

December 12, 2019

Kari Parsons
Planning and Community Development
2880 International Circle, Suite 110
Colorado Springs, CO 80910

**Re: Preliminary Drainage Conformance Letter for King Soopers #147 on Lot 2 & 3
– Falcon Marketplace Subdivision Filing No. 1**

This drainage conformance letter has been prepared for Lots 2 & 3 of Falcon Marketplace Subdivision Filing No. 1 located in the southeast quarter of the southeast quarter of Section 1, Township 13 South, Range 65 West of the 6th Principal Meridian, County of El Paso, State of Colorado. The purpose of this letter is to show that the proposed drainage for Lots 2 & 3 conform to the current El Paso County *Drainage Criteria Manual* and the *Final Drainage Report for Falcon Marketplace* prepared by Drexel, Barrell & Co. dated July 22, 2019. A composite runoff coefficient calculation was performed for the subject site and these calculations are attached herein.

The King Soopers grocery store is to be located on Lot 2 of the subdivision, a 9.977-acre lot, and the King Soopers fuel facility is to be located on Lot 3 of the subdivision, a 1.309-acre lot. The project site is located within basins B4, B6, B11, B14, and B15 of the *Final Drainage Report*. Runoff from these lots was designed to be captured on-site and routed to storm sewer stubs provided along the adjacent public street. Detention and water quality will be provided by a pond located on the south side of the development, adjacent to E Woodmen Road.

The proposed site generally slopes from the north to the south and the grading is consistent with the intended grading and drainage pattern proposed in the original *Final Drainage Report* design. The proposed 5-yr and 100-yr runoff coefficients for the site were compared to the those designed in the *Final Drainage Report* to determine that the storm sewer system and detention pond provided by the master infrastructure has adequate capacity. Hydrologic calculations are included herein. All proposed inlets will be sized using UDFCD Street and Inlet Hydraulic spreadsheets. StormCAD will be used to model the proposed storm sewer on-site and calculations will be included with the Final Drainage Conformance Letter.

The proposed drainage plan for Lots 2 & 3 consists of 18 drainage basins (totaling 14.81 acres). Runoff from basins A-1 through A-9 will be collected into multiple curb inlets on-site which will connect to the master infrastructure storm sewer system and be routed to the south pond provided by the master developer. Basins B-1 through B-4 consist of roof areas that will be connected via roof drains to the on-site storm sewer system. Basins OS-1 through OS-5 consist of paved access aprons that sheet flow off-site and route to inlets within the adjacent public street provided by the master developer. The 100-year spillway will remain in the inundation easement, per plat and no structures will be built within this easement. The combined runoff coefficients for basins A-1 through A-9, B-1



through B-4, and OS-1 through OS-5 are estimated to be 0.75 and 0.84 for the 5- and 100- year storms, respectively (see calculations included herein). These runoff coefficients are equal to the planned values designed in the *Final Drainage Report* and thus the runoff will not exceed the anticipated amount. The overall imperviousness of the site after final stabilization has been calculated to be 85%. These findings indicated that this project will have no negative impacts on the existing drainage infrastructure.

Stormwater runoff from the fuel facility on Lot 2 will be collected at the inlet located at design point 8 and routed to Water Quality Pond #2 as determined by the *Final Drainage Report*. Water quality will be provided by Pond #2 and discharged into the open grass-lined channel along the north side of Woodmen Road.

The Four Step Process:

Step 1: Employ Runoff Reduction Practices

This step uses low impact development (LID) practices to reduce runoff at the source. Every attempt was made to reduce impervious areas while also complying with the parking requirements set forth by El Paso County. The site is comprised of NRCS Type A soils, so all landscaped areas promote infiltration. Grass buffers have been utilized where possible.

Step 2: Implement BMPs that Provide a Water Quality Capture Volume with Slow Release

The proposed storm sewer inlets are scattered around the perimeter of the site, ensuring that the stormwater quality and flood detention is not concentrated in one area.

Step 3: Stabilize Drainageways

Pond S4 The upstream SR4 pond, as constructed by the master developer, reduces downstream runoff, therefore stabilizing the downstream systems.

Step 4: Implement Site Specific and Other Source Control BMPs

The site is compliant with the approved Final Drainage Report for Falcon Marketplace, prepared by Drexel, Barrell & Co. The runoff from this site will be collected via the proposed storm sewer and will tie into the existing storm sewer, which is routed to an existing water quality pond located south of the site.

Drainage Fees:

The El Paso County Drainage Basin Fee is \$303,921.72 based on the 2019 fee schedule of \$29,622/impervious acre. This fee is expected to be paid for by the seller of the property due at the time of Final Plat recording.

The El Paso County Bridge Fee is \$41,747.94 based on the 2019 fee schedule of \$4,069/impervious acre. This fee is expected to be paid for by the seller of the property due at the time of Final Plat recording.



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.

Jennifer R. Romano, PE
Licensed Professional Engineer, State of Colorado No. 44401

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.

Charles Boehm
King Soopers
800 Ridgelake Boulevard
Memphis, TN 38101-1878

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:



Attachments:

Vicinity Map

Soil Map

FEMA Flood Insurance Rate Map

Annotated FIRM from CLOMR

Master Development Detention Basin Storage Table (by others)

Master Development Drainage Plans (by others)

Master Development Rational Calculations (by others)

Web Soil Survey

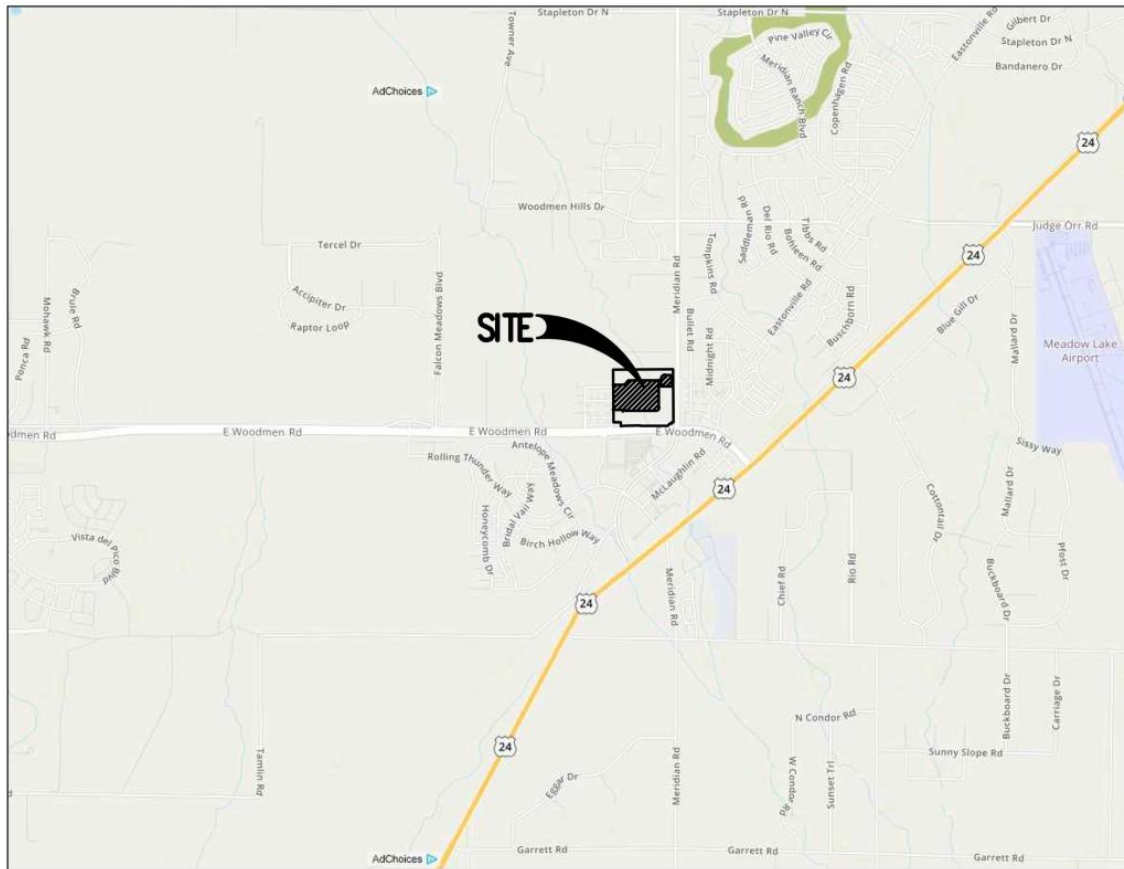
Developed Hydrologic Calculations

Final Drainage Plan



VICINITY MAP

LOTS 2 & 3, BLOCK 1, FALCON MARKETPLACE
EL PASO COUNTY, CO



NOT TO SCALE

NOTES TO USERS

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. The community map repository should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations (BFEs)** and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

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 National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 13. The **horizontal datum** was NAD83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRM for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the **North American Vertical Datum of 1988 (NAVD88)**. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at <http://www.ngs.noaa.gov/> or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, NIMS512
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, MD 20910-3282

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242 or visit its website at <http://www.ngs.noaa.gov/>.

Base Map information shown on this FIRM was provided in digital format by El Paso County, Colorado Springs Utilities, City of Fountain, Bureau of Land Management, National Oceanic and Atmospheric Administration, United States Geological Survey, and Anderson Consulting Engineers, Inc. These data are current as of 2006.

This map reflects more detailed and up-to-date **stream channel configurations and floodplain delineations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map. The profile baselines depicted on this map represent the hydraulic modeling baselines that match the flood profiles and Floodway Data Tables if applicable, in the FIS report. As a result, the profile baselines may deviate significantly from the new base map channel representation and may appear outside of the floodplain.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels, community map repository addresses, and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

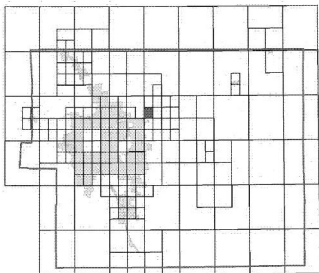
Contact **FEMA Map Service Center (MSC)** via the FEMA Map Information eXchange (FMIX) 1-877-336-2627 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. The MSC may also be reached by Fax at 1-800-358-9620 and its website at <http://www.msc.fema.gov/>.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA website at <http://www.fema.gov/business/nfp/>.

El Paso County Vertical Datum Offset Table

Flooding Source	Vertical Datum Offset (ft)
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION	

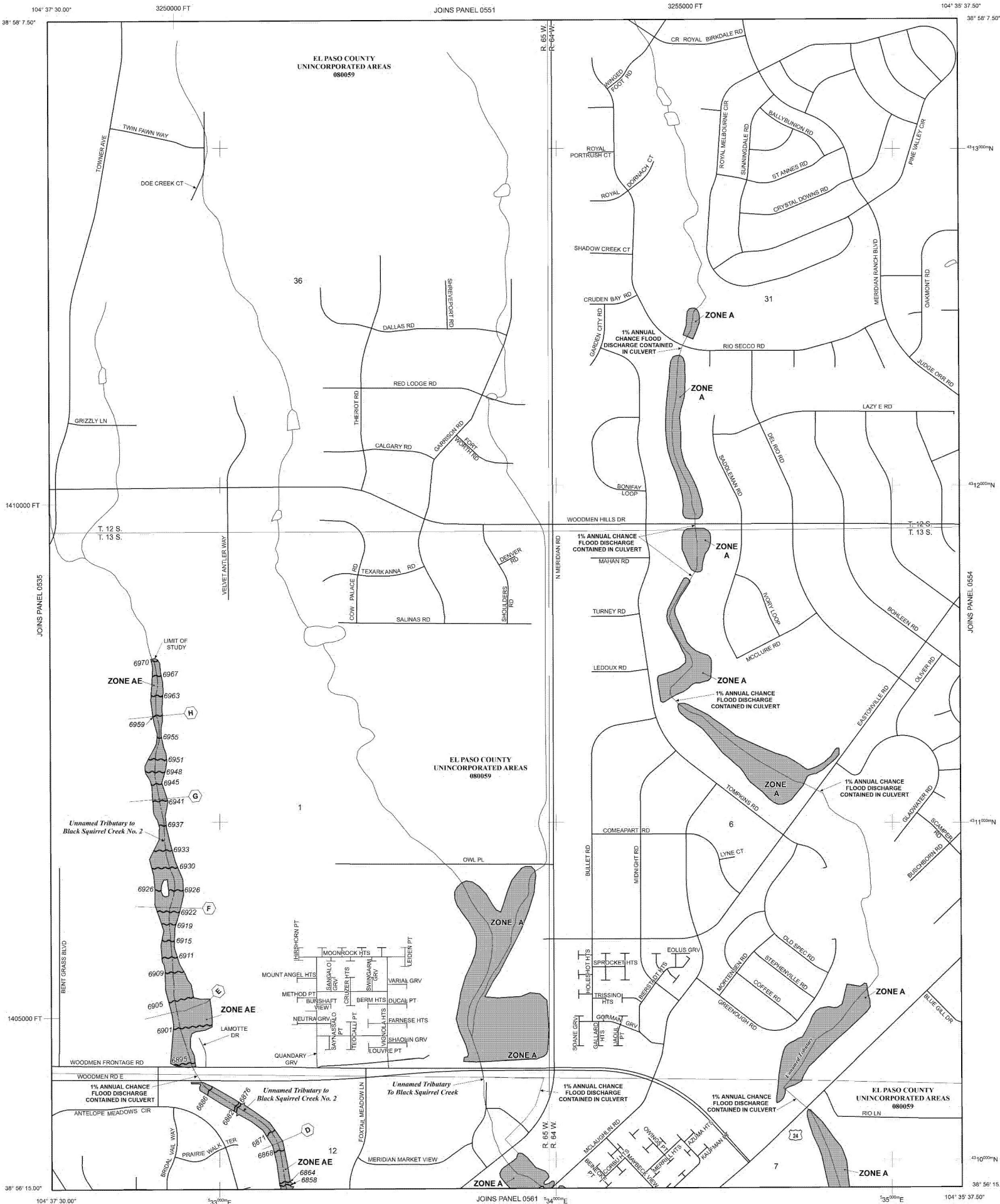
Panel Location Map



This Digital Flood Insurance Rate Map (DFIRM) was produced through a Cooperating Technical Partner (CTP) agreement between the State of Colorado Water Conservation Board (CWC) and the Federal Emergency Management Agency (FEMA).



Additional Flood Hazard information and resources are available from local communities and the Colorado Water Conservation Board.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance 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 AR** Special Flood Hazard Area Formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
- ZONE A99** Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
- ZONE V** Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
- ZONE VE** Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- Floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities
- Base Flood Elevation line and value; elevation in feet*
- Base Flood Elevation value where uniform within zone; elevation in feet*

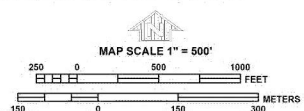
* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

- Cross section line
- Transect line
- Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
- 1000-meter Universal Transverse Mercator grid ticks, zone 13
- 5000-foot grid ticks: Colorado State Plane coordinate system, central zone (FIPSZONE 0502), Lambert Conformal Conic Projection
- Bench mark (see explanation in Notes to Users section of this FIRM panel)
- River Mile

- MAP REPOSITORIES**
Refer to Map Repositories list on Map Index
- EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP**
MARCH 17, 1997
- EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL**
DECEMBER 7, 2018 - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

For community map revision history prior to countywide mapping, refer to the Community Map History Table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.



NFP
PANEL 0553G

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

PANEL 553 OF 1300
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:
COMMUNITY EL PASO COUNTY
NUMBER 08059
PANEL 0553
SUFFIX G

Notice to User: The Map Number shown below should be used when placing map orders. The Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER
08041C0553G

MAP REVISED
DECEMBER 7, 2018
Federal Emergency Management Agency

EL PASO COUNTY
UNINCORPORATED AREAS
080059



MAP SCALE 1" = 500'

250 0 500 1000
FEET

150 0 150 300
METERS

PANEL 0553G

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY,
COLORADO
AND INCORPORATED AREAS

PANEL 553 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
EL PASO COUNTY	080059	0553	G

PRELIMINARY

JULY 29, 2015



1% ANNUAL CHANCE
FLOODPLAIN

GUTTER LINE

Notice to User: The Map Number shown below should be used when placing map orders: the Community Number shown above should be used on insurance applications for the subject community.



MAP NUMBER
08041C0553G

MAP REVISED

Federal Emergency Management Agency

AREA SHOWN LOCATED IN S1, T3S, R65W
VERTICAL DATUM: NAVD 88
COORDINATE SYSTEM: NAD83, COLORADO STATE PLANE,
CENTRAL ZONE

ZONE A

ZONE A

ZONE A

Unnamed Tributary
To Black Squirrel Creek

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11:20:58 AM 10/18/2016 11:57:00 AM. DWG TO PDF: 143
FIRM.dwg
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1

12

ZONE A

MERIDIAN MARKET VIEW

R. 65 W.
R. 64 W.

MCLAUGHLIN RD

BULLETT RD

SCANE GRV
GALLARD HTS
GOFF HTS
TRISH HTS
SPRING HTS
HOLESHT HTS

OWL PL

LEIDEN PT

XXXXXXXXXX

XXXXXXXXXX C C XXXXXXXX
XXXX C XXXXXXXX C XXXXXXXX

HIRSHORN PT

MOONROCK HTS

ANGEL HTS

METHOD PT

BUNSHAFT VIEW

NEUTRA GRV

SAYNASSALO PT

TEOCALLI PT

LOUVRE PT

VIGNOLA HTS

SHAOLIN GRV

FARNESE HTS

DUCA PT

BERM HTS

SWINGARM GRV

CRUZER HTS

SANGALO GRV

METHOD PT

ANGEL HTS

HIRSHORN PT

MOONROCK HTS

LEIDEN PT

OWL PL

BULLETT RD

SCANE GRV

GALLARD HTS

GOFF HTS

TRISH HTS

SPRING HTS

HOLESHT HTS

BULLETT RD

OWL PL

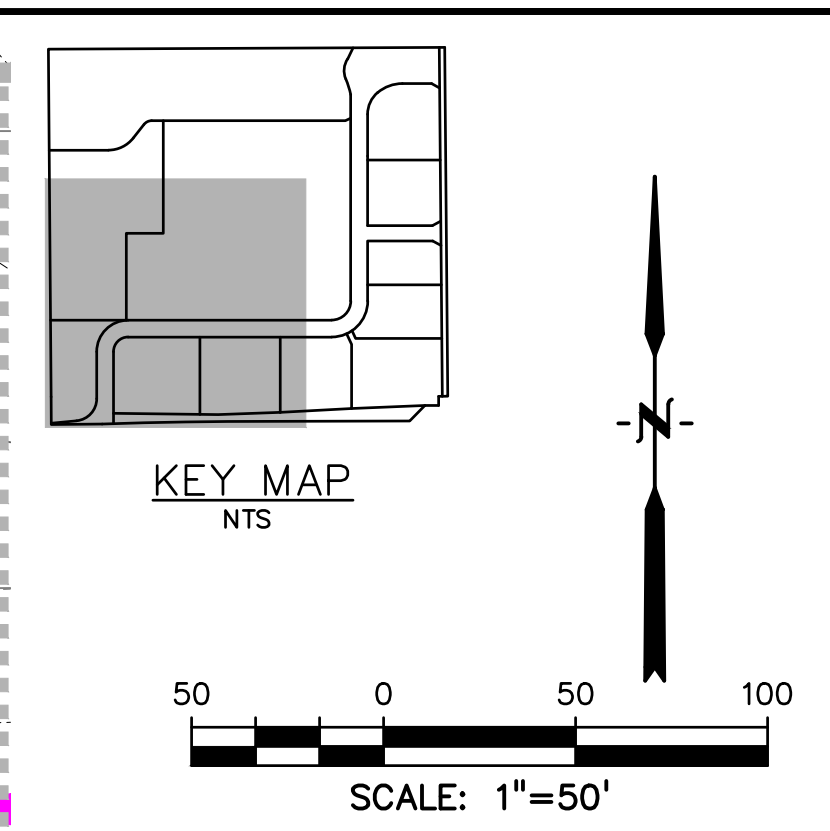
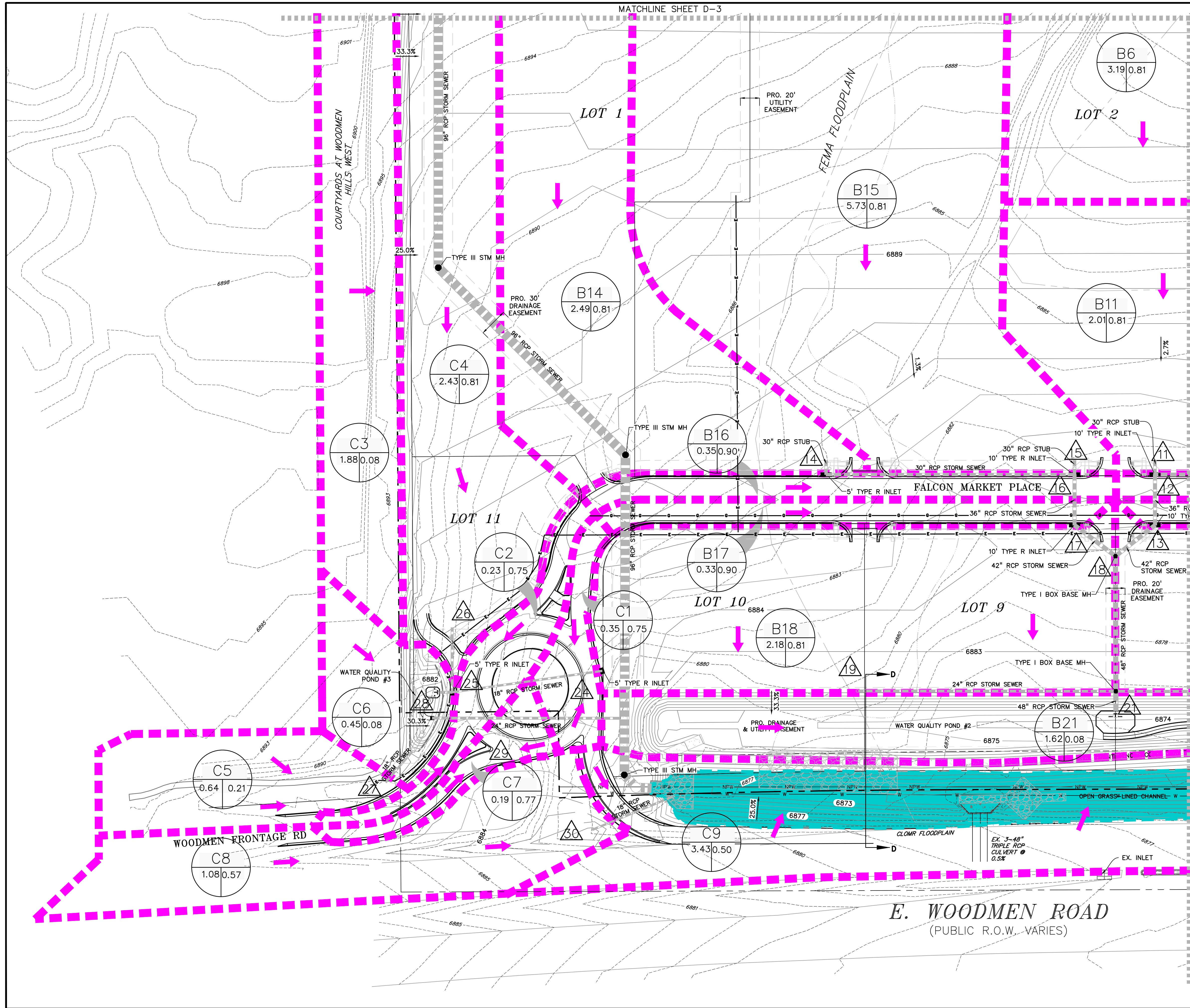
MOONROCK HTS

LEIDEN PT

HIRSHORN PT

XXXX C M XXXXXXXX C C M

XXXXXXXXXX M



RUNOFF SUMMARY

BASIN	DP	Area (Ac.)	Q ₅ (CFS)	Q ₁₀₀ (CFS)
A1	DP1	1.81	3.4	7.7
	DP2	1.81	3.4	7.7
A2		4.82	1.4	10.2
B4	DP3	6.63	4.6	17.3
	DP4	2.35	7.5	14.6
B5		0.63	2.8	5.1
	DP5	2.99	10.0	19.3
B6	DP6	3.19	12.8	23.6
B7		0.46	2.0	3.7
	DP7	6.63	23.8	28.0
B8	DP8	1.04	3.5	6.9
B9		0.30	1.4	2.5
	DP9	1.35	4.9	9.3
B10		0.18	0.8	1.4
	DP10	8.16	29.2	38.1
B11	DP11	2.01	7.8	14.6
B12		0.18	0.8	1.5
	DP12	10.35	36.4	51.9
B13		0.20	0.9	1.6
	DP13	10.55	37.1	53.2
B14	DP14	2.49	9.1	17.0
B15	DP15	5.73	20.3	38.0
B16		0.35	1.6	2.9
	DP16	8.56	30.6	57.1
B17		0.33	1.5	2.7

BASIN	DP	Area (Ac.)	Q ₅ (CFS)	Q ₁₀₀ (CFS)
B18	DP17	8.89	31.9	59.3
	DP18	19.44	52.1	88.2
B19	DP19	2.18	7.8	15.0
	DP20	2.57	10.1	18.8
	DP21	24.19	67.6	117.5
B20	DP22	2.03	5.6	11.4
B21		1.62	0.5	4.0
	DP23	27.85	67.4	121.8
C1	DP24	0.35	1.3	2.6
C2		0.23	0.8	1.5
	DP25	0.59	2.0	3.8
C3		1.88	0.6	4.2
C4		2.19	6.9	13.8
	DP26	4.08	5.4	13.7
C5	DP27	0.64	0.5	1.9
C6		0.45	0.2	1.2
	DP28	5.31	7.4	18.3
C7	DP29	0.19	0.7	1.3
C8		1.14	2.5	5.5
	DP30	1.33	3.1	6.6
C9		3.43	7.3	16.2
D1		2.62	4.1	8.8
D2		0.07	0.3	0.6
D3		0.07	0.3	0.6
DP01		32.50	10.3	30.2

PREPARED BY:

DREXEL, BARRELL & CO.
Engineers • Surveyors
3 SOUTH 7TH STREET
COLORADO SPGS, COLORADO 80905
CONTACT: TIM D. McCONNELL, P.E.
(719)260-0887
BOULDER • COLORADO SPRINGS

CLIENT:

HUMMEL INVESTMENTS, LLC
8117 PRESTON ROAD, SUITE 120
DALLAS, TEXAS 75225
(214) 416-9820

DRAINAGE PLAN FOR

FALCON MARKETPLACE
FALCON, COLORADO

ISSUE	DATE
INITIAL ISSUE	6-28-19
REVISED	7-19-19
DESIGNED BY:	TDM
DRAWN BY:	KGV
CHECKED BY:	TDM
FILE NAME:	

PREPARED UNDER MY DIRECT SUPERVISION FOR AND ON BEHALF OF DREXEL, BARRELL & CO.

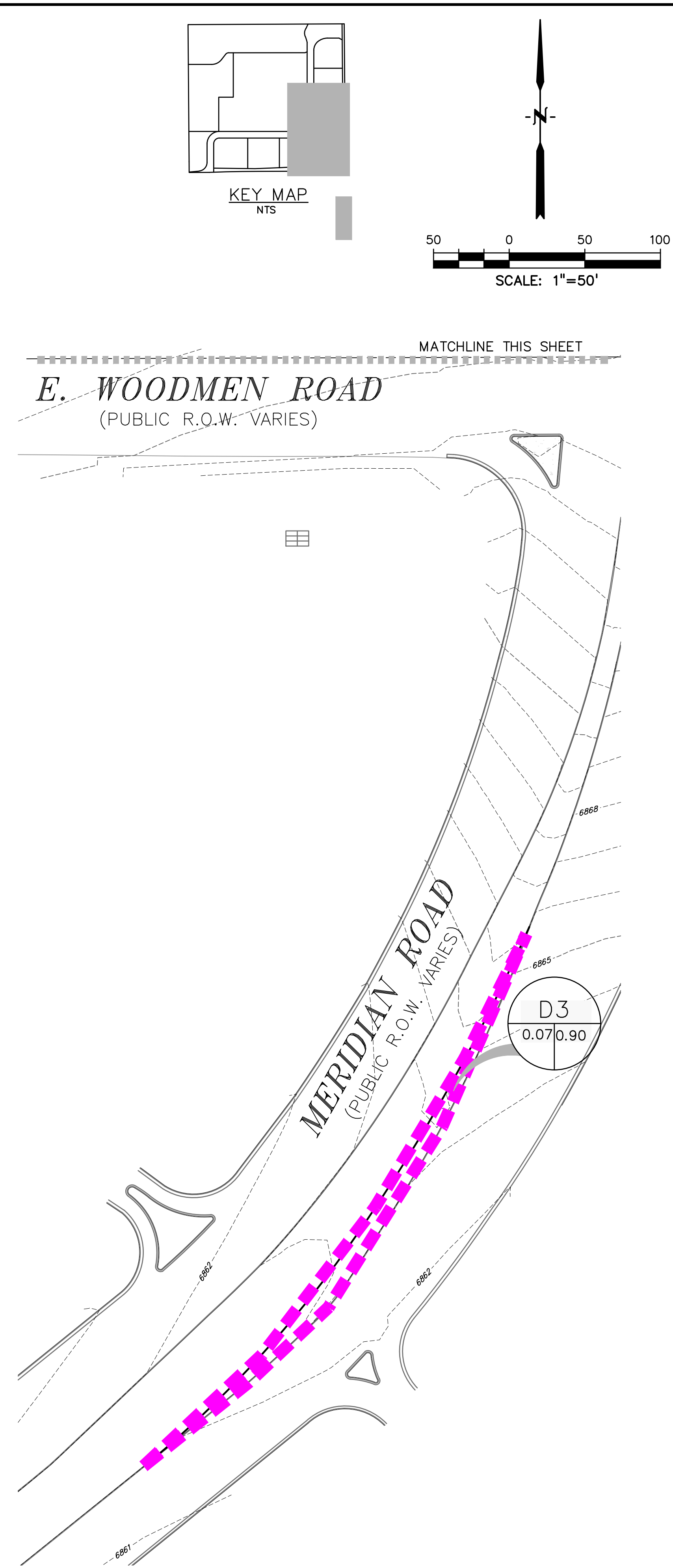
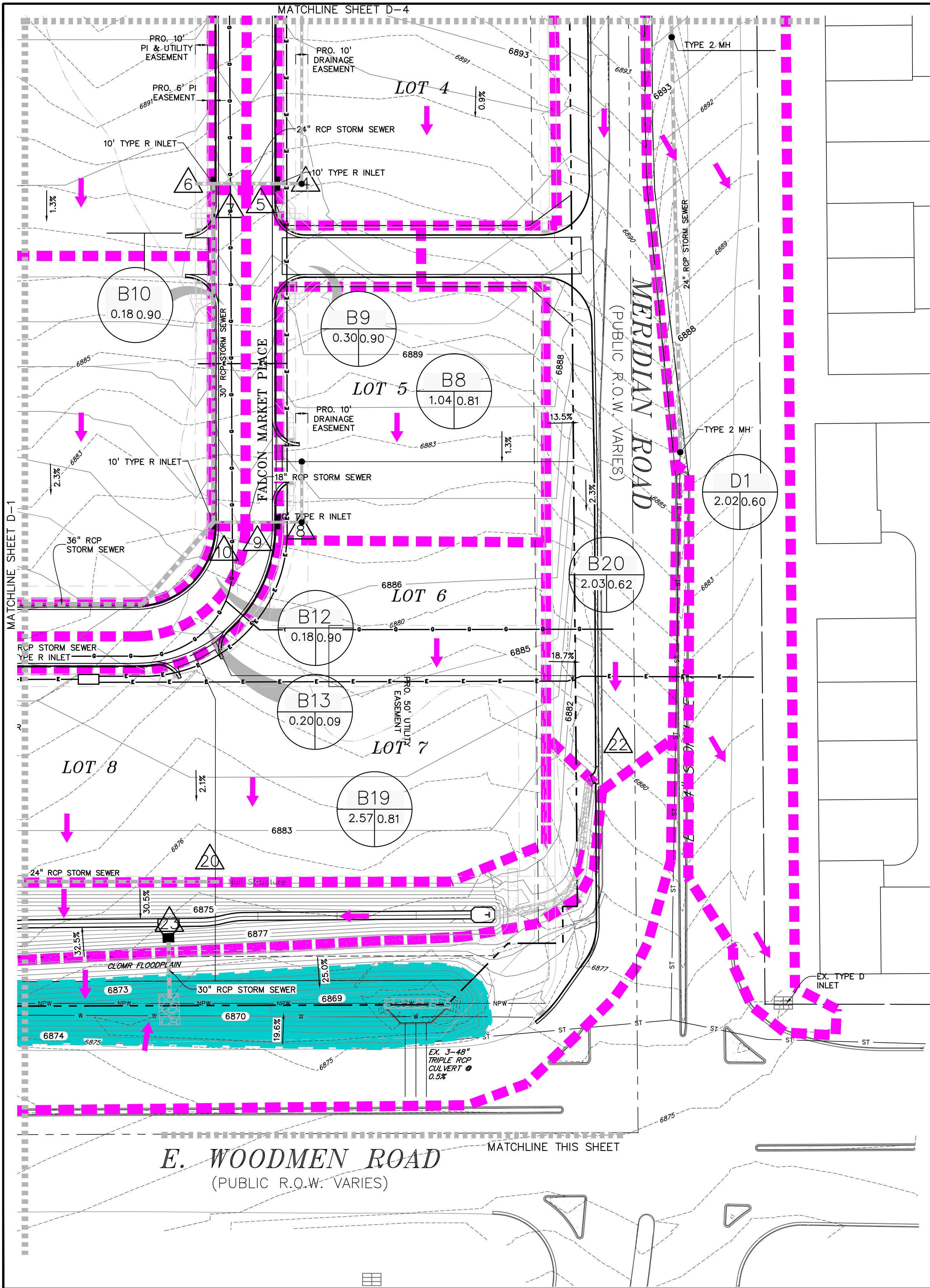
DRAWING SCALE:
HORIZONTAL: 1"=50'
VERTICAL: N/A

PROPOSED DRAINAGE CONDITIONS

PROJECT NO. 20988-00CSCV
DRAWING NO.

D-1

SHEET: 1 OF 5



RUNOFF SUMMARY

BASIN	DP	Area (Ac.)	Q ₂ (CFS)	Q ₁₀₀ (CFS)
A1	DP1	1.81	3.4	7.7
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B4	DP4	6.63	4.6	17.3
B5	DP5	2.35	7.5	14.6
B6	DP6	0.63	2.8	5.1
	DP7	2.99	10.0	19.3
B7	DP8	3.19	12.8	23.6
B8	DP9	0.46	2.0	3.7
	DP10	6.63	23.8	28.0
B9	DP11	1.04	3.5	6.9
B10	DP12	0.30	1.4	2.5
	DP13	1.35	4.9	9.3
B11	DP14	0.18	0.8	1.4
B12	DP15	8.16	29.2	38.1
B13	DP16	2.01	7.8	14.6
	DP17	0.18	0.8	1.5
B14	DP18	10.35	36.4	51.9
B15	DP19	0.20	0.9	1.6
B16	DP20	10.55	37.1	53.2
B17	DP21	2.49	9.1	17.0
	DP22	5.73	20.3	38.0
B18	DP23	0.35	1.6	2.9
	DP24	8.56	30.6	57.1
B19	DP25	0.33	1.5	2.7

BASIN	DP	Area (Ac.)	Q ₂ (CFS)	Q ₁₀₀ (CFS)
B20	DP26	8.89	31.9	59.3
B21	DP27	19.44	52.1	88.2
B22	DP28	2.18	7.8	15.0
	DP29	2.57	10.1	18.8
B23	DP30	24.19	67.6	117.5
C1	DP31	2.03	5.6	11.4
C2	DP32	1.62	0.5	4.0
C3	DP33	27.85	67.4	121.8
C4	DP34	0.35	1.3	2.6
C5	DP35	0.23	0.8	1.5
C6	DP36	0.59	2.0	3.8
C7	DP37	1.88	0.6	4.2
C8	DP38	2.19	6.9	13.8
C9	DP39	4.08	5.4	13.7
D1	DP40	0.64	0.5	1.9
D2	DP41	0.45	0.2	1.2
D3	DP42	5.31	7.4	18.3
D4	DP43	0.19	0.7	1.3
D5	DP44	1.14	2.5	5.5
D6	DP45	1.33	3.1	6.6
D7	DP46	3.43	7.3	16.2
D8	DP47	2.62	4.1	8.8
D9	DP48	0.07	0.3	0.6
D10	DP49	0.07	0.3	0.6
D11	DP50	32.50	10.3	30.2

PREPARED BY:

DREXEL, BARRELL & CO.
Engineers • Surveyors
3 SOUTH 7TH STREET
COLORADO SPGS, COLORADO 80905
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(214) 416-9820

DRAINAGE PLAN FOR
**FALCON
MARKETPLACE**
FALCON, COLORADO

ISSUE	DATE
INITIAL ISSUE	6-28-19
REVISED	7-19-19
DESIGNED BY:	TDM
DRAWN BY:	KGV
CHECKED BY:	TDM
FILE NAME:	

PREPARED UNDER MY DIRECT
SUPERVISION FOR AND ON BEHALF
OF DREXEL, BARRELL & CO.

DRAWING SCALE:
HORIZONTAL: 1"=50'
VERTICAL: N/A

PROPOSED
DRAINAGE
CONDITIONS

PROJECT NO. 20988-00CSCV
DRAWING NO.

D-2

SHEET: 2 OF 5

PROJECT INFORMATION

PROJECT: Falcon Marketplace
 PROJECT NO: 20988-00CSCV
 DESIGN BY: KGV
 REV. BY: TDM
 AGENT: El Paso County
 REPORT TYPE: Final
 DATE: 4/17/2019

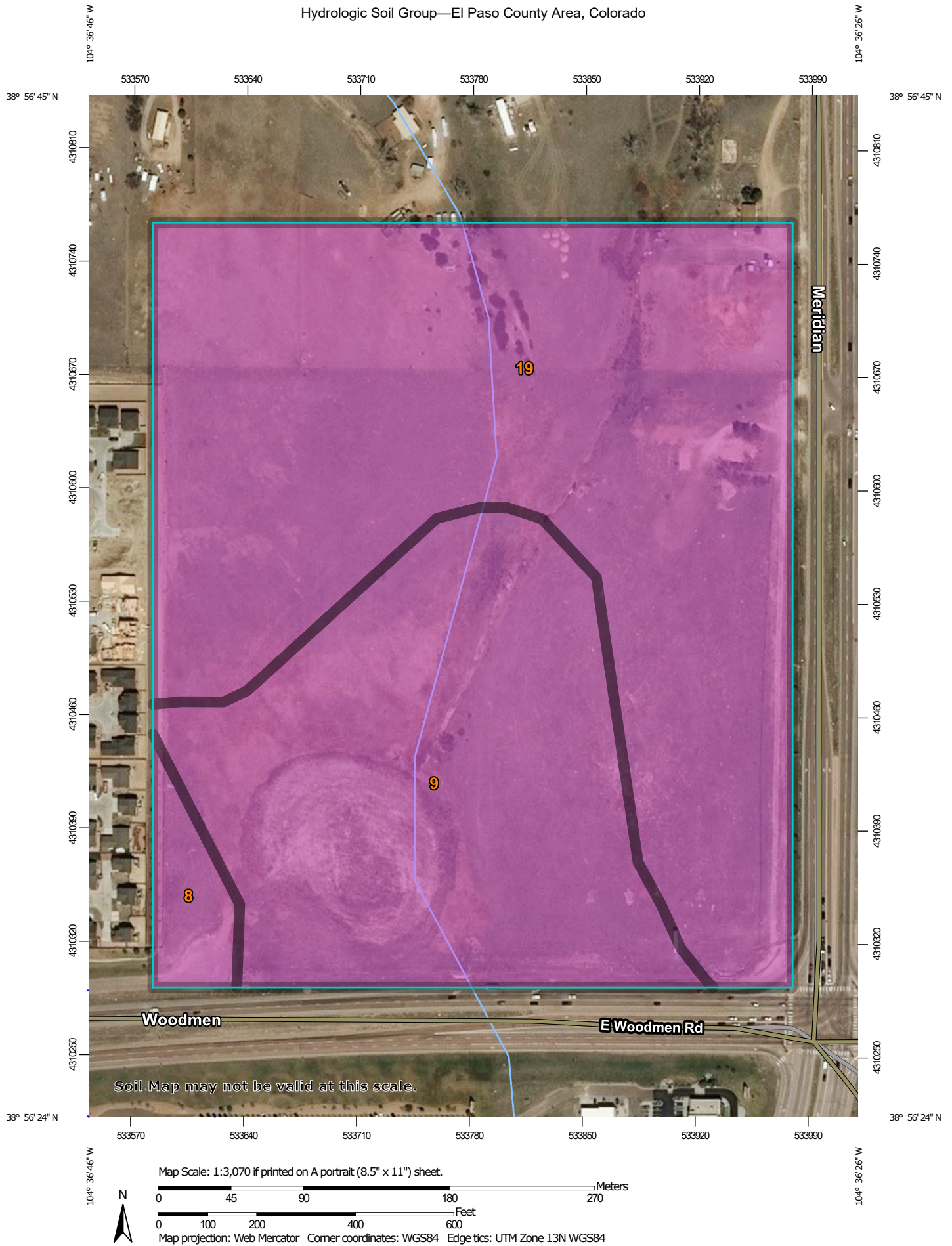


RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

DEVELOPED		RUNOFF		5 YR		STORM		P1=		2.52		
BASIN (S)		DIRECT RUNOFF						TOTAL RUNOFF				
		DESIGN POINT	AREA (AC)	RUNOFF COEFF	t _c (MIN)	C * A	I (IN/HR)	Q (CFS)	t _c (MIN)	S (C * A)	I (IN/HR)	Q (CFS)
		(2)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
A1		DP1	1.81	0.65	11.2	1.18	6.51	7.7				
A2			4.82	0.35	13.3	1.69	6.04	10.2				
		DP3	6.63	0.43	13.3	2.87	6.04	17.3				
B4		DP4	2.35	0.78	6.3	1.83	7.99	14.6				
B5			0.63	0.93	5.0	0.59	8.55	5.1				
		DP5	2.99	0.81	6.4	2.42	7.96	19.3				
B6		DP6	3.19	0.87	5.0	2.76	8.55	23.6				
B7			0.46	0.94	5.0	0.43	8.55	3.7				
		DP7	6.63	0.53	6.5	3.53	7.92	28.0				
B8		DP8	1.04	0.79	5.4	0.82	8.37	6.9				
B9			0.30	0.96	5.0	0.29	8.55	2.5				
		DP9	1.35	0.83	5.5	1.11	8.33	9.3				
B10			0.18	0.96	5.0	0.17	8.55	1.4				
		DP10	8.16	0.59	6.5	4.81	7.92	38.1				
B11		DP11	2.01	0.85	5.0	1.71	8.55	14.6				
B12			0.18	0.96	5.0	0.17	8.55	1.5				


	DP12	10.35	0.65	7.0	6.69	7.76	51.9				
B13		0.20	0.96	5.0	0.19	8.55	1.6				
	DP13	10.55	0.65	7.1	6.88	7.72	53.2				
B14	DP14	2.49	0.84	6.0	2.10	8.11	17.0				
B15	DP15	5.73	0.84	6.6	4.81	7.89	38.0				
B16		0.35	0.96	5.0	0.34	8.55	2.9				
	DP16	8.56	0.85	6.6	7.25	7.88	57.1				
B17		0.33	0.96	5.0	0.32	8.55	2.7				
	DP17	8.89	0.85	6.7	7.56	7.84	59.3				
	DP18	19.44	0.58	6.8	11.30	7.80	88.2				
B18	DP19	2.18	0.80	5.0	1.75	8.55	15.0				
B19	DP20	2.57	0.85	5.0	2.20	8.55	18.8				
	DP21	24.19	0.63	7.1	15.25	7.70	117.5				
B20	DP22	2.03	0.75	7.8	1.53	7.47	11.4				
B21		1.62	0.35	9.3	0.57	7.02	4.0				
POND 2	DP23	27.85	0.62	9.3	17.34	7.02	121.8				
C1	DP24	0.35	0.85	5.1	0.30	8.51	2.6				
C2		0.23	0.85	7.2	0.20	7.66	1.5				
	DP25	0.59	0.85	7.2	0.50	7.66	3.8				
C3		1.88	0.35	12.0	0.66	6.32	4.2				
C4		2.19	0.75	5.2	1.64	8.44	13.8				
	DP26	4.08	0.56	13.6	2.29	5.99	13.7				
C5	DP27	0.64	0.45	10.9	0.29	6.59	1.9				
C6		0.45	0.35	8.1	0.16	7.37	1.2				
POND 3	DP28	5.31	0.58	13.9	3.08	5.93	18.3				
C7	DP29	0.19	0.86	6.8	0.16	7.82	1.3				
C8		1.14	0.69	9.6	0.79	6.94	5.5				
	DP30	1.33	0.72	9.6	0.95	6.94	6.6				
C9		3.43	0.66	8.9	2.28	7.12	16.2				
D1		2.62	0.70	20.9	1.82	4.84	8.8				
D2		0.07	0.96	5.0	0.07	8.55	0.6				
D3		0.07	0.96	5.0	0.07	8.55	0.6				

Hydrologic Soil Group—El Paso County Area, Colorado




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

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 16, Sep 10, 2018

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

Date(s) aerial images were photographed: Sep 8, 2018—May 26, 2019

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

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
8	Blakeland loamy sand, 1 to 9 percent slopes	A	1.4	3.0%
9	Blakeland-Fluvaquentic Haplaquolls	A	16.6	35.7%
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	A	28.5	61.4%
Totals for Area of Interest			46.4	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

PROJECT: King Soopers Falcon Marketplace
LOCATION: E. Woodsmen Road & Meridian Road
Colorado Springs, El Paso County

Project No.: KSS147
Date: August 26, 2019
Engineer: Natalie Haber

*PERCENT IMPERVIOUS VALUES	
LANDSCAPE	0
PAVING	100
ROOFING	90
COMMERCIAL	95

* RUNOFF COEFFICIENTS USED (Type A Soils)				
	2-Year	5-Year	10-year	100-Year
LANDSCAPE	0.02	0.08	0.15	0.35
PAVING	0.89	0.90	0.92	0.96
ROOFING	0.71	0.73	0.75	0.81
COMMERCIAL	0.79	0.81	0.83	0.88

* Table 6-6 in CO Springs, Drainage Criteria
Manual Revised May 2014

Composite Runoff Coefficients and Percent Imperviousness for Developed Drainage Basins

BASIN DESIG.	OVERALL AREA (sf)	LANDSCAPE AREA (sf)	PAVED AREA (sf)	ROOF AREA (sf)	COMMERCIAL AREA (sf)	2-YEAR COEFF.	5-YEAR COEFF.	10-YEAR COEFF.	100-YEAR COEFF.	PERCENT IMPERVIOUS
A-1	6,275	0	6,275	0	0	0.89	0.90	0.92	0.96	100%
A-2	18,589	8,629	9,960	0	0	0.49	0.52	0.56	0.68	54%
A-3	14,303	6,725	7,578	0	0	0.48	0.51	0.56	0.67	53%
A-4	22,967	7,038	15,929	0	0	0.62	0.65	0.68	0.77	69%
A-5	49,735	17,988	31,747	0	0	0.58	0.60	0.64	0.74	64%
A-6	18,257	5,209	13,048	0	0	0.64	0.67	0.70	0.79	71%
A-7	71,902	8,126	63,776	0	0	0.79	0.81	0.83	0.89	89%
A-8	233,171	21,075	116,465	0	95,631	0.77	0.79	0.81	0.87	89%
A-9	74,415	3,580	70,835	0	0	0.85	0.86	0.88	0.93	95%
B-1	56,790	0	0	56,790	0	0.71	0.73	0.75	0.81	90%
B-2	64,063	0	0	64,063	0	0.71	0.73	0.75	0.81	90%
B-3	3,742	0	0	3,742	0	0.71	0.73	0.75	0.81	90%
B-4	6,880	0	0	6,880	0	0.71	0.73	0.75	0.81	90%
TOTAL ON-SITE	641,089	78,370	335,613	131,475	95,631	0.73	0.75	0.78	0.84	85%
OS-1	713	0	713	0	0	0.89	0.90	0.92	0.96	100%
OS-2	710	0	710	0	0	0.89	0.90	0.92	0.96	100%
OS-3	1,044	0	1,044	0	0	0.89	0.90	0.92	0.96	100%
OS-4	710	0	710	0	0	0.89	0.90	0.92	0.96	100%
OS-5	712	0	712	0	0	0.89	0.90	0.92	0.96	100%
TOTAL OFF-SITE	3,889	0	3,889	0	0	0.89	0.90	0.92	0.96	100%
TOTAL SITE	644,978	78,370	339,502	131,475	95,631	0.73	0.75	0.78	0.84	85%

FINAL DRAINAGE REPORT FOR FALCON MARKETPLACE

B4	102,436	0.67	0.78
B6	138,913	0.79	0.87
B11	87,628	0.77	0.85
B14	108,260	0.76	0.84
B15	249,501	0.75	0.84
TOTAL SITE	686,738	0.75	0.84

STANDARD FORM SF-2 TIME OF CONCENTRATION

Subdivision: _____
Location: CO, El Paso County

Project Name: King Soopers Falcon Marketplace
Project No.: KSS147
Calculated By: SMB
Checked By: _____
Date: 11/16/19

SUB-BASIN DATA						INITIAL/OVERLAND (T _i)			TRAVEL TIME (T _t)					T _c CHECK (URBANIZED BASINS)			FINAL T _c (MIN)
BASIN ID	D.A. (AC)	Hydrologic Soils Group	Impervious (%)	C ₁₀₀	C ₅	L (FT)	S (%)	T _i (MIN)	L (FT)	S (%)	C _v	VEL. (FPS)	T _t (MIN)	COMP. T _c (MIN)	TOTAL LENGTH (FT)	Urbanized T _c (MIN)	
A-1	0.14	A	100	0.96	0.90	95	6.0	2.0						2.0	95.0	10.5	5.0
A-2	0.43	A	54	0.68	0.52	85	1.0	9.8	105	0.5	20.0	1.4	1.2	11.0	190.0	11.1	11.0
A-3	0.33	A	53	0.67	0.51	45	1.0	7.2	115	0.5	20.0	1.4	1.4	8.5	160.0	10.9	8.5
A-4	0.53	A	69	0.77	0.65	75	4.6	4.3	125	0.5	20.0	1.4	1.5	5.8	200.0	11.1	5.8
A-5	1.14	A	64	0.74	0.60	100	1.8	7.5	120	1.8	20.0	2.7	0.7	8.2	220.0	11.2	8.2
A-6	0.42	A	71	0.79	0.67	95	0.7	8.7	85	2.0	20.0	2.8	0.5	9.2	180.0	11.0	9.2
A-7	1.65	A	89	0.89	0.81	100	2.3	4.1	365	1.5	20.0	2.4	2.5	6.5	465.0	12.6	6.5
A-8	5.35	A	89	0.87	0.79	55	2.9	3.0	480	1.8	20.0	2.7	3.0	5.9	535.0	13.0	5.9
A-9	1.71	A	95	0.93	0.86	100	2.0	3.5	305	2.5	20.0	3.2	1.6	5.1	405.0	12.3	5.1
B-1	1.30	A	90	0.81	0.73												5.0
B-2	1.47	A	90	0.81	0.73												5.0
B-3	0.09	A	90	0.81	0.73												5.0
B-4	0.16	A	90	0.81	0.73												5.0
OS-1	0.02	A	100	0.96	0.90	16	2.0	1.2						1.2	16.0	10.1	5.0
OS-2	0.02	A	100	0.96	0.90	20	2.0	1.3						1.3	20.0	10.1	5.0
OS-3	0.02	A	100	0.96	0.90	22	2.0	1.4						1.4	22.0	10.1	5.0
OS-4	0.02	A	100	0.96	0.90	18	2.0	1.2						1.2	18.0	10.1	5.0
OS-5	0.02	A	100	0.96	0.90	20	2.0	1.3						1.3	20.0	10.1	5.0

NOTES:

$T_i = (0.395 * (1.1 - C_5) * (L)^{0.5}) / ((S)^{0.33})$, S in ft/ft

$T_t = L / 60V$ (Velocity From Fig. 501)

Velocity $V = C_v * S^{0.5}$, S in ft/ft

$T_c \text{ Check} = 10 + L / 180$

For Urbanized basins a minimum T_c of 5.0 minutes is required.

For non-urbanized basins a minimum T_c of 10.0 minutes is required

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

Subdivision: _____
Location: CO, El Paso County
Design Storm: 5-Year

Project Name: King Soopers Falcon Marketplace
Project No.: KSS147
Calculated By: SMB
Checked By: _____
Date: 11/16/19

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
		Basin ID	Area (Ac)	Runoff Coeff.	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Slope (%)	Street Flow (cfs)	Design Flow (cfs)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	Tt (min)	
	1	B-1	1.30	0.73	5.0	0.95	5.10	4.8													Roof drain piped to DP 2
	2	A-1	0.14	0.90	5.0	0.13	5.10	0.7													Type 13 Combination Sump Inlet
	2								5.0	1.08	5.10	5.5			5.5						Piped to DP 3
	3	A-2	0.43	0.52	11.0	0.22	3.95	0.9													Type 13 Combination Sump Inlet
	3								5.0	1.30	5.10	6.6			6.6						Piped to DP 5
	4	B-2	1.47	0.73	5.0	1.07	5.10	5.5													Roof drain piped to DP 5
	5	A-3	0.33	0.51	8.5	0.17	4.34	0.7													Type 13 Combination Sump Inlet
	5								8.5	2.54	4.34	11.0			11.0						Piped to DP 6
	6	A-4	0.53	0.65	5.8	0.34	4.91	1.7													Type 13 Combination Sump Inlet
	6								8.5	2.88	4.34	12.5			12.5						Piped to DP 9
	7	B-4	0.16	0.73	5.0	0.12	5.10	0.6													Roof drain piped to DP 8
	8	A-5	1.14	0.60	8.2	0.69	4.40	3.0													10' CDOT Type R Sump Inlet
	8								8.2	0.81	4.40	3.6			3.6						Piped to stub from overall development
	9	A-6	0.42	0.67	9.2	0.28	4.23	1.2													Type 13 Combination Inlet
	9								9.2	3.16	4.23	13.4			13.4						Piped to stub from overall development
	10	A-7	1.65	0.81	6.5	1.33	4.74	6.3							6.3						10' CDOT Type R Sump Inlet
	11	A-8	5.35	0.79	5.9	4.22	4.87	20.6							20.6						Piped to stub from overall development
	12	B-3	0.09	0.73	5.0	0.06	5.10	0.3													20' CDOT Type R Sump Inlet
	13	A-9	1.71	0.86	5.1	1.47	5.08	7.5													Piped to stub from overall development
	13								5.1	1.53	5.08	7.8			7.8						Roof drain piped to DP 13
	14	OS-1	0.02	0.90	5.0	0.01	5.10	0.1													10' CDOT Type R Sump Inlet
	15	OS-2	0.02	0.90	5.0	0.01	5.10	0.1													Piped to stub from overall development
	16	OS-3	0.02	0.90	5.0	0.02	5.10	0.1													Flows directly into roadway
																					Flows directly into roadway
																					Flows directly into roadway

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

Subdivision: _____
Location: CO, El Paso County
Design Storm: 5-Year

Project Name: King Soopers Falcon Marketplace
Project No.: KSS147
Calculated By: SMB
Checked By: _____
Date: 11/16/19

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE		TRAVEL TIME			REMARKS
		Basin ID	Area (Ac)	Runoff Coeff.	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Slope (%)	Street Flow (cfs)	Design Flow (cfs)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	
	17	OS-5	0.02	0.90	5.0	0.01	5.10	0.1												Flows directly into roadway
	18	OS-4	0.02	0.90	5.0	0.01	5.10	0.1												Flows directly into roadway

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

Subdivision: _____
Location: CO, El Paso County
Design Storm: 100-Year

Project Name: King Soopers Falcon Marketplace
Project No.: KSS147
Calculated By: SMB
Checked By: _____
Date: 11/16/19

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
		Basin ID	Area (Ac)	Runoff Coeff.	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Slope (%)	Street Flow (cfs)	Design Flow (cfs)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	Tt (min)	
	1	B-1	1.30	0.81	5.0	1.06	9.09	9.6													Roof drain piped to DP 2
	2	A-1	0.14	0.96	5.0	0.14	9.09	1.3													Type 13 Combination Sump Inlet
	2								5.0	1.20	9.09	10.9			10.9						Piped to DP 3
	3	A-2	0.43	0.68	11.0	0.29	7.03	2.0													Type 13 Combination Sump Inlet
	3								5.0	1.49	9.09	13.5			13.5						Piped to DP 5
	4	B-2	1.47	0.81	5.0	1.19	9.09	10.8													Roof drain piped to DP 5
	5	A-3	0.33	0.67	8.5	0.22	7.73	1.7													Type 13 Combination Sump Inlet
	5								8.5	2.90	7.73	22.4			22.4						Piped to DP 6
	6	A-4	0.53	0.77	5.8	0.41	8.74	3.6													Type 13 Combination Sump Inlet
	6								8.5	3.31	7.73	25.6			25.6						Piped to DP 9
	7	B-4	0.16	0.81	5.0	0.13	9.09	1.2													Roof drain piped to DP 8
	8	A-5	1.14	0.74	8.2	0.84	7.84	6.6													10' CDOT Type R Sump Inlet
	8								8.2	0.97	7.84	7.6			7.6						Piped to stub from overall development
	9	A-6	0.42	0.79	9.2	0.33	7.53	2.5													Type 13 Combination Inlet
	9								9.2	3.64	7.53	27.4			27.4						Piped to stub from overall development
	10	A-7	1.65	0.89	6.5	1.47	8.43	12.4							12.4						10' CDOT Type R Sump Inlet Piped to stub from overall development
	11	A-8	5.35	0.87	5.9	4.67	8.67	40.5							40.5						20' CDOT Type R Sump Inlet Piped to stub from overall development
	12	B-3	0.09	0.81	5.0	0.07	9.09	0.6													Roof drain piped to DP 13
	13	A-9	1.71	0.93	5.1	1.59	9.05	14.4													10' CDOT Type R Sump Inlet
	13								5.1	1.66	9.05	15.0			15.0						Piped to stub from overall development
	14	OS-1	0.02	0.96	5.0	0.02	9.09	0.2													Flows directly into roadway
	15	OS-2	0.02	0.96	5.0	0.02	9.09	0.2													Flows directly into roadway
	16	OS-3	0.02	0.96	5.0	0.02	9.09	0.2													Flows directly into roadway
	17	OS-5	0.02	0.96	5.0	0.02	9.09	0.2													Flows directly into roadway
	18	OS-4	0.02	0.96	5.0	0.02	9.09	0.2													Flows directly into roadway

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

Subdivision: _____
Location: CO, El Paso County
Design Storm: 100-Year

Project Name: King Soopers Falcon Marketplace
Project No.: KSS147
Calculated By: SMB
Checked By: _____
Date: 11/16/19

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
		Basin ID	Area (Ac)	Runoff Coeff.	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Slope (%)	Street Flow (cfs)	Design Flow (cfs)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	Tt (min)	

