. If the entrance changes from where it presently exists, the existing 18” culvert will be removed and a new driveway culvert will be installed under a new driveway. From the existing public 18” culvert, runoff continues easterly in a roadside ditch and combines with flows from offsite sub-basin OS-A2. These flows are collected and routed to the south, under Pinery Circle, in a public 24” CSP culvert at design point 1 (DP-1).This sub-basin generates peak flow discharges of Q_5 = 1.1 cfs and Q_{100} = 5.1 cfs (proposed flows). The allocated development factors for this sub-basin increases the flows for the 5-yr storm event from 0.60 cfs (existing) to 1.1 cfs (developed); an increase of 0.5 cfs. For the 100-yr. Storm event, flows are increased from 4.4 (existing) to 5.1 (developed); an increase of 0.7 cfs.

Proposed onsite sub-basin **PR-B** containing 4.44 ± acres is located within the west and central portion of the site. Sub-basin PR-B includes the assumption that two homes, a few outbuildings and two driveways could be developed within this sub-basin. The land use values that were applied in this sub-basin were 10,000 sf of roofs and 6400 sf of gravel, whereas the rest of the sub-basin will remain as pasture meadow. This sub-basin generates peak flow discharges of Q_5 = 1.9 cfs and Q_{100} = 9.4 cfs (proposed flows). The allocated development factors for this sub-basin increase the flows for the 5-yr storm event from 1.2 cfs (existing) to 1.9 cfs (developed); an increase of 0.7 cfs. For the 100-yr. Storm event, flows are increased from 8.5 (existing) to 9.4 (developed); an increase of 0.9 cfs. The runoff from this sub-basin drains to the west and south into offsite basin B-1 (OS-B1).

Proposed onsite sub-basin **PR-C1** containing 1.77 ± acres is located within the northeast portion of the site. This sub-basin has been assumed to remain as undeveloped pasture/meadow, due to it's proximity and the amount of ponderosa pines contained within this sub-basin. This sub-basin accepts flows from two offsite basins, OS-C1 and OS-C2 and the combined flows are summarized at design point 3 (DP-3), just to the north of this sub-basin. This sub-basin generates peak flow discharges of Q_5 = 0.5 cfs and Q_{100} = 3.9 cfs (developed flows). Onsite sub-basin PR-C1 flows do not increase in the developed condition, as applied land use values did not change. This runoff combines with flows at Design Point 4 (DP4).

Proposed onsite sub-basin **PR-C2** containing 1.05 ± acres is located within the northwest portion of the site. This sub-basin has been assumed to remain as undeveloped pasture/meadow, due to it's proximity and the amount of ponderosa pines contained within this sub-basin. This sub-basin accepts all the flows summarized at design point 4 (DP-4), which include flows from OS-C1, Os-C2, OS-C3, OS-C4 and onsite basin PR-C1. This sub-basin generates peak flow discharges of Q_5 = 0.3 cfs and Q_{100} = 2.4 cfs (developed flows). Onsite sub-basin PR-C2 flows do not increase in the developed condition, as applied land use values did not change. The runoff from this sub-basin drains to the west into offsite basin C6 (OS-C6).

3.5 Design Point Summary (Existing and Proposed)

Design Point 1 (EX-DP-1/DP-1) consists of OS-A1, OS-A2, OS-A3 and EX-A/ PR-A with a collective area of 24.60 ± acres. This design point is located to the south-east of onsite basin EX-A/ PR-A. This design point represents the flows that will enter the existing public 24" CSP culvert, which routes flows under Pinery Circle to the south. The proposed conditions reflects a proposed lot where an increased collective area of 5,000 SF roof and 3,200 SF gravel is utilized. Design Point 1 **(EX-DP-1/DP-1)** has an existing peak discharge of Q_5 = 6.2 cfs and Q_{100} = 39.7 cfs and a proposed peak discharge of Q_5 = 6.9 cfs and Q_{100} = 42.0 cfs. This results in a negligible flow change of Q_5 = 0.7 cfs and Q_{100} = 2.3 cfs. This runoff will continue south, under Pinery Circle, into the aforementioned existing public 24" CSP culvert.

Design Point 2 (EX-DP-2/DP-2) consists of OS-B1 and EX-B/ PR-B with a collective area of 4.87 ± acres. This design point is located to the south-west of onsite basin EX-B/ PR-B. This design point represents the flows that will enter the existing public 24" CSP culvert, which routes flows under Pinery Circle to the south. The proposed conditions reflects two proposed lot development where an increased collective area of 10,000 SF roof and 6,400 SF gravel is utilized. Design Point 2 **(EX-DP-2/DP-2)** has an existing peak discharge of Q_5 = 1.5 cfs and Q_{100} = 9.2 cfs and a proposed peak discharge of Q_5 = 2.2 cfs and Q_{100} = 10.2 cfs. This results in a negligible flow change of Q_5 = 0.7 cfs and Q_{100} = 1.0 cfs. This runoff will continue south, under Pinery Circle, into the aforementioned existing public 24" CSP culvert.

Design Point 3 (EX-DP-3/DP-3) consists of OS-C1 and OS-C2 with a collective area of 40.23 ± acres. This design point is located north of onsite basin EX-C1/PR-C1. Design Point 3 has an existing peak discharge of Q_5 = 11.0 cfs and Q_{100} = 70.1 cfs and an unchanged proposed peak discharge of Q_5 = 11.0 cfs and Q_{100} = 70.1 cfs. This runoff flows westerly and combines with flows at Design Point 4 (EX-DP-4/DP-4).

Design Point 4 (EX-DP-4/DP-4) consists of design point 3 (**EX-DP-3/DP-3),** OS-C3, OS-C4 and EX-C1/PR-C1 with a collective area of 59.27 ± acres. This design point is located on the west side of onsite sub-basin EX-C1/PR-C1. Design Point 4 has an existing peak discharge of Q_5 = 15.9 cfs and Q_{100} = 101.5 cfs and an unchanged proposed peak discharge of Q_5 = 15.9 cfs and Q_{100} = 101.5 cfs. This results in no flow increase as it was assumed that no structures or driveways will be installed in the sub-basins included in this design point. This runoff flows westerly and combines with flows at Design Point 5 (EX-DP-5/DP-5).

Design Point 5 (EX-DP-5/DP-5) consists of EX-DP-4/DP-4, OS-C6, OS-C5 and EX-C2/ PR-C2 with a collective area of 62.08 ± acres. This design point is located to the west of onsite basin EX-C2/ PR-C2. This design point represents the flows that will enter the existing public 18" CSP culvert, which routes flows under Pinery Circle to the west. Design Point 5 has an existing peak discharge of Q_5 = 16.2 cfs and Q_{100} = 103.8 cfs and an unchanged proposed peak discharge of Q_5 = 16.2 cfs and

Q_{100} = 103.8 cfs. This results in no flow increase as it was assumed that no structures or driveways will be installed in the sub-basins included in this design point. This runoff will continue west, under Pinery Circle, into the aforementioned existing public 18" CSP culvert.

Calculations were done on the existing culverts that convey flows under Pinery Circle and represented by Design Points 1, 2, and 5. The existing culverts were analyzed for both the 5-yr and the 100-yr proposed storm events. The calculations indicated that the two 24" culverts (DP-1, DP-2) will carry the 5-yr flows, but the 18" culvert (DP-5) is under capacity and the existing 5-yr flows over top the road. The 24" culverts at DP-1 and DP-2, respectably, will carry 13 cfs and 11 cfs, flowing full. The 18" culvert at DP-5 will carry 11 cfs, maximum.

The culvert capacity analysis does not take into account any possible affects from existing upstream facilities, such as upstream culverts or agricultural ponds. The calculations for the existing public culverts are included in the **Appendix**.

3.6 Erosion Control

There is no public infrastructure construction or overlot grading associated with this subdivision. Any required control measures (CM's) for the individual lot home construction will be handled on the BESQCP for each lot at time of building permit.

3.7 Four Step Process

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

The entire site consists of 2.5-acre single family residential lots which are excluded from Post Construction Stormwater Management requirements by ECM 1.7.1.B.5 due to the low development density as 2.5-acre lots. There is no public roadway being dedicated or constructed as part of this project. The site is not subject to Post Construction Stormwater Treatment requirements.

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

2) Step 2: Stabilize Drainageways: There are no drainage paths on the site that are required to be stabilized as they are well vegetated with no visual erosion. A HEC-RAS analysis was performed for the drainage path that crosses the northwest corner of the site including design points DP-3, DP-4 and DP-5. The section of the analysis that falls within the subject property is represented by HEC-RAS sections 0 thru 400. Only three sections exhibited froude numbers greater than 1.0, stations 150, 300 and 375, with a maximum of 1.07. Even in that section, the velocities were 4.4 cfs. The results of the HEC-RAS analysis are included in the **Appendix**.

3) Step 3: Provide Water Quality Capture Volume (WQCV): The project contains no potentially hazardous uses. The site is exempted from the use of WQCV CMs by ECM 1.7.1.B.5 by virtue of the large lot rural residential nature of the site having percent imperiousness of less than 10%.

4) Step 4: Consider Need for Industrial and Commercial BMPs: The rural residential lot is not anticipated to contain storage of potentially harmful substances or use of potentially harmful substances. No site specific or other source control BMPs are required. There is no anticipated industrial or commercial use of the proposed roadways. No site specific or other source control BMPs are required.

4 Drainage and Bridge Fees

The site is located within the Kettle Creek Drainage Basin, El Paso Basin Number FOMO3000, which which has no DBPS. Fees associated with this basin are Drainage Fees of $14,733 per impervious acre and Bridge Fees of $0 per impervious acre. The percent Imperiousness of the portion lying within the Kettle Creek Drainage Basin is 2.5-acre Rural Residential site at 11% in accordance with El Paso County Engineering Criteria Manual Appendix L Table 3-1. Also, reductions in the per acre Drainage Fee are allowed pursuant to El Paso County Resolution 99-383. A fee reduction in the of 25% for lots 2.5 acres or larger is utilized for this project. The Greaves Pinery Subdivision site within the Kettle Creek Drainage Basin contains 9.093 acres. Drainage and Bridge Fees for the site are calculated below:

FEE CALCULATION (Kettle Creek 2025 Drainage and Bridge Fees)

Drainage Fee	=	9.093 x $14,733/Imp. Ac x 0.11 Imp.	=	$ 14,736.39
		25% Fee Reduction	=	($3,684.10)
Bridge Fee	=	9.093 x $0/Imp. Ac x 0.11 Imp.	=	$ 0.00
		Grand Total Fees	**=**	**$ 11,052.29**

5 Conclusion

This Final Drainage Report presents existing and proposed drainage conditions for the proposed Greaves Pinery Subdivision project. The development will have negligible and inconsequential effects on the existing site drainage and drainage conditions downstream. The site is exempted from the use of WQCV CMs by ECM 1.7.1.B.5 by virtue of the large lot rural residential nature of the site having percent imperviousness of less than 10%. The entire site is consists of 2.5-acre single family residential lots which are excluded from Post Construction Stormwater Management requirements due to the low development density as 2.5-acre lots. The site is not subject to Post Construction Stormwater Treatment requirements. With such a negligible increase in stormwater flows from the site, detention will not be necessary for the proposed development and will not be provided. The proposed project will not, with respect to stormwater runoff, negatively impact the adjacent properties and downstream properties.

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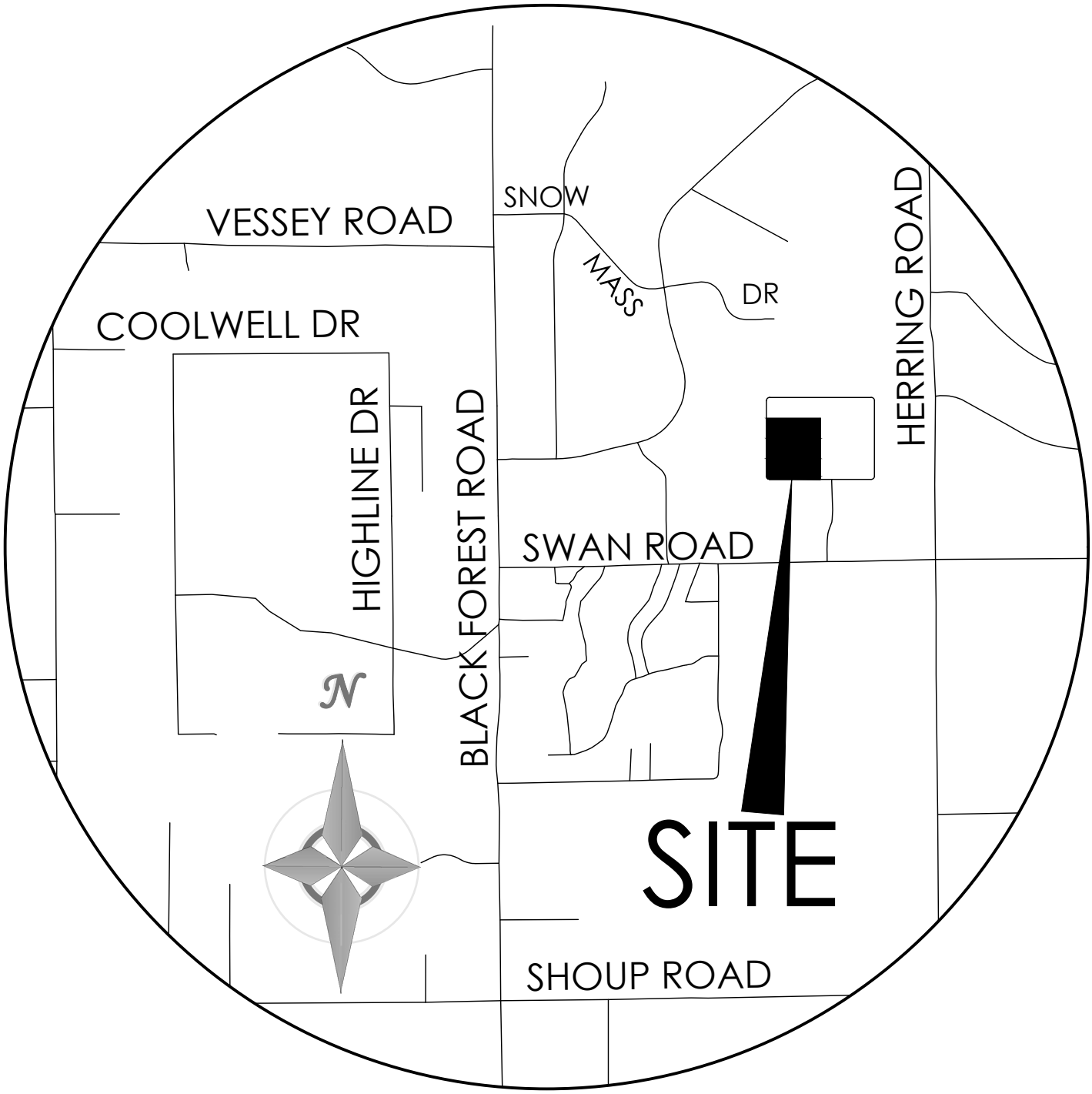
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Appendices

1 General Maps and Supporting Data

Vicinity Map
Portions of Flood Insurance Rate Map
NRCS Soil Map and Tables
SCS Soil Type Descriptions
Hydrologic Soil Group Map and Tables



VICINITY MAP

NOT TO SCALE

National Flood Hazard Layer FIRMette

FEMA

104°41'26"W 39°2'8"N



104°40'49"W 39°1'40"N

Feet

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

1:6,000

Basemap Imagery Source: USGS National Map 2023

Legend

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

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

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

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

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

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

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

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

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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 6/18/2025 at 9:13 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

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

Custom Soil Resource Report for El Paso County Area, Colorado



June 18, 2025

Preface

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

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

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

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

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

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

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How Soil Surveys Are Made

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

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

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

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

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

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

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

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

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

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

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

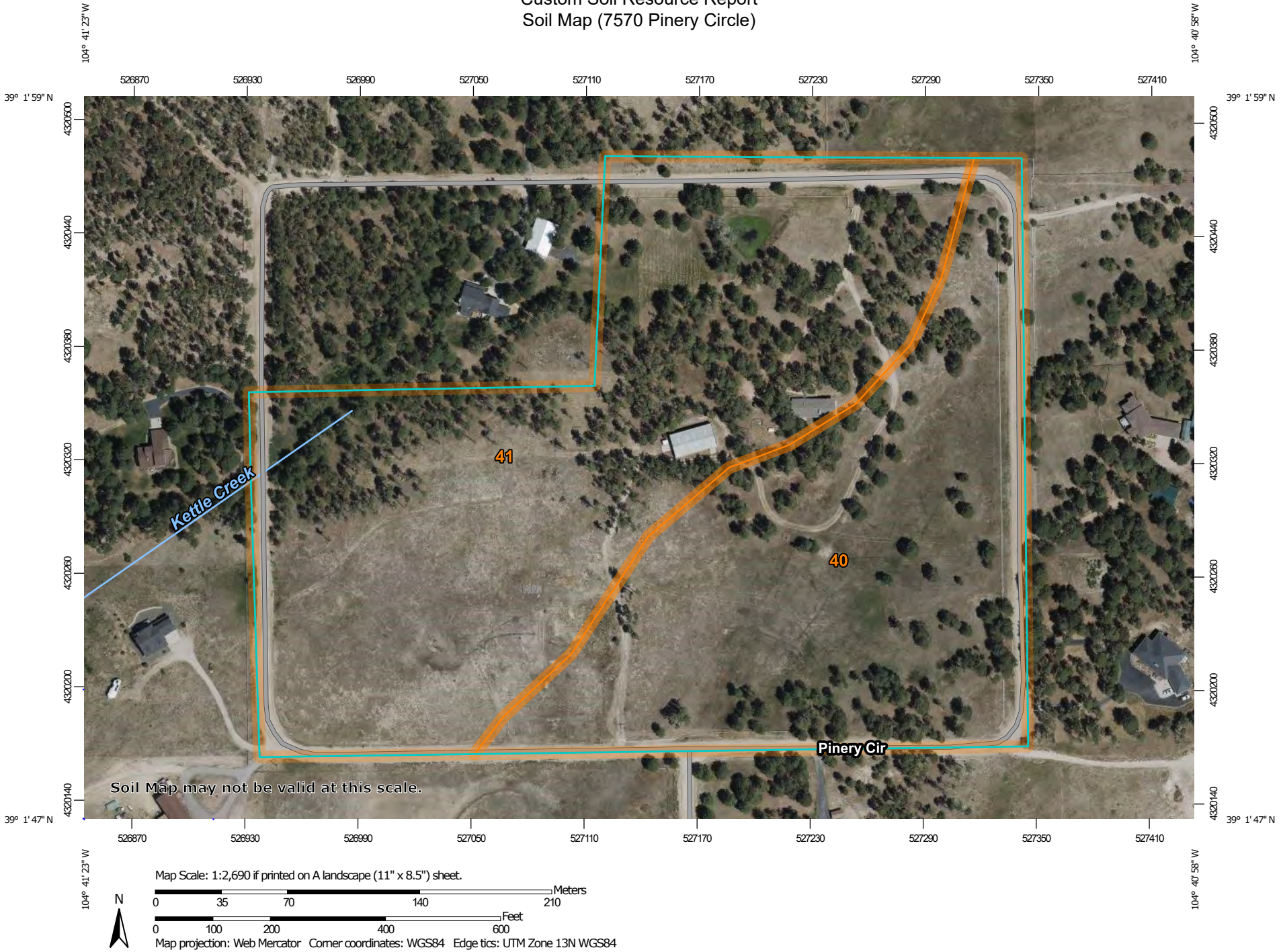
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

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

Soil Map

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

Custom Soil Resource Report
Soil Map (7570 Pinery Circle)



Map Scale: 1:2,690 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 35 70 140 210

Feet: 0 100 200 400 600

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

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 22, Sep 3, 2024

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

Date(s) aerial images were photographed: Jul 23, 2024—Aug 4, 2024

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 (7570 Pinery Circle)

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
40	Kettle gravelly loamy sand, 3 to 8 percent slopes	11.0	41.7%
41	Kettle gravelly loamy sand, 8 to 40 percent slopes	15.4	58.3%
Totals for Area of Interest		**26.3**	**100.0%**

Map Unit Descriptions (7570 Pinery Circle)

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

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
Minor components: 5 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

Pleasant

Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: Yes

Other soils

Percent of map unit:

Hydric soil rating: No

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
Minor components: 5 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: 5 percent

Landform: Depressions
Hydric soil rating: Yes

Other soils

Percent of map unit:
Hydric soil rating: No

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Permeability of the Kettle soil is rapid. Effective rooting depth is more than 60 inches. Available water capacity is low to moderate. Surface runoff is medium to rapid, and the hazard of erosion is slight to high. Soil slippage and deep gullies are common.

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

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

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

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

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

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

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

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

Almost all areas of this soil are used as rangeland.

2 Hydrologic Calculations

Runoff Coefficients and Percent Imperviousness Table 6-6
Colorado Springs Rainfall Intensity Duration Frequency Table 6-5
Hydrologic Calculations Summary Form SF-1 for Existing & Developed Conditions
Hydrologic Calculations Summary 5-yr Form SF-2 for Existing & Developed Conditions
Hydrologic Calculations Summary 100-yr Form SF-2 for Existing & Developed Conditions

Job No.: **61233**
Project: **Greaves Pinery Subdivision**

Date: **8/28/2025 15:08**
Calcs By: **SLB**
Checked By:

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

Sub-Basin	Sub-Basin Data				Overland			Shallow Channel				Channelized				t_c Check		
	Area (Acres)	C_5	C_{100}/CN	% Imp.	L_0 (ft)	S_0 (%)	t_i (min)	L_{0t} (ft)	S_{0t} (ft/ft)	v_{0sc} (ft/s)	t_t (min)	L_{0c} (ft)	S_{0c} (ft/ft)	v_{0c} (ft/s)	t_c (min)	L (min)	$t_{c,alt}$ (min)	t_c (min)
OS-A1	11.75	0.10	0.38	7%	100	5%	11.0	771.1	0.051	1.6	8.2	509.6	0.026	2.4	3.5	1381	N/A	22.6
OS-A2	10.75	0.10	0.38	7%	100	5%	10.8	654.3	0.044	1.5	7.4	638.8	0.027	2.4	4.4	1393	N/A	22.6
OS-A3	0.27	0.24	0.46	25%	18	11%	3.0	0	0.000	0.0	0.0	357.4	0.008	1.2	5.1	375.4	N/A	8.0
OS-B1	0.43	0.25	0.47	27%	27	7%	4.1	0	0.000	0.0	0.0	220.6	0.027	2.1	1.7	247.6	N/A	5.8
OS-C1	33.65	0.10	0.38	7%	100	6%	9.8	914.2	0.073	1.9	8.0	895.2	0.035	3.8	4.0	1909	N/A	21.8
OS-C2	6.59	0.10	0.38	7%	100	6%	9.8	615.9	0.025	1.1	9.2	526.3	0.032	2.2	4.0	1242	N/A	23.0
OS-C3	16.29	0.10	0.38	7%	100	3%	13.2	702.4	0.103	2.2	5.2	494.5	0.040	3.2	2.6	1297	N/A	21.0
OS-C4	0.98	0.10	0.38	7%	100	14%	7.6	0	0.000	0.0	0.0	366.7	0.048	1.4	4.3	466.7	N/A	11.9
OS-C5	1.63	0.10	0.38	7%	100	14%	7.6	280.7	0.055	1.6	2.8	0	0.000	0.0	0.0	380.7	N/A	10.5
OS-C6	0.14	0.23	0.45	23%	35	11%	4.2	0	0.000	0.0	0.0	135	0.044	1.9	1.2	170	N/A	5.4
EX-A	1.83	0.08	0.35	0%	100	9%	8.9	140.1	0.071	1.9	1.2	0	0.000	0.0	0.0	240.1	N/A	10.2
EX-B	4.44	0.08	0.35	0%	100	5%	10.9	592.9	0.039	1.4	7.2	0	0.000	0.0	0.0	692.9	N/A	18.1
EX-C1	1.77	0.08	0.35	0%	100	7%	9.5	179.4	0.056	1.7	1.8	101.3	0.025	1.4	1.2	380.7	N/A	12.5
EX-C2	1.05	0.08	0.35	0%	100	6%	10.2	199.5	0.070	1.9	1.8	0	0.000	0.0	0.0	299.5	N/A	12.0
PR-A	1.83	0.14	0.39	9%	100	9%	8.4	140.1	0.071	1.9	1.2	0	0.000	0.0	0.0	240.1	N/A	9.6
PR-B	4.44	0.13	0.39	7%	100	5%	10.4	592.9	0.039	1.4	7.2	0	0.000	0.0	0.0	692.9	N/A	17.5
PR-C1	1.77	0.08	0.35	0%	100	7%	9.5	179.4	0.056	1.7	1.8	101.3	0.025	1.4	1.2	380.7	N/A	12.5
PR-C2	1.05	0.08	0.35	0%	100	6%	10.2	199.5	0.070	1.9	1.8	0	0.000	0.0	0.0	299.5	N/A	12.0

Job No.: **61233**
Project: **Greaves Pinery Subdivision**
Design Storm: **5-Year Storm** *(20% Probability)*
Jurisdiction: **DCM**

Date: **8/28/2025 15:08**
Calcs By: **SLB**
Checked By:

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

				Direct Runoff				Combined Runoff				Streetflow			Pipe Flow					Travel Time		
DP	Sub-Basin	Area (Acres)	C5	t_c (min)	CA (Acres)	I5 (in/hr)	Q5 (cfs)	t_c (min)	CA (Acres)	I5 (in/hr)	Q5 (cfs)	Slope (%)	Length (ft)	Q (cfs)	Q (cfs)	Slope (%)	Mnngs n	Length (ft)	D_{Pipe} (in)	Length (ft)	v_{0sc} (ft/s)	t_t (min)
	OS-A1	11.75	0.10	22.6	1.17	2.90	3.41															
	OS-A2	10.75	0.10	22.6	1.08	2.91	3.13															
	OS-A3	0.27	0.24	8.0	0.06	4.46	0.29															
	OS-B1	0.43	0.25	5.8	0.11	4.94	0.54															
	OS-C1	33.65	0.10	21.8	3.36	2.96	9.96															
	OS-C2	6.59	0.10	23.0	0.66	2.88	1.89															
	OS-C3	16.29	0.10	21.0	1.63	3.02	4.92															
	OS-C4	0.98	0.10	11.9	0.10	3.87	0.38															
	OS-C5	1.63	0.10	10.5	0.16	4.06	0.66															
	OS-C6	0.14	0.23	5.4	0.03	5.07	0.16															
	EX-A	1.83	0.08	10.2	0.15	4.10	0.60															
	EX-B	4.44	0.08	18.1	0.36	3.24	1.15															
	EX-C1	1.77	0.08	12.5	0.14	3.79	0.54															
	EX-C2	1.05	0.08	12.0	0.08	3.86	0.32															
	PR-A	1.83	0.14	9.6	0.26	4.19	1.08															
	PR-B	4.44	0.13	17.5	0.58	3.29	1.90															
	PR-C1	1.77	0.08	12.5	0.14	3.80	0.54															
	PR-C2	1.05	0.08	12.0	0.08	3.86	0.32															
EX-DP-1		24.60	0.10					28.9	2.46	2.54	6.2											
DP-1		24.60	0.10					26.5	2.57	2.67	6.9											
EX-DP-2		4.87	0.10					19.4	0.46	3.13	1.5											
DP-2		4.87	0.14					18.8	0.69	3.18	2.2											
EX-DP-3		40.23	0.10					25.4	4.02	2.73	11.0											
DP-3		40.23	0.10					25.4	4.02	2.73	11.0											
EX-DP-4		59.27	0.10					26.1	5.89	2.69	15.9											
DP-4		59.27	0.10					26.1	5.89	2.69	15.9											
EX-DP-5		62.08	0.10					27.2	6.17	2.63	16.2											
DP-5		62.09	0.10					27.2	6.17	2.63	16.2											

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

Job No.: **61233**
Project: **Greaves Pinery Subdivision**
Design Storm: **100-Year Storm** *(1% Probability)*
Jurisdiction: **DCM**

Date: **8/28/2025 15:08**
Calcs By: **SLB**
Checked By:

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

				Direct Runoff				Combined Runoff				Streetflow			Pipe Flow					Travel Time		
DP	Sub-Basin	Area (Acres)	C100	t_c (min)	CA (Acres)	I100 (in/hr)	Q100 (cfs)	t_c (min)	CA (Acres)	I100 (in/hr)	Q100 (cfs)	Slope (%)	Length (ft)	Q (cfs)	Q (cfs)	Slope (%)	Mnngs n	Length (ft)	D_{Pipe} (in)	Length (ft)	v_{Osc} (ft/s)	t_t (min)
	OS-A1	11.75	0.38	22.6	4.46	4.87	21.76															
	OS-A2	10.75	0.38	22.6	4.09	4.88	19.93															
	OS-A3	0.27	0.46	8.0	0.12	7.48	0.92															
	OS-B1	0.43	0.47	5.8	0.20	8.29	1.67															
	OS-C1	33.65	0.38	21.8	12.79	4.97	63.55															
	OS-C2	6.59	0.38	23.0	2.50	4.83	12.09															
	OS-C3	16.29	0.38	21.0	6.19	5.07	31.37															
	OS-C4	0.98	0.38	11.9	0.37	6.50	2.42															
	OS-C5	1.63	0.38	10.5	0.62	6.82	4.21															
	OS-C6	0.14	0.45	5.4	0.06	8.51	0.54															
	EX-A	1.83	0.35	10.2	0.64	6.89	4.42															
	EX-B	4.44	0.35	18.1	1.55	5.44	8.46															
	EX-C1	1.77	0.35	12.5	0.62	6.37	3.94															
	EX-C2	1.05	0.35	12.0	0.37	6.48	2.37															
	PR-A	1.83	0.39	9.6	0.72	7.03	5.06															
	PR-B	4.44	0.39	17.5	1.71	5.52	9.44															
	PR-C1	1.77	0.35	12.5	0.62	6.37	3.94															
	PR-C2	1.05	0.35	12.0	0.37	6.48	2.38															
EX-DP-1		24.60	0.38					28.9	9.31	4.26	39.7											
DP-1		24.60	0.38					26.5	9.39	4.47	42.0											
EX-DP-2		4.87	0.36					19.4	1.76	5.26	9.2											
DP-2		4.87	0.39					18.8	1.91	5.34	10.2											
EX-DP-3		40.23	0.38					25.4	15.29	4.59	70.1											
DP-3		40.23	0.38					25.4	15.29	4.59	70.1											
EX-DP-4		59.27	0.38					26.1	22.47	4.52	101.5											
DP-4		59.27	0.38					26.1	22.47	4.52	101.5											
EX-DP-5		62.08	0.38					27.2	23.52	4.41	103.8											
DP-5		62.09	0.38					27.2	23.52	4.41	103.8											

DCM: I = C1 * ln (tc) + C2
C1: 2.52
C1: 12.735

Sub-Basin OS-A1 Runoff Calculations

Job No.:	**61233**	Date:	**8/28/2025 15:08**
Project:	**Greaves Pinery Subdivision**	Calcs by:	**SLB**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Non-Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
5 Acre	511,682	11.75	0.06	0.1	0.2	0.29	0.34	0.38	7%
Combined	**511,682**	**11.75**	**0.06**	**0.10**	**0.20**	**0.29**	**0.34**	**0.38**	**7.0%**

511682.1623

Basin Travel Time

Shallow Channel Ground Cover: Short Pasture/Lawns

$L_{max,Overland}$ 300 ft C_v 7

	L (ft)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	1,381	57	-	-	-	-	
Initial Time	100	5	0.045	-	11.0	N/A	DCM Eq. 6-8
Shallow Channel	771	39	0.051	1.6	8.2	-	DCM Eq. 6-9
Channelized	510	13	0.026	2.4	3.5	-	Trap Ditch
				t_c	**22.6**	**min.**	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.32	2.90	3.39	3.87	4.36	4.87
Runoff (cfs)	1.6	**3.4**	8.0	13.2	17.4	**21.8**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	1.6	**3.4**	8.0	13.2	17.4	**21.8**

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

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

Notes

Sub-Basin OS-A2 Runoff Calculations

Job No.:	**61233**	Date:	**8/28/2025 15:08**
Project:	**Greaves Pinery Subdivision**	Calcs by:	**SLB**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Non-Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
5 Acre	468,300	10.75	0.06	0.1	0.2	0.29	0.34	0.38	7%
Combined	**468,300**	**10.75**	**0.06**	**0.10**	**0.20**	**0.29**	**0.34**	**0.38**	**7.0%**

468300.1633

Basin Travel Time

Shallow Channel Ground Cover: Short Pasture/Lawns

$L_{max,Overland}$: 300 ft C_v: 7

	L (ft)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	1,393	51	-	-	-	-	
Initial Time	100	5	0.048	-	10.8	N/A	DCM Eq. 6-8
Shallow Channel	654	29	0.044	1.5	7.4	-	DCM Eq. 6-9
Channelized	639	17	0.027	2.4	4.4	-	Trap Ditch
				t_c	**22.6**	**min.**	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.33	2.91	3.39	3.88	4.36	4.88
Runoff (cfs)	1.5	**3.1**	7.3	12.1	15.9	**19.9**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	1.5	**3.1**	7.3	12.1	15.9	**19.9**

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

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

Notes

Sub-Basin OS-A3 Runoff Calculations

Job No.:	**61233**	Date:	**8/28/2025 15:08**
Project:	**Greaves Pinery Subdivision**	Calcs by:	**SLB**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Non-Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
Pasture/Meadow	7,952	0.18	0.02	0.08	0.15	0.25	0.3	0.35	0%
Gravel	3,667	0.08	0.57	0.59	0.63	0.66	0.68	0.7	80%
Combined	**11,619**	**0.27**	**0.19**	**0.24**	**0.30**	**0.38**	**0.42**	**0.46**	**25.2%**

11619.6663

Basin Travel Time

Shallow Channel Ground Cover: Short Pasture/Lawns

$L_{max,Overland}$: 300 ft C_v: 7

	L (ft)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	375	5	-	-	-	-	
Initial Time	18	2	0.111	-	3.0	N/A	DCM Eq. 6-8
Shallow Channel			0.000	0.0	0.0	-	DCM Eq. 6-9
Channelized	357	3	0.008	1.2	5.1	-	V-Ditch
				t_c	**8.0 min.**		

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	3.55	4.46	5.20	5.94	6.68	7.48
Runoff (cfs)	0.2	**0.3**	0.4	0.6	0.7	**0.9**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.2	**0.3**	0.4	0.6	0.7	**0.9**

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

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

Notes

Sub-Basin OS-B1 Runoff Calculations

Job No.:	**61233**	Date:	**8/28/2025 15:08**
Project:	**Greaves Pinery Subdivision**	Calcs by:	**SLB**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Non-Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
Pasture/Meadow	12,486	0.29	0.02	0.08	0.15	0.25	0.3	0.35	0%
Gravel	6,322	0.15	0.57	0.59	0.63	0.66	0.68	0.7	80%
Combined	**18,808**	**0.43**	**0.20**	**0.25**	**0.31**	**0.39**	**0.43**	**0.47**	**26.9%**

18808.1586

Basin Travel Time

Shallow Channel Ground Cover: Short Pasture/Lawns

$L_{max,Overland}$: 300 ft C_v: 7

	L (ft)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	248	8	-	-	-	-	
Initial Time	27	2	0.074	-	4.1	N/A	DCM Eq. 6-8
Shallow Channel			0.000	0.0	0.0	-	DCM Eq. 6-9
Channelized	221	6	0.027	2.1	1.7	-	V-Ditch
				t_c	**5.8 min.**		

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	3.94	4.94	5.76	6.58	7.41	8.29
Runoff (cfs)	0.3	**0.5**	0.8	1.1	1.4	**1.7**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.3	**0.5**	0.8	1.1	1.4	**1.7**

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

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

Notes

Sub-Basin OS-C1 Runoff Calculations

Job No.:	**61233**	Date:	**8/28/2025 15:08**
Project:	**Greaves Pinery Subdivision**	Calcs by:	**SLB**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Non-Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
5 Acre	1,465,579	33.65	0.06	0.1	0.2	0.29	0.34	0.38	7%
Combined	**1,465,579**	**33.65**	**0.06**	**0.10**	**0.20**	**0.29**	**0.34**	**0.38**	**7.0%**
	1465578.879								

Basin Travel Time

Shallow Channel Ground Cover: Short Pasture/Lawns

$L_{max,Overland}$: 300 ft C_v: 7

	L (ft)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	1,909	104	-	-	-	-	
Initial Time	100	6	0.064	-	9.8	N/A	DCM Eq. 6-8
Shallow Channel	914	67	0.073	1.9	8.0	-	DCM Eq. 6-9
Channelized	895	31	0.035	3.8	4.0	-	Trap Ditch
				t_c	**21.8**	**min.**	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.37	2.96	3.46	3.95	4.44	4.97
Runoff (cfs)	4.8	**10.0**	23.2	38.5	50.8	**63.5**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	4.8	**10.0**	23.2	38.5	50.8	**63.5**

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

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

Notes

Sub-BasinOS-C2 Runoff Calculations

Job No.:	**61233**	Date:	**8/28/2025 15:08**
Project:	**Greaves Pinery Subdivision**	Calcs by:	**SLB**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Non-Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
5 Acre	286,907	6.59	0.06	0.1	0.2	0.29	0.34	0.38	7%
Combined	**286,907**	**6.59**	**0.06**	**0.10**	**0.20**	**0.29**	**0.34**	**0.38**	**7.0%**

286906.5885

Basin Travel Time

Shallow Channel Ground Cover: Short Pasture/Lawns

$L_{max,Overland}$ 300 ft C_v 7

	L (ft)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	1,242	39	-	-	-	-	
Initial Time	100	6	0.064	-	9.8	N/A	DCM Eq. 6-8
Shallow Channel	616	16	0.025	1.1	9.2	-	DCM Eq. 6-9
Channelized	526	17	0.032	2.2	4.0	-	Trap Ditch
				t_c	**23.0**	**min.**	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.30	2.88	3.36	3.84	4.32	4.83
Runoff (cfs)	0.9	**1.9**	4.4	7.3	9.7	**12.1**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.9	**1.9**	4.4	7.3	9.7	**12.1**

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

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

Notes

Sub-Basin OS-C3 Runoff Calculations

Job No.:	**61233**	Date:	**8/28/2025 15:08**
Project:	**Greaves Pinery Subdivision**	Calcs by:	**SLB**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Non-Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
5 Acre	709,571	16.29	0.06	0.1	0.2	0.29	0.34	0.38	7%
Combined	**709,571**	**16.29**	**0.06**	**0.10**	**0.20**	**0.29**	**0.34**	**0.38**	**7.0%**

709571.4284

Basin Travel Time

Shallow Channel Ground Cover: Short Pasture/Lawns

$L_{max,Overland}$: 300 ft C_v: 7

	L (ft)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	1,297	95	-	-	-	-	
Initial Time	100	3	0.026	-	13.2	N/A	DCM Eq. 6-8
Shallow Channel	702	72	0.103	2.2	5.2	-	DCM Eq. 6-9
Channelized	494	20	0.040	3.2	2.6	-	Trap Ditch
				t_c	**21.0**	**min.**	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.41	3.02	3.52	4.03	4.53	5.07
Runoff (cfs)	2.4	**4.9**	11.5	19.0	25.1	**31.4**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	2.4	**4.9**	11.5	19.0	25.1	**31.4**

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

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

Notes

Sub-Basin OS-C4 Runoff Calculations

Job No.:	**61233**	Date:	**8/28/2025 15:08**
Project:	**Greaves Pinery Subdivision**	Calcs by:	**SLB**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Non-Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
5 Acre	42,664	0.98	0.06	0.1	0.2	0.29	0.34	0.38	7%
Combined	**42,664**	**0.98**	**0.06**	**0.10**	**0.20**	**0.29**	**0.34**	**0.38**	**7.0%**

42664.4841

Basin Travel Time

Shallow Channel Ground Cover: Short Pasture/Lawns

$L_{max,Overland}$: 300 ft C_v: 7

	L (ft)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	467	32	-	-	-	-	
Initial Time	100	14	0.140	-	7.6	N/A	DCM Eq. 6-8
Shallow Channel			0.000	0.0	0.0	-	DCM Eq. 6-9
Channelized	367	18	0.048	1.4	4.3	-	Trap Ditch
				t_c	**11.9**	**min.**	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	3.09	3.87	4.52	5.16	5.81	6.50
Runoff (cfs)	0.2	**0.4**	0.9	1.5	1.9	**2.4**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.2	**0.4**	0.9	1.5	1.9	**2.4**

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

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

Notes

Sub-Basin OS-C5 Runoff Calculations

Job No.:	**61233**	Date:	**8/28/2025 15:08**
Project:	**Greaves Pinery Subdivision**	Calcs by:	**SLB**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Non-Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
5 Acre	70,871	1.63	0.06	0.1	0.2	0.29	0.34	0.38	7%
Combined	**70,871**	**1.63**	**0.06**	**0.10**	**0.20**	**0.29**	**0.34**	**0.38**	**7.0%**
	70870.7479								

Basin Travel Time

Shallow Channel Ground Cover: Short Pasture/Lawns

$L_{max,Overland}$: 300 ft C_v: 7

	L (ft)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	381	29	-	-	-	-	
Initial Time	100	14	0.136	-	7.6	N/A	DCM Eq. 6-8
Shallow Channel	281	16	0.055	1.6	2.8	-	DCM Eq. 6-9
Channelized			0.000	0.0	0.0	-	V-Ditch
				t_c	**10.5**	**min.**	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	3.24	4.06	4.74	5.41	6.09	6.82
Runoff (cfs)	0.3	**0.7**	1.5	2.6	3.4	**4.2**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.3	**0.7**	1.5	2.6	3.4	**4.2**

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

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

Notes

Sub-Basin OS-C6 Runoff Calculations

Job No.:	**61233**	Date:	**8/28/2025 15:08**
Project:	**Greaves Pinery Subdivision**	Calcs by:	**SLB**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Non-Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
Pasture/Meadow	4,342	0.10	0.02	0.08	0.15	0.25	0.3	0.35	0%
Gravel	1,796	0.04	0.57	0.59	0.63	0.66	0.68	0.7	80%
Combined	**6,138**	**0.14**	**0.18**	**0.23**	**0.29**	**0.37**	**0.41**	**0.45**	**23.4%**
	6137.8735								

Basin Travel Time

Shallow Channel Ground Cover: Short Pasture/Lawns

$L_{max,Overland}$: 300 ft C_v: 7

	L (ft)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	170	10	-	-	-	-	
Initial Time	35	4	0.114	-	4.2	N/A	DCM Eq. 6-8
Shallow Channel			0.000	0.0	0.0	-	DCM Eq. 6-9
Channelized	135	6	0.044	1.9	1.2	-	V-Ditch
				t_c	**5.4 min.**		

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	4.04	5.07	5.91	6.76	7.60	8.51
Runoff (cfs)	0.1	**0.2**	0.2	0.4	0.4	**0.5**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.1	**0.2**	0.2	0.4	0.4	**0.5**

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

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

Notes

Sub-Basin EX-A Runoff Calculations

Job No.:	**61233**	Date:	**8/28/2025 15:08**
Project:	**Greaves Pinery Subdivision**	Calcs by:	**SLB**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Non-Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
Pasture/Meadow	79,801	1.83	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	**79,801**	**1.83**	**0.02**	**0.08**	**0.15**	**0.25**	**0.30**	**0.35**	**0.0%**

79800.5004

Basin Travel Time

Shallow Channel Ground Cover: Short Pasture/Lawns

$L_{max,Overland}$: 300 ft C_v: 7

	L (ft)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	240	19	-	-	-	-	
Initial Time	100	9	0.090	-	8.9	N/A	DCM Eq. 6-8
Shallow Channel	140	10	0.071	1.9	1.2	-	DCM Eq. 6-9
Channelized			0.000	0.0	0.0	-	Trap Ditch
				t_c	**10.2**	**min.**	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	3.28	4.10	4.79	5.47	6.16	6.89
Runoff (cfs)	0.1	**0.6**	1.3	2.5	3.4	**4.4**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.1	**0.6**	1.3	2.5	3.4	**4.4**

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

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

Notes

Sub-Basin EX-B Runoff Calculations

Job No.:	**61233**	Date:	**8/28/2025 15:08**
Project:	**Greaves Pinery Subdivision**	Calcs by:	**SLB**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Non-Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
Pasture/Meadow	193472.5687	4.44	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	**193,473**	**4.44**	**0.02**	**0.08**	**0.15**	**0.25**	**0.30**	**0.35**	**0.0%**

193472.5687

Basin Travel Time

Shallow Channel Ground Cover: Short Pasture/Lawns

$L_{max,Overland}$: 300 ft C_v: 7

	L (ft)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	693	28	-	-	-	-	
Initial Time	100	5	0.049	-	10.9	N/A	DCM Eq. 6-8
Shallow Channel	593	23	0.039	1.4	7.2	-	DCM Eq. 6-9
Channelized			0.000	0.0	0.0	-	Trap Ditch
				t_c	**18.1**	**min.**	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.59	3.24	3.78	4.32	4.86	5.44
Runoff (cfs)	0.2	**1.2**	2.5	4.8	6.5	**8.5**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.2	**1.2**	2.5	4.8	6.5	**8.5**

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

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

Notes

Sub-Basin EX-C1 Runoff Calculations

Job No.:	**61233**	Date:	**8/28/2025 15:08**
Project:	**Greaves Pinery Subdivision**	Calcs by:	**SLB**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Non-Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
Pasture/Meadow	76,986	1.77	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	**76,986**	**1.77**	**0.02**	**0.08**	**0.15**	**0.25**	**0.30**	**0.35**	**0.0%**

76986.0341

Basin Travel Time

Shallow Channel Ground Cover: Short Pasture/Lawns

$L_{max,Overland}$ 300 ft C_v 7

	L (ft)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	381	20	-	-	-	-	
Initial Time	100	7	0.074	-	9.5	N/A	DCM Eq. 6-8
Shallow Channel	179	10	0.056	1.7	1.8	-	DCM Eq. 6-9
Channelized	101	3	0.025	1.4	1.2	-	Trap Ditch
				t_c	**12.5**	**min.**	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	3.03	3.79	4.42	5.06	5.69	6.37
Runoff (cfs)	0.1	**0.5**	1.2	2.2	3.0	**3.9**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.1	**0.5**	1.2	2.2	3.0	**3.9**

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

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

Notes

Sub-Basin EX-C2 Runoff Calculations

Job No.:	**61233**	Date:	**8/28/2025 15:08**
Project:	**Greaves Pinery Subdivision**	Calcs by:	**SLB**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Non-Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
Pasture/Meadow	45,640	1.05	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	**45,640**	**1.05**	**0.02**	**0.08**	**0.15**	**0.25**	**0.30**	**0.35**	**0.0%**

45639.6545

Basin Travel Time

Shallow Channel Ground Cover: Short Pasture/Lawns

$L_{max,Overland}$ 300 ft C_v 7

	L (ft)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	300	20	-	-	-	-	
Initial Time	100	6	0.060	-	10.2	N/A	DCM Eq. 6-8
Shallow Channel	200	14	0.070	1.9	1.8	-	DCM Eq. 6-9
Channelized			0.000	0.0	0.0	-	Trap Ditch
				t_c	**12.0**	**min.**	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	3.08	3.86	4.50	5.14	5.79	6.48
Runoff (cfs)	0.1	**0.3**	0.7	1.3	1.8	**2.4**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.1	**0.3**	0.7	1.3	1.8	**2.4**

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

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

Notes

Sub-Basin PR-A Runoff Calculations

Job No.:	**61233**	Date:	**8/28/2025 15:08**
Project:	**Greaves Pinery Subdivision**	Calcs by:	**SLB**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Non-Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
Roofs	5,000	0.11	0.71	0.73	0.75	0.78	0.8	0.81	90%
Gravel	3,200	0.07	0.57	0.59	0.63	0.66	0.68	0.7	80%
Pasture/Meadow	71,601	1.64	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	**79,801**	**1.83**	**0.09**	**0.14**	**0.21**	**0.30**	**0.35**	**0.39**	**8.8%**

79800.5004

Basin Travel Time

Shallow Channel Ground Cover: Short Pasture/Lawns

$L_{max,Overland}$: 300 ft C_v: 7

	L (ft)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	240	19	-	-	-	-	
Initial Time	100	9	0.090	-	8.4	N/A	DCM Eq. 6-8
Shallow Channel	140	10	0.071	1.9	1.2	-	DCM Eq. 6-9
Channelized			0.000	0.0	0.0	-	Trap Ditch
				t_c	**9.6 min.**		

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	3.34	4.19	4.88	5.58	6.28	7.03
Runoff (cfs)	0.5	**1.1**	1.9	3.1	4.0	**5.1**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.5	**1.1**	1.9	3.1	4.0	**5.1**

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

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

Notes

Sub-Basin PR-B Runoff Calculations

Job No.:	**61233**	Date:	**8/28/2025 15:08**
Project:	**Greaves Pinery Subdivision**	Calcs by:	**SLB**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Non-Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
Roofs	10,000	0.23	0.71	0.73	0.75	0.78	0.8	0.81	90%
Gravel	6,400	0.15	0.57	0.59	0.63	0.66	0.68	0.7	80%
Pasture/Meadow	177,073	4.07	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	**193,473**	**4.44**	**0.07**	**0.13**	**0.20**	**0.29**	**0.34**	**0.39**	**7.3%**

193472.5687

Basin Travel Time

Shallow Channel Ground Cover: Short Pasture/Lawns

$L_{max,Overland}$: 300 ft C_v: 7

	L (ft)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	693	28	-	-	-	-	
Initial Time	100	5	0.049	-	10.4	N/A	DCM Eq. 6-8
Shallow Channel	593	23	0.039	1.4	7.2	-	DCM Eq. 6-9
Channelized			0.000	0.0	0.0	-	Trap Ditch
				t_c	**17.5**	**min.**	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.63	3.29	3.84	4.38	4.93	5.52
Runoff (cfs)	0.9	**1.9**	3.4	5.7	7.4	**9.4**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.9	**1.9**	3.4	5.7	7.4	**9.4**

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

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

Notes

Sub-Basin PR-C1 Runoff Calculations

Job No.:	**61233**	Date:	**8/28/2025 15:08**
Project:	**Greaves Pinery Subdivision**	Calcs by:	**SLB**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Non-Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
Pasture/Meadow	76,986	1.77	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	**76,986**	**1.77**	**0.02**	**0.08**	**0.15**	**0.25**	**0.30**	**0.35**	**0.0%**

76986.0341

Basin Travel Time

Shallow Channel Ground Cover: Short Pasture/Lawns

$L_{max,Overland}$ 300 ft C_v 7

	L (ft)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	381	20	-	-	-	-	
Initial Time	100	7	0.074	-	9.5	N/A	DCM Eq. 6-8
Shallow Channel	179	10	0.056	1.7	1.8	-	DCM Eq. 6-9
Channelized	101	3	0.025	1.4	1.2	-	Trap Ditch
				t_c	**12.5**	**min.**	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	3.03	3.80	4.43	5.06	5.69	6.37
Runoff (cfs)	0.1	**0.5**	1.2	2.2	3.0	**3.9**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.1	**0.5**	1.2	2.2	3.0	**3.9**

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

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

Notes

Sub-Basin PR-C2 Runoff Calculations

Job No.:	**61233**	Date:	**8/28/2025 15:08**
Project:	**Greaves Pinery Subdivision**	Calcs by:	**SLB**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Non-Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
Pasture/Meadow	45,776	1.05	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	**45,776**	**1.05**	**0.02**	**0.08**	**0.15**	**0.25**	**0.30**	**0.35**	**0.0%**

45775.5679

Basin Travel Time

Shallow Channel Ground Cover: Short Pasture/Lawns

$L_{max,Overland}$ 300 ft C_v 7

	L (ft)	ΔZ_0 (ft)	S_0 (ft/ft)	v (ft/s)	t (min)	t_{Alt} (min)	
Total	300	20	-	-	-	-	
Initial Time	100	6	0.060	-	10.2	N/A	DCM Eq. 6-8
Shallow Channel	200	14	0.070	1.9	1.8	-	DCM Eq. 6-9
Channelized			0.000	0.0	0.0	-	Trap Ditch
				t_c	**12.0**	**min.**	

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	3.08	3.86	4.50	5.14	5.79	6.48
Runoff (cfs)	0.1	**0.3**	0.7	1.4	1.8	**2.4**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	0.1	**0.3**	0.7	1.4	1.8	**2.4**

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

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

Notes

Combined Sub-Basin Runoff Calculations (EX-DP-1)

Includes Basins OS-A1 OS-A2 OS-A3 EX-A

Job No.:	**61233**	Date:	**8/28/2025 15:08**
Project:	**Greaves Pinery Subdivision**	Calcs by:	**SLB**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Non-Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
5 Acre	979,982	22.50	0.06	0.1	0.2	0.29	0.34	0.38	7%
Pasture/Meadow	87,753	2.01	0.02	0.08	0.15	0.25	0.3	0.35	0%
Gravel	3,667	0.08	0.57	0.59	0.63	0.66	0.68	0.7	80%
Roofs	-	0.00	0.71	0.73	0.75	0.78	0.8	0.81	90%
Combined	**1,071,402**	**24.60**	**0.06**	**0.10**	**0.20**	**0.29**	**0.34**	**0.38**	**6.7%**

Basin Travel Time

	Sub-basin or Channel Type	Material Type	L (ft)	Elev. ΔZ_0 (ft)	Q_i (cfs)	Base or Dia (ft)	Sides z:1 (ft/ft)	v (ft/s)	t (min)
Furthest Reach	OS-A1	-	1,381	57	-	-	-	-	22.6
Channelized-1	Trap Ditch	2	641	28	4	8	10	1.7	6.2
Channelized-2									
Channelized-3									
Total			2,022	85					

2 = Natural, Winding, minimal vegetation/shallow grass

t_c (min) **28.9**

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

Contributing Basins/Areas

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

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

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.03	2.54	2.96	3.38	3.81	4.26
Site Runoff (cfs)	2.92	**6.25**	14.38	23.98	31.65	**39.67**
OffSite Runoff (cfs)	-	**0.00**	-	-	-	**0.00**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	-	**6.2**	-	-	-	**39.7**
DCM: I = C1 * ln (tc) + C2						
C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

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

Combined Sub-Basin Runoff Calculations (DP-1)

Includes Basins OS-A1 OS-A2 OS-A3 PR-A

Job No.:	**61233**	Date:	**8/28/2025 15:08**
Project:	**Greaves Pinery Subdivision**	Calcs by:	**SLB**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Non-Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
5 Acre	979,982	22.50	0.06	0.1	0.2	0.29	0.34	0.38	7%
Pasture/Meadow	79,553	1.83	0.02	0.08	0.15	0.25	0.3	0.35	0%
Roofs	5,000	0.11	0.71	0.73	0.75	0.78	0.8	0.81	90%
Gravel	6,867	0.16	0.57	0.59	0.63	0.66	0.68	0.7	80%
Combined	**1,071,403**	**24.60**	**0.06**	**0.10**	**0.20**	**0.29**	**0.34**	**0.38**	**7.3%**

Basin Travel Time

	Sub-basin or Channel Type	Material Type	L (ft)	Elev. ΔZ_0 (ft)	Q_i (cfs)	Base or Dia (ft)	Sides z:1 (ft/ft)	v (ft/s)	t (min)
Furthest Reach	OS-A1	-	1,381	57	-	-	-	-	22.6
Channelized-1	Trap Ditch	2	641	28	5	2	3	2.7	3.9
Channelized-2									
Channelized-3									
Total			2,022	85					

2 = Natural, Winding, minimal vegetation/shallow grass

t_c (min) **26.5**

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

Contributing Basins/Areas

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

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

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.13	2.67	3.11	3.56	4.00	4.47
Site Runoff (cfs)	3.32	**6.86**	15.42	25.51	33.58	**42.02**
OffSite Runoff (cfs)	-	**0.00**	-	-	-	**0.00**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	-	**6.9**	-	-	-	**42.0**

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

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

Notes

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

Combined Sub-Basin Runoff Calculations (EX-DP-2)

Includes Basins EX-B OS-B1

Job No.:	**61233**	Date:	**8/28/2025 15:08**
Project:	**Greaves Pinery Subdivision**	Calcs by:	**SLB**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Non-Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
5 Acre	-	0.00	0.06	0.1	0.2	0.29	0.34	0.38	7%
Pasture/Meadow	205,959	4.73	0.02	0.08	0.15	0.25	0.3	0.35	0%
Gravel	6,322	0.15	0.57	0.59	0.63	0.66	0.68	0.7	80%
Roofs	-	0.00	0.71	0.73	0.75	0.78	0.8	0.81	90%
Combined	**212,280**	**4.87**	**0.04**	**0.10**	**0.16**	**0.26**	**0.31**	**0.36**	**2.4%**

Basin Travel Time

	Sub-basin or Channel Type	Material Type	L (ft)	Elev. ΔZ_0 (ft)	Q_i (cfs)	Base or Dia (ft)	Sides z:1 (ft/ft)	v (ft/s)	t (min)
Furthest Reach	EX-B	-	693	28	-	-	-	-	18.1
Channelized-1	Trap Ditch	2	221	6	9	2	3	2.7	1.3
Channelized-2									
Channelized-3									
Total			914	34					

2 = Natural, Winding, minimal vegetation/shallow grass

t_c (min) **19.4**

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

Contributing Basins/Areas

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

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

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.51	3.13	3.66	4.18	4.70	5.26
Site Runoff (cfs)	0.44	**1.45**	2.93	5.34	7.13	**9.24**
OffSite Runoff (cfs)	-	**0.00**	-	-	-	**0.00**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	-	**1.5**	-	-	-	**9.2**

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

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

Notes

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

Combined Sub-Basin Runoff Calculations (DP-2)

Includes Basins PR-B OS-B1

Job No.:	**61233**	Date:	**8/28/2025 15:08**
Project:	**Greaves Pinery Subdivision**	Calcs by:	**SLB**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Non-Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
5 Acre	-	0.00	0.06	0.1	0.2	0.29	0.34	0.38	7%
Pasture/Meadow	189,559	4.35	0.02	0.08	0.15	0.25	0.3	0.35	0%
Gravel	12,722	0.29	0.57	0.59	0.63	0.66	0.68	0.7	80%
Roofs	10,000	0.23	0.71	0.73	0.75	0.78	0.8	0.81	90%
Combined	**212,281**	**4.87**	**0.09**	**0.14**	**0.21**	**0.30**	**0.35**	**0.39**	**9.0%**

Basin Travel Time

	Sub-basin or Channel Type	Material Type	L (ft)	Elev. ΔZ_0 (ft)	Q_i (cfs)	Base or Dia (ft)	Sides z:1 (ft/ft)	v (ft/s)	t (min)
Furthest Reach	PR-B	-	693	28	-	-	-	-	17.5
Channelized-1	Trap Ditch	2	221	6	10	2	3	2.9	1.3
Channelized-2									
Channelized-3									
Total			914	34					

2 = Natural, Winding, minimal vegetation/shallow grass

t_c (min) **18.8**

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

Contributing Basins/Areas

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

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

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.54	3.18	3.71	4.24	4.77	5.34
Site Runoff (cfs)	1.06	**2.19**	3.75	6.19	8.06	**10.22**
OffSite Runoff (cfs)	-	**0.00**	-	-	-	**0.00**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	-	**2.2**	-	-	-	**10.2**
DCM: I = C1 * ln (tc) + C2						
C1	1.19	1.5	1.75	2	2.25	2.52
C2	6.035	7.583	8.847	10.111	11.375	12.735

Notes

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

Combined Sub-Basin Runoff Calculations (EX-DP-3)

Includes Basins OS-C1 OS-C2

Job No.:	**61233**	Date:	**8/28/2025 15:08**
Project:	**Greaves Pinery Subdivision**	Calcs by:	**SLB**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Non-Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
5 Acre	1,752,485	40.23	0.06	0.1	0.2	0.29	0.34	0.38	7%
Pasture/Meadow	-	0.00	0.02	0.08	0.15	0.25	0.3	0.35	0%
Roofs	-	0.00	0.71	0.73	0.75	0.78	0.8	0.81	90%
Gravel	-	0.00	0.57	0.59	0.63	0.66	0.68	0.7	80%
Combined	**1,752,485**	**40.23**	**0.06**	**0.10**	**0.20**	**0.29**	**0.34**	**0.38**	**7.0%**

Basin Travel Time

	Sub-basin or Channel Type	Material Type	L (ft)	Elev. ΔZ_0 (ft)	Q_i (cfs)	Base or Dia (ft)	Sides z:1 (ft/ft)	v (ft/s)	t (min)
Furthest Reach	OS-C1	-	1,909	104	-	-	-	-	21.8
Channelized-1	Trap Ditch	2	840	32	64	8	10	3.9	3.6
Channelized-2									
Channelized-3									
Total			2,749	136					

2 = Natural, Winding, minimal vegetation/shallow grass

t_c (min) **25.4**

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

Contributing Basins/Areas

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

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

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.19	2.73	3.19	3.64	4.10	4.59
Site Runoff (cfs)	5.28	**10.99**	25.66	42.52	56.08	**70.12**
OffSite Runoff (cfs)	-	**0.00**	-	-	-	**0.00**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	-	**11.0**	-	-	-	**70.1**

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

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

Notes

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

Combined Sub-Basin Runoff Calculations (DP-3)

Includes Basins OS-C1 OS-C2

Job No.:	**61233**	Date:	**8/28/2025 15:08**
Project:	**Greaves Pinery Subdivision**	Calcs by:	**SLB**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Non-Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
5 Acre	1,752,485	40.23	0.06	0.1	0.2	0.29	0.34	0.38	7%
Roofs	-	0.00	0.71	0.73	0.75	0.78	0.8	0.81	90%
Gravel	-	0.00	0.57	0.59	0.63	0.66	0.68	0.7	80%
Pasture/Meadow	-	0.00	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	**1,752,485**	**40.23**	**0.06**	**0.10**	**0.20**	**0.29**	**0.34**	**0.38**	**7.0%**

Basin Travel Time

	Sub-basin or Channel Type	Material Type	L (ft)	Elev. ΔZ_0 (ft)	Q_i (cfs)	Base or Dia (ft)	Sides z:1 (ft/ft)	v (ft/s)	t (min)
Furthest Reach	OS-C1	-	1,909	104	-	-	-	-	21.8
Channelized-1	Trap Ditch	2	840	32	64	8	10	3.9	3.6
Channelized-2									
Channelized-3									
Total			2,749	136					

2 = Natural, Winding, minimal vegetation/shallow grass

t_c (min) **25.4**

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

Contributing Basins/Areas

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

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

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.19	2.73	3.19	3.64	4.10	4.59
Site Runoff (cfs)	5.28	**10.99**	25.66	42.52	56.08	**70.12**
OffSite Runoff (cfs)	-	**0.00**	-	-	-	**0.00**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	-	**11.0**	-	-	-	**70.1**

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

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

Notes

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

Combined Sub-Basin Runoff Calculations (EX-DP-4)

Includes Basins EX-DP-3 OS-C3 OS-C4 EX-C1

Job No.:	**61233**	Date:	**8/28/2025 15:08**
Project:	**Greaves Pinery Subdivision**	Calcs by:	**SLB**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Non-Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
5 Acre	2,504,721	57.50	0.06	0.1	0.2	0.29	0.34	0.38	7%
Pasture/Meadow	76,986	1.77	0.02	0.08	0.15	0.25	0.3	0.35	0%
Roofs	-	0.00	0.71	0.73	0.75	0.78	0.8	0.81	90%
Gravel	-	0.00	0.57	0.59	0.63	0.66	0.68	0.7	80%
Combined	**2,581,707**	**59.27**	**0.06**	**0.10**	**0.20**	**0.29**	**0.34**	**0.38**	**6.8%**

Basin Travel Time

	Sub-basin or Channel Type	Material Type	L (ft)	Elev. ΔZ_0 (ft)	Q_i (cfs)	Base or Dia (ft)	Sides z:1 (ft/ft)	v (ft/s)	t (min)
Furthest Reach	EX-DP-3	-	2,749	136	-	-	-	-	25.4
Channelized-1	Trap Ditch	2	167	6	64	8	10	3.8	0.7
Channelized-2									
Channelized-3									
Total			2,916	142					

2 = Natural, Winding, minimal vegetation/shallow grass

t_c (min) **26.1**

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

Contributing Basins/Areas

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

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

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.15	2.69	3.14	3.59	4.04	4.52
Site Runoff (cfs)	7.51	**15.85**	36.93	61.41	81.05	**101.46**
OffSite Runoff (cfs)	-	**0.00**	-	-	-	**0.00**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	-	**15.9**	-	-	-	**101.5**

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

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

Notes

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

Combined Sub-Basin Runoff Calculations (DP-4)

Includes Basins DP-3 OS-C3 OS-C4 PR-C1

Job No.:	**61233**	Date:	**8/28/2025 15:08**
Project:	**Greaves Pinery Subdivision**	Calcs by:	**SLB**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Non-Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
5 Acre	2,504,721	57.50	0.06	0.1	0.2	0.29	0.34	0.38	7%
Roofs	-	0.00	0.71	0.73	0.75	0.78	0.8	0.81	90%
Gravel	-	0.00	0.57	0.59	0.63	0.66	0.68	0.7	80%
Pasture/Meadow	76,986	1.77	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	**2,581,707**	**59.27**	**0.06**	**0.10**	**0.20**	**0.29**	**0.34**	**0.38**	**6.8%**

Basin Travel Time

	Sub-basin or Channel Type	Material Type	L (ft)	Elev. ΔZ_0 (ft)	Q_i (cfs)	Base or Dia (ft)	Sides z:1 (ft/ft)	v (ft/s)	t (min)
Furthest Reach	DP-3	-	2,749	136	-	-	-	-	25.4
Channelized-1	Trap Ditch	2	167	6	64	8	10	3.8	0.7
Channelized-2									
Channelized-3									
Total			2,916	142					

2 = Natural, Winding, minimal vegetation/shallow grass

t_c (min) **26.1**

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

Contributing Basins/Areas

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

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

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.15	2.69	3.14	3.59	4.04	4.52
Site Runoff (cfs)	7.51	**15.85**	36.93	61.41	81.05	**101.46**
OffSite Runoff (cfs)	-	**0.00**	-	-	-	**0.00**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	-	**15.9**	-	-	-	**101.5**

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

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

Notes

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

Combined Sub-Basin Runoff Calculations (EX-DP-5)

Includes Basins EX-DP-4 OS-C6 OS-C5 EX-C2

Job No.:	**61233**	Date:	**8/28/2025 15:08**
Project:	**Greaves Pinery Subdivision**	Calcs by:	**SLB**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Non-Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
5 Acre	2,575,592	59.13	0.06	0.1	0.2	0.29	0.34	0.38	7%
Roofs	-	0.00	0.71	0.73	0.75	0.78	0.8	0.81	90%
Gravel	1,796	0.04	0.57	0.59	0.63	0.66	0.68	0.7	80%
Pasture/Meadow	126,968	2.91	0.02	0.08	0.15	0.25	0.3	0.35	0%
Combined	**2,704,356**	**62.08**	**0.06**	**0.10**	**0.20**	**0.29**	**0.34**	**0.38**	**6.7%**

Basin Travel Time

	Sub-basin or Channel Type	Material Type	L (ft)	Elev. ΔZ_0 (ft)	Q_i (cfs)	Base or Dia (ft)	Sides z:1 (ft/ft)	v (ft/s)	t (min)
Furthest Reach	EX-DP-4	-	2,916	142	-	-	-	-	26.1
Channelized-1	Trap Ditch	2	259	7	98	8	10	3.9	1.1
Channelized-2									
Channelized-3									
Total			3,175	149					

2 = Natural, Winding, minimal vegetation/shallow grass

t_c (min) **27.2**

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

Contributing Basins/Areas

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

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

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.10	2.63	3.07	3.51	3.94	4.41
Site Runoff (cfs)	7.64	**16.22**	37.69	62.75	82.84	**103.75**
OffSite Runoff (cfs)	-	**0.00**	-	-	-	**0.00**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	-	**16.2**	-	-	-	**103.8**

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

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

Notes

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

Combined Sub-Basin Runoff Calculations (DP-5)

Includes Basins DP-4 OS-C6 OS-C5 PR-C2

Job No.:	**61233**	Date:	**8/28/2025 15:08**
Project:	**Greaves Pinery Subdivision**	Calcs by:	**SLB**
		Checked by:	
Jurisdiction	**DCM**	Soil Type	**B**
Runoff Coefficient	**Surface Type**	Urbanization	**Non-Urban**

Basin Land Use Characteristics

	Area		Runoff Coefficient						%
Surface	**(SF)**	**(Acres)**	**C2**	**C5**	**C10**	**C25**	**C50**	**C100**	**Imperv.**
5 Acre	2,575,592	59.13	0.06	0.1	0.2	0.29	0.34	0.38	7%
Pasture/Meadow	127,104	2.92	0.02	0.08	0.15	0.25	0.3	0.35	0%
Gravel	1,796	0.04	0.57	0.59	0.63	0.66	0.68	0.7	80%
Roofs	-	0.00	0.71	0.73	0.75	0.78	0.8	0.81	90%
Combined	**2,704,492**	**62.09**	**0.06**	**0.10**	**0.20**	**0.29**	**0.34**	**0.38**	**6.7%**

Basin Travel Time

	Sub-basin or Channel Type	Material Type	L (ft)	Elev. ΔZ_0 (ft)	Q_i (cfs)	Base or Dia (ft)	Sides z:1 (ft/ft)	v (ft/s)	t (min)
Furthest Reach	DP-4	-	2,916	142	-	-	-	-	26.1
Channelized-1	Trap Ditch	2	259	7	98	8	10	3.9	1.1
Channelized-2									
Channelized-3									
Total			3,175	149					

2 = Natural, Winding, minimal vegetation/shallow grass

t_c (min) **27.2**

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

Contributing Basins/Areas

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

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

Rainfall Intensity & Runoff

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Intensity (in/hr)	2.10	2.63	3.07	3.51	3.94	4.41
Site Runoff (cfs)	7.64	**16.22**	37.69	62.76	82.84	**103.76**
OffSite Runoff (cfs)	-	**0.00**	-	-	-	**0.00**
Release Rates (cfs/ac)	-	-	-	-	-	-
Allowed Release (cfs)	-	**16.2**	-	-	-	**103.8**

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

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

Notes

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

3 Hydraulic Calculations

Culvert Calculations
HEC-RAS Exhibits

Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Aug 28 2025

Culvert A (DP-1) (5yr - 6.9 cfs)

Invert Elev Dn (ft)	=	7507.22
Pipe Length (ft)	=	40.00
Slope (%)	=	1.17
Invert Elev Up (ft)	=	7507.69
Rise (in)	=	24.0
Shape	=	Circular
Span (in)	=	24.0
No. Barrels	=	1
n-Value	=	0.023
Culvert Type	=	Circular Corrugate Metal Pipe
Culvert Entrance	=	Projecting
Coeff. K,M,c,Y,k	=	0.034, 1.5, 0.0553, 0.54, 0.9

Embankment

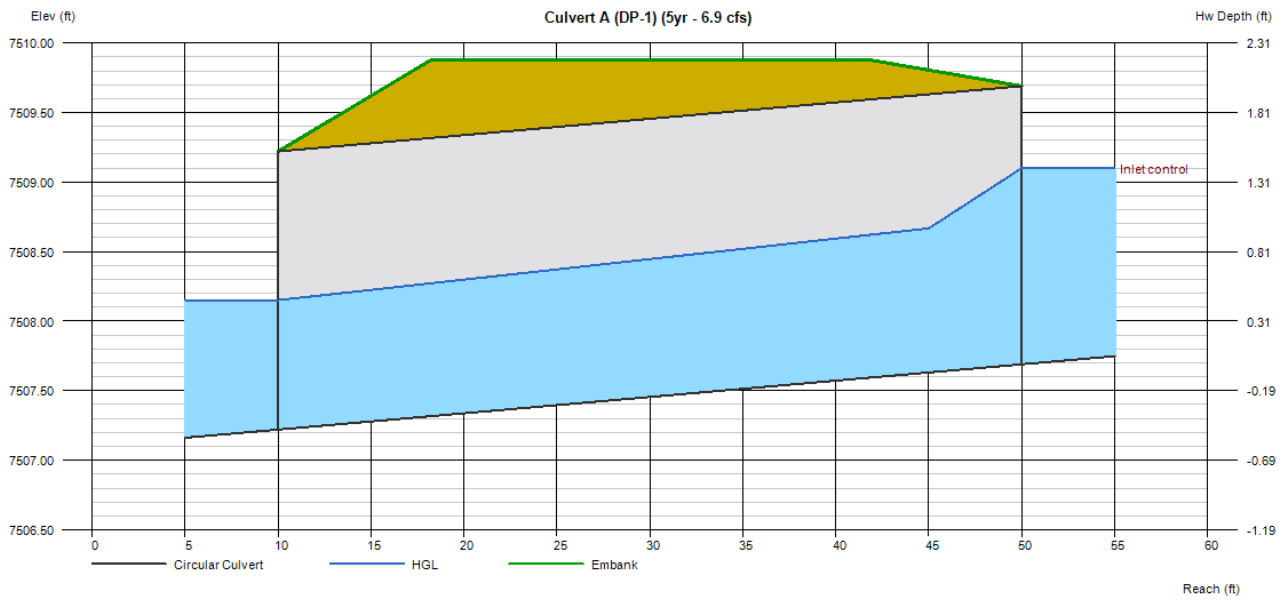
Top Elevation (ft)	=	7509.88
Top Width (ft)	=	23.50
Crest Width (ft)	=	100.00

Calculations

Qmin (cfs)	=	6.90
Qmax (cfs)	=	6.90
Tailwater Elev (ft)	=	0.00

Highlighted

Qtotal (cfs)	=	6.90
Qpipe (cfs)	=	6.90
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	4.81
Veloc Up (ft/s)	=	4.12
HGL Dn (ft)	=	7508.15
HGL Up (ft)	=	7508.74
Hw Elev (ft)	=	7509.10
Hw/D (ft)	=	0.71
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Aug 28 2025

Culvert A (DP-1) (100yr - 42.0 cfs)

Invert Elev Dn (ft)	=	7507.22
Pipe Length (ft)	=	40.00
Slope (%)	=	1.17
Invert Elev Up (ft)	=	7507.69
Rise (in)	=	24.0
Shape	=	Circular
Span (in)	=	24.0
No. Barrels	=	1
n-Value	=	0.023
Culvert Type	=	Circular Corrugate Metal Pipe
Culvert Entrance	=	Projecting
Coeff. K,M,c,Y,k	=	0.034, 1.5, 0.0553, 0.54, 0.9

Embankment

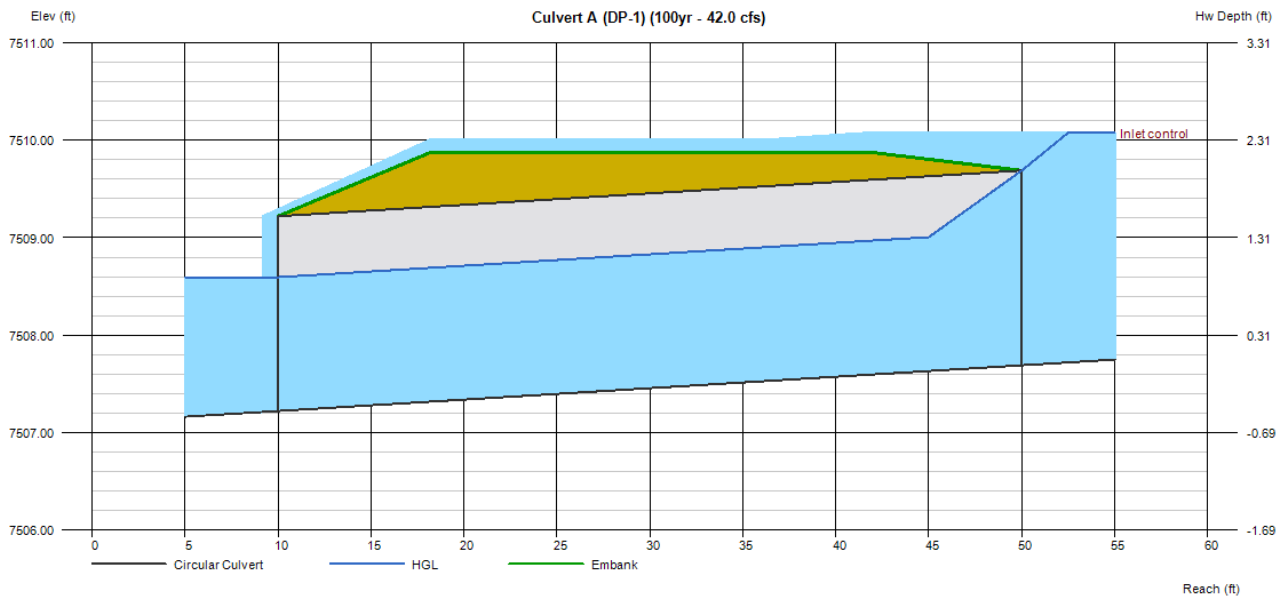
Top Elevation (ft)	=	7509.88
Top Width (ft)	=	23.50
Crest Width (ft)	=	100.00

Calculations

Qmin (cfs)	=	42.00
Qmax (cfs)	=	42.00
Tailwater Elev (ft)	=	0.00

Highlighted

Qtotal (cfs)	=	42.00
Qpipe (cfs)	=	14.57
Qovertop (cfs)	=	27.43
Veloc Dn (ft/s)	=	6.33
Veloc Up (ft/s)	=	6.33
HGL Dn (ft)	=	7508.60
HGL Up (ft)	=	7509.06
Hw Elev (ft)	=	7510.08
Hw/D (ft)	=	1.19
Flow Regime	=	Inlet Control



Culvert Report

Culvert B (DP-2) (5yr - 2.2 cfs)

Invert Elev Dn (ft)	=	7502.06
Pipe Length (ft)	=	30.00
Slope (%)	=	0.73
Invert Elev Up (ft)	=	7502.28
Rise (in)	=	24.0
Shape	=	Circular
Span (in)	=	24.0
No. Barrels	=	1
n-Value	=	0.023
Culvert Type	=	Circular Corrugate Metal Pipe
Culvert Entrance	=	Projecting
Coeff. K,M,c,Y,k	=	0.034, 1.5, 0.0553, 0.54, 0.9

Embankment

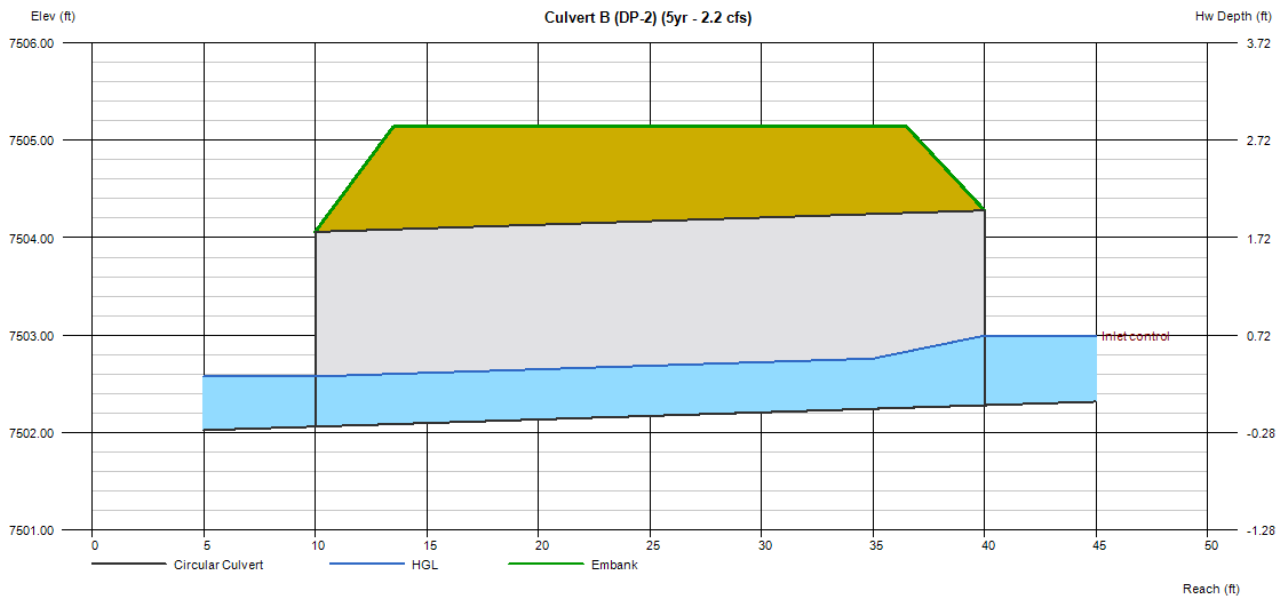
Top Elevation (ft)	=	7505.14
Top Width (ft)	=	23.00
Crest Width (ft)	=	100.00

Calculations

Qmin (cfs)	=	2.20
Qmax (cfs)	=	2.20
Tailwater Elev (ft)	=	0.00

Highlighted

Qtotal (cfs)	=	2.20
Qpipe (cfs)	=	2.20
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	3.43
Veloc Up (ft/s)	=	3.44
HGL Dn (ft)	=	7502.58
HGL Up (ft)	=	7502.80
Hw Elev (ft)	=	7503.00
Hw/D (ft)	=	0.36
Flow Regime	=	Inlet Control



Culvert Report

Culvert B (DP-2) (100yr - 10.2 cfs)

Invert Elev Dn (ft)	=	7502.06
Pipe Length (ft)	=	30.00
Slope (%)	=	0.73
Invert Elev Up (ft)	=	7502.28
Rise (in)	=	24.0
Shape	=	Circular
Span (in)	=	24.0
No. Barrels	=	1
n-Value	=	0.023
Culvert Type	=	Circular Corrugate Metal Pipe
Culvert Entrance	=	Projecting
Coeff. K,M,c,Y,k	=	0.034, 1.5, 0.0553, 0.54, 0.9

Embankment

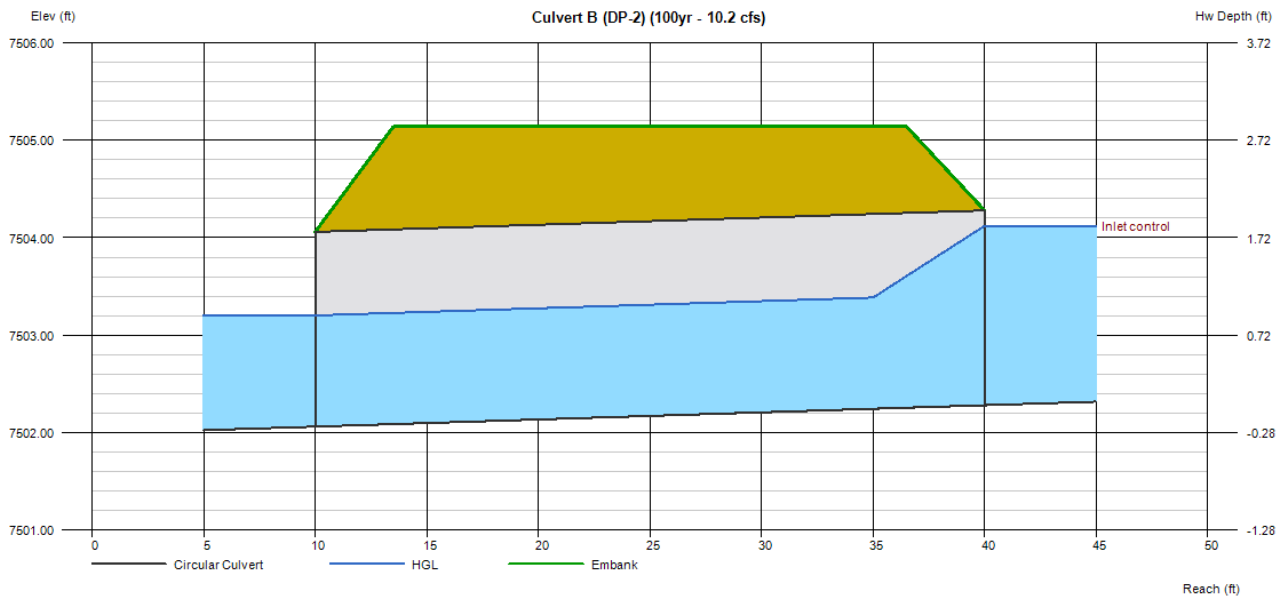
Top Elevation (ft)	=	7505.14
Top Width (ft)	=	23.00
Crest Width (ft)	=	100.00

Calculations

Qmin (cfs)	=	10.20
Qmax (cfs)	=	10.20
Tailwater Elev (ft)	=	0.00

Highlighted

Qtotal (cfs)	=	10.20
Qpipe (cfs)	=	10.20
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	5.50
Veloc Up (ft/s)	=	5.50
HGL Dn (ft)	=	7503.20
HGL Up (ft)	=	7503.42
Hw Elev (ft)	=	7504.12
Hw/D (ft)	=	0.92
Flow Regime	=	Inlet Control



Culvert Report

Culvert C (DP-5) (5yr - 16.2 cfs)

Invert Elev Dn (ft)	=	7509.00
Pipe Length (ft)	=	45.00
Slope (%)	=	3.58
Invert Elev Up (ft)	=	7510.61
Rise (in)	=	18.0
Shape	=	Circular
Span (in)	=	18.0
No. Barrels	=	1
n-Value	=	0.023
Culvert Type	=	Circular Corrugate Metal Pipe
Culvert Entrance	=	Projecting
Coeff. K,M,c,Y,k	=	0.034, 1.5, 0.0553, 0.54, 0.9

Embankment

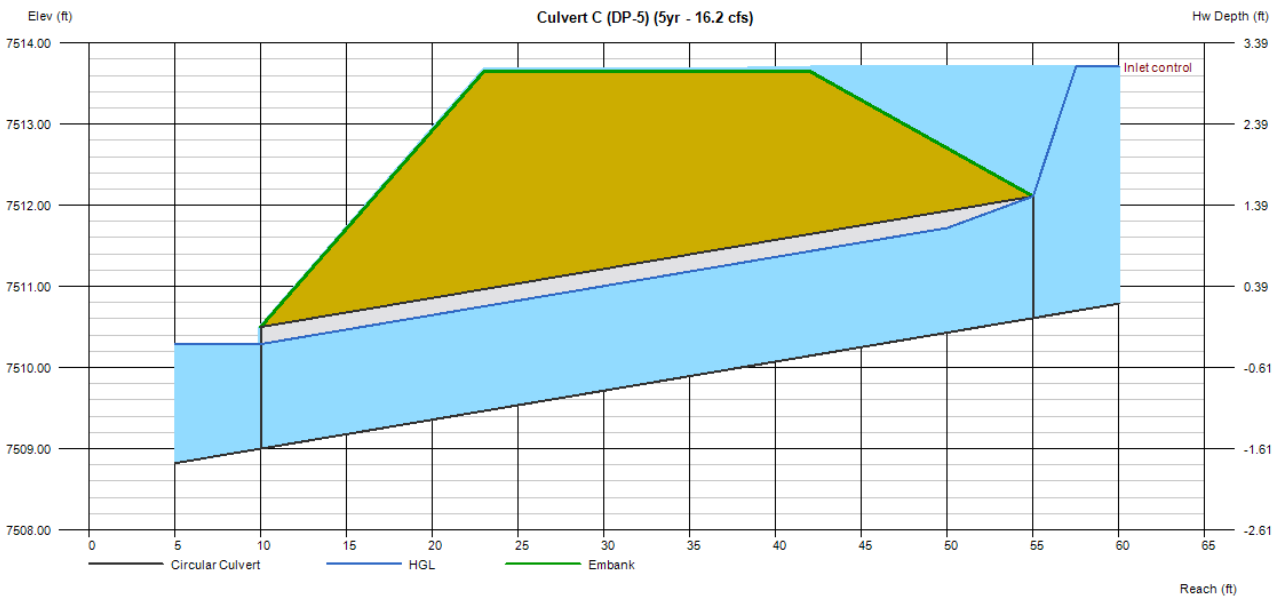
Top Elevation (ft)	=	7513.65
Top Width (ft)	=	19.00
Crest Width (ft)	=	100.00

Calculations

Qmin (cfs)	=	16.20
Qmax (cfs)	=	16.20
Tailwater Elev (ft)	=	0.00

Highlighted

Qtotal (cfs)	=	16.20
Qpipe (cfs)	=	11.43
Qovertop (cfs)	=	4.77
Veloc Dn (ft/s)	=	7.07
Veloc Up (ft/s)	=	7.07
HGL Dn (ft)	=	7510.29
HGL Up (ft)	=	7511.90
Hw Elev (ft)	=	7513.71
Hw/D (ft)	=	2.06
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Aug 28 2025

Culvert C (DP-5) (100yr - 103.8 cfs)

Invert Elev Dn (ft)	=	7509.00
Pipe Length (ft)	=	45.00
Slope (%)	=	3.58
Invert Elev Up (ft)	=	7510.61
Rise (in)	=	18.0
Shape	=	Circular
Span (in)	=	18.0
No. Barrels	=	1
n-Value	=	0.023
Culvert Type	=	Circular Corrugate Metal Pipe
Culvert Entrance	=	Projecting
Coeff. K,M,c,Y,k	=	0.034, 1.5, 0.0553, 0.54, 0.9

Embankment

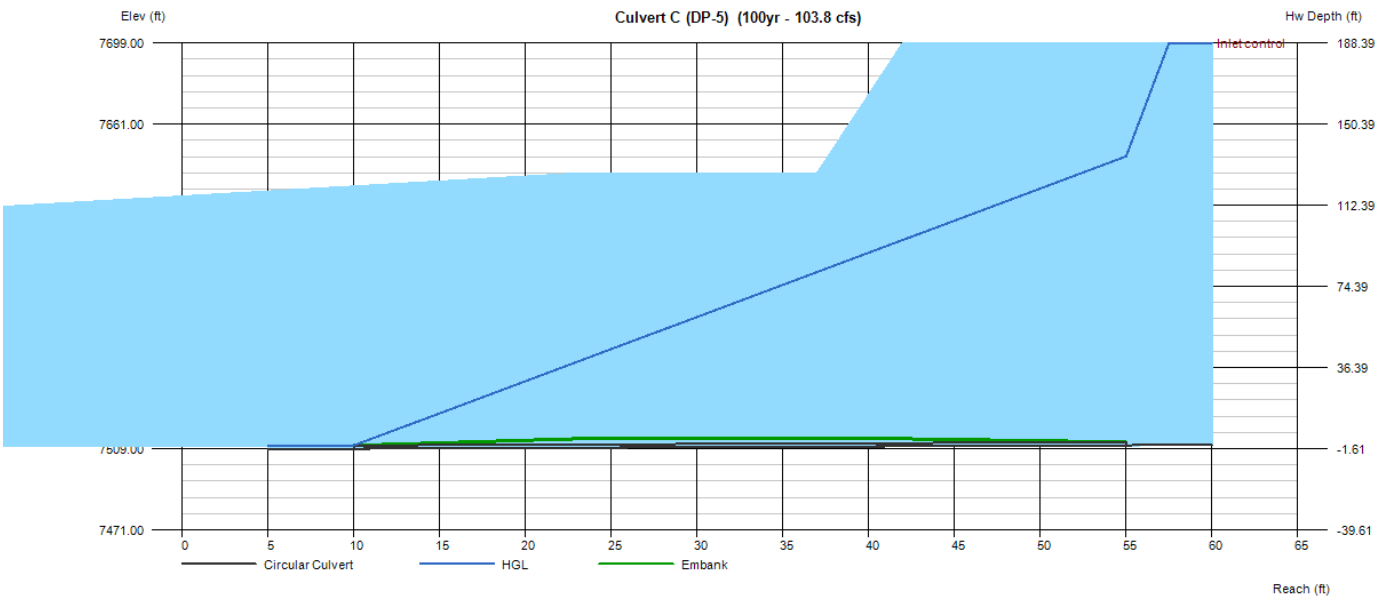
Top Elevation (ft)	=	7513.65
Top Width (ft)	=	19.00
Crest Width (ft)	=	100.00

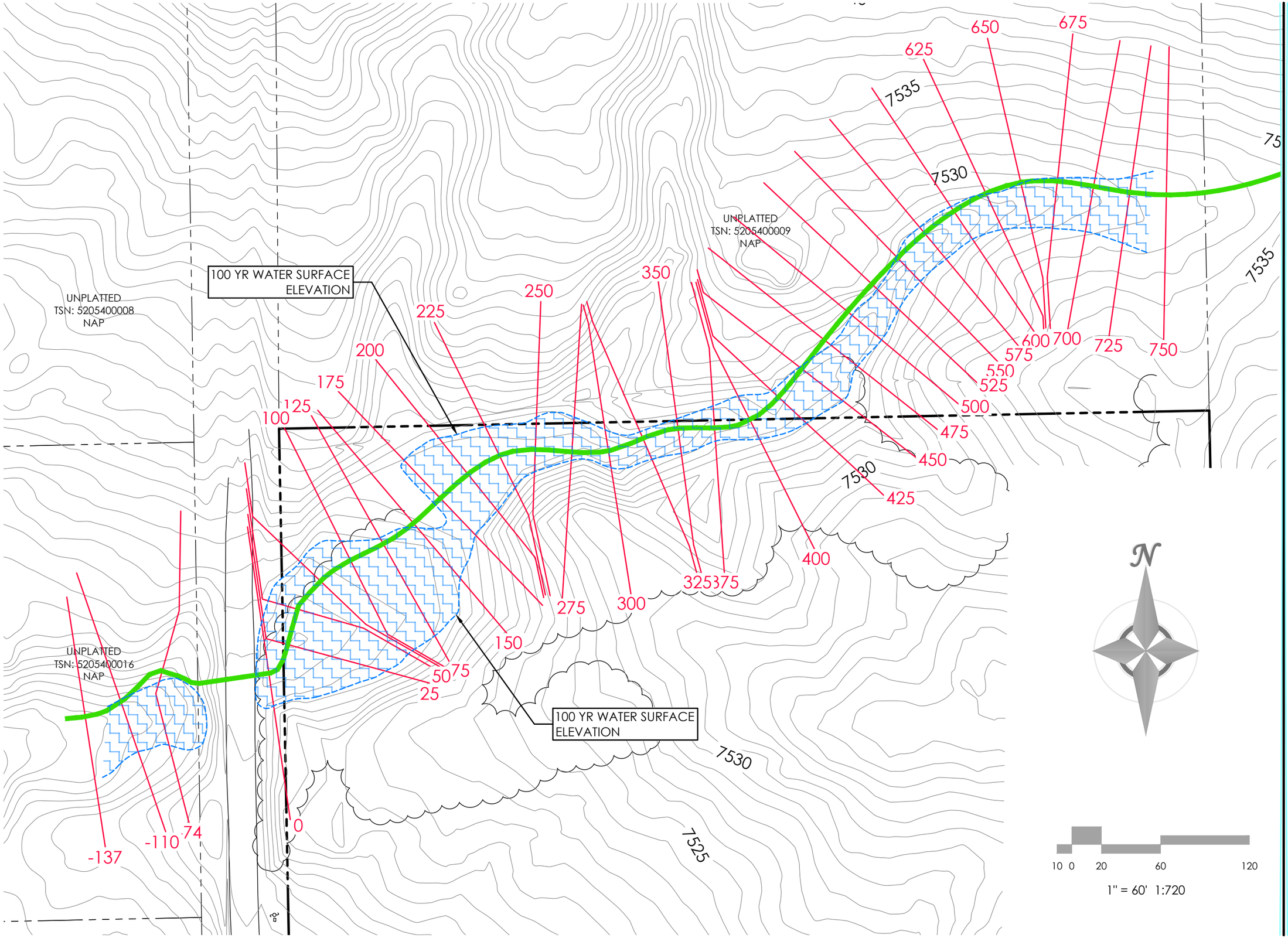
Calculations

Qmin (cfs)	=	103.80
Qmax (cfs)	=	103.80
Tailwater Elev (ft)	=	0.00

Highlighted

Qtotal (cfs)	=	103.80
Qpipe (cfs)	=	102.93
Qovertop (cfs)	=	0.87
Veloc Dn (ft/s)	=	58.26
Veloc Up (ft/s)	=	58.24
HGL Dn (ft)	=	7510.50
HGL Up (ft)	=	7645.87
Hw Elev (ft)	=	7698.99
Hw/D (ft)	=	125.59
Flow Regime	=	Inlet Control





N

10 0 20 60 120

1" = 60' 1:720

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

REVISIONS

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

GREAVES PINERY

CHANNEL MAP
HEC RAS SECTIONS

MVE PROJECT **61233**
MVE DRAWING

AUGUST 20, 2025
SHEET **1** OF **1**

GREAVES PINERY
NORTH REACH (BASIN C2)

61233

TABLE 10-1

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

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

	Channel Conditions	Value	
Material Type n_o	Earth	0.020	– 0.022
	Fine Gravel	0.024	
	Coarse Gravel	0.028	
Degree of Irregularity n_1	Smooth	0.000	
	Minor	0.005	– 0.005
	Moderate	0.010	
	Severe	0.020	
Variation of Channel Cross Section n_2	Gradual	0.000	
	Alternating Occasionally	0.005 –	0.005
	Alternating Frequently	0.010 – 0.015	
Relative Effect of Obstructions n_3	Negligible	0.000	
	Minor	0.010 – 0.015	– 0.010
	Appreciable	0.020 – 0.030	
	Severe	0.040 – 0.060	
Vegetation n_4	Low	0.005 – 0.010	
	Medium	0.010 – 0.025	– 0.010
	High	0.025 – 0.050	
	Very High	0.050 – 0.100	
Degree of Meandering m	Minor	1.000 – 1.200	– 1.100
	Appreciable	1.200 – 1.500	
	Severe	1.500	

$n = (0.022 + 0.005 + 0.005 + 0.010 + 0.010)\,1.1$

$n = (0.052)\,1.1$

$n = \underline{0.057}$ MAIN CHANNEL

HEC-RAS Plan: Default Scenario River: Main Reach: Main-DS-0

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Max Chl Dpth	Hydr Depth C	Flow Area	Top Width	Vel Chnl	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft)	(ft)	(sq ft)	(ft)	(ft/s)	
Main-DS-0	750	100yr	70.10	7531.35	7532.17	7531.98	7532.25	0.019057	0.82	0.52	30.12	57.90	2.33	0.57
Main-DS-0	750	5yr	11.00	7531.35	7531.72	7531.65	7531.75	0.024027	0.37	0.20	8.04	40.77	1.37	0.54
Main-DS-0	725	100yr	70.10	7530.58	7531.61		7531.72	0.024150	1.03	0.55	25.71	46.51	2.73	0.65
Main-DS-0	725	5yr	11.00	7530.58	7531.05		7531.10	0.029270	0.47	0.26	6.12	23.92	1.80	0.63
Main-DS-0	700	100yr	70.10	7529.78	7530.79		7530.97	0.038575	1.01	0.55	20.36	36.87	3.44	0.82
Main-DS-0	700	5yr	11.00	7529.78	7530.27		7530.33	0.033689	0.49	0.27	5.51	20.45	2.00	0.68
Main-DS-0	675	100yr	70.10	7528.93	7530.04		7530.19	0.025785	1.11	0.65	22.34	34.36	3.14	0.69
Main-DS-0	675	5yr	11.00	7528.93	7529.44		7529.50	0.032911	0.51	0.27	5.57	20.61	1.97	0.67
Main-DS-0	650	100yr	70.10	7528.17	7529.50		7529.64	0.018930	1.33	0.75	23.65	31.34	2.96	0.60
Main-DS-0	650	5yr	11.00	7528.17	7528.77		7528.82	0.023785	0.59	0.33	5.70	17.12	1.93	0.59
Main-DS-0	625	100yr	70.10	7527.50	7528.66	7528.61	7528.92	0.047010	1.16	0.63	16.93	26.88	4.14	0.92
Main-DS-0	625	5yr	11.00	7527.50	7528.08	7527.98	7528.15	0.030661	0.58	0.34	4.96	14.56	2.22	0.67
Main-DS-0	600	100yr	70.10	7526.48	7527.55		7527.81	0.042704	1.07	0.66	17.19	25.96	4.08	0.88
Main-DS-0	600	5yr	11.00	7526.48	7526.89	7526.89	7527.02	0.074777	0.41	0.25	3.86	15.28	2.85	1.00
Main-DS-0	575	100yr	70.10	7525.49	7527.15		7527.26	0.011907	1.66	0.93	26.07	28.16	2.69	0.49
Main-DS-0	575	5yr	11.00	7525.49	7526.25	7526.06	7526.29	0.014867	0.76	0.40	6.35	15.69	1.73	0.48
Main-DS-0	550	100yr	70.10	7525.04	7526.77		7526.92	0.015596	1.73	0.95	22.48	23.69	3.12	0.56
Main-DS-0	550	5yr	11.00	7525.04	7525.91		7525.96	0.013118	0.87	0.45	6.32	14.10	1.74	0.46
Main-DS-0	525	100yr	70.10	7524.66	7525.87	7525.87	7526.24	0.054473	1.21	0.72	14.43	19.95	4.86	1.01
Main-DS-0	525	5yr	11.00	7524.66	7525.14	7525.14	7525.31	0.067583	0.47	0.36	3.25	9.06	3.39	1.00
Main-DS-0	500	100yr	70.10	7523.72	7525.09	7524.78	7525.24	0.016880	1.37	0.87	22.82	26.24	3.07	0.58
Main-DS-0	500	5yr	11.00	7523.72	7524.36	7524.17	7524.40	0.014857	0.64	0.38	6.59	17.23	1.67	0.48
Main-DS-0	475	100yr	70.10	7523.06	7524.19	7524.19	7524.53	0.055365	1.13	0.66	15.08	22.72	4.65	1.01
Main-DS-0	475	5yr	11.00	7523.06	7523.58	7523.58	7523.71	0.066566	0.52	0.28	3.87	14.02	2.84	0.95
Main-DS-0	450	100yr	70.10	7522.20	7524.13	7523.22	7524.17	0.003208	1.93	1.15	43.54	38.00	1.61	0.27
Main-DS-0	450	5yr	11.00	7522.20	7523.27	7522.62	7523.27	0.001149	1.06	0.67	16.38	24.61	0.67	0.15
Main-DS-0	425	100yr	70.10	7522.47	7523.82		7523.98	0.026824	1.35	0.66	21.77	33.11	3.22	0.70
Main-DS-0	425	5yr	11.00	7522.47	7523.14		7523.19	0.022037	0.66	0.35	5.73	16.32	1.92	0.57
Main-DS-0	400	100yr	70.10	7522.07	7523.33		7523.45	0.016431	1.26	0.76	25.27	33.29	2.77	0.56
Main-DS-0	400	5yr	11.00	7522.07	7522.68		7522.72	0.016627	0.61	0.32	6.99	21.79	1.57	0.49
Main-DS-0	375	100yr	70.10	7521.34	7522.42	7522.42	7522.74	0.055724	1.08	0.65	15.29	23.63	4.58	1.00
Main-DS-0	375	5yr	11.00	7521.34	7521.81	7521.81	7521.95	0.075553	0.47	0.26	3.75	14.22	2.94	1.01
Main-DS-0	350	100yr	70.10	7520.01	7521.57	7521.27	7521.74	0.018991	1.56	0.89	21.17	23.66	3.31	0.62
Main-DS-0	350	5yr	11.00	7520.01	7520.72	7520.59	7520.79	0.023390	0.71	0.39	5.24	13.61	2.10	0.60
Main-DS-0	325	100yr	70.10	7519.37	7520.71	7520.65	7521.03	0.044494	1.34	0.76	15.44	20.37	4.54	0.92
Main-DS-0	325	5yr	11.00	7519.37	7520.09		7520.16	0.026613	0.72	0.38	5.00	13.32	2.20	0.63
Main-DS-0	300	100yr	70.10	7518.34	7519.66	7519.59	7519.92	0.043592	1.32	0.67	16.97	25.45	4.13	0.89
Main-DS-0	300	5yr	11.00	7518.34	7518.97	7518.97	7519.11	0.076935	0.63	0.26	3.71	14.03	2.96	1.02
Main-DS-0	275	100yr	70.10	7517.70	7519.37		7519.46	0.008519	1.67	1.00	29.32	29.32	2.39	0.42
Main-DS-0	275	5yr	11.00	7517.70	7518.53	7518.23	7518.56	0.005943	0.83	0.48	8.92	18.42	1.23	0.31
Main-DS-0	250	100yr	101.50	7517.50	7518.93		7519.11	0.021587	1.43	0.81	30.52	37.55	3.33	0.65
Main-DS-0	250	5yr	15.90	7517.50	7518.16		7518.23	0.028614	0.66	0.35	7.33	21.16	2.17	0.65
Main-DS-0	225	100yr	101.50	7517.18	7518.72		7518.79	0.007035	1.54	1.02	46.02	45.75	2.21	0.39
Main-DS-0	225	5yr	15.90	7517.18	7518.09		7518.10	0.001790	0.91	0.59	20.51	34.68	0.78	0.18
Main-DS-0	200	100yr	101.50	7517.48	7518.60		7518.64	0.004826	1.11	0.98	57.98	63.51	1.78	0.32
Main-DS-0	200	5yr	15.90	7517.48	7518.04		7518.05	0.001822	0.56	0.44	24.63	55.99	0.65	0.17
Main-DS-0	175	100yr	101.50	7517.67	7518.15	7518.15	7518.34	0.064163	0.48	0.39	28.85	74.12	3.52	0.99
Main-DS-0	175	5yr	15.90	7517.67	7517.85	7517.84	7517.91	0.080336	0.18	0.13	8.39	64.61	1.89	0.93
Main-DS-0	150	100yr	101.50	7515.40	7516.39	7516.41	7516.69	0.066973	0.99	0.52	23.18	44.26	4.38	1.07
Main-DS-0	150	5yr	15.90	7515.40	7515.86	7515.86	7515.99	0.074862	0.46	0.26	5.52	21.53	2.88	1.00
Main-DS-0	125	100yr	101.50	7514.37	7515.06	7514.97	7515.20	0.033925	0.69	0.47	35.02	74.63	2.90	0.75
Main-DS-0	125	5yr	15.90	7514.37	7514.72	7514.64	7514.75	0.023329	0.35	0.20	11.63	57.81	1.37	0.54
Main-DS-0	100	100yr	101.50	7513.56	7514.79		7514.84	0.007145	1.23	0.66	60.95	93.15	1.67	0.36
Main-DS-0	100	5yr	15.90	7513.56	7513.99		7514.05	0.035499	0.43	0.24	8.32	34.25	1.91	0.68
Main-DS-0	75	100yr	103.80	7513.22	7514.74		7514.76	0.001475	1.52	1.03	101.56	98.34	1.02	0.18
Main-DS-0	75	5yr	16.20	7513.22	7513.95		7513.95	0.001117	0.73	0.43	32.47	74.90	0.50	0.13
Main-DS-0	50	100yr	103.80	7512.62	7514.73		7514.74	0.000550	2.11	1.36	138.84	104.53	0.75	0.11
Main-DS-0	50	5yr	16.20	7512.62	7513.95		7513.95	0.000101	1.33	0.87	67.91	78.20	0.24	0.05
Main-DS-0	25	100yr	103.80	7512.02	7514.72		7514.72	0.000414	2.70	1.56	147.18	106.19	0.71	0.10
Main-DS-0	25	5yr	16.20	7512.02	7513.94		7513.95	0.000063	1.92	1.02	77.07	75.40	0.21	0.04

HEC-RAS Plan: Default Scenario River: Main Reach: Main-DS-0 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Max Chl Dpth	Hydr Depth C	Flow Area	Top Width	Vel Chnl	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft)	(ft)	(sq ft)	(ft)	(ft/s)	
Main-DS-0	0	100yr	103.80	7512.70	7514.68	7513.61	7514.70	0.001959	1.98	1.21	79.41	65.64	1.31	0.21
Main-DS-0	0	5yr	16.20	7512.70	7513.94	7513.08	7513.94	0.000359	1.24	0.80	38.11	47.61	0.43	0.08
Main-DS-0	-20		Culvert											
Main-DS-0	-74	100yr	103.80	7505.46	7506.67		7506.83	0.023014	1.20	0.76	31.61	41.65	3.28	0.66
Main-DS-0	-74	5yr	16.20	7505.46	7505.91		7505.98	0.031956	0.45	0.31	7.56	24.25	2.14	0.68
Main-DS-0	-110	100yr	103.80	7504.50	7505.56	7505.45	7505.81	0.036658	1.06	0.71	26.28	37.20	3.95	0.83
Main-DS-0	-110	5yr	16.20	7504.50	7504.97		7505.03	0.022546	0.47	0.34	8.49	24.89	1.91	0.58
Main-DS-0	-137	100yr	103.80	7503.60	7504.34	7504.34	7504.60	0.058703	0.74	0.52	25.38	48.67	4.09	1.00
Main-DS-0	-137	5yr	16.20	7503.60	7503.89	7503.89	7504.00	0.083656	0.29	0.20	6.24	30.92	2.59	1.02

HEC-RAS HEC-RAS 5.0.7 March 2019
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
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X     X  X        X           X   X    X    X   X
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X     X  X        X           X  X     X    X        X
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PROJECT DATA
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Project File : 61233-GeoHECRAS.prj
Run Date and Time: 8/29/2025 10:31:02 AM

Project in English units

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FLOW DATA

Flow Title: Default Steady Flow
Flow File : Z:\61233_Design Dwgs\61233-GeoHECRAS\61233-GeoHECRAS.f01

Flow Data (cfs)

River	Reach	RS	100yr	5yr
Main	Main-DS-0	750	70.1	11
Main	Main-DS-0	250	101.5	15.9
Main	Main-DS-0	75	103.8	16.2

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Main	Main-DS-0	100yr	Normal S = 0.032086	Normal S = 0.066711
Main	Main-DS-0	5yr	Normal S = 0.032086	Normal S = 0.066711

SUMMARY OF MANNING'S N VALUES

River:Main

Reach	River Sta.	n1	n2	n3
Main-DS-0	750	.065	.057	.065
Main-DS-0	725	.065	.057	.065
Main-DS-0	700	.065	.057	.065
Main-DS-0	675	.065	.057	.065
Main-DS-0	650	.065	.057	.065
Main-DS-0	625	.065	.057	.065
Main-DS-0	600	.065	.057	.065
Main-DS-0	575	.065	.057	.065
Main-DS-0	550	.065	.057	.065
Main-DS-0	525	.065	.057	.065
Main-DS-0	500	.065	.057	.065
Main-DS-0	475	.065	.057	.065
Main-DS-0	450	.065	.057	.065
Main-DS-0	425	.065	.057	.065
Main-DS-0	400	.065	.057	.065
Main-DS-0	375	.065	.057	.065
Main-DS-0	350	.065	.057	.065
Main-DS-0	325	.065	.057	.065
Main-DS-0	300	.065	.057	.065
Main-DS-0	275	.065	.057	.065
Main-DS-0	250	.065	.057	.065
Main-DS-0	225	.065	.057	.065
Main-DS-0	200	.065	.057	.065
Main-DS-0	175	.065	.057	.065
Main-DS-0	150	.065	.057	.065
Main-DS-0	125	.065	.057	.065
Main-DS-0	100	.065	.057	.065
Main-DS-0	75	.065	.057	.065
Main-DS-0	50	.065	.057	.065

Main-DS-0	25		.065	.057	.065
Main-DS-0	0		.065	.057	.065
Main-DS-0	-20	Culvert			
Main-DS-0	-74		.065	.057	.065
Main-DS-0	-110		.065	.057	.065
Main-DS-0	-137		.065	.057	.065

Profile Output Table - MVE Standard Table No Sheer

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Max Chl Dpth (ft)	Hydr Depth C (ft)	Flow Area (sq ft)	Top Width (ft)	Vel Chnl (ft/s)	Froude # Chl
Main-DS-0	750	100yr	70.10	7531.35	7532.17	7531.98	7532.25	0.019057	0.82	0.52	30.12	57.90	2.33	0.57
Main-DS-0	750	5yr	11.00	7531.35	7531.72	7531.65	7531.75	0.024027	0.37	0.20	8.04	40.77	1.37	0.54
Main-DS-0	725	100yr	70.10	7530.58	7531.61		7531.72	0.024150	1.03	0.55	25.71	46.51	2.73	0.65
Main-DS-0	725	5yr	11.00	7530.58	7531.05		7531.10	0.029270	0.47	0.26	6.12	23.92	1.80	0.63
Main-DS-0	700	100yr	70.10	7529.78	7530.79		7530.97	0.038575	1.01	0.55	20.36	36.87	3.44	0.82
Main-DS-0	700	5yr	11.00	7529.78	7530.27		7530.33	0.033689	0.49	0.27	5.51	20.45	2.00	0.68
Main-DS-0	675	100yr	70.10	7528.93	7530.04		7530.19	0.025785	1.11	0.65	22.34	34.36	3.14	0.69
Main-DS-0	675	5yr	11.00	7528.93	7529.44		7529.50	0.032911	0.51	0.27	5.57	20.61	1.97	0.67
Main-DS-0	650	100yr	70.10	7528.17	7529.50		7529.64	0.018930	1.33	0.75	23.65	31.34	2.96	0.60
Main-DS-0	650	5yr	11.00	7528.17	7528.77		7528.82	0.023785	0.59	0.33	5.70	17.12	1.93	0.59
Main-DS-0	625	100yr	70.10	7527.50	7528.66	7528.61	7528.92	0.047010	1.16	0.63	16.93	26.88	4.14	0.92
Main-DS-0	625	5yr	11.00	7527.50	7528.08	7527.98	7528.15	0.030661	0.58	0.34	4.96	14.56	2.22	0.67

Main-DS-0	600	100yr	70.10	7526.48	7527.55		7527.81	0.042704	1.07	0.66	17.19
25.96	4.08	0.88									
Main-DS-0	600	5yr	11.00	7526.48	7526.89	7526.89	7527.02	0.074777	0.41	0.25	3.86
15.28	2.85	1.00									
Main-DS-0	575	100yr	70.10	7525.49	7527.15		7527.26	0.011907	1.66	0.93	26.07
28.16	2.69	0.49									
Main-DS-0	575	5yr	11.00	7525.49	7526.25	7526.06	7526.29	0.014867	0.76	0.40	6.35
15.69	1.73	0.48									
Main-DS-0	550	100yr	70.10	7525.04	7526.77		7526.92	0.015596	1.73	0.95	22.48
23.69	3.12	0.56									
Main-DS-0	550	5yr	11.00	7525.04	7525.91		7525.96	0.013118	0.87	0.45	6.32
14.10	1.74	0.46									
Main-DS-0	525	100yr	70.10	7524.66	7525.87	7525.87	7526.24	0.054473	1.21	0.72	14.43
19.95	4.86	1.01									
Main-DS-0	525	5yr	11.00	7524.66	7525.14	7525.14	7525.31	0.067583	0.47	0.36	3.25
9.06	3.39	1.00									
Main-DS-0	500	100yr	70.10	7523.72	7525.09	7524.78	7525.24	0.016880	1.37	0.87	22.82
26.24	3.07	0.58									
Main-DS-0	500	5yr	11.00	7523.72	7524.36	7524.17	7524.40	0.014857	0.64	0.38	6.59
17.23	1.67	0.48									
Main-DS-0	475	100yr	70.10	7523.06	7524.19	7524.19	7524.53	0.055365	1.13	0.66	15.08
22.72	4.65	1.01									
Main-DS-0	475	5yr	11.00	7523.06	7523.58	7523.58	7523.71	0.066566	0.52	0.28	3.87
14.02	2.84	0.95									
Main-DS-0	450	100yr	70.10	7522.20	7524.13	7523.22	7524.17	0.003208	1.93	1.15	43.54
38.00	1.61	0.27									
Main-DS-0	450	5yr	11.00	7522.20	7523.27	7522.62	7523.27	0.001149	1.06	0.67	16.38
24.61	0.67	0.15									
Main-DS-0	425	100yr	70.10	7522.47	7523.82		7523.98	0.026824	1.35	0.66	21.77
33.11	3.22	0.70									
Main-DS-0	425	5yr	11.00	7522.47	7523.14		7523.19	0.022037	0.66	0.35	5.73
16.32	1.92	0.57									
Main-DS-0	400	100yr	70.10	7522.07	7523.33		7523.45	0.016431	1.26	0.76	25.27
33.29	2.77	0.56									
Main-DS-0	400	5yr	11.00	7522.07	7522.68		7522.72	0.016627	0.61	0.32	6.99
21.79	1.57	0.49									

Main-DS-0	375	100yr	70.10	7521.34	7522.42	7522.42	7522.74	0.055724	1.08	0.65	15.29
23.63	4.58	1.00									
Main-DS-0	375	5yr	11.00	7521.34	7521.81	7521.81	7521.95	0.075553	0.47	0.26	3.75
14.22	2.94	1.01									
Main-DS-0	350	100yr	70.10	7520.01	7521.57	7521.27	7521.74	0.018991	1.56	0.89	21.17
23.66	3.31	0.62									
Main-DS-0	350	5yr	11.00	7520.01	7520.72	7520.59	7520.79	0.023390	0.71	0.39	5.24
13.61	2.10	0.60									
Main-DS-0	325	100yr	70.10	7519.37	7520.71	7520.65	7521.03	0.044494	1.34	0.76	15.44
20.37	4.54	0.92									
Main-DS-0	325	5yr	11.00	7519.37	7520.09		7520.16	0.026613	0.72	0.38	5.00
13.32	2.20	0.63									
Main-DS-0	300	100yr	70.10	7518.34	7519.66	7519.59	7519.92	0.043592	1.32	0.67	16.97
25.45	4.13	0.89									
Main-DS-0	300	5yr	11.00	7518.34	7518.97	7518.97	7519.11	0.076935	0.63	0.26	3.71
14.03	2.96	1.02									
Main-DS-0	275	100yr	70.10	7517.70	7519.37		7519.46	0.008519	1.67	1.00	29.32
29.32	2.39	0.42									
Main-DS-0	275	5yr	11.00	7517.70	7518.53	7518.23	7518.56	0.005943	0.83	0.48	8.92
18.42	1.23	0.31									
Main-DS-0	250	100yr	101.50	7517.50	7518.93		7519.11	0.021587	1.43	0.81	30.52
37.55	3.33	0.65									
Main-DS-0	250	5yr	15.90	7517.50	7518.16		7518.23	0.028614	0.66	0.35	7.33
21.16	2.17	0.65									
Main-DS-0	225	100yr	101.50	7517.18	7518.72		7518.79	0.007035	1.54	1.02	46.02
45.75	2.21	0.39									
Main-DS-0	225	5yr	15.90	7517.18	7518.09		7518.10	0.001790	0.91	0.59	20.51
34.68	0.78	0.18									
Main-DS-0	200	100yr	101.50	7517.48	7518.60		7518.64	0.004826	1.11	0.98	57.98
63.51	1.78	0.32									
Main-DS-0	200	5yr	15.90	7517.48	7518.04		7518.05	0.001822	0.56	0.44	24.63
55.99	0.65	0.17									
Main-DS-0	175	100yr	101.50	7517.67	7518.15	7518.15	7518.34	0.064163	0.48	0.39	28.85
74.12	3.52	0.99									
Main-DS-0	175	5yr	15.90	7517.67	7517.85	7517.84	7517.91	0.080336	0.18	0.13	8.39
64.61	1.89	0.93									

Main-DS-0	150	100yr	101.50	7515.40	7516.39	7516.41	7516.69	0.066973	0.99	0.52	23.18
44.26	4.38	1.07									
Main-DS-0	150	5yr	15.90	7515.40	7515.86	7515.86	7515.99	0.074862	0.46	0.26	5.52
21.53	2.88	1.00									
Main-DS-0	125	100yr	101.50	7514.37	7515.06	7514.97	7515.20	0.033925	0.69	0.47	35.02
74.63	2.90	0.75									
Main-DS-0	125	5yr	15.90	7514.37	7514.72	7514.64	7514.75	0.023329	0.35	0.20	11.63
57.81	1.37	0.54									
Main-DS-0	100	100yr	101.50	7513.56	7514.79		7514.84	0.007145	1.23	0.66	60.95
93.15	1.67	0.36									
Main-DS-0	100	5yr	15.90	7513.56	7513.99		7514.05	0.035499	0.43	0.24	8.32
34.25	1.91	0.68									
Main-DS-0	75	100yr	103.80	7513.22	7514.74		7514.76	0.001475	1.52	1.03	101.56
98.34	1.02	0.18									
Main-DS-0	75	5yr	16.20	7513.22	7513.95		7513.95	0.001117	0.73	0.43	32.47
74.90	0.50	0.13									
Main-DS-0	50	100yr	103.80	7512.62	7514.73		7514.74	0.000550	2.11	1.36	138.84
104.53	0.75	0.11									
Main-DS-0	50	5yr	16.20	7512.62	7513.95		7513.95	0.000101	1.33	0.87	67.91
78.20	0.24	0.05									
Main-DS-0	25	100yr	103.80	7512.02	7514.72		7514.72	0.000414	2.70	1.56	147.18
106.19	0.71	0.10									
Main-DS-0	25	5yr	16.20	7512.02	7513.94		7513.95	0.000063	1.92	1.02	77.07
75.40	0.21	0.04									
Main-DS-0	0	100yr	103.80	7512.70	7514.68	7513.61	7514.70	0.001959	1.98	1.21	79.41
65.64	1.31	0.21									
Main-DS-0	0	5yr	16.20	7512.70	7513.94	7513.08	7513.94	0.000359	1.24	0.80	38.11
47.61	0.43	0.08									
Main-DS-0	-20	Culvert									
Main-DS-0	-74	100yr	103.80	7505.46	7506.67		7506.83	0.023014	1.20	0.76	31.61
41.65	3.28	0.66									
Main-DS-0	-74	5yr	16.20	7505.46	7505.91		7505.98	0.031956	0.45	0.31	7.56
24.25	2.14	0.68									

Main-DS-0	-110	100yr	103.80	7504.50	7505.56	7505.45	7505.81	0.036658	1.06	0.71	26.28	37.20	3.95	0.83
Main-DS-0	-110	5yr	16.20	7504.50	7504.97		7505.03	0.022546	0.47	0.34	8.49	24.89	1.91	0.58
Main-DS-0	-137	100yr	103.80	7503.60	7504.34	7504.34	7504.60	0.058703	0.74	0.52	25.38	48.67	4.09	1.00
Main-DS-0	-137	5yr	16.20	7503.60	7503.89	7503.89	7504.00	0.083656	0.29	0.20	6.24	30.92	2.59	1.02

ERRORS WARNINGS AND NOTES
Errors Warnings and Notes for Plan : Default Scenario

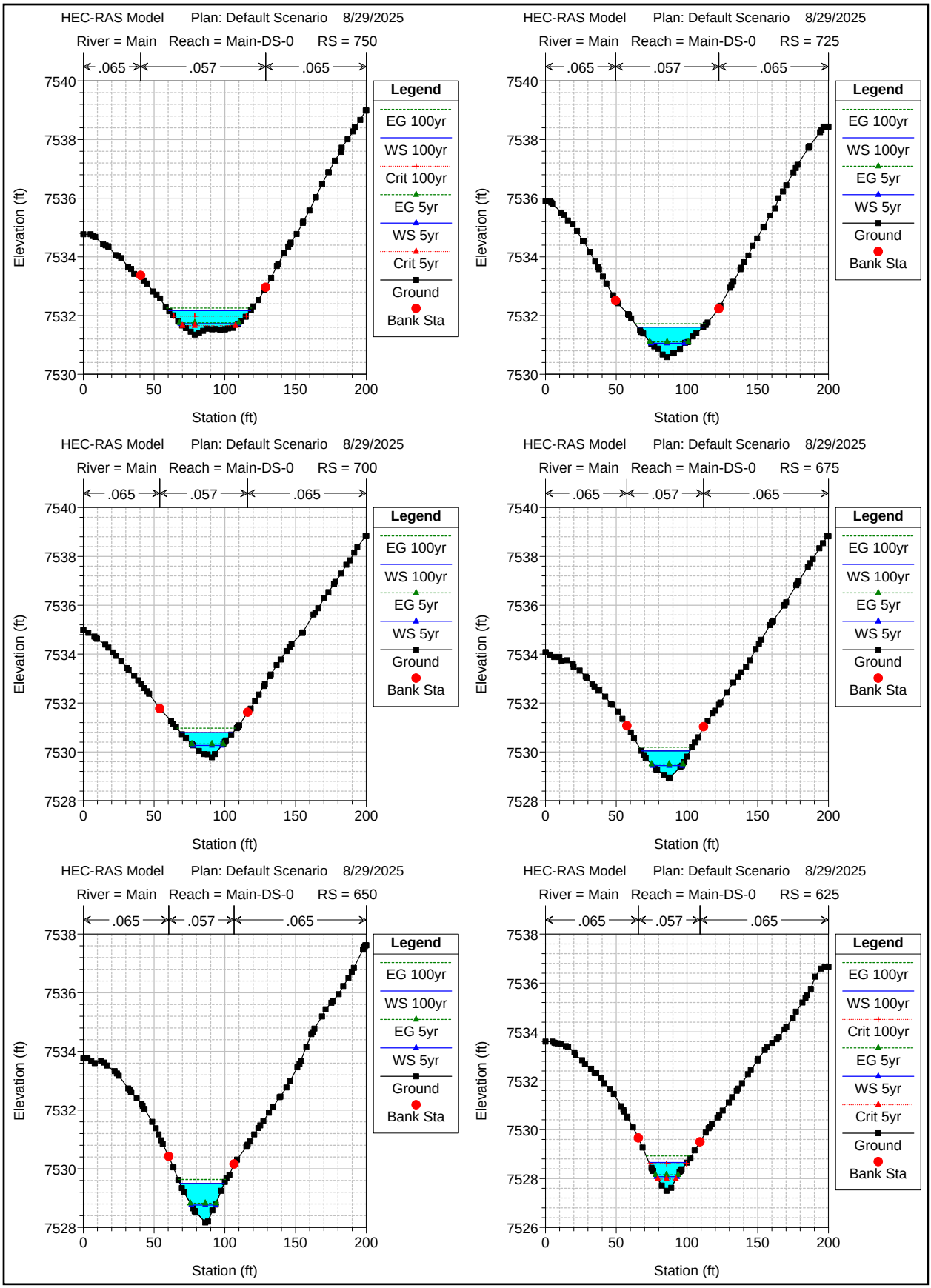
River: Main Reach: Main-DS-0 RS: 650 Profile: 100yr
  Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
  This may indicate the need for additional cross sections.
River: Main Reach: Main-DS-0 RS: 625 Profile: 100yr
  Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
  the need for additional cross sections.
River: Main Reach: Main-DS-0 RS: 625 Profile: 5yr
  Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
  This may indicate the need for additional cross sections.
  Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate
  the need for additional cross sections.
River: Main Reach: Main-DS-0 RS: 600 Profile: 100yr
  Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
  This may indicate the need for additional cross sections.
River: Main Reach: Main-DS-0 RS: 600 Profile: 5yr
  Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
  This may indicate the need for additional cross sections.
River: Main Reach: Main-DS-0 RS: 550 Profile: 100yr
  Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
  This may indicate the need for additional cross sections.
River: Main Reach: Main-DS-0 RS: 550 Profile: 5yr
  Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
  This may indicate the need for additional cross sections.
River: Main Reach: Main-DS-0 RS: 525 Profile: 100yr
  Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
  for the water surface and continued on with the calculations.
  Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
  This may indicate the need for additional cross sections.
  Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
  water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The
  program defaulted to critical depth.
River: Main Reach: Main-DS-0 RS: 525 Profile: 5yr
  Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical depth
  for the water surface and continued on with the calculations.

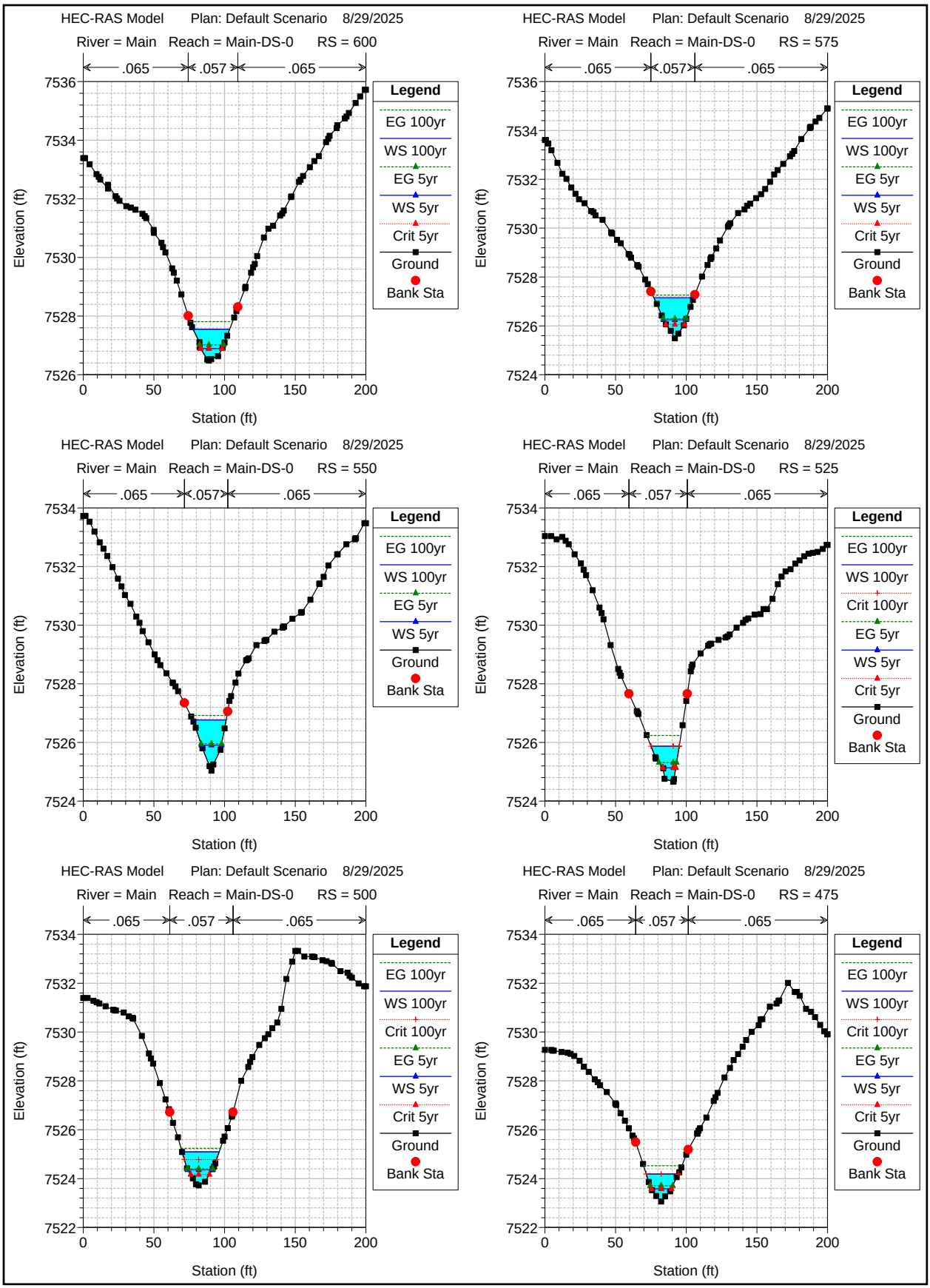
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     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
     Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
             water surface came back below critical depth.  This indicates that there is not a valid subcritical answer.  The
             program defaulted to critical depth.
River: Main  Reach: Main-DS-0     RS: 500     Profile: 100yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Main  Reach: Main-DS-0     RS: 500     Profile: 5yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Main  Reach: Main-DS-0     RS: 475     Profile: 100yr
     Warning:The energy equation could not be balanced within the specified number of iterations.  The program used critical depth
             for the water surface and continued on with the calculations.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
     Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
             water surface came back below critical depth.  This indicates that there is not a valid subcritical answer.  The
             program defaulted to critical depth.
River: Main  Reach: Main-DS-0     RS: 475     Profile: 5yr
     Warning:The energy equation could not be balanced within the specified number of iterations.  The program used critical depth
             for the water surface and continued on with the calculations.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
     Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
             water surface came back below critical depth.  This indicates that there is not a valid subcritical answer.  The
             program defaulted to critical depth.
River: Main  Reach: Main-DS-0     RS: 450     Profile: 100yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Main  Reach: Main-DS-0     RS: 450     Profile: 5yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Main  Reach: Main-DS-0     RS: 400     Profile: 100yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Main  Reach: Main-DS-0     RS: 400     Profile: 5yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Main  Reach: Main-DS-0     RS: 375     Profile: 100yr
     Warning:The energy equation could not be balanced within the specified number of iterations.  The program used critical depth
             for the water surface and continued on with the calculations.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
     Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.  This may indicate
             the need for additional cross sections.
     Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
             water surface came back below critical depth.  This indicates that there is not a valid subcritical answer.  The
             program defaulted to critical depth.
River: Main  Reach: Main-DS-0     RS: 375     Profile: 5yr
     Warning:The energy equation could not be balanced within the specified number of iterations.  The program used critical depth
             for the water surface and continued on with the calculations.
     Warning:Divided flow computed for this cross-section.
```

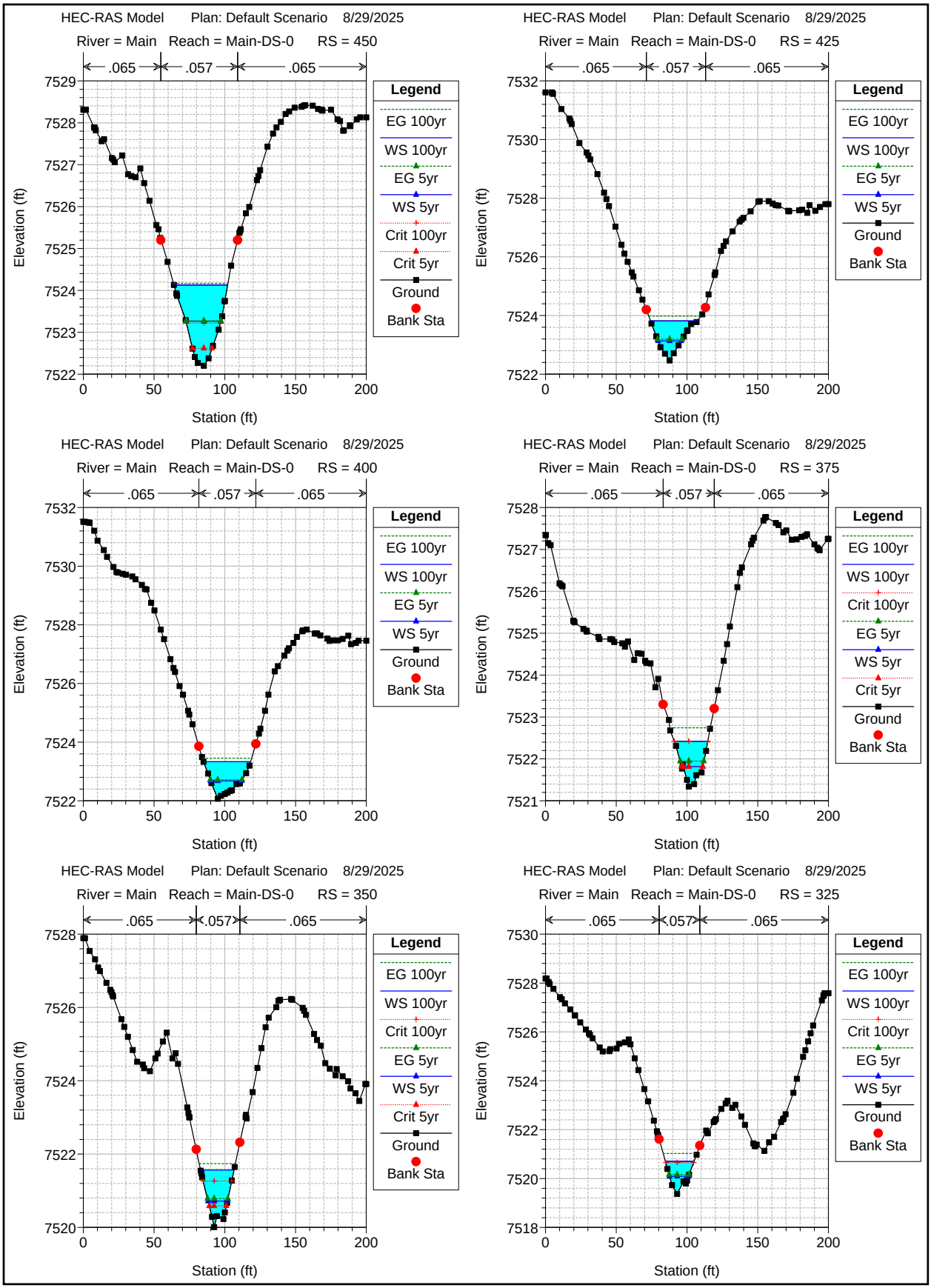
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     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
     Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.  This may indicate
             the need for additional cross sections.
     Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
             water surface came back below critical depth.  This indicates that there is not a valid subcritical answer.  The
             program defaulted to critical depth.
River: Main  Reach: Main-DS-0     RS: 350     Profile: 100yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Main  Reach: Main-DS-0     RS: 325     Profile: 100yr
     Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.  This may indicate
             the need for additional cross sections.
River: Main  Reach: Main-DS-0     RS: 325     Profile: 5yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
     Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.  This may indicate
             the need for additional cross sections.
River: Main  Reach: Main-DS-0     RS: 300     Profile: 100yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Main  Reach: Main-DS-0     RS: 300     Profile: 5yr
     Warning:The energy equation could not be balanced within the specified number of iterations.  The program used critical depth
             for the water surface and continued on with the calculations.
     Warning:Divided flow computed for this cross-section.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
     Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
             water surface came back below critical depth.  This indicates that there is not a valid subcritical answer.  The
             program defaulted to critical depth.
River: Main  Reach: Main-DS-0     RS: 275     Profile: 5yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Main  Reach: Main-DS-0     RS: 250     Profile: 100yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Main  Reach: Main-DS-0     RS: 250     Profile: 5yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Main  Reach: Main-DS-0     RS: 200     Profile: 100yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Main  Reach: Main-DS-0     RS: 200     Profile: 5yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Main  Reach: Main-DS-0     RS: 175     Profile: 100yr
     Warning:The energy equation could not be balanced within the specified number of iterations.  The program used critical depth
             for the water surface and continued on with the calculations.
     Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.  This may indicate
             the need for additional cross sections.
     Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
             water surface came back below critical depth.  This indicates that there is not a valid subcritical answer.  The
             program defaulted to critical depth.
```

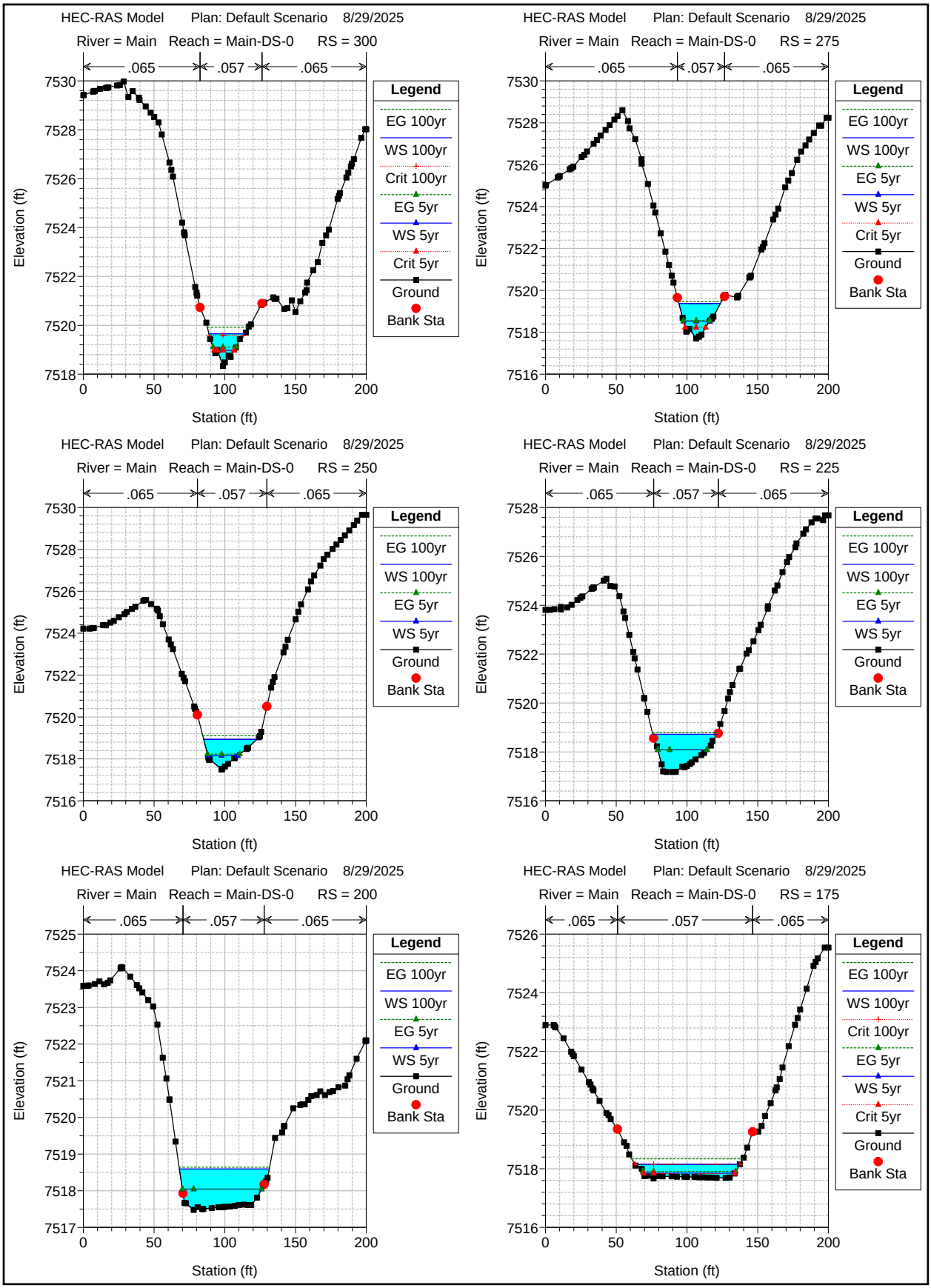
```
River: Main  Reach: Main-DS-0     RS: 175     Profile: 5yr
     Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.  This may indicate
             the need for additional cross sections.
River: Main  Reach: Main-DS-0     RS: 150     Profile: 100yr
     Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.  This may indicate
             the need for additional cross sections.
     Note:   Program found supercritical flow starting at this cross section.
River: Main  Reach: Main-DS-0     RS: 150     Profile: 5yr
     Warning:The energy equation could not be balanced within the specified number of iterations.  The program used critical depth
             for the water surface and continued on with the calculations.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
     Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.  This may indicate
             the need for additional cross sections.
     Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
             water surface came back below critical depth.  This indicates that there is not a valid subcritical answer.  The
             program defaulted to critical depth.
River: Main  Reach: Main-DS-0     RS: 125     Profile: 100yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
     Note:   Hydraulic jump has occurred between this cross section and the previous upstream section.
River: Main  Reach: Main-DS-0     RS: 100     Profile: 100yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Main  Reach: Main-DS-0     RS: 100     Profile: 5yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Main  Reach: Main-DS-0     RS: 75     Profile: 100yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Main  Reach: Main-DS-0     RS: 75     Profile: 5yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Main  Reach: Main-DS-0     RS: 25     Profile: 100yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Main  Reach: Main-DS-0     RS: 25     Profile: 5yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Main  Reach: Main-DS-0     RS: -20     Profile: 100yr
     Warning:The flow through the culvert is supercritical.  However, since there is flow over the road (weir flow), the program
             cannot determine if the downstream cross section should be subcritical or supercritical.  The program used the
             downstream subcritical answer, even though it may not be valid.
River: Main  Reach: Main-DS-0     RS: -20     Profile: 100yr     Culv: Culvert #1
     Warning:During the supercritical analysis, the program could not converge on a supercritical answer in the downstream cross
             section.  The program used the solution with the least error.
     Note:   During supercritical analysis, the culvert direct step method went to normal depth.  The program then assumed normal
             depth at the outlet.
     Note:   The flow in the culvert is entirely supercritical.
River: Main  Reach: Main-DS-0     RS: -20     Profile: 5yr
     Warning:The flow through the culvert is supercritical.  However, since there is flow over the road (weir flow), the program
             cannot determine if the downstream cross section should be subcritical or supercritical.  The program used the
             downstream subcritical answer, even though it may not be valid.
```

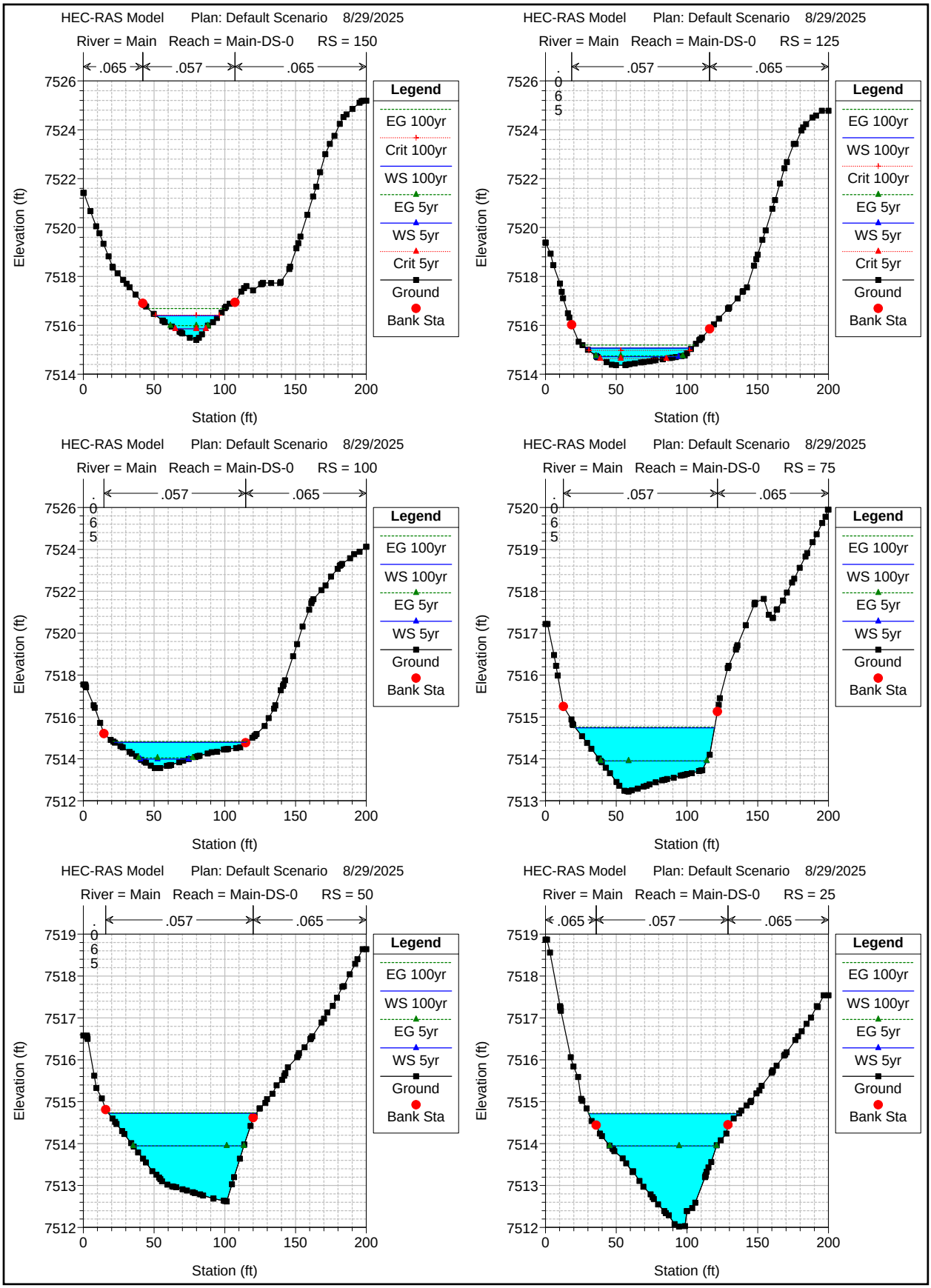
River: Main Reach: Main-DS-0 RS: -20 Profile: 5yr Culv: Culvert #1
  Warning:During the supercritical analysis, the program could not converge on a supercritical answer in the downstream cross section. The program used the solution with the least error.
  Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
  Note: The flow in the culvert is entirely supercritical.
River: Main Reach: Main-DS-0 RS: -74 Profile: 100yr
  Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
River: Main Reach: Main-DS-0 RS: -110 Profile: 100yr
  Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
River: Main Reach: Main-DS-0 RS: -110 Profile: 5yr
  Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
  Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
River: Main Reach: Main-DS-0 RS: -137 Profile: 100yr
  Warning:Slope too steep for slope area to converge during supercritical flow calculations (normal depth is below critical depth). Water surface set to critical depth.
River: Main Reach: Main-DS-0 RS: -137 Profile: 5yr
  Warning:Slope-Area method could not converge on a starting water surface elevation within the specified number of trials. The program used critical depth as the starting water surface.

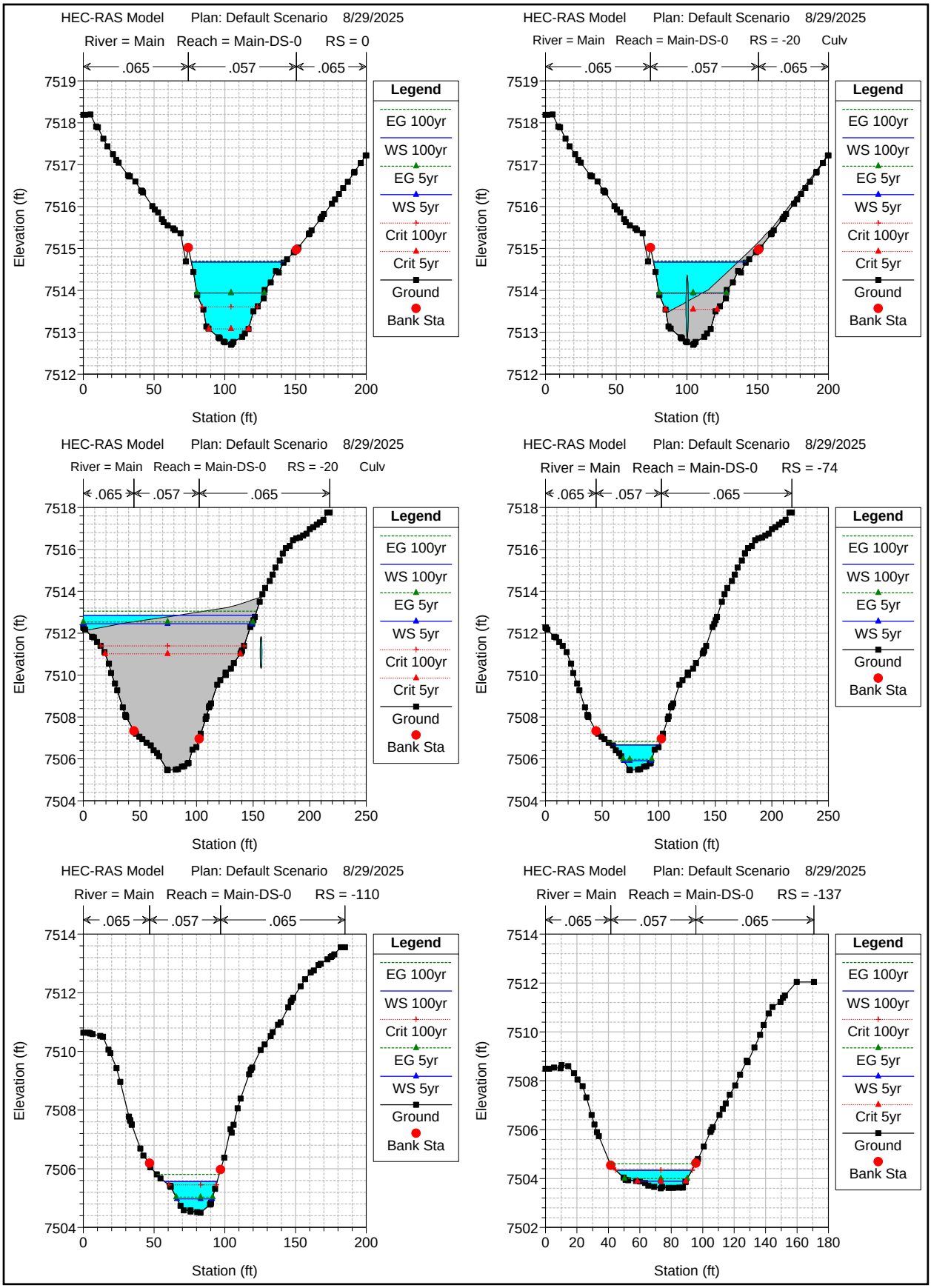

HEC-RAS Model Plan: Default Scenario 8/29/2025
River = Main Reach = Main-DS-0 RS = 750
.065 .057 .065
Legend
EG 100yr
WS 100yr
Crit 100yr
EG 5yr
WS 5yr
Crit 5yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 8/29/2025
River = Main Reach = Main-DS-0 RS = 725
.065 .057 .065
Legend
EG 100yr
WS 100yr
EG 5yr
WS 5yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 8/29/2025
River = Main Reach = Main-DS-0 RS = 700
.065 .057 .065
Legend
EG 100yr
WS 100yr
EG 5yr
WS 5yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 8/29/2025
River = Main Reach = Main-DS-0 RS = 675
.065 .057 .065
Legend
EG 100yr
WS 100yr
EG 5yr
WS 5yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 8/29/2025
River = Main Reach = Main-DS-0 RS = 650
.065 .057 .065
Legend
EG 100yr
WS 100yr
EG 5yr
WS 5yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
HEC-RAS Model Plan: Default Scenario 8/29/2025
River = Main Reach = Main-DS-0 RS = 625
.065 .057 .065
Legend
EG 100yr
WS 100yr
Crit 100yr
EG 5yr
WS 5yr
Crit 5yr
Ground
Bank Sta
Elevation (ft)
Station (ft)


HEC-RAS Model Plan: Default Scenario 8/29/2025
River = Main Reach = Main-DS-0 RS = 600
.065 .057 .065
Elevation (ft)
Station (ft)
Legend
EG 100yr
WS 100yr
EG 5yr
WS 5yr
Crit 5yr
Ground
Bank Sta
HEC-RAS Model Plan: Default Scenario 8/29/2025
River = Main Reach = Main-DS-0 RS = 575
.065 .057 .065
Elevation (ft)
Station (ft)
Legend
EG 100yr
WS 100yr
EG 5yr
WS 5yr
Crit 5yr
Ground
Bank Sta
HEC-RAS Model Plan: Default Scenario 8/29/2025
River = Main Reach = Main-DS-0 RS = 550
.065 .057 .065
Elevation (ft)
Station (ft)
Legend
EG 100yr
WS 100yr
EG 5yr
WS 5yr
Ground
Bank Sta
HEC-RAS Model Plan: Default Scenario 8/29/2025
River = Main Reach = Main-DS-0 RS = 525
.065 .057 .065
Elevation (ft)
Station (ft)
Legend
EG 100yr
WS 100yr
Crit 100yr
EG 5yr
WS 5yr
Crit 5yr
Ground
Bank Sta
HEC-RAS Model Plan: Default Scenario 8/29/2025
River = Main Reach = Main-DS-0 RS = 500
.065 .057 .065
Elevation (ft)
Station (ft)
Legend
EG 100yr
WS 100yr
Crit 100yr
EG 5yr
WS 5yr
Crit 5yr
Ground
Bank Sta
HEC-RAS Model Plan: Default Scenario 8/29/2025
River = Main Reach = Main-DS-0 RS = 475
.065 .057 .065
Elevation (ft)
Station (ft)
Legend
EG 100yr
WS 100yr
Crit 100yr
EG 5yr
WS 5yr
Crit 5yr
Ground
Bank Sta


HEC-RAS Model Plan: Default Scenario 8/29/2025
River = Main Reach = Main-DS-0 RS = 450
.065 .057 .065
Elevation (ft)
Station (ft)
Legend
EG 100yr
WS 100yr
EG 5yr
WS 5yr
Crit 100yr
Crit 5yr
Ground
Bank Sta
HEC-RAS Model Plan: Default Scenario 8/29/2025
River = Main Reach = Main-DS-0 RS = 425
.065 .057 .065
Elevation (ft)
Station (ft)
Legend
EG 100yr
WS 100yr
EG 5yr
WS 5yr
Ground
Bank Sta
HEC-RAS Model Plan: Default Scenario 8/29/2025
River = Main Reach = Main-DS-0 RS = 400
.065 .057 .065
Elevation (ft)
Station (ft)
Legend
EG 100yr
WS 100yr
EG 5yr
WS 5yr
Ground
Bank Sta
HEC-RAS Model Plan: Default Scenario 8/29/2025
River = Main Reach = Main-DS-0 RS = 375
.065 .057 .065
Elevation (ft)
Station (ft)
Legend
EG 100yr
WS 100yr
Crit 100yr
EG 5yr
WS 5yr
Crit 5yr
Ground
Bank Sta
HEC-RAS Model Plan: Default Scenario 8/29/2025
River = Main Reach = Main-DS-0 RS = 350
.065 .057 .065
Elevation (ft)
Station (ft)
Legend
EG 100yr
WS 100yr
Crit 100yr
EG 5yr
WS 5yr
Crit 5yr
Ground
Bank Sta
HEC-RAS Model Plan: Default Scenario 8/29/2025
River = Main Reach = Main-DS-0 RS = 325
.065 .057 .065
Elevation (ft)
Station (ft)
Legend
EG 100yr
WS 100yr
Crit 100yr
EG 5yr
WS 5yr
Ground
Bank Sta


HEC-RAS Model Plan: Default Scenario 8/29/2025
River = Main Reach = Main-DS-0 RS = 300
.065 .057 .065
Elevation (ft)
Station (ft)
Legend
EG 100yr
WS 100yr
Crit 100yr
EG 5yr
WS 5yr
Crit 5yr
Ground
Bank Sta
HEC-RAS Model Plan: Default Scenario 8/29/2025
River = Main Reach = Main-DS-0 RS = 275
HEC-RAS Model Plan: Default Scenario 8/29/2025
River = Main Reach = Main-DS-0 RS = 250
HEC-RAS Model Plan: Default Scenario 8/29/2025
River = Main Reach = Main-DS-0 RS = 225
HEC-RAS Model Plan: Default Scenario 8/29/2025
River = Main Reach = Main-DS-0 RS = 200
HEC-RAS Model Plan: Default Scenario 8/29/2025
River = Main Reach = Main-DS-0 RS = 175


HEC-RAS Model Plan: Default Scenario 8/29/2025
River = Main Reach = Main-DS-0 RS = 150
.065 .057 .065
Elevation (ft)
Station (ft)
Legend
EG 100yr
Crit 100yr
WS 100yr
EG 5yr
WS 5yr
Crit 5yr
Ground
Bank Sta
HEC-RAS Model Plan: Default Scenario 8/29/2025
River = Main Reach = Main-DS-0 RS = 125
.065 .057 .065
Elevation (ft)
Station (ft)
Legend
EG 100yr
WS 100yr
Crit 100yr
EG 5yr
WS 5yr
Crit 5yr
Ground
Bank Sta
HEC-RAS Model Plan: Default Scenario 8/29/2025
River = Main Reach = Main-DS-0 RS = 100
.065 .057 .065
Elevation (ft)
Station (ft)
Legend
EG 100yr
WS 100yr
EG 5yr
WS 5yr
Ground
Bank Sta
HEC-RAS Model Plan: Default Scenario 8/29/2025
River = Main Reach = Main-DS-0 RS = 75
.065 .057 .065
Elevation (ft)
Station (ft)
Legend
EG 100yr
WS 100yr
EG 5yr
WS 5yr
Ground
Bank Sta
HEC-RAS Model Plan: Default Scenario 8/29/2025
River = Main Reach = Main-DS-0 RS = 50
.065 .057 .065
Elevation (ft)
Station (ft)
Legend
EG 100yr
WS 100yr
EG 5yr
WS 5yr
Ground
Bank Sta
HEC-RAS Model Plan: Default Scenario 8/29/2025
River = Main Reach = Main-DS-0 RS = 25
.065 .057 .065
Elevation (ft)
Station (ft)
Legend
EG 100yr
WS 100yr
EG 5yr
WS 5yr
Ground
Bank Sta


HEC-RAS Model Plan: Default Scenario 8/29/2025
River = Main Reach = Main-DS-0 RS = 0
.065 .057 .065
Elevation (ft)
Station (ft)
Legend
EG 100yr
WS 100yr
EG 5yr
WS 5yr
Crit 100yr
Crit 5yr
Ground
Bank Sta
HEC-RAS Model Plan: Default Scenario 8/29/2025
River = Main Reach = Main-DS-0 RS = -20 Culv
.065 .057 .065
Elevation (ft)
Station (ft)
Legend
EG 100yr
WS 100yr
EG 5yr
WS 5yr
Crit 100yr
Crit 5yr
Ground
Bank Sta
HEC-RAS Model Plan: Default Scenario 8/29/2025
River = Main Reach = Main-DS-0 RS = -20 Culv
.065 .057 .065
Elevation (ft)
Station (ft)
Legend
EG 100yr
WS 100yr
EG 5yr
WS 5yr
Crit 100yr
Crit 5yr
Ground
Bank Sta
HEC-RAS Model Plan: Default Scenario 8/29/2025
River = Main Reach = Main-DS-0 RS = -74
.065 .057 .065
Elevation (ft)
Station (ft)
Legend
EG 100yr
WS 100yr
EG 5yr
WS 5yr
Ground
Bank Sta
HEC-RAS Model Plan: Default Scenario 8/29/2025
River = Main Reach = Main-DS-0 RS = -110
.065 .057 .065
Elevation (ft)
Station (ft)
Legend
EG 100yr
WS 100yr
Crit 100yr
EG 5yr
WS 5yr
Ground
Bank Sta
HEC-RAS Model Plan: Default Scenario 8/29/2025
River = Main Reach = Main-DS-0 RS = -137
.065 .057 .065
Elevation (ft)
Station (ft)
Legend
EG 100yr
WS 100yr
Crit 100yr
EG 5yr
WS 5yr
Crit 5yr
Ground
Bank Sta

4 Report Maps

Existing Condition Hydraulic Analysis Map (Map Pocket)
Proposed Condition Hydraulic Analysis Map (Map Pocket)