WILSON &COMPANY
HIGHER RELATIONSHIPS

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Final Drainage Report
Red Mountain Ranch
Town of Eagle, CO

Prepared for:
Tres Birds

Prepared by:
Wilson & Company, Inc.
Project #: 23-600-690-00

Date Prepared:
9/22/2025

Contents

ENGINEERS STATEMENT

The report for the drainage design of the Red Mountain Ranch project was prepared by me (or under my direct supervision) in accordance with the provisions of the Town of Eagle Drainage Design Criteria and was designed to comply with the provisions thereof. I understand that the Town of Eagle does not, and will not, assume liability for the drainage facilities designed by others.

_____

Benjamin D Beisler
Registered Professional Engineer No. 56778
State of Colorado
For and on Behalf of Wilson & Company

1.0 GENERAL LOCATION AND DESCRIPTION

1.1 Purpose

This Final Drainage Report is intended to support the onsite development of the proposed Red Mountain Ranch project. This report has been prepared by Wilson and Company, Inc. and is submitted for review and approval by the Town of Eagle on behalf of Tres Birds.

1.2 Location

The Red Mountain Ranch site is located in the Northeast ¼ of Section 33, Township 4 South, Range 84 West of the 6th P.M., Town of Eagle, Eagle County, Colorado. The project is bounded by the Eagle River to the south, and Grand Highway to the north. See the vicinity map below.

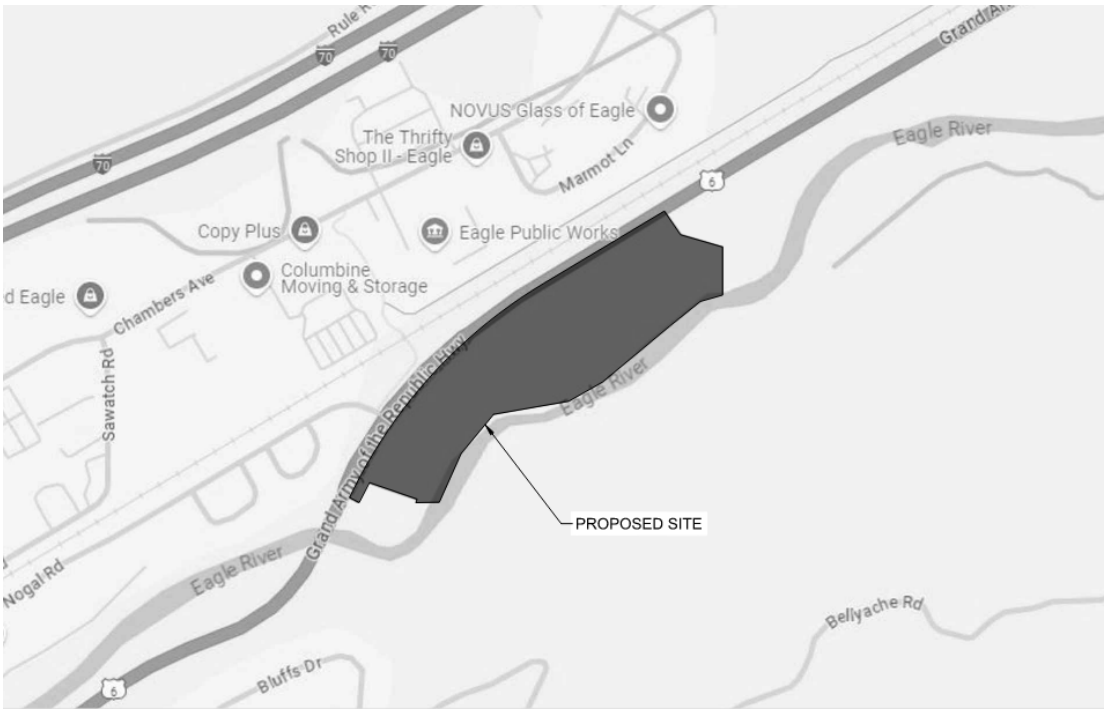


Figure 1.2.1 – Vicinity Map (NTS)

1.3 Description of Property

The existing 17.50-acre site consists of open land with no structures, the majority of the property is vegetated open land. The site generally slopes from northeast to southwest towards the Eagle River. A portion of the property is a delineated wetland adjacent to the Eagle River.

USDA Soil Survey information shows that the majority of the site is Dahlquist-Southace Complex which is listed as Hydrologic Soil Group B. Soil Survey information is included in Appendix B.

1.4 Groundwater Conditions

A geotechnical report performed by Kumar & Associates, Inc. did not show groundwater in boring pits completed at depths of up to 15'.

Groundwater is not anticipated to be encountered for the installation of the site utilities. If groundwater is encountered during construction, construction activities are to cease, and the Contractor shall notify the engineer and attain any necessary permits to address the groundwater issue.

1.5 Project Description

The proposed Red Mountain Ranch project consists of 66 dwelling units spread over eight multi-unit townhome buildings, six duplexes, and 12 single-family homes. The project will include the necessary site infrastructure to support the 66 dwelling units including private roads, private stormwater sewer and ponds, private sanitary sewer, and public water main extension.

Storm runoff will be routed through the site to one of three stormwater ponds via gutter pans and storm sewer. The three ponds along with grass landscape areas will provide Water Quality treatment for all stormwater runoff. The 10-year and 100-year storm runoff will be collected and routed through the proposed storm system but will not be detained.

The project will also include two drainage channels which will convey offsite flows through the proposed site.

2.0 MAJOR DRAINAGE BASIN

2.1 Major Drainage Basin

The project site lies in the Eagle River drainage Basin.

The proposed project spans two FEMA Flood Insurance Rate Maps (FIRM), Map Number 08037C0389D, revised December 4, 2007, and 08037C0391D, revised December 4, 2007. A FIRMETTE of the project site is included in Appendix A.

2.2 Previous Investigations

There are no previous drainage reports used for preparing the design for the project site. Additional reports were used for the off-site storm conveyance.

3.0 DRAINAGE DESIGN CRITERIA AND METHODOLOGY

3.1 Development Criteria

The development criteria applicable to this site are established to be in general conformance with the Mile High Flood District (MHFD) Urban Storm Drainage Criteria Manual (USDCM), and the Town of Eagle.

3.2 Hydrologic Criteria

The MHFD Rational Method was used to determine the peak runoff for the project site and off-site basins. The MHFD UD-Rational 2.00 spreadsheet and a spreadsheet developed in accordance with MHFD design guidelines were used to determine the peak runoff and characteristics of the sub-basins, respectively. For this report, the 10-yr storm was used for the minor storm event and the 100-yr storm was used for the major storm event.

Design rainfalls were identified from the National Oceanic and Atmospheric Administation (NOAA) Atlas 14-point percepitation frequency estimates. See Table 3.2.1 for design rainfall data used in the drainage calculations for the site.

Table 3.2.1. One-Hour Rainfall Values

Frequency	Depth (inches)
2-YR	0.427
5-YR	0.579
10-YR	0.708
25-YR	0.893
50-YR	1.04
100-YR	1.19

The proposed water quality treatment was calculated and sized using the MHFD Detention Design spreadsheet. The release rate for the WQCV is based on the drain time of 40 hours.

3.3 Hydraulic Criteria

The proposed storm conveyance system was sized to ensure that the 100-yr storm flows will be contained to the proposed storm conveyance system.

3.4 Waivers from Criteria

As discussed during concept phases with the Town of Eagle a waiver to not detain the 100-yr storm and allow these storm flows from the proposed site to reach the Eagle River and be further downstream as the upstream 100-yr storm flows reach our site.

4.0 DRAINAGE FACILITY DESIGN

4.1 General Concept

The general concept for the Red Mountain Ranch project is to capture and treat the water quality capture volume for the proposed development area. Due to the site's proximity to the Eagle River, we are proposing to use the “beat the peak” method to eliminate the need for onsite detention of the minor and major rainfall events. By using the beat-the-peak method we will be releasing the site's runoff to the Eagle River long before the river's peak flow is reached at the exiting outfall location, which will help to reduce the river's peak flow during storm events.

Three small storm ponds, Pond A, Pond B, and Pond C, are proposed to provide water quality treatment for the project. The storm ponds will be shallow and will allow for native vegetation to grow within the pond replicating the existing conditions for native wildlife and plants.

Pond C, along with portions of the proposed Discovery Trail, will be located within the 100-year floodplain. To minimize impacts, both Pond C and the trail segments within the floodplain will be excavated into the existing ground surface. This approach is intended to preserve the natural floodplain conditions as much as possible and reduce any adverse effects.

4.2 Specific Details

For this drainage analysis and discussion, the Red Mountain Ranch project site has been subdivided into seven (7) drainage sub-basins as illustrated on the enclosed drainage map (see Appendix A). Sub-basins A, B, C, and E are designated basins in which runoff will be collected and Water Quality treatment performed. Sub-basins D and F represents areas of the site where runoff will not be collected and treated. The large portion of sub-basin F will remain as existing conditions, with nearly all of the basin proposed to be landscape or native vegetation. Runoff from this basin will not increase by a significant amount. The below table summarizes the data for each sub-basin.

Table 4.2.1. Proposed Site Sub-basins

SUB-BASIN ID	DESIGN POINT	AREA	IMPERVIOUSNESS (%)
A	1	1.61 ac	63.8%
B	2	2.22 ac	62.7%
C	3	5.19 ac	45.6%
D	4	0.18 ac	20.0%
E	5	0.43 ac	21.4%
F	6	5.11 ac	12.5%
G	7	2.75 ac	100%
OS-1	8	0.48 ac	27.6%
OS-2	9	0.95 ac	34.2%
OS-3	10	1.01 ac	46.9%
OS-4	9	1.9 sq mi	10.0%
OS-5	8	0.23 sq mi	10.0%
Total On-Site		17.5 ac	32.5%

Sub-basins OS-1 - OS-3 designate basins in which runoff will enter the site from the adjacent CDOT Highway 6 and will not be collected or treated on-site. Flows from these basins will be routed towards the two large drainage channels that bisect the proposed site.

Sub-basins OS-4 and OS-5 represent the large off-site basins that flows through the proposed site via the two large swales. These basins are 1.9 sq mi and 0.23 sq miles respectively. SWMM modeling was used to analyzis these large off-site sub-basins, those calculations are included in appendix B.

4.3 Water Quality Treatment

Water Quality Treatment for the proposed site will be provided collectively by the three on-site ponds. Release rates and volume requirements were based on the MANUAL for WQCV. The parameters are based on the WQ area of 17.5 acres and an imperviousness of 32.52%. Approximately 8.04 acres of the site will not be collected and treated, 2.75 acres being the Eagle River. Ponds A and B have been oversized to accommodate the extra volume to provide tratement for the additional areas that can not be collected and treated. The table below summarizes the water quality and drain time for the proposed development.

Table 4.3.1 Water Quality & Drain Time

Pond	Water Quality Volume		Drain Time
	Required (cu-ft)	Provided (cu-ft)	(hrs)
Pond A	1,960.2	3,427	38
Pond B	1,393.9	4,865	43
Pond C	3,684.0	3,684	43
Site Total	10,105.9	11,976	43

*required volume for pond equals volume required for sub-basins collected.

4.4 Offsite Drainage Swale

The proposed site includes two Drainage Swales that will convey offsite flows through the proposed site. These swales and culverts at road crossings have been sized to covney the calculed flows of the two large offsite basins. Hydraulic calculations for the drainage swales and culverts are included in Appendix C of this report.

4.5 Maintenance

All onsite drainage facilities identified are private and shall be the responsibility of the property owner. Routine maintenance such as sediment and trash removal should occur at regular intervals. Regular inspections should be scheduled to ensure the drainage facilities are full functionality. Inspection-based maintenance, such as material replacement and structural repair should also be anticipated over the lifespan of the control measures. Water quality facilities designed for the development will need observation and minimal screening and removal of floatable and silts twice annually.

4.6 Emergency Overflow and Path

In the event that any Type C inlet becomes clogged in the storm ponds, all runoff will continue to the south, flowing directly to the Eagle River.

5.0 CONCLUSIONS

5.1 Compliance with Standards

With the exception of the variance request to waive the major storm detention, this report has been prepared in accordance with the Town of Eagle Criteria and the Mile High Flood District's Urban Storm Drainage Criteria Manual.

5.2 Drainage Concept

The proposed drainage facilities are designed to comply with the criteria listed above and align with the Town of Eagle's Design intent. The design will maintain existing drainage patterns to the highest extent possible.

It is not anticipated that this project would result in any adverse impacts to upstream or downstream properties.

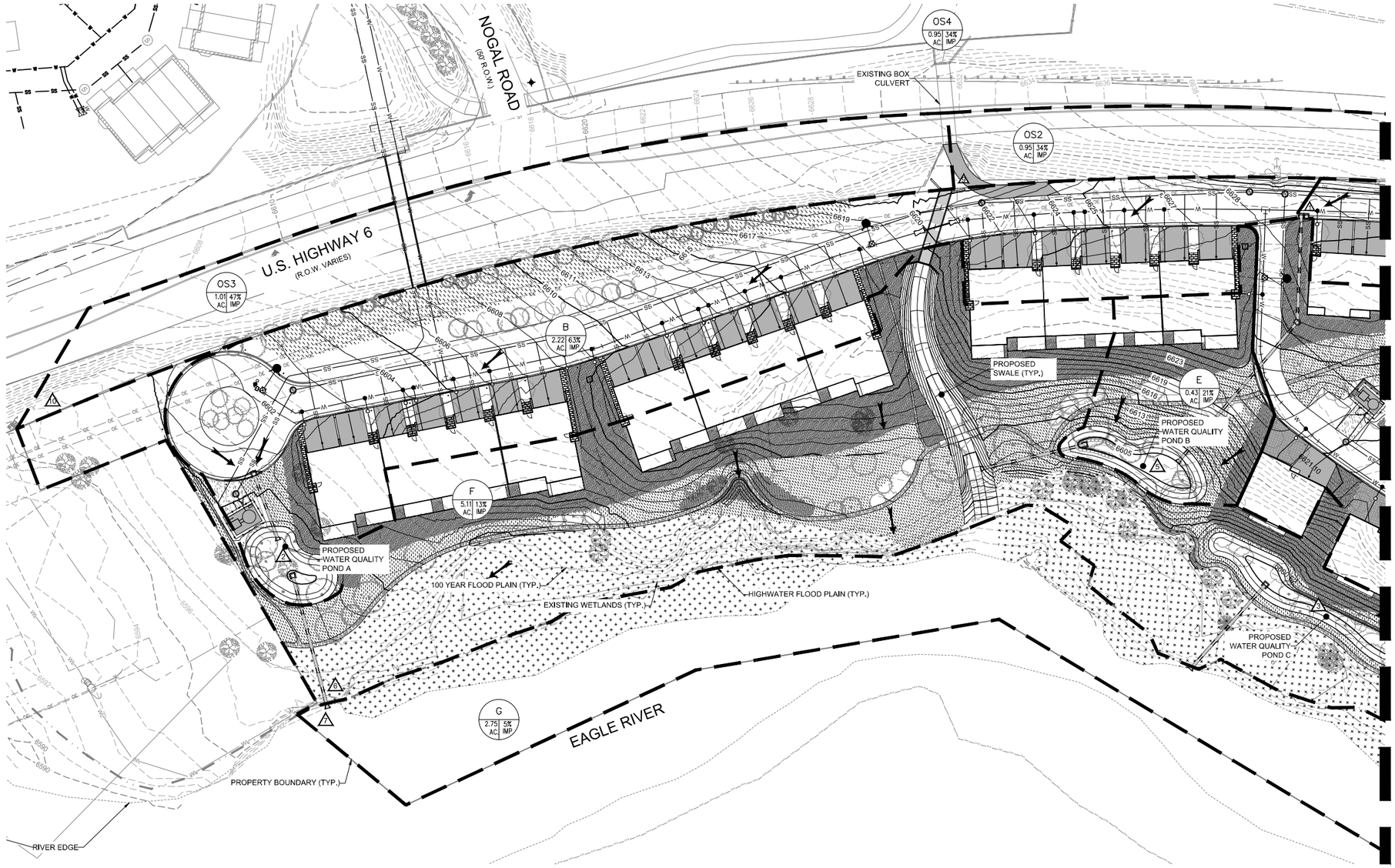
5.3 Water Quality Treatment

The project is proposing to construct a rain garden pond in accordance with the Mile High Flood Districts criteria to provide water quality treatment and to ensure the removal of sediment and other pollutants is achieved.

6.0 REFERENCES

1. Mile High Flood District, Urban Storm Drainage Criteria Manual, Volumes I, II, III. Revised 2024.

Appendix A – Maps



LEGEND

- EXISTING CONTOUR MAJOR
- EXISTING CONTOUR MINOR
- PROPOSED CONTOUR MAJOR
- PROPOSED CONTOUR MINOR
- BASIN BOUNDARY
- CURB AND GUTTER
- PROPERTY BOUNDARY
- DIRECTION OF DRAINAGE
- SURFACE FLOW DESIGN POINT

SUB-BASIN ID
BASIN IDENTIFIER — A — IMPERVIOUSNESS
AREA IN ACRES — 0.50 AC. 90% IMP.

RUNOFF SUMMARY DATA

BASIN ID	DESIGN POINT	AREA (AC)	I (%)
A	1	1.61	63.8%
B	2	2.22	62.7%
C	3	5.19	45.6%
D	4	0.18	20.0%
E	5	0.43	21.4%
F	6	5.11	12.5%
G	7	2.75	5.0%
TOTAL ON-SITE		17.50	32.5%
OS-1	8	0.48	27.6%
OS-2	9	0.95	34.2%
OS-3	10	1.01	46.9%
OS-4	9	1.9 sq mi	10.0%
OS-5	8	0.23 sq mi	10.0%

POND SUMMARY TABLE

POND	WATER QUALITY VOLUME		DRAIN TIME
	REQUIRED (CU-FT)	PROVIDED (CU-FT)	(HRS)
POND A	1,960.2	3,427.0	38
POND B	1,393.9	4,865.0	43
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TOTAL SITE	10,105.9	11,976.0	43

Know what's below. Call before you dig.

40 0 40 80
SCALE 1"=40' FEET

CIVIL ENGINEER:
WILSON & COMPANY
990 S BROADWAY SUITE 220
DENVER, COLORADO 80209
PHONE: 303-297-2976
FAX: 303-297-2693
www.wilsonco.com

PROPERTY OWNERS:
GRIFFIN DEVELOPMENT, LLC
701 W. LIONHEAD CIR.
VAIL, CO 81657

SEAL:
THIS CONSTRUCTION DOCUMENT IS FOR REFERENCE ONLY. ALL WORK IS TO BE COMPLETED USING FINAL APPROVED AND STAMPED PLANS BY THE TOWN OF EAGLE.

PROJECT NAME:
RED MOUNTAIN RANCH
17500 US-6
EAGLE COLORADO 81631

REV.	DATE	DESCRIPTION	BY

PROJECT NO:	23-600-691-00
DESIGNED BY:	BDB
DRAWN BY:	TLC
CHECKED BY:	BDB
DATE:	SEPTEMBER 22, 2025

SHEET TITLE:
DRAINAGE MAP - WEST

SHEET DESC. : C5.07
SHEET NO. : 54 OF 75

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17500 US-6
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REV.	DATE	DESCRIPTION	BY

PROJECT NO:	23-600-691-00
DESIGNED BY:	BDB
DRAWN BY:	TLC
CHECKED BY:	BDB
DATE:	SEPTEMBER 22, 2025

SHEET TITLE:
DRAINAGE MAP - EAST

SHEET DESC. : C5.08
SHEET NO. : 55 OF 75

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National Flood Hazard Layer FIRMette

FEMA

106°49'W 39°40'2"N

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

1:6,000

106°48'23"W 39°39'34"N

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 / 17.5 Cross Sections with 1% Annual Chance / Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- 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 1/10/2025 at 9:21 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.

Appendix B – Hydroligic Calculations

NOAA Atlas 14, Volume 8, Version 2
Location name: Eagle, Colorado, USA*
Latitude: 39.6629°, Longitude: -106.8115°
Elevation: 6625 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Deborah Martin, Sandra Pavlovic, Ishani Roy, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Michael Yekta, Geoffery Bonnin

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.104** (0.085-0.129)	**0.156** (0.127-0.195)	**0.240** (0.195-0.301)	**0.308** (0.249-0.389)	**0.400** (0.307-0.527)	**0.469** (0.350-0.631)	**0.537** (0.385-0.748)	**0.604** (0.411-0.874)	**0.690** (0.448-1.04)	**0.753** (0.477-1.16)
10-min	**0.152** (0.124-0.189)	**0.228** (0.186-0.285)	**0.351** (0.286-0.441)	**0.451** (0.364-0.570)	**0.586** (0.449-0.771)	**0.687** (0.513-0.924)	**0.786** (0.563-1.10)	**0.884** (0.602-1.28)	**1.01** (0.657-1.52)	**1.10** (0.698-1.70)
15-min	**0.185** (0.151-0.231)	**0.279** (0.227-0.348)	**0.429** (0.348-0.537)	**0.550** (0.444-0.695)	**0.714** (0.548-0.941)	**0.838** (0.626-1.13)	**0.958** (0.687-1.34)	**1.08** (0.734-1.56)	**1.23** (0.801-1.86)	**1.34** (0.851-2.08)
30-min	**0.258** (0.211-0.322)	**0.353** (0.288-0.441)	**0.509** (0.414-0.638)	**0.639** (0.516-0.806)	**0.819** (0.632-1.08)	**0.959** (0.719-1.30)	**1.10** (0.791-1.54)	**1.24** (0.849-1.81)	**1.43** (0.935-2.17)	**1.58** (1.00-2.44)
60-min	**0.336** (0.275-0.419)	**0.427** (0.348-0.533)	**0.579** (0.470-0.726)	**0.708** (0.572-0.894)	**0.893** (0.691-1.19)	**1.04** (0.782-1.41)	**1.19** (0.858-1.67)	**1.35** (0.922-1.96)	**1.56** (1.02-2.36)	**1.72** (1.09-2.66)
2-hr	**0.414** (0.341-0.513)	**0.500** (0.411-0.620)	**0.648** (0.531-0.807)	**0.778** (0.632-0.974)	**0.966** (0.757-1.28)	**1.12** (0.851-1.51)	**1.28** (0.932-1.78)	**1.45** (1.00-2.09)	**1.68** (1.11-2.52)	**1.87** (1.20-2.85)
3-hr	**0.477** (0.394-0.588)	**0.555** (0.458-0.685)	**0.692** (0.569-0.857)	**0.815** (0.665-1.02)	**0.996** (0.786-1.31)	**1.15** (0.877-1.54)	**1.31** (0.958-1.81)	**1.48** (1.03-2.12)	**1.72** (1.14-2.55)	**1.91** (1.23-2.88)
6-hr	**0.609** (0.506-0.744)	**0.685** (0.569-0.838)	**0.821** (0.679-1.01)	**0.944** (0.775-1.16)	**1.13** (0.898-1.47)	**1.28** (0.991-1.70)	**1.45** (1.07-1.98)	**1.63** (1.15-2.31)	**1.88** (1.27-2.76)	**2.08** (1.36-3.10)
12-hr	**0.758** (0.635-0.919)	**0.867** (0.725-1.05)	**1.05** (0.877-1.28)	**1.22** (1.01-1.49)	**1.45** (1.16-1.86)	**1.64** (1.28-2.14)	**1.84** (1.37-2.48)	**2.05** (1.46-2.86)	**2.34** (1.59-3.38)	**2.57** (1.69-3.77)
24-hr	**0.928** (0.782-1.12)	**1.07** (0.901-1.29)	**1.31** (1.10-1.58)	**1.52** (1.27-1.85)	**1.82** (1.46-2.30)	**2.06** (1.61-2.65)	**2.30** (1.73-3.06)	**2.56** (1.83-3.52)	**2.91** (2.00-4.14)	**3.19** (2.12-4.61)
2-day	**1.12** (0.947-1.33)	**1.27** (1.08-1.52)	**1.54** (1.30-1.85)	**1.78** (1.49-2.14)	**2.12** (1.72-2.66)	**2.40** (1.89-3.06)	**2.69** (2.04-3.54)	**3.00** (2.17-4.07)	**3.43** (2.37-4.80)	**3.76** (2.53-5.36)
3-day	**1.23** (1.05-1.46)	**1.41** (1.20-1.67)	**1.70** (1.44-2.03)	**1.96** (1.65-2.35)	**2.34** (1.90-2.92)	**2.64** (2.10-3.35)	**2.96** (2.26-3.86)	**3.30** (2.40-4.44)	**3.76** (2.62-5.22)	**4.12** (2.78-5.82)
4-day	**1.33** (1.14-1.57)	**1.52** (1.29-1.80)	**1.83** (1.56-2.18)	**2.11** (1.78-2.51)	**2.50** (2.04-3.11)	**2.82** (2.24-3.56)	**3.15** (2.41-4.09)	**3.50** (2.55-4.68)	**3.98** (2.78-5.49)	**4.35** (2.95-6.10)
7-day	**1.59** (1.36-1.86)	**1.78** (1.53-2.10)	**2.11** (1.80-2.49)	**2.40** (2.04-2.84)	**2.81** (2.30-3.45)	**3.14** (2.51-3.92)	**3.48** (2.68-4.46)	**3.83** (2.82-5.07)	**4.32** (3.05-5.89)	**4.71** (3.22-6.51)
10-day	**1.81** (1.56-2.12)	**2.01** (1.73-2.36)	**2.36** (2.02-2.76)	**2.65** (2.26-3.12)	**3.07** (2.53-3.76)	**3.41** (2.74-4.24)	**3.76** (2.91-4.80)	**4.13** (3.06-5.42)	**4.64** (3.29-6.27)	**5.03** (3.46-6.91)
20-day	**2.42** (2.10-2.81)	**2.68** (2.32-3.11)	**3.11** (2.68-3.62)	**3.47** (2.98-4.06)	**3.98** (3.31-4.80)	**4.39** (3.55-5.37)	**4.80** (3.75-6.03)	**5.23** (3.90-6.75)	**5.81** (4.16-7.71)	**6.25** (4.35-8.44)
30-day	**2.94** (2.56-3.38)	**3.25** (2.83-3.75)	**3.78** (3.27-4.37)	**4.21** (3.63-4.89)	**4.81** (4.00-5.75)	**5.27** (4.28-6.39)	**5.73** (4.49-7.13)	**6.20** (4.65-7.93)	**6.83** (4.92-8.97)	**7.30** (5.12-9.76)
45-day	**3.60** (3.15-4.13)	**4.00** (3.50-4.60)	**4.65** (4.05-5.35)	**5.17** (4.48-5.98)	**5.88** (4.90-6.96)	**6.40** (5.22-7.69)	**6.92** (5.44-8.51)	**7.43** (5.59-9.39)	**8.08** (5.84-10.5)	**8.56** (6.04-11.3)
60-day	**4.18** (3.67-4.78)	**4.66** (4.08-5.33)	**5.41** (4.72-6.21)	**6.01** (5.22-6.92)	**6.80** (5.67-7.99)	**7.37** (6.02-8.80)	**7.92** (6.24-9.67)	**8.44** (6.38-10.6)	**9.10** (6.60-11.7)	**9.56** (6.78-12.6)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

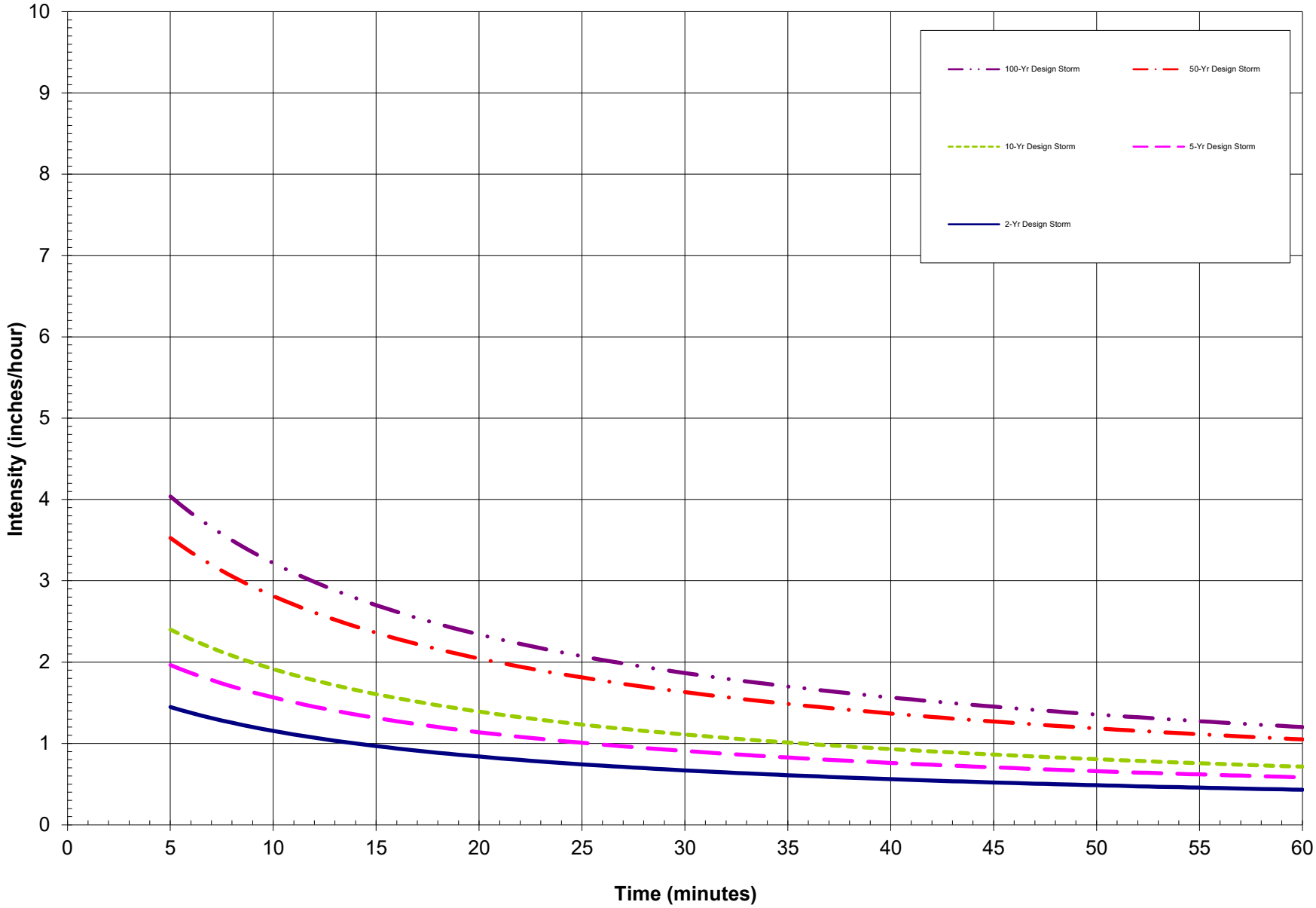
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

Back to Top

PF graphical

Town of Silverthorne
Intensity-Duration-Frequency Curves



Project Name: Red Mountain Ranch
Job Number: **23-600-691-00**
Subject: **Hydrologic Calculations**
Date: **9/16/2025**
By: **MRH**

COMPOSITE RUNOFF COEFFICIENTS

Global Parameters		Hydrologic Soil Group:			C
Land Use	% Imp.	C_2	C_5	C_{10}	C_{100}
Hardscape (Drives & Walks)	95.0%	0.79	0.81	0.83	0.87
Roofs	95.0%	0.79	0.81	0.83	0.87
Gravel (Packed)	40.0%	0.30	0.36	0.43	0.65
Disturbed Soil	20.0%	0.14	0.20	0.28	0.57
Landscaping	5.0%	0.03	0.08	0.17	0.50

Sub-Basin	Total Area (sf)	Total Area (acres)	Land Use Area per Sub-Basin										% Check	Composite Imperviousness	Composite Runoff Coefficient		
			Hardscape		Roofs		Gravel		Disturbed Soil		Landscape				5-year	10-year	100-year
			Area (acres)	%	Area (acres)	%	Area (acres)	%	Area (acres)	%	Area (acres)	%					
A	70336	1.61	0.70	43.4%	0.354	21.9%	0.00	0.0%	0.00	0.0%	0.56	34.7%	100.0%	**63.79%**	**0.54**	**0.59**	**0.74**
B	96654	2.22	1.04	46.8%	0.383	17.3%	0.00	0.1%	0.00	0.0%	0.79	35.8%	100.0%	**62.73%**	**0.54**	**0.59**	**0.74**
C	226070	5.19	1.16	22.4%	1.149	22.1%	0.07	1.4%	0.00	0.0%	2.81	54.1%	100.0%	**45.58%**	**0.40**	**0.46**	**0.67**
D	8049	0.18	0.00	0.0%	0.000	0.0%	0.00	0.0%	0.18	100.0%	0.00	0.0%	100.0%	**20.00%**	**0.20**	**0.28**	**0.57**
E	18854	0.43	0.02	4.0%	0.058	13.4%	0.01	2.0%	0.00	0.0%	0.35	80.5%	100.0%	**21.39%**	**0.21**	**0.29**	**0.57**
F	222400	5.11	0.08	1.5%	0.288	5.6%	0.15	2.9%	0.00	0.0%	4.59	89.9%	100.0%	**12.47%**	**0.14**	**0.22**	**0.53**
G	119845.68	2.75	0.00	0.0%	0.000	0.0%	0.00	0.0%	0.00	0.0%	2.75	100.0%	100.0%	**100.00%**	**0.85**	**0.87**	**0.89**
Site Total	**762209.20**	**17.50**	**3.00**	**17.1%**	**2.23**	**12.8%**	**0.23**	**1.3%**	**0.18**	**1.1%**	**9.10**	**67.7%**	**100.0%**	**32.52%**	**0.30**	**0.37**	**0.62**
OS-1	20883.71	0.48	0.12	25.1%	0.000	0.0%	0.00	0.0%	0.00	0.0%	0.36	74.9%	100.0%	**27.63%**	**0.26**	**0.33**	**0.60**
OS-2	41251	0.95	0.31	32.5%	0.000	0.0%	0.00	0.0%	0.00	0.0%	0.64	67.5%	100.0%	**34.23%**	**0.31**	**0.38**	**0.63**
OS-3	43838	1.01	0.47	46.5%	0.000	0.0%	0.00	0.0%	0.00	0.0%	0.54	53.5%	100.0%	**46.87%**	**0.41**	**0.47**	**0.67**
EXISTING	1083829.88	24.88	0.21	0.8%	0.000	0.0%	0.00	0.0%	0.00	0.0%	24.67	99.2%	100.0%	**5.75%**	**0.08**	**0.17**	**0.50**

Site total does not include OS-1, OS-2, OS-3,OS-4, and OS-5 sub-basins.

Notes:
1. Global Parameters from Table RO-3 in the UDFCD USDCM.
2. Weighted C values based on composite imperviousness & Table RO-5 in the UDFCD USDCM.

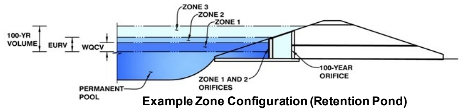
Pond C

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

Project: **Red Mountain Ranch**

Basin ID: **Basin C**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	5.19	acres
Watershed Length =	750	ft
Watershed Length to Centroid =	450	ft
Watershed Slope =	0.020	ft/ft
Watershed Imperviousness =	45.58%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	100.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.084	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	0.251	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 0.43 in.) =	0.060	acre-feet	0.43	inches
5-yr Runoff Volume (P1 = 0.58 in.) =	0.086	acre-feet	0.58	inches
10-yr Runoff Volume (P1 = 0.71 in.) =	0.109	acre-feet	0.71	inches
25-yr Runoff Volume (P1 = 0.89 in.) =	0.156	acre-feet	0.89	inches
50-yr Runoff Volume (P1 = 1.04 in.) =	0.194	acre-feet	1.04	inches
100-yr Runoff Volume (P1 = 1.19 in.) =	0.259	acre-feet	1.19	inches
500-yr Runoff Volume (P1 = 1.56 in.) =	0.409	acre-feet	1.56	inches
Approximate 2-yr Detention Volume =	0.067	acre-feet		
Approximate 5-yr Detention Volume =	0.100	acre-feet		
Approximate 10-yr Detention Volume =	0.141	acre-feet		
Approximate 25-yr Detention Volume =	0.172	acre-feet		
Approximate 50-yr Detention Volume =	0.186	acre-feet		
Approximate 100-yr Detention Volume =	0.215	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.084	acre-feet
Select Zone 2 Storage Volume (Optional) =		acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	0.084	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

Total detention volume is less than 100-year volume.

Depth Increment = 0.10 ft

5312

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	237	0.005		
	--	0.50	--	--	--	1,264	0.029	375	0.009
	--	1.00	--	--	--	1,768	0.041	1,133	0.026
	--	1.50	--	--	--	2,443	0.056	2,186	0.050
	--	2.00	--	--	--	3,054	0.070	3,560	0.082
	--	2.50	--	--	--	3,690	0.085	5,246	0.120
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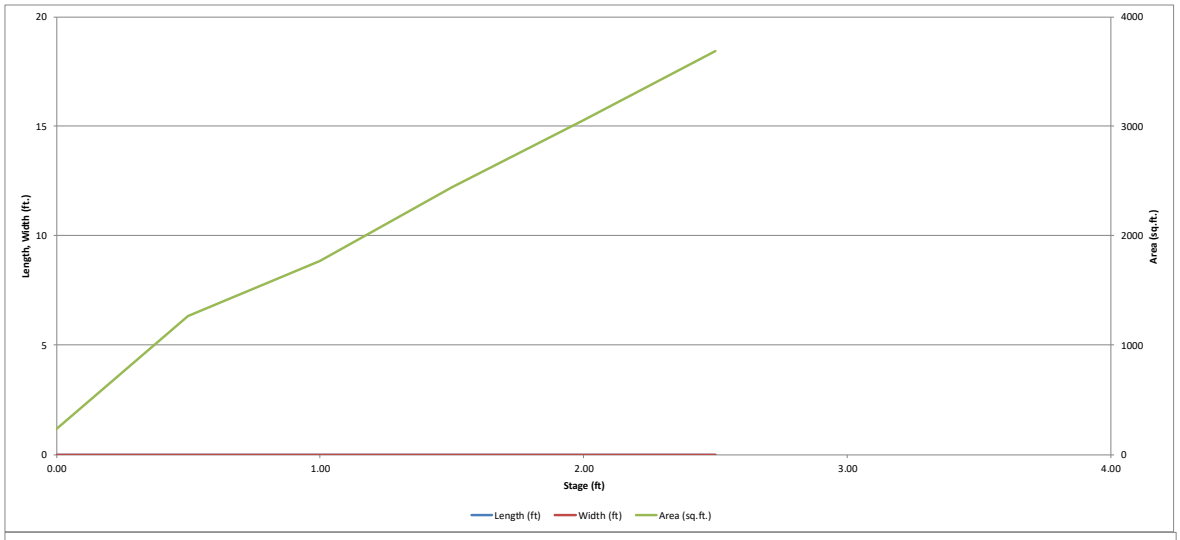
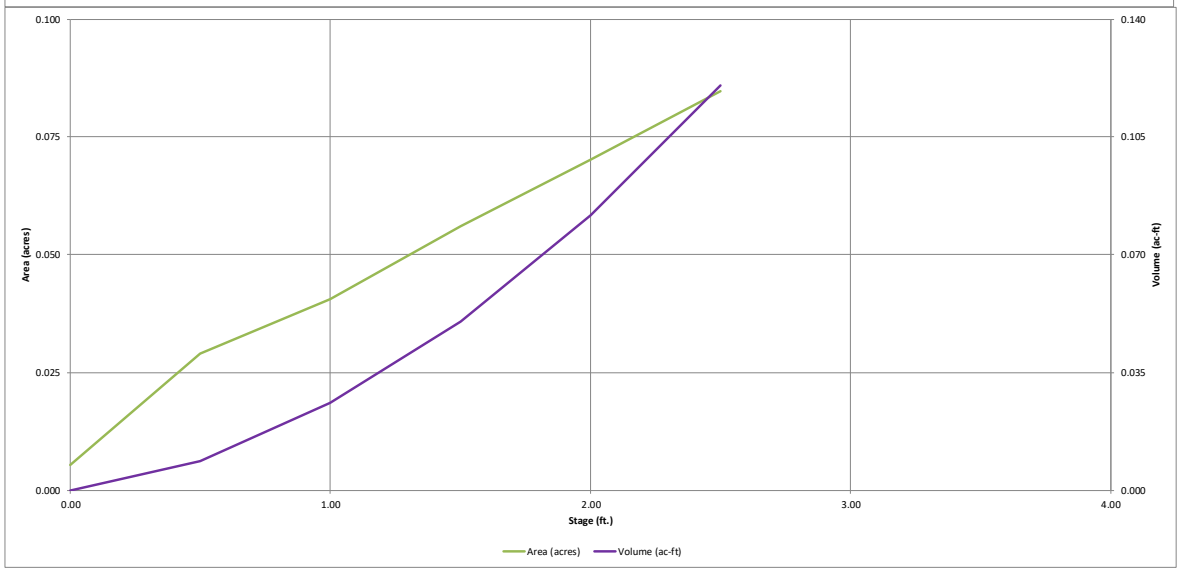
DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

2854



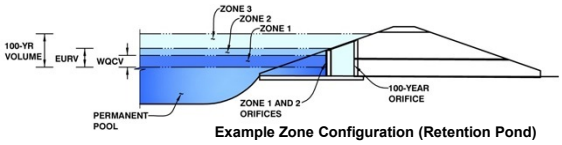


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: Red Mountain Ranch

Basin ID: Basin C



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.04	0.084	Orifice Plate
Zone 2			Weir (No Pipe)
Zone 3			
Total (all zones)		0.084	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth = ft (distance below the filtration media surface)

Underdrain Orifice Diameter = inches

Calculated Parameters for Underdrain

Underdrain Orifice Area = ft^2

Underdrain Orifice Centroid = feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Invert of Lowest Orifice = 0.00 ft (relative to basin bottom at Stage = 0 ft)

Depth at top of Zone using Orifice Plate = 2.04 ft (relative to basin bottom at Stage = 0 ft)

Orifice Plate: Orifice Vertical Spacing = N/A inches

Orifice Plate: Orifice Area per Row = 0.31 sq. inches (diameter = 5/8 inch)

Calculated Parameters for Plate

WQ Orifice Area per Row = 2.153E-03 ft^2

Elliptical Half-Width = N/A feet

Elliptical Slot Centroid = N/A feet

Elliptical Slot Area = N/A ft^2

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.33	0.67	1.00	1.33			
Orifice Area (sq. inches)	0.31	0.31	0.31	0.31	0.31			

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected	
Invert of Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =			inches

Calculated Parameters for Vertical Orifice

Not Selected	Not Selected	
		Vertical Orifice Area = ft^2
		Vertical Orifice Centroid = feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe)

	Zone 2 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	2.04		ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Bottom Length =	12.00		feet
Overflow Weir Side Slopes =	0.00		H:V
Horiz. Length of Weir Sides =	N/A		feet
Overflow Grate Type =	Type C Grate		
Debris Clogging % =	N/A		%

Calculated Parameters for Overflow Weir

Zone 2 Weir	Not Selected	
N/A		Height of Grate Upper Edge, H_t = feet
N/A		Overflow Weir Slope Length = feet
N/A		Grate Open Area / 100-yr Orifice Area =
N/A		Overflow Grate Open Area w/o Debris = ft^2
N/A		Overflow Grate Open Area w/ Debris = ft^2

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Not Selected	Not Selected	
Depth to Invert of Outlet Pipe =	N/A		ft (distance below basin bottom at Stage = 0 ft)
Circular Orifice Diameter =	N/A		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

Not Selected	Not Selected	
N/A		Outlet Orifice Area = ft^2
N/A		Outlet Orifice Centroid = feet
N/A	N/A	Half-Central Angle of Restrictor Plate on Pipe = radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage= ft (relative to basin bottom at Stage = 0 ft)

Spillway Crest Length = feet

Spillway End Slopes = H:V

Freeboard above Max Water Surface = feet

Spillway position relative to Overflow Weir =

Calculated Parameters for Spillway

Spillway Design Flow Depth= feet

Stage at Top of Freeboard = feet

Basin Area at Top of Freeboard = acres

Basin Volume at Top of Freeboard = acre-ft

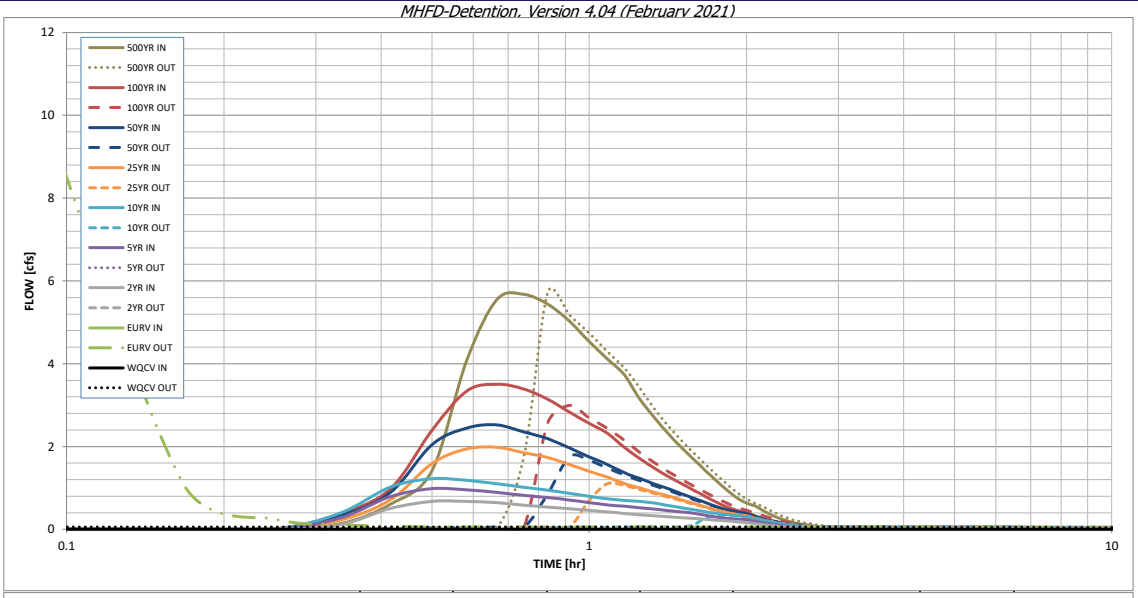
Routed Hydrograph Results

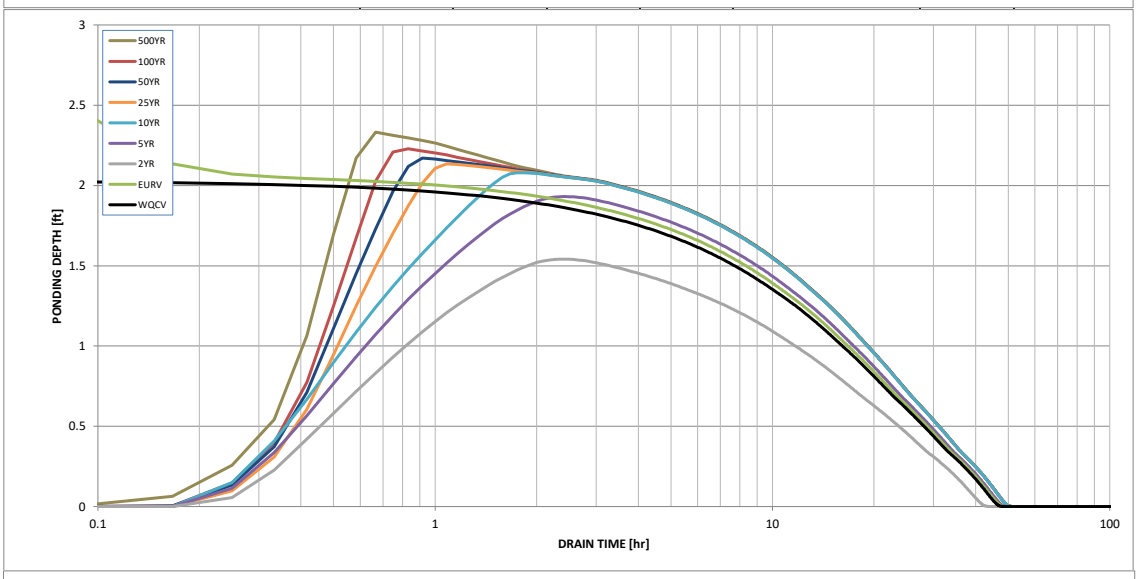
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

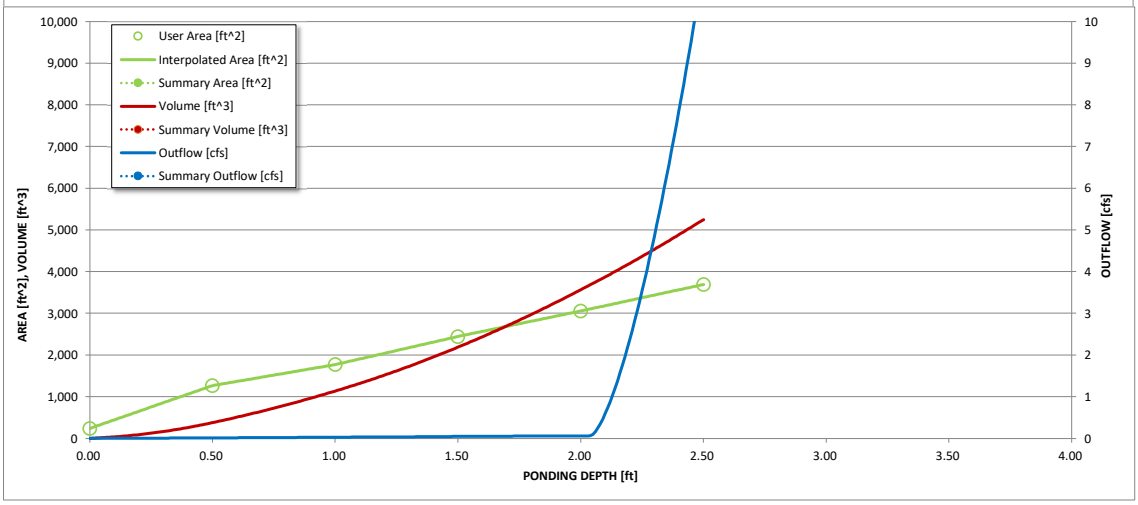
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.43	0.58	0.71	0.89	1.04	1.19	1.56
CUHP Runoff Volume (acre-ft) =	0.084	0.251	0.060	0.086	0.109	0.156	0.194	0.259	0.409
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.060	0.086	0.109	0.156	0.194	0.259	0.409
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.0	0.0	0.0	0.1	0.1	0.8	2.2
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.00	0.00	0.00	0.01	0.03	0.16	0.43
Peak Inflow Q (cfs) =	N/A	N/A	0.7	1.0	1.2	2.0	2.5	3.5	5.7
Peak Outflow Q (cfs) =	0.1	11.3	0.0	0.1	0.3	1.1	1.8	3.0	5.7
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	#DIV/0!	21.4	21.1	12.9	3.7	2.5
Structure Controlling Flow =	Overflow Weir 1	N/A	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	31	35	39	39	36	34	32	28
Time to Drain 99% of Inflow Volume (hours) =	**43**	39	39	44	45	43	42	41	37
Maximum Ponding Depth (ft) =	2.04	2.50	1.54	1.93	2.08	2.13	2.17	2.23	2.33
Area at Maximum Ponding Depth (acres) =	0.07	0.08	0.06	0.07	0.07	0.07	0.08	0.08	0.08
Maximum Volume Stored (acre-ft) =	0.085	0.120	0.052	0.077	0.087	0.091	0.094	0.098	0.106

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)







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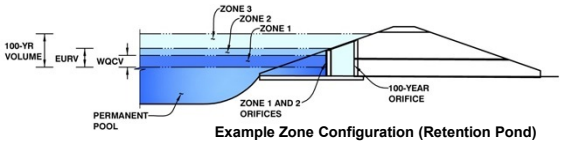
S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: Red Mountain Ranch

Basin ID: Basin C



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.04	0.084	Orifice Plate
Zone 2			Weir (No Pipe)
Zone 3			
Total (all zones)		0.084	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth = ft (distance below the filtration media surface)

Underdrain Orifice Diameter = inches

Calculated Parameters for Underdrain

Underdrain Orifice Area = ft^2

Underdrain Orifice Centroid = feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Invert of Lowest Orifice = 0.00 ft (relative to basin bottom at Stage = 0 ft)

Depth at top of Zone using Orifice Plate = 2.04 ft (relative to basin bottom at Stage = 0 ft)

Orifice Plate: Orifice Vertical Spacing = N/A inches

Orifice Plate: Orifice Area per Row = 0.31 sq. inches (diameter = 5/8 inch)

Calculated Parameters for Plate

WQ Orifice Area per Row = 2.153E-03 ft^2

Elliptical Half-Width = N/A feet

Elliptical Slot Centroid = N/A feet

Elliptical Slot Area = N/A ft^2

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.33	0.67	1.00	1.33			
Orifice Area (sq. inches)	0.31	0.31	0.31	0.31	0.31			

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected	
Invert of Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =			inches

Calculated Parameters for Vertical Orifice

Not Selected	Not Selected	
		Vertical Orifice Area = ft^2
		Vertical Orifice Centroid = feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe)

	Zone 2 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	2.04		ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Bottom Length =	12.00		feet
Overflow Weir Side Slopes =	0.00		H:V
Horiz. Length of Weir Sides =	N/A		feet
Overflow Grate Type =	Type C Grate		
Debris Clogging % =	N/A		%

Calculated Parameters for Overflow Weir

Zone 2 Weir	Not Selected	
N/A		Height of Grate Upper Edge, H_t = feet
N/A		Overflow Weir Slope Length = feet
N/A		Grate Open Area / 100-yr Orifice Area =
N/A		Overflow Grate Open Area w/o Debris = ft^2
N/A		Overflow Grate Open Area w/ Debris = ft^2

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Not Selected	Not Selected	
Depth to Invert of Outlet Pipe =	N/A		ft (distance below basin bottom at Stage = 0 ft)
Circular Orifice Diameter =	N/A		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

Not Selected	Not Selected	
N/A		Outlet Orifice Area = ft^2
N/A		Outlet Orifice Centroid = feet
N/A	N/A	Half-Central Angle of Restrictor Plate on Pipe = radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage= ft (relative to basin bottom at Stage = 0 ft)

Spillway Crest Length = feet

Spillway End Slopes = H:V

Freeboard above Max Water Surface = feet

Spillway position relative to Overflow Weir =

Calculated Parameters for Spillway

Spillway Design Flow Depth= feet

Stage at Top of Freeboard = feet

Basin Area at Top of Freeboard = acres

Basin Volume at Top of Freeboard = acre-ft

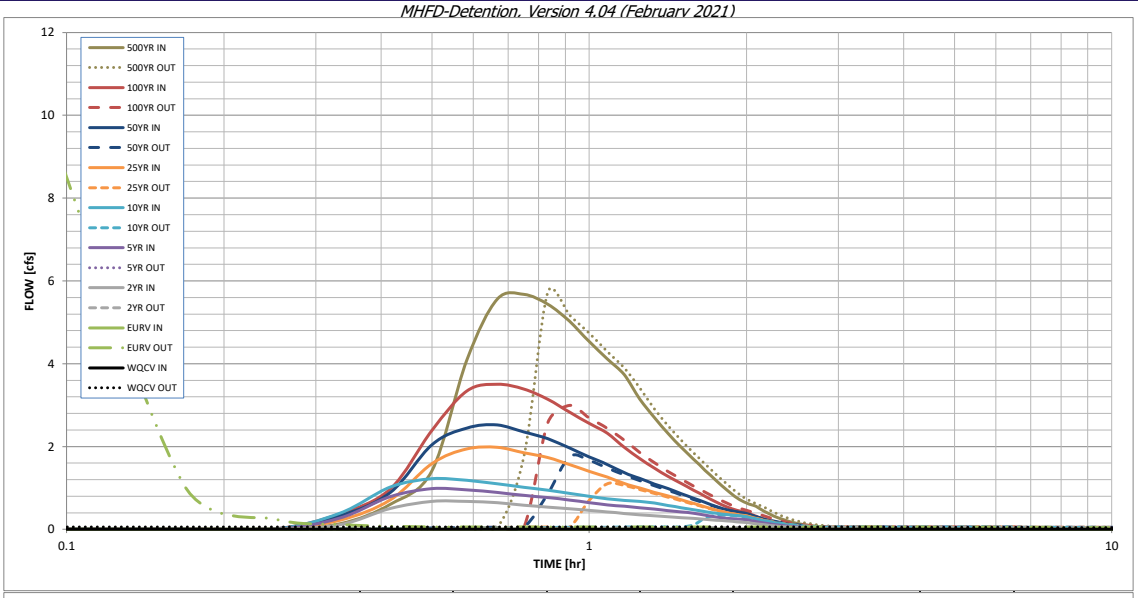
Routed Hydrograph Results

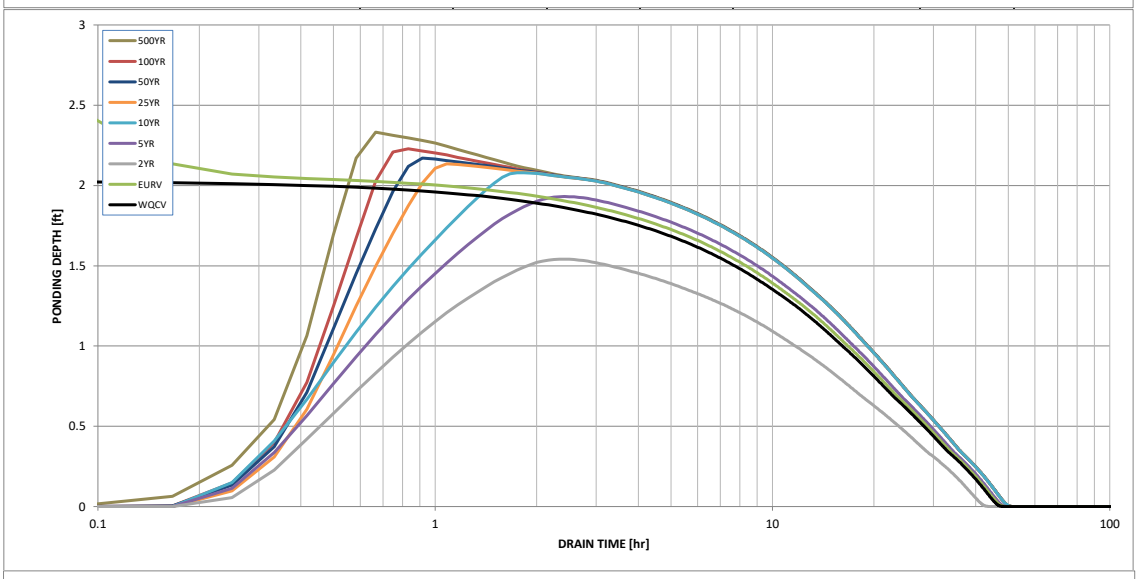
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

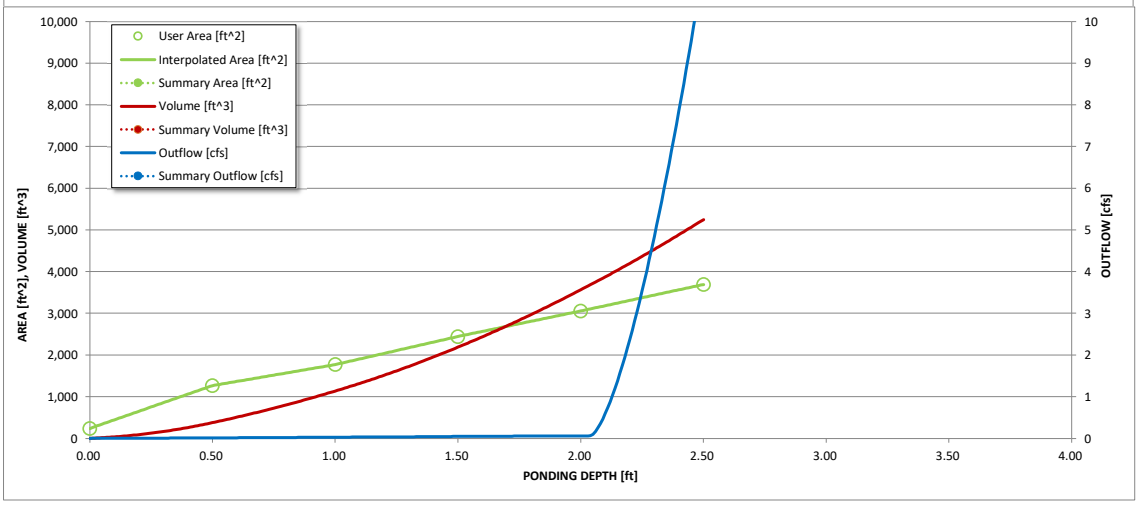
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.43	0.58	0.71	0.89	1.04	1.19	1.56
CUHP Runoff Volume (acre-ft) =	0.084	0.251	0.060	0.086	0.109	0.156	0.194	0.259	0.409
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.060	0.086	0.109	0.156	0.194	0.259	0.409
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.0	0.0	0.0	0.1	0.1	0.8	2.2
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.00	0.00	0.00	0.01	0.03	0.16	0.43
Peak Inflow Q (cfs) =	N/A	N/A	0.7	1.0	1.2	2.0	2.5	3.5	5.7
Peak Outflow Q (cfs) =	0.1	11.3	0.0	0.1	0.3	1.1	1.8	3.0	5.7
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	#DIV/0!	21.4	21.1	12.9	3.7	2.5
Structure Controlling Flow =	Overflow Weir 1	N/A	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	31	35	39	39	36	34	32	28
Time to Drain 99% of Inflow Volume (hours) =	**43**	39	39	44	45	43	42	41	37
Maximum Ponding Depth (ft) =	2.04	2.50	1.54	1.93	2.08	2.13	2.17	2.23	2.33
Area at Maximum Ponding Depth (acres) =	0.07	0.08	0.06	0.07	0.07	0.07	0.08	0.08	0.08
Maximum Volume Stored (acre-ft) =	0.085	0.120	0.052	0.077	0.087	0.091	0.094	0.098	0.106

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)







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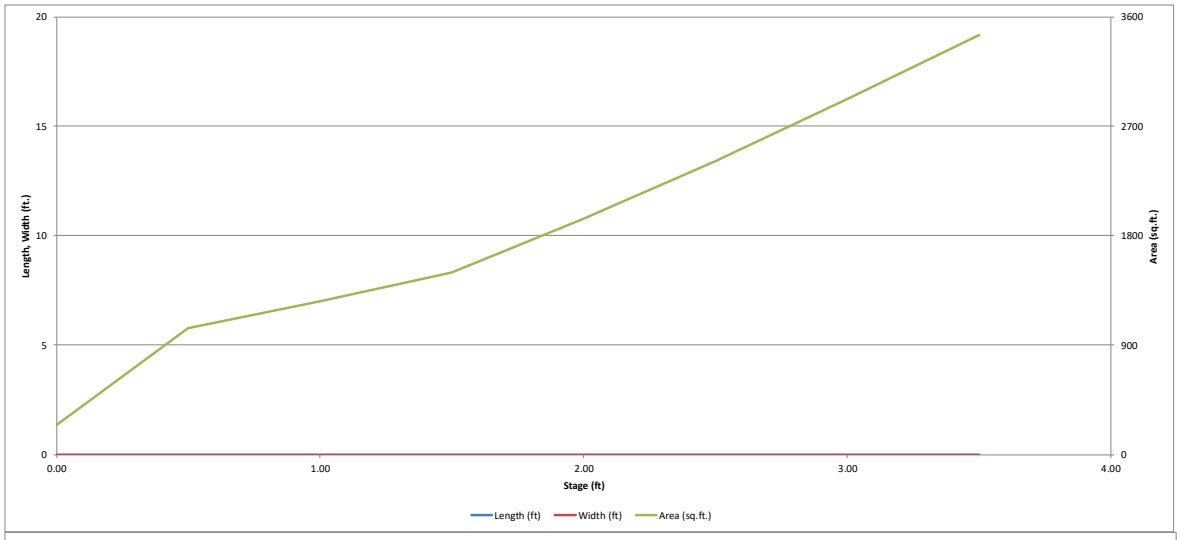
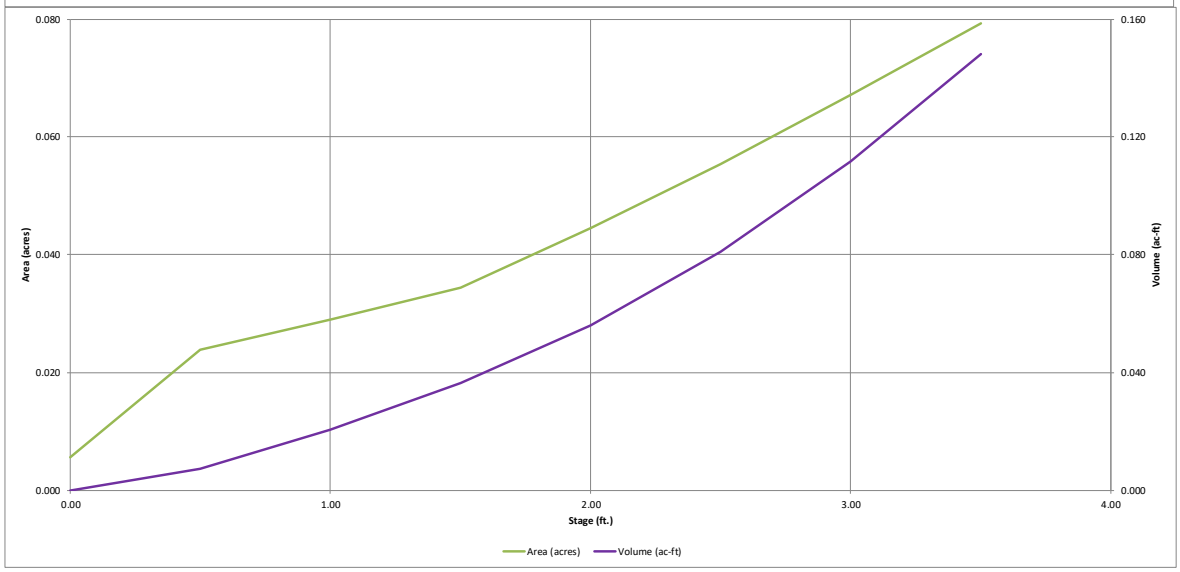
S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

2854



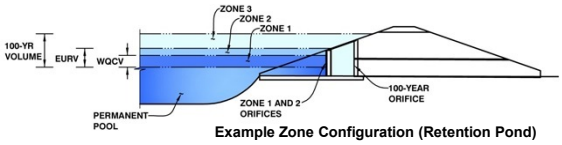


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: Red Mountain Ranch

Basin ID: Basin A & E



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.37	0.032	Orifice Plate
Zone 2			Weir (No Pipe)
Zone 3			
Total (all zones)		0.032	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth = ft (distance below the filtration media surface)

Underdrain Orifice Diameter = inches

Calculated Parameters for Underdrain

Underdrain Orifice Area = ft^2

Underdrain Orifice Centroid = feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Invert of Lowest Orifice = 0.00 ft (relative to basin bottom at Stage = 0 ft)

Depth at top of Zone using Orifice Plate = 3.00 ft (relative to basin bottom at Stage = 0 ft)

Orifice Plate: Orifice Vertical Spacing = N/A inches

Orifice Plate: Orifice Area per Row = 0.20 sq. inches (diameter = 1/2 inch)

Calculated Parameters for Plate

WQ Orifice Area per Row = 1.389E-03 ft^2

Elliptical Half-Width = N/A feet

Elliptical Slot Centroid = N/A feet

Elliptical Slot Area = N/A ft^2

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.33	0.67	1.00	1.33	1.67	2.00	
Orifice Area (sq. inches)	0.20	0.20	0.20	0.20	0.20	0.20	0.20	

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected	
Invert of Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =			inches

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected	
Vertical Orifice Area =			ft^2
Vertical Orifice Centroid =			feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe)

	Zone 2 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	3.00		ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Bottom Length =	12.00		feet
Overflow Weir Side Slopes =	0.00		H:V
Horiz. Length of Weir Sides =	N/A		feet
Overflow Grate Type =	Type C Grate		
Debris Clogging % =	N/A		%

Calculated Parameters for Overflow Weir

	Zone 2 Weir	Not Selected	
Height of Grate Upper Edge, H_t =	N/A		feet
Overflow Weir Slope Length =	N/A		feet
Grate Open Area / 100-yr Orifice Area =	N/A		
Overflow Grate Open Area w/o Debris =	N/A		ft^2
Overflow Grate Open Area w/ Debris =	N/A		ft^2

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Not Selected	Not Selected	
Depth to Invert of Outlet Pipe =	N/A		ft (distance below basin bottom at Stage = 0 ft)
Circular Orifice Diameter =	N/A		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Not Selected	Not Selected	
Outlet Orifice Area =	N/A		ft^2
Outlet Orifice Centroid =	N/A		feet
Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage= ft (relative to basin bottom at Stage = 0 ft)

Spillway Crest Length = feet

Spillway End Slopes = H:V

Freeboard above Max Water Surface = feet

Spillway position relative to Overflow Weir =

Calculated Parameters for Spillway

Spillway Design Flow Depth= feet

Stage at Top of Freeboard = feet

Basin Area at Top of Freeboard = acres

Basin Volume at Top of Freeboard = acre-ft

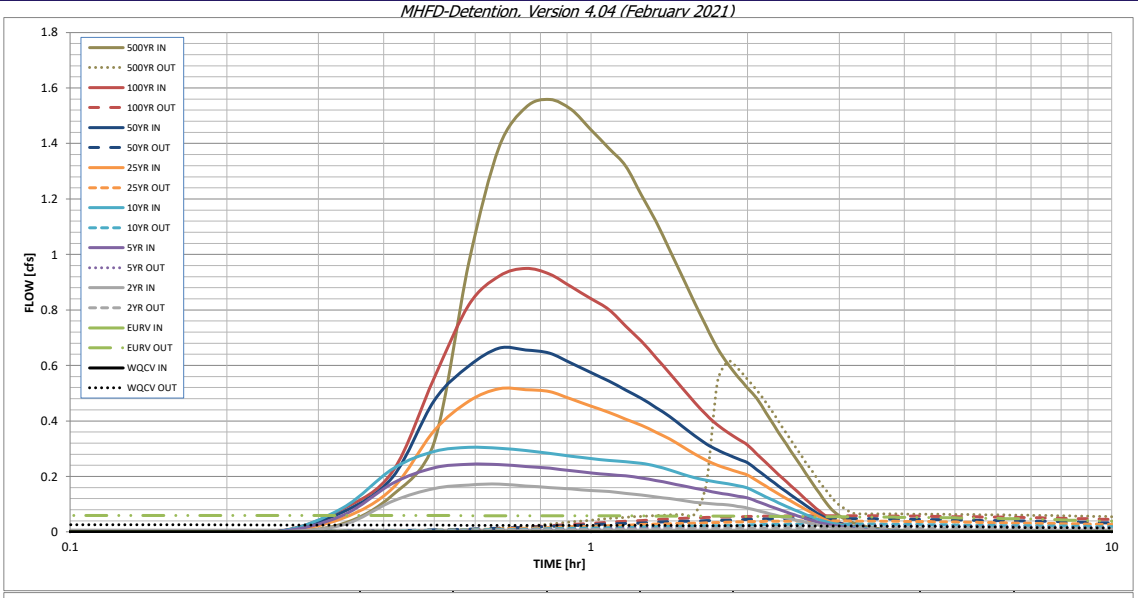
Routed Hydrograph Results

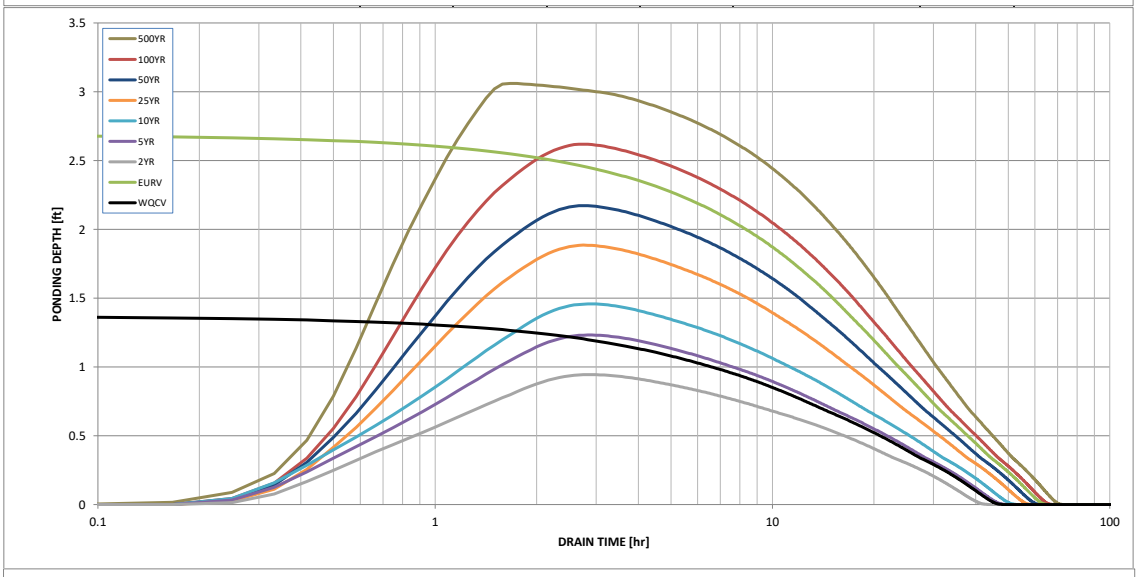
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

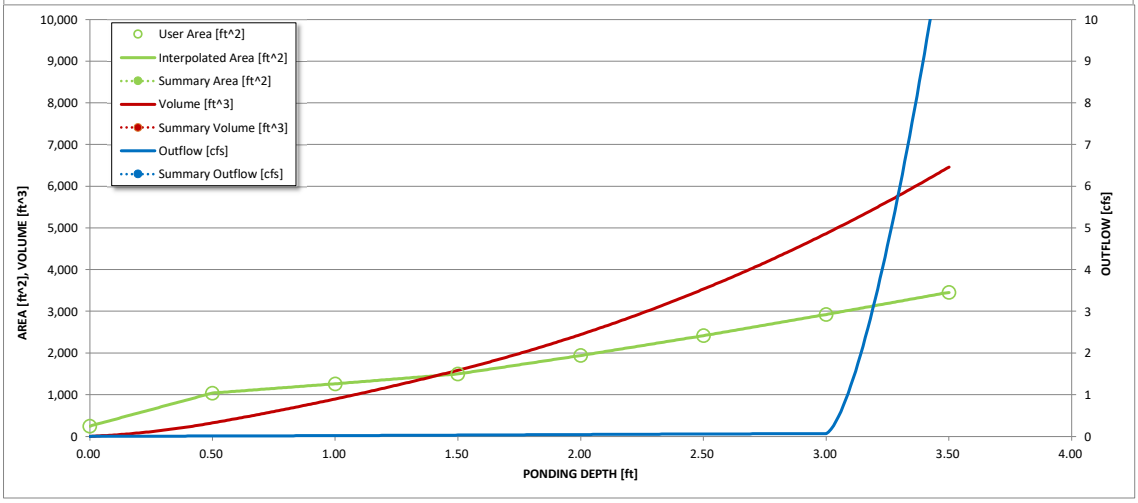
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.43	0.58	0.71	0.89	1.04	1.19	1.56
CUHP Runoff Volume (acre-ft) =	0.032	0.092	0.022	0.032	0.040	0.058	0.072	0.098	0.158
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.022	0.032	0.040	0.058	0.072	0.098	0.158
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.0	0.0	0.0	0.0	0.0	0.2	0.6
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.00	0.00	0.00	0.01	0.02	0.11	0.30
Peak Inflow Q (cfs) =	N/A	N/A	0.2	0.2	0.3	0.5	0.7	0.9	1.6
Peak Outflow Q (cfs) =	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.6
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	#DIV/0!	6.8	2.7	1.3	0.3	1.0
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Plate	Plate	Plate	Plate	Overflow Weir
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	39	49	36	40	42	46	48	50	50
Time to Drain 99% of Inflow Volume (hours) =	**43**	56	39	44	47	52	54	58	60
Maximum Ponding Depth (ft) =	1.38	2.69	0.94	1.23	1.46	1.89	2.17	2.62	3.06
Area at Maximum Ponding Depth (acres) =	0.03	0.06	0.03	0.03	0.03	0.04	0.05	0.06	0.07
Maximum Volume Stored (acre-ft) =	0.032	0.092	0.019	0.027	0.035	0.051	0.064	0.087	0.116

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)







1

S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

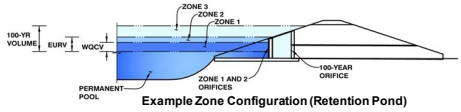
Pond A

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

Project: Red Mountain Ranch

Basin ID: Basin B



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	2.22	acres
Watershed Length =	800	ft
Watershed Length to Centroid =	450	ft
Watershed Slope =	0.020	ft/ft
Watershed Imperviousness =	62.73%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	100.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides
Water Quality Capture Volume (WQCV) =	0.045	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	0.152	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 0.43 in.) =	0.038	acre-feet	0.43 inches
5-yr Runoff Volume (P1 = 0.58 in.) =	0.056	acre-feet	0.58 inches
10-yr Runoff Volume (P1 = 0.71 in.) =	0.070	acre-feet	0.71 inches
25-yr Runoff Volume (P1 = 0.89 in.) =	0.096	acre-feet	0.89 inches
50-yr Runoff Volume (P1 = 1.04 in.) =	0.116	acre-feet	1.04 inches
100-yr Runoff Volume (P1 = 1.19 in.) =	0.145	acre-feet	1.19 inches
500-yr Runoff Volume (P1 = 1.56 in.) =	0.212	acre-feet	1.56 inches
Approximate 2-yr Detention Volume =	0.042	acre-feet	
Approximate 5-yr Detention Volume =	0.061	acre-feet	
Approximate 10-yr Detention Volume =	0.082	acre-feet	
Approximate 25-yr Detention Volume =	0.097	acre-feet	
Approximate 50-yr Detention Volume =	0.105	acre-feet	
Approximate 100-yr Detention Volume =	0.116	acre-feet	

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.045	acre-feet
Select Zone 2 Storage Volume (Optional) =		acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	0.045	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

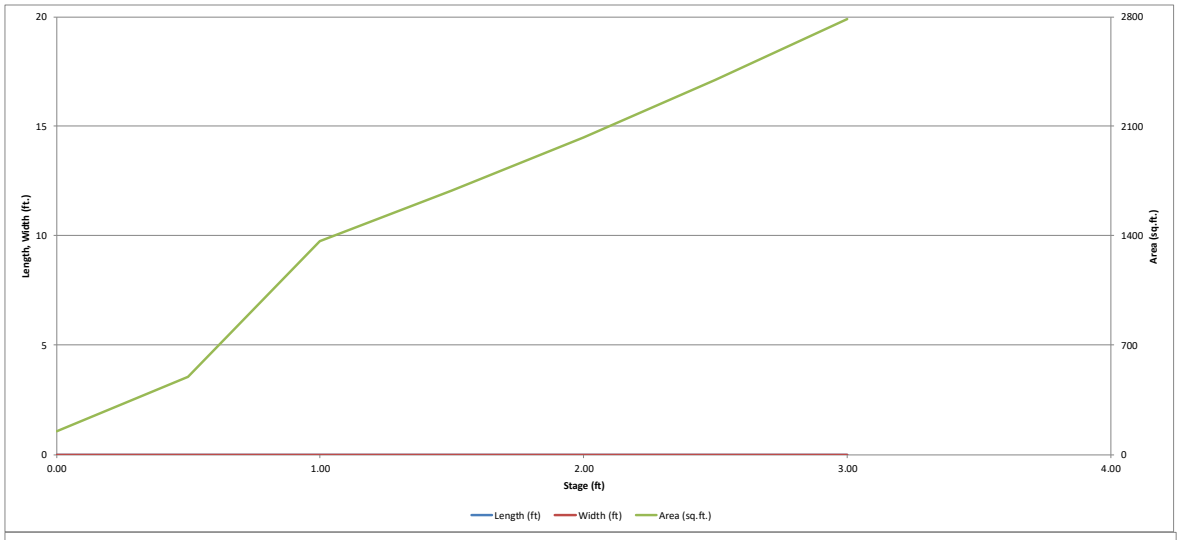
Depth Increment = 0.10 ft

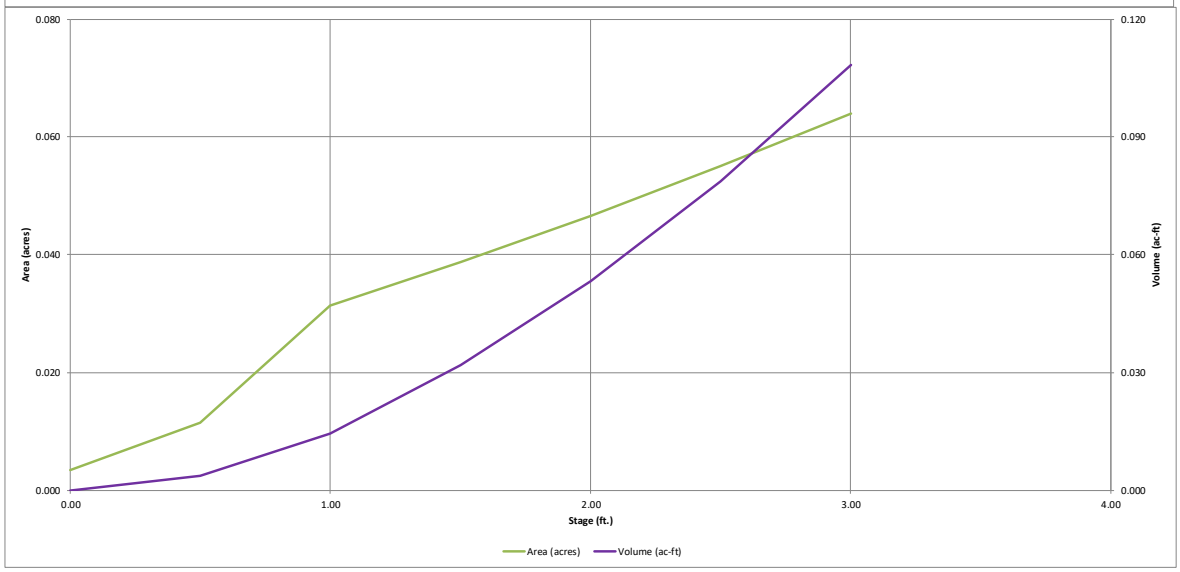
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	150	0.003		
	--	0.50	--	--	--	498	0.011	162	0.004
	--	1.00	--	--	--	1,367	0.031	628	0.014
	--	1.50	--	--	--	1,688	0.039	1,392	0.032
	--	2.00	--	--	--	2,028	0.047	2,321	0.053
	--	2.50	--	--	--	2,396	0.055	3,427	0.079
	--	3.00	--	--	--	2,787	0.064	4,723	0.108

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

2854



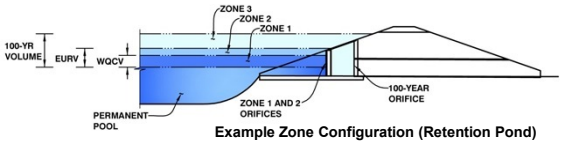


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: Red Mountain Ranch

Basin ID: Basin B



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.83	0.045	Orifice Plate
Zone 2			Weir (No Pipe)
Zone 3			
Total (all zones)		0.045	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth = ft (distance below the filtration media surface)

Underdrain Orifice Diameter = inches

Calculated Parameters for Underdrain

Underdrain Orifice Area = ft^2

Underdrain Orifice Centroid = feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Invert of Lowest Orifice = 0.00 ft (relative to basin bottom at Stage = 0 ft)

Depth at top of Zone using Orifice Plate = 2.50 ft (relative to basin bottom at Stage = 0 ft)

Orifice Plate: Orifice Vertical Spacing = N/A inches

Orifice Plate: Orifice Area per Row = 0.19 sq. inches (diameter = 1/2 inch)

Calculated Parameters for Plate

WQ Orifice Area per Row = 1.319E-03 ft^2

Elliptical Half-Width = N/A feet

Elliptical Slot Centroid = N/A feet

Elliptical Slot Area = N/A ft^2

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.33	0.67	1.00				
Orifice Area (sq. inches)	0.19	0.19	0.19	0.19				

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected	
Invert of Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =			inches

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected	
Vertical Orifice Area =			ft^2
Vertical Orifice Centroid =			feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe)

	Zone 2 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	2.50		ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Bottom Length =	12.00		feet
Overflow Weir Side Slopes =	0.00		H:V
Horiz. Length of Weir Sides =	N/A		feet
Overflow Grate Type =	Type C Grate		
Debris Clogging % =	N/A		%

Calculated Parameters for Overflow Weir

	Zone 2 Weir	Not Selected	
Height of Grate Upper Edge, H_t =	N/A		feet
Overflow Weir Slope Length =	N/A		feet
Grate Open Area / 100-yr Orifice Area =	N/A		
Overflow Grate Open Area w/o Debris =	N/A		ft^2
Overflow Grate Open Area w/ Debris =	N/A		ft^2

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Not Selected	Not Selected	
Depth to Invert of Outlet Pipe =	N/A		ft (distance below basin bottom at Stage = 0 ft)
Circular Orifice Diameter =	N/A		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Not Selected	Not Selected	
Outlet Orifice Area =	N/A		ft^2
Outlet Orifice Centroid =	N/A		feet
Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage= ft (relative to basin bottom at Stage = 0 ft)

Spillway Crest Length = feet

Spillway End Slopes = H:V

Freeboard above Max Water Surface = feet

Spillway position relative to Overflow Weir =

Calculated Parameters for Spillway

Spillway Design Flow Depth= feet

Stage at Top of Freeboard = feet

Basin Area at Top of Freeboard = acres

Basin Volume at Top of Freeboard = acre-ft

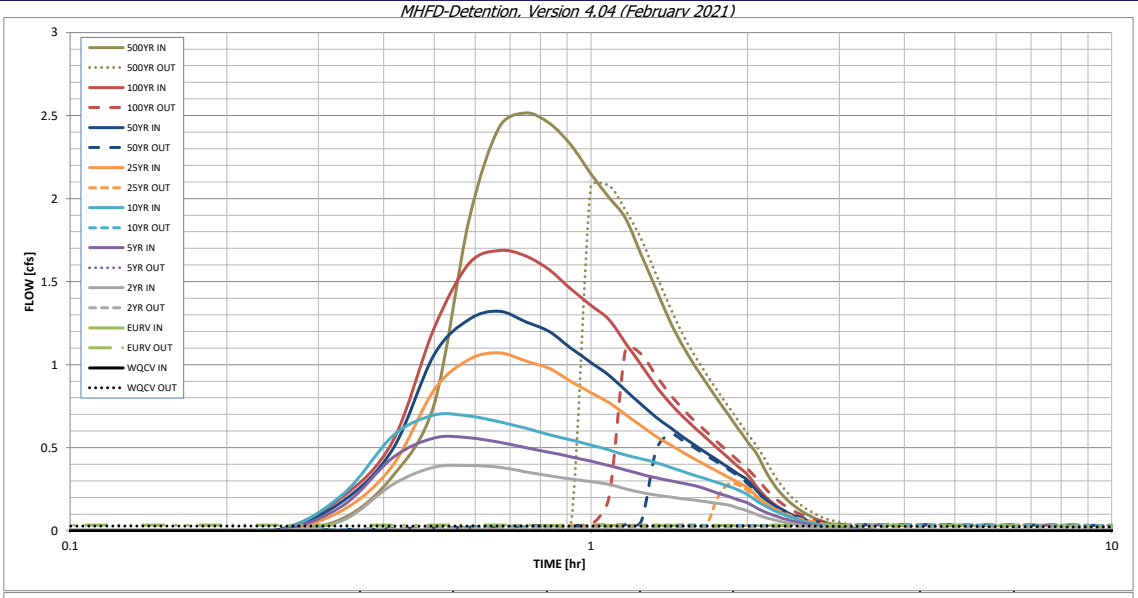
Routed Hydrograph Results

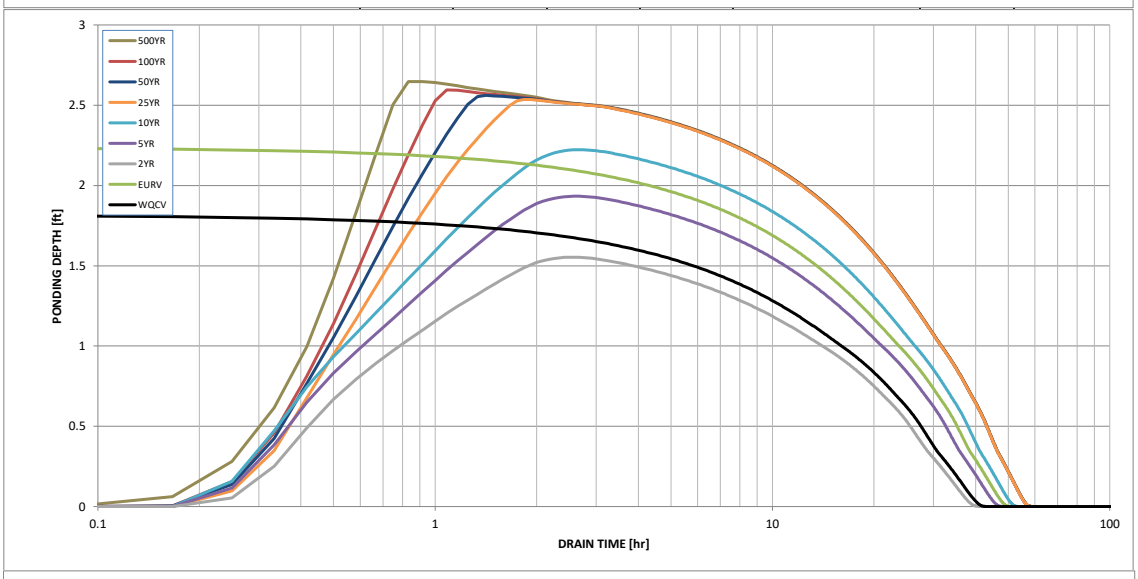
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

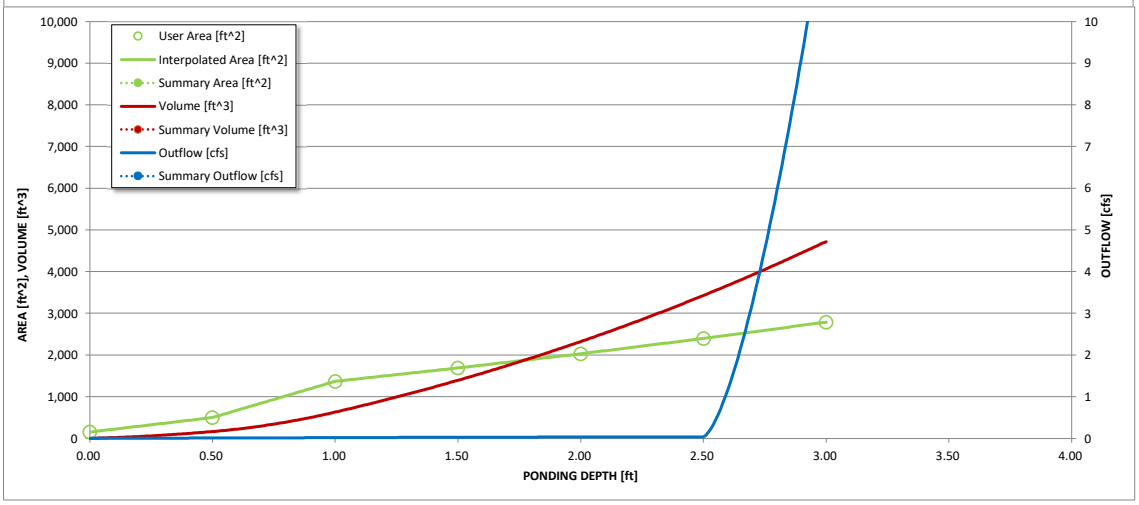
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	0.43	0.58	0.71	0.89	1.04	1.19	1.56
CUHP Runoff Volume (acre-ft) =	0.045	0.152	0.038	0.056	0.070	0.096	0.116	0.145	0.212
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.038	0.056	0.070	0.096	0.116	0.145	0.212
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.0	0.0	0.0	0.0	0.0	0.2	0.7
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.00	0.00	0.00	0.01	0.02	0.11	0.31
Peak Inflow Q (cfs) =	N/A	N/A	0.4	0.6	0.7	1.1	1.3	1.7	2.5
Peak Outflow Q (cfs) =	0.0	12.7	0.0	0.0	0.0	0.3	0.6	1.1	2.1
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	#DIV/0!	7.2	17.2	14.4	4.5	3.0
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	34	36	32	37	41	45	44	42	39
Time to Drain 99% of Inflow Volume (hours) =	**38**	42	36	42	47	51	50	49	47
Maximum Ponding Depth (ft) =	1.82	2.23	1.55	1.93	2.22	2.54	2.56	2.60	2.65
Area at Maximum Ponding Depth (acres) =	0.04	0.05	0.04	0.05	0.05	0.06	0.06	0.06	0.06
Maximum Volume Stored (acre-ft) =	0.045	0.064	0.034	0.050	0.064	0.080	0.082	0.084	0.087

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)





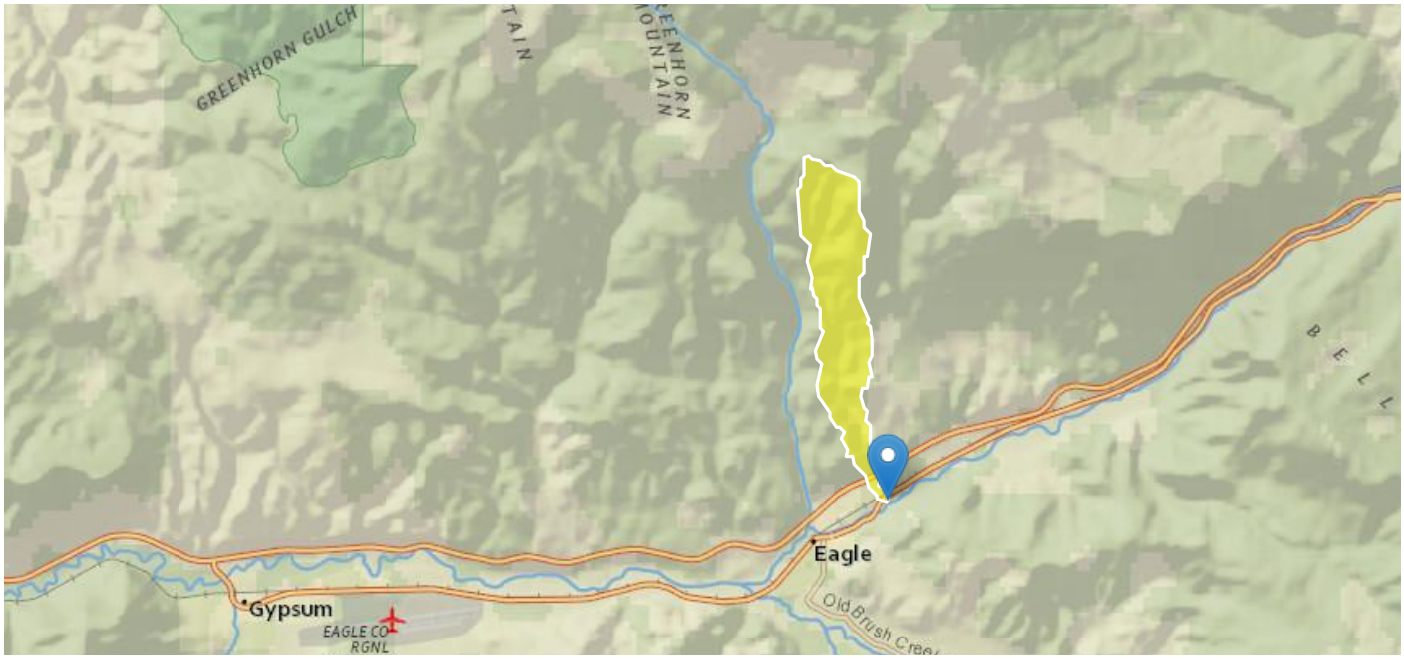


1

S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

RMR Western Basin - StreamStats Report

Region ID: CO
Workspace ID: CO20240923183540544000
Clicked Point (Latitude, Longitude): 39.66191, -106.81324
Time: 2024-09-23 12:36:07 -0600



Collapse All

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
BSLDEM10M	Mean basin slope computed from 10 m DEM	31	percent
DRNAREA	Area that drains to a point on a stream	1.9	square miles
LC11IMP	Average percentage of impervious area determined from NLCD 2011 impervious dataset	1.5	percent
LFPLENGTH	Length of longest flow path	4.73	miles
SSURGOA	Percentage of area of Hydrologic Soil Type A from SSURGO	0.0692	percent
SSURGOB	Percentage of area of Hydrologic Soil Type B from SSURGO	3.47	percent
SSURGOC	Percentage of area of Hydrologic Soil Type C from SSURGO	37.2	percent
SSURGOD	Percentage of area of Hydrologic Soil Type D from SSURGO	46.1	percent

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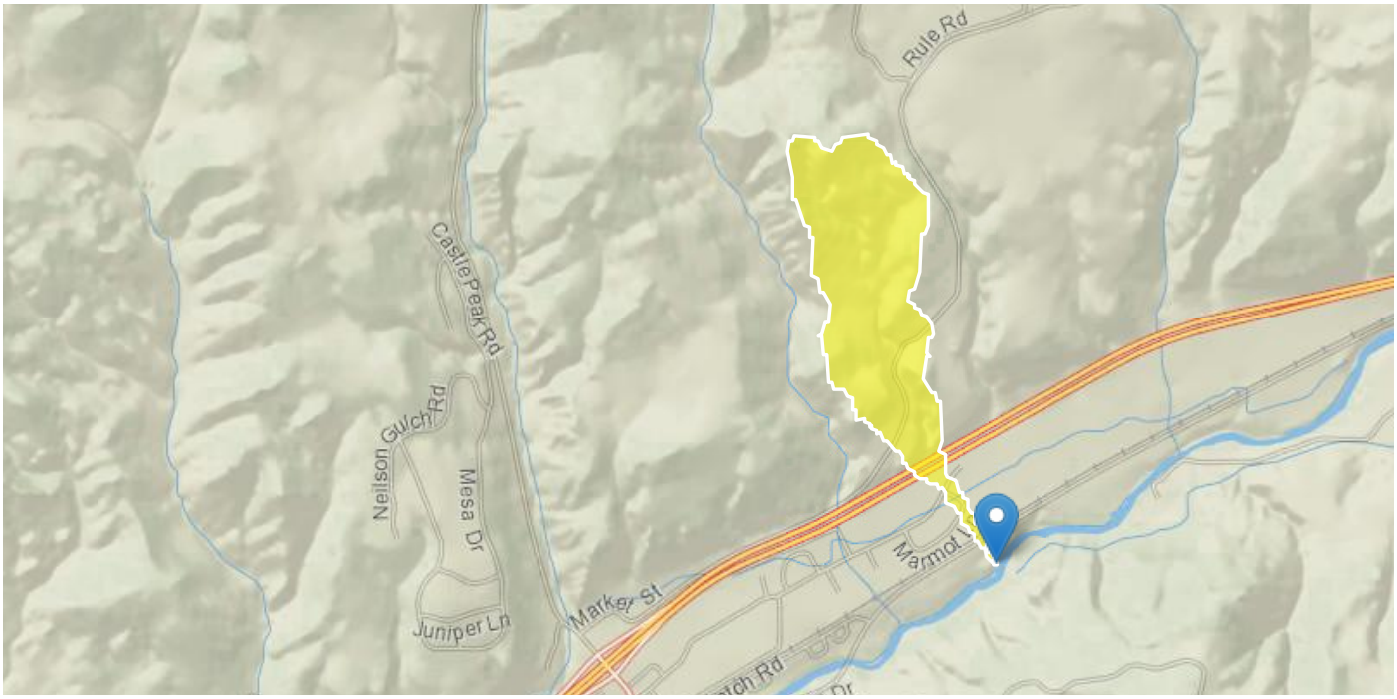
Application Version: 4.24.0
StreamStats Services Version: 1.2.22
NSS Services Version: 2.2.1

RMR Eastern Basin - StreamStats Report

Region ID: CO
Workspace ID: CO20240923182207609000
Clicked Point (Latitude, Longitude): 39.66399, -106.80833
Time: 2024-09-23 12:22:33 -0600



Collapse All

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
BSLDEM10M	Mean basin slope computed from 10 m DEM	20	percent
DRNAREA	Area that drains to a point on a stream	0.23	square miles
LC11IMP	Average percentage of impervious area determined from NLCD 2011 impervious dataset	6.9	percent
LFPLENGTH	Length of longest flow path	1.4	miles
SSURGOA	Percentage of area of Hydrologic Soil Type A from SSURGO	3.79	percent
SSURGOB	Percentage of area of Hydrologic Soil Type B from SSURGO	31.8	percent
SSURGOC	Percentage of area of Hydrologic Soil Type C from SSURGO	28.7	percent
SSURGOD	Percentage of area of Hydrologic Soil Type D from SSURGO	0	percent

Application Version: 4.24.0
StreamStats Services Version: 1.2.22
NSS Services Version: 2.2.1

Columns with this color heading are for required user-input
Columns with this color heading are for optional override values
Columns with this color heading are for program-calculated values

								Maximum Depression Storage (Watershed inches)		Horton's Infiltration Parameters			DCIA	Directly Connected Impervious Fraction DCIF (Decimal)		Receiving Pervious Fraction RPF (Decimal)		Effective Imperviousness	C_T		C_p	
Subcatchment Name	EPA SWMM Target Node	Raingage	Area (mi^2)	Length to Centroid (mi)	Length (mi)	Slope (ft/ft)	Percent Imperviousness	Pervious	Impervious	Initial Rate (in/hr)	Decay Coefficient (1/seconds)	Final Rate (in/hr)	Level 0, 1, or 2	Override	Used	Override	Used	(Percent)	Override	Used	Override	Used
WBasin100Y	na	100 YR	1.9	2.375	4.75	0.31	1.5	0.4	0.1	3	0.0018	0.5	0		0.03		0.02	1.20		0.159		0.442
EBasin100Y	na	100 YR	0.23	0.7	1.4	0.31	6.9	0.4	0.1	3	0.0018	0.5	0		0.14		0.07	5.66		0.142		0.212
WBasin10Y	na	10 YR	1.9	2.375	4.75	0.31	1.5	0.4	0.1	3	0.0018	0.5	0		0.03		0.02	1.04		0.159		0.444
Ebasin10Y	na	10 YR	0.23	0.7	1.4	0.31	6.9	0.4	0.1	3	0.0018	0.5	0		0.14		0.07	4.97		0.145		0.215

Comment	100YR Raingage		
1Hr Depth	1.25		
Return Period	100	Years	
Time	Depth	CurveValue	
0:05	0.013		0.01
0:10	0.038		0.03
0:15	0.058		0.046
0:20	0.1		0.08
0:25	0.175		0.14
0:30	0.313		0.25
0:35	0.175		0.14
0:40	0.1		0.08
0:45	0.078		0.062
0:50	0.063		0.05
0:55	0.05		0.04
1:00	0.05		0.04
1:05	0.05		0.04
1:10	0.025		0.02
1:15	0.025		0.02
1:20	0.015		0.012
1:25	0.015		0.012
1:30	0.015		0.012
1:35	0.015		0.012
1:40	0.015		0.012
1:45	0.015		0.012
1:50	0.015		0.012
1:55	0.015		0.012
2:00	0.015		0.012
2:05	0		

Comment	10 YR Raingage		
1Hr Depth	0.75		
Return Period	10	Years	
Time	Depth	CurveValue	
0:05	0.015		0.02
0:10	0.028		0.037
0:15	0.062		0.082
0:20	0.113		0.15
0:25	0.188		0.25
0:30	0.09		0.12
0:35	0.042		0.056
0:40	0.032		0.043
0:45	0.029		0.038
0:50	0.024		0.032
0:55	0.024		0.032
1:00	0.024		0.032
1:05	0.024		0.032
1:10	0.024		0.032
1:15	0.024		0.032
1:20	0.019		0.025
1:25	0.014		0.019
1:30	0.014		0.019
1:35	0.014		0.019
1:40	0.014		0.019
1:45	0.014		0.019
1:50	0.014		0.019
1:55	0.013		0.017
2:00	0.01		0.013
2:05	0		

Summary of Unit Hydrograph Parameters Used By Program and Calculated Results (Version 2.0.1)

		Unit Hydrograph Parameters and Results									Excess Precip.		Storm Hydrograph			
Catchment Name/ID	User Comment for Catchment	CT	Cp	W50 (min.)	W50 Before Peak	W75 (min.)	W75 Before Peak	Time to Peak (min.)	Peak (cfs)	Volume (c.f)	Excess (inches)	Excess (c.f.)	Time to Peak (min.)	Peak Flow (cfs)	Total Volume (c.f.)	Runoff per Unit Area (cfs/acre)
WBasin100Y		0.159	0.442	71.2	24.49	37.0	17.31	40.8	800	4,414,080	0.27	1,203,192	79.0	207	1,203,193	0.17
EBasin100Y		0.142	0.212	41.2	7.01	21.4	4.95	11.7	167	534,336	0.32	170,910	53.0	43	170,906	0.29
WBasin10Y		0.159	0.444	71.2	24.58	37.0	17.37	41.0	800	4,414,080	0.00	18,154	72.0	3	18,154	0.00
Ebasin10Y		0.145	0.215	41.3	7.13	21.5	5.04	11.9	167	534,336	0.02	11,280	45.0	3	11,280	0.02

Appendix C – Hydraulic Calculations

Worksheet for USGS Eastern Basin - 100 YR PR Swale Calculation

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.045
Channel Slope	1.500 %
Left Side Slope	4.000 H:V
Right Side Slope	4.000 H:V
Bottom Width	10.00 ft
Discharge	43.00 cfs

Results	
Normal Depth	11.4 in
Flow Area	13.1 ft²
Wetted Perimeter	17.8 ft
Hydraulic Radius	8.8 in
Top Width	17.58 ft
Critical Depth	9.0 in
Critical Slope	3.537 %
Velocity	3.29 ft/s
Velocity Head	0.17 ft
Specific Energy	1.12 ft
Froude Number	0.673
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	11.4 in
Critical Depth	9.0 in
Channel Slope	1.500 %
Critical Slope	3.537 %

Worksheet for USGS Western Basin - 100 YR PR Swale Calculation

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Roughness Coefficient	0.045
Channel Slope	4.000 %
Left Side Slope	2.000 H:V
Right Side Slope	2.000 H:V
Bottom Width	10.00 ft
Discharge	207.00 cfs

Results	
Normal Depth	22.1 in
Flow Area	25.2 ft²
Wetted Perimeter	18.2 ft
Hydraulic Radius	16.6 in
Top Width	17.38 ft
Critical Depth	24.6 in
Critical Slope	2.709 %
Velocity	8.20 ft/s
Velocity Head	1.04 ft
Specific Energy	2.89 ft
Froude Number	1.199
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	22.1 in
Critical Depth	24.6 in
Channel Slope	4.000 %
Critical Slope	2.709 %

Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Sep 22 2025

Circular Culvert

Invert Elev Dn (ft)	=	29.80
Pipe Length (ft)	=	33.10
Slope (%)	=	1.99
Invert Elev Up (ft)	=	30.46
Rise (in)	=	36.0
Shape	=	Circular
Span (in)	=	36.0
No. Barrels	=	2
n-Value	=	0.013
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Square edge w/headwall (C)
Coeff. K,M,c,Y,k	=	0.0098, 2, 0.0398, 0.67, 0.5

Embankment

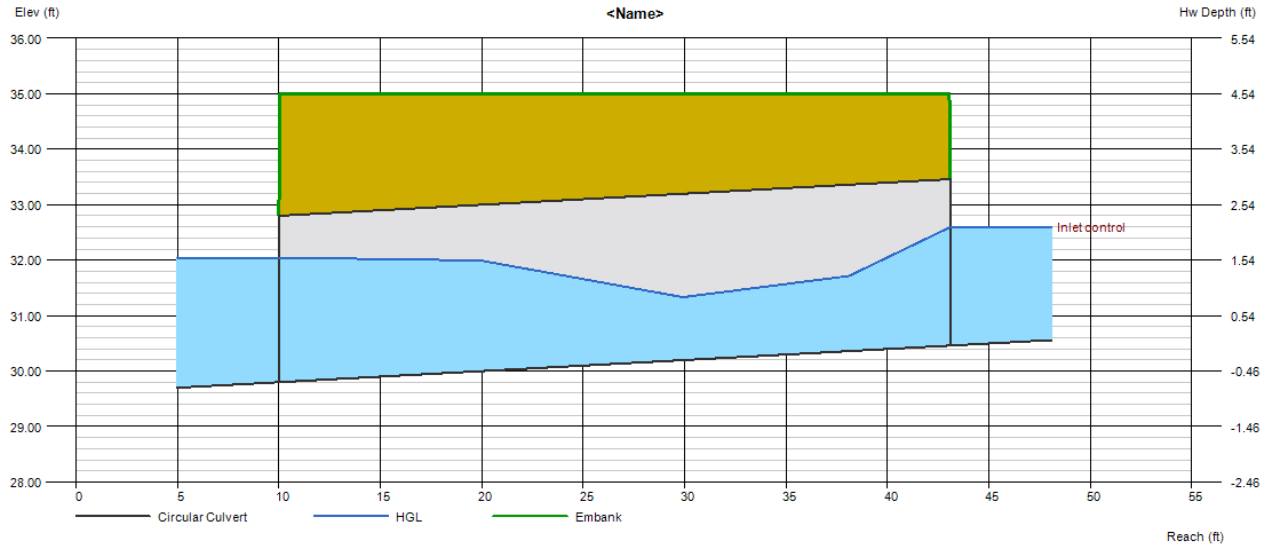
Top Elevation (ft)	=	35.00
Top Width (ft)	=	33.00
Crest Width (ft)	=	10.00

Calculations

Qmin (cfs)	=	42.00
Qmax (cfs)	=	43.00
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	43.00
Qpipe (cfs)	=	43.00
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	3.79
Veloc Up (ft/s)	=	6.14
HGL Dn (ft)	=	32.04
HGL Up (ft)	=	31.95
Hw Elev (ft)	=	32.60
Hw/D (ft)	=	0.71
Flow Regime	=	Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Sep 22 2025

Box Culvert

Invert Elev Dn (ft)	=	13.48
Pipe Length (ft)	=	58.30
Slope (%)	=	2.01
Invert Elev Up (ft)	=	14.65
Rise (in)	=	36.0
Shape	=	Box
Span (in)	=	96.0
No. Barrels	=	1
n-Value	=	0.013
Culvert Type	=	Rectagular Concrete
Culvert Entrance	=	Tapered inlet throat
Coeff. K,M,c,Y,k	=	0.475, 0.667, 0.0179, 0.97, 0.2

Embankment

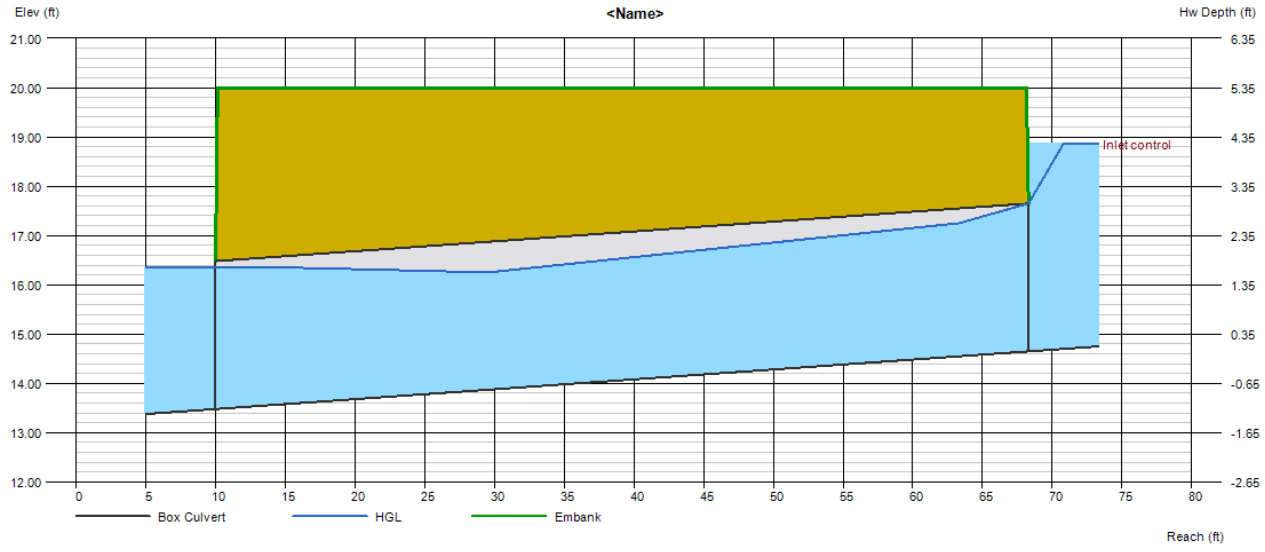
Top Elevation (ft)	=	20.00
Top Width (ft)	=	58.00
Crest Width (ft)	=	20.00

Calculations

Qmin (cfs)	=	200.00
Qmax (cfs)	=	207.00
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	207.00
Qpipe (cfs)	=	207.00
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	9.00
Veloc Up (ft/s)	=	9.42
HGL Dn (ft)	=	16.35
HGL Up (ft)	=	17.40
Hw Elev (ft)	=	18.86
Hw/D (ft)	=	1.40
Flow Regime	=	Inlet Control



Appendix D – Geotechnical Report

Kumar & Associates, Inc.®
Geotechnical and Materials Engineers
and Environmental Scientists

5020 County Road 154
Glenwood Springs, CO 81601
phone: (970) 945-7988
fax: (970) 945-8454
email: kaglenwood@kumarusa.com
www.kumarusa.com

An Employee Owned Company

Office Locations: Denver (HQ), Parker, Colorado Springs, Fort Collins, Glenwood Springs, and Summit County, Colorado

October 21, 2024

Griffin Development
Attn: Rocky Cortina
701 West Lionshead Circle
Vail, Colorado 81657
rcortina@pegaso.net

Project No. 23-7-513

Subject: Supplemental Subsoil Study, Proposed Residential Development, Parcel 1, Red Mountain Ranch, U.S. Highway 6, Eagle, Colorado

Gentlemen:

As requested, Kumar & Associates performed a supplemental subsoil study for the proposed development at the subject site. The data obtained and our geotechnical recommendations including those for foundation design are presented in this report. The study is supplemental to our agreement for professional services to Griffen Development dated August 3, 2023.

Background Information: We previously performed a preliminary subsoil study for foundation design for the site development submitting our findings in a report dated December 21, 2023 under the above project number. Additionally, we have been provided a preliminary subsoil study for the property prepared by Hepworth-Pawlak Geotechnical (H-P Geotech) dated February 29, 2016, Job. No. 115 548A. We have reviewed the information in those reports and considered it in the preparation of this report.

Proposed Construction: The proposed construction is generally similar to that discussed in our previous report and will consist of single family, duplex and multifamily residential townhome buildings located on the site as shown on Figure 1. The buildings will be two story wood frame structures with slab-on-grade ground floors, some with walkout basements. Storage buildings shown in the northwest part of the site may not be constructed. Cut depths for the individual buildings is expected to range between about 3 to 10 or 12 feet. Foundation loadings for this type of construction are assumed to be relatively light and typical of the proposed type of construction. There may be some overlot grading during the subdivision infrastructure construction.

If building conditions, grading or foundation loadings are significantly different from those described above, we should be notified to re-evaluate the recommendations presented in this report.

Site Conditions: At the time of our current field exploration, the site conditions were similar to those described in our previous report. A drainage outlet from a culvert below Highway 6 has been identified through about the middle of the property, see Figure 1. There is a moderately steep riverbank slope beyond the planned building locations along the northwest side of the Eagle River. Elevation differences across the individual building foot-prints is about 3 to 10 or 12 feet.

Subsurface Conditions: The subsurface conditions at the site were evaluated by excavating five exploratory pits at the approximate locations shown on Figure 1. The number of pits and their locations were selected and dug with a backhoe by the client. Our previous boring locations, as well as the previous H-P Geotech boring locations, are also shown on Figure 1.

The logs of the current pits are presented on Figure 2. The subsoils encountered were somewhat variable and, in general, below up to 1 foot of topsoil, consisted of 7 feet of fill at Pits 2 and 3 or 1½ to 13½ feet of loose, silty to very silty sand overlying dense, silty sandy gravel and cobbles below depths from ½ to 14½ feet. At Pit 2, below 1 foot of topsoil and 3 feet of fill, stiff sandy to very sandy silty clay was encountered underlain at a depth of 7½ by hard, claystone/siltstone bedrock down to the Pit 2 depth of 9 feet. The dense, silty sandy gravel and cobble (coarse granular soils) included boulders and extended down to the maximum depth explored at Pits 1 and 3 through 5 of 15 feet. The claystone/siltstone bedrock is the Eagle Valley Evaporite Formation. Based on our experience in the area, the bedrock is not expansive but should be further evaluated as needed.

Results of swell-consolidation testing performed on relatively undisturbed samples of the fine grained soils, presented on Figures 4 through 7, indicate moderate to high compressibility under conditions of loading and wetting and a low to moderate collapse potential when wetted under a constant 1,000 psf surcharge. Results of a gradation analyses performed on disturbed bulk samples of the coarse granular soils (minus 3-inch fraction) obtained from the pits are presented on Figure 7. The laboratory testing is summarized in Table 1.

No groundwater was observed in the pits at the time of excavation and the soils were slightly moist to moist, and the claystone/siltstone bedrock was slightly moist.

Foundation Bearing Conditions: The bearing soils expected to be encountered at building excavation subgrades will vary from unsuitable fill to low bearing and compressible fine grain soils to dense coarse granular soils depending on the building location. Spread footings (or well reinforced structural slabs) bearing on the natural soils or on properly placed and compacted structural fill can be used for foundation support of the buildings, with some risk of settlement in the fine grained soils and deeper fill areas. A lower risk of foundation movement would be to bear the footings entirely on the underlying dense coarse granular soils or bedrock such as by subexcavation or use of a deep foundation system such as helical piers and/or drilled piers.

We understand spread footings with a uniform design criteria for all the buildings is the desired approach for the foundation system. This can be done by designing the footings for a relatively low soil bearing pressure and removing all existing fill (e.g. at Pit 5 and previous Boring 4) and either extending the footings down to suitable natural soils or re-establishing design footing bearing elevation with compacted structural fill. In fine grained bearing soil area (e.g. at Pits 1 and 2), sub-excavation of a depth (typically 3 feet) of the compressible fine grained soils and

replacement with compacted structural fill should be done to reduce foundation settlement and building distress.

All structural fill below footing (and floor slab) areas should be properly processed, and placed and compacted. The structural fill can consist of the onsite soils excluding of debris, topsoil and oversized (plus 6-inch) rocks. The on-site coarse granular soils or similar granular material (minus 6-inch fraction) or CDOT Class 2, 5 or 6 aggregate base course is preferred for ease of construction and to help reduce settlements. The onsite fine grained (and possibly fill) soils can be used as the structural fill but may be difficult to process and compact. The need for structural fill and suitability of the on-site soils as structural fill below footing (and floor slab) areas should be further evaluated at the time of construction.

Similar subgrade preparation and removal and replacement of fine grained soils (typically 2 to 3 feet) and replacement with structural fill as discussed above should also be observed for floor slabs on grade. It may be feasible to remove a partial depth of the fill and replace with a geo-grid and compacted structural fill, but needs to be further evaluate at the time of construction. Structural floor slabs over crawlspace, commonly used in area, would provide a relatively low risk of floor movement.

It appears that obtaining additional subsoil information of the bearing soils at each individual building site, prior to construction and/or at the time of the building foundation excavation, is desirable to better evaluate the needed subgrade preparation. This could be done by backhoe pits or borings.

Recommendations: The previous foundation design recommendations provided in our 2023 report remain applicable. The buildings can be designed on be supported on spread footings or well reinforced structural slabs using an allowable soil bearing pressure of 1,500 psf for bearing on the natural soils or compacted structural fill. Settlements similar to those discussed in our previous report are expected with the lower settlement potential for bearing on the dense coarse granular soils. The structural fill should be placed and compacted as discussed on page 4 of our previous report. We should evaluate the foundation bearing conditions at the time of construction, approve any structural fill material planned to be placed below footing (and floor slab) areas, and test structural fill compaction on a regular basis during placement.

For the access roads/drives, we understand the buildings will be constructed and sold as the project progresses, and the roads/drives subjected to construction traffic. For this condition we recommend a pavement section consisting of a minimum 4 inches of asphalt pavement on 12 inches of CDOT Class 6 base course, or a minimum 4 inches of asphalt on 6 inches of CDOT Class 6 base course on 8 inches of CDOT Class 2 sub-base (minus 3-inch base course) should be used. These recommended pavement sections assume some construction traffic loading but the section with the granular sub-base (minimum 8 inches of CDOT Class 2 material) should hold up better to the construction traffic. Also, it may be desirable to delay placing the surface layer of the asphalt paving until the end of the construction when the building has been completed. For automobile only parking areas, the pavement section can consist of 3 inches of asphalt on

8 inches of CDOT Class 6 base course. Other applicable recommendations provided on pages 6 and 7 of our previous report should also be observed.

8 inches of CDOT Class 6 base course. Other applicable recommendations provided on pages 6 and 7 of our previous report should also be observed.

Perimeter foundation drains should not be needed around floor "slab-at grade" construction. It has been our experience in mountainous areas that local perched groundwater can develop during times of heavy precipitation or seasonal runoff. Frozen ground during spring runoff can also create a perched condition. We recommend below-grade construction, such as retaining walls, crawlspace and basement areas, be protected from wetting and hydrostatic pressure buildup by an underdrain and wall drain system as discussed on page 6 on our previous report.

Limitations: This study has been conducted in accordance with generally accepted geotechnical engineering principles and practices in this area at this time. We make no warranty either express or implied. The conclusions and recommendations submitted in this report are based upon the data obtained from the exploratory pits excavated at the locations indicated on Figure 1 and to the depths shown on Figure 2, the previous exploratory boring information at the site, the proposed type of construction, and our experience in the area. Our services do not include determining the presence, prevention or possibility of mold or other biological contaminants (MOBC) developing in the future. If the client is concerned about MOBC, then a professional in this special field of practice should be consulted.

This report has been prepared for the exclusive use by our client for planning and design purposes. We are not responsible for technical interpretations by others of our information. As the project evolves, we should provide continued consultation and field services during construction to review and monitor the implementation of our recommendations, and to verify that the recommendations have been appropriately interpreted. Significant design changes may require additional analysis or modifications to the recommendations presented herein. We recommend on-site observation of excavations and foundation bearing strata and testing of structural fill on a regular basis by a representative of the geotechnical engineer.

If you have any questions or if we may be of further assistance, please let us know.

Respectfully Submitted,

Kumar & Associates, Inc.

COLORADO REGISTERED DAVID A. YOUNG 32216 10.23.24 PROFESSIONAL ENGINEER

David A. Young, P.E.

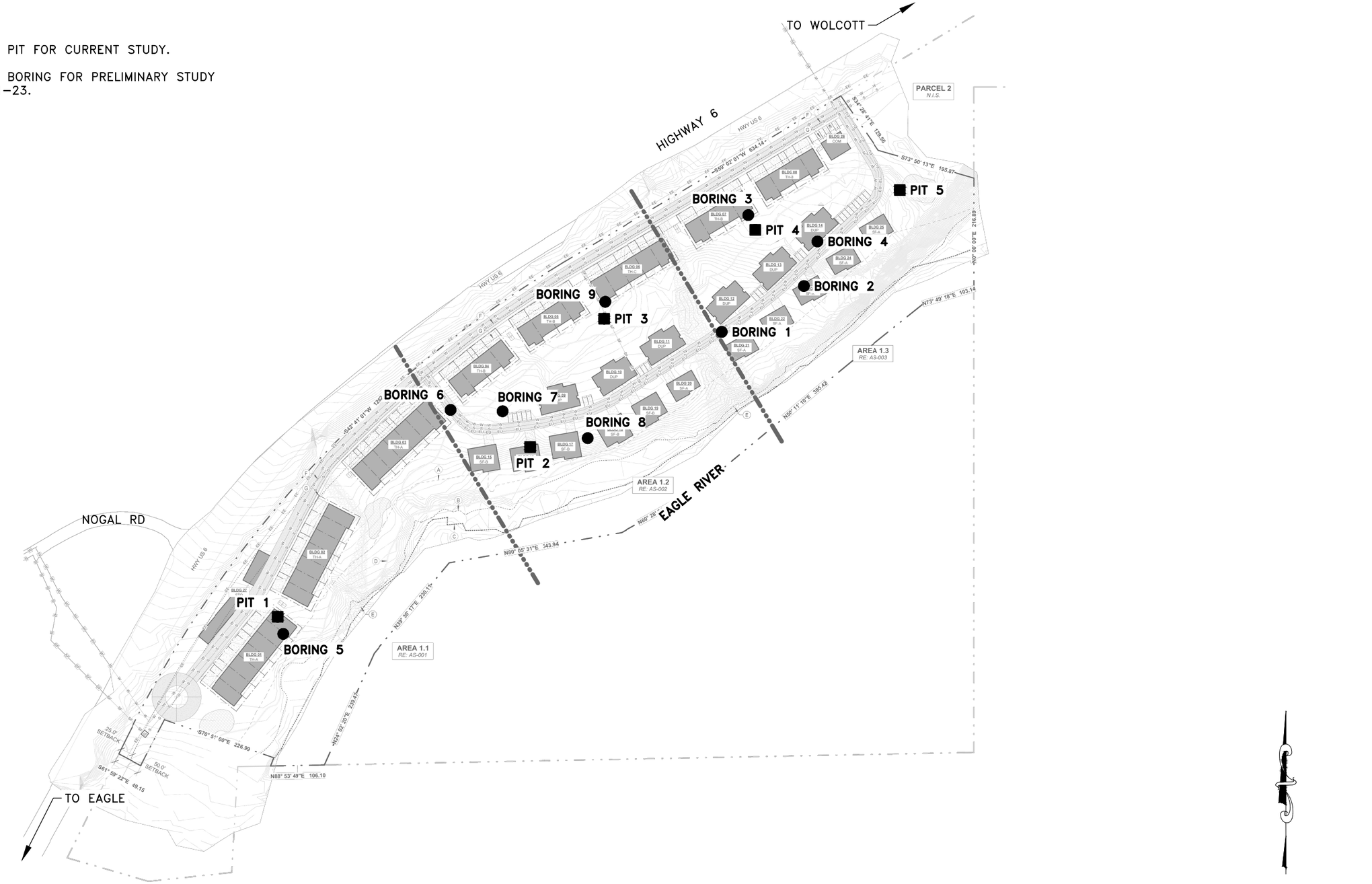
DAY/kac

attachments Figure 1 – Location of Exploratory Pits
Figure 2 – Logs of Exploratory Pits
Figure 3 – Legend and Notes
Figures 4 through 6 – Swell-Consolidation Test Results
Figure 7 – Gradation Test Results
Table 1 – Summary of Laboratory Test Results

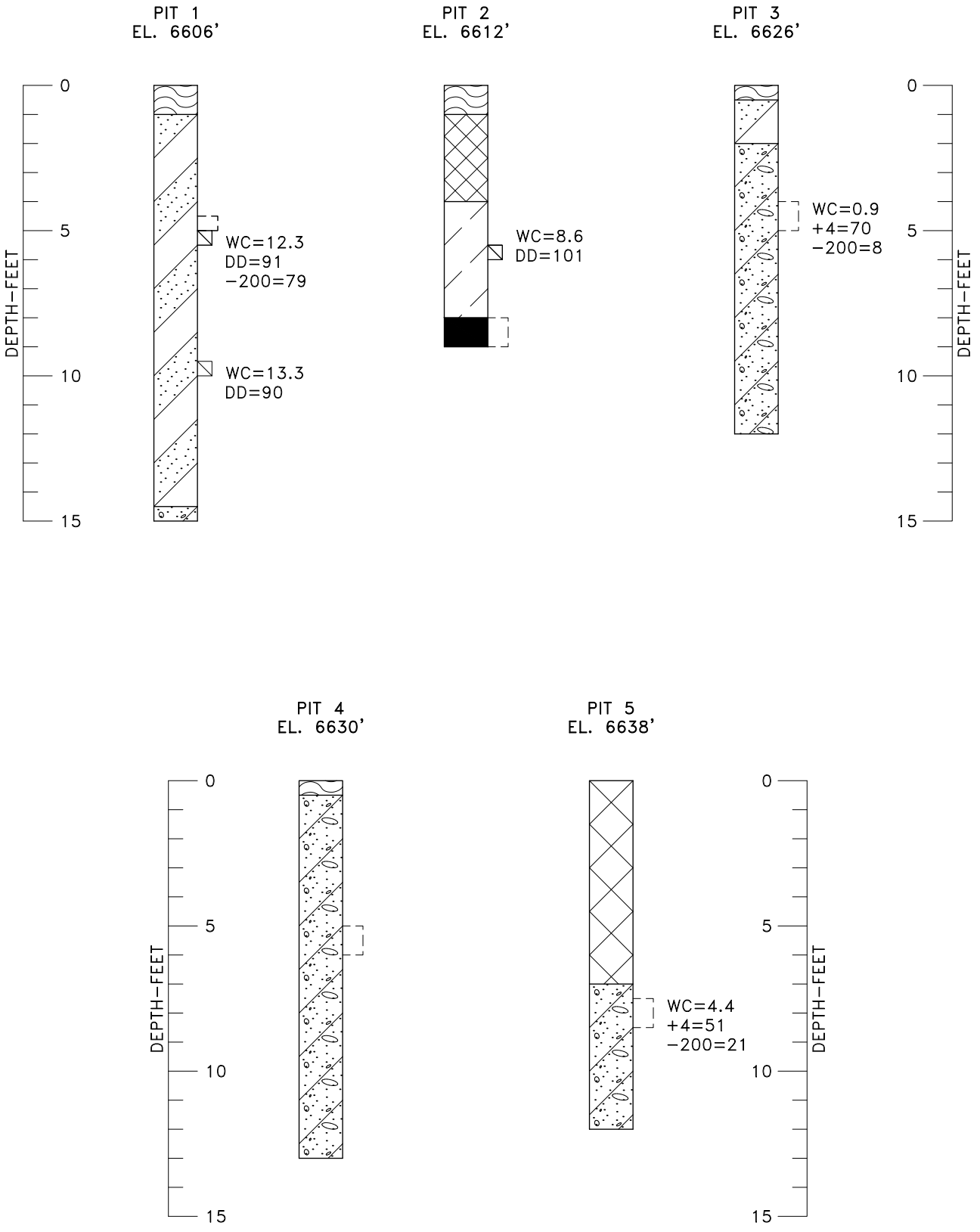
cc: The Dwell Company – Steve Stone – (stone@dwellmountain.com)

LEGEND:

- ■ EXPLORATORY PIT FOR CURRENT STUDY.
- ● EXPLORATORY BORING FOR PRELIMINARY STUDY DATED 12-21-23.



23-7-513	Kumar & Associates	PARCEL 1, RED MOUNTAIN RANCH	LOCATION OF EXPLORATORY PITS	Fig. 1



23-7-513	Kumar & Associates	LOGS OF EXPLORATORY PITS	Fig. 2

LEGEND


TOPSOIL; ORGANIC SANDY SILT AND CLAY, FIRM, SLIGHTLY MOIST, DARK BROWN.


FILL; SILTY SANDY GRAVEL, MEDIUM DENSE, SLIGHTLY MOIST, GRAY AND BROWN, ROOT ZONE AT SURFACE.


FILL: MIXED SANDY SILT AND CLAY WITH GRAVEL, SCATTERED COBBLES, FIRM, SLIGHTLY MOIST, MIXED BROWN, ORGANICS.


CLAY (CL); SILTY, SANDY TO VERY SANDY, STIFF, SLIGHTLY MOIST, GRAY–BROWN, LOW PLASTICITY.


SAND (SM–ML); SILTY TO VERY SILTY, SLIGHTLY CLAYEY, SCATTERED GRAVEL, LOOSE, MOIST TO VERY MOIST WITH DEPTH, MIXED BROWN AND RED–BROWN.


GRAVEL AND COBBLES (GM); WITH BOULDERS, SANDY, SILTY TO SLIGHTLY SILTY, DENSE, SLIGHTLY MOIST, LIGHT BROWN.


CLAYSTONE/SILTSTONE BEDROCK; FRACTURED, HARD, SLIGHTLY MOIST, GRAY. EAGLE VALLEY EVAPORITE FORMATION.

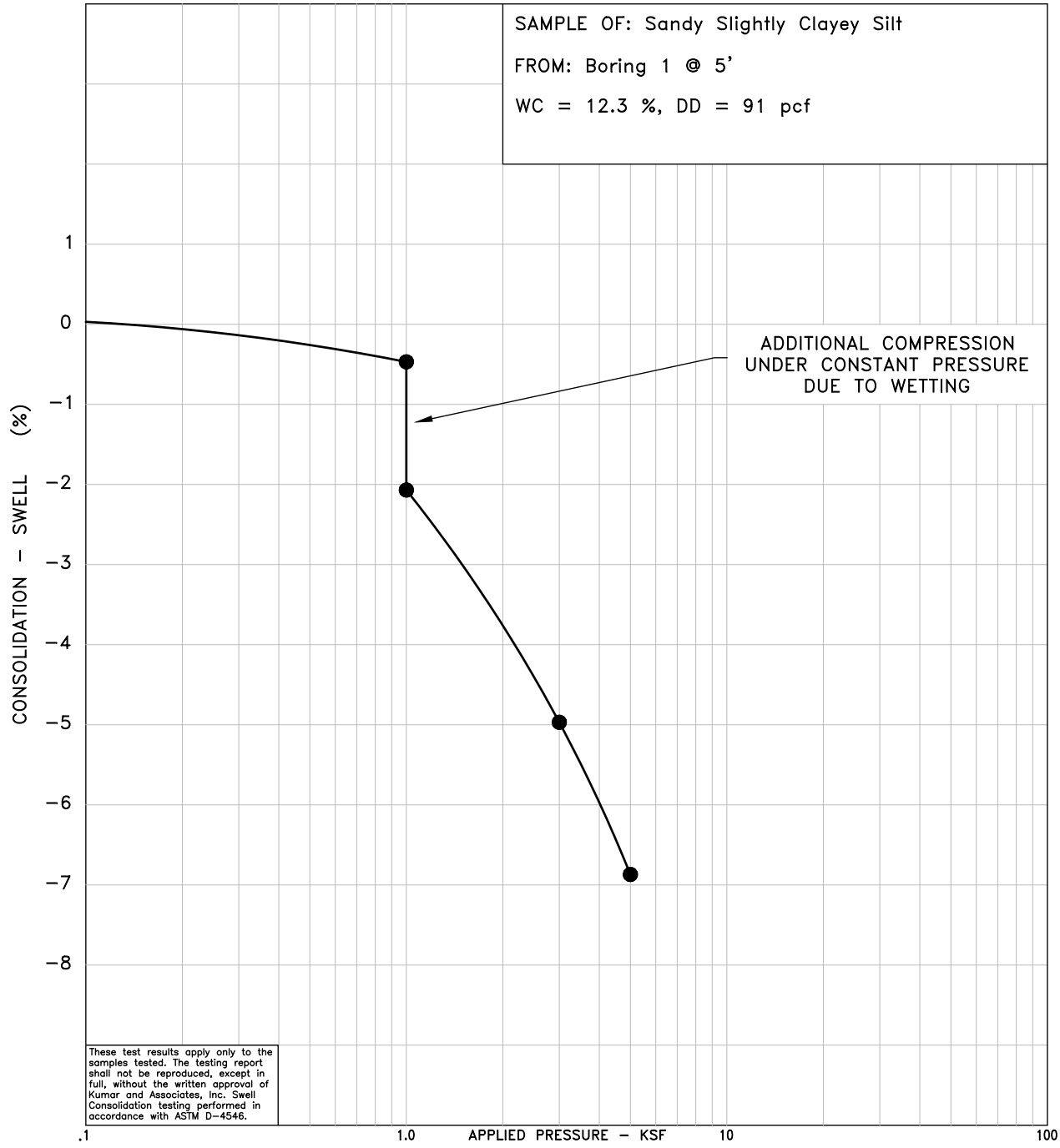

HAND DRIVE SAMPLE.


DISTURBED BULK SAMPLE.

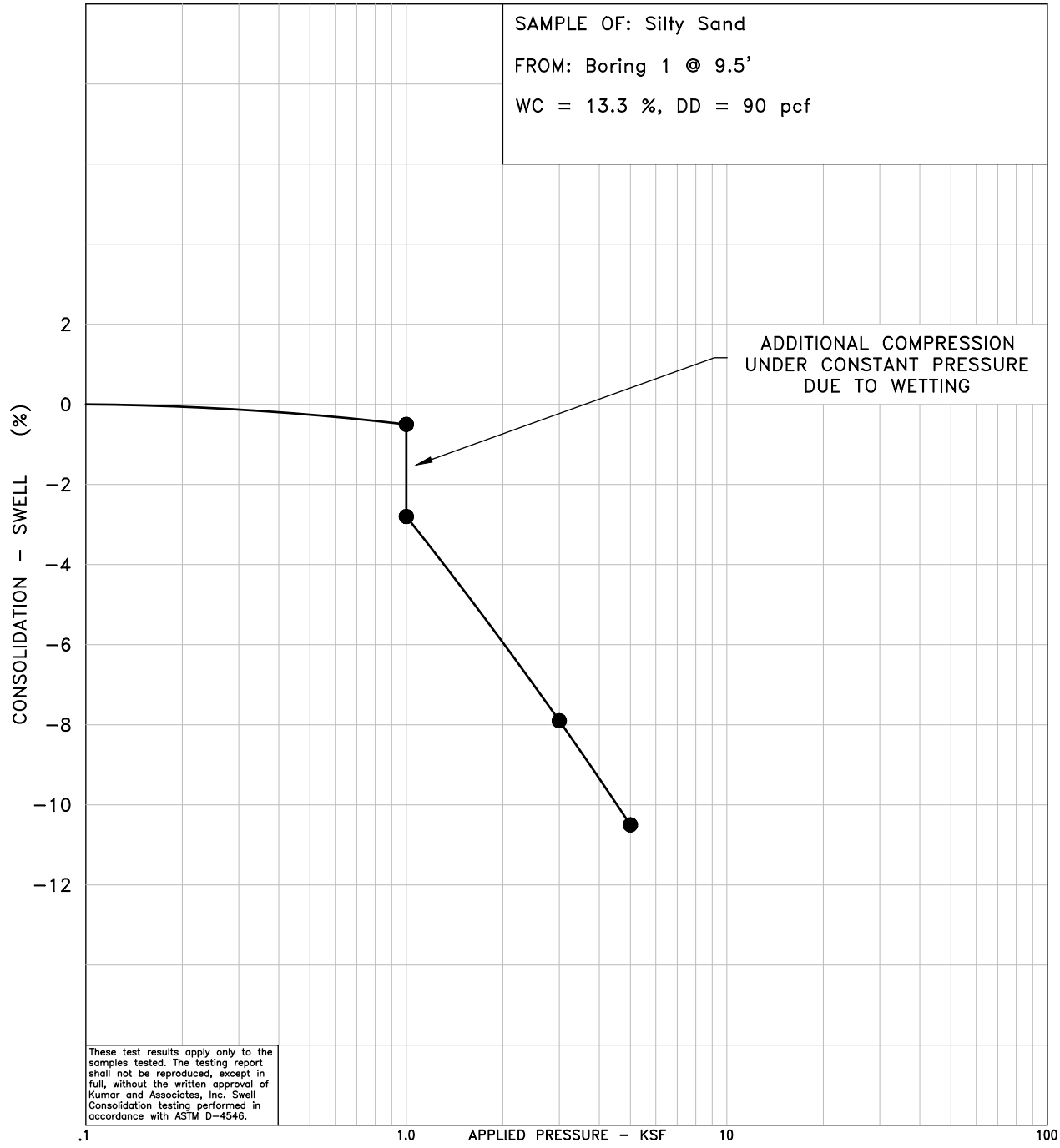
NOTES

1. THE EXPLORATORY PITS WERE EXCAVATED WITH A BACKHOE ON AUGUST 7, 2024.
2. THE LOCATIONS OF THE EXPLORATORY PITS WERE LOCATED AND DUG BY THE CLIENT.
3. THE ELEVATIONS OF THE EXPLORATORY PITS WERE OBTAINED BY INTERPOLATION BETWEEN CONTOURS ON THE SITE PLAN PROVIDED.
4. THE EXPLORATORY PIT LOCATIONS AND ELEVATIONS SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.
5. THE LINES BETWEEN MATERIALS SHOWN ON THE EXPLORATORY PIT LOGS REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN MATERIAL TYPES AND THE TRANSITIONS MAY BE GRADUAL.
6. GROUNDWATER WAS NOT ENCOUNTERED IN THE PITS AT THE TIME OF EXCAVATION. PITS WERE BACKFILLED SUBSEQUENT TO SAMPLING.
7. LABORATORY TEST RESULTS:
   WC = WATER CONTENT (%) (ASTM D 2216);
   DD = DRY DENSITY (pcf) (ASTM D 2216);
   +4 = PERCENTAGE RETAINED ON NO. 4 SIEVE (ASTM D 422);
   −200= PERCENTAGE PASSING NO. 200 SIEVE (ASTM D 1140).

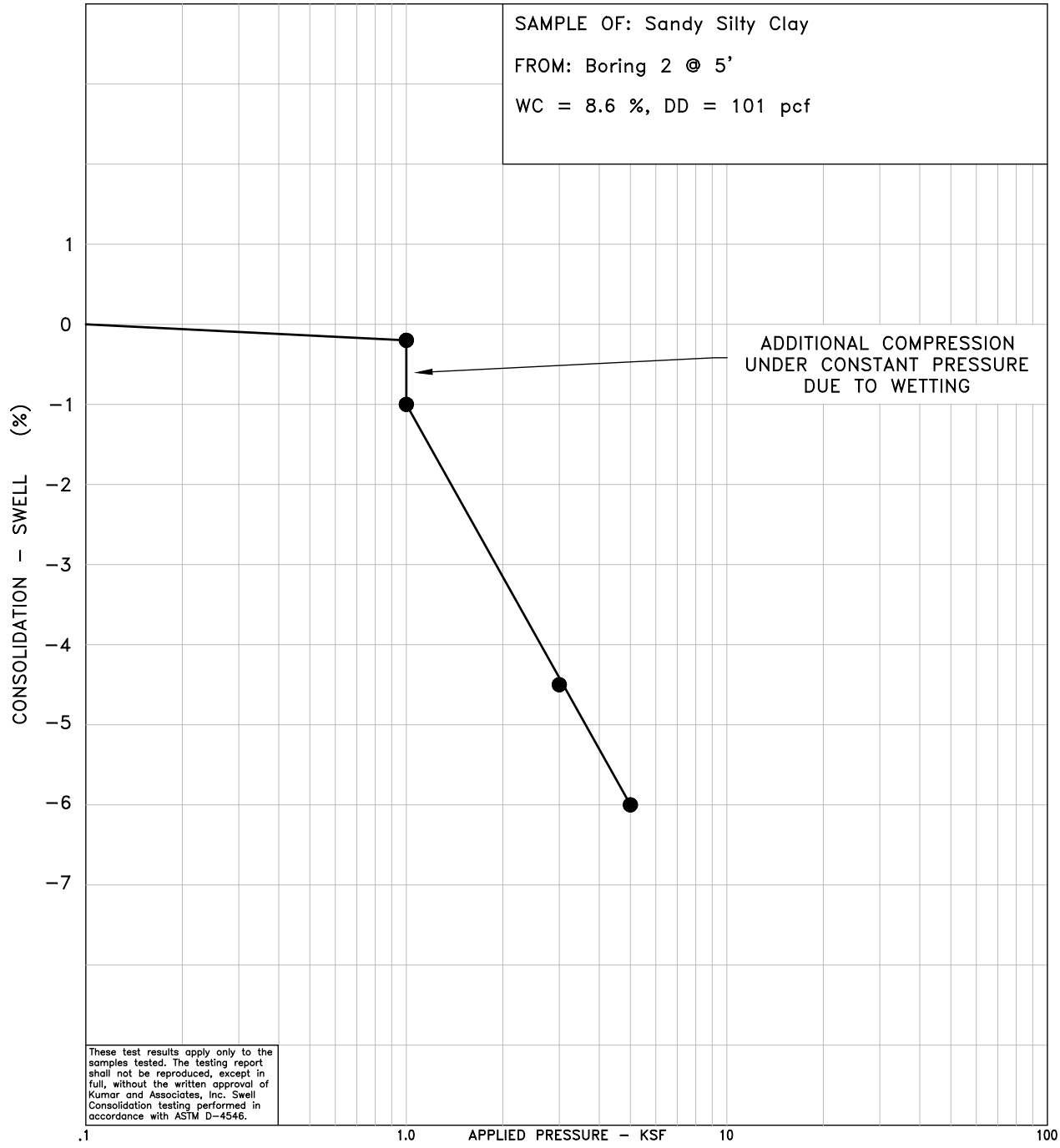
23-7-513	Kumar & Associates	LEGEND AND NOTES	Fig. 3



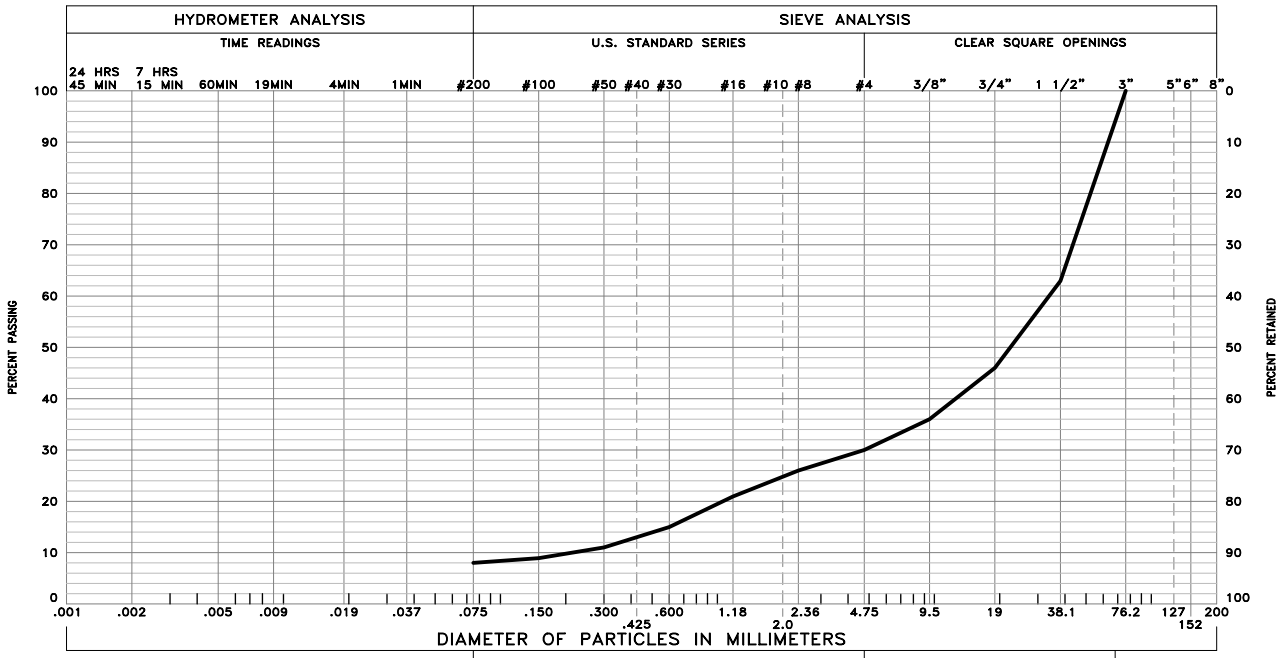
23-7-513	Kumar & Associates	SWELL-CONSOLIDATION TEST RESULTS	Fig. 4



23-7-513	Kumar & Associates	SWELL-CONSOLIDATION TEST RESULTS	Fig. 5



23-7-513	Kumar & Associates	SWELL-CONSOLIDATION TEST RESULTS	Fig. 6



GRAVEL 70 % SAND 22 % SILT AND CLAY 8 %

LIQUID LIMIT – PLASTICITY INDEX –

SAMPLE OF: Slightly Silty Sandy Gravel FROM: Pit 3 @ 4'–5'

GRAVEL 51 % SAND 28 % SILT AND CLAY 21 %

LIQUID LIMIT – PLASTICITY INDEX –

SAMPLE OF: Silty Sandy gravel FROM: Pit 5 @ 6.5'–7.5'

23–7–513	Kumar & Associates	GRADATION TEST RESULTS	Fig. 7

Kumar & Associates, Inc.®
Geotechnical and Materials Engineers
and Environmental Scientists

TABLE 1
SUMMARY OF LABORATORY TEST RESULTS

Project No. 23-7-513

SAMPLE LOCATION		NATURAL MOISTURE CONTENT	NATURAL DRY DENSITY	GRADATION		PERCENT PASSING NO. 200 SIEVE	ATTERBERG LIMITS		UNCONFINED COMPRESSIVE STRENGTH	SOIL TYPE
PIT	DEPTH (ft)	(%)	(pcf)	GRAVEL (%)	SAND (%)		LIQUID LIMIT (%)	PLASTIC INDEX (%)	(psf)	
1	5	12.3	91			79				Sandy Slightly Clayey Silt
	9½	13.3	90							Silty Sand
2	5	8.6	101							Very Sandy Silty Clay
3	4 - 5	0.9		70	22	8				Slightly Silty Sandy Gravel
5	6½ - 7½	4.4		51	28	21				Silty Sandy Gravel

Appendix E – USGS Soil Survey

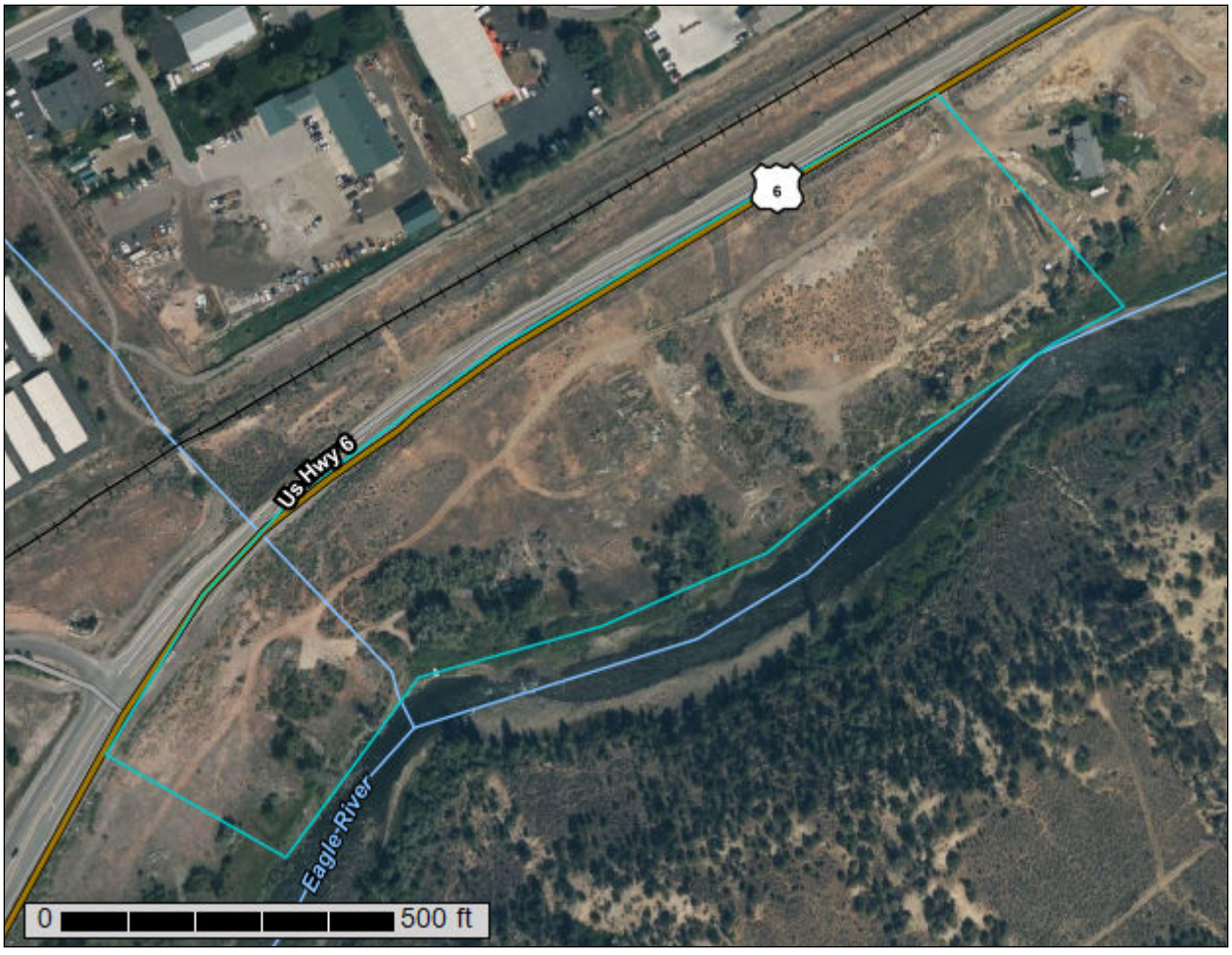
United States Department of Agriculture

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 Aspen-Gypsum Area, Colorado, Parts of Eagle, Garfield, and Pitkin Counties



January 10, 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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Contents

How Soil Surveys Are Made

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

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

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

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

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

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

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

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

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

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

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

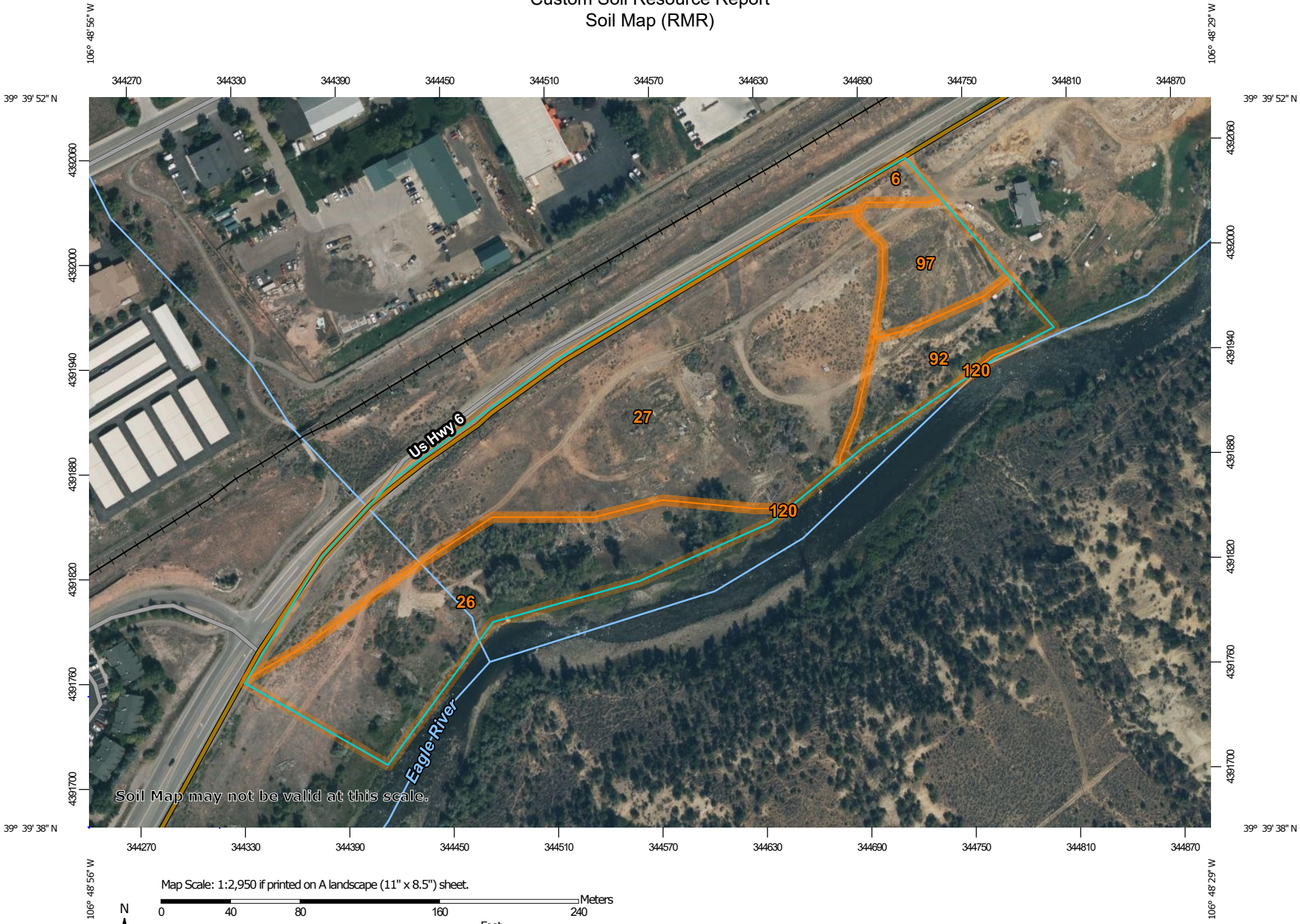
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

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

Soil Map

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

Custom Soil Resource Report
Soil Map (RMR)



Map Scale: 1:2,950 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 40 80 160 240

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: Aspen-Gypsum Area, Colorado, Parts of Eagle, Garfield, and Pitkin Counties
Survey Area Data: Version 15, Aug 29, 2024

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

Date(s) aerial images were photographed: Sep 5, 2021—Sep 7, 2021

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background

MAP LEGEND

MAP INFORMATION

imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend (RMR)

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
6	Almy loam, 1 to 12 percent slopes	0.3	1.8%
26	Dahlquist-Southace complex, 6 to 12 percent slopes	3.8	26.5%
27	Dahlquist-Southace complex, 12 to 25 percent slopes	8.1	56.6%
92	Redrob loam, 1 to 6 percent slopes	1.2	8.0%
97	Southace cobbly sandy loam, 6 to 12 percent slopes	1.0	7.0%
120	Water	0.0	0.1%
Totals for Area of Interest		**14.4**	**100.0%**

Map Unit Descriptions (RMR)

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.

Aspen-Gypsum Area, Colorado, Parts of Eagle, Garfield, and Pitkin Counties

6—Almy loam, 1 to 12 percent slopes

Map Unit Setting

National map unit symbol: jq6l
Elevation: 6,000 to 7,800 feet
Mean annual precipitation: 12 to 14 inches
Mean annual air temperature: 42 to 46 degrees F
Frost-free period: 85 to 105 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Almy and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Almy

Setting

Landform: Hills, alluvial fans
Landform position (two-dimensional): Footslope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from calcareous sandstone and/or alluvium derived from calcareous shale

Typical profile

H1 - 0 to 8 inches: loam
H2 - 8 to 26 inches: fine sandy loam
H3 - 26 to 60 inches: sandy clay loam

Properties and qualities

Slope: 1 to 12 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 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: Moderate (about 8.6 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: R048AY306UT - Upland Loam (Wyoming Big Sagebrush)
Other vegetative classification: ROLLING LOAM (null_20)
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit: 20 percent
Hydric soil rating: No

26—Dahlquist-Southace complex, 6 to 12 percent slopes

Map Unit Setting

National map unit symbol: jq5d
Elevation: 6,200 to 7,400 feet
Mean annual precipitation: 12 to 16 inches
Mean annual air temperature: 42 to 46 degrees F
Frost-free period: 75 to 95 days
Farmland classification: Not prime farmland

Map Unit Composition

Dahlquist and similar soils: 50 percent
Southace and similar soils: 40 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Dahlquist

Setting

Landform: Terraces, alluvial fans
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed alluvium

Typical profile

H1 - 0 to 6 inches: cobbly sandy loam
H2 - 6 to 13 inches: very cobbly sandy clay loam
H3 - 13 to 23 inches: very cobbly sandy loam
H4 - 23 to 60 inches: extremely cobbly sandy loam

Properties and qualities

Slope: 6 to 12 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water supply, 0 to 60 inches: Low (about 3.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: B
Ecological site: R048AY303CO - Loamy Slopes
Other vegetative classification: LOAMY SLOPES (null_31)
Hydric soil rating: No

Description of Southace

Setting

Landform: Terraces, alluvial fans
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed alluvium

Typical profile

H1 - 0 to 10 inches: very stony sandy loam
H2 - 10 to 22 inches: extremely stony sandy loam
H3 - 22 to 60 inches: extremely stony loamy coarse sand

Properties and qualities

Slope: 6 to 12 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 2.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Ecological site: R048AY287CO - Stony Foothills
Other vegetative classification: Stony Foothills (null_81)
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit: 10 percent
Hydric soil rating: No

27—Dahlquist-Southace complex, 12 to 25 percent slopes

Map Unit Setting

National map unit symbol: jq5f
Elevation: 6,200 to 7,400 feet
Mean annual precipitation: 12 to 16 inches
Mean annual air temperature: 42 to 46 degrees F
Frost-free period: 105 to 115 days
Farmland classification: Not prime farmland

Map Unit Composition

Dahlquist and similar soils: 45 percent
Southace and similar soils: 40 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Dahlquist

Setting

Landform: Terraces, alluvial fans
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed alluvium

Typical profile

H1 - 0 to 6 inches: cobbly sandy loam
H2 - 6 to 13 inches: very cobbly sandy clay loam
H3 - 13 to 23 inches: very cobbly sandy loam
H4 - 23 to 60 inches: extremely cobbly sandy loam

Properties and qualities

Slope: 12 to 25 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water supply, 0 to 60 inches: Low (about 3.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: R048AY303CO - Loamy Slopes

Other vegetative classification: LOAMY SLOPES (null_6)
Hydric soil rating: No

Description of Southace

Setting
Landform: Terraces, alluvial fans
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed alluvium

Typical profile
H1 - 0 to 10 inches: very stony sandy loam
H2 - 10 to 22 inches: extremely stony sandy loam
H3 - 22 to 60 inches: extremely stony loamy coarse sand

Properties and qualities
Slope: 12 to 25 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 2.0 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Ecological site: R048AY287CO - Stony Foothills
Other vegetative classification: Stony Foothills (null_81)
Hydric soil rating: No

Minor Components

Other soils
Percent of map unit: 15 percent
Hydric soil rating: No

92—Redrob loam, 1 to 6 percent slopes

Map Unit Setting
National map unit symbol: jq7r
Elevation: 5,800 to 7,200 feet

Mean annual precipitation: 16 to 18 inches
Mean annual air temperature: 40 to 44 degrees F
Frost-free period: 85 to 105 days
Farmland classification: Not prime farmland

Map Unit Composition

Redrob and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Redrob

Setting

Landform: Valley floors, terraces, flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed alluvium derived from sandstone and shale

Typical profile

H1 - 0 to 14 inches: loam
H2 - 14 to 20 inches: stratified loamy sand to stony loam
H3 - 20 to 60 inches: extremely cobbly loamy sand

Properties and qualities

Slope: 1 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 18 to 48 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): 4w
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: C
Ecological site: R048AY010UT - Wet Fresh Streambank (Willow)
Other vegetative classification: riverbottom (null_19)
Hydric soil rating: No

Minor Components

Fluvaquents

Percent of map unit: 10 percent
Landform: Flood plains
Hydric soil rating: Yes

Other soils

Percent of map unit: 5 percent
Hydric soil rating: No

97—Southace cobbly sandy loam, 6 to 12 percent slopes

Map Unit Setting

National map unit symbol: jq7x
Elevation: 6,000 to 7,000 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 42 to 46 degrees F
Frost-free period: 95 to 105 days
Farmland classification: Not prime farmland

Map Unit Composition

Southace and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Southace

Setting

Landform: Terraces, mountains, alluvial fans
Landform position (three-dimensional): Lower third of mountainflank, tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sandstone and shale

Typical profile

H1 - 0 to 3 inches: cobbly sandy loam
H2 - 3 to 14 inches: gravelly loam
H3 - 14 to 26 inches: very gravelly loam
H4 - 26 to 60 inches: very cobbly fine sandy loam

Properties and qualities

Slope: 6 to 12 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 5.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Ecological site: R048AY303CO - Loamy Slopes
Other vegetative classification: LOAMY SLOPES (null_31)

Hydric soil rating: No

Minor Components

Other soils

Percent of map unit: 15 percent
Hydric soil rating: No

120—Water

Map Unit Composition

Water: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Minor Components

Aquolls

Percent of map unit: 5 percent
Landform: Marshes
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: Yes

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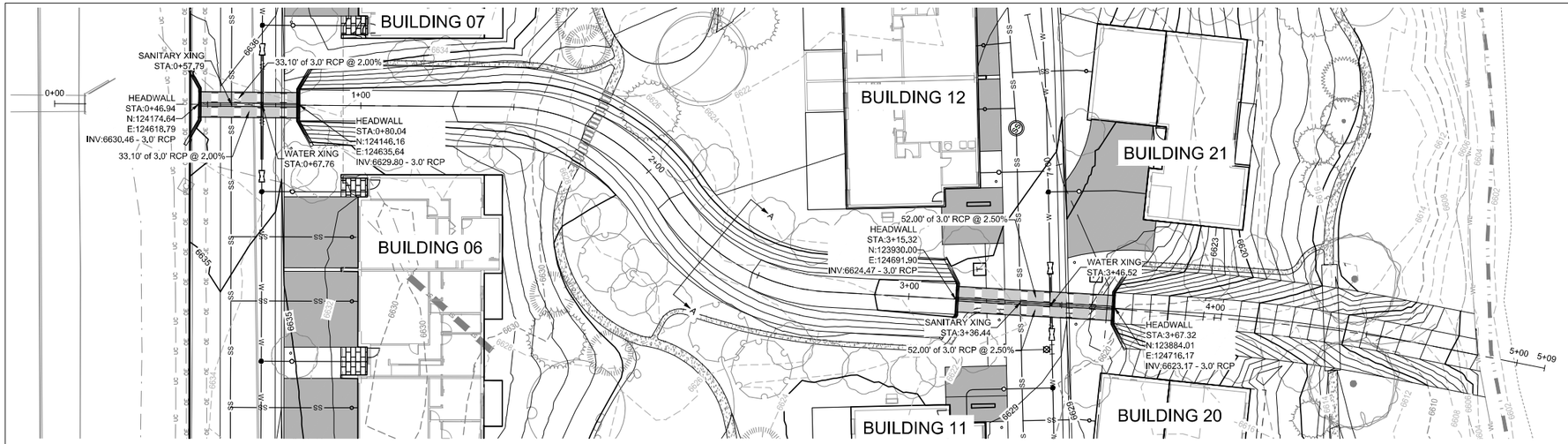
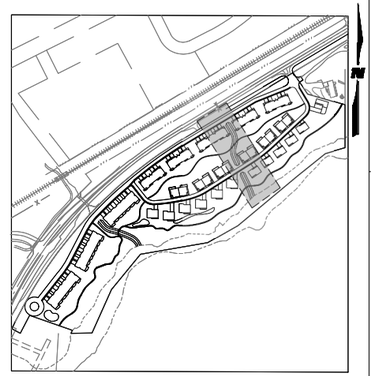
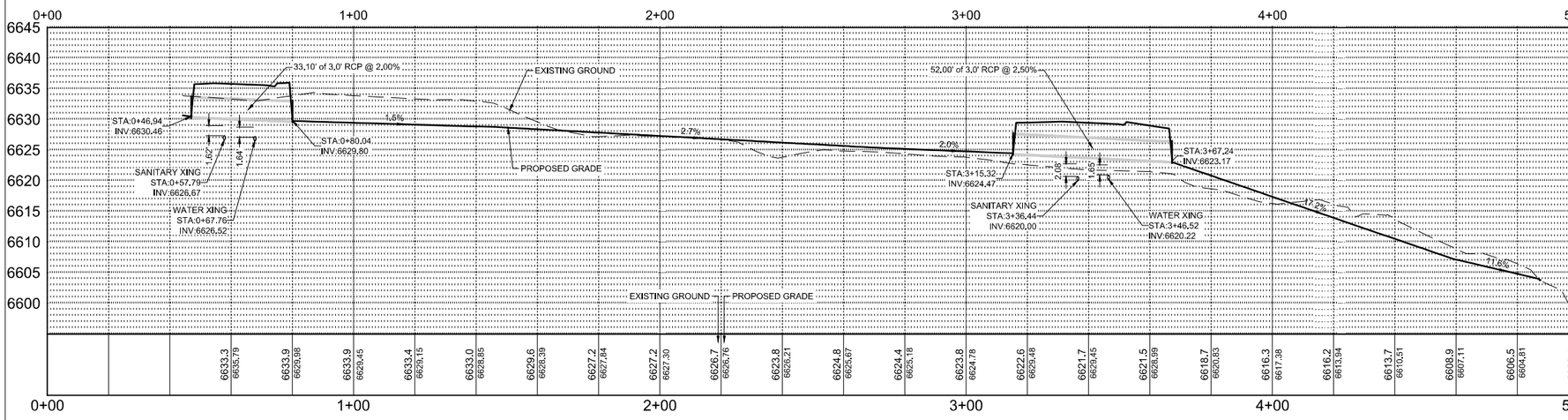
Appendix F – Civil Drawings (Half Size)



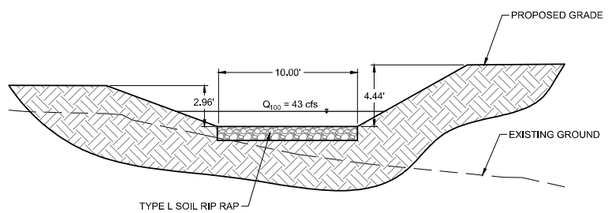
A STORM SWALE EAST - PLAN VIEW
SCALE: 1" = 20'



KEY MAP
SCALE: 1" = 350'



B STORM SWALE EAST - PROFILE VIEW
SCALE: H 1" = 20' V 1" = 10'



C STORM SWALE EAST - SECTION A-A
SCALE: 1" = 5'

GENERAL NOTES

1. WILSON & COMPANY DOES NOT GUARANTEE THE LOCATION OF UNDERGROUND UTILITIES SHOWN HEREON. CONTRACTOR TO VERIFY EXISTING/PROPOSED UTILITIES VERTICAL AND HORIZONTAL LOCATIONS PRIOR TO CONSTRUCTION.
2. CONTRACTOR TO ADJUST FITTINGS FOR CONNECTION TO PIPE BENDS USING MAXIMUM JOINT DEFLECTION SPECIFIED BY MANUFACTURER.
3. ALL PIPE CONNECTIONS SHALL BE WATERTIGHT.
4. REFERENCE ARCHITECTURAL PLANS FOR BUILDING LOCATION AND BUILDING INTERIOR.
5. REFERENCE MECHANICAL AND PLUMBING PLANS FOR UTILITY INTO BUILDING.

REPLACEMENT OF PUBLIC IMPROVEMENTS

1. ASPHALT REMOVAL SHALL BE SAW CUT STRAIGHT LINES WITH AS MINIMAL ASPHALT REMOVAL AS POSSIBLE.
2. ALL SIDEWALKS AND CROSS-PANS SHALL BE REMOVED AND RECONSTRUCTED TO MEET THE TOWN OF EAGLE STANDARDS AND DETAILS.
3. ALL PAVING TO BE REPLACED AT A DEPTH OF THE EXISTING ASPHALT, PLUS ONE INCH (1").

STATIONING AND PIPE LENGTH NOTE

STATIONING AND LENGTHS ARE LABELED FROM CENTER TO CENTER OF BOTH MANHOLES/INLETS. CONTRACTOR SHOULD COMPENSATE FOR TRUE LENGTHS.

NOTE TO CONTRACTOR

CONTRACTOR TO VERIFY VERTICAL AND HORIZONTAL LOCATIONS OF ALL POTENTIAL CONFLICTING UTILITIES PRIOR TO CONSTRUCTION OF WATER LINES.

Know what's below. Call before you dig.

SCALE 1" = 20' HORZ FEET
1" = 5' VERT

CIVIL ENGINEER:
WILSON & COMPANY
990 S BROADWAY SUITE 220
DENVER, COLORADO 80209
PHONE: 303-297-2626
FAX: 303-297-2693
www.wilsonco.com

PROPERTY OWNERS:
GRIFFIN DEVELOPMENT, LLC
701 W. LIONHEAD CIR.
VAIL, CO 81657

SEAL:
THIS CONSTRUCTION DOCUMENT IS FOR REFERENCE ONLY. ALL WORK IS TO BE COMPLETED USING FINAL APPROVED AND STAMPED PLANS BY THE TOWN OF EAGLE.

PROJECT NAME:
RED MOUNTAIN RANCH
17500 US-6
EAGLE COLORADO 81631

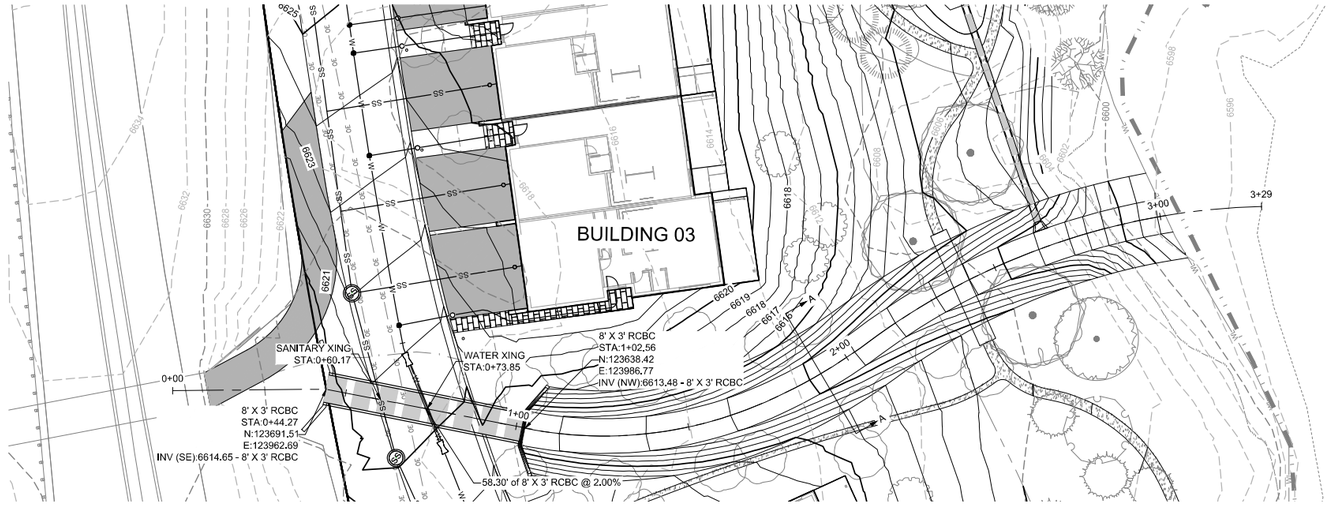
REV.	DATE	DESCRIPTION	BY

PROJECT NO:	23-600-691-00
DESIGNED BY:	BDB
DRAWN BY:	TLC
CHECKED BY:	BDB
DATE:	SEPTEMBER 22, 2025

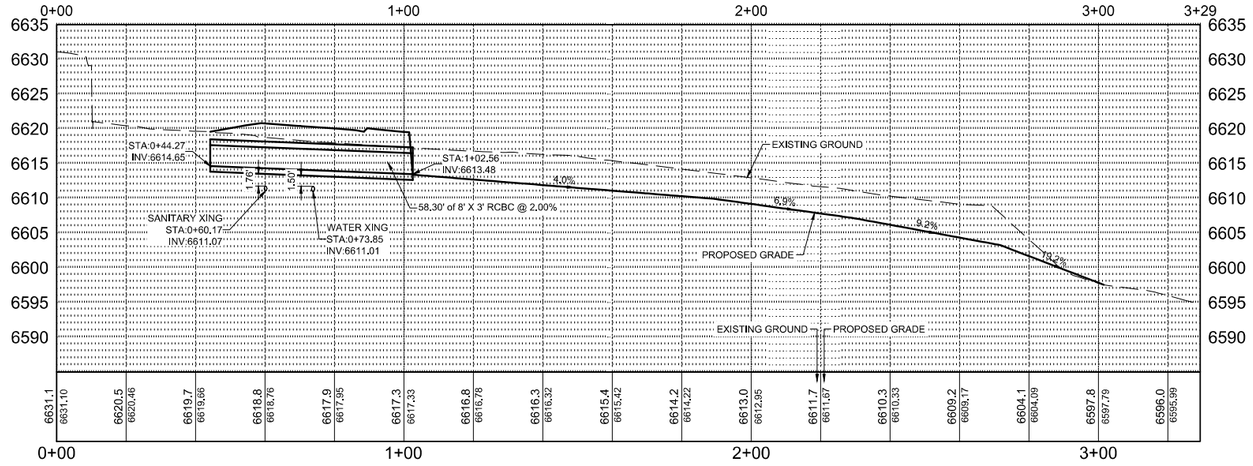
SHEET TITLE:
STORM SWALE EAST

SHEET DESC. :	C5.01
SHEET NO. :	49 OF 75

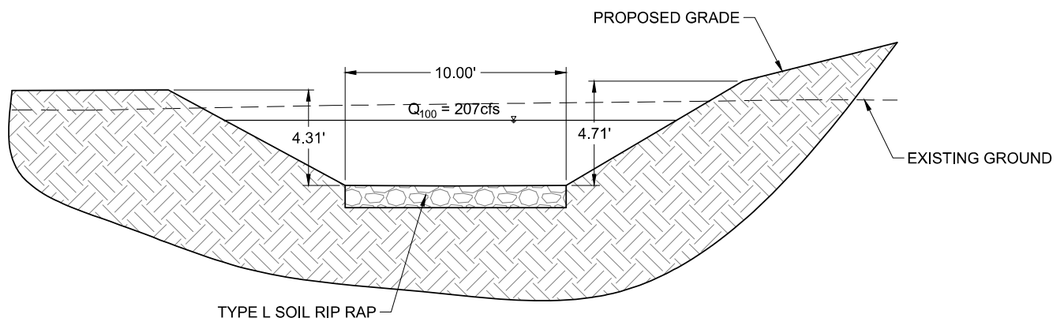
9/22/2025 M:\MSD\23-600-691-002_Disciplines_SHEETS\PSP\Red Mountain Ranch - PSP - Storm Plan and Profile .dwg



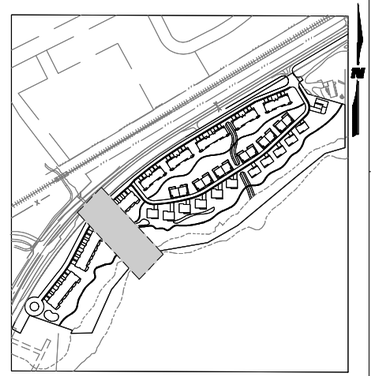
A STORM SWALE WEST - PLAN VIEW
SCALE: 1" = 20'



B STORM SWALE WEST - PROFILE VIEW
SCALE: H 1" = 20' V 1" = 10'



C STORM SWALE WEST - SECTION A-A
SCALE: 1" = 5'



KEY MAP
SCALE: 1" = 350'

GENERAL NOTES

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2. CONTRACTOR TO ADJUST FITTINGS FOR CONNECTION TO PIPE BENDS USING MAXIMUM JOINT DEFLECTION SPECIFIED BY MANUFACTURER.
3. ALL PIPE CONNECTIONS SHALL BE WATERTIGHT.
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5. REFERENCE MECHANICAL AND PLUMBING PLANS FOR UTILITY INTO BUILDING.

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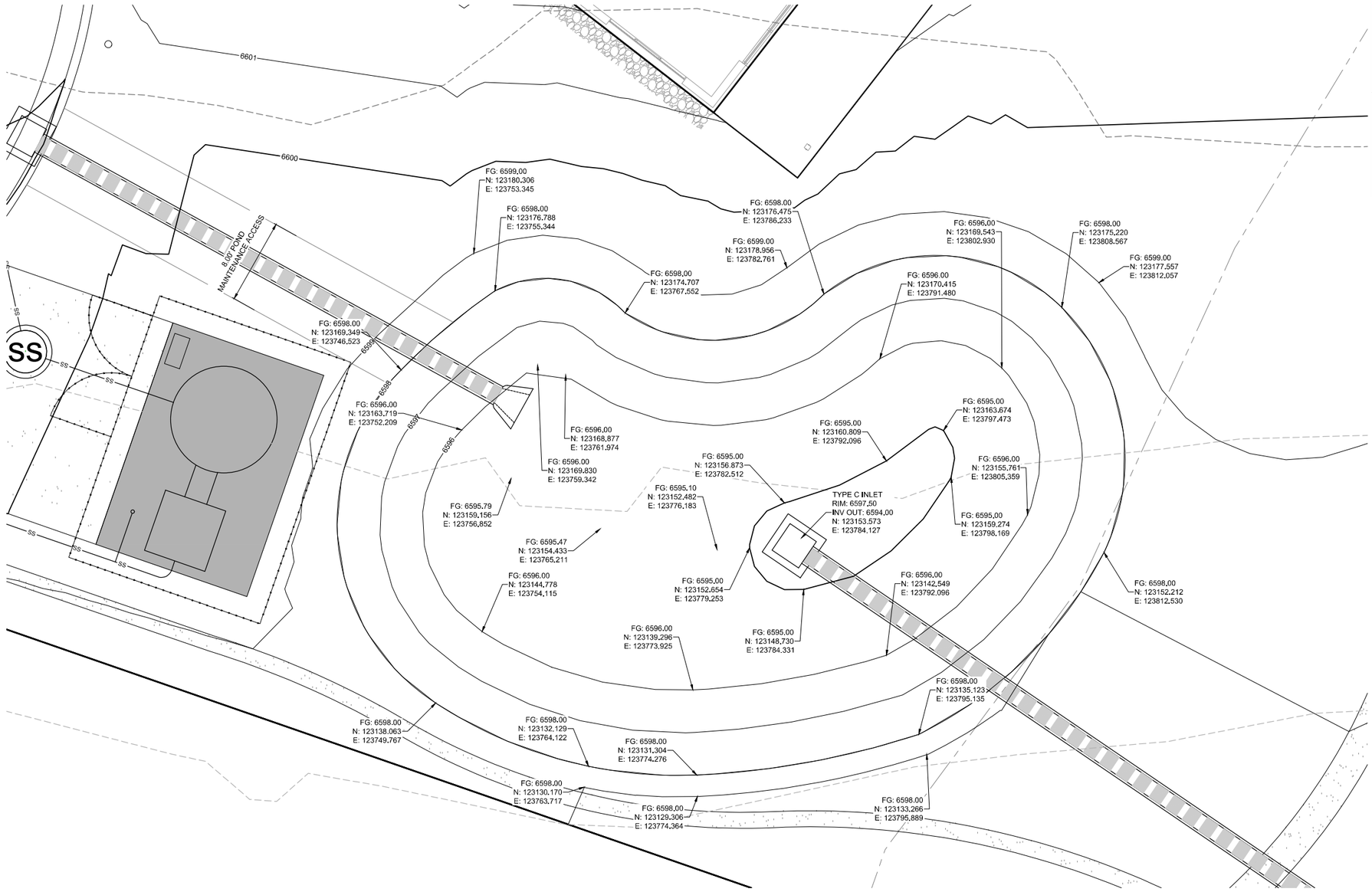
DESIGNED BY:	BDB
DRAWN BY:	TLC
CHECKED BY:	BDB
DATE:	SEPTEMBER 22, 2025

SHEET TITLE:
STORM SWALE WEST

SHEET DESC. : C5.02

SHEET NO. : 50 OF 75

9/22/2025 M:\MSD\23-600-691-002_Disciplines_SHEETS\PSP\Red Mountain Ranch - PSP - Storm Plan and Profile .dwg



KEY MAP
SCALE: 1" = 350'

Know what's below. Call before you dig.

5 0 5 10
SCALE 1"=5' FEET

CIVIL ENGINEER:
WILSON &COMPANY
990 S. BROADWAY SUITE 220
DENVER, COLORADO 80209
PHONE: 303-297-2536
FAX: 303-297-2693
www.wilsonco.com

PROPERTY OWNERS:
GRIFFIN DEVELOPMENT, LLC
701 W. LIONHEAD CIR.
VAIL, CO 81657

SEAL:
THIS CONSTRUCTION DOCUMENT IS FOR REFERENCE ONLY. ALL WORK IS TO BE COMPLETED USING FINAL APPROVED AND STAMPED PLANS BY THE TOWN OF EAGLE.

PROJECT NAME:
RED MOUNTAIN RANCH
17500 US-6
EAGLE COLORADO 81631

BY	DESCRIPTION	DATE	REV.

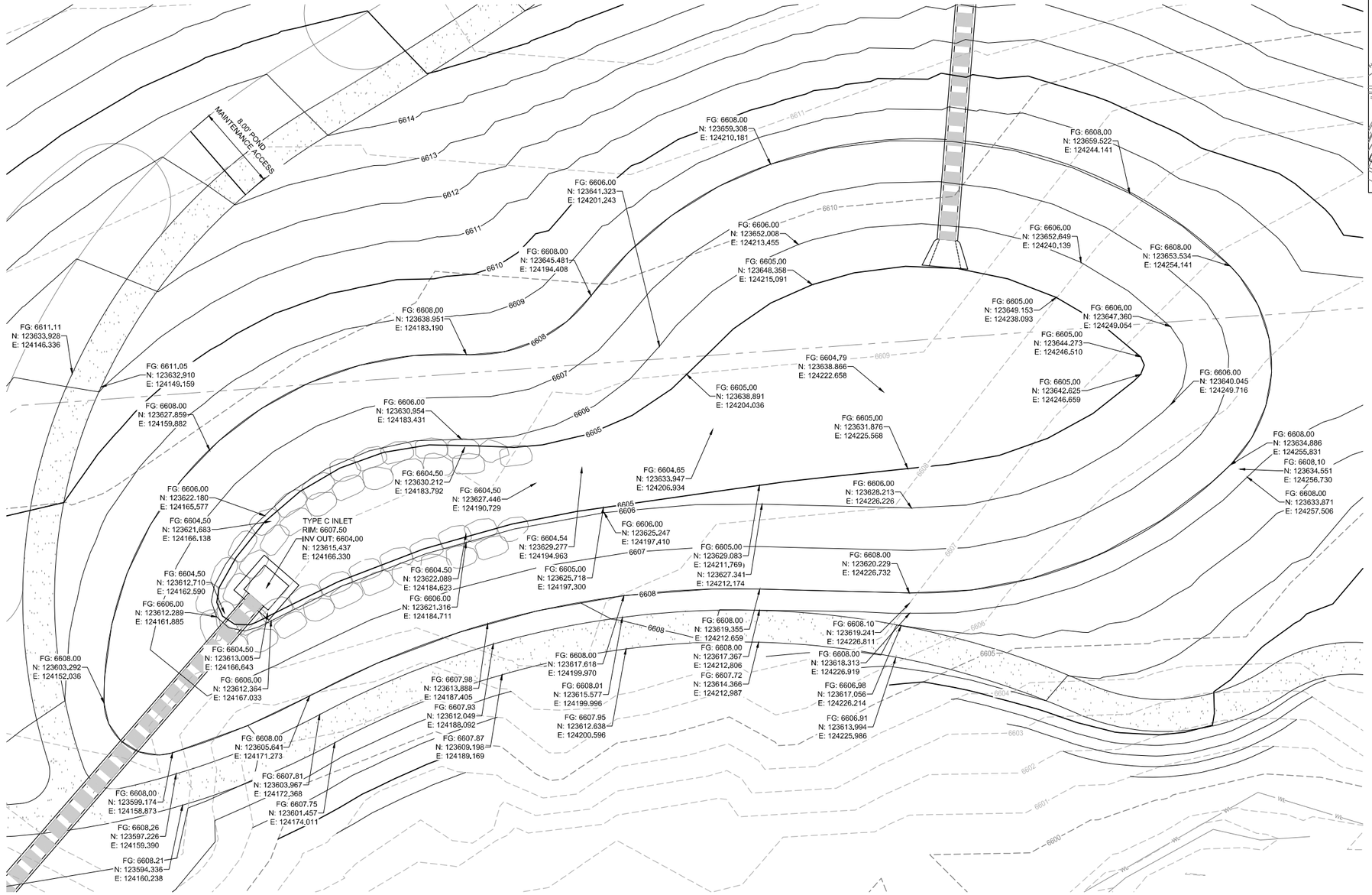
PROJECT NO:	23-600-691-00
DESIGNED BY:	BDB
DRAWN BY:	TLC
CHECKED BY:	BDB
DATE:	SEPTEMBER 22, 2025

SHEET TITLE:
WQ POND A DETAILED GRADING

SHEET DESC. : C5.03

SHEET NO. : 51 OF 75

9/22/2025 M:\MSD\23-600-691-00\2_Disciplines_SHEETS\PSP\Red Mountain Ranch - PSP - Storm Pond Grading.dwg



KEY MAP
SCALE: 1" = 350'

Know what's below. Call before you dig.

5 0 5 10
SCALE 1"=5' FEET

9/22/2025 M:\MSD\23-600-691-0012_Disciplines_SHEETS\PSP\Red Mountain Ranch - PSP - Storm Pond Grading.dwg

CIVIL ENGINEER:
WILSON & COMPANY
990 S. BROADWAY SUITE 220
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PHONE: 303-297-2626
FAX: 303-297-2693
www.wilsonco.com

PROPERTY OWNERS:
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701 W. LIONHEAD CIR.
VAIL, CO 81657

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PROJECT NAME:
RED MOUNTAIN RANCH
17500 US-6
EAGLE COLORADO 81631

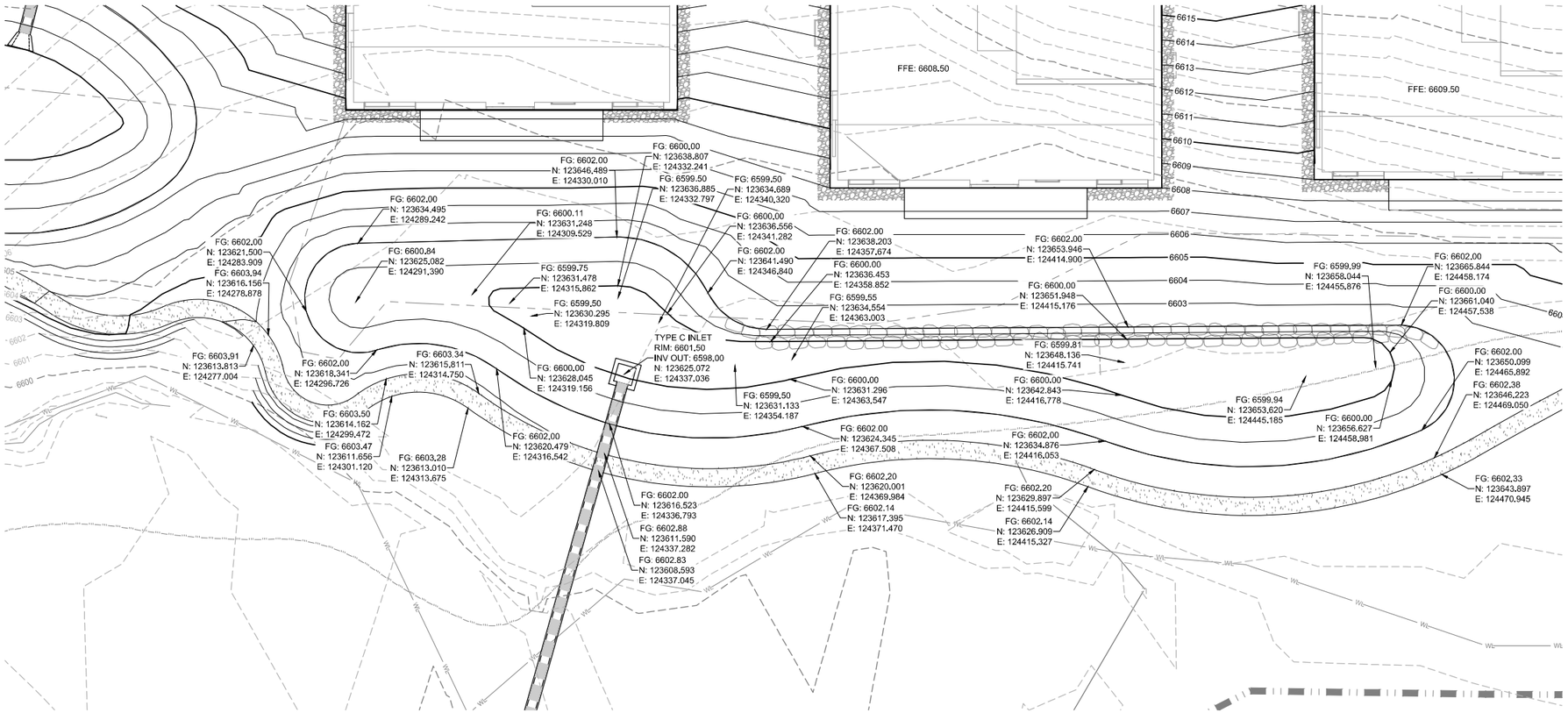
REV.	DATE	DESCRIPTION	BY

PROJECT NO:	23-600-691-00
DESIGNED BY:	BDB
DRAWN BY:	TLC
CHECKED BY:	BDB
DATE:	SEPTEMBER 22, 2025

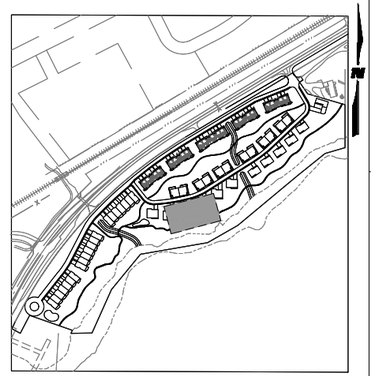
SHEET TITLE:
WQ POND B DETAILED GRADING

SHEET DESC. : C5.04

SHEET NO. : 52 OF 75



KEY MAP
SCALE: 1" = 350'



10 0 10 20
SCALE 1"=10' FEET

Know what's below.
Call before you dig.

9/22/2025 M:\IMSD\23-600-691-00\2_Disciplines_SHEETS\PSP\Red Mountain Ranch - PSP - Storm Pond Grading.dwg

CIVIL ENGINEER:
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990 S BROADWAY SUITE 220
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PROJECT NAME:
RED MOUNTAIN RANCH
17500 US-6
EAGLE COLORADO 81631

REV.	DATE	DESCRIPTION	BY

PROJECT NO:	23-600-691-00
DESIGNED BY:	BDB
DRAWN BY:	TLC
CHECKED BY:	BDB
DATE:	SEPTEMBER 22, 2025

SHEET TITLE:
WQ POND C DETAILED GRADING

SHEET DESC. : C5.05

SHEET NO. : 53 OF 75