4-23-99

Master Development Drainage Plan
for
The Range @ Springs Ranch Development
and
Final Drainage Report for
The Range @ Springs Ranch Filing No. 1
June, 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# 97-082

Master Development Drainage Plan
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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
25086
6/9/98
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: ______________________ DATE 6/8/98
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.

______________________ 6/17/98
CITY ENGINEER DATE

Master Development Drainage Plan
for
The Range @ Springs Ranch Development
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GENERAL LOCATION AND DESCRIPTION

The Range at Springs Ranch is located east of Peterson Road and south of North Carefree Circle and consists of approximately 60 acres. The site lies within portions of Sections 29 and 32, Township 13 South, Range 65 West of the 6th P.M., El Paso County, Colorado (see Figure 1). The 60.062 acre is bound on the west by future residential development (Highlands @ Springs Ranch), Pony Tracks Drive and Sand Creek High School, on the north by North Carefree Circle, on the east by undeveloped, unplatted land, and on the south by undeveloped, unplatted land.

The entire site lies within the Sand Creek Drainage Basin and will be developed as 1/8 acre single family residential lots. An existing ridge runs north and south through the middle of the site. The area east of this ridge slopes to the east at grades of approximately 5%. The northwest corner of the site slopes toward a wide swale located approximately 500 feet south of the future extension of North Carefree Circle. The existing grades in this area are also in the range of 4% to 5%. The southwest corner of the site slopes to the southwest. The existing ground cover consists of native grasses with no trees.

REFERENCES

1. The Springs Ranch MDDP Update (December, 1996), prepared by Kiowa Engineering, Colorado Springs, CO.

2. Preliminary and Final Drainage Report for Pony Tracks Drive Subdivision Filing No. 1 (March, 1997), prepared by Rockwell-Minchow Consultants, Inc., Colorado Springs.

3. Preliminary Drainage Report for The Highlands at Springs Ranch and Final Drainage Report for The Highlands at Springs Ranch Filing No. 1 (January, 1997), prepared by Rockwell-Minchow Consultants, Inc., Colorado Springs, CO.

4. Sand Creek Drainage Basin Planning Study (November, 1995), prepared by Kiowa Engineering, Colorado Springs, CO.

5. Preliminary and Final Drainage Report for The Highlands at Springs Ranch Filing Nos. 2 & 3 (April, 1998), prepared by Rockwell-Minchow Consultants, Inc., Colorado Springs, CO.

SOILS

According to the US Department of Agriculture Soil Conservation Services Soil Survey of El Paso County, The Range at Springs Ranch is underlain by the Truckton Series (Soil 97) which is classified as a Hydrologic Group "B" soil (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.

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 site is divided into 4 on-site historic drainage basins. No off-site flows enter this site. Following is a description of each basin and the existing runoff patterns and drainage improvements:

Basin A encompasses 9.47 acres toward the southwest corner of the site. Runoff rates of $Q_5 = 6.2$ cubic feet per second (cfs) and $Q_{100} = 14.9$ cfs generated from this basin exit the site as swale flow. This swale currently discharges onto other land owned by Springs Ranch.

Approximately 7.25 acres located just north of Basin A encompasses Basin B. The runoff generated from this area ($Q_5 = 4.5$ cfs and $Q_{100} = 10.9$ cfs) flows to the west onto unplatted land which will eventually be developed as Pony Tracks Drive and The Highlands at Springs Ranch.

Basin C consists of the eastern 19.66 acres of the site. Runoff rates of 14.7 cfs and 35.8 cfs are generated from this area during the 5 year and 100 year storms, respectively. These flows sheet flow to the east onto undeveloped land. A wide existing swale then carries these flows southerly.

The northwest corner of the proposed developed comprises Basin D. Runoff generated from this basin flows south and north to an existing swale located in the middle of the basin. This swale which slopes east to west toward the Sand Creek High School property carries approximately 15.0 cfs during the 5 year storm and 37.5 cfs during the 100 year storm.

DEVELOPED DRAINAGE ANALYSIS

This portion of the report analyzes the developed runoff quantities and patterns for the site. The area has been depicted on the developed drainage plan by nineteen basins. Following is a description of each basin and the proposed runoff patterns and drainage improvements.

Basin I covers 6.1 acres along the south and east sides of Bonnie Brae Lane. Runoff rates of 11.3 cfs and 22.2 cfs are generated from this basin during the 5 year and 100 year storms, respectively. The runoff sheet flows to the street and then flows westerly within Bonnie Brae Lane to Pony Tracks Drive. The area north of Bonnie Brae Drive comprises Basin II. Flows generated from this basin (Q_5 = 12.6 cfs and Q_{100} = 25.1 cfs) also discharge to Bonnie Brae Lane as sheet flow. With ramp curb and a slope of 1%, Bonnie Brae Lane has a 5 year street capacity of 11.2 cfs per side. This is not adequate to convey the 5 year storm at the southwest end of Bonnie Brae. Therefore, 8" vertical curb will be installed on the south side of Bonnie Brae from Roping Drive to Pony Tracks Drive.

Two 15' inlets will be installed in Bonnie Brae just west of the Pony Tracks Drive intersection to collect runoff from Basins I and II. These inlets will collect approximately 18.3 cfs during the 5 year storm and 30.7 cfs during the 100 year storm. A 24" diameter reinforced concrete pipe (RCP) will be installed within Pony Tracks Drive to convey these flows to the south. This pipe will tie into the storm sewer system to be built with The Highlands at Springs Ranch Filing No. 2 prior to The Range. The remaining surface flows (17.5 cfs/40.5 cfs) will continue to the south as street flow in Pony Tracks Drive. The street flow within Pony Tracks Drive continuing south is within street capacity of 24 cfs per side (5 year). These street flows will be collected by inlets to be constructed with The Highlands.

Basin III consists of the lots on both sides of McEwan Street from Cattle Drive to Pony Tracks Drive. McEwan Street carries developed flow rates of 9.4 cfs during the 5 year storm and 18.7 cfs during the 100 year storm to Pony Tracks Drive as street flow. McEwan Street at a slope of 1% has the same street capacity as Bonnie Brae (11.2 cfs/side) which is adequate to convey the flows to Pony Tracks Drive.

The lots along the south side of Cattle Drive make up Basin IV. Cattle Drive also at a slope of 1% and a 5 year street capacity of 11.2 cfs has adequate capacity to convey the flow rates of Q_5 = 5.0 cfs and Q_{100} = 10.0 cfs generated from this basin.

Basin V consists of the east half of Pony Tracks Drive from Highland Vista Drive to Cattle Drive and the adjacent lots to the east. Flow rates of Q_5 = 2.5 cfs and Q_{100} = 5.1 cfs continue southerly within Pony Tracks combining with the flows generated from Basins I, II, III and IV. The combined flows from Basins I, II, III, IV, and V are 35.8 cfs during the 5 year storm and 71.2 cfs during the 100 year storm (Design Point #1). Pony Tracks Drive with a Collector street classification, a longitudinal slope of 2% and 8" vertical curb and gutter has a 5 year street capacity of 24 cfs/side. The 2 - 15' inlets described above will reduce the flows entering Pony Tracks to 17.5 cfs during the 5 year storm and 40.5 cfs during the 100 year storm.

The west half of Pony Tracks Drive from Cattle Drive to Highland Vista Drive comprises Basin VI. Basin VI generates flows of 3.3 cfs and 6.1 cfs during the 5 year and 100 year storms, respectively. These flows will continue southerly in Pony Tracks Drive and turn down the streets to the west in

The Highlands.

Basin VII consists of the lots on the north and south side of Westerner Drive. Runoff rates of 7.8 cfs and 15.5 cfs flow westerly within Westerner Drive to the Cattle Drive and Westerner Drive intersection. Westerner Drive at a slope of 1% had adequate street capacity (Q_{5cap} = 11.2 cfs per side) to convey this flows.

The lots on the north side of Cattle Drive comprise Basin VIII. This basin generates runoff rates of 4.1 cfs during the 5 year storm and 8.0 cfs during the 100 year storm. The combined flows from Basin VII and VIII are Q_5 = 11.3 cfs and Q_{100} = 22.7 cfs (Design Point #2). Cattle Drive has the capacity to convey these flows to Pony Tracks Drive (Q_{5cap} = 11.9 cfs per side).

Basin IX consists of the rear portion of all the lots abutting the eastern property line of The Range @ Springs Ranch development. Runoff rates of 12.1 cfs during the 5 year storm and 24.3 cfs during the 100 year storm sheet flow to the east onto the adjacent property. This is less than the historic flows exiting along this boundary line (Basin C - Q_5 = 14.7 cfs and Q_{100} = 35.8 cfs).

The lots on the east side of McEwan Street and the south side of Pony Tracks Drive comprises Basin X. Basin X generates flows of 10.6 cfs during the 5 year storm and 21.1 cfs during the 100 year storm. Pony Tracks Drive at 1% has a 5 year street capacity of 17.2 cfs per side.

The combined flows from Basins VII, VIII and X converge at Design Point #3. Combined flow rates of Q_5 = 21.3 cfs and Q_{100} = 42.7 cfs reach a proposed 10' sump inlet to be constructed along the southeast side of Pony Tracks Drive at the intersection with Springs Ranch Drive. This inlet will collect the total 5 year storm flows before and the majority of the 100 year storm flows. Approximately 13.0 cfs will overtop the centerline of Pony Tracks Drive and continue northerly in Springs Ranch Drive during the 100 year storm.

Basin XI consists of the lots north of Pony Tracks Drive between Cattle Drive Springs Ranch Drive and McEwan Street and generates flows of Q_5 = 7.5 cfs and Q_{100} = 15.0 cfs. Basin XII is located east and north of Basin XI. Flow rates of 6.9 cfs during the 5 year storm and 13.9 cfs during the 100 year storm are generated from Basin XII. The combined flows of Q_5 = 11.7 cfs and Q_{100} = 23.2 cfs generated from Basins XI and XII flow westerly within Pony Tracks Drive to Design Point #4. Pony Tracks Drive at a slope of 1% and a 5 year street capacity of 17.2 cfs has adequate capacity to convey these flows.

Basin XIII consists of approximately 3.3 acres on the east side of Saddle Up Drive. Approximately 6.9 cfs and 13.9 cfs will be conveyed westerly within the south side of Saddle Up Drive from this basin. Runoff rates of 11.5 cfs and 23.1 cfs are generated from Basin XIV which is located northeast of Saddle Up Drive. Saddle Up Drive with a slope of 3% and a corresponding 5 year street capacity of 19.5 cfs per side has adequate capacity to Springs Ranch Drive.

A 10' inlet will be constructed on the north side of Saddle Up Drive just east of the intersection with Springs Ranch Drive. This inlet will collect 4.5 cfs during the 5 year storm and 6.7 cfs during the 100 year storm and discharge to the south via a proposed 18" RCP.

Basin XV consists of the rear portion of lots along North Carefree Circle. Flows of 3.8 cfs during the 5 year storm and 7.8 cfs during the 100 year storm will discharge into North Carefree Circle as sheet flow. These flows will continue westerly and turn into Springs Ranch Drive to the south.

Approximately 1.7 acres located east of Springs Ranch Drive and north of Saddle Up Drive comprises Basin XVI. Springs Ranch Drive will collect flows of 4.1 cfs and 8.3 cfs generated from Basin XVI during the 5 year and 100 year storms, respectively. A 10' inlet to be constructed in Springs Ranch Drive north of the intersection with Saddle Up Drive will collect flows of 4.8 cfs during the 5 year storm and 6.8 cfs during the 100 year storm.

Design Point #5 is located at the southeast corner of the intersection of Springs Ranch Drive and Saddle Up Drive. Total runoff (pipe & street) exiting this intersection to the south will be 22.9 cfs (5yr) and 45.8 cfs (100yr).

The west half of Springs Ranch Drive from North Carefree Circle to Pony Tracks Drive plus approximately 350 feet of the west side of Pony Tracks Drive encompasses Basin XVII. Approximately 4.7 cfs and 8.6 cfs generated from this basin flows as street flow to a proposed low point in Springs Ranch Drive. A 15'sump inlet is proposed to be constructed at this point.

Basin XIX covers 0.6 acres east of Springs Ranch Drive between Pony Tracks Drive and Saddle Up Drive. Runoff quantities of 1.4 cfs (5yr) and 2.9 cfs (100yr) sheet flow to the proposed low point in Springs Ranch Drive. A 15' sump inlet is also proposed to be constructed on the east side of the street at this point. Total street flow reaching the east sump inlet will be 30.1 cfs (5yr) and 42.5 cfs (100yr). The 100 year runoff (85.1cfs) will be evenly split on both sides of the street. The pair of 15' sump inlets will collect all of the developed runoff. A 36" RCP will connect the inlets and a 42" RCP will exit the westerly inlet and discharge to an existing drainage channel running through the Sand Creek High School. This is Design Point #6, Q_5 = 48.0 cfs and Q_{100} = 97.0 cfs routed flows. This is Design Point #20 in the Springs Ranch MDDP Update (Q_{100} = 68.0 cfs). The downstream facilities (channel through high school site and high school outfall) have been checked for capacity to ensure the peak 97 cfs release rate is conveyed safely. Calculations are provided in the appendix.

The extreme northeast 1.2 acres of the site comprises Basin XVIII. The runoff generated from this basin (Q_5 = 2.8 cfs and Q_{100} = 5.7 cfs) will discharge into North Carefree Circle and flow easterly to a future low point.

Street capacities will not be exceeded within the proposed development under this drainage plan and report. All streets except Pony Tracks Drive and Springs Ranch Drive are classified as residential and will be 34' fl-fl with ramp type curb & gutter. Bonnie Brae Lane will have a stretch of vertical curb & gutter between Pony Tracks Dr. and Roping Dr. Pony Tracks Drive and Springs Ranch Drive are classified as collectors and will be 40' fl-fl with vertical curb and gutter.

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 facilities required for The Range at Springs Ranch Filing No. 1 consist of 2 -15' inlets and approximately 350 feet of 24" RCP.

Filing No. 1 - Street Systems (Public Non-reimbursable):

1. 15' D-10-R Inlet	2 Ea. @ $3,600.00/Ea.	$ 7,200.00
2. 24" RCP	150 L.F. @ $32.00/L.F.	$ 4,800.00
	Sub-total:	$ 12,000.00
	15% Engineering & Contingency:	$ 1,800.00
	TOTAL:	**$ 13,800.00**

Future Filings - Street Systems (Public Non-reimbursable):

1. 10' D-10-R Inlet	3 Ea. @ $3,000.00/Ea.	$ 9,000.00
2. 15' D-10-R Inlet	2 Ea. @ $3,600.00/Ea.	$ 7,200.00
3. 18" RCP	250 L.F. @ $22.00/L.F.	$ 5,500.00
4. 24" RCP	250 L.F. @ $32.00/L.F.	$ 8,000.00
5. 36" RCP	50 L.F. @ $48.00/L.F.	$ 2,400.00
6. 42" RCP	50 L.F. @ $55.00/L.F.	$ 2,750.00
7. 42" RCP Outfall to School Connect to channel	1 Ea. L.F. @ $5000.00/Ea.	$ 5,000.00
	Sub-total:	$ 39,850.00
	15% Engineering & Contingency:	$ 5,977.50
	TOTAL:	**$ 45,827.50**

DRAINAGE FEES

The Ranch at Springs Ranch Development is located within the Sand Creek Drainage Basin. The total area for Filing No. 1 is 12.702 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 $1,331.00/acre (Facilities).

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

The Range at Springs Ranch Filing No. 1 Fees:

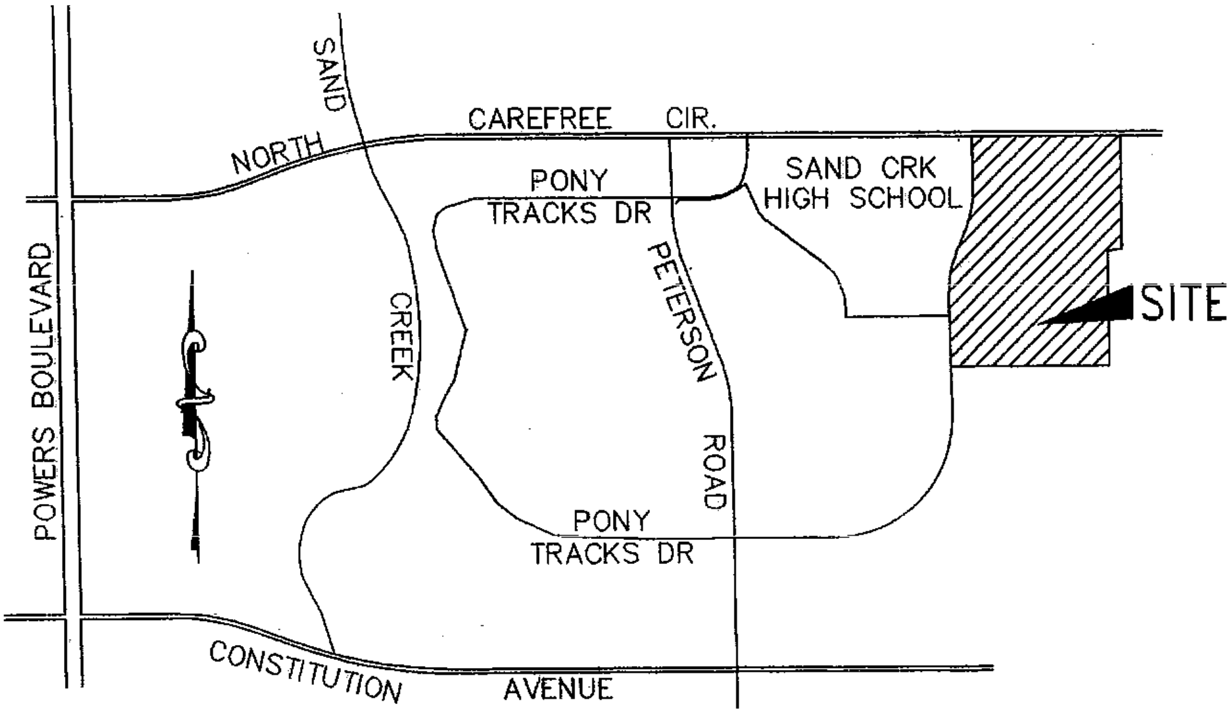
Drainage Fees:	12.702 ac. x $5,552.00/ac	=$ 70,521.50
Bridge Fees:	12.702 ac. x $ 356.00/ac.	=$ 4,521.91
Pond Fees (Land):	12.702 ac. x $ 335.00/ac	=$ 4,255.17
Pond Fees (Facilities):	12.702 ac. x $1,331.00/ac.	=$ 16,906.36
Pond Assurance:	12.702 ac. x $ 879.00/ac.	=$ 11,165.06
	Total:	=$107,370.00

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

FIGURE 1

FILE: 97082DEV.DWG
DATE: 1/20/98

JOB NO. 97-082

ROCKWELL MINCHOW CONSULTANTS, INC.
ENGINEERING • SURVEYING
2928 STRAUS LANE, SUITE #100
COLORADO SPRINGS, CO 80907
(719) 475-2575 • FAX (719) 475-9223

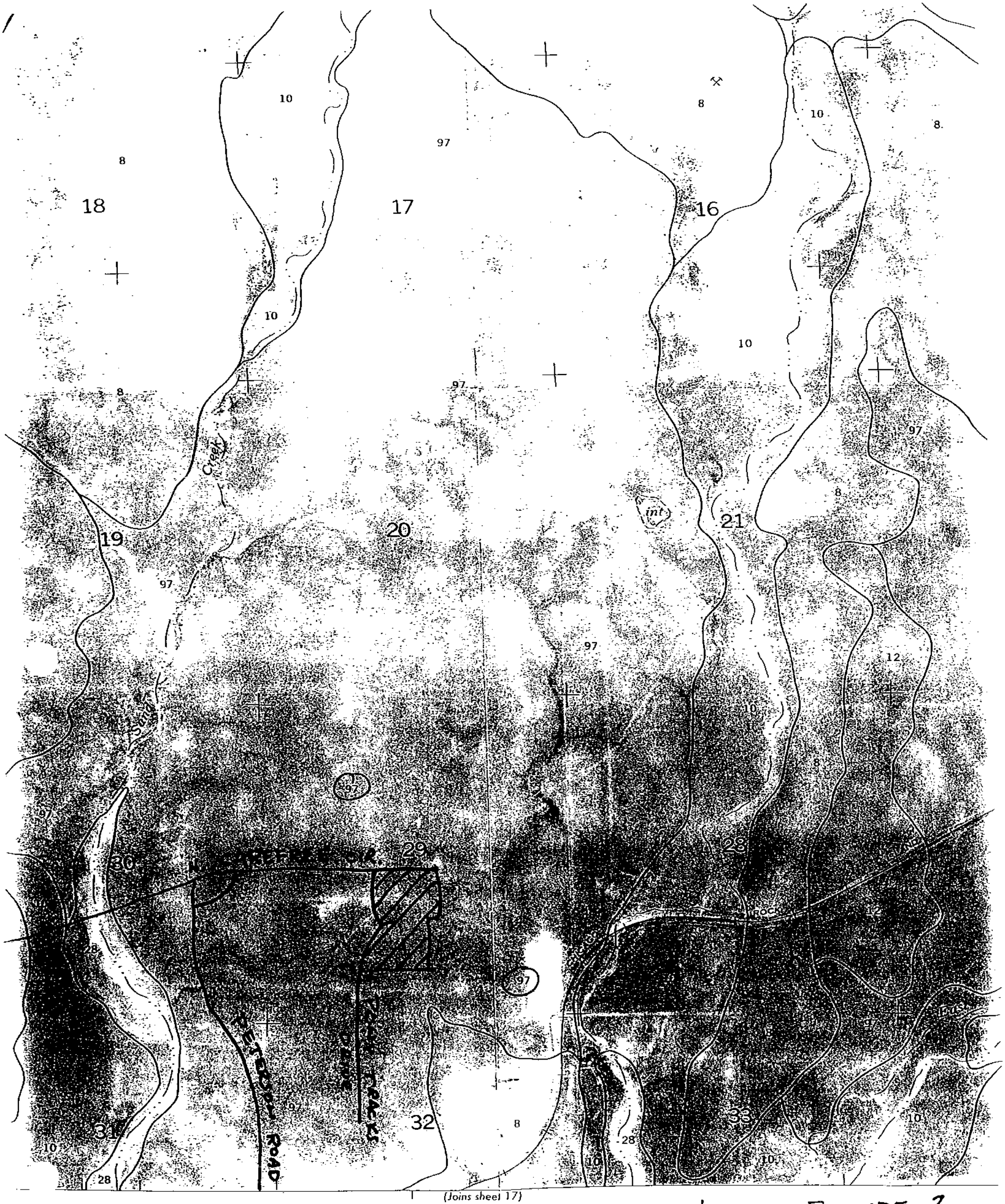


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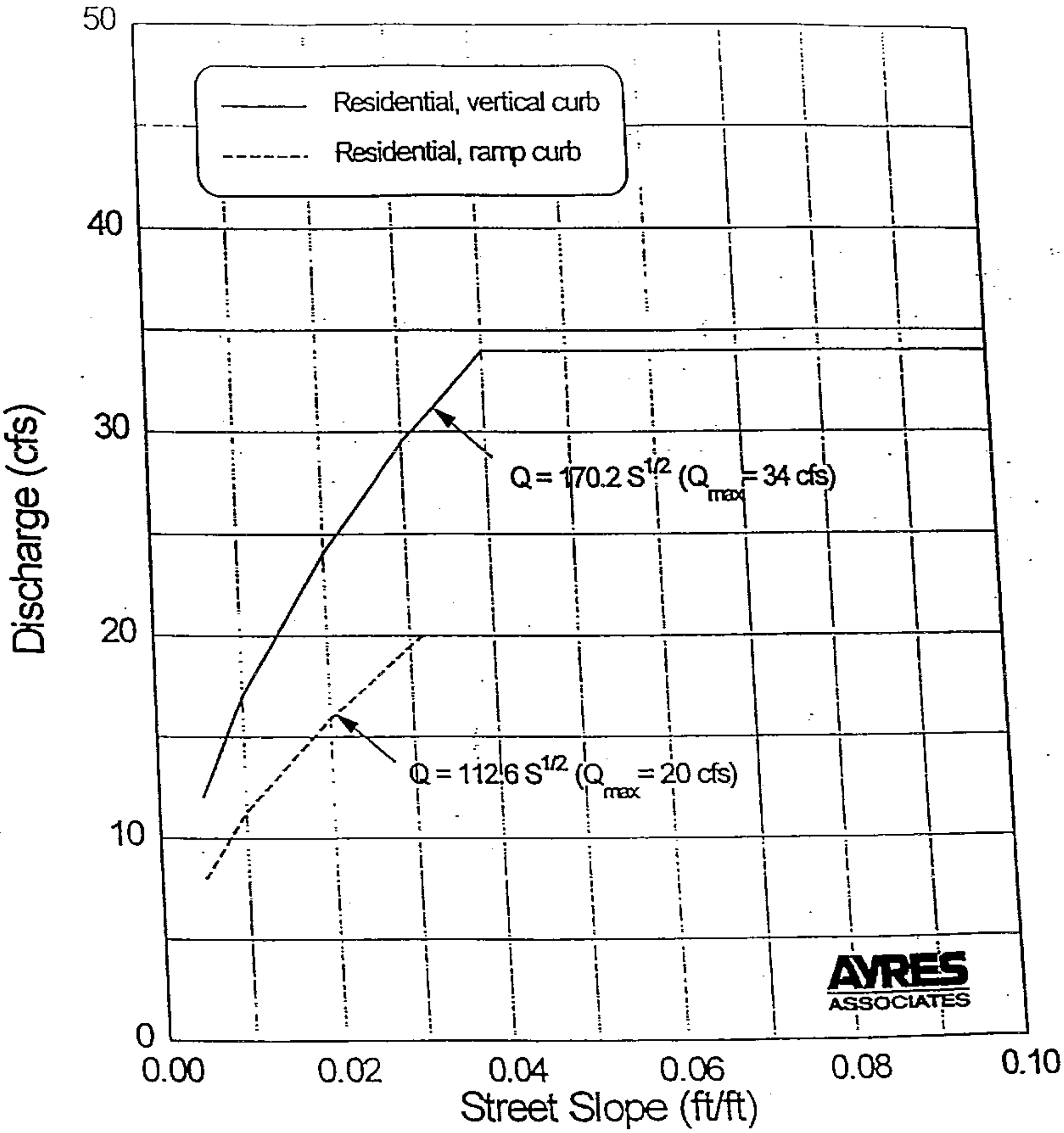
FIGURE 2
SOILS MAP

1" = 2000'

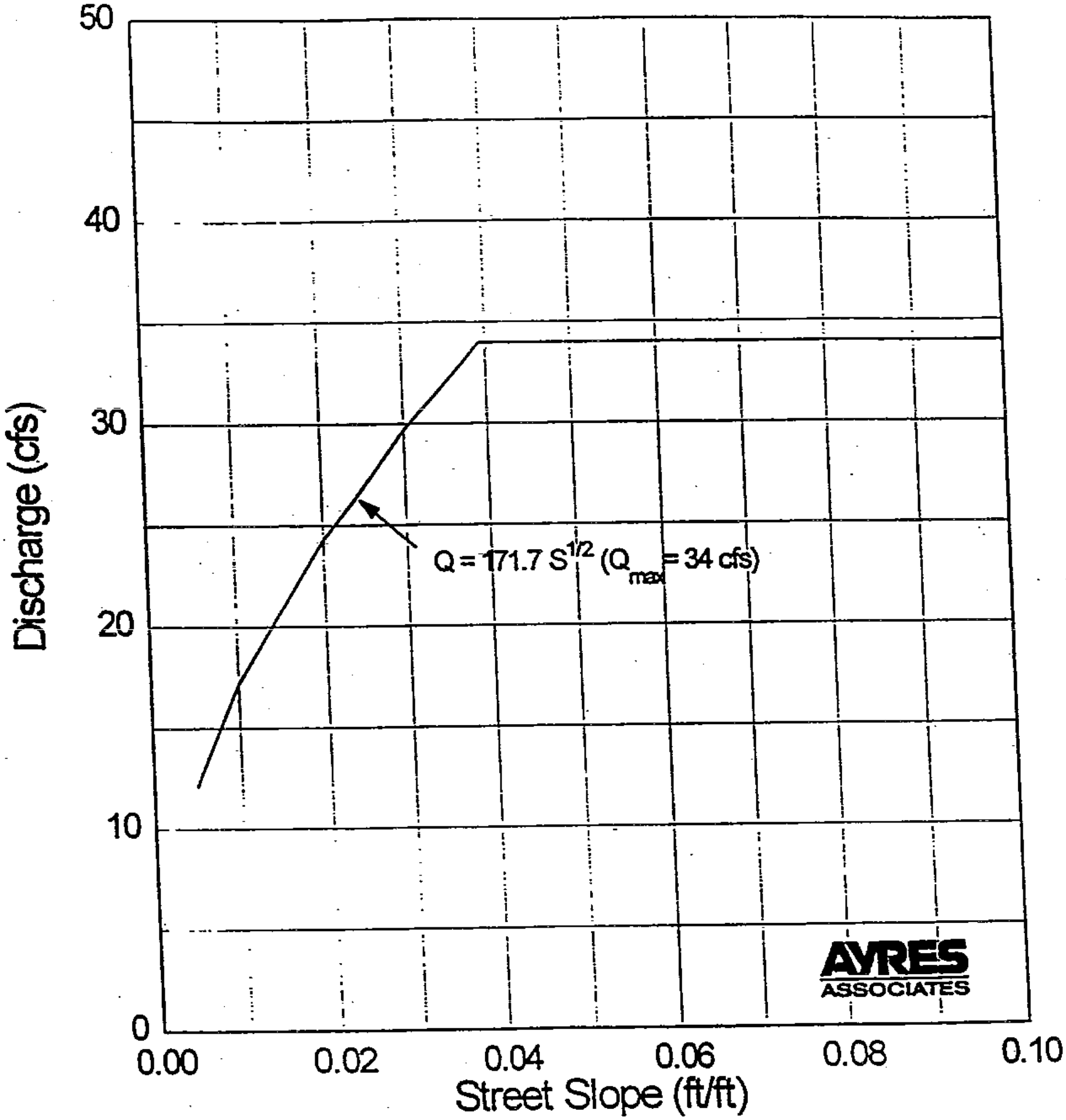
RESIDENTIAL STREET (34' Flowline to flowline)



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.

COLLECTOR STREETS (Major and Minor)



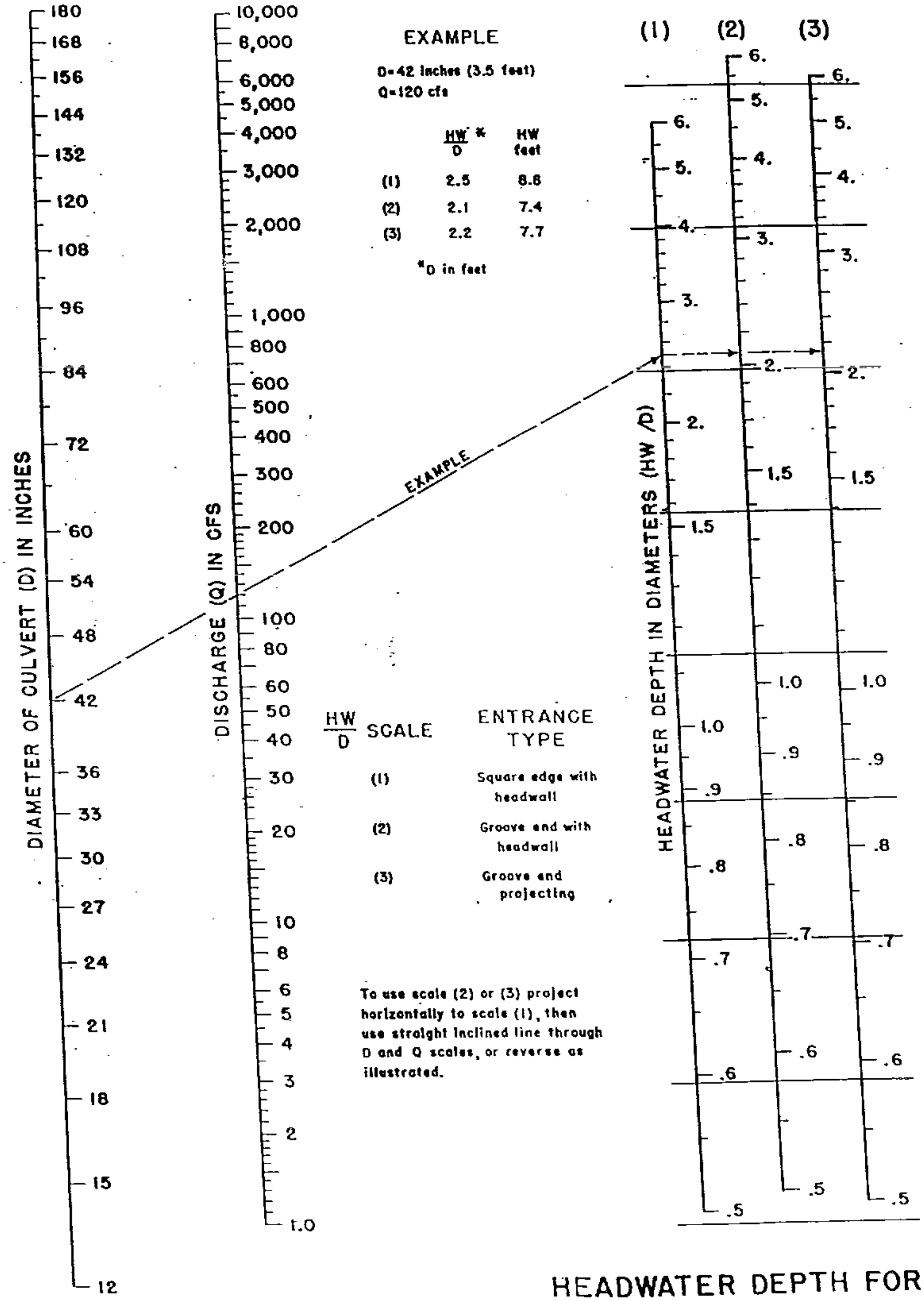
Interim Release October 12, 1994
City of Colorado Springs

Use this graph to determine the allowable street capacity per side, initial storm, for the typical street section using a 2% crown. No flow may cross the crown.

CONCRETE PIPE
Capacity (Velocity)

0.5%		1%	2%	3%	4%	5%	6%	7%	8%
						25.3 (14.7)	27.7 (16.1)	29.9 (17.4)	32.0 (18.6)
5.0	18"	11.3 (6.6)	16.0 (9.3)	19.6 (11.4)	22.6 (13.2)	54.4 (17.6)	59.6 (19.3)	64.4 (20.9)	68.8 (22.3)
17.2	24"	24.3 (8.1)	34.4 (11.2)	42.2 (13.7)	48.7 (15.8)	98.7 (21.2)	108.1 (23.2)	116.8 (25.1)	124.8 (26.8)
31.2	30"	44.1 (9.5)	62.4 (13.4)	76.4 (16.4)	88.2 (19.0)	160.4 (23.0)	175.8 (25.2)	189.8 (27.2)	202.9 (29.1)
50.7	36"	71.8 (10.3)	101.5 (14.6)	124.3 (17.8)	143.5 (20.6)	242.0 (24.2)	265.1 (26.5)	286.3 (28.6)	306.1 (30.6)
76.5	42"	108.2 (10.8)	153.1 (15.3)	187.5 (18.7)	216.5 (21.6)	345.5 (25.0)	378.5 (27.4)	408.8 (29.6)	437.0 (31.6)
109.3	48"	154.5 (11.2)	218.5 (15.8)	267.6 (19.4)	309.0 (22.4)	473.0 (25.6)	518.2 (28.1)	559.7 (30.3)	598.3 (32.4)
149.6	54"	211.5 (11.5)	299.2 (16.2)	366.4 (19.8)	423.1 (22.9)	626.5 (26.1)	686.3 (28.6)	741.2 (30.9)	792.4 (33.0)
198.1	60"	280.2 (11.7)	396.2 (16.5)	485.3 (20.2)	560.3 (23.3)	807.8 (26.5)	884.8 (29.0)	955.7 (31.3)	1021.7 (33.5)
255.4	66"	361.2 (11.8)	510.9 (16.7)	625.7 (20.5)	722.5 (23.7)	1018.7 (26.8)	1115.9 (29.3)	1205.3 (31.7)	1288.6 (33.9)
322.1	72"	455.6 (12.0)	644.3 (17.0)	789.1 (20.8)	911.1 (24.0)				

CHART 1



HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

HEADWATER SCALES 2&3
REVISED MAY 1964

BUREAU OF PUBLIC ROADS JAN. 1963

Hydrology

Location: A

Area: 9.47 Ac.

Soil or Land Use: B

Runoff Coefficient, C:

Area Zone	C5	C100	%Area
Open Space	0.25	0.35	100

Composite: C5 C100 100%

Time of Concentration: T_c in minutes:

Travel Type	L(ft)	H	s%	v(fps)	T_c
OVERLAND	750	25	3.3%		25.9

T_c Total: 25.9

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

I5: 2.6 in/hr I100 4.5 in/hr

Peak Flow: Q = CIA in cfs

Q5 6.2 cfs Q100: 14.9 cfs

Hydrology

Location: B

Area: 7.25 Ac.

Soil or Land Use:

Runoff Coefficient, C:

Area Zone	C5	C100	%Area
OPEN SPACE	0.25	0.35	100

Composite: C5 0.25 C100 0.35 100%

Time of Concentration: T_c in minutes:

Travel Type	L(ft)	H	s%	v(fps)	T_c
OVERLAND	800	24	3%		27.6

T_c Total: 27.6

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

I5: 2.5 in/hr I100 4.3 in/hr

Peak Flow: Q = CIA in cfs

Q5 4.5 cfs Q100: 10.9 cfs

Hydrology

Location: C

Area: 19.66 Ac.

Soil or Land Use:

Runoff Coefficient, C:

Area Zone	C5	C100	%Area
OPEN SPACE	0.25	0.35	100.

Composite: C5. 0.25 C100 0.35 100%

Time of Concentration: T_c in minutes:

Travel Type	L(ft)	H	s%	v(fps)	T_c
OVERLAND	600	36	6%		19.0

T_c Total: 19.0

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

I5: 3.0 in/hr I100 5.2 in/hr

Peak Flow: Q = CIA in cfs

Q5 14.7 cfs Q100: 35.8 cfs

Hydrology

Location: D

Area: 24.92 Ac.

Soil or Land Use:

Runoff Coefficient, C:

Area Zone	C5	C100	%Area
OPEN SPACE	0.25	0.35	100

Composite: C5 0.25 C100 0.35 100%

Time of Concentration: T_c in minutes:

Travel Type	L(ft)	H	s%	v(fps)	T_c
OVERLAND	900	30	3.33%		28.3

T_c Total: 28.5

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

I5: 2.4 in/hr I100 4.3 in/hr

Peak Flow: Q = CIA in cfs

Q5 15.0 cfs Q100: 37.5 cfs

Hydrology

Location: I
Area: 6.1 Ac
Soil or Land Use:

Runoff Coefficient, C:

Area Zone	C5	C100	%Area
1/8 Ac RESIDENTIAL			

Composite: C5 0.60 C100 0.70 100%

Time of Concentration: T_c in minutes:

Travel Type	L(ft)	H	s%	v(fps)	T_c
OVERLAND	150	5	3.3%		11.6
STREET	900		1%	2	7.5

T_c Total: 19.1

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

I5: 3.1 in/hr I100 5.2 in/hr

Peak Flow: Q = CIA in cfs

Q5 11.3 cfs Q100: 22.2 cfs

Hydrology

Location: II
Area: 7.8 Ac
Soil or Land Use:

Runoff Coefficient, C:

Area Zone	C5	C100	%Area
1/8 Ac RESIDENTIAL			

Composite: C5 0.60 C100 0.70 100%

Time of Concentration: T_c in minutes:

Travel Type	L(ft)	s%	v(fps)	T_c
OVERLAND	100	4%		8.9
STREET	1800	1%	2.0	15.0

T_c Total: 23.9

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

I5: 2.7 in/hr I100 4.6 in/hr

Peak Flow: Q = CIA in cfs

Q5 12.6 cfs Q100: 25.1 cfs

Hydrology

Location: III

Area: 4.6 Ac.

Soil or Land Use:

Runoff Coefficient, C:

Area Zone	C5	C100	%Area
1/3 Ac Residential			

Composite: C5 0.60 C100 0.70 100%

Time of Concentration: T_c in minutes:

Travel Type	L(ft)	s%	v(fps)	T_c
Overland	100	4%		8.9
Street	820	1%	2.0	6.8

T_c Total: 15.7

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

I5: 3.4 in/hr I100 5.8 in/hr

Peak Flow: Q = CIA in cfs

Q5 9.4 cfs Q100: 18.7 cfs

Hydrology

Location: IV

Area: 2.4 Ac.

Soil or Land Use:

Runoff Coefficient, C:

Area Zone	C5	C100	%Area
1/3 Ac Residential			

Composite: C5 0.60 C100 0.70 100%

Time of Concentration: T_c in minutes:

Travel Type	L(ft)	s%	v(fps)	T_c
Overland	100	4%		8.9
Street	550	1%	2.0	4.6

T_c Total: 13.5

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 5.0 cfs Q100: 10.0 cfs

Hydrology

Location: V
Area: 1.2 Ac.
Soil or Land Use:

Runoff Coefficient, C:

Area Zone	C5	C100	%Area
1/8 Ac Residential	0.60	0.70	

Composite: C5 0.60 C100 0.70 100%

Time of Concentration: T_c in minutes:

Travel Type	L(ft)	H	s%	v(fps)	T_c
OVERLAND	150	8	5.3%		9.9
STREET	700		2%	3.0	3.9

T_c Total: 13.8

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 2.5 cfs Q100: 5.1 cfs

Hydrology

Location: VI
Area: 0.7 Ac.
Soil or Land Use:

Runoff Coefficient, C:

Area Zone	C5	C100	%Area
STREET	0.90	0.95	

Composite: C5 0.90 C100 0.95 100%

Time of Concentration: T_c in minutes:

Travel Type	L(ft)	H	s%	v(fps)	T_c
STREET	1000	19	1.9%	3.0	

T_c Total: 5.6

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

I5: 5.0 in/hr I100 8.8 in/hr

Peak Flow: Q = CIA in cfs

Q5 3.3 cfs Q100 6.1 cfs

Hydrology

Location: VII
Area: 3.81 Ac.
Soil or Land Use:

Runoff Coefficient, C:

Area Zone	C5	C100	%Area
1/8 Ac Residential			

Composite: C5 0.60 C100 0.70 100%

Time of Concentration: T_c in minutes:

Travel Type	L(ft)	s%	v(fps)	T_c
Overland	110	3%		10.2
Street	600	1%	2.0	5.0

T_c Total: 15.2

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

I5: 3.4 in/hr I100 5.8 in/hr

Peak Flow: Q = CIA in cfs

Q5 7.8 cfs Q100: 15.5 cfs

Hydrology

Location: VIII
Area: 2.1 Ac
Soil or Land Use:

Runoff Coefficient, C:

Area Zone	C5	C100	%Area
1/8 Ac Residential			

Composite: C5 0.60 C100 0.70 100%

Time of Concentration: T_c in minutes:

Travel Type	L(ft)	s%	v(fps)	T_c
Overland	130	3%		11.1
Street	750	1%	2.0	6.2

T_c Total: 17.3

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

I5: 3.2 in/hr I100 5.5 in/hr

Peak Flow: Q = CIA in cfs

Q5 4.0 cfs Q100: 8.1 cfs

Hydrology

Location: IX

Area: 4.7 Ac.

Soil or Land Use: ____

Runoff Coefficient, C:

Area Zone	C5	C100	%Area
1/3 Ac. Residential			

Composite: C5 0.60 C100 0.70 100%

Time of Concentration: T_c in minutes:

Travel Type	L(ft)	H	s%	v(fps)	T_c
OVERLAND	170	18	10.5%		8.4

T_c Total: 8.4

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

I5: 4.3 in/hr   I100 7.4 in/hr

Peak Flow: Q = CIA in cfs

Q5 12.1 cfs   Q100: 24.3 cfs

Hydrology

Location: X

Area: 5.20 Ac.

Soil or Land Use: ____

Runoff Coefficient, C:

Area Zone	C5	C100	%Area
1/3 Ac. Residential			

Composite: C5 0.60 C100 0.70 100%

Time of Concentration: T_c in minutes:

Travel Type	L(ft)	H	s%	v(fps)	T_c
OVERLAND	110		4%		9.3
STREET	950	16	1.7%	2.5	6.3

T_c Total: 15.6

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

I5: 3.4 in/hr   I100 5.8 in/hr

Peak Flow: Q = CIA in cfs

Q5 10.6 cfs   Q100: 21.1 cfs

Hydrology

Location: XI
Area: 3.6 Ac.
Soil or Land Use:

Runoff Coefficient, C:

Area Zone	C5	C100	%Area
1/8 Ac. Residential			

Composite: C5 0.60 C100 0.70 100%

Time of Concentration: T_c in minutes:

Travel Type	L(ft)	s%	v(fps)	T_c
Overland	100	4%		8.9
Street	950	1.9%	3.0	5.3

T_c 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 7.5 cfs Q100: 15.0 cfs

Hydrology

Location: XII
Area: 3.6 Ac.
Soil or Land Use:

Runoff Coefficient, C:

Area Zone	C5	C100	%Area
1/8 Ac. Residential			

Composite: C5 0.60 C100 0.70 100%

Time of Concentration: T_c in minutes:

Travel Type	L(ft)	s%	v(fps)	T_c
Overland	120	3%		10.7
Street	900	1.2%	2.2	6.8

T_c Total: 17.5

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

I5: 3.2 in/hr I100 5.5 in/hr

Peak Flow: Q = CIA in cfs

Q5 6.9 cfs Q100: 13.9 cfs

Hydrology

Location: XIII
Area: 3.3 Ac.
Soil or Land Use:

Runoff Coefficient, C:

Area Zone	C5	C100	%Area
1/3 Ac. Residential			

Composite: C5 0.60 C100 0.70 100%

Time of Concentration: T_c in minutes:

Travel Type	L(ft)	s%	v(fps)	T_c
Overland	100	3%		9.8
Street	800	2.5%	3.5	3.8

T_c Total: 13.6

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 6.9 cfs Q100: 13.9 cfs

Hydrology

Location: XIV
Area: 5.5 Ac.
Soil or Land Use:

Runoff Coefficient, C:

Area Zone	C5	C100	%Area
1/3 Ac. Residential			

Composite: C5 0.60 C100 0.70 100%

Time of Concentration: T_c in minutes:

Travel Type	L(ft)	s%	v(fps)	T_c
Overland	120	3%		10.7
Street	900	2.8%	3.8	3.9

T_c Total: 14.6

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 11.5 cfs Q100: 23.1 cfs

Hydrology

Location: XV
Area: 1.6 Ac.
Soil or Land Use:

Runoff Coefficient, C:

Area Zone	C5	C100	%Area
1/8 Ac. Residential			

Composite: C5 0.60 C100 0.70 100%

Time of Concentration: T_c in minutes:

Travel Type	L(ft)	s%	v(fps)	T_t
Overland	100	3%		9.8

T_c Total: 9.8

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 3.8 cfs Q100: 7.8 cfs

Hydrology

Location: XVI
Area: 1.7 Ac.
Soil or Land Use:

Runoff Coefficient, C:

Area Zone	C5	C100	%Area
1/8 Ac. Residential			

Composite: C5 0.60 C100 0.70 100%

Time of Concentration: T_c in minutes:

Travel Type	L(ft)	s%	v(fps)	T_t
Overland	160	6.2%		9.7

T_c Total: 9.7

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 4.1 cfs Q100: 8.3 cfs

Hydrology

Location: XVII

Area: 1.0 Ac.

Soil or Land Use:

Runoff Coefficient, C:

Area Zone	C5	C100	%Area
STREET			

Composite: C5 0.90 C100 0.95 100%

Time of Concentration: T_c in minutes:

Travel Type	L(ft)	s%	v(fps)	T_c
STREET	500	1%	2%	4.2

T_c Total: USE 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 4.7 cfs Q100: 8.6 cfs

Hydrology

Location: XVIII

Area: 1.2 Ac.

Soil or Land Use:

Runoff Coefficient, C:

Area Zone	C5	C100	%Area
1/3 Ac. Residential			

Composite: C5 0.60 C100 0.70 100%

Time of Concentration: T_c in minutes:

Travel Type	L(ft)	s%	v(fps)	T_c
OVERLAND	120	4%		9.7
STREET	150	1%	2.0	1.3

T_c Total: 11.0

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

I5: 3.9 in/hr I100 6.8 in/hr

Peak Flow: Q = CIA in cfs

Q5 2.8 cfs Q100 5.7 cfs

Hydrology

Location: XIX

Area: 0.6 Ac.

Soil or Land Use:

Runoff Coefficient, C:

Area Zone	C5	C100	%Area
1/3 Ac Residential			

Composite: C5 0.60 C100 0.70 100%

Time of Concentration: T_c in minutes:

Travel Type	L(ft)	s%	v(fps)	T_c
OVERLAND	120	3%		10.7

T_c Total: 10.7

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

I5: 3.9 in/hr I100 6.8 in/hr

Peak Flow: Q = CIA in cfs

Q5 1.4 cfs Q100: 2.9 cfs

Hydrology

Location:

Area: Ac.

Soil or Land Use:

Runoff Coefficient, C:

Area Zone	C5	C100	%Area

Composite: C5 C100 100%

Time of Concentration: T_c in minutes:

Travel Type	L(ft)	s%	v(fps)	T_c

T_c Total:

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

I5: in/hr I100 in/hr

Peak Flow: Q = CIA in cfs

Q5 cfs Q100: cfs

Hydrology

Location: DESIGN PT #1
Area: 22.1 Ac.
Soil or Land Use:

Runoff Coefficient, C:

Area Zone		C5	C100	%Area
I	6.1			
II	7.8			
III	4.6			
IV	2.4			
V	1.2			

Composite: C5 0.60 C100 0.70 100%

Time of Concentration: T_c in minutes:

Travel Type	L(ft)	s%	v(fps)	T_t
Use Tc from Basin II				23.9

T_c Total: 23.9

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

I5: 2.7 in/hr I100 4.6 in/hr

Peak Flow: Q = CIA in cfs

Q5 35.8 cfs Q100: 71.2 cfs

Hydrology

Location: DESIGN PT #2
Area: 5.9 Ac.
Soil or Land Use:

Runoff Coefficient, C:

Area Zone		C5	C100	%Area
VII	3.8			
VIII	2.1			

Composite: C5 0.60 C100 0.70 100%

Time of Concentration: T_c in minutes:

Travel Type	L(ft)	s%	v(fps)	T_t
Use Tc from Basin VII				

T_c Total: 17.[illegible]

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

I5: 3.2 in/hr I100 5.5 in/hr

Peak Flow: Q = CIA in cfs

Q5 11.3 cfs Q100: 22.7 cfs

Hydrology

Location: DESIGN PT #3

Area: 11.1 Ac.

Soil or Land Use:

Runoff Coefficient, C:

Area Zone	AREA	C5	C100	%Area
DP #2	5.9			
X	5.2			

Composite: C5 0.60 C100 0.70 100%

Time of Concentration: T_c in minutes:

Travel Type	L(ft)	s%	v(fps)	T
USE Tc FROM VIII				17.3

T_c Total: 17.3

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

I5: 3.2 in/hr I100 5.5 in/hr

Peak Flow: Q = CIA in cfs

Q5 21.3 cfs Q100: 42.7 cfs

Hydrology

Location: DESIGN PT #4

Area: 7.2 Ac.

Soil or Land Use:

Runoff Coefficient, C:

Area Zone	C5	C100	%Area
XI 3.6			
XI 3.6			

Composite: C5 0.60 C100 [illegible] 100%

Time of Concentration: T_c in minutes:

Travel Type	L(ft)	s%	v(fps)	T
USE Tc FROM BASIN XII				17.5
PLUS STREET FLOW	L=700	S=1%	V=2	[illegible]

T_c Total: 23.3

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

I5: 2.7 in/hr I100 4.6 in/hr

Peak Flow: Q = CIA in cfs

Q5 11.7 cfs Q100 23.2 cfs

Hydrology

Location: DP #5
Area: 10.9 Ac.
Soil or Land Use:

Runoff Coefficient, C:

Area Zone	Area	C5	C100	%Area
XIII	2.1			
XIV	5.5			
XV	1.6			
XVI	1.7			

Composite: C5 0.60 C100 0.70 100%

Time of Concentration: T_c in minutes:

Travel Type	L(ft)	s%	v(fps)	T_c
Tc from Basin XIV				14.6

T_c Total: 14.6

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 22.9 cfs Q100: 45.8 cfs

Hydrology

Location: DP #6
Area: 30.8 Ac.
Soil or Land Use:

Runoff Coefficient, C:

Area Zone	Area	C5	C100	%Area
DP #4	7.2			
DP #5	10.9			
XIX	0.6			
XVII	1.0			
DP #3	11.1			

Composite: C5 0.60 C100 0.70 100%

Time of Concentration: T_c in minutes:

Travel Type	L(ft)	s%	v(fps)	T_c
Use Tc from DP #4				23.3
+ Street	200'	1%	3	1.1

T_c Total: 24.4

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

I5: 2.4 in/hr I100 4.5 in/hr

Peak Flow: Q = CIA in cfs

Q5 48.0 cfs Q100: 97.0 cfs

Basin I & II Inlets

Basin I $\quad Q_5 = \frac{+4.2 \quad 11.3}{15.5} \quad Q_{100} = \frac{+10.9 \quad 22.2}{33.1}$ + Inlet II Flowby

$T_5 = 3.04 \left[\frac{Q}{(S)^{0.5}}\right]^{0.375}$ $\qquad$ $T_{100} = 3.04 \left[\frac{Q}{(S)^{0.5}}\right]^{0.375}$

$T = 3.04 \left[\frac{15.5}{0.0^{0.5}}\right]^{0.375}$ $\qquad$ $T = 3.04 \left[\frac{33.1}{0.01^{0.5}}\right]^{0.375}$

$T_5 = 20.1$ $\qquad$ $T_{100} = 26.8$

$F_w = 16.4 \left[(T-2)(S_x)\right]^{1/6} (S)^{1/2}$ $\qquad$ $F_w = 16.4 \left[(26.8-2)(0.02)\right]^{1/6} (0.01)^{1/2}$

$F_{w5} = 16.4 \left[(20.1-2)(0.02)\right]^{1/6} (0.01)^{1/2}$

$F_{w5} = 1.38$ $\qquad$ $F_{w100} = 1.46$

$L_1 = 2.49\, S_x^{0.3} F_w T$ $\qquad$ $L_1 = 2.49(0.02)^{0.3}(1.46)(26.8)$

$L_1 = 2.49(0.02)^{0.3}(1.38)(20.1)$
$= 21.4$ $\qquad$ $L_1 = 30.1$

$L_2 = 3.27 (S_x)^{0.5}(F_w)(T)$ $\qquad$ $L_2 = 3.27(0.02)^{0.5}(1.46)(26.8)$

$L_2 = 3.27(0.02)^{0.5}(1.38)(20.1)$
$= 12.8$ $\qquad$ $L_2 = 18.1$

$L_3 = 1.65 (F_w)(T)$
$= 1.65(1.38)(20.1)$
$= 45.8$ $\qquad$ $L_3 = 1.65(1.46)(26.8)$
$= 64.6$

TRY $L_i = 15 > L_2$ $\qquad$ $L_i = 15 < L_2$

$\therefore Q_i = Q\left(\frac{L_i}{L_3}\right)^{0.4}$ $\qquad$ $\therefore Q_i = Q\left(\frac{L_i}{L_1}\right)$

$= 15.5\left(\frac{15}{45.8}\right)^{0.4}$ $\qquad$ $= 33.1\left(\frac{15}{30.1}\right)$

$Q_i = 9.9$ $\qquad$ $Q_i = 16.5$

$Q_{FB} = 5.6$ $\qquad$ $Q_{FB} = 16.6$

BASIN II

$Q_5 = 12.6$ $Q_{100} = 25.1$

$T_5 = 3.04 \left[\frac{12.6}{0.0\ldots^{1/2}}\right]^{0.375}$	$T_{100} = 3.04 \left[\frac{25.1}{0.0\ldots^{1/2}}\right]^{0.375}$
$= 18.6$	$= 24.1$
$F_w = 16.4 [18.6 - 2(0.02)]^{1/2} (0.01)^{1/2}$	$F_w = 16.4 [(24.1 - 2)(0.02)]^{1/2} (0.01)^{1/2}$
$= 1.36$	$= 1.43$
$L_1 = 2.49 (0.02)^{0.3} (18.6)(1.36)$	$L_1 = 2.49 (0.02)^{0.3} (24.1)(1.43)$
$= 19.5$	$= 26.5$
$L_2 = 3.27 (0.02)^{0.5} (18.6)(1.36)$	$L_2 = 3.27 (0.02)^{0.5} (24.1)(1.43)$
$= 11.7$	15.9
$L_3 = 1.65 (1.36)(18.6)$	$L_3 = 1.65 (1.43)(24.1)$
$= 41.7$	$= 56.9$
$L_i = 15 > L_2$	$L_i = 15 < L_2$
$\therefore Q_i = Q \left(\frac{L_i}{L_3}\right)^{0.4}$	$\therefore Q_i = Q \left(\frac{L_i}{L_1}\right)$
$Q_i = 12.6 \left(\frac{15}{41.7}\right)^{0.4}$	$Q_i = 25.1 \left(\frac{15}{26.5}\right)$
$Q_i = 8.4$	$Q_i = 14.2$
$Q_{FB} = 4.2$	$Q_{FB} = 10.9$

DESIGN PT #.	Q_5 = 35.8	Q_{100} = 71.2
(– FLOW COLLECTED @ BASIN I)	– 9.9	– 16.5
(– FLOW COLLECTED @ BASIN II)	– 8.4	– 14.2
FLOW ON EAST SIDE OF PONY TRACKS	17.5 cfs	40.5 cfs

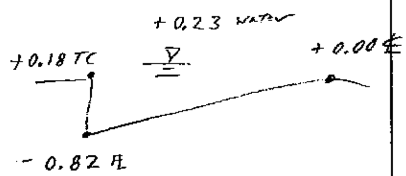
Pony Tracks Capacity = 24cfs per side @ 2% ✓ ok

DESIGN POINT #3 (Sump Inlet 10')

$Q_5 = 21.3$ cfs $Q_{100} = 42.7$ cfs

$Q = 1.7(L_i + 1.8(w))(d_{max} + w/12)^{1.85}$ w = 3

$d_{max\,5} = 0.64'$



$d_{max\,100} = 1.05'$ portion will overtop

$d_{max} = 0.82'$ prior to overtop

$Q_i = 29.7$ cfs

$Q_{by} = 13.0$ cfs overtop to Springs Ranch Drive 100yr storm

BASIN XIV   s = 3 %

$Q_5 = 11.5$ cfs $Q_{100} = 23.1$ cfs

$T_5 = 3.04 \left[\frac{11.5}{(0.03)^{1/2}}\right]^{0.375}$ $T_{100} = 3.04 \left[\frac{23.1}{(0.03)^{1/2}}\right]^{0.375}$

$= 14.7$ $= 19.0$

$F_w = 16.4 \left[(14.7-2)(0.02)\right]^{1/6} (0.03)^{1/2}$ $F_w = 16.4\left[(19.0-2)(0.02)\right]^{1/6}(0.03)^{1/2}$

$= 2.26$ $= 2.37$

$L_1 = 2.49\,(0.02)^{0.3}(14.7)(2.26)$ $L_1 = 2.49(0.02)^{0.3}(19.0)(2.37)$

$= 25.6$ $= 34.7$

$L_2 = 3.27\,(0.02)^{0.5}(14.7)(2.26)$ $L_2 = 3.27(0.02)^{0.5}(19.0)(2.37)$

$= 15.4$ $= 20.8$

$L_3 = 1.65\,(14.7)(2.26)$ $L_3 = 1.65\,(19.0)(2.37)$

$= 54.8$ $= 74.3$

Try $L_i = 10'$ $< L_2$ $\therefore$ $Q_i = Q\left(\frac{L_i}{L_1}\right)$

$Q_{i_5} = 11.5\left(\frac{10}{25.6}\right)$ $Q_{i_{100}} = 23.1\left(\frac{10}{34.7}\right)$

$Q_{i_5} = 4.5$ cfs $Q_{i_{100}} = 6.7$ cfs

$Q_{by_5} = 7.0$ cfs $Q_{by_{100}} = 16.4$ cfs

BASIN XVI & XV   S = 1 %

$Q_5 = 7.9$ cfs $Q_{100} = 13.9$ cfs

$T_5 = 3.04\left[\frac{7.9}{(0.01)^{1/2}}\right]^{0.375}$ $T_{100} = 3.04\left[\frac{13.9}{(0.01)^{1/2}}\right]^{0.375}$

$= 15.6$ $= 19.3$

$F_W = 16.4\left[(15.6-2)(0.02)\right]^{1/6}(0.01)^{1/2}$ $F_W = 16.4\left[(19.3-2)(0.02)\right]^{1/6}(0.01)^{1/2}$

$= 1.32$ $= 1.37$

$L_1 = 2.49\,(0.02)^{0.3}(15.6)(1.32)$ $L_1 = 2.49\,(0.02)^{0.3}(19.3)(1.37)$

$= 15.9$ $= 20.4$

$L_2 = 3.27\,(0.02)^{0.5}(15.6)(1.32)$ $L_2 = 3.27\,(0.02)^{0.5}(19.3)(1.37)$

$= 9.5$ $= 12.2$

$L_3 = 1.65\,(1.32)(15.6)$ $L_3 = 1.65\,(1.37)(19.3)$

$= 34.0$ $= 43.6$

Try $L_i = 10' \gtrless L_2$ $\therefore$ $Q_i = Q\left(\frac{L_i}{L_1}\right)$ ($< L_2$) or $Q_i = Q\left(\frac{L_i}{L_3}\right)^{0.4}$ ($> L_2$)

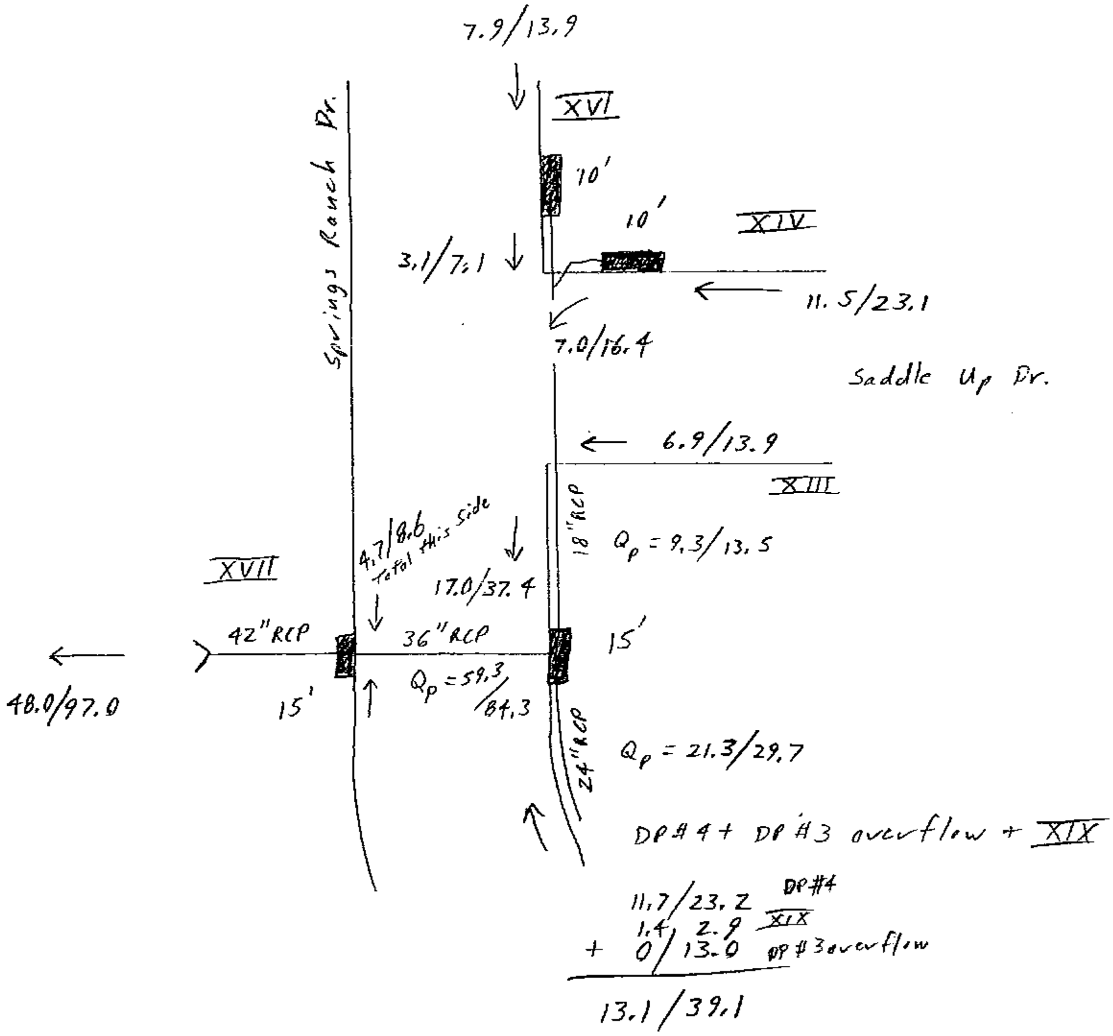
$Q_{i_5} = 7.9\left(\frac{10}{34.0}\right)^{0.4}$ $Q_{i_{100}} = 13.9\left(\frac{10}{20.4}\right)$

$Q_{i_5} = 4.8$ cfs $Q_{i_{100}} = 6.8$ cfs

$Q_{by} = 3.1$ cfs $Q_{by} = 7.1$ cfs

Sump Inlets @ Low Point in Springs Ranch Dr.

½ street Capacity @ 1% min = 17 cfs (5yr)



30.1 cfs east (5yr)

100yr street flow evenly split both sides = 85.1/2 = 42.5 cfs/side (100yr)

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

$$d_{max_5} \Rightarrow 30.1 = 1.7\left(15 + 1.8(3)\right)\left(d_{max} + 3/12\right)^{1.85}$$

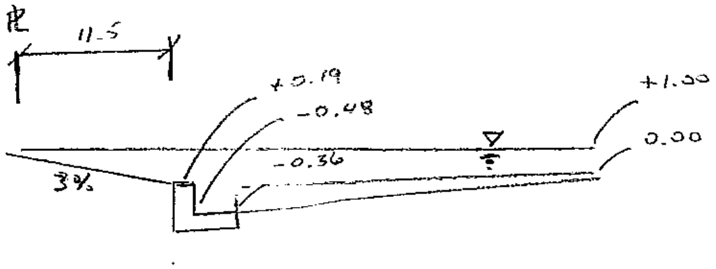
$$= 0.68'$$

$$d_{max_{100}} \Rightarrow 42.5 = 1.7\left(15 + 1.8(3)\right)\left(d_{max} + 3/12\right)^{1.85}$$

$$= 0.87'$$

100 YR STREET CAPACITY OF PONY TRACKS DRIVE
& Springs Ranch Drive

PONDING DEPTH = 12"



$$A = \tfrac{1}{2}(0.36)(18) + \tfrac{1}{2}(0.12)(2) + (2)(0.36) + (0.18)(20) + (0.81)(20.5) + \tfrac{1}{2}(11.5)(0.345)$$

$$A = 26.27$$

$$P = 20.67$$

$$Q_{100\,cap} = \frac{1.486}{0.016}(26.27)\left(\frac{26.27}{20.67}\right)^{0.67} S^{1/2}$$

$$= 2864.96\,S^{1/2}$$

$$= 405 \qquad @\ 2\%$$

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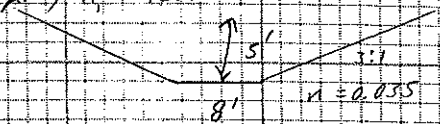
48" RCP $Q = 202$ cfs, $d = 30.7"$, $V_2 = 24.3$ fps, $A_2 = 12.6$

54" RCP $Q = 202$ cfs, $d = 27.8"$, $V_1 = 24.5$ fps, $A_1 = 15.9$

Channel $Q = 202$ cfs, $d = 1.7'$, $V = 9.4$ fps



Bend $H_b = K_b \left(\frac{V^2}{2g}\right)$ $K_b = 0.25\sqrt{\frac{\phi}{90}}$ $\phi = 30°$ $K_b = 0.14$

$H_b = 0.14 \frac{(24.4)^2}{2g} = 1.3'$

Reducer $H_t = 0.1\left(\frac{V_1^2}{2g} - \frac{V_2^2}{2g}\right) = 0.1\left(\frac{(24.5)^2}{2g} - \frac{(24.3)^2}{2g}\right) = 0.1'$

Entrance $H_e = K_e \frac{V_e^2}{2g} = 4.7'$ $K_e = 0.5$

Total $= H_b + H_t + H_e$

$= 1.3' + 0.1' + 4.7'$

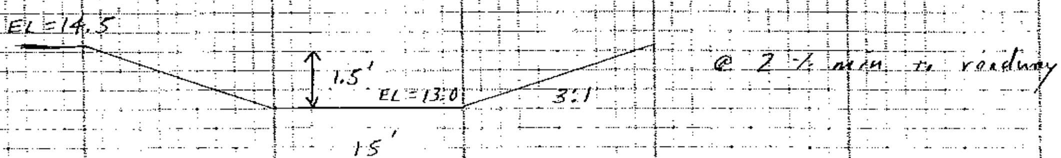
$H_L = 6.1' = HW$

WSEL $= 6.1' + 6506.34$

$= 6512.44$

FB = 13.0 Top Curb
− 12.44 WSEL
= 0.56'

⇒ Emergency Overflow Swale Section @ West end of High School
– from 54" RCP FES to Pony Tracks Drive



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The Range @ Springs Ranch

DATE 6/1/98 PAGE 1 of

Release Rate onto Sand Creek High School

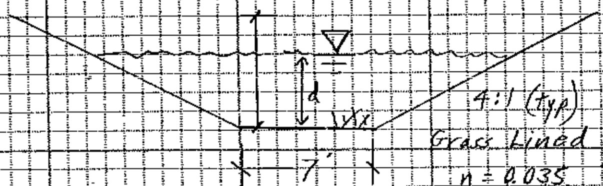
Q_{100} = 68 cfs per Springs Ranch MDDP Update (DP #21)

Q_{100} = 97 cfs proposed per The Range @ Springs Ranch MDDP

Area in Range developed basin is larger than in S.R. MDDP Update

Δ = + 29 cfs

Existing Channel Section Through High School



	Q = 68 cfs	Q = 97 cfs
1%	d = 1.36' V = 4.0 fps	d = 1.62' V = 4.4 fps
2%	d = 1.14' V = 5.2 fps	d = 1.36' V = 5.7 fps
3%	d = 1.02' V = 6.0 fps	d = 1.23' V = 6.6 fps

Δ in depth ≤ 0.26'

Δ in velocity ≤ 0.6 fps

High School Release Rate

Ex. 48" RCP outfall with 54" RCP FES Entrance Condition

Q_{100} = 173 cfs per Springs Ranch MDDP Update (DP #20)

Q_{100} = 182 cfs as designed

Q_{100} = 202 cfs (173 + 29) Worst Case Un-routed flows with addition from Range

Existing allowable headwater: Top of Curb = 6513.00

℄ 48" RCP = 6506.34

$HW_{allowable}$ = 6.66 feet

Top of Berm = 6514.50