HIDDEN CREEK ESTATES

FINAL DRAINAGE REPORT

EPC PROJECT #: SF-253

ALL TERRAIN ENGINEERING PROJECT NO: 24008

MAY 2025

PREPARED FOR:

3405 HAY CREEK, LLC

CONTACT: JAMIE HULL

3405 HAY CREEK ROAD

COLORADO SPRINGS, CO 80921

PREPARED BY:

ALL TERRAIN ENGINEERING LLC

CONTACT: NICHOLAS Q. JOKERST

NJOKERST@ALLTERRAINENG.COM

(530) 391-7635

ENGINEER'S STATEMENT

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

05/07/20

Nicholas Q. Jokerst, PE — Date

State of Colorado No. 59273

For and on behalf of All Terrain Engineering LLC

DEVELOPER'S STATEMENT

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

5-28-25

Jamie Hull — Date

3405 Hay Creek, LLC

3405 Hay Creek Road, Colorado Springs, CO 80921

EL PASO COUNTY ONLY

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

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

Conditions:

Table of Contents

Appendices

I. General Purpose, Location & Description

a. Purpose

The purpose of this Final Drainage Report (FDR) for HIDDEN CREEK ESTATES is to describe the site's onsite and offsite drainage patterns, existing and proposed storm infrastructure, and to safely route developed stormwater to adequate outfalls.

b. Location

HIDDEN CREEK ESTATES, referred to as 'the site' herein, is in a portion of southeast quarter of Section 33, Township 11 South, Range 67 West of the 6th P.M., El Paso County, Colorado. The site is bound by Hay Creek Road to the north and single family residential parcels to the east, west and south. Surrounding platted developments include Hay Creek Ranch subdivision to the east. A vicinity map is presented in Appendix A.

c. Description of Property

The site is approximately 28.54 acres and includes a single family residence and barn. The remaining area of the lot is undeveloped land with existing vegetation consisting of native grasses. The approximate disturbed area associated with this project is 0.99 acres. The site is currently unplatted. The development will plat 6 single family residential lots. In general, the site slopes towards Hay Creek. Onsite elevations range from 6935' - 7114' with slopes ranging 1 – 50%. Per a NRCS soil survey, the site is made up of Hydrologic Type B soils consisting of Jarre-Tecolote complex and Type B Peyton-Pring complex.

Hay Creek bisects the site. Hay Creek is tributary to Beaver Creek to the east. There are on-site utility services to the existing residence, however; there are no on-site utility mains within the project's disturbance area. An existing, private 18" CMP private culvert is present within Hay Creek in addition to two bridge crossings.

d. Floodplain Statement

Based on FEMA Firm map 08041C0267G dated December 7, 2018, the site is Zone X and Zone A. Zone X are areas determined to be outside the 0.2% annual chance flood. Zone A (no base flood elevations determined) areas are determined to be within the 1% annual chance of flooding zone.

Portions of the proposed lots within the Zone A floodplain will be platted in a no-build easement.

El Paso County, CO Risk Map Project has completed a "Base Line Engineering" (BLE) study of Hay Creek which used detailed methods to determine Base Flood Elevations (BFE's). The results of the study are considered the "best available data" and have been reviewed and accepted by FEMA. The study did not include flood plain mapping for Hay Creek, just BFE's. The cross sections and BFE's from the BLE study are shown on the attached drainage map. Reference material from the BLE study are included in Appendix E.

II. Drainage Basins

a. Major Basin Description

The site is located within the Hay Creek Valley which is within the Beaver Creek Major Drainage Basin. There is no current DBPS for the site. Hay Creek discharges to Beaver Creek approximately a mile downstream of the

site. El Paso County, CO Risk Map Project has completed a "Base Line Engineering" (BLE) study of Hay Creek, which includes Base Flood Elevations, however, no floodplain mapping. The Study has been reviewed and accepted by FEMA, and is considered the best available data. The BLE study utilized a 100-yr design flow for Hay Creek @ it's confluence with Beaver Creek of 311 CFS (which includes nearly a mile of downstream creek and it associated tributary area from this project site). It should be noted that the Hay Creek Valley subdivision (currently under construction), utilized a design flow for Hay Creek of 127 CFS, which is approximately 40% of the BLE flow of 311 CFS, and therefore is assumed to be a very conservative analysis.

b. Existing Subbasin Description

In the existing condition, Hay Creek collects the site's stormwater and conveys it east, approximately 1-mile until it's confluence Beaver Creek, collecting flows from the downstream properties and tributary areas along the way. It should be noted that the "Hay Creek Valley" subdivision, currently under construction, is a down - stream development directly tributary to Hay Creek, and has been approved with a design flow of 127 CFS for Hay Creek. This is about 40% of the flow presented in this report, and therefore is presumed to be an extremely conservative number. See below for existing basin descriptions:

Basin EX1 is 9.89 acres of Hay Creek Road, a single residence and undeveloped land. Existing stormwater from this basin (Q_5 = 2.9 cfs Q_{100} = 14.3 cfs) flows into Hay Creek at DP1 (Q_5 = 6.7cfs, Q_{100} = 39.6 cfs) and is conveyed easterly offsite.

Basin EX2 is 19.19 acres of undeveloped land. Existing stormwater from this basin (Q_5 = 4.1 cfs Q_{100} = 27.4 cfs) flows into Hay Creek at DP1 (Q_5 = 6.7cfs, Q_{100} = 39.6 cfs) and is conveyed easterly offsite.

c. Proposed Subbasin Description

The proposed site has been divided into 4 subbasins for analysis. The site is being developed as a "Large Lot Single-Family Site". An imperviousness of 10% impervious is assumed for buildable portions of the lots. No-build areas are delineated on the plat and drainage map for areas within the Zone A floodplain. Generally, runoff is conveyed overland to Hay Creek which flows east and offsite. Per the County BLE study, Hay Creek conveys Q_{100} = 311 cfs through the site (including the site flow). The culvert at DP1 is sized per this flow + any increase from the site, as the peak flow in Hay Creek is valid per the County BLE study until it's confluence with Beaver Creek, nearly a mile downstream of the site. The total increase in flow to the creek from the site in the proposed condition, versus the existing condition is less than 1.7 cfs. This increase in flow joins the creek long before the Creek is peaking, and therefore the increase is negligible and not observed. However, for the purposes of this report, 1.7 cfs has been added to all proposed design calculations showing a Hay Creek design flow of 312.7 cfs. Please note the Hay Creek BLE study flow of 311 CFS includes a mile of Creek downstream of the site, and it's associated tributary area runoff, including the Hay Creek Valley subdivision, which is approved and under construction with a design flow of only 127 cfs for the Hay Creek. Q_5 and Q_{100} values below indicate that basin's contribution to the 312.7 cfs 100-yr design flow. See below for proposed detailed basin descriptions:

Basin 1 is 4.54 acres of Hay Creek Road, an existing barn, existing dirt driveways and undeveloped area. There is no proposed development or disturbance within this basin. Stormwater from this basin (Q_5 = 1.5 cfs Q_{100} = 7.6 cfs) follows historic drainage patterns to Hay Creek at DP1 (Q_5 = 4.2 cfs, Q_{100} = 21.7 cfs). A proposed,

private 21'7" (3)-sided aluminum box culvert (ALBC) conveys DP1 flows under the proposed, private driveway to DP2.

Basin 2 is 10.07 acres of 5 acre single family residential lots and undeveloped area. Stormwater from this basin (Q_5 = 2.9 cfs Q_{100} = 15.0 cfs) sheet flows north and east per historic drainage patterns to Hay Creek at DP1. A proposed, private 21'7" (3)-sided aluminum box culvert (ALBC) conveys DP1 flows under the proposed, private roadway to DP2.

Basin 3 is 5.35 acres of Hay Creek Road, 5 acre lots, a private driveway and undeveloped area. Stormwater from this basin (Q_5 = 3.2 cfs Q_{100} = 12.2 cfs) flows overland south and east to Hay Creek at DP2 (Q_5 = 8.6 cfs, Q_{100} = 41.3 cfs).

Basin 4 is 9.12 acres of 5-acre single family residential lots and a private cul-de-sac. Stormwater from this basin (Q_5 = 3.0 cfs, Q_{100} = 15.3 cfs) sheet flows north and east per historic drainage patterns to Hay Creek at DP2 (Q_5 = 8.6 cfs, Q_{100} = 41.3 cfs).

III. Drainage Design Criteria

a. Development Criteria Reference

The drainage analysis, proposed stormwater improvements follow the criteria from the "Drainage Criteria Manual of El Paso County, Colorado" Volumes 1 and 2, as amended (EPCDCM).

b. Hydrologic Criteria

Hydrologic data was obtained from NOAA Atlas 14 for the site location. Onsite drainage analysis included the 5-year storm (minor event) and 100-year storm (major event) using 1-hr duration rainfall depths from NOAA Atlas 14. Runoff was calculated per Chapter 6 of the 2014 Colorado Springs Drainage Criteria Manual.

c. Hydraulic Criteria

Hydraulic criteria for culvert design was obtained from the EPCDCM Chapter 9 – Culvert Design. The U.S. Department of Transportation HY-8 Culvert Hydraulic Analysis program was utilized in culvert analysis.

IV. Drainage Facility Design

a. General Concept

Proposed improvements for the subdivision are limited to the proposed, private roadway, cul-de-sac and box culverts, which do not alter the site's stormwater discharge point. The remainder of the site will remain undisturbed and follow historic drainage patterns to Hay Creek until individual lots are developed. This drainage report assumes an imperviousness of 10% imperviousness for buildable lot area. If future improvements exceed the maximum 10% imperviousness threshold, an additional drainage report will be required to address the increase. The proposed imperviousness increase generates a minor increase in flow.

RUNOFF COMPARISON				
BASINS	**AREA**	**$Q_{5\text{-}YR}$**	**$Q_{100\text{-}YR}$**	**$HC_{100\text{-}yr}$**
EX1 & EX2	29.08 AC	6.7	39.6	311.0
1 - 4	29.08 AC	8.6	41.3	312.3
Percent Increase		29%	4%	0.4%

The increase in 5-year and 100-year flows will have a negligible impact to downstream infrastructure or water quality. The increase in flow will be experienced on-site only as the time of concentration of the Hay Creek basin greatly exceeds the on-site time of concentration of 37.7 minutes. Hay Creek's time of concentration in this reach is approximately 2-hours. Therefore, peak flows leaving the site will be gone prior to the Hay Creek basin and creek flow peaks. Therefore the increase in peak 100-yr flows downstream of this site is not expected to have any negative effects. Excerpts from an adjacent drainage report (Hay Creek Ranch) including Hay Creek Time of Concentration calculations have been included in Appendix E.

To address the increase in the site's stormwater flows on-site, onsite stormwater flows will not be concentrated and allowed to sheet flow across undisturbed ground. This approach will promote infiltration and thereby reduce runoff. The site and Creek on-site has well established vegetation, and therefore, limiting disturbance is a goal of this project, as it will help to promote evapotranspiration and soil stability.

The proposed Hay Creek crossing will consist of a private, 21'-7" x 4'11" ALBC (3) side Contech Aluminum Box Culvert, sized to convey Hay Creek's 100-yr peak flows, without causing a rise greater than 6" to the computed 100-yr water surface elevation. The culvert is open bottom and therefore the existing channel section through the culvert will be preserved to the extent practical. The culvert has a headwater to depth ratio of less than 1.5 and will include type L buried soil-riprap stabilization on the downstream end per the calculations included in appendix C. The upstream end will include minor grading to direct flows to the center of structure. Culvert calculations are presented in Appendix C.

This crossing is being coordinated with the Flood Plain Manager and a "Letter of Minimal Rise" has been submitted and approved by the floodplain manager based on the design and hydraulics presented herein.

b. Hay Creek Hydraulics

Hay Creek on-site has been analyzed for the existing and proposed design flows and conditions. The Creek is stable, non erosive, and has well established riparian vegetation. Existing, well established vegetation includes willows, sedges, rushes, grasses, bulrushes, and along the entire length, no erosion is present, or has been observed by the property owner. The existing vegetation and conditions of the Creek will be preserved to the extent practical, which is providing natural bank protection and stabilization. Please see the Photos included in appendix E, showcasing the current condition of the Creek and it's existing vegetation.

The Hay Creek BLE study includes two on-site cross sections, 7101, & 7599. Due to the existing vegetation in the Creek, it is expected to be stable to 7 fps, per MHFD Table 8-1 (shown below).

Table 8-1. Maximum prudent values for natural channel hydraulic parameters

Design Parameter	Non-Cohesive Soils or Poor Vegetation	Cohesive Soils and Vegetation
Maximum flow velocity (average of section)	5 ft/s	7 ft/s
Maximum Froude number	0.6	0.8
Maximum tractive force (average of section)	0.60 lb/sf	1.0 lb/sf
Maximum depth outside bankfull channel	5 ft	5 ft

However, X-section 7599 per the BLE study shows a 100-yr flow velocity of 7.38 fps. However, the study/analysis is flawed for this site, as the study used a Manning's N value of 0.03, which is not appropriate for any section of creek on this site due to the well established vegetation and degree of meandering. Per El Paso County DCM table 10-2, 0.03 for a natural channel would need to be clean, straight, with no rifts, or deep pools, however those conditions do no exist on-site. A manning's N value of 0.05 for the Channel is appropriate (winding natural channel, w/ weeds & stones and some pools). Cross section 7599, has been analyzed utilizing a Mannings n of 0.05 (to be conservative), and the results are included in Appendix C, showing the actual velocities per the conditions present on-site and anticipated conditions to remain on-site are not erosive (<7 fps).

Cross sections 7101 from the Hay Creek BLE is also on-site, and shows a 100-yr velocity of 6.32 FPS. This cross section also utilized a Mannings N of 0.03, which is not appropriate for the condition of the creek on-site due to its well established vegetation and degree of meandering, however, it shows a max velocity of 6.32 FPS which is expected to be stable per Table 8-1 from MHFD Volume 1 above.

c. Water Quality & Detention

The site will not require water quality treatment as it is being developed as "Large Lot Single-Family Residential" lots with total imperviousness areas of less than 10%. These lots are excluded from water quality treatment per Section I.7.1.B.5 of the ECM. Please note that this exclusion does not apply to the proposed road grading, however the disturbance and grading associated with the roadway construction will total 0.99 acres and therefore, water quality treatment is not required. It is worth noting that the site design and restraints include large no-build areas centered on the creek and flood plain. This will guarantee that a large vegetated buffer will remain in perpetuity between proposed imperviousness from the future home construction and the creek/site outfall.

No detention is proposed for the site, as the site will not cause any negative downstream effects. An increase of 4% above historic rates for the 100-yr storm is anticipated on-site, however this increase equates to only a 1.7 cfs increase in 100-yr peak flows. The site naturally drains over-land to the creek from both sides and these drainage patterns will be preserved, therefore; flows are distributed across the entire creek frontage length prior to entering the creek (950 LF feet per side), this equates to only 0.0009 cfs per foot, which is indetectable and negligible. A 29% increase to 5-yr peak flows is anticipated which equates to a 1.9 cfs

increase. However, no adverse affects are anticipated due to this increase as the 100-yr peak flows are stable, and therefore the 5-yr flows are stable and non-erosive as well.

d. Operations & Maintenance

An Operations and Maintenance Manual has been provided for the Creek and associated crossing. No other on-site permanent stormwater facilities are proposed with this project.

e. Grading & Erosion Control Plan

A separate Grading and Erosion Control plan has been submitted concurrently with this report to support the proposed site improvements (private road and culvert).

f. Four Step Method

Step 1 – Reducing Runoff Volumes: The site is currently farm land/range land and is highly vegetated with native grasses and shrubs. The natural vegetation on-site will be preserved to the extent practical with this project and historic drainage patterns will be preserved. Overall lot imperviousness will be limited to less than 10%. The site drains towards Hay Creek from the north and south, and the floodplain will be plated with a "no build" easement, along with additional "no build" areas south of the creek. This facilitates a permanent vegetated buffer between the proposed improvements and Hay Creek which will slow runoff, promote infiltration and increase water quality treatment for the developed runoff.

Step 2 – Treat and slowly release the WQCV: The projects total disturbance will be 0.99 acres, and therefore WQ treatment is not required. However, the site design promotes passive water quality treatment. The site is comprised of 5+ acre lots with imperviousness less than 10% and meets the requirements for "Large Lot Single-Family Residential". These lots are excluded from water quality treatment per Section I.7.1.B.5 of the ECM. Additionally, the site includes "no build" easements encompassing the floodplain and Hay Creek. This will preserve the existing grass buffers and native vegetation between developed areas and the site outfall. This grass buffer will provide in-line water quality treatment for developed flows prior to them leaving the site. Please note this grass buffer is not required and is a non-PCM Grass Buffer and therefore no easement, maintenance agreement, or operation and maintenance manual is required either. A MHFD UD-BMP, Runoff-Reduction workbook has been included in appendix B to demonstrate that the runoff reduction standard is met for the common private access road although it is not a requirement because this project disturbs less than 1-acre. Furthermore, the common improvement proposed within the development largely consists of pervious surfaces, such as the proposed gravel road which total approximately 2/3rds of the disturbed area.

Step 3 – Stabilize stream channels: All new and re-development projects are required to construct or participate in the funding of channel stabilization measures. Drainage basin fees paid, at the time of platting, go towards channel stabilization with the drainage basin. This site has been designed to preserve historical overland, non-concentrated flow patterns to the creek, and minimizes disturbance to the existing well-established riparian vegetation which provides stability to the soil and creek banks. No negative effects downstream or to adjacent properties are anticipated as a result of this project.

Step 4 – Consider the need for source controls: No industrial or commercial uses are proposed within this development and therefore no source controls are proposed.

g. Drainage Basin & Bridge Fees

Drainage and bridge fees for the Beaver Creek Drainage Basin are due at time of platting. See table below for anticipated drainage and bridge fees for HIDDEN CREEK ESTATES. Per the El Paso County Engineering Criteria Manual, Appendix I, Section 3.10.1a fee reductions for low density lots are applicable at a rate of 25%. Please see the calculation for imperviousness area in Appendix E and the resulting table below.

Beaver Creek Drainage Basin Fees					
Total Acreage	Site % Impervious	Impervious Acreage	Basin Fee/ Imp. Ac.	Total Basin Fee	75% Basin fee (low density)
28.4	8.4%	2.39	$15,959	$38,071.79	$28,553.84

h. Engineer's Opinion of Probable Cost

An engineer's opinion of probable cost has been included in Appendix E.

V. Summary

HIDDEN CREEK ESTATES remains consistent with pre-development drainage conditions with the construction of the recommended drainage improvements. The proposed development will not adversely affect downstream or adjacent properties, stormwater infrastructure, or surrounding developments. This report meets the latest El Paso County Drainage criteria.

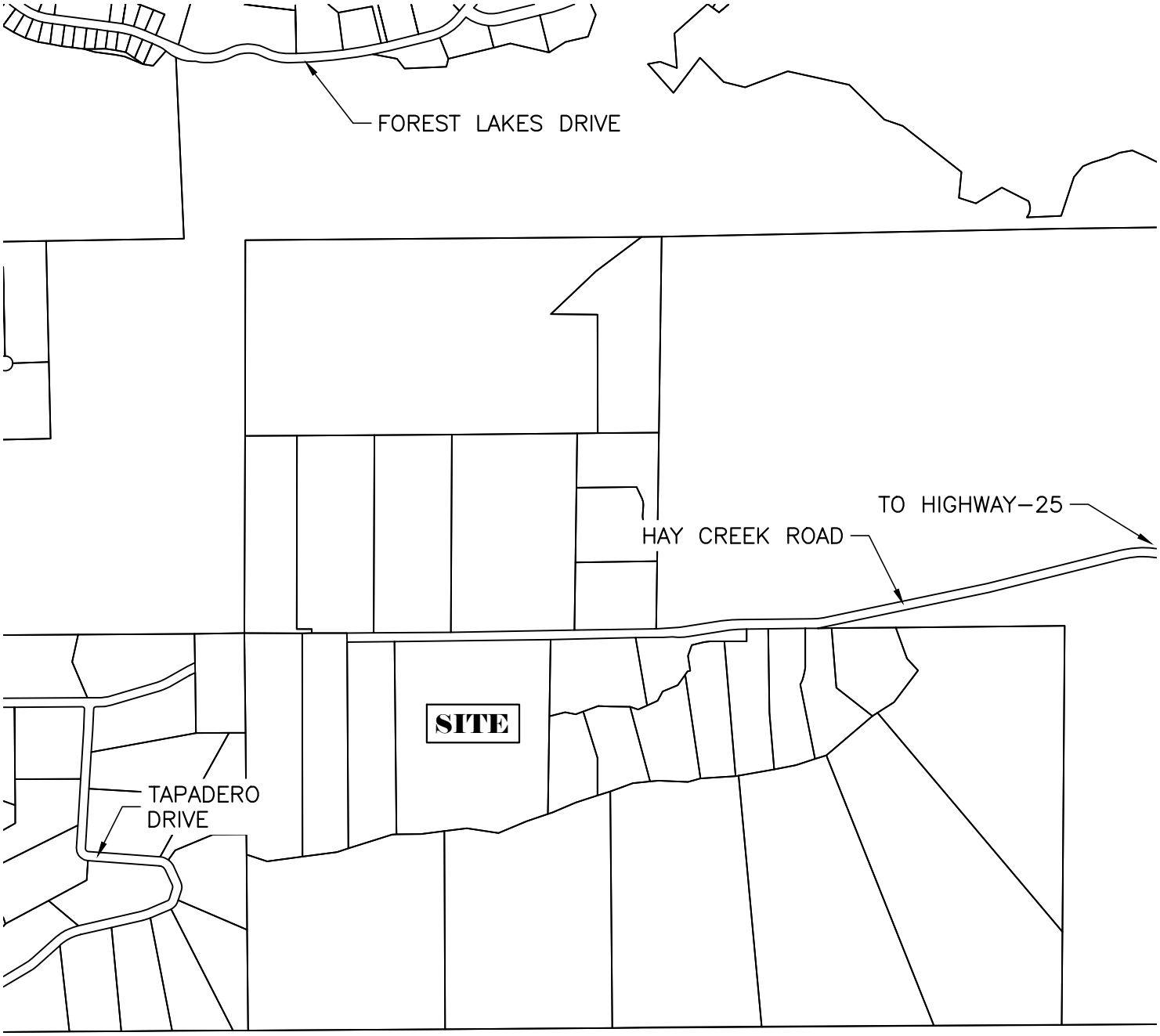
VI. References

1. Drainage Criteria Manual of El Paso County, Colorado, October 2018.
2. Urban Storm Drainage Criteria Manual, Mile High Flood District, January 2018.
3. Final Drainage Report for Hay Creek Ranch, Matrix Design Group, March 28, 2003
4. El Paso County Base Level Engineering Study Effort, HEC-RAS model

APPENDIX A – VICINITY MAP, FEMA MAP, NRCS WEB SOIL SURVEY & NOAA ATLAS 14

HAY CREEK SUBDIVISION

VICINITY MAP



AIR FORCE ACADEMY

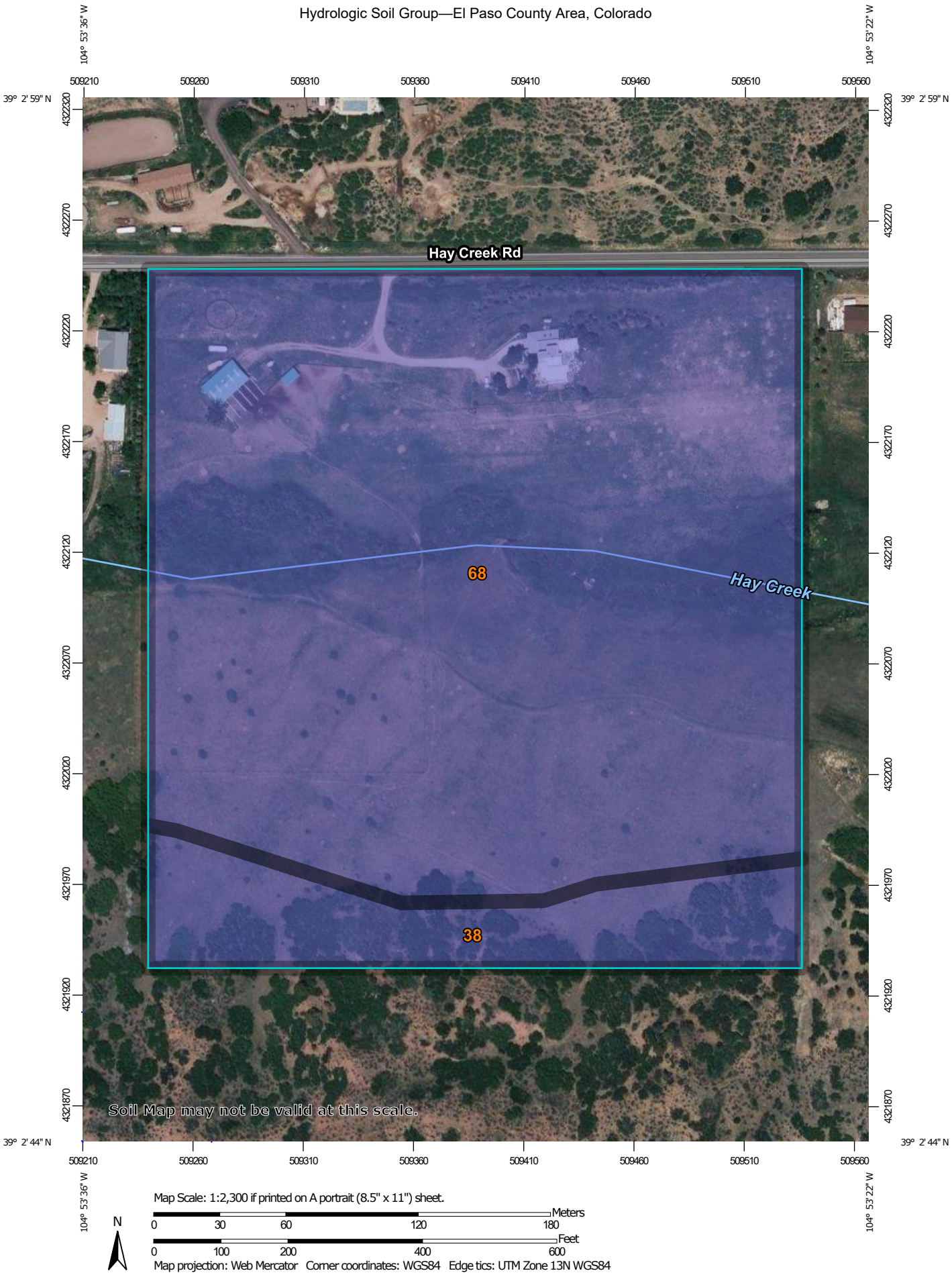
N

1000 500 0 1000 2000

ORIGINAL SCALE: 1" = 1000'

VICINITY MAP	
HAY CREEK SUBDIVISION	
JOB NO. 24008	
LOCATION: EPC	SHEET 1
09/13/2024	

ALL TERRAIN ENGINEERING
1004 WEST VAN BUREN STREET
COLORADO SPRINGS, CO 80907


104° 53' 36" W
104° 53' 22" W
509210
509260
509310
509360
509410
509460
509510
509560
39° 2' 59" N
39° 2' 44" N
4322320
4322270
4322220
4322170
4322120
4322070
4322020
4321970
4321920
4321870
Hay Creek Rd
68
38
Hay Creek
Soil Map may not be valid at this scale.
Map Scale: 1:2,300 if printed on A portrait (8.5" x 11") sheet.
N
Meters
0 30 60 120 180
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 Rating Polygons

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

Soil Rating Lines

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

Soil Rating Points

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

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 21, Aug 24, 2023

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

Date(s) aerial images were photographed: Jun 9, 2021—Jun 12, 2021

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
38	Jarre-Tecolote complex, 8 to 65 percent slopes	B	3.1	13.1%
68	Peyton-Pring complex, 3 to 8 percent slopes	B	20.2	86.9%
Totals for Area of Interest			**23.2**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

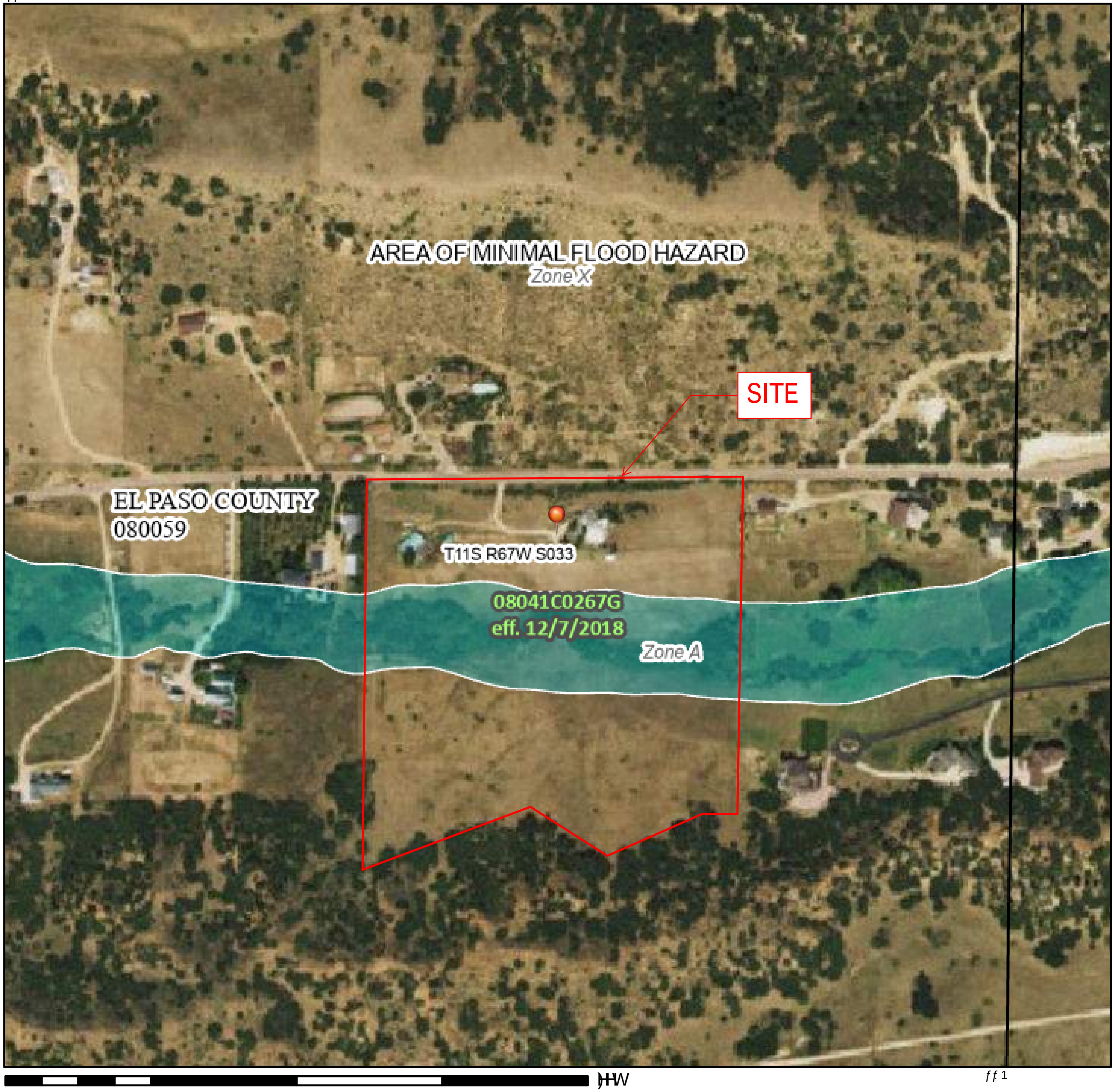
Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

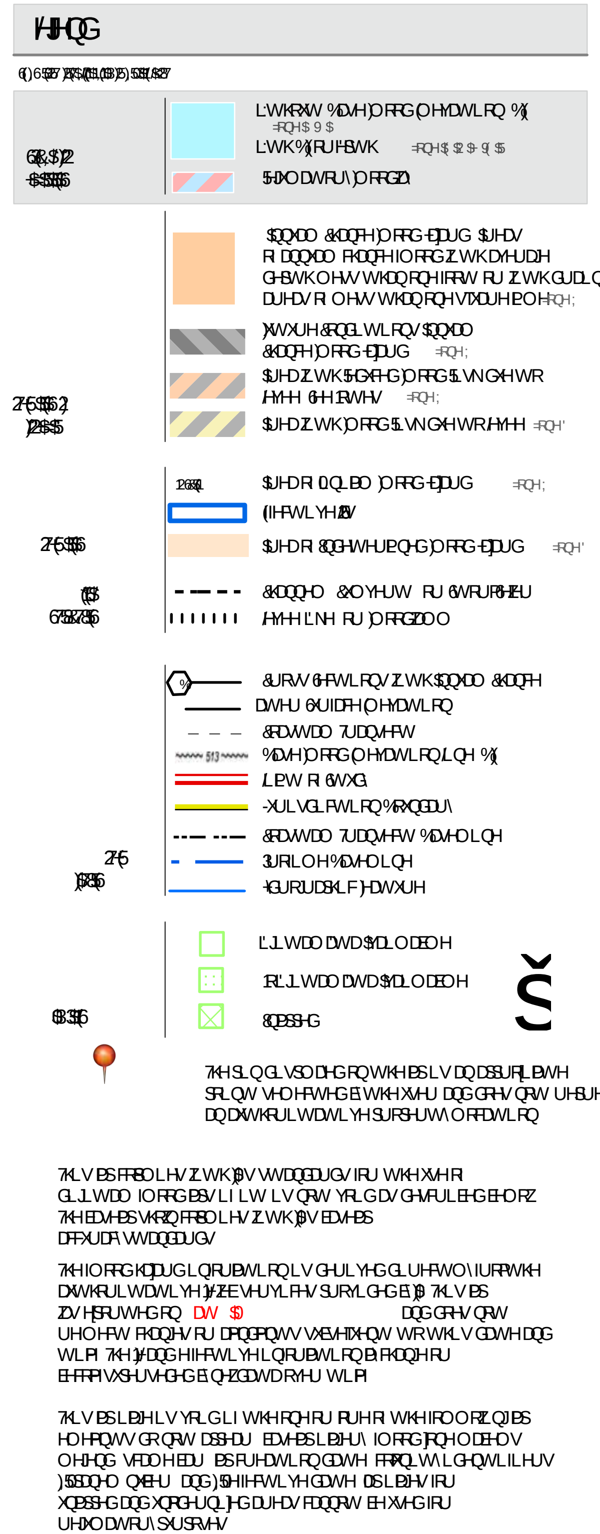
If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

1DWLRQDO)ORRG +D]DUG /D\HU)





NOAA Atlas 14, Volume 8, Version 2
Location name: Colorado Springs, Colorado, USA*
Latitude: 39.05°, Longitude: -104.8925°
Elevation: 7044 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	**0.233** (0.190-0.284)	**0.297** (0.243-0.363)	**0.405** (0.329-0.495)	**0.497** (0.402-0.610)	**0.627** (0.490-0.797)	**0.730** (0.557-0.938)	**0.836** (0.615-1.10)	**0.947** (0.667-1.27)	**1.10** (0.742-1.51)	**1.21** (0.799-1.69)
10-min	**0.341** (0.279-0.416)	**0.435** (0.355-0.531)	**0.593** (0.482-0.725)	**0.727** (0.588-0.893)	**0.918** (0.717-1.17)	**1.07** (0.815-1.37)	**1.22** (0.901-1.61)	**1.39** (0.977-1.86)	**1.61** (1.09-2.21)	**1.78** (1.17-2.48)
15-min	**0.416** (0.340-0.507)	**0.530** (0.433-0.647)	**0.723** (0.588-0.884)	**0.887** (0.717-1.09)	**1.12** (0.875-1.42)	**1.30** (0.994-1.68)	**1.49** (1.10-1.96)	**1.69** (1.19-2.27)	**1.96** (1.32-2.70)	**2.17** (1.43-3.02)
30-min	**0.560** (0.458-0.683)	**0.715** (0.584-0.873)	**0.975** (0.793-1.19)	**1.20** (0.968-1.47)	**1.51** (1.18-1.92)	**1.76** (1.34-2.26)	**2.02** (1.48-2.64)	**2.28** (1.61-3.06)	**2.64** (1.79-3.64)	**2.92** (1.92-4.07)
60-min	**0.715** (0.585-0.873)	**0.879** (0.718-1.07)	**1.17** (0.950-1.43)	**1.43** (1.15-1.75)	**1.81** (1.43-2.33)	**2.13** (1.63-2.76)	**2.47** (1.83-3.27)	**2.84** (2.01-3.84)	**3.35** (2.28-4.64)	**3.77** (2.48-5.25)
2-hr	**0.871** (0.716-1.05)	**1.04** (0.857-1.26)	**1.36** (1.11-1.65)	**1.66** (1.35-2.02)	**2.11** (1.68-2.71)	**2.51** (1.94-3.23)	**2.93** (2.19-3.86)	**3.40** (2.42-4.58)	**4.07** (2.79-5.61)	**4.62** (3.06-6.39)
3-hr	**0.982** (0.810-1.18)	**1.14** (0.943-1.38)	**1.46** (1.20-1.76)	**1.77** (1.45-2.15)	**2.27** (1.83-2.92)	**2.71** (2.11-3.50)	**3.20** (2.41-4.22)	**3.75** (2.70-5.06)	**4.56** (3.14-6.28)	**5.22** (3.48-7.20)
6-hr	**1.20** (1.00-1.44)	**1.38** (1.15-1.65)	**1.74** (1.44-2.09)	**2.11** (1.73-2.54)	**2.70** (2.20-3.46)	**3.24** (2.55-4.16)	**3.84** (2.91-5.04)	**4.52** (3.27-6.06)	**5.52** (3.83-7.57)	**6.35** (4.26-8.70)
12-hr	**1.48** (1.23-1.75)	**1.73** (1.44-2.05)	**2.21** (1.84-2.63)	**2.68** (2.21-3.19)	**3.40** (2.76-4.29)	**4.04** (3.18-5.12)	**4.74** (3.60-6.14)	**5.51** (4.01-7.31)	**6.63** (4.63-9.00)	**7.56** (5.10-10.3)
24-hr	**1.78** (1.50-2.09)	**2.12** (1.78-2.49)	**2.73** (2.28-3.21)	**3.28** (2.73-3.88)	**4.13** (3.36-5.12)	**4.84** (3.83-6.06)	**5.61** (4.28-7.18)	**6.45** (4.71-8.46)	**7.64** (5.36-10.3)	**8.61** (5.85-11.6)
2-day	**2.10** (1.78-2.44)	**2.48** (2.09-2.88)	**3.14** (2.65-3.67)	**3.75** (3.14-4.39)	**4.66** (3.80-5.72)	**5.42** (4.31-6.72)	**6.24** (4.78-7.90)	**7.12** (5.23-9.25)	**8.36** (5.90-11.2)	**9.37** (6.41-12.6)
3-day	**2.27** (1.93-2.63)	**2.66** (2.26-3.08)	**3.36** (2.84-3.90)	**3.99** (3.36-4.66)	**4.94** (4.05-6.03)	**5.74** (4.57-7.07)	**6.58** (5.07-8.30)	**7.50** (5.53-9.70)	**8.79** (6.23-11.7)	**9.83** (6.75-13.2)
4-day	**2.41** (2.05-2.77)	**2.81** (2.39-3.24)	**3.53** (2.99-4.08)	**4.18** (3.52-4.85)	**5.15** (4.23-6.26)	**5.97** (4.77-7.33)	**6.84** (5.28-8.60)	**7.78** (5.76-10.0)	**9.12** (6.48-12.1)	**10.2** (7.02-13.6)
7-day	**2.78** (2.38-3.19)	**3.20** (2.74-3.67)	**3.95** (3.37-4.54)	**4.64** (3.93-5.35)	**5.67** (4.68-6.84)	**6.53** (5.25-7.97)	**7.46** (5.79-9.32)	**8.46** (6.29-10.8)	**9.88** (7.06-13.0)	**11.0** (7.64-14.6)
10-day	**3.14** (2.69-3.57)	**3.59** (3.08-4.09)	**4.39** (3.75-5.02)	**5.11** (4.34-5.87)	**6.20** (5.13-7.44)	**7.10** (5.73-8.62)	**8.08** (6.29-10.0)	**9.12** (6.81-11.6)	**10.6** (7.60-13.9)	**11.8** (8.20-15.6)
20-day	**4.15** (3.59-4.69)	**4.75** (4.10-5.38)	**5.78** (4.97-6.55)	**6.67** (5.70-7.60)	**7.96** (6.61-9.41)	**9.00** (7.29-10.8)	**10.1** (7.89-12.4)	**11.2** (8.42-14.2)	**12.8** (9.23-16.6)	**14.0** (9.84-18.4)
30-day	**4.99** (4.32-5.60)	**5.72** (4.96-6.44)	**6.94** (5.99-7.83)	**7.97** (6.84-9.03)	**9.41** (7.82-11.0)	**10.5** (8.56-12.5)	**11.7** (9.17-14.2)	**12.9** (9.68-16.1)	**14.5** (10.5-18.6)	**15.7** (11.1-20.6)
45-day	**6.02** (5.24-6.73)	**6.91** (6.01-7.73)	**8.35** (7.24-9.37)	**9.53** (8.21-10.7)	**11.1** (9.26-12.9)	**12.4** (10.0-14.6)	**13.6** (10.7-16.4)	**14.8** (11.1-18.4)	**16.4** (11.8-20.9)	**17.5** (12.4-22.9)
60-day	**6.88** (6.01-7.67)	**7.90** (6.88-8.80)	**9.50** (8.26-10.6)	**10.8** (9.33-12.1)	**12.5** (10.4-14.4)	**13.8** (11.2-16.1)	**15.0** (11.8-18.0)	**16.2** (12.2-20.1)	**17.8** (12.9-22.6)	**18.9** (13.4-24.5)

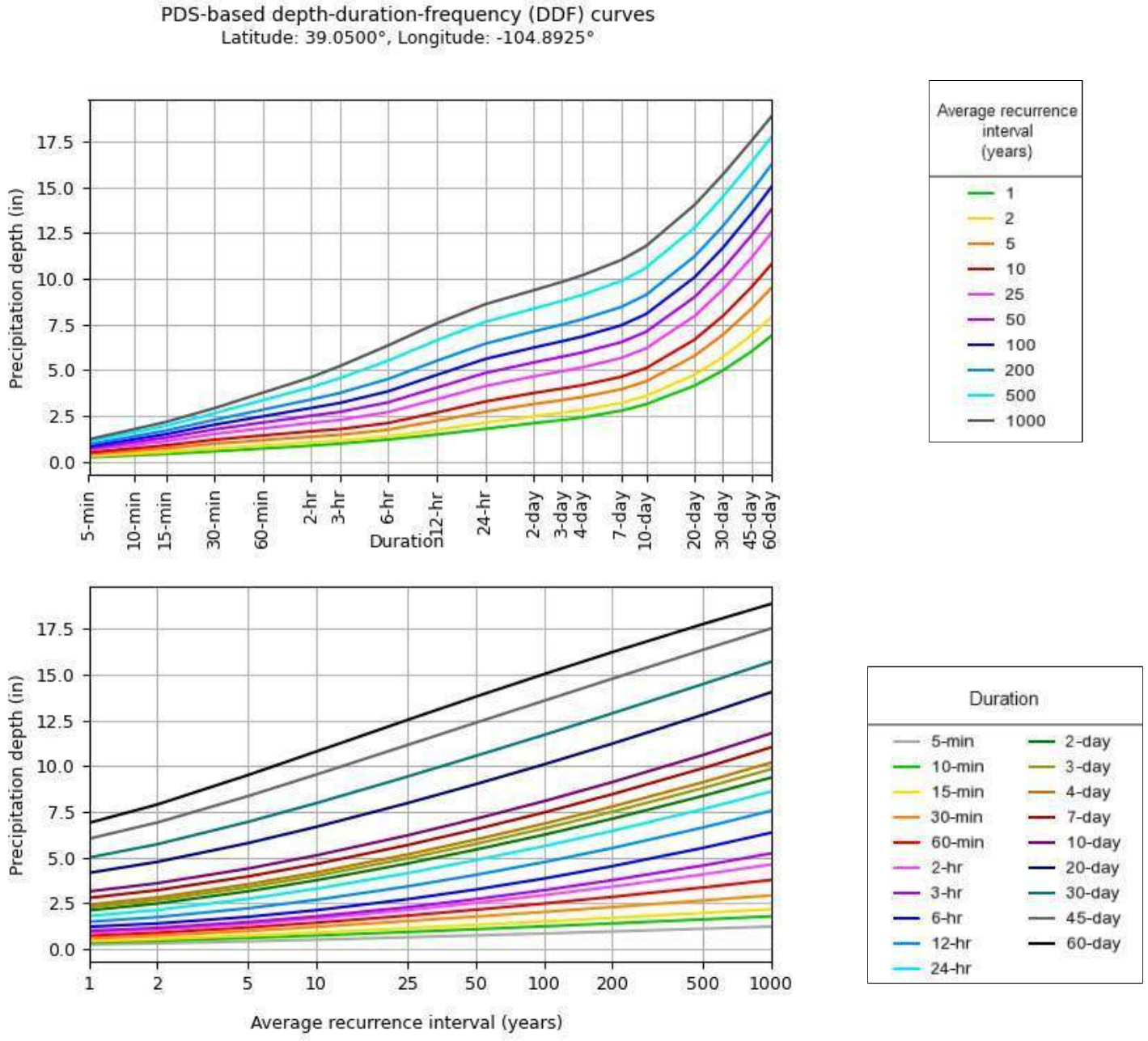
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

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



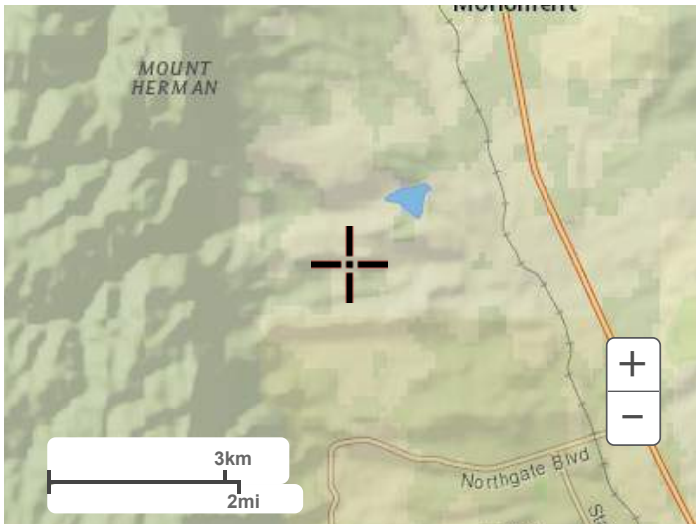
NOAA Atlas 14, Volume 8, Version 2

Created (GMT): Fri Sep 13 15:49:24 2024

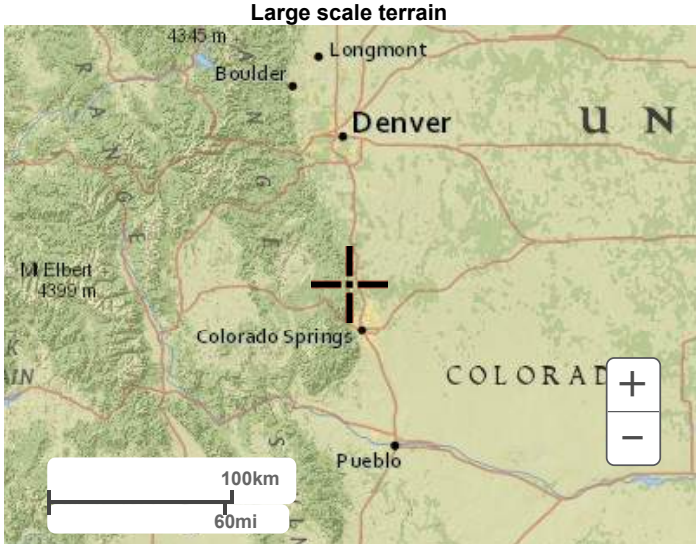
Back to Top

Maps & aerials

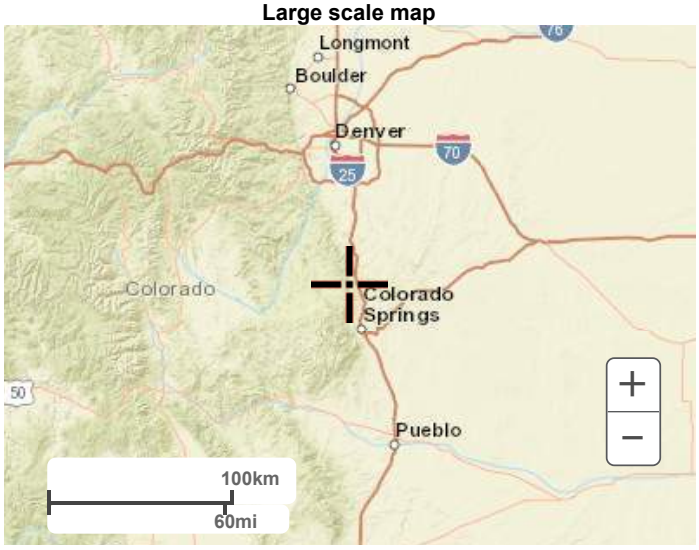
Small scale terrain



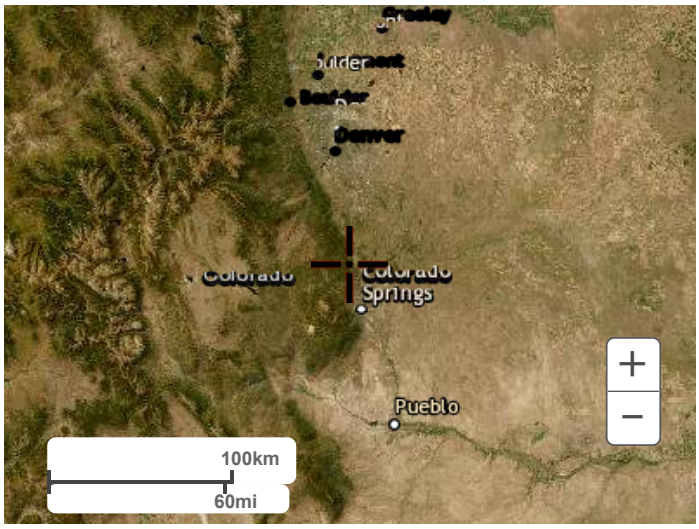
Large scale terrain



Large scale map



Large scale aerial



Back to Top

US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

APPENDIX B – HYDROLOGIC CALCULATIONS

COMPOSITE % IMPERVIOUS CALCULATIONS - EXISTING CONDITIONS

Subdivision: Hidden Creek Estates
Location: El Paso County

Project Name: Hidden Creek Estates
Project No.: 24008.00
Calculated By: NQJ
Checked By:
Date: 3/20/25

		Gravel Drives				Paved				Roofs				Historic/Agriculture				Weighted C_5 & C_{100}		Basins Total Weighted % Imp.
Basin ID	Total Area (ac)	C_5	C_{100}	Area (ac)	% Imp.	C_5	C_{100}	Area (ac)	% Imp.	C_5	C_{100}	Area (ac)	% Imp.	C_5	C_{100}	Area (ac)	% Imp.	C_5	C_{100}	
EX1	9.89	0.59	0.70	0.26	80.0%	0.90	0.96	0.29	100.0%	0.73	0.81	0.14	90.0%	0.09	0.36	9.20	2.0%	0.14	0.39	8.2%
EX2	19.19	0.59	0.70	0.00	80.0%	0.90	0.96	0.00	100.0%	0.73	0.81	0.00	90.0%	0.09	0.36	19.19	2.0%	0.09	0.36	2.0%
Total	**29.08**																			**4.1%**

STANDARD FORM SF-2 - EXISTING CONDITIONS
TIME OF CONCENTRATION

Subdivision: Hidden Creek Estates
Location: El Paso County

Project Name: Hidden Creek Estates
Project No.: 24008.00
Calculated By: NQJ
Checked By:
Date: 3/20/25

SUB-BASIN DATA					INITIAL/OVERLAND (T_i)			TRAVEL TIME (T_t)					*tc* CHECK (URBANIZED BASINS)			FINAL
BASIN ID	D.A. (ac)	Hydrologic Soils Group	Weighted C_5	Impervious (%)	L (ft)	S_o (%)	t_i (min)	L_t (ft)	S_t (%)	K	VEL. (ft/s)	t_t (min)	COMP. t_c (min)	TOTAL LENGTH (ft)	Urbanized t_c (min)	t_c (min)
EX1	9.89	B	0.14	4.1%	226	6.8%	13.9	1092	2.6%	5.0	0.8	22.6	36.5	1318.0	37.1	36.5
EX2	19.19	B	0.09	2%	217	30.0%	8.7	1674	5.5%	5.0	1.2	23.8	32.5	1891.0	38.5	32.5

NOTES:

$$t_c = t_i + t_t$$

Where:

t_c = computed time of concentration (minutes)

t_i = overland (initial) flow time (minutes)

t_t = channelized flow time (minutes).

$$t_t = \frac{L_t}{60K\sqrt{S_o}} = \frac{L_t}{60V_t}$$

Where:

t_t = channelized flow time (travel time, min)
L_t = waterway length (ft)
S_o = waterway slope (ft/ft)
V_t = travel time velocity (ft/sec) = $K\sqrt{S_o}$
K = NRCS conveyance factor (see Table 6-2).

Eq $$t_i = \frac{0.395(1.1 - C_5)\sqrt{L_i}}{S_o^{.033}}$$ Equation 6-3

Where:

t_i = overland (initial) flow time (minutes)
C_5 = runoff coefficient for 5-year frequency (from Table 6-4)
L_i = length of overland flow (ft)
S_o = average slope along the overland flow path (ft/ft).

Equation 6-4 $(26 - 17i) + \frac{L_t}{60(14i + 9)\sqrt{S_t}}$ Equation 6-5

:

t_c = minimum time of concentration for first design point when less than t_c from Equation 6-1.
L_t = length of channelized flow path (ft)
i = imperviousness (expressed as a decimal)
S_t = slope of the channelized flow path (ft/ft).

Table 6-2. NRCS Conveyance factors, K

Type of Land Surface	Conveyance Factor, K
Heavy meadow	2.5
Tillage/field	5
Short pasture and lawns	7
Nearly bare ground	10
Grassed waterway	15
Paved areas and shallow paved swales	20

Use a minimum t_c value of 5 minutes for urbanized areas and a minimum t_c value of 10 minutes for areas that are not considered urban. Use minimum values even when calculations result in a lesser time of concentration.

STANDARD FORM SF-3 - EXISTING CONDITIONS

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Hidden Creek Estates
Location: El Paso County
Design Storm: 5-Year

Project Name: Hidden Creek Estates
Project No.: 24008.00
Calculated By: NQJ
Checked By:
Date: 3/20/25

		DIRECT RUNOFF							TOTAL RUNOFF				STREET			PIPE				TRAVEL TIME			
STREET	Design Point	Basin ID	Area (Ac)	Runoff Coeff.	t_c (min)	C*A (Ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	Q_{street} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	REMARKS
		EX1	9.89	0.14	36.5	1.34	2.19	2.9															BASIN EX1 HISTORIC FLOW, OVERLAND FLOW TO HAY CREEK, CREEK FLOW TO DP1
		EX2	19.19	0.09	32.5	1.73	2.36	4.1															BASIN EX1 HISTORIC FLOW, OVERLAND FLOW TO HAY CREEK, CREEK FLOW TO DP1
	1								36.5	3.07	2.19	6.7											TOTAL **ONSITE** FLOW @ DP1 (TOTAL FLOW IN HAY CREEK PER FEMA HEC-RAS MODEL = 311 CFS)

Notes:
Street and Pipe C*A values are determined by Q/i using the catchment's intensity value.

STANDARD FORM SF-3 - EXISTING CONDITIONS

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Hidden Creek Estates
Location: El Paso County
Design Storm: 100-Year

Project Name: Hidden Creek Estates
Project No.: 24008.00
Calculated By: NQJ
Checked By:
Date: 3/20/25

		DIRECT RUNOFF							TOTAL RUNOFF				STREET			PIPE				TRAVEL TIME			
STREET	Design Point	Basin ID	Area (ac)	Runoff Coeff.	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	Q_{street} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	REMARKS
		EX1	9.89	0.39	36.5	3.89	3.67	14.3															BASIN EX1 HISTORIC FLOW, OVERLAND FLOW TO HAY CREEK, CREEK FLOW TO DP1
		EX2	19.19	0.36	32.5	6.91	3.96	27.4															BASIN EX1 HISTORIC FLOW, OVERLAND FLOW TO HAY CREEK, CREEK FLOW TO DP1
	1								36.5	10.79	3.67	39.6											TOTAL **ONSITE** FLOW @ DP1 (TOTAL FLOW IN HAY CREEK PER FEMA HEC-RAS MODEL = 311 CFS)

Notes:
Street and Pipe C*A values are determined by Q/i using the catchment's intensity value.

COMPOSITE % IMPERVIOUS CALCULATIONS - PROPOSED CONDITIONS

Subdivision: Hidden Creek Estates
Location: El Paso County

Project Name: Hidden Creek Estates
Project No.: 24008.00
Calculated By: NQJ
Checked By:
Date: 3/20/25

		Gravel Drives				Paved				Roofs				5-acre Lots (10% max imp.)				Lawns/Pasture				Weighted C_5 & C_{100}		Basins Total Weighted
Basin ID	Total Area (ac)	C_5	C_{100}	Area (ac)	% Imp.	C_5	C_{100}	Area (ac)	% Imp.	C_5	C_{100}	Area (ac)	% Imp.	C_5	C_{100}	Area (ac)	% Imp.	C_5	C_{100}	Area (ac)	% Imp.	C_5	C_{100}	
1	4.54	0.59	0.70	0.18	80.0%	0.90	0.96	0.12	100.0%	0.73	0.81	0.06	90.0%	0.14	0.40	0.00	10.0%	0.08	0.35	4.18	0.0%	0.13	0.39	7.0%
2	10.07	0.59	0.70	0.00	80.0%	0.90	0.96	0.00	100.0%	0.73	0.81	0.00	90.0%	0.14	0.40	7.32	10.0%	0.08	0.35	2.75	0.0%	0.12	0.39	7.3%
3	5.35	0.59	0.70	0.28	80.0%	0.90	0.96	0.24	100.0%	0.73	0.81	0.09	90.0%	0.14	0.40	3.57	10.0%	0.08	0.35	1.17	0.0%	0.19	0.44	16.8%
4	9.12	0.59	0.70	0.20	80.0%	0.90	0.96	0.00	100.0%	0.73	0.81	0.00	90.0%	0.14	0.40	5.59	10.0%	0.08	0.35	3.33	0.0%	0.13	0.39	7.9%
Total	**29.08**																							**9.2%**

STANDARD FORM SF-2 - PROPOSED CONDITIONS
TIME OF CONCENTRATION

Subdivision: Hidden Creek Estates
Location: El Paso County

Project Name: Hidden Creek Estates
Project No.: 24008.00
Calculated By: NQJ
Checked By:
Date: 3/20/25

SUB-BASIN DATA					INITIAL/OVERLAND (T_i)			TRAVEL TIME (T_t)					*tc* CHECK (URBANIZED BASINS)			FINAL
BASIN ID	D.A. (ac)	Hydrologic Soils Group	Weighted C_5	Impervious (%)	L (ft)	S_o (%)	t_i (min)	L_t (ft)	S_t (%)	K	VEL. (ft/s)	t_t (min)	COMP. t_c (min)	TOTAL LENGTH (ft)	Urbanized t_c (min)	t_c (min)
1	4.54	B	0.08	7.0%	201	6.1%	14.4	665	2.6%	5.0	0.8	13.7	28.1	866.0	31.7	28.1
2	10.07	B	0.08	7.3%	177	29.0%	8.1	1309	5.5%	3.0	0.7	31.0	39.1	1486.0	34.1	34.1
3	5.35	B	0.08	16.8%	179	13.2%	10.5	718	7.0%	5.0	1.3	9.0	19.6	897.0	27.1	19.6
4	9.12	B	0.08	7.9%	207	15.4%	10.7	881	7.9%	3.0	0.8	17.4	28.2	1088.0	29.8	28.2

NOTES:

$$t_c = t_i + t_t$$

Where:

t_c = computed time of concentration (minutes)

t_i = overland (initial) flow time (minutes)

t_t = channelized flow time (minutes).

$$t_t = \frac{L_t}{60K\sqrt{S_o}} = \frac{L_t}{60V_t}$$

Where:

t_t = channelized flow time (travel time, min)
L_t = waterway length (ft)
S_o = waterway slope (ft/ft)
V_t = travel time velocity (ft/sec) = $K\sqrt{S_o}$
K = NRCS conveyance factor (see Table 6-2).

Eq $$t_i = \frac{0.395(1.1 - C_5)\sqrt{L_i}}{S_o^{0.33}}$$ Equation 6-3

Where:

t_i = overland (initial) flow time (minutes)
C_5 = runoff coefficient for 5-year frequency (from Table 6-4)
L_i = length of overland flow (ft)
S_o = average slope along the overland flow path (ft/ft).

Equation 6-4 $26 - 17i) + \frac{L_t}{60(14i + 9)\sqrt{S_t}}$ Equation 6-5

:

t_c = minimum time of concentration for first design point when less than t_c from Equation 6-1.
L_t = length of channelized flow path (ft)
i = imperviousness (expressed as a decimal)
S_t = slope of the channelized flow path (ft/ft).

Table 6-2. NRCS Conveyance factors, K

Type of Land Surface	Conveyance Factor, K
Heavy meadow	2.5
Tillage/field	5
Short pasture and lawns	7
Nearly bare ground	10
Grassed waterway	15
Paved areas and shallow paved swales	20

Use a minimum t_c value of 5 minutes for urbanized areas and a minimum t_c value of 10 minutes for areas that are not considered urban. Use minimum values even when calculations result in a lesser time of concentration.

STANDARD FORM SF-3 - PROPOSED CONDITIONS

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Hidden Creek Estates
Location: El Paso County
Design Storm: 5-Year

Project Name: Hidden Creek Estates
Project No.: 24008.00
Calculated By: NQJ
Checked By:
Date: 3/20/25

		DIRECT RUNOFF							TOTAL RUNOFF				STREET			PIPE				TRAVEL TIME			
STREET	Design Point	Basin ID	Area (Ac)	Runoff Coeff.	t_c (min)	C*A (Ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	Q_{street} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	REMARKS
		1	4.54	0.13	28.1	0.59	2.58	1.5															BASIN 1 HISTORIC FLOW, OVERLAND FLOW TO HAY CREEK, CREEK FLOW TO DP1
		2	10.07	0.12	34.1	1.24	2.29	2.9															BASIN 2 HISTORIC FLOW, OVERLAND FLOW TO HAY CREEK, CREEK FLOW TO DP1
	1								34.1	1.84	2.29	4.2	4.21	1.84	2.7					360	1.6	3.7	COMBINED BASIN 1 & 2 FLOW @ DP1, CREEK FLOW TO DP2
		3	5.35	0.19	19.6	1.04	3.12	3.2															BASIN 3 FLOW @ DP2
		4	9.12	0.13	28.2	1.17	2.58	3.0															BASIN 4 FLOW @ DP2
	2								37.7	4.04	2.14	8.6											TOTAL **ONSITE** FLOW TO DP2 (HAY CREEK), FOLLOWS HISTORIC PATTERNS OFFSITE TO THE EAST

Notes:
Street and Pipe C*A values are determined by Q/i using the catchment's intensity value.

STANDARD FORM SF-3 - PROPOSED CONDITIONS

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Hidden Creek Estates
Location: El Paso County
Design Storm: 100-Year

Project Name: Hidden Creek Estates
Project No.: 24008.00
Calculated By: NQJ
Checked By:
Date: 3/20/25

		DIRECT RUNOFF							TOTAL RUNOFF				STREET			PIPE				TRAVEL TIME			
STREET	Design Point	Basin ID	Area (ac)	Runoff Coeff.	t_c (min)	C*A (ac)	I (in/hr)	Q (cfs)	tc (min)	C*A (ac)	I (in/hr)	Q (cfs)	Q_{street} (cfs)	C*A (ac)	Slope (%)	Q_{pipe} (cfs)	C*A (ac)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	t_t (min)	REMARKS
		1	4.54	0.39	28.1	1.75	4.33	7.6															BASIN 1 HISTORIC FLOW, OVERLAND FLOW TO HAY CREEK, CREEK FLOW TO DP1
		2	10.07	0.39	34.1	3.89	3.84	15.0															BASIN 2 HISTORIC FLOW, OVERLAND FLOW TO HAY CREEK, CREEK FLOW TO DP1
	1								34.1	5.64	3.84	21.7	21.7	5.64	2.7					360	1.6	3.7	COMBINED BASIN 1 & 2 FLOW @ DP1, CREEK FLOW TO DP2
		3	5.35	0.44	19.6	2.34	5.24	12.2															BASIN 3 FLOW @ DP2
		4	9.12	0.39	28.2	3.54	4.32	15.3															BASIN 4 FLOW @ DP2
	2								37.7	11.52	3.59	41.3											TOTAL **ONSITE** FLOW TO DP2 (HAY CREEK), FOLLOWS HISTORIC PATTERNS OFFSITE TO THE EAST

Notes:
Street and Pipe C*A values are determined by Q/i using the catchment's intensity value.

APPENDIX C – HYDRAULIC CALCULATIONS

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Mar 11 2025

Hay Creek Existing Cross Section @ Upstream End Bridge Culvert

User-defined

Invert Elev (ft)	= 44.60
Slope (%)	= 0.86
N-Value	= 0.035

Calculations

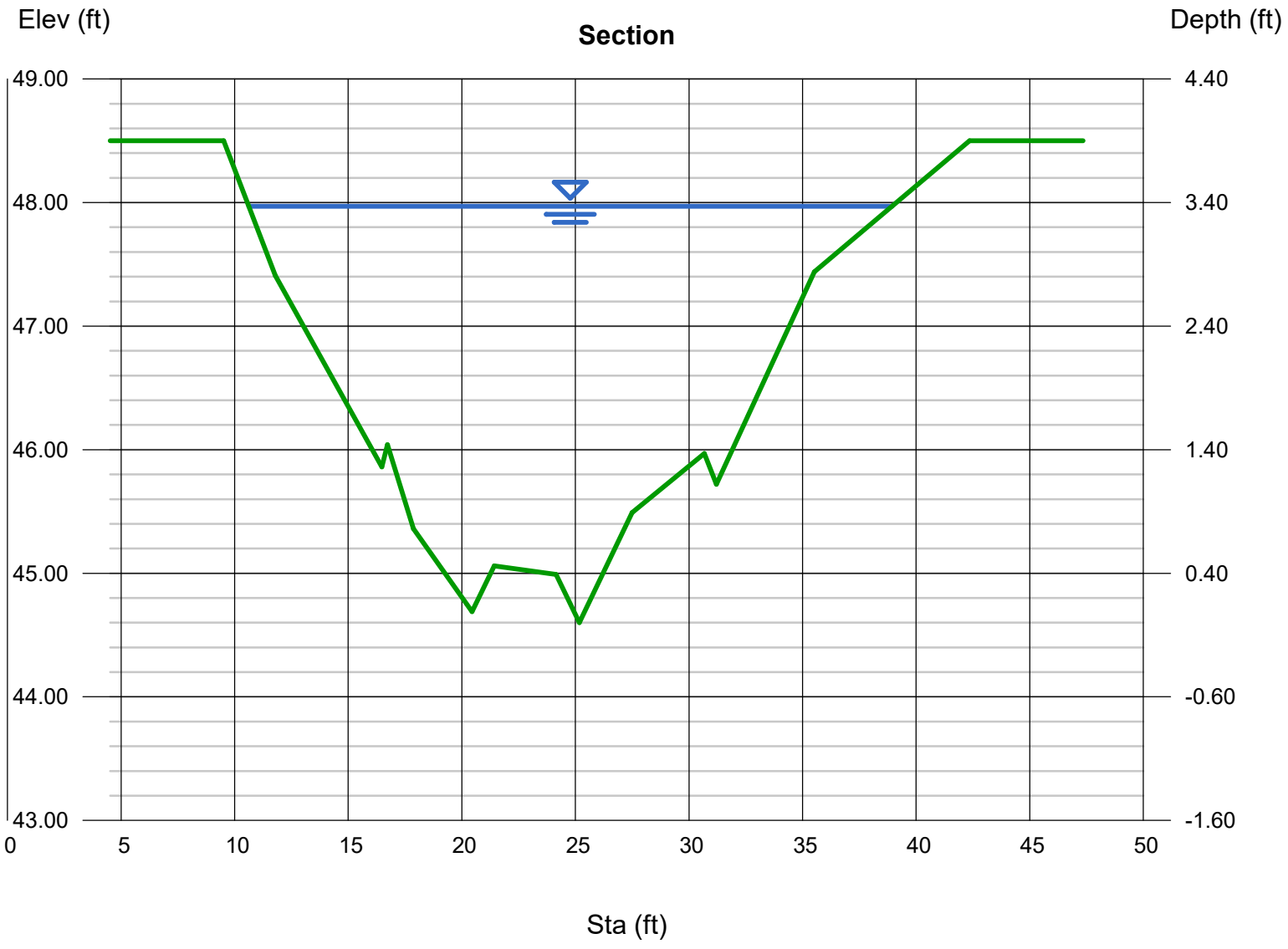
Compute by:	Known Q
Known Q (cfs)	= 311.00

Highlighted

Depth (ft)	= 3.37
Q (cfs)	= 311.00
Area (sqft)	= 53.52
Velocity (ft/s)	= 5.81
Wetted Perim (ft)	= 29.79
Crit Depth, Yc (ft)	= 2.94
Top Width (ft)	= 28.31
EGL (ft)	= 3.89

(Sta, El, n)-(Sta, El, n)...

(9.52, 48.50)-(11.79, 47.41, 0.035)-(16.48, 45.86, 0.035)-(16.73, 46.04, 0.035)-(17.87, 45.36, 0.035)-(20.45, 44.69, 0.035)-(21.43, 45.06, 0.035)
-(24.15, 44.99, 0.035)-(25.17, 44.60, 0.035)-(27.50, 45.49, 0.035)-(30.68, 45.97, 0.035)-(31.21, 45.72, 0.035)-(35.52, 47.44, 0.035)-(42.35, 48.50, 0.035)



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, May 27 2025

Hay Creek Proposed Cross Section @ Upstream End Bridge Culvert

User-defined

Invert Elev (ft)	= 44.60
Slope (%)	= 0.86
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 312.70

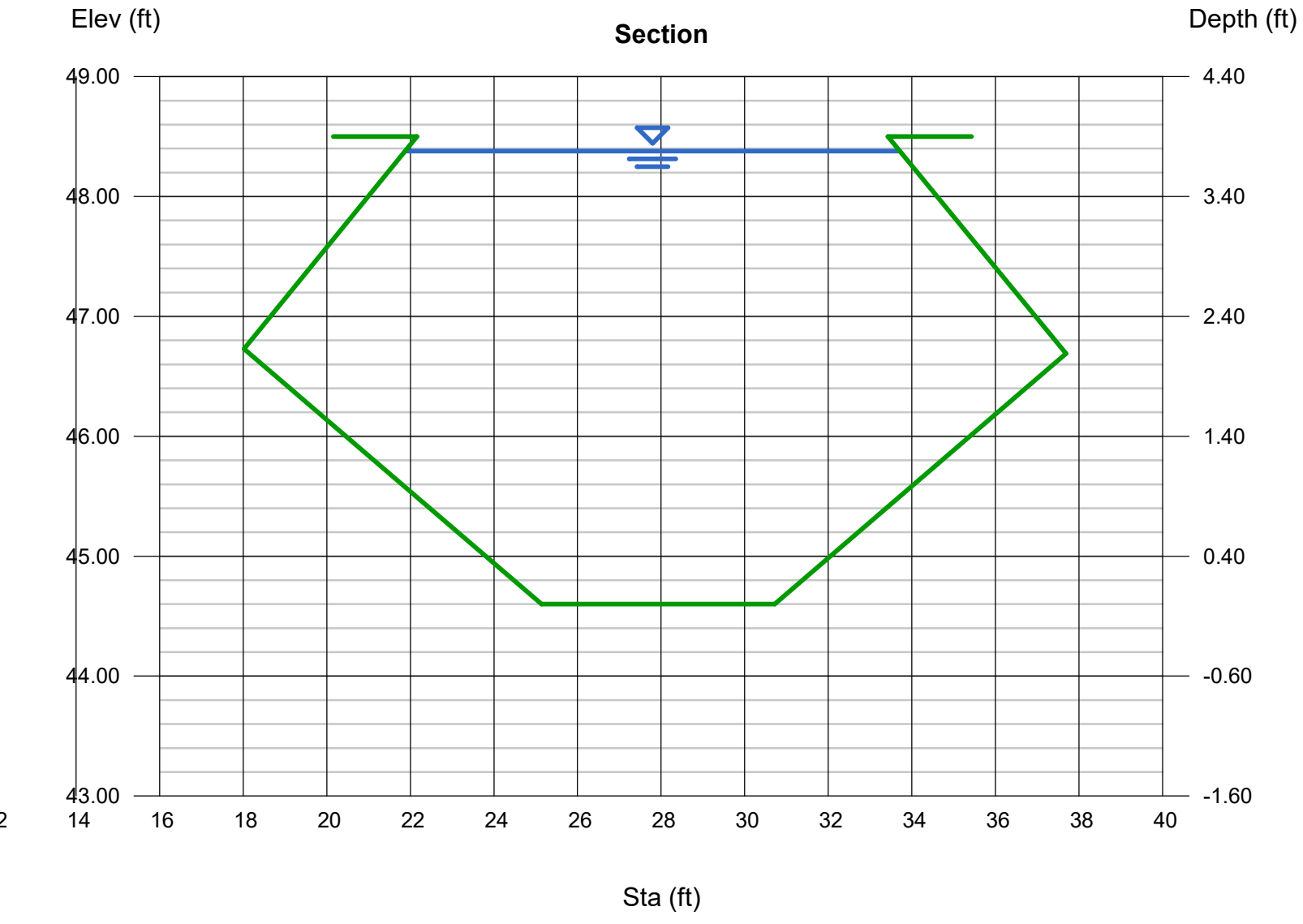
Highlighted

Depth (ft)	= 3.78
Q (cfs)	= 312.70
Area (sqft)	= 52.94
Velocity (ft/s)	= 5.91
Wetted Perim (ft)	= 28.81
Crit Depth, Yc (ft)	= 2.69
Top Width (ft)	= 11.83
EGL (ft)	= 4.32

(Sta, El, n)-(Sta, El, n)...

(22.16, 48.50)-(18.02, 46.73, 0.035)-(25.14, 44.60, 0.035)-(30.72, 44.60, 0.035)-(37.69, 46.69, 0.035)-(33.43, 48.50, 0.035)

21'-7" x 4'-11" 3-sided Aluminum Box Culvert
HW/D = 3.77/4.92 = 0.77



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Mar 11 2025

Hay Creek Existing Cross Section @ Downstream End Bridge Culvert

User-defined

Invert Elev (ft)	= 44.35
Slope (%)	= 1.00
N-Value	= 0.035

Calculations

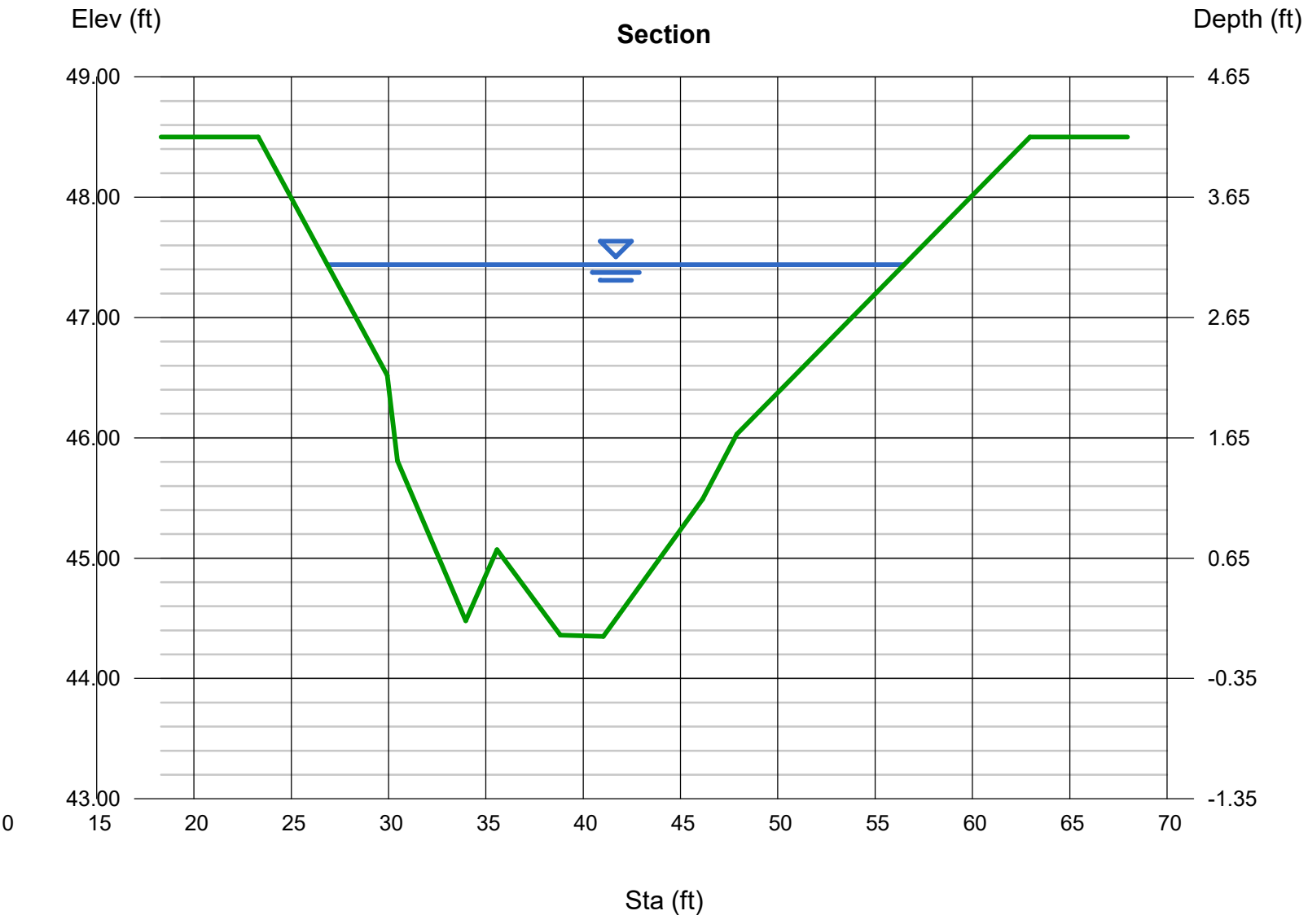
Compute by:	Known Q
Known Q (cfs)	= 311.00

Highlighted

Depth (ft)	= 3.09
Q (cfs)	= 311.00
Area (sqft)	= 51.96
Velocity (ft/s)	= 5.98
Wetted Perim (ft)	= 30.88
Crit Depth, Yc (ft)	= 2.78
Top Width (ft)	= 29.63
EGL (ft)	= 3.65

(Sta, El, n)-(Sta, El, n)...

(23.31, 48.50)-(29.94, 46.52, 0.035)-(30.46, 45.81, 0.035)-(33.96, 44.48, 0.035)-(35.57, 45.07, 0.035)-(38.82, 44.36, 0.035)-(41.04, 44.35, 0.035)
-(46.14, 45.49, 0.035)-(47.89, 46.03, 0.035)-(62.96, 48.50, 0.035)



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, May 27 2025

Hay Creek Proposed Cross Section @ Downstream End Bridge Culvert

21'-7" x 4'-11" 3-sided Aluminum Box Culvert

User-defined

Invert Elev (ft)	= 44.35
Slope (%)	= 1.30
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 312.70

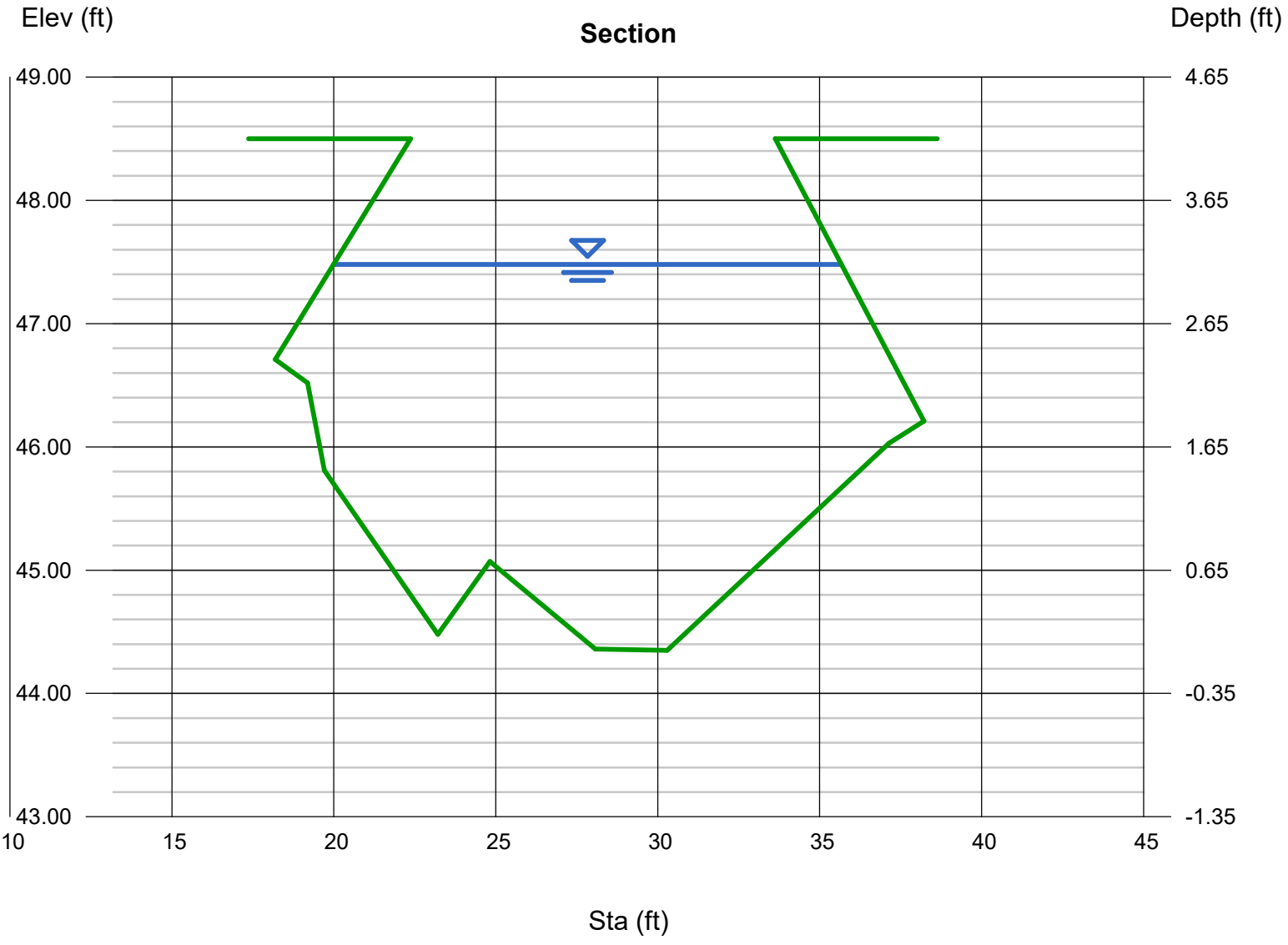
Highlighted

Depth (ft)	= 3.13
Q (cfs)	= 312.70
Area (sqft)	= 44.85
Velocity (ft/s)	= 6.97
Wetted Perim (ft)	= 25.85
Crit Depth, Yc (ft)	= 2.70
Top Width (ft)	= 15.69
EGL (ft)	= 3.89

(Sta, El, n)-(Sta, El, n)...

(22.37, 48.50)-(18.19, 46.71, 0.035)-(19.19, 46.52, 0.035)-(19.71, 45.81, 0.035)-(23.21, 44.48, 0.035)-(24.82, 45.07, 0.035)-(28.07, 44.36, 0.035) -(30.29, 44.35, 0.035)-(37.14, 46.03, 0.035)-(38.22, 46.21, 0.035)-(33.63, 48.50, 0.035)

Channel expected to be stable to 7 fps due to cohesive soils and vegetation. Channel armored for 15' downstream w/ buried type L soil riprap in the case that erosion does occur.



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, May 27 2025

Hay Creek Existing Cross Section 2 @ Downstream End Bridge Culvert

cross section is just downstream of proposed buried soil riprap

User-defined

Invert Elev (ft)	= 44.20
Slope (%)	= 1.30
N-Value	= 0.050

Calculations

Compute by:	Known Q
Known Q (cfs)	= 312.70

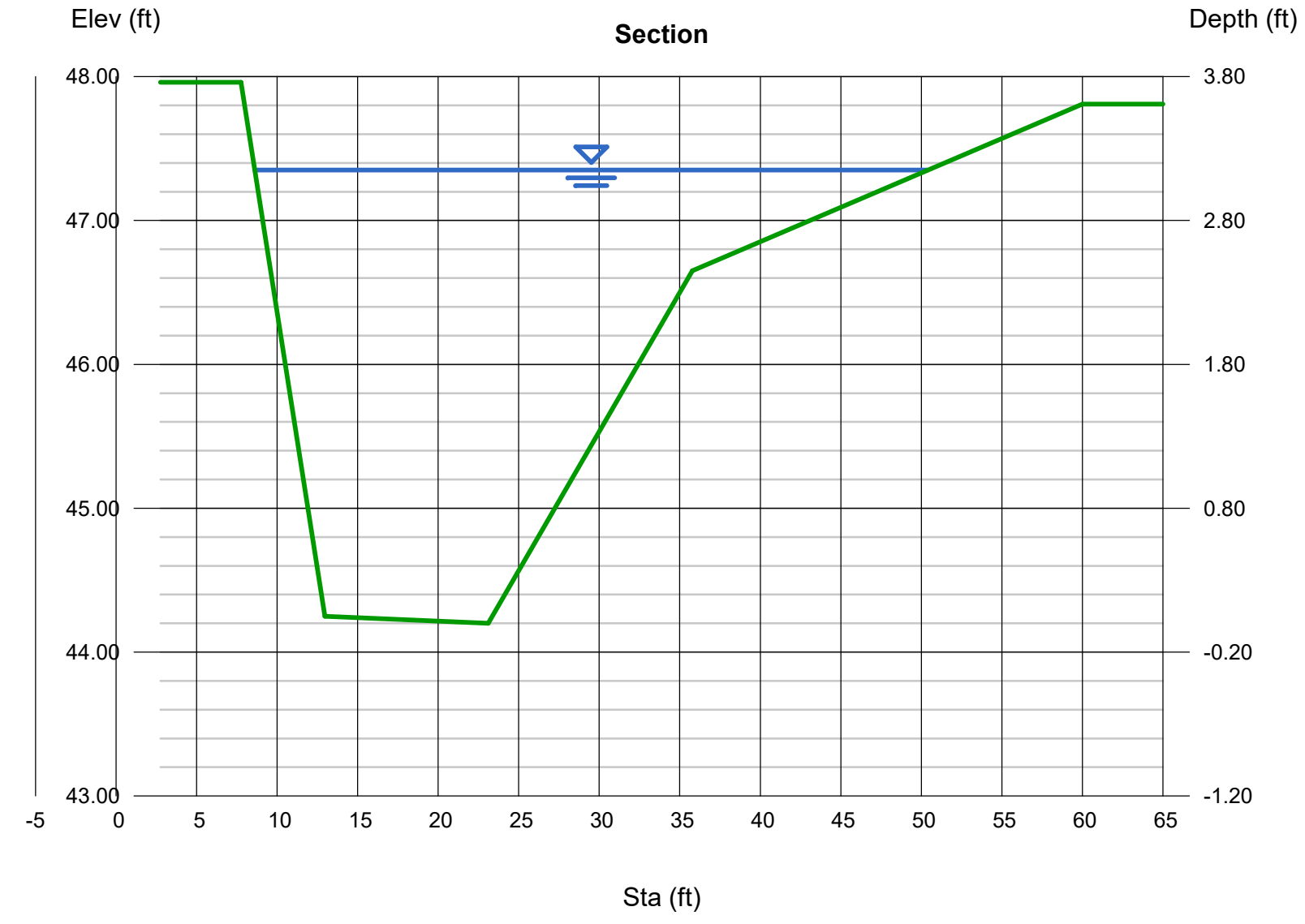
Highlighted

Depth (ft)	= 3.15
Q (cfs)	= 312.70
Area (sqft)	= 67.94
Velocity (ft/s)	= 4.60
Wetted Perim (ft)	= 43.02
Crit Depth, Yc (ft)	= 2.40
Top Width (ft)	= 41.78
EGL (ft)	= 3.48

(Sta, El, n)-(Sta, El, n)...

(7.76, 47.96)-(12.97, 44.25, 0.050)-(23.11, 44.20, 0.050)-(35.78, 46.65, 0.050)-(60.00, 47.81, 0.050)

Channel is stable with proposed design flows



culvert outlet protection calculation

3.2.1 Riprap Apron

This section addresses the use of riprap for erosion protection downstream of conduit and culvert outlets. Refer to the *Open Channels* chapter for additional information on applications for and placement of riprap. Those criteria will be useful in design of erosion protection for conduit outlets. When incorporating a drop into the outfall use Figure 9-40 or 9-41.

Rock Size
The procedure for determining the required riprap size downstream of a conduit outlet is in Section 3.2.3.

Configuration of Riprap Apron
Figure 9-34 illustrates typical riprap protection of culverts at conduit outlets.

Extent of Protection
The length of the riprap protection downstream from the outlet depends on the degree of protection desired. If it is necessary to prevent all erosion, the riprap must extend until the velocity decreases to an acceptable value. The acceptable major event velocity is set at 5 ft/sec for non-cohesive soils and at 7 ft/sec for erosion resistant soils. The rate at which the velocity of a jet from a conduit outlet decreases is not well known. The procedure recommended here assumes the rate of decrease in velocity is related to the angle of lateral expansion, θ, of the jet. The velocity is related to the expansion factor, $(1/(2\tan\theta))$, which can be determined directly using Figure 9-35 or Figure 9-36, by assuming that the expanding jet has a rectangular shape:

$$L_p = \left(\frac{1}{2\tan\theta}\right)\left(\frac{A_t}{Y_t} - W\right)$$

1/(2*tan(45)) = .5

(58.92/3.1)-21 = -1.99

Equation 9-11

Where:

L_p = length of protection (ft) LP = 0.5*-1.99 = -1

W = width of the conduit (ft, use diameter for circular conduits)

Y_t = tailwater depth (ft)

θ = the expansion angle of the culvert flow

and:

$$A_t = \frac{Q}{V}$$

At = 311/5.3 = 58.92

Equation 9-12

Where:

Q = design discharge (cfs)

V = the allowable non-eroding velocity in the downstream channel (ft/sec)

A_t = required area of flow at allowable velocity (ft^2)

In certain circumstances, Equation 9-11 may yield unreasonable results. Therefore, in no case should L_p be less than 3H or 3D, nor does L_p need to be greater than 10H or 10D whenever the Froude parameter, $Q/WH^{1.5}$ or $Q/D^{2.5}$, is less than 8.0 or 6.0, respectively. Whenever the Froude parameter is greater than these maximums, increase the maximum L_p required by ¼ D_c or ¼ H for circular or rectangular (box) culverts, respectively, for each whole number by which the Froude parameter is greater than 8.0 or 6.0, respectively.

312.3/21*5^1.5 = 1.32, use 3H

Once L_p has been determined, the width of the riprap protection at the furthest downstream point should be verified. This dimension is labeled "T" on Figure 9-34. The first step is to solve for θ using the results from Figure 9-35 or 9-36:

$$\theta = \tan^{-1}\left(\frac{1}{2(\text{ExpansionFactor})}\right) \qquad \text{Equation 9-13}$$

Where:

Expansion Factor = determined using Figure 9-35 or 9-36

T is then calculated using the following equation:

$$T = 2(L_p \tan\theta) + W \qquad \text{Equation 9-14}$$

Riprap installed to entire wetted perimeter for 3H, T varies

Multiple Conduit Installations

The procedures outlined in this section can be used to design outlet erosion protection for multi-barrel culvert installations by replacing the multiple barrels with a single hydraulically equivalent hypothetical rectangular conduit. The dimensions of the equivalent conduit may be established as follows:

1. Distribute the total discharge, Q, among the individual conduits. Where all the conduits are hydraulically similar and identically situated, the flow can be assumed to be equally distributed; otherwise, the flow through each barrel must be computed.

2. Compute the Froude parameter $Q_i/D_{ci}^{2.5}$ (circular conduit) or $Q_i/W_iH_i^{1.5}$ (rectangular conduit), where the subscript i indicates the discharge and dimensions associated with an individual conduit.

3. If the installation includes dissimilar conduits, select the conduit with the largest value of the Froude parameter to determine the dimensions of the equivalent conduit.

4. Make the height of the equivalent conduit, H_{eq}, equal to the height, or diameter, of the selected individual conduit.

5. The width of the equivalent conduit, W_{eq}, is determined by equating the Froude parameter from the selected individual conduit with the Froude parameter associated with the equivalent conduit, $Q/W_iH_{eq}^{1.5}$.

APPENDIX D – WATER QUALITY & DETENTION

FOR INFORMATION ONLY - GRASS BUFFERS ARE NOT REQUIRED, TOTAL DISUTRBANCE IS < 1 ACRE

Design Procedure Form: Runoff Reduction

UD-BMP (Version 3.07, March 2018) — **Sheet 1 of 1**

Designer:	NQJ
Company:	ALL TERRAIN ENGINEERING
Date:	March 20, 2025
Project:	Hidden Creek Estates
Location:	EL PASO COUNTY

SITE INFORMATION (User Input in Blue Cells)

WQCV Rainfall Depth = 0.60 inches

Depth of Average Runoff Producing Storm, d_6 = 0.43 inches (for Watersheds Outside of the Denver Region, Figure 3-1 in USDCM Vol. 3)

Area Type	UIA:RPA	UIA:RPA
Area ID	Basin 3	Basin 4
Downstream Design Point ID	2	2
Downstream BMP Type	None	None
DCIA (ft^2)	--	--
UIA (ft^2)	7,392	7,432
RPA (ft^2)	6,000	4,000
SPA (ft^2)	--	--
HSG A (%)	0%	0%
HSG B (%)	100%	100%
HSG C/D (%)	0%	0%
Average Slope of RPA (ft/ft)	0.320	0.044
UIA:RPA Interface Width (ft)	452.00	42.00

UIA = access road imperviousness only

CALCULATED RUNOFF RESULTS

Area ID	Basin 3	Basin 4
UIA:RPA Area (ft^2)	13,392	11,432
L / W Ratio	0.07	6.48
UIA / Area	0.5520	0.6501
Runoff (in)	0.00	0.00
Runoff (ft^3)	0	0
Runoff Reduction (ft^3)	308	310

CALCULATED WQCV RESULTS

Area ID	Basin 3	Basin 4
WQCV (ft^3)	308	310
WQCV Reduction (ft^3)	308	310
WQCV Reduction (%)	100%	100%
Untreated WQCV (ft^3)	0	0

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

Downstream Design Point ID	2	2
DCIA (ft^2)	0	0
UIA (ft^2)	14,824	14,824
RPA (ft^2)	10,000	10,000
SPA (ft^2)	0	0
Total Area (ft^2)	24,824	24,824
Total Impervious Area (ft^2)	14,824	14,824
WQCV (ft^3)	618	618
WQCV Reduction (ft^3)	618	618
WQCV Reduction (%)	100%	100%
Untreated WQCV (ft^3)	0	0

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

Total Area (ft^2)	49,648
Total Impervious Area (ft^2)	29,648
WQCV (ft^3)	618
WQCV Reduction (ft^3)	618
WQCV Reduction (%)	100%
Untreated WQCV (ft^3)	0

APPENDIX E – REFERENCE MATERIAL

1. @ Existing bridge location (proposed crossing location), looking north

2. Approximately 100’ upstream of eastern propoerty line (looking east)

3. East end of property, looking west

4. Typical vegetation (south of existing Barn, looking north)

COMPOSITE % IMPERVIOUS CALCULATIONS - PROPOSED CONDITIONS

Subdivision: Hidden Creek Estates
Location: El Paso County

Project Name: Hidden Creek Estates
Project No.: 24008.00
Calculated By: NQJ
Checked By:
Date: 9/13/24

.68 acres of ROW removed for Fee calculation

		Gravel Drives				Paved				Roofs				5-acre Lots (10% max imp.)				Lawns/Pasture				Weighted C_5 & C_{100}		Basins Total
Basin ID	Total Area (ac)	C_5	C_{100}	Area (ac)	% Imp.	C_5	C_{100}	Area (ac)	% Imp.	C_5	C_{100}	Area (ac)	% Imp.	C_5	C_{100}	Area (ac)	% Imp.	C_5	C_{100}	Area (ac)	% Imp.	C_5	C_{100}	Weighted
1	3.86	0.59	0.70	0.18	80.0%	0.90	0.96	0.00	100.0%	0.73	0.81	0.06	90.0%	0.14	0.40	0.00	10.0%	0.08	0.35	3.62	0.0%	0.11	0.37	5.1%
2	10.07	0.59	0.70	0.00	80.0%	0.90	0.96	0.00	100.0%	0.73	0.81	0.00	90.0%	0.14	0.40	7.32	10.0%	0.08	0.35	2.75	0.0%	0.12	0.39	7.3%
3	5.35	0.59	0.70	0.28	80.0%	0.90	0.96	0.06	100.0%	0.73	0.81	0.09	90.0%	0.14	0.40	3.75	10.0%	0.08	0.35	1.17	0.0%	0.17	0.42	13.8%
4	9.12	0.59	0.70	0.20	80.0%	0.90	0.96	0.00	100.0%	0.73	0.81	0.00	90.0%	0.14	0.40	5.59	10.0%	0.08	0.35	3.33	0.0%	0.13	0.39	7.9%
Total	**28.40**																							**8.4%**

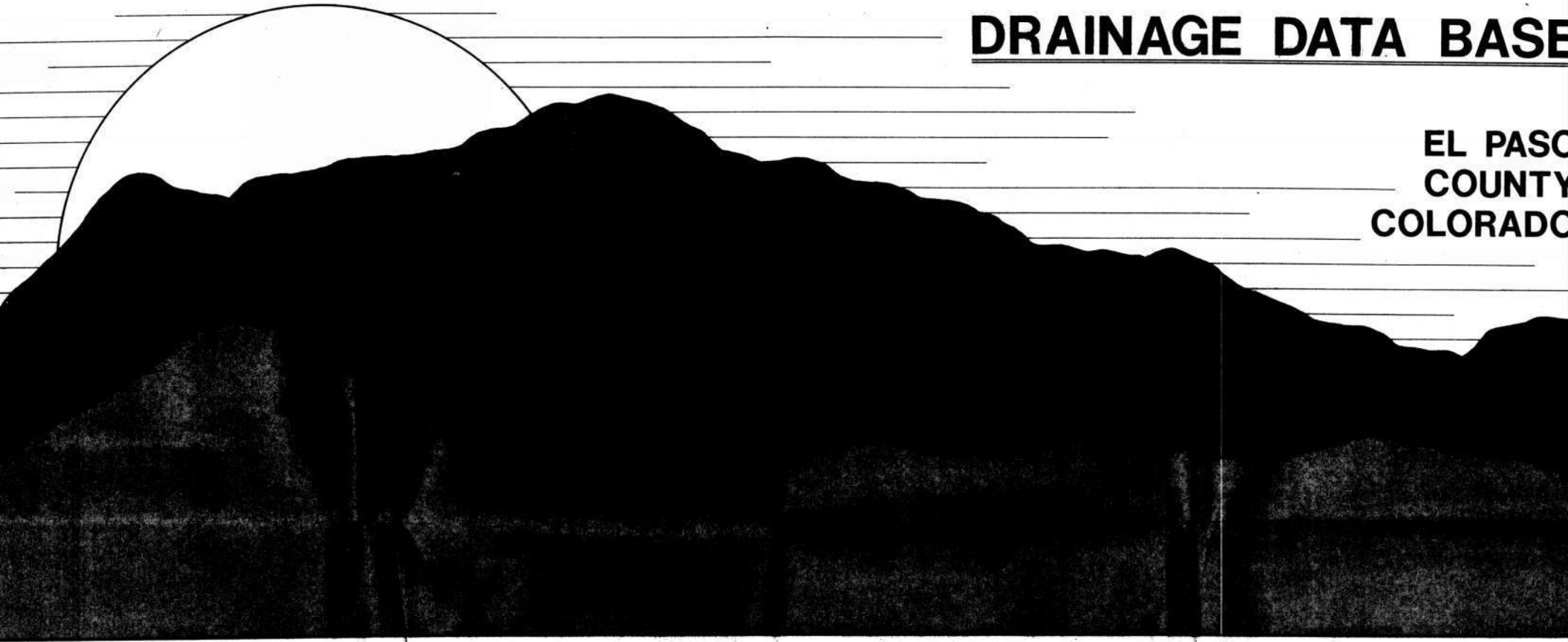
Off-site impervious areas not included (Hay Creek Road ROW improvements)

Total on-site imperviouness

0.084 * 28.40 ac = 2.39 impervious acres
Drainage Fee = $15,959/imp. acre
Total Fee Calculated = 2.39 * $15,959 = $38,071.79
25% reduction (low density lots) = .75* $38,071.79 = $28,553.84

DRAINAGE DATA BASE

EL PASO COUNTY COLORADO



DRAINAGE BASIN IDENTIFICATION AND FEE ESTIMATION MAPS

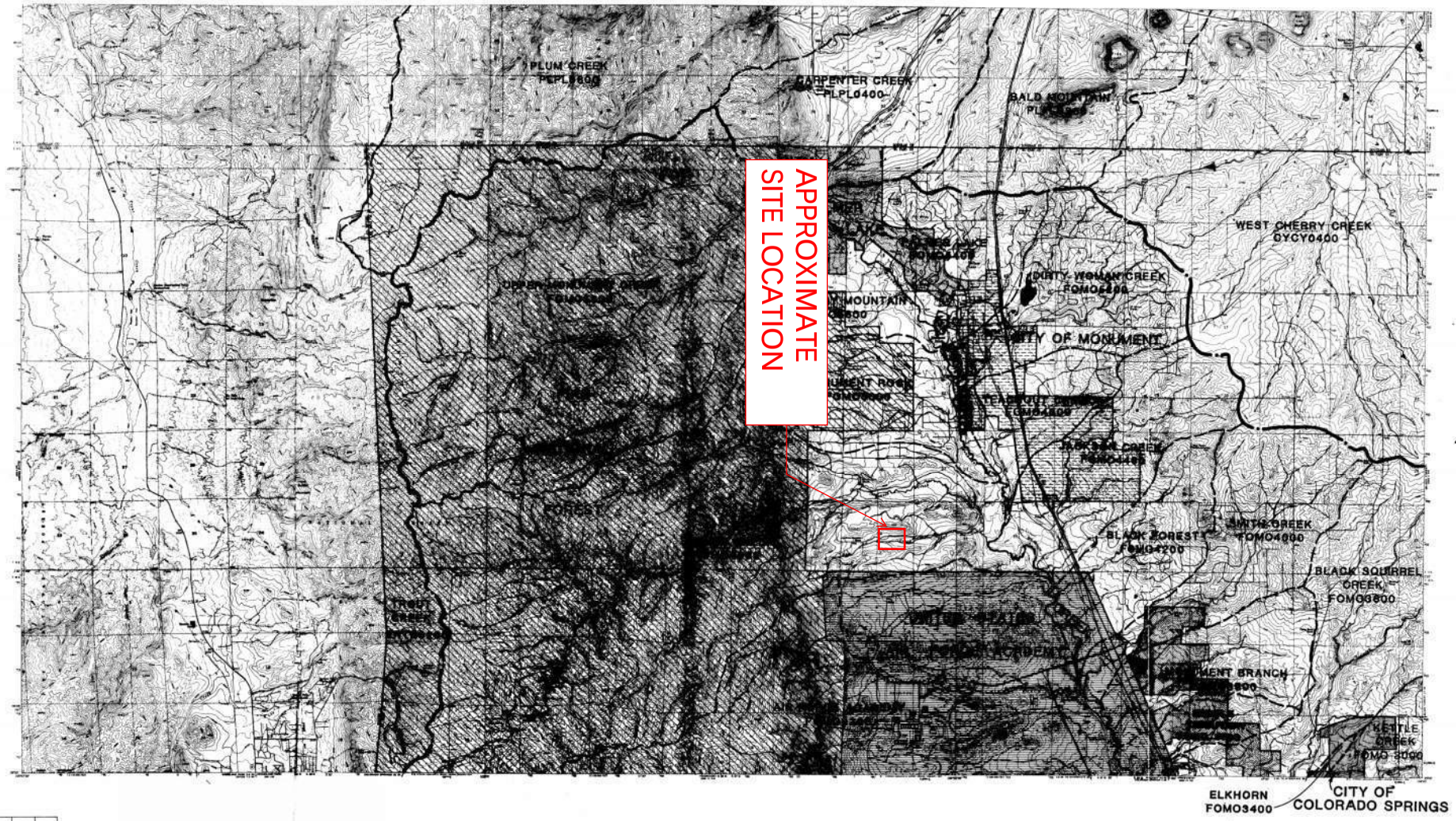
VOLUME II

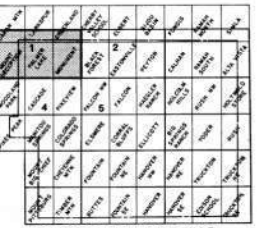
LEGEND

- HYDROLOGIC REGION BOUNDARY
- MAJOR BASIN BOUNDARY
- BASIN BOUNDARY
- STREAM
- COUNTY BOUNDARY
- SAND CREEK — BASIN NAME
- FOFO4000 — BASIN NUMBER
- CITY OF COLORADO SPRINGS
- CITY OF MONUMENT
- CITY OF PALMER LAKE
- CITY OF MANITOU SPRINGS
- CITY OF FOUNTAIN
- PIKE NATIONAL FOREST
- MILITARY RESERVATION

MULLER ENGINEERING COMPANY, INC.
CONSULTING ENGINEERS
7000 WEST FOURTEENTH AVENUE
LAKEWOOD, COLORADO 80215
(303) 232-9340

DRAWING INDEX





USGS QUADRANGLE MAP
AND BASIN MAP INDEX

7.5 MINUTE USGS QUADRANGLE MAPS

DAKAN MOUNTAIN	MOUNT DECEPTION
LARKSPUR	PALMER LAKE
GREENLAND	MONUMENT

MULLER ENGINEERING COMPANY, INC.
CONSULTING ENGINEERS
7000 WEST FOURTEENTH AVENUE
LAKEWOOD, COLORADO 80215
(303) 232-9340

DESIGNED	JTW, BAD	DATE	4/88
DRAWN	BMG	DATE	4/88
CHECKED	LAM	DATE	4/88
REVISED	FOR/JTW	DATE	12-1K

EL PASO COUNTY, COLORADO
Department of Transportation
3170 CENTURY STREET, COLORADO SPRINGS, COLORADO 80907

DRAINAGE AREA
IDENTIFICATION STUDY

DRAINAGE BASIN
MAP NO. 1

Drawing No
Sheet 3
MEC Proje

FINAL DRAINAGE REPORT

for

Hay Creek Ranch

Prepared for:
El Paso County
Department of Public Works
Engineering Division

On Behalf of:

Hay Creek, LLC

Prepared by:

Matrix Design Group, Inc.
Integrated Design Solutions
Infrastructure Engineering
Community Development
Program Management

2925 Professional Place, Suite 202
Colorado Springs, Colorado 80904
(719) 575-0100
fax (719) 575-0208

March 28, 2003

R:\01.054.001\Drainage\03-2003DR.doc

Engineer's Statement:

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

SEAL

Jay S. Peters
Registered Professional Engineer
State of Colorado
No. 35068

Developer's Statement:

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

Hay Creek, LLC.
Business Name

By: _____
Title: Member
Address: 3045 Hay Creek Road
Colorado Springs, CO
80921

El Paso County:

Filed in accordance with Section 51.1 of the El Paso Land Development Code, as amended.

_____ 5-23-03
County Engineer/Director Date

Conditions:

3.0 Drainage Design Criteria

3.1 Development Criteria

Matrix Design Group (Matrix) planned the stormwater system based on the criteria presented in the City of Colorado Springs and El Paso County Drainage Criteria Manual, 1987, revised in 1994. The system is planned to not adversely impact off site flows, or aggravate existing stormwater related off site problems.

3.2 Hydrologic Criteria

Matrix conducted the hydrologic analyses based on the information presented in the City of Colorado Springs and El Paso County Drainage Criteria Manual, 1987, revised 1994.

Major Basin Hydrology

Flows for the Hay Creek Basin were analyzed using the National Resource Conservation Service (NRCS, Previously the Soil Conservation Service, or SCS) hydrograph method. We used the TR-20 computer model developed by the NRCS, which applies the unit hydrograph method presented in the DCM.

We evaluated the 10- and 100-year 24-hour storm events. The 24-hour rainfall depths are 3.0 and 4.4 inches for the 10- and 100-year storm events, respectively. We used the NRCS 24-hour Type IIa rainfall distribution (see Figure 5) to simulate storm events. Hydrologic information used in the analysis is summarized in Table 1. Detailed calculations are presented in Appendix A, as well as the TR-20 input and output.

The Hay Creek Watershed area was planimetered from the USGS quadrangle map. Land cover was obtained from aerial photos of the watershed. Soils information was obtained from the El Paso County Soil Survey and the 1992 Monument Creek Drainage Basin Study. The Curve Numbers (CN) used in the hydrologic analysis match the projected values presented in the Monument Creek Study (see Tables A.1 and A.2, and Figure A.2 in Appendix A).

We estimated the time of concentration using the standard NRCS method. The Hay Creek channel has a slope of about 4% for most of its length, and 33% for about 4,700 feet. See Figure A.2 and Table A.3 in Appendix A illustrating the time of concentration calculations. Matrix used the normal depth method to estimate the average channel velocity used in the NRCS peak flow estimates. The channel slopes used in the calculations were derived from contours on the USGS maps. The velocities used in the NRCS calculations are reasonable.

Table 1
NRCS Hydrograph Method Parameters

10-year 24-Hr Rainfall Depth (in)	100-Year 24-Hr Rainfall Depth (in)	Rainfall Distribution Type	Watershed Area (sq. mi.)	Time of Concentration (hrs)	CN
3.0	4.4	IIa 24-Hour	2.85	2.07	75

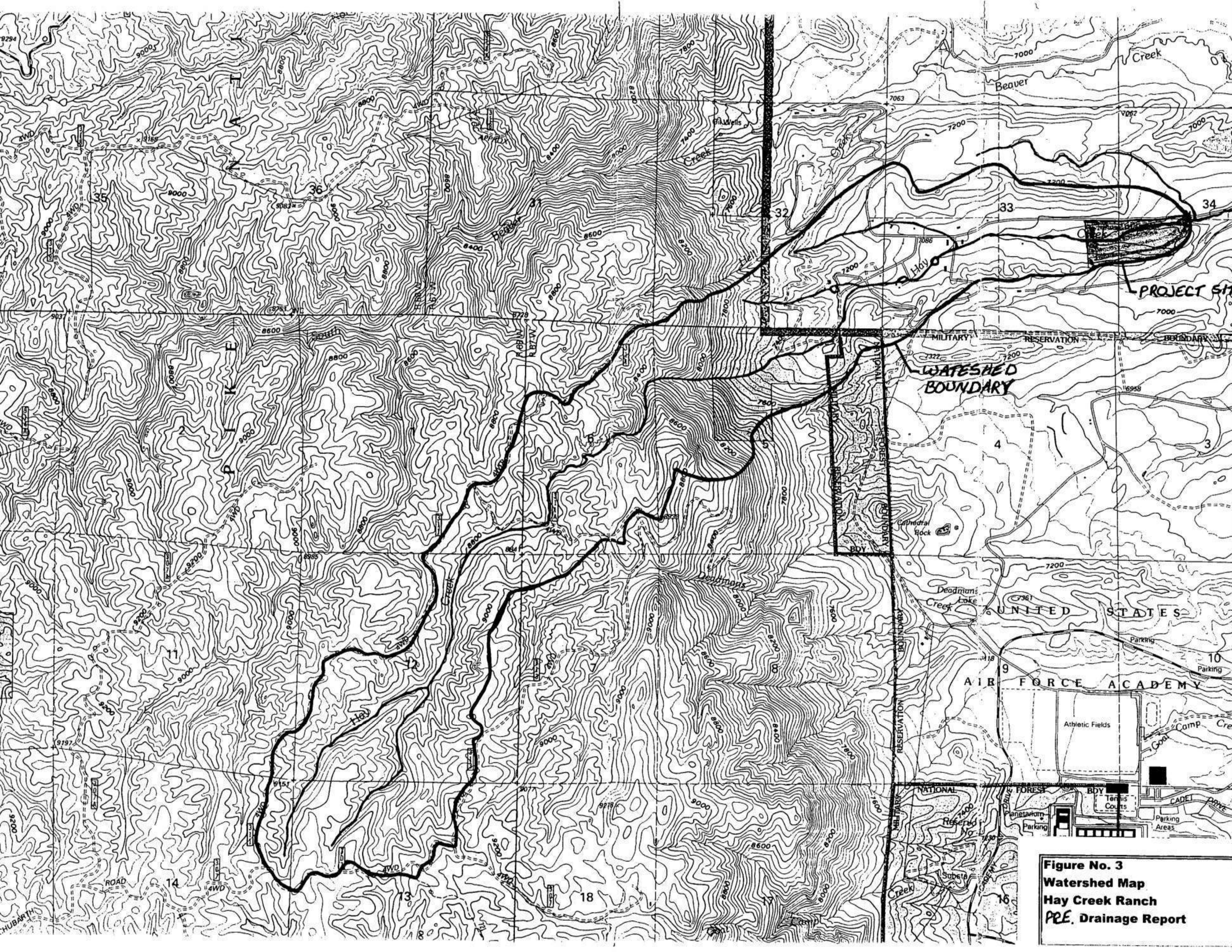


Figure No. 3
Watershed Map
Hay Creek Ranch
PRE. Drainage Report

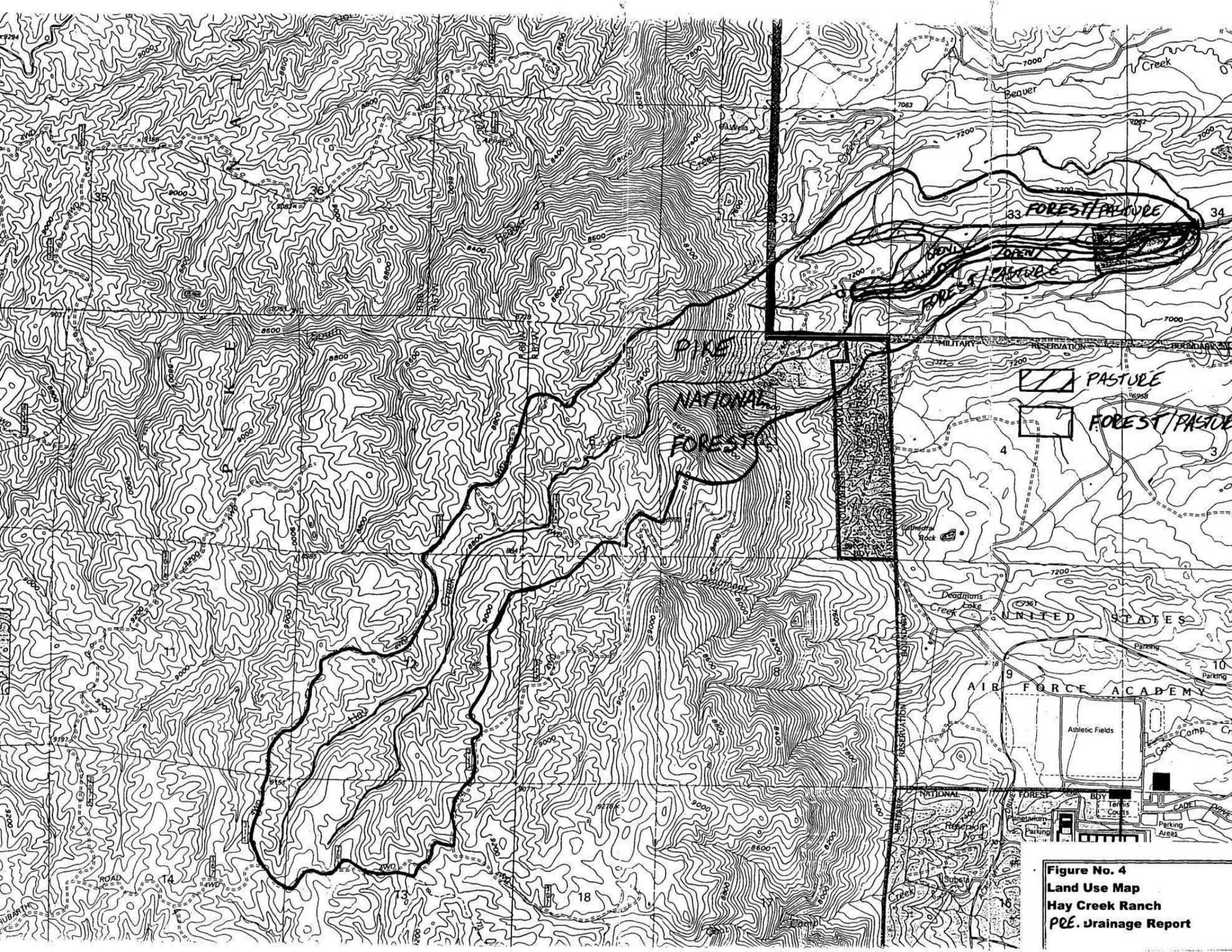


Figure No. 4
Land Use Map
Hay Creek Ranch
PRE. Drainage Report

FIGURE 5

TR-55

Custom Rainfall Distribution

C:\Program Files\WinTR55\RainfallDistributions\IA.tbl

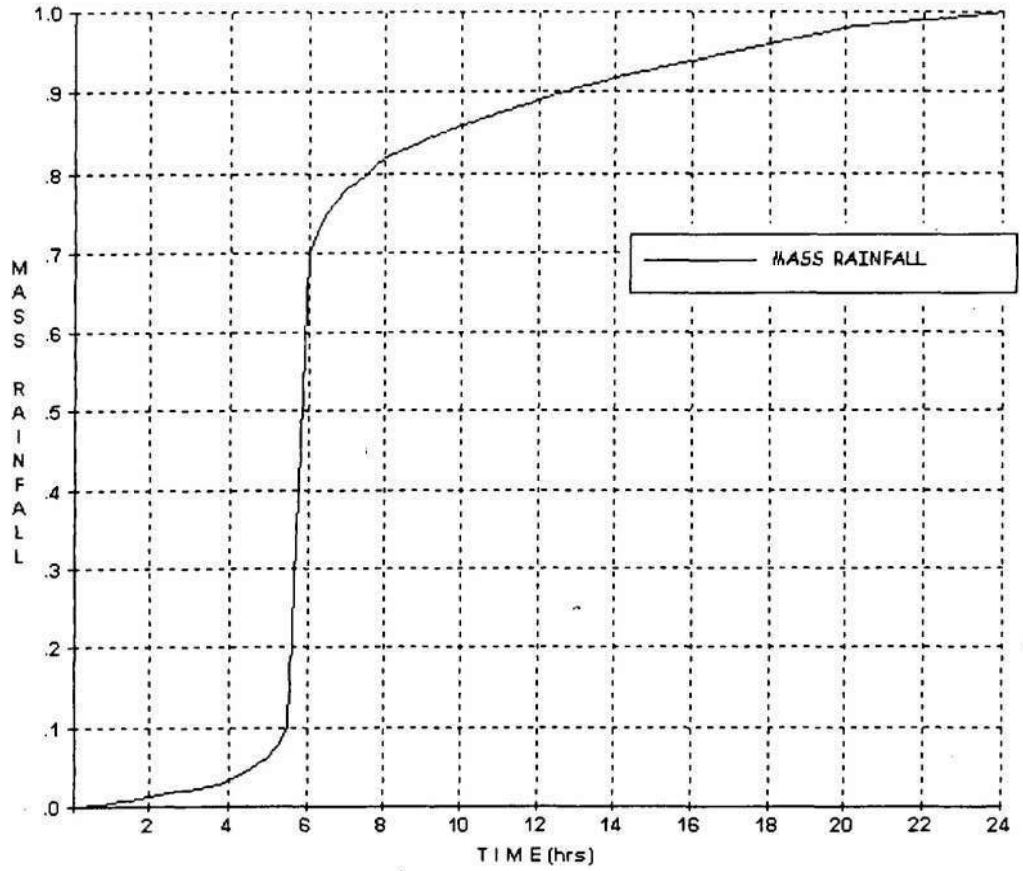


FIGURE 6

TR-55 Output Hydrograph

Project: Hay Creek Ranch
Subarea: (Outlet) Storms: 10-Yr, 100-Yr

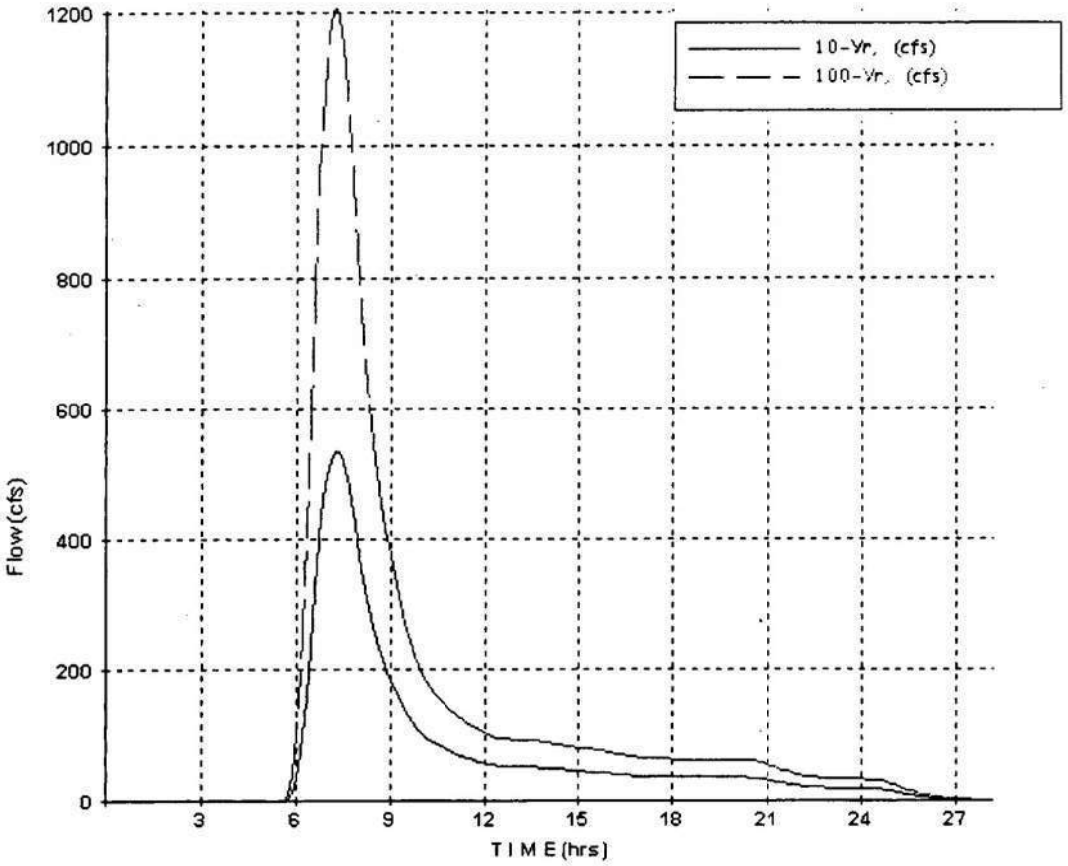


Table A.1
CN Value Computations
Monument Creek Basin Study Comparison
Projected Values

Subbasin	Area	Percent Soil Type			Land Cover	CN
		B	D	% check		
HYC157	0.72	0%	100%	100%	Forest	80
HYC159	0.64	0%	100%	100%	Forest	80
HYC161	0.73	34%	66%	100%	Forest	75
HYC163	0.73	100%	0%	100%	Forest, Pasture	65
Total Area	2.82				Average CN Value	74.8

Note: Hay Creek CN values used in the Hay Creek Ranch Hydrology match those used in the Monument Creek Drainage Basin Study. See Table A.2

TABLE A.2

Jay Peters

Hay Creek Ranch
Hay Creek Hydrology
El Paso County, Colorado

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use		Hydrologic Soil Group	Sub-Area Area (mi^2)	Curve Number
Hay Creek	Pasture, grassland or range	(fair)	B	.72	69
	Woods	(fair)	B	.28	60
	Woods	(fair)	D	1.85	79
	Total Area / Weighted Curve Number			2.85	75

Jay Peters

TABLE A.3

Hay Creek Ranch
Hay Creek Hydrology
El Paso County, Colorado

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)
Hay Creek							
SHEET	100	0.1200					0.221
SHALLOW	1000	0.1000	0.050				0.054
CHANNEL	24000					4.000	1.667
CHANNEL	4700					10.000	0.131
					Time of Concentration		2.07

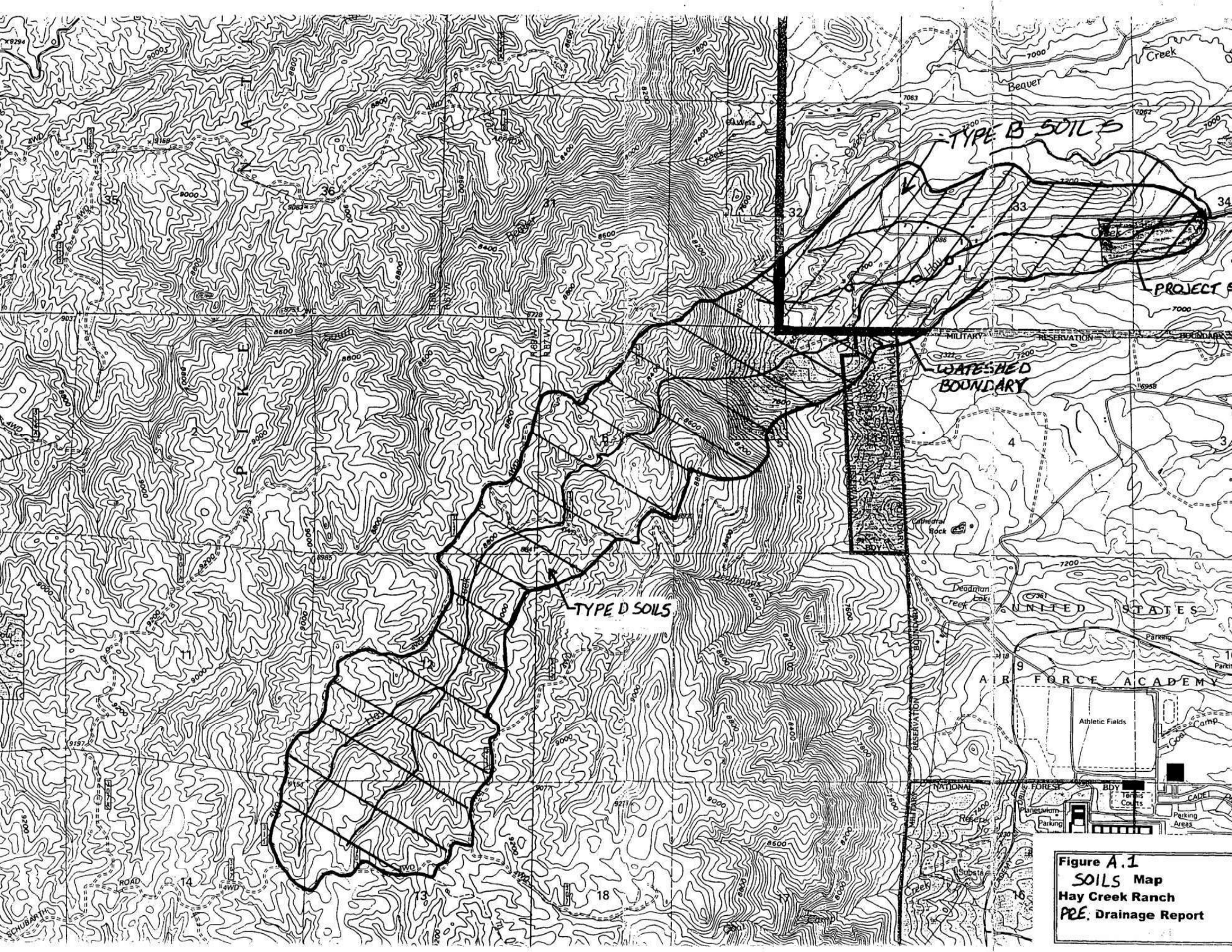


Figure A.1
SOILS Map
Hay Creek Ranch
PRE. Drainage Report

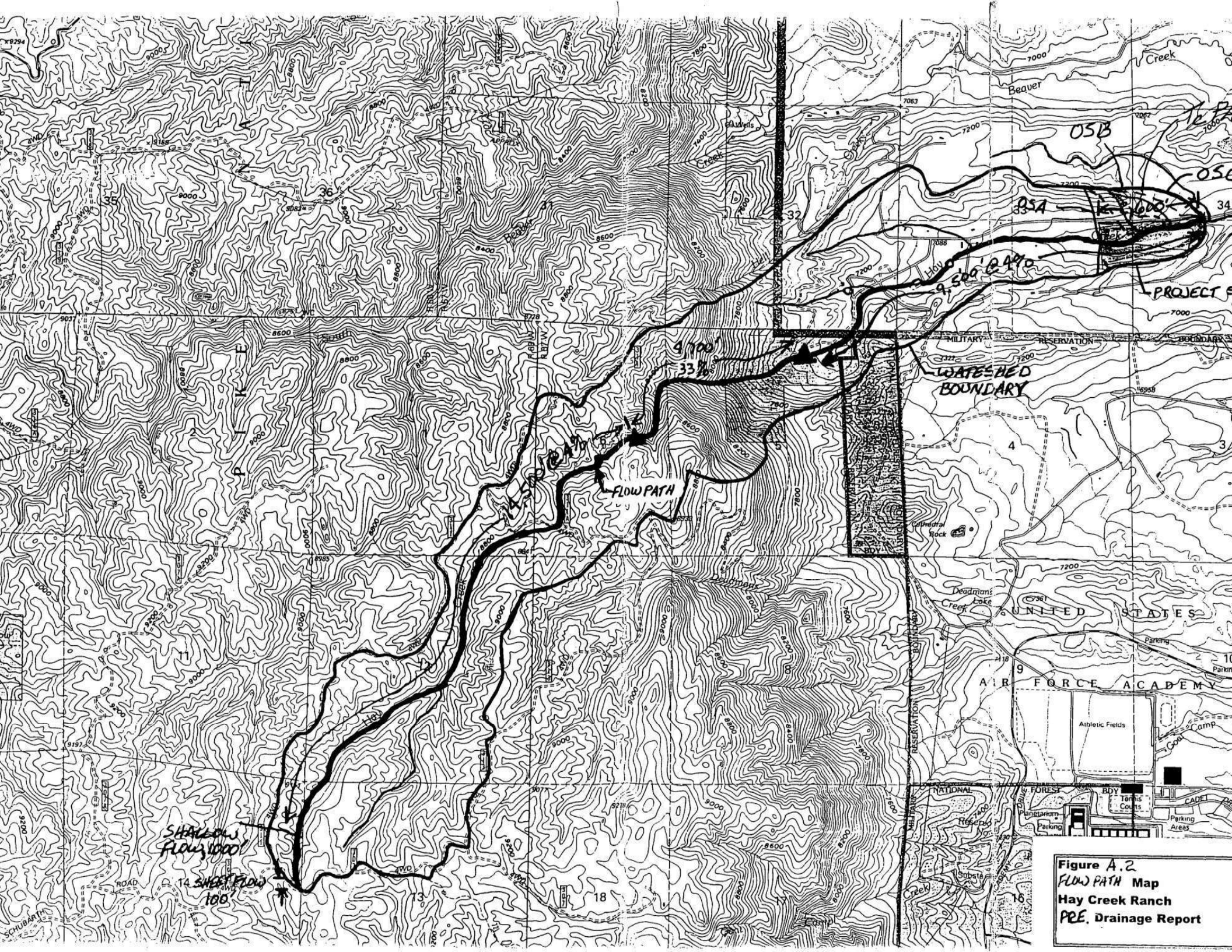


Figure A.2
FLOW PATH **Map**
Hay Creek Ranch
PRE. **Drainage Report**

2025 Financial Assurance Estimate Form
(with pre-plat construction)

Updated: 2/2025

PROJECT INFORMATION

Project Name:HAY CREEK SUBDIVISION	Date: 05/27/2025	PCD File No.SF-253

Description	Quantity	Units	Unit Cost		Total	(with Pre-Plat Construction) % Complete	Remaining	
SECTION 1 - GRADING AND EROSION CONTROL (Construction and Permanent BMPs)								
Earthwork								*
less than 1,000; $5,300 min	150.	CY	$ 10.00	=	$ 5,300.00		$ 5,300.00	*
1,000-5,000; $8,000 min		CY	$ 7.50	=	$ -		$ -	*
5,001-20,000; $30,000 min		CY	$ 6.50	=	$ -		$ -	*
20,001-50,000; $100,000 min		CY	$ 4.50	=	$ -		$ -	*
50,001-200,000; $175,000 min		CY	$ 3.00	=	$ -		$ -	*
greater than 200,000; $500,000 min		CY	$ 2.50	=	$ -		$ -	*
Permanent Erosion Control Blanket	1723.	SY	$ 9.50	=	$ 16,368.50		$ 16,368.50	*
Permanent Seeding (inc. noxious weed mgmnt.) & Mulching	.4	AC	$ 2,169.00	=	$ 867.60		$ 867.60	*
Permanent Pond/BMP (provide engineer's estimate)		EA		=	$ -		$ -	*
					$ -		$ -	*
					$ -		$ -	*
[insert items not listed but part of construction plans]					$ -		$ -	*
Concrete Washout Basin	1.	EA	$ 1,260.00	=	$ 1,260.00		$ 1,260.00	
Inlet Protection		EA	$ 233.00	=	$ -		$ -	
Rock Check Dam		EA	$ 700.00	=	$ -		$ -	
Safety Fence		LF	$ 3.00	=	$ -		$ -	
Sediment Basin		EA	$ 2,466.00	=	$ -		$ -	
Sediment Trap		EA	$ 578.00	=	$ -		$ -	
Silt Fence	1088.	LF	$ 4.00	=	$ 4,352.00		$ 4,352.00	
Slope Drain		LF	$ 46.00	=	$ -		$ -	
Straw Bale		EA	$ 35.00	=	$ -		$ -	
Straw Wattle/Rock Sock (for CIP)	32.	LF	$ 9.00	=	$ 288.00		$ 288.00	
Surface Roughening		AC	$ 289.00	=	$ -		$ -	
Temporary Erosion Control Blanket		SY	$ 4.00	=	$ -		$ -	
Temporary Seeding and Mulching		AC	$ 1,927.00	=	$ -		$ -	
Vehicle Tracking Control	1.	EA	$ 3,316.00	=	$ 3,316.00		$ 3,316.00	
				=	$ -		$ -	
				=	$ -		$ -	
				=	$ -		$ -	
[insert items not listed but part of construction plans]				=	$ -		$ -	
MAINTENANCE (35% of Construction BMPs)				=	$ 2,784.60		$ 2,784.60	
* - Subject to defect warranty financial assurance. A minimum of 20% shall be retained until final acceptance (MAXIMUM OF 80% COMPLETE ALLOWED)		**Section 1 Subtotal**		**=**	**$ 34,536.70**		**$ 34,536.70**	
SECTION 2 - PUBLIC IMPROVEMENTS *								
ROADWAY IMPROVEMENTS								*
Construction Traffic Control		LS		=	$ -		$ -	*
Aggregate Base Course (135 lbs/cf)	76.	Tons	$ 40.00	=	$ 3,040.00		$ 3,040.00	*
Aggregate Base Course (135 lbs/cf)		CY	$ 71.00	=	$ -		$ -	*
Asphalt Pavement (3" thick)		SY	$ 19.00	=	$ -		$ -	*
Asphalt Pavement (4" thick)	222.	SY	$ 27.00	=	$ 5,994.00		$ 5,994.00	*
Asphalt Pavement (6" thick)		SY	$ 41.00	=	$ -		$ -	*
Asphalt Pavement (147 lbs/cf) __" thick		Tons	$ 123.00	=	$ -		$ -	*
Raised Median, Paved		SF	$ 12.00	=	$ -		$ -	*
Regulatory Sign/Advisory Sign	1.	EA	$ 421.00	=	$ 421.00		$ 421.00	*
Guide/Street Name Sign	1.	EA	$ 421.00	=	$ 421.00		$ 421.00	*
Epoxy Pavement Marking		SF	$ 18.00	=	$ -		$ -	*
Thermoplastic Pavement Marking		SF	$ 32.00	=	$ -		$ -	*
Barricade - Type 3		EA	$ 278.00	=	$ -		$ -	*
Delineator - Type I		EA	$ 33.00	=	$ -		$ -	*
Curb and Gutter, Type A (6" Vertical)		LF	$ 41.00	=	$ -		$ -	*
Curb and Gutter, Type B (Median)		LF	$ 41.00	=	$ -		$ -	*
Curb and Gutter, Type C (Ramp)		LF	$ 41.00	=	$ -		$ -	*
4" Sidewalk (common areas only)		SY	$ 67.00	=	$ -		$ -	*
5" Sidewalk		SY	$ 83.00	=	$ -		$ -	*
6" Sidewalk		SY	$ 101.00	=	$ -		$ -	*
8" Sidewalk		SY	$ 134.00	=	$ -		$ -	*
Pedestrian Ramp		EA	$ 1,608.00	=	$ -		$ -	*
Cross Pan, local (8" thick, 6' wide to include return)		LF	$ 85.00	=	$ -		$ -	*
Cross Pan, collector (9" thick, 8' wide to include return)		LF	$ 128.00	=	$ -		$ -	*
Curb Opening with Drainage Chase		EA	$ 2,070.00	=	$ -		$ -	*
Guardrail Type 3 (W-Beam)		LF	$ 70.00	=	$ -		$ -	*
Guardrail Type 7 (Concrete)		LF	$ 101.00	=	$ -		$ -	*
Guardrail End Anchorage		EA	$ 2,936.00	=	$ -		$ -	*
Guardrail Impact Attenuator		EA	$ 5,270.00	=	$ -		$ -	*
Sound Barrier Fence (CMU block, 6' high)		LF	$ 110.00	=	$ -		$ -	*
Sound Barrier Fence (panels, 6' high)		LF	$ 112.00	=	$ -		$ -	*
Electrical Conduit, Size =		LF	$ 24.00	=	$ -		$ -	*
Traffic Signal, (provide engineer's estimate)		EA		=	$ -		$ -	*
Survey Monumentation		EA	$ 1,200.00	=	$ -		$ -	*

PROJECT INFORMATION			
Project Name:HAY CREEK SUBDIVISION		**Date: 05/27/2025**	**PCD File No.SF-253**

Description	Quantity	Units	Unit Cost		Total	(with Pre-Plat Construction) % Complete	Remaining	
				=	$ -		$ -	*

PROJECT INFORMATION

Project Name:HAY CREEK SUBDIVISION	Date: 05/27/2025	PCD File No.SF-253

Description	Quantity	Units	Unit Cost		Total	(with Pre-Plat Construction) % Complete	Remaining	
				=	$ -		$ -	*
				=	$ -		$ -	*
[insert items not listed but part of construction plans]				=	$ -		$ -	*
STORM DRAIN IMPROVEMENTS								*
Concrete Box Culvert (M Standard), Size (W x H)		LF		=	$ -		$ -	*
18" Reinforced Concrete Pipe		LF	$ 88.00	=	$ -		$ -	*
24" Reinforced Concrete Pipe		LF	$ 105.00	=	$ -		$ -	*
30" Reinforced Concrete Pipe		LF	$ 132.00	=	$ -		$ -	*
36" Reinforced Concrete Pipe		LF	$ 162.00	=	$ -		$ -	*
42" Reinforced Concrete Pipe		LF	$ 216.00	=	$ -		$ -	*
48" Reinforced Concrete Pipe		LF	$ 263.00	=	$ -		$ -	*
54" Reinforced Concrete Pipe		LF	$ 344.00	=	$ -		$ -	*
60" Reinforced Concrete Pipe		LF	$ 402.00	=	$ -		$ -	*
66" Reinforced Concrete Pipe		LF	$ 465.00	=	$ -		$ -	*
72" Reinforced Concrete Pipe		LF	$ 532.00	=	$ -		$ -	*
18" Corrugated Steel Pipe		LF	$ 113.00	=	$ -		$ -	*
24" Corrugated Steel Pipe		LF	$ 130.00	=	$ -		$ -	*
30" Corrugated Steel Pipe		LF	$ 166.00	=	$ -		$ -	*
36" Corrugated Steel Pipe		LF	$ 198.00	=	$ -		$ -	*
42" Corrugated Steel Pipe		LF	$ 228.00	=	$ -		$ -	*
48" Corrugated Steel Pipe		LF	$ 240.00	=	$ -		$ -	*
54" Corrugated Steel Pipe		LF	$ 352.00	=	$ -		$ -	*
60" Corrugated Steel Pipe		LF	$ 379.00	=	$ -		$ -	*
66" Corrugated Steel Pipe		LF	$ 459.00	=	$ -		$ -	*
72" Corrugated Steel Pipe		LF	$ 540.00	=	$ -		$ -	*
78" Corrugated Steel Pipe		LF	$ 621.00	=	$ -		$ -	*
84" Corrugated Steel Pipe		LF	$ 743.00	=	$ -		$ -	*
Flared End Section (FES) RCP Size = (unit cost = 6x pipe unit cost)		EA		=	$ -		$ -	*
Flared End Section (FES) CSP Size = (unit cost = 6x pipe unit cost)		EA		=	$ -		$ -	*
				=	$ -		$ -	*
[insert items not listed but part of construction plans]				=	$ -		$ -	*
End Treatment- Headwall		EA		=	$ -		$ -	*
End Treatment- Wingwall		EA		=	$ -		$ -	*
End Treatment - Cutoff Wall		EA		=	$ -		$ -	*
Curb Inlet (Type R) L=5', Depth < 5'		EA	$ 7,753.00	=	$ -		$ -	*
Curb Inlet (Type R) L=5', 5' ≤ Depth < 10'		EA	$ 10,800.00	=	$ -		$ -	*
Curb Inlet (Type R) L =5', 10' ≤ Depth < 15'		EA	$ 11,673.00	=	$ -		$ -	*
Curb Inlet (Type R) L =10', Depth < 5'		EA	$ 10,669.00	=	$ -		$ -	*
Curb Inlet (Type R) L =10', 5' ≤ Depth < 10'		EA	$ 10,997.00	=	$ -		$ -	*
Curb Inlet (Type R) L =10', 10' ≤ Depth < 15'		EA	$ 13,765.00	=	$ -		$ -	*
Curb Inlet (Type R) L =15', Depth < 5'		EA	$ 13,875.00	=	$ -		$ -	*
Curb Inlet (Type R) L =15', 5' ≤ Depth < 10'		EA	$ 14,873.00	=	$ -		$ -	*
Curb Inlet (Type R) L =15', 10' ≤ Depth < 15'		EA	$ 16,265.00	=	$ -		$ -	*
Curb Inlet (Type R) L =20', Depth < 5'		EA	$ 14,787.00	=	$ -		$ -	*
Curb Inlet (Type R) L =20', 5' ≤ Depth < 10'		EA	$ 16,320.00	=	$ -		$ -	*
Grated Inlet (Type C), Depth < 5'		EA	$ 6,490.00	=	$ -		$ -	*
Grated Inlet (Type D), Depth < 5'		EA	$ 8,017.00	=	$ -		$ -	*
Storm Sewer Manhole, Box Base		EA	$ 16,265.00	=	$ -		$ -	*
Storm Sewer Manhole, Slab Base		EA	$ 8,946.00	=	$ -		$ -	*
Geotextile (Erosion Control)		SY	$ 11.50	=	$ -		$ -	*
Rip Rap, d50 size from 6" to 24"		Tons	$ 112.00	=	$ -		$ -	*
Rip Rap, Grouted		Tons	$ 133.00	=	$ -		$ -	*
Drainage Channel Construction, Size (W x H)		LF		=	$ -		$ -	*
Drainage Channel Lining, Concrete		CY	$ 797.00	=	$ -		$ -	*
Drainage Channel Lining, Rip Rap		CY	$ 156.00	=	$ -		$ -	*
Drainage Channel Lining, Grass		AC	$ 2,054.00	=	$ -		$ -	*
Drainage Channel Lining, Other Stabilization				=	$ -		$ -	*
				=	$ -		$ -	*
				=	$ -		$ -	*
				=	$ -		$ -	*
[insert items not listed but part of construction plans]				=	$ -		$ -	*
* - Subject to defect warranty financial assurance. A minimum of 20% shall be retained until final acceptance (MAXIMUM OF 80% COMPLETE ALLOWED)		**Section 2 Subtotal**		**=**	**$ 9,876.00**		**$ 9,876.00**	*

PROJECT INFORMATION		
Project Name:HAY CREEK SUBDIVISION	**Date: 05/27/2025**	**PCD File No.SF-253**

Description	Quantity	Units	Unit Cost		Total	(with Pre-Plat Construction) % Complete	Remaining
SECTION 3 - COMMON DEVELOPMENT IMPROVEMENTS (Private or District and NOT Maintained by EPC)**							
ROADWAY IMPROVEMENTS							
Aggregate Base Course (135 lbs/cf)	500.	CY	$ 66.00	=	$ 33,000.00		$ 33,000.00
Earthwork - 1,000-5,000;	1400.	CY	$ 6.00	=	$ 8,400.00		$ 8,400.00
				=	$ -		$ -
				=	$ -		$ -
				=	$ -		$ -
				=	$ -		$ -
STORM DRAIN IMPROVEMENTS (Exception: Permanent Pond/BMP shall be itemized under Section 1)							
22' X 5' ALBC	29.	LF	$ 985.00	=	$ 28,565.00		$ 28,565.00
Rip Rap, d50 size from 6" to 24"	42.	TONS	$ 104.00	=	$ 4,368.00		$ 4,368.00
Headwall	2.	EA	$ 3,750.00	=	$ 7,500.00		$ 7,500.00
Wingwall	4.	EA	$ 2,500.00	=	$ 10,000.00		$ 10,000.00
Foundation	1.	LS	$ 10,000.00	=	$ 10,000.00		$ 10,000.00
				=	$ -		$ -
WATER SYSTEM IMPROVEMENTS							
Water Main Pipe (PVC), Size 8"		LF	$ 90.00	=	$ -		$ -
Water Main Pipe (Ductile Iron), Size 8"		LF	$ 105.00	=	$ -		$ -
Gate Valves, 8"		EA	$ 2,599.00	=	$ -		$ -
Fire Hydrant Assembly, w/ all valves		EA	$ 9,228.00	=	$ -		$ -
Water Service Line Installation, inc. tap and valves		EA	$ 1,852.00	=	$ -		$ -
Fire Cistern Installation, complete		EA		=	$ -		$ -
				=	$ -		$ -
[insert items not listed but part of construction plans]				=	$ -		$ -
SANITARY SEWER IMPROVEMENTS							
Sewer Main Pipe (PVC), Size 8"		LF	$ 90.00	=	$ -		$ -
Sanitary Sewer Manhole, Depth < 15 feet		EA	$ 6,136.00	=	$ -		$ -
Sanitary Service Line Installation, complete		EA	$ 1,962.00	=	$ -		$ -
Sanitary Sewer Lift Station, complete		EA		=	$ -		$ -
				=	$ -		$ -
[insert items not listed but part of construction plans]				=	$ -		$ -
LANDSCAPING IMPROVEMENTS (For subdivision specific condition of approval, or PUD)							
		EA		=	$ -		$ -
		EA		=	$ -		$ -
		EA		=	$ -		$ -
		EA		=	$ -		$ -
		EA		=	$ -		$ -
** - Section 3 is not subject to defect warranty requirements		**Section 3 Subtotal**		**=**	**$ 101,833.00**		**$ 101,833.00**

PROJECT INFORMATION		
Project Name:HAY CREEK SUBDIVISION	**Date: 05/27/2025**	**PCD File No.SF-253**

Description	Quantity	Units	Unit Cost		Total	(with Pre-Plat Construction) % Complete	Remaining
AS-BUILT PLANS (Public Improvements inc. Permanent WQCV BMPs)			$ 100.00	=	$ 100.00		$ 100.00
POND/BMP CERTIFICATION (inc. elevations and volume calculations)		LS	$ 500.00	=	$ 500.00		$ 500.00

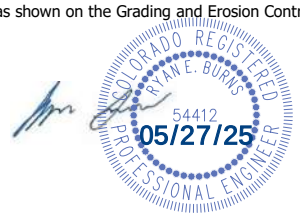
Total Construction Financial Assurance **$ 146,845.70**
(Sum of all section subtotals plus as-builts and pond/BMP certification)

Total Remaining Construction Financial Assurance (with Pre-Plat Construction) **$ 146,845.70**
(Sum of all section totals less credit for items complete plus as-builts and pond/BMP certification)

Total Defect Warranty Financial Assurance **$ 6,482.42**
(20% of all items identified as (*). To be collateralized at time of preliminary acceptance)

Approvals

I hereby certify that this is an accurate and complete estimate of costs for the work as shown on the Grading and Erosion Control Plan and Construction Drawings associated with the Project.



Ryan Burns
Engineer (P.E. Seal Required)

Approved by Owner / Applicant — Date

Approved by El Paso County Engineer / ECM Administrator — Date

APPENDIX F – DRAINAGE MAPS

HIDDEN CREEK ESTATES

EXISTING DRAINAGE MAP

HAY CREEK DRIVE
EX 60.00' ROW
EX EDGE OF ASPHALT
EX EDGE OF ASPHALT
EX HOUSE
EX DIRT DRIVEWAY
EX BARN
EX HORSE DEN
EX FENCE (TYP)
EX1
9.89 | 2.9 | 14.3
APPROXIMATE LOCATION OF BLE STUDY X-SECTION RS = 7599
THALWEG ELEVATION = 6960.43
100-YR WSEL = 6962.63
Depth = 2.20'
HAY CREEK
EX WOODEN BRIDGE
EX 18" CMP CULVERT (PRIVATE)
EX HAY CREEK FLOW
Q100 = 311 CFS (PER BLE STUDY)
BASIN & DESIGN POINT SUMMARY TABLES CALCULATE SITE'S CONTRIBUTION TO TOTAL FLOW OF 311 CFS
APPROXIMATE LOCATION OF BLE STUDY X-SECTION RS = 7101
THALWEG ELEVATION = 6948.73
100-YR WSEL = 6950.46
DEPTH = 1.73'
EX HAY CREEK FLOW
Q100 = 311 CFS
INCLUDES RUNOFF FROM SITE
EX2
19.19 | 4.1 | 27.4
3555 HAY CREEK DRIVE
LOT 1 TIMMINS SUB EXEMPTION
ZONE: RR-5
OWNER: GERARD P. TIMMINS
3255 HAY CREEK ROAD
LOT 9 HAY CREEK RANCH SUB
ZONE: PUD
OWNER: MATTHEW W DUNSTON
3260 SNOW MOUNTAIN HEIGHTS
LOT 8 HAY CREEK RANCH SUB
ZONE: PUD
OWNER: EDWARD P. BEHR
2855 HAY CREEK ROAD
UNPLATTED
ZONE: RR-5
OWNER: RANDALL OLEARY
UNPLATTED
ZONE: RR-5
OWNER: RANDALL OLEARY

LEGEND

	EXISTING	PROPOSED
BOUNDARY LINE		
PROPERTY LINE		
EASEMENT LINE		
RIGHT OF WAY		
CENTERLINE		
STORM SEWER		
SWALE/WATERWAY FLOWLINE		
INDEX CONTOUR	6100	6100
INTERMEDIATE CONTOUR		
FLOW DIRECTION		
BASIN ID	ID / AC / Q5 / Q100	
	DESIGN POINT DESIGNATION: 1	
SUB-BASIN DELINEATION		
OVERLAND FLOW PATH		

EX DRAINAGE CALCS - BASIN SUMMARY TABLE

Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
EX1	9.89	4%	0.09	0.36	37.1	2.9	14.3
EX2	19.19	2%	0.09	0.36	38.5	4.1	27.4

DESIGN POINT SUMMARY TABLE

DP#	$Q_{5\text{-YR}}$	$Q_{100\text{-YR}}$
1*	6.7	39.6
HC	n/a	311.0

* ON-SITE RUNOFF ONLY

N

50 25 0 50 100

ORIGINAL SCALE: 1" = 50'

EX DRAINAGE MAP
HIDDEN CREEK ESTATES
JOB NO. 24008
LOCATION: EPC
03/20/2025
SHEET 1

ALL TERRAIN ENGINEERING

HIDDEN CREEK ESTATES

PROPOSED DRAINAGE MAP

HAY CREEK DRIVE
EX 60.00' ROW
EX EDGE OF ASPHALT
PR. ASPHALT (TYP)
PR. GRASS BUFFER AREA >6,000 SF
EX DIRT DRIVEWAY
EX HORSE DEN
EX FENCE (TYP)
EX BARN
EX HOUSE
PR. PROP LINE (TYP)
Lot 1
5.00 ac
Lot 2
3.54 ac
1
4.54 | 1.5 | 7.6
3
5.35 | 3.2 | 12.2
16 ACCESS DRIVE
W/ 2' SHOULDERS
(GRAVEL)
24.00' ACCESS ESMT
NO-BUILD EASEMENT
NO-BUILD EASEMENT
(CONTIGUOUS W/ ZONE A FLOODPLAIN)
APPROXIMATE LOCATION OF BLE STUDY X-SECTION RS = 7101
THALWEG ELEVATION = 6948.73
100-YR WSEL = 6950.46
DEPTH = 1.73'
HAY CREEK
EX ZONE A
100-YR FLOODPLAIN
APPROXIMATE LOCATION OF BLE STUDY X-SECTION RS = 7599
THALWEG ELEVATION = 6960.43
100-YR WSEL = 6962.63
Depth = 2.20'
CHANNEL XSECTION - PROPOSED UPSTREAM END
CHANNEL XSECTION - EXISTING UPSTREAM XING
CHANNEL XSECTION - PROPOSED DOWNSTREAM XING
CHANNEL XSECTION -EX DOWNSTREAM_2
EX TREES (TYP.)
APPROXIMATE LOCATION OF
BLE STUDY X-SECTION RS = 6599
THALWEG ELEVATION = 6934.46
100-YR WSEL = 6936.84
DEPTH = 2.38'
HAY CREEK FLOW
Q100 = 312.3 CFS*
*Q100 INCLUDES ENTIRE DEVELOPED PROJECT SITE AREA
EX HAY CREEK FLOW
Q100 = 311 CFS*
*Q100 INCLUDES ENTIRE UNDEVELOPED PROJECT SITE AREA
EX WOODEN BRIDGE
(TO BE REMOVED)
EX 18" CMP CULVERT (PRIVATE)
FEMA ZONE A 100-YR FLOODPLAIN
(WIDTH VARIES)
PR 21'-7" x 4'-11"
ALUMINUM BOX CULVERT (ALBC)
W/ HEADWALL & WINGWALL
PR RIPRAP OUTFALL PROTECTION
TYPE L SOIL RIPRAP, 18" DEPTH
PR. GRASS BUFFER AREA >4,000 SF
144.43' ACCESS ESMT
NO-BUILD EASEMENT
(WIDTH VARIES)
PR. PROP LINE (TYP)
R50.00'
Lot 6
5.00 ac
Lot 5
5.00 ac
Lot 4
5.00 ac
Lot 3
5.00 ac
NO-BUILD EASEMENT
NO-BUILD EASEMENT
2
0.07 | 2.9 | 15.0
4
9.12 | 3.0 | 15.3
EX TREES (TYP.)
2855 HAY CREEK ROAD
UNPLATTED
ZONE: RR-5
OWNER: RANDALL OLEARY
UNPLATTED
ZONE: RR-5
OWNER: RANDALL OLEARY
3555 HAY CREEK DRIVE
LOT 1 TIMMINS SUB EXEMPTION
ZONE: RR-5
OWNER: GERARD P. TIMMINS
3255 HAY CREEK ROAD
LOT 9 HAY CREEK RANCH SUB
ZONE: PUD
OWNER: MATTHEW W DUNSTON
3260 SNOW MOUNTAIN HEIGHTS
LOT 8 HAY CREEK RANCH SUB
ZONE: PUD
OWNER: EDWARD P. BEHR

LEGEND

	EXISTING	PROPOSED
BOUNDARY LINE		
PROPERTY LINE		
EASEMENT LINE		
RIGHT OF WAY		
CENTERLINE		
STORM SEWER		
SWALE/WATERWAY FLOWLINE		
INDEX CONTOUR	6100	6100
INTERMEDIATE CONTOUR		
FLOW DIRECTION		
BASIN ID	ID / AC / Q5 / Q100	
	DESIGN POINT DESIGNATION: 1	
SUB-BASIN DELINEATION		
OVERLAND FLOW PATH		

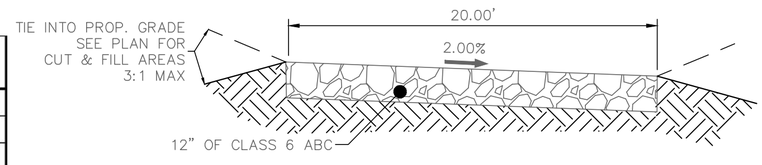
PR DRAINAGE CALCS - BASIN SUMMARY TABLE

Tributary Sub-basin	Area (acres)	Percent Impervious	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
1	4.54	7.0%	0.13	0.39	28.1	1.5	7.6
2	10.07	7.3%	0.12	0.39	34.1	2.9	15.0
3	5.35	16.8%	0.19	0.44	19.6	3.2	12.2
4	9.12	7.9%	0.13	0.39	28.2	3.0	15.3

DESIGN POINT SUMMARY TABLE

DP#	$Q_{5\text{-YR}}$	$Q_{100\text{-YR}}$
1	4.2	21.7
2*	8.6	41.3
HC @ 2	N/A	312.3

*on-site runoff only



20' FIRE ACCESS ROAD
N.T.S.

N

50 25 0 50 100
ORIGINAL SCALE: 1" = 50'

PR DRAINAGE MAP
HIDDEN CREEK ESTATES
JOB NO. 24008
LOCATION: EPC
03/20/2025
SHEET #

ALL TERRAIN ENGINEERING