MASTER DEVELOPMENT DRAINAGE PLAN & FINAL DRAINAGE REPORT

for

"Dublin Terrace"

Prepared for:
City of Colorado Springs
Department of Public Works
Engineering Division

On Behalf of:
Spring Creek Construction, LLC
2776 Janitell Road East
Colorado Springs, CO 80906

Prepared by:
CTR Engineering
6451 Galeta Drive
Colorado Springs, CO 80922
(719) 964-6654

September 2006

05.900.001

16332-21

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 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.

Jonathan Moore, PE
Registered Professional Engineer
State of Colorado
No. 34944

SEAL

Developer's Statement:

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

Today's Homes
Business Name

By: _____

Title: President

Address: 2776 Janitell Road East
Colorado Springs, CO 80906

City of Colorado Springs:

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

City Engineer

Sept 11, 2006
Date

Conditions:

Project Description

The Dublin Terrace Townhomes project is located currently within El Paso County approximately 950-feet west of the Powers Blvd. and Dublin Blvd. intersection. More specifically the project is located at the southwest corner of Dublin Blvd. and Balsam Street; bound on the north by Dublin Blvd., on the east by Balsam Street, on the south by Sundown North Sub. Filing No. 7, on the west by open field, see Vicinity Map. This project has submitted an application for Annexation into the City and is currently under review for approval. The land is currently zoned A1 and is being used as open grass land with two residential homes on the land. An application for rezone to Planned Unit Development (PUD) will accompany this drainage report. This property is currently platted as Lot 23 in Templeton Gap Heights Filing No. 3 and Lot 4 in Templeton Gap Heights Filing No. 2.

The Dublin Terrace Townhomes area currently occupies 12.6 +/- acres and is currently only developing Lot #2, which contains 11+/- acres. This drainage report only pertains to Lot #2 and Track A (open space/drainage way) only. No other lots are scheduled for development at this time. Dublin Terrace Townhomes are constructing private roadways throughout the 11 +/- acres site with public utilities running in a 41-foot dedicated easement.

This development will design the ultimate 6-lane roadway and storm system for Dublin Blvd. so all drainage for Dublin Blvd. and the property to the north will direct storm runoff west to the City drainage way. The roadway plans will be submitted as a separate submittal.

Existing Drainage Characteristics

The existing drainage patterns for Lot #2 consist of pervious runoff to the southwest. All existing drainage runoff flows to the offsite drainage and then to an existing water quality pond. Offsite flows from the north currently flow under Dublin Blvd. by way of a 30-inch diameter concrete culvert. Offsite is defined as areas outside of Lot #2, see offsite drainage characteristics below for further information.

"The historic flow rate from the east side of Powers Blvd. tributary to the greenbelt is approximately 200 cfs during the 100-year storm. Additional historic flow rates of approximately 60 cfs reach the greenbelt from the Bridle Pass Subdivision. Therefore, the total historic flow rates within the greenbelt just upstream of Dublin is approximately 260 cfs", see reference #1. Two existing 54-inch concrete pipes convey the historic flow under Dublin Blvd.

Soil type within the site was taken from the Soil Survey of El Paso County Area, Colorado. The average soil condition reflects Hydrologic Group "B" (Truckton 95,) with permeability soil moderately rapid.

The site is shown on the Federal Emergency Management Agency Flood Insurance Rate Map # 536 F, Dated March 17, 1997, as zone X outside the 500-Year flood plain.

Offsite Drainage Characteristics

A previous drainage report by URS Consultants (see reference #2) has indicated that 494 cfs will be flowing under Dublin Blvd. at the current location of an existing 30-inch diameter corrugated metal pipe. Based on offsite drainage characteristics, only 375.1 cfs will be flowing to the existing 30-inch pipe. The 375.1 cfs was calculated by adding up the various basins, which is a conservative approach. Please see the following:

Dublin North (see ref. #6)	= 107.9 cfs
Cottonwood Creek DBPS (Roadside Ditch, Dev. Flows)	= 148.0 cfs
The New Grace Fellowship Church (see ref. #7)	= 34.0 cfs
OS-1 (north of Dublin Blvd. west of Powers Blvd.)	= 73.4 cfs
OS-2 (1/2 Powers Blvd. runoff)	= 11.8 cfs
Total	**= 375.1 cfs**

An offsite drainage plan (DP-02) can be found in the appendix.

The existing 30-inch pipe will be replaced with a 60-inch reinforced concrete pipe (RCP) that will direct offsite drainage flows along the south half of Dublin Blvd. to the west and outfall flows just south of the existing (2) 54-inch culverts. Said report also indicted that a 14'x5' box culvert may be required at this located, but it has been determined that the proposed 60-inch RCP with a slope of roughly 1.8% can carry 375.8 cfs, which will exceed the requirements of the 375.1 cfs.

A sedimentation basin will be provided in the existing drainage channel, south of this site next to the existing church building as well as sediment will be removed from said channel. These items will be performed and quantified at the direction of the City of Colorado Springs Engineering Department and will most likely be made in the field at time of construction.

All offsite riprap will be owned and maintained by the City of Colorado Springs.

Ayers & Assoc. in their drainage report (see reference #5) have recommended an armored dam in the greenbelt. This dam is shown 50 feet to the south of this projects southern property line, therefore this project is not required to build this structure.

Proposed Drainage Characteristics

The proposed drainage patterns for this site will direct flows west to proposed drainage way (greenbelt). All streets have been designed as a 28-foot flowline-flowline roadway section, with the street grades averaging 3.7% & 4.3% at the critical areas. Street hydraulics have been calculated at the confluence/routed design points for the minor (5-year) & major (100-year) storm events. The hydraulic calculations show that no inlets are required for the minor or major storm events. Design point #2 and basin B will be directed to type "L" riprap that will run down to the offsite drainage way, see drainage plan in the appendix. This riprap will act as an energy dissipater for the storm flows as well as protecting the drainage rundown from erosion. The riprap rundown will average 3.4% slope.

By added the riprap; which will be owned and maintained by the Home Owners Association to the outfall of the storm drainage areas, this will greatly reduce erosion downstream. The drainage way (greenbelt) is very well vegetated and is a wide channel, which helps to prevent erosion from the small amount of storm water being introduced from this site. Two proposed inlets on Dublin Blvd. will direct the flows to the greenbelt.

The over-all developed drainage flow in the channel at Dublin Blvd. has been estimated to be **649.8 cfs** (260 cfs + 375.1 cfs + 14.7 cfs Inlets from Dublin Blvd.) in the 100-year storm event, where this site is only added an additional 54 cfs, which will not adversely affect downstream property. The existing greenbelt directs flow through riprap and into an existing pond which slows the water down before is crosses under Oakwood Blvd.

The drainage way (greenbelt) has been calculated for capacity based on an existing cross-section. It was estimated that **703.8 cfs** (649.8 cfs + 54 cfs) at the 100-year storm event would be flowing in the channel along the frontage to this development, which would produce a surface elevation at the cross-section location of 69.37, the finish floor elevation will be 72.00, see appendix for calculation and cross-section exhibit.

This development will clean all sediment piles from Tract D, as depicted on the drainage plan and the final plat. Tract D will be owned and maintained by the City of Colorado Springs.

Onsite Water Quality

This development will have water quality features onsite, see drainage plan for the water quality areas. Some of the water quality features will consist of a grass swale running along the southern property line. Other features will be planted swales running between buildings. Another water quality feature will be riprap at outlet points to collect sediment and to slow the storm water to prevent erosion.

Conclusion

All drainage fees have been paid with the original platting. This report adheres to all design specifications set forth in previously approved drainage reports. This development will be a bright star for The City of Colorado Springs, which will allow for desirable and affordable housing for families to live and enjoy a high quality of life in the State of Colorado.

5-Year & 100-Year Storm Runoff (Proposed)

Basin	Design Point	Area	Tc	5 Intensity	100 Intensity	5 Comp. C	100 Comp. C	5 Q	100 Q
		(Acres)	(Min.)	(In./hr.)	(In./hr.)			(cfs)	(cfs)
A		0.97	9.63	4.10	7.40	0.77	0.83	**3.1**	**6.0**
B	5	3.01	14.51	3.50	6.20	0.77	0.83	**8.1**	**15.5**
C		1.43	12.46	3.85	6.80	0.58	0.65	**3.2**	**6.3**
D		0.68	11.57	3.95	6.95	0.67	0.74	**1.8**	**3.5**
E		1.59	12.25	3.80	6.70	0.64	0.71	**3.9**	**7.6**
F		1.23	11.75	3.90	6.90	0.74	0.80	**3.5**	**6.8**
G		0.70	9.04	4.30	7.60	0.77	0.83	**2.3**	**4.4**
H		0.95	11.71	3.90	6.90	0.61	0.68	**2.3**	**4.5**
OS-1		15.80	17.56	3.30	5.80	0.77	0.83	**40.1**	**76.1**
OS-2		2.15	12.83	3.80	6.60	0.77	0.83	**6.3**	**11.8**
Inlet #1 (Dublin)		1.86	17.50	3.30	5.80	0.77	0.83	**4.7**	**9.0**
Inlet #2 (Dublin)		1.03	13.33	3.85	6.70	0.77	0.83	**3.1**	**5.7**
ROUTED									
All Onsite Basins		10.58	12.55	3.85	6.70	0.69	0.76	**28.2**	**53.8**
C,D,E,F,G,H	1	6.59	12.55	3.85	6.70	0.76	0.82	**19.2**	**36.1**
C,D,E,F	2	4.94	12.55	3.85	6.70	0.66	0.73	**12.5**	**24.0**
D,E,F	3	3.51	12.46	3.85	6.70	0.68	0.75	**9.2**	**17.6**
E,F	4	2.83	11.93	3.90	6.80	0.69	0.76	**7.6**	**14.5**

Previous Drainage Reports

1) Bridle Pass Subdivision Master Development Drainage Report & Final Drainage Report for Bridle Pass Subdivision Filings 1 through 8, prepared by Rockwell Minchow., dated March, 2003.

2) Cottonwood Creek Drainage Basin Planning Study, prepared by URS Consultants, Inc., June 9, 1994

3) Soil Survey for El Paso County, Colorado, U.S. Department of Agriculture, Soil Conservation Service, June 1980

4) This report adheres to the City of Colorado Springs & El Paso County Drainage Criteria Manual, dated November 1991, and the Subdivision Policy Manual and Public Works Design Manual, May 1980, Revised January 1990.

5) Cottonwood Creek Drainage Basin Planning Study, prepared by Ayres & Assoc., dated June 2000.

6) Master Development Drainage Plan "Dublin North", prepared by Berge-Brewer & Assoc., Inc, dated Jan. 23, 2006

7) Master Development Drainage Plan, Preliminary Drainage Plan & Erosion Control Plan "The New Grace Fellowship Church", prepared by Kiowa Engineering Corp., dated May 2, 1997

Drainage Fees

Drainage & Bridge Fees for Cottonwood Creek:
No fees are due, as this site has already been platted.

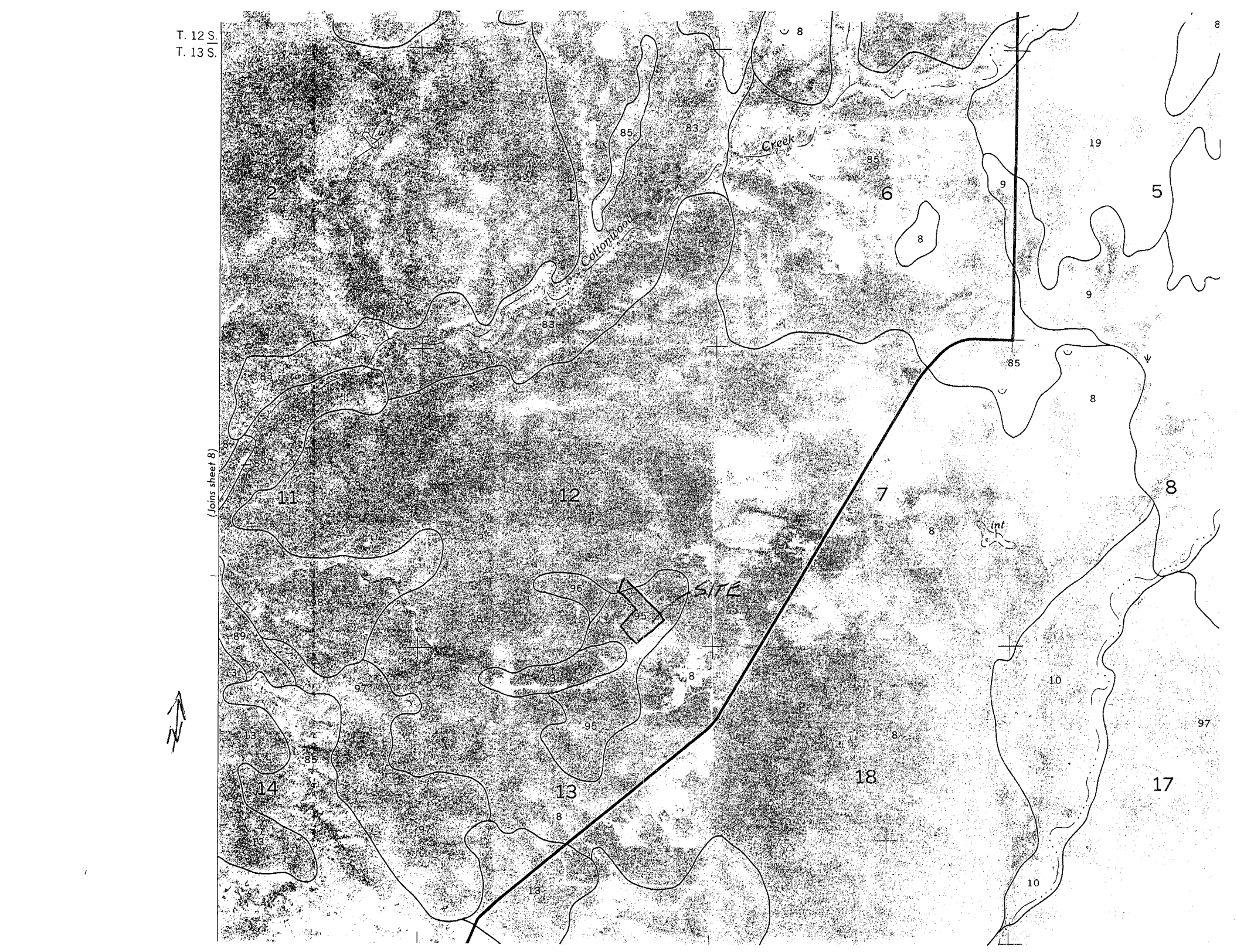
Private Drainage Costs: (Non-Reimbursable)

Item	*Unit Cost*	*Unit*	*Quantity*	*Total Cost*
Riprap	$35	CY	80	$2,800.00
			Total =	**$2,800.00**

Public Drainage Costs for Dublin Blvd. Improvements: (Reimbursable)

Item	*Unit Cost*	*Unit*	*Quantity*	*Total Cost*
Inlets, MH's	$6,500.00	EA	3	$19,500.00
Riprap	$35	CY	140	$4,900.00
60" RCP	$142.00	LF	740	$105,080.00
54" RCP	$125.00	LF	140	$17,500.00
			Total =	**$146,980.00**

APPENDIX


T. 12 S.
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Cottonwood Creek
SITE
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NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 536 OF 1300

(SEE MAP INDEX FOR PANELS NOT PRINTED)

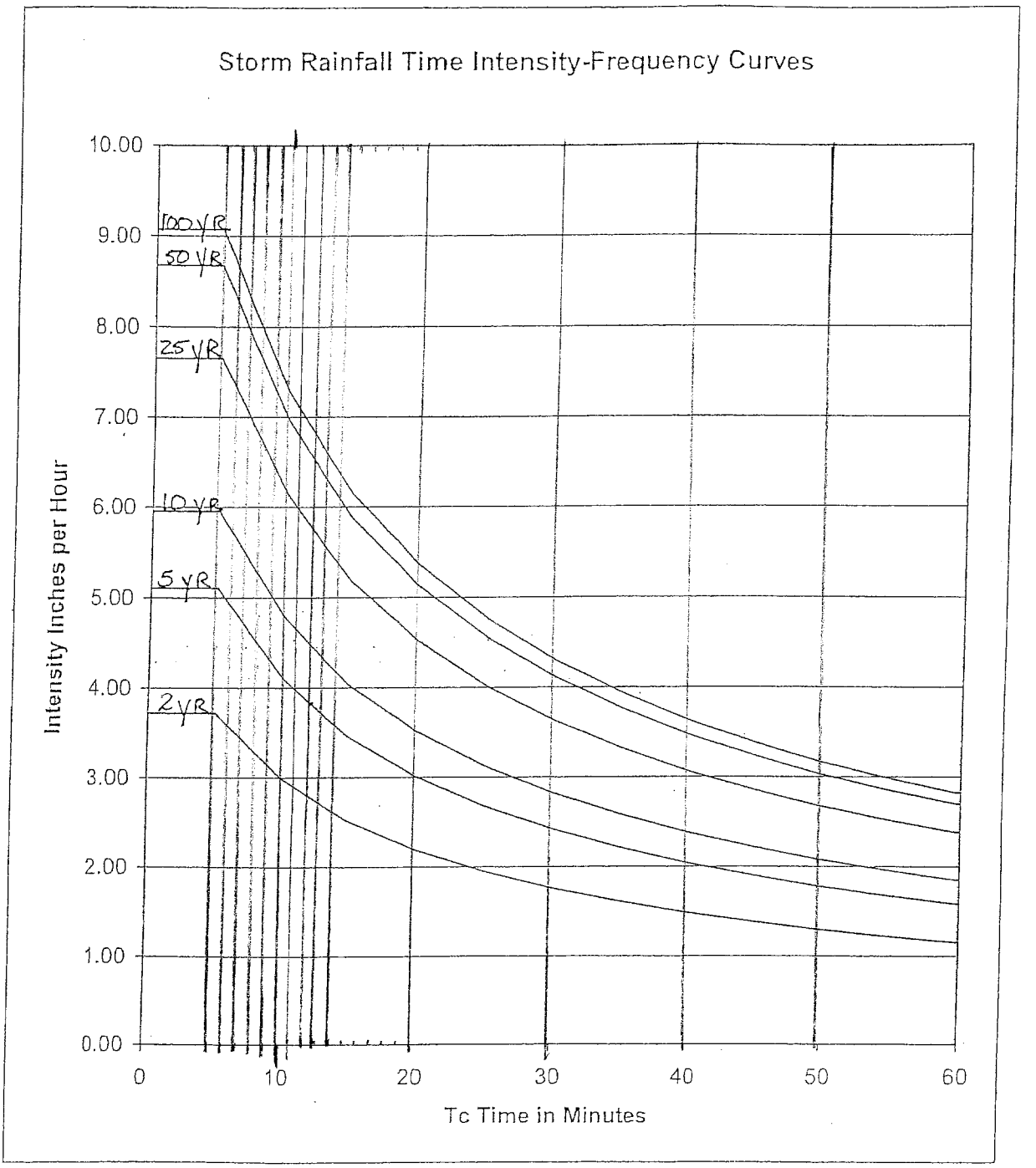
CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
COLORADO SPRINGS, CITY OF	080060	0536	F
EL PASO COUNTY, UNINCORPORATED AREAS	080059	0536	F

MAP NUMBER
08041C0536 F

EFFECTIVE DATE:
MARCH 17, 1997

Federal Emergency Management Agency



Rainfall Depth - Duration - Frequency Table derived from Rainfall Atlas III for Colorado
Resource: Guo, James C.Y., (2001) "Urban Storm Water Modeling", Chapter 5: Runoff Prediction for Small Catchment, published by Auraria Campus Book Company, University of Colorado at Denver, Denver, Colorado.

CTR Engineering, Inc.

Composite "C" Values (Proposed)

Basin	Design Point	Area	Area	% Imper.	Impervious Area	Pervious Area	5 Comp.	100 Comp
		(SF)	(Acres)	%	(Acres)	(Acres)	"C"	"C"
A		42,300	0.97	80%	0.78	0.19	0.77	0.83
B	5	131,250	3.01	80%	2.41	0.60	0.77	0.83
C		62,215	1.43	50%	0.71	0.71	0.58	0.65
D		29,750	0.68	65%	0.44	0.24	0.67	0.74
E		69,460	1.59	60%	0.96	0.64	0.64	0.71
F		53,622	1.23	75%	0.92	0.31	0.74	0.80
G		30,600	0.70	80%	0.56	0.14	0.77	0.83
H		41,516	0.95	55%	0.52	0.43	0.61	0.68
OS-1		688,248	15.80	80%	12.64	3.16	0.77	0.83
OS-2		93,654	2.15	80%	1.72	0.43	0.77	0.83
Inlet #1 (Dublin)		81,000	1.86	80%	1.49	0.37	0.77	0.83
Inlet #2 (Dublin)		45,000	1.03	80%	0.83	0.21	0.77	0.83

Routed Flows

All Onsite Basins		460,713	10.6	0.68	7.21	3.37	0.69	0.76
C,D,E,F,G,H	1	287,163	6.59	78%	5.13	1.46	0.76	0.82
C,D,E,F	2	215,047	4.94	63%	3.09	1.85	0.66	0.73
D,E,F	3	152,832	3.51	67%	2.34	1.17	0.68	0.75
E,F	4	123,082	2.83	68%	1.91	0.92	0.69	0.76

5 Impervious "C"	0.90
5 Pervious "C"	0.25
100 Impervious "C"	0.95
100 Pervious "C"	0.35

OS = Off-site basins

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Time of Concentration (Proposed)

Sub-Basin Data			Initial/Overland Time (Ti)			Pavement Travel Time (Tt)				Pipe Travel Time (Tt)				Grass Swale Travel Time (Tt)					Tc Check (Urbanized Basins)		Tc=Ti+Tt	Final Tc	Remarks
Basin	Design Point	Area (ac)	Length (ft)	Slope (%)	*Ti (min)	Length (ft)	Slope (%)	Vel. (fps)	Tt (min)	Length (ft)	Slope (%)	Vel. (fps)	Tt (min)	Length (ft)	Slope (%)	**Vel. (fps)	Tt (min)	Total Tt (min)	Total Length (ft)	Tc=(L/180)+10 (min)	(min)	(min)	
A		0.97	56	2.00	9.46			0.00	0.00					20	2.00	2.00	0.17	0.17	76	10.42	9.63	9.63	
B	5	3.01	235	1.50	21.31	500	4.30	12.22	0.68					77	5.00	3.20	0.40	1.08	812	14.51	22.40	14.51	
C		1.43	172	1.50	18.24	190	1.80	7.91	0.40					80	5.00	3.20	0.42	0.82	442	12.46	19.05	12.46	
D		0.68	140	1.50	16.45	67	3.70	11.34	0.10					75	3.50	2.80	0.45	0.54	282	11.57	17.00	11.57	
E		1.59	135	1.00	18.47	200	2.90	10.04	0.33					70	4.00	3.00	0.39	0.72	405	12.25	19.19	12.25	
F		1.23	70	2.00	10.58	277	1.60	7.45	0.62					50	2.00	1.50	0.56	1.17	397	12.21	11.75	11.75	
G		0.70	61	3.00	8.64	270	3.70	11.34	0.40					0	0.00	0.00	0.00	0.40	331	11.84	9.04	9.04	
H		0.95	70	3.50	8.80	0		0.00	0.00					262	1.00	1.50	2.91	2.91	332	11.84	11.71	11.71	
OS-1		15.80																	1360	17.56		17.56	
OS-2		2.15																	510	12.83		12.83	
Inlet #1 (Dublin)		1.86																	1350	17.50		17.50	
Inlet #2 (Dublin)		1.03																	600	13.33		13.33	
ROUTED																							
All Onsite Basins		10.58	70	2.00	10.58	870	2.50	9.32	1.56					50	2.00	2.00	0.42	1.97	990	15.50	12.55	12.55	
C,D,E,F,G,H	1	6.59	70	2.00	10.58	870	2.50	9.32	1.56					50	2.00	2.00	0.42	1.97	990	15.50	12.55	12.55	
C,D,E,F	2	4.94	70	2.00	10.58	870	2.50	9.32	1.56					50	2.00	2.00	0.42	1.97	990	15.50	12.55	12.55	
D,E,F	3	3.51	70	2.00	10.58	820	2.50	9.32	1.47					50	2.00	2.00	0.42	1.88	940	15.22	12.46	12.46	
E,F	4	2.83	70	2.00	10.58	520	2.50	9.32	0.93					50	2.00	2.00	0.42	1.35	640	13.56	11.93	11.93	

C5 = 0.25
Ti=(1.87(1.1-C5)*(L)^.5)/(s)^.33
n (street) 0.016
n (RCP) 0.013
R (street & pipe) 0.50
Tc min. of 5 min.

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By: Jonathan Moore
Project: Dublin Terrace
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5-Year & 100-Year Storm Runoff (Proposed)

Basin	Design Point	Area	Tc	5 Intensity	100 Intensity	5 Comp. C	100 Comp. C	5 Q	100 Q
		(Acres)	(Min.)	(In./hr.)	(In./hr.)			(cfs)	(cfs)
A		0.97	9.63	4.10	7.40	0.77	0.83	**3.1**	**6.0**
B	5	3.01	14.51	3.50	6.20	0.77	0.83	**8.1**	**15.5**
C		1.43	12.46	3.85	6.80	0.58	0.65	**3.2**	**6.3**
D		0.68	11.57	3.95	6.95	0.67	0.74	**1.8**	**3.5**
E		1.59	12.25	3.80	6.70	0.64	0.71	**3.9**	**7.6**
F		1.23	11.75	3.90	6.90	0.74	0.80	**3.5**	**6.8**
G		0.70	9.04	4.30	7.60	0.77	0.83	**2.3**	**4.4**
H		0.95	11.71	3.90	6.90	0.61	0.68	**2.3**	**4.5**
OS-1		15.80	17.56	3.30	5.80	0.77	0.83	**40.1**	**76.1**
OS-2		2.15	12.83	3.80	6.60	0.77	0.83	**6.3**	**11.8**
Inlet #1 (Dublin)		1.86	17.50	3.30	5.80	0.77	0.83	**4.7**	**9.0**
Inlet #2 (Dublin)		1.03	13.33	3.85	6.70	0.77	0.83	**3.1**	**5.7**
ROUTED									
All Onsite Basins		10.58	12.55	3.85	6.70	0.69	0.76	**28.2**	**53.8**
C,D,E,F,G,H	1	6.59	12.55	3.85	6.70	0.76	0.82	**19.2**	**36.1**
C,D,E,F	2	4.94	12.55	3.85	6.70	0.66	0.73	**12.5**	**24.0**
D,E,F	3	3.51	12.46	3.85	6.70	0.68	0.75	**9.2**	**17.6**
E,F	4	2.83	11.93	3.90	6.80	0.69	0.76	**7.6**	**14.5**

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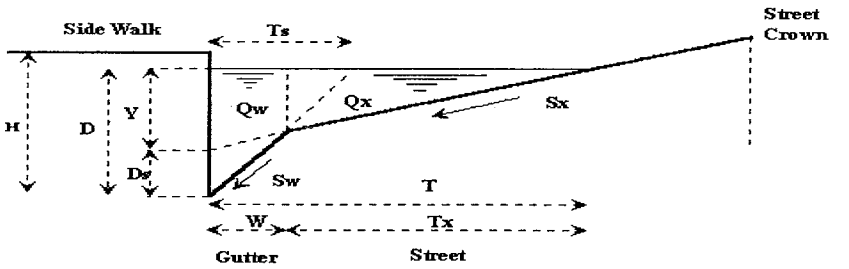
Project: Dublin Terrace
Printed: 9/8/2006 17:52

Gutter Storm Water Conveyance Capacity for Minor Event

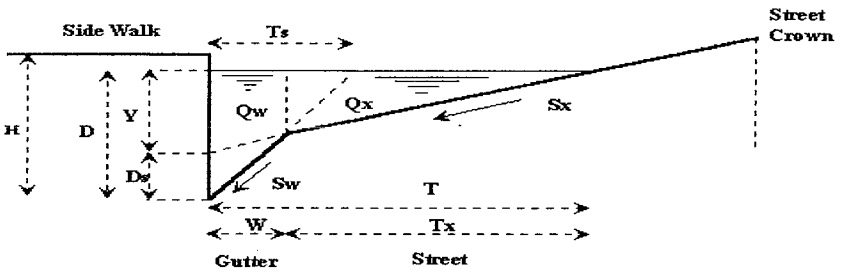
Project: Dublin Terrace
Street ID: North half of Pennywhistle Point



Gutter Geometry			
Curb Height	H =	4.50	inches
Gutter Width	W =	1.00	ft
Gutter Depression	Ds =	1.50	inches
Street Transverse Slope	Sx =	0.0200	ft/ft
Street Longitudinal Slope	So =	0.0430	ft/ft
Manning's Roughness	N =	0.016	
Maximum Allowable Water Spread for Minor Event	T =	14.00	ft
Gutter Conveyance Capacity Based On Maximum Water Spread			
Gutter Cross Slope:	Sw =	0.1450	ft/ft
Water Depth without Gutter Depression	Y =	0.28	ft
Water Depth with a Gutter Depression	D =	0.41	ft
Spread for Side Flow on the Street	Tx =	13.00	ft
Spread for Gutter Flow along Gutter Slope	Ts =	2.79	ft
Flow Rate Carried by Width Ts	Qws =	4.5	cfs
Flow Rate Carried by Width (Ts - W)	Qww =	1.4	cfs
Gutter Flow	Qw =	3.1	cfs
Side Flow	Qx =	9.9	cfs
Maximum Spread Capacity	**Q-Tm =**	**13.1**	**cfs**
Gutter Full Conveyance Capacity Based on Curb Height			
Spread for Side Flow on the Street	Tx =	12.50	ft
Spread for Gutter Flow along Gutter Slope	Ts =	2.59	ft
Flow Rate Carried by Width Ts	Qws =	3.6	cfs
Flow Rate Carried by Width (Ts - W)	Qww =	1.0	cfs
Gutter Flow	Qw =	2.7	cfs
Side Flow	Qx =	9.0	cfs
Gutter Full Capacity	**Q-full =**	**11.6**	**cfs**
Gutter Design Conveyance Capacity Based on Min(Q-Tm, R*Q-full)			
Reduction Factor for Minor Event	R-min =	0.56	
Gutter Design Conveyance Capacity for Minor Event	**Q-min =**	**6.5**	**cfs**

Gutter Storm Water Conveyance Capacity for Major Event

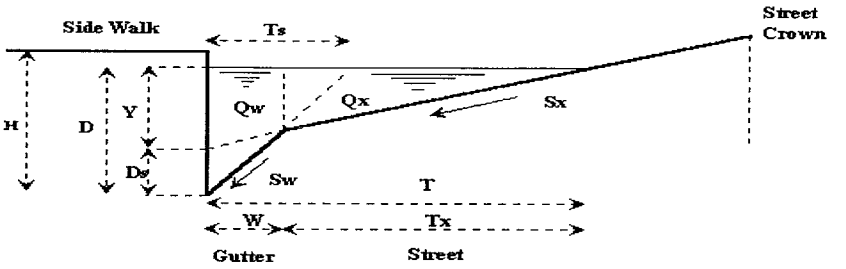
Project: Dublin Terrace Townhomes
Street ID: Both sides fo the street for Pennywhistle Point



Gutter Geometry			
Curb Height	H =	12.00	inches
Gutter Width	W =	1.00	ft
Gutter Depression	Ds =	1.50	inches
Street Transverse Slope	Sx =	0.0200	ft/ft
Street Longitudinal Slope	So =	0.0430	ft/ft
Manning's Roughness	N =	0.016	
Maximum Water Spread for Major Event	T =	28.00	ft
Gutter Conveyance Capacity Based On Maximum Water Spread			
Gutter Cross Slope	Sw =	0.1450	ft/ft
Water Depth without Gutter Depression	Y =	0.56	ft
Water Depth with a Gutter Depression	D =	0.69	ft
Spread for Side Flow on the Street	Tx =	27.00	ft
Spread for Gutter Flow along Gutter Slope	Ts =	4.72	ft
Flow Rate Carried by Width Ts	Qws =	18.2	cfs
Flow Rate Carried by Width (Ts - W)	Qww =	9.7	cfs
Gutter Flow	Qw =	8.6	cfs
Side Flow	Qx =	70.0	cfs
Maximum Spread Capacity	**Q-Tm =**	**78.6**	**cfs**
Gutter Full Conveyance Capacity Based on Curb Height			
Spread for Side Flow on the Street	Tx =	43.75	ft
Spread for Gutter Flow along Gutter Slope	Ts =	6.90	ft
Flow Rate Carried by Width Ts	Qws =	50.1	cfs
Flow Rate Carried by Width (Ts - W)	Qww =	32.9	cfs
Gutter Flow	Qw =	17.1	cfs
Side Flow	Qx =	254.1	cfs
Gutter Full Capacity	**Q-full =**	**271.2**	**cfs**
Gutter Design Conveyance Capacity Based on Min(Q-Tm, R*Q-full)			
Reduction Factor for Major Event	R-maj =	0.45	
Gutter Design Conveyance Capacity for Major Event	**Q-maj =**	**78.6**	**cfs**

Gutter Storm Water Conveyance Capacity for Minor Event

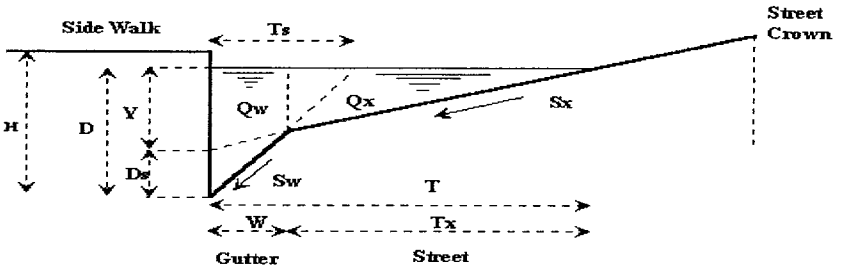
Project: Dublin Terrace
Street ID: North half of Emerald Isle Heights DP#2



Gutter Geometry			
Curb Height	H =	4.50	inches
Gutter Width	W =	1.00	ft
Gutter Depression	Ds =	1.50	inches
Street Transverse Slope	Sx =	0.0200	ft/ft
Street Longitudinal Slope	So =	0.0370	ft/ft
Manning's Roughness	N =	0.016	
Maximum Allowable Water Spread for Minor Event	T =	14.00	ft
Gutter Conveyance Capacity Based On Maximum Water Spread			
Gutter Cross Slope:	Sw =	0.1450	ft/ft
Water Depth without Gutter Depression	Y =	0.28	ft
Water Depth with a Gutter Depression	D =	0.41	ft
Spread for Side Flow on the Street	Tx =	13.00	ft
Spread for Gutter Flow along Gutter Slope	Ts =	2.79	ft
Flow Rate Carried by Width Ts	Qws =	4.2	cfs
Flow Rate Carried by Width (Ts - W)	Qww =	1.3	cfs
Gutter Flow	Qw =	2.9	cfs
Side Flow	Qx =	9.2	cfs
Maximum Spread Capacity	**Q-Tm =**	**12.1**	**cfs**
Gutter Full Conveyance Capacity Based on Curb Height			
Spread for Side Flow on the Street	Tx =	12.50	ft
Spread for Gutter Flow along Gutter Slope	Ts =	2.59	ft
Flow Rate Carried by Width Ts	Qws =	3.4	cfs
Flow Rate Carried by Width (Ts - W)	Qww =	0.9	cfs
Gutter Flow	Qw =	2.5	cfs
Side Flow	Qx =	8.3	cfs
Gutter Full Capacity	**Q-full =**	**10.8**	**cfs**
Gutter Design Conveyance Capacity Based on Min(Q-Tm, R*Q-full)			
Reduction Factor for Minor Event	R-min =	0.63	
Gutter Design Conveyance Capacity for Minor Event	**Q-min =**	**6.8**	**cfs**

Gutter Storm Water Conveyance Capacity for Major Event

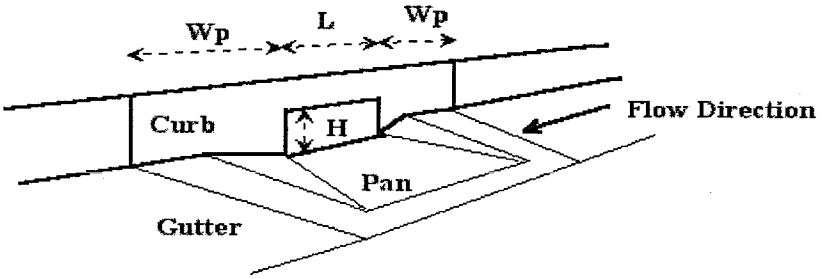
Project: Dublin Terrace Townhomes
Street ID: Both sides of the street for Emerald Isle Heights DP#2



Gutter Geometry			
Curb Height	H =	12.00	inches
Gutter Width	W =	1.00	ft
Gutter Depression	Ds =	1.50	inches
Street Transverse Slope	Sx =	0.0200	ft/ft
Street Longitudinal Slope	So =	0.0370	ft/ft
Manning's Roughness	N =	0.016	
Maximum Water Spread for Major Event	T =	28.00	ft
Gutter Conveyance Capacity Based On Maximum Water Spread			
Gutter Cross Slope	Sw =	0.1450	ft/ft
Water Depth without Gutter Depression	Y =	0.56	ft
Water Depth with a Gutter Depression	D =	0.69	ft
Spread for Side Flow on the Street	Tx =	27.00	ft
Spread for Gutter Flow along Gutter Slope	Ts =	4.72	ft
Flow Rate Carried by Width Ts	Qws =	16.9	cfs
Flow Rate Carried by Width (Ts - W)	Qww =	9.0	cfs
Gutter Flow	Qw =	7.9	cfs
Side Flow	Qx =	65.0	cfs
Maximum Spread Capacity	**Q-Tm =**	**72.9**	**cfs**
Gutter Full Conveyance Capacity Based on Curb Height			
Spread for Side Flow on the Street	Tx =	43.75	ft
Spread for Gutter Flow along Gutter Slope	Ts =	6.90	ft
Flow Rate Carried by Width Ts	Qws =	46.4	cfs
Flow Rate Carried by Width (Ts - W)	Qww =	30.6	cfs
Gutter Flow	Qw =	15.9	cfs
Side Flow	Qx =	235.7	cfs
Gutter Full Capacity	**Q-full =**	**251.5**	**cfs**
Gutter Design Conveyance Capacity Based on Min(Q-Tm, R*Q-full)			
Reduction Factor for Major Event	R-maj =	0.51	
Gutter Design Conveyance Capacity for Major Event	**Q-maj =**	**72.9**	**cfs**

CURB OPENING INLET ON A GRADE

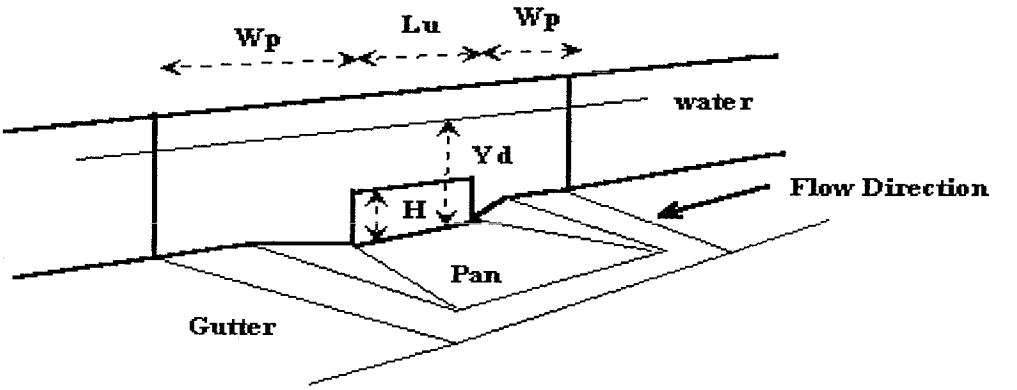
Project: Dublin Terrace - Dublin Blvd.
Inlet ID: #1



Design Information (Input)		
Design Discharge on the Street (from *Street Hy*)	**Qo =**	**9.0 cfs**
Gutter Flow to Design Flow Ratio (from *Street Hy*)	Eo =	0.33
Length of a Single Inlet Unit	Lu =	20.00 ft
Clogging Factor for a Single Unit Inlet	Co =	0.20
Number of Inlet Units in Curb Opening	No =	1
Analysis (Calculated)		
Total Length of Curb Opening Inlet	L =	20.00 ft
Equivalent Slope Se (from *Street Hy*)	Se =	0.0500 ft/ft
Required Length Lo to Have 100% Interception	Lo =	33.17 ft
Clogging Coefficient	C-coeff =	1.00
Clogging Factor for Multiple-unit Curb Opening Inlet	Clog =	0.20
Effective (Unclogged) Length	Le =	16.00 ft
Under No-Clogging Condition		
Effective Length of Curb Opening Inlet (must be ≤ Lo)	L =	20.00 ft
Interception Capacity	Qi =	7.3 cfs
Under Clogging Condition		
Effective Length of Curb Opening Inlet (must be ≤ Lo)	Le =	16.00 ft
Interception Capacity	**Qa =**	**6.2 cfs**
Carryover flow = Qo - Qa =	**Q-co =**	**2.8 cfs**
Capture Percentage for this Inlet = Qa / Qo =	**C% =**	**69.44 %**

CURB OPENING INLET IN A SUMP

Project = Dublin Terrace - Dublin Blvd.
Inlet ID = #2



Design Information (Input)			
Design Discharge on the Street (from *Street Hy*)	**Qo =**	**5.7**	**cfs**
Length of a Unit Inlet	Lu =	10.00	ft
Side Width for Depression Pan	Wp =	5.00	ft
Clogging Factor for a Single Unit	Co =	0.15	
Height of Curb Opening in Inches	H =	8.00	inches
Orifice Coefficient	Cd =	0.65	
Weir Coefficient	Cw =	3.40	
Water Depth for the Design Condition	Yd =	0.67	ft
Angle of Throat (see USDCM Chapter 6, Figure ST-5)	Theta =	45.0	degrees
Number of Curb Opening Inlets	No =	1	

Curb Opening Inlet Capacity in a Sump			
As a Weir			
Total Length of Curb Opening Inlet	L =	10.00	ft
Capacity as a Weir without Clogging	Qwi =	35.4	cfs
Clogging Coefficient for Multiple Units	Clog-Coeff =	1.00	
Clogging Factor for Multiple Units	Clog =	0.15	
Capacity as a Weir with Clogging	Qwa =	32.6	cfs
As an Orifice			
Capacity as an Orifice without Clogging	Qoi =	22.9	cfs
Capacity as an Orifice with Clogging	Qoa =	19.5	cfs
Capacity for Design with Clogging	**Qa =**	**19.5**	**cfs**
Capture Percentage for this Inlet = Qa / Qo =	**C% =**	**100.00**	**%**

Note: Unless additional ponding depth or spilling over the curb is acceptable, a capture percentage of less than 100% in a sump may indicate the need for additional inlet units.

Dublin Terrace Channel
Worksheet for Irregular Channel

Project Description	
Project File	g:\haestad\fmw\dublin t.fm2
Worksheet	Dublin Terrace Chann
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

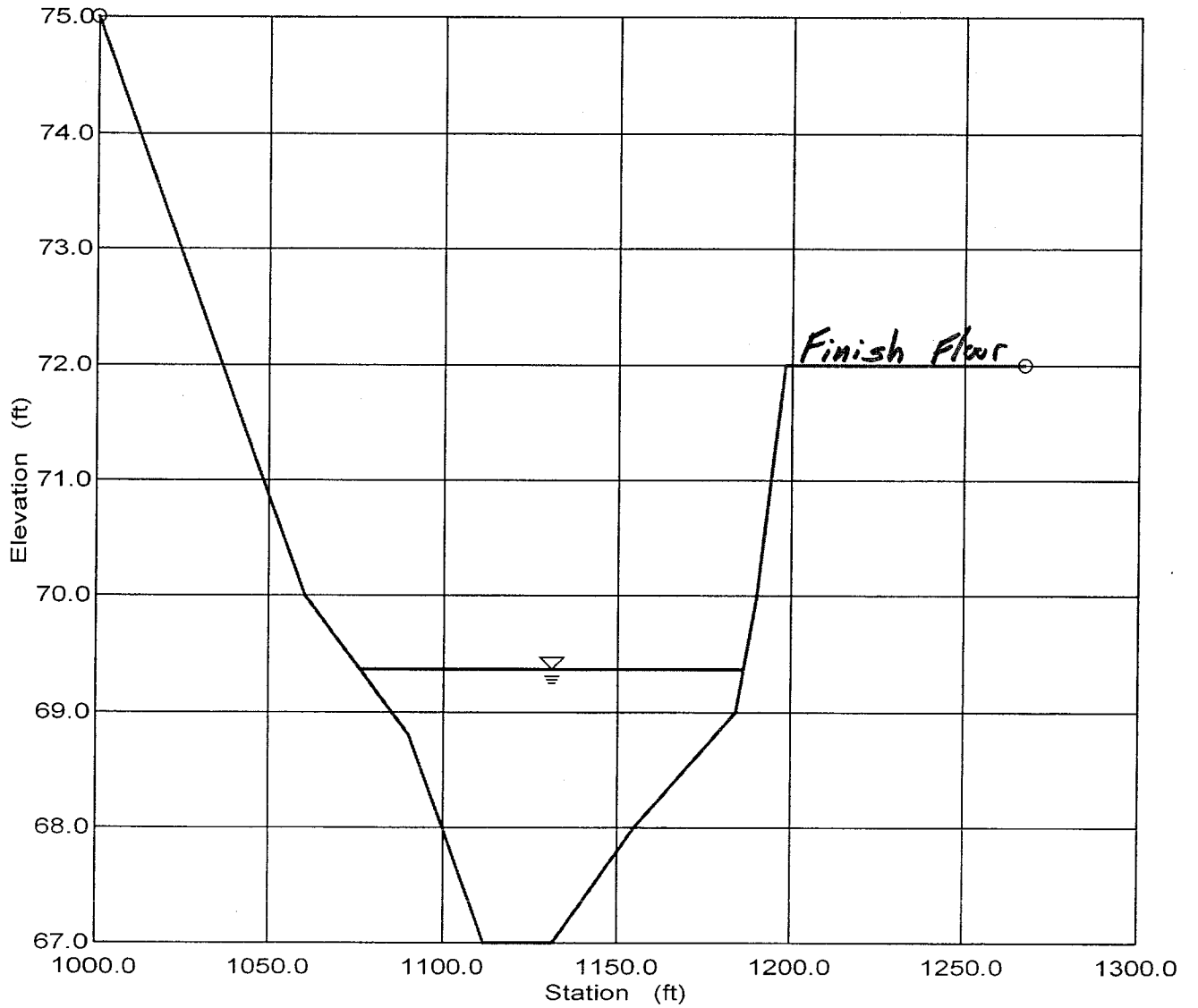
Input Data				
Channel Slope	0.015700 ft/ft			
Elevation range: 67.00 ft to 75.00 ft.				
Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
1,000.00	75.00	1,000.00	1,267.40	0.050
1,060.50	70.00			
1,090.00	68.80			
1,111.76	67.00			
1,131.76	67.00			
1,155.20	68.00			
1,184.30	69.00			
1,190.20	70.00			
1,198.30	72.00			
1,267.40	72.00			
Discharge	704.80 cfs			

Results		
Wtd. Mannings Coefficient	0.050	
Water Surface Elevation	69.37	ft
Flow Area	152.66	ft²
Wetted Perimeter	110.57	ft
Top Width	110.42	ft
Height	2.37	ft
Critical Depth	69.01	ft
Critical Slope	0.034739	ft/ft
Velocity	4.62	ft/s
Velocity Head	0.33	ft
Specific Energy	69.70	ft
Froude Number	0.69	
Flow is subcritical.		

Dublin Terrace Channel
Cross Section for Irregular Channel

Project Description	
Project File	g:\haestad\fmw\dublin t.fm2
Worksheet	Dublin Terrace Chann
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data		
Wtd. Mannings Coefficient	0.050	
Channel Slope	0.015700	ft/ft
Water Surface Elevation	69.37	ft
Discharge	704.80	cfs



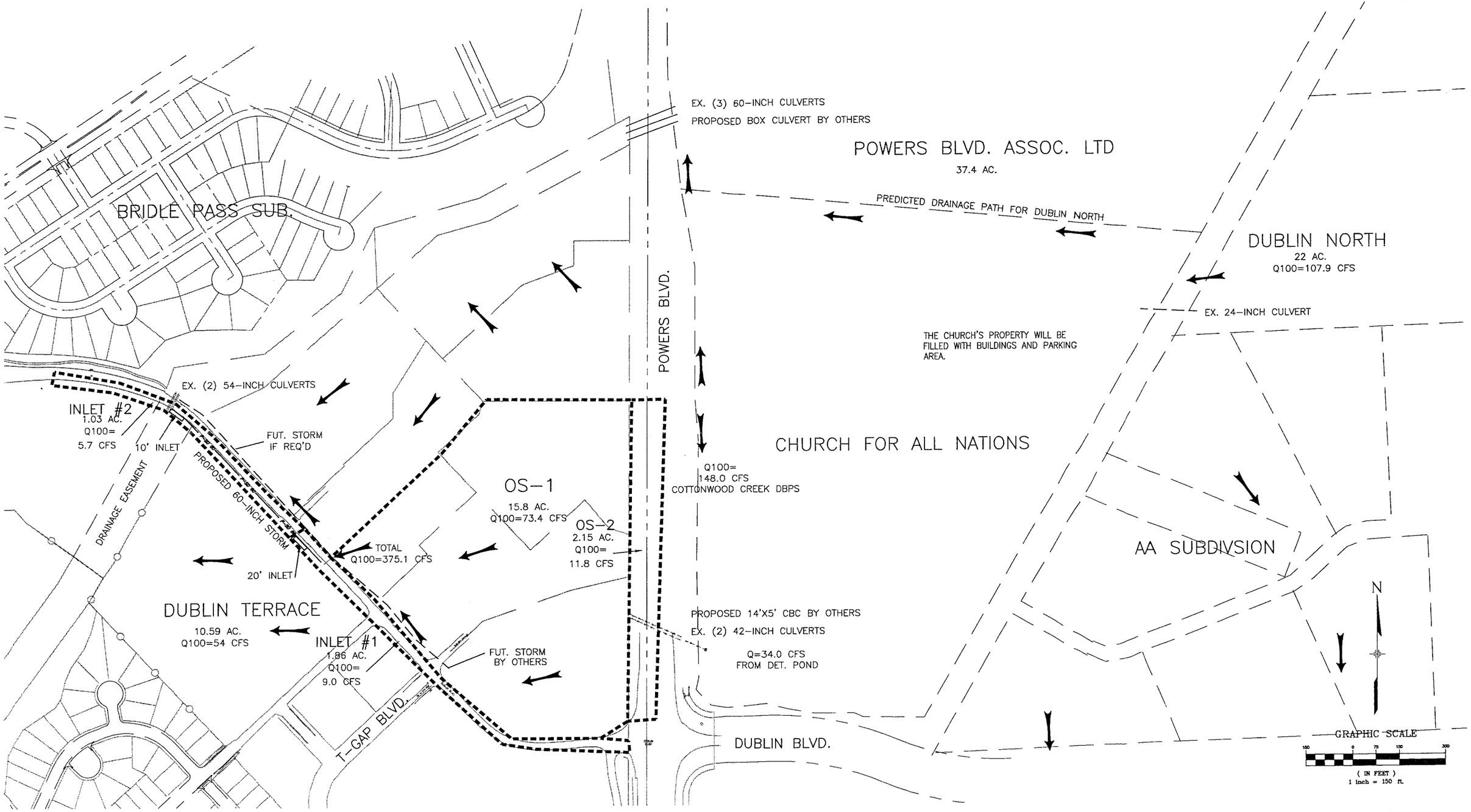
Manning Pipe Calculator

Given Input Data:

Shape	Circular
Solving for	Flowrate
Diameter	60.0000 in
Depth	56.0000 in
Slope	0.0180 ft/ft
Manning's n	0.0130

Computed Results:

Flowrate	375.8096 cfs
Area	19.6350 ft2
Wetted Area	19.0728 ft2
Wetted Perimeter	157.1567 in
Perimeter	188.4956 in
Velocity	19.7040 fps
Hydraulic Radius	17.4761 in
Percent Full	93.3333 %
Full flow Flowrate	349.4204 cfs
Full flow velocity	17.7958 fps



S:\05.900.001(DubMF)\dwg\DP\DEV PLANS\DP-03-OFFSITE.dwg, 9/8/2006 6:44:41 PM, RICOH1

REFERENCE DRAWINGS
X-BASE
X-EX-FEAT
X-TOPO
X-EX-AREA
X-TITLE

NO.	DATE	DESCRIPTION	BY
		REVISIONS	

NAME: S:\05.900.001(DubMF)\dwg\DP\DEV PLANS\DP-03-OFFSITE.dwg
PCP: Matrix.ctb
PLOT DATE: Fri Sep 08, 2006 6:44pm

BENCHMARK DATA(ELEV.)
(DATUM)
(DESCRIPTION/LOCATION)

OWNER:
PAUL ZEIEN
5575 DUBLIN BLVD.
COLORADO SPRINGS, CO 80918
(719) 599-0018

OWNER:
CANDY RODEWALD
5560 BALSAM STREET
COLORADO SPRINGS, CO 80918
(719) 594-2227

FOR AND ON BEHALF OF CTR ENGINEERING, INC.

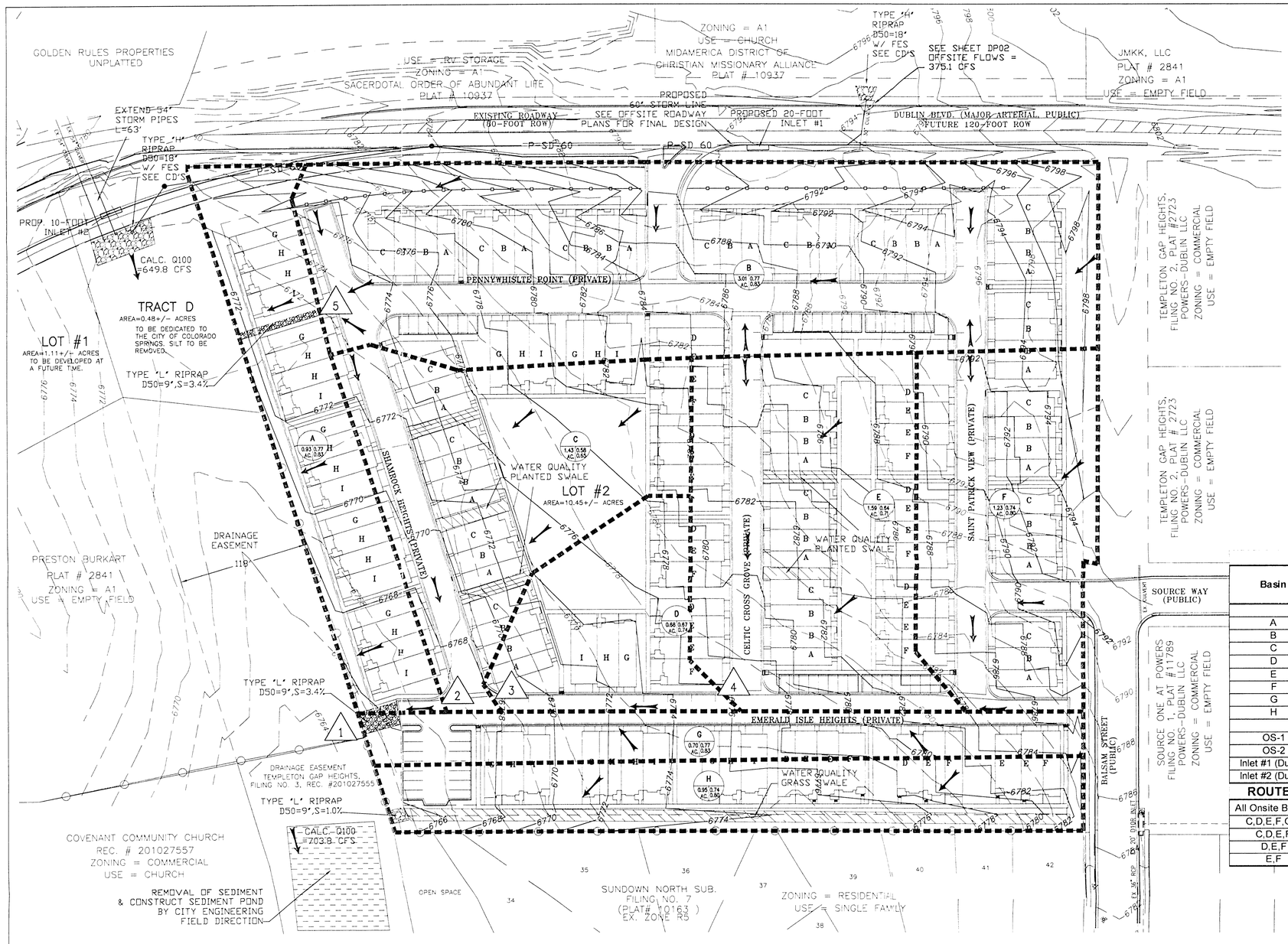
CTR ENGINEERING, INC.
6451 GALETA DRIVE
COLORADO SPRINGS, CO 80922
(719) 964-6654

DUBLIN TERRACE TOWNHOMES

DEVELOPMENT PLAN

DRAINAGE PLAN OFFSITE

DESIGNED BY: JCM	SCALE	DATE ISSUED: AUG, 2006	DP02
DRAWN BY: JCM	HORIZ: 1"=150'		
CHECKED BY: JCM	VERT: N/A	SHEET NO. 2 OF 2 SHEETS	



GRAPHIC SCALE

50 0 25 50 100

(IN FEET)
1 inch = 50 ft.

LEGEND

- SUB-BASIN BOUNDARY
- EXISTING CONTOUR
- 6780 — PROPOSED CONTOUR
- FLOW DIRECTION
- X — DESIGN POINT
- K (1.70 0.64 AC. 0.71) — SUB BASIN DESIGNATION
- SUB BASIN "C" COEFFICENTS
- SUB BASIN AREA (ACRES)

5-Year & 100-Year Storm Runoff (Proposed)

Basin	Design Point	Area	Tc	5 Intensity	100 Intensity	5 Comp. C	100 Comp. C	5 Q	100 Q
		(Acres)	(Min.)	(In./hr.)	(In./hr.)			(cfs)	(cfs)
A		0.97	9.63	4.10	7.40	0.77	0.83	3.1	6.0
B	5	3.01	14.51	3.50	6.20	0.77	0.83	8.1	15.5
C		1.43	12.46	3.85	6.80	0.58	0.65	3.2	6.3
D		0.68	11.57	3.95	6.95	0.67	0.74	1.8	3.5
E		1.59	12.25	3.80	6.70	0.64	0.71	3.9	7.6
F		1.23	11.75	3.90	6.90	0.74	0.80	3.5	6.8
G		0.70	9.04	4.30	7.60	0.77	0.83	2.3	4.4
H		0.95	11.71	3.90	6.90	0.61	0.68	2.3	4.5
OS-1		15.80	17.56	3.30	5.80	0.77	0.83	40.1	76.1
OS-2		2.15	12.83	3.80	6.60	0.77	0.83	6.3	11.8
Inlet #1 (Dublin)		1.86	17.50	3.30	5.80	0.77	0.83	4.7	9.0
Inlet #2 (Dublin)		1.03	13.33	3.85	6.70	0.77	0.83	3.1	5.7
ROUTED									
All Onsite Basins		10.58	12.55	3.85	6.70	0.69	0.76	28.2	53.8
C,D,E,F,G,H	1	6.59	12.55	3.85	6.70	0.76	0.82	19.2	36.1
C,D,E,F	2	4.94	12.55	3.85	6.70	0.66	0.73	12.5	24.0
D,E,F	3	3.51	12.46	3.85	6.70	0.68	0.75	9.2	17.6
E,F	4	2.83	11.93	3.90	6.80	0.69	0.76	7.6	14.5

CALL UTILITY NOTIFICATION CENTER OF COLORADO
1-800-922-1987
CALL 2-BUSINESS DAYS IN ADVANCE BEFORE YOU DIG, GRADE, OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES.

REFERENCE DRAWINGS
X-TITLE
X-TOPO
X-BASE
X-EX-FEAT
X-EX-AREA
X-ROAD-2-16-06

NO.	DATE	DESCRIPTION	BY
		REVISIONS	

NAME: S:\05.900.001(DublMF)\dwg\DP\DEV PLANS\DP01.dwg
PDP: Matrix.ctb
PLOT DATE: Sat Sep 09, 2006 6:34am

BENCHMARK DATA(ELEV.) _____
(DATUM) _____
(DESCRIPTION/LOCATION) _____

OWNER:
PAUL ZEIEN
5575 DUBLIN BLVD.
COLORADO SPRINGS, CO 80918
(719) 599-0018

OWNER:
CANDY RODEWALD
5560 BALSAM STREET
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FOR AND ON BEHALF OF CTR ENGINEERING, INC.

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6451 GALETA DRIVE
COLORADO SPRINGS, CO 80922
(719) 964-6654

DUBLIN TERRACE TOWNHOMES

DEVELOPMENT PLAN

DRAINAGE PLAN ONSITE

DESIGNED BY: JCM	SCALE	DATE ISSUED: AUG, 2006
DRAWN BY: JCM	HORIZ: 1"=50'	
CHECKED BY: JCM	VERT: N/A	SHEET NO. 1 OF 1 SHEET

DP01