

MASTER DEVELOPMENT DRAINAGE PLAN

For

DUBLIN TOWNE CENTRE

6465 Marksheffel Road, Colorado 80817

June 26, 2014

Prepared For:

DUBLIN TOWNE CENTRE, LLC

P.O. BOX 60069

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Project Number: 20534-01CSCV

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Rpt.Master Drng.docx)*

MASTER DEVELOPMENT DRAINAGE PLAN
For
DUBLIN TOWNE CENTRE ANNEXATION
Colorado Springs, Colorado

Table of Contents

DRAINAGE PLAN STATEMENTS	ii
I. INTRODUCTION	1
II. DRAINAGE DESIGN CRITERIA.....	1
III. HYDROLOGY	2
IV. FLOODPLAIN STATEMENT.....	3
V. SOILS	3
VI. CONCLUSIONS	3
VII. REFERENCES	3

Appendices

- Appendix A: Maps and Figures
- Appendix B: Hydrologic Calculations
- Appendix C: Charts and Graphs

DRAINAGE PLAN STATEMENTS

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 acceptable to the City of Colorado Springs 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.


Tim D. McConnell, P.E. #33797 _____ DATE



DEVELOPER'S STATEMENT

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

Dublin Towne Centre, LLC
BY:  _____ DATE 6/26/14
Robert C. Irwin

TITLE: Manager
ADDRESS: P.O. Box 60069
Colorado Springs, CO 80960-0069

CITY OF COLORADO SPRINGS

Filed in accordance with Section 7.7.906.C of the Code of the City of Colorado Springs, 2001, as amended.


CITY ENGINEER _____ DATE 7/14/14

CONDITIONS:

I. INTRODUCTION

A. Purpose

The purpose of this report is to identify major drainage ways, detention areas, locations of culverts, open channels, drainage areas/patterns and runoff quantities which are tributary to Dublin Towne Centre Annexation. Additionally, the report presents the ability to safely pass developed runoff to downstream drainage facilities.

B. Location and Description

The proposed Dublin Towne Centre Annexation site is located within a portion of the Northwest Quarter of Section 16, Township 15 South, Range 65 West of the Sixth Prime Meridian, El Paso County, Colorado (see Vicinity Map in appendix). The site is located at the southeast corner of Dublin Boulevard and Marksheffel Road and contains approximately 8.66 acres.

The site is bounded on the north by Dublin Boulevard, on the east by single family residential (County, RR-5, Residential Rural), on the south by single family residential (County, RR-5, Residential Rural), and on the west by Marksheffel Road

The proposed Annexation calls for a change in zoning to C-5 (Intermediate Business as well as multi-family development). This zone district accommodates general commercial uses that are of moderate intensity. The emphasis of the zone is placed on individual sites, which in some cases will be located near established residential zoning.

The proposed concept plan will provide for five pad sites with a proposed commercial or multi-family residential land use, access drives, and an on-site stormwater quality (SWQ)/detention pond to be maintained by the Dublin Towne Centre and provide SWQ for all five pad sites. Drainage reports will be required with each development plan for each pad site. Drainage fees will be required to be paid at the time of platting.

II. DRAINAGE DESIGN CRITERIA

The drainage analysis is performed in accordance with the current City of Colorado Springs/El Paso County ***Drainage Criteria Manual*** (DCM) and Urban Drainage and Flood Control District (UDFCD) ***Urban Storm Drainage Criteria Manual*** (USDCM).

Calculations were performed to determine existing and proposed runoff quantities during the 5- and 100-year storm for developed conditions using the Rational Method as required for basins containing less than 100 acres.

The Detention Volume by the Full Spectrum Method of the USDCM was used to determine the proposed detention pond storage and release rate. As noted in the USDCM, the 100-year detention volume includes WQCV, so there is no need to add more volume for WQCV.

III. HYDROLOGY

A. Existing Drainage Conditions

The site lies within the Sand Creek Drainage Basin. Runoff for the site consists of off-site and on-site runoff which discharges to the adjacent lot to the south. Addendum #1 to Banning Lewis Ranch Filing 2 Final Drainage Report (September 2006), prepared by TCB provided a revision to the storm sewer outfall of Pond 93 at the northeast corner of Dublin Boulevard and Marksheffel Road. The pond outfall pipe was relocated to allow stormwater discharge to return to the historic flow pattern more quickly within the proposed Dublin Towne Centre site. The drainage report noted a 100-year and 100-year emergency overflow of 102.8 cfs and 362 cfs, respectively. See appendix for 100-yr Emergency Overflow Extents.

The on-site storm runoff consists of sheet flow for the entire 8.66 acres site area onto the adjacent southern property. The existing terrain generally slopes from northeast to southwest at grades of approximately 3% in its current condition. Native grasses and vegetation cover the site. For on-site storm runoff, this drainage report will use 8% impervious coverage, for large residential lots, to determine the storm runoff. The existing condition peak runoff rates are $Q_5=8.31$ cfs and $Q_{100}=18.71$ cfs. Under existing conditions, storm runoff from the property flows off-site un-detained.

The Sand Creek Drainage Basin Planning Study (DBPS) shows a proposed land use for the site as agricultural/ranchette (5 Ac+), 5-20% imperviousness. The existing site condition's imperviousness is within the DBPS noted range.

B. Proposed Drainage Conditions

The existing off-site runoff from Banning Lewis Ranch Pond 93 will be diverted off-site by extending the existing 42" RCP storm sewer in order to discharge the 100-yr at the southwest corner of the property and into the adjacent southern property where it returns to the historic flow pattern. The Dublin Towne Centre detention pond will not be designed to detain or provide water quality capture volume for the off-site runoff. The proposed extension of the existing 42" RCP storm sewer will be constructed by Dublin Towne Centre or with the Marksheffel Road improvement project (County), whichever is first.

This drainage report will use a 90% maximum impervious coverage (commercial land use) for the proposed on-site runoff calculation. The increase in imperviousness will require an on-site water quality and detention pond to detain the additional runoff created by the proposed development. The developed peak runoff rates are $Q_5=24.94$ cfs and $Q_{100}=42.09$ cfs. The site percent impervious may change with the future development plan.

The required 100-year detention volume is $V_{100}=1.55$ acre ft with a release rate of 4.33 cfs per the Detention Volume by the Full Spectrum Method of the UDFCD Detention_v2.34 spreadsheet, see appendix. The release rate is less than the existing 100-year peak runoff rate for the site. A rip-rap lined overflow channel or weir must be designed to discharge the historic off-site overflow plus on-site peak runoff rate, $Q_{\text{overflow}}=404$ cfs. A flow path for the 100-year emergency overflow will be accommodated through the Dublin Towne Centre site or along Marksheffel Road. The on-site SWQ/detention pond and the emergency flow channel or weir

for the offsite Pond 93 will be constructed by Dublin Towne Centre as part of the Site Development Plan, (Dev. Plan submittal date is unknown). Said structures will be designed and detailed in a future Drainage Report which will be submitted with the Site Development Plan.

The future storm sewer improvements for Marksheffel Road shown in the drainage plan exhibits will be constructed by El Paso County as part of the future Marksheffel Road improvements which is documented in the preliminary project plans/corridor improvement project, see Appendix A.

IV. FLOODPLAIN STATEMENT

Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Panel #08041C0545 F (March 1997) shows the site located within Zone X (area of minimal flood hazard, usually depicted on FIRM as above the 500-year flood level). A FIRM map is included in the appendix

V. SOILS

The Soil Survey of El Paso County Area, Colorado, prepared by the U.S. Department of Agriculture Soil Conservation Service, shows the site is underlain by the Blakeland Loamy Sand, Hydrologic Soil Group 'A'. A Soils map is included in the appendix.

VI. CONCLUSIONS

The Dublin Towne Centre site contains 8.66 acres that is proposed to be annexed into the City of Colorado Springs and will be changed from a RR-5 to C-5 zoning for an anticipated commercial or multi-family residential land use. Future development for the updated zoning will increase the site imperviousness and will require an on-site water quality and detention pond to accommodate developed flows and meet City of Colorado Springs drainage criteria. Future development will discharge off-site in historic flow patterns at historic rates or less to prevent drainage problems to existing downstream facilities. This report is in conformance with the Sand Creek DBPS.

All drainage facilities described herein and shown on the included drainage plan are subject to change due to final design considerations.

The drainage analysis has been prepared in accordance with the current City of Colorado Springs/El Paso County Drainage Criteria Manual and Urban Storm Drainage Criteria Manual. Supporting information is included in the Appendix. The recommendations contained herein are subject to the conditions set forth.

VII. REFERENCES

1. City of Colorado Springs and El Paso County "Drainage Criteria Manual", October 1987, revised November 1991.

2. Urban Drainage and Flood Control District (UDFCD) "Urban Storm Drainage Criteria Manual" (USDCM), Volume 1 & 2, June 2001, revised April 2008.
3. Urban Drainage and Flood Control District (UDFCD) "Urban Storm Drainage Criteria Manual" (USDCM), Volume 3, June 2001, revised April 2008.
4. FEMA Emergency Management Agency, Flood Insurance Rate Map, El Paso County Colorado and Incorporated Areas, Map Number 08041C0545 F, effective date March 17, 1997.
5. "Banning Lewis Ranch Filing No. 2 – Major Channels & Detention Basin Addendum No. 1 Final Drainage Report," prepared by TCB, September 2006.
6. Natural Resources Conservation Service Web Soil Survey.
7. Sand Creek Drainage Basin Planning Study, prepared by Kiowa Engineering Corp., March 1996.

APPENDIX A

Vicinity Map

FEMA FIRM Map

Soils Map

Future Marksheffel Road Improvement

Existing Conditions Drainage Plan, Sheet DR-1

Proposed Conditions Drainage Plan, Sheet DR-2



N.T.S.

BANNING LEWIS RANCH

PROJECT

Dublin Blvd.

Dublin Blvd.



TOY RANCHES

Hawk Wind Blvd.

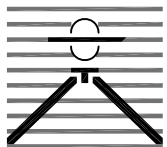
INDIGO RANCH

Marksheffel Rd.

Luther Rd.

Wrangler Ridge Dr.

Issaquah Dr.



VICINITY MAP

Drexel, Barrell & Co.
Engineers • Surveyors

DATE:
10-23-13

DWG. NO.

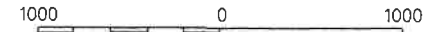
JOB NO:
20534-01CSCV

VMAP

SHEET 1 OF 1



APPROXIMATE SCALE IN FEET



NATIONAL FLOOD INSURANCE PROGRAM

**FIRM
FLOOD INSURANCE RATE MAP**

**EL PASO COUNTY,
COLORADO AND
INCORPORATED AREAS**

PANEL 545 OF 1300
(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS: COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS CITY OF	080000	064E	F
EL PASO COUNTY, UNINCORPORATED AREAS	080059	064E	F

**MAP NUMBER
08041C0545 F**

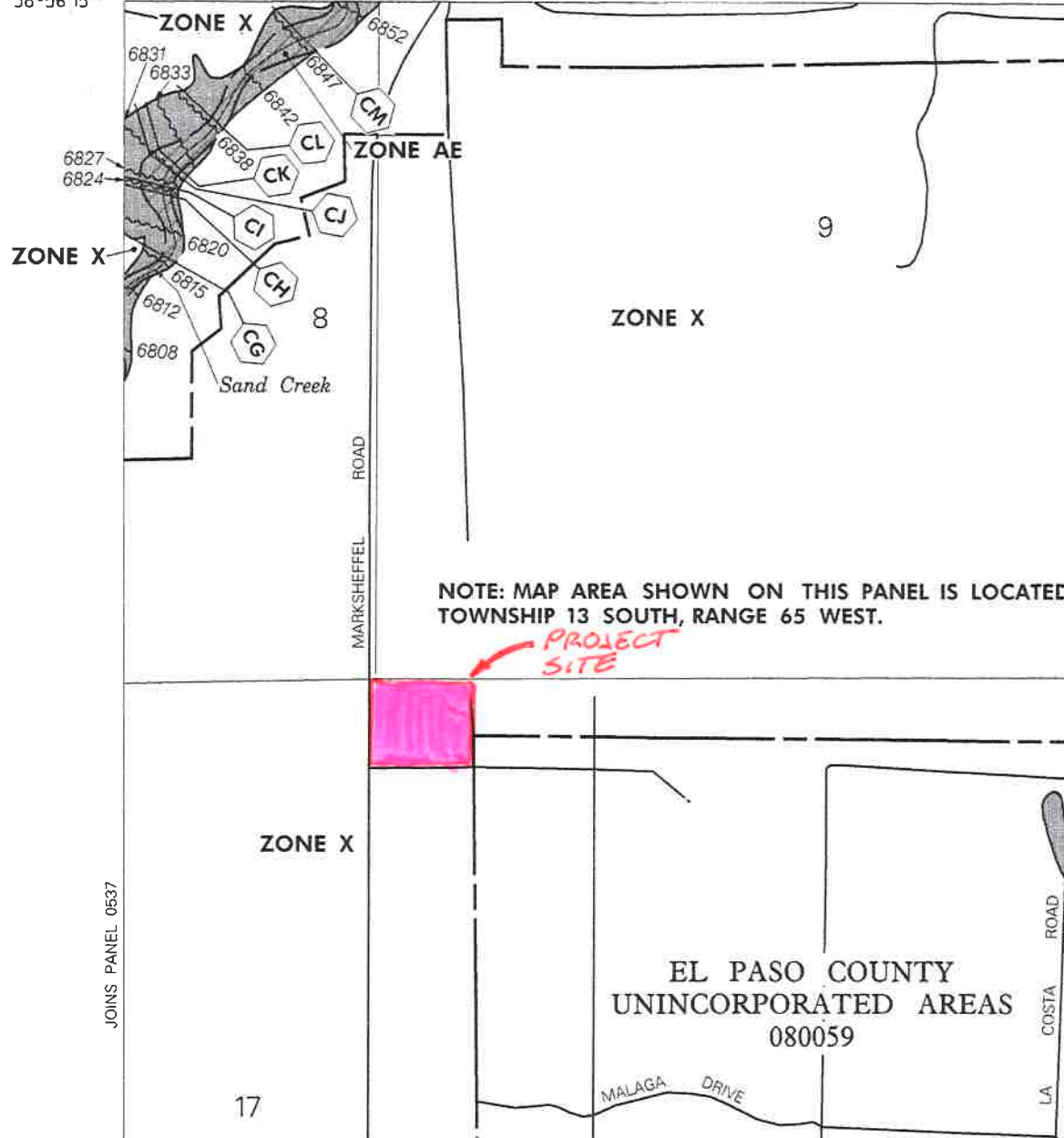
**EFFECTIVE DATE:
MARCH 17, 1997**



Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It 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

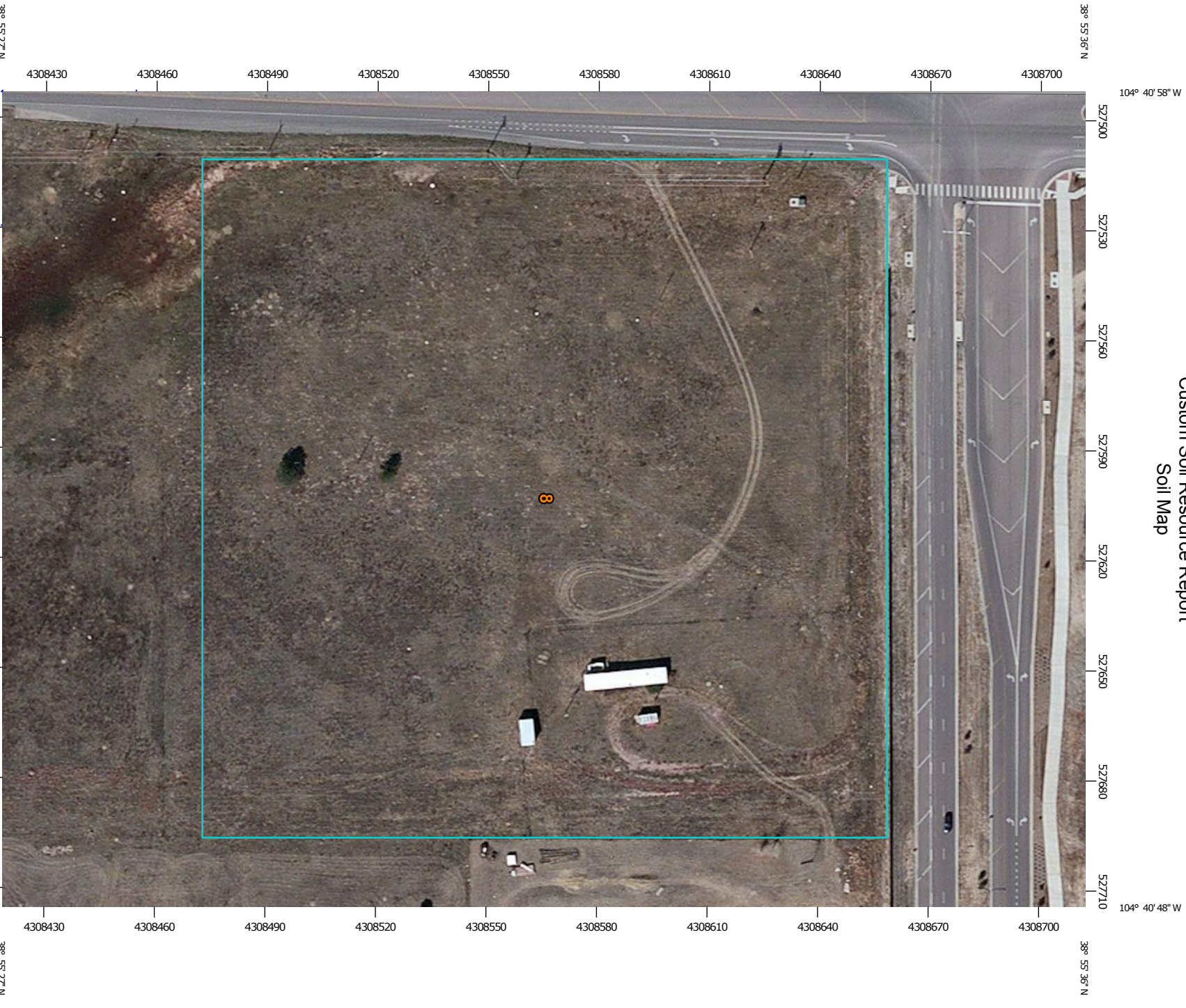
104°41'15"
38°56'15"



JOINS PANEL 0537

17

Custom Soil Resource Report Soil Map



38° 55' 36" N

104° 40' 58" W

527500

527530

527560

527590

527620

527650

527680

527710

38° 55' 36" N

38° 55' 27" N

4308430

4308460

4308490

4308520

4308550

4308580

4308610

4308640

4308670

4308700

527500

527530

527560

527590

527620

527650

527680

527710

38° 55' 27" N

104° 40' 58" W




Map Scale: 1:1,430 if printed on A portrait (8.5" x 11") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edgetics: 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: <http://websoilsurvey.nrcs.usda.gov>
 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 9, Sep 17, 2012

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

Date(s) aerial images were photographed: Apr 15, 2011—Sep 22, 2011

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

El Paso County Area, Colorado (CO625)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
8	Blakeland loamy sand, 1 to 9 percent slopes	8.5	100.0%
Totals for Area of Interest		8.5	100.0%

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Custom Soil Resource Report

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

El Paso County Area, Colorado

8—Blakeland loamy sand, 1 to 9 percent slopes

Map Unit Setting

Elevation: 4,600 to 5,800 feet

Mean annual precipitation: 14 to 16 inches

Mean annual air temperature: 46 to 48 degrees F

Frost-free period: 125 to 145 days

Map Unit Composition

Blakeland and similar soils: 85 percent

Description of Blakeland

Setting

Landform: Flats, hills

Landform position (three-dimensional): Side slope, talf

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Alluvium derived from sedimentary rock and/or eolian deposits derived from sedimentary rock

Properties and qualities

Slope: 1 to 9 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Somewhat excessively drained

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

Calcium carbonate, maximum content: 5 percent

Available water capacity: Low (about 4.5 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability classification (irrigated): 3e

Land capability (nonirrigated): 6e

Hydrologic Soil Group: A

Ecological site: Sandy Foothill (R049BY210CO)

Typical profile

0 to 11 inches: Loamy sand

11 to 27 inches: Loamy sand

27 to 60 inches: Sand

Minor Components

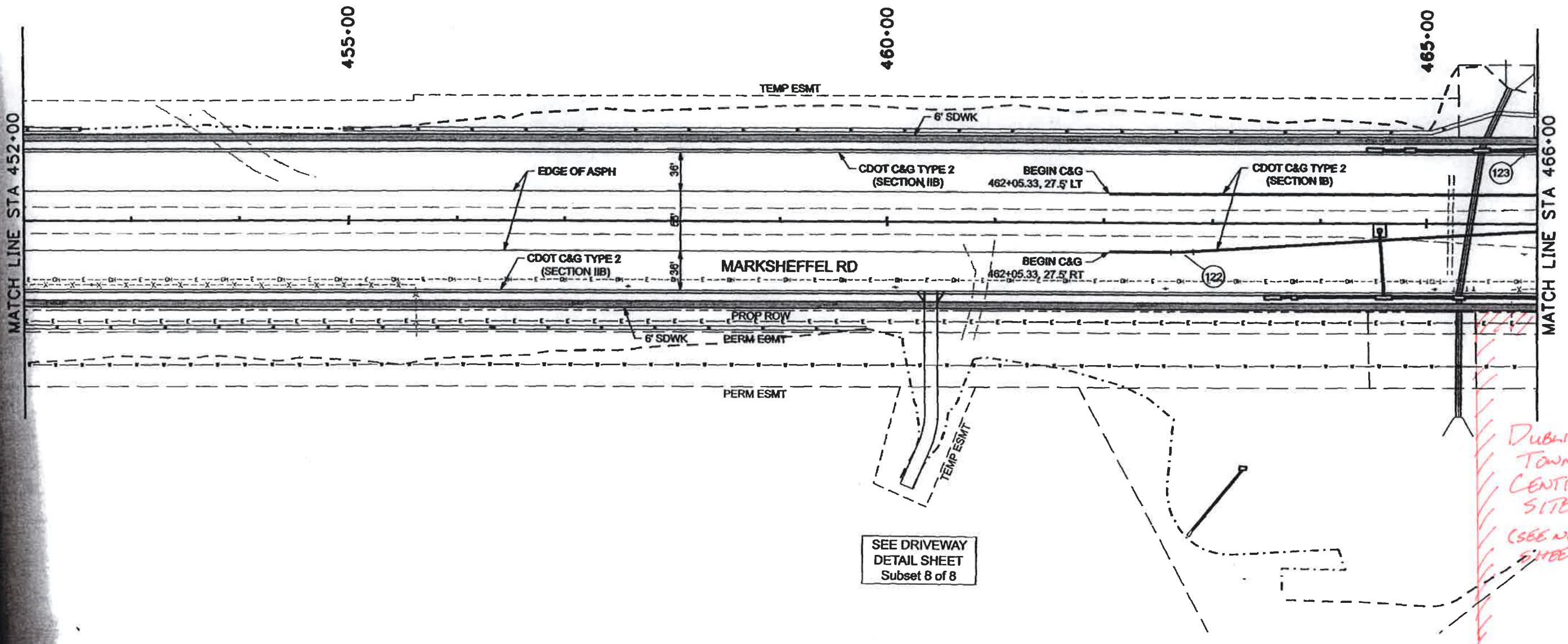
Other soils

Percent of map unit:

Pleasant

Percent of map unit:

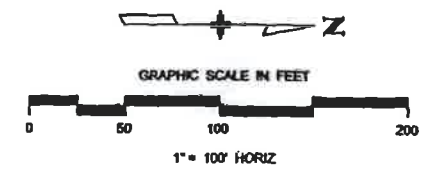
Landform: Depressions



POINT ID	STATION	OFFSET	ELEV @ LIP OF PAN
PC	462+61.51	27.50' RT	6798.09
MID PNT 350' RAD	462+71.99	27.34' RT	6797.96
PT	462+82.47	26.87' RT	6797.84
PC	465+78.75	63.50' LT	6797.78
MID PNT 250' RAD	465+87.76	63.66' LT	6797.79
PT	465+96.76	64.15' LT	6797.82

ALL CURB & GUTTER DIMENSIONS, STATION & OFFSET, ELEVATION LABELS, AND CURVE DATA ARE TO THE LIP OF PAN UNLESS OTHERWISE DENOTED.

NOTE: SEE ROW PLANS FOR DESCRIPTIONS OF ROW AND EASEMENT DIMENSIONS AND LOCATION.



Computer File Information	
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07/2008	Initials: DVD

Sheet Revisions		
Date:	Comments	Init.

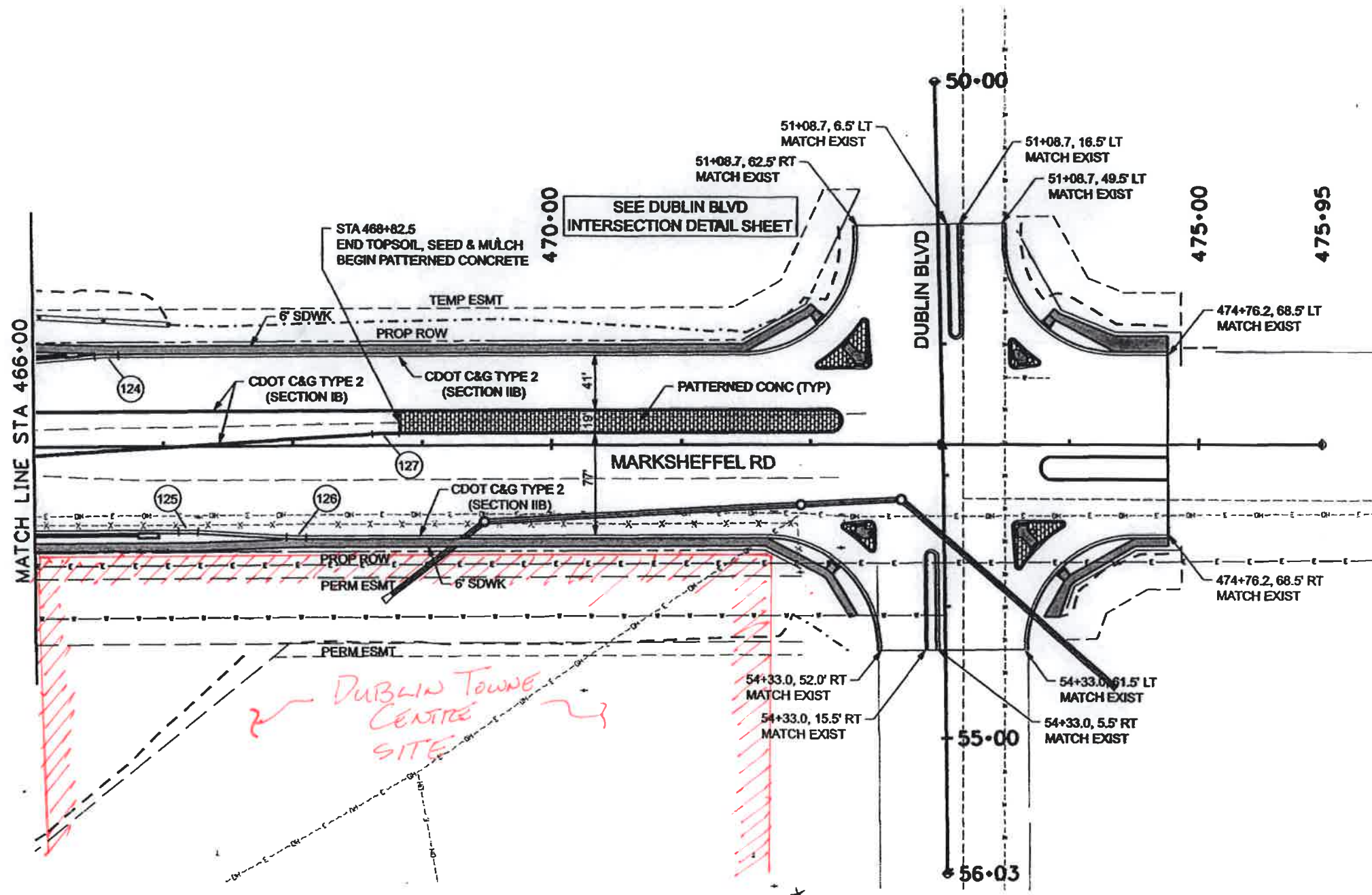


WILSON & COMPANY
 Engineers & Architects
 5755 Mark Dabling Blvd.
 Ste. 228
 Colorado Springs, CO 80919
 Phone: 719-526-5880
 Fax: 719-526-0188

As Constructed
No Revisions:
Revised:
Void:

Marksheffel Road Roadway Plan			
Designer: JJW	Structure Numbers	N/A	N/A
Detailer: DVD	Structure Numbers	N/A	N/A
Sheet Subset: P & P	Subset Sheets:	31 of 34	

Project No./Code
PPRTA 75174
Sheet Number 97



POINT ID	STATION	OFFSET	ELEV @ LIP OF PAN
PC	466+48.01	67.85' LT	6798.04
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PT	466+66.02	68.50' LT	6798.18
PC	467+11.18	63.50' RT	6798.46
MID PNT 250' RAD	467+18.67	63.61' RT	6798.60
PT	467+28.15	63.95' RT	6798.75

ID	POINT ID	STATION	OFFSET	ELEV @ LIP OF PAN
126	PC	467+94.52	68.05' RT	6800.04
	MID PNT 250' RAD	468+02.00	68.39' RT	6800.18
	PT	468+09.49	68.50' RT	6800.33
127	PC	468+61.53	7.87' LT	6802.89
	MID PNT 350' RAD	468+72.01	8.34' LT	6803.11
	PT	468+82.49	8.50' LT	6803.33

ALL CURB & GUTTER DIMENSIONS, STATION & OFFSET, ELEVATION LABELS, AND CURVE DATA ARE TO THE LIP OF PAN UNLESS OTHERWISE DENOTED.

NOTE: SEE ROW PLAN FOR DESCRIPTIONS OF ROW AND EASEMENT DIMENSIONS AND LOCATION.



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Date:	Initials: DVD

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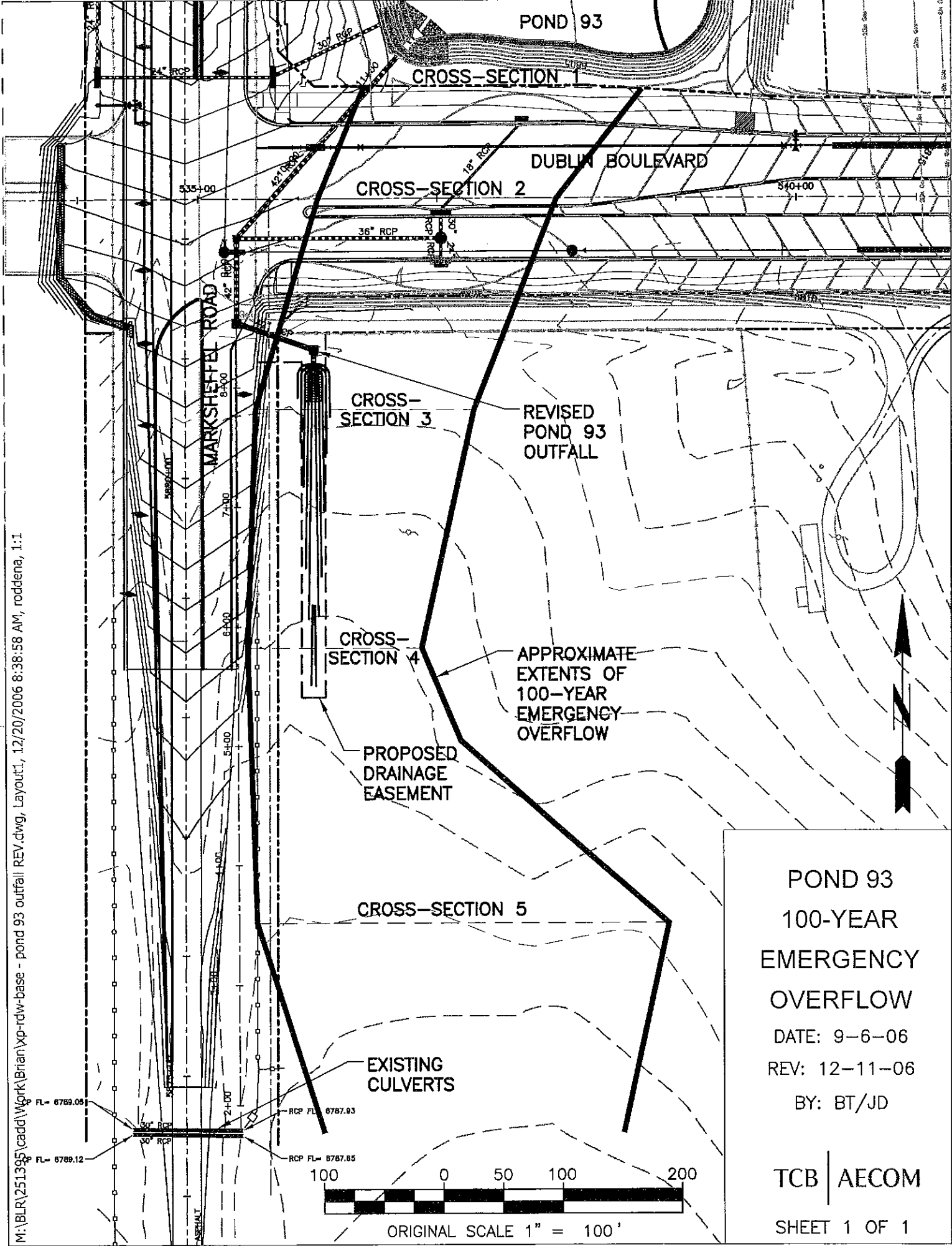


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 Fax: 719-520-0188

As Constructed
No Revisions:
Revised:
Void:

Marksheffel Road Roadway Plan			
Designer: JJW	Structure Numbers	N/A	
Detailer: DVD		N/A	
Sheet Subset: P & P	Subset Sheets:	33 of 34	

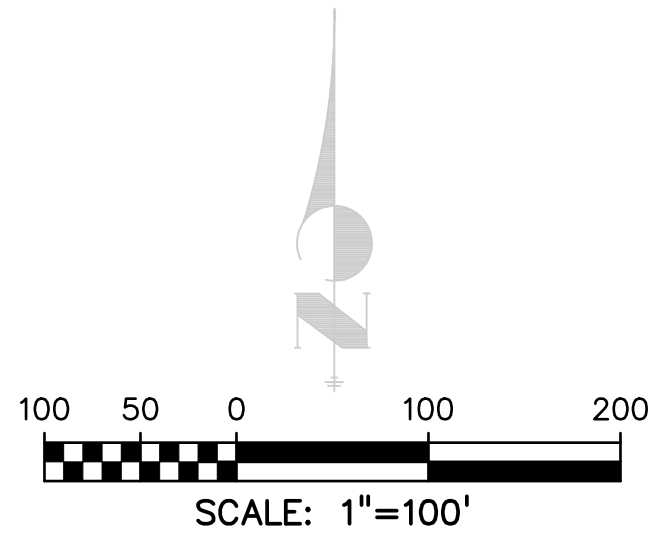
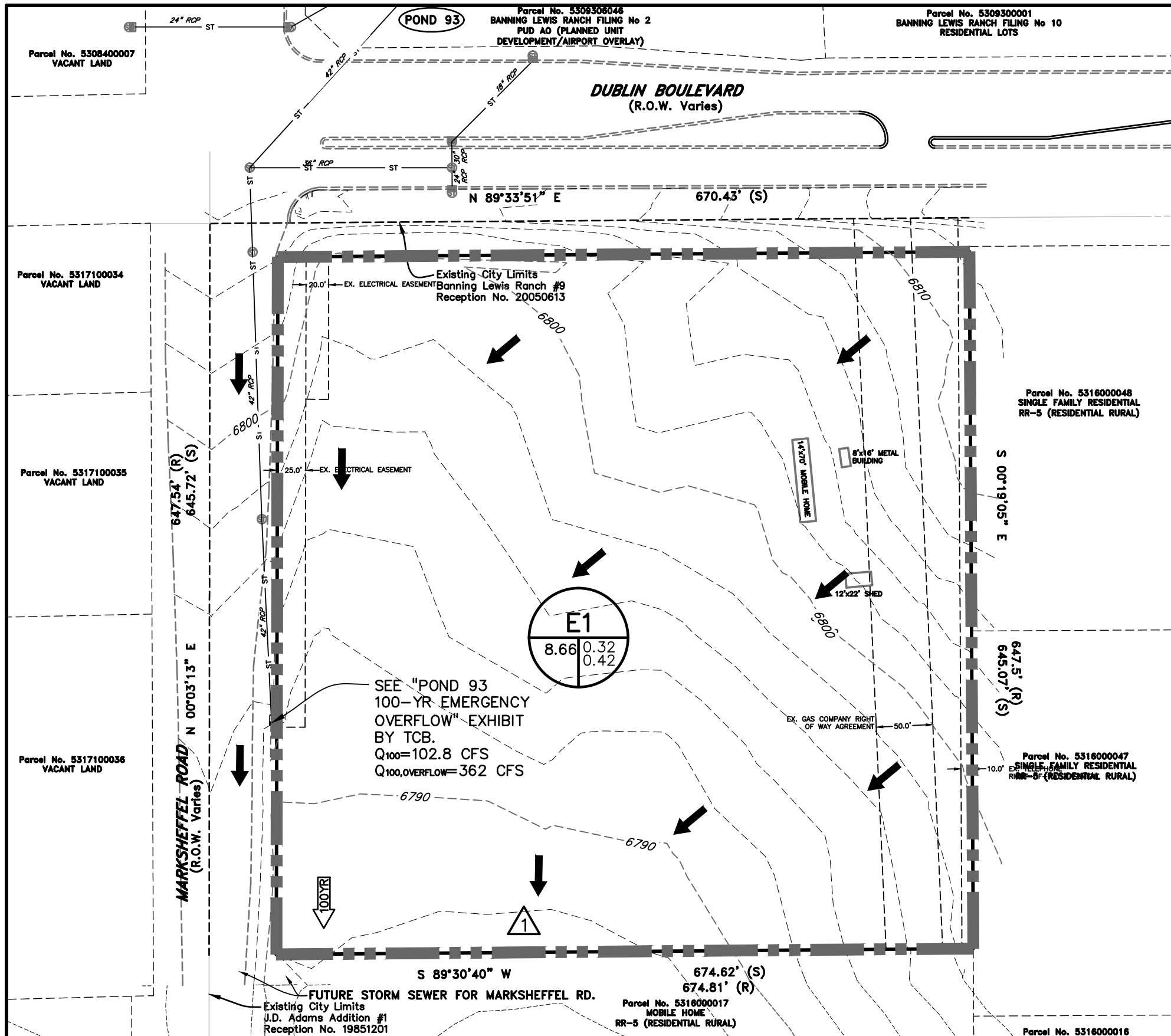
Project No./Code
PPRTA 75174
Sheet Number 99



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POND 93
 100-YEAR
 EMERGENCY
 OVERFLOW
 DATE: 9-6-06
 REV: 12-11-06
 BY: BT/JD

TCB | AECOM
 SHEET 1 OF 1



LEGEND

- DRAINAGE BASIN BOUNDARY [thick dashed line]
- DRAINAGE BASIN DESIGN POINT [triangle with 'B']
- BASIN I.D. [solid line]
- BASIN AREA (Acres) [circle with 'C-3' and numbers]
- 5 YEAR RUNOFF COEFFICIENT [line to 3.45]
- 100 YEAR RUNOFF COEFFICIENT [line to 0.90]
- EX. INTERMEDIATE CONTOUR [dashed line 5364]
- EX. INDEX CONTOUR [dashed line 5365]
- DIRECTION OF FLOW [solid arrow]
- 100 YEAR DETENTION POND OVERFLOW [arrow with '100YR']
- EX. STORM SEWER [line with 'EX. 18" RCP STORM ST']
- EX. MANHOLE [circle with 'MH']

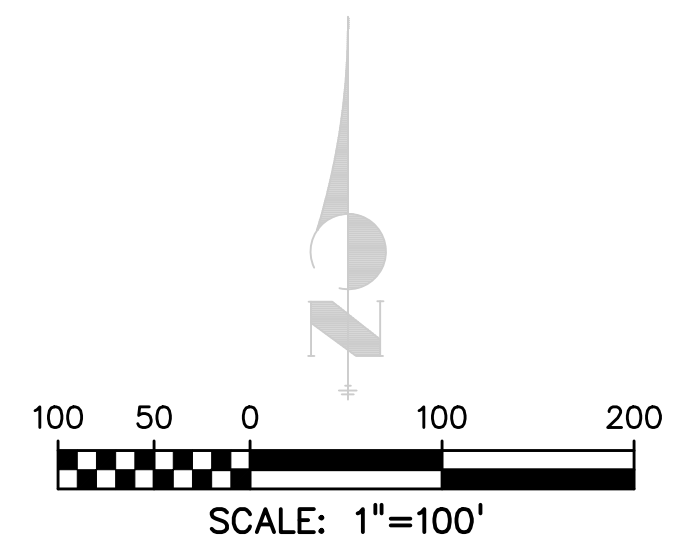
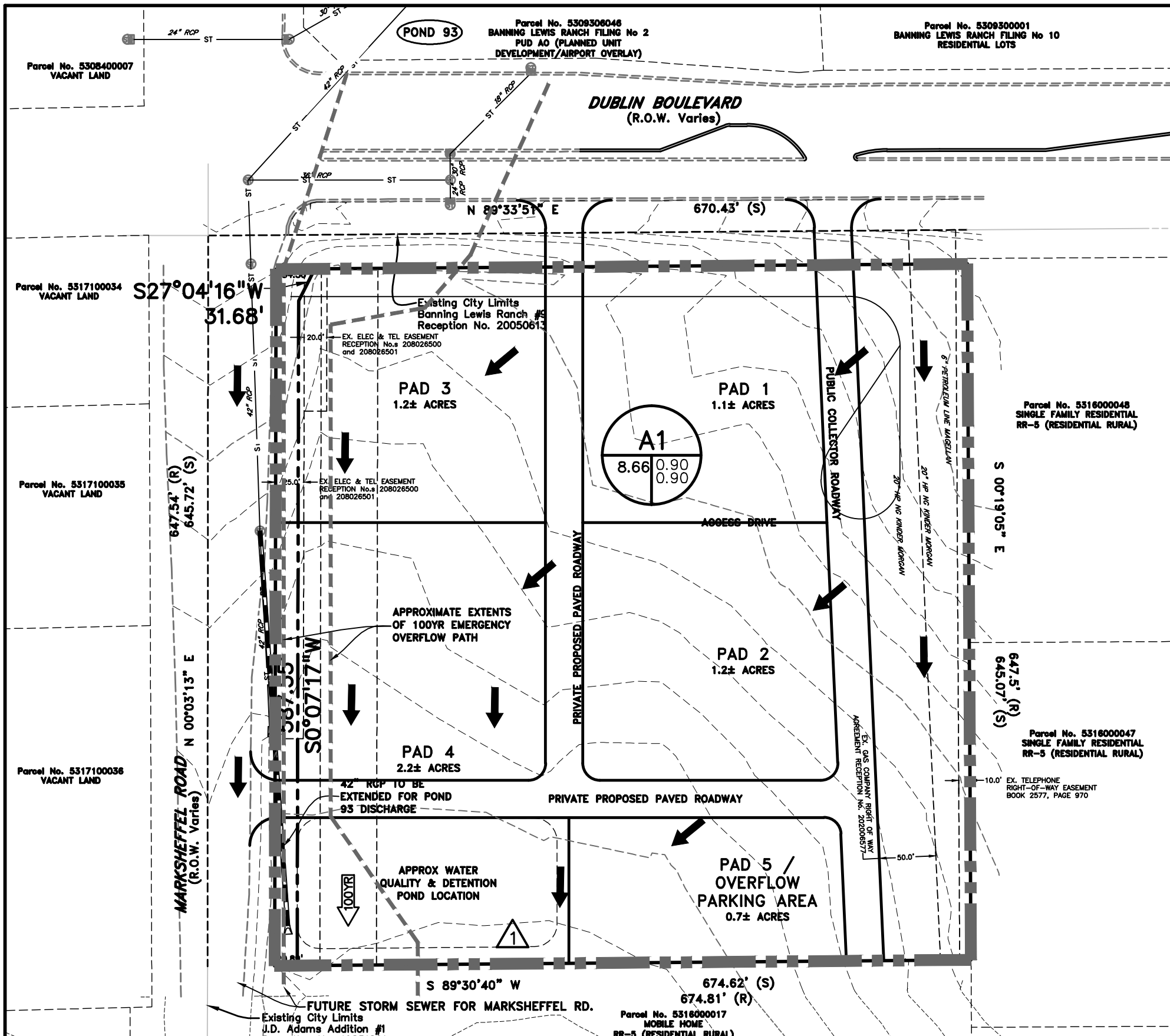
SUMMARY RUNOFF TABLE					
BASIN	AREA (AC)	DESIGN PT	Q ₅ (CFS)	Q ₁₀₀ (CFS)	Q _{OVERFLOW} (CFS)
E1	8.66	1	8.31	18.71	
OFFSITE	POND 93			102.8	362

PREPARED BY: **Drexel, Barrell & Co.**
 Engineers • Surveyors
 3 SOUTH 7TH STREET
 COLORADO SPRINGS, COLORADO 80905
 (719) 260-0887
 BOULDER • GREELEY • STEAMBOAT SPRINGS • GRAND JUNCTION

REVISION DESCRIPTIONS	DATE

**EXISTING CONDITION
DRAINAGE PLAN**

DATE: 03/03/14	JOB NO: 20534-01CSCV	SHEET 1
SCALE: H: 1"=100' V: N/A	DRAWING NO.: DR-1	SHEETS 2



LEGEND

- DRAINAGE BASIN BOUNDARY [dashed line]
- DRAINAGE BASIN DESIGN POINT [triangle with B]
- BASIN I.D. [line to circle]
- BASIN AREA (Acres) [line to circle with 8.66]
- 5 YEAR RUNOFF COEFFICIENT [line to circle with 0.45]
- 100 YEAR RUNOFF COEFFICIENT [line to circle with 0.90]
- DIRECTION OF FLOW [arrow]
- 100 YEAR DETENTION POND OVERFLOW [arrow with 100YR]
- EX. STORM SEWER [dashed line with ST]
- EX. MANHOLE [circle with MH]

SUMMARY RUNOFF TABLE				
BASIN	AREA (AC)	DESIGN PT	Q _{RELEASE} (CFS)	Q _{OVERFLOW} (CFS)
A1	8.66	1	4.33	102.8

PREPARED BY: **Drexel, Barrell & Co.**
 Engineers • Surveyors
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 COLORADO SPRINGS, COLORADO 80905
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 BOULDER • GREELEY • STEAMBOAT SPRINGS • GRAND JUNCTION

REVISION DESCRIPTIONS	DATE

PROPOSED CONDITION DRAINAGE PLAN

DATE: 03/03/14	JOB NO: 20534-01CSCV	SHEET 2
SCALE: H: 1"=100' V: N/A	DRAWING NO.: DR-2	SHEETS 2

APPENDIX B

Existing Conditions Hydrology
Proposed Conditions Hydrology
Proposed Detention Pond Sizing

Existing Conditions Hydrology

**DUBLIN TOWNE CENTRE ANNEXATION
COMPOSITE C AND IMPERVIOUS AREA CALCULATION, EXISTING CONDITION**

Project Engineer: Gilbert LaForce
 Design Firm: Drexel, Barrell & Co
 Project Number: 20534-01CSCV
 Date: 3/3/2014

DESIGN CRITERIA:

City of Colorado Springs and El Paso County "Drainage Criteria Manual", November 1994 as amended
 Urban Storm Drainage Criteria Manual

BASINS:

Composite C values and percent impervious obtained from Table 5-1 in the City of Colorado Springs Drainage Criteria Manual
 Soil Survey: Blakeland Loamy Sand, Hydrologic Soil Group A

C VALUE	C ₁₀	C ₁₀₀	% Impervious
*Large Lot Residential	0.30	0.40	5%
Gravel Street	0.80	0.85	80.0%
Roof	0.90	0.95	90.0%

*-Table III-1: Percent Impervious Values, Sand Creek DBPS

Sub-basin Designation	A _{total} (acres)	A _{gravel} (acres)	A _{roof} (acres)	A _{grass} (acres)	Percent Impervious		Description
					C ₁₀	C ₁₀₀	
E1	8.660	0.256	0.033	8.371	0.32	0.42	0.08 Existing Condition

DUBLIN TOWNE CENTRE ANNEXATION
TIME OF CONCENTRATION, EXISTING CONDITION

Project Engineer: Gilbert LaForce
 Design Firm: Drexel, Barrell & Co
 Project Number: 20534-01CSCV
 Date: 3/3/2014

DESIGN CRITERIA:

City of Colorado Springs and El Paso County "Drainage Criteria Manual", October 1994 as amended

EQUATIONS:

$$t_c = t_i + t_t$$

$$t_i = \text{Fig 5-2 (Drainage Criteria Manual)}$$

$$t_t = 1.87(1.1 - C_{10})(L^{.5})(S^{.1/3})$$

CONSTRAINTS:

300 ft - Overland flow shall not exceed for proposed condition

1000 ft - Overland flow shall not exceed for historical condition

Final t_c = minimum of $t_i + t_t$

recommended minimum t_c = 5 min

BASINS:

SUB-BASIN DATA				INITIAL/OVERLAND TIME (t_o)			TRAVEL TIME (t_t)			Final t_c	REMARKS
DESIGN POINT	Sub-basin	C_{10}	AREA A_c	LENGTH Ft	SLOPE %	t_i Min	LENGTH Ft	SLOPE %	t_t Min	$t_c = t_i + t_t$ Min	(13)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(11)	(12)	(13)
1	E1	0.32	8.66	750	3.00	37.00	0.00	0.00	0.00	37.00	Existing Condition

DUBLIN TOWNE CENTRE ANNEXATION

RATIONAL METHOD - RUNOFF, EXISTING CONDITION

Project Engineer: Gilbert LaForce
 Design Firm: Drexel, Barrell & Co
 Project Number: 20534-01CSCV
 Date: 3/3/2014

EQUATIONS:

$$Q = ciA$$

Q= peak discharge (cfs)

C= runoff coefficient

i= rainfall intensity (in/hr); Interim Release Oct 1994 IDF Chart

A= drainage area (ac)

BASINS:

Design Point (1)	Sub-basin (2)	PEAK RUNOFF						REMARKS (10)
		AREA Ac (3)	Runoff Coeff. (C ₁₀) (4)	A*C (5)	t _c min. (6)	i in/hr (7)	Q cfs (8)	
1	E1	8.66	0.30	2.60	37.00	3.20	8.31 5yr	Existing Condition
		8.66	0.40	3.46	37.00	5.40	18.71 100yr	

Proposed Conditions Hydrology

DUBLIN TOWNE CENTRE ANNEXATION
COMPOSITE C AND IMPERVIOUS AREA CALCULATION, CONCEPT PLAN - DEVELOPED CONDITION

Project Engineer: Gilbert LaForce
 Design Firm: Drexel, Barrell & Co
 Project Number: 20534-01CSCV
 Date: 12/11/2013

DESIGN CRITERIA:

City of Colorado Springs and El Paso County "Drainage Criteria Manual", November 1994 as amended
 Urban Storm Drainage Criteria Manual

BASINS:

Composite C values and percent impervious obtained from Table 5-1 in the City of Colorado Springs Drainage Criteria Manual
 Soil Survey: Blakeland Loamy Sand, Hydrologic Soil Group A

C VALUE	C ₁₀	C ₁₀₀	% Impervious
Business, Commercial Area	0.90	0.90	90.0%

Sub-basin Designation	A _{total} (acres)	A _{paved} (acres)	A _{roof} (acres)	A _{lawn} (acres)	C		Percent Impervious	Description
					C ₁₀	C ₁₀₀		
A1	8.660				0.90	0.90	90%	Anticipated Land Use

DUBLIN TOWNE CENTRE ANNEXATION
TIME OF CONCENTRATION, CONCEPT PLAN - DEVELOPED CONDITION

Project Engineer: Gilbert LaForce
 Design Firm: Drexel, Barrell & Co
 Project Number: 20534-01CSCV
 Date: 12/11/2013

DESIGN CRITERIA:

City of Colorado Springs and El Paso County "Drainage Criteria Manual", October 1994 as amended

EQUATIONS:

$$t_c = t_i + t_t$$

$$t_i = \text{Fig 5-2 (Drainage Criteria Manual)}$$

$$t_t = 1.87(1.1 - C_{10})(L^{.5})(S^{.1/3})$$

CONSTRAINTS:

300 ft - Overland flow shall not exceed for proposed condition

1000 ft - Overland flow shall not exceed for historical condition

Final t_c = minimum of $t_i + t_t$
 recommended minimum t_c = 5 min

BASINS:

SUB-BASIN DATA				INITIAL/OVERLAND TIME (t_o)			TRAVEL TIME (t_t)			Final t_c	REMARKS
DESIGN POINT	Sub-basin	C_{10}	AREA A_c	LENGTH Ft	SLOPE %	t_i Min	LENGTH Ft	SLOPE %	t_t Min	$t_c = t_i + t_t$ Min	(13)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(11)	(12)	(13)
1	A1	0.90	8.66			5.00	580.00	3.00	12.94	17.94	Anticipated Land Use

DUBLIN TOWNE CENTRE ANNEXATION

RATIONAL METHOD - RUNOFF, CONCEPT PLAN - DEVELOPED CONDITION

Project Engineer: Gilbert LaForce
 Design Firm: Drexel, Barrell & Co
 Project Number: 20534-01CSCV
 Date: 12/11/2013

EQUATIONS:

$$Q = ciA$$

Q= peak discharge (cfs)

C= runoff coefficient

i= rainfall intensity (in/hr); Interim Release Oct 1994 IDF Chart

A= drainage area (ac)

BASINS:

Design Point (1)	Sub-basin (2)	PEAK RUNOFF						REMARKS (10)
		AREA Ac (3)	Runoff Coeff. (C ₁₀) (4)	A*C (5)	t _c min. (6)	i in/hr (7)	Q cfs (8)	
1	A1	8.66	0.90	7.79	17.94	3.20	24.94 5yr	Anticipated Land Use
		8.66	0.90	7.79	17.94	5.40	42.09 100yr	

Proposed Detention Pond Sizing

DETENTION VOLUME BY THE FULL SPECTRUM METHOD

Project: _____
 Basin ID: _____

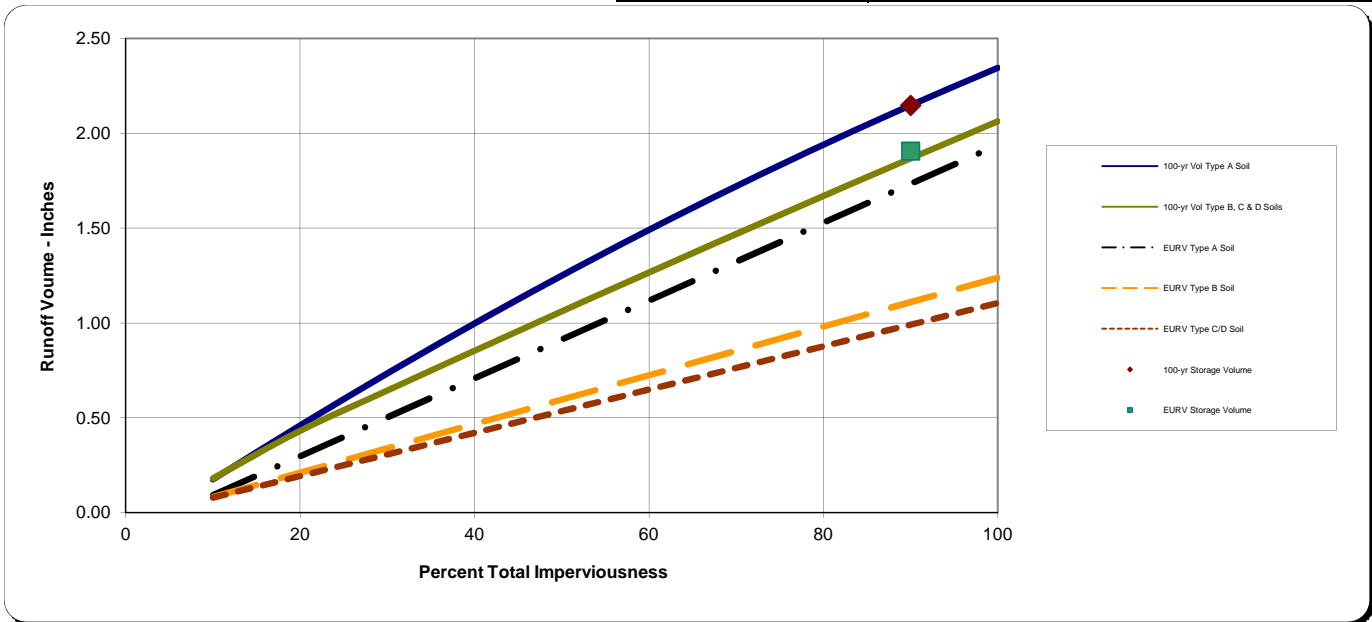
* User input data shown in blue.

Area of Watershed (acres)	8.66	
Subwatershed Imperviousness	90.0%	
Level of Minimizing Directly Connected Impervious Area (MDCIA)	0	0 ▼
Effective Imperviousness ¹	90.0%	
Hydrologic Soil Type	Percentage of Area	Area (acres)
Type A	100.0%	8.7
Type B		0.0
Type C or D		0.0

Recommended Horton's Equation Parameters for CUHP		
Infiltration (inches per hour)		Decay Coefficient-- α
Initial-- f_i	Final-- f_o	
5	1.0	0.0007
Detention Volumes ^{2,5}		
(watershed inches)	(acre-feet)	Maximum Allowable Release Rate, cfs ³
1.91	1.38	Design Outlet to Empty EURV in 72 Hours
2.15	1.55	4.33

Excess Urban Runoff Volume⁴

100-year Detention Volume Including WQCV⁵



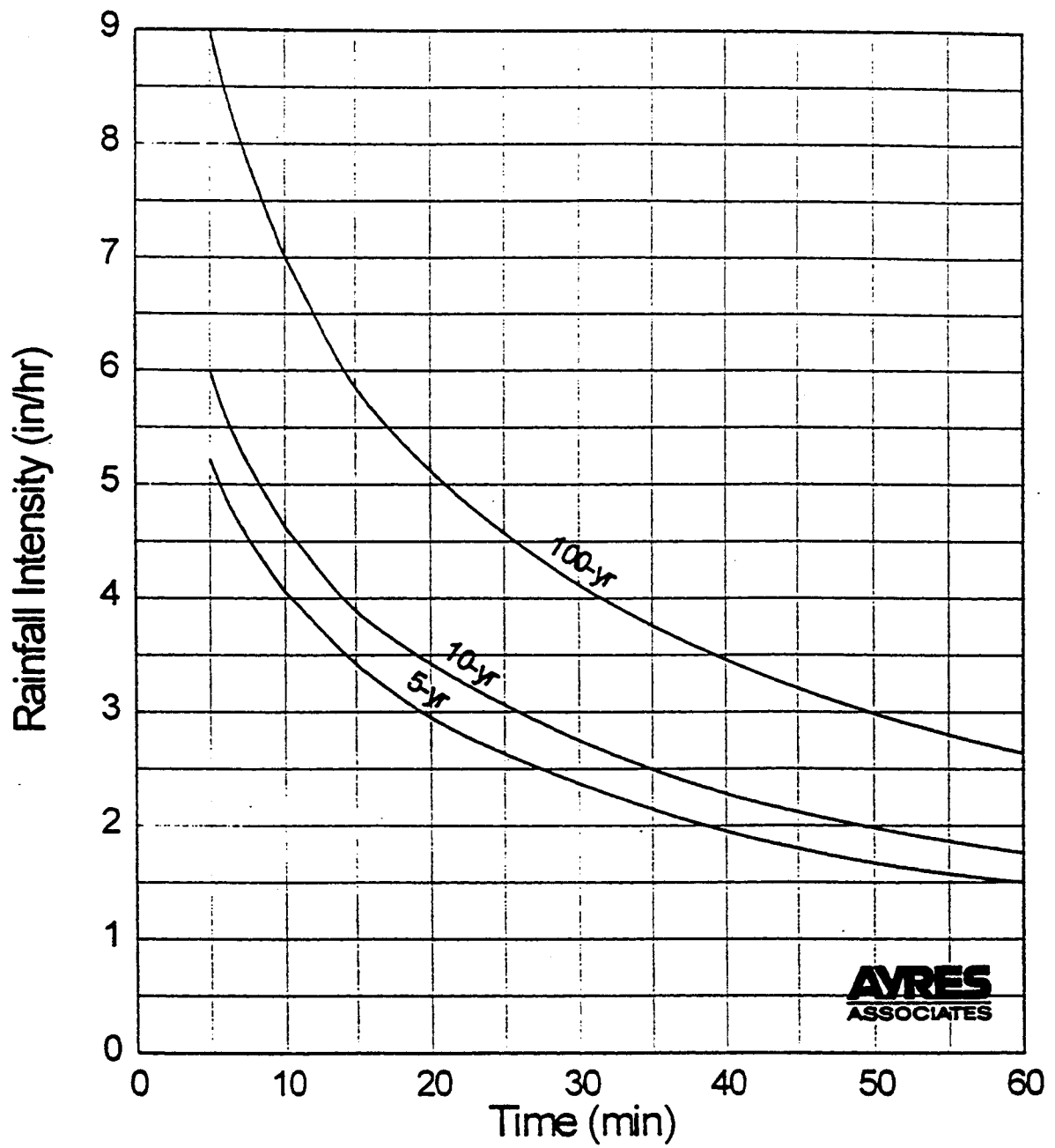
Notes:

- 1) Effective imperviousness is based on Figure ND-1 of the Urban Storm Drainage Criteria Manual (USDCM).
- 2) Results shown reflect runoff reduction from Level 1 or 2 MDCIA and are plotted at the watershed's total imperviousness value; the impact of MDCIA is reflected by the results being below the curves.
- 3) Maximum allowable release rates for 100-year event are based on Table SO-1. Outlet for the Excess Urban Runoff Volume (EURV) to be designed to empty out the EURV in 72 hours. Outlet design is similar to one for the WQCV outlet of an extended detention basin (i.e., perforated plate with a micro-pool) and extends to top of EURV water surface elevation.
- 4) EURV approximates the difference between developed and pre-developed runoff volume.
- 5) 100-yr detention volume includes EURV. No need to add more volume for WQCV or EURV

APPENDIX C

Table 5-1: Recommended Avg Runoff Coefficients and Percent Impervious
Rainfall Intensity Curves

Figure 5-2: Overland Flow Curves



Interim Release October 12, 1994 , Rainfall Intensity Curves
 City Of Colorado Springs Drainage Criteria Manual

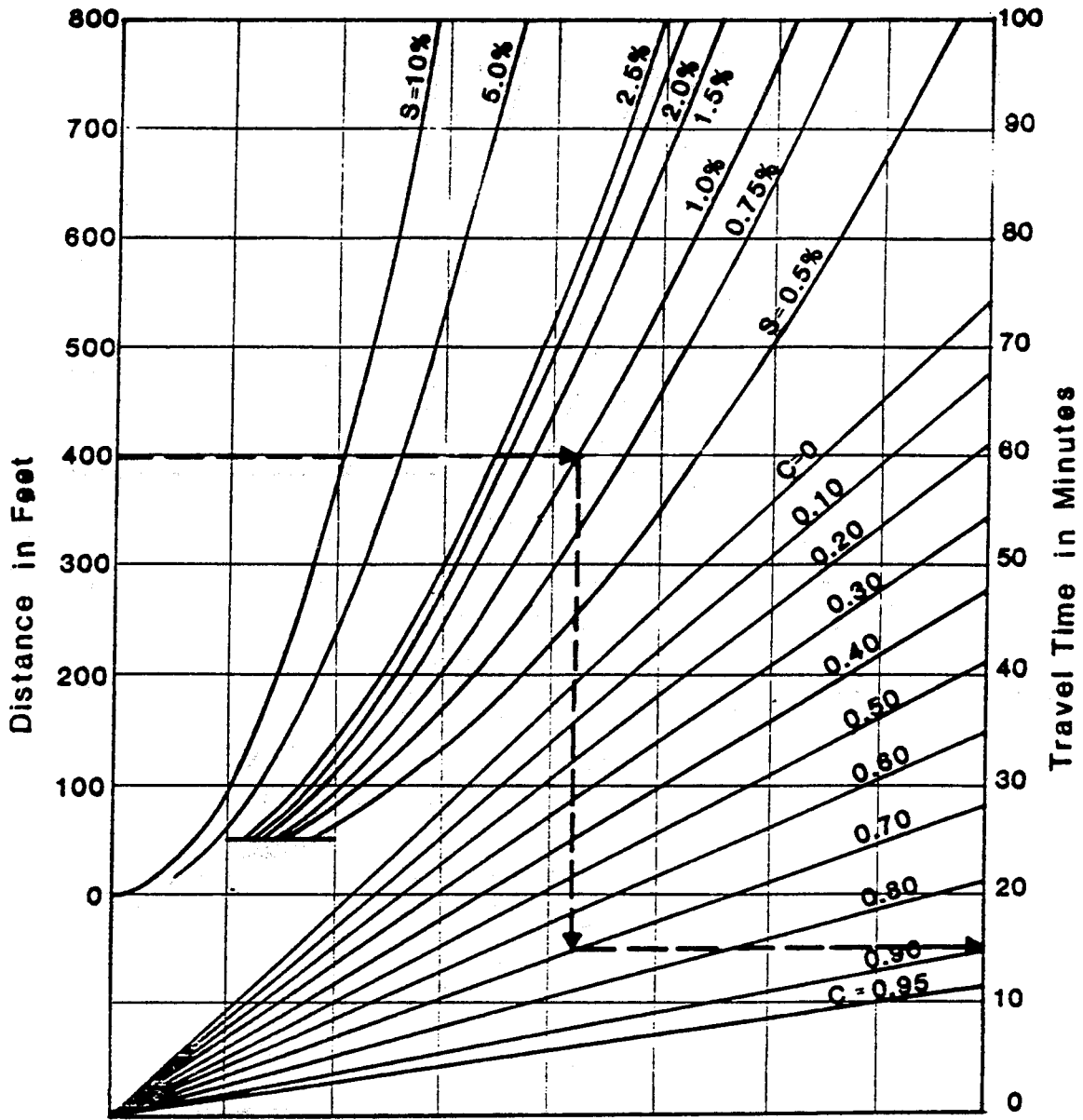
TABLE 5-1

RECOMMENDED AVERAGE RUNOFF COEFFICIENTS AND PERCENT IMPERVIOUS

LAND USE OR SURFACE CHARACTERISTICS	PERCENT IMPERVIOUS	"C" FREQUENCY			
		10		100	
		A&B*	C&D*	A&B*	C&D*
Business					
Commercial Areas	95	0.90	0.90	0.90	0.90
Neighborhood Areas	70	0.75	0.75	0.80	0.80
Residential					
1/8 Acre or less	65	0.60	0.70	0.70	0.80
1/4 Acre	40	0.50	0.60	0.60	0.70
1/3 Acre	30	0.40	0.50	0.55	0.60
1/2 Acre	25	0.35	0.45	0.45	0.55
1 Acre	20	0.30	0.40	0.40	0.50
Industrial					
Light Areas	80	0.70	0.70	0.80	0.80
Heavy Areas	90	0.80	0.80	0.90	0.90
Parks and Cemeteries	7	0.30	0.35	0.55	0.60
Playgrounds	13	0.30	0.35	0.60	0.65
Railroad Yard Areas	40	0.50	0.55	0.60	0.65
Undeveloped Areas					
Historic Flow Analysis- Greenbelts, Agricultural Pasture/Meadow	0	0.25	0.30	0.35	0.45
Forest	0	0.10	0.15	0.15	0.20
Exposed Rock	100	0.90	0.90	0.95	0.95
Offsite Flow Analysis (when land use not defined)	45	0.55	0.60	0.65	0.70
Streets					
Paved	100	0.90	0.90	0.95	0.95
Gravel	80	0.80	0.80	0.85	0.85
Drive and Walks	100	0.90	0.90	0.95	0.95
Roofs	90	0.90	0.90	0.95	0.95
Lawns	0	0.25	0.30	0.35	0.45

* Hydrologic Soil Group

9/30/90



REFERENCE : Wright - McLaughlin Engineers, Urban Storm Drainage Criteria Manual, Vol. 1,
 Denver Regional Council of Governments, Denver, Co. 1977



HDR Infrastructure, Inc.
 A Centerra Company

The City of Colorado Springs / El Paso County
 Drainage Criteria Manual

Overland Flow Curves

Date

OCT. 1987

Figure

5-2