



Master Development Drainage Plan and
Final Drainage Report

Peerless Farms
16975 Falcon Hwy
Peyton, CO 80831

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Project #: 19611400

PCD File No. _____

Prepared: July 20, 2021

Kimley»Horn



CERTIFICATION

ENGINEERS 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 applicable master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparing this report.

SIGNATURE (Affix Seal): _____
Mitchell Hess, Colorado P.E. No. 53916 Date

DEVELOPER'S STATEMENT

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

Name of Developer

Authorized Signature Date

Printed Name

Title

Address:

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.
County Engineer / ECM Administrator

Date

Conditions:

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INTRODUCTION

PURPOSE AND SCOPE OF STUDY

The purpose of this final drainage report is to outline the drainage facilities for 16975 Falcon Hwy Peyton, CO (the “Property”), El Paso County, Colorado (the “County”). This final drainage report identifies drainage patterns and infrastructure for the Site and proposes to safely route storm water to adequate outfalls. The Property is 40 acres in size.

The Property is located in the Haegler Ranch major drainage basin and is tributary to Black Squirrel Creek. The Site is discussed in the *Haegler Ranch Basin Drainage Basin Planning Study*, dated May 2009 and prepared by URS (“DBPS”).

GENERAL PROJECT DESCRIPTION

The project improvements consist of the construction of a single public road (60’ ROW), two private driveways, and private utilities (the “Project”) within the Property (the “Site”). The Project will be processed through El Paso County.

The Project is located in a portion of the northwest quarter of Section 13, Township 13 south, Range 64 west of the 6th P.M., County of El Paso, State of Colorado (see Vicinity Map in Appendix A). More specifically, the site is located at 16975 Falcon Hwy Peyton, CO 80831. The Property is bounded by Falcon Hwy to the north, privately owner pastures to the west and south, and Sagecreek South Filing No. 1 to the east. The Property is mostly vacant but contains two single family houses, one large barn and some small chicken coops and sheds. The Site is to be replatted as 7 individual lots approximately 5-6 acres each with two private driveways connected to a public access road branching from Falcon Hwy. Stormwater will ultimately outfall to Black Squirrel Creek after initially discharging into an unnamed vegetated creek along the western portion of the Property.

A field survey was completed by Centennial Surveying, dated January 2021, and is the basis for design for the drainage improvements.

PROJECT CHARACTERISTICS

The Project Site is 40 acres in size. The Project involves the construction of a public road with two private driveways, roadside ditches, and culverts. The Site will be subdivided into large-lot residential lots for future single-family residences. The proposed impervious area consists of 0.66 acres for the public/paved roadway in addition to any future single-family residences constructed as part of the development.

The existing Project Site generally slopes from east to west as well as from the southeast to the north at grades of approximately 1.5 – 3.5%. The historical drainage patterns will be generally maintained. The Site consists of two single-family homes, a large barn and some small chicken coops and sheds. The Site does not have any existing stormwater infrastructure with the exception of a 24” culvert beneath Falcon Highway that allows the unnamed drainageway to drain from the north side of Falcon Highway to the Site.

DRAINAGE BASIN PLANNING STUDY INFRASTRUCTURE AND ANALYSIS

The Project Site is contained within the Haegler Ranch Basin and is discussed within the DBPS. Haegler Ranch Drainage Basin consists of 16.6 square miles in unincorporated El Paso County. The basin mostly consists of residential lots greater than 2-acres in size and large agricultural parcels. According to the DBPS, "...the subregional detention alternative is preferred and recommended for implementation" as the drainage basin continues to develop and more dense zoning uses are developed. The DBPS does not recommend that a subregional detention basin be constructed on the subject Site. The DBPS recommends that the existing storm drain culvert that beneath Falcon Highway which discharges stormwater onto the property be upsized to a 66" RCP Culvert.

SOILS CONDITIONS

NRCS soil data is available for this Site and it has been noted that onsite soils are primarily USCS Type A. The NRSC Soils map has been provided in Appendix B.

DRAINAGE DESIGN CRITERIA

REGULATIONS

The proposed development does not propose any deviations from The City of Colorado Springs/El Paso County Drainage Criteria Manual, dated October 12, 1994 or any subsequent revisions.

DEVELOPMENT DESIGN CRITERIA REFERENCE AND CONSTRAINTS

The custom Flood Insurance Rate Map (FIRM) map listed in Appendix B shows the western portion of the Site to be located inside the 100-year flood plain. The proposed private storm facilities follow The City of Colorado Springs/El Paso County Drainage Criteria Manual (the "CRITERIA"), El Paso County Engineering Criteria Manual (the "ECM"), and the Urban Storm Drainage Criteria Manual (the "MANUAL"). Site drainage is not significantly impacted by constraints such as utilities or existing development. Further detail regarding onsite drainage patterns has been provided in the Proposed Drainage Conditions Section.

HYDROLOGIC CRITERIA

The 5-year and 100-year design storm events were used in determining rainfall and runoff for the proposed drainage system per Chapter 6 of the CRITERIA. Table 6-2 of the CRITERIA is the source for rainfall data for the 5-year and 100-year design storm events. Design runoff was calculated using the Rational Method for developed conditions as established in the CRITERIA and MANUAL. Runoff coefficients for the proposed development were determined using Table 6-6 of the CRITERIA by calculating weighted impervious values for each specific site sub-basin.

HYDRAULIC CRITERIA

The proposed drainage facilities are designed in accordance with the CRITERIA and MANUAL. Floodplain identification was determined using a custom FIRMette map by FEMA and information provided in the CRITERIA. Results of hydraulic calculations are summarized in Appendix D.

VARIANCES FROM CRITERIA

Due to existing grades and to match the historical flows presented at the Site, some drainage will be directed back to the county ROW. This is an existing condition. Besides this condition, no variances from the CRITERIA have been proposed for this development.

EXISTING DRAINAGE CONDITIONS

EXISTING DRAINAGE BASIN

The existing property contains 2 sub-basin. Sub-Basin EX1 is 40.01 acres with a basin impervious value of 1% and 5-year and 100-year storm event direct runoff values of 0.19 and 15.21 cubic feet per second (cfs) respectively. A portion of the stormwater runoff flows north into a roadside ditch within the ROW before discharging into the unnamed drainage way, traveling through the site and then leaving the Site at the southwest corner. All flows discharge to the unnamed drainageway located on the west side of the Site. A second sub-basin, Sub-Basin EX2, consists of a portion of the northern property frontage within the ROW that drains to the property. Sub-Basin EX2 is 2.62 acres with a basin impervious value of 1% and 5-year and 100-year storm event direct runoff values of 0.90 and 3.00 cubic feet per second (cfs) respectively.

PROPOSED DRAINAGE CONDITIONS

The developed runoff from the Project will generally be collected by means of roadside ditches located adjacent to the proposed public road and private gravel driveways. The runoff collected in the roadside ditches will be conveyed to the unnamed drainageway, following historical runoff patterns. The Property has been divided into 2 sub-basins, Sub-Basin 1 and Sub-Basin EX2. The proposed conditions map is provided in Appendix F.

Sub-Basin 1

Sub-basin 1 is 40.01 acres with a basin impervious value of 7% and consists of the entire Site. The runoff developed within this sub-basin will be collected within proposed roadside ditches before being flowing into the unnamed drainageway. Developed runoff during the 5-year and 100-year storm events will be 2.07 and 19.76 cfs respectively. Stormwater runoff within Sub-Basin 1 will continue to follow its historical path.

Sub-Basin EX2

Sub-Basin EX2 consists of a portion of the northern property frontage within the ROW that drains to the property. Sub-Basin EX2 is 2.62 acres with a basin impervious value of 1% and 5-year and 100-year storm event direct runoff values of 0.90 and 3.00 cubic feet per second (cfs) respectively. Stormwater runoff within Sub-Basin EX2 will continue to follow its historical path.

CONFORMANCE WITH THE DBPS

The proposed Project includes single-family lots which are all greater than 5-acres in size. The impervious value of 7% was used for the total site (see ECM Table 3-1). The 5-year and 100-year storm event direct runoff for the site will be 2.07 and 19.06 cfs respectively. The proposed development is in general conformance with the DBPS and will not negatively affect downstream drainage.

EMERGENCY OVERFLOW ROUTING

All overflow routing will be directed to the existing unnamed drainageway that is located on the western side of the site. This flow path matches the historical stormwater runoff path.

HYDRAULIC ANALYSIS METHODOLOGY

The proposed drainage facilities were designed in accordance with the CRITERIA and MANUAL. Floodplain identification was determined using a custom FIRMette map by FEMA and information provided in the CRITERIA. Apart from road culverts, no underground storm drain pipes as proposed for the development. Culvert sizing calculations were computed using Flow master. There are no proposed variances from the City of Colorado Springs/El Paso County Criteria for the proposed development.

No inlets have been proposed as part of the Project. Stormwater runoff will be routed above ground through roadside ditches and culverts beneath the public roadway and private driveways.

Four-Step Process

The Site was designed in accordance with the four-step process to minimize adverse impacts of urbanization, as outlined in Section I.7.2 BMP Selection of the CRITERIA. The four-step process per the CRITERIA provides guidance and requirements for the selection of siting of structural Best Management Practices (BMPs) for new development and significant redevelopment.

Step 1: Employ Runoff Reduction Practices

Currently the site is mostly vacant land. Development of the site will increase current runoff conditions due to increased imperviousness values. The increase in impervious area is minimal though due to the Site size of 40-acres. Stormwater runoff from the proposed impervious area, the public road, will be collected in roadside ditches. The vegetated ditches will promote stormwater infiltration. The Site was designed to conserve as much of the existing vegetation as possible and to minimize the extent of paved areas. Additionally, the Site was designed to eliminate underground storm drains and storm drain culverts will only be used to route water beneath the public road and private driveways.

Step 2: Stabilize Drainageways

An existing unnamed drainageway flows through the western portion of the Site. During a Site visit, it was found that the drainageway is currently well-stabilized and extremely vegetated. Site visit photos of the drainageway have been included in Appendix G. As the drainageway is currently stable and the development of the large-lot subdivision will only minimally increase the stormwater runoff it has been determined that leaving the unnamed drainageway as-is, currently stabilized and vegetated, will allow the channel to remain stabilized. As discussed in the DBPS, “The disturbance of the native vegetation and failure to properly revegetate areas impacted by site development, utility, roadway and landscape construction activities have in some cases negatively affected downstream areas.” Furthermore, as noted in Chapter 1, Section 1.4 of the CRITERIA, “Natural channel systems, primarily the designated Major Drainageways and Primary outfalls, serve to store flood waters, enhance water quality, provide for ground water recharge and preserve riparian corridors. The use of historical channels to convey storm water runoff from developed and developing areas is acceptable. However, if historical storm water flows are increased, or if historical channels are unstable in their natural conditions, these channels must be adequately stabilized to prevent excessive erosion.” Additionally, Chapter 2, Section 2.2 of the CRITERIA states, “A stable natural channel reaches ‘equilibrium’ over many years. Therefore, channel modifications should be minimal.” Because the existing drainageway is properly stabilized, it is felt that attempts to change the natural channel may lead to destabilization of the drainageway and therefore, no changes to the unnamed drainageway, with the exception of stabilization at the location of the proposed ditches, are recommended.

The proposed Project involves construction of roadside ditches which will discharge into the unnamed drainageway. To reduce the opportunity for erosion where the ditches outfall, riprap will be added to dissipate energy from stormwater runoff.

Step 3: Provide Water Quality Capture Volume (WQCV)

The proposed Project development includes large-lot single-family lots which include minimal impervious areas. As discussed within the CRITERIA, the Project is exempt from WQCV requirements as the proposed public road is less than 1-acre of impervious area.

Step 4: Consider Need for Industrial and Commercial BMPs

The proposed Project consists of a single-family subdivision. No industrial and commercial uses or developments are anticipated as part of the proposed development.

DETENTION AND WATER QUALITY REQUIREMENTS

As discussed in Section I.7.1B of Appendix I of the ECM, detention and water-quality facilities are not required for the Project as the development consists of 5-acre residential lots and less than 1-acre of public roadway is proposed for the Site. Additionally, per Chapter 1, Section 1.5 of the CRITERIA, “Regional detention ponds are required in place of numerous smaller detention ponds.”

EROSION CONTROL PLAN

Erosion Control Plans will be submitted separately as a standalone construction document.

FLOODPLAIN STATEMENT

The western portion of the Site is within Area AE, special flood hazard areas with base flood elevations and Zone X, 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.

The remaining portion of the Site is located outside of the 100-year floodplain as determined by the custom FIRMet map created on April 20, 2021 and contained with Appendix B.

FEES DEVELOPMENT

APPLICABLE FEES

Drainage and Bridge Fees are required to be paid at the time of Final Plat recording for the Project. The Site is within the Haeger Drainage Basin. Drainage Fees are based on the number of impervious acres for the development. The 2021 Drainage and Bridge Fees are \$11,113 and \$1,640, respective, per impervious acre. The impervious value for the Site was taken from Table 3-1 of the ECM.

Total Acreage (40-acres) x Site Impervious Value (7%) = Impervious Acres (2.8)

Drainage Basins Fees = 2.8-acres x (\$11,113 + \$1,640) = \$35,708.40

25% Reduction for 5-acre lots

Final Fee = 0.75 x \$35,708.40 = **\$26,781.30**

CONSTRUCTION COST OPINION

An opinion of probable construction cost for the construction of the private drainage facilities for the Project has been included in Appendix E. There are no public drainage ponds or permanent control measures proposed as part of the Project.

MAINTENANCE AND OPERATIONS

Detention and WQCV BMP's are not proposed as part of the development.

GROUNDWATER CONSIDERATIONS

A Geotechnical Evaluation by RMG and dated 4/14/2021 was performed for the Site. According to the Geotechnical Evaluation, "Groundwater was encountered in all three test borings at depths ranging from between 11.0 feet to 18.0 feet below the existing ground surface at the time of boring. When checked five days subsequent to drilling, groundwater was encountered at depths ranging between 4.0 feet to 18.6 feet. Groundwater levels are anticipated to have sufficient separation from the bottom of proposed crawlspace and basement foundation components on Lots 2, 4, 6 and 7. Due to the shallow groundwater conditions encountered near the unnamed intermittent creek, the use of basements on Lots 1 and 5 may be limited. Groundwater conditions should be considered in the site-specific soils investigations and OWTS designs."

SUMMARY

COMPLIANCE WITH STANDARDS

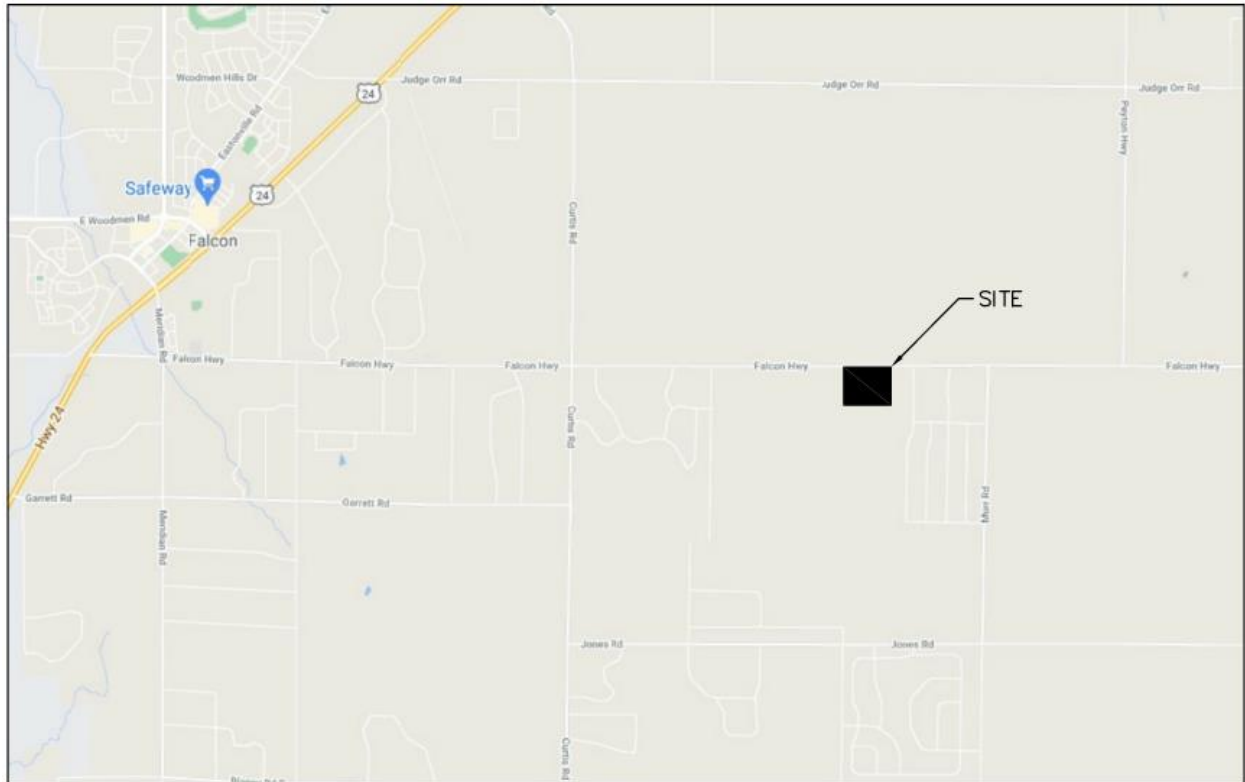
The drainage design presented within this report for the Peerless Farms Large-Lot Single-Family Development conforms to the City of Colorado Springs/El Paso County Storm Drainage Criteria and the Urban Drainage and Flood Control District Manual. Additionally, the Site runoff and private storm sewer facilities will not adversely affect the downstream and surrounding developments or waterways. This report and its findings are consistent with the drainage requirements documented in the DBPS.

REFERENCES

1. The City of Colorado Springs Drainage Criteria Manual, May 2014
2. El Paso County Drainage Criteria Manual, Vol. 1 and 2, October 1994
3. Urban Drainage and Flood Control District Drainage Criteria Manual (UDFCDCM), Vol. 1, prepared by Wright-McLaughlin Engineers, June 2001, with latest revisions.
4. Flood Insurance Rate Map, El Paso County, Colorado and Incorporated Areas, Map Number 08041C0553G, Effective Date December 7, 2018, prepared by the Federal Emergency Management Agency (FEMA).
5. Haegler Ranch Basin Drainage Basin Planning Study. Prepared by URS, May 2009.
6. Geotechnical Evaluation prepared by RMG. April 14, 2021.

APPENDIX

APPENDIX A - VICINITY MAP



APPENDIX B - SOILS MAP AND FEMA FIRM PANEL



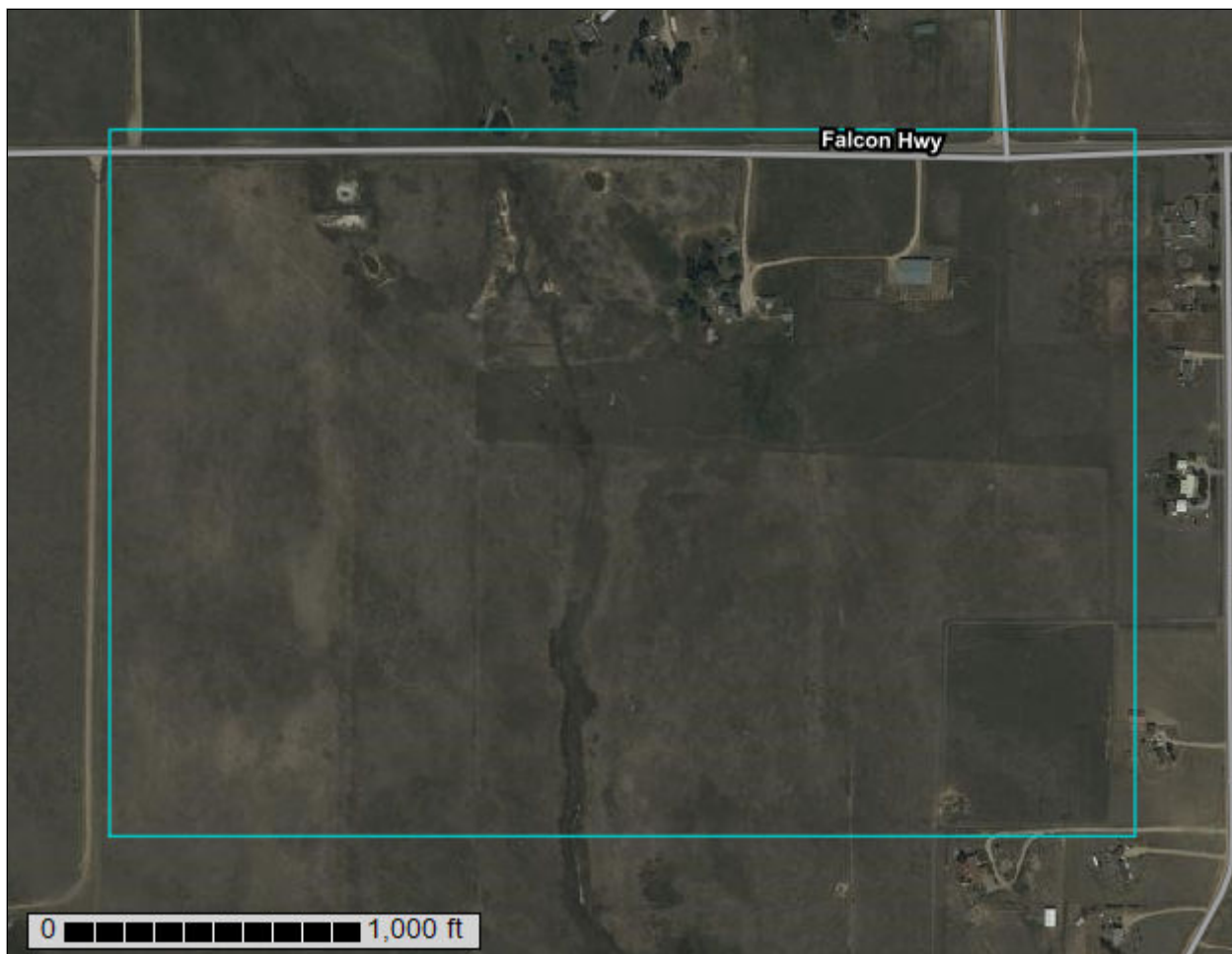
United States
Department of
Agriculture

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**



Preface

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

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

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

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

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

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

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How Soil Surveys Are Made

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

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

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

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

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

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

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

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

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

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

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

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

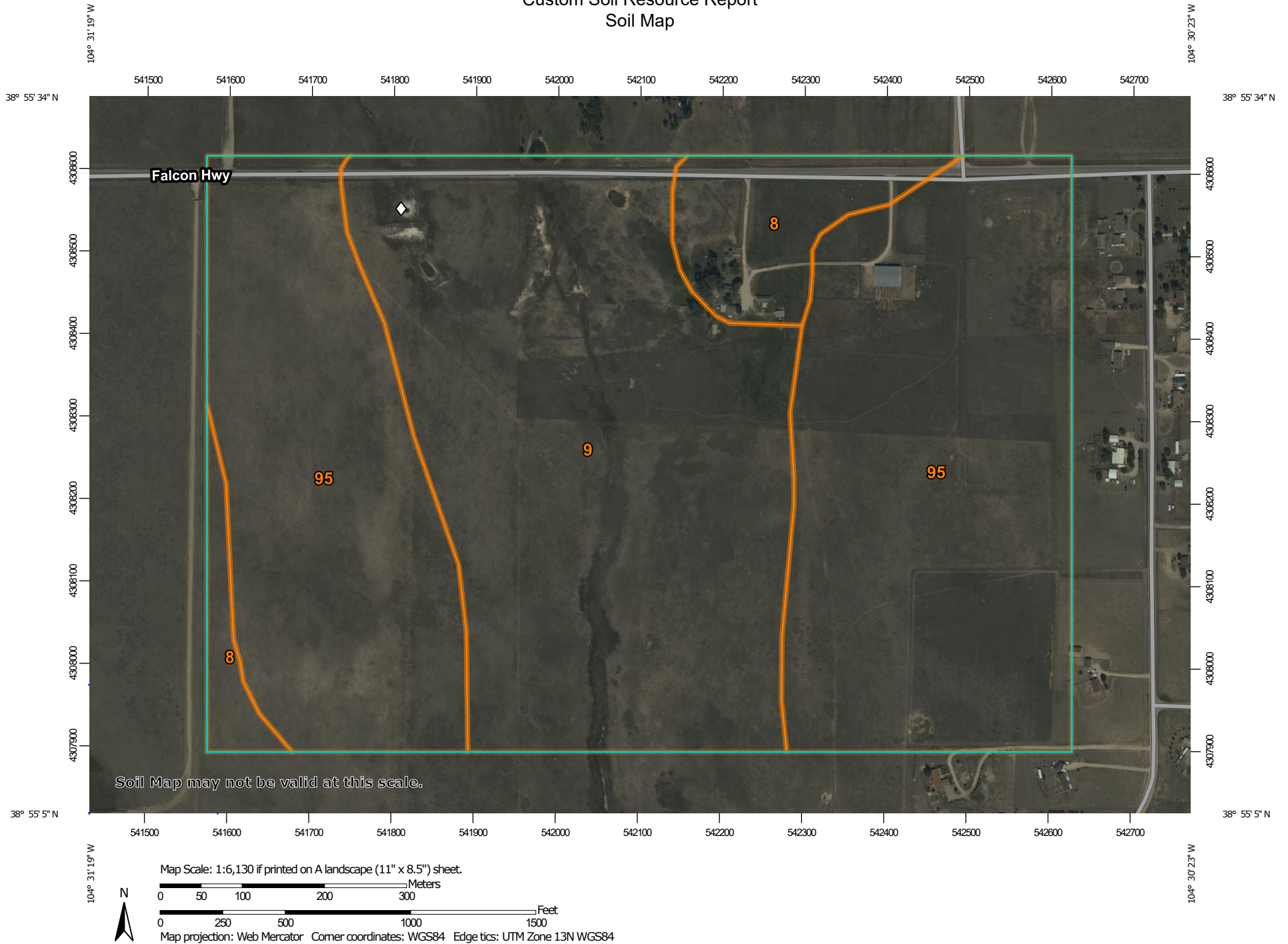
Custom Soil Resource Report

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

Soil Map

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


Custom Soil Resource Report Soil Map




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 18, Jun 5, 2020

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	13.9	7.4%
9	Blakeland-Fluvaquentic Haplaquolls	75.0	39.7%
95	Truckton loamy sand, 1 to 9 percent slopes	99.9	52.9%
Totals for Area of Interest		188.9	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

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 capacity: 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

Pleasant

Percent of map unit: 1 percent

Landform: Depressions

Hydric soil rating: Yes

Other soils

Percent of map unit: 1 percent

Hydric soil rating: No

9—Blakeland-Fluvaquentic Haplaquolls

Map Unit Setting

National map unit symbol: 36b6

Elevation: 3,500 to 5,800 feet

Mean annual precipitation: 13 to 17 inches

Mean annual air temperature: 46 to 55 degrees F

Frost-free period: 110 to 165 days

Farmland classification: Not prime farmland

Map Unit Composition

Blakeland and similar soils: 60 percent

Fluvaquentic haplaquolls and similar soils: 38 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, talf

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Sandy alluvium derived from arkose and/or eolian deposits
derived from arkose

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 capacity: 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

Description of Fluvaquentic Haplaquolls

Setting

Landform: Swales
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

H1 - 0 to 12 inches: variable

Properties and qualities

Slope: 1 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.20 to 6.00 in/hr)
Depth to water table: About 0 to 24 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Maximum salinity: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)

Interpretive groups

Land capability classification (irrigated): 6w
Land capability classification (nonirrigated): 6w
Hydrologic Soil Group: D
Hydric soil rating: Yes

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

95—Truckton loamy sand, 1 to 9 percent slopes

Map Unit Setting

National map unit symbol: 36bd
Elevation: 6,000 to 7,000 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

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

Description of Truckton

Setting

Landform: Hills, flats
Landform position (three-dimensional): Side slope, talf
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 8 inches: loamy sand
Bt - 8 to 24 inches: sandy loam
C - 24 to 60 inches: coarse sandy loam

Properties and qualities

Slope: 1 to 9 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 (1.98 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 5.4 inches)

Interpretive groups

Land capability classification (irrigated): 4e
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: 4 percent

Hydric soil rating: No

Pleasant

Percent of map unit: 1 percent

Landform: Depressions

Hydric soil rating: Yes

Soil Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Erosion Factors

Soil Erosion Factors are soil properties and interpretations used in evaluating the soil for potential erosion. Example soil erosion factors can include K factor for the whole soil or on a rock free basis, T factor, wind erodibility group and wind erodibility index.

K Factor, Whole Soil

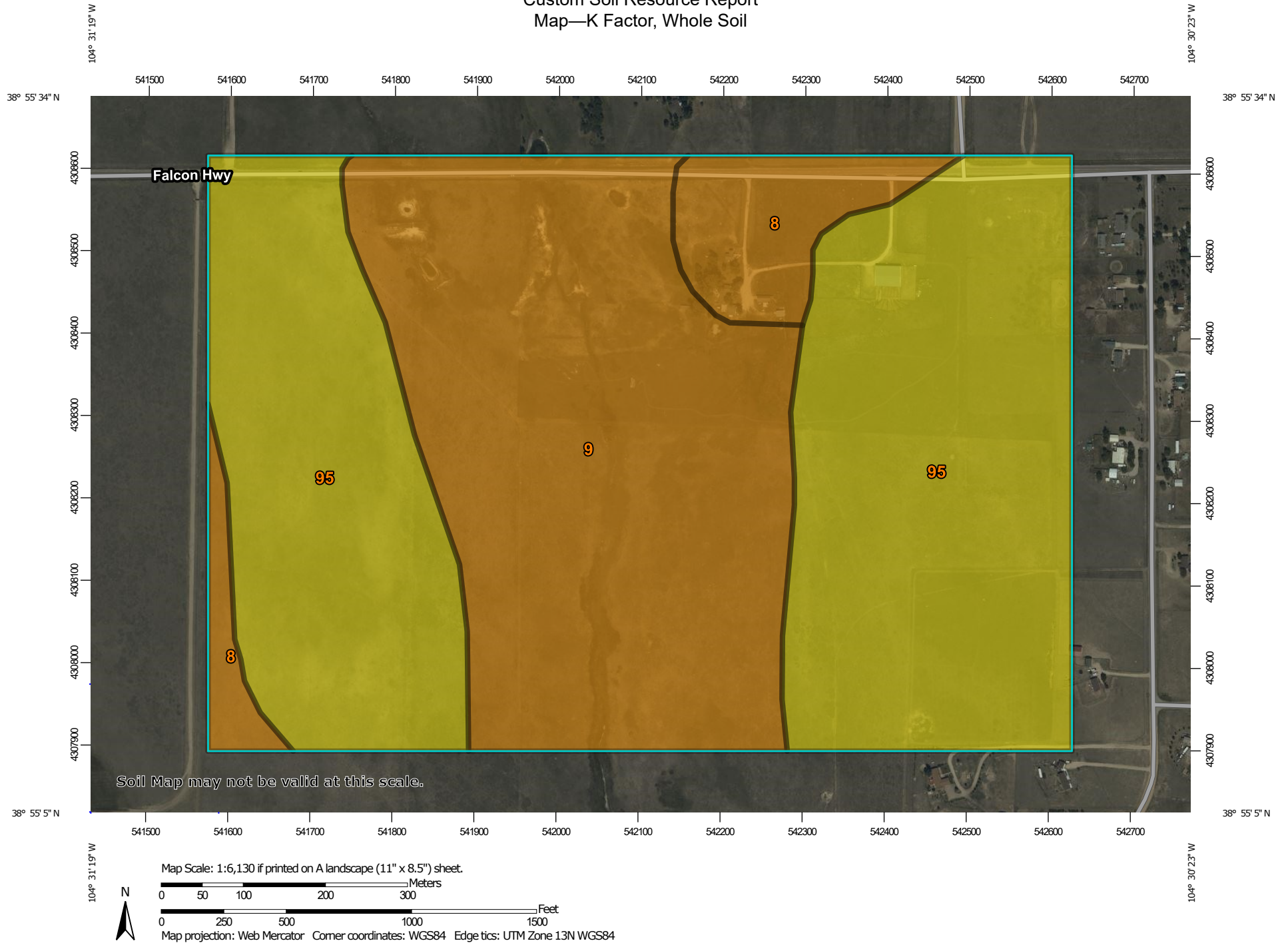
Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and saturated hydraulic conductivity (Ksat). Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

"Erosion factor Kw (whole soil)" indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

Factor K does not apply to organic horizons and is not reported for those layers.

Custom Soil Resource Report


Map—K Factor, Whole Soil



Custom Soil Resource Report
















MAP LEGEND

Area of Interest (AOI)







 Area of Interest (AOI)










Soils

Soil Rating Polygons
















	.02
	.05
	.10
	.15
	.17
	.20
	.24
	.28
	.32
	.37
	.43
	.49
	.55
	.64
	Not rated or not available

Soil Rating Lines








	.02
	.05
	.10
	.15
	.17
	.20

	.24
	.28
	.32
	.37
	.43
	.49
	.55
	.64
	Not rated or not available

Soil Rating Points

	.02
	.05
	.10
	.15
	.17
	.20
	.24
	.28
	.32
	.37
	.43
	.49
	.55
	.64
	Not rated or not available

Water Features

	Streams and Canals
	Rails
	Interstate Highways
	US Routes
	Major Roads
	Local Roads
	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.

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Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 18, Jun 5, 2020

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Date(s) aerial images were photographed: Sep 11, 2018—Oct 20, 2018

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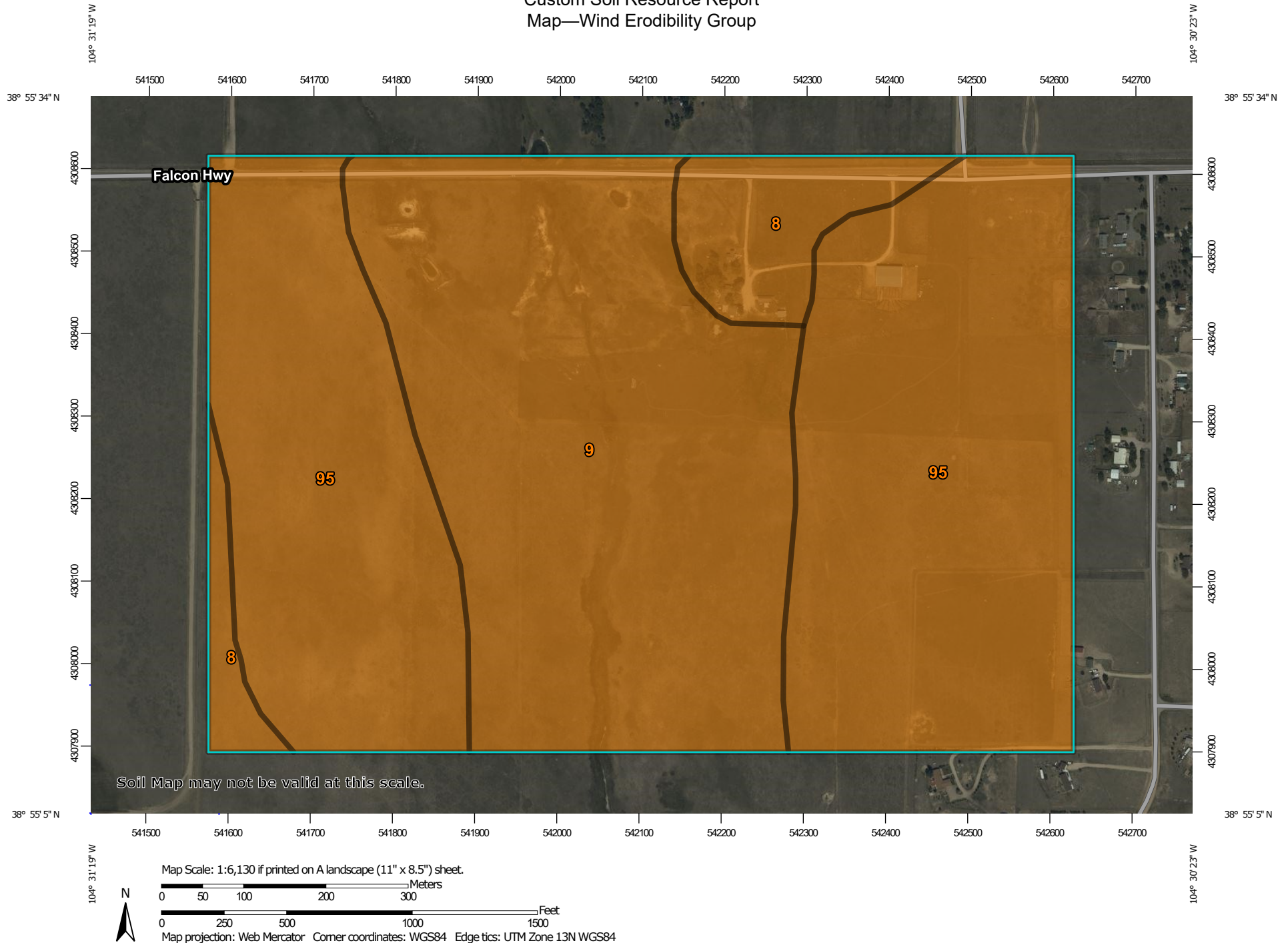
Table—K Factor, Whole Soil

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
8	Blakeland loamy sand, 1 to 9 percent slopes	.10	13.9	7.4%
9	Blakeland-Fluvaquentic Haplaquolls	.10	75.0	39.7%
95	Truckton loamy sand, 1 to 9 percent slopes	.17	99.9	52.9%
Totals for Area of Interest			188.9	100.0%

Rating Options—K Factor, Whole Soil*Aggregation Method: Dominant Condition**Component Percent Cutoff: None Specified**Tie-break Rule: Higher**Layer Options (Horizon Aggregation Method): Surface Layer (Not applicable)***Wind Erodibility Group**

A wind erodibility group (WEG) consists of soils that have similar properties affecting their susceptibility to wind erosion in cultivated areas. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible.


Custom Soil Resource Report
Map—Wind Erodibility Group



Custom Soil Resource Report




MAP LEGEND

Area of Interest (AOI)











 Area of Interest (AOI)

Soils

Soil Rating Polygons

-  1
-  2
-  3
-  4
-  4L
-  5
-  6
-  7
-  8
-  Not rated or not available


Soil Rating Lines

-  1
-  2
-  3
-  4
-  4L
-  5
-  6
-  7
-  8
-  Not rated or not available






Soil Rating Points

-  1
-  2
-  3
-  4
-  4L
-  5
-  6
-  7
-  8
-  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

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

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Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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Table—Wind Erodibility Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
8	Blakeland loamy sand, 1 to 9 percent slopes	2	13.9	7.4%
9	Blakeland-Fluvaquentic Haplaquolls	2	75.0	39.7%
95	Truckton loamy sand, 1 to 9 percent slopes	2	99.9	52.9%
Totals for Area of Interest			188.9	100.0%

Rating Options—Wind Erodibility Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Hydrologic Soil Group

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

Custom Soil Resource Report

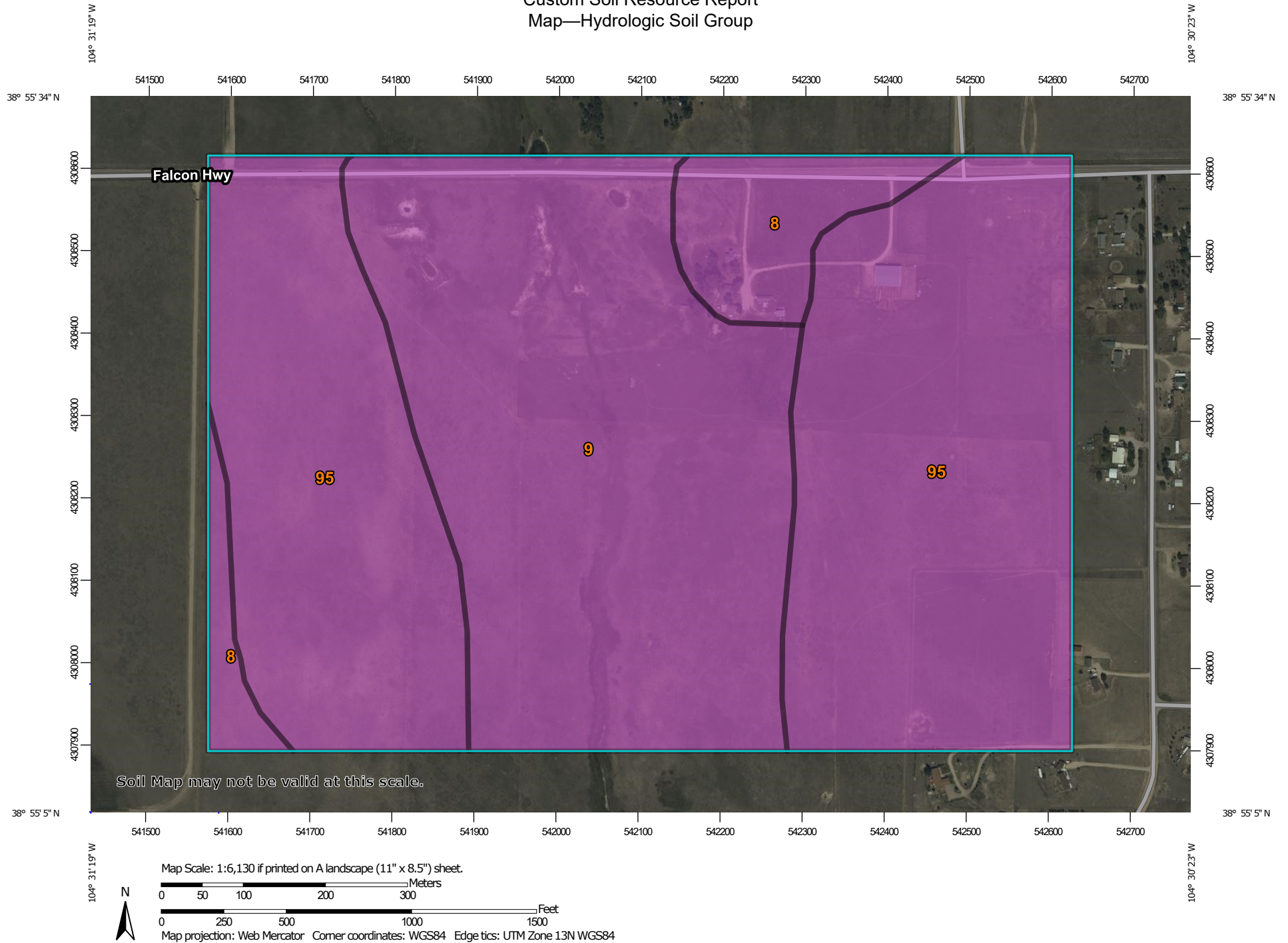
soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

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.

Custom Soil Resource Report Map—Hydrologic Soil Group



Custom Soil Resource Report

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

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Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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Table—Hydrologic Soil Group

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8	Blakeland loamy sand, 1 to 9 percent slopes	A	13.9	7.4%
9	Blakeland-Fluvaquentic Haplaquolls	A	75.0	39.7%
95	Truckton loamy sand, 1 to 9 percent slopes	A	99.9	52.9%
Totals for Area of Interest			188.9	100.0%

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

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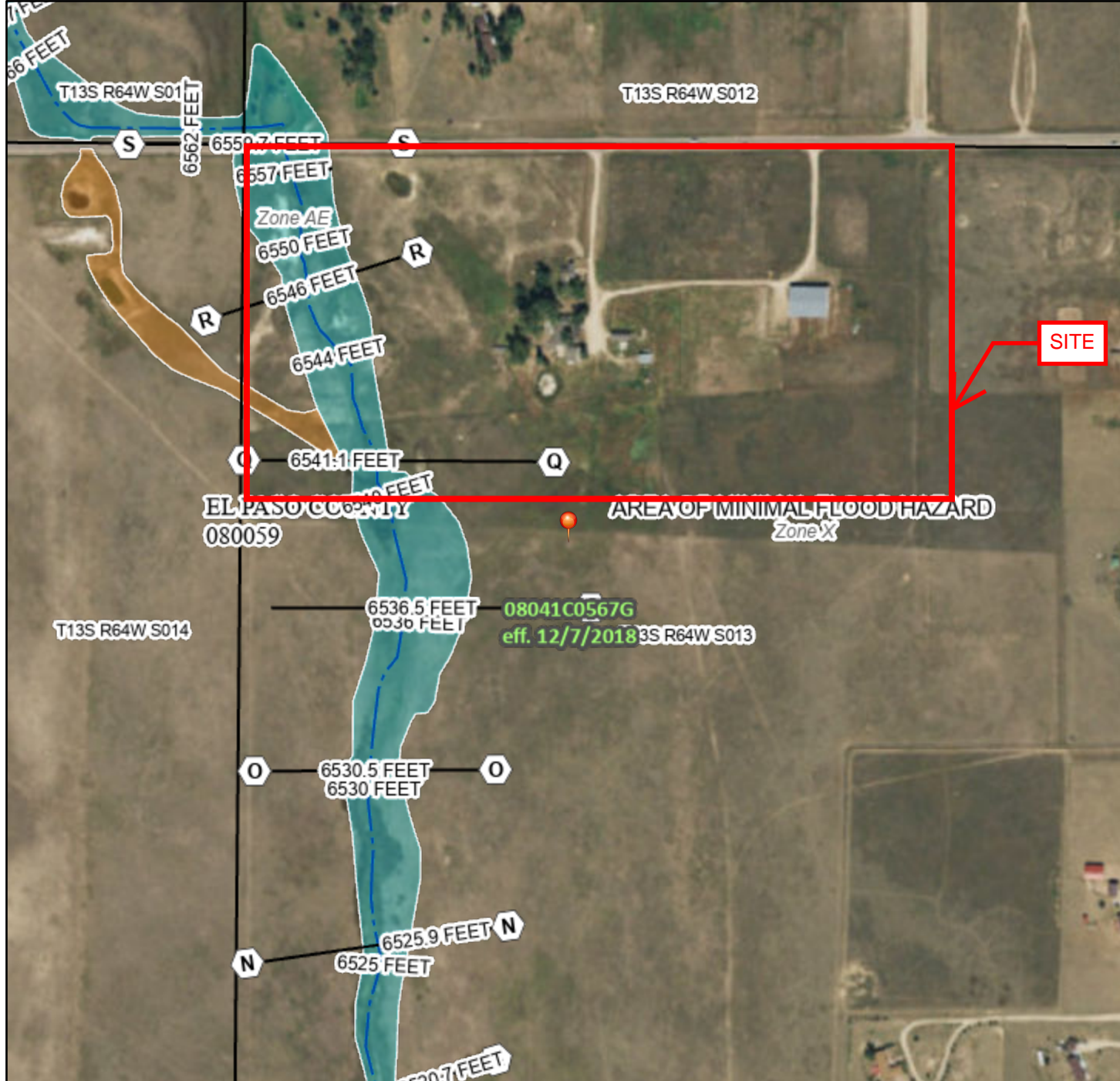
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National Flood Hazard Layer FIRMMette



104°31'6"W 38°55'35"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
		Coastal Transect
		Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary
MAP PANELS		Coastal Transect Baseline
		Profile Baseline
		Hydrographic Feature
		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 4/20/2021 at 4:13 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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

APPENDIX C - HYDROLOGIC CALCULATIONS

EXISTING BASIN IMPERVIOUSNESS

Landuse	I	Runoff Coefficient		
		2-YR	5-YR	100-YR
Landscape	0%	0.02	0.08	0.50
Roof	90%	0.57	0.59	0.74
Drives&Walks	100%	0.89	0.90	0.96

Basin Designation	A _{TOTAL} (AC)	A _{TOTAL} (SF)	A _{LANDSCAPE} (SF)	A _{ROOF} (SF)	A _{PAVEMENT} (SF)	I _{WEIGHTED}
1	40.01	1,742,836	1,723,623	15,888	3,325	1%
Total	40.01	1,742,836	1,723,623	15,888	3,325	1%

Calculation of Peak Runoff using Rational Method	
--	--

$$Q(cfs) = CIA$$
[illegible]

Calculation of Peak Runoff using Rational Method	
--	--

Cells of this color are for required user-input
Cells of this color are for optional override values
Cells of this color are for calculated results based on overrides

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

$$\text{Regional } t_c = (26 - 17i) + \frac{L_t}{60(14i + 9)\sqrt{S_t}}$$

$$\text{Selected } t_c = \max\{t_{\text{minimum}}, \min(\text{Computed } t_c, \text{Regional } t_c)\}$$

	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr
1-hour rainfall depth, P1 (in) =	1.19	1.50	1.75	2.00	2.25	2.52	

	a	b	c	$I(\text{in/hr}) = \frac{a * P_1}{(b + t_c)^c}$
Rainfall Intensity Equation Coefficients =	28.50	10.00	0.786	

$$I(in/hr) = \frac{a * P_1}{(b + t_c)^c}$$

$$Q(cfs) = CIA$$

[illegible]

APPENDIX D - HYDRAULIC CALCULATIONS

Culvert Capacity

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Capacity
Input Data	
Roughness Coefficient	0.010
Channel Slope	0.005 ft/ft
Normal Depth	18.0 in
Diameter	18.0 in
Discharge	9.66 cfs
Results	
Discharge	9.66 cfs
Normal Depth	18.0 in
Flow Area	1.8 ft ²
Wetted Perimeter	4.7 ft
Hydraulic Radius	4.5 in
Top Width	0.00 ft
Critical Depth	14.4 in
Percent Full	100.0 %
Critical Slope	0.005 ft/ft
Velocity	5.46 ft/s
Velocity Head	0.46 ft
Specific Energy	1.96 ft
Froude Number	(N/A)
Maximum Discharge	10.39 cfs
Discharge Full	9.66 cfs
Slope Full	0.005 ft/ft
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	23.3 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	18.0 in
Critical Depth	14.4 in
Channel Slope	0.005 ft/ft
Critical Slope	0.005 ft/ft

APPENDIX E - EOPCC



Kimley-Horn & Associates, Inc.

Opinion of Probable Construction Cost

Client: Robert S. Williams	Date: 7/19/2021
Project: Peerless Farms, El Paso County, CO	Prepared By: MH
KHA No.: 196114000	Checked By:

Sheet: 1 of 1

This OPC is not intended for basing financial decisions, or securing funding. Review all notes and assumptions. Since Kimley-Horn & Associates, Inc. has no control over the cost of labor, materials, equipment, or services furnished by others, or over methods of determining price, or over competitive bidding or market conditions, any and all opinions as to the cost herein, including but not limited to opinions as to the costs of construction materials, shall be made on the basis of experience and best available data. Kimley-Horn & Associates, Inc. cannot and does not guarantee that proposals, bids, or actual costs will not vary from the opinions on costs shown herein. The total costs and other numbers in this Opinion of Probable Cost have been rounded.

Item No.	Item Description	Quantity	Unit	Unit Price	Item Cost
1	Private Storm Sewer (Non-Reimbursible) 18" RCP Storm Pipe	146	LF	\$67.00	\$9,782
Subtotal:					\$9,782
Contingency (%,+/-) 10%					\$978
Project Total:					\$10,760

Basis for Cost Projection:

- ☐ No Design Completed
- ☒ Preliminary Design
- ☐ Final Design

Design Engineer:

Mitchell O. Hess
Registered Professional Engineer, State of Colorado No. 53916

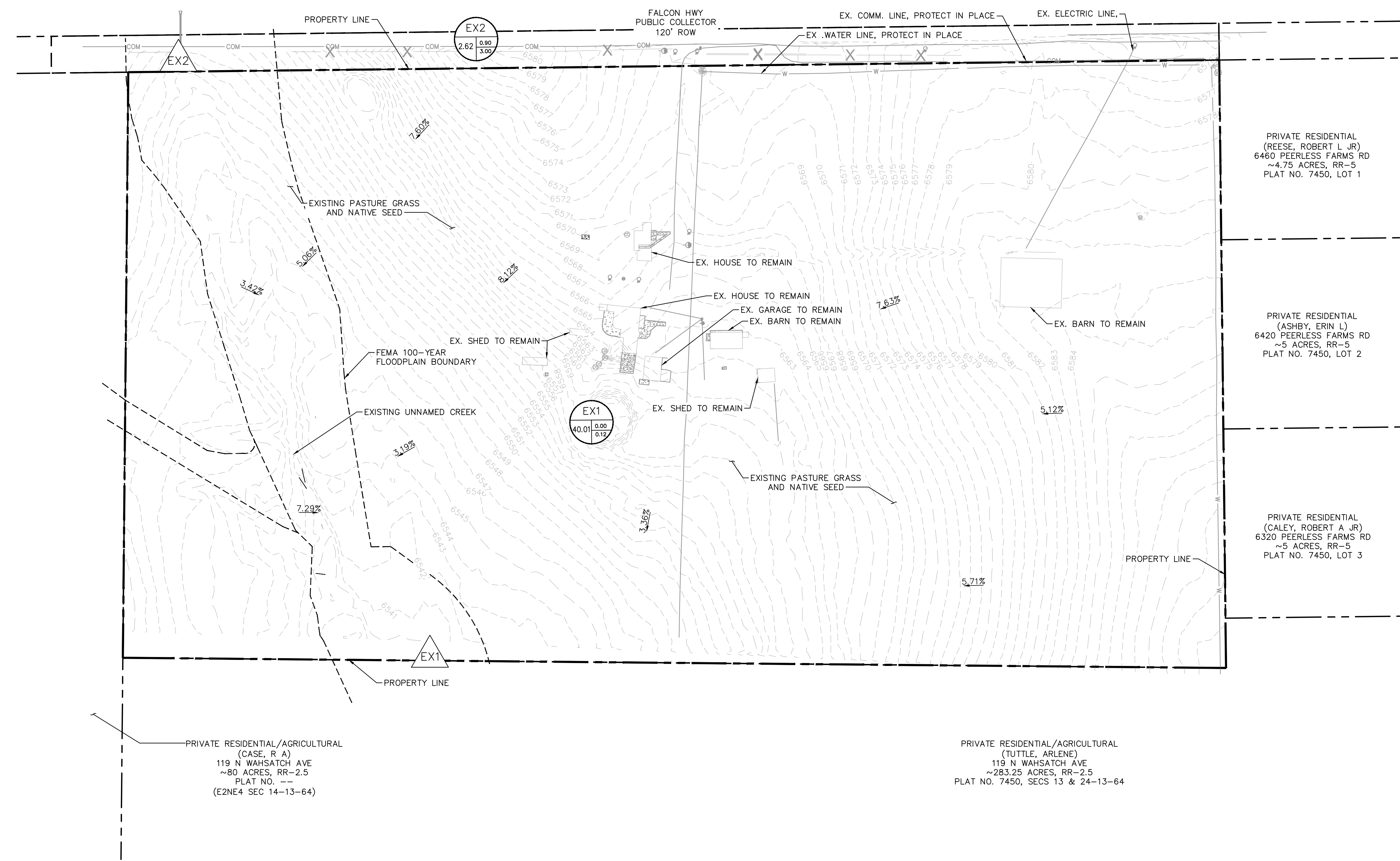
APPENDIX F – DRAINAGE EXHIBITS

K:\COS_LA\196114000 - Peerless Farms\CADD\Exhibits\Existing Drainage Map.dwg

LEGEND

- SITE PROPERTY LINE
- 10- EXISTING MAJOR CONTOURS
- 11- EXISTING MINOR CONTOURS
- DRAINAGE BASIN BOUNDARY
- EXISTING STORM SEWER CULVERT
- | |
|---|
| A |
| B |
| C |
| D |

 A = BASIN DESIGNATION
B = AREA IN ACRES
C = 5-YR RUNOFF COEFFICIENT
D = 100-YR RUNOFF COEFFICIENT
- # = DESIGN POINT DESIGNATION



EXISTING DRAINAGE MAP
PEERLESS FARMS
07/19/2021

Kimley»Horn

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APPENDIX G – UNNAMED DRAINAGEWAY PHOTOGRAPHS



Figure 1: Storm Drain Culver Beneath Falcon Highway



Figure 2: Looking East Towards the Unnamed Drainageway



Figure 3: Looking East Towards the Unnamed Drainageway



Figure 4: Looking North Towards Falcon Highway



Figure 5: Looking Southeast at the Unnamed Drainageway



Figure 6: Unnamed Drainageway



Figure 7: Looking North at the Unnamed Drainageway



Figure 8: Looking East at the Unnamed Drainageway at the South End of the Site