FINAL DRAINAGE REPORT FOR
HUNSINGER SUBDIVISION
LOT 10, VAC W 20.0 FT OF OTERO AVE ADJ, BLK B CPRING CREST AMD FIL - LOT K, VAC W 20.0 FT OF OTERO AVE ADJ, BLK B SPRING CREST FIL NO 2 – LOT L, VAC W 20.0 FT OF OTERO AVE ADJ, BLK B SPRING CREST FIL 2
10140 OTERO AVENUE
COLORADO SPRINGS, COLORADO

JANUARY 2019

Prepared For:
HUNSINGER DEVELOPMENT CORPORATION
Attn: Steve Hunsinger
10140 Otero Avenue
Colorado Springs, Colorado
719.955.1634

Prepared By:

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Job No. 1609.00

PCD File No. VR-18-014

FINAL DRAINAGE REPORT FOR
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APPENDICIES

FINAL DRAINAGE REPORT FOR
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LOT 10, VAC W 20.0 FT OF OTERO AVE ADJ, BLK B CPRING CREST AMD FIL - LOT K, VAC W 20.0 FT OF OTERO AVE ADJ, BLK B SPRING CREST FIL NO 2 – LOT L, VAC W 20.0 FT OF OTERO AVE ADJ, BLK B SPRING CREST FIL 2
10140 OTERO AVENUE
COLORADO SPRINGS, COLORADO

DESIGN ENGINEER'S STATEMENT:

The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by the County for drainage reports and said report is in conformity with the 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.

_____ _____
L Ducett, P.E. 32339 Date

OWNER/DEVELOPER'S STATEMENT:

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

_____ _____
Authorized Signature Date

_____
Printed Name, Title

_____
Business Name

_____
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. Date
County Engineer / ECM Administrator

Conditions:

FINAL DRAINAGE REPORT FOR
HUNSINGER SUBDIVISION
LOT 10, VAC W 20.0 FT OF OTERO AVE ADJ, BLK B CPRING CREST AMD FIL - LOT K, VAC W 20.0 FT OF OTERO AVE ADJ, BLK B SPRING CREST FIL NO 2 – LOT L, VAC W 20.0 FT OF OTERO AVE ADJ, BLK B SPRING CREST FIL 2
10140 OTERO AVENUE
COLORADO SPRINGS, COLORADO

PURPOSE AND JUSTIFICATION

The purpose of this Final Drainage Report is to identify and analyze the existing drainage patterns, determine existing runoff quantities, and analyze the current development of this site as a residential subdivision. These lots have previously been platted and have not been part of previous drainage studies.

GENERAL DESCRIPTION

This Final Drainage Report for "HUNSINGER SUBDIVISION", located at 10140 Otero Road, is an analysis of an approximately 697,800 sf (16.02 ac) basin. The site is platted as LOT 10, VAC W 20.0 FT OF OTERO AVE ADJ, BLK B CPRING CREST AMD FIL - LOT K, VAC W 20.0 FT OF OTERO AVE ADJ, BLK B SPRING CREST FIL NO 2 – LOT L, VAC W 20.0 FT OF OTERO AVE ADJ, BLK B SPRING CREST FIL 2; with Lot 10 currently in use as a residence, and Lot K and Lot L currently being grazing/pasture land. The proposed development is a subdivision into five residential lots.

The site is in the northwest quarter of Section 28, Township 12 South, Range 66 West of the 6th Principal Meridian within El Paso County. The parcels are bounded to the north by Old Ranch Road, to the east and south by Otero Avenue, and to the west by Lot 9 & E 153.00 ft of Lot 8 Blk B Spring Crest AMD Fil and Lot M, Vac W 20.0 ft of Otero Ave, Blk B Spring Crest Fil 2. (See vicinity map, Appendix A).

The site lies within the Kettle Creek Basin, with storm runoff draining into Kettle Creek at the southwest corner of the subdivision.

The site consists of 52% Columbine gravelly sandy loam (hydrologic group "A") and 48% Stapleton-Bernal sandy loams (hydrologic group "B") per the USDA, NRCS web soil survey. The

hydrologic group "A" was used to represent the soil types and determine the onsite basin overland flow. (See map in appendix)

The study area consists of mostly undeveloped land, which currently includes a residence and grazing/pasture land, with mostly grass and dirt surfaces. The southwest corner of the study area is wooded, with a smaller number of trees scattered about the remainder of the study area. Approximately 1% of the study area is currently impervious (from roofs) and none of the study area is currently paved. The site currently drains toward the southwest, with an average slope of 12%.

EXISTING DRAINAGE CONDITIONS

There are seven existing structures, and Kettle Creek, in the southwest corner of the site. There is an existing drainage channel on the east and south sides of the site along Otero Avenue that drains into Kettle Creek on the site. There are two pond areas on the site, and two culverts along Otero Avenue for drive access' for the existing structures.

There are two offsite basins along the north side of the site where Old Ranch Road drains onto the site (as sheet flow). Offsite basin OS-1 is 0.37 acres and drains to Design Point Z. Offsite basin OS-1 has flows of Q_5 = 1.2 cfs and Q_{100} = 2.7 cfs. These flows are based on approximately 50% of the basin being impervious (half is paved and half is native grasses). See attached Existing Drainage Map (in appendix).

Offsite basin OS-2 is 0.17 acres and drains to Design Point Y. Offsite basin OS-2 has flows of Q_5 = 0.4 cfs and Q_{100} = 1.2 cfs. These flows are based on approximately 50% of the basin being impervious (half is paved and half is native grasses). See attached Existing Drainage Map (in appendix).

The site has one existing drainage basin (EX-A) which is 16.02 acres and drains to Design Point A. Drainage basin EX-A has flows of Q_5 = 4.7 cfs and Q_{100} = 34.3 cfs. These flows are bases on approximately 1% of the basin being impervious. See attached Existing Drainage Map (in appendix). Some of the current drainage flows directly into Kettle Creek and some flows into a

drainage channel along Otero Avenue before flowing into Kettle Creek. All of the drainage enters Kettle Creek onsite.

PROPOSED DRAINAGE CONDITIONS

In the proposed condition the drainage pattern for the site will remain essentially unchanged. No significant grading is proposed as part of this subdivision. The impervious area for the site has been set at 11% at the direction of El Paso County. Drainage will continue to flow into Kettle Creek on the southwest corner of the site.

There are two offsite basins along the north side of the site where Old Ranch Road drains onto the site (as sheet flow). Offsite basin OS-1 is 0.37 acres and drains to Design Point Z. Offsite basin OS-1 has flows of Q_5 = 1.2 cfs and Q_{100} = 2.7 cfs. These flows are based on approximately 50% of the basin being impervious (half is paved and half is native grasses). See attached Existing Drainage Map (in appendix).

Offsite basin OS-2 is 0.17 acres and drains to Design Point Y. Offsite basin OS-2 has flows of Q_5 = 0.4 cfs and Q_{100} = 1.2 cfs. These flows are based on approximately 50% of the basin being impervious (half is paved and half is native grasses). See attached Existing Drainage Map (in appendix).

Basin PR-1 (16.02 acres) covers the entire site and includes roof area, gravel surfaces, and dirt/grass surfaces that sheet and channel flows to the southwest corner of the basin and Design Point 1, where Kettle Creek leaves the site. Basin PR-1 flow is 9.4 cfs for the 5 year event and 41.5 cfs for the 100 year event. These flows are bases on 11% of the basin being impervious.

Flows within basin PR-1 will include only surface routing (no pipe routing). Surface routing includes sheet flow and channel flow directly into Kettle Creek and sheet flow into a channel along Otero Avenue before the channel flows into Kettle Creek on the southwest corner of the site.

The two existing pond areas onsite will be filled in or breached as part of this development.

Please see detailed calculations in the appendix.

In an effort to protect receiving water and as part of the "four-step process to minimize adverse impacts of urbanization" this site was analyzed in the following manner (note: this is not an urban site):

1. Reduce Runoff- The proposed lots will be rural residential on 2.5 acre lots. The percent impervious has been set at 11% and was previously estimated to be lower than that. The vast majority of the site is expected to remain in a primarily natural condition (lots of native grasses with some bushes and trees). Due to this the impervious areas of the site will be scatters around the site and will likely all be surrounded by natural/pervious areas.
2. Stabilize Drainageways- The only existing or proposed drainage channel onsite is the Sand Creek channel, which is on a portion of the site that has already been developed (existing residence). There are no drainage channels in the to be developed area of the site to be stabilized.
3. Provide Water Quality Capture Volume (WQCV)- Water quality is not required for this site due to the disturbed area being less than one acre and this development being low density (rural) housing (2.5 acre or larger lots), per ECM Appendix I.7.1.B.
4. Consider Need for Industrial and Commercial BMPs- As this is a residential development, industrial and commercial BMPs do not apply.

HYDROLOGIC CALCULATIONS

Hydrologic calculations were performed using the City of Colorado Springs Storm Drainage Design Criteria Manual Volumes 1 & 2 May 2014. The Rational Method was used to estimate storm water runoff anticipated from design storms with 5-year and 100-year recurrence intervals.

HYDRAULIC CALCULATIONS

Not applicable.

Additional justification for "negligible" is required.
A 20% increase from existing wouldn't be considered negligible.
Therefore, identify the overall creek flow through design point 1. The comparison to the creek flow would be more suitable for justifying negligible impact to downstream properties.

WATER QUALITY

As the disturbed area including the subdivision roadways, building pads and 20' wide drive access ways) is less than one acre, no water quality treatment is required. Additionally, the percent impervious set for the subdivision is only 11%.

Flood control detention is not proposed as part of this development per the Drainage Basin Planning Study For Kettle Creek Basin not requiring flood control on this site, and this development being for low density residential and the disturbed area being less than one acre. The existing 100 year event flow for the site is Q_{100} = 34.3 cfs and the proposed flow is Q_{100} = 41.5 cfs, with a change in flow of $Q_{100\Delta}$ = 7.2 cfs for the entire 16 acres site (or an additional 0.45 cfs of runoff per acre). This change in runoff is considered negligible and therefore, does now warrant onsite flood control detention.

FLOODPLAIN STATEMENT

Approximately 0.43 ac of the southwest corner of the site is within the designated F.E.M.A. 100 year flood plain of Kettle Creek per Flood Insurance Rate Map No. 08041C0506 F dated March 17, 1997 (see appendix and drainage maps). The 100 year flood elevation is shown as 6,631 feet on the site.

No changes to the lot lines in or adjacent to this flood plain are proposed as part of this subdivision. Additionally, no new structures are proposed in the proposed lot that includes this flood plain.

EROSION CONTROL

As no significant grading is proposed as part of this subdivision, no erosion control measures have been included.

CONSTRUCTION COST OPINION

Not applicable.

DRAINAGE FEES

The existing site is in the Kettle Creek Basin (# FOMO3000). 2018 drainage fees due prior to final plat recordation for the Hunsinger Subdivision are as follows:

DRAINAGE FEES: 16 ac x 11% imp = 1.76 imp ac

1.76 imp ac x 0.75 x $9,287 per imp ac = $ 12,259

TOTAL $ 12,259

There are no associated bridge fees in the Kettle Creek Basin.

MAINTENANCE

Not applicable.

SUMMARY

Subdivision of this site will not adversely affect the surrounding development. In the proposed condition the drainage pattern for the site will remain essentially unchanged. No significant grading is proposed as part of this subdivision. Water quality is not required due to the disturbed area included in this subdivision being less than 1 acre.

PREPARED BY:
TERRA NOVA ENGINEERING, INC.

Luanne Ducett, P.E.
President

BIBLIOGRAPHY

"City of Colorado Springs Drainage Criteria Manual Volumes 1 & 2, May 2014

"NRCS Soil Map for El Paso County Area, Colorado

"F.E.M.A. Flood Insurance Rate Map No. 08041C0506 F dated March 17, 1997

"Drainage Basin Planning Study For Kettle Creek Basin, May 5, 2015

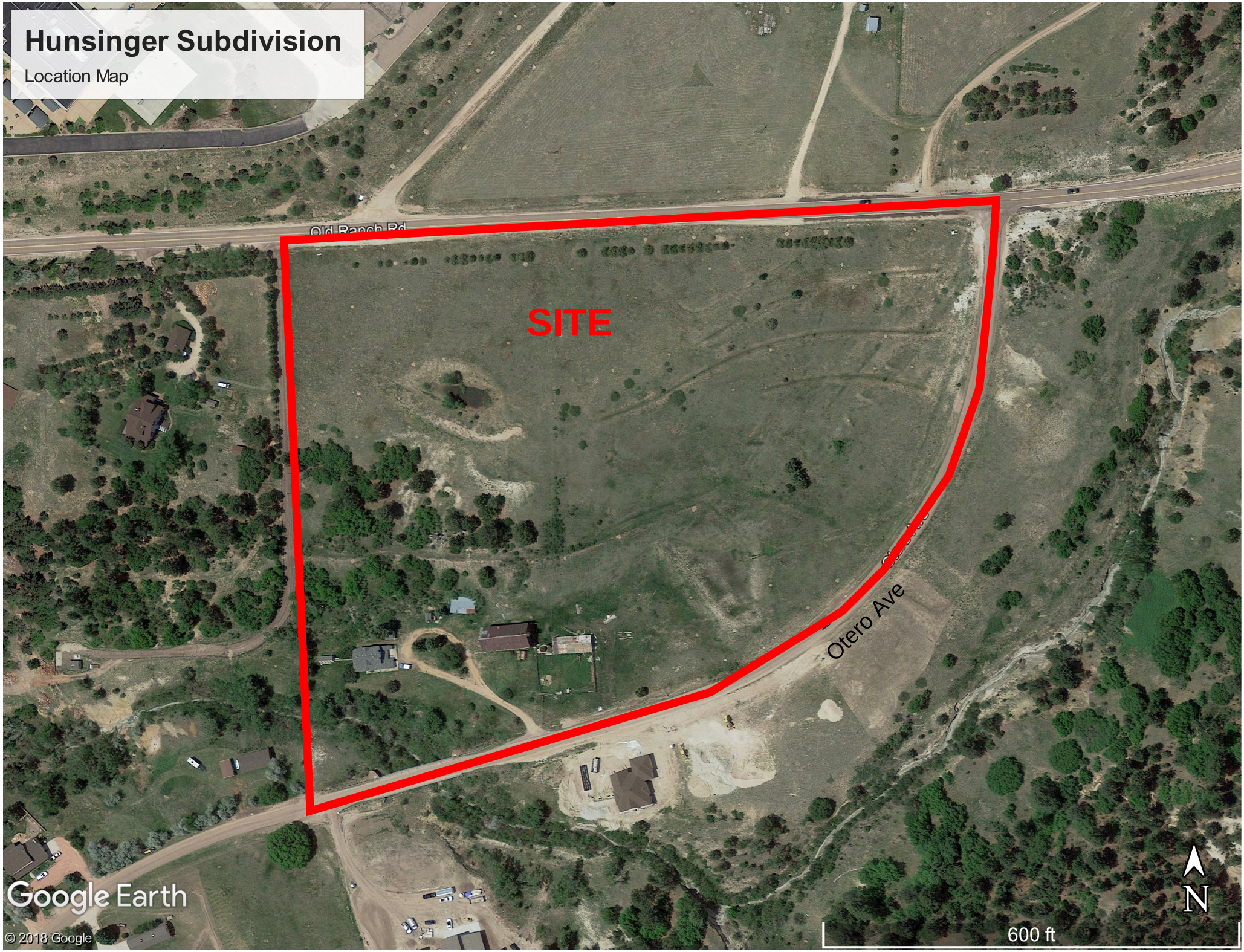
VICINITY MAP

Hunsinger Subdivision
Vicinity Map

Map data ©2018 Google 500 ft

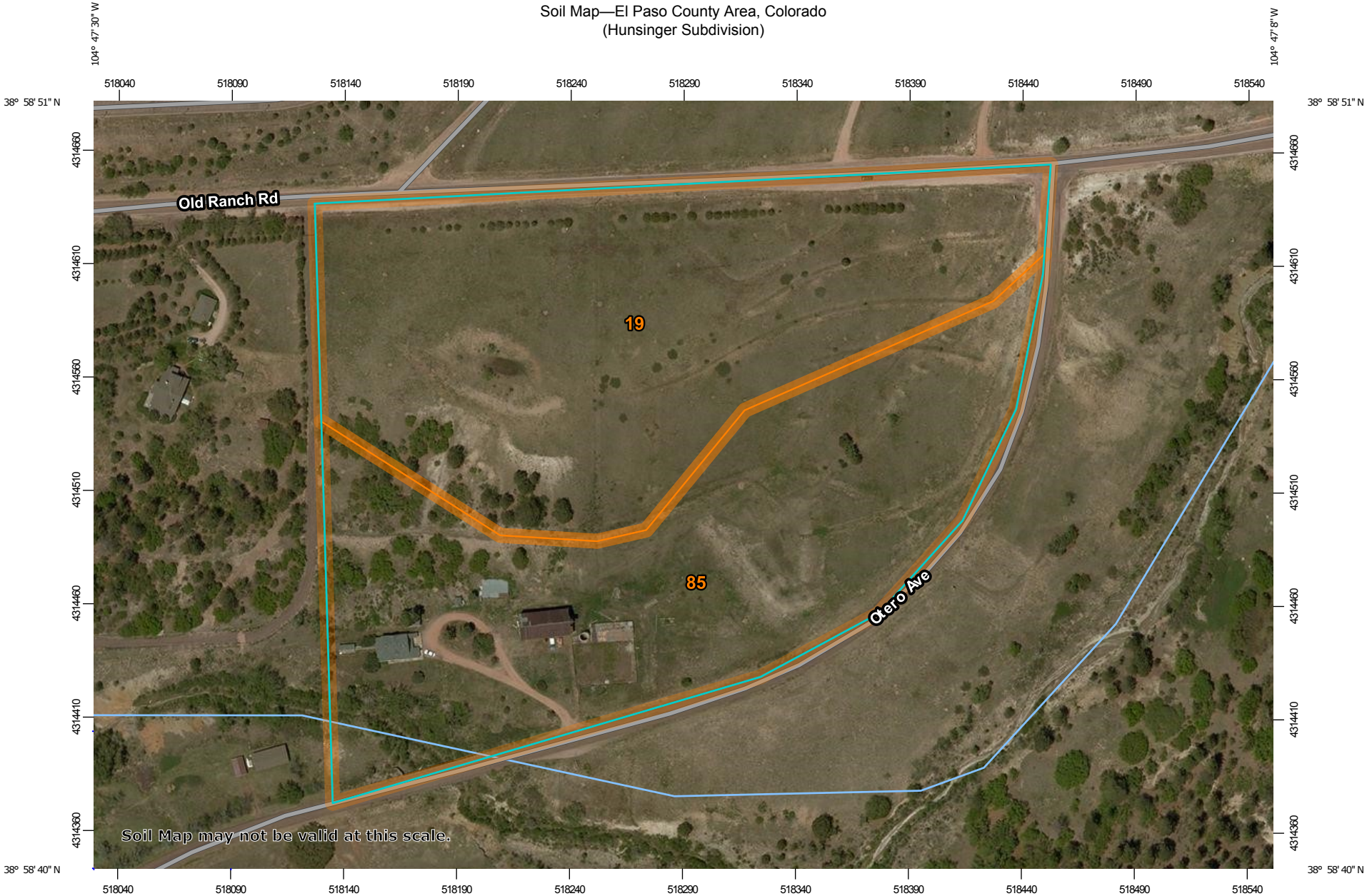
N

GENERAL LOCATION MAP


Hunsinger Subdivision
Location Map
Old Ranch Rd
SITE
Otero Ave
Google Earth
© 2018 Google
N
600 ft

NRCS SOIL MAP

Soil Map—El Paso County Area, Colorado
(Hunsinger Subdivision)



Map Scale: 1:2,390 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 35 70 140 210

Feet: 0 100 200 400 600

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

MAP LEGEND

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

Soils
- Soil 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 15, Oct 10, 2017

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

Date(s) aerial images were photographed: Jun 3, 2014—Jun 17, 2014

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
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	8.8	51.7%
85	Stapleton-Bernal sandy loams, 3 to 20 percent slopes	8.2	48.3%
Totals for Area of Interest		**16.9**	**100.0%**

El Paso County Area, Colorado

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

Map Unit Setting

National map unit symbol: 367p
Elevation: 6,500 to 7,300 feet
Mean annual precipitation: 14 to 16 inches
Mean annual air temperature: 46 to 50 degrees F
Frost-free period: 125 to 145 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Columbine

Setting

Landform: Fan terraces, fans, flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

A - 0 to 14 inches: gravelly sandy loam
C - 14 to 60 inches: very gravelly loamy sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.5 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: Gravelly Foothill (R049BY214CO)
Hydric soil rating: No

Minor Components

Fluvaquentic haplaquolls

Percent of map unit:
Landform: Swales

Hydric soil rating: Yes

Other soils

Percent of map unit:
Hydric soil rating: No

Pleasant

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

Data Source Information

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 15, Oct 10, 2017

El Paso County Area, Colorado

85—Stapleton-Bernal sandy loams, 3 to 20 percent slopes

Map Unit Setting

National map unit symbol: 36b1
Elevation: 6,500 to 6,800 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

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

Description of Stapleton

Setting

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

Typical profile

A - 0 to 11 inches: sandy loam
Bw - 11 to 17 inches: gravelly sandy loam
C - 17 to 60 inches: gravelly loamy sand

Properties and qualities

Slope: 3 to 15 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: Gravelly Foothill (R049BY214CO)
Hydric soil rating: No

Description of Bernal

Setting

Landform: Hills
Landform position (three-dimensional): Crest, side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum weathered from sandstone

Typical profile

A - 0 to 4 inches: sandy loam
Bt - 4 to 11 inches: sandy clay loam
C - 11 to 13 inches: sandy loam
R - 13 to 17 inches: unweathered bedrock

Properties and qualities

Slope: 3 to 20 percent
Depth to restrictive feature: 8 to 20 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 1.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Ecological site: Shallow Foothill (R049BY204CO)
Hydric soil rating: No

Minor Components

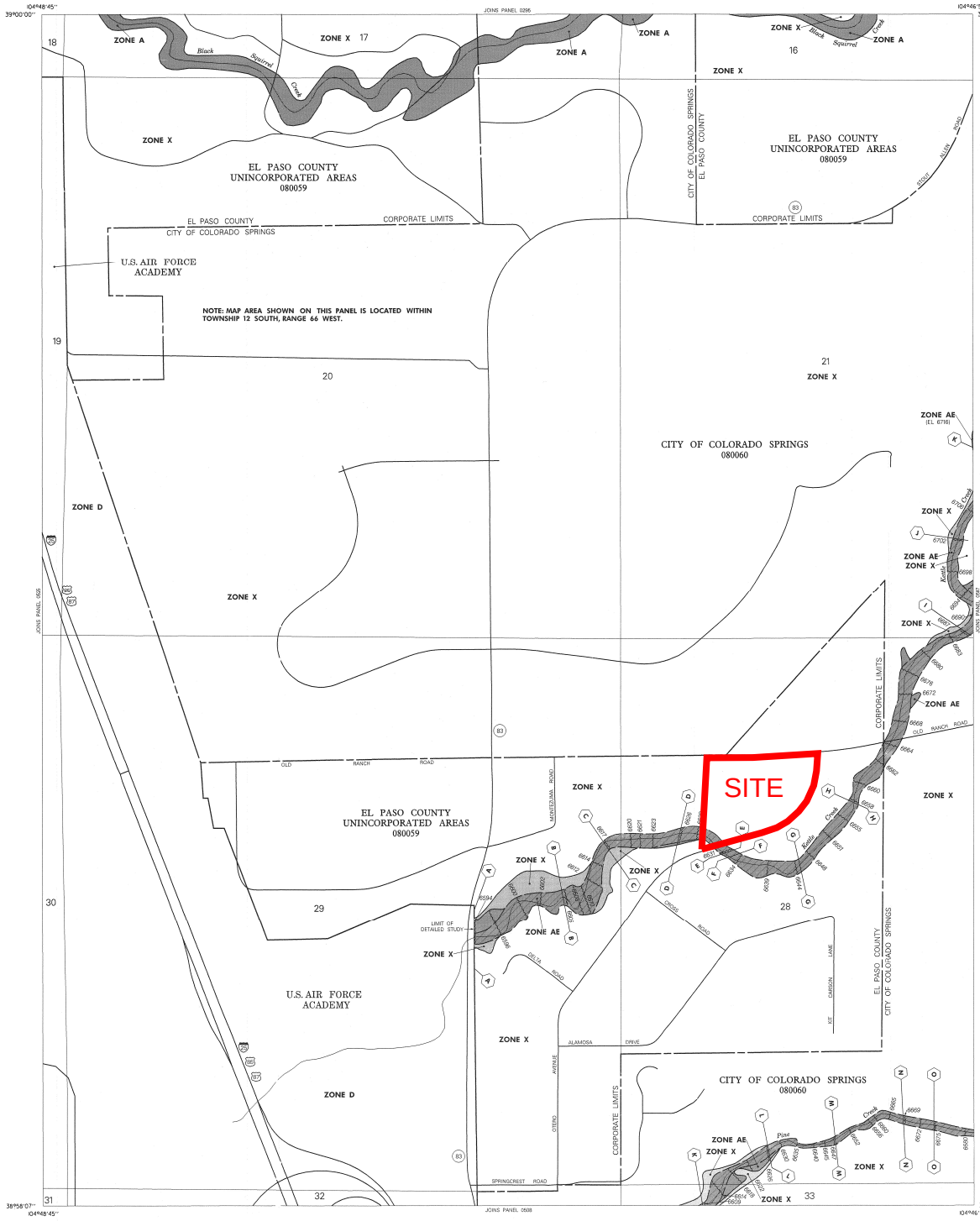
Other soils

Percent of map unit:
Hydric soil rating: No

Data Source Information

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 15, Oct 10, 2017

FEMA FIRM MAP



LEGEND

SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR FLOOD

- **ZONE A** No base flood elevations determined.
- **ZONE AE** Base flood elevations determined.
- **ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.
- **ZONE AO** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- **ZONE A99** To be protected from 100-year flood by Federal flood protection system under construction; no base elevations determined.
- **ZONE V** Coastal flood with velocity hazard (wave action); no base flood elevations determined.
- **ZONE VE** Coastal flood with velocity hazard (wave action); base flood elevations determined.

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

- **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.

OTHER AREAS

- **ZONE X** Areas determined to be outside 500-year floodplain.
- **ZONE D** Areas in which flood hazards are undetermined.

UNDEVELOPED COASTAL BARRIERS

Identified 1983 | Identified 1990 | Otherwise Protected Areas

Coastal barrier areas are normally located within or adjacent to Special Flood Hazard Areas.

Flood Boundary

Floodway Boundary

Zone D Boundary

Boundary Dividing Special Flood Hazard Zones, and Boundary Dividing Areas of Different Coastal Base Flood Elevations Within Special Flood Hazard Zones.

513 — Base Flood Elevation Line; Elevation in Feet. See Map Index for Elevation Datum.

D — Cross Section Line

(EL 987) — Base Flood Elevation in Feet Where Uniform Within Zone. See Map Index for Elevation Datum.

RM7 — Elevation Reference Mark

M2 — River Mile

97°07'30", 32°22'30" — Horizontal Coordinates Based on North American Datum of 1927 (NAD 27) Projection.

NOTES

This map is for use in administering the National Flood Insurance Program; it does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size, or all planimetric features outside Special Flood Hazard Areas.

Coastal base flood elevations apply only landward of 0.0 NGVD, and include the effects of wave action; these elevations may also differ significantly from those designated by the National Weather Service for hurricane evacuation planning.

Areas of Special Flood Hazard (100-year flood) include Zones A, AE, AH, AO, A99, V, and VE.

Certain areas not in Special Flood Hazard Areas may be protected by flood control structures.

Boundaries of the floodways were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the Federal Emergency Management Agency.

Floodway widths in some areas may be too narrow to show to scale. Floodway widths are provided in the Flood Insurance Study Report.

This map may incorporate approximate boundaries of Coastal Barrier Resource System Units and /or Otherwise Protected Areas established under the Coastal Barrier Improvement Act of 1990 (PL 101-591).

Corporate limits shown are current as of the date of this map. The user should contact appropriate community officials to determine if corporate limits have changed subsequent to the issuance of this map.

For community map revision history prior to countywide mapping, see Section 6.0 of the Flood Insurance Study Report.

For adjoining map panels and base map source see separately printed Map Index.

MAP REPOSITORY
Refer to Repository Listing on Map Index

EFFECTIVE DATE OF
COUNTYWIDE FLOOD INSURANCE RATE MAP:
MARCH 17, 1997

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL:

Refer to the FLOOD INSURANCE RATE MAP EFFECTIVE DATE shown on this map to determine when actuarial rates apply to structures in zones where elevations or depths have been established.

To determine if flood insurance is available, contact an insurance agent or call the National Flood Insurance Program at (800) 638-6620.

APPROXIMATE SCALE IN FEET
500 0 500

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

EL PASO COUNTY,
COLORADO AND
INCORPORATED AREAS

PANEL 506 OF 1300
(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS: COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	080060	0506	F
EL PASO COUNTY UNINCORPORATED AREAS	080059	0506	F

MAP NUMBER
08041C0506 F

EFFECTIVE DATE:
MARCH 17, 1997

Federal Emergency Management Agency

HYDROLOGIC CALCULATIONS

HUNSINGER SUBDIVISION
AREA RUNOFF COEFFICIENT (C) SUMMARY

EXISTING

		DEVELOPED			*UNDEVELOPED*			*WEIGHTED*		*WEIGHTED CA*	
BASIN	**TOTAL AREA**	**AREA**	**C5**	**C100**	**AREA**	**C5**	**C100**	**C5**	**C100**	**CA5**	**CA100**
	(Acres)	*(Acres)*			*(Acres)*						
OS-1	0.37	0.37	0.55	0.65	0.00	0.08	0.35	0.55	0.65	0.20	0.24
OS-2	0.17	0.17	0.55	0.65	0.00	0.08	0.35	0.55	0.65	0.09	0.11
EX-A	16.02	3.00	0.09	0.36	13.02	0.08	0.35	0.08	0.35	1.31	5.64

DEVELOPED

		DEVELOPED			*UNDEVELOPED*			*WEIGHTED*		*WEIGHTED CA*	
BASIN	**TOTAL AREA**	**AREA**	**C5**	**C100**	**AREA**	**C5**	**C100**	**C5**	**C100**	**CA5**	**CA100**
	(Acres)	*(Acres)*			*(Acres)*						
OS-1	0.37	0.37	0.55	0.65	0.00	0.08	0.35	0.55	0.65	0.20	0.24
OS-2	0.17	0.17	0.55	0.65	0.00	0.08	0.35	0.55	0.65	0.09	0.11
PR-1	16.02	16.02	0.16	0.41	0.00	0.08	0.35	0.16	0.41	2.56	6.57

Calculated by: DLF
Date: 10/18/2018
Checked by: _____

HUNSINGER SUBDIVISION
RUNOFF SUMMARY

EXISTING

		WEIGHTED		*OVERLAND*				*STREET / CHANNEL FLOW*				T_C	*INTENSITY*		*TOTAL FLOWS*	
BASIN	**AREA TOTAL** *(Acres)*	C_5	C_{100}	C_5	**Length** *(ft)*	**Slope** *(ft/ft)*	T_t *(min)*	**Length** *(ft)*	**Slope** *(%)*	**Velocity** *(fps)*	T_t *(min)*	**TOTAL** *(min)*	I_5 *(in/hr)*	I_{100} *(in/hr)*	Q_5 *(c.f.s.)*	Q_{100} *(c.f.s.)*
		** For Calcs See Runoff Summary*														
OS-1	0.37	0.55	0.65	0.55	25	0.12	2.2	0	12.0%	0.7	0.0	2.2	5.9	11.0	1.2	2.7
OS-2	0.17	0.55	0.65	0.55	75	0.03	5.9	0	12.0%	0.7	0.0	5.9	4.8	8.6	0.4	1.0
EX-A	16.02	0.08	0.35	0.08	300	0.12	14.0	0	12.0%	0.7	0.0	14.0	3.6	6.1	4.7	34.3

DEVELOPED

		WEIGHTED		*OVERLAND*				*STREET / CHANNEL FLOW*				T_C	*INTENSITY*		*TOTAL FLOWS*	
BASIN	**AREA TOTAL** *(Acres)*	C_5	C_{100}	C_5	**Length** *(ft)*	**Slope** *(ft/ft)*	T_t *(min)*	**Length** *(ft)*	**Slope** *(%)*	**Velocity** *(fps)*	T_t *(min)*	**TOTAL** *(min)*	I_5 *(in/hr)*	I_{100} *(in/hr)*	Q_5 *(c.f.s.)*	Q_{100} *(c.f.s.)*
		** For Calcs See Runoff Summary*														
OS-1	0.37	0.55	0.65	0.55	25	0.12	2.2	0	12.0%	0.7	0.0	2.2	5.9	11.0	1.2	2.7
OS-2	0.17	0.55	0.65	0.55	75	0.03	5.9	0	12.0%	0.7	0.0	5.9	4.8	8.6	0.4	1.0
PR-1	16.02	0.16	0.41	0.16	300	0.12	13.0	0	12.0%	0.7	0.0	13.0	3.7	6.3	9.4	41.5

Calculated by: DLF

Date: 10/18/2018

Checked by: _____

HUNSINGER SUBDIVISION
SURFACE ROUTING SUMMARY

Design Point(s)	*Contributing Basins*	*Flow*	
		Q_5	Q_{100}
Z	**OS-1**	1.2	2.7
Y	**OS-2**	0.4	1.0
A	**OS-1, OS-2, EX-A**	6.3	38.0
1	**OS-1, OS-2, PR-1**	11.0	45.2

Calculated by: DLF

Date: 10/18/2018

Checked by: _____

PAGES FROM KETTLE CREEK BASIN DBPS

Drainage Basin Planning Study
For
Kettle Creek Basin

Prepared for:

High Valley Land Company, Inc.
1755 Telestar Drive, Suite 211
Colorado Springs, CO 80920
Contact: Tom Taylor

Prepared by:

JR Engineering LLC
3730 Sinton Road, Suite
Colorado Springs, CO 80903
(719) 593-2593
Contact: Steve Rossoll

JR Project Number: 25100.00
May 5, 2015
X:\2510000.all\2510000\Word\Reports\Kettle Creek DBPS

Drainage Basin Planning Study
For Kettle Creek

ENGINEER'S STATEMENT:
The attached Drainage Basin Planning Study was prepared under my direction and supervision and is correct to the best of my knowledge and belief. Said Drainage Basin Planning Study has been prepared according to the criteria established by the City for Drainage Basin Planning Studies and said report is in conformity with the master plan of the drainage basin area. I accept responsibility for any liability caused by any negligent acts, errors, or omissions on my part in preparing this report.

Steve Rossoll, Colorado P.E. # 34655
For and On Behalf of JR Engineering, LLC

COLORADO REGISTERED STEVE ROSSOLL JR. 34655 PROFESSIONAL ENGINEER

5/6/15
Date

DEVELOPER'S STATEMENT:
I, the developer, have read and will comply with all of the requirements specified in this Drainage Basin Planning Study.

Business Name: High Valley Land Company, Inc.

By: Thomas Taylor
Title: Vice President
Address: 1755 Telestar Drive, Suite 211
Colorado Springs, CO 80920
Phone Number: (719) 260-7477

CITY OF COLORADO SPRINGS ONLY:
Filed in accordance with Section 7.7.906 of the Code of the City of Colorado Springs, 2001, as amended.

EMM
For the City Engineer

5/13/15
Date

Conditions:

DISCLAIMER:
This report has been prepared based on certain key assumptions made by JR Engineering, which substantially affect the conclusions and recommendations of this report. These assumptions, although thought to be reasonable and appropriate, may not prove true in the future. The conclusions and recommendations made by JR Engineering are conditioned upon these assumptions.

Background information, design bases, and other data have been furnished to JR Engineering by third parties, which JR Engineering has used in preparing this report. JR Engineering has relied on this information as furnished, and is not responsible for and has not confirmed the accuracy of this information. Information that became available after data procurement was complete was not incorporated.

THIS REPORT IS A PLANNING DOCUMENT AND IS NOT TO BE USED AS THE BASIS FOR FINAL DESIGN, CONSTRUCTION OR REMEDIAL ACTION, NOR AS A BASIS FOR MAJOR CAPITAL DECISIONS.

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FIGURES

APPENDICES

"clean, straight, full stage, no rifts or deep pools". The channel characteristics are assumed to remain consistent through all stages of development.

4.2.5 Cross-Sections

A total of 44 cross-sections were modeled along the reach, with cross-sections located at geometry changes and downstream of all crossings. Channel cross-section locations were manually selected to represent confluences, changes in channel geometry and slope. Each cross-section was adjusted to extend across the estimated floodplain and was placed perpendicular to the anticipated direction of flow in both the main channel and left/right floodplains. The cross-sections were bent in some locations to accomplish the requirement to lie perpendicular to the flow path as described in Chapter 3 of HEC-RAS Hydraulic Reference Manual.

There are existing bridges over Kettle Creek located at Powers Boulevard, Old Ranch Road, Otero Avenue, and Voyager Parkway (State Highway 83). At each of these locations, four cross-sections were added to the HEC-RAS model that included an upstream cross-section prior to flow contraction, a cross-section at the upstream face of the structure, a cross-section at the downstream face of the structure, and a downstream cross-section where flow is fully expanded. Pier location and dimensions and deck elevations were roughly measured in the field. Photos are included in **Appendix D**.

The cross sections generated from the surface TIN in AutoCAD Civil 3D may potentially represent the top of the vegetated surface and not necessarily the true channel invert. In locations where vegetation is sparse, and not deep, the channel invert is assumed to be accurately represented. In locations of dense and deep vegetative cover, the channel invert may not be accurately represented and could be shallower that what actually exists. This condition may result in cross sections with less flood capacity than actually exists and leads to a conservative estimation of floodplain widths.

Several non-critical model warnings were generated during model runs. To address model warnings by either defining numerous additional cross sections or by interpolating cross sections between every defined cross section would be necessary. Neither of these solutions was determined to be necessary given the level of detail required for this study and as such were not completed.

Expansion and contraction coefficients in the cross-sections were estimated based on the ratio of expansion and contraction of the effective flow area in the floodplain occurring at cross-sections and at major drainageway crossings. For subcritical flow conditions where the change in the stream cross-section is gradual, a contraction coefficient of 0.1 and expansion coefficient of 0.3 are typically used for hydraulic modeling. The channel characteristics for the study reach justified the use of these typical values. An contraction coefficient of 0.3 and an expansion coefficient of 0.5 were used at the two upstream sections and immediate downstream section at each bridge crossing in accordance with standard practice, which reflects the energy loss resulting from increased flow contraction approaching the bridge, and increased flow expansion when leaving the bridge.

4.2.6 Ineffective Flow Areas

Ineffective flow areas are used to describe portions of a cross section in which water does not actively flow. Ineffective flow is typically used at the upstream and downstream bounding cross sections of a drainageway crossing and for a side channel with stagnant storage. All ineffective flow is considered permanent and will not become effective flow until the barrier is overtopped. Ineffective flow areas were used at major drainageway crossings only and it was assumed that channel invert irregularities are all contributing flow areas for the purposes of this study.

4.2.7 Bridges

The surface TIN was used to develop the bounding cross sections upstream and downstream of each major drainageway crossing, in addition to the approximate roadway characteristics at each crossing. The required inputs for bridge modeling include data for the deck/roadway, pier, and sloping abutments. This data was obtained from the surface topography and approximate measurements taken during the site inspection.

4.2.8 Detention Ponds

No existing detention ponds lie along the study reach except for the regional detention facility located on the upstream side of I-25. Information from the U.S. Air Force Academy Kettle Creek Watershed Hydrology Study (AFA Study) was used to determine the storage and water surface elevations of the Kettle Creek detention facility.

4.2.9 Steady Flow and Boundary Conditions

Steady flow data were entered for the study reach based on the results of the hydrologic modeling in Section 3. Steady flow data corresponding to the peak flow for flood events with recurrence intervals of 2-, 5-, 10-, 25-, 50- and 100-years for historic, existing, and future hydrologic conditions was entered for each reach at points of significant hydrologic change as determined in the hydrologic model. A summary of hydrologic flows for each tributary at different points is provided in tabular form in **Appendix B**.

The upstream boundary condition for the reach was based on the estimated normal depth of Kettle Creek based on invert slope. The downstream boundary conditions were based on water surface elevations in the I-25 regional detention pond obtained from the AFA Study. A mix of supercritical and subcritical flow conditions was evaluated. The mixed flow regime was selected to provide conservative water surface elevations while reflecting maximum velocities, in order to present the results most consistent with actual flood conditions in the channel.

4.3 Approximate Floodplains

After the HEC-RAS model analysis was complete, the 100-year water surface elevations were exported back to AutoCAD Civil 3D. Approximate floodplains for the existing and future 100-year floods were delineated for Kettle Creek and are shown in **Figures 4-1** and **4-2**. Due to negligible differences in the water surface profiles at the scale shown, the existing and future flow results are shown as one water surface profile. The FEMA floodplains for the Kettle Creek watershed are overlaid in the plan for comparison to the results of this analysis. Flood profiles for the existing and future 100-year floods are shown in **Figure 4-3** through **Figure**

The regional detention alternatives presented herein only are considered for the purposes of attenuating developed flow rates. Consideration of regional detention alternatives will have significant environmental impacts as discussed in Section 5. Sub-regional detention alone will not reduce flow rates in Kettle Creek to historic levels, as past development in the upper portion of the basin is a contributing factor to the increased flows under existing conditions. Regional detention must be owned and maintained by a public entity, with ownership and maintenance responsibilities clearly defined to ensure the proper function of the facility in perpetuity.

6.3 Sub-Regional Detention

The anticipated approach is sub-regional detention with full spectrum detention and water quality treatment. Any future development in the Kettle Creek basin within the City of Colorado Springs shall have sub-regional detention for each development/phase. Detention facilities serving drainage basins between 20 and 130 acres are considered "sub-regional detention". Sub-regional detention may be constructed by a public entity such as a municipality or special district to serve several landowners in the upstream watershed or by a single landowner. It may be possible for a single landowner to construct sub-regional detention if the upper part of the watershed is owned by others and if the necessary conditions are achieved. Sub-regional detention should be addressed in subsequent Master Development Drainage Plans (MDDP) for individual development projects. The ownership and maintenance of these ponds are anticipated to be public or quasi-public. In order to be considered for public maintenance the contributory area shall be in the range of 70-120 acres. A conceptual map illustrating the locations of required sub-regional detention facilities is shown in **Figure 6-1**.

6.3.1 Full Spectrum Detention

The full spectrum detention approach, as defined in Chapter 13 of the DCM, shall be implemented as the standard detention approach. Impervious surfaces associated with development increase peak flows, frequency of runoff and total volume of stormwater surface runoff when compared to pre-development conditions. This increase is most pronounced for the smaller, more frequent storms and can result in stream degradation and water quality impacts as well as flooding during large storm events.

In addition to detaining developed conditions stormwater discharge for flood control and for water quality considerations, it is also important to expand the focus to the range of flows responsible for transporting the most bedload in the receiving stream. This range depends on reach specific characteristics but is between the annual event and the 5-year event. Runoff events in this range can produce geomorphic changes in local receiving streams resulting in severe erosion, loss of riparian habitat, and water quality degradation.

Outflow hydrographs from traditional flood-control detention facilities tend to maintain flows near the maximum release rates for relatively long periods of time. This allows hydrographs released from multiple independent ponds to overlap and add to each other to generate flows exceeding pre-development conditions. Traditional flood-control detention concepts can result in an increase in total watershed discharges even if individual detention facilities each control peak discharges to pre-developed conditions. Full spectrum detention modeling reduces urban runoff peaks to levels similar to pre-development conditions for a wide range of storms over an entire watershed, even with multiple independent detention facilities. A result of full spectrum detention is that discharges from storms smaller than approximately the 2-year event will be reduced to very low flows near or below the sediment carrying threshold value for downstream drainageways.

6.3.2 Water Quality

Each sub-regional detention pond shall detain flows not only for flood control, but also for water quality. The Water Quality Capture Volume (WQCV) is intended to capture most runoff events and reduce their pollutant load prior to discharging into drainageways. The size of this storage element depends primarily on the amount of tributary impervious area and can be reduced by implementing development practices that reduce the effective imperviousness, discussed in more detail below.

Future development in the basin shall consider other land planning and engineering design approaches to manage stormwater runoff and water quality. Low Impact Development (LID) is a comprehensive approach with the goal of mimicking the pre-development hydrologic regime. LID emphasizes conservation of natural features and use of engineered, on-site, small-scale hydrologic controls that infiltrate, filter, store, evaporate, and detain runoff close to its source. Portions of the site that aid in reducing the developed conditions discharge should be preserved, which may include mature trees, stream corridors, wetlands, and NRCS Type A/B soils with higher infiltration rates.

Minimizing Directly Connected Impervious Area (MDCIA) includes a variety of runoff reduction strategies based on reducing impervious areas and routing runoff from impervious surfaces over grassy areas to slow runoff and promote infiltration. MDCIA is a technique for reducing runoff peaks and volumes following urbanization. Paved areas can be reduced in extent to the minimum amount practical, and implement methods to route runoff over grassed areas rather than directly into storm sewer. When soils vary over the site, concentrate new impervious areas over NRCS Type C and D soils, while preserving NRCS Type A and B soils for landscape areas and other permeable surfaces. Increasing the number and lengths of flow paths will all reduce the impact of the development.

Volume reduction is a key hydrologic objective, as opposed to peak flow reduction being the only objective. Volume reduction is emphasized not only to reduce pollutant loading and peak flows, but also to move toward hydrologic regimes with flow durations and frequencies closer to the natural hydrologic regime.

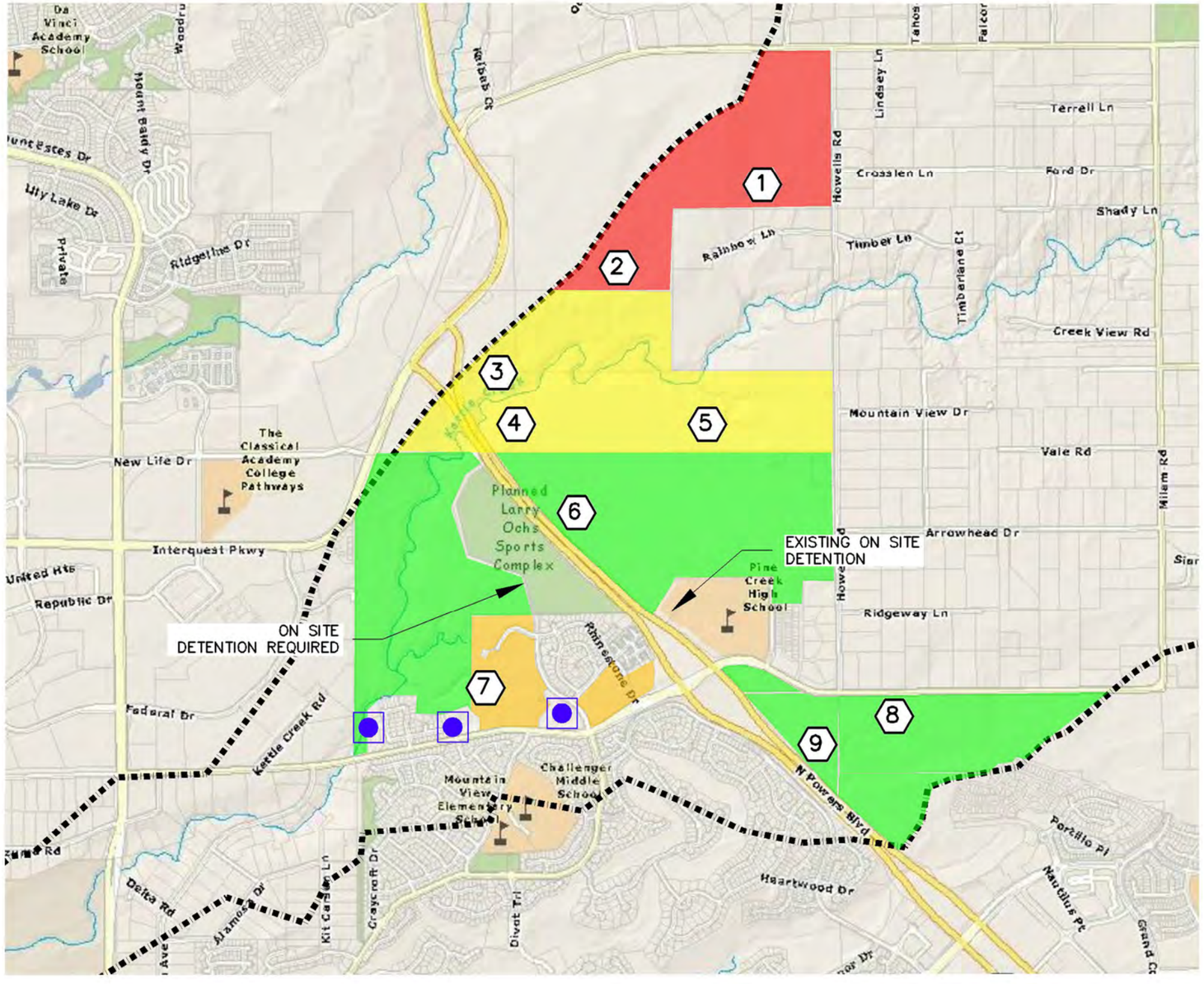
6.4 Limited Channel Stabilization Alternative

Channel improvements may be necessary in the main study reach of Kettle Creek to limit erosion and deposition resulting from high velocities as determined in Section 4. However, grading and grade control structures may not be feasible in Kettle Creek due to the disturbance they would cause with the presence of the Preble's meadow jumping mouse. Conceptual check structure placement is provided for reference, should grade control structures become an option in the future.

The locations of these conceptual check structures were determined by areas where mean channel velocities exceeded 5 feet per second for the 100-year event. Future grade between check structures was estimated to stabilize at approximately 0.20 percent. Check structure placement was shown to lower velocities above 5

LEGEND

- JOVENCHI–I LLC
- 260 EB LLC
- HIGH VALLEY LAND COMPANY INC
- KETTLE CREEK LLC & VENEZIA JOHN FAMILY TRUST
- ESTIMATED LOCATION OF PROPOSED SUBREGIONAL PONDS
- EXISTING LOCATION OF SUBREGIONAL PONDS
- KETTLE CREEK BASIN BOUNDARY



N

2000 1000 0 2000

ORIGINAL SCALE: 1" = 2000'

FIGURE 6–1
SUBREGIONAL POND LOCATIONS
KETTLE CREEK DBPS
JOB NO. 25100.00
MAY 2015

J·R ENGINEERING
A Westrian Company

Centennial 303–740–9393 • Colorado Springs 719–593–2593
Fort Collins 970–491–9888 • www.jrengineering.com

DRAINAGE MAPS

HUNSINGER SUBDIVISION

EL PASO COUNTY

EXISTING DRAINAGE MAP

OCTOBER 2018

BASIN SUMMARY

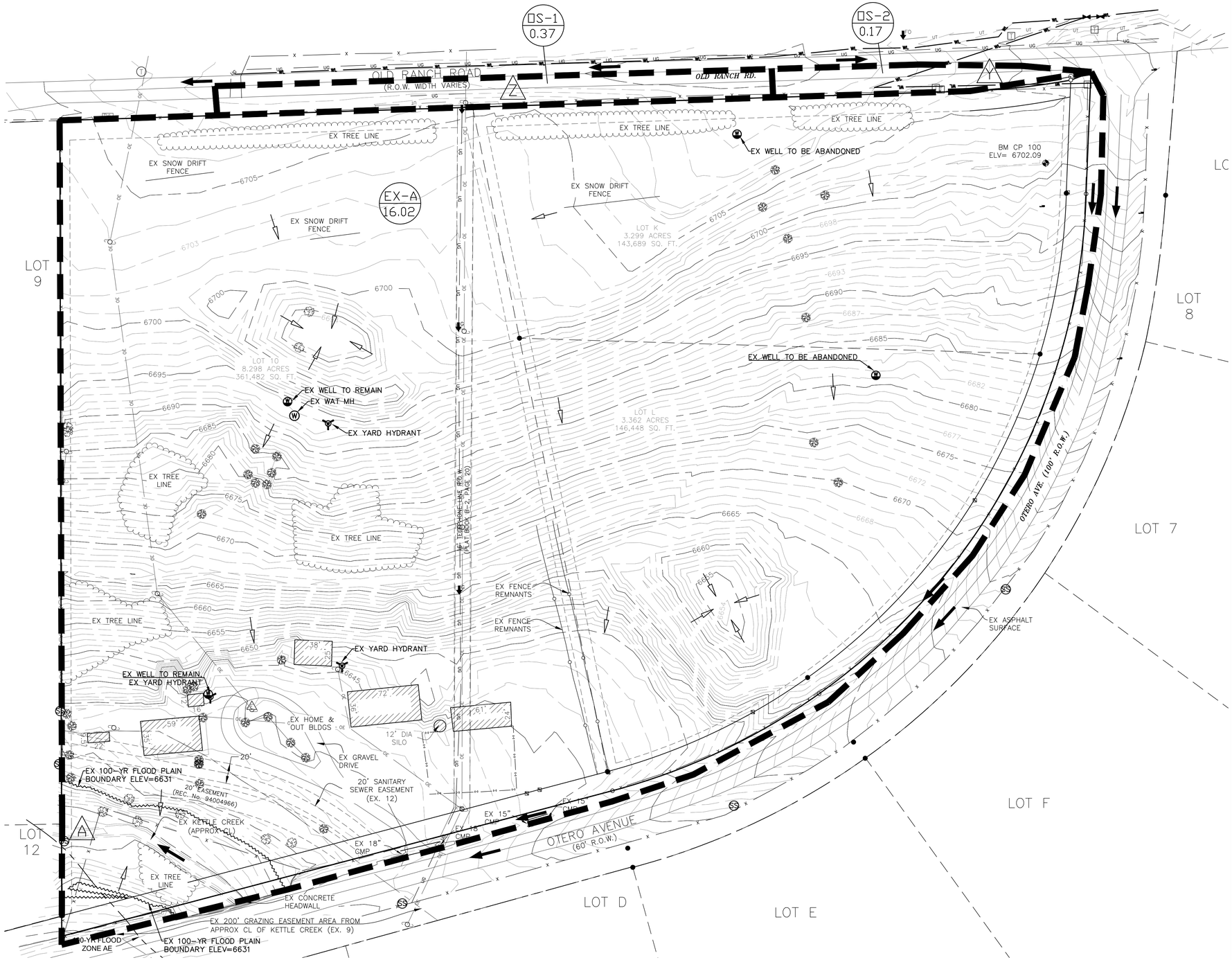
DESIGN POINT	BASIN	AREA (ACRES)	FLOW 5 YR (cfs)	FLOW 100 YR (cfs)
Z	OS-1	0.37	1.2	2.7
Y	OS-2	0.17	0.4	1.0
A	EX-A	16.02	4.7	34.3

DRAINAGE SUMMARY

DESIGN POINT	BASIN TRIBUTARY	AREA (ACRES)	FLOW 5 YR (cfs)	FLOW 100 YR (cfs)
Z	OS-1	0.37	1.2	2.7
Y	OS-2	0.17	0.4	1.0
A	OS-1,OS-2,EX-A	16.56	6.3	38.0

LEGEND

- P-7 / 12.22 — BASIN DESIGNATION / AREA IN BASIN (AC)
- D — DESIGN POINT
- BASIN BOUNDARY
- EXISTING 1' CONTOUR
- EXISTING 5' CONTOUR
- GROUND SURFACE FLOW DIRECTION
- ROAD AND DITCH FLOW DIRECTION
- YARD HYDRANT
- ELECTRIC METER
- OE — OVERHEAD ELECTRIC LINE
- UG — UNDERGROUND GAS LINE
- FO — UNDERGROUND FIBER-OPTIC MARKER
- TELEPHON PEDESTAL
- UNDERGROUND TELEPHONE MARKER
- UTILITY POLE
- GUY WIRE
- STREET SIGN
- MAILBOX
- CHAIN-LINK FENCE
- x — BARBED-WIRE FENCE
- CL EX SWALE
- EX TREE
- SS — EX SANITARY SEWER MANHOLE



REVISIONS

NO.	DESCRIPTION	DATE
1.	REV'D PER 6/2/16 CITY COMMENTS	8/22/16

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721 S. 23RD STREET
COLORADO SPRINGS, CO 80904
OFFICE: 719-635-6422
FAX: 719-635-6426
www.tnesinc.com

HUNSINGER SUBDIVISION

EXISTING DRAINAGE PLAN

DESIGNED BY JF
DRAWN BY JF
CHECKED BY LD
H-SCALE AS SHOWN
V-SCALE N/A
JOB NO. 1609.00
DATE ISSUED 10/18/18
SHEET NO. 1 OF 2

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HUNSINGER SUBDIVISION
EL PASO COUNTY
PROPOSED DRAINAGE MAP
OCTOBER 2018

BASIN SUMMARY

DESIGN POINT	BASIN	AREA (ACRES)	FLOW 5 YR (cfs)	FLOW 100 YR (cfs)
Z	OS–1	0.37	1.2	2.7
Y	OS–2	0.17	0.4	1.0
1	PR–1	16.02	9.4	41.5

DRAINAGE SUMMARY

DESIGN POINT	BASIN TRIBUTARY	AREA (ACRES)	FLOW 5 YR (cfs)	FLOW 100 YR (cfs)
Z	OS–1	0.37	1.2	2.7
Y	OS–2	0.17	0.4	1.0
1	OS–1,OS–2,PR–1	16.56	11.0	45.2

LEGEND

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- D — DESIGN POINT
- BASIN BOUNDARY
- EXISTING 1' CONTOUR
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- GUY WIRE
- STREET SIGN
- MAILBOX
- CHAIN–LINK FENCE
- BARBED–WIRE FENCE
- CL EX SWALE
- EX TREE
- SS — EX SANITARY SEWER MANHOLE

NOTES

1. PR BUILDING PAD AND DRIVE ACCESS LOCATIONS ARE SUGGESTIONS
2. NO SIGNIFICANT GRADING CHANGES ARE INCLUDED IN THIS PLAN

N

50' 0 50' 100'

SCALE: 1"=50'

OS–1 0.37

OS–2 0.17

PR–1 16.02

OLD RANCH ROAD (R.O.W. WIDTH VARIES)

OLD RANCH RD.

LOT 3
2.53 ACRES
110,329 SQ. FT.

LOT 4
2.57 ACRES
112,097 SQ. FT.

LOT 2
2.67 ACRES
116,529 SQ. FT.

LOT 5
2.89 ACRES
126,069 SQ. FT.

LOT 1
3.06 ACRES
133,360 SQ. FT.

EX LOT 1 DRIVEWAY

50' X 50' BUILDING PAD

PR WELL TO BE INSTALLED WITHIN 100' OF POINT

EX WELL TO BE ABANDONED

EX WELL TO REMAIN
EX WAT MH
EX YARD HYDRANT

EX WAT LINE FROM WELL TO SOUTH YARD HYDRANT TO BE ADANDONED, ELEC SRV LINE FROM LOT 1 TO WELL TO BE ABANDONED AND REPLACED WITH LOCAL ELEC SRV

EX POND TO BE FILLED IN OR BREACHED

PR LOT LINES

PR 30' ACCESS ESMT

20' ACCESS DRIVE

PR 20' WIDE DRIVE ACCESS WITH 18" RCP STORM CULVERT AT 7.3%

PR 20' WIDE DRIVE ACCESS WITH 18" RCP STORM CULVERT AT 7.5%

PR 20' WIDE DRIVE ACCESS WITH 18" RCP STORM CULVERT AT 5.5%

EX ASPHALT SURFACE

EX HOME & OUT BLDGS

12' DIA SILO

EX GRAVEL DRIVE

20' SANITARY SEWER EASEMENT (EX. 12)

EX 100–YR FLOOD PLAIN BOUNDARY ELEV=6631

20' EASEMENT (REC. No. 94004966)

EX KETTLE CREEK (APPROX CL)

EX 18" CMP

EX 15" CMP

EX 10" CMP

EX CONCRETE HEADWALL

EX 200' GRAZING EASEMENT AREA FROM APPROX CL OF KETTLE CREEK (EX. 9)

EX 100–YR FLOOD PLAIN BOUNDARY ELEV=6631

100–YR FLOOD ZONE AE

EX FENCE REMNANTS

EX SNOW DRIFT FENCE

EX TREE LINE

OF TELEPHONE LINE R/O W (PL 41 BOOK B-2 PAGE 20)

BM CP 100
ELV= 6702.09

OTERO AVE. (100' R.O.W.)

OTERO AVENUE (60' R.O.W.)

LOT 7

LOT 8

LOT F

LOT D

LOT E

LOT 12

LOT 9

REVISIONS

NO.	DESCRIPTION	DATE
1.	REVD PER 6/2/16 CITY COMMENTS	8/22/16

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HUNSINGER SUBDIVISION

PROPOSED DRAINAGE PLAN

DESIGNED BY LD
DRAWN BY DLF
CHECKED BY LD
H–SCALE AS SHOWN
V–SCALE N/A
JOB NO. 1609.00
DATE ISSUED 10/18/18
SHEET NO. 2 OF 2

N:\jobs\1609.00\Drawings\SDP\160900 SDP.dwg, PR-DR, 10/18/2018 11:05:42 AM

Markup Summary

dsdlaforce (1)

Subject: Callout
Page Label: 8
Lock: Locked
Author: dsdlaforce
Date: 4/12/2019 9:03:34 AM
Color:

Additional justification for "negligible" is required. A 20% increase from existing wouldn't be considered negligible.
Therefore, identify the overall creek flow through design point 1. The comparison to the creek flow would be more suitable for justifying negligible impact to downstream properties.