Due to the quantity and nature of the comments on this submittal, EPC reserves the right to make additional comments on the resubmittal. Please call reviewing engineer, Jack Patton (719) 520-7951, prior to resubmittal to discuss.

Please refer to the EPC Drainage Criteria Manual Vol I, Section I, Chapter 4.5 Small Subdivision Drainage Report Format for required Engineer/Developer statements, report contents, etc.

Drainage Report for

Please revise to Drainage Letter

Arby's | Falcon, Colorado

Project:

Arby's | Falcon, CO
11775 Meridian Market VW
Falcon, CO 80831

Client:

Bell American Group LLC
8930 Bash Street, Suite L
Indianapolis, Indiana 46256
p. 317-788-0374

Engineer:

Hamilton Designs, LLC
11 Municipal Drive, Suite 300
Fishers, Indiana 46038
p. 317-570-8800

Professional Certification:

October 21, 2020

(Seal/Signature to be inserted prior to final submittal)

Please use the attached signature blocks on the next page:

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1.0 DRAINAGE NARRATIVE: 1

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1.2 Zoning Status 1

2.0 EXISTING CONDITIONS: 1

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4.0 WATER QUALITY 2

5.0 CHANNEL PROTECTION 2

6.0 FLOOD PROTECTION 2

7.0 SUMMARY: 2

8.0 APPENDIX: 2

A. **Site Maps** i
B. **Existing Conditions** i
C. **Proposed Conditions** i
D. **Excerpts from Falcon Highlands Market Place Filing No. 1B Report** i

Please provide the Hydrologic and Hydraulic calculations per Drainage Criteria Manual Vol I, 4.5.4.d. Only coefficients and time of concentration are provide, please include flow (Q) and hydraulic calculations for proposed inlets and storm pipes.

Please add a section on EPC drainage fees. Drainage fees are not due at this time as they were paid with the original plat. Drainage fees are not assessed with Site Development Plan applications.

Please note that there is no floodplain on site, and the site is in the CHWS1400 Falcon Drainage Basin, and identify the Soil Group of the site.

1.0 DRAINAGE NARRATIVE:

1.1 Introduction

The site is located near the southwest corner of Woodmen Road and Meridian Road in El Paso County, CO within the Falcon Highlands Market Place commercial subdivision. The subject property has been platted as Lot 2 within the FHMP Filing No. 1B and has been assigned an address of 11775 Meridian Market View; Falcon, Colorado. The proposed improvements will include a ±2,579 square-foot Arby's fast-food restaurant building along with its associated parking, drainage, and utility infrastructure.

Stormwater quality and detention has been master planned for the subject site's proposed improvements and the overall calculations for the entire commercial subdivision has been provided in the appendix of this report. Applicable pages from the "Falcon Highlands Market Place Filing No. 1B Preliminary and Final Drainage Report" prepared by URS (October 18, 2005) can be found in Appendix #.

Please finish sentence. Filing 1B is a drainage letter, not a Preliminary and Final Drainage Report. Please revise the reference.

1.2 Zoning Status

The site is currently zoned CR, Commercial Regional Zoning District.

2.0 EXISTING CONDITIONS:

The existing site is currently a vacant 1.14-acre 'pad-ready' commercial outlot that mainly consists of grass vegetation with an east/west access drive at the north end of the property. The ground cover over the existing site generally directs stormwater runoff from north to south into a master planned storm sewer system located in the Meridian Market VW right-of-way. Stormwater is collected by the existing storm sewer system and then directed to an existing wet stormwater quality detention pond (Pond 'MN' in the master planned report) that is located just south of the subject site and across Meridian Road.

3.0 PROPOSED CONDITIONS

Please list and discuss conformance with all previously approved drainage studies and plans.

The proposed project includes a land disturbance of ±0.80 acres which involves the development of the new ±2,579 square-foot Arby's fast-food restaurant building along with its associated parking, drainage, and utility infrastructure. Stormwater will travel via overland flow from north to south, just as it does in the existing condition, and then will be collected by a new on-site storm sewer system. The new on-site storm sewer system will be routed to an existing 24" RCP stub at the southeast corner of the site. Stormwater will then travel to the existing wet detention pond (Pond MN), which also treats the proposed runoff with its stormwater quality features, and ultimately discharge into Black Squirrel Creek.

Stormwater detention and stormwater quality calculations are not required for the proposed development being that the project site's improvements fall into an already master planned drainage analysis for the existing commercial development. The project site, Lot 2 of the Falcon Highlands Market Place Filing No. 1B, falls within master planned drainage basin D-24, which was designed with a weighted runoff coefficient of C=0.90 in a 5-year storm event and C=0.95 in a 100-year storm event. The post-developed improvements generate a runoff coefficient of C=0.58 in the proposed condition. The proposed runoff coefficient is significantly lower than that in the master planned report; therefore, the existing wet pond is adequately sized for the post-developed improvements.

Please elaborate on proposed stormwater features, including inlets, storm pipes, the existing pond's status (whether or not it is functioning properly and being maintained adequately).

4.0 WATER QUALITY

The proposed improvements will result in an impervious area lot coverage of approximately 59%. The calculated water quality control volume (WQCV) from the proposed improvements equals 0.23. The overall development was designed with a master planned WQCV of 0.49. The proposed value is significantly less than that in the master planned report for the overall Falcon Highlands Market Place commercial development and therefore suggests that water quality is being adequately provided by the overall development. Narrative and calculation can be found in the overall development Stormwater Report.

5.0 CHANNEL PROTECTION

None Required

Please discuss the four step process per ECM I.7.2.

6.0 FLOOD PROTECTION

None Required

7.0 SUMMARY:

In summary, this report establishes that the proposed improvements will present no adverse impacts to the subject site and/or the surrounding properties.

8.0 APPENDIX:

Please remove.

A. Site Maps

Please remove.

B. Existing Conditions

Please remove.

C. Proposed Conditions

Please remove.

D. Excerpts from Falcon Highlands Market Place Filing No. 1B Report

Please remove.

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6.0 FLOOD PROTECTION

None Required

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In summary, this report establishes that the proposed improvements will present no adverse impacts to the subject site and/or the surrounding properties.

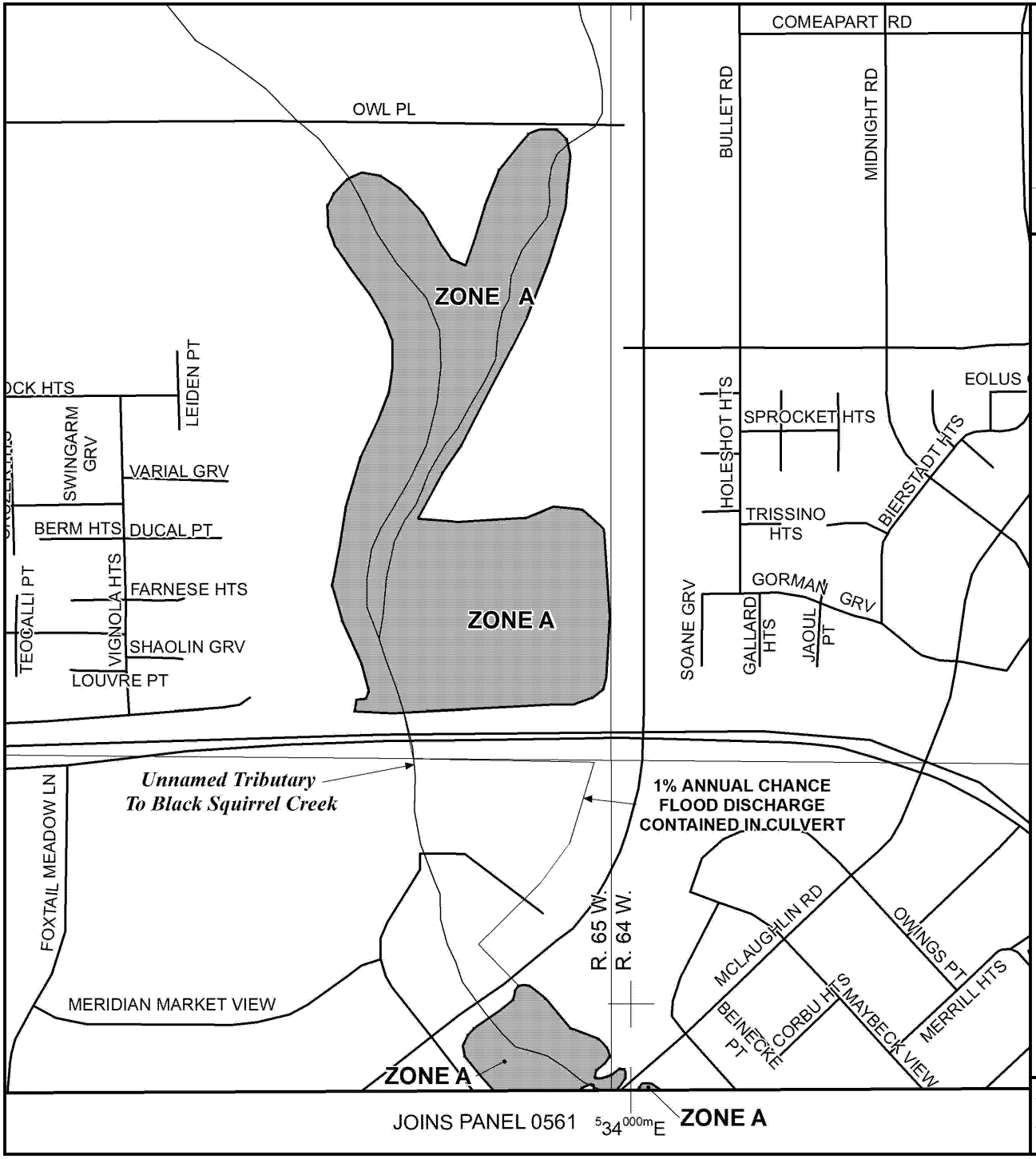
8.0 APPENDIX:

A. Site Maps

VICINITY MAP

1" = 3,000'

FALCON, COLORADO



MAP SCALE 1" = 500'

250 0 500 1000 FEET

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

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

Notice: This map was reissued on 05/15/2020 to make a correction.This version replaces any previous versions. See the Notice-to-User Letter that accompanied this correction for details.

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

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

Soil Map—El Paso County Area, Colorado

Map Scale: 1:596 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 5 10 20 30

Feet: 0 25 50 100 150

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 18, Jun 5, 2020

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

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

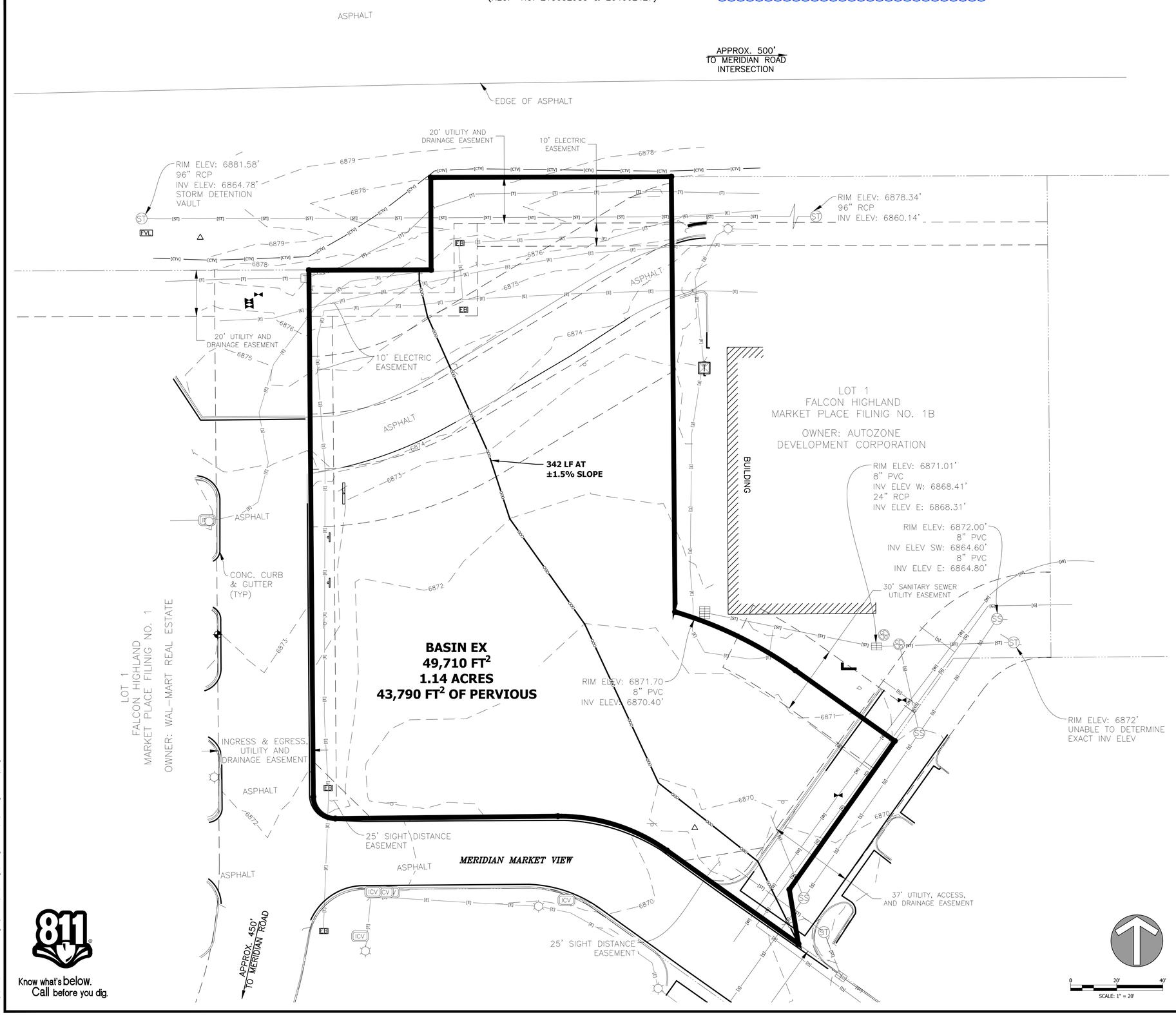
The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
9	Blakeland-Fluvaquentic Haplaquolls	1.3	100.0%
Totals for Area of Interest		**1.3**	**100.0%**

B. Existing Conditions

Please move the existing and proposed conditions maps to the end of the report for review purposes.



LEGEND OF EXISTING FEATURES

	PROPERTY LINE		BENCHMARK
	RIGHT-OF-WAY LINE	RBC	MONUMENT
	SETBACK LINE		SECTION CORNER
	EASEMENT	ET HC	TRANSFORMER HVAC
	SECTION LINE	E(M) E	ELECTRIC METER ELECTRIC MANHOLE
	CENTERLINE		POWER POLE | GUY WIRE
799	INTERMEDIATE CONTOUR		LIGHT POLE
800	INDEX CONTOUR		TELEPHONE PEDESTAL TELEPHONE MANHOLE
[T]	TELEPHONE UNDER GR.	G E	GAS MARKER ELECTRIC MARKER
[OH-T]	TELEPHONE OVERHEAD	TR TR	TRAFFIC POLE TRAFFIC MANHOLE
[FO]	FIBER OPTIC SERVICE	G(M) G	GAS METER GAS VALVE
[G]	GAS SERVICE	ST S	STORM MANHOLE SANITARY MANHOLE
[E]	POWER UNDERGROUND		STORM INLETS
[OH-E]	POWER OVERHEAD	C.O. D.S.	CLEAN-OUT DOWNSPOUT
[W]	WATER SERVICE		FIRE HYDRANTS
[S]	SANITARY SEWER	W(M) W	WATER METER WATER VALVES
[ST]	STORM SEWER		POST INDICATOR VALVE FIRE DEPARTMENT CONN.
[NP]	POND NORMAL POOL		SIGNS
	EX. FLOWLINE		MAILBOX
	CHAIN LINK FENCE		ADA PARKING
	FARM FENCE	24	PARKING COUNT
	WOOD FENCE		TREES
	IRON FENCE | RAILING		SHRUB
	BUILDING | STRUCTURE		
	EX. BUILDING OVERHEAD	× 891.25	SPOT GRADE
RIM	RIM ELEVATION		
INV.	INVERT ELEVATION		
FFE	FINISHED FLOOR ELEVATION		

GRADING PLAN LEGEND

ST	STORM SEWER	RIM	RIM ELEVATION
SSD	SUBSURFACE DRAIN	INV.	INVERT ELEVATION
	SWALE | FLOWLINE	FFE	FINISHED FLOOR ELEVATION
NP	POND (NORMAL POOL)		FLOW ARROW
799	INTERMEDIATE CONTOUR	ST	STORM MANHOLE
800	INDEX CONTOUR		STORM INLETS
	MATCH EXISTING		STORM ENDSECTION
	PAVEMENT SPOT GRADE	C.O.	CLEAN-OUT
	GROUND SPOT GRADE	D.S.	DOWNSPOUT
	TOP OF CURB BOTTOM OF CURB TOP OF WALL BOTTOM OF WALL		

REVISION BLOCK

NOT FOR CONSTRUCTION

DATE 10/16/2020

DRAWN BY KPB | CHECKED BY AMT

HAMILTON DESIGNS
A LIMITED LIABILITY COMPANY
11Municipal Drive, Suite 300
Fishers, Indiana 46038
P. (317) 570-8800
www.hamilton-designs.com

CONSTRUCTION PLANS FOR:
ARBY'S I FALCON, CO
11775 Meridian Market View
Falcon, Colorado 80831

BELL AMERICAN GROUP, LLC
8930 Bash Street, Suite L
Indianapolis, Indiana 46256

PROJECT NO. 2019-0246

DATE 10/16/2020

SCALE 1" = 20'

SHEET NAME **EXISTING BASINS MAP**

SHEET NO. B-1

Know what's below. Call before you dig.

p:\2019\0246 - bell american group - falcon, co\drainage\existing conditions\b-1, existing basins map.dwg

Hamilton Designs Project No.:	2019-0246	By:	KPB
Project Name:	Arby's - Falcon | El Paso County, CO	Date	10/09/20
Description:	**Composite C Computation**		

Rational Method runoff coefficients

All watertight roof surfaces	…….	0.90
Pavement	…….	0.85
Gravel	…….	0.85
Slightly perivous soil (with turf)	…….	0.20

EX	All watertight surfaces	Pavement	Gravel	Pervious soil / turf	Total	Total	Composite C
	(ft^2)	(ft^2)	(ft^2)	(ft^2)	(ft^2)	(acres)	(ft^2)
	0	5,920	0	43,790	49,710	1.141	**0.28**

PR	All watertight surfaces	Pavement	Gravel	Pervious soil / turf	Total	Total	Composite C
	(ft^2)	(ft^2)	(ft^2)	(ft^2)	(ft^2)	(acres)	(ft^2)
	2,579	26,628	0	20,503	49,710	1.141	**0.58**

Percent Impervious

Basin EX	12%
Basin PR	59%

Hamilton Designs Project No.:	2019-0246		
Project Name:	Arby's - Falcon | El Paso County, CO	By:	KPB
Description:	**Time of Concentration**	Date:	10/16/20

L = length, feet
S = slope, percent
n = Manning's roughness coefficient
T_t = travel time, hours
T_c = time of concentration, minutes
V = velocity, feet per second

2-year, 24-hour rainfall = 2.64 inches
minimum T_c = 5.0 minutes

Roughness coefficients (Manning's n) for sheet flow *

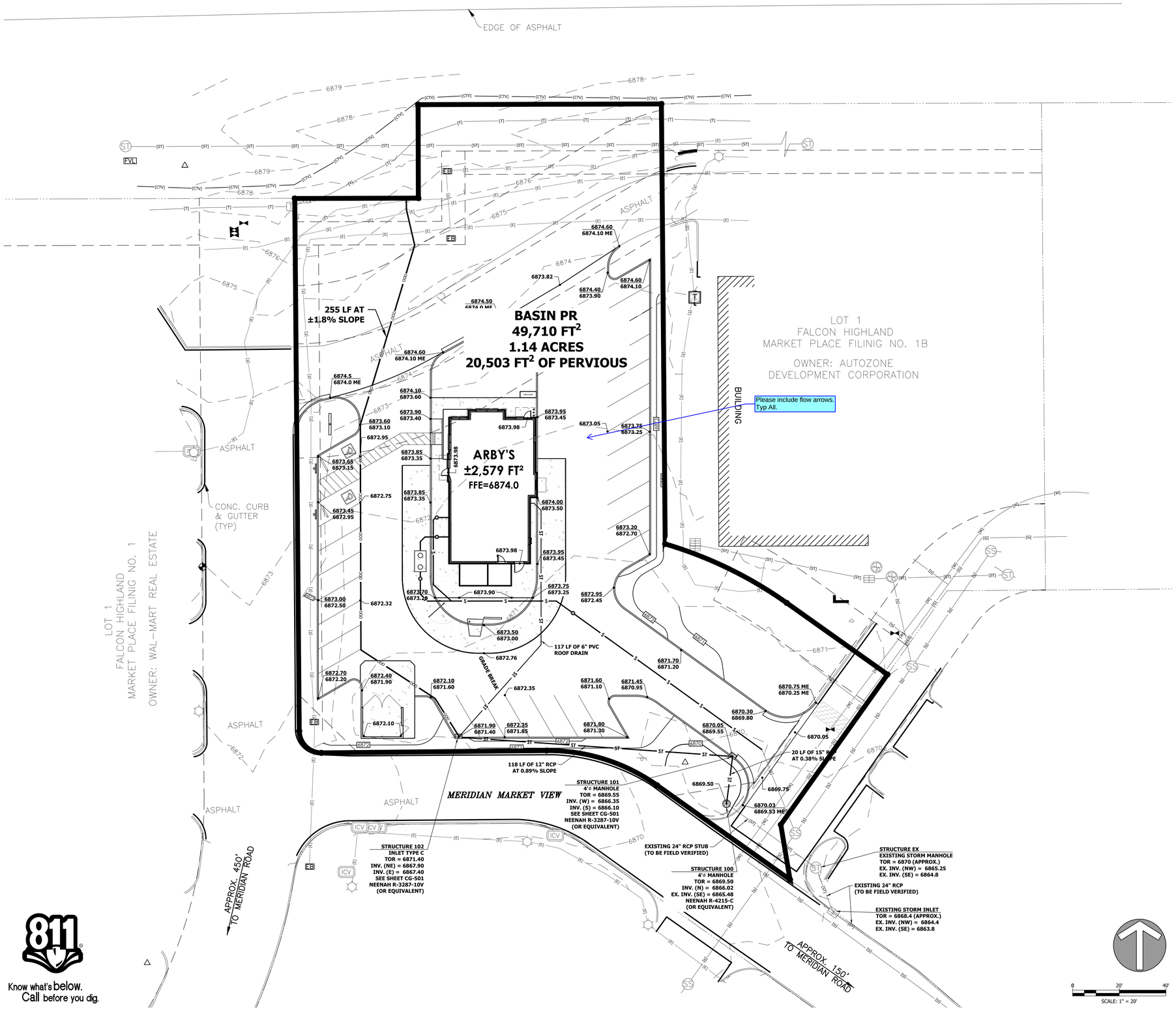
Smooth surfaces, concrete, asphalt, gravel, or bare soil	0.011
Fallow (no residue)	0.050
Grass, short prairie	0.150
Grass, dense grass	0.240
Woods, light underbrush	0.400

** Table 3-1, TR-55, Second Ed., June 1986*

Basin Name	Overland Flow, (1)				Overland Flow, (2)				Shallow Concentrated Flow					Channel Flow			
	L	S	n	T_t	L	S	n	T_t	L	S	paved/ unpaved	V	T_t	L	V	T_t	T_c
EX	66	2.0	0.150	7.74	34	2.0	0.011	0.56	242	1.0	Unpaved	1.6	2.50				**10.8**
PR	54	2.0	0.150	6.59	46	2.0	0.011	0.72	155	1.1	Paved	2.1	1.21				**8.5**

C. Proposed Conditions

Please move the existing and proposed conditions maps to the end of the report for review purposes.



LEGEND OF EXISTING FEATURES

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	SETBACK LINE		SECTION CORNER
	EASEMENT	ET HC	TRANSFORMER HVAC
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799	INTERMEDIATE CONTOUR		LIGHT POLE
800	INDEX CONTOUR	T	TELEPHONE PEDESTAL TELEPHONE MANHOLE
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800.00 ME -	MATCH EXISTING		STORM ENDSECTION
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800.4 -	GROUND SPOT GRADE	D.S.	DOWNSPOUT
800.00 / 800.50	TOP OF CURB / BOTTOM OF CURB		
800.00 TW / 800.50 BW	TOP OF WALL / BOTTOM OF WALL		

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PROJECT NO. 2019-0246
DATE 10/16/2020
SCALE 1" = 20'
SHEET NAME **PROPOSED BASINS MAP**
SHEET NO. C-1

811 Know what's below. Call before you dig.

p:\2019\0246 - bell american group - falcon, co\drainage\proposed conditions\c-1, proposed basins map.dwg

Hamilton Designs Project No.:	2019-0246	By:	KPB
Project Name:	Arby's - Falcon | El Paso County, CO	Date	10/09/20
Description:	**Composite C Computation**		

Rational Method runoff coefficients

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Pavement	.....	0.85
Gravel	.....	0.85
Slightly perivous soil (with turf)	.....	0.20

Please revise. Please use the runoff coefficients per Drainage Criteria Manual Vol I Table 6-6:
https://library.municode.com/co/el_paso_county/codes/drainage_criteria_manual?nodeId=VO1UP_CH6HY_6.0SSIDEHYRO
Typ. All.

EX	All watertight surfaces	Pavement	Gravel	Pervious soil / turf	Total	Total	Composite C
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Hamilton Designs Project No.:	2019-0246	By:	KPB
Project Name:	Arby's - Falcon | El Paso County, CO	Date	10/16/20
Description:	**Rational Runoff Method**		

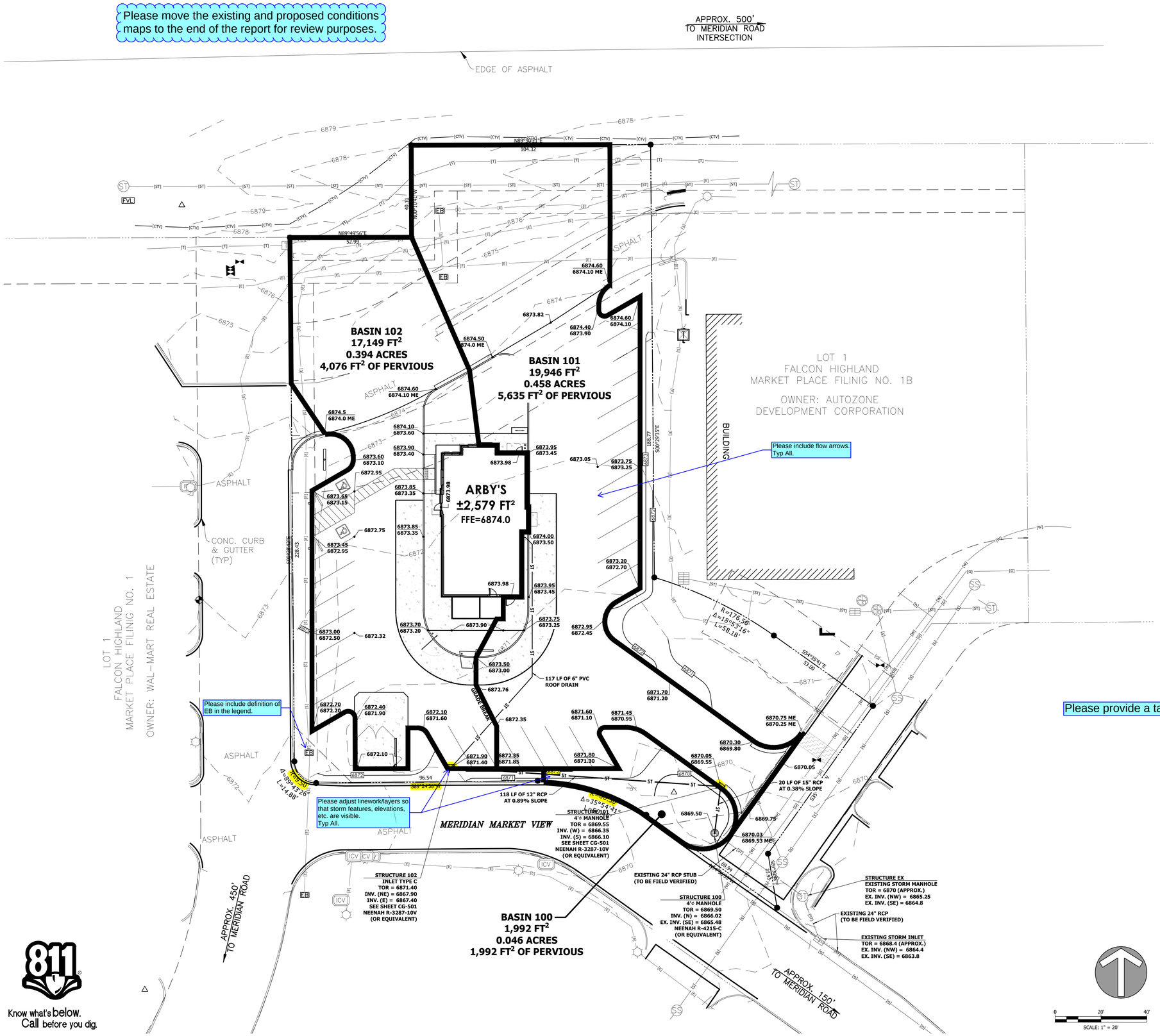
Rational Runoff Method, Q = CiA

C = composite C
i = rainfall intesity, inches per hour
A = area, acres
Q = runoff peak flow rate, cubic feet per second

	Rainfall Event	Composite C	Time of Concentration	Rainfall Intensity	Area	Peak Runoff Rate
EX	2-Year	0.28	10.8	3.50	1.141	**1.12**
	10-Year	0.28	10.8	5.30	1.141	**1.69**
	100-Year	0.28	10.8	7.53	1.141	**2.41**

	Rainfall Event	Composite C	Time of Concentration	Rainfall Intensity	Area	Peak Runoff Rate
PR	2-Year	0.58	8.5	3.89	1.141	**2.58**
	10-Year	0.58	8.5	5.85	1.141	**3.87**
	100-Year	0.58	8.5	8.25	1.141	**5.46**

Please move the existing and proposed conditions maps to the end of the report for review purposes.



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[T]	TELEPHONE UNDER GR.	G E	GAS MARKER ELECTRIC MARKER
[OH-T]	TELEPHONE OVERHEAD	TR TR	TRAFFIC POLE TRAFFIC MANHOLE
[FO]	FIBER OPTIC SERVICE	G(M) G	GAS METER GAS VALVE
[G]	GAS SERVICE	ST S	STORM MANHOLE SANITARY MANHOLE
[E]	POWER UNDERGROUND		STORM INLETS
[OH-E]	POWER OVERHEAD	C.O. D.S.	CLEAN-OUT DOWNSPOUT
[W]	WATER SERVICE		FIRE HYDRANTS
[S]	SANITARY SEWER	W(M) W	WATER METER WATER VALVES
[ST]	STORM SEWER		POST INDICATOR VALVE FIRE DEPARTMENT CONN.
[NP]	POND NORMAL POOL		SIGNS
	EX. FLOWLINE		MAILBOX
	CHAIN LINK FENCE		ADA PARKING
	FARM FENCE	24	PARKING COUNT
	WOOD FENCE		TREES
	IRON FENCE | RAILING		SHRUB
	BUILDING | STRUCTURE		
	EX. BUILDING OVERHEAD	× 801.25	SPOT GRADE
RIM	RIM ELEVATION		
INV.	INVERT ELEVATION		
FFE	FINISHED FLOOR ELEVATION		

GRADING PLAN LEGEND

ST	STORM SEWER	RIM	RIM ELEVATION
SSD	SUBSURFACE DRAIN	INV.	INVERT ELEVATION
	SWALE | FLOWLINE	FFE	FINISHED FLOOR ELEVATION
NP	POND (NORMAL POOL)		FLOW ARROW
799	INTERMEDIATE CONTOUR	ST	STORM MANHOLE
800	INDEX CONTOUR		STORM INLETS
800.00 ME	MATCH EXISTING		STORM ENDSECTION
800.00	PAVEMENT SPOT GRADE	C.O.	CLEAN-OUT
800.4	GROUND SPOT GRADE	D.S.	DOWNSPOUT
800.00 / 800.50	TOP OF CURB / BOTTOM OF CURB		
800.00 TW / 800.50 BW	TOP OF WALL / BOTTOM OF WALL		

REVISION BLOCK

NOT FOR CONSTRUCTION

DATE 10/16/2020

DRAWN BY KPB | CHECKED BY AMT

HAMILTON DESIGNS
A LIMITED LIABILITY COMPANY
11Municipal Drive, Suite 300
Fishers, Indiana 46038
P. (317) 570-8800
www.hamilton-designs.com

CONSTRUCTION PLANS FOR:
ARBY'S I FALCON, CO
11775 Meridian Market View
Falcon, Colorado 80831

BELL AMERICAN GROUP, LLC
8930 Bash Street, Suite L
Indianapolis, Indiana 46256

PROJECT NO. 2019-0246
DATE 10/16/2020
SCALE 1" = 20'
SHEET NAME **STORM SEWER BASINS MAP**
SHEET NO. D-1

Know what's below. Call before you dig.

p:\2019\0246 - bell american group - falcon, co\drainage\proposed conditions\d-1, storm sewer basins map.dwg

Hamilton Designs Project No.:	2019-0246	By:	KPB
Project Name:	Arby's - Falcon | El Paso County, CO	Date	10/16/20
Description:	**Composite C Computation**		

Rational Method runoff coefficients

All watertight roof surfaces	.....	0.90
Pavement	.....	0.85
Gravel	.....	0.85
Slightly perivous soil (with turf)	.....	0.20

Please see comment on previous calculations

102	All watertight surfaces	Pavement	Gravel	Pervious soil / turf	Total	Total	Composite C
	(ft^2)	(ft^2)	(ft^2)	(ft^2)	(ft^2)	(acres)	(ft^2)
	2,579	10,494	0	4,076	17,149	0.394	**0.70**

101	All watertight surfaces	Pavement	Gravel	Pervious soil / turf	Total	Total	Composite C
	(ft^2)	(ft^2)	(ft^2)	(ft^2)	(ft^2)	(acres)	(ft^2)
	0	14,311	0	5,635	19,946	0.458	**0.67**

100	All watertight surfaces	Pavement	Gravel	Pervious soil / turf	Total	Total	Composite C
	(ft^2)	(ft^2)	(ft^2)	(ft^2)	(ft^2)	(acres)	(ft^2)
	0	0	0	1,992	1,992	0.046	**0.20**

Hamilton Designs Project No.: 2020-0246
Project Name: Arby's - Falcon, CO
Description: **Proposed Conditions - Storm Sewer Sizing Worksheet**

By: KPB
Date 10/16/20

Design Storm Frequency = 10-year
Manning's n = 0.013

STRUCTURE		LENGTH	DRAINAGE AREA "A"		RUNOFF COEFFICIENT "C"	"A" x "C"		FLOW TIME		RAINFALL INTENSITY	TOTAL RUNOFF	PIPE DIAMETER	SLOPE OF SEWER	FULL CAPACITY	VELOCITY		RIM ELEVATION		INVERT ELEVATION		COVER	
			Increment	Total				To Upper End	In Section						Flowing Full	Design Flow	U/S Structure	D/S Structure	U/S Structure	D/S Structure	U/S Structure	D/S Structure
U/S	D/S	(ft)	(acres)	(acres)		Increment	Total	(min)	(min)	(in/hr)	(cfs)	(ft)	%	(cfs)	(ft/s)	(ft/s)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)
102	101	118	0.39	0.39	0.70	0.28	0.28	5.00	0.46	6.98	1.93	1.00	0.89	3.37	4.29	-	6871.40	6869.55	6867.40	6866.35	2.83	2.03
101	100	20	0.46	0.85	0.67	0.31	0.58	5.46	0.10	6.81	3.97	1.25	0.38	3.99	3.25	-	6869.55	6869.50	6866.10	6866.02	2.01	2.04
100	EX	47	0.05	0.90	0.20	0.01	0.59	5.56	0.15	6.77	4.01	2.00	0.50	16.04	5.11	-	6869.50	6869.53	6865.48	6865.25	1.77	2.03

Note: The Storm Run from Str. 100 to Str. EX is an Existing 24" RCP Stub.

Hamilton Designs Project No.:	2019-0246		
Project Name:	Arby's - Falcon | El Paso County, CO	By:	KPB
Description:	**Time of Concentration**	Date:	10/16/20

L = length, feet
S = slope, percent
n = Manning's roughness coefficient
T_t = travel time, hours
T_c = time of concentration, minutes
V = velocity, feet per second

2-year, 24-hour rainfall = 2.64 inches
minimum T_c = 5.0 minutes

Roughness coefficients (Manning's n) for sheet flow *

Smooth surfaces, concrete, asphalt, gravel, or bare soil	0.011
Fallow (no residue)	0.050
Grass, short prairie	0.150
Grass, dense grass	0.240
Woods, light underbrush	0.400

** Table 3-1, TR-55, Second Ed., June 1986*

Basin Name	Overland Flow, (1)				Overland Flow, (2)				Shallow Concentrated Flow					Channel Flow			
	L	S	n	T_t	L	S	n	T_t	L	S	paved/ unpaved	V	T_t	L	V	T_t	T_c
EX	66	2.0	0.150	7.74	34	2.0	0.011	0.56	242	1.0	Unpaved	1.6	2.50				**10.8**
PR	54	2.0	0.150	6.59	46	2.0	0.011	0.72	155	1.1	Paved	2.1	1.21				**8.5**

Hamilton Designs Project No.:	2019-0246	By:	KPB
Project Name:	Arby's I Falcon, CO	Date	10/16/20
Description:	**Water Quality Control Volume (WQCV)**		

WQCV = Water quality control volume (watershed-in)
a = BMP Type Coefficient
I = Percent imprervious cover (%)

$$WQCV = a \times [\ 0.91(I)^3 - 1.19(I)^2 + 0.78(I)\ ]$$

(Per *Urban Storm Drainage Criteria Manual* Vol. 3)

Drain Time Coefficients (a)	
Drain Time (hours)	Coefficient, a
12 hours (filtration BMP / Retention Pond)	0.8
24 hours (constructed wetland pond)	0.9
40 hours (extended detention)	1.0
No attenuation (ex. Swale)	1.0

SUBAREA ID	ONSITE CONTRIBUTING AREA	IMPERVIOUS AREA	IMPERVIOUS AREA
	(acres)	(acres)	(%)
	1.14	0.67	59%
PR			
	I	a	WQCV
	(%)		(watershed-inches)
	0.59	1.00	0.23

D. Excerpts from Falcon Highlands Market Place Filing No. 1B Report

NEW DOC

Market Place Filing No. 1B
DRAINAGE LETTER
El Paso County, Colorado
June 2009

Prepared for:

Regency Centers
1873 S. Bellaire St., Suite 600
Denver, Colorado 80222

Prepared by:

Springs Engineering
31 N Tejon Street
Suite 315
Colorado Springs, CO 80903
Phone: 719-227-7388

Project No. 090-09-010

VR-09-004

CERTIFICATIONS

Market Place Filing No. 1B – Drainage Letter

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 City/County for drainage reports and said report is in conformity with the 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.

Charlene Sammons

For and on behalf of Springs Engineering
Charlene Sammons, PE # 36727

COLORADO REGISTERED
CHARLENE M. SAMMONS
36727
PROFESSIONAL ENGINEER

Developer's Statement:

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

Regency Centers

By: Eric A. Chekal 10/16/09

Title: Sr. Project Manager

Address: 1873 Bellaire St., Suite 600 Denver, CO 80222

El Paso County Statement

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

for Max L Rothschild PE
County Engineer/ECM Administrator

10/22/09
Date

Conditions:

Market Place Filing No. 1B
– Drainage Letter -

This Drainage Letter/Report is prepared in accordance with the City of Colorado Springs/El Paso County Drainage Criteria Manual. This site was originally part of the Falcon Highlands Market Place Filing No. 1 Preliminary and Final Drainage Reports, prepared by URS. The analysis and drainage plans from this report have been included in the appendix for reference.

GENERAL LOCATION AND DESCRIPTION

This development (Site) was originally platted as Lot 3 of Market Place Filing No. 1, and replatted as Lots 1 and 2 of Market Place Filing No. 1A. The site is situated approximately 240 feet west of the southwest intersection of Woodmen and Meridian Roads. The project Site is approximately 1.94 acres and is located in a portion of Section 12, Township 13 South and Range 65 West of the 6th Principal Meridian. This report is accompanying a plat amendment, which relocates the internal lot line for lots 1 and 2 from the Market Place Filing No. 1A replat. The overall area between the 2 lots being addressed remains the same.

The Site is currently vacant. The vegetation is typical eastern Colorado prairie grass. The terrain is evenly sloped to the south with slopes ranging from 1% to 4%. The entire site will enter into the existing detention pond, Pond MN located just south of the project on the east side of Meridian Road. An existing storm system intercept flows from this area and conveys flow under Meridian Road to the existing Detention Pond. This is consistent with the design in the Market Place Filing No. 1 drainage report. On-site specific drainage will be addressed with the site development plan.

The intermittent runoff from this development drains directly into the Black Squirrel Creek and eventually into the Arkansas River. The Flood Insurance Rate Map (FIRM No. 08041C0575 revised 11/26/03) indicates that there is no floodplain in the vicinity of the proposed site. The floodplain was modified in this area, so that an existing underground storm system along the north side of the site was constructed to convey all the flow from the north side of Woodmen, through and around the site to Detention Pond MN. There remains an existing floodplain north of Woodmen Road.

PREVIOUS DRAINAGE STUDIES

The City of Colorado Springs/El Paso County - Drainage Criteria Manual, Volumes I and II, latest revision.

Falcon Basin - Drainage Basin Planning Study, (DBPS) prepared by URS, latest revision.

Falcon Highlands Master Drainage Development Plan (MDDP) prepared by URS, latest revision

Falcon Highlands Market Place Filing No. 1 Preliminary and Final Drainage Report, prepared by URS October 18, 2005.

EXISTING DRAINAGE CHARACTERISTICS

As stated above, the terrain of the Site is evenly sloped to the south with slopes ranging from 2% to 4%. The existing conditions of this site were analyzed with the Market Place Filing No. 1 drainage report. These calculations and drainage plan have been included in the index for reference.

PROPOSED DRAINAGE CHARACTERISTICS

The site was analyzed as part of the Market Place Filing No.1 Final Drainage Report. The area was located within the larger basin D-24. This basin directs flows toward Design Point 20, a stub pipe located at the back of the existing inlet at Design Point 3. This system releases into Pond MN. There are no changes to the proposed site, which would change any basin boundaries, flow paths or design point locations. A copy of the proposed drainage analysis has been included in the appendix. No new calculations have been performed at this time.

STORM SYSTEM:

It is anticipated, that there maybe the need for some on-site structures. These will be designed during the site development stage of the project.

WATER QUALITY:

No water quality will be necessary for this site, as all flows are directed towards Pond MN which has a water quality facility.

DETENTION POND MN:

Please discuss the current functionality in the narrative.

There are current deficiencies in Detention Pond MN. The construction of this site does not increase the deficiencies which are present in the pond. These issues are being dealt with by the Falcon Highlands Metropolitan District directly in order to have drainage credits assigned and to allow their collateral to be released.

CONCLUSION

There have been no changes to the proposed site, which allows the drainage calculations performed in the Market Place Filing No. 1 Final Drainage Report to remain current and up to date. This Drainage Report for the Site is in accordance with Section 4.5 of the El Paso County Drainage Criteria manual.

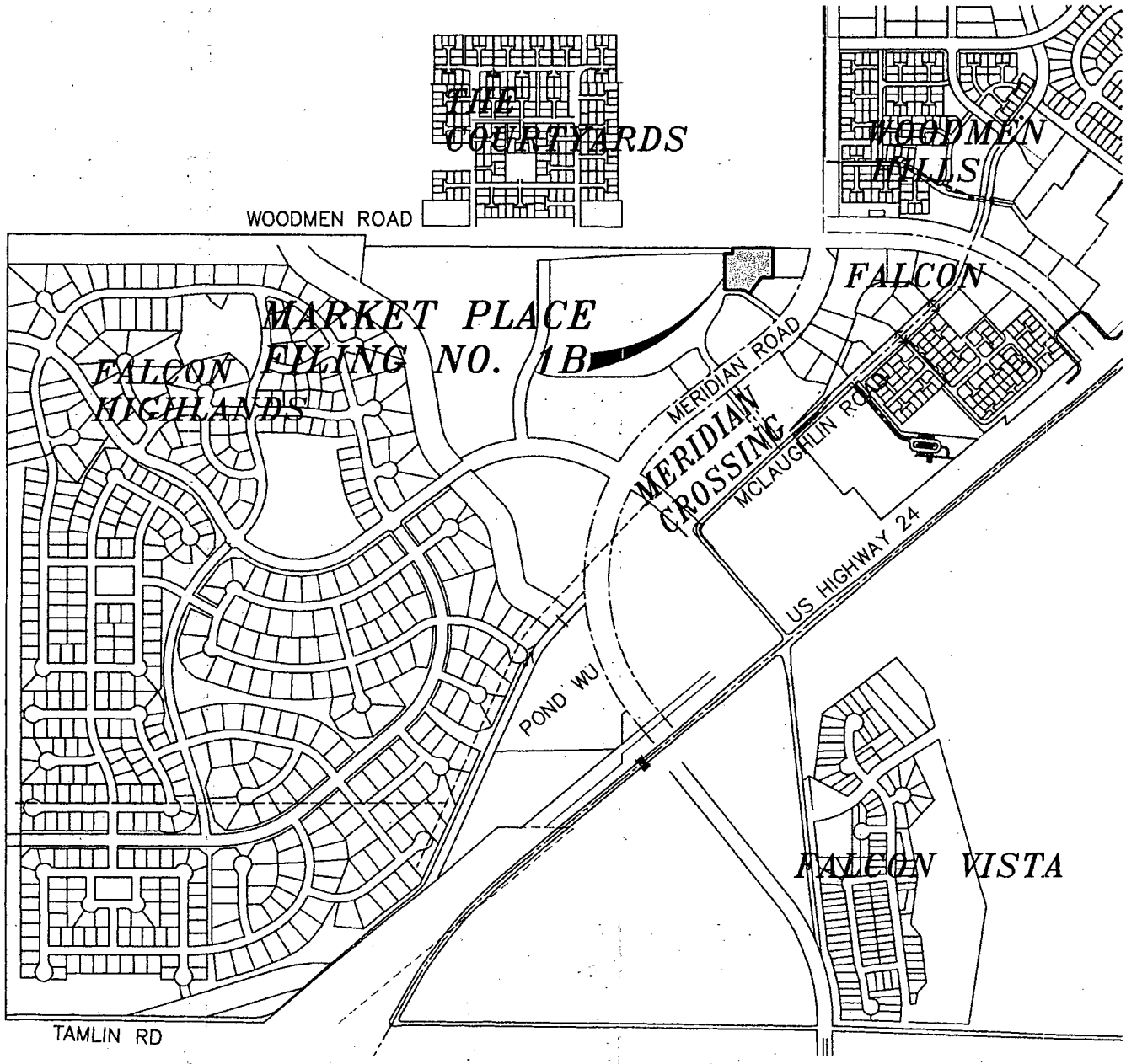
If you have any questions or comments, please contact me at 719-227-7388.

Sincerely,
Springs Engineering

Charlene Sammons

Charlene Sammons, P. E..
Project Engineer

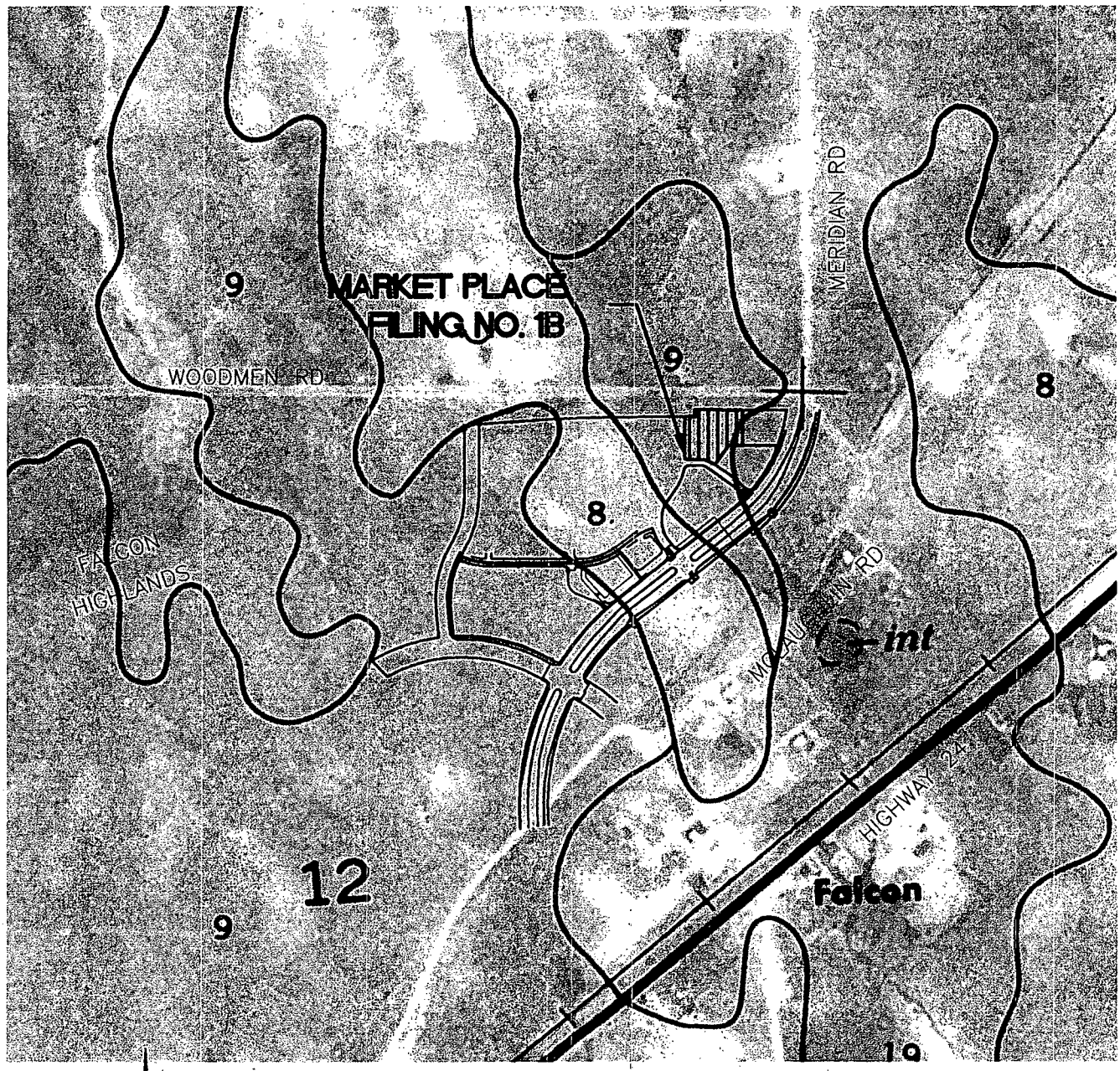
Appendix A: Exhibits



VICINITY MAP

N.T.S.

FALCON HIGHLANDS MARKET PLACE FILING NO. 1B VICINITY MAP	SE Springs Engineering	31 NORTH TEJON, SUITE 315 COLORADO SPRINGS, CO 80903 TEL: (719) 227-7388 FAX: (719) 227-7392
	FIGURE 1	
	PROJECT NO. 090-09-010	

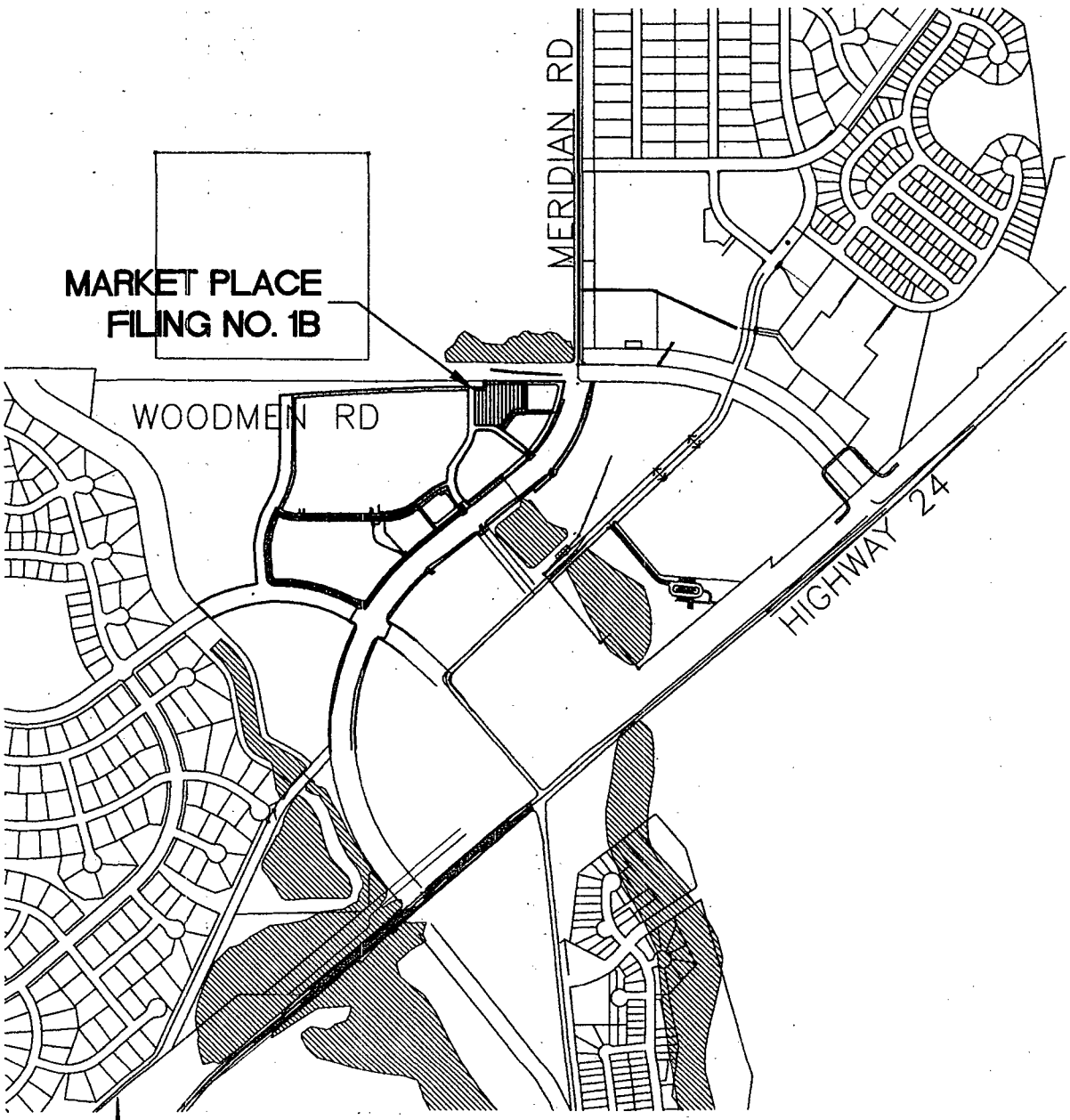


—N—

SOIL MAP

N.T.S.

FALCON HIGHLANDS MARKET PLACE FILING NO. 1B SCS Soils Map	SE Springs Engineering	31 NORTH TEJON, SUITE 315 COLORADO SPRINGS, CO 80903 TEL: (719) 227-7388 FAX: (719) 227-7392
	FIGURE 2	
		PROJECT NO. 090-09-010



—N—

FLOODPLAIN MAP

N.T.S.

FALCON HIGHLANDS
MARKET PLACE FILING NO. 1B

FIRM MAP 08041CO575 REV 11/26/03

SE Springs Engineering
31 NORTH TEJON, SUITE 315
COLORADO SPRINGS, CO 80903
TEL: (719) 227-7388
FAX: (719) 227-7392

FIGURE 3

PROJECT NO. 090-09-010

Appendix B: Excerpts from Market Place Filing No. 1 Report

(Calculations & Drainage Plans)

MARKET PLACE FILING NO. 1-PDR & FDR - EXISTING CONDITIONS
(RATIONAL METHOD Q=CIA)

BASIN	TOTAL FLOWS				AREA TOTAL	WEIGHTED		OVERLAND				CHANNEL				Tc TOTAL	INTENSITY		COMMENTS
	Q_5	Q_{100}	CA(equiv.)			C_5	C_{100}	C_5	Length	Slope	Tco	Length	Slope	Velocity	Tcc		I_5	I_{100}	
	(c.f.s.)	(c.f.s.)	5 YR	100 YR	(Ac)				(ft)	(ft)	(min)	(ft)	(%)	(fps)	(min)	(min)	(in/hr)	(in/hr)	
E-1	21.5	53.7	7.12	9.96	28.47	0.25	0.35	0.25	140	7.5%	9.7	1,650	1.8%	2.7	10.2	19.8	3.0	5.4	
E-2	19.0	47.4	7.65	10.71	30.61	0.25	0.35	0.25	285	5.3%	15.5	2,180	1.9%	2.8	13.1	28.7	2.5	4.4	
E-3	12.8	31.9	5.85	8.19	23.41	0.25	0.35	0.25	400	2.9%	22.4	2,100	1.7%	2.6	13.5	35.8	2.2	3.9	
E-4	24.3	60.4	8.53	11.94	34.12	0.25	0.35	0.25	100	9.0%	7.7	2,320	1.7%	2.6	14.7	22.4	2.8	5.1	
E-5	2.4	5.9	0.66	0.92	2.64	0.25	0.35	0.25	40	1.0%	10.1	545	1.5%	2.4	3.7	13.8	3.6	6.4	
E-6	5.3	13.3	1.39	1.94	5.54	0.25	0.35	0.25	15	2.0%	4.9	975	1.4%	2.4	6.8	11.7	3.9	6.9	
Offsite	21.2	48.5	6.35	8.16	18.14	0.35	0.45	0.25	20	2.0%	5.7	1,650	1.7%	2.6	10.5	16.2	3.3	5.9	
Formula:	C*I*A	C*I*A	Q/I	Q/I		0.25	0.35				*1			*2	*3	Tco+Tcc	*4	*6	
					142.93									20			1.5	2.67	

Tco = 1.87*(1.1-C5)*(L^0.5)*((S*100)^-0.33) (DCM page 5-11)
Vc = 20*S^0.5 (USDCM RO-4)
Tcc = 1/V*L/60
I_5 = (26.65*1.50)/(10+Tc)^0.76 (City Letter of 1/7/2003)
I_{100} =(26.65*2.67)/(10+Tc)^0.76 (City Letter of 1/7/2003)

MARKET PLACE FILING NO. 1-PDR & FDR - EXISTING CONDITIONS
SURFACE ROUTING

DESIGN POINT	CONTRIBUTING BASINS	CA(equivalent)		Tc	INTENSITY		TOTAL FLOWS	
		CA(5)	CA(100)	(min.)	I(5) (in/hr)	I(100) (in/hr)	Q(5) (cfs)	Q(100) (cfs)
1	E-1	7.12	9.96	19.8	2.9	5.1	21	51
				TRAVEL TIME				
		7.12	9.96	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)
								19.8
2	E-2	7.65	10.71	28.7	2.4	4.2	18	45
				TRAVEL TIME				
		7.65	10.71	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)
					457	4.5	1.7	30.4
3	E-3	5.85	8.19	35.8	2.1	3.6	74	517
	Beckett Property	3.06	3.23					
	MN1	12.05	62.78					
	MN2	14.56	67.83	TRAVEL TIME				
		35.52	142.03	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)
								35.8
4	E-4	8.53	11.94	22.4	2.7	4.8	23	57
				TRAVEL TIME				
		8.53	11.94	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)
						4.5	0.0	22.4
5	E-5	0.66	0.92	13.8	3.5	6.1	2	6
				TRAVEL TIME				
		0.66	0.92	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)
						4.5	0.0	13.8
6	E-6	1.39	1.94	11.7	3.8	6.6	5	13
				TRAVEL TIME				
		1.39	1.94	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)
						4.5	0.0	11.7

MARKET PLACE FILING NO. 1- PDR & FDR - DEVELOPED CONDITIONS
(RATIONAL METHOD Q=CIA)

BASIN	TOTAL FLOWS				AREA TOTAL	WEIGHTED		OVERLAND				CHANNEL				Tc TOTAL	INTENSITY		COMMENTS
	Q_5	Q_{100}	CA(equiv.)			C_5	C_{100}	C_5	Length	Slope	Tco	Length	Slope	Velocity	Tcc		I_5	I_{100}	
	(c.f.s.)	(c.f.s.)	5 YR	100 YR	(Ac)				(ft)	(ft)	(min)	(ft)	(%)	(fps)	(min)	(min)	(in/hr)	(in/hr)	
D-1	7.0	13.2	1.38	1.45	1.53	0.90	0.95	0.90	5	2.0%	0.7	536	3.0%	3.5	2.6	5.0	5.1	9.1	
D-2	6.7	12.6	1.31	1.39	1.46	0.90	0.95	0.90	5	2.0%	0.7	624	3.0%	3.5	3.0	5.0	5.1	9.1	
D-4	5.9	11.1	1.16	1.23	1.29	0.90	0.95	0.90	5	2.0%	0.7	344	1.0%	2.0	2.9	5.0	5.1	9.1	
D-5	6.2	11.7	1.22	1.29	1.36	0.90	0.95	0.90	5	2.0%	0.7	336	1.0%	2.0	2.8	5.0	5.1	9.1	
D-6	9.5	17.8	2.02	2.13	2.24	0.90	0.95	0.90	5	2.0%	0.7	925	1.6%	2.5	6.1	6.8	4.7	8.4	
D-7	9.4	17.6	1.96	2.07	2.18	0.90	0.95	0.90	5	2.0%	0.7	867	1.6%	2.5	5.7	6.4	4.8	8.5	
D-11	9.2	17.3	1.96	2.07	2.18	0.90	0.95	0.90	5	2.0%	0.7	928	1.6%	2.5	6.1	6.8	4.7	8.3	
D-12	9.3	17.5	1.94	2.04	2.15	0.90	0.95	0.90	5	2.0%	0.7	848	1.6%	2.5	5.6	6.3	4.8	8.5	
D-14	11.6	21.7	2.36	2.49	2.62	0.90	0.95	0.90	5	2.0%	0.7	873	2.0%	2.8	5.1	5.8	4.9	8.7	
D-15	10.5	19.7	2.09	2.20	2.32	0.90	0.95	0.90	5	2.0%	0.7	797	2.0%	2.8	4.7	5.4	5.0	8.9	
D-16	40.2	75.6	7.88	8.32	8.76	0.90	0.95	0.90	10	2.0%	0.9	647	2.0%	2.8	3.8	5.0	5.1	9.1	
D-17	92.9	174.5	21.50	22.70	23.89	0.90	0.95	0.90	10	2.0%	0.9	1,315	2.0%	2.8	7.7	8.7	4.3	7.7	
D-18	3.6	6.8	0.72	0.76	0.81	0.90	0.95	0.90	35	2.0%	1.8	760	2.8%	3.3	3.8	5.5	5.0	8.8	
D-19	27.6	51.8	5.40	5.70	6.00	0.90	0.95	0.90	25	2.0%	1.5	425	2.0%	2.8	2.5	5.0	5.1	9.1	
D-20	42.9	80.7	8.43	8.90	9.37	0.90	0.95	0.90	145	5.5%	2.6	475	2.5%	3.2	2.5	5.1	5.1	9.1	
D-21	44.8	85.2	11.12	11.87	15.03	0.74	0.79	0.90	140	6.8%	2.4	1,385	2.0%	2.8	8.1	10.5	4.0	7.2	
D-22	4.1	7.7	1.15	1.22	1.28	0.90	0.95	0.25	35	2.0%	7.5	1,305	2.8%	3.3	6.6	14.0	3.6	6.3	
D-23	43.6	82.0	11.63	12.27	12.92	0.90	0.95	0.90	25	5.3%	1.1	2,100	2.4%	3.1	11.4	12.5	3.8	6.7	
D-24	74.1	139.2	15.88	16.76	17.64	0.90	0.95	0.90	105	5.7%	2.2	1,030	3.3%	3.6	4.7	6.9	4.7	8.3	
D-25	15.8	29.8	3.69	3.90	4.10	0.90	0.95	0.25	25	2.9%	5.6	550	2.0%	2.8	3.2	8.8	4.3	7.6	
D-26	4.3	8.0	1.28	1.35	1.42	0.90	0.95	0.25	35	2.0%	7.5	1,735	2.8%	3.3	8.7	16.2	3.3	5.9	
D-27	3.3	6.3	0.77	0.82	0.86	0.90	0.95	0.25	25	2.0%	6.3	440	2.4%	3.1	2.3	8.7	4.3	7.7	
D-28	1.7	3.2	0.42	0.45	0.47	0.90	0.95	0.25	25	2.0%	6.3	360	0.6%	1.5	3.9	10.2	4.1	7.2	
D-29	28.4	53.4	10.03	10.58	11.14	0.90	0.95	0.25	230	3.5%	16.0	955	1.5%	2.4	6.6	22.5	2.8	5.0	
D-30	12.1	27.8	3.29	4.23	9.41	0.35	0.45	0.25	60	10.0%	5.8	1,020	1.4%	2.3	7.3	13.0	3.7	6.6	
D-31	0.5	1.2	0.11	0.14	0.32	0.35	0.45	0.25	10	2.0%	4.0	285	0.6%	1.5	3.1	7.1	4.6	8.2	
OFFSITE	16.4	37.5	4.89	6.28	13.96	0.35	0.45	0.25	20	2.0%	5.7	1,370	1.2%	2.2	10.4	16.1	3.4	6.0	
Formula:	C*I*A	C*I*A	Q/I	Q/I							*1			*2	*3	Tco+Tcc	*4	*6	
					156.71									20			1.5	2.67	

1* Tco = 1.87*(1.1-C5)*(L^0.5)*((S*100)^-0.33) (DCM page 5-11)
2* Vc = 20*S^0.5 (USDCM RO-4)
3* Tcc = 1/V*L/60
4* I_5 = (26.65*1.50)/(10+Tc)^0.76 (City Letter of 1/7/2003)
6* I_{100} =(26.65*2.67)/(10+Tc)^0.76 (City Letter of 1/7/2003)

MARKET PLACE FILING NO. 1- PDR & FDR - DEVELOPED CONDITIONS
SURFACE ROUTING

DESIGN POINT	CONTRIBUTING BASINS	CA(equivalent) CA(5)	CA(100)	Tc (min.)	INTENSITY I(5) (in/hr)	I(100) (in/hr)	TOTAL FLOWS Q(5) (cfs)	Q(100) (cfs)
1	D-1	1.38	1.45	5.0	5.2	9.1	7.1	13.2
				TRAVEL TIME				
		1.38	1.45	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)
						2.9	0.0	5.0
2	D-2	1.31	1.39	5.0	5.2	9.1	6.8	12.6
				TRAVEL TIME				
		1.31	1.39	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)
						2.8	0.0	5.0
3	D-4	1.16	1.23	5.0	5.2	9.1	6.0	11.1
				TRAVEL TIME				
		1.16	1.23	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)
					83	3.3	0.4	5.4
5	D-5	1.22	1.29	5.0	5.2	9.1	6.4	11.7
				TRAVEL TIME				
		1.22	1.29	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)
						4.5	0.0	5.0
6	D-7	1.96	2.07	6.4	4.8	8.4	9.4	17.4
				TRAVEL TIME				
		1.96	2.07	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)
						4.5	0.0	6.4
7	DP-6 (INLET)	0.62	0.80	6.4	4.8	8.4	40.8	76.5
	D-16	7.88	8.32	TRAVEL TIME				
		8.51	9.12	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)
					77	4.7	0.3	6.7
10	D-6	2.02	2.13	6.8	4.7	8.2	9.5	17.5
				TRAVEL TIME				
		2.02	2.13	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)
					83	5.8	0.2	7.0
11	D-19	5.40	5.70	8.8	4.3	7.4	38.7	71.3
	D-25	3.69	3.90	TRAVEL TIME				
		9.09	9.60	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)
						0.0	0.0	8.8
13	D-12	1.94	2.04	6.3	4.8	8.4	9.4	17.2
				TRAVEL TIME				
		1.94	2.04	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)
					98	6.1	0.3	6.5

DESIGN POINT	CONTRIBUTING BASINS	CA(equivalent) CA(5)	CA(100)	Tc (min.)	INTENSITY I(5) (in/hr)	I(100) (in/hr)	TOTAL FLOWS Q(5) (cfs)	Q(100) (cfs)
14	D-11	1.96	2.07	6.8	4.7	8.2	9.2	17.0
				TRAVEL TIME				
		1.96	2.07	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)
						5.2	0.0	6.8
15	D-15	2.09	2.20	5.4	5.1	8.9	10.6	19.6
				TRAVEL TIME				
		2.09	2.20	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)
					347	2.0	2.9	8.3
16	D-14	2.36	2.49	5.8	5.0	8.6	11.7	21.5
				TRAVEL TIME				
		2.36	2.49	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)
					62	9.0	0.1	5.9
17	DP-7	8.51	9.12	8.7	4.3	7.5	157.9	300.6
	DP-13	1.94	2.04					
	D-17	21.50	22.70					
	OFFSITE	4.89	6.28	TRAVEL TIME				
		36.83	40.14	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)
					36	1.5	0.4	9.1
18	DP-17	36.83	40.14	5.9	4.9	8.6	181.2	345.5
	DP-15 (INLET)	0.00	0.07					
	DP-16 (INLET)	0.00	0.00	TRAVEL TIME				
		36.83	40.21	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)
					139	8.4	0.3	6.2
19	D-18	0.72	0.76	5.5	5.0	8.8	3.6	6.7
				TRAVEL TIME				
		0.72	0.76	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)
					62	9.0	0.1	5.7
20	D-24	15.88	16.76	6.9	4.7	8.2	74.2	136.9
				TRAVEL TIME				
		15.88	16.76	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)
					139	8.4	0.3	7.2
21	D-26	1.28	1.35	16.2	3.2	5.7	10.2	12.3
	DP-10 (INLET)	0.64	0.82					
	D-22	1.15	1.22					
	DP-19 (INLET)	0.06	0.04	TRAVEL TIME				
		3.13	2.17	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)
					139	8.4	0.3	16.5
22	D-27	0.77	0.82	8.7	4.3	7.5	3.3	6.1
	DP 21 (INLET)	0.00	0.00	TRAVEL TIME				
		0.77	0.82	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)
					139	8.4	0.3	8.9

DESIGN POINT	CONTRIBUTING BASINS	CA(equivalent) CA(5)	CA(100)	Tc (min.)	INTENSITY I(5) (in/hr)	I(100) (in/hr)	TOTAL FLOWS Q(5) (cfs)	Q(100) (cfs)
23	DP-11	9.09	9.60	10.5	4.0	6.9	39.2	72.2
	DP-22 (INLET)	0.77	0.82					
				TRAVEL TIME				
		9.86	10.41	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)
					139	8.4	0.3	
25	DP-18	36.83	40.21	13.0	3.6	6.3	221.9	1479.1
	POND WU	19.44	188.25					
	DP-14	1.96	2.07					
	D-30	3.29	4.23					
				TRAVEL TIME				
		61.53	234.76	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)
					83	5.8	0.2	13.3
26	DP-3 (INLET)	0.00	0.02	7.2	4.6	8.1	160.9	788.5
	DP-5 (INLET)	0.00	0.09					
	DP-2 (INLET)	0.29	0.41					
	DP-20	15.88	16.76					
	BECKETT PROP	3.06	3.23					
	DP-MN1	7.07	37.20					
	DP-MN2	8.61	40.20	TRAVEL TIME				
		34.91	97.91	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)
						5.8	0.0	7.2
27	D-31	0.11	0.14	7.1	4.6	8.1	0.5	1.2
				TRAVEL TIME				
		0.11	0.14	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)
					139	8.4	0.3	7.3
28	D-28	0.42	0.45	10.2	4.0	7.0	1.7	3.1
				TRAVEL TIME				
		0.42	0.45	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)
					139	8.4	0.3	10.5

MARKET PLACE FILING NO. 1- PDR & FDR - DEVELOPED CONDITIONS
INLET CALCULATIONS

							Q_5						Q_{100}					
DP	Inlet size L(i)	INLET TYPE	CROSS SLOPE	STREET SLOPE	Q(5)	Q(100)	Qi	CA(eqv.)	FB	CA(eqv.)	DEPTH (max)	SPREAD	Qi	CA(eqv.)	FB	CA(eqv.)	DEPTH (max)	SPREAD
2	15	FLOW-BY	2.0%	0.5%	7	13	5.3	1.02	2	0.29	0.42	16.9	8.8	0.97	4	0.41	0.51	21.2
3	10	SUMP	2.0%	SAG	6	11	6.0	1.16	0	0.00	0.50		10.9	1.20	0	0.02	0.50	
5	10	SUMP	2.0%	SAG	6	12	6.4	1.22	0	0.00	0.50		10.9	1.20	1	0.09	0.50	
6	15	FLOW-BY	2.0%	1.0%	9	17	6.4	1.34	3	0.62	0.42	16.7	10.7	1.27	7	0.80	0.51	21.0
10	15	FLOW-BY	2.0%	1.0%	9	17	6.5	1.37	3	0.64	0.42	16.8	10.7	1.31	7	0.82	0.51	21.1
13	20	SUMP	2.0%	SAG	9	17	9.4	1.94	0	0.00	0.50		17.2	2.04	0	0.00	0.50	
14	20	SUMP	2.0%	SAG	9	17	9.2	1.96	0	0.00	0.50		17.0	2.07	0	0.00	0.50	
15	20	SUMP	2.0%	SAG	11	20	10.6	2.09	0	0.00	0.50		18.9	2.14	1	0.07	0.50	
16	25	SUMP	2.0%	SAG	12	22	11.7	2.36	0	0.00	0.50		21.5	2.49	0	0.00	0.50	
19	5	FLOW-BY	2.0%	2.8%	1	1	0.4	0.09	0	0.06	0.19	5.3	0.4	0.05	0	0.04	0.19	5.4
21	25	SUMP	2.0%	SAG	10	12	10.2	3.13	0	0.00	0.50		12.3	2.17	0	0.00	0.50	
22	5	SUMP	2.0%	SAG	3	6	3.3	0.77	0	0.00	0.50		6.1	0.82	0	0.00	0.50	
27	5	FLOW-BY	2.0%	0.6%	1	1	0.4	0.08	0	0.03	0.21	6.2	0.8	0.10	0	0.05	0.25	8.4
28	10	FLOW-BY	2.0%	0.6%	2	3	1.4	0.35	0	0.08	0.28	9.7	2.3	0.33	1	0.12	0.33	12.2

STREET CAPACITY

VERTICAL CURB

FOR 1/2 STREET SECTION

	Formula	Slope	Slope	n	Type	flow	Q_{max}	Q	Comments
Residential	$Q=171.7\ S^{1/2}$	0.5%	0.02	0.016	V	0.5	34	12.0	
		1.0%					34	17.0	
		1.5%					34	20.8	
		2.0%					34	24.1	
		2.5%					34	26.9	
		3.0%					34	29.5	
		3.5%					34	31.8	
		4.0%					34	34.0	
Collector/Arterial	$Q=171.7\ S^{1/2}$	0.5%	0.02	0.016	V	0.5	34	12.0	
		1.0%					34	17.0	
		1.5%					34	20.8	
		2.0%					34	24.1	
		2.5%					34	26.9	
		3.0%					34	29.5	
		3.5%					34	31.8	
		4.0%					34	34.0	

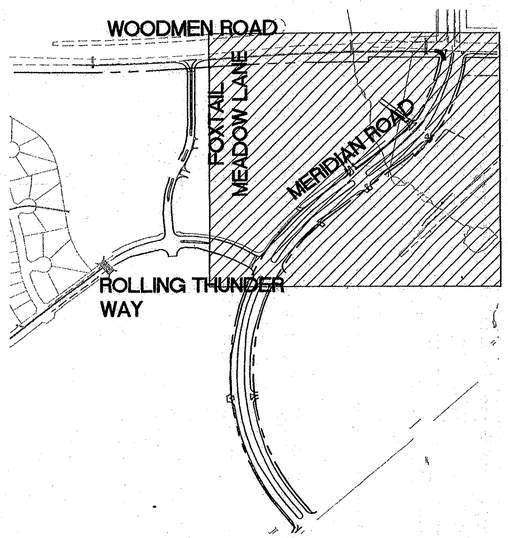
STREET CAPACITY

RAMP CURB

FOR 1/2 STREET SECTION

	Formula	Slope	Slope	n	Type	flow	Q_{max}	Q	Comments
Residential	$Q=112.6\ S^{1/2}$	0.5%	0.02	0.016	R	0.5	20	8.0	County ramp curb is 6"
		1.0%					20	11.3	
		1.5%					20	13.8	
		2.0%					20	15.9	
		2.5%					20	17.8	
		3.0%					20	19.5	
		3.15%					20	20.0	

DEVELOPED DRAINAGE PLAN – FALCON HIGHLANDS MARKET PLACE FILING NO. 1



KEY MAP
N.T.S.

LEGEND

D–25 / AREA / Q5 Q100	BASIN DATA
12	DESIGN POINT
HP	ROAD HIGH POINT
LP	ROAD LOW POINT
1.2%	ROAD GRADE
	BASIN BOUNDARY
	FLOW PATH
	EX. 10' CONTOUR
	EX. 2' CONTOUR
	PR 10' CONTOUR
	PR 2' CONTOUR
	WEST TRIBUTARY FLOODPLAIN (LOMR SUBMITTAL–AWAITING APPROVAL)
	MIDDLE TRIBUTARY FLOODPLAIN (CLOMR SUBMITTAL–APPROVED MAY 2005)
	EXISTING WETLANDS

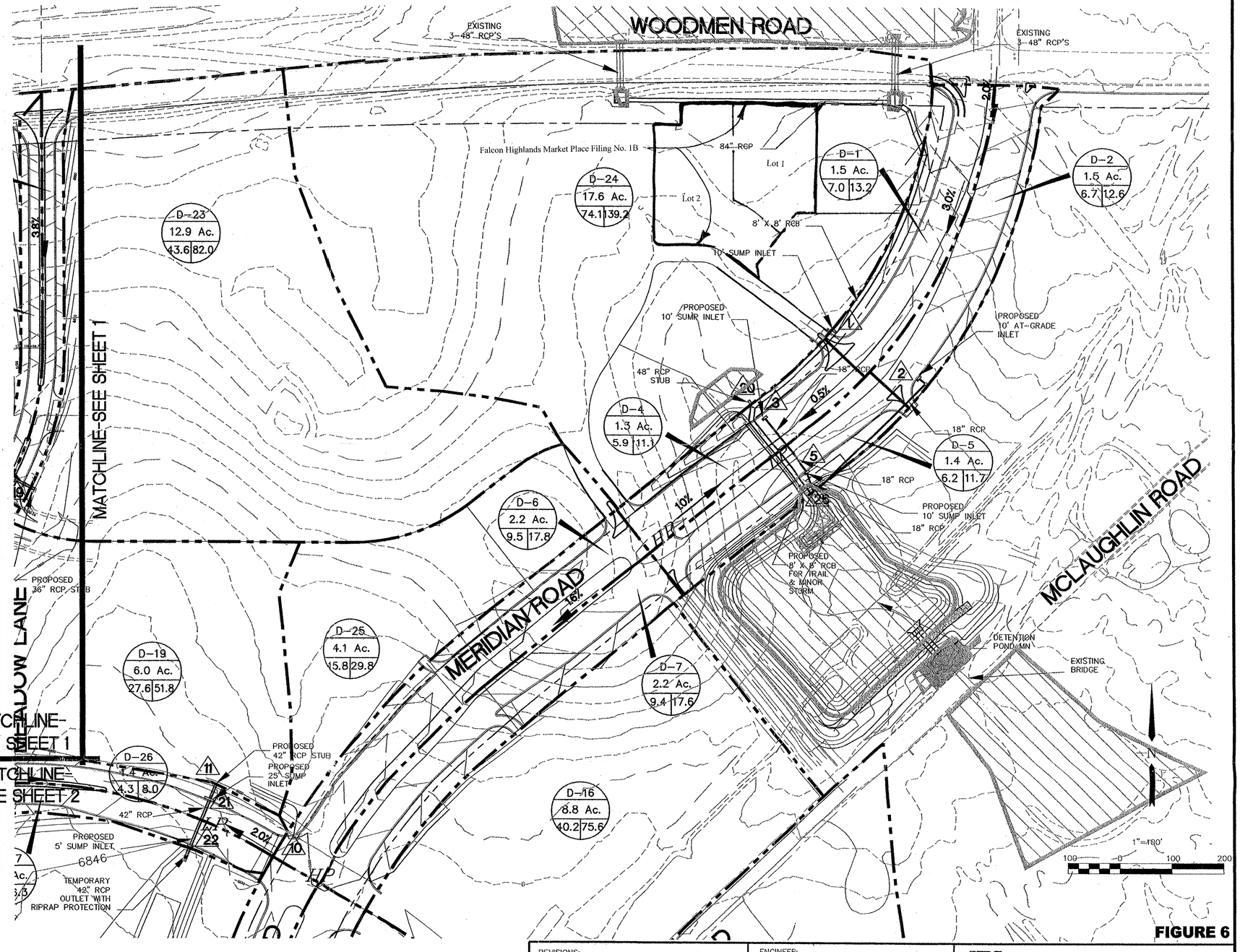


FIGURE 6

REVISIONS:		
NO.	DESCRIPTION	DATE

ENGINEER:
DESIGNED BY: CMS DATE: 8/9/05
DRAWN BY: CMS DATE: 8/9/05
CHECKED BY: XXX DATE: XX/XX/XX

48 HOURS BEFORE YOU DIG, CALL UTILITY LOCATORS
1–800–922–1987
(SEE COVER FOR LIST OF UTILITY CONTACTS)

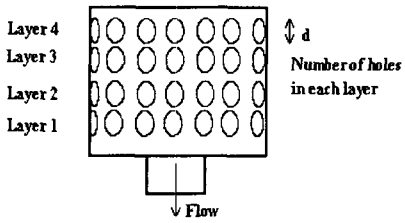
URS
9960 FEDERAL DRIVE #300
COLORADO SPRINGS, COLORADO 80921
PHONE: (719) 531–0001
FAX: (719) 531–0007

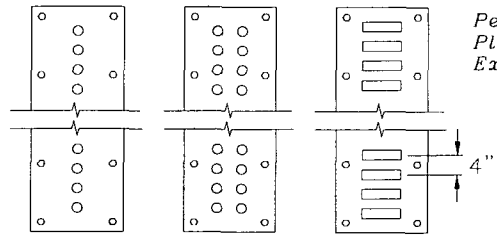
PROJECT F.H. MARKET PLACE – PDR/FDR
SHEET TITLE DEVELOPED DRAINAGE PLAN
FROM _____ TO _____
JOB NO. 21711426 SHEET 4 OF 4

Appendix G: Water Quality Pond Calculations

STAGE-DISCHARGE SIZING OF THE WATER QUALITY CAPTURE VOLUME (WQCV) OUTLET

Project: Armstrong Development
Basin ID: Lowes Site Incl. Meridian Crossing





WQCV Design Volume (Input):

Catchment Imperviousness, I_a = 99.0 percent
Catchment Area, A = 27.6600 acres
Depth at WQCV outlet above lowest perforation, H = 12.00 *inches*
Number of layers, N_L = 3
Vertical distance between layers, h = 4.00 inches
Orifice discharge coefficient, C_o = 0.65

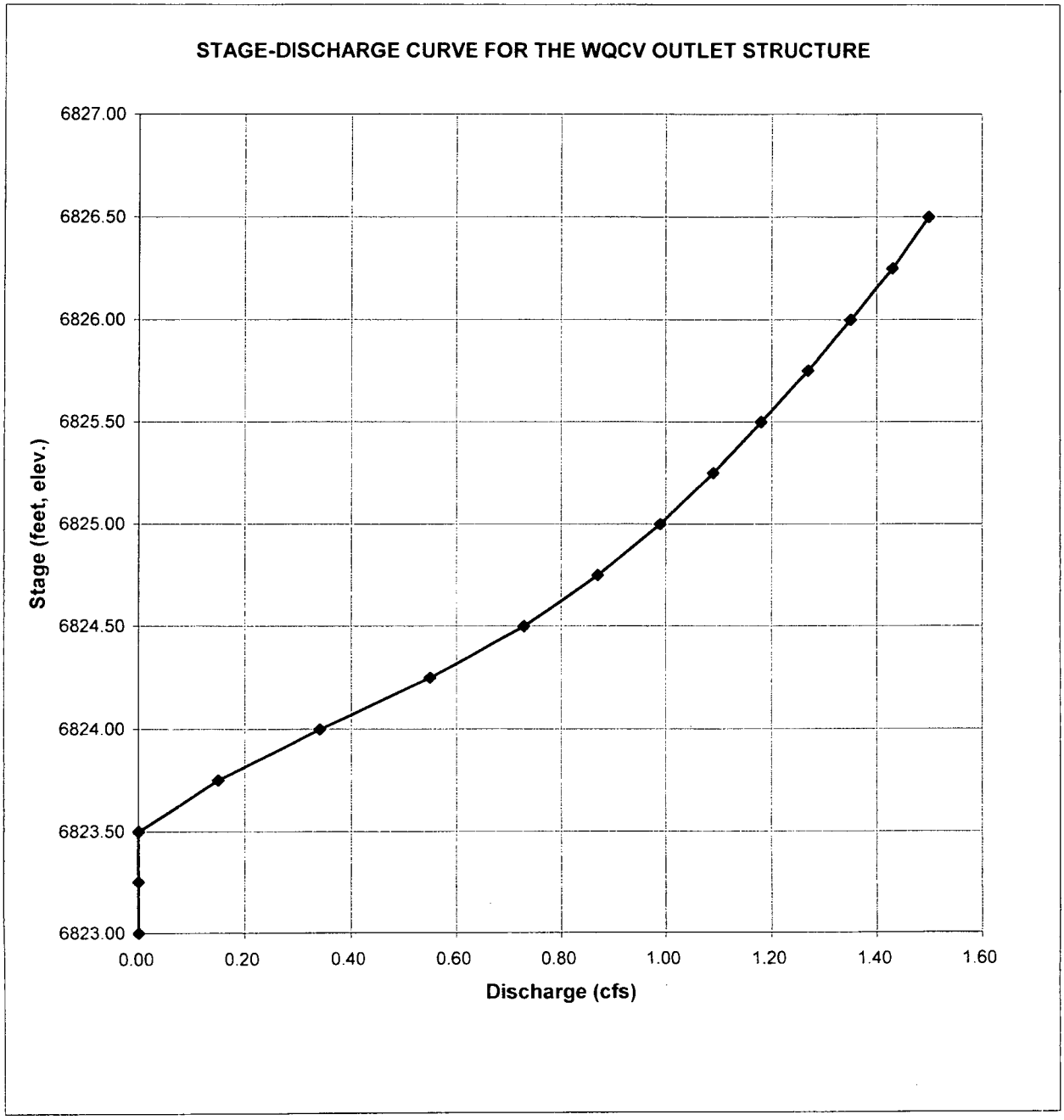
Diameter of holes, D = in.
Number of holes per layer, N =
OR
Height of slot, H = 2.00 in.
Width of slot, W = 4.24 in.

Outlet Design Information (Output):

Water Quality Capture Volume (1.0 * (0.91 * I3 - 1.19 * I2 + 0.78 * I)), WQCV = 0.49 watershed inches
Design Volume (WQCV / 12 * Area * 1.2) Vol = 1.3522 acre-feet
Recommended maximum outlet area per layer (based on 4" vertical spacing of layerss), A_o = 8.47 square inches
Total opening area at each layer, A_o = 8.47 square inches
Total opening area at each layer, A_o = 0.0588 square feet

Calculation of Collection Capacity :

Stage ft (input)	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6	Layer 7	Layer 8	Layer 9	Layer 10	Layer 11	Layer 12	Flow cfs
	Central Elevations of Layers of Holes in feet												
	6823.50	6823.83	6824.17										
	Collection Capacity for Each Layer of Holes in cfs												
6823.00	0.000	0.000	0.000										0.00
6823.25	0.000	0.000	0.000										0.00
6823.50	0.000	0.000	0.000										0.00
6823.75	0.153	0.000	0.000										0.15
6824.00	0.217	0.127	0.000										0.34
6824.25	0.266	0.199	0.087										0.55
6824.50	0.307	0.251	0.176										0.73
6824.75	0.343	0.294	0.234										0.87
6825.00	0.376	0.332	0.280										0.99
6825.25	0.406	0.366	0.319										1.09
6825.50	0.434	0.397	0.354										1.18
6825.75	0.460	0.425	0.386										1.27
6826.00	0.485	0.452	0.415										1.35
6826.25	0.509	0.477	0.443										1.43
6826.50	0.532	0.501	0.468										1.50
	#N/A	#N/A	#N/A										#N/A
	#N/A	#N/A	#N/A										#N/A
	#N/A	#N/A	#N/A										#N/A
	#N/A	#N/A	#N/A										#N/A
	#N/A	#N/A	#N/A										#N/A
	#N/A	#N/A	#N/A										#N/A

STAGE-DISCHARGE SIZING OF THE WATER QUALITY CAPTURE VOLUME (WQCV) OUTLET

Project: Armstrong Development
Basin ID: Lowes Site Incl. Meridian Crossing