MVE, INC.
ENGINEERS / SURVEYORS
1903 lelaray street, suite 200
colorado springs, co 80909
719.635.5736

Final Drainage Report

Jackson Ranch Filing No. 3

April 18, 2017

Project No. 61044

Add: "PCD Project No. SF-17-017"

Final Drainage Report

for

Jackson Ranch Filing No. 3

Project No. 61044

April 18, 2017

prepared for

Four Gates Land Development LLC
17435 Roller Coaster Road
Monument, CO 80132
719.488.9329

prepared by

MVE, Inc.
1903 Lelaray Street, Suite 200
Colorado Springs, CO 80909
719.635.5736

61044 Filing 3 Final Drainage Report.odt

Statements and Acknowledgments

"master"

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 El Paso County for drainage reports and said report is in conformity with the applicable aster 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.

Charles C. Crum, P.E. 4-27-17

Charles C. Crum, P.E. Colorado No. 13348 Date
For and on Behalf of MVE, Inc.

Developer's Statement

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

Add title

Marlene J. Brown Date
Four Gates Land Development LLC

Address

El Paso County

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

Revise to "Jennifer Irvine, P.E."

Jennifer Irvine , County Engineer / ECM Administrator Date
El Paso County

Contents

Final Drainage Report

The purpose of this Final Drainage Report is to identify drainage patterns and quantities within and affecting the proposed Jackson Ranch Filing No. 3 subdivision. The development project is a residential subdivision with 2.5 +/- acre lots. The report will identify specific solutions to problems on-site and off-site resulting from the proposed project.[1] The report and included maps present results of hydrologic and drainage facilities analyses. The report will discuss the recommend drainage improvements to the site and identify drainage requirements relative to the proposed project. This report has been prepared and submitted in accordance with the requirements of the El Paso County p Final Plat approval process. An Appendix is included with this report with pertinent calculations and graphs used in the facility design and drainage analyses.

1 General Location and Description

1.1 Location

The proposed Jackson Ranch Filing No. 3 site is located to the north and adjacent to Jackson Ranch Filing No. 2 and is in the Northwest One-Quarter of Section 21, Township 11 South, Range 66 West of the 6th principal meridian in unincorporated El Paso County, Colorado. The site is situated to the north of Higby Road, and to the east of Roller Coaster Road. The property is currently unplatted. A **Vicinity Map** is included in the **Appendix**.

1.2 Description of Property

Jackson Ranch Filing No. 3 site contains 26.2± acres of undeveloped property. The acreage will remain zoned RR-2.5 (Residential Rural District). The proposed Jackson Ranch Filing No. 3 includes 9 rural residential lots, Tract A open space and drainage area, and about 1,495 feet of paved roads. The road system to be constructed at this time include the southern 990+/- linear feet of Jackson Ranch Court, up to and including 505+/- lineal feet of the southern-most cul-de-sac named Mahaffie Court.

The ground cover, which is in fair to good condition, consists of native grasses, sparse brush and areas of mature coniferous trees. The trees are concentrated on the site along a line from the center of the southern boundary of the site and along the ridge line traversing the site towards the northeast.

The existing topography on the eastern portion of the Jackson Ranch Filing No. 3 site slopes to the northeast with grades that range from 5% to 6%. The existing topography on the western portion of Jackson Ranch Filing No. 3 slopes from the east to the west at slopes of 5% to 7% into the existing channel which slopes to the northeast at a slope of about 2%. Off-site flows enter the property via overland flow from Basin C2.1 which is a portion of Jackson Ranch Filing No. 2. They enter at the common lot line of Lot 7, Jackson Ranch Filing No. 2 and Lot 9, Jackson Ranch No.3.

Soils on the site are generally conducive for land development. According to the National Resources Conservation Service, there are four (4) soil types in the immediate area of the Jackson Ranch Filing No. 3 site. Kettle gravelly loam (map unit 40), makes up a small portion of the northeast corner of the site. The Kettle gravelly loam is typically deep and well drained. Permeability is rapid, surface runoff is slow, and the hazard of erosion is slight to moderate. Kettle gravelly loam is classified as being part of Hydrologic Soil Group B.

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1 DCM, 4-6.

The second soil type is Peyton Pring Complex (map unit 68) which makes up a portion of the soils in the southeast corner of the sites watershed. The Peyton-Pring Complex is deep, non-calcareous and well drained. Permeability is moderate, surface runoff is medium to rapid, and the hazard of erosion is moderate to high. Peyton-Pring Complex is classified as being part of Hydrologic Soil Group B.

The third soil type is Tomah-Crowfoot Complex (amp unit 92) which makes up the majority of the site. The Tomah-Crowfoot Complex is typically deep and well drained. Permeability is moderately rapid, surface runoff is slow, and the hazard of erosionis slight to moderate. Tomah-Crowfoot Complex is classified as being a part of Hydrologic Soil Group B.

The fourth soil type is Tomah-Crowfoot Complex (map unit 93) which makes up a the portion of the soils in the south central portion on the site watershed with slopes of 8% to 15%. The Tomah-Crowfoot Complex is typically deep and well drained. Permeability is moderately rapid, surface runoff is medium, and the hazard of erosion is moderate. Tomah-Crowfoot Complex is classified as being part of Hydrologic Soil Group B.

The soil has good potential for urban development, but is prone to water and wind erosion if protective vegetation is removed and not mitigated by proper erosion control practices.[2] [3] A portion of the **Soil Map** and data tables from the National Cooperative Soil Survey are included in the **Appendix.**

No significant utilities occupy the site. There are no irrigation facilities on the site.

2 Drainage Basins and Sub-Basins

2.1 Major Basin Descriptions

Jackson Ranch Filing No. 3 site is located in the West Cherry Creek Basin of the Cherry Creek Major Drainage Basin. The basin is an unstudied drainage basin with no Drainage or Bridge fees required.

The current Flood Insurance Study of the region includes Flood Insurance Rate Maps (FIRM), effective March 17, 1997.[4] [5] The project site is included in Community Panel Number 08041C0285 F of the FIRM for El Paso County, Colorado. No part of the site is shown to be included in a 100-year flood hazard area as determined by FEMA. The project site and surrounding property is Zone X, being "Areas determined to be outside 500-year floodplain". A portion of the current **FEMA Flood Insurance Rate Maps** is included in the **Appendix.**

Jackson Ranch Filing No. 3 development includes storm water detention as identified in the Jackson Ranch Filing No. 1 Preliminary and Final Drainage Report and in the Jackson Ranch Preliminary Drainage Report which mitigates increased storm flows that would otherwise be directed downstream through the existing drainage way.[6] [7] No new storm detention facilities are proposed.

2.2 Sub-Basin Description

2.2.1 Existing Drainage Patterns (On-Site)

The majority of the western portion western portion of the existing site drains to the existing natural channel in Tract A which traverses the total Jackson Ranch site from the southwest corner to the northern boundary of said site. An existing dam interrupts the natural channel flow about 100' northerly of the southwest corner of the proposed Jackson Ranch Filing No. 3. The dam incorporates a 12" CSP standpipe and flows are released to downstream once the water surface level reaches the stand pipe end elevation. The eastern edge of of the property drains overland and exits the eastern boundary. An **Existing Drainage Map** is included and shows existing basin delineations.

2 WSS El Paso County Area, Colorado.
3 OSD
4 FIS
5 FIRM, Map No. 08041C0285 F
6 JRF1
7 JR Prelim

2.2.2 Off-Site Drainage Flow Patterns

There is no off-site inflow to the site except for some minor flow from Basin C2.1 which flows overland into the site and combines with Basin C2.2 adjacent to Jackson Court..

3 Drainage Design Criteria

3.1 Development Criteria Reference

This *Final Drainage Report for Jackson Ranch Filing No. 3* has been prepared according to the report guidelines presented in the latest edition of *City of Colorado Springs/El Paso County Drainage Criteria Manual* (DCM)[8]. This *Final Drainage Report* is consistent with the Preliminary Drainage Report for Jackson Ranch. The on-site (local) hydrologic analysis is based on a collection of data from the DCM, the NRCS Web Soil Survey[9], a topographic survey of the site prepared by LWA Land Surveying, Inc., proposed residential site layout by Land Resource Associates (LRA), future land use according to RR-2.5 zoning and property boundary information provided by LWA Land Surveying, Inc.

3.2 Previous Drainage Studies

The West Cherry Creek Basin of the Cherry Creek Major Drainage Basin has not been studied.

Drainage reports for Jackson Ranch Filing No. 1 [10], Oldborough Subdivision [11], the Preliminary Drainage Report for Jackson Ranch [12] and Jackson Ranch Filing No. 2 [13] were reviewed for the preparation of this Final Drainage Report.

3.3 Hydrologic Criteria

Flow rates at all design points in the subdivision with contributing areas greater than 100 acres are calculated using SCS hydrologic flow computation method in accordance with El Paso County criteria. Flow rates at all design points having contributing areas less than 100 acres are calculated using the Rational Method as described in the DCM. Flow rates were calculated for 5-year and 100-year rainfall recurrence intervals.

The Rational Method utilized 'Intensity Duration Frequency Curves' Figure 6-5 in the DCM to obtain the design rainfall values. The 'Overland Flow Equation' Page 6-18, and Manning's equation with estimated depths were used in time of concentration calculation. Table 6-6 'Runoff Coefficients for Rational Method' was utilized as a guide in estimating runoff coefficient values.

3.4 Hydraulic Criteria

The hydraulic design and analysis for the facilities in this *Final Drainage Report* have been prepared according to the provisions of the *City of Colorado Springs/El Paso County Drainage Criteria Manual* (DCM)[14].

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4 Drainage Facility Design

4.1 General Concept

The proposed *Jackson Ranch Filing No. 3* project will consist of 9 rural residential lots, Tract A open space and drainage area, and about 1495 feet of paved roads. Storm water runoff from Lots 7 & 8 along with the eastern one-half of Jackson Courtall drain northerly to the northeast corner of the proposed *Jackson Ranch Filing No. 3.*

8 DCM Section 4.3 and Section 4.4
9 WSS
10 JRF1
11 Old
12 JR Prelim
13 JRF2
14 DCM Section 4.3 and Section 4.4

Storm water runoff from the southern portions of Lots 1, 2, & 3 of this Phase will drain into the existing dam located in previously platted Tract A. The dam is a non-jurisdictional dam and is owned and maintained by the Jackson Ranch Homeowners Association along with the open space/drainage Tract A.

Storm water runoff from the remainder of said Lots 1, 2, & 3 along with Lots 4, 5, 6, & 7, all of Mahaffie Court, and the western one-half of Jackson Court all drain westerly to the adjacent Tract A.

The intent of the drainage concept presented in this report is to maintain existing drainage directions and patterns as much as practically allowable, while safely routing developed on-site storm flows through the property to the designated discharge points in accordance with El Paso County drainage criteria.

There are no drainage way encumbrances due to existing or proposed utilities are anticipated.

The existing drainage conditions and the proposed drainage concept are described in more detail below. Input data and results for all calculations are included in the **Appendix**. Drainage maps for the site hydrology are also included in the **Appendix**.

4.2 Specific Details

4.2.1 Existing Hydrologic Conditions

The Jackson Ranch Filing No. 3 site includes all or part of 3 sub-basins delineated in the Jackson Ranch Preliminary Drainage Report. Portions of Sub-basins B2, B3, and C2 lie within the Jackson Ranch Filing No. 3 developed area, as indicated on the attached **Existing Drainage Map**.

The **Existing Drainage Map** depicts the existing topographic mapping, drainage basin delineations, drainage patterns, adjacent roads with storm drain facilities/piping, the existing dam, and runoff quantities with a data table including drainage areas and storm water runoff flows along with storm water runoff flows.

4.2.2 Proposed Hydrologic Conditions

The Proposed Drainage basins within the Site basically mirror the Existing Basins as the proposed Roads were laid out along or near the common Drainage Basin lines. Five (5) sub-basins have been delineated in *Jackson Ranch Filing No. 3* project site for analysis and design of the developed drainage system composed of road & ditch flows as indicated on the attached **Developed Drainage Map**.

Point of Interest No. 1 reflects developed flows from Basin B2.4. The developed storm water flows overland westerly and exits the subdivision along a small portion of the western side of Lot 5 with a developed storm water flow of Q_5 = 1.2 cfs and Q_{100} = 6.3 cfs. This storm water runoff flows into the previously mentioned non-jurisdictional dam in Tract A.

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Point of Interest No. 2 reflects developed storm water flow rates from Sub-basin B3.1 and are Q_5 = 1.6 cfs and Q_{100} = 6.0 cfs which will contribute to the ditch along the west and south sides of the proposed roads to be constructed has been designed to accommodate this flow. In general, the ditch will be a 2.5 foot deep V-channel, seeded and mulched to protect against erosion. In sections where the slope exceeds 6%, erosion control blankets will be used in conjunction with the seeding and mulching to provide further protection against erosion. A rock ditch check is proposed at the end of the road way ditch at the up-stream side of the driveway entrance to flag Lot 5.

Point of Interest No. 3 storm water runoff flows overland in Basin B3.2a and combines with Point of Interest No. 2 flows. These storm water runoff flows exiting the subdivision along the westerly boundary from Lots 3, 4, & 5 with a developed flow of Q_5 =3.6 cfs and Q_{100} = 16.9 cfs.

Point of Interest No. 4 is located at the northeasterly corner of Jackson Ranch Filing No. 3. Storm water runoff includes off-site overland flows from Basins C2.1 and Jackson Ranch Filing No. 3 Basin C2.2. Storm water runoff combines into ditch flow and exits the Subdivision at a developed storm water flow of Q_5 = 3.7 cfs and Q_{100} = 14.7 cfs. A rock ditch check is proposed at the end of the road way ditch.

Point of Interest 5 is located along the northern boundary of Lots 5 & 6 of said subdivision No. 3. This point represents the overland storm water from Basin B3.2.b being collected in flowing to an existing swale within a proposed drainage easement. The runoff at this point is Q_5=3.9 cfs and Q_{100}=19.6 cfs. A rock ditch check is proposed at the end of the said swale within the proposed drainage easement.

For all lots within this Jackson Ranch Filing No. 3 that will have a future driveway crossing a roadside drainage ditch, the minimum size for the culvert is 18" RCP. Other approved products with equivalent or greater capacity may be used in lieu of the 18" RCP.

4.2.3 Proposed Drainage Facilities

No new flows are being added to to the adjacent Higby Road and Roller Coaster Road. The proposed new subdivision Roads will have ditches.

5 Opinion of Probable Cost for Drainage Facilities

There are no costs of new drainage facilities anticipated for the Jackson Ranch Filing No. 3 development.

6 Drainage and Bridge Fees

Jackson Ranch Filing No. 3 Is located within the Cherry Creek Major Drainage Basin which is unstudied. There are no Drainage Fees or Bridge Fees adopted for this Basin. The property is being subdivided into a lots, tracts and road right-of-way.

<u>**Drainage Fee**</u>

(None Required)

Drainage Fees Due = $0.00

<u>**Bridge Fee**</u>

(None Required)

Bridge Fee Due = $0.00

Review of the June 2016 Preliminary Drainage Report shows an increase in flows at the ultimate release point. Also, based on rough estimate Fil 3 & 4 creates around 6 acres of impervious land (17 lots @ 11% imp = 4.7 ac and 2300 lf @ 28' wide asphalt road = 1.5ac) which could result in approximately 2 ac-ft of detention. Therefore, detention seems to be required for the overall development so the ultimate release is at or below historic rate.

7 Conclusion

This Final Drainage Report for the Jackson Ranch Filing No. 3 presents a drainage concept for this proposed subdivision. The subdivision development will function to route and convey storm runoff with the site grading and drainage facilities to be provided as part of the development. The proposed project with associated improvements will not, with respect to stormwater runoff, negatively impact the adjacent properties and downstream drainage facilities.

References

City of Colorado Springs/El Paso County Drainage Criteria Manual. City of Colorado Springs, Department of Public Works, Engineering Division; HDR Infrastructure, Inc.; El Paso County, Department of Public Works, Engineering Division (Colorado Springs: City of Colorado Springs, Revised November 1991).

Official Soil Series Descriptions. Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture ("Available online at http://soils.usda.gov/technical/classification/osd/index.html", accessed December 12, 2013).

Web Soil Survey. Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture ("Available online at http://websoilsurvey.nrcs.usda.gov/", accessed December 12, 2013).

Flood Insurance Rate Map. Federal Emergency Management Agency, National Flood Insurance Program (Washington D.C.: FEMA, March 17, 1997).

Flood Insurance Study for El Paso County, Colorado and incorporated Areas. Federal Emergency Management Agency (Washington D.C.: FEMA, March 17, 1997).

Preliminary Drainage Report, Jackson Ranch. M.V.E., Inc. (Colorado Springs, CO: , February 29, 2016).

Preliminary and Final Drainage Report, Jackson Ranch Filing No. 1. MVE, Inc. (Colorado Springs, CO: , Rev. September 23, 2014).

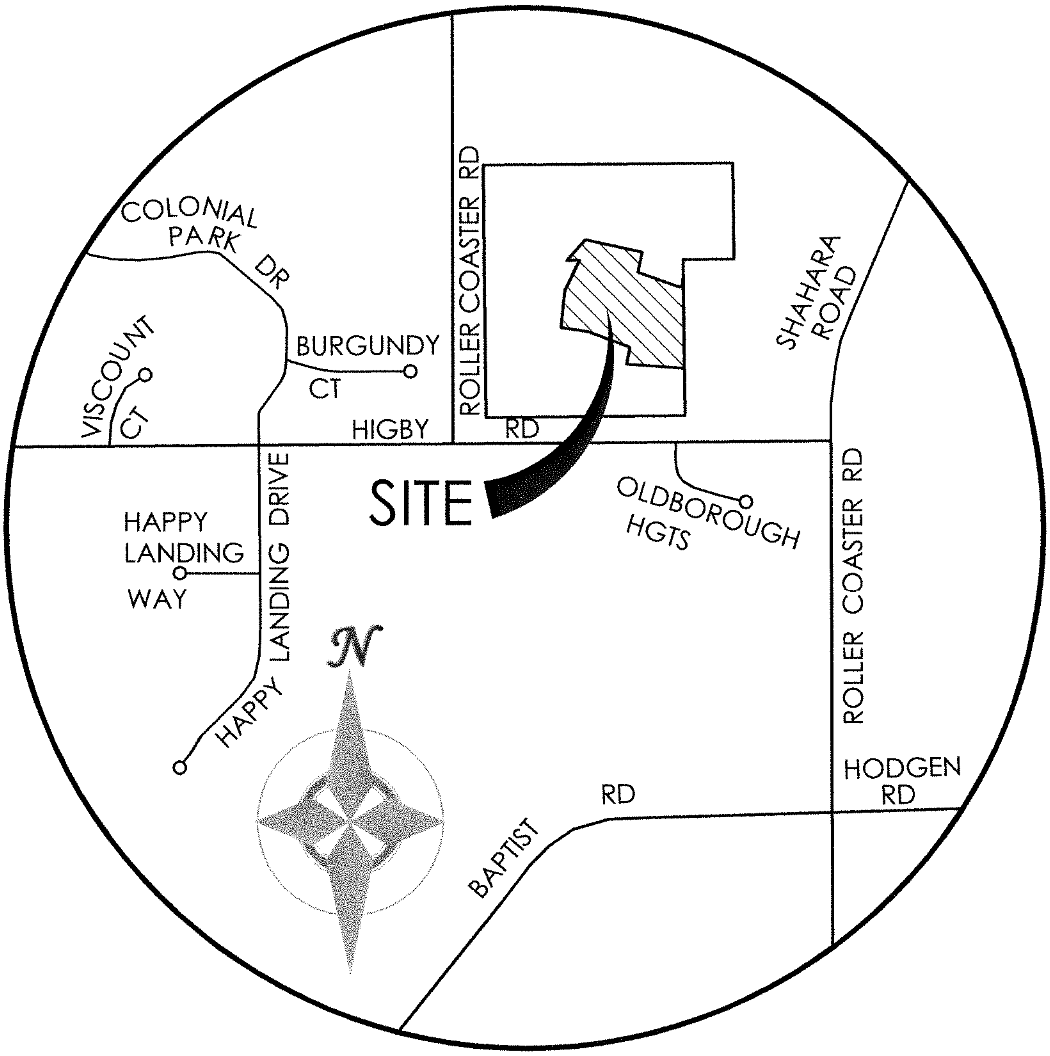
Final Drainage Report for Jackson Ranch Filing No. 2. M.V.E., Inc. (Colorado Springs, CO: , May 9, 2016).

Final Drainage Report and Plan for Oldborough Subdivision. Leigh, Whitehead & Assoc (Colorado Springs, CO: , September, 2003).

Appendices

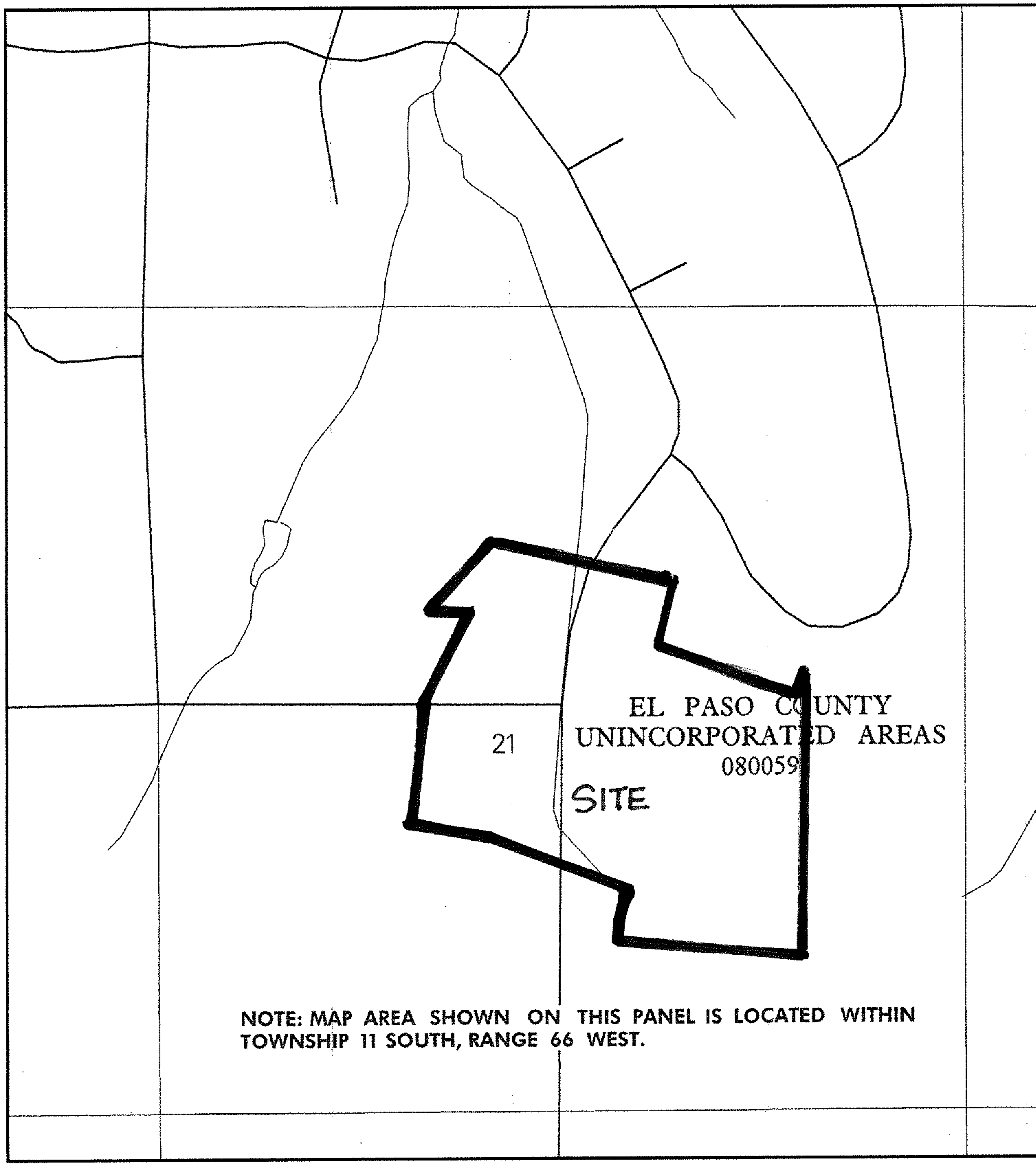
General Maps and Supporting Data

Vicinity Map
Portions of Flood Insurance Rate Map and LOMR Maps
NRCS Soil Map and Data



VICINITY MAP

NOT TO SCALE



APPROXIMATE SCALE IN FEET

1000 0 1000

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY,
COLORADO AND
INCORPORATED AREAS

PANEL 285 OF 1300
(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS: COMMUNITY	NUMBER	PANEL	SUFFIX
EL PASO COUNTY, UNINCORPORATED AREAS	080059	0285	F

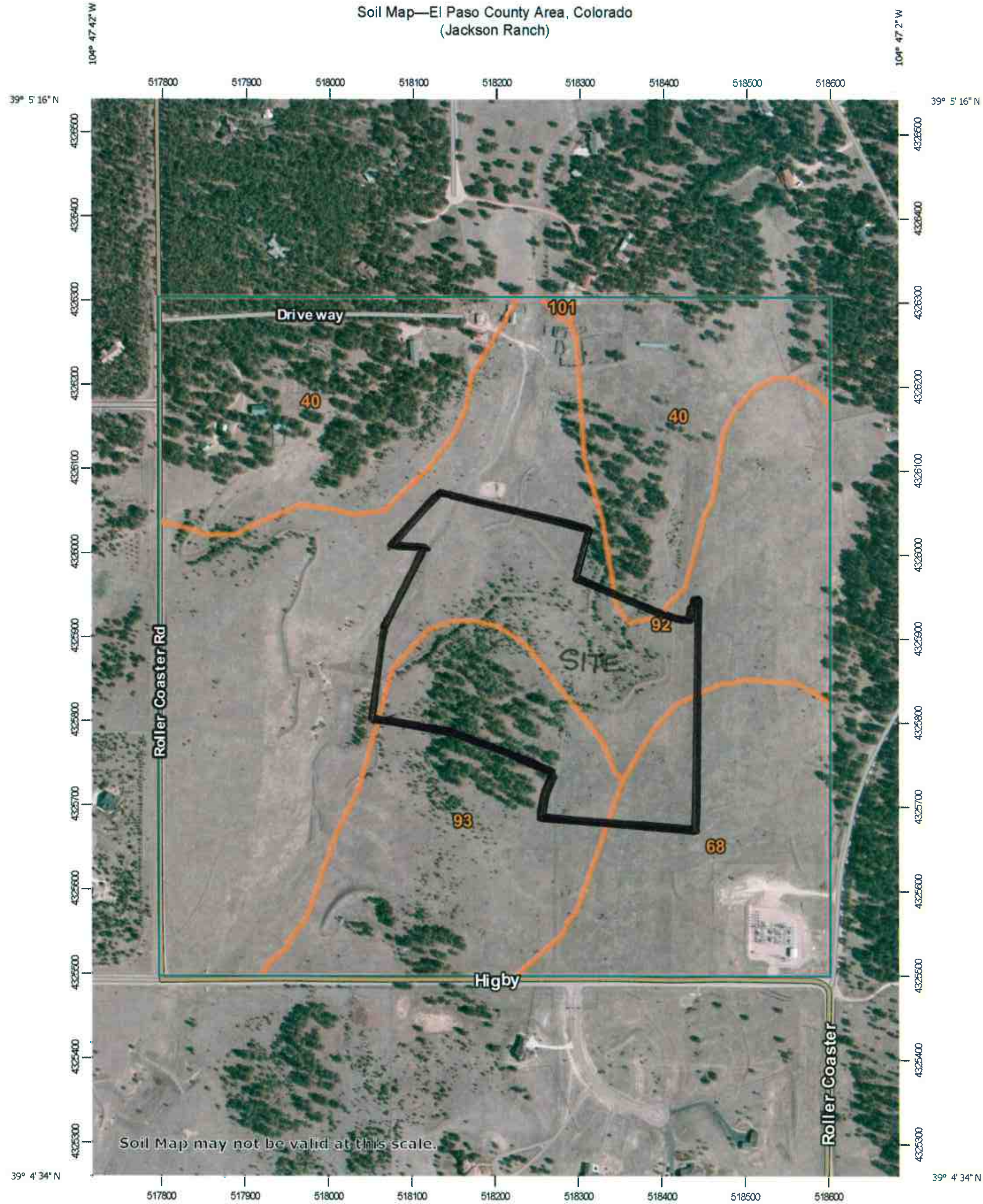
MAP NUMBER
08041C0285 F

EFFECTIVE DATE:
MARCH 17, 1997

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

Soil Map—El Paso County Area, Colorado
(Jackson Ranch)



Map Scale: 1:6,230 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 50, 100, 200, 300

Feet: 0, 300, 600, 1200, 1800

N

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

MAP LEGEND

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

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

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 14, Sep 23, 2016

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

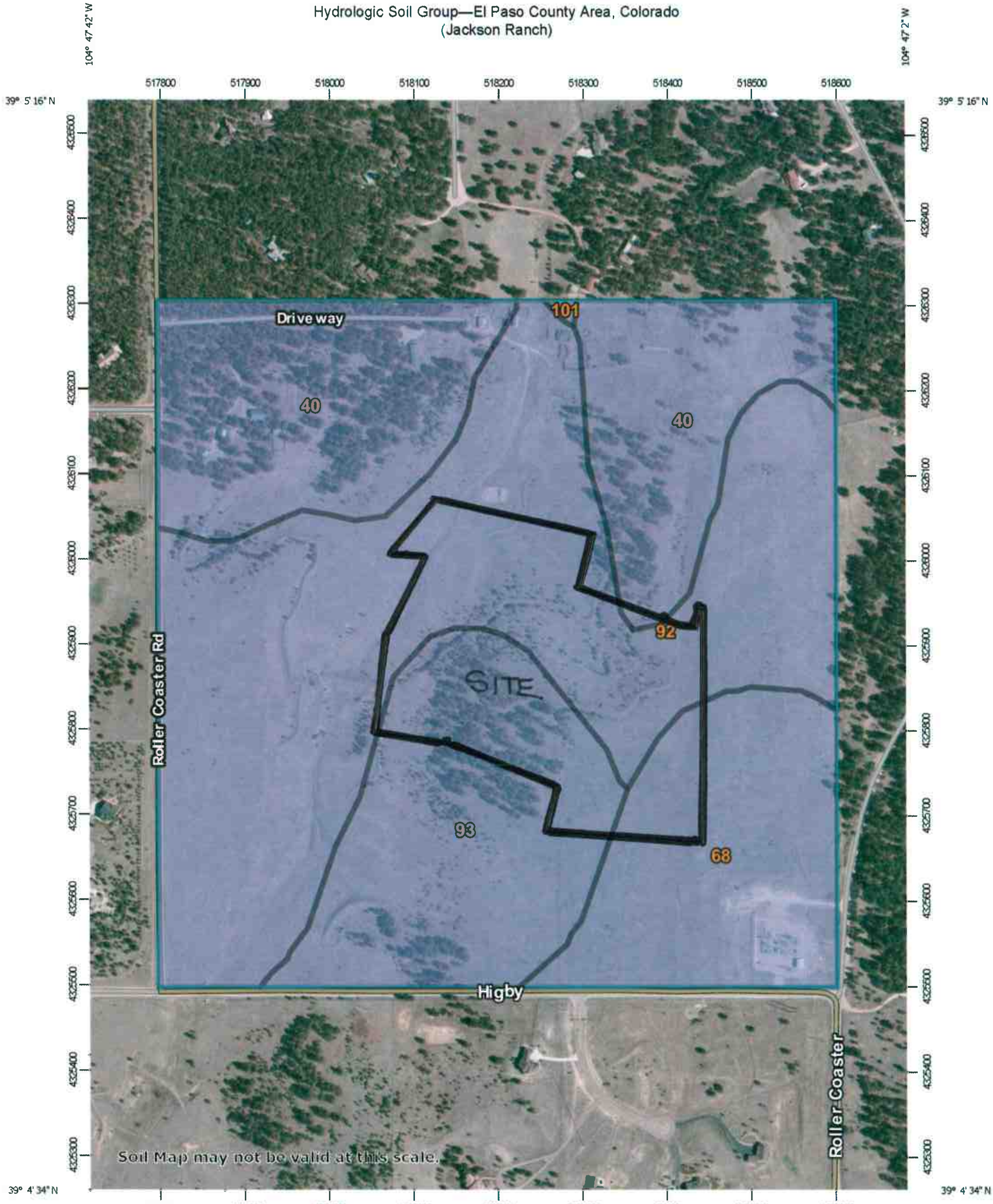
Date(s) aerial images were photographed: Apr 15, 2011—Sep 22, 2011

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

El Paso County Area, Colorado (CO625)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
40	Kettle gravelly loamy sand, 3 to 8 percent slopes	40.5	25.2%
68	Peyton-Pring complex, 3 to 8 percent slopes	22.9	14.2%
92	Tomah-Crowfoot loamy sands, 3 to 8 percent slopes	69.0	42.9%
93	Tomah-Crowfoot complex, 8 to 15 percent slopes	28.4	17.6%
101	Ustic Torrifluvents, loamy	0.2	0.1%
Totals for Area of Interest		**161.0**	**100.0%**

Hydrologic Soil Group—El Paso County Area, Colorado
(Jackson Ranch)



Map Scale: 1:6,230 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 300 600 1200 1800

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

MAP LEGEND

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

Soils

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

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

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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Coordinate System: Web Mercator (EPSG:3857)

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

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — El Paso County Area, Colorado (CO625)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
40	Kettle gravelly loamy sand, 3 to 8 percent slopes	B	40.5	25.2%
68	Peyton-Pring complex, 3 to 8 percent slopes	B	22.9	14.2%
92	Tomah-Crowfoot loamy sands, 3 to 8 percent slopes	B	69.0	42.9%
93	Tomah-Crowfoot complex, 8 to 15 percent slopes	B	28.4	17.6%
101	Ustic Torrifluvents, loamy	B	0.2	0.1%
Totals for Area of Interest			**161.0**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

pricklypear occur. Ample amounts of litter and forage should be left on the soil because of the high hazard of soil blowing.

Windbreaks and environmental plantings are generally well suited to this soil. Summer fallow a year prior to planting and continued cultivation for weed control are needed to insure establishment and survival of plantings. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, Siberian peashrub, and American plum.

Depending on land use, this soil can produce habitat that is suitable for either rangeland wildlife, such as antelope, or for openland wildlife, such as pheasant, cottontail, and mourning dove. Availability of irrigation water largely determines the land use. Where no irrigation water is available, this soil is mainly used as rangeland, a use that favors rangeland wildlife. If this soil is used as rangeland, fences, livestock water developments, and proper livestock grazing use are practices that enhance habitat for rangeland wildlife. Production of crops such as wheat, corn, and alfalfa provides suitable habitat for openland wildlife, especially pheasant. Among the practices that increase openland wildlife populations are planting trees and shrubs and providing undisturbed nesting cover.

The main limitation of this soil for urban use is shrink-swell potential. Buildings and roads need to be designed to overcome this limitation. Roads need to be designed to minimize frost-heave damage. Capability subclasses IVe, nonirrigated, and IIe, irrigated.

40—Kettle gravelly loamy sand, 3 to 8 percent slopes. This deep, well drained soil formed in sandy arkosic deposits on uplands. Elevation ranges from 7,000 to 7,700 feet. The average annual precipitation is about 18 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

Typically, the surface layer is gray gravelly loamy sand about 3 inches thick. The subsurface layer is light gray gravelly loamy sand about 13 inches thick. The subsoil is very pale brown gravelly sandy loam about 24 inches thick. It consists of a matrix of loamy coarse sand that has thin bands of coarse sandy loam or sandy clay loam. The substratum to a depth of 60 inches or more is light yellowish brown extremely gravelly loamy sand.

Included with this soil in mapping are small areas of Alamosa loam, 1 to 3 percent slopes; Elbeth sandy loam, 3 to 8 percent slopes; Pring coarse sandy loam, 3 to 8 percent slopes; Tomah-Crowfoot loamy sands, 3 to 8 percent slopes; and a few rock outcrops.

Permeability of this Kettle soil is rapid. Effective rooting depth is 60 inches or more. Available water capacity is low to moderate. Surface runoff is slow, and the hazard of erosion is slight to moderate. A few gullies have formed in drainageways.

This soil is used for woodland, livestock grazing, wildlife habitat, recreation, and homesites.

This soil is suited to the production of ponderosa pine. It is capable of producing about 2,240 cubic feet or 4,900 board feet (International rule), of merchantable timber per acre from a fully stocked, even-aged stand of 80-year-old trees. The main limitation for the production or harvesting of timber is the low available water capacity. The low available water capacity also influences seedling survival, especially in areas where understory plants are plentiful. Erosion must be kept to a minimum when harvesting timber.

This soil has good potential for mule deer, tree squirrels, cottontail rabbit, and wild turkey. These animals obtain their food and shelter from pine trees, shrubs, and ground cover, which provide browse, forbs, fruit, and seeds. The presence of ponderosa pine and Gambel oak should encourage wild turkey populations; however, where water is not naturally present, wildlife watering facilities must be provided to attract and maintain wild turkey and other wildlife species. Livestock grazing management is vital on this soil if wildlife populations are to be maintained.

This soil has good potential for use as homesites. Plans for homesite development on this soil should provide for the preservation of as many trees as possible in order to maintain the esthetic value of the sites. During seasons of low precipitation, fire may become a hazard to homesites. This hazard can be minimized by installing firebreaks and reducing the amount of litter on the forest floor. Capability subclass VIe.

41—Kettle gravelly loamy sand, 8 to 40 percent slopes. This deep, well drained soil formed in sandy arkosic deposits on uplands. Elevation ranges from 7,000 to 7,700 feet. The average annual precipitation is about 18 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

Typically, the surface layer is gray gravelly loamy sand about 3 inches thick. The subsurface layer is light gray gravelly loamy sand about 13 inches thick. The subsoil is very pale brown gravelly sandy loam about 24 inches thick. It consists of a matrix of loamy coarse sand that has thin bands of coarse sandy loam or sandy clay loam. The substratum to a depth of 60 inches or more is light yellowish brown extremely gravelly loamy sand.

Included with this soil in mapping are small areas of Elbeth sandy loam, 8 to 15 percent slopes; Pring coarse sandy loam, 8 to 15 percent slopes; Tomah-Crowfoot loamy sands, 8 to 15 percent slopes; and a few rock outcrops.

Permeability of this Kettle soil is rapid. Effective rooting depth is 60 inches or more. Available water capacity is low to moderate. Surface runoff is medium, and the hazard of erosion is moderate. Some gullies have formed in drainageways.

The soil is used for woodland, livestock grazing, wildlife habitat, recreation, and homesites.

This soil is suited to the production of ponderosa pine. It is capable of producing 2,240 cubic feet, or 4,900 board support a load and potential frost action on roads and streets. Roads and buildings can be designed to overcome these limitations. Capability subclass IVe.

67—**Peyton sandy loam, 5 to 9 percent slopes.** This deep, noncalcareous, well drained soil formed in alluvium and residuum derived from weathered arkosic sedimentary rock on uplands. Elevation ranges from 6,800 to 7,600 feet.

Typically, the surface layer is grayish brown sandy loam about 12 inches thick. The subsoil, about 23 inches thick, is pale brown sandy clay loam in the upper 13 inches and pale brown sandy loam in the lower 10 inches. The substratum is pale brown sandy loam to a depth of 60 inches.

Included with this soil in mapping are small areas of Holderness loam, 5 to 8 percent slopes; Pring coarse sandy loam, 3 to 8 percent slopes; and Tomah-Crowfoot loamy sands, 3 to 8 percent slopes.

Permeability of this soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is high. Surface runoff is medium, and the hazard of erosion is moderate. Gullies and rills are common.

Most of the acreage of this Peyton soil is used as rangeland. Some areas are used for wheat and oats. Stubble mulching or other crop residue management practices are needed to control water erosion. Wildlife habitat is also an important use.

This soil is well suited to the production of native vegetation suitable for grazing. The native vegetation is mainly mountain muhly, bluestem, mountain brome, needleandthread, and blue grama. This soil is subject to invasion by Kentucky bluegrass and Gambel oak. Minor amounts of forbs such as hairy goldenrod, geranium, milkvetch, low larkspur, fringed sage, and buckwheat are in the stand.

Proper location of livestock watering facilities helps to control grazing. Timely deferment of grazing is needed to protect the plant cover.

Windbreaks and environmental plantings generally are suited to this soil. Soil blowing is the main limitation to the establishment of trees and shrubs. This limitation can be overcome by cultivating only in the tree rows and leaving a strip of vegetation between the rows. Supplemental irrigation may be necessary when planting and during dry periods. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

This soil is suited to habitat for openland and rangeland wildlife. Rangeland wildife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

This soil has good potential for homesites. The main limitation is the limited ability to support a load and potential frost action. Buildings and roads can be designed to overcome these limitations. Capability subclass IVe.

68—**Peyton-Pring complex, 3 to 8 percent slopes.** These gently sloping to moderately sloping soils are on valley side slopes and on uplands. Elevation ranges from 6,800 to 7,600 feet. The average annual precipitation is about 17 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

The Peyton soil makes up about 40 percent of the complex, the Pring soil about 30 percent, and other soils about 30 percent.

Included with these soils in mapping are areas of Holderness loam, 1 to 5 percent slopes; Holderness loam, 5 to 8 percent slopes; and Tomah-Crowfoot loamy sands, 3 to 8 percent slopes. In some places arkosic beds of sandstone and shale are at a depth of 0 to 40 inches.

The Peyton soil is commonly on the less sloping part of the landscape. It is deep, noncalcareous, and well drained. It formed in alluvium and residuum derived from weathered arkosic sedimentary rock. Typically, the surface layer is grayish brown sandy loam about 12 inches thick. The subsoil, about 23 inches thick, is pale brown sandy clay loam in the upper 13 inches and pale brown sandy loam in the lower 10 inches. The substratum is pale brown sandy loam to a depth of 60 inches or more.

Permeability of the Peyton soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is high. Surface runoff is medium, and the hazard of erosion is moderate.

The Pring soil is deep, noncalcareous, and well drained. It formed in sandy sediment derived from weathered arkosic sedimentary rock. Typically, the surface layer is dark grayish brown coarse sandy loam about 4 inches thick. The substratum is dark grayish brown coarse sandy loam about 10 inches thick over pale brown gravelly sandy loam that extends to a depth of 60 inches or more.

Permeability of the Pring soil is rapid. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is medium, and the hazard of erosion is moderate.

These soils are used as rangeland, for wildlife habitat, and for homesites.

These soils are well suited to the production of native vegetation suitable for grazing. The dominant native species are mountain muhly, bluestem, needleandthread, and blue grama. These soils are subject to invasion of Kentucky bluegrass and Gambel oak. Common forbs are hairy goldenrod, geranium, milkvetch, low larkspur, fringed sage, and buckwheat.

Properly locating livestock watering facilities helps to control grazing. Timely deferment of grazing is needed to protect the plant cover.

Windbreaks and environmental plantings generally are suited to these soils. Soil blowing is the main limitation to the establishment of trees and shrubs. This limitation can be overcome by cultivating only in the tree rows and leaving a strip of vegetation between the rows. Supplemental irrigation may be needed when planting and during dry periods. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

These soils are suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

These soils have a good potential for homesites. The main limitations, especially on the Peyton soil, are low bearing strength and frost-action potential. Buildings and roads can be designed to overcome these limitations. Access roads should have adequate cut-slope grade and be provided with drains to control surface runoff and keep soil losses to a minimum. Capability subclass VIe.

69—Peyton-Pring complex, 8 to 15 percent slopes. These gently to moderately sloping soils are on valley side slopes and on uplands. Elevation ranges from 6,800 to 7,600 feet. The average annual precipitation is about 17 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

The Peyton soil makes up about 40 percent of the complex, the Pring soil about 30 percent, and other soils about 30 percent.

Included with these soils in mapping are areas of Holderness loam, 8 to 15 percent slopes; Tomah-Crowfoot loamy sands, 8 to 15 percent slopes; Kettle gravelly loamy sand, 8 to 40 percent slopes; and a few areas of Rock outcrop.

The Peyton soil is commonly on the less sloping part of the landscape. It is deep, noncalcareous, and well drained. It formed in alluvium and residuum derived from weathered, arkosic, sedimentary rock. Typically, the surface layer is grayish brown sandy loam about 12 inches thick. The subsoil, about 23 inches thick, is pale brown sandy clay loam in the upper 13 inches and pale brown sandy loam in the lower 10 inches. The substratum is pale brown sandy loam to a depth of 60 inches or more.

Permeability of the Peyton soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is high. Surface runoff is medium to rapid, and the hazard of erosion is moderate to high. Some gullies have developed along drainageways and livestock trails.

The Pring soil is deep, noncalcareous, and well drained. It formed in sandy sediment derived from weathered, arkosic, sedimentary rock. Typically, the surface layer is dark grayish brown coarse sandy loam about 4 inches thick. The substratum is dark grayish brown coarse sandy loam about 10 inches thick over pale brown gravelly sandy loam that extends to a depth of 60 inches or more.

Permeability of the Pring soil is rapid. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is medium to rapid, and the hazard of erosion is moderate to high. Some gullies have developed along drainageways and livestock trails.

The soils in this complex are used as rangeland, for wildlife habitat, and for homesites.

These soils are well suited to the production of native vegetation suitable for grazing. The dominant native species are mountain muhly, bluestem grasses, needleandthread, and blue grama. These soils are subject to invasion of Kentucky bluegrass and Gambel oak. Common forbs are hairy goldenrod, geranium, milkvetch, low larkspur, fringed sage, and buckwheat.

Properly locating livestock watering facilities helps to control grazing. Timely deferment of grazing is needed to protect the plant cover.

Windbreaks and environmental plantings generally are suited to these soils. Soil blowing is the main limitation to the establishment of trees and shrubs. This limitation can be overcome by cultivating only in the tree rows and leaving a strip of vegetation between the rows. Supplemental irrigation may be needed when planting and during dry periods. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

These soils are well suited to wildlife habitat. They are best suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

These soils have good potential for use as homesites. The main limitations are steepness of slope, limited ability to support a load, and frost-action potential. Buildings and roads can be designed to overcome these limitations. These soils also require special site or building designs because of the slope. Access roads should have adequate cut-slope grade, and drains should be provided to control surface runoff and keep soil losses to a minimum. Capability subclass VIe.

70—Pits, gravel. Gravel pits are in nearly level to rolling areas. They are open excavations several feet deep and commonly 5 acres or less in size.

Gravel pits are very low in natural fertility and are highly susceptible to soil blowing. A cover of weeds or straw helps to control erosion.

Windbreaks and environmental plantings generally are not suited to these areas. Onsite investigation is needed to determine if plantings are feasible. Capability subclass VIIIs.

71—Pring coarse sandy loam, 3 to 8 percent slopes. This deep, noncalcareous, well drained soil formed in sandy sediment derived from arkosic sedimentary rock on valley side slopes and on uplands. Elevation ranges from 6,800 to 7,600 feet. The average annual precipitation is about 17 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 120 days.

Typically, the surface layer is dark grayish brown coarse sandy loam about 4 inches thick. The substratum is dark grayish brown coarse sandy loam about 10 inches thick over pale brown gravelly sandy loam that extends to a depth of 60 inches or more.

strength. Special designs for buildings and roads are required to offset these limitations. Methods of sewage disposal other than septic tank absorption fields are needed because of the limited depth to bedrock. Capability subclass VIe.

92—Tomah-Crowfoot loamy sands, 3 to 8 percent slopes. These gently sloping to moderately sloping soils are on alluvial fans, hills, and ridges in the uplands. Elevation ranges from about 7,300 to 7,600 feet. The average annual precipitation is about 17 inches, the average annual air temperature is about 42 degrees F, and the average frost-free period is about 120 days.

The Tomah soil makes up about 50 percent of the complex, the Crowfoot soil about 30 percent, and other soils about 20 percent.

Included with these soils in mapping are areas of Elbeth sandy loam, 3 to 8 percent slopes; Kettle gravelly loamy sand, 3 to 8 percent slopes; and Pring coarse sandy loam, 3 to 8 percent slopes.

The Tomah soil is deep and well drained. It formed in alluvium or residuum derived from arkose beds. Typically, the surface layer is dark grayish brown loamy sand about 10 inches thick. The subsurface layer is very pale brown coarse sand about 12 inches thick. The subsoil, about 26 inches thick, is a matrix of very pale brown coarse sand in which are embedded many thin bands and lamellae of pale brown coarse sandy clay loam. The substratum is very pale brown coarse sand to a depth of 60 inches or more.

Permeability of the Tomah soil is moderately rapid. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is slow, and the hazard of erosion is slight to moderate.

The Crowfoot soil is deep and well drained. It formed in sediment weathered from arkosic sandstone. Typically, the surface layer is grayish brown loamy sand about 12 inches thick. The subsurface layer is very pale brown sand about 11 inches thick. The subsoil is light yellowish brown sandy clay loam about 13 inches thick. The substratum is very pale brown coarse sand to a depth of about 68 inches.

Permeability of the Crowfoot soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is slow, and the hazard of erosion is slight to moderate.

This complex is used as rangeland, for wildlife habitat, and as homesites.

Native vegetation is mainly mountain muhly, bluestem, mountain brome, needleandthread, and blue grama. These soils are subject to invasion by Kentucky bluegrass and Gambel oak. Noticeable forbs are hairy goldenrod, geranium, milkvetch, low larkspur, fringed sage, and buckwheat.

Properly locating livestock watering facilities helps to control grazing. Timely deferment of grazing is needed to protect the plant cover.

Windbreaks and environmental plantings are fairly well suited to these soils. Blowing sand and moderate available water capacity are the principal limitations for the establishment of trees and shrubs. The soils are so loose that trees need to be planted in shallow furrows and plant cover needs to be maintained between the rows. Supplemental irrigation may be needed to insure survival. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, and Siberian elm. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

These soils are best suited to habitat for openland wildlife such as pronghorn antelope and sharp-tailed grouse. Although sharp-tailed grouse are not plentiful, they could be encouraged on these soils, especially where brush species are interspersed with grasses and forbs. If these soils are used as rangeland, wildlife production can be increased by managing livestock grazing to preclude overuse of the more desirable grass species and depletion of the various brush species.

These soils have good potential for use as homesites. The main limitation of the Crowfoot soil is frost-action potential. Roads and streets need to be designed to minimize frost-heave damage. Maintaining the existing vegetation on building sites during construction helps to control erosion. Capability subclass IVe.

93—Tomah-Crowfoot loamy sands, 8 to 15 percent slopes. These moderately sloping to strongly sloping soils are on alluvial fans, hills, and ridges in the uplands. Elevation ranges from about 7,300 to 7,600 feet. The average annual precipitation is about 17 inches, the average annual air temperature is about 42 degrees F, and the average frost-free period is about 120 days.

The Tomah soil makes up about 50 percent of the complex, the Crowfoot soil about 30 percent, and other soils about 20 percent.

Included with these soils in mapping are areas of Elbeth sandy loam, 8 to 15 percent slopes; Peyton-Pring complex, 8 to 15 percent slopes; and Kettle gravelly loamy sand, 8 to 40 percent slopes.

The Tomah soil is deep and well drained. It formed in alluvium or residuum derived from arkose beds. Typically, the surface layer is dark grayish brown loamy sand about 10 inches thick. The subsurface layer is very pale brown coarse sand about 12 inches thick. The subsoil, about 26 inches thick, consists of a matrix of very pale brown coarse sandy clay loam. The substratum is very pale brown coarse sand to a depth of 60 inches or more.

Permeability of the Tomah soil is moderately rapid. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is medium, and the hazard of erosion is moderate. Some gullies are present in some drainageways and along stock trails.

The Crowfoot soil is deep and well drained. It formed in sediment weathered from arkosic sandstone. Typically, the surface layer is grayish brown loamy sand about 12 inches thick. The subsurface layer is very pale brown sand about 11 inches thick. The subsoil is light yellowish brown sandy clay loam about 13 inches thick. The substratum is very pale brown coarse sand to a depth of about 68 inches.

Permeability of the Crowfoot soil is moderate. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is medium, and the hazard of erosion is moderate. Some gullies are present in some drainageways and along stock trails.

The soils in this complex are used as rangeland, for recreation and wildlife habitat, and as homesites.

Native vegetation is mainly mountain muhly, bluestem, mountain brome, needleandthread, and blue grama. These soils are subject to invasion by Kentucky bluegrass and Gambel oak. Noticeable forbs are hairy goldenrod, geranium, milkvetch, low larkspur, fringed sage, and buckwheat.

Proper location of livestock watering facilities helps to control grazing. Timely deferment of grazing is needed to protect the plant cover.

Windbreaks and environmental plantings are fairly well suited to these soils. Blowing sand and moderate available water capacity are the main limitations for the establishment of trees and shrubs. The soils are so loose that trees need to be planted in shallow furrows and plant cover needs to be maintained between the rows. Supplemental irrigation may be needed to insure survival. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, and Siberian elm. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

These soils are best suited to habitat for openland wildlife species, such as pronghorn antelope and sharp-tailed grouse. Although sharp-tailed grouse are not plentiful, they could be encouraged on these soils, especially where brush species are interspersed with grasses and forbs. If these soils are used as rangeland, wildlife production can be increased by managing livestock grazing to preclude overuse of the more desirable grass species and depletion of the various brush species.

The main limitations for urban uses are frost-action potential and slope on the Crowfoot soil and slope on the Tomah soil. Buildings and roads must be designed to overcome these limitations. Access roads must have adequate cut-slope grade and be provided with drains to control surface runoff. Maintaining the existing vegetation on building sites during construction helps to control erosion. Capability subclass VIe.

94—Travessilla-Rock outcrop complex, 8 to 90 percent slopes. This moderately sloping to extremely steep complex is mostly on rocky uplands (fig. 5). Elevation ranges from 6,200 to 6,700 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 47 degrees F, and the average frost-free period is about 140 days.

The Travessilla soil makes up about 45 percent of the complex, Rock outcrop about 30 percent, and included areas about 25 percent.

Included with this complex in mapping are areas of Bresser sandy loam, 5 to 9 percent slopes, Elbeth sandy loam, 8 to 15 percent slopes, Kettle gravelly loamy sand, 8 to 40 percent slopes, and Louviers silty clay loam, 3 to 18 percent slopes. The Elbeth and Kettle soils commonly are on the north-facing slopes.

The Travessilla soil is shallow and well drained. It formed in residuum derived from sandstone. Typically, the surface layer is light brownish gray sandy loam about 3 inches thick. The underlying material is pale brown sandy loam about 8 inches thick. Hard arkosic sandstone that has some fractures is at a depth of about 11 inches.

Permeability of the Travessilla soil is moderately rapid. Effective rooting depth is 6 to 20 inches. Available water capacity is low. Surface runoff is medium to rapid, and the hazard of erosion is high. Gullies are common along drainageways and trails.

Rock outcrop occurs mostly as ledges on cliffs.

This complex is used for urban development, as homesites, and for recreation and wildlife habitat.

This complex is suited to the production of ponderosa pine. The main limitations are the presence of stones and rock outcrop on the surface and a high hazard of erosion. Stones on the surface can hinder felling, yarding, and other operations involving the use of equipment. Practices must be used to minimize soil erosion when harvesting timber. The low available water capacity can influence seedling survival.

Wildlife on these soils is limited mostly to small animals such as cottontail, squirrel, and birds because of the extent of urban development. Ponderosa pine, mountain-mahogany, Gambel oak, and various grasses provide food, cover, and nesting areas.

This complex is extensively used for urban development and as homesites (fig. 6). The main limitations for these uses are depth to bedrock, rock outcrop, and steep slopes. Septic tank absorption fields do not function properly because of the depth to bedrock. Special designs for buildings and roads and streets are needed to overcome the limitations. Plans for homesite development should provide for the preservation of as many trees as possible because of their esthetic value. Capability subclass VIIe.

95—Truckton loamy sand, 1 to 9 percent slopes. This deep, well drained soil formed in alluvium and residuum derived from arkosic sedimentary rock on uplands. Elevation ranges from 6,000 to 7,000 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 47 degrees F, and the average frost-free period is about 135 days.

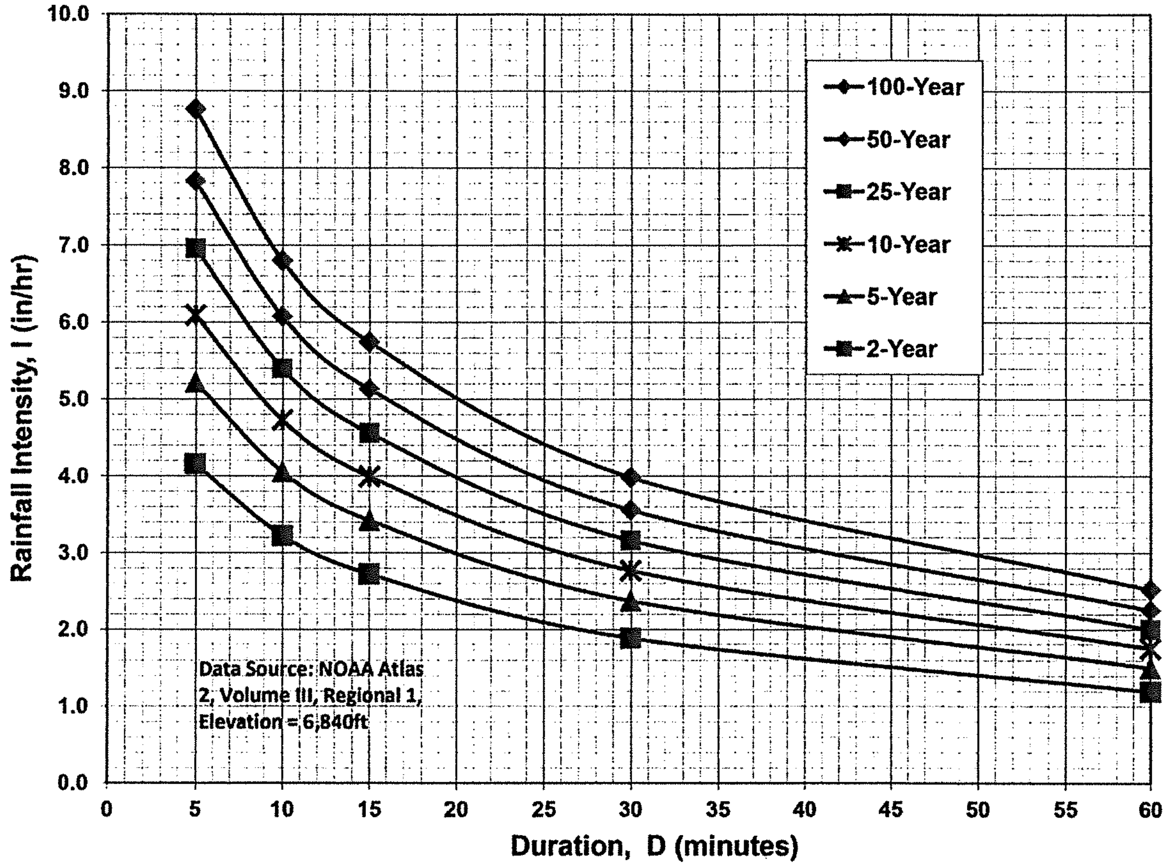
Typically, the surface layer is grayish brown loamy sand about 8 inches thick. The subsoil is brown sandy loam about 18 inches thick. The substratum is light yellowish brown coarse sandy loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Blakeland loamy sand, 1 to 9 percent slopes; Bresser sandy loam, 3 to 5 percent sloeps; Bresser sandy loam, 5 to 9 percent slopes; Truckton sandy loam, 0 to 3 percent slopes; and Truckton sandy loam, 3 to 9 percent slopes.

Permeability of this Truckton soil is moderately rapid. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is slow, and the hazard of erosion is moderate to high.

Hydrologic Calculations

Figure 6-5. Colorado Springs Rainfall Intensity Duration Frequency



IDF Equations

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

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

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

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

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

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

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

Table 6-6. Runoff Coefficients for Rational Method

(Source: UDFCD 2001)

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

Job No.: **61044**

Project: **Jackson Ranch Filing No. 3**

Date: **4/30/17 16:41**

Calcs By: **D. Gorman**

Checked By:

Time of Concentration (Modified from Standard Form SF-1)

Sub-Basin	Sub-Basin Data				Overland			Shallow Channel				Channelized				t_c Check		t_c (min)
	Area (Acres)	C_5	C_{100}/CN	% Imp.	L_0 (ft)	S_0 (%)	t_i (min)	L_{0t} (ft)	S_{0t} (ft/ft)	v_{0sc} (ft/s)	t_t (min)	L_{0c} (ft)	S_{0c} (ft/ft)	v_{0c} (ft/s)	t_c (min)	L (min)	$t_{c,alt}$ (min)	
EX B2.4	2.96	0.09	0.36	2.0%	95	7%	9.2	670	0.064	1.8	6.3	0	0.000	0.0	0.0	765	N/A	15.5
EX B3.1	23.94	0.09	0.36	2.0%	200	5%	15.7	525	0.067	1.8	4.8	725	0.047	5.4	2.2	1450	N/A	22.8
EX B3.2	11.63	0.09	0.36	2.0%	190	6%	14.1	850	0.062	1.7	8.1	0	0.000	0.0	0.0	1040	N/A	22.2
EX C1	5.39	0.13	0.39	7.5%	300	5%	17.4	280	0.054	1.6	2.9	0	0.000	0.0	0.0	580	N/A	20.3
EX C2.1	1.02	0.24	0.46	19.9%	205	3%	14.9	0	0.000	0.0	0.0	0	0.000	0.0	0.0	205	N/A	14.9
EX C2.2	3.02	0.10	0.36	2.7%	170	4%	14.8	790	0.025	1.1	11.8	0	0.000	0.0	0.0	960	N/A	26.6
EX C2.3	8.90	0.09	0.36	2.0%	270	4%	18.8	410	0.063	1.8	3.9	0	0.000	0.0	0.0	680	N/A	22.7

Job No.: **61044**
Project: **Jackson Ranch Filing No. 3**
Design Storm: **5-Year Storm** *(20% Probability)*
Jurisdiction: **UDFCD**

Revise Jurisdiction to EPC (typ)

Date: **4/30/17 16:41**
Calcs By: **D. Gorman**
Checked By:

Sub-Basin and Combined Flows (Modified from Standard Form SF-2)

				Direct Runoff				Combined Runoff				Streetflow			Pipe Flow					Travel Time		
DP	Sub-Basin	Area (Acres)	C5	t_c (min)	CA (Acres)	I5 (in/hr)	Q5 (cfs)	t_c (min)	CA (Acres)	I5 (in/hr)	Q5 (cfs)	Slope (%)	Length (ft)	Q (cfs)	Q (cfs)	Slope (%)	Mnngs n	Length (ft)	D_{Pipe} (in)	Length (ft)	V_{Osc} (ft/s)	t_t (min)
	EX B2.4	2.96	0.09	15.5	0.27	3.35	0.9															
	EX B3.1	23.94	0.09	22.8	2.15	2.75	5.9															
	EX B3.2	11.63	0.09	22.2	1.05	2.79	2.9															
	EX C1	5.39	0.13	20.3	0.72	2.93	2.1															
	EX C2.1	1.02	0.24	14.9	0.24	3.42	0.8															
	EX C2.2	3.02	0.10	26.6	0.29	2.52	0.7															
	EX C2.3	8.90	0.09	22.7	0.80	2.76	2.2															
POI 1	C2.1, B3.1	24.96	0.10					22.8	2.40	2.75	6.6											

Rainfall Intensity: I = (28.5 * P1) / (10 + tc)^0.786
P1: 1.5

Job No.: **61044**
Project: **Jackson Ranch Filing No. 3**
Design Storm: **100-Year Storm** *(1% Probability)*
Jurisdiction: **UDFCD**

Date: **4/30/17 16:41**
Calcs By: **D. Gorman**
Checked By:

Sub-Basin and Combined Flows (Modified from Standard Form SF-2)

				Direct Runoff				Combined Runoff				Streetflow			Pipe Flow					Travel Time		
DP	Sub-Basin	Area (Acres)	C100	t_c (min)	CA (Acres)	I100 (in/hr)	Q100 (cfs)	t_c (min)	CA (Acres)	I100 (in/hr)	Q100 (cfs)	Slope (%)	Length (ft)	Q (cfs)	Q (cfs)	Slope (%)	Mnngs n	Length (ft)	D_{Pipe} (in)	Length (ft)	v_{0sc} (ft/s)	t_t (min)
	EX B2.4	2.96	0.36	15.5	1.06	5.63	6.0															
	EX B3.1	23.94	0.36	22.8	8.62	4.63	39.9															
	EX B3.2	11.63	0.36	22.2	4.19	4.69	19.6															
	EX C1	5.39	0.39	20.3	2.09	4.92	10.3															
	EX C2.1	1.02	0.46	14.9	0.48	5.74	2.7															
	EX C2.2	3.02	0.36	26.6	1.10	4.24	4.7															
	EX C2.3	8.90	0.36	22.7	3.20	4.63	14.8															
POI 1	C2.1, B3.1	24.96	0.36					22.8	9.09	4.63	42.1											

Combined flow must be for the total flows (including offsite flows) draining to the design point. similar comment for developed calculations.

Rainfall Intensity: I = (28.5 * P1) / (10 + tc)^0.786
P1: 2.52

Job No.: **61044**
Project: **Jackson Ranch Filing No. 3**

Date: **4/21/17 12:45**
Calcs By: **D. Gorman**
Checked By:

Time of Concentration (Modified from Standard Form SF-1)

	Sub-Basin Data				Overland			Shallow Channel				Channelized				t_c Check		
Sub-Basin	Area (Acres)	C_5	C_{100}/CN	% Imp.	L_0 (ft)	S_0 (%)	t_i (min)	L_{0t} (ft)	S_{0t} (ft/ft)	v_{0sc} (ft/s)	t_t (min)	L_{0c} (ft)	S_{0c} (ft/ft)	v_{0c} (ft/s)	t_c (min)	L (min)	$t_{c,alt}$ (min)	t_c (min)
DV B2.4	2.96	0.12	0.38	4.9%	95	7%	9.0	670	0.064	1.8	6.3	0	0.000	0.0	0.0	765	N/A	15.3
DV B3.1	2.75	0.20	0.44	15.4%	300	6%	15.8	340	0.068	1.8	3.1	175	0.011	3.1	0.9	815	N/A	19.9
DV B3.2a	6.54	0.12	0.38	5.0%	190	10%	11.5	700	0.070	1.9	6.3	0	0.000	0.0	0.0	890	N/A	17.8
DV B3.2b	9.99	0.14	0.40	8.1%	300	7%	15.5	640	0.047	1.5	7.0	0	0.000	0.0	0.0	940	N/A	22.6
DV B3.2c	1.40	0.09	0.36	2.0%	238	9%	13.5	288	0.042	1.4	3.4	0	0.000	0.0	0.0	526	N/A	16.9
DV C1	5.39	0.13	0.39	7.5%	300	5%	17.4	280	0.054	1.6	2.9	0	0.000	0.0	0.0	580	N/A	20.3
DV C2.1	1.21	0.20	0.44	15.9%	205	3%	15.4	0	0.000	0.0	0.0	0	0.000	0.0	0.0	205	N/A	15.4
DV C2.2	6.03	0.17	0.42	12.5%	300	5%	17.1	225	0.053	1.6	2.3	540	0.017	4.3	2.1	1065	N/A	21.5
DV C2.3	8.83	0.09	0.36	2.0%	260	4%	18.9	410	0.063	1.8	3.9	0	0.000	0.0	0.0	670	N/A	22.7

Job No.: **61044**
Project: **Jackson Ranch Filing No. 3**
Design Storm: **5-Year Storm** *(20% Probability)*
Jurisdiction: **UDFCD**

Date: **4/21/17 12:45**
Calcs By: **D. Gorman**
Checked By:

Sub-Basin and Combined Flows (Modified from Standard Form SF-2)

				Direct Runoff				Combined Runoff				Streetflow			Pipe Flow					Travel Time		
DP	Sub-Basin	Area (Acres)	C5	t_c (min)	CA (Acres)	I5 (in/hr)	Q5 (cfs)	t_c (min)	CA (Acres)	I5 (in/hr)	Q5 (cfs)	Slope (%)	Length (ft)	Q (cfs)	Q (cfs)	Slope (%)	Mnngs n	Length (ft)	D_{Pipe} (in)	Length (ft)	V_{0sc} (ft/s)	t_t (min)
	DV B2.4	2.96	0.12	15.3	0.34	3.38	1.2															
	DV B3.1	2.75	0.20	19.9	0.55	2.96	1.6															
	DV B3.2a	6.54	0.12	17.8	0.76	3.14	2.4															
	DV B3.2b	9.99	0.14	22.6	1.42	2.77	3.9															
	DV B3.2c	1.40	0.09	16.9	0.13	3.22	0.4															
	DV C1	5.39	0.13	20.3	0.72	2.93	2.1															
	DV C2.1	1.21	0.20	15.4	0.25	3.36	0.8															
	DV C2.2	6.03	0.17	21.5	1.04	2.84	2.9															
	DV C2.3	8.83	0.09	22.7	0.79	2.76	2.2															
POI 1	B2.4	2.96	0.12					15.3	0.34	3.38	1.2											
POI 2	B3.1	2.75	0.20					19.9	0.55	2.96	1.6											
POI 3	B3.1, B3.2a	9.29	0.14					22.9	1.31	2.74	3.6											
POI 4	C2.1, C2.2	7.24	0.18					21.0	1.28	2.88	3.7											
POI 5	B3.2b	9.99	0.14					22.6	1.42	2.77	3.9											

Rainfall Intensity: I = (28.5 * P1) / (10 + tc)^0.786
P1: 1.5

Job No.: **61044**
Project: **Jackson Ranch Filing No. 3**
Design Storm: **100-Year Storm** *(1% Probability)*
Jurisdiction: **UDFCD**

Date: **4/21/17 12:45**
Calcs By: **D. Gorman**
Checked By:

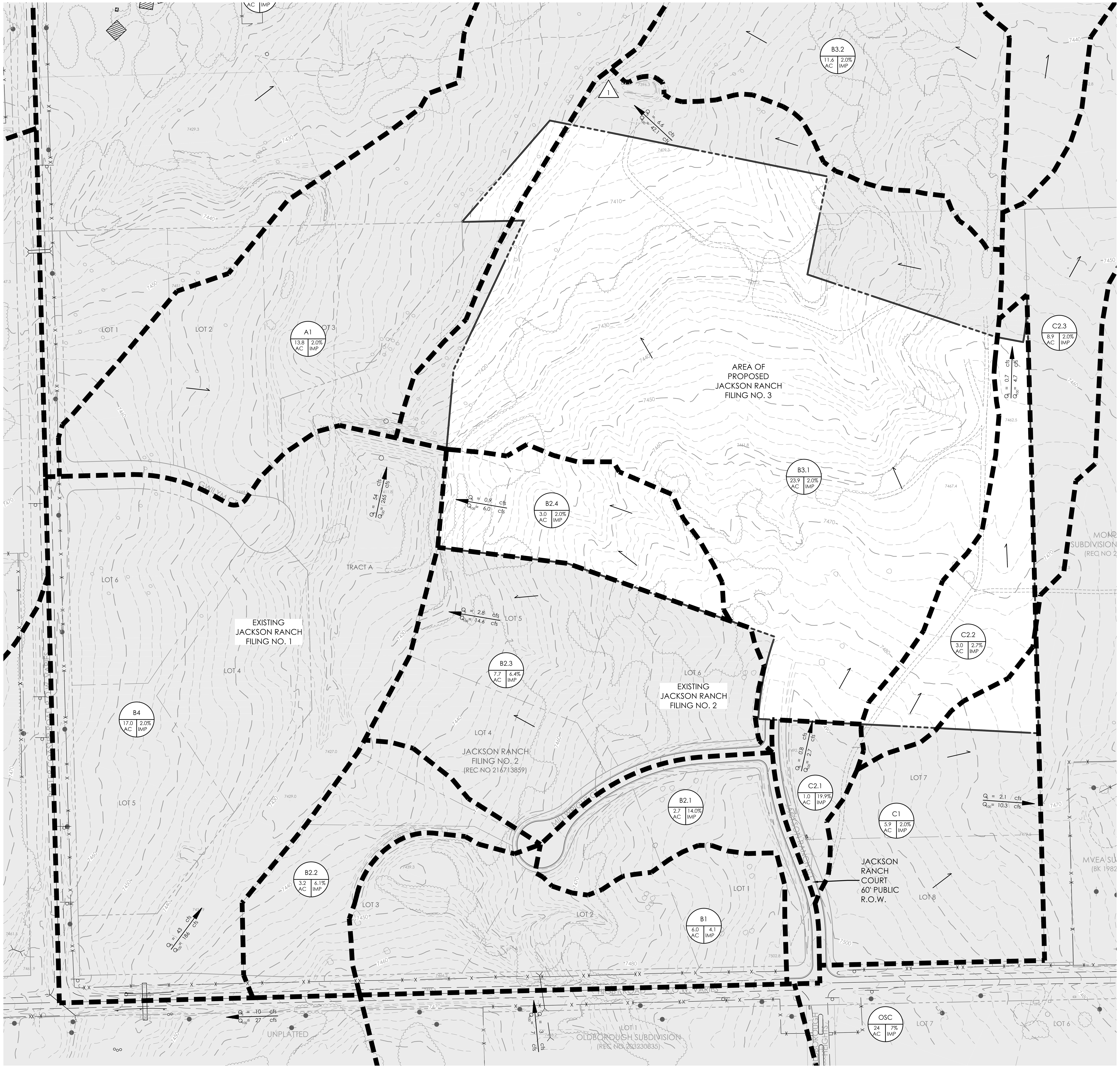
Sub-Basin and Combined Flows (Modified from Standard Form SF-2)

				Direct Runoff				Combined Runoff				Streetflow			Pipe Flow					Travel Time		
DP	Sub-Basin	Area (Acres)	C100	t_c (min)	CA (Acres)	I100 (in/hr)	Q100 (cfs)	t_c (min)	CA (Acres)	I100 (in/hr)	Q100 (cfs)	Slope (%)	Length (ft)	Q (cfs)	Q (cfs)	Slope (%)	Mnngs n	Length (ft)	D_{Pipe} (in)	Length (ft)	v_{0sc} (ft/s)	t_t (min)
	DV B2.4	2.96	0.38	15.3	1.11	5.67	6.3															
	DV B3.1	2.75	0.44	19.9	1.21	4.97	6.0															
	DV B3.2a	6.54	0.38	17.8	2.46	5.27	13.0															
	DV B3.2b	9.99	0.40	22.6	3.95	4.65	18.4															
	DV B3.2c	1.40	0.36	16.9	0.51	5.41	2.7															
	DV C1	5.39	0.39	20.3	2.09	4.92	10.3															
	DV C2.1	1.21	0.44	15.4	0.53	5.64	3.0															
	DV C2.2	6.03	0.42	21.5	2.51	4.77	12.0															
	DV C2.3	8.83	0.36	22.7	3.18	4.63	14.7															
POI 1	B2.4	2.96	0.38					15.3	1.11	5.67	6.3											
POI 2	B3.1	2.75	0.44					19.9	1.21	4.97	6.0											
POI 3	B3.1, B3.2a	9.29	0.39					22.9	3.67	4.61	16.9											
POI 4	C2.1, C2.2	7.24	0.42					21.0	3.04	4.84	14.7											
POI 5	B3.2b	9.99	0.40					22.6	3.95	4.65	18.4											

Rainfall Intensity: I = (28.5 * P1) / (10 + tc)^0.786
P1: 2.52

Report Maps

Existing Drainage Map
Developed Drainage Map



LEGEND

PROPERTY LINE

EASEMENT LINE

LOT LINE

BUILDING SETBACK LINE

EXISTING

5985 INDEX CONTOUR

84 INTERMEDIATE CONTOUR

BARBED WIRE FENCE

TREE (EVERGREEN/DECID.)

PROPOSED

5985 INDEX CONTOUR

84 INTERMEDIATE CONTOUR

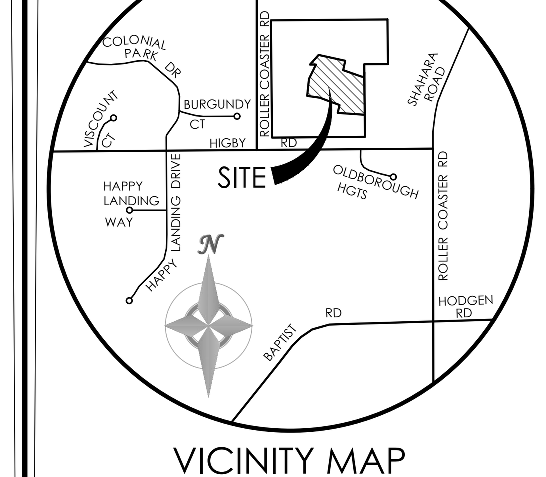
BASIN BOUNDARY

Q_5 = 19.0 cfs, Q_{100} = 60.0 cfs GENERAL FLOW/DIRECTION

1.5% SLOPE DIRECTION AND GRADE

A1 1.0 AC 50% IMP BASIN LABEL AREA IN ACRES PERCENT IMPERVIOUS

1 POINT OF INTEREST



VICINITY MAP
NOT TO SCALE

BENCHMARK

1" = 100' 1:1,200

MVE INC.
ENGINEERS / SURVEYORS
1903 lelaray street, suite 200 colorado springs co 80909 719.635.5736

REVISIONS

EXISTING DRAINAGE SUMMARY TABLE					
POINT OF INTEREST / BASIN(S)		AREA (ACRES)	Tc (MIN.)	RUNOFF (CFS) Q5	Q100
	B2.4	3.0	15.5	0.9	6.0
	B3.1	23.9	22.8	5.9	39.9
	B3.2	11.6	22.2	2.9	19.6
	C1	14.2	20.3	2.1	10.3
	C2.1	1.0	14.9	0.8	2.7
	C2.2	3.0	26.6	0.7	4.7
	C2.3	8.9	22.7	2.2	14.8
POI 1	C2.1, B3.1	25.0	22.8	6.6	42.1

DESIGNED BY
DRAWN BY
CHECKED BY
AS-BUILTS BY
CHECKED BY

JACKSON RANCH
FILING NO. 3

EXISTING
DRAINAGE MAP

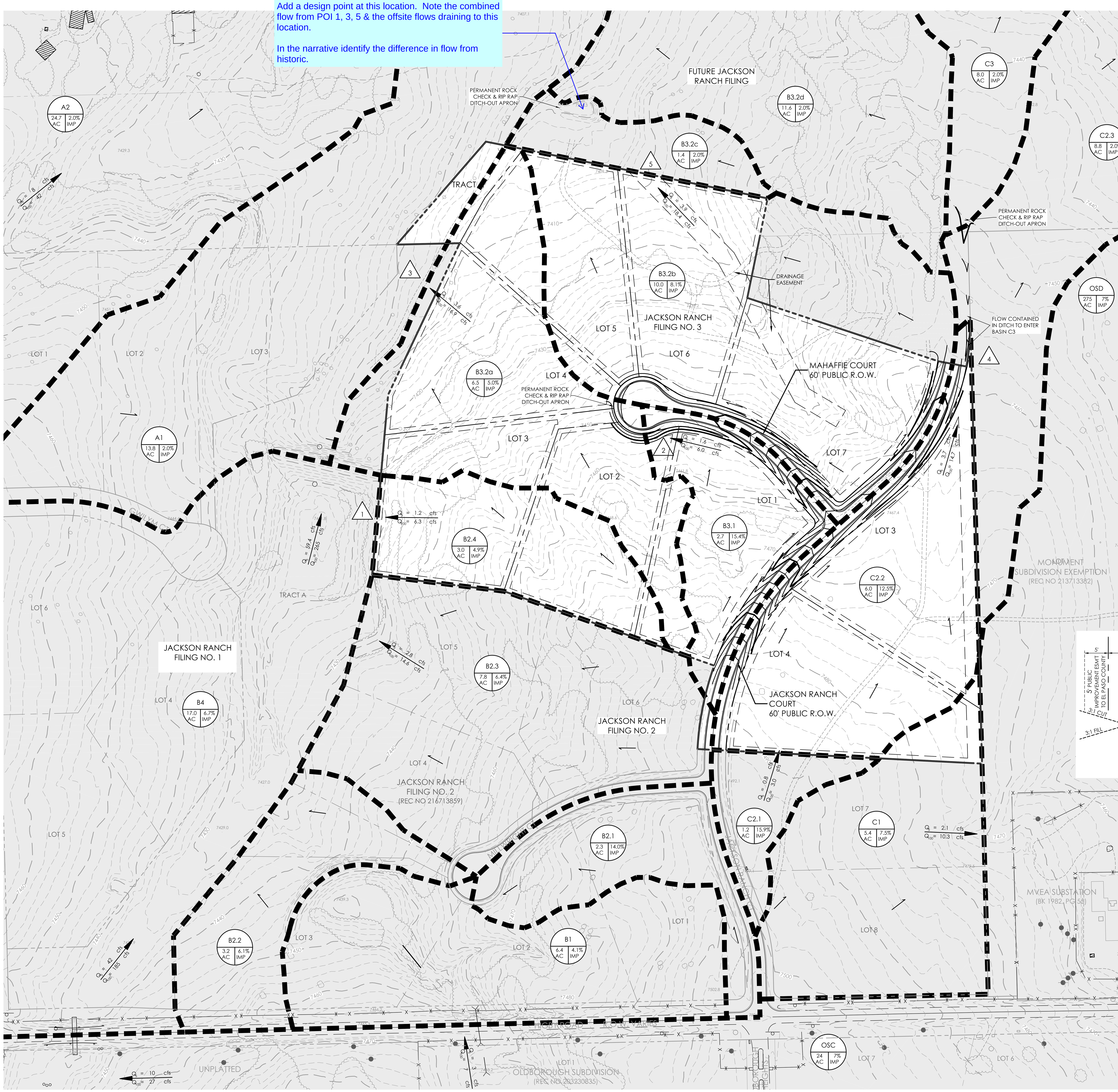
MVE PROJECT 61044
MVE DRAWING EX-DR-MapF3

April 18, 2017

SHEET 1 **OF** 2

Add a design point at this location. Note the combined flow from POI 1, 3, 5 & the offsite flows draining to this location.

In the narrative identify the difference in flow from historic.



LEGEND

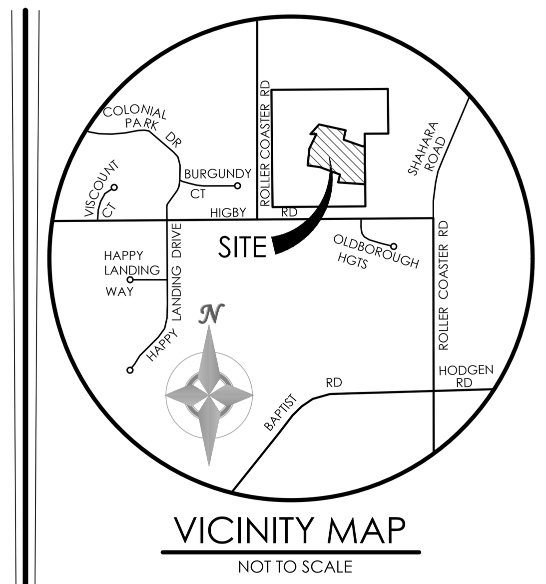
- PROPERTY LINE
- EASEMENT LINE
- LOT LINE
- BUILDING SETBACK LINE

EXISTING

- INDEX CONTOUR
- INTERMEDIATE CONTOUR
- BARBED WIRE FENCE
- TREE (EVERGREEN/DECID.)

PROPOSED

- INDEX CONTOUR
- INTERMEDIATE CONTOUR
- BASIN BOUNDARY
- GENERAL FLOW/DIRECTION
- SLOPE DIRECTION AND GRADE
- BASIN LABEL AREA IN ACRES PERCENT IMPERVIOUS
- POINT OF INTEREST



BENCHMARK

FLOODPLAIN STATEMENT:

A PORTION OF THE SUBJECT PROPERTY IS LOCATED WITHIN FEMA DESIGNATED SPECIAL FLOOD HAZARD AREA (SFHA) ZONE X (AREAS OF 500-YEAR FLOOD; AREAS OF 100-YEAR FLOOD WITH AVERAGE DEPTHS OF LESS THAN 1 FOOT OR WITH DRAINAGE AREAS LESS THAN 1 SQUARE MILE; AND AREAS PROTECTED BY LEVEES FROM 100-YEAR FLOOD) AS INDICATED ON THE FLOOD INSURANCE RATE MAP (FIRM) FOR EL PASO COUNTY, COLORADO AND INCORPORATED AREAS - MAP NUMBER 08041C0741 F, EFFECTIVE MARCH 17, 1997. THE STRUCTURES WILL BE CONSTRUCTED MORE THAN 1.0 FEET ABOVE THE ADJACENT FEMA BASE FLOOD ELEVATION.

MAP NOTES:

1. ALL BEARINGS USED HEREIN ARE BASED ON AN ASSUMED BEARING BETWEEN A NO. 4 REBAR WITH NO CAP AT THE NORTHEAST CORNER AND A NO. 5 REBAR WITH NO CAP AT THE SOUTHEAST CORNER OF THE SUBJECT PROPERTY. THE ASSUMED BEARING BETWEEN THOSE MONUMENTS IS S 17° 11' 24" E, PER THE RECORDED PLAT OF AIR PRODUCTS SUBDIVISION.

2. ELEVATIONS SHOWN ON THIS MAP ARE RELATIVE TO THE NORTHEAST CORNER OF THE SUBJECT PROPERTY, MONUMENTED WITH AN ALUMINUM CAP HAVING ILLEGIBLE MARKINGS. ELEVATION = 5816.25 (ASSUMED DATUM).

3. THE EXISTING TOPOGRAPHY SHOWN ON THIS PLAN WAS PREPARED BY ROCKY MOUNTAIN LAND SERVICES, INC. AND DATED AUGUST 14, 2014.

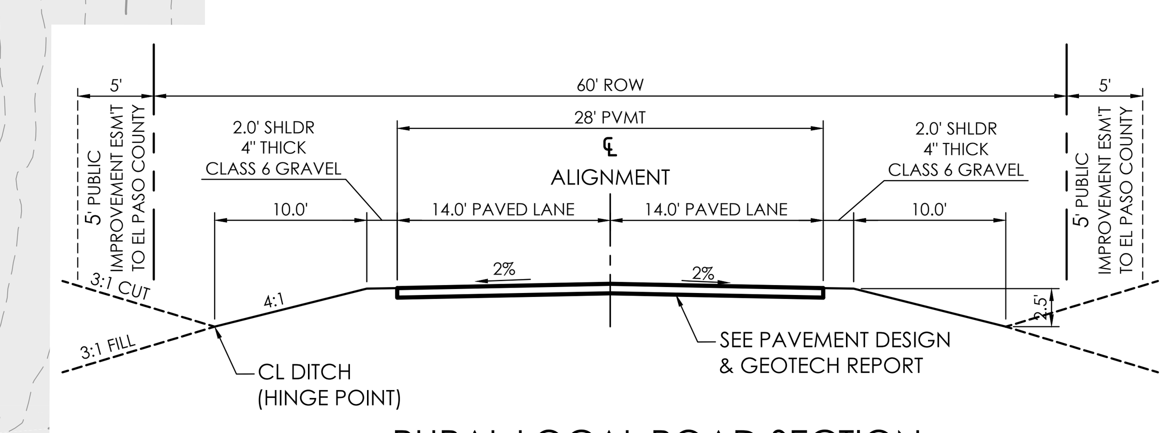
4. ALL EXISTING UNDERGROUND UTILITIES SHOWN ON THIS MAP ARE FROM UTILITY MAIN RECORD MAPS, UTILITY SERVICE LOCATION MAPS OBTAINED FROM COLORADO SPRINGS UTILITIES AND SURFACE EVIDENCE AS SURVEYED IN THE FIELD. THE LOCATION OF UTILITIES AS SHOWN ARE APPROXIMATE. ALL UTILITIES MAY NOT BE SHOWN OR MAY NOT HAVE BEEN LOCATED. BELOW GROUND UTILITY LOCATIONS WERE NOT PERFORMED.

EASEMENTS FOR DRAINAGE:

UNLESS SHOWN GREATER IN WIDTH, SIDE AND REAR LOT LINES ARE HEREBY PLATTED WITH A TEN (10) FOOT EASEMENT FOR DRAINAGE AND PUBLIC UTILITIES ONLY, FRONT LOT LINES ARE HEREBY PLATTED WITH A FIFTEEN (15) FEET EASEMENT FOR DRAINAGE AND PUBLIC UTILITIES ONLY, TRACT A IS A DRAINAGE AND PUBLIC UTILITY EASEMENT IN IT'S ENTIRETY AND THE SUBDIVISION EASTERLY BOUNDARY IS HEREBY PLATTED WITH A THIRTY FOOT EASEMENT FOR DRAINAGE AND PUBLIC UTILITIES ONLY, WITH THE SOLE RESPONSIBILITY FOR MAINTENANCE BEING VESTED WITH THE PROPERTY OWNERS.

LOTS 8 AND 9 CONTAIN PLATTED DRAINAGE AND NO BUILD AREAS TO ACCOMMODATE ONSITE DRAINAGE.

1" = 100' 1:1,200



RURAL LOCAL ROAD SECTION

SCALE: 1" = 10'

DEVELOPED DRAINAGE SUMMARY TABLE

POINT OF INTEREST/ BASIN(S)		AREA (AC)	Tc (MIN.)	RUNOFF Q5 (CFS)	RUNOFF Q100 (CFS)
POI 1	B2.4	3.0	15.3	1.2	6.3
POI 2	B3.1	2.7	19.9	1.6	6.0
	B3.2a	6.5	17.8	2.4	16.9
POI 3	B3.1, B3.2a	9.3	22.9	3.6	16.9
	C1	5.4	20.3	2.1	10.3
	C2.1	1.2	15.4	0.8	3.0
	C2.2	6.0	21.5	2.9	12.0
POI 4	C2.1, C2.2	7.2	21.0	3.7	14.7
	C2.3	8.8	22.7	2.2	14.7
POI 5	B3.2b	10.0	22.6	3.9	18.4
	B3.2c	1.4	16.9	0.4	2.7

MVE INC. ENGINEERS / SURVEYORS

1903 lelaray street, suite 200 colorado springs co 80909 719.635.5736

REVISIONS

DESIGNED BY
DRAWN BY
CHECKED BY
AS-BUILTS BY
CHECKED BY

JACKSON RANCH
FILING NO. 3

DEVELOPED DRAINAGE MAP

MVE PROJECT 61044
MVE DRAWING PP-DR-MapF3

April 18, 2017

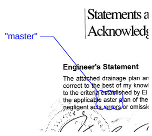
SHEET 2 OF 2

Markup Summary

dsdlaforce (11)

Subject: Text Box
Page Label: 1
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdlaforce
Date: 6/12/2017 11:35:49 AM
Color:

Add: "PCD Project No. SF-17-017"



Subject: Cloud+
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Author: dsdlaforce
Date: 6/26/2017 9:06:41 AM
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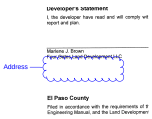

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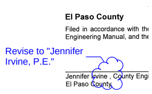

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Author: dsdlaforce
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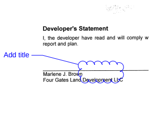
Revise to "Jennifer Irvine, P.E."



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Author: dsdlaforce
Date: 6/12/2017 12:33:40 PM
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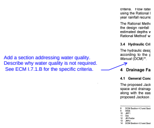
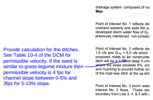
Add title



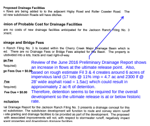
Subject: Callout
Page Label: 8
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdlaforce
Date: 6/12/2017 3:32:01 PM
Color:

Add a section addressing water quality. Describe why water quality is not required. See ECM I.7.1.B for the specific criteria.



Subject: Callout
Page Label: 9
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdlaforce
Date: 6/12/2017 4:33:13 PM
Color:

Provide calculation for the ditches. See Table 10-4 of the DCM for permissible velocity. If the seed is similar to grass-legume mixture then permissible velocity is 4 fps for channel slope between 0-5% and 3fps for 5-10% slope.



Subject: Callout
Page Label: 10
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdlaforce
Date: 6/26/2017 9:06:58 AM
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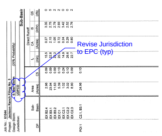
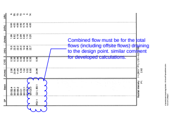
Review of the June 2016 Preliminary Drainage Report shows an increase in flows at the ultimate release point. Also, based on rough estimate Fil 3 & 4 creates around 6 acres of impervious land (17 lots @ 11% imp = 4.7 ac and 2300 lf @ 28' wide asphalt road = 1.5ac) which could result in approximately 2 ac-ft of detention.
Therefore, detention seems to be required for the overall development so the ultimate release is at or below historic rate.



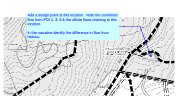
Subject: Cloud+
Page Label: 31
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdlaforce
Date: 6/21/2017 1:45:28 PM
Color:

Revise Jurisdiction to EPC (typ)



Subject: Cloud+
Page Label: 32
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdlaforce
Date: 6/12/2017 4:24:02 PM
Color:

Combined flow must be for the total flows (including offsite flows) draining to the design point. similar comment for developed calculations.



Subject: Callout
Page Label: 38
Lock: Unlocked
Status:
Checkmark: Unchecked
Author: dsdlaforce
Date: 6/12/2017 2:28:47 PM
Color:

Add a design point at this location. Note the combined flow from POI 1, 3, 5 & the offsite flows draining to this location.

In the narrative identify the difference in flow from historic.