

Please provide a drainage map that shows the contours of the lots and Smith Creek.

December 18, 2017

Raimere Fitzpatrick
El Paso County Planning and Community Development
2880 International Circle, Suite 110
Colorado Springs, CO 80910

RE: Grant Subdivision Drainage Letter

The purpose of this drainage letter is to satisfy requirements of the El Paso County Planning and Community Development division pertaining to the proposed minor subdivision of the Grant Property. This letter was prepared in accordance with Section 8.4.5 Drainage Considerations and Standards for Subdivision Design, Improvements, and Dedications of the 2016 Land Development Code.

Property Description:

The Grant Property (Site) is located at 1315 Walsen Rd, Colorado Springs, El Paso County, Colorado. The Site is located in the southwest one-quarter (SW1/4) of the northeast one-quarter (NE1/4) of Section 22, Township 12 South (T12S), Range 66 West (R66W), El Paso County Assessor's schedule number 6205000029. The existing property is 41 acres. The proposed minor subdivision will divide the property from north to south into one 11-acre parcel on the west and one 30-acre parcel on the east. The proposed access to each parcel will be from Walsen Rd. on a shared driveway in the northwest corner of the site as shown on the Grant Subdivision plat provided separate from this letter. Smith Creek travels through the northern portion of the property and the shared driveway splits after the Smith Creek crossing. The 11-acre parcel contains an existing single-family residence, barn, gravel driveway, water well, and septic system. The 30-acre parcel of land is bare land with no proposed improvements at this time. In order to estimate future impacts to stormwater runoff on the Site, a single-family residence and driveway were assumed for future development.

Existing Drainage Characteristics:

The drainage characteristics for the Site were determined from the 2002 Smith Creek Drainage Basin Planning Study (2002 Drainage Report) by JR Engineering, Inc. (JRE) and the City of Colorado Springs in 2003. The Grant Property is located outside the 100-year flood plain as shown on the map included with this letter. According to the 2002 Drainage Report, the 100-year flood plain is narrow and mostly contained within the stream channel for this section of Smith Creek.

Please call out the width of the existing channel, state what width the easement will need to be to pass this water safely through the site.

The major drainage characteristics include the conveyance of water (via sheet-flow) northwest across the site into the stream channel of Smith Creek which then flows into one (1) existing 36-inch CMP culvert. A small portion of the Site is located north of Smith Creek and drains southwest into Smith Creek.

According to the NRCS Soil Resource Report, the on-site soils are classified as a combination of Tomah-Crowfoot complex and Pring coarse sandy loam, both of which are in hydrologic soil group "B". Both are well-drained soils with medium to low surface runoff. A copy of the NRCS Soil Resource Report will be submitted separate of this Drainage Letter.

The table below shows the runoff coefficients for the existing site which were taken from Table 5-1 of the El Paso County Drainage Criteria Manual (DCM) and Table 6-6 of the City of Colorado Springs DCM.

Please add MS 17-005 (to the bottom of the cover of each submitted document).

Site Composition (SF)		C ₅	C ₁₀	C ₁₀₀
Roof (House-11-acre parcel)	2,639	0.73	0.9	0.95
Roof (Barn-11-acre parcel)	500	0.73	0.9	0.95
Paved Driveway (11-acre parcel)	17,400	0.9	0.9	0.95
Native	1,721,861	0.08	0.2	0.25
Total	1,742,400	.09	0.21	0.26

The following table displays the peak runoff flow rate for the existing site and the corresponding rainfall intensity used to calculate it. The rainfall intensity was found using Figure 5-1 of the El Paso County DCM. The runoff was calculated using the Rational Method and the time of concentration was calculated to be approximately 28.8 minutes.

	5-year	10-year	100-year
Intensity (in/hr)	2.49	3.00	4.50
Q (CFS)	8.90	24.99	46.49

Proposed Drainage Characteristics:

The proposed drainage from this site will generally remain the same as the existing drainage. The 30-acre parcel will likely be developed in the future. These developments may include a single-family residence and driveway in accordance with the local zoning. The table below contains the runoff coefficients from the proposed site improvements which were also taken from Table 5-1 of the El Paso County DCM and Table 6-6 of the City of Colorado Springs DCM.

Site Composition (SF)		C ₅	C ₁₀	C ₁₀₀
Roof (House-11-acre parcel)	2,639	0.73	0.9	0.95
Roof (Barn-11-acre parcel)	500	0.73	0.9	0.95
Roof (Proposed House-30-acre parcel)	3,000	0.73	0.9	0.95
Paved Driveway (11-acre parcel)	17,400	0.9	0.9	0.95
Paved Driveway (Proposed-30-acre parcel)	17,500	0.9	0.9	0.95
Native	1,701,461	0.08	0.2	0.25
Total	1,742,400	0.10	0.22	0.27

The following table displays the peak runoff flow rate for the proposed site and the corresponding rainfall intensity used to calculate it. The rainfall intensity was also found using Figure 5-1 of the El Paso County DCM. The runoff was calculated using the Rational Method and the time of concentration was calculated to be approximately 28.6 minutes. The time of concentration reduced due to the increased runoff coefficient for the proposed site development.

	5-year	10-year	100-year
Intensity (in/hr)	2.51	3.00	4.50
Q (CFS)	9.91	25.98	47.97
Difference (CFS)	1.01	0.99	1.48

These calculations project a slight increase of 1.01, 0.99 and 1.48 cfs in the 5-, 10- and 100-year peak flows, respectively. This is primarily due to the increased impervious area for the proposed development.

Existing Culvert Evaluation:

The existing driveway crossing over Smith Creek has one (1) 36-inch corrugated metal pipe (CMP) culvert. The culvert is 24-feet in length with a slope of 2.24%. The entire Smith Creek drainage basin is 5.48 square miles. The culvert has a drainage area of approximately 4.02 square miles. The culvert is located at Station 156+00 on Reach 5 of Smith Creek as shown in the 2002 Drainage Report. The hydrologic analysis data from the 2002 Drainage Report was used to evaluate the existing culvert. Below is a table summarizing the 2-, 5-, 10-, 50-, and 100-year storm event peak runoff flow rates. The future flows are based on the proposed future development in the Smith Creek Drainage Basin.

Storm Event	Existing Flows, cfs	Future Flows, cfs
2-year	66	65
5-year	268	270
10-year	464	504
50-year	1219	1240
100-yr	1770	2019

The existing culvert was evaluated using Manning's Equation and found to be capable of passing 53 cubic feet per second (cfs) at a velocity of 7.5 feet per second (fps). The calculation was included as an attachment. Based on these calculations and the peak runoff flowrates calculated in the 2002 Drainage Report, the existing culvert is unable to pass a 2-year or greater storm event without flooding the driveway.

The El Paso County DCM culvert criteria for streets permits an allowable culvert headwater depth (AHW) ratio (Hw/D) for design flows with clear opening 50 square feet or less of no greater than 1.5 without County approval. The existing driveway crossing was evaluated for the 5-yr and 10-yr storm events. The culvert size necessary for each storm event was selected using the discharge capacity curves on Figure 9-14 in the DCM for a standard circular corrugated metal pipe with a standard inlet and outlet. Below is a summary of the culvert sizing results. The calculations are included as an attachment.

Storm Event	AHW, ft	Culvert Dia., inches	Hw/D	Design Discharge (per culvert), cfs	L/100So	Resulting Headwater Depth (ft)
5-yr	6.75	54	1.5	140	14	6.0
10-yr	7.50	60	1.5	172	16	6.3

The existing driveway crossing would require two (2) 54-inch CMP culverts at a 1.70% slope to pass a 5-yr storm event (estimated future flow of 270 cfs) and maintain a velocity less than 10 fps. In order to pass a 10-yr storm event (estimated future flow of 504 cfs) and maintain a velocity less than 10 fps, the existing driveway crossing would require three (3) 60-inch CMP culverts at a 1.48% slope. Additional configurations (culvert size, number, slope, outlet energy dissipaters) could be evaluated in the event the culvert was to be replaced.

Habitat Conservation:

Field observations confirmed the downstream invert of the existing culvert is near the natural channel bottom which allows upstream migration of fish and other animal species, including the Preble's Meadow Jumping Mouse. Native vegetation, including willows, shrubs, grasses, and trees are abundant

Please explicitly state that no changes to the existing culvert (unless you plan on changing it) is anticipated and The culvert at the driveway crossing is not designed to pass the 5 year flow and inundation of the driveway is expected during a minor and major storm event.

surrounding this area of Smith Creek which provides a natural habitat for the Preble's Meadow Jumping Mouse and other "listed" species. The proposed access to the 30-acre parcel will be from a shared driveway over Smith Creek. The portion of the shared driveway over Smith Creek is existing. Based on these observations, the minor subdivision will have negligible adverse impact to the "listed" species and their habitat.

Drainage Fees:

The Site is in the Smith Creek Drainage Basin of Monument Creek (Basin Number FOMO4000). The Smith Creek Basin 2017 fees are \$6,633.00 per impervious acre. The proposed minor subdivision has 41 acres of land (an 11-acre and 30-acre parcel). Per the El Paso County Resolution 99-383, a fee reduction of 25% for lots 2.5 acre and larger may be applied. The 11-acre parcel is approximately 4.3% impervious resulting in a fee of \$2,353.00. The impervious acreage for the 11-acre parcel is based on the existing structures and driveway. The 30-acre parcel is approximately 1.6% impervious resulting in a fee of \$2,388.00. The estimated impervious acreage for the 30-acre parcel is based on a 3,000 sf single-family residence and 17,500 sf driveway. The total drainage fees for the Site are \$4,741.00 for 41-acres of land.

Respectfully,
JDS-Hydro Consultants, Inc.



Ryan M. Mangino, P.E.

Enclosures

Floodplain Map (FIRM)
Culvert Calculations

545 East Pikes Peak Avenue, Suite 300
Colorado Springs, Colorado 80903
(719) 227-0072
IDS-HYDRO CONSULTANTS, INC.

GRANT SUBDIVISION MINOR SUBDIVISION FLOODPLAIN MAP

Project No.	278.01
Scale	AS NOTED
Date	08-05-17
Design	EAS
Drawn	EAS
Check	RAM
Reviewed	

F1
1



NATIONAL FLOOD INSURANCE PROGRAM
FIRM
FLOOD INSURANCE RATE MAP
EL PASO COUNTY,
COLORADO AND
INCORPORATED AREAS

PANEL 295 OF 1300
(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS:
COMMUNITY
EL PASO SPRINGS, CITY OF
EL PASO COUNTY,
UNINCORPORATED AREAS

NUMBER	PANEL	SUFFIX
080060	295A	F
080060	295B	F

MAP NUMBER
088410295 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
or amendments which may have been made subsequent to the date on this
file book. For the latest product information about National Flood Insurance
Program, flood maps contact the Flood Plain Map Store at www.msc.fema.gov



3/05/02 Project Fm 278.01 Grant Property/08/05/17/01 Grant Property/08/05/17/01
3/17/02/05/17/01 Grant Property/08/05/17/01 Grant Property/08/05/17/01

Culvert Evaluation: Existing 36-inch CMP (Flowing Full)

Manning's Formula

$$Q = (1.486/n)AR_h^{2/3}S^{1/2}$$

$$V = (1.486/n)R_h^{2/3}S^{1/2}$$

$$Q = V \cdot A$$

$$R = A/P$$

A=cross sectional area

P=wetter perimeter

S=slope of channel

n=Manning's roughness coefficient

Diameter= 36 inches
 n (CMP)= 0.025 Mannings coeff
 Length= 24 feet
 Invert (Upstream)= 15.58 feet
 Invert (Downstream)= 16.14 feet
 Slope= 0.023 in/in
 L/100S= 10

			Solution to Manning's Equation	
Area, ft ²	Wetted Perimeter, ft	Hydraulic Radius, ft	Velocity, ft/s	Flow, cfs
7.07	9.42	0.75	7.49	53.0

Culvert Evaluation: 5-yr Storm Event, Two 54-inch CMPs (Flowing Full)

Manning's Formula

$$Q = (1.486/n)AR_h^{2/3}S^{1/2}$$

$$V = (1.486/n)R_h^{2/3}S^{1/2}$$

$$Q = V * A$$

$$R = A/P$$

A=cross sectional area

P=wetter perimeter

S=slope of channel

n=Manning's roughness coefficient

Diameter= 54 inches
 n (CMP)= 0.024 Mannings coeff
 Length= 24 feet
 Slope= 0.017 in/in
 L/100S= 14

Solution to Manning's Equation				
Area, ft ²	Wetted Perimeter, ft	Hydraulic Radius, ft	Velocity, ft/s	Flow, cfs
15.90	14.14	1.13	8.73	138.9

277.8 2 - 54" CMPs

Culvert Evaluation: 10-yr Storm Event, Three 60-inch CMPs (Flowing Full)

Manning's Formula

$$Q = (1.486/n)AR_h^{2/3}S^{1/2}$$

$$V = (1.486/n)R_h^{2/3}S^{1/2}$$

$$Q = V \cdot A$$

$$R = A/P$$

A=cross sectional area

P=wetter perimeter

S=slope of channel

n=Manning's roughness coefficient

Diameter= 60 inches
 n (CMP)= 0.024 Mannings coeff
 Length= 24 feet
 Slope= 0.0148 in/in
 L/100S= 16

Solution to Manning's Equation					
Area, ft ²	Wetted Perimeter, ft	Hydraulic Radius, ft	Velocity, ft/s	Flow, cfs	
19.63	15.71	1.25	8.74	171.6	

514.9 3 - 60" CMPs

Drainage Reports

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.

R. M. Mangino
Ryan M. Mangino, PE #43304

12/18/17
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.

Clive S. Grant
Clive Grant, Owner
1315 Walsen Road, Colorado Springs, CO 80921

12/18/2017
Date

El Paso County:

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

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

Date

Conditions: