FINAL DRAINAGE REPORT

for

KINCH MINOR SUBDIVISION

Prepared for:

Paul and Amy Kinch
10805 Milam Road
Colorado Springs, CO 80908

December 6, 2021
Revised July 29, 2022
Revised October 8, 2022

Prepared by:

JPS ENGINEERING

19 E. Willamette Avenue
Colorado Springs, CO 80903
(719)-477-9429
www.jpsengr.com

JPS Project No. 072101
PCD File No.: MS-224

KINCH SUBDIVISION
FINAL DRAINAGE REPORT
TABLE OF CONTENTS

PAGE

DRAINAGE STATEMENT i

I. GENERAL LOCATION AND DESCRIPTION 1

II. DRAINAGE BASINS AND SUB-BASINS 2

III. DRAINAGE DESIGN CRITERIA 3

IV. DRAINAGE PLANNING FOUR STEP PROCESS 4

V. GENERAL DRAINAGE RECOMMENDATIONS 4

VI. DRAINAGE FACILITY DESIGN 5

VII. EROSION / SEDIMENT CONTROL 8

VIII. STORMWATER DETENTION AND WATER QUALITY 8

IX. COST ESTIMATE AND DRAINAGE FEES 9

X. SUMMARY 9

APPENDICES

APPENDIX A Soils Information
APPENDIX B Hydrologic Calculations
APPENDIX C Hydraulic Calculations

APPENDIX D Figures
Figure FIRM Floodplain Map
Sheet EX1 Historic Drainage Plan
Sheet D1 Developed Drainage Plan

DRAINAGE STATEMENT

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 liability caused by negligent acts, errors or omissions on my part in preparing this report.

COLORADO REGISTERED PROFESSIONAL ENGINEER 29891

10/29/22

John P. Schwab, P.E. #29891

Developer's Statement:

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

PAUL AND AMY KINCH

By: 12/05/22

Printed Name: Paul and Amy Kinch, Owners Date
10805 Milam Road, Colorado Springs, CO 80908

El Paso County's Statement

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

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

Conditions:

I. GENERAL LOCATION AND DESCRIPTION

A. Background

Kinch Subdivision is a proposed 4-lot rural residential minor subdivision located in the Black Forest area of northern El Paso County, Colorado. The minor subdivision will create four residential lots on the existing 29.1-acre parcel (El Paso County Assessor's Number 62240-00-011) located on the east side of Milam Road, generally northeast of the intersection of Milam Road and Old Ranch Road. The existing residence on the west side of the property will be platted as Lot 1, and three additional lots will be platted with access from a new public road (Kinch Court) extending south from Sierra Ridge Trail. The site disturbance for the proposed subdivision improvements is anticipated to be less than one acre.

B. Scope

This report will provide a summary of site drainage issues impacting the proposed residential minor subdivision. The report will analyze upstream drainage patterns, site-specific developed drainage patterns, and impacts on downstream facilities. This report is based on the guidelines and criteria presented in the El Paso County Drainage Criteria Manual, and the report is intended to fulfill the requirements for a "Final Drainage Report" in support of the Final Plat process for this property.

C. Site Location and Description

Kinch Minor Subdivision is located in the Southwest Quarter of Section 24, Township 12 South, Range 66 West of the 6th Principal Meridian. The 29.1-acre parcel is currently a partially developed rural residential property with an existing residence on the west side of the property. The property is zoned RR-5 (rural residential), allowing for 5-acre minimum lot sizes, and the proposed minor subdivision is fully in conformance with the existing zoning of the site. Access to Lot 1 will be provided by the existing driveway connection to Sierra Ridge Trail, and access to the new Lots 2-4 will be provided by a new public road (Kinch Court) extending south into the site from Sierra Ridge Trail. The proposed public road extension was planned during previous development of the adjoining Timber Ridge Estates Subdivision, which included dedication of public right-of-way to this property.

The site is bordered by developed rural residential properties on all sides. Milam Road is an improved, asphalt-paved public street along the west boundary of the Lot 1 driveway, and the north boundary of the property adjoins existing platted 5-acre residential lots within the Timber Ridge Estates Subdivision. The east boundary of the property adjoins an unplatted 40-acre rural residential parcel (Zoned RR-5). The west and south boundaries of the property adjoin several developed 5-acre lots (Zoned RR-5), including lots platted as part of Sanford Subdivision Filing No. 3 along the west boundary, and Lieberg Subdivision along the south boundary of the property.

The site is located in the Kettle Creek Drainage Basin, and surface drainage from this site generally sheet flows westerly to existing drainage swales, ultimately flowing to the Kettle Creek Channel downstream of this site. The terrain is gently rolling with average grades ranging from 2 to 10 percent. Ground elevations within the site range from approximately 7,330 feet above mean sea level at the eastern property boundary down to approximately 7,240 at the western property boundary.

D. General Soil Conditions

According to the Custom Soil Resource Report for this site (see details in Appendix A) provided by the Natural Resources Conservation Service (NRCS), on-site soils are predominately comprised of "Type 41: Kettle gravelly loamy sand." These soils are classified as hydrologic soils group "B" (moderate infiltration rate).

E. References

City of Colorado Springs & El Paso County "Drainage Criteria Manual," revised October 31, 2018.

City of Colorado Springs "Drainage Criteria Manual, Volumes 1 and 2," revised October 31, 2018.

El Paso County "Engineering Criteria Manual," revised December 13, 2016.

FEMA, Flood Insurance Rate Map (FIRM) Number 08041C0526G, December 7, 2018.

JPS Engineering, Inc., "Preliminary & Final Drainage Report for Timber Ridge Estates," October 23, 2007 (approved by County 10/24/07).

II. DRAINAGE BASINS AND SUB-BASINS

A. Major Basin Description

The majority of the proposed subdivision property lies within the Kettle Creek Drainage Basin (FOM 03000) as classified by El Paso County. Drainage from this site flows to existing natural drainage swales draining westerly. There is no Drainage Basin Planning Study (DBPS) on file for this drainage basin.

A small fringe along the south edge of the property is located within the Pine Creek Drainage Basin (FOM 02800). No significant subdivision development impact is anticipated within the Pine Creek Basin.

B. Floodplain Impacts

This site is not impacted by any FEMA 100-year floodplain limits. The delineated floodplain limits in vicinity of the site are shown in FEMA Flood Insurance Rate Map (FIRM) Number 08041C0526G, dated December 7, 2018 (see FIRMette exhibit in Appendix C).

C. Sub-Basin Description

The existing drainage basins lying in and around the proposed development are depicted on Figure EX1 (Appendix C). The property has been delineated as four on-site developed drainage basins (C2, C3, H, and I), flowing to existing drainage swales at the north and west boundaries of the site.

The site is impacted by off-site drainage areas on the east side of the property. Off-site Basins OC1 and OI1 have been delineated as the off-site areas of unplatted rural parcels which sheet flow westerly into Basins C2 and I.

Developed runoff in this minor subdivision will generally continue to follow historic paths.

III. DRAINAGE DESIGN CRITERIA

A. Development Criteria Reference

The adjoining Timber Ridge Estates Subdivision along the north boundary of this site was platted in 2007. The "Preliminary & Final Drainage Report for Timber Ridge Estates" by JPS Engineering dated October 23, 2007 accounted for historic upstream drainage entering the south and east boundaries of the Timber Ridge Estates site.

B. Hydrologic Criteria

The tributary drainage basins impacting this site are all less than 100 acres, so Rational Method Hydrology procedures were utilized for calculation of peak flows. Rational Method hydrologic calculations were based on the following assumptions:

• Design storm (minor)	5-year	
• Design storm (major)	100-year	
• Rainfall Intensities	El Paso County I-D-F Curve	
• Hydrologic soil type	B	
	C5	C100
• Runoff Coefficients - undeveloped: Meadow / Forest areas	0.08	0.35
• Runoff Coefficients - developed: Proposed Building / Pavement Areas	0.90	0.96

(see composite runoff coefficient calculations in Appendix B)

Hydrologic calculations are enclosed in Appendix B, and peak design flows are identified on the drainage plan drawings.

IV. DRAINAGE PLANNING FOUR STEP PROCESS

El Paso County Drainage Criteria require drainage planning to include a Four Step Process for receiving water protection that focuses on reducing runoff volumes, treating the water quality capture volume (WQCV), stabilizing drainageways, and implementing long-term source controls. As stated in DCM Volume 2, the Four Step Process is applicable to all new and re-development projects with construction activities that disturb 1 acre or greater or that disturb less than 1 acre but are part of a larger common plan of development. The Four Step Process has been implemented as follows in the planning of this project:

Step 1: Employ Runoff Reduction Practices

- Minimize Impacts: The proposed minor rural residential subdivision is an inherently low impact development. The proposed 5-acre minimum lot sizes will significantly minimize drainage impacts in comparison to higher density development alternatives.

Step 2: Stabilize Drainageways

- There are no major drainageways within the site. Vegetated buffer strips will be maintained between developed areas of the site and downstream drainage channels.
- Drainage basin fees will be paid at the time of recording of the subdivision plat, and these fees provide the applicable cost contribution towards regional drainage improvements.

Step 3: Provide Water Quality Capture Volume (WQCV)

- Water quality detention is not required based on the rural residential development proposed (5-acre minimum lot sizes). According to ECM Appendix I Section I.7.1.B.5, single-family residential lots greater than or equal to 2.5 acres in size per dwelling and having a total lot impervious area of less than 10 percent are excluded from permanent WQ control measures. As detailed in Appendix B, the total assumed impervious area for the new Lots 2-4 is approximately 4.8 percent, which meets the criteria for exclusion from water quality requirements.
- Water quality mitigation for the public roadway improvements (extension of Kinch Court) will be provided by utilizing gravel roads to minimize the impervious area and grass-lined roadside ditches for Runoff Reduction.

Step 4: Consider Need for Industrial and Commercial BMPs

- No industrial or commercial land uses are proposed as part of this development.

V. GENERAL DRAINAGE RECOMMENDATIONS

The developed drainage plan for the site is to provide and maintain positive drainage away from structures and conform to the established drainage patterns for the overall site. JPS Engineering recommends that positive drainage be established and maintained away from all structures within the site in conformance with applicable building codes and geotechnical engineering recommendations.

Individual lot grading is the sole responsibility of the individual builders and property owners. Final grading of each home site should establish proper protective slopes and positive drainage in accordance with HUD guidelines and building codes. In general, main floor elevations for each home should be established a minimum of 2 feet above the top of curb of the adjoining street.

In general, we recommend a minimum of 6 inches clearance from the top of concrete foundation walls to adjacent finished site grades. Positive drainage slopes should be maintained away from all structures, with a minimum recommended slope of 5 percent for the first 10 feet away from buildings in landscaped areas, a minimum recommended slope of 2 percent for the first 10 feet away from buildings in paved areas, and a minimum slope of 1 percent for paved areas beyond buildings.

VI. DRAINAGE FACILITY DESIGN

A. General Concept

The general concept for management of developed storm runoff is to establish site grading to provide positive drainage away from the building pads and divert runoff to drainage swales following historic drainage patterns.

B. Specific Details

1. Existing Drainage Conditions

Historic drainage conditions are depicted on Figure EX1 (Appendix D). The property is currently undeveloped with the exception of the existing residence on the west side of the property. There are no existing drainage facilities within the property. There are no existing irrigation facilities, major utilities, or significant encumbrances impacting the site.

Drainage from off-site Basin OC1 sheet flows northwesterly and combines with the on-site flows in Basin C2, draining northwesterly to an existing drainage swale at the north boundary of the site. Historic peak flows at Design Point #1 are calculated as Q_5 = 3.8 cfs and Q_{100} = 22.9 cfs.

Drainage from Basin H sheet flows westerly across the property, draining to an existing drainage swale at the west boundary of the site. Historic peak flows at Design Point #2 are calculated as Q_5 = 3.6 cfs and Q_{100} = 19.9 cfs.

Drainage from off-site Basin OI1 sheet flows westerly and combines with the on-site flows in Basin I, draining westerly to the existing natural drainage swales at the west boundary of the site. Historic peak flows at Design Point #3 are calculated as Q_5 = 7.8 cfs and Q_{100} = 51.5 cfs.

2. Developed Drainage Conditions

The developed drainage basins and projected flows are shown on the Developed Drainage Plan (Figure D1, Appendix D). The two proposed rural residential lots within the developed minor subdivision have been identified as Sub-Basins A1 (Lot 1) and A2 (Lot 2).

Drainage from off-site Basin OC1 will continue to flow northwesterly and combine with the on-site flows in Basin C2, draining northwesterly to the roadside ditch along the east side of Kinch Court, which will flow north to the existing roadside ditch system along Sierra Ridge Trail. Developed peak flows at Design Point #C2 (combined Basins OC1 and C2) are calculated as Q_5 = 4.1 cfs and Q_{100} = 20.3 cfs. At the intersection of Kinch Court and Sierra Ridge Trail, the proposed Culvert C2 (18" RCP) will be installed to convey ditch flows westerly along the south side of Sierra Ride Trail. The previously approved 2007 "Preliminary & Final Drainage Report for Timber Ridge Estates" by JPS Engineering included ditch calculations demonstrating adequate capacity in the existing downstream ditch along the south side of Sierra Ridge Trail.

Basin C3 will sheet flow northwesterly to the existing drainage swale at the northwest corner of the proposed Lot 2. Drainage from this corner will continue to flow northwesterly through the adjoining Timber Ridge Estates to an existing downstream culvert crossing Sierra Ridge Trail. Developed peak flows at Design Point #C3 are calculated as Q_5 = 2.0 cfs and Q_{100} = 7.0 cfs.

Design Point #1 represents the combined flow from Basins OC1, C2, and C3), with developed peak flows calculated as Q_5 = 5.4 cfs and Q_{100} = 24.9 cfs. These flows combine with off-site Basin C1 (located in Timber Ridge Estates Subdivision) flowing northwest to the existing downstream Culvert C1 (36" RCP) crossing Sierra Ridge Trail. The 2007 "Preliminary & Final Drainage Report for Timber Ridge Estates" by JPS Engineering identified the peak flows at downstream Culvert C1 as Q_5 = 11.2 cfs and Q_{100} = 26.3 cfs. The hydrologic calculations in this report have identified the calculated peak flows at Design Point C1 as Q_5 = 8.1 cfs and Q_{100} = 28.1 cfs, which are consistent with the flows in the previous report. Based on the rural residential nature of the proposed minor subdivision, no significant impact on the existing downstream drainage facilities is anticipated.

Drainage from Basin H will continue to sheet flow westerly across the property, draining to the existing drainage swale at the west boundary of the site. Developed peak flows at Design Point #2 are calculated as Q_5 = 4.7 cfs and Q_{100} = 21.4 cfs.

Drainage from off-site Basin OI1 will continue to sheet flow westerly and combine with the on-site flows in Basin I, draining westerly to the existing natural drainage swales at the west boundary of the site. Developed peak flows at Design Point #3 are calculated as Q_5 = 8.7 cfs and Q_{100} = 52.6 cfs. Proposed drainage easements have been delineated along several existing drainage swales along the west boundary of Lots 2 and 4 (based on the channel hydraulic calculations in Appendix C).

Recognizing the rural residential nature of the proposed minor subdivision (5-acre minimum lots), the small increase in developed flows will have no significant impact on downstream facilities. The limit of disturbance associated with Kinch Subdivision is the connection of Kinch Court to the south side of the existing cul-de-sac at the east end of Sierra Ridge Trail.

C. Comparison of Developed to Historic Discharges

Based on the hydrologic calculations in Appendix B, the comparison of developed to historic discharges at key design points is summarized as follows:

Design Point	Historic Flow			Developed Flow			Comparison of Developed to Historic Flow
	Area (ac)	Q_5 (cfs)	Q_{100} (cfs)	Area (ac)	Q_5 (cfs)	Q_{100} (cfs)	
1	13.3	3.8	22.9	13.3	5.4	24.9	+1.6 cfs / +2.0 cfs (minimal increase)
2	8.7	3.6	19.9	8.7	4.7	21.4	+1.1 cfs / +1.5 cfs (minimal increase)
3	26.5	7.8	51.5	26.5	8.7	52.6	+0.9 cfs / +1.1 cfs (minimal increase)

With proper site drainage and erosion control measures within the site, the proposed rural residential minor subdivision will not have any significant developed drainage impact.

D. On-Site Drainage Facility Design

Developed drainage basins and drainage patterns are depicted on the enclosed Developed Drainage Plan (Sheet D1). No public drainage improvements are required for this minor subdivision.

Based on the rural residential nature of this minor subdivision and the large lot sizes proposed, there will be no significant increase in developed flows, and there is no need for on-site flood control detention. Water quality mitigation for the public road improvements will be provided by runoff reduction utilizing gravel roads to minimize impervious areas and grass-lined roadside ditches.

E. Analysis of Existing and Proposed Downstream Facilities

The proposed subdivision area will drain westerly to existing natural drainage swales flowing to the Kettle Creek Drainage Basin. Development of this property as a rural residential subdivision will have no significant impact on downstream drainage facilities.

There is no evidence of erosive conditions at the outfall points, and the existing downstream grass-lined drainage channels provide a hydrologically and hydraulically adequate drainage outfall system.

F. Anticipated Drainage Problems and Solutions

The drainage plan for this minor subdivision consists of maintaining positive drainage away from home sites, and conveying surface drainage through the site in general conformance with historic drainage patterns. The primary drainage problems anticipated within this type of development consist of maintenance of proper drainage patterns and erosion control.

Care will need to be taken to implement proper erosion control measures associated with the proposed driveways, home sites, and drainage swales. Proposed drainage facilities outside the public right-of-way will be owned and maintained by the individual lot owners unless otherwise noted.

VII. EROSION CONTROL / SEDIMENT CONTROL

Contractors and Owners will need to implement and maintain proper Best Management Practices (BMP's) and control measures for erosion and sediment control during and after construction. Erosion control measures should include installation of silt fence at the toe of disturbed areas, straw bales protecting drainage ditches, vehicle tracking control pads at access points, riprap protection at culvert outlets, and revegetation of disturbed areas. Cut slopes will need to be stabilized during excavation as necessary and vegetation will need to be re-established as soon as possible for stabilization of graded areas.

VIII. STORMWATER DETENTION AND WATER QUALITY

As previously stated, the proposed development will result in a minimal increase in developed flows based on the rural residential development plan. There is no need for on-site stormwater detention based on the minimal developed drainage impact.

Water quality facilities are not required as this site meets exclusions listed in the revised El Paso County Engineering Criteria Manual (ECM). Section I.7.1.B.5 of the ECM identifies "Large Lot Single Family Sites" as excluded sites under the following definition: "A single-family residential lot, or agricultural zoned lands, greater than or equal to 2.5 acres in size per dwelling and having a total lot impervious area of less than 10 percent." The proposed subdivision plat will create four lots, but Lot 1 is an existing rural residential property, so the drainage impact of this minor subdivision is to create three new rural residential lots (Lots 2-4). The estimated new impervious area has been calculated as approximately 4.8 percent (see Appendix B), which is well below the "10 percent" threshold.

Water quality mitigation for the public roadway improvements (extension of Kinch Court) will be provided by utilizing gravel roads to minimize the impervious area and grass-lined roadside ditches for Runoff Reduction (see calculation in Appendix).

IX. COST ESTIMATE AND DRAINAGE FEES

The developer will finance all costs for required subdivision improvements, and there are no public drainage facilities proposed as part of this minor subdivision plat.

The property is located entirely within the Kettle Creek Drainage Basin (FOM 03000), which has a 2022 drainage basin fee of $11,413 per impervious acre and no bridge fee. Applicable drainage basin fees are calculated as follows:

Minor Subdivision Area =	29.1 acres
On-Site Percent Impervious Area = 4.808%	
(per Site-Specific Impervious Calculation in Appendix B)	
On-Site Estimated Impervious area =	1.40 ac.
Impervious Area of Off-Site Road Improvements:	
New Gravel Pavement = 15,443 sf * 80% Impervious =	12,354 sf
Off-Site Impervious Area =	0.28 acres
Total Calculated Impervious area =	1.68 acres

Adjusted Impervious area = (1.68 ac) * 75% = 1.26 ac.
(includes 25% reduction on drainage fees for 2.5 to 5-acre lots per ECM Appendix L Section 3.10.2a)
Drainage Basin Fee = (1.26 ac.) @ $11,413/ac. = $14,380.38

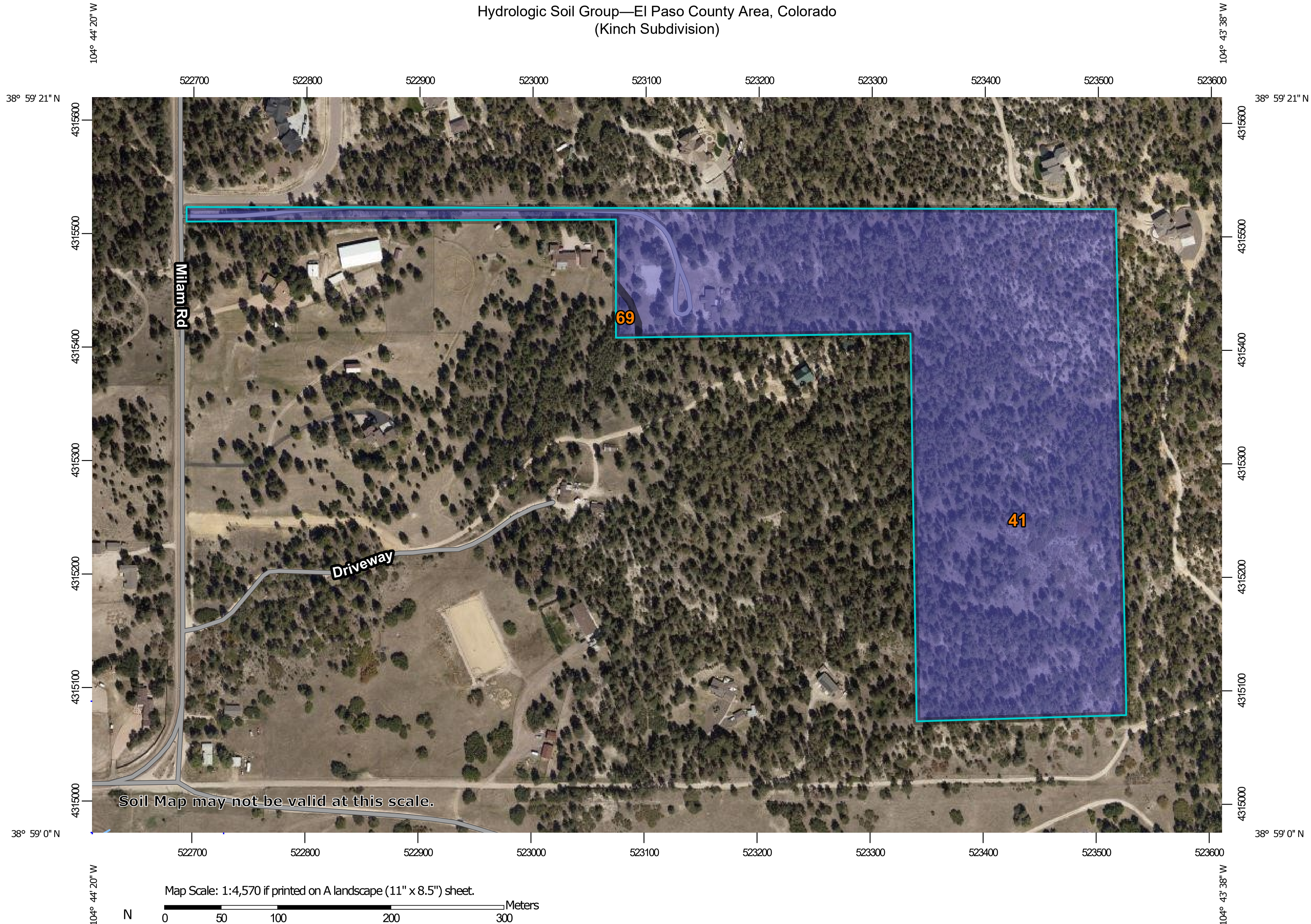
X. SUMMARY

Kinch Subdivision is a proposed rural residential minor subdivision consisting of 4 lots on a 29.1-acre site. Development of the proposed subdivision is anticipated to result in a negligible increase in developed runoff from the site, and erosion control best management practices will be implemented to mitigate developed drainage impacts. The proposed drainage patterns will remain consistent with historic conditions. Implementation and maintenance of proper erosion control measures will ensure that this minor subdivision has no significant adverse drainage impact on downstream properties or drainage facilities.

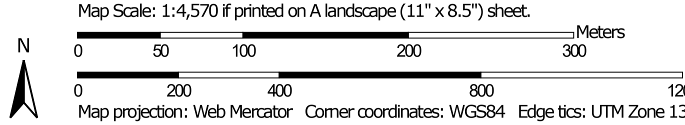
APPENDIX A

SOILS INFORMATION

Hydrologic Soil Group—El Paso County Area, Colorado
(Kinch Subdivision)



Map Scale: 1:4,570 if printed on A landscape (11" x 8.5") sheet.



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

MAP LEGEND

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

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

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

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

Date(s) aerial images were photographed: Aug 19, 2018—Sep 23, 2018

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
41	Kettle gravelly loamy sand, 8 to 40 percent slopes	B	28.7	99.4%
69	Peyton-Pring complex, 8 to 15 percent slopes	B	0.2	0.6%
Totals for Area of Interest			**28.9**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

United States Department of Agriculture

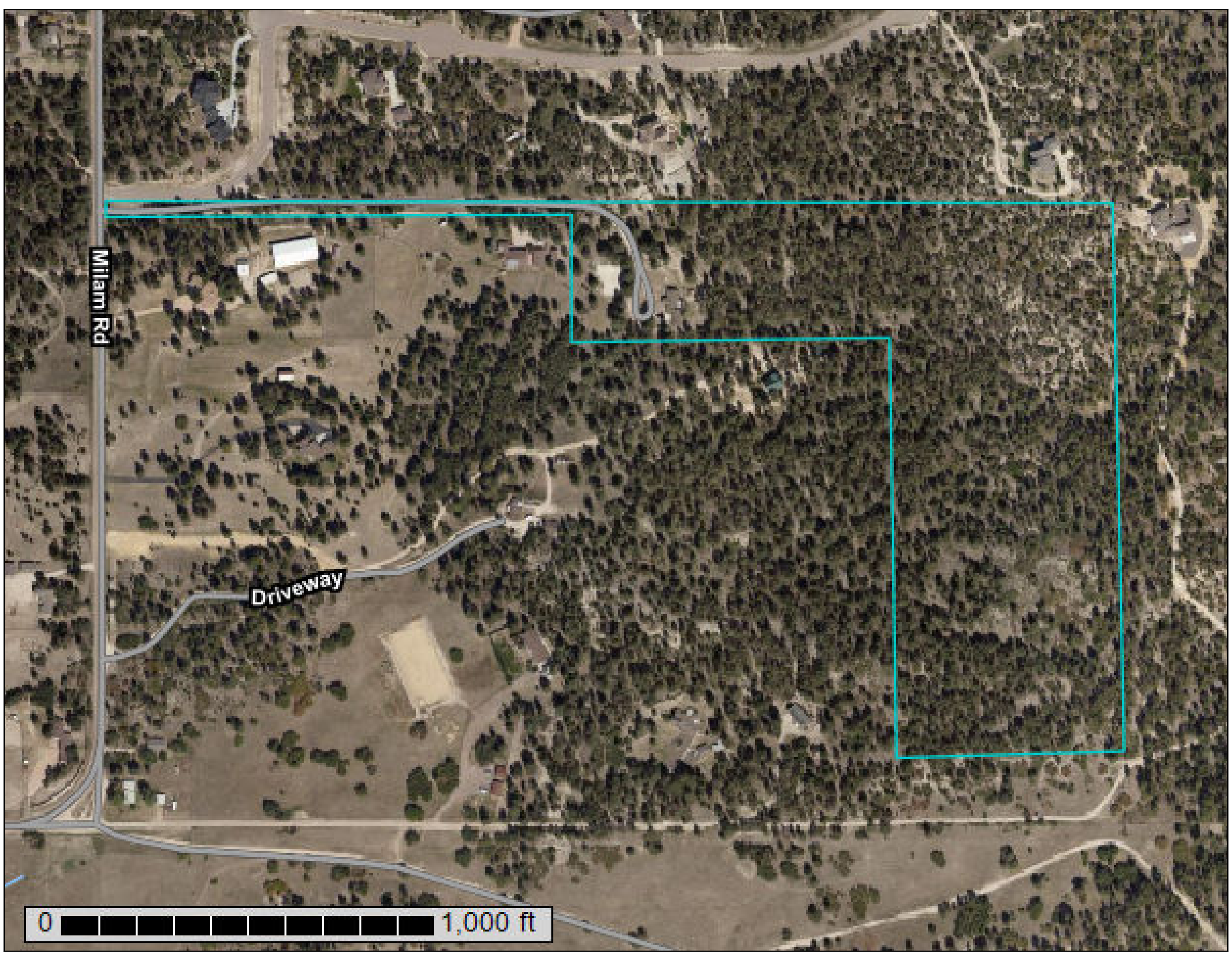
NRCS

Natural Resources Conservation Service

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

Custom Soil Resource Report for

El Paso County Area, Colorado



November 27, 2021

Preface

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

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

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

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

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

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

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

Preface.. 2
How Soil Surveys Are Made...5
Soil Map.. 8
Soil Map..9
Legend..10
Map Unit Legend.. 11
Map Unit Descriptions..11
El Paso County Area, Colorado.. 13
41—Kettle gravelly loamy sand, 8 to 40 percent slopes............................ 13
69—Peyton-Pring complex, 8 to 15 percent slopes................................... 14
References...16

How Soil Surveys Are Made

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

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

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

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

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

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

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

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

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

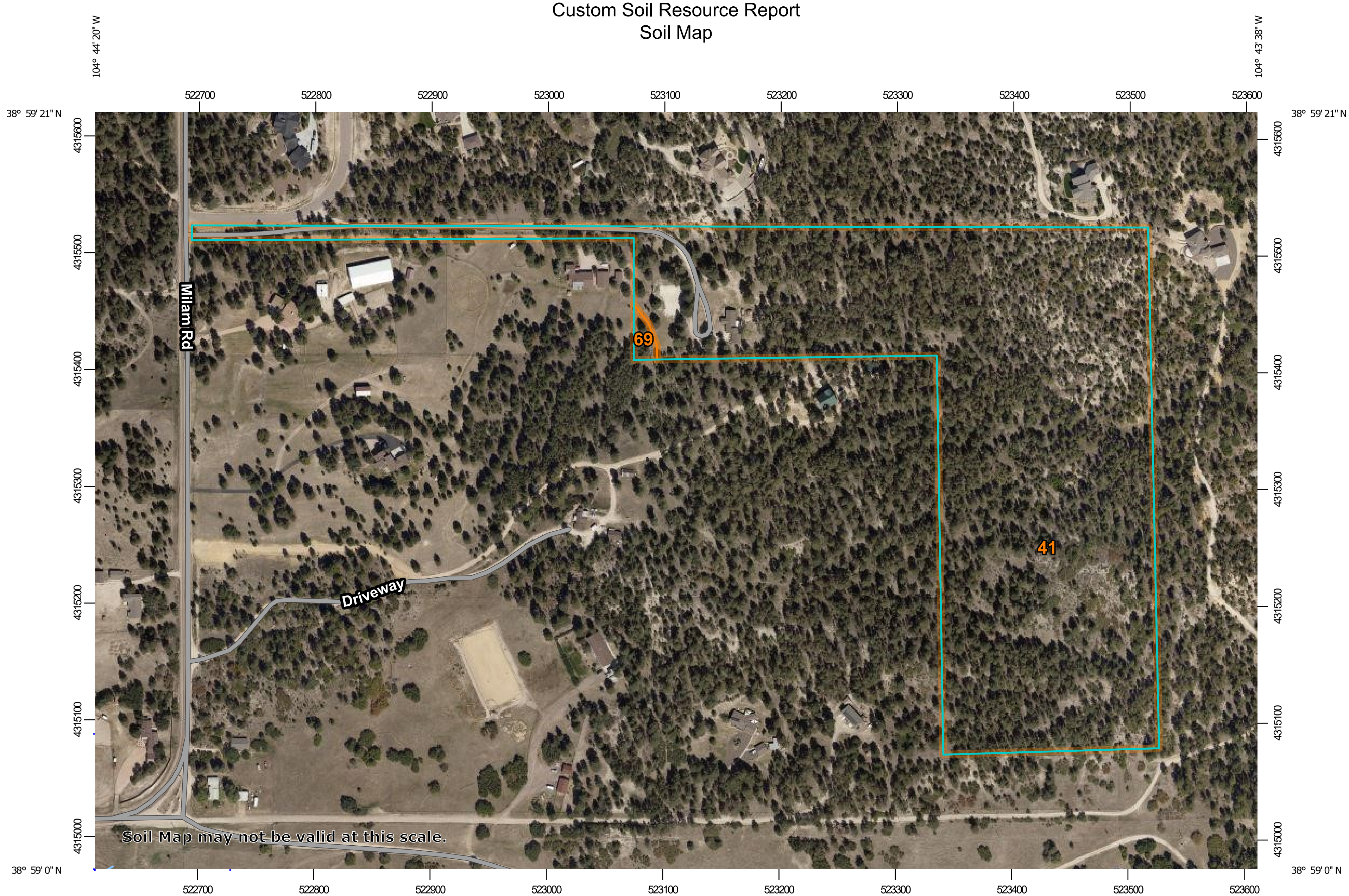
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree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

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

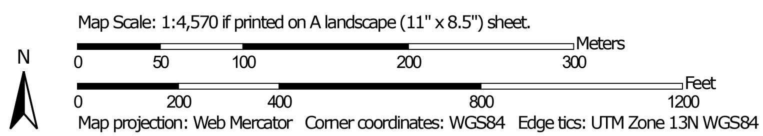
Soil Map

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

Soil Map



104° 44' 20" W
104° 43' 38" W
38° 59' 21" N
38° 59' 0" N
522700
522800
522900
523000
523100
523200
523300
523400
523500
523600
4315600
4315500
4315400
4315300
4315200
4315100
4315000
Milam Rd
Driveway
69
41
Soil Map may not be valid at this scale.



Map Scale: 1:4,570 if printed on A landscape (11" x 8.5") sheet.
Meters
0
50
100
200
300
Feet
0
200
400
800
1200
N
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

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

Special Point Features

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

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

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

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

Date(s) aerial images were photographed: Aug 19, 2018—Sep 23, 2018

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
41	Kettle gravelly loamy sand, 8 to 40 percent slopes	28.7	99.4%
69	Peyton-Pring complex, 8 to 15 percent slopes	0.2	0.6%
Totals for Area of Interest		**28.9**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

El Paso County Area, Colorado

41—Kettle gravelly loamy sand, 8 to 40 percent slopes

Map Unit Setting

National map unit symbol: 368h
Elevation: 7,000 to 7,700 feet
Farmland classification: Not prime farmland

Map Unit Composition

Kettle and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kettle

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy alluvium derived from arkose

Typical profile

E - 0 to 16 inches: gravelly loamy sand
Bt - 16 to 40 inches: gravelly sandy loam
C - 40 to 60 inches: extremely gravelly loamy sand

Properties and qualities

Slope: 8 to 40 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Ecological site: F048AY908CO - Mixed Conifer
Hydric soil rating: No

Minor Components

Pleasant

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

Other soils

Percent of map unit:
Hydric soil rating: No

69—Peyton-Pring complex, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 369g
Elevation: 6,800 to 7,600 feet
Farmland classification: Not prime farmland

Map Unit Composition

Peyton and similar soils: 40 percent
Pring and similar soils: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Peyton

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Arkosic alluvium derived from sedimentary rock and/or arkosic residuum weathered from sedimentary rock

Typical profile

A - 0 to 12 inches: sandy loam
Bt - 12 to 25 inches: sandy clay loam
BC - 25 to 35 inches: sandy clay loam
C - 35 to 60 inches: sandy loam

Properties and qualities

Slope: 8 to 9 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 (0.20 to 0.60 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 7.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: R049XY216CO - Sandy Divide
Hydric soil rating: No

Description of Pring

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Arkosic alluvium derived from sedimentary rock

Typical profile

A - 0 to 14 inches: coarse sandy loam
C - 14 to 60 inches: gravelly sandy loam

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 6.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: R048AY222CO - Loamy Park
Hydric soil rating: No

Minor Components

Pleasant

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

Other soils

Percent of map unit:
Hydric soil rating: No

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

APPENDIX B

HYDROLOGIC CALCULATIONS

Table 6-6. Runoff Coefficients for Rational Method

(Source: UDFCD 2001)

Land Use or Surface Characteristics	Percent Impervious	Runoff Coefficients											
		2-year		5-year		10-year		25-year		50-year		100-year	
		HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D
Business													
Commercial Areas	95	0.79	0.80	0.81	0.82	0.83	0.84	0.85	0.87	0.87	0.88	0.88	0.89
Neighborhood Areas	70	0.45	0.49	0.49	0.53	0.53	0.57	0.58	0.62	0.60	0.65	0.62	0.68
Residential													
1/8 Acre or less	65	0.41	0.45	0.45	0.49	0.49	0.54	0.54	0.59	0.57	0.62	0.59	0.65
1/4 Acre	40	0.23	0.28	0.30	0.35	0.36	0.42	0.42	0.50	0.46	0.54	0.50	0.58
1/3 Acre	30	0.18	0.22	0.25	0.30	0.32	0.38	0.39	0.47	0.43	0.52	0.47	0.57
1/2 Acre	25	0.15	0.20	0.22	0.28	0.30	0.36	0.37	0.46	0.41	0.51	0.46	0.56
1 Acre	20	0.12	0.17	0.20	0.26	0.27	0.34	0.35	0.44	0.40	0.50	0.44	0.55
Industrial													
Light Areas	80	0.57	0.60	0.59	0.63	0.63	0.66	0.66	0.70	0.68	0.72	0.70	0.74
Heavy Areas	90	0.71	0.73	0.73	0.75	0.75	0.77	0.78	0.80	0.80	0.82	0.81	0.83
Parks and Cemeteries	7	0.05	0.09	0.12	0.19	0.20	0.29	0.30	0.40	0.34	0.46	0.39	0.52
Playgrounds	13	0.07	0.13	0.16	0.23	0.24	0.31	0.32	0.42	0.37	0.48	0.41	0.54
Railroad Yard Areas	40	0.23	0.28	0.30	0.35	0.36	0.42	0.42	0.50	0.46	0.54	0.50	0.58
Undeveloped Areas													
Historic Flow Analysis-- Greenbelts, Agriculture	2	0.03	0.05	0.09	0.16	0.17	0.26	0.26	0.38	0.31	0.45	0.36	0.51
Pasture/Meadow	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50
Forest	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50
Exposed Rock	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Offsite Flow Analysis (when landuse is undefined)	45	0.26	0.31	0.32	0.37	0.38	0.44	0.44	0.51	0.48	0.55	0.51	0.59
Streets													
Paved	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Gravel	80	0.57	0.60	0.59	0.63	0.63	0.66	0.66	0.70	0.68	0.72	0.70	0.74
Drive and Walks	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Roofs	90	0.71	0.73	0.73	0.75	0.75	0.77	0.78	0.80	0.80	0.82	0.81	0.83
Lawns	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50

3.2 Time of Concentration

One of the basic assumptions underlying the Rational Method is that runoff is a function of the average rainfall rate during the time required for water to flow from the hydraulically most remote part of the drainage area under consideration to the design point. However, in practice, the time of concentration can be an empirical value that results in reasonable and acceptable peak flow calculations.

For urban areas, the time of concentration (t_c) consists of an initial time or overland flow time (t_i) plus the travel time (t_t) in the storm sewer, paved gutter, roadside drainage ditch, or drainage channel. For non-urban areas, the time of concentration consists of an overland flow time (t_i) plus the time of travel in a concentrated form, such as a swale or drainageway. The travel portion (t_t) of the time of concentration can be estimated from the hydraulic properties of the storm sewer, gutter, swale, ditch, or drainageway. Initial time, on the other hand, will vary with surface slope, depression storage, surface cover, antecedent rainfall, and infiltration capacity of the soil, as well as distance of surface flow. The time of concentration is represented by Equation 6-7 for both urban and non-urban areas.

$$t_c = t_i + t_t \qquad \text{(Eq. 6-7)}$$

Where:

t_c = time of concentration (min)

t_i = overland (initial) flow time (min)

t_t = travel time in the ditch, channel, gutter, storm sewer, etc. (min)

3.2.1 Overland (Initial) Flow Time

The overland flow time, t_i, may be calculated using Equation 6-8.

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L}}{S^{0.33}} \qquad \text{(Eq. 6-8)}$$

Where:

t_i = overland (initial) flow time (min)
C_5 = runoff coefficient for 5-year frequency (see Table 6-6)
L = length of overland flow (300 ft maximum for non-urban land uses, 100 ft maximum for urban land uses)
S = average basin slope (ft/ft)

Note that in some urban watersheds, the overland flow time may be very small because flows quickly concentrate and channelize.

3.2.2 Travel Time

For catchments with overland and channelized flow, the time of concentration needs to be considered in combination with the travel time, t_t, which is calculated using the hydraulic properties of the swale, ditch, or channel. For preliminary work, the overland travel time, t_t, can be estimated with the help of Figure 6-25 or Equation 6-9 (Guo 1999).

$$V = C_v S_w^{0.5} \qquad \text{(Eq. 6-9)}$$

Where:

V = velocity (ft/s)

C_v = conveyance coefficient (from Table 6-7)

S_w = watercourse slope (ft/ft)

Table 6-7. Conveyance Coefficient, C_v

Type of Land Surface	C_v
Heavy meadow	2.5
Tillage/field	5
Riprap (not buried)*	6.5
Short pasture and lawns	7
Nearly bare ground	10
Grassed waterway	15
Paved areas and shallow paved swales	20

* For buried riprap, select C_v value based on type of vegetative cover.

The travel time is calculated by dividing the flow distance (in feet) by the velocity calculated using Equation 6-9 and converting units to minutes.

The time of concentration (t_c) is then the sum of the overland flow time (t_i) and the travel time (t_t) per Equation 6-7.

3.2.3 First Design Point Time of Concentration in Urban Catchments

Using this procedure, the time of concentration at the first design point (typically the first inlet in the system) in an urbanized catchment should not exceed the time of concentration calculated using Equation 6-10. The first design point is defined as the point where runoff first enters the storm sewer system.

$$t_c = \frac{L}{180} + 10 \qquad \text{(Eq. 6-10)}$$

Where:

t_c = maximum time of concentration at the first design point in an urban watershed (min)

L = waterway length (ft)

Equation 6-10 was developed using the rainfall-runoff data collected in the Denver region and, in essence, represents regional "calibration" of the Rational Method. Normally, Equation 6-10 will result in a lesser time of concentration at the first design point and will govern in an urbanized watershed. For subsequent design points, the time of concentration is calculated by accumulating the travel times in downstream drainageway reaches.

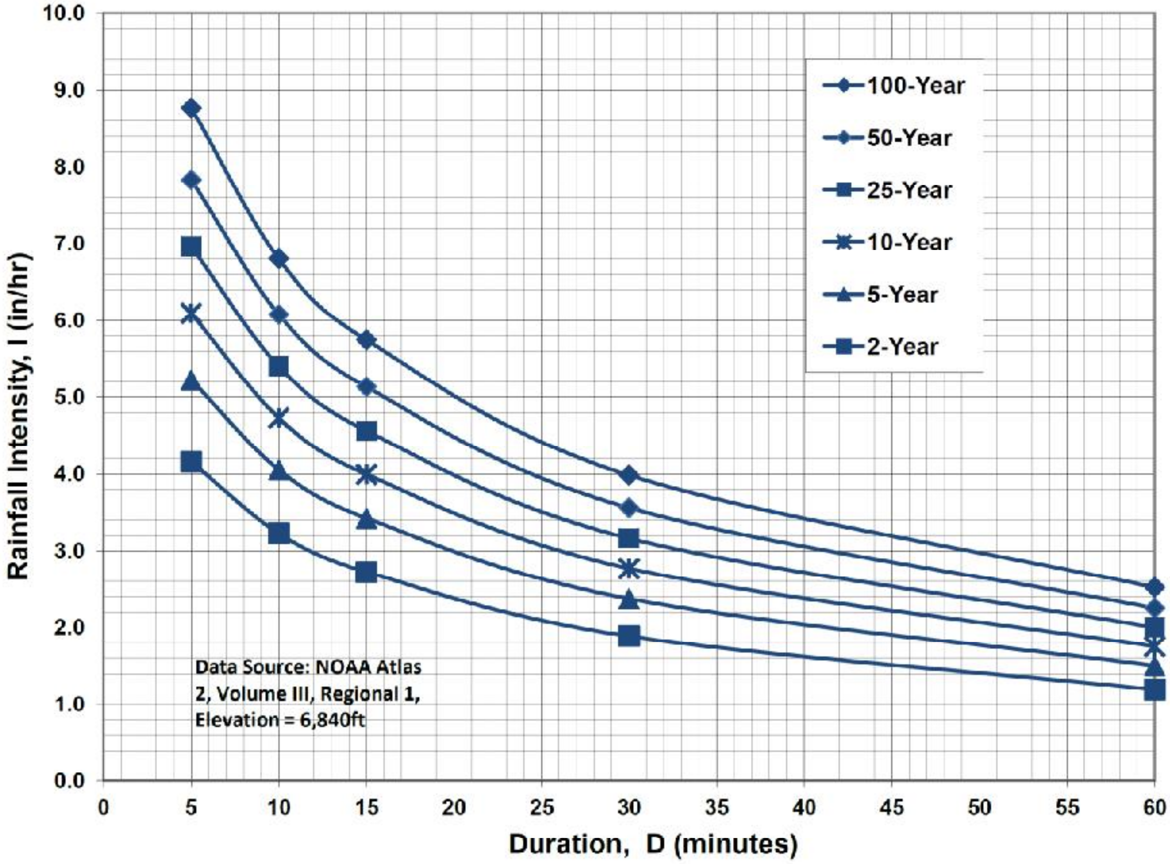
3.2.4 Minimum Time of Concentration

If the calculations result in a t_c of less than 10 minutes for undeveloped conditions, it is recommended that a minimum value of 10 minutes be used. The minimum t_c for urbanized areas is 5 minutes.

3.2.5 Post-Development Time of Concentration

As Equation 6-8 indicates, the time of concentration is a function of the 5-year runoff coefficient for a drainage basin. Typically, higher levels of imperviousness (higher 5-year runoff coefficients) correspond to shorter times of concentration, and lower levels of imperviousness correspond to longer times of

Figure 6-5. Colorado Springs Rainfall Intensity Duration Frequency



IDF Equations

$$I_{100} = -2.52 \ln(D) + 12.735$$

$$I_{50} = -2.25 \ln(D) + 11.375$$

$$I_{25} = -2.00 \ln(D) + 10.111$$

$$I_{10} = -1.75 \ln(D) + 8.847$$

$$I_{5} = -1.50 \ln(D) + 7.583$$

$$I_{2} = -1.19 \ln(D) + 6.035$$

Note: Values calculated by equations may not precisely duplicate values read from figure.

KINCH SUBDIVISION
IMPERVIOUS AREA CALCULATIONS

IMPERVIOUS AREAS - TYPICAL 5-ACRE RURAL RESIDENTIAL LOTS - FOR REFERENCE ONLY

` BASIN	TOTAL AREA (AC)	AREA (%)	SUB-AREA 1 DEVELOPMENT/ COVER	PERCENT IMPERVIOUS	AREA (%)	SUB-AREA 2 DEVELOPMENT/ COVER	PERCENT IMPERVIOUS	AREA (%)	SUB-AREA 3 DEVELOPMENT/ COVER	PERCENT IMPERVIOUS	WEIGHTED % IMP
5-ACRE LOTS	5.00	7.00	BUILDING / PAVEMENT	100.00	93.00	MEADOW/FOREST	0				7.000

BASIN	TOTAL AREA (AC)	AREA (AC)	SUB-AREA 1 DEVELOPMENT/ COVER	PERCENT IMPERVIOUS	AREA (AC)	SUB-AREA 2 DEVELOPMENT/ COVER	PERCENT IMPERVIOUS	AREA (AC)	SUB-AREA 3 DEVELOPMENT/ COVER	PERCENT IMPERVIOUS	WEIGHTED % IMP
5-ACRE LOTS	5.00	0.350	BUILDING / PAVEMENT	100.00	4.65	MEADOW/FOREST	0				7.000

* PRESUMPTIVE IMPERVIOUS VALUE FOR 5-ACRE LOTS IS 7.0% PER EL PASO COUNTY DRAINAGE BASIN FEE ADDENDUM DATED 6/21/01

DEVELOPED IMPERVIOUS AREAS - KINCH SUBDIVISION

BASIN	TOTAL AREA (AC)	AREA (AC)	SUB-AREA 1 DEVELOPMENT/ COVER	PERCENT IMPERVIOUS	AREA (AC)	SUB-AREA 2 DEVELOPMENT/ COVER	PERCENT IMPERVIOUS	AREA (AC)	SUB-AREA 3 DEVELOPMENT/ COVER	PERCENT IMPERVIOUS	WEIGHTED % IMP
C1,C2,H,I	29.12	1.40	BUILDING / PAVEMENT	100	27.72	MEADOW/FOREST	0				4.808

*** NEW IMPERVIOUS AREA (FOR DRAINAGE FEE CALCULATION) = LOTS 2-4 ONLY = (3 LOTS * 0.35 ACRES IMPERVIOUS / LOT) = 1.05 AC TOTAL IMPERVIOUS**

KINCH SUBDIVISION
COMPOSITE RUNOFF COEFFICIENTS

HISTORIC CONDITIONS

5-YEAR C-VALUES

BASIN	TOTAL AREA (AC)	AREA (AC)	SUB-AREA 1 DEVELOPMENT/ COVER	C	AREA (AC)	SUB-AREA 2 DEVELOPMENT/ COVER	C	AREA (AC)	SUB-AREA 3 DEVELOPMENT/ COVER	C	WEIGHTED C VALUE
OC1	8.79	0.35	BUILDING / PAVEMENT	0.900	8.44	FOREST / MEADOW	0.08				0.113
C2	4.53	0.35	FOREST / MEADOW	0.080							0.080
OC1,C2	13.32										0.102
H	8.69	0.35	BUILDING / PAVEMENT	0.900	8.34	FOREST / MEADOW	0.08				0.113
OI1	10.98	0.35	BUILDING / PAVEMENT	0.900	10.63	FOREST / MEADOW	0.08				0.106
I	15.56	0.35	FOREST / MEADOW	0.080							0.080
OI1,I	26.54										0.091

100-YEAR C-VALUES

BASIN	TOTAL AREA (AC)	AREA (AC)	SUB-AREA 1 DEVELOPMENT/ COVER	C	AREA (AC)	SUB-AREA 2 DEVELOPMENT/ COVER	C	AREA (AC)	SUB-AREA 3 DEVELOPMENT/ COVER	C	WEIGHTED C VALUE
OC1	8.79	0.35	BUILDING / PAVEMENT	0.960	8.44	FOREST / MEADOW	0.35				0.374
C2	4.53	0.35	FOREST / MEADOW	0.350							0.350
OC1,C2	13.32										0.366
H	8.69	0.35	BUILDING / PAVEMENT	0.960	8.34	FOREST / MEADOW	0.35				0.375
OI1	10.98	0.35	BUILDING / PAVEMENT	0.960	10.63	FOREST / MEADOW	0.35				0.369
I	15.56	0.35	FOREST / MEADOW	0.350							0.350
OI1,I	26.54										0.358

KINCH SUBDIVISION
COMPOSITE RUNOFF COEFFICIENTS

DEVELOPED CONDITIONS

5-YEAR C-VALUES

BASIN	TOTAL AREA (AC)	AREA (AC)	SUB-AREA 1 DEVELOPMENT/ COVER	C	AREA (AC)	SUB-AREA 2 DEVELOPMENT/ COVER	C	AREA (AC)	SUB-AREA 3 DEVELOPMENT/ COVER	C	WEIGHTED C VALUE
OC1	8.79	0.35	BUILDING / PAVEMENT	0.900	8.44	FOREST / MEADOW	0.08				0.113
C2	2.29	0.35	BUILDING / PAVEMENT	0.900	1.94	FOREST / MEADOW	0.08				0.205
OC1,C2	11.08										0.132
C3	2.24	0.35	BUILDING / PAVEMENT	0.900	1.89	FOREST / MEADOW	0.08				0.208
OC1,C2,C3	13.32										0.145
C1	9.74	9.74	5-ACRE LOTS (EXISTING)	0.174							0.174
OC1,C2,C1	20.82										0.152
H	8.69	0.70	BUILDING / PAVEMENT	0.900	7.99	FOREST / MEADOW	0.08				0.146
OI1	10.98	0.35	BUILDING / PAVEMENT	0.900	10.63	FOREST / MEADOW	0.08				0.106
I	15.56	0.35	BUILDING / PAVEMENT	0.900	15.21	FOREST / MEADOW	0.08				0.098
OI1,I	26.54										0.102

100-YEAR C-VALUES

BASIN	TOTAL AREA (AC)	AREA (AC)	SUB-AREA 1 DEVELOPMENT/ COVER	C	AREA (AC)	SUB-AREA 2 DEVELOPMENT/ COVER	C	AREA (AC)	SUB-AREA 3 DEVELOPMENT/ COVER	C	WEIGHTED C VALUE
OC1	8.79	0.35	BUILDING / PAVEMENT	0.960	8.44	FOREST / MEADOW	0.35				0.374
C2	2.29	0.35	BUILDING / PAVEMENT	0.960	1.94	FOREST / MEADOW	0.35				0.443
OC1,C2	11.08										0.389
C3	2.24	0.35	BUILDING / PAVEMENT	0.960	1.89	FOREST / MEADOW	0.35				0.445
OC1,C2,C3	13.32										0.398
C1	9.74	9.74	5-ACRE LOTS (EXISTING)	0.232							0.232
OC1,C2,C1	20.82										0.315
H	8.69	0.70	BUILDING / PAVEMENT	0.960	7.99	FOREST / MEADOW	0.35				0.399
OI1	10.98	0.35	BUILDING / PAVEMENT	0.960	10.63	FOREST / MEADOW	0.35				0.369
I	15.56	0.35	BUILDING / PAVEMENT	0.960	15.21	FOREST / MEADOW	0.35				0.364
OI1,I	26.54										0.366

KINCH SUBDIVISION
RATIONAL METHOD

HISTORIC FLOWS

BASIN	DESIGN POINT	AREA (AC)	C 5-YEAR	C 100-YEAR	Overland Flow LENGTH (FT)	Overland Flow SLOPE (FT/FT)	Overland Flow Tco [1] (MIN)	Channel flow CHANNEL LENGTH (FT)	Channel flow CONVEYANCE COEFFICIENT C	Channel flow SLOPE (FT/FT)	Channel flow SCS [2] VELOCITY (FT/S)	Channel flow Tt [3] (MIN)	TOTAL Tc [4] (MIN)	TOTAL Tc [4] (MIN)	INTENSITY [5] 5-YR (IN/HR)	INTENSITY [5] 100-YR (IN/HR)	PEAK FLOW Q5 [6] (CFS)	PEAK FLOW Q100 [6] (CFS)
OC1		8.79	0.113	0.374	300	0.100	14.5	800	15.0	0.013	1.71	7.8	22.3	22.3	2.92	4.91	2.90	16.13
C2		4.53	0.080	0.350			0.0	450	15.0	0.067	3.88	1.9	1.9	5.0	5.17	8.68	1.87	13.76
OC1,C2	1	13.32	0.102	0.366									24.3	24.3	2.80	4.70	3.80	22.91
H	2	8.69	0.113	0.375	100	0.100	8.4	1250	15.0	0.064	3.79	5.5	13.9	13.9	3.64	6.11	3.57	19.90
OI1		10.98	0.106	0.369	300	0.130	13.4	550	15.0	0.15	5.81	1.6	15.0	15.0	3.52	5.91	4.10	23.95
I		15.56	0.080	0.350			0.0	700	15.0	0.057	3.58	3.3						
OI1,I	3	26.54	0.091	0.358									18.3	18.3	3.23	5.42	7.79	51.46

DEVELOPED FLOWS

BASIN	DESIGN POINT	AREA (AC)	C 5-YEAR	C 100-YEAR	Overland Flow LENGTH (FT)	Overland Flow SLOPE (FT/FT)	Overland Flow Tco [1] (MIN)	Channel flow CHANNEL LENGTH (FT)	Channel flow CONVEYANCE COEFFICIENT C	Channel flow SLOPE (FT/FT)	Channel flow SCS [2] VELOCITY (FT/S)	Channel flow Tt [3] (MIN)	TOTAL Tc [4] (MIN)	TOTAL Tc [4] (MIN)	INTENSITY [5] 5-YR (IN/HR)	INTENSITY [5] 100-YR (IN/HR)	PEAK FLOW Q5 [6] (CFS)	PEAK FLOW Q100 [6] (CFS)
OC1		8.79	0.113	0.374	300	0.100	14.5	800	15.0	0.013	1.71	7.8	22.3	22.3	2.92	4.91	2.90	16.13
C2		2.29	0.205	0.443			0.0	450	15.0	0.067	3.88	1.9	1.9	5.0	5.17	8.68	2.43	8.80
OC1,C2	C2	11.08	0.132	0.389									24.3	24.3	2.80	4.70	4.09	20.25
C3		2.24	0.208	0.445	100	0.100	7.6	400	15.0	0.05	3.35	2.0	9.6	9.6	4.19	7.04	1.95	7.02
OC1,C2,C3	1	13.32	0.145	0.398									24.3	24.3	2.80	4.70	5.41	24.91
C1		9.74	0.174	0.232			0.0	950	15.0	0.058	3.61	4.4						
OC1,C2,C1	C1	20.82	0.152	0.315									28.6	28.6	2.55	4.28	8.07	28.07
H	2	8.69	0.146	0.399	100	0.100	8.1	1250	15.0	0.064	3.79	5.5	13.6	13.6	3.67	6.16	4.65	21.35
OI1		10.98	0.106	0.369	300	0.130	13.4	550	15.0	0.15	5.81	1.6	15.0	15.0	3.52	5.91	4.10	23.95
I		15.56	0.098	0.364			0.0	700	15.0	0.057	3.58	3.3						
OI1,I	3	26.54	0.102	0.366									18.3	18.3	3.23	5.42	8.73	52.61

1) OVERLAND FLOW Tco = (0.395*(1.1-RUNOFF COEFFICIENT)*(OVERLAND FLOW LENGTH^(0.5)/(SLOPE^(0.333))
2) SCS VELOCITY = C * ((SLOPE(FT/FT)^0.5)
C = 2.5 FOR HEAVY MEADOW
C = 5 FOR TILLAGE/FIELD
C = 7 FOR SHORT PASTURE AND LAWNS
C = 10 FOR NEARLY BARE GROUND
C = 15 FOR GRASSED WATERWAY
C = 20 FOR PAVED AREAS AND SHALLOW PAVED SWALES

3) MANNING'S CHANNEL TRAVEL TIME = L/V (WHEN CHANNEL VELOCITY IS KNOWN)
4) Tc = Tco + Tt
*** IF TOTAL TIME OF CONCENTRATION IS LESS THAN 5 MINUTES, THEN 5 MINUTES IS USED
5) INTENSITY BASED ON I-D-F EQUATIONS IN CITY OF COLORADO SPRINGS DRAINAGE CRITERIA MANUAL
$I_5 = -1.5 * \ln(Tc) + 7.583$
$I_{100} = -2.52 * \ln(Tc) + 12.735$
6) Q = CiA

APPENDIX C

HYDRAULIC CALCULATIONS

KINCH SUBDIVISION
DITCH CALCULATION SUMMARY

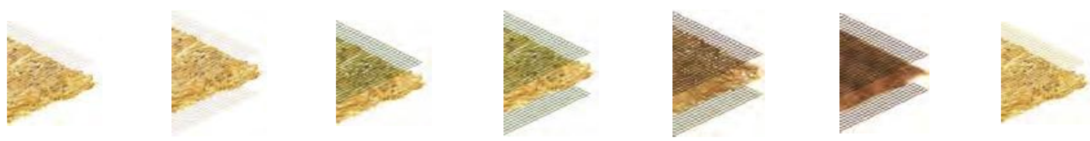
PROPOSED ROADSIDE DITCHES

ROADWAY	FROM STA	TO STA	SIDE	PROPOSED SLOPE (%)	SIDE SLOPE (Z)	CHANNEL DEPTH (FT)	FRICTION FACTOR (n)	ROW WIDTH (ft)	BASIN	Q100 FLOW (CFS)	DITCH FLOW % OF BASIN	DITCH FLOW (CFS)	Q100 DEPTH (FT)	Q100 VELOCITY (FT/S)	DITCH LINING
KINCH COURT	1100	1200	E	3.80	4:1/3:1	2.5	0.030	60	C2	20.3	100	20.3	0.9	5.9	**GRASS / ECB**
KINCH COURT	1100	1200	W	3.80	4:1/3:1	2.5	0.030	60	C3	7.0	15	1.1	0.3	2.8	GRASS
KINCH COURT	1200	1500	E	8.00	4:1/3:1	2.5	0.030	60	C2	20.3	100	20.3	0.9	7.8	**GRASS / ECB**
KINCH COURT	1200	1500	W	8.00	4:1/3:1	2.5	0.030	60	C3	7.0	15	1.1	0.3	3.8	GRASS
KINCH COURT	1500	1700	E	2.00	4:1/3:1	2.5	0.030	60	C2	20.3	100	20.3	1.1	4.6	GRASS
KINCH COURT	1500	1700	W	2.00	4:1/3:1	2.5	0.030	60	C3	7.0	15	1.1	0.4	2.2	GRASS

1) Channel flow calculations based on Manning's Equation
2) Channel depth includes 1' minimum freeboard
3) n = 0.03 for grass-lined non-irrigated channels (minimum)
4) n = 0.045 for riprap-lined channels
5) Vmax = 5.0 fps per El Paso County criteria (p. 10-13) for fescue (dry land grass) for 100-year flows
6) Vmax = 8.0 fps with Erosion Control Blankets (Tensar Eronet SC150 or equal)

The complete line of RollMax™ products offers a variety of options for both short-term and permanent erosion control needs. Reference the RollMax Products Chart below to find the right solution for your next project.

RollMax Product Selection Chart



	TEMPORARY						
	ERONET						BIONET
	DS75	DS150	S75	S150	SC150	C125	S75BN
Longevity	45 days	60 days	12 mo.	12 mo.	24 mo.	36 mo.	12 mo.
Applications	Low Flow Channels 4:1-3:1 Slopes	Moderate Flow Channels 3:1-2:1 Slopes	Low Flow Channels 4:1-3:1 Slopes	Moderate Flow Channels 3:1-2:1 Slopes	Medium Flow Channels 2:1-1:1 Slopes	High-Flow Channels 1:1 and Greater Slopes	Low Flow Channels 4:1-3:1 Slopes
Design Permissible Shear Stress lbs/ft² (Pa)	Unvegetated 1.55 (74)	Unvegetated 1.75 (84)	Unvegetated 1.55 (74)	Unvegetated 1.75 (84)	Unvegetated 2.00 (96)	Unvegetated 2.25 (108)	Unvegetated 1.60 (76)
Design Permissible Velocity ft/s (m/s)	Unvegetated 5.00 (1.52)	Unvegetated 6.00 (1.52)	Unvegetated 5.00 (1.2)	Unvegetated 6.00 (1.83)	Unvegetated 8.00 (2.44)	Unvegetated 10.00 (3.05)	Unvegetated 5.00 (1.52)
Top Net	Lightweight accelerated photodegradable polypropylene 1.50 lbs/1000 ft² (0.73 kg/100 m²) approx wt	Lightweight accelerated photodegradable polypropylene 1.50 lbs/1000 ft² (0.73 kg/100 m²) approx wt	Lightweight photodegradable polypropylene 1.50 lbs/1000 ft² (0.73 kg/100 m²) approx wt	Lightweight photodegradable polypropylene 1.50 lbs/1000 ft² (0.73 kg/100 m²) approx wt	Heavyweight UV-stabilized polypropylene 2.9 lbs/1000 ft² (1.47 kg/100 m²) approx wt	Heavyweight UV-stabilized polypropylene 2.9 lbs/1000 ft² (1.47 kg/100 m²) approx wt	Leno woven. 100% biodegradable jute fiber 9.30 lbs/1000 ft² (4.53 kg/100 m²) approx wt
Center Net	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Fiber Matrix	Straw fiber 0.50 lbs/yd² (0.27 kg/m²)	Straw fiber 0.50 lbs/yd² (0.27 kg/m²)	Straw fiber 0.50 lbs/yd² (0.27 kg/m²)	Straw fiber 0.50 lbs/yd² (0.27 kg/m²)	Straw/coconut matrix 70% Straw 0.35 lbs/yd² (0.19 kg/m²) 30% Coconut 0.15 lbs/yd² (0.08 kg/m²)	Coconut fiber 0.50 lbs/yd² (0.27 kg/m²)	Straw fiber 0.50 lbs/yd² (0.27 kg/m²)
Bottom Net	N/A	Lightweight accelerated photodegradable polypropylene 1.50 lbs/1000 ft² (0.73 kg/100 m²) approx wt	N/A	Lightweight photodegradable polypropylene 1.50 lbs/1000 ft² (0.73 kg/100 m²) approx wt	Lightweight photodegradable polypropylene 1.50 lbs/1000 ft² (0.73 kg/100 m²) approx wt	Heavyweight UV-stabilized polypropylene 2.9 lbs/1000 ft² (1.47 kg/100 m²) approx wt	N/A
Thread	Accelerated degradable	Accelerated degradable	Degradable	Degradable	Degradable	UV-stabilized polypropylene	Biodegradable

Hydraulic Analysis Report

Project Data

Project Title: Project - Kinch Subdivision

Designer: JPS

Project Date: Sunday, November 28, 2021

Project Units: U.S. Customary Units

Notes:

Channel Analysis: Ditch-STA-1100-1200-E

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 4.0000 ft/ft

Side Slope 2 (Z2): 3.0000 ft/ft

Longitudinal Slope: 0.0380 ft/ft

Manning's n: 0.0300

Flow: 20.3000 cfs

Result Parameters

Depth: 0.9922 ft

Area of Flow: 3.4454 ft^2

Wetted Perimeter: 7.2283 ft

Hydraulic Radius: 0.4767 ft

Average Velocity: 5.8919 ft/s

Top Width: 6.9452 ft

Froude Number: 1.4742

Critical Depth: 1.1636 ft

Critical Velocity: 4.2838 ft/s

Critical Slope: 0.0162 ft/ft

Critical Top Width: 8.31 ft

Calculated Max Shear Stress: 2.3526 lb/ft^2

Calculated Avg Shear Stress: 1.1302 lb/ft^2

Channel Analysis: Ditch-STA-1100-1200-W

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 4.0000 ft/ft

Side Slope 2 (Z2): 3.0000 ft/ft

Longitudinal Slope: 0.0380 ft/ft

Manning's n: 0.0300

Flow: 1.1000 cfs

Result Parameters

Depth: 0.3325 ft

Area of Flow: 0.3870 ft^2

Wetted Perimeter: 2.4224 ft

Hydraulic Radius: 0.1597 ft

Average Velocity: 2.8427 ft/s

Top Width: 2.3275 ft

Froude Number: 1.2286

Critical Depth: 0.3625 ft

Critical Velocity: 2.3912 ft/s

Critical Slope: 0.0240 ft/ft

Critical Top Width: 2.59 ft

Calculated Max Shear Stress: 0.7884 lb/ft^2

Calculated Avg Shear Stress: 0.3788 lb/ft^2

Channel Analysis: Ditch-STA-1200-1500-E

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 4.0000 ft/ft

Side Slope 2 (Z2): 3.0000 ft/ft

Longitudinal Slope: 0.0800 ft/ft

Manning's n: 0.0300

Flow: 20.3000 cfs

Result Parameters

Depth: 0.8629 ft

Area of Flow: 2.6061 ft^2

Wetted Perimeter: 6.2866 ft

Hydraulic Radius: 0.4146 ft

Average Velocity: 7.7893 ft/s

Top Width: 6.0404 ft

Froude Number: 2.0898

Critical Depth: 1.1636 ft

Critical Velocity: 4.2838 ft/s

Critical Slope: 0.0162 ft/ft

Critical Top Width: 8.31 ft

Calculated Max Shear Stress: 4.3076 lb/ft^2

Calculated Avg Shear Stress: 2.0695 lb/ft^2

Channel Analysis: Ditch-STA-1200-1500-W

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 4.0000 ft/ft

Side Slope 2 (Z2): 3.0000 ft/ft

Longitudinal Slope: 0.0800 ft/ft

Manning's n: 0.0300

Flow: 1.1000 cfs

Result Parameters

Depth: 0.2892 ft

Area of Flow: 0.2927 ft^2

Wetted Perimeter: 2.1068 ft

Hydraulic Radius: 0.1389 ft

Average Velocity: 3.7581 ft/s

Top Width: 2.0243 ft

Froude Number: 1.7417

Critical Depth: 0.3625 ft

Critical Velocity: 2.3912 ft/s

Critical Slope: 0.0240 ft/ft

Critical Top Width: 2.59 ft

Calculated Max Shear Stress: 1.4436 lb/ft^2

Calculated Avg Shear Stress: 0.6935 lb/ft^2

Channel Analysis: Ditch-STA-1500-1700-E

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 4.0000 ft/ft

Side Slope 2 (Z2): 3.0000 ft/ft

Longitudinal Slope: 0.0200 ft/ft

Manning's n: 0.0300

Flow: 20.3000 cfs

Result Parameters

Depth: 1.1191 ft

Area of Flow: 4.3830 ft^2

Wetted Perimeter: 8.1528 ft

Hydraulic Radius: 0.5376 ft

Average Velocity: 4.6315 ft/s

Top Width: 7.8334 ft

Froude Number: 1.0912

Critical Depth: 1.1636 ft

Critical Velocity: 4.2838 ft/s

Critical Slope: 0.0162 ft/ft

Critical Top Width: 8.31 ft

Calculated Max Shear Stress: 1.3966 lb/ft^2

Calculated Avg Shear Stress: 0.6709 lb/ft^2

Channel Analysis: Ditch-STA-1500-1700-W

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 4.0000 ft/ft

Side Slope 2 (Z2): 3.0000 ft/ft

Longitudinal Slope: 0.0200 ft/ft

Manning's n: 0.0300

Flow: 1.1000 cfs

Result Parameters

Depth: 0.3750 ft

Area of Flow: 0.4923 ft^2

Wetted Perimeter: 2.7322 ft

Hydraulic Radius: 0.1802 ft

Average Velocity: 2.2346 ft/s

Top Width: 2.6252 ft

Froude Number: 0.9094

Critical Depth: 0.3625 ft

Critical Velocity: 2.3912 ft/s

Critical Slope: 0.0240 ft/ft

Critical Top Width: 2.59 ft

Calculated Max Shear Stress: 0.4680 lb/ft^2

Calculated Avg Shear Stress: 0.2249 lb/ft^2

KINCH MINOR SUBDIVISION
CULVERT DESIGN SUMMARY

BASIN	DESIGN POINT	RD CL ELEV	INV IN ELEV	INV OUT ELEV	PIPE LENGTH (FT)	PIPE DIA (FT)	TOTAL Q_5 (CFS)	Q_5 MAX ALLOWABLE HEADWATER [1]	CALC Q_5 HW ELEV	TOTAL Q_{100} (CFS)	Q_{100} MAX ALLOWABLE HEADWATER [2]	CALC Q_{100} HW ELEV	CALC Q_{100} HW/D
KINCH COURT:													
OC1,C2	C2	7263.84	7260.50	7260.20	52.0	2.0	4.1	7262.5	7261.5	20.3	7264.02	7263.19	1.34

[1] Q_5 MAX. ALLOWABLE HEADWATER, HW/D = 1.0

[2] Q_{100} MAX. ALLOWABLE HEADWATER = 6" DEPTH AT SHOULDER (PER DCM TABLE 6-1)

HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 2.00 cfs

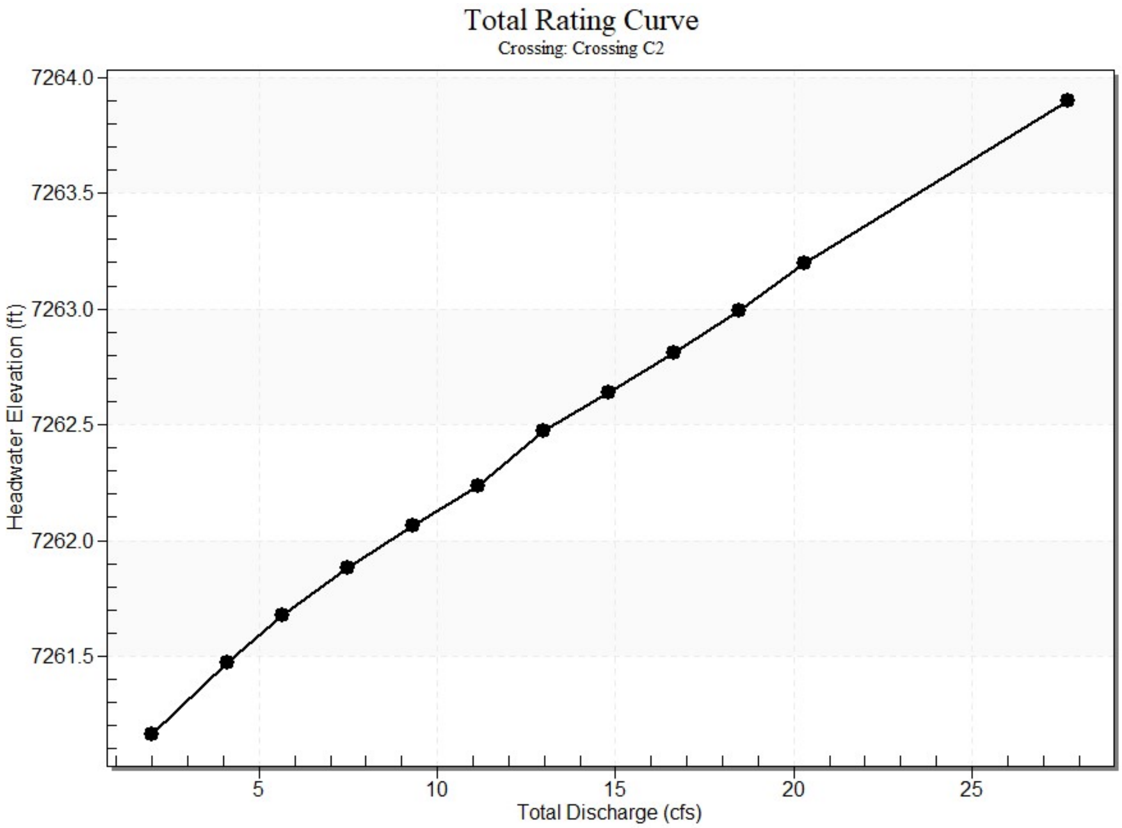
Design Flow: 4.10 cfs

Maximum Flow: 20.30 cfs

Table 1 - Summary of Culvert Flows at Crossing: Crossing C2

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert C2 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
7261.16	2.00	2.00	0.00	1
7261.47	4.10	4.10	0.00	1
7261.67	5.66	5.66	0.00	1
7261.88	7.49	7.49	0.00	1
7262.07	9.32	9.32	0.00	1
7262.24	11.15	11.15	0.00	1
7262.47	12.98	12.98	0.00	1
7262.64	14.81	14.81	0.00	1
7262.81	16.64	16.64	0.00	1
7262.99	18.47	18.47	0.00	1
7263.19	20.30	20.30	0.00	1
7263.84	24.64	24.64	0.00	Overtopping

Rating Curve Plot for Crossing: Crossing C2



Culvert Data: Culvert C2

Table 1 - Culvert Summary Table: Culvert C2

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
2.00 cfs	2.00 cfs	7261.16	0.66	0.202	1-S2n	0.46	0.49	0.46	0.45	3.66	2.52
4.10 cfs	4.10 cfs	7261.47	0.97	0.459	1-S2n	0.66	0.71	0.66	0.58	4.49	3.02
5.66 cfs	5.66 cfs	7261.67	1.17	0.633	1-S2n	0.79	0.84	0.79	0.66	4.91	3.27
7.49 cfs	7.49 cfs	7261.88	1.38	0.835	1-S2n	0.92	0.97	0.92	0.73	5.29	3.51

9.32 cfs	9.32 cfs	7262.07	1.57	1.042	1-S2n	1.05	1.09	1.05	0.79	5.59	3.71
11.15 cfs	11.15 cfs	7262.24	1.74	1.258	1-S2n	1.17	1.20	1.17	0.85	5.83	3.87
12.98 cfs	12.98 cfs	7262.47	1.91	1.973	2-M2c	1.30	1.30	1.30	0.90	6.03	4.02
14.81 cfs	14.81 cfs	7262.64	2.08	2.138	7-M2c	1.43	1.39	1.39	0.94	6.37	4.16
16.64 cfs	16.64 cfs	7262.81	2.27	2.308	7-M2c	1.58	1.47	1.47	0.99	6.72	4.28
18.47 cfs	18.47 cfs	7262.99	2.47	2.490	7-M2c	2.00	1.55	1.55	1.02	7.08	4.40
20.30 cfs	20.30 cfs	7263.19	2.69	2.692	7-M2c	2.00	1.62	1.62	1.06	7.46	4.50

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

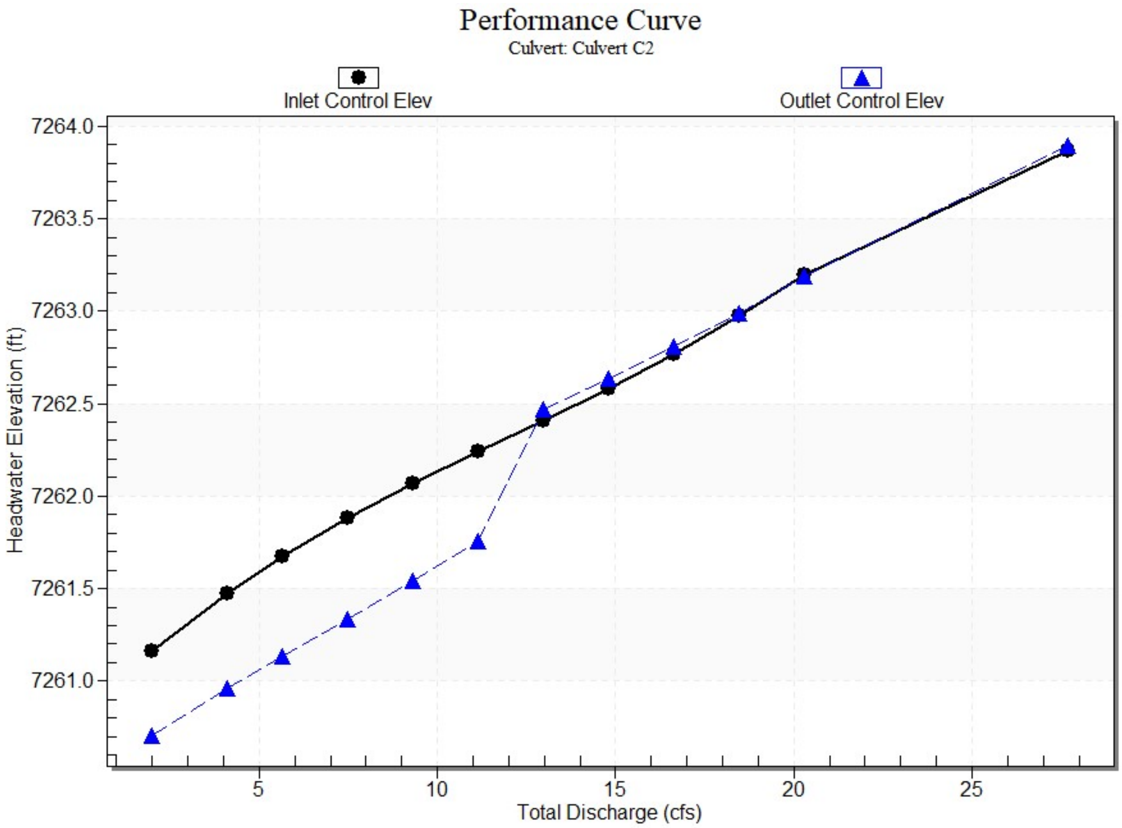
Inlet Elevation (invert): 7260.50 ft,

Outlet Elevation (invert): 7260.20 ft

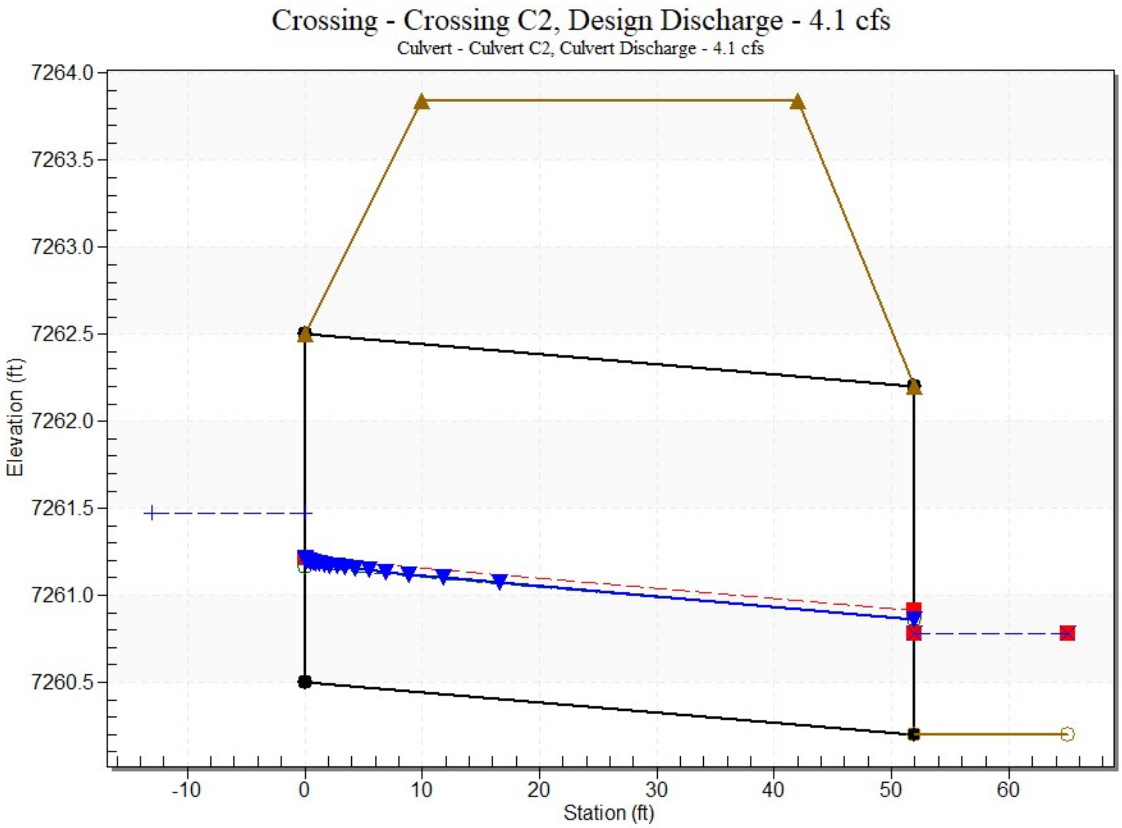
Culvert Length: 52.00 ft,

Culvert Slope: 0.0058

Culvert Performance Curve Plot: Culvert C2



Water Surface Profile Plot for Culvert: Culvert C2



Site Data - Culvert C2

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 7260.50 ft

Outlet Station: 52.00 ft

Outlet Elevation: 7260.20 ft

Number of Barrels: 1

Culvert Data Summary - Culvert C2

Barrel Shape: Circular

Barrel Diameter: 2.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0130

Culvert Type: Straight

Inlet Configuration: Grooved End Projecting (Ke=0.2)

Inlet Depression: None

Tailwater Data for Crossing: Crossing C2

Table 2 - Downstream Channel Rating Curve (Crossing: Crossing C2)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
2.00	7260.65	0.45	2.52	0.56	0.94
4.10	7260.78	0.58	3.02	0.73	0.99
5.66	7260.86	0.66	3.27	0.82	1.01
7.49	7260.93	0.73	3.51	0.91	1.02
9.32	7260.99	0.79	3.71	0.99	1.04
11.15	7261.05	0.85	3.87	1.06	1.05
12.98	7261.10	0.90	4.02	1.12	1.06
14.81	7261.14	0.94	4.16	1.18	1.07
16.64	7261.19	0.99	4.28	1.23	1.08
18.47	7261.22	1.02	4.40	1.28	1.08
20.30	7261.26	1.06	4.50	1.33	1.09

Tailwater Channel Data - Crossing C2

Tailwater Channel Option: Triangular Channel

Side Slope (H:V): 4.00 (_:1)

Channel Slope: 0.0200

Channel Manning's n: 0.0300

Channel Invert Elevation: 7260.20 ft

Roadway Data for Crossing: Crossing C2

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 75.00 ft

Crest Elevation: 7263.84 ft

Roadway Surface: Gravel

Roadway Top Width: 32.00 ft

KINCH SUBDIVISION
CHANNEL CALCULATIONS
DEVELOPED FLOWS

DRAINAGE CHANNELS

CHANNEL	MIN. SLOPE (%)	BOTTOM WIDTH (B, FT)	SIDE SLOPE (Z)	MIN. DEPTH (FT)	FRICTION FACTOR (n)	BASIN	Q100 FLOW (CFS)	CHANNEL FLOW % OF BASIN	CHANNEL FLOW (CFS)	Q100 DEPTH (FT)	Q100 VELOCITY (FT/S)	TOP WIDTH (FT)	PROPOSED EASEMENT WIDTH (FT)	CHANNEL LINING
I1	0.074	10	7:1	2.0	0.030	I	52.5	25	13.1	0.2	4.7	13.3	**30**	GRASS
I2	0.068	10	10:1	2.0	0.030	I	52.5	25	13.1	0.2	4.4	14.8	**30**	GRASS
I3	0.044	15	8:1	2.0	0.030	I	52.5	30	15.8	0.2	3.8	18.9	**40**	GRASS

Hydraulic Analysis Report

Project Data

Project Title: Project - Kinch Subdivision - Drainage Channels

Designer: JPS

Project Date: Saturday, October 8, 2022

Project Units: U.S. Customary Units

Notes:

Channel Analysis: Channel Analysis - I1

Notes:

Input Parameters

Channel Type: Trapezoidal

Side Slope 1 (Z1): 7.0000 ft/ft

Side Slope 2 (Z2): 7.0000 ft/ft

Channel Width: 10.0000 ft

Longitudinal Slope: 0.0740 ft/ft

Manning's n: 0.0300

Flow: 13.1000 cfs

Result Parameters

Depth: 0.2378 ft

Area of Flow: 2.7736 ft^2

Wetted Perimeter: 13.3628 ft

Hydraulic Radius: 0.2076 ft

Average Velocity: 4.7231 ft/s

Top Width: 13.3290 ft

Froude Number: 1.8246

Critical Depth: 0.3456 ft

Critical Velocity: 3.0518 ft/s

Critical Slope: 0.0199 ft/ft

Critical Top Width: 14.84 ft

Calculated Max Shear Stress: 1.0980 lb/ft^2

Calculated Avg Shear Stress: 0.9584 lb/ft^2

Channel Analysis: Channel Analysis - I2

Notes:

Input Parameters

Channel Type: Trapezoidal

Side Slope 1 (Z1): 10.0000 ft/ft

Side Slope 2 (Z2): 10.0000 ft/ft

Channel Width: 10.0000 ft

Longitudinal Slope: 0.0680 ft/ft

Manning's n: 0.0300

Flow: 13.1000 cfs

Result Parameters

Depth: 0.2392 ft

Area of Flow: 2.9643 ft^2

Wetted Perimeter: 14.8080 ft

Hydraulic Radius: 0.2002 ft

Average Velocity: 4.4193 ft/s

Top Width: 14.7841 ft

Froude Number: 1.7393

Critical Depth: 0.3345 ft

Critical Velocity: 2.9346 ft/s

Critical Slope: 0.0204 ft/ft

Critical Top Width: 16.69 ft

Calculated Max Shear Stress: 1.0150 lb/ft^2

Calculated Avg Shear Stress: 0.8494 lb/ft^2

Channel Analysis: Channel Analysis -I3

Notes:

Input Parameters

Channel Type: Trapezoidal

Side Slope 1 (Z1): 8.0000 ft/ft

Side Slope 2 (Z2): 8.0000 ft/ft

Channel Width: 15.0000 ft

Longitudinal Slope: 0.0440 ft/ft

Manning's n: 0.0300

Flow: 15.8000 cfs

Result Parameters

Depth: 0.2459 ft

Area of Flow: 4.1717 ft^2

Wetted Perimeter: 18.9645 ft

Hydraulic Radius: 0.2200 ft

Average Velocity: 3.7874 ft/s

Top Width: 18.9339 ft

Froude Number: 1.4219

Critical Depth: 0.3073 ft

Critical Velocity: 2.9453 ft/s

Critical Slope: 0.0204 ft/ft

Critical Top Width: 19.92 ft

Calculated Max Shear Stress: 0.6751 lb/ft^2

Calculated Avg Shear Stress: 0.6040 lb/ft^2

Design Procedure Form: Runoff Reduction

UD-BMP (Version 3.07, March 2018)

Designer: JPS
Company: JPS
Date: July 22, 2022
Project: Kinch Subdivision
Location: Kinch Court - Runoff Reduction from Gravel Road with Grass-lined Roadside Ditches

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	KC-EAST	KC-WEST									
Downstream Design Point ID	KC-SRT	KC-SRT									
Downstream BMP Type	None	None									
DCIA (ft^2)	--	--									
UIA (ft^2)	10,324	10,324									
RPA (ft^2)	12,600	12,600									
SPA (ft^2)	--	--									
HSG A (%)	0%	0%									
HSG B (%)	100%	100%									
HSG C/D (%)	0%	0%									
Average Slope of RPA (ft/ft)	0.048	0.048									
UIA:RPA Interface Width (ft)	17.50	17.50									

CALCULATED RUNOFF RESULTS

Area ID	KC-EAST	KC-WEST									
UIA:RPA Area (ft^2)	22,924	22,924									
L / W Ratio	16.00	16.00									
UIA / Area	0.4504	0.4504									
Runoff (in)	0.00	0.00									
Runoff (ft^3)	0	0									
Runoff Reduction (ft^3)	430	430									

CALCULATED WQCV RESULTS

Area ID	KC-EAST	KC-WEST									
WQCV (ft^3)	430	430									
WQCV Reduction (ft^3)	430	430									
WQCV Reduction (%)	100%	100%									
Untreated WQCV (ft^3)	0	0									

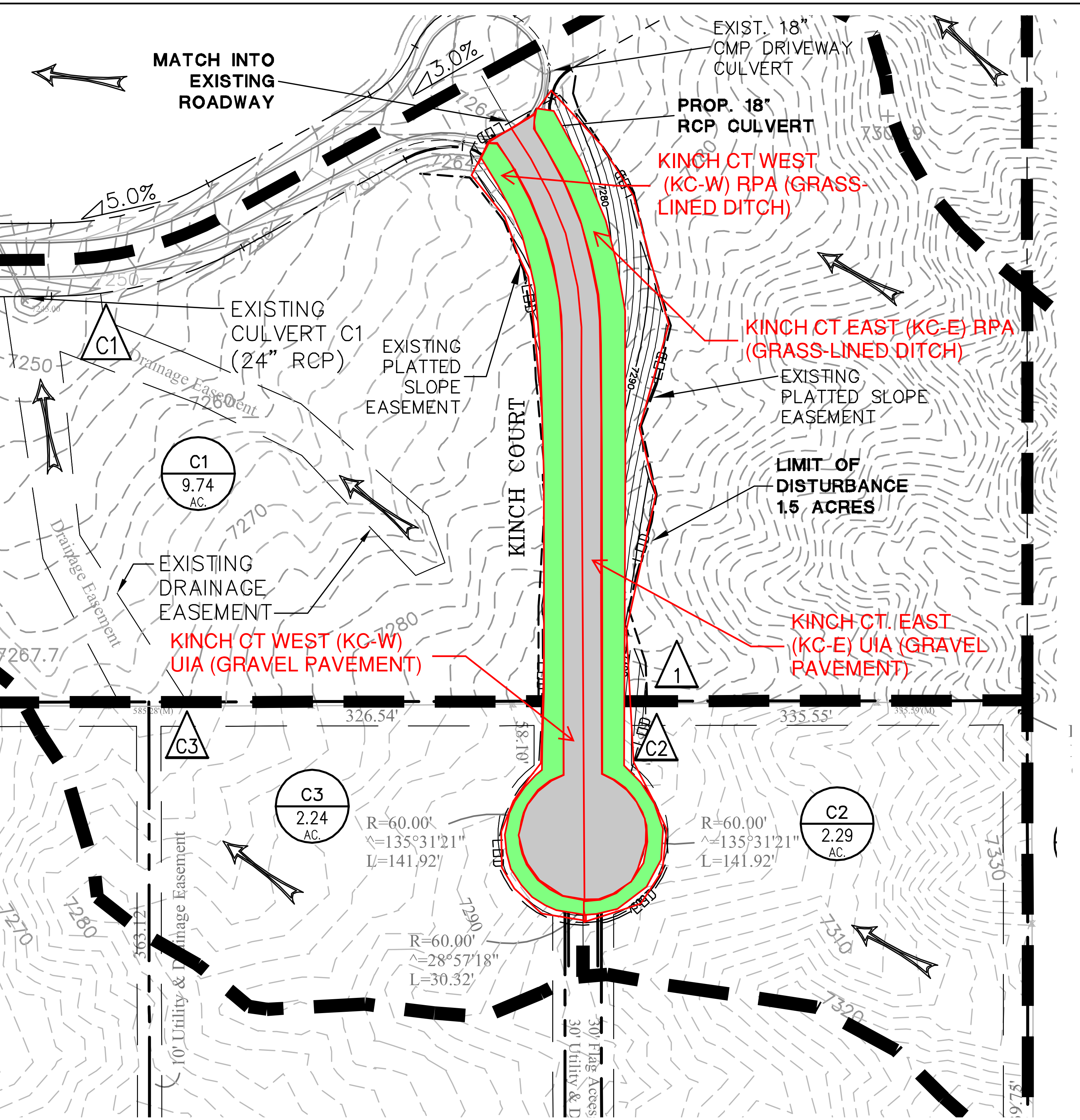
CALCULATED DESIGN POINT RESULTS (sums results from all columns with the same Downstream Design Point ID)

Downstream Design Point ID	KC-SRT										
DCIA (ft^2)	0										
UIA (ft^2)	20,648										
RPA (ft^2)	25,200										
SPA (ft^2)	0										
Total Area (ft^2)	45,848										
Total Impervious Area (ft^2)	20,648										
WQCV (ft^3)	860										
WQCV Reduction (ft^3)	860										
WQCV Reduction (%)	100%										
Untreated WQCV (ft^3)	0										

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

Total Area (ft^2)	45,848
Total Impervious Area (ft^2)	20,648
WQCV (ft^3)	860
WQCV Reduction (ft^3)	860
WQCV Reduction (%)	100%
Untreated WQCV (ft^3)	0

KINCH COURT - RUNOFF REDUCTION EXHIBIT



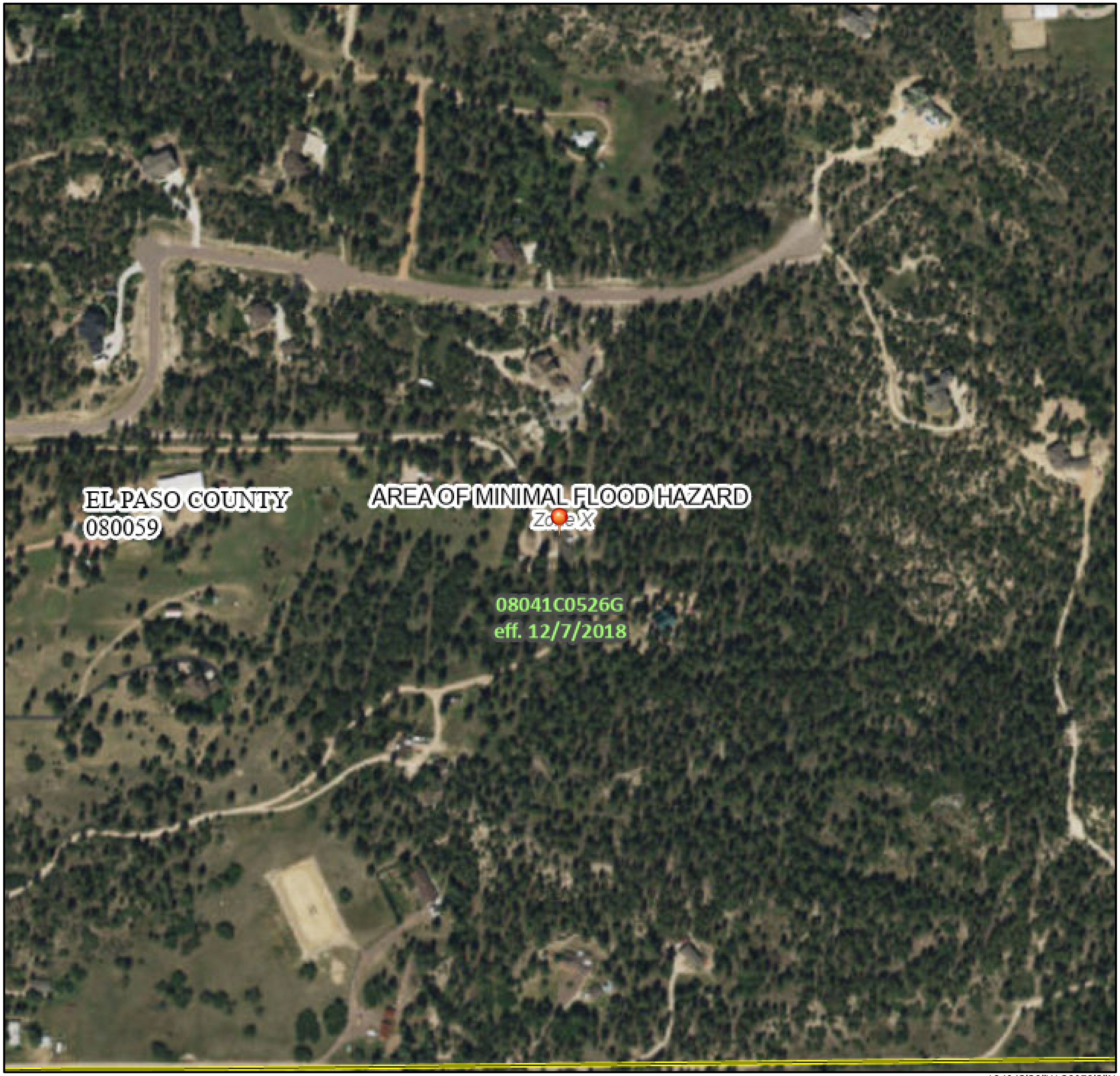
APPENDIX D

FIGURES

National Flood Hazard Layer FIRMette

FEMA

104°44'16"W 38°59'30"N



104°43'39"W 38°59'2"N

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

1:6,000

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

Legend

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

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

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

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

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

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

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

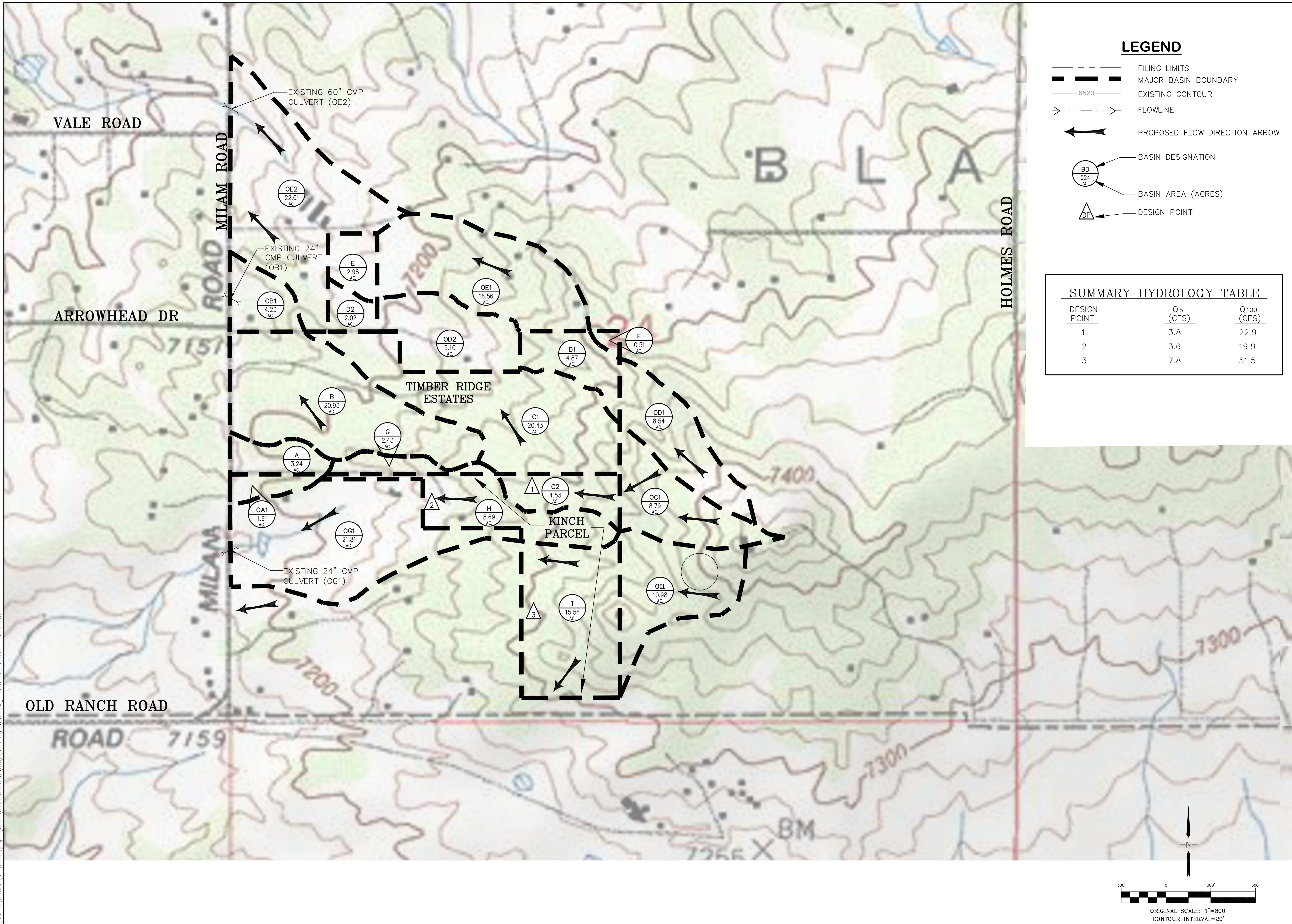
N

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

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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 11/28/2021 at 4:17 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.



SUMMARY HYDROLOGY TABLE

DESIGN POINT	Q_5 (CFS)	Q_{100} (CFS)
1	3.8	22.9
2	3.6	19.9
3	7.8	51.5

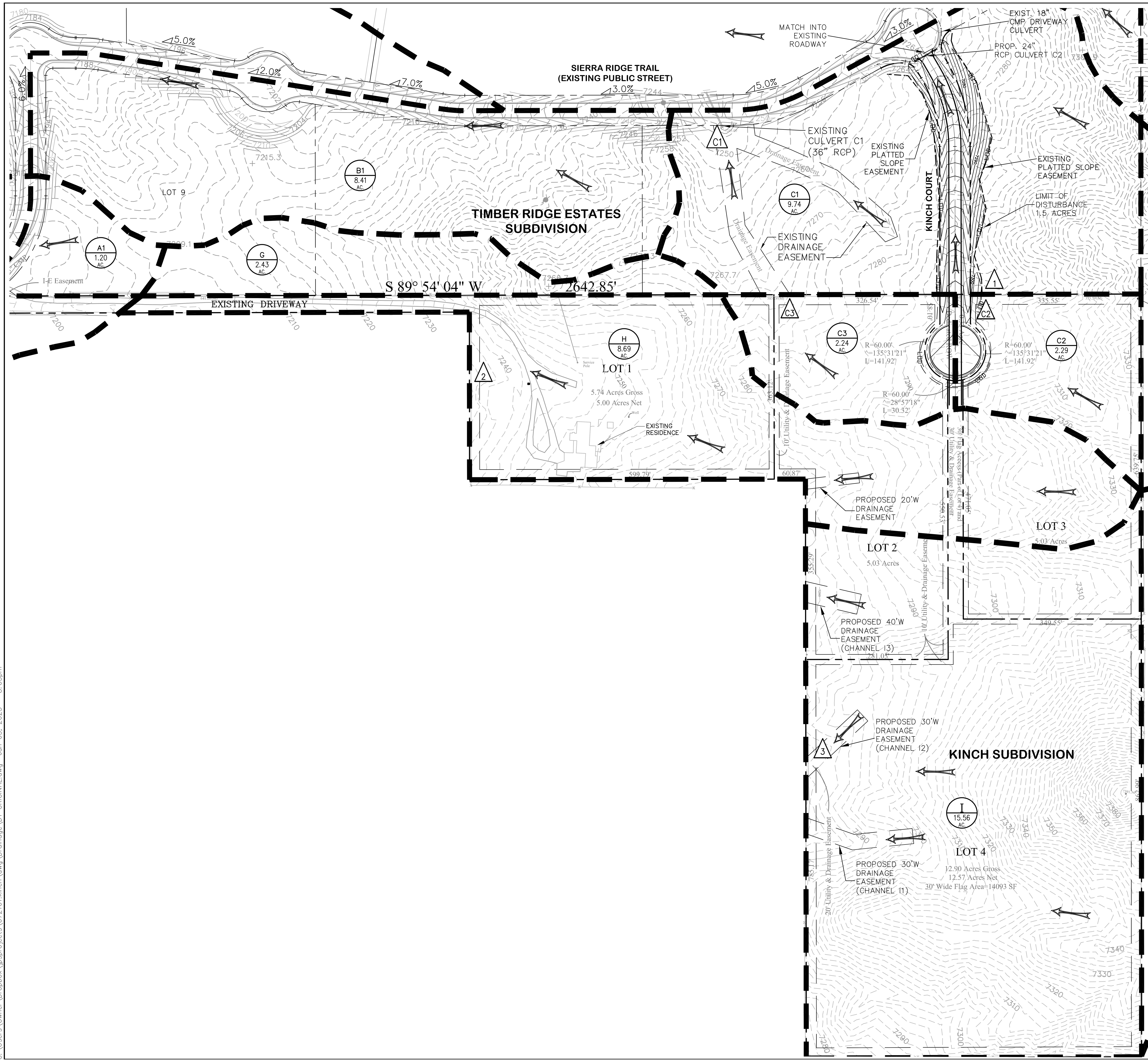
JPS ENGINEERING
19 E. Willamette Ave.
Colorado Springs, CO 80903
PH: 719-477-9429
FAX: 719-471-0766

KINCH SUBDIVISION

MAJOR BASIN / HISTORIC DRAINAGE PLAN

No.	REVISION	BY	DATE

HORZ. SCALE:	1"=300'	DRAWN:	RMD
VERT. SCALE:	N/A	DESIGNED:	JPS
SURVEYED:	HANNIGAN	CHECKED:	JPS
CREATED:	4/20/07	LAST MODIFIED:	12/30/22
PROJECT NO:	072101	MODIFIED BY:	MSP
SHEET:	EX1		



GENERAL DRAINAGE NOTES:

1. INDIVIDUAL BUILDERS SHALL PROVIDE POSITIVE DRAINAGE AWAY FROM STRUCTURES AND ACCOUNT FOR POTENTIAL CROSS-LOT DRAINAGE IMPACTS WITHIN EACH LOT.

2. BUILDERS AND PROPERTY OWNERS SHALL IMPLEMENT & MAINTAIN EROSION CONTROL BEST MANAGEMENT PRACTICES FOR PROTECTION OF DOWNSTREAM PROPERTIES AND FACILITIES INCLUDING PROTECTION OF EXISTING GRASS BUFFER STRIPS ALONG THE DOWNSTREAM PROPERTY BOUNDARIES.

LEGEND

- PROPERTY LINES
- MAJOR BASIN BOUNDARY
- 6520 EXISTING CONTOUR
- FLOWLINE
- PROPOSED FLOW DIRECTION ARROW
- LOD LIMITS OF DISTURBANCE/ CONSTRUCTION BOUNDARY
- BD 524 AC — BASIN DESIGNATION / BASIN AREA (ACRES)
- DP — DESIGN POINT

SUMMARY HYDROLOGY TABLE

DESIGN POINT	Q_5 (CFS)	Q_{100} (CFS)
C1	8.1	28.1
C2	4.1	20.3
C3	2.0	7.0
1	5.4	24.9
2	4.7	21.4
3	8.7	52.6

N

100' 0 100' 200'

ORIGINAL SCALE: 1"=100'
CONTOUR INTERVAL = 2'

JPS ENGINEERING
19 E. Willamette Ave.
Colorado Springs, CO 80903
PH: 719-477-9429
FAX: 719-471-0766
www.jpsengr.com

CALL UTILITY NOTIFICATION CENTER OF COLORADO
1-800-922-1987
CALL 2-BUSINESS DAYS IN ADVANCE BEFORE YOU DIG, GRADE, OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES.

No.	REVISION	BY	DATE

KINCH SUBDIVISION

DEVELOPED DRAINAGE PLAN

HORZ. SCALE:	1"=100'	DRAWN:	MSP
VERT. SCALE:	N/A	DESIGNED:	JPS
SURVEYED:	HANNIGAN	CHECKED:	JPS
CREATED:	11/3/21	LAST MODIFIED:	12/30/22
PROJECT NO:	072101	MODIFIED BY:	MSP
SHEET:			

D1

C:\Users\Owner\Dropbox\jpsprojects\072101.kinch\dwg\Drainage\D1 ORIGINAL.dwg Jan 05, 2023 – 8:03pm