MDDP for
The Island at Springs Ranch and
Final Drainage Report for
The Island at Springs Ranch Filing No. 1
July, 1998

Prepared for:

Springs Ranch LLC
2 N Cascade Avenue, Suite 1100
Colorado Springs, CO 80903

Prepared by:

Rockwell-Minchow Consultants, Inc.
2928 Straus Lane, Suite 100
Colorado Springs, CO 80907
475-2575

Project# 96-101

MDDP for
The Island at Springs Ranch and
Final Drainage Report for
The Island at Springs Ranch Filing No. 1

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 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.

Kent D. Rockwell, P.E.

COLORADO REGISTERED KENT D. ROCKWELL KDR 25086 9/14/98 PROFESSIONAL ENGINEER

DEVELOPER'S STATEMENT

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

BRE/SPRINGS RANCH LLC

BY: Donald S. Magill DATE 9/14/98

Donald S. Magill

TITLE: Manager

ADDRESS: 2 N Cascade Ave., Suite 1100
Colorado Springs, CO 80903

CITY OF COLORADO SPRINGS

Filed in accordance with Section 15-3-906 of the code of the City of Colorado Springs, 1980, as amended.

for CITY ENGINEER 9/30/98 DATE

CONDITION: APPROVAL SUBJECT TO THE TERMS OF THE PRIVATE MAINTENANCE AGREEMENT BETWEEN BRE/SPRINGS RANCH LLC AND TOM TAUCHE, INC. (SEE ENCLOSED)

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General Location and Description

The Island at Springs Ranch is located west of Peterson Road and north of N. Carefree Circle. The site lies within a portion of Section 30, Township 13 South, Range 65 West of the 6th P.M., El Paso County, Colorado (see Figure 1). The ~25 acre site, of which 9.762 acres encompasses Filing No. 1, is bound almost entirely by the Springs Ranch Golf Course. The entire site lies within the Sand Creek Drainage Basin and will be developed as +1/8 acre single family residential lots.

References

1. The Springs Ranch MDDP Update (approved July, 1998), prepared by Kiowa Engineering, Colorado Springs.

Soils

According to the US Department of Agriculture Soil Conservation Services Soil Survey of El Paso County, The Highlands North at Springs Ranch is underlain by the Truckton Series (Soil 97), and is classified under Hydrologic Group "B" (see Figure 2). Hydrologic Group "B" was used for runoff calculation purposes.

Flood Plain Statement

According to the Federal Emergency Management Agency (FEMA), as depicted on Flood Insurance Rate Map (FIRM) 08041 CO539 F (March, 1997), no portion of this site lies within a designated Flood Plain.

Drainage Design Criteria

The current City of Colorado Springs and El Paso County Drainage Criteria was used in the preparation of this report. The Rational Method was used to determine the runoff quantities as required for basins containing less than 100 acres. Peak runoff was determined for both the 5 year and 100 year frequency storms.

Existing Drainage Facilities

There is an existing 36" RCP running east to west at the west end of the site. The developed runoff collected on the site will be discharged to this existing pipe. The pipe was installed with the construction of the golf course. A 36" RCP was also stubbed along the north side of North Carefree Circle. This pipe will be extended to the east of the access road off of North Carefree Circle. The pipes were installed to accomodate the development of the parcels to the east of the golf course.

Historic Drainage Analysis

This portion of the report analyzes the historic runoff quantities and patterns for the site and contributing or affected off-site areas. The area has been depicted on the historic drainage plan by two drainage basins. Following is a description of each basin and the existing runoff patterns and drainage improvements:

Basin H-1 encompasses 2.6 acres along the eastern end of the site. The runoff quantities of 2.6 cfs (5 yr)/6.4 cfs (100 yr) from this basin sheet flows onto the Springs Ranch Golf Course to the east.

Basin H-2 covers 23.0 acres of the majority of the site. The runoff quantities of 17.2 cfs (5 yr)/41.9 cfs (100 yr) from this basin sheet flow to an existing natural swale running north to south along the west end of the site. The runoff exits onto the golf course to the south.

Developed Drainage Analysis

This portion of the report analyzes the developed runoff quantities and patterns for the site and contributing or affected off-site areas. The area has been depicted on the developed drainage plan by seven drainage basins. Following is a description of each basin and the proposed runoff patterns and drainage improvements:

Basin OS-1 encompasses 2.0 acres to the northeast of the site. The runoff quantities of 5.4 cfs (5 yr)/10.8 cfs (100 yr) will sheet flow to Golf Club Drive and enter the northeast corner of the site.

Basin D-1 covers 3.8 acres along the east end of the site. The runoff quantities of 9.1 cfs (5 yr)/18.4 cfs (100 yr) will sheet flow to Golf Club Drive and travel to Showhorse Court.

Basin D-2 encompasses 5.7 acres covering a portion of the center of the site. The runoff quantities of 14.0 cfs (5 yr)/28.3 cfs (100 yr) will sheet flow to Showhorse Court and travel to Greens Drive. Design Point #1 is located at this intersection. Total developed flows of 21.7 cfs (5 yr)/43.9 cfs (100 yr) will reach the intersection. An 8' D-10-R sump inlet will be constructed on the east side of this tee intersection, collecting 18.0 cfs (5 yr)/29.5 cfs (100 yr). The runoff will be piped west in a proposed 24" RCP.

Basin D-3 covers 2.3 acres along Augusta Drive at the southwest end of the site. The runoff quantities of 5.9 cfs (5 yr)/12.1 cfs (100 yr) will sheet flow to Greens Drive and travel northward to a proposed low point in Greens Drive. Total flows (street & pipe) reaching the low point from the south in Augusta Drive (Design Point #2) will be 24.8 cfs (5 yr)/49.6 cfs (100 yr).

Basin D-4 encompasses 8.1 acres along the northwest end of the site. The runoff quantities of 19.4 cfs (5 yr)/39.7 cfs (100 yr) will sheet flow to Golf Club Drive and Greens Drive and travel to the proposed low point in Greens Drive. Total flows (street & pipe) reaching the low point from the north in Greens Drive (Design Point #3) will be 23.0 cfs (5 yr)/46.7 cfs (100 yr).

Design Point #4 is located at the proposed low point in Greens Drive. Total flows (street & pipe) reaching the low point in Greens Drive will be 46.0 cfs (5 yr)/92.0 cfs (100 yr). A pair of 10' D-10-R sump inlets will be constructed at the low point (one on each side of street) to collect the street flow. A 30" RCP will run from the east inlet to the west inlet, and a 36" RCP will exit the west inlet and tie into the existing 36" RCP outfall to the west. The 24" RCP from DP#1 will tie into the drainage system at the low point. THe 36" RCP will discharge onto the existing golf course property. The golf course has agreed to maintain the area between the 36" RCP and the Sand Creek right-of-way per the attached agreement.

Basin D-5 covers 1.6 acres along the northwest edge of the site. The runoff quantities of 5.0 cfs (5 yr)/10.1 cfs (100 yr) will sheet flow off-site to the northwest to a proposed emergency overflow swale along the site. An emergency overflow swale will be constructed along the northwest end of the site in the event that the existing 54" RCP upstream becomes plugged.

Basin D-6 covers 1.7 acres along the southwest edge of the site. The runoff quantities of 5.3 cfs (5 yr)/10.7 cfs (100 yr) will sheet flow off-site to the southwest onto the Springs Ranch Golf Course.

Basin D-7 encompasses 1.8 acres along Showhorse Court at the south end of the site. The runoff quantities of 6.5 cfs (5 yr)/11.9 cfs (100 yr) will sheet flow to the street and travel as street flow to North Carefree Circle. A 36" RCP was stubbed along the north side of North Carefree Circle with the construction of the golf course. This pipe will be extended to the east of Showhorse Court for future use of the sites east and west of Showhorse Court.

Basin D-8 covers 0.7 acres along the east end of the site. The runoff quantities of 1.8 cfs (5 yr)/4.4 cfs (100 yr) will sheet flow off-site to the east onto the Springs Ranch Golf Course.

Basin D-9 encompasses 7.1 acres south and east of the site proposed to be developed as a multi-family development. The runoff quantities of 22.1 cfs (5 yr)/44.7 cfs (100 yr) will travel to the southwest corner of the basin. A 30" RCP is proposed to collect this runoff and deliver it to Sand Creek to the west.

Street capacities will not be exceeded within the proposed development under this drainage plan and report. All on-site streets are classified as residential (34' fl-fl), and will be constructed with a monolithic ramp type curb, gutter & sidewalk. Showhorse Court from N. Carefree Circle to the site is classified as a minor collector and will be constructed with 8" vertical curb (36' fl-fl).

The Lot Owner/Home Builder/Home Owner will be responsible for individual lot drainage.

Proposed Facilities (Construction Cost Estimate):

All proposed drainage facilities will be public and non-reimbursable. Following is a cost estimate of the proposed facilities required for this development.

The Island at Springs Ranch Filing No. 1:

(Public Non-reimbursable):

8' D-10-R Inlet	1 Each @ 3,500.00/Ea.	3,500.00
10' D-10-R Inlet	1 Each @ 4,000.00/Ea.	4,000.00
Type I Manhole	1 Each @ 4,000.00/Ea.	4,000.00
Type II Manhole	1 Each @ 2,500.00/Ea.	2,500.00
24" RCP	600 L.F. @ 32.00/L.F.	19,200.00
30" RCP	60 L.F. @ 44.00/L.F.	2,640.00
36" RCP	600 L.F. @ 55.00/L.F.	33,000.00
	Sub-total:	$ 68,840.00
	15% Engineering & Contingency:	$ 10,326.00
	TOTAL:	**$ 79,166.00**

Remainder of The Island at Springs Ranch:

(Public Non-reimbursable):

10' D-10-R Inlet	1 Each @ 4,000.00/Ea.	4,000.00
30" RCP	40 L.F. @ 44.00/L.F.	1,760.00
Swale Earthwork	1 Each @ 3,000.00/Ea.	3,000.00
	Sub-total:	$ 8,760.00
	15% Engineering & Contingency:	$ 1,314.00
	TOTAL:	**$ 10,074.00**

Drainage Fees:

The Island at Springs Ranch is a Development within the Springs Ranch Master Plan. This area is located in the Sand Creek Drainage Basin. The total area for which facilities or fees will be due is approximately 25 acres. The Island at Springs Ranch Filing No. 1 contains 9.762 acres.

The 1998 Drainage and Bridge Fees for the Sand Creek Drainage Basin are $5,552.00/acre and $356.00/acre, respectively.

The 1998 Pond Fees for the Sand Creek Drainage Basin are $335.00/acre (Land) and $1331.00/acre (Facilities).

The 1998 Regional Pond Assurance Fee is $879.00/acre.

The Island at Springs Ranch Filing No. 1 Fees:

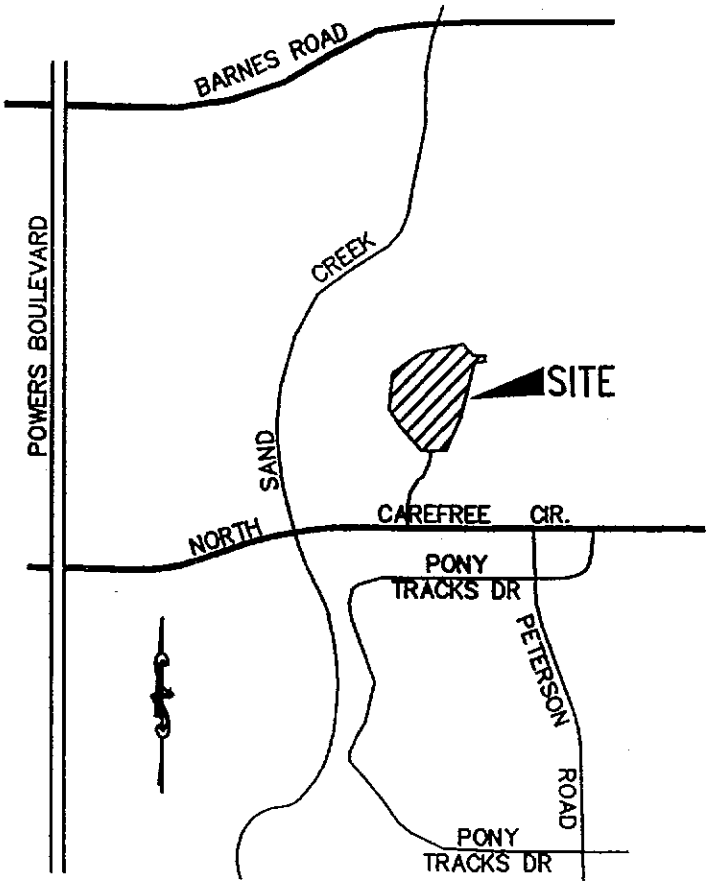
Drainage Fees:	9.762 ac. x $5,552.00/ac.	=$ 54,198.62
Bridge Fees:	9.762 ac. x $356.00/ac.	=$ 3,475.27
Pond Fees (Land):	9.762 ac. x $335.00/ac.	=$ 3,270.27
Pond Fees (Facilities):	9.762 ac. x $1,331.00/ac.	=$ 12,993.22
Pond Assurance:	9.762 ac. x $879.00/ac.	=$ 8,580.80
	Total:	=$ 82,518.18

Drainage Credits will be utilized to cover the cost of the Drainage Fees.

Bridge and Pond Fees will be paid at time of platting.

Fees will be paid for future filings at the time of platting.

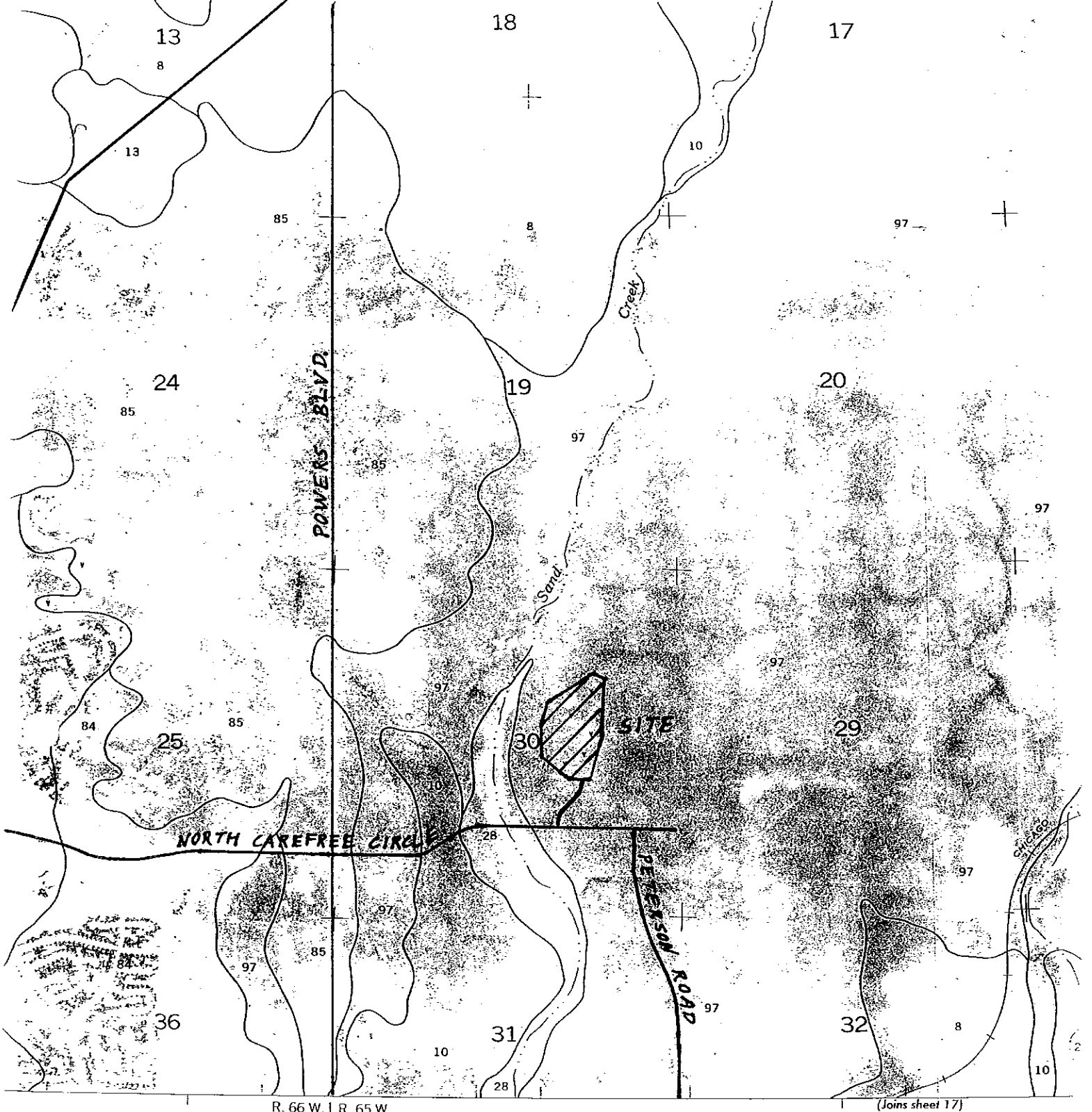
APPENDIX



VICINITY MAP

NOT TO SCALE

Vicinity Map
Figure 1



1" = 2000'

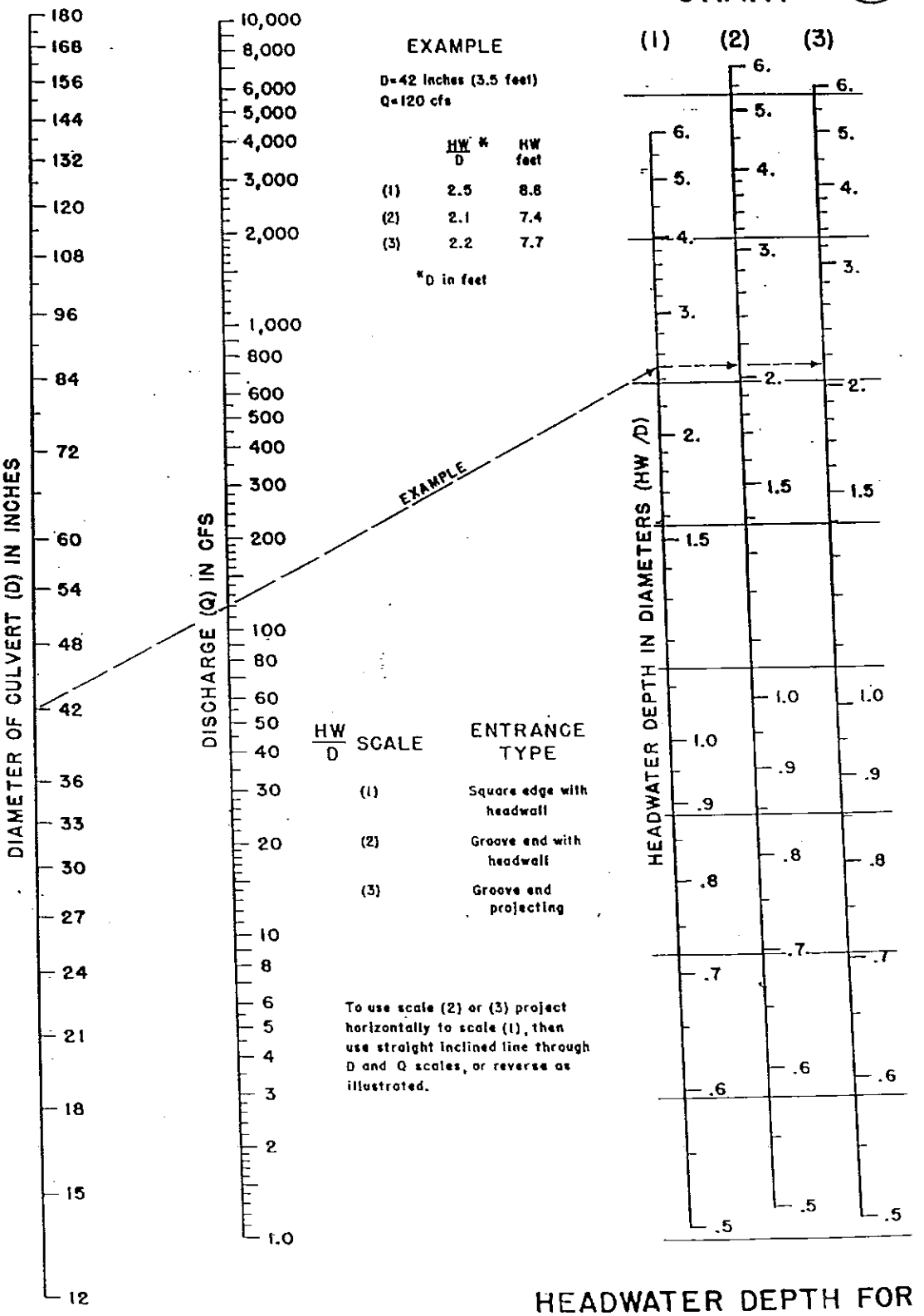
Soils Map

Figure 2

CONCRETE PIPE
Capacity (Velocity)

0.5%		1%	2%	3%	4%	5%	6%	7%	8%
8.0	18"	11.3 (6.6)	16.0 (9.3)	19.6 (11.4)	22.6 (13.2)	25.3 (14.7)	27.7 (16.1)	29.9 (17.4)	32.0 (18.6)
17.2	24"	24.3 (8.1)	34.4 (11.2)	42.2 (13.7)	48.7 (15.8)	54.4 (17.6)	59.6 (19.3)	64.4 (20.9)	68.8 (22.3)
31.2	30"	44.1 (9.5)	62.4 (13.4)	76.4 (16.4)	88.2 (19.0)	98.7 (21.2)	108.1 (23.2)	116.8 (25.1)	124.8 (26.8)
50.7	36"	71.8 (10.3)	101.5 (14.6)	124.3 (17.8)	143.5 (20.6)	160.4 (23.0)	175.8 (25.2)	189.8 (27.2)	202.9 (29.1)
76.5	42"	108.2 (10.8)	153.1 (15.3)	187.5 (18.7)	216.5 (21.6)	242.0 (24.2)	265.1 (26.5)	286.3 (28.6)	306.1 (30.6)
109.3	48"	154.5 (11.2)	218.5 (15.8)	267.6 (19.4)	309.0 (22.4)	345.5 (25.0)	378.5 (27.4)	408.8 (29.6)	437.0 (31.6)
149.6	54"	211.5 (11.5)	299.2 (16.2)	366.4 (19.8)	423.1 (22.9)	473.0 (25.6)	518.2 (28.1)	559.7 (30.3)	598.3 (32.4)
198.1	60"	280.2 (11.7)	396.2 (16.5)	485.3 (20.2)	560.3 (23.3)	626.5 (26.1)	686.3 (28.6)	741.2 (30.9)	792.4 (33.0)
255.4	66"	361.2 (11.8)	510.9 (16.7)	625.7 (20.5)	722.5 (23.7)	807.8 (26.5)	884.8 (29.0)	955.7 (31.3)	1021.7 (33.5)
322.1	72"	455.6 (12.0)	644.3 (17.0)	789.1 (20.8)	911.1 (24.0)	1018.7 (26.8)	1115.9 (29.3)	1205.3 (31.7)	1288.6 (33.9)

CHART 1

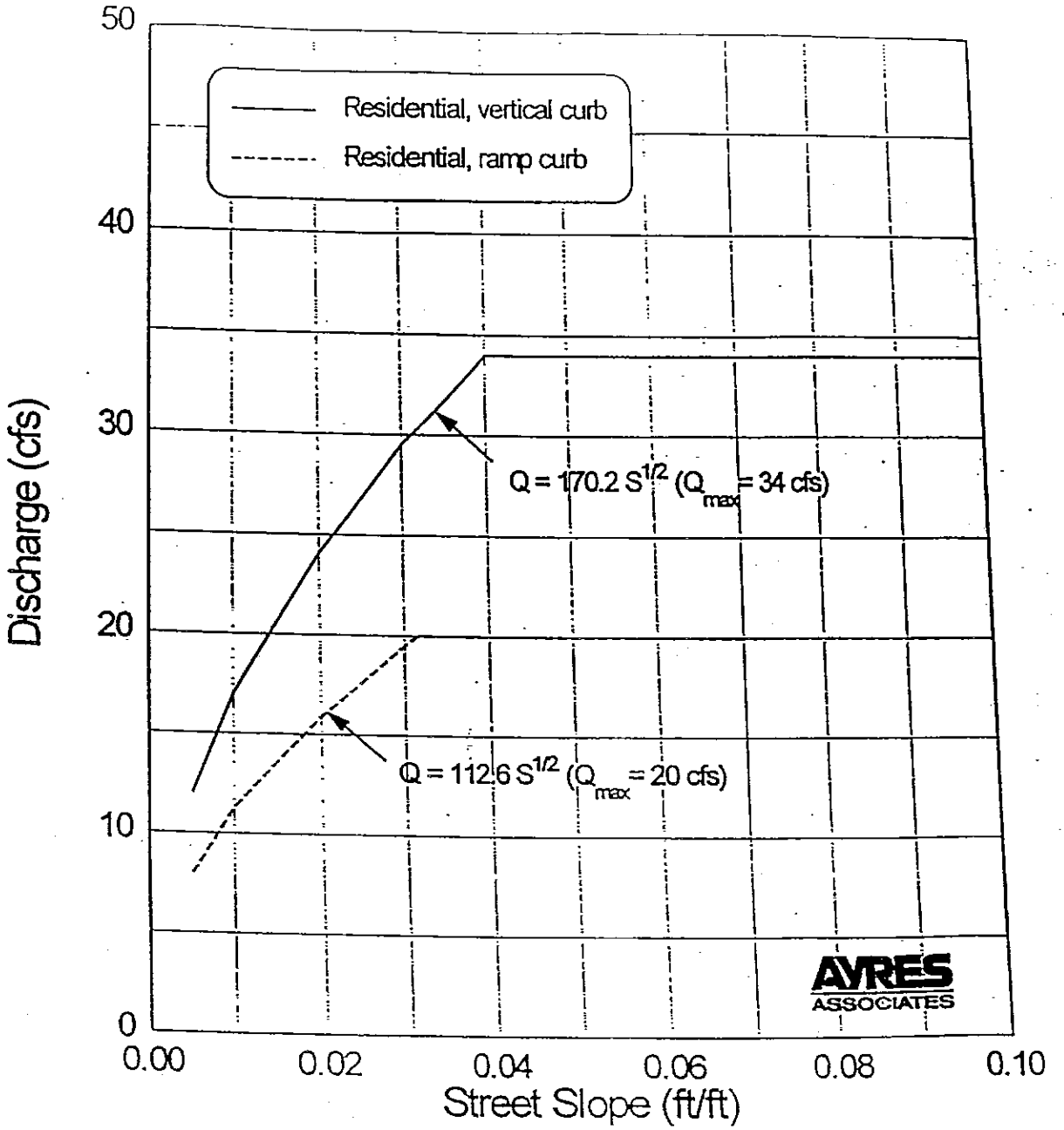


HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

HEADWATER SCALES 283
REVISED MAY 1964

BUREAU OF PUBLIC ROADS JAN. 1963

RESIDENTIAL STREET (34' Flowline to flowline)



Interim Release October 12, 1994
City of Colorado Springs

Use this graph to determine the allowable street capacity per side, initial storm, for the typical street section using a 2% crown.

Hydrology

Location: The Island @ Springs Ranch H-1
Area: 2.6 Ac.
Soil or Landuse: "B"

Runoff Coefficient, C:

Area Zone	C5	C100	% Area
Pasture	0.25	0.35	100 %

Composite: C5 0.25 C100: 0.35 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s (%)	v (fps)	Tc
Overland	100'	4 %		10.1

Tc Total: 10.1

Intensity, I (inches/hr) from Fig 5-1

I5: 4.0 in/hr I100: 7.0 in/hr

Peak Flow: Q = CIA in cfs

Q5: 2.6 cfs Q100: 6.4 cfs

Hydrology

Location: The Island @ SR H-2
Area: 23.0 Ac.
Soil or Landuse: "B"

Runoff Coefficient, C:

Area Zone	C5	C100	% Area
Pasture	0.25	0.35	100 %

Composite: C5 0.25 C100: 0.35 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s (%)	v (fps)	Tc
Overland	500'	8 %		17.9
Swale	400'	2.5 %	5	1.3

Tc Total: 19.2

Intensity, I (inches/hr) from Fig 5-1

I5: 3.0 in/hr I100: 5.2 in/h

Peak Flow: Q = CIA in cfs

Q5: 17.2 cfs Q100: 41.9 cfs

3/20/98 TCM

Hydrology

Location: The Island @ S.R. 05-1
Area: 2.0 Ac.
Soil or Landuse: "B"

Runoff Coefficient, C:

Area Zone	C5	C100	% Area
1/8 acre RES	0.60	0.70	100%

Composite: C5 0.60 C100: 0.70 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s (%)	v (fps)	Tc
Overland	100'	4%		5.9
Street	500'	5%	5	1.7

Tc Total: 7.6

Intensity, I (inches/hr) from Fig 5-1

I5: 4.5 in/hr I100: 7.7 in/hr

Peak Flow: Q = CIA in cfs

Q5: 5.4 cfs Q100: 10.8 cfs

Hydrology

Location: The Island @ S.R. D-1
Area: 3.8 Ac.
Soil or Landuse: "B"

Runoff Coefficient, C:

Area Zone	C5	C100	% Area
1/8 acre Res.	0.60	0.70	100%

Composite: C5 0.60 C100: 0.70 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s (%)	v (fps)	Tc
Overland	150'	3%		8.0
Street	600'	2%	4	2.5

Tc Total: 10.5

Intensity, I (inches/hr) from Fig 5-1

I5: 4.0 in/hr I100: 6.9 in/h

Peak Flow: Q = CIA in cfs

Q5: 9.1 cfs Q100: 18.4 cfs

3/20/98 TM

Hydrology

Location: The Island @ S.R. D-2
Area: 5.7 Ac.
Soil or Landuse: "B"

Runoff Coefficient, C:

Area Zone	C5	C100	% Area
1/8 ac. Res.	0.60	0.70	100%

Composite: C5 0.60 C100: 0.70 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s(%)	v(fps)	Tc
Overland	150'	4%		7.2
Street	700'	3%	5	2.3

Tc Total: 9.5

Intensity, I (inches/hr) from Fig 5-1

I5: 4.1 in/hr I100: 7.1 in/hr

Peak Flow: Q = CIA in cfs

Q5: 14.0 cfs Q100: 28.3 cfs

Hydrology

Location: The Island @ S.R. D-3
Area: 2.3 Ac. "B"
Soil or Landuse:

Runoff Coefficient, C:

Area Zone	C5	C100	% Area
1/8 ac. Res.	0.60	0.70	100%

Composite: C5 0.60 C100: 0.70 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s(%)	v(fps)	Tc
Overland	150'	4%		7.2
Street	250'	1%	3	1.4

Tc Total: 8.6

Intensity, I (inches/hr) from Fig 5-1

I5: 4.3 in/hr I100: 7.5 in/h

Peak Flow: Q = CIA in cfs

Q5: 5.9 cfs Q100: 12.1 cfs

3/20/08 TDM

Hydrology

Location: The Island @ S.R. D-4
Area: 8.1 Ac.
Soil or Landuse: "B"

Runoff Coefficient, C:

Area Zone	C5	C100	% Area
1/8 ac. Res.	0.60	0.70	100 %

Composite: C5 0.60 C100: 0.70 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s(%)	v(fps)	Tc
Overland	150'	4 %		7.4
Street	800'	3 %	5	2.7

Tc Total: 10.1

Intensity, I (inches/hr) from Fig 5-1

I5: 4.0 in/hr I100: 7.0 in/hr

Peak Flow: Q = CIA in cfs

Q5: 19.4 cfs Q100: 39.7 cfs

Hydrology

Location: The Island @ S.R. D-5
Area: 1.6 Ac.
Soil or Landuse: "B"

Runoff Coefficient, C:

Area Zone	C5	C100	% Area
1/8 ac. Res.	0.60	0.70	100%

Composite: C5 0.60 C100: 0.70 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s(%)	v(fps)	Tc
Overland	100'	8 %		4.7

Tc Total: 5.0

Intensity, I (inches/hr) from Fig 5-1

I5: 5.2 in/hr I100: 9.0 in/h

Peak Flow: Q = CIA in cfs

Q5: 5.0 cfs Q100: 10.1 cfs

3/20/96 TOM

Hydrology

Location: The Island @ S.R. D-6
Area: 1.7 Ac.
Soil or Landuse: "B"

Runoff Coefficient, C:

Area Zone	C5	C100	% Area
1/8 ac. Res.	0.60	0.70	100%

Composite: C5 0.60 C100: 0.70 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s (%)	v (fps)	Tc
Overland	100'	15%		5.0

Tc Total: 5.0

Intensity, I (inches/hr) from Fig 5-1

I5: 5.2 in/hr I100: 9.0 in/hr

Peak Flow: Q = CIA in cfs

Q5: 5.3 cfs Q100: 10.7 cfs

Hydrology

Location: The Island @ S.R. D-7
Area: 1.8 Ac.
Soil or Landuse: "B"

Runoff Coefficient, C:

Area Zone	C5	C100	% Area
Street/Open	0.80	0.85	100%

Composite: C5 0.80 C100: 0.85 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s (%)	v (fps)	Tc
Overland	100'	8%		4.7
Street	800'	5%	5	2.7

Tc Total: 7.4

Intensity, I (inches/hr) from Fig 5-1

I5: 4.5 in/hr I100: 7.8 in/h

Peak Flow: Q = CIA in cfs

Q5: 6.5 cfs Q100: 11.9 cfs

3/20/98 TOM

Hydrology

Location: The Island @ S.R. D-8
Area: 0.7 Ac.
Soil or Landuse: "B"

Runoff Coefficient, C:

Area Zone	C5	C100	% Area
1/4 ac. Res.	0.50	0.60	100%

Composite: C5 0.60 C100: 0.70 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s (%)	v (fps)	Tc
Overland				5.0

Tc Total: 5.0

Intensity, I (inches/hr) from Fig 5-1

I5: 5.2 in/hr I100: 9.0 in/hr

Peak Flow: Q = CIA in cfs

Q5: 1.8 cfs Q100: 4.4 cfs

Hydrology

Location: The Island @ S.R. D-9
Area: 7.1 Ac.
Soil or Landuse: "B"

Runoff Coefficient, C:

Area Zone	C5	C100	% Area
Multifamily	0.60	0.70	100%

Composite: C5 0.60 C100: 0.70 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s (%)	v (fps)	Tc
Worst Case				5.0

Tc Total: 5.0

Intensity, I (inches/hr) from Fig 5-1

I5: 5.2 in/hr I100: 9.0 in/hr

Peak Flow: Q = CIA in cfs

Q5: 22.1 cfs Q100: 44.7 cfs

7/22/98

Hydrology

Location: The Island @ S.R. DP #1
Area: 9.5 Ac.
Soil or Landuse: "B"

Runoff Coefficient, C:

Area Zone	C5	C100	% Area
1/8 ac. Res.	0.60	0.70	100%

Composite: C5 0.60 C100: 0.70 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s(%)	v(fps)	Tc
From D-1 + thru D-2				10.5
+	300'	2%	4	1.2

Tc Total: 11.7

Intensity, I (inches/hr) from Fig 5-1

I5: 3.8 in/hr I100: 6.6 in/hr

Peak Flow: Q = CIA in cfs

Q5: 21.7 cfs Q100: 43.9 cfs

Hydrology

Location: The Island @ S.R. DP #2
Area: 11.8 Ac.
Soil or Landuse: "B"

Runoff Coefficient, C:

Area Zone	C5	C100	% Area
1/8 ac. Res.	0.60	0.70	100%

Composite: C5 0.60 C100: 0.70 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s(%)	v(fps)	Tc
From DP#1 + thru D-3				11.7
+	450'	1%	3	2.5

Tc Total: 14.2

Intensity, I (inches/hr) from Fig 5-1

I5: 3.5 in/hr I100: 6.0 in/hr

Peak Flow: Q = CIA in cfs

Q5: 24.8 cfs Q100: 49.6 cfs

3/20/98 TOM

Hydrology

Location: The Island @ S.R. DP #3
Area: 10.1 Ac. "B"
Soil or Landuse:

Runoff Coefficient, C:

Area Zone	C5	C100	% Area
1/8 ac. Res.	0.60	0.70	100 %

Composite: C5 0.60 C100: 0.70 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s(%)	v(fps)	Tc
From D-4			=	TO-1
or				
From OS-1 + thru D-4				7.6
+	1200'	3 %	5	4.0 → 11.6

Tc Total: 11.6

Intensity, I (inches/hr) from Fig 5-1

I5: 3.8 in/hr I100: 6.6 in/hr

Peak Flow: Q = CIA in cfs

Q5: 23.0 cfs Q100: 46.7 cfs

Hydrology

Location: The Island @ S.R. DP #4
Area: 21.9 Ac. "B"
Soil or Landuse:

Runoff Coefficient, C:

Area Zone	C5	C100	% Area
1/8 ac. Res.	0.60	0.70	100 %

Composite: C5 0.60 C100: 0.70 100%

Time of Concentration: Tc, in minutes:

Travel Type	L(ft)	s(%)	v(fps)	Tc
From DP #2				14.2

Tc Total: 14.2

Intensity, I (inches/hr) from Fig 5-1

I5: 3.5 in/hr I100: 6.0 in/h

Peak Flow: Q = CIA in cfs

Q5: 46.0 cfs Q100: 92.0 cfs

3/20/98 TOM

Sump Inlet @ DP#1

$Q_5 = 21.7$ cfs / $Q_{100} = 43.9$ cfs less area west side Torrey Pines

700' x 100' = 1.6 ac. $\frac{9.5 ac - 1.6 ac}{9.5 ac.} = 83\%$

$Q_5 = 83\% \times 21.7 = 18.0$ cfs by = 3.7 cfs

$Q_{100} = 83\% \times 43.9 = 36.4$ cfs by = 7.5 cfs

Try 8' Inlet = L_i

$$Q = 1.7 \left(L_i + 1.8 W\right)\left(d_{max} + W/12\right)^{1.85} \qquad W = 3'$$

$$Q_5 = 18.0 = 1.7\left(8 + 1.8(3)\right)\left(d_{max} + \tfrac{3}{12}\right)^{1.85}$$

$$d_{max} = 0.63'$$

$$Q_{100} = 36.4 = 1.7\left(8 + 1.8(3)\right)\left(d_{max} + \tfrac{3}{12}\right)^{1.85}$$

$$d_{max} = 1.04'$$

For $d_{max} = 0.9'$ crown $Q_i = 29.5$ cfs 36.4 - 29.5 = 6.9

$Q_{by} = 6.9$ cfs

⇒ Use 8' sump inlet & 24" RCP out @ 1% min

Sump Inlets @ DP #4

Q_5 = 46.0 cfs / Q_{100} = 92.0 cfs less inlet @ DP #1

18.0 cfs -29.5 cfs

Q_5 = 28.0 cfs / Q_{100} = 62.5 cfs

1/2 per side

Q_5 = 14.0 cfs / Q_{100} = 31.2 cfs

Try 10' inlet each side = L_i

$$Q = 1.7 \left(L_i + 1.8\,W\right)\left(d_{max} + {}^{W}/_{12}\right)^{1.85} \qquad W = 3'$$

$$Q_5 = 14.0 = 1.7\left(10 + 1.8(3)\right)\left(d_{max} + {}^{3}/_{12}\right)^{1.85}$$

$$d_{max} = 0.46'$$

$$Q_{100} = 31.2 = 1.7\left(10 + 1.8(3)\right)\left(d_{max} + {}^{3}/_{12}\right)^{1.85}$$

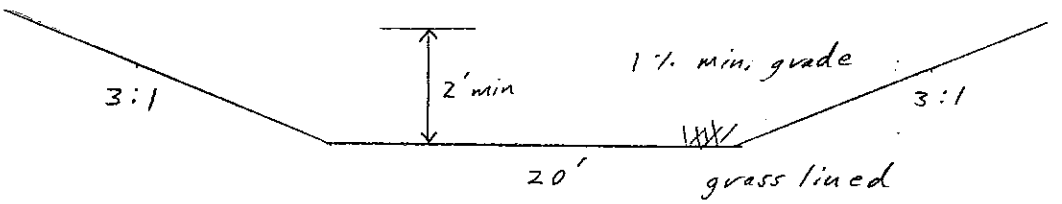
$$d_{max} = 0.85'$$

⇒ Use 10' sump inlet east, out to west w/ 30" RCP @ 1% min.

⇒ Use 10' sump inlet west, out to west w/ 36" RCP @ 2% min.

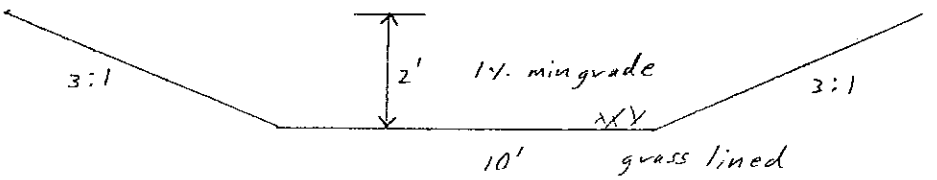
Emergency Swale along North end of Site

Q_{100} = 290 cfs from DP #40 Springs Ranch MDDP Update



Emergency overflow swale @ DP #4

Q_{100} = 93.2 cfs



AGREEMENT
PRIVATE MAINTENANCE OF DRAINAGE FACILITIES

THIS AGREEMENT FOR MAINTENANCE OF DRAINAGE FACILITIES is made this 24th day of September, 1998 by and between Tom Tauche Inc., a Colorado Corporation together with its successor and assigns, hereafter called (Tom Tauche Inc.) and THE CITY OF COLORADO SPRINGS, a municipal corporation (The "CITY").

RECITALS:

1. **BRE / Springs Ranch, L.L.C.**, a Delaware limited liability company, has had accepted by the City a drainage report for certain private drainage facilities at **The Islands at Springs Ranch** ("Drainage Facilities") as shown and described on the drainage report entitled: **Final Report for The Islands at Springs Ranch Filing No. 1.**

2. **Tom Tauche Inc.** is willing to agree, for itself, its successors and assigns, to maintain in perpetuity the Drainage Facilities as described herein.

NOW, THEREFORE, for good and valuable consideration, the receipt and sufficiency of which is acknowledged, the parties agree as follows:

1. The Drainage Facilities are and shall remain the property of **Tom Tauche Inc.**, its successors or assigns.

2. The City shall have the right in an emergency to enter the property and make any necessary immediate repairs to damaged Drainage Facilities where such damaged sections immediately threaten the strength and stability of existing adjacent Drainage Facilities which are maintained by the City.

3. **Tom Tauche Inc.**, its successors or assigns shall maintain the Drainage Facilities in good working condition and in conformity with the approved Construction Plans. The City shall have no responsibility for such maintenance. Such maintenance shall include, by way of example and not by way of limitation, replacing construction materials as needed from time to time, removing lodged materials in the Drainage Facilities from time to time; and generally rendering the Drainage Facilities unencumbered by obstacles or blockages which might render the Drainage Facilities incapable to handle the water flow through them.

4. The City may enter onto the property for inspection of the Drainage Facilities. In the event **Tom Tauche Inc.**, its successors or assigns shall fail to properly maintain the Drainage Facilities therein in a timely manner, The City shall give **Tom Tauche Inc.**, its successors or assigns thirty (30) days written notice of such failure, during which time **Tom Tauche Inc.**, its successors or assigns may cure the failure. If **Tom Tauche Inc.**, its successors or assigns does not cure or commence to cure as provided in this paragraph, or fails there after to complete curing the default within a reasonable period of time once cure is commenced, the City may make all necessary repairs and initiate a special assessment against the Property pursuant Article 1 Chapter 7 of the Code of the City of Colorado Springs, as the same may be amended from time to time.

5. This Agreement shall be binding upon the parties, their successors and assigns, and shall be governed by and interpreted in accordance with the laws of the State of Colorado. This Agreement shall be recorded in El Paso County, Colorado. The benefits and burdens of this Agreement shall run with the land.

TOM TAUCHE INC.
a Colorado Corporation

By: _____
Tom Tauche, President

STATE OF COLORADO)
)ss
COUNTY OF EL PASO)

The foregoing instrument was subscribed and acknowledged before me this 24 day of September, 1998, by **Tom Tauche** as, **President of Tom Tauche Inc.**

WITNESS my hand and official seal.

_____
NOTARY PUBLIC
My Commission Expires: 6/17/2001

KAREN M. BIGGS NOTARY PUBLIC STATE OF COLORADO

CITY OF COLORADO SPRINGS, a Colorado Municipal Corporation

By: _____
CITY ENGINEER

FOR THE DIRECTOR OF PUBLIC WORKS
CITY OF COLORADO SPRINGS

APPROVED AS TO FORM:

STATE OF)
)ss
COUNTY OF)

The foregoing instrument was subscribed and acknowledged before me this _____ day of _____, 19___, by _____, as City Engineer for the Director of Public Works, Colorado Springs, a Colorado Municipal Corporation.

WITNESS my hand and official seal.

_____
NOTARY PUBLIC
My Commission Expires: _____

DRAINAGE AGREEMENT

TOM TAUCHE, INC., a Colorado corporation, whose address is c/o Thomas Tauche 1055 Allegheny, Colorado Springs, 80919 (hereinafter "Grantor") Being the owner of the hereinafter described real property located in the County of El Paso, State of Colorado, for and in consideration of Ten Dollars ($10.00) and other good and valuable consideration, the receipt and adequacy of which are hereby acknowledged, does hereby grant to BRE / SPRINGS RANCH, L.L.C., a Delaware limited liability company (hereinafter "BRE / Springs Ranch"), whose address is 102 North Cascade Avenue, Suite 1100, Colorado Springs, Colorado 80903, together with other owners of property as depicted on Exhibit "B" attached hereto (the "Grantee Property") (BRE / Springs Ranch and the other owners of the Grantee Property are herein after collectively referred to herein as Grantees"), their heirs, successors and assigns, a permanent drainage easement over, under and across the following property:

See Exhibit "A" attached hereto (the "Grantor's Property")

By execution and delivery of this Drainage Agreement by Grantor, Grantor acknowledges that Grantor's Property shall accept the flow of surface and subsurface stormwater (both historic flow and additional flow, if any, due to development of adjacent or upgradient property) from adjacent land, including discharge of stormwater from those certain stormwater pipes the current location of which are depicted on Exhibit "B". Grantor Further acknowledges that Grantees shall not be responsible for any damage or injury to the Grantor's Property as a result of the flow of stormwater onto and through Grantor's Property. Grantees shall install such drainage improvements as are necessary to accommodate the stormwater across the Grantor's Property. Grantor shall maintain such improvements once installed by Grantees and such improvements shall become the property of Grantor.

The provisions of this Drainage Agreement shall inure to the benefit of and bind the heirs, successors and assigns of the respective parties hereto, and shall run with the land of the Grantee Property and the Grantor Property.

Signed, sealed and delivered this 24th day of September, 1998.

TOM TAUCHE , INC.
A Colorado Corporation

By: _____
Thomas C. Tauche, President

STATE OF COLORADO)
)ss
COUNTY OF EL PASO)

The Forgoing instrument was acknowledged before me this _____ day of September, 1998, by Thomas Tauche as President of Tom Tauche, Inc., a Colorado corporation.

WITNESS my hand and official seal.

SEAL

_____
NOTARY PUBLIC
My Commission Expires: _____

EXHIBIT "A"
(Sheet 1 of 2)

A public storm drain easement located in the Northeast 1/4 of Section 30, Township 13 South, Range 65 West of the 6th P.M., El Paso County, Colorado more particularly described as follows:

All bearings in this description are relative to the Annexation Plat of The Colorado Springs Ranch Addition.

COMMENCING at the Southwest corner of the Northeast 1/4 of the Northeast 1/4 of said Section 30; thence S52°02'48"W a distance of 1024.24 feet to the Point of BEGINNING of this description; thence S37°03'01"E a distance of 60.00 feet; thence S52°56'59"W a distance of 73.26 feet; thence S73°12'36"E a distance of 65.93 feet; thence S16°47'24"W a distance of 60.00 feet; thence N73°12'36"W a distance of 484.07 feet to the southeasterly right-of-way line of Sand Creek Drainage Channel as recorded under Reception No. 1341344 of the records of said County; thence along said Southeasterly right-of-way line on a curve to the right having a central angle of 00°46'10", a radius of 1400.00 feet for a distance of 18.80 feet, the chord bears N34°46'27"E; thence N35°09'32"E continuing along said Southeasterly right-of-way line a distance of 44.38 feet; thence S73°12'36"E a distance of 324.03 feet; thence N52°56'59"E a distance of 117.11 feet to the point of beginning, and containing 0.784 acre more or less.

Prepared By:

Rockwell-Minchow Consultants
John L. Bailey, PLS #19586
Project #98-048
September 9, 1998
File # 96101drn.doc

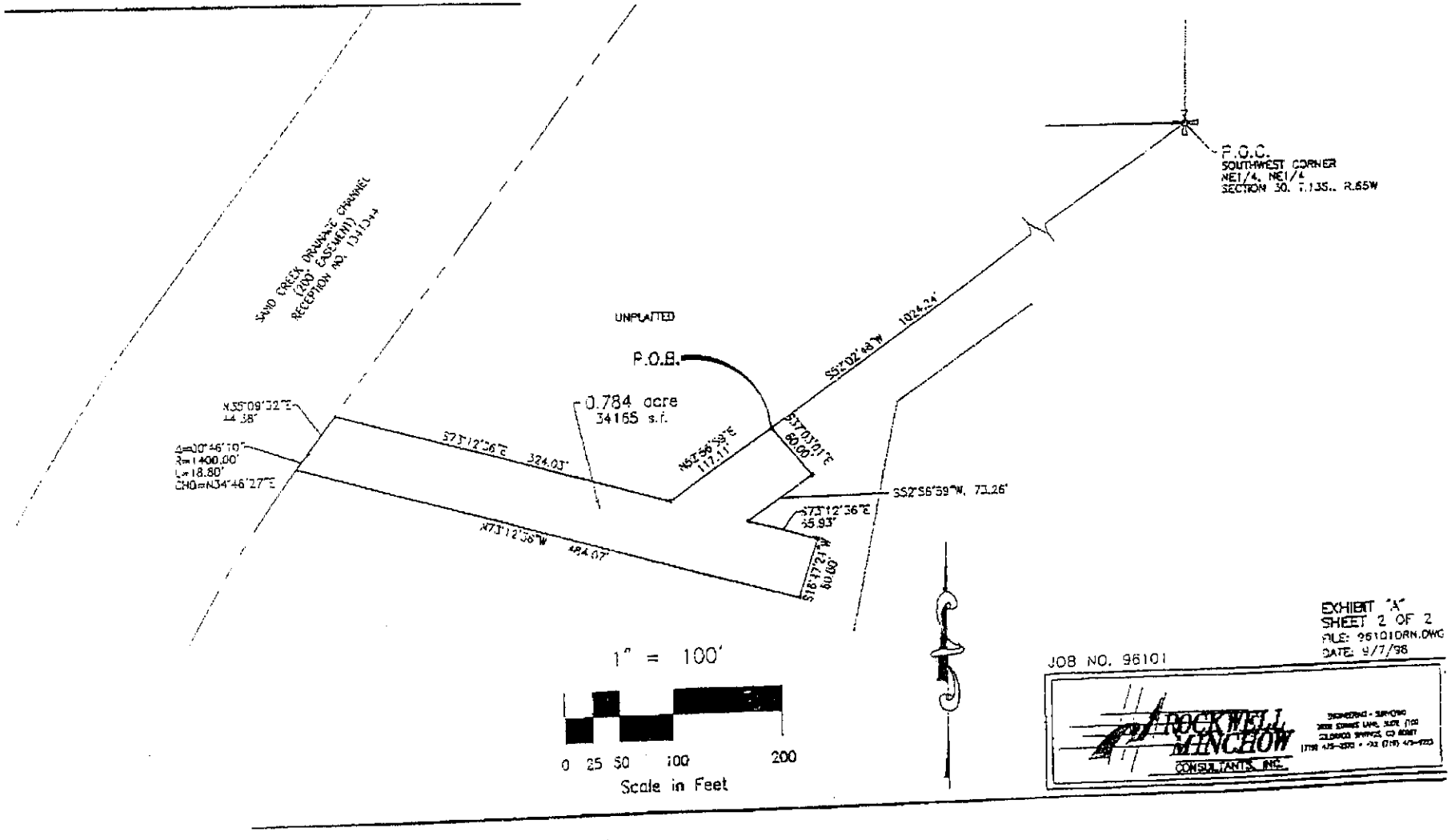
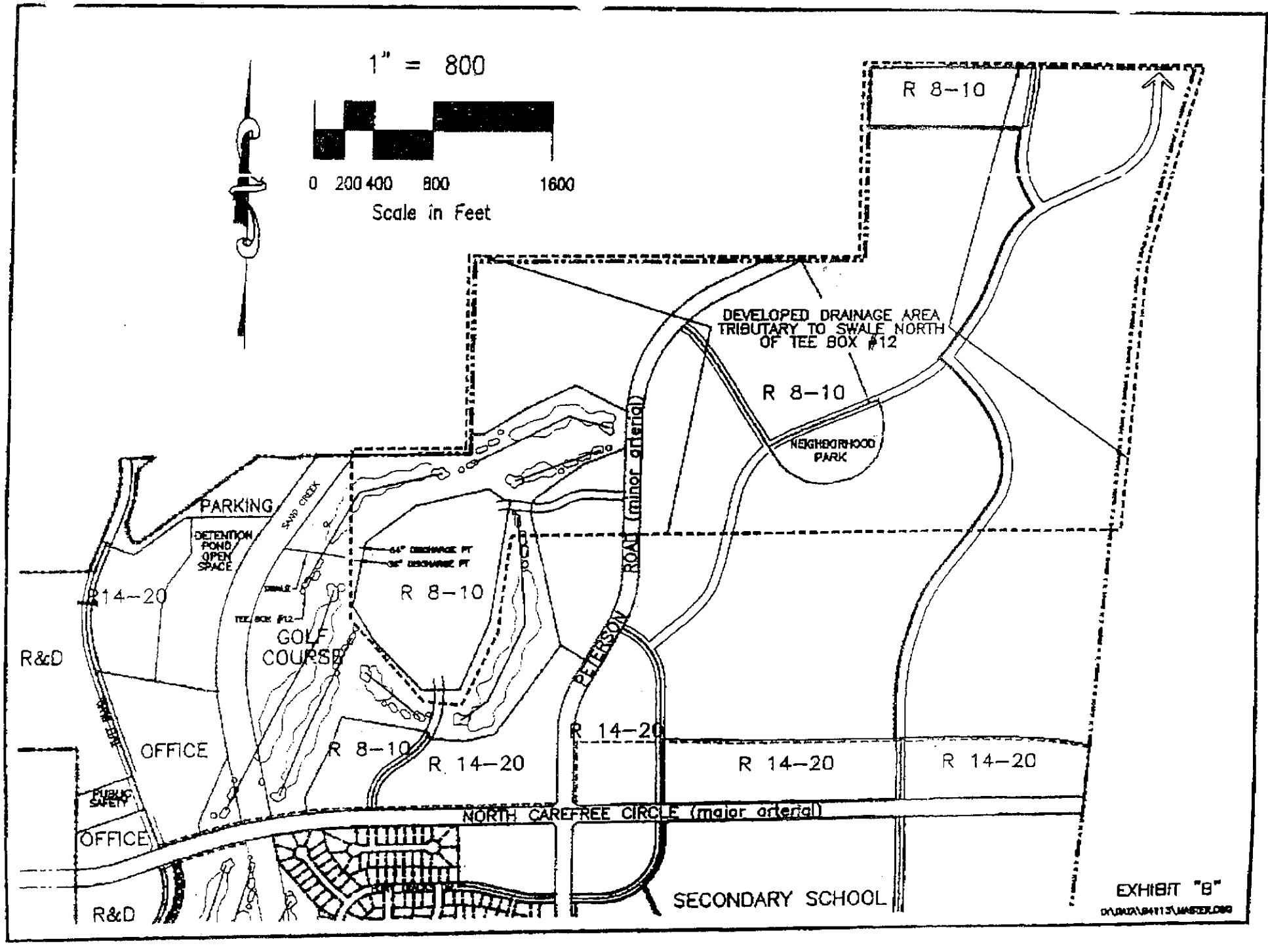

SAND CREEK DRAINAGE CHANNEL
(200' EASEMENT)
RECEPTION NO. 134134
UNPLATTED
P.O.B.
0.784 acre
34165 s.f.
P.O.C.
SOUTHWEST CORNER
NE1/4, NE1/4
SECTION 30, T.13S., R.65W
S5°02'48"W 1024.24'
S37°01'01"E
60.00'
S52°58'59"W, 73.26'
S73°12'36"E
65.93'
S16°47'24"W
60.00'
N73°12'36"W 484.07'
N52°58'59"E
117.11'
S73°12'36"E 324.03'
N35°09'32"E
44.38'
Δ=30°46'10"
R=1400.00'
L=18.80'
CHD=N34°46'27"E
1" = 100'
0 25 50 100 200
Scale in Feet
EXHIBIT "A"
SHEET 2 OF 2
FILE: 96101DRN.DWG
DATE: 9/7/98
JOB NO. 96101
ROCKWELL MANCHOW
CONSULTANTS, INC.

EXHIBIT "B" (1 of 2)

The property within the hatched box depicted on the attached page located in the North 1/2 of Section 29, and the Northeast 1/4 of Section 30, Township 13 South, Range 65 West of the 6th PM, County of El Paso, State of Colorado.


1" = 800
0 200 400 800 1600
Scale in Feet
R 8–10
DEVELOPED DRAINAGE AREA TRIBUTARY TO SWALE NORTH OF TEE BOX #12
R 8–10
NEIGHBORHOOD PARK
PETERSON ROAD (minor arterial)
PARKING
DETENTION POND OPEN SPACE
SAND CREEK
R 14–20
R 8–10
GOLF COURSE
R&D
OFFICE
R 8–10
R 14–20
R 14–20
R 14–20
R 14–20
PUBLIC SAFETY
OFFICE
NORTH CAREFREE CIRCLE (major arterial)
R&D
SECONDARY SCHOOL
EXHIBIT "B"