

FINAL DRAINAGE REPORT
for
LOT 1 BLOCK 1, JOHNSON VACATION

Falcon, Colorado

October 20, 2021

Prepared for:

Kenshin Martial Arts
10308 Mt. Evans Drive
Peyton, CO 80831
Contact: David Caban
(787) 565-5774

Prepared by:

Drexel, Barrell & Co.
3 South Seventh Street
Colorado Springs, CO 80905
Contact: Tim McConnell, P.E.
(719) 260-0887

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FINAL DRAINAGE REPORT
for
LOT 1 BLOCK 1, JOHNSON VACATION

1.0 CERTIFICATION STATEMENTS

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 city/county for drainage reports and said report is in conformity with the master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparing this report.

SIGNATURE (Affix Seal): _____
For and on behalf of Drexel, Barrell & Co. Date
Tim D. McConnell, P.E. #33797

Developer's Statement

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

Authorized Signature Date
David Caban
Kenshin Martial Arts

El Paso County

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

Jennifer Irvine, P.E. Date
County Engineer / ECM Administrator

Conditions:

FINAL DRAINAGE REPORT
for
LOT 1 BLOCK 1, JOHNSON VACATION

2.0 PURPOSE

The purpose of this Final Drainage Report for Lot 1 Block 1 Johnson Vacation is to identify the existing and proposed runoff patterns and drainage facilities required to safely route developed runoff to historic downstream facilities.

3.0 GENERAL SITE DESCRIPTION

Location

Lot 1 Block 1, Johnson Vacation is located in Falcon, El Paso County, Colorado, within the Southeast Quarter of Section 1, Township 13 South, Range 65 West of the 6th P.M. The property is bounded by Old Meridian Road to the southwest, Chicago Avenue to the northwest, and Lot 1 High Prairie Branch Library to the southeast.

This property lies within the Falcon Drainage Basin and was included in the sizing for Regional Detention Pond WU as part of the Falcon Highlands Master Development Drainage Plan (URS, Revised 2005). Pond WU lies at the southwest corner of Meridian Road and Tamlin Road, and was studied as part of the Falcon Drainage Basin Planning Study (Matrix Design Group, September 2015) and confirmed to be functioning as designed. As a result, the development of this property will not require full-spectrum detention, but water quality treatment will be provided. See appendix for DBPS mapping and excerpts.

A topographical field survey was completed by Drexel, Barrell & Co., dated September 8, 2021 and is used as the basis of design for the drainage improvements.

Proposed Development

The proposed development of Lot 1 is the construction of a multi-tenant commercial building/Karate studio, with associated parking and landscaping. The property area consists of 0.80 acres.

Soils

According to the Soil Survey of El Paso County Area, Colorado, prepared by the U.S. Department of Agriculture Soil Conservation Service, the site is underlain by the Blakeland loamy sand (Soil No. 9) and the Columbine gravelly sandy loam (Soil No. 19), both hydrologic type A soils. See appendix for Soils map.

Climate

This area of El Paso County can be described as the foothills, with total precipitation amounts typical of a semi-arid region. Winters are generally cold and dry, and summers

relatively warm and dry. Precipitation ranges from 12 to 14 inches per year, with the majority of this moisture occurring in the spring and summer in the form of rainfall. Thunderstorms are common during the summer months.

Floodplain Statement

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Panel 08041CO561G (December 7, 2018), no portion of the site lies within a floodplain.

4.0 DRAINAGE CRITERIA

The drainage analysis has been prepared in accordance with the current El Paso County Drainage Criteria Manual. Calculations were performed to determine runoff quantities during the 5-year and 100-year frequency storms for existing and developed conditions using the Rational Method as required for basins containing less than 100 acres.

5.0 EXISTING CONDITION

The site appears to have been overlot graded and generally slopes from northeast to southwest between 2%-4%. Sparse grasses and gravel cover the site. See existing conditions map in the appendix.

Improvements to Old Meridian Road, adjacent to the property have recently been completed. As part of these improvements, a Type D grated inlet was installed at the south corner of the Lot 1 property. This inlet captures onsite flows and directs them to the south and west, towards Regional Detention Pond WU at the intersection of Meridian Road and Tamlin Road.

See below for basin/design point table and description:

RUNOFF SUMMARY			
BASIN (S)	AREA (AC)	Q5	Q100
OS1	1.01	2.2	4.2
E1	0.73	1.7	3.2
E2	0.09	0.2	0.4

DESIGN POINT SUMMARY		
DP	Q5	Q100
DP1	3.8	7.2

Basin OS1 covers an offsite area to the north of Lot 1. In the existing condition flows from this basin travel overland across the Lot 1 site property to the existing inlet at the southwest corner.

Basin 1 covers the majority of the Lot 1 site. Flows generated by this basin combine with those from offsite basin OS1, ultimately reaching the existing Type D inlet (Existing Design Point DP1) at the southwest corner alongside Old Meridian Road.

6.0 DEVELOPED CONDITION

The proposed development consists of two commercial buildings, and associated

parking and landscaping. As the site is under an acre and detention is provided offsite by the regional detention facility WU, runoff reduction and treatment for water quality is provided by the proposed grassy swale around the side and rear of the buildings, rather than a traditional detention facility. Flows are intended to reach the swale, by curb cut from the parking lot and downspout discharge. Erosion protection at the outfalls into the swale will be provided by buried riprap. Flows will ultimately be captured by the existing Type D area inlet and discharge via the existing public storm sewer in Old Meridian Road.

Runoff generated by the offsite basin discussed in the existing conditions section of this report will be captured by the proposed improvements to Chicago Avenue. As part of the Old Meridan Road improvements, curb inlets at the intersection were installed and curb and gutter was partially installed, and is to be extended beyond the entrance to this property with this development. The County accounted for this basin in their design, and so it has not been included in this analysis for the developed condition – see map in the appendix.

See below for basin/design point table and description:

RUNOFF SUMMARY				DESIGN POINT SUMMARY		
BASIN (S)	AREA (AC)	Q5	Q100	DP	Q5	Q100
A1	0.14	0.6	1.0	DP1	0.6	1.0
A2	0.26	0.9	1.8	DP2	1.4	2.6
A3	0.12	0.5	0.9	DP3	0.5	0.9
A4	0.26	0.8	1.6	DP4	2.7	5.0
A5	0.02	0.0	0.1			

Basins 1 & 3 cover the parking lot to the northeast of the proposed buildings. Flows will travel as curb and gutter flow and exit into the open swale by curb cut/sidewalk chase.

Basins 2 & 4 cover the buildings and the swale around the sides and rear. This swale is proposed as a 2-ft deep, 2-ft wide trapezoidal grass swale. The design intent is for the swale to provide the required water quality and runoff reduction for the development of the site, while allowing for 1-ft of freeboard for the larger storm flows. Reference the appendix for swale design and runoff reduction calculations.

Basin 5 covers a small portion of the site that will discharge offsite to the east. This area will be landscaped and minimal flow will exit the site.

7.0 DRAINAGE & BRIDGE FEES

Drainage and bridge fees are not required as the site has been previously platted.

8.0 SUMMARY

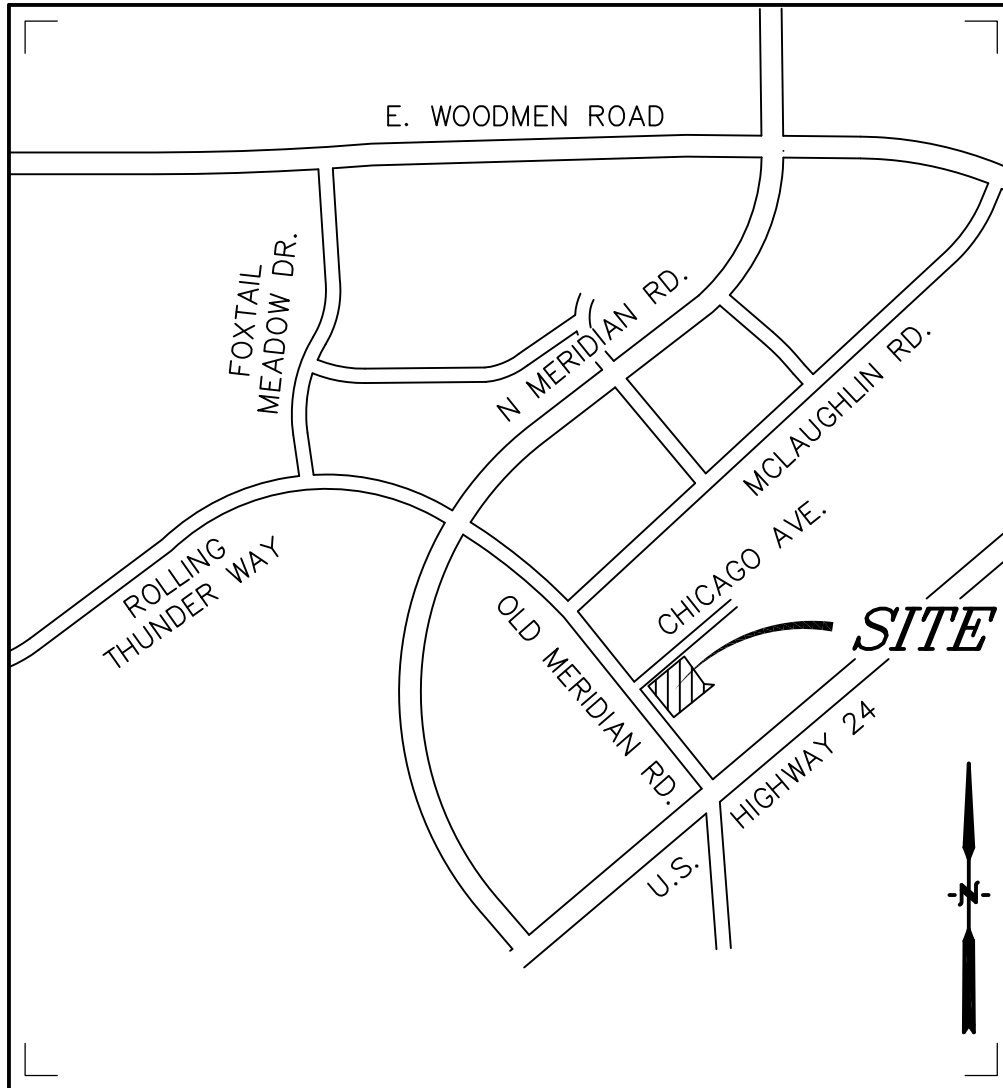
Development of Lot 1, Block 1 Johnson's Vacation will not adversely affect surrounding or downstream developments.

9.0 REFERENCES

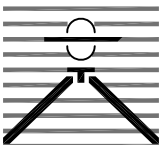
The sources of information used in the development of this study are listed below:

1. El Paso County Drainage Criteria Manual, 10-31-2018.
2. Falcon Highlands Master Development Drainage Plan & Preliminary Drainage Report & Final Drainage Report for Filing No. 1 (URS, Revised January 2005)
3. Falcon Drainage Basin Planning Study (Matrix Design Group, September 2015).

Appendix



Vicinity Map
Not to scale



**LOT 1, BLOCK 1 JOHNSONS VAC.
FALCON, CO
VICINITY MAP**

Drexel, Barrell & Co.
Engineers • Surveyors

DATE:

DWG. NO.

JOB NO:

21496-01CSCV

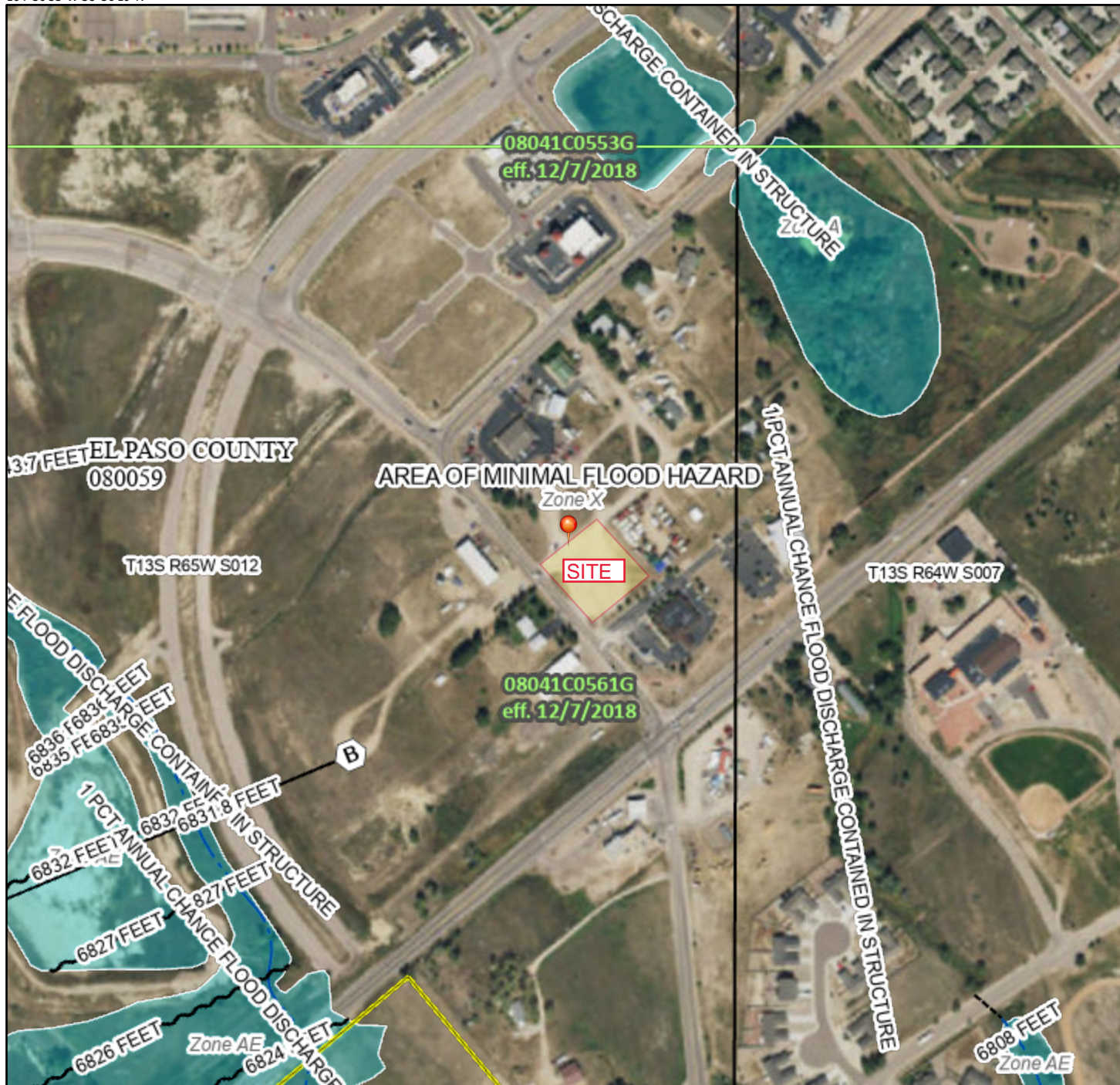
VMAP

SHEET 1 OF 1

National Flood Hazard Layer FIRMette



104°36'53"W 38°56'19"N



0 250 500 1,000 1,500 2,000 Feet 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
GENERAL STRUCTURES		Area of Undetermined Flood Hazard Zone D
		Channel, Culvert, or Storm Sewer
		Levee, Dike, or Floodwall
OTHER FEATURES		20.2 Cross Sections with 1% Annual Chance Water Surface Elevation
		17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
		Coastal Transect
		Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary
MAP PANELS		Coastal Transect Baseline
		Profile Baseline
		Hydrographic Feature
MAP PANELS		Digital Data Available
		No Digital Data Available
		Unmapped



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 **10/20/2021 at 3:25 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.

Custom Soil Resource Report Soil Map



Custom Soil Resource Report

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: Sep 11, 2018—Oct 20, 2018

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
8	Blakeland loamy sand, 1 to 9 percent slopes	0.7	57.6%
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	0.5	42.4%
Totals for Area of Interest		1.2	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

8—Blakeland loamy sand, 1 to 9 percent slopes

Map Unit Setting

National map unit symbol: 369v
Elevation: 4,600 to 5,800 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 46 to 48 degrees F
Frost-free period: 125 to 145 days
Farmland classification: Not prime farmland

Map Unit Composition

Blakeland and similar soils: 98 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Blakeland

Setting

Landform: Hills, flats
Landform position (three-dimensional): Side slope, talus
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sedimentary rock and/or eolian deposits
derived from sedimentary rock

Typical profile

A - 0 to 11 inches: loamy sand
AC - 11 to 27 inches: loamy sand
C - 27 to 60 inches: sand

Properties and qualities

Slope: 1 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Available water supply, 0 to 60 inches: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: R049XB210CO - Sandy Foothill
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit: 1 percent

Hydric soil rating: No

Pleasant

Percent of map unit: 1 percent

Landform: Depressions

Hydric soil rating: Yes

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

Map Unit Setting

National map unit symbol: 367p

Elevation: 6,500 to 7,300 feet

Mean annual precipitation: 14 to 16 inches

Mean annual air temperature: 46 to 50 degrees F

Frost-free period: 125 to 145 days

Farmland classification: Not prime farmland

Map Unit Composition

Columbine and similar soils: 97 percent

Minor components: 3 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Columbine

Setting

Landform: Flood plains, fan terraces, fans

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Alluvium

Typical profile

A - 0 to 14 inches: gravelly sandy loam

C - 14 to 60 inches: very gravelly loamy sand

Properties and qualities

Slope: 0 to 3 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Runoff class: Very low

Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Available water supply, 0 to 60 inches: Very low (about 2.5 inches)

Interpretive groups

Land capability classification (irrigated): 4e

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: A

Ecological site: R049XY214CO - Gravelly Foothill

Custom Soil Resource Report

Hydric soil rating: No

Minor Components

Fluvaquentic haplaquolls

Percent of map unit: 1 percent

Landform: Swales

Hydric soil rating: Yes

Other soils

Percent of map unit: 1 percent

Hydric soil rating: No

Pleasant

Percent of map unit: 1 percent

Landform: Depressions

Hydric soil rating: Yes

PROJECT INFORMATION

PROJECT: Falcon Kenshin
 PROJECT NO: 21496-01
 DESIGN BY: KGV
 REV. BY: TDM
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Drexel, Barrell & Co.

	C2*	C5*	C10*	C100*	% IMPERV
Open Space		0.30		0.45	0
Roof		0.90		0.95	90
Parking/Drives		0.90		0.95	100
Streets: Gravel		0.80		0.85	80

*C-Values and Basin Imperviousness based on Table 5-1, El Paso County Drainage Criteria Manual

EXISTING CONDITION

SUB-BASIN	SURFACE DESIGNATION	AREA ACRE	COMPOSITE RUNOFF COEFFICIENTS				% IMPERV
			C2	C5	C10	C100	
OS1	Open Space	0.42		0.30		0.45	0
	Roof	0.00		0.90		0.95	90
	Parking/Drives	0.00		0.90		0.95	100
	Streets: Gravel	0.59		0.80		0.85	80
	WEIGHTED AVERAGE			0.59		0.68	47%
TOTAL OS1		1.01					
E1	Open Space	0.25		0.30		0.45	0
	Roof	0.00		0.90		0.95	90
	Parking/Drives	0.00		0.90		0.95	100
	Streets: Gravel	0.47		0.80		0.85	80
	WEIGHTED AVERAGE			0.63		0.71	52%
TOTAL E1		0.73					
E2	Open Space	0.06		0.30		0.45	0
	Roof	0.00		0.90		0.95	90
	Parking/Drives	0.00		0.90		0.95	100
	Streets: Gravel	0.03		0.80		0.85	80
	WEIGHTED AVERAGE			0.46		0.58	26%
TOTAL E2		0.09					

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Drexel, Barrell & Co.

RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

EXISTING TIME OF CONCENTRATION

SUB-BASIN DATA					INITIAL/OVERLAND TIME (t_i)			TRAVEL TIME (t_t)				TIME OF CONCENTRATION t_c		
BASIN	DESIGN PT:	C_5	C_{100}	AREA	LENGTH	SLOPE	t_i	LENGTH	SLOPE	VEL.	t_t	COMP.		MINIMUM
				A_c	Ft	%	Min	Ft	%	FPS	Min	t_c		t_c
OS1		0.59	0.68	1.01	200	1.0	13.4	235	1.0	5.20	0.8	14.2		5
E1		0.63	0.71	0.73	200	1.0	12.6	150	1.0	5.20	0.5	13.0		5
	DP1	0.61	0.70	1.74				150	1.0	5.20	0.5	14.6		5
E2		0.46	0.58	0.09	76	1.0	10.4					10.4		5

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Drexel, Barrell & Co.

RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

EXISTING RUNOFF 5 YR STORM P1= 1.50

DIRECT RUNOFF							
BASIN (S)	DESIGN POINT	AREA (AC)	RUNOFF COEFF	t _c (MIN)	C * A	I (IN/HR)	Q (CFS)
OS1		1.01	0.59	14.2	0.60	3.61	2.2
E1		0.73	0.63	13.0	0.46	3.73	1.7
	DP1	1.74	0.61	14.6	1.06	3.56	3.8
E2		0.09	0.46	10.4	0.04	4.07	0.2

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Drexel, Barrell & Co.

RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

EXISTING RUNOFF 100 YR STORM P1= 2.52

DIRECT RUNOFF							
BASIN (S)	DESIGN POINT	AREA (AC)	RUNOFF COEFF	t _c (MIN)	C * A	I (IN/HR)	Q (CFS)
OS1		1.01	0.68	14.2	0.69	6.06	4.2
E1		0.73	0.71	13.0	0.52	6.27	3.2
	DP1	1.74	0.70	14.6	1.21	5.97	7.2
E2		0.09	0.58	10.4	0.05	6.83	0.4

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Drexel, Barrell & Co.

	C2*	C5*	C10*	C100*	% IMPERV
Open Space		0.30		0.45	0
Roof		0.90		0.95	90
Asphalt/Concrete		0.90		0.95	100
Gravel		0.80		0.85	80

*C-Values and Basin Imperviousness based on Table 5-1, El Paso County Drainage Criteria Manual

DEVELOPED CONDITION

SUB-BASIN	SURFACE DESIGNATION	AREA ACRE	COMPOSITE RUNOFF COEFFICIENTS				% IMPERV
			C2	C5	C10	C100	
A1	Open Space	0.03		0.30		0.45	0
	Roof	0.00		0.90		0.95	90
	Asphalt/Concrete	0.11		0.90		0.95	100
	Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.78		0.85	80%
TOTAL A1		0.14					
A2	Open Space	0.09		0.30		0.45	0
	Roof	0.12		0.90		0.95	90
	Asphalt/Concrete	0.05		0.90		0.95	100
	Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.69		0.78	61%
TOTAL A2		0.26					
A3	Open Space	0.01		0.30		0.45	0
	Roof	0.00		0.90		0.95	90
	Asphalt/Concrete	0.11		0.90		0.95	100
	Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.84		0.90	90%
TOTAL A3		0.12					
A4	Open Space	0.09		0.30		0.45	0
	Roof	0.12		0.90		0.95	90
	Asphalt/Concrete	0.04		0.90		0.95	100
	Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.69		0.77	60%
TOTAL A4		0.26					
A5	Open Space	0.02		0.30		0.45	0
	Roof	0.00		0.90		0.95	90

PROJECT INFORMATION

PROJECT: Falcon Kenshin
 PROJECT NO: 21496-01
 DESIGN BY: KGV
 REV. BY: TDM
 AGENCY: El Paso County
 REPORT TYPE: Final
 DATE: 10/17/2021



Drexel, Barrell & Co.

	C2*	C5*	C10*	C100*	% IMPERV
Open Space		0.30		0.45	0
Roof		0.90		0.95	90
Asphalt/Concrete		0.90		0.95	100
Gravel		0.80		0.85	80

*C-Values and Basin Imperviousness based on Table 5-1, El Paso County Drainage Criteria Manual

	Asphalt/Concrete	0.00		0.90		0.95	100
	Gravel	0.00		0.80		0.85	80
	WEIGHTED AVERAGE			0.30		0.45	0%
TOTAL A5		0.02					

PROJECT INFORMATION

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Drexel, Barrell & Co.

RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

DEVELOPED TIME OF CONCENTRATION

SUB-BASIN DATA					INITIAL/OVERLAND TIME (t_i)			TRAVEL TIME (t_t)				TIME OF CONCENTRATION t_c			FINAL t_c
BASIN	DESIGN PT:	C_5	C_{100}	AREA	LENGTH	SLOPE	t_i	LENGTH	SLOPE	VEL.	t_t	COMP.		MINIMUM	
				A_c	Ft	%	Min	Ft	%	FPS	Min	t_c		t_c	Min
A1	DP1	0.78	0.85	0.14	10	1.0	1.9	85	2.0	4.50	0.3	2.2		5	5.0
A2		0.69	0.78	0.26	20	10.0	1.6	187	1.0	2.50	1.2	2.8		5	5.0
A1+A2	DP2	0.72	0.80	0.40				187	1.0	2.50	1.2	6.2		5	6.2
A3	DP3	0.84	0.90	0.12	20	2.0	1.7	110	1.5	3.00	0.6	2.3		5	5.0
A4		0.69	0.77	0.26	20	10.0	1.6	67	1.0	2.50	0.4	6.7		5	6.7
DP2+DP3+A4	DP4	0.73	0.81	0.78				67	1.0	2.50	0.4	6.7		5	6.7
A5		0.30	0.45	0.02	25	1.0	7.5					7.5		5	7.5

PROJECT INFORMATION

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Drexel, Barrell & Co.

RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

DEVELOPED RUNOFF 5 YR STORM P1= 1.50

DIRECT RUNOFF							
BASIN (S)	DESIGN POINT	AREA (AC)	RUNOFF COEFF	t _c (MIN)	C * A	I (IN/HR)	Q (CFS)
A1	DP1	0.14	0.78	5.0	0.11	5.17	0.6
A2		0.26	0.69	5.0	0.18	5.17	0.9
	DP2	0.40	0.72	6.2	0.29	4.83	1.4
A3	DP3	0.12	0.84	5.0	0.10	5.17	0.5
A4		0.26	0.69	6.7	0.18	4.73	0.8
	DP4	0.78	0.73	6.7	0.57	4.73	2.7
A5		0.02	0.30	7.5	0.00	4.56	0.02

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Drexel, Barrell & Co.

RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

DEVELOPED RUNOFF 100 YR STORM P1= 2.52

DIRECT RUNOFF							
BASIN (S)	DESIGN POINT	AREA (AC)	RUNOFF COEFF	t _c (MIN)	C * A	I (IN/HR)	Q (CFS)
A1	DP1	0.14	0.85	5.0	0.12	8.68	1.0
A2		0.26	0.78	5.0	0.20	8.68	1.8
	DP2	0.40	0.80	6.2	0.32	8.12	2.6
A3	DP3	0.12	0.90	5.0	0.11	8.68	0.9
A4		0.26	0.77	6.7	0.20	7.94	1.6
	DP4	0.78	0.81	6.7	0.63	7.94	5.0
A5		0.02	0.45	7.5	0.01	7.66	0.1

Design Procedure Form: Runoff Reduction

UD-BMP (Version 3.07, March 2018)

Sheet 1 of 1

Designer: _____
Company: _____
Date: October 17, 2021
Project: _____
Location: _____

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	1 & 2	3 & 4											
Downstream Design Point ID	DP2	DP4											
Downstream BMP Type	None	None											
DCIA (ft ²)	--	--											
UIA (ft ²)	17,424	16,553											
RPA (ft ²)	4,046	4,732											
SPA (ft ²)	--	--											
HSG A (%)	100%	100%											
HSG B (%)	0%	0%											
HSG C/D (%)	0%	0%											
Average Slope of RPA (ft/ft)	0.010	0.010											
UIA:RPA Interface Width (ft)	38.00	40.00											

CALCULATED RUNOFF RESULTS

Area ID	1 & 2	3 & 4											
UIA:RPA Area (ft ²)	21,470	21,285											
L / W Ratio	14.87	13.30											
UIA / Area	0.8116	0.7777											
Runoff (in)	0.00	0.00											
Runoff (ft ³)	0	0											
Runoff Reduction (ft ³)	726	690											

CALCULATED WQCV RESULTS

Area ID	1 & 2	3 & 4											
WQCV (ft ³)	726	690											
WQCV Reduction (ft ³)	726	690											
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	DP2	DP4											
DCIA (ft ²)	0	0											
UIA (ft ²)	17,424	16,553											
RPA (ft ²)	4,046	4,732											
SPA (ft ²)	0	0											
Total Area (ft ²)	21,470	21,285											
Total Impervious Area (ft ²)	17,424	16,553											
WQCV (ft ³)	726	690											
WQCV Reduction (ft ³)	726	690											
WQCV Reduction (%)	100%	100%											
Untreated WQCV (ft ³)	0	0											

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

Total Area (ft ²)	42,755
Total Impervious Area (ft ²)	33,977
WQCV (ft ³)	1,416
WQCV Reduction (ft ³)	1,416
WQCV Reduction (%)	100%
Untreated WQCV (ft ³)	0

Worksheet

Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Trapezoidal Channel
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Mannings Coefficient	0.035
Slope	015000 ft/ft
Left Side Slope	3.00 V : H
Right Side Slope	3.00 V : H
Bottom Width	2.00 ft
Discharge	5.00 cfs

Results	
Depth	0.72 ft
Flow Area	1.6 ft ²
Wetted Perimeter	3.52 ft
Top Width	2.48 ft
Critical Depth	0.56 ft
Critical Slope	0.032882 ft/ft
Velocity	3.09 ft/s
Velocity Head	0.15 ft
Specific Energy	0.87 ft
Froude Number	0.68
Flow Type	Subcritical

2' DEEP CHANNEL. 0.72' FLOW DEPTH
= MORE THAN 1' OF FREEBOARD AT
100-YR CONDITION

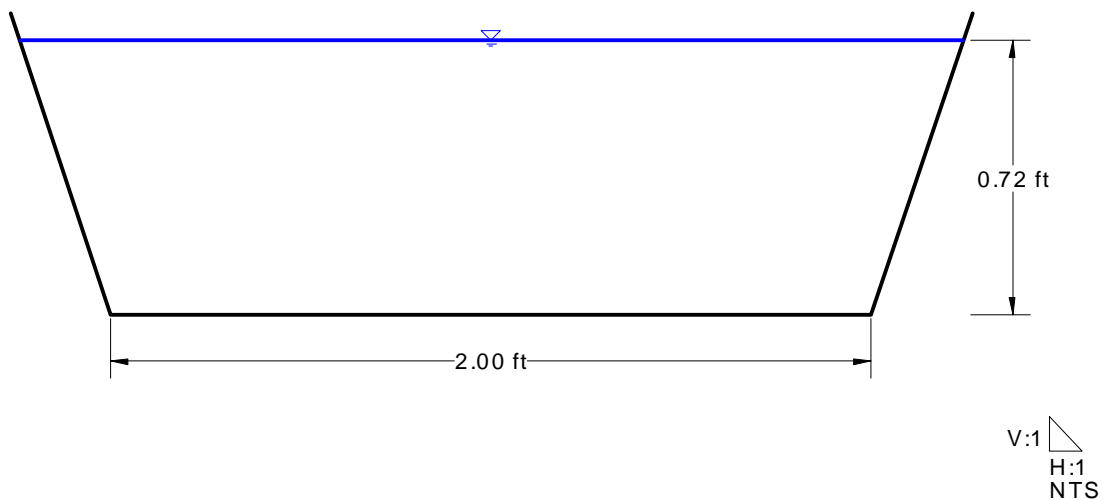
Cross Section

Cross Section for Trapezoidal Channel

Project Description	
Worksheet	Trapezoidal Channel
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data	
Mannings Coefficient	0.035
Slope	015000 ft/ft
Depth	0.72 ft
Left Side Slope	3.00 V : H
Right Side Slope	3.00 V : H
Bottom Width	2.00 ft
Discharge	5.00 cfs

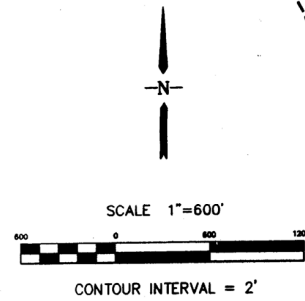
2' DEEP CHANNEL. 0.72' FLOW DEPTH
= MORE THAN 1' OF FREEBOARD AT
100-YR CONDITION



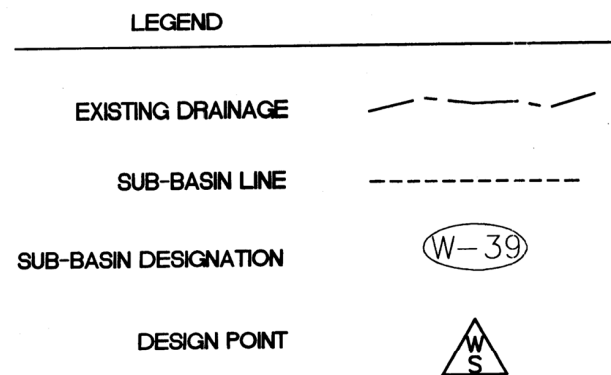
FALCON HIGHLANDS

EL PASO, COUNTY

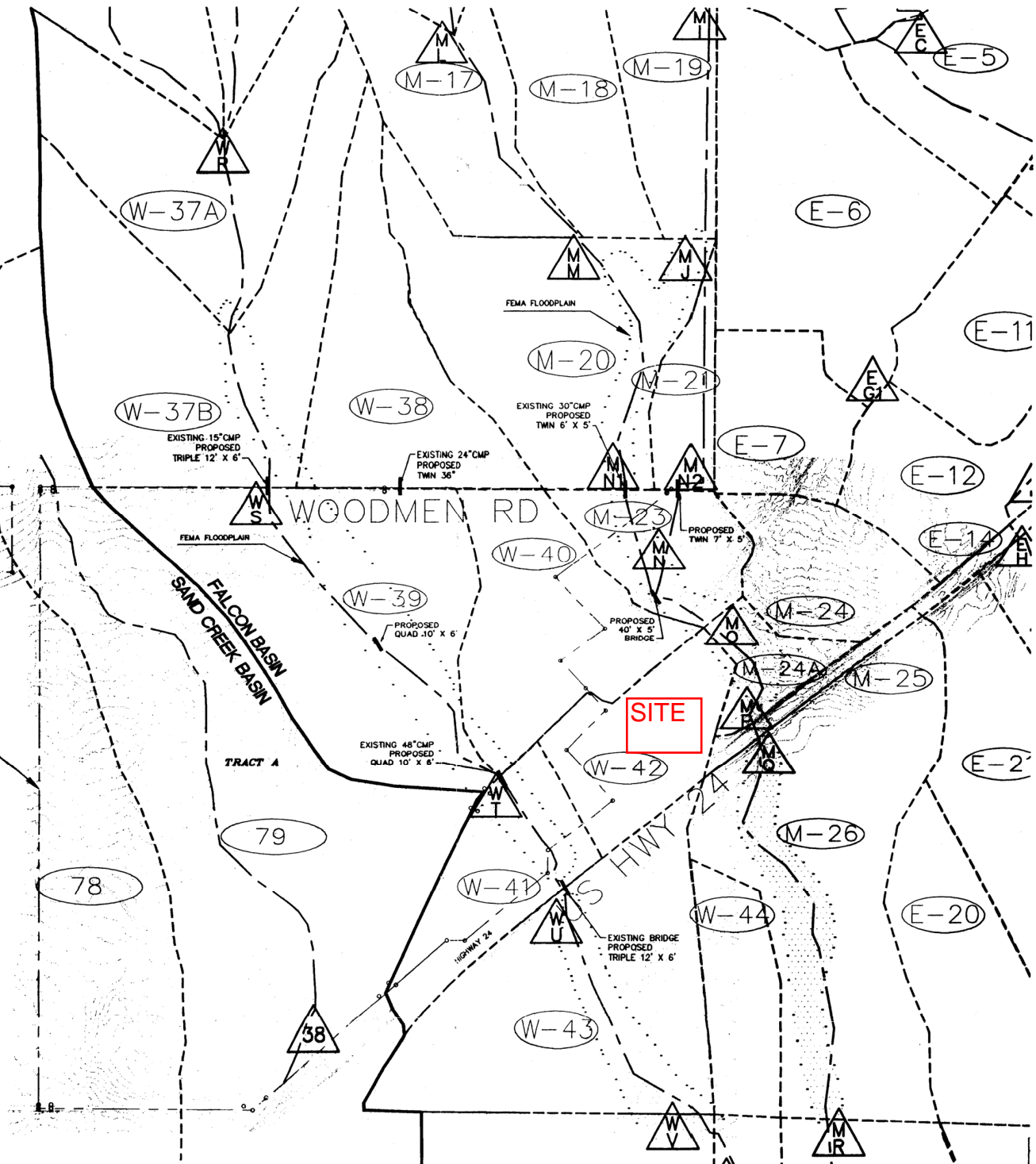
DBPS BASIN MAP



DEVELOPED FLOWS					
SAND CREEK BASIN			FALCON BASIN		
DESIGN POINT	Q _{s-m} (cfs)	Q _{100-m} (cfs)	DESIGN POINT	Q _{s-m} (cfs)	Q _{100-m} (cfs)
38	130	350	WS	162	1,623
39	290	680	WT	175	1,749
40	1,820	3,570	WV	176	1,734
52	1,210	2,120	MN	115	725
54	150	420			

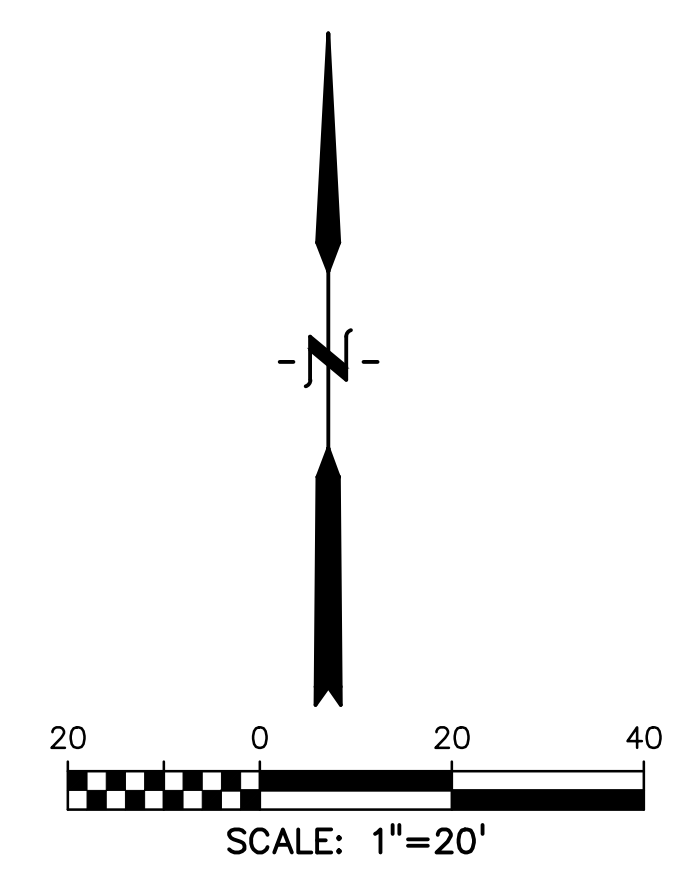



NOTE:
PRELIMINARY STRUCTURE SIZE FROM EITHER
SANDCREEK DBPS AND FALCON DBPS.



REVISIONS:			ENGINEER:	
NO.	DESCRIPTION	DATE	DESIGNED BY: WDC	DATE: 5-30-00
			DRAWN BY: WDC	DATE: 5-30-00
			CHECKED BY: CKC	DATE:
			48 HOURS BEFORE YOU DIG, CALL UTILITY LOCATORS 1-800-922-1987 CITY OF COLORADO SPRINGS DEPT. OF UTILITIES GAS, ELECTRIC, WATER AND WASTEWATER	
			URS 8415 EXPLORER DRIVE, SUITE 110 COLORADO SPRINGS, COLORADO PHONE: (719) 531-0001 FAX: (719) 531-0007	
			PROJECT FALCON HIGHLANDS	
			SHEET TITLE FIGURE 4	
			FROM _____ TO _____	
			JOB NO. 6742219 SHEET 1 OF 1	





<div>PREPARED BY:</div> <div><div>DREXEL, BARRELL & CO. Engineers • Surveyors 13008 7TH STREET COLORADO SPRGS, COLORADO 80905 CONTACT: TIM D. McCONNELL, P.E. (719)260-0887 BOULDER • COLORADO SPRINGS • GREELEY</div></div>	
<div>CLIENT:</div> <div>HESED, LLC 10308 MT. EVANS DRIVE PEYTON, CO 80831</div>	
<div>SITE PLAN FOR:</div> <div>FALCON KENSHIN KARATE STUDIO</div> <div>FALCON, COLORADO</div>	
ISSUE	DATE
INITIAL ISSUE	10/17/21
DESIGNED BY:	KGV
DRAWN BY:	KGV
CHECKED BY:	TDM
FILE NAME:	21496-01 DRN
<div>PREPARED UNDER MY DIRECT SUPERVISION FOR AND ON BEHALF OF DREXEL, BARRELL & CO.</div> <div>DRAWING SCALE: HORIZONTAL: 1" = 20' VERTICAL: N/A</div>	
<div>PROPOSED DRAINAGE CONDITIONS</div>	
PROJECT NO. 21496-01CSOV	
DRAWING NO.	
<div>P1</div>	
SHEET: 2 OF 2	