FINAL DRAINAGE REPORT FOR
LOT 2 BECKETT AT WOODMEN HILLS FILING NO. 3
7368 MCLAUGHLIN ROAD
COLORADO SPRINGS, COLORADO

October 4, 2017
Revised November 2018

Prepared For:

TBONE CONSTRUCTION
1310 FORD STREET
COLORADO SPRINGS, CO 80915
(719) 570-1456

Prepared By:

TERRA NOVA ENGINEERING, INC.
721 S. 23RD STREET
Colorado Springs, CO 80904
(719) 635-6422

Job No. 1729.00
PCD FILE NO. PPR-17-055

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CERTIFICATION STATEMENT:

Engineers Statement

This 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 master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparing this report.

L Ducett, P.E. 32339 Seal

Developers Statements

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

Shops at McLaughlin 2 LLC
Business Name

By: _____
Title: Manager
Address: 3902 Mazeland Rd
Colorado Springs, Co 80915

El Paso County Approval:

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

Jennifer Ervine, P.E. Date
County Engineer / ECM Administrator

Conditions:

FINAL DRAINAGE LETTER FOR
LOT 2 BECKETT AT WOODMEN HILLS FILING NO. 3
7368 MCLAUGHLIN ROAD
COLORADO SPRINGS, COLORADO

PURPOSE

The purpose of this Final Drainage Report is to identify and analyze the existing drainage patterns, determine existing runoff quantities and to analyze the current development of this site as a commercial site. This lot was previously platted with an existing drainage report entitled "Final Drainage Report for Beckett at Woodmen Hills Filing 3" by URS dated May 27, 2003. The proposed use and development is in conformance with the previously approved report.

GENERAL DESCRIPTION

This Final Drainage Letter (F.D.L.) for the site located at 7368 McLaughlin Road is an analysis of approximately 37,497 square feet. The site is currently vacant and is platted as Lot 2 Beckett at Woodmen Hills Filing No. 3. This area is part of a previous study entitled "Final Drainage Report for Becket at Woodmen Hills Filing No. 3" by URS dated May 27, 2003. The property is located in the northwest quarter of Section 7, Township 13 South, Range 64 West of the 6th Principal Meridian in the El Paso County, Colorado, near the intersection of McLaughlin and Woodmen Roads (See vicinity map, Appendix A) More specifically, the site is bounded by platted acreage properties with the same zoning on all sides.

The site lies within the Falcon Drainage Basin

The site consists of Columbine gravelly sandy loam (19) and is part of the hydrologic soil group 'B' therefore hydrologic group "B" was used to represent the dominant soil type. (See map in appendix)

The study area consists of undeveloped land consisting of prairie vegetation. The existing topography is sloping from the north west to the south east.

HISTORIC DRAINAGE CONDITIONS- Basin 1 from the URS Report

Currently the existing storm runoff drains overland to the southwest via sheet flow and then into the existing McLaughlin Road curb and gutter and into the existing 10' sump inlet at the south east corner of the site. From here, the flow continues in existing storm sewer to the existing regional detention pond 5 east of the site. This pond was designed with water quality and detention volume for this developed site. Total onsite existing flows from approximately 0.88 acres is 0.2 cfs in the 5 year event and 1.5 cfs in the 100 year event.

DEVELOPED DRAINAGE CONDITIONS

In the proposed condition, there will be an onsite storm gutter system that will convey flows to the existing inlet in McLaughlin Road. This inlet is sized for the developed flows. The sizing and basin areas for the onsite storm gutters are shown on the map and calculations in the appendix. The roof of the proposed building will drain into a proposed storm gutter.

Basin A, B, C and D are roof areas that will drain into the proposed storm gutter in Basin E. Flows at each point are less than 0.6 cfs in both the 5 and 100 year events.

Basins E (0.22 acres) has sheet and channel flow, and flow from the roof basins, that will discharge into a private road at Design Point 2. These combined flows will be approximately 3.6 cfs in the 100 year even and will be directed to the existing inlet at the south east corner of the site.

Basin F (0.28 acres) will flow much as it does today directly into the existing inlet. It will join with flows from Basin E and Basin G for total combined flows of 4.0 cfs in the 5 year event and 3.6 cfs in the 100 year event at Design Point 1, at the existing inlet.

These flows are consistent with the flows anticipated in the original drainage report for this area.

Please see detailed calculations in the appendix.

HYDROLOGIC CALCULATIONS

Hydrologic calculations were performed using the El Paso County Storm Drainage Design Criteria Manual Volumes 1 & 2 latest editions. The Rational Method was used to estimate storm water runoff anticipated from the 24-Hour Rainfall Depths listed in the El Paso County Drainage Criteria Manual. Figure 6-5 Intensity Frequency Duration Curve was used to obtain the intensity.

FLOODPLAIN STATEMENT

No portion of this site is within a designated F.E.M.A. floodplain, as determined by Flood Insurance Rate Map No. 08041C0575 F dated March 17, 1997 (see appendix).

EROSION CONTROL/WATER QUALITY

An erosion control plan is included with this drainage report as we are under one acre.

Below is a description of the BMP's to be used for erosion control and water quality. For more detail see the erosion control plan.

The first and most effective way to eliminate erosion is to minimize disturbance. Therefore, we have shown on the plan to reseed as soon as possible.

In an effort to protect receiving water and as part of the "four step process to minimize adverse impacts of urbanization" this site was analyzed in the following manner:

1. Runoff Reduction - The new improvements and impervious area to the site will be routed to an existing public extended detention basin (EDB). In addition to this, runoff will be trapped behind the back of walks and curbs. There is also the surface roughing that has been added to the undeveloped slopes that some of the flow will be trapped and infiltrate into the ground. These above mentioned items will reduce the volume of runoff using ponding and infiltration.
2. Stabilize Drainageways - By reducing the rate of runoff to the adjacent watershed the site is helping to stabilize the creek. The creek is currently stable as it was regraded with low flow water channel and stabilized with vegetation with previous development.
3. Provide WQCV- The EDB has been sized and designed to sufficiently capture the required

WQCV and slowly release it though the restrictor plate outlet, thereby also allowing solids and contaminants to settle out.

4. Need for Industrial and Commercial BMPs - This development will not include outdoor storage or the potential for the introduction of contaminants to the County's MS4, so no industrial or commercial BMPs are proposed or necessary.

CONSTRUCTION COST OPINION

Public Non Reimbursable

NOT APPLICABLE

Private Non Reimbursable

RipRap Rundown	2.3 CY	$85/ LF	$ 196
Storm Gutter Chase	32 LF	$250/ LF	$ 8,000
		Total:	**$ 8,196**

DRAINAGE FEES

This site is not being platted. Drainage or bridge fees do not apply.

MAINTENANCE

The proposed erosion control and water quality measures will be repaired and maintained by the property owner or owner's representative as required.

SUMMARY

Development of this site will not adversely affect the surrounding development at this time per the previously approved drainage reports, this site will drain into the existing storm sewer system that drains into the existing pond. See the attached previous drainage report in the appendix.

PREPARED BY:
TERRA NOVA ENGINEERING, INC.

L Ducett P.E.
President
Terra Nova Engineering, Inc.

BIBLIOGRAPHY

"El Paso County Drainage Criteria Manual-Volumes 1 & 2, latest edition"

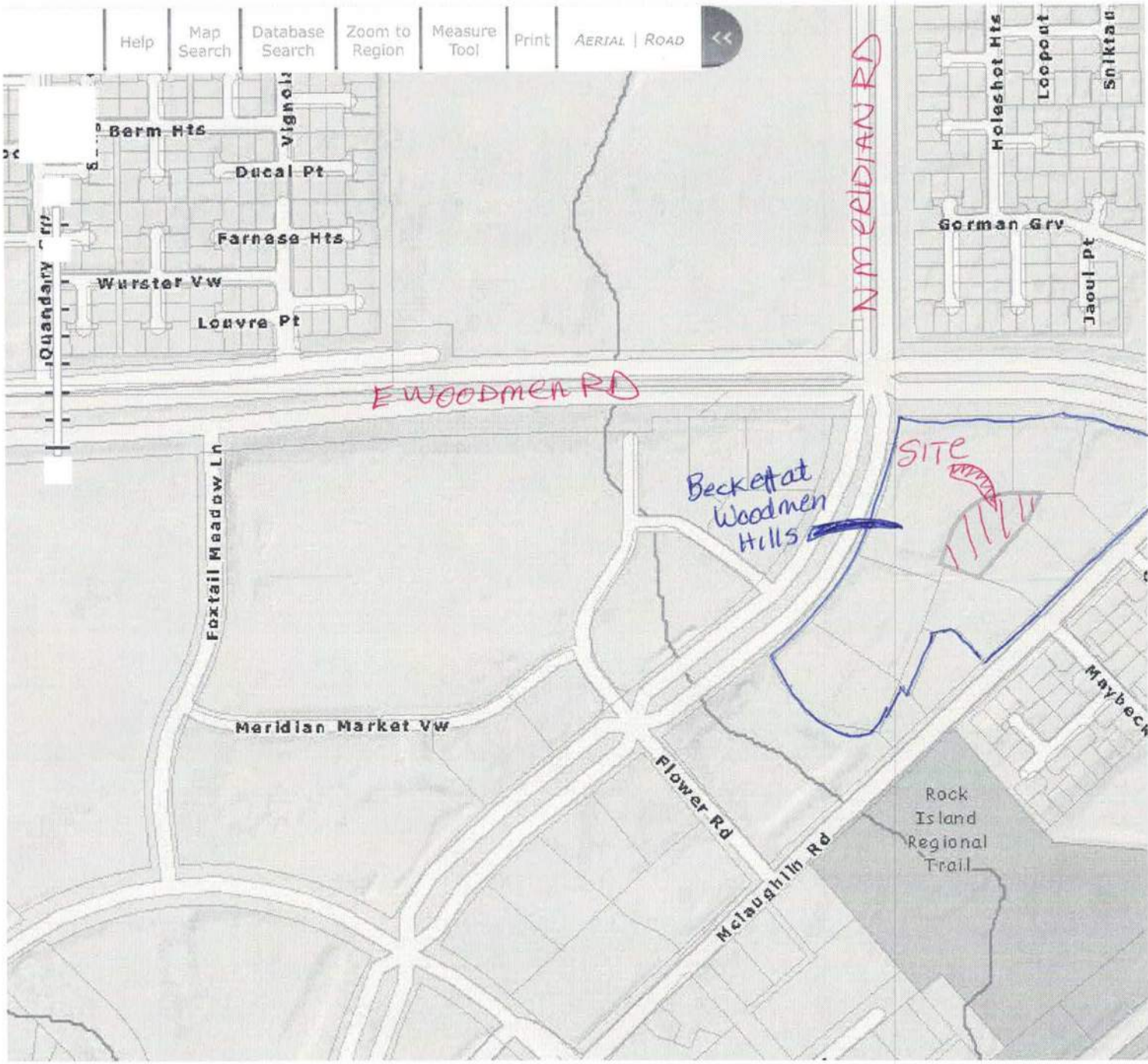
SCS Soils Map for El Paso County

Federal Emergency Management Agency (FEMA) flood maps

"Final Drainage Report for Beckett at Woodmen Hills Filing 3" by URS dated May 27, 2003

Falcon Drainage Basin Planning Study

VICINITY MAP


Help
Map Search
Database Search
Zoom to Region
Measure Tool
Print
AERIAL | ROAD
Berm Hts
Ducal Pt
Farnese Hts
Wurster Vw
Louvre Pt
Quandary Trl
E WOODMEN RD
NMERIDIAN RD
Holeshot Hts
Loopout
Sniktau
Gorman Grv
Jaoul Pt
Foxtail Meadow Ln
Becketat Woodmen Hills
SITE
Meridian Market Vw
Flower Rd
Mclaughlin Rd
Rock Island Regional Trail
Maybeck
0
200
400ft

NOT TO Scale

S.C.S. SOILS MAP

Soil Map—El Paso County Area, Colorado
(Lot 2 Beckett at Woodmen Hills Filing No. 3)

Map Scale: 1:590 if printed on A landscape (11" x 8.5") 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 15, Oct 10, 2017

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

Date(s) aerial images were photographed: May 22, 2016—Mar 9, 2017

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	0.6	100.0%
Totals for Area of Interest		**0.6**	**100.0%**

El Paso County Area, Colorado

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

Map Unit Setting

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

Map Unit Composition

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

Description of Columbine

Setting

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

Typical profile

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

Properties and qualities

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

Interpretive groups

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

Minor Components

Fluvaquentic haplaquolls

Percent of map unit:
Landform: Swales

Hydric soil rating: Yes

Other soils

Percent of map unit:
Hydric soil rating: No

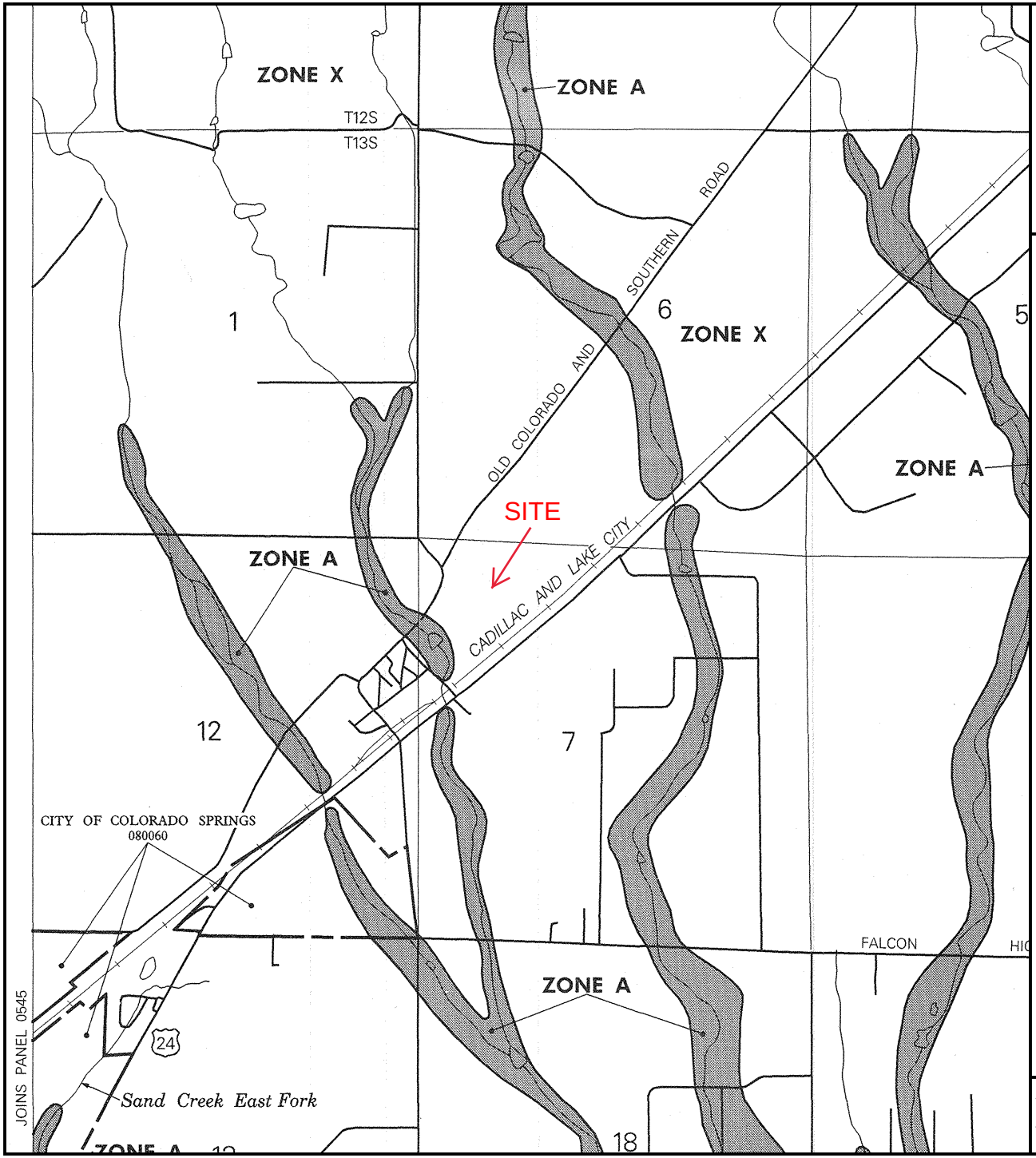
Pleasant

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

Data Source Information

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

FEMA FIRM MAP



APPROXIMATE SCALE IN FEET

2000 0 2000

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 575 OF 1300

(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	080060	0575	F
EL PASO COUNTY, UNINCORPORATED AREAS	080059	0575	F

MAP NUMBER
08041C0575 F

EFFECTIVE DATE:
MARCH 17, 1997

Federal Emergency Management Agency

HYDROLOGIC/HYDRAULIC CALCULATIONS

SHOPS AT MCLAUGHLIN II
AREA DRAINAGE SUMMARY

EXISTING CONDITIONS

		WEIGHTED		*OVERLAND*				*STREET / CHANNEL FLOW*				T_t	*INTENSITY*		*TOTAL FLOWS*	
BASIN	**AREA TOTAL**	C_5	C_{100}	C_5	**Length**	**Height**	T_C	**Length**	**Slope**	**Velocity**	T_t	**TOTAL**	I_5	I_{100}	Q_5	Q_{100}
	(Acres)	* For Calcs See Runoff Summary			*(ft)*	*(ft)*	*(min)*	*(ft)*	*(%)*	*(fps)*	*(min)*	*(min)*	*(in/hr)*	*(in/hr)*	*(c.f.s.)*	*(c.f.s.)*
EX-1	0.88	0.09	0.36	0.09	220	5.0	21.4	172	1.7%	2.5	1.1	22.5	2.9	4.8	0.2	1.5

SHOPS AT MCLAUGHLIN II
AREA DRAINAGE SUMMARY

DEVELOPED CONDITIONS

		WEIGHTED		*OVERLAND*				*STREET / CHANNEL FLOW*				T_t	*INTENSITY*		*TOTAL FLOWS*	
BASIN	**AREA TOTAL** *(Acres)*	C_5	C_{100}	C_5	**Length** *(ft)*	**Height** *(ft)*	T_C *(min)*	**Length** *(ft)*	**Slope** *(%)*	**Velocity** *(fps)*	T_t *(min)*	**TOTAL** *(min)*	I_5 *(in/hr)*	I_{100} *(in/hr)*	Q_5 *(c.f.s.)*	Q_{100} *(c.f.s.)*
		** For Calcs See Runoff Summary*														
A	0.04	0.73	1.00	0.73	0	0.0	0.0	45	2.0%	2.5	0.3	0.3	6.8	13.5	0.2	0.6
B	0.03	0.73	0.81	0.73	0	0.0	0.0	45	2.0%	2.5	0.3	0.3	6.8	13.5	0.1	0.3
C	0.03	0.78	0.87	0.78	0	0.0	0.0	45	2.0%	2.5	0.3	0.3	6.8	13.5	0.1	0.3
D	0.04	0.83	0.93	0.83	0	0.0	0.0	45	2.0%	2.5	0.3	0.3	6.8	13.5	0.2	0.4
E	0.22	0.81	0.88	0.81	30	2.0	1.6	215	0.7%	1.7	2.1	3.7	5.4	9.9	1.0	1.9
F	0.28	0.81	0.88	0.81	10	0.5	1.0	320	3.0%	3.5	1.5	2.5	5.7	10.7	1.3	2.6
G	0.24	0.81	0.88	0.81	30	1.0	2.0	180	0.5%	1.4	2.1	4.1	5.2	9.6	1.0	2.0

Calculated by: DLF

Date: 7/17/2018

Checked by: LD

SHOPS AT MCLAUGHLIN II
SURFACE ROUTING SUMMARY

	A	B	C	D	E
1	***DEVELOPED CONDITIONS***				
2				***Flow***	
3	***Design Point(s)***	***Contributing Basins***	***Area (Acres)***	Q_5	Q_{100}
4	1	***A,B,C,D,E,F,G***	0.88	4.0	8.2
5	2	***A,B,C,D,E***	0.36	1.7	3.6
6	3	***G***	0.24	1.0	2.0
7	4	***A***	0.04	0.2	0.6
8	5	***B***	0.03	0.1	0.3
9	6	***C***	0.03	0.1	0.3
10	7	***D***	0.04	0.2	0.4
11				Calculated by:	DLF
12				Date:	7/17/2018
13				Checked by:	LD

Shops at McLaughlin II
Area Runoff
Existing and Proposed

PROPOSED CONDITIONS

		DEVELOPED			*UNDEVELOPED*			*WEIGHTED*	
BASIN	**TOTAL AREA**	**AREA**	**C_5**	**C_{100}**	**AREA**	**C_5**	**C_{100}**	**C_5**	**C_{100}**
	(Acres)	***(Acres)***			***(Acres)***				
A	0.04	0.04	0.73	0.81	0.00	0.81	0.88	0.73	1.00
B	0.03	0.03	0.73	0.81	0.00	0.81	0.88	0.73	0.81
C	0.03	0.03	0.73	0.81	0.00	0.81	0.88	0.78	0.87
D	0.04	0.04	0.73	0.81	0.00	0.81	0.88	0.83	0.93
E	0.22	0.22	0.81	0.88	0.00	0.81	0.88	0.81	0.88
F	0.28	0.28	0.81	0.88	0.00	0.81	0.88	0.81	0.88
G	0.24	0.24	0.81	0.88	0.00	0.81	0.88	0.81	0.88

Shops at McLaughlin II
Area Runoff
Existing and Proposed

DEVELOPED CONDITIONS

		STREETS / IMPERVIOUS			*OVERLAND / NONIMPERVIO*			*WEIGHTED*	
BASIN	**TOTAL AREA** *(Acres)*	**AREA** *(Acres)*	**C_5**	**C_{100}**	**AREA** *(Acres)*	**C_5**	**C_{100}**	**C_5**	**C_{100}**
A	0.04	0.04	0.70	0.80	0.00	0.25	0.30	0.70	0.80
B	0.03	0.03	0.70	0.80	0.00	0.25	0.30	0.70	0.80
C	0.03	0.03	0.70	0.80	0.00	0.30	0.30	0.70	0.80
D	0.04	0.04	0.70	0.80	0.00	0.25	0.30	0.70	0.80
E	0.22	0.22	0.70	0.80	0.00	0.25	0.30	0.70	0.80
F	0.28	0.28	0.70	0.80	0.00	0.25	0.30	0.70	0.80
G	0.24	0.24	0.70	0.80	0.00	0.25	0.30	0.70	0.80

MANNING'S EQUATION for OPEN CHANNEL FLOW

Project: **Shops at MCLaughlin 2** Location: 2' Chase at Southwest Property Corner - Capacity

By: Dane Frank Date: 7/17/2018

Chk By: Date: version 12-2004

Mannings Formula

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

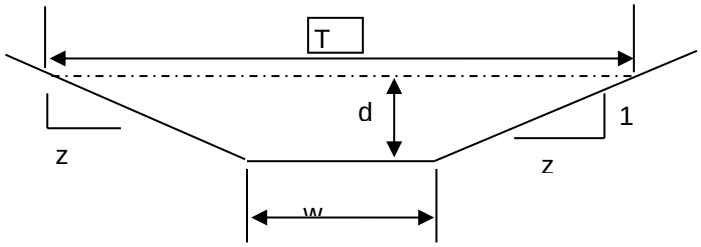
R = A/P

A = cross sectional area

P= wetted perimeter

S = slope of channel

n = Manning's roughness coefficient



$V = (1.49/n)R_h^{2/3}S^{1/2}$

Q = V x A

INPUT	
z (sideslope)=	0
z (sideslope)=	0
b (btm width, ft)=	2
d (depth, ft)=	0.5
S (slope, ft/ft)	0.15
n_{low} =	0.012
n_{high} =	0.012

Clear Data Entry Cells

				Low N		High N			
Depth, ft	Area, sf	Wetted Perimeter, ft	Hydraulic Radius, ft	Velocity, fps	Flow, cfs	Velocity, fps	Flow, cfs		
0.5	1.00	3.00	0.33	23.0561321	23.0561	23.05613	23.0561	T =	2
								Dm =	0.500
				Sc low =	0.0045	Sc high =	0.0045		
				.7 Sc	1.3 Sc	.7 Sc	1.3 Sc		
				0.0032	0.0059	0.0032	0.0059		

s_c = critical slope ft / ft

T = top width of the stream

d_m = a/T = mean depth of flow

Created by: Mike O'Shea

MANNING'S EQUATION for OPEN CHANNEL FLOW

Project:	**Shops at MCLaughlin 2**	Location:	4' Chase at Northeast of Building - Capacity	
By:	Dane Frank	Date:	7/17/2018	
Chk By:		Date:		version 12-2004

Mannings Formula

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

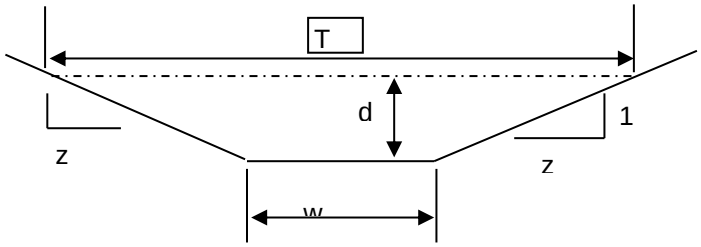
R = A/P

A = cross sectional area

P= wetted perimeter

S = slope of channel

n = Manning's roughness coefficient



$V = (1.49/n)R_h^{2/3}S^{1/2}$

Q = V x A

INPUT	
z (sideslope)=	0
z (sideslope)=	0
b (btm width, ft)=	4
d (depth, ft)=	0.5
S (slope, ft/ft)	0.0105
n_{low} =	0.012
n_{high} =	0.012

Clear Data Entry Cells

				Low N		High N			
Depth, ft	Area, sf	Wetted Perimeter, ft	Hydraulic Radius, ft	Velocity, fps	Flow, cfs	Velocity, fps	Flow, cfs		
0.5	2.00	5.00	0.40	6.88851501	13.777	6.888515	13.777	T =	4
								Dm =	0.500
				Sc low =	0.0036	Sc high =	0.0036		
				.7 Sc	1.3 Sc	.7 Sc	1.3 Sc		
				0.0025	0.0046	0.0025	0.0046		

s_c = critical slope ft / ft

T = top width of the stream

d_m = a/T = mean depth of flow

Created by: Mike O'Shea

MANNING'S EQUATION for OPEN CHANNEL FLOW

Project:	**Shops at MCLaughlin 2**	Location:	Northwest Pan Gutter - Capacity	
By:	Dane Frank	Date:	7/17/2018	
Chk By:		Date:		version 12-2004

Mannings Formula

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

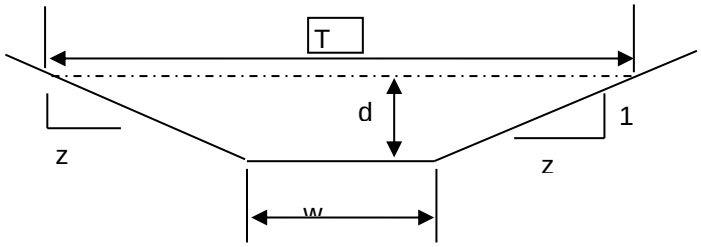
R = A/P

A = cross sectional area

P= wetted perimeter

S = slope of channel

n = Manning's roughness coefficient



$V = (1.49/n)R_h^{2/3}S^{1/2}$

Q = V x A

INPUT	
z (sideslope)=	100
z (sideslope)=	100
b (btm width, ft)=	0
d (depth, ft)=	0.68
S (slope, ft/ft)	0.005
n_{low} =	0.012
n_{high} =	0.012

Clear Data Entry Cells

				Low N		High N			
Depth, ft	Area, sf	Wetted Perimeter, ft	Hydraulic Radius, ft	Velocity, fps	Flow, cfs	Velocity, fps	Flow, cfs		
0.68	46.24	136.01	0.34	4.26525581	197.225	4.265256	197.225	T =	136
								Dm =	0.340
				Sc low =	0.0030	Sc high =	0.0030		
				.7 Sc	1.3 Sc	.7 Sc	1.3 Sc		
				0.0021	0.0039	0.0021	0.0039		

s_c = critical slope ft / ft

T = top width of the stream

d_m = a/T = mean depth of flow

Created by: Mike O'Shea

MANNING'S EQUATION for OPEN CHANNEL FLOW

Project:	**Shops at MCLaughlin 2**	Location:	Northeast Pan Gutter - Capacity	
By:	Dane Frank	Date:	7/17/2018	
Chk By:		Date:		version 12-2004

Mannings Formula

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

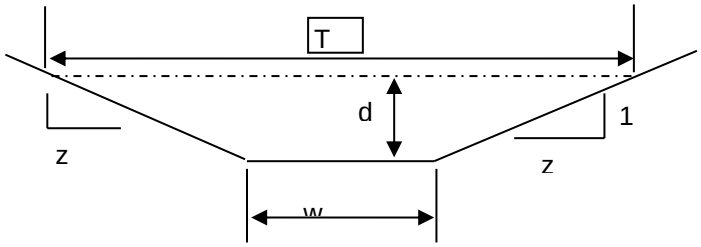
R = A/P

A = cross sectional area

P= wetted perimeter

S = slope of channel

n = Manning's roughness coefficient



$V = (1.49/n)R_h^{2/3}S^{1/2}$

Q = V x A

INPUT	
z (sideslope)=	45
z (sideslope)=	27
b (btm width, ft)=	0
d (depth, ft)=	0.89
S (slope, ft/ft)	0.005
n_{low} =	0.012
n_{high} =	0.012

Clear Data Entry Cells

				Low N		High N			
Depth, ft	Area, sf	Wetted Perimeter, ft	Hydraulic Radius, ft	Velocity, fps	Flow, cfs	Velocity, fps	Flow, cfs		
0.89	28.52	64.11	0.44	5.10228938	145.495	5.102289	145.495	T =	64.08
								Dm =	0.445
				Sc low =	0.0027	Sc high =	0.0027		
				.7 Sc	1.3 Sc	.7 Sc	1.3 Sc		
				0.0019	0.0036	0.0019	0.0036		

s_c = critical slope ft / ft

T = top width of the stream

d_m = a/T = mean depth of flow

Created by: Mike O'Shea

MANNING'S EQUATION for OPEN CHANNEL FLOW

Project:	**Shops at MCLaughlin 2**	Location:	Southeast Gutter Channel- Capacity	
By:	Dane Frank	Date:	7/17/2018	
Chk By:		Date:		version 12-2004

Mannings Formula

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

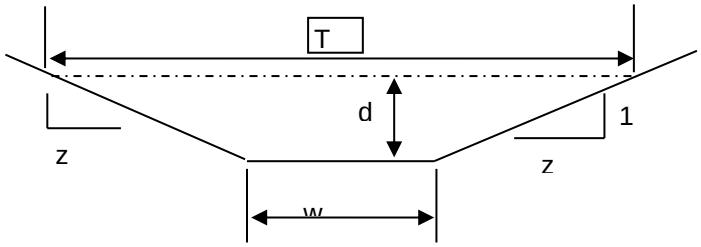
R = A/P

A = cross sectional area

P= wetted perimeter

S = slope of channel

n = Manning's roughness coefficient



$V = (1.49/n)R_h^{2/3}S^{1/2}$

Q = V x A

INPUT	
z (sideslope)=	0
z (sideslope)=	11
b (btm width, ft)=	0
d (depth, ft)=	0.5
S (slope, ft/ft)	0.007
n_{low} =	0.012
n_{high} =	0.012

Clear Data Entry Cells

				Low N		High N			
Depth, ft	Area, sf	Wetted Perimeter, ft	Hydraulic Radius, ft	Velocity, fps	Flow, cfs	Velocity, fps	Flow, cfs		
0.5	1.38	6.02	0.23	3.8699657	5.3212	3.869966	5.3212	T =	5.5
								Dm =	0.250
				Sc low =	0.0038	Sc high =	0.0038		
				.7 Sc	1.3 Sc	.7 Sc	1.3 Sc		
				0.0026	0.0049	0.0026	0.0049		

s_c = critical slope ft / ft

T = top width of the stream

d_m = a/T = mean depth of flow

Created by: Mike O'Shea

DRAINAGE MAP

125 N. WAHSATCH AVE., SUITE 101
COLORADO SPRINGS, CO. 80903

OFFICE: 719-635-6422
FAX: 719-635-6426
www.tnesinc.com

DRAINAGE SUMMARY

DESIGN POINT	BASIN TRIBUTARY	AREA (ACRES)	FLOW 5 YR (cfs)	FLOW 100 YR (cfs)
4	A	0.043	0.2	0.6
5	B	0.030	0.1	0.3
6	C	0.028	0.1	0.3
7	D	0.035	0.2	0.4
---	E	0.22	1.0	1.9
---	F	0.28	1.3	2.6
3	G	0.24	1.0	2.0
1	ALL	0.88	4.0	8.2
2	A,B,C,D,E	0.36	1.7	3.6

NOTES
1. THE SITE IS NOT WITHIN A FEMA 100 YEAR FLOOD PLAIN.

DRAINAGE LEGEND

P-7 / 12.22 — BASIN DESIGNATION / AREA IN BASIN (AC)

D — DESIGN POINT

BASIN BOUNDARY

ROAD AND DITCH FLOW DIRECTION

LEGEND

EXISTING CONTOURS – MINOR	6132
EXISTING CONTOURS – MAJOR	6130
UNERGROUND ELECTRIC LOCATES (RED FLAGS)	ULE(R)
UNDERGROUND GAS LOCATES (YELLOW FLAGS)	ULG(Y)
UNDERGROUND FIB. OPT. LOCATES (ORANGE FLAGS)	ULL(R)
UNDERGROUND WATER LOCATES (BLUE FLAGS)	ULW(B)
UNDERGROUND CTV LOCATES (ORANGE FLAGS)	ULCTV(O)
UNDERGROUND TEL. LOCATES (ORANGE FLAGS)	ULT(O)
PROPOSED FINISHED SURFACE	FS
PROPOSED FLOWLINE	FL
SPOT ELEVATION	SE
ASPHALT EDGE	AE
LOW POINT	LP
HIGH POINT	HP
EXISTING ELEVATION	12.00*
GRADE & DIRECTION	2.2%
TERRAIN STRING	TS
BOUNDARY MONUMENT	BM
CONCRETE CURB TOP BACK	TBC
PROPOSED CONTOUR	6932
EXISTING SPOT GRADE	× EX 7314.00
PROPOSED SPOT GRADE	× 7314.00
CONCRETE EDGE	CE
PROPOSED FINISHED GROUND	FG

N

2 SITE PLAN
1 of 4
1" = 20'-0"

20' 0 20' 40'

SCALE: 1"=20'

PCD FILE NO. PPR-17-055

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Terra Nova Engineering, Inc. — Creative Civil Engineering Solutions

Design Development Consultants @
T-BONE CONSTRUCTION, INC. GENERAL CONTRACTOR
1310 FORD STREET
COLORADO SPRINGS, CO 80915 (719) 570-1456

Revisions

#	DESCRIPTION	DATE

SHOPS AT MCLAUGHLIN II
7368 McLaughlin Road, Peyton CO 80831

D1-7074

DATE	8/07/18
CHECKED	LD
DRAWN BY	JF

PROPOSED DRAINAGE MAP

1/1

HISTORIC DRAINAGE REPORT

FINAL DRAINAGE REPORT FOR BECKETT AT WOODMEN HILLS FILING 3

May 27, 2003

Prepared for:

BECKETT DEVELOPMENT, LLP
P.O. BOX 49487
COLORADO SPRINGS, CO 80949

Prepared by:

URS
9960 FEDERAL DRIVE, SUITE 300
COLORADO SPRINGS, CO 80921

URS Project No. 21710935

CERTIFICATIONS

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.

Seal

William D. Chaffin, PE # 35136

Developer's Statement:

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

Beckett Development LLP
Beckett Development, LLP.

By: Audrey C Beckett

Title: Partner

Address: 1674 Pinon Glen Circle
Col Springs, Co, 80919

El Paso County's Statement

Filed in accordance with Section 51.1 of the El Paso Land Development Code, as amended.

John A. McCarty
John McCarty, County Engineer / Director

7-8-03
Date

Conditions:

TABLE OF CONTENTS

LIST OF FIGURES

APPENDICES

PURPOSE

The purpose of this Final Drainage Report for Beckett at Woodmen Hills Filing 3 is to identify on-site drainage patterns and design adequate storm water facilities for routing and capturing developed storm water runoff.

This drainage report supercedes the previous drainage report submitted for Beckett at Woodmen Hills Filing No. 1. It contains the drainage information for the entire property as shown in Figure 1: Vicinity Map. This map includes areas previously platted as Beckett at Woodmen Hills Filing 1, Filing 2 and Woodmen Hills Filing 7D.

GENERAL LOCATION AND DESCRIPTION

Beckett at Woodmen Hills, Filing 3, is located approximately 1/2 mile north-northeast of Falcon, Colorado in El Paso County as shown on Figure 1, and further illustrated in Figure 2.

Filing 3, which is platted to be 9.21 acres, is located partly in Section 7, Township 13 South, Range 64 West, and partly in Section 12, Township 13 South, Range 65 West. Planned development for Filing 3 is commercial.

The terrain is generally flat with gentle northwest to southeast slopes ranging from 1% to 3%. The vegetation is typical eastern Colorado prairie grasses with little or no shrubs. Trees are present only near the existing drainage ways. The intermittent streams drain into the Black Squirrel Creek Basin which ultimately outfalls into the Arkansas River.

The site and surrounding area have soil characteristics of hydrologic soil Group A (Columbine and Blakeland) as classified by the Soil Conservation Service (See Figure 4). There are no irrigation facilities, utilities or other encumbrances that affect the drainage analysis of this site.

A FEMA regulated flood plain has been identified running adjacent with Filing 3 as shown in Figure 3.

The drainage design for Beckett at Woodmen Hills Filing 3 is consistent with the Final Drainage Report for Beckett at Woodmen Hills Filing 1 dated March 8, 2001.

DRAINAGE BASINS AND SUB-BASINS

The Falcon Basin Drainage Basin Planning Study was completed and adopted by El Paso County in December 2000. In addition, a Drainage Plan and Report was submitted to El Paso County for Phase III and Filing 7 Woodmen Hills in February 1999. This report is supplemental to the 1999 report. Drainage Reports have also been accepted and approved for Woodmen Hills Filings 1 through 11 and Drainage Letters have been approved for the Lot 3, Beckett at Woodmen Hills Filaing 1 and Lot 2, Beckett at Woodmen Hills Filing No. 2.

Developed condition basins for the Falcon Basin have been detailed in the previously mentioned Phase III Preliminary and Filing 7 Final Drainage and Erosion Control Report. These basin boundaries and designations are consistent with the earlier MDDP and Preliminary and Final Drainage Reports submitted for Woodmen Hills Subdivision Filing numbers 1 through 11 and remain consistent for this property. Beckett at Woodmen Hills Filing No. 3 is contained within basins 35A and 35B (the right-of-way for McLaughlin Road) as detailed in these previous reports.

DRAINAGE DESIGN CRITERIA

SCS Hydrologic Criteria

The SCS method was used in calculating drainage for Filing 7 (including this property). Please see Phase III Preliminary and Filing 7 Final Drainage and Erosion Control Report for HEC-1 computer model results.

Rational Method Hydrologic Criteria

The Rational Method was used to estimate stormwater runoff facilities for the 5-year and 100-year design storm. The Rational Method coefficients "C" were selected from Table 5-1 in the Drainage Criteria Manual. The time of concentration is calculated per Drainage Criteria Manual requirements. The intensities for each basin are calculated from Figure 5-1 of the Drainage Criteria Manual based upon the basin time of concentration. Because there is no current development plan for the property, maximum values for C and intensity were used. Proposed developed subbasins used in the Rational Method analysis are detailed in Figure 5.

Detention Storage Criteria

Detention Pond No. 5 was designed in Woodmen Hills Filing 7 to handle runoff from the Woodmen Hills development, including portions of this property. Please see Phase III Preliminary and Filing 7 Final Drainage and Erosion Control Report for calculations and discussion on design.

DRAINAGE FACILITY DESIGN

General Concept

This Final Drainage Report for Beckett at Woodmen Hills Filing 3 consists of seven drainage sub-basins as shown on Figure 5. Runoff from the area will drain to McLaughlin Road and to the existing FEMA floodplain along the southern boundary of the site. The direct flow to the FEMA floodplain will be compensated for by over detention of developed flows in Pond No. 5 as designed in the Phase III Preliminary and Filing 7 Final Drainage and Erosion Control Report.

Existing Drainage Characteristics

Currently, runoff from this property flows south and east and is intercepted by existing roads or flows over the curb and gutter into McLaughlin Road. Existing inlets intercept flows in McLaughlin Road per the Phase III Preliminary and Filing 7 Final Drainage and Erosion Control Report. Please see Phase III Preliminary and Filing 7 Final Drainage and Erosion Control Report for details.

Proposed Design Drainage Characteristics

The sub-basins shown on Figure 5 were developed based on the proposed lot layout for this site. The northwestern area (Basin 1) will be graded to drain to two 10-foot sump inlets located at Design Point 1. The inlets will discharge into an existing storm system and eventually discharge into Detention Pond 5. Design flows are estimated to be 15 cfs and 28 cfs for 5-year and 100-year storm.

Basin 2 contains 4.3 acres and is located in the northeastern part of the site. Runoff drains south to the existing access road from McLaughlin Road. Runoff travels along the curb and gutter to Design Point 2 located at the intersection with McLaughlin Road. Anticipated design flows are 13 cfs and 24 cfs for the 5-year and 100-year storm. Flows are routed south to Design Point 3 to the existing 15-foot on-grade inlet along the western flowline of McLaughlin Road.

Basin 3 contains 1.6 acres west of McLaughlin Road. Runoff drains south to a proposed access road from McLaughlin Road. Runoff is directed east, via curb and gutter, to Design Point 3. Anticipated flows from Basin 3 are 6 cfs and 12 cfs for the 5-year and 100-year storm.

Flows from Basin 2 and 3 are combined at Design Point 3 and intercepted by the existing 15-foot on-grade inlet. Routed flows to Design Point 3 are 17 cfs and 31 cfs. The 15-foot on-grade inlet at Design Point 3 will intercept approximately 10 cfs and 13 cfs and bypass 7 cfs and 18 cfs for the 5-year and 100-year storm. Bypassed flows continue south to Design Point 4.

Basin 4 contains 2.3 acres west of McLaughlin Road. Runoff drains south to a proposed access road from McLaughlin Road. Runoff is directed east and south, via curb and gutter, to an existing inlet in McLaughlin Road at Design Point 4. The inlet discharges directly into the FEMA floodplain. Anticipated design flows for Basin 4 are 6 cfs and 13 cfs for 5-year and 100-year storm. Routed flows from Basin 4 and Design Point 3 are 10 cfs and 25 cfs for the 5-year and 10-year storm at Design Point 4. The existing inlet along the western side of McLaughlin Road is a 5-foot type R inlet. The inlet will not handle the 5-year or 100-year storm. Both storms will overtop the curb and flow into the existing FEMA floodplain. Riprap protection can be added behind the inlet for stabilization.

Basin 5 is along the southern boundary of the site, adjacent to McLaughlin Road. This small basin drains south directly into the FEMA floodplain. Anticipated flows for Basin 5 are 2 cfs and 3 cfs for the 5-year and 100-year storm.

Basin 6 is centrally located and adjacent to the future Meridian Road. Runoff flows south to Design Point 5. Estimated runoff of 8 cfs and 14 cfs will be generated for the 5-year and 100-year storm.

Basin 7 is located along the southern boundary of the site, adjacent to the future Meridian Road. Anticipated flows for Basin 7 are 7 cfs and 13 cfs. Runoff from basins 6 and 7 are routed to Design Point 6 and discharge directly into the FEMA floodplain. Routed flows are estimated to be 14 cfs and 26 cfs for the 5-year and 100-year storm. The discharge structure at Design Point 6 will be designed as part of the individual development plan for these lots. The owner of the lot will be responsible for the installation of the required drainage structure. The structure at Design Point 6 will be equivalent to a 15-foot sump inlet.

EROSION CONTROL

General Concept

All ditches will be designed to meet El Paso County criteria for slope and velocity. During construction, best management practices for erosion control will be employed based on El Paso County Criteria and the erosion control plans shown in Figure 6.

Detention Ponds

The detention ponds will act as the primary erosion control facilities for this property and other tributary areas. The ponds will serve dual purposes in facilitating the settling of sediment in runoff during and after construction, and in maintaining runoff to existing levels.

Silt Fencing

Silt fencing will be placed along the southern and eastern property boundaries. This will prevent suspended sediment from leaving the site during construction. Silt fencing is to remain in place until vegetation is reestablished after completion of construction.

Erosion Bales

Erosion bales will be placed within the Woodmen Road ditch as check dams. Erosion bales will remain in place until vegetation is reestablished in drainage swales. Erosion bales will also be placed around all inlets to minimize sediment transport.

Miscellaneous

Best erosion control practices will be utilized as deemed necessary by the Contractor or Engineer and are not limited to the measures described above or as shown in Figure 6.

COST ESTIMATE

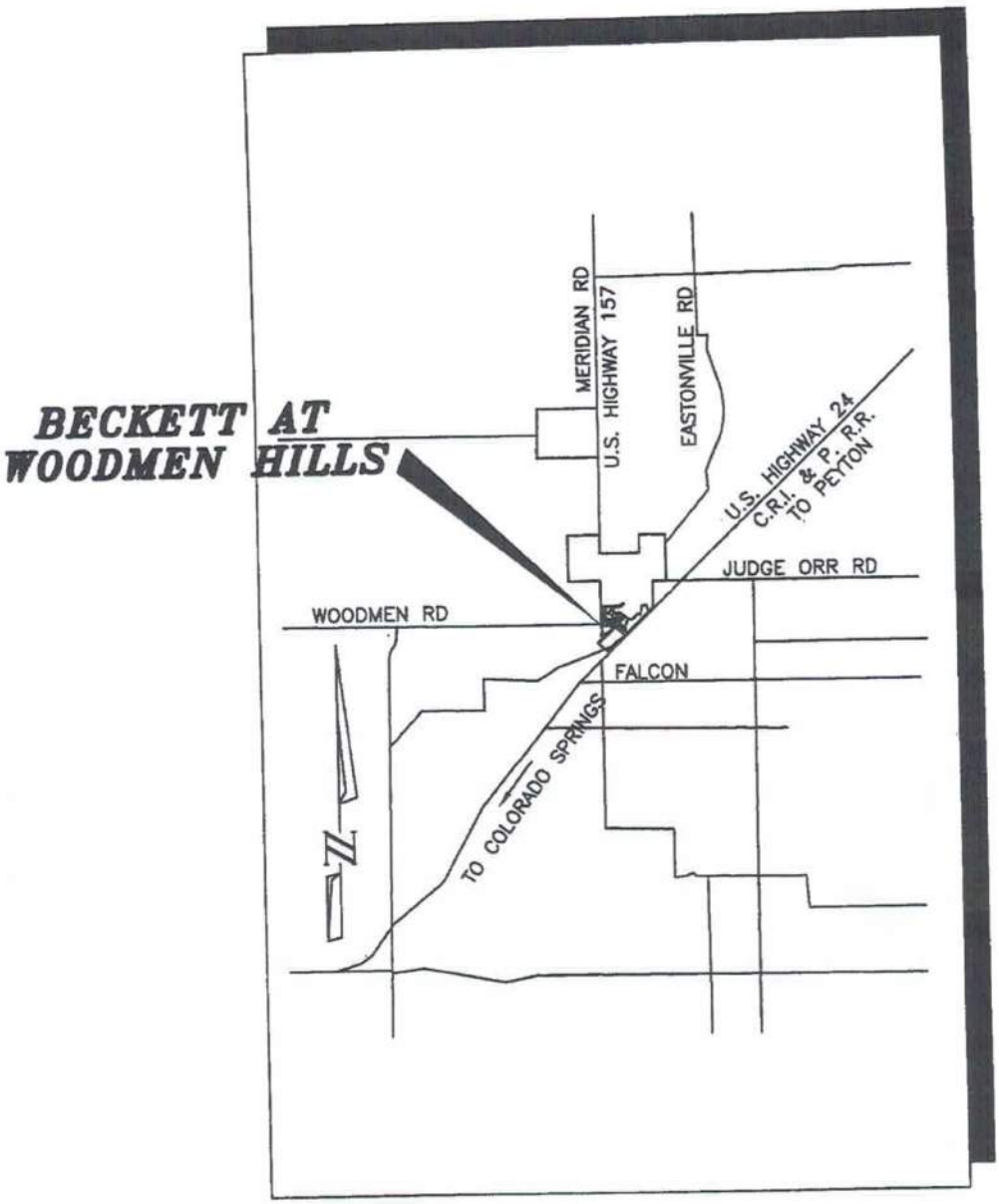
The following table is a summary of estimated costs for proposed drainage improvements and erosion control measures for Beckett at Woodmen Hills Filing 3. The cost estimate submitted herein is based on time-honored practices within the construction industry. As such, the engineer does not control the cost of labor, material, equipment or a contractor's method of determining prices and competitive bidding practices or market conditions. The estimate contained represents our best judgement as design professionals using current information available at the time of preparation. The engineer cannot guarantee that proposals, bids, and/or construction costs will not vary from this cost estimate.

Item	Quantity	Unit	Unit Cost	Extension
Erosion Control Measures				
Erosion Control Hay Bales	8	EA	$ 15.00	120
Silt Fencing	1,000	LF	$ 2.00	2,000
Subtotal, Erosion Control Measures				**$ 2,120**
Subtotal, All Drainage & Erosion Control				**$ 2,120**
Engineering (10%)				**$ 212**
Contingency (10%)				**$ 212**
TOTAL, DRAINAGE & EROSION CONTROL				**$ 2,544**

Drainage Fees

Drainage fees for Beckett at Woodmen Hills Filing 3 have been paid in the previous submittals for Beckett at Woodmen Hills Filing 1 and Filing 2.

FIGURES



VICINITY MAP

N.T.S.

BECKETT AT WOODMEN HILLS VICINITY MAP	**URS** PROJ NO. 6742451
	FIGURE 1

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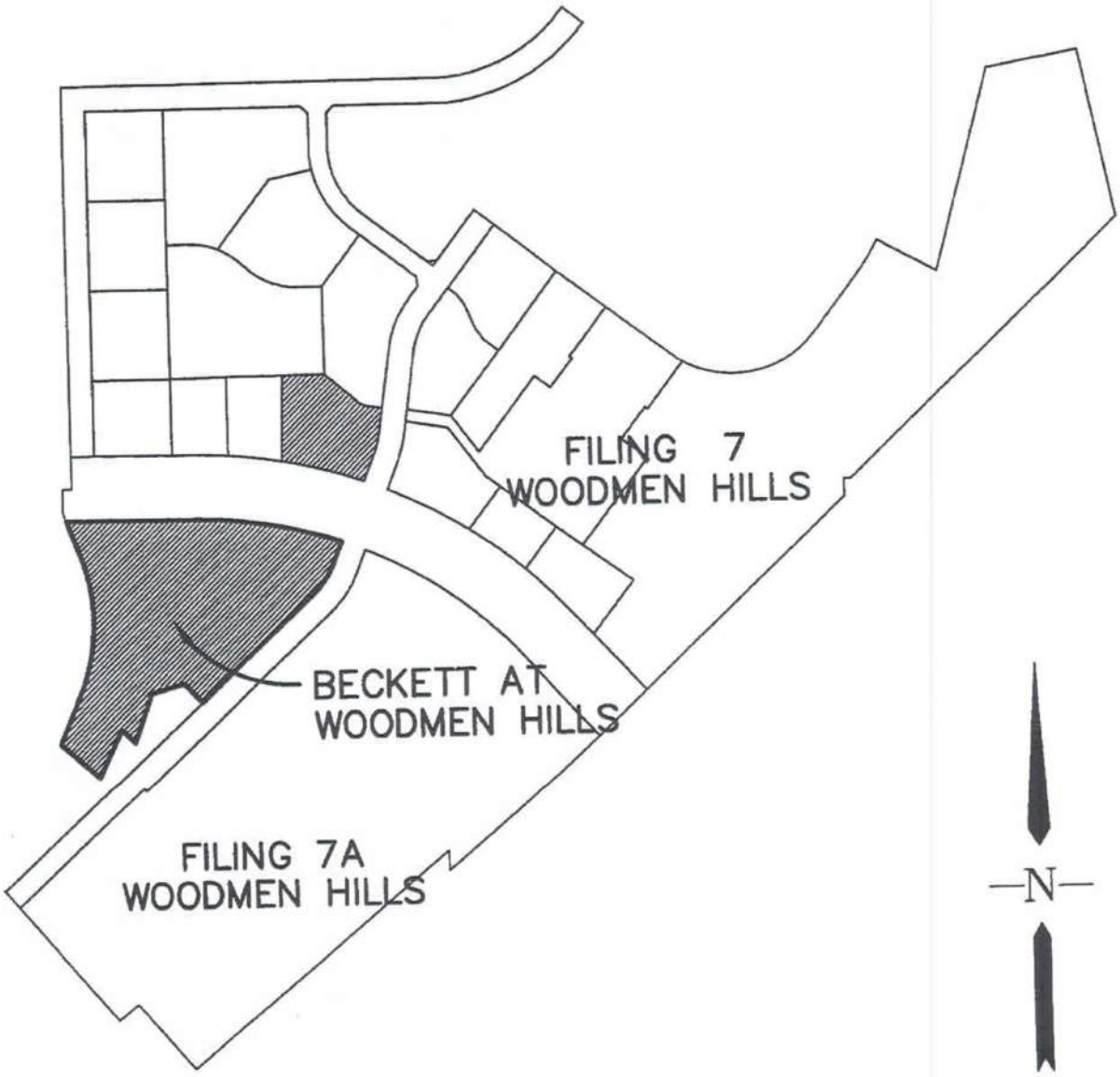

BECKETT AT WOODMEN HILLS

SITE MAP

NO SCALE

URS

PROJ NO. 6742451

FIGURE 2

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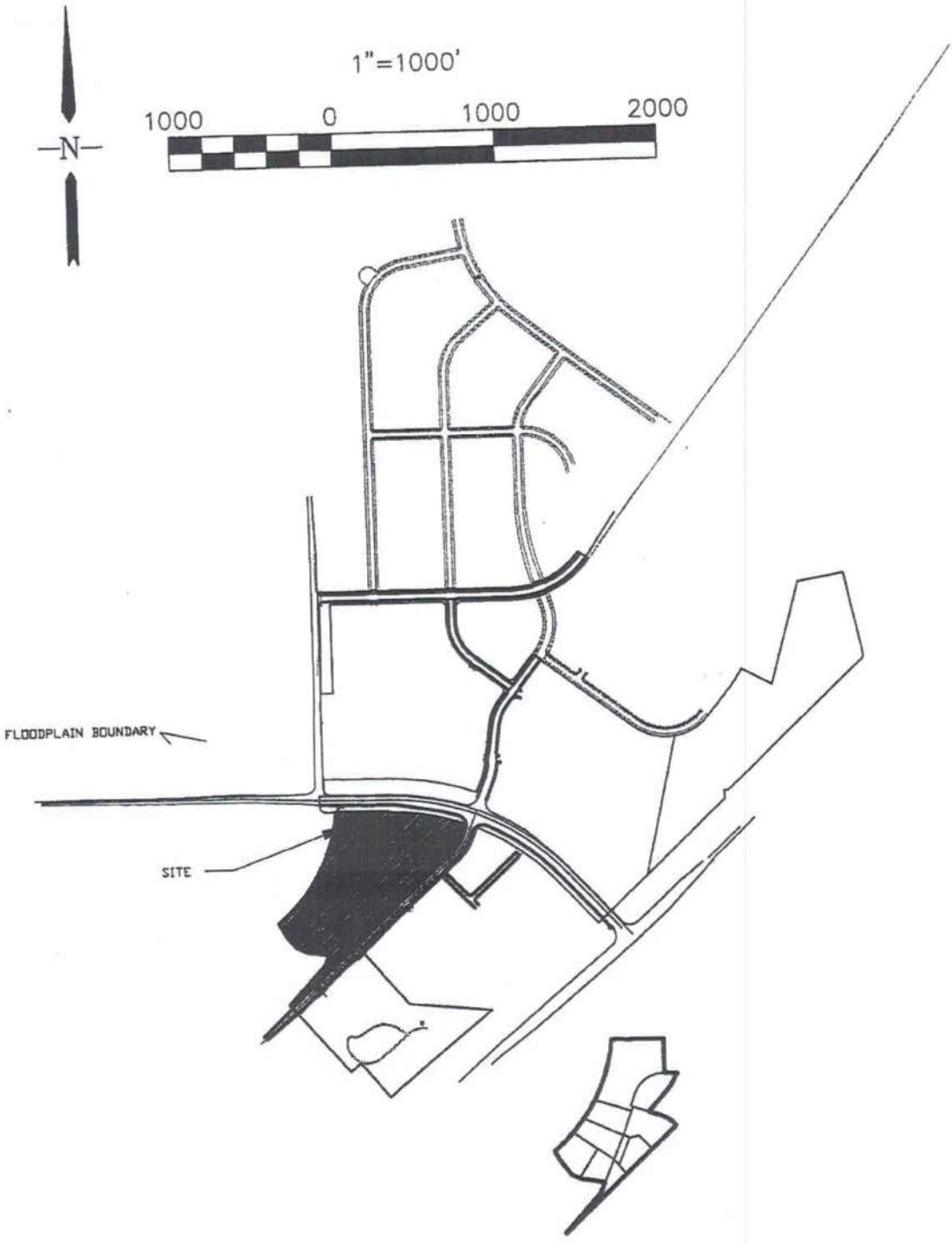

BECKETT AT WOODMEN HILLS

FEMA FLOOD INSURANCE RATE MAP

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PROJ NO. 6700042451

FIGURE 3

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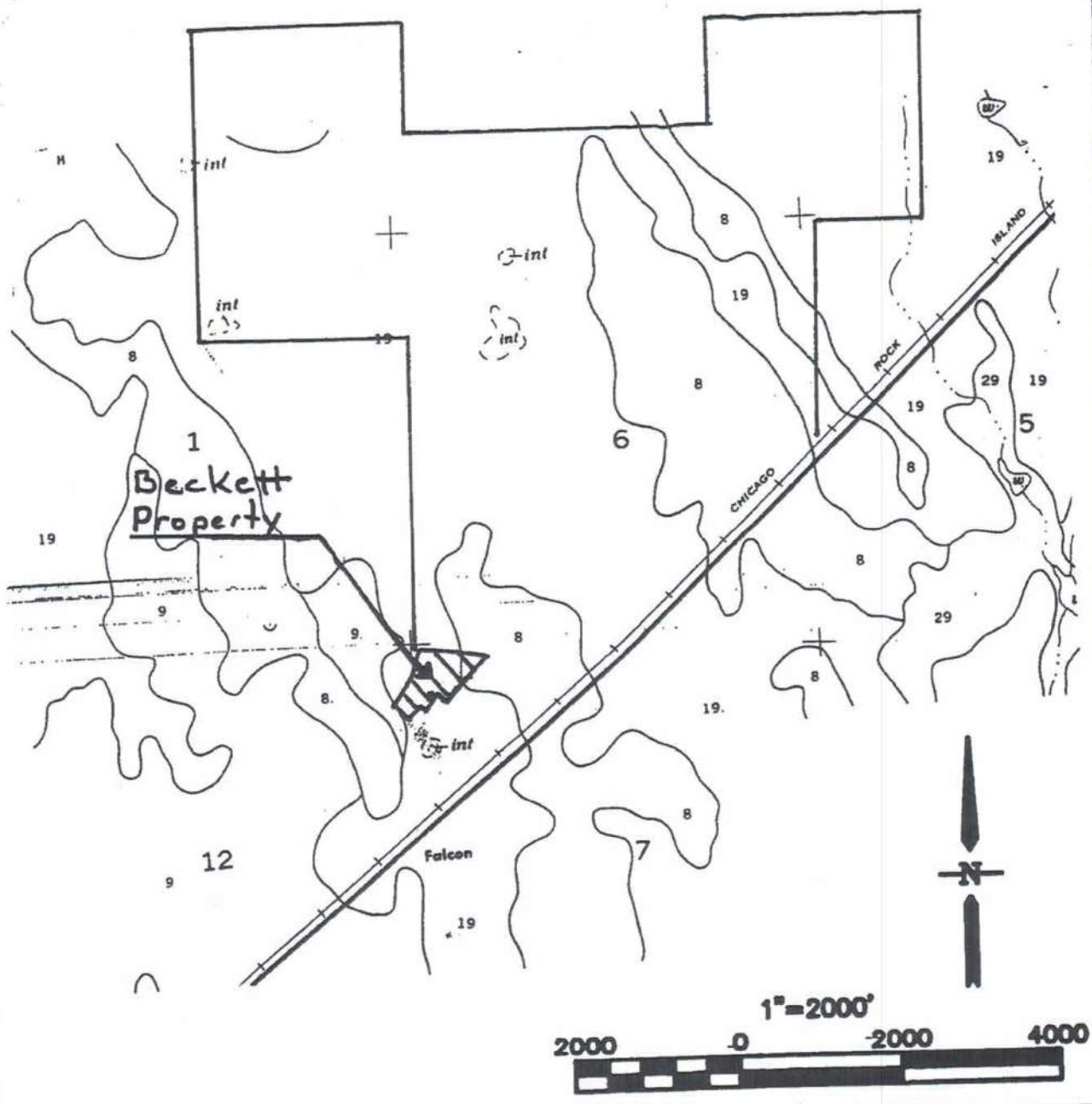


BECKETT AT WOODMEN HILLS

SOILS MAP

URS

PROJ NO. 6742451

FIGURE 4

APPENDIX A:
Rational Method Calculations

BECKETT @ WOODMEN HILLS FILING 3
ON-GRADE INLET CALCULATIONS

Based on table 7-2 Drainage Criteria Manual

						Q_5							Q_{100}					Bypass	
DP	Inlet size L(i)	CROSS SLOPE	STREET SLOPE	Q(5)	Q(100)	Qi (5)	T	F_W	L1	L2	L3	Qi (100)	T	F_W	L1	L2	L3	Q_5	Q_{100}
3	[illegible]	2.0%	2.0%	17	31	10	18	1.9244	27	16	58	13	23	2.0077	36	21	75	7	18

BECKETT @ WOODMEN HILLS FILING 3
SUMP INLET CALCULATIONS

Based on formula: $Q_i = 1.7(L_i + 1.8w)(d_{max} + w/12)^{1.85}$

					Q_5				Q_{100}					
DP	Inlet size L(i) initial	CROSS SLOPE	Q(5)	Q(100)	Qi (5)	d_{max}	W	a	Qi (100)	d_{max}	W	a	Clogging Factor	Length Final
1	16	2.0%	15	28	15	0.5	2	0.17	28	1.0	2	0.2	1.25	[illegible]
6	12	2.0%	14	26	14	0.5	2	0.17	26	1.0	2	0.2	1.25	[illegible]
4	5	2.0%	10	25	8	0.5	2	0.17	19	1.0	2	0.2	NA	[illegible]

D	Q	SX	SO
0.48406	22	0.02	0.005
0.41014	20	0.02	0.01
0.38011	20	0.02	0.015
0.36015	20	0.02	0.02
0.3454	20	0.02	0.025
0.33379	20	0.02	0.03

BECKETT @ WOODMEN HILLS FILING 3
(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	Tc	Length	Slope	Velocity	Tc		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)	
1	15	28	3.53	3.72	3.92	0.90	0.95	0.25	35	3.0%	6.5	620	2.0%	4.5	2.3	8.8	4.3	7.4	
2	13	24	3.90	4.11	4.33	0.90	0.95	0.25	130	3.0%	12.6	780	2.0%	4.5	2.9	15.5	3.3	5.8	
3	6	12	1.41	1.49	1.57	0.90	0.95	0.25	30	2.0%	6.9	330	2.0%	5.5	1.0	7.9	4.4	7.8	
4	6	13	1.38	1.66	2.34	0.59	0.71	0.25	25	3.0%	5.5	660	1.9%	6.5	1.7	7.2	4.6	8.0	
5	1	1	0.13	0.17	0.37	0.35	0.45	0.25	25	3.0%	5.5	360	2.0%	7.5	0.8	6.3	4.8	8.4	
6	8	14	1.60	1.69	1.78	0.90	0.95	0.25	25	3.0%	5.5	280	3.1%	8.5	0.5	6.1	4.9	8.5	
7	7	13	1.46	1.54	1.62	0.90	0.95	0.25	25	3.0%	5.5	220	3.0%	5.5	0.7	6.2	4.8	8.5	

BECKETT @ WOODMEN HILLS FILING 3
SURFACE ROUTING

DESIGN POINT	CONTRIBUTING BASINS	CA(equivalent) CA(5)	CA(equivalent) CA(100)	Tc (min.)	INTENSITY I(5) (in/hr)	INTENSITY I(100) (in/hr)	TOTAL FLOWS Q(5) (cfs)	TOTAL FLOWS Q(100) (cfs)
2	2	3.90	4.11	15.5	3.3	5.8	13	24
				TRAVEL TIME				
		3.90	4.11	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)
					320	4.5	1.2	16.7
3	2	3.90	4.11	16.7	3.2	5.6	17	31
	3	1.41	1.49	TRAVEL TIME				
		5.31	5.61	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)
					660	4.5	2.4	19.1
4	4	1.38	1.66	19.1	3.0	5.2	20	38
	2,3	5.31	5.61	TRAVEL TIME				
		6.69	7.27	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)
5	6	1.60	1.69	6.1	4.9	8.5	8	14
				TRAVEL TIME				
		1.60	1.69	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)
					210	4.5	0.8	6.9
6	6	1.60	1.69	6.9	4.7	8.2	14	26
	7	1.46	1.54	TRAVEL TIME				
		3.06	3.23	Type/flow	Length (ft)	Velocity (fps)	d. Time (min)	T. Time (min)

Flows intercepted at DP-3 are 10 cfs and 13 cfs

this flow is removed from the 20 cfs and 38 cfs routed flows,

20 cfs − 10 cfs = 10 cfs 5 year

38 cfs − 13 cfs = 25 cfs 100 yr.

at DP-4

BECKETT @ WOODMEN HILLS FILING 3
ON-GRADE INLET CALCULATIONS

Based on table 7-2 Drainage Criteria Manual

						Q_5							Q_{100}					Bypass	
DP	Inlet size L(i)	CROSS SLOPE	STREET SLOPE	Q(5)	Q(100)	Qi (5)	T	F_W	L1	L2	L3	Qi (100)	T	F_W	L1	L2	L3	Q_5	Q_{100}
3	15	2.0%	2.0%	17	31	10	18	1.9244	27	16	58	18	23	2.0077	36	21	75	7	18

BECKETT @ WOODMEN HILLS FILING 3
SUMP INLET CALCULATIONS

Based on formula: $Q_i = 1.7(L_i + 1.8w)(d_{max} + w/12)^{1.85}$

					Q_5				Q_{100}					
DP	Inlet size L(i) initial	CROSS SLOPE	Q(5)	Q(100)	Qi (5)	d_{max}	W	a	Qi (100)	d_{max}	W	a	Clogging Factor	Length Final
1	16	2.0%	15	28	15	0.5	2	0.17	28	1.0	2	0.2	1.25	20 (10)
6	12	2.0%	14	26	14	0.5	2	0.17	26	1.0	2	0.2	1.25	15 (10)
4	5	2.0%	10	25	8	0.5	2	0.17	19	1.0	2	0.2	NA	NA

D	Q	SX	SO
0.48406	22	0.02	0.005
0.41014	20	0.02	0.01
0.38011	20	0.02	0.015
0.36015	20	0.02	0.02
0.3454	20	0.02	0.025
0.33379	20	0.02	0.03

STREET CAPACITY

FOR 1/2 STREET SECTION

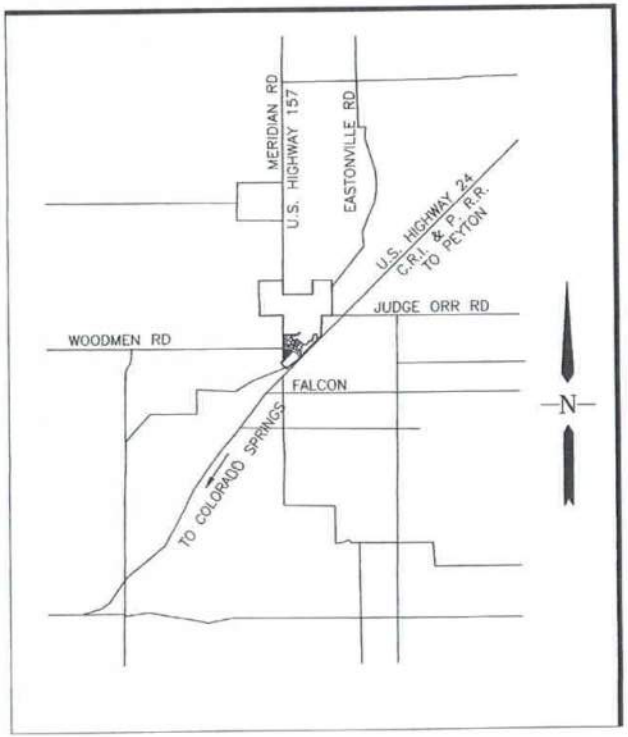
	Formula	Longitudinal Slope	Cross Slope	n	Curb Type	Depth of flow	Q_{max}	Q	Comments
Residential	$Q=170.2\ S^{1/2}$	0.5%	0.02	0.016	V/R	0.5	34	12.0	County ramp curb is 6"
		1.0%					34	17.0	
		1.5%					34	20.8	
		2.0%					34	24.1	
		2.5%					34	26.9	
		3.0%					34	29.5	
		3.5%					34	31.8	
		4.0%					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	

BECKETT AT WOODMEN HILLS
FILING No. 3
GRADING AND
EROSION CONTROL PLAN

GENERAL NOTES:

1. ALL DRAINAGE CONSTRUCTION SHALL MEET THE SPECIFICATIONS OF THE CITY OF COLORADO SPRINGS/EL PASO COUNTY DRAINAGE CRITERIA MANUAL.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE NOTIFICATION AND FIELD LOCATION OF ALL EXISTING UTILITIES, WHETHER SHOWN ON THE PLANS OR NOT, BEFORE BEGINNING CONSTRUCTION. LOCATION OF EXISTING UTILITIES SHALL BE VERIFIED BY THE CONTRACTOR PRIOR TO ACTUAL CONSTRUCTION.
3. THE SOILS REPORT FOR THIS SITE, PREPARED BY CTL, DATED NOVEMBER 17, 2000 SHALL BE CONSIDERED A PART OF THESE PLANS AND SHALL BE ADHERED TO.
4. THE CONTRACTOR SHALL HAVE AT LEAST ONE (1) SIGNED COPY OF THESE APPROVED PLANS AND SOILS REPORT PREPARED FOR THIS SITE BY CTL, DATED NOVEMBER 17, 2000 AND AT LEAST ONE (1) COPY OF THE APPROPRIATE DESIGN AND CONSTRUCTION STANDARDS AND SPECIFICATIONS AT THE JOB SITE AT ALL TIMES. MANUALS SHALL INCLUDE, BUT NOT LIMITED TO THE FOLLOWING:
   A. STATE OF COLORADO SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION.
   B. EL PASO COUNTY SUBDIVISION CRITERIA MANUAL.
   C. CITY OF COLORADO SPRINGS/ EL PASO COUNTY DRAINAGE CRITERIA MANUAL.
   D. CDOT, M & S STANDARDS.
5. A PRE-CONSTRUCTION MEETING BETWEEN THE CONTRACTOR, ENGINEER, AND EL PASO COUNTY DEPARTMENT OF TRANSPORTATION WILL BE HELD PRIOR TO ANY CONSTRUCTION. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO COORDINATE THE MEETING TIME AND PLACE WITH ALL PERSONS TO ATTEND.
6. BENCHMARK: 2-1/2" METAL CAP, LS 17664, AT THE NW CORNER OF SECTION 7 (INTERSECTION OF WOODMEN ROAD AND MERIDIAN ROAD).
7. ALL APPROPRIATE PERMITS (SUCH AS EL PASO COUNTY GRADING PERMIT, APDES, FLOODPLAIN DEVELOPMENT, 404 etc.) MUST BE OBTAINED BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
8. CONSTRUCTION SURVEYING WILL BE PROVIDED BY THE ENGINEER.
9. GRADING OPERATIONS TO BEGIN IN FEBRUARY 2003, TO BE COMPLETED FEBRUARY 2004.
10. ALL FILL & CUT SLOPES SHALL NOT EXCEED 3H: 1V.
11. PROPOSED CONTOURS AND SPOT ELEVATIONS SHOWN WITHIN THE RIGHT-OF-WAY ARE TO FINISHED GRADE.
12. URS IS NOT RESPONSIBLE FOR THE ACCURACY OF THE EXISTING CONTOURS.
13. ALL DISTURBED SLOPES SHALL BE REVEGETATED WITH THE SEED MIX SHOWN BELOW ON THESE PLANS OR AN APPROVED EQUAL TWO WEEKS AFTER FINAL GRADE IS ACHIEVED. EROSION CONTROL FABRIC, SHALL BE USED ON SANDY SLOPES WHICH ARE EQUAL TO OR GREATER THAN 3H: 1V SLOPE.
14. EROSION CONTROL WILL CONSIST OF BUT NOT LIMITED TO STRAW BALES PLACED AT THE POSITION SHOWN ON THIS PLAN, AND TOP SOIL MIXED WITH GRASS SEED WHICH WILL BE WATERED UNTIL VEGETATION HAS BEEN REESTABLISHED.
15. THE EROSION CONTROL MEASURES OUTLINED ON THIS PLAN ARE THE RESPONSIBILITY OF THE DEVELOPER TO MONITOR AND REPLACE, REGRADE AND REBUILD AS NECESSARY UNTIL VEGETATION IS REESTABLISHED.
16. EROSION CONTROL MEASURES SHALL BE IMPLEMENTED IN A MANNER THAT WILL PROTECT ADJACENT PROPERTIES AND PUBLIC FACILITIES FROM THE ADVERSE EFFECTS OF EROSION AND SEDIMENTATION AS A RESULT OF CONSTRUCTION AND EARTHWORK ACTIVITIES WITHIN THE PROJECT SITE.
17. EROSION CONTROL BLANKET TO BE EXCELSIOR HI-VELOCITY CURLEX BLANKET OR EQUIVALENT, FOR ALL SLOPES EQUAL TO OR GREATER THAN 3:1.
18. ADDITIONAL STRUCTURES MAY BE REQUIRED AT TIME OF CONSTRUCTION.
19. ADDITIONAL MEASURES MAY BE REQUIRED.
20. OWNER IS RESPONSIBLE FOR IMPLEMENTATION OF STORM WATER MANAGEMENT PLAN.
21. ALL PROPOSED MODIFICATIONS OF THE APPROVED GRADING AND EROSION CONTROL PLANS MUST BE SUBMITTED ALONG WITH SUPPORTING MATERIALS TO THE COUNTY ENGINEER. NO WORK IN CONNECTION WITH THE PROPOSED MODIFICATIONS SHALL BE PERMITTED WITHOUT PRIOR APPROVAL OF THE COUNTY ENGINEER. APPROVAL FOR WHICH MAY BE ISSUED IF THE APPLICANT CAN DEMONSTRATE THAT THE MODIFICATIONS WILL PROVIDE SOIL EROSION CONTROLS EQUIVALENT TO, OR BETTER THAN THAT OF THE ORIGINALLY APPROVED SOIL DISTURBANCE PLANS.
22. AT LEAST TEN DAYS PRIOR TO THE ANTICIPATED START OF CONSTRUCTION, FOR PROJECTS THAT WILL DISTURB 5 ACRES OR MORE (ONE ACRE OR MORE AFTER JULY 1, 2002), THE OWNER OR OPERATOR OF THE CONSTRUCTION ACTIVITY SHALL SUBMIT A PERMIT APPLICATION FOR STORMWATER DISCHARGE TO THE COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT, WATER QUALITY CONTROL DIVISION. THE APPLICATION CONTAINS CERTIFICATION OF COMPLETION OF A STORM WATER MANAGEMENT PLAN (SWMP), OF WHICH THIS GRADING AND EROSION CONTROL PLAN MAY BE APART. FOR INFORMATION OR APPLICATION MATERIALS CONTACT:

    COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT
    WATER QUALITY CONTROL DIVISION
    WQCD--PERMITS
    4300 CHERRY CREEK DRIVE SOUTH
    DENVER, COLORADO 80246-1530
    ATTN: PERMITS
23. SOIL SHALL NOT BE STOCKPILED FOR MORE THAN 6 MONTHS. ADDITIONAL EROSION CONTROL MEASURES MAY BE REQUIRED IF STOCKPILED MATERIAL EXCEEDS 6 MONTHS. IF STOCKPILES ARE LOCATED WITHIN 100 FEET OF DRAINAGEWAYS, ADDITIONAL SEDIMENT CONTROLS MAY BE NECESSARY, SUCH AS DIVERSION DIKES OR SILT FENCE.
24. ALL DISTURBED AREAS, OUTSIDE OF THE PROPOSED PAVEMENT WILL REQUIRE RESEEDING WITHIN TWO WEEKS OF ESTABLISHING FINAL GRADE.
25. AFTER GRADING BEGINS, SOIL SURFACE STABILIZATION SHALL BE APPLIED TO ALL DISTURBED AREAS THAT MAY NOT BE AT FINAL GRADE BUT WILL REMAIN DORMANT (UNDISTURBED) FOR PERIODS LONGER THAN AN ADDITIONAL 30 CALENDAR DAYS. TEMPORARY REVEGETATION IS REQUIRED ON ALL DISTURBED AREAS HAVING A PERIOD OF EXPOSURE PRIOR TO FINAL STABILIZATION OF 6 MONTHS OR LONGER. PERMANENT REVEGETATION IS REQUIRED TO PROVIDE VEGITATIVE COVER ON DISTURBED AREAS WHICH WILL NOT BE PAVED OR BUILT UPON FOR A PERIOD OF 1 YEAR OR LONGER OR FOR ANY INDETERMINATE AMOUNT OF TIME.
26. GRADING OUTSIDE OF THE PROJECT BOUNDARIES MAY REQUIRE TEMPORARY CONSTRUCTION EASEMENTS. THE DEVELOPER IS RESPONSIBLE FOR OBTAINING ANY SUCH REQUIRED EASEMENTS IF NECESSARY.



VICINITY MAP
N.T.S.

THESE DETAILED PLANS AND SPECIFICATIONS WERE PREPARED UNDER MY DIRECTION AND SUPERVISION. SAID DETAILED PLANS AND SPECIFICATIONS HAVE BEEN PREPARED ACCORDIN THE CRITERIA ESTABLISHED BY THE COUNTY FOR DETAILED DRAINAGE PLANS AND SPECIFICA AND SAID DETAILED PLANS AND SPECIFICATIONS ARE IN CONFORMITY WITH THE MASTER PLA THE DRAINAGE BASIN. SAID DETAILED DRAINAGE PLANS AND SPECIFICATIONS MEET THE PUI FOR WHICH THE PARTICULAR DRAINAGE FACILITY IS DESIGNED. I ACCEPT RESPONSIBILITY FC LIABILITY CAUSED BY ANY NEGLIGENT ACTS, ERRORS OR OMISSIONS ON MY PART IN PREPAI OF THE DETAILED DRAINAGE PLANS AND SPECIFICATIONS.

THESE PLANS WERE PREPARED FOR OR ON BEHALF OF URS UNDER THE SUPERVISION OF:

WILLIAM DOUGLAS CHAFFIN, P.E. 35136 — DATE 4/4/03

COUNTY PLAN REVIEW IS PROVIDED ONLY FOR GENERAL CONFORMANCE WITH COUNTY DESIGN CRITERIA. THE COUNTY IS NOT RESPONSIBLE FOR THE ACCURACY AND ADEQUACY OF THE DE DIMENSIONS, AND/OR ELEVATIONS WHICH SHALL BE CONFIRMED AT THE JOB SITE. THE COUN THROUGH THE APPROVAL OF THIS DOCUMENT ASSUMES NO RESPONSIBILITY FOR COMPLETENI AND/OR ACCURACY OF THIS DOCUMENT.

JOHN A. McCARTY, P.E. — DATE 7-8-03
COUNTY ENGINEER/DIRECTOR

ANY PROPOSED MODIFICATION TO THE APPROVED GRADING AND EROSION CONTROL PLAN MUST BE SUBMITTED, ALONG WITH SUPPORTING DOCUMENTS, TO THE COUNTY ENGINEER FOR APPROVAL PRIOR TO ANY WORK RELATED TO THE PROPOSED MODIFICATION TAKING PLACE. APPROVAL FROM THE COUNTY ENGINEER SHALL BE ISSUED IF THE APPLICANT DEMONSTRATES THAT THE MODIFICATION WILL PROVIDE SOIL EROSION CONTROLS EQUIVALENT TO OR EXCEEDING THOSE OF THE PREVIOUSLY APPROVED GRADING AND EROSION CONTROL PLAN.

DEVELOPERS STATEMENT:

I, THE DEVELOPER HAVE REVIEWED AND WILL COMPLY WITH ALL OF THE REQUIREMENTS SPECIFIED IN THIS GRADING AND EROSION CONTROL PLAN

BECKETT DEVELOPMENT — DATE 6/9/03

SHEET INDEX

EROSION CONTROL

STEPS FOR CONSTRUCTION:

THE ANTICIPATED START FOR THIS PROJECT IS FEBRUARY 2003 WITH AN ANTICIPATED COMPLETION DATE OF FEBRUARY 2004. BELOW IS A BRIEF OUTLINE OF THE CONSTRUCTION SEQUENCE FOR THIS PROJECT.

* CONSTRUCTION OF EROSION CONTROL STRUCTURES
* ROUGH GRADING
* UTILITIES INSTALLATION
* FINAL GRADING

EROSION AND SEDIMENT CONTROLS

SILT FENCES AND STRAW BALE CHECK DAMS WILL BE INSTALLED IMMEDIATELY AFTER ANY EXCAVATION FOR THE MAJOR ROADS. STRAW BALE CHECK DAMS WILL BE PLACED AT ALL ENTRANCES AND EXITS OF DRAINAGE WAYS. THE TEMPORARY SEDIMENTATION PONDS WILL ALSO BE USED AS AN INFILTRATION POND FOR TRAPPING ANY SEDIMENT-LADEN RUNOFF FROM NEW CONSTRUCTION. STRAW BALES WILL BE INSTALLED AROUND THE OUTLET AND OVERFLOW STRUCTURE. THE OUTLET STRUCTURE WILL ALSO BE PROTECTED WITH RIP RAP ON THE DOWNSTREAM SIDE.

NON-STRUCTURE PRACTICES TO CONTROL EROSION AND SEDIMENTATION WILL INCLUDE RESEEDING OF GROUND COVER IN DISTURBED AREAS ACCORDING TO THE EROSION CONTROL PLAN. TEMPORARY SEEDING OF THE DETENTION POND AND MULCHING ALONG STEEP EMBANKMENTS WILL BE PERFORMED WHEN PERMISSIBLE.

MATERIAL HANDLING AND SPILL PREVENTION

THE MOST PROBABLE SOURCE OF NON-STORMWATER POLLUTION IS REFUELING AND DAILY MAINTENANCE OPERATIONS. IF MOBILE FUEL TRUCKS ARE USED TO SERVICE EQUIPMENT, ABSORBENT MATERIALS AND CONTAINERS FOR THE STORAGE OF USED ABSORBENT MATERIAL WILL BE CLOSE BY. IF A FUEL TANK IS LEFT ON SITE, BERMS WILL BE BUILT AROUND THE TANK TO CAPTURE ANY SPILLED FUEL. ADAMS ABSORBENT MATERIALS AND THEIR CONTAINERS WILL BE ON HAND.

FINAL STABILIZATION AND LONG TERM STORMWATER MANAGEMENT

ONCE THE MAJOR ROADS ARE PAVED AND THE SURROUNDING DISTURBED AREAS ARE TO BE ESTABLISHED WITH VEGETATION, THE STRAW BALE CHECK DAMS AND THE SILT FENCES AROUND THE STREETS CAN BE REMOVED. AFTER COMPLETION OF THE STORM SEWER SYSTEM, THE STRAW BALES AROUND THE INLETS CAN BE REMOVED. AFTER ALL GROUND DISTURBING CONSTRUCTION HAS BEEN COMPLETED AND ALL SLOPES ARE 70% ESTABLISHED WITH VEGETATION, REMAINING STRAW BALE CHECK DAMS AND SILT FENCES CAN BE REMOVED. THE RIP RAP ON ANY OF THE OUTLETS WILL REMAIN AFTER CONSTRUCTION TO REDUCE EROSION OF THE CHANNELS. ANY SWALES WILL BE LINED WITH LANDSCAPING TO SLOW RUNOFF AND FILTER SEDIMENTS.

OTHER CONTROLS

THERE ARE SEVERAL BEST MANAGEMENT PRACTICES THAT CAN BE EMPLOYED TO PREVENT OR MITIGATE THE SOURCE OF POLLUTANTS AND CONTAMINATION OF STORMWATER RUNOFF. SOME OF THESE ARE:

* ALL REFUSE DUMPSTERS AND RECEPTACLES SHALL BE EQUIPPED WITH FUNCTIONAL LIDS TO PREVENT RAIN AND SNOW FROM ENTERING.
* STORAGE CONTAINERS, DRUMS AND BAGS SHALL BE STORED AWAY FROM DIRECT TRAFFIC ROUTES TO PREVENT ACCIDENTAL SPILLS.
* EMPTY DRUMS SHALL BE COVERED TO PREVENT COLLECTION OF PRECIPITATION.
* CONTAINERS SHALL BE STORED ON PALLETS OR OTHER DUNNAGE, TO PREVENT CORROSION OF CONTAINERS, WHICH CAN RESULT WHEN CONTAINERS COME IN CONTACT WITH MOISTURE ON THE GROUND.
* REGULARLY SCHEDULED REMOVAL OF CONSTRUCTION TRASH AND DEBRIS. THE CONTRACTOR IS CERTAINLY NOT LIMITED TO THESE GOOD HOUSEKEEPING MEASURES, AND MAY IMPLEMENT FURTHER CONTROLS AS PRUDENCE AND GOOD JUDGEMENT DEEM NECESSARY.

INSPECTION AND MAINTENANCE

A THOROUGH INSPECTION OF THE STORMWATER MANAGEMENT SYSTEM SHALL BE PERFORMED EVERY 14 DAYS AS WELL AS AFTER ANY RAIN OR SNOWMELT EVENT THAT CAUSES SURFACE EROSION:

* EROSION OF CHANNELS AND SIDE SLOPES SHALL BE REPAIRED.
* WHEN STRAW BALE CHECK DAMS HAVE SILTED UP TO HALF THEIR HEIGHT, THE SILT SHALL BE REMOVED, CHANNEL GRADE REESTABLISHED, AND SIDE SLOPES RE-SEEDED IF NECESSARY. ANY STRAW BALES THAT HAVE SHIFTED OR DECAYED SHALL BE REPAIRED OR REPLACED.
* SILT FENCES SHALL BE CLEANED WHENEVER SEDIMENT HAS REACHED A DEPTH OF 6" AT THE FENCE, AND BROKEN WOODEN PARTS OR TORN FABRIC SHALL BE REPAIRED OR REPLACED.
* ANY ACCUMULATED TRASH OR DEBRIS SHALL BE REMOVED FROM OUTLETS.
* IF THE DEPTH OF SEDIMENTATION EXCEEDS 2' IN THE TEMPORARY DETENTION POND, THE POND SHALL BE CLEANED OUT AND RESTORED TO ITS ORIGINAL DEPTH. THE OVERFLOW SPILLWAY SHALL BE CLEANED OR REPAIRED AS NECESSARY.

AN INSPECTION AND MAINTENANCE LOG FOLLOWS THIS STORMWATER MANAGEMENT PLAN.

REVEGETATION AND SEEDING

ALL DISTURBED AREA SHALL BE REQUIRE SEEDING WITHIN TWO (2) WEEKS FOLLOWING THE ESTABLISHMENT OF FINAL GRADE. AREAS TO RECEIVE PAVEMENT DURING THE CONSTRUCTION OF THE ROAD SYSTEM SHALL NOT RECEIVE ANY SEEDING. SEEDING SHOULD BE ACCOMPLISHED USING AN APPROPRIATE GRASS DRILL, BY BROADCASTING OR BY HYDROMULCHING. IF SEEDING BY THE BROADCAST METHOD IS SELECTED THE APPLICATION RATE SHOULD BE DOUBLED. IF HYDROMULCHING IS SELECTED TWO OPERATIONS SHOULD BE CONSIDERED, APPLYING THE SEED FIRST AND THE MULCH IN A SECOND OPERATION. UPON COMPLETION OF THE SEEDING OPERATION THE SITE SHOULD BE COVERED WITH WEED FREE MULCH AT A RATE OF 4,000 LBS. PER ACRE. BELOW IS THE ACCEPTED GRASS MIX FOR SANDY SOILS:

GRASS	VARIETY	AMOUNT IN PLS LBS. PER ACRE
SIDEOATS GRAMA	EL RENO	3.0
WESTERN WHEATGRASS	BARTON	2.5
SLENDER WHEATGRASS	NATIVE	2.0
LITTLE BLUESTEM	PASTURA	2.0
SAND DROPSEED	NATIVE	0.5
SWITCH GRASS	NEBRASKA	3.0
WEEPING LOVE GRASS	MORPHA	1.0

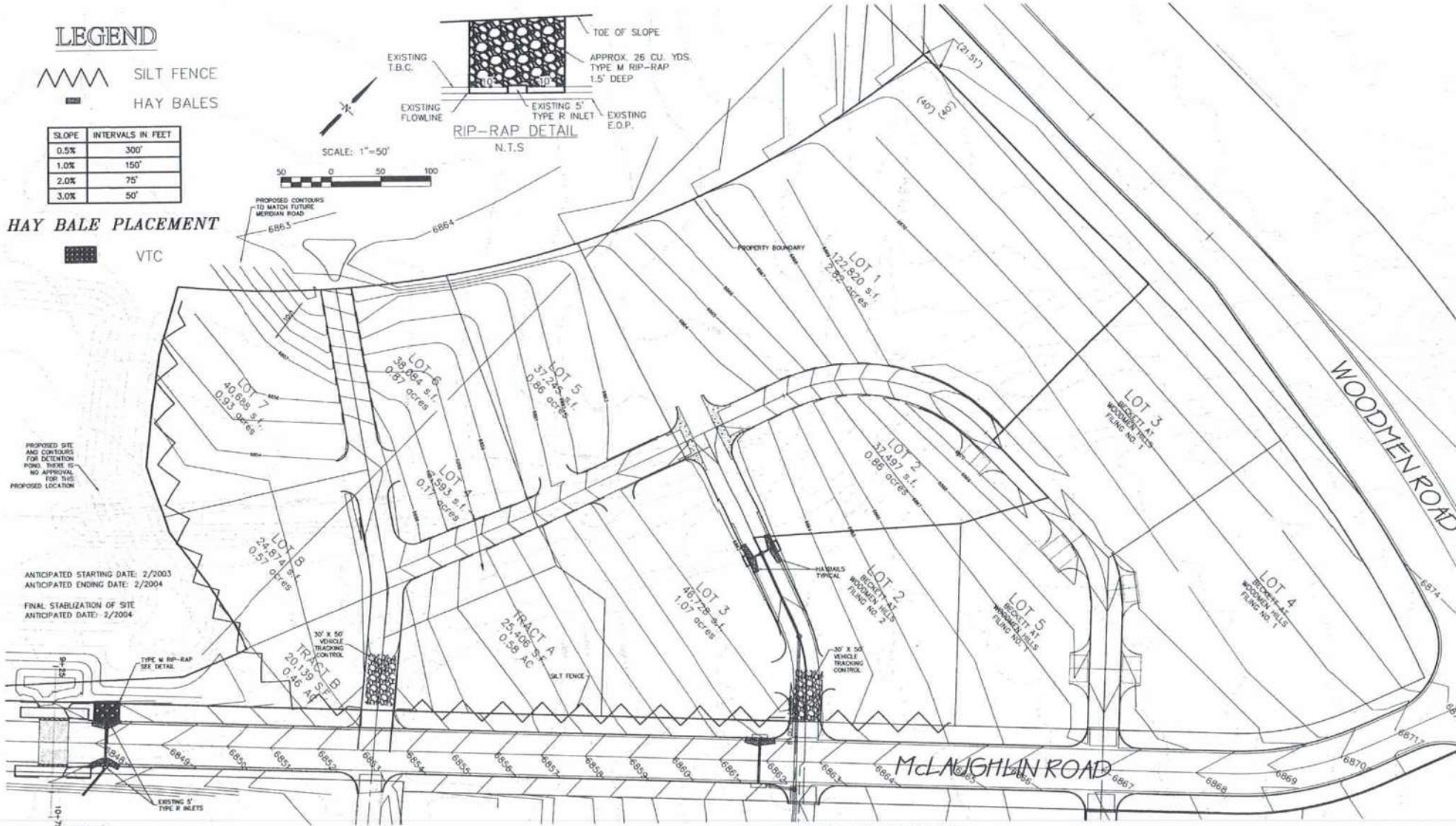
REVISIONS:		
NO.	DESCRIPTION	DATE

ENGINEER:
DESIGNED BY: DC DATE: 2-26-03
DRAWN BY: DC DATE: 2-26-03
CHECKED BY: DC DATE: 2-26-03

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 809

PROJECT BECKETT AT W
SHEET TITLE ROUGH GRADING
FROM
JOB NO. 21710935



EMBEDDING DETAIL

ANCHORING DETAIL

HAY BALE DETAIL
SCALE: N.T.S.

GRADING NOTES:

1) ALL FILL & CUT SLOPES SHALL NOT EXCEED 3H:1V.

2) PROPOSED CONTOURS AND SPOT ELEVATIONS ARE TO FINISHED GRADE.

3) URS IS NOT RESPONSIBLE FOR THE ACCURACY OF THE EXISTING CONTOURS.

4) EROSION CONTROL WILL CONSIST OF HAY BALES PLACED AT THE POSITIONS SHOWN ON THIS PLAN, AND TOP SOIL MIXED WITH GRASS SEED WHICH WILL BE WATERED UNTIL VEGETATION HAS BEEN REESTABLISHED.

5) THE EROSION CONTROL MEASURES OUTLINED ON THIS PLAN ARE THE RESPONSIBILITY OF THE DEVELOPER TO MONITOR AND REPLACE, REGRADE AND REBUILD AS NECESSARY UNTIL VEGETATION IS REESTABLISHED.

6) EROSION CONTROL MEASURES SHALL BE IMPLEMENTED IN A MANNER THAT WILL PROTECT ADJACENT PROPERTIES AND PUBLIC FACILITIES FROM THE ADVERSE EFFECTS OF EROSION AND SEDIMENTATION AS A RESULT OF CONSTRUCTION AND EARTHWORK ACTIVITIES WITHIN THE PROJECT SITE.

7) ALL LOTS SHOULD HAVE A GEOTECHNICAL REPORT PREPARED FOR DESIGN OF THE PROPER FOUNDATION REQUIRED FOR THE LOT.

8) ADDITIONAL MEASURES MAY BE REQUIRED.

REVISIONS:		
NO.	DESCRIPTION	DATE

ENGINEER:
DESIGNED BY: DC DATE: 2-1-01
DRAWN BY: DC DATE: 2-1-01
CHECKED BY: 2-1-01 DATE: 2-1-01

48 HOURS BEFORE YOU DIG, CALL UTILITY LOCATORS
1-800-922-1987
CITY OF COLORADO SPRINGS DEPT. OF UTILITIES GAS, ELECTRIC, WATER AND WASTEWATER

URS
8415 EXPLORER DRIVE, SUITE 110
COLORADO SPRINGS, COLORADO

PROJECT BECKETT AT WOO
SHEET TITLE EROSION CONTROL P
FROM TO
JOB NO. 6742451

FILENAME: FGDTEN06 DATE:

REVISIONS:		
NO.	DESCRIPTION	DATE

ENGINEER:
DESIGNED BY: DC DATE: 2-1-01
DRAWN BY: DC DATE: 2-1-01
CHECKED BY: CKC DATE: 2-1-01

48 HOURS BEFORE YOU DIG,
CALL UTILITY LOCATORS
1-800-922-1987
CITY OF COLORADO SPRINGS, DEPT. OF UTILITIES
GAS, ELECTRIC, WATER AND WASTEWATER

URS
8415 EXPLORER DRIVE, SUITE 110 PHONE:
COLORADO SPRINGS, COLORADO FAX:

PROJECT BECKETT AT WOODME
SHEET TITLE GRADING AND DRAINAGE
FROM TO
JOB NO. 6742451