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DRAINAGE REPORT

STORM RUNOFF IN CHEYENNE MEADOWS BOULEVARD

FOR

GATES LAND DEVELOPMENT CO.

?

WHAT SUBDIVISION - 8

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CITY OF COLORADO SP
STORM WATER & SUBDIVI
101 W. COSTILLA, SUITE 11
COLORADO SPRINGS, CO 80
(719) 385-5979

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DREXEL, BARRELL & CO.
ENGINEERS — SURVEYORS
1700 38TH STREET BOULDER, COLORADO 80301 (303) 442-4338

REVIEWED CL 10/9/80

DRAINAGE REPORT

STORM RUNOFF IN CHEYENNE MEADOWS BOULEVARD

FOR

GATES LAND DEVELOPMENT CO.

?

WHAT SUBDIVISION - A

September 3, 1980

Prepared by:

DREXEL, BARRELL & CO.
E-2214

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DREXEL, BARRELL & CO.

ENGINEERS — SURVEYORS

1700 38TH STREET BOULDER, COLORADO 80301 (303) 442-4338

8 October, 1980

DRAINAGE REPORT

FOR

Storm Runoff in Cheyenne Meadows Blvd.

This report includes that portion of Cheyenne Meadows Blvd. from the intersection of Bayfield Drive and Cheyenne Meadows to U.S. Highway 85-87 located in the SW¼ Section 32, T14S, R66W of the 6th P.M. El Paso County, Colorado.

This area is a part of a master drainage study prepared by Hartzell-Pfeiffenberger and Associates entitled "Drainage Basin Hydrologic Studies - Cheyenne Mountain Ranch", prepared May 17, 1971.

The modified SCS methodology was used to determine the flows, taken from the City of Colorado Springs Runoff Criteria Manual, March, 1977, using a design storm of 5 year - 6 hour duration.

Two inlets, one 5' inlet on the Northerly & a 6' inlet on the Southerly side of Cheyenne Meadows Blvd. will be located approximately 1500' Northeasterly of Bayfield Drive and Cheyenne Meadows Blvd. A 5' inlet will be placed on the Westerly and a 6' inlet on the Easterly side of Cheyenne Meadows approximately 800 feet Southwesterly of Highway 85-87.

Water from these inlets will be carried away partially in a 30" RCP, 36" RCP and a swale to eventually end up in an existing ditch lying Northwest of Cheyenne Meadows and Highway 85-87. Runoff along the Northerly portion of Cheyenne Meadows will be carried in the street to ultimately flow under 85-87 to the East.

Until final development plans of the area immediately West of Cheyenne Meadows and Southwest of 85-87 are completed, a temporary ditch is to be constructed as shown on the enclosed drainage plan.

Included with this report is a drainage plan, vicinity map and the calculations for your review.

Respectfully submitted
Drexel, Barrell & Co.

Robert A. Berry

Reviewed by:

Barbara Weiss

Barbara Weiss
P.E. No. 15471

CERTIFICATIONS

I, Barbara Weiss, a registered engineer in the State of Colorado, hereby certify that the attached drainage plan and report for Cheyenne Meadows Blvd. storm sewer were prepared under my direction and supervision and are correct to the best of my knowledge and belief. I further certify that said drainage report is in accordance with all City of Colorado Springs ordinances, specifications and criteria to the best of my knowledge.

BARBARA NAN WEISS
REGISTERED
15471
PROFESSIONAL ENGINEER
STATE OF COLORADO

Barbara Weiss 9/3/80

The developer has read and will comply with all of the requirements specified this drainage report as approved by the City Engineer.

By _____
Robert Svejkovsky
Director of Engineering

DRAINAGE CONCEPT AND FORMAT APPROVAL IN ACCORDANCE WITH THE CITY OF COLORADO SPRINGS CRITERIA. THIS IS NOT AN APPROVAL OF [illegible] LOT GRADING AND DRAINAGE.

_____ Oct. 12, 1980
CITY ENGINEER DATE
As Noted

This drainage report is approved for purposes of processing the profile for Cheyenne Meadows Blvd. Cheyenne Meadows Blvd is a private street designed in accordance with City of Colorado Springs procedures.

Project: Cheyenne Meadows Blvd Storm Sewer — Job No: E-2214

Client: Gates Land Company — By: R.P. — Date: 22 Aug 80

REDO - SCS METHOD

REV 2 OCT 80
REV 8 OCT 80

BASIN A

5YR - 6 HR STORM

AREA = 15.8 Ac.

HYD. GROUP A & C

(INMOS SITE SEE IQ203 SHT 2)

A_1

AREA 3.6 Ac.

42% ASPHALT

58% LANDSCAPE

T_c = 0.1 Hr. (FIG II)

	%	CN	PRODUCT
ASPHALT	42	98	4116
LANDSCAPE	58	57	3306
			7422

WEIGHTED CN = $\frac{7422}{100}$ = 74.2

Q = 0.41 in (TABLE I)

q_p = 1280 CSM/IN (FIG I)

PEAK DISCHARGE = q_p (A) Q

= $1280\left(\frac{3.6}{640}\right)(0.41)$ = 2.95 cfs

A_2

AREA 7.5 Ac. T_c = 0.1 Hr.

84 % ASPHALT
16 % LANDSCAPE

	%	CN	PRODUCT
ASPHALT	84	98	8232
LANDSCAPE	16	57	912
			9144

WEIGHTED CN = 91

Q = 1.25 (TABLE I)

q_p = 1280 CSM/in (FIG I)

$1280\left(\frac{7.5}{640}\right)1.25$ = 18.8 cfs

A_3

AREA = 4.7 Ac. T_c = 0.1 Hr.

76 % Asphalt 24% LANDSCAPE

	%	CN	PRODUCT
ASPHALT	76	98	7448
LANDSCAPE	24	57	1368
			8816

WEIGHTED CN = 88.2

Q = 1.05 (TABLE I)

q_p = 1280 CSM/in (FIG I)

$1280\left(\frac{4.7}{640}\right)1.05$ = 9.9 cfs

Project: CHEYENNE MEADOWS BLVD STORM SEWER | Job No: E-2214

Client: GATES LAND COMPANY | By: R.P. | Date: 22 AUG 80

REV 8 OCT 80

BASIN B

HYD. GROUP (A) & (C)

5YR - 6HR STORM
AREA = 17.0 Ac.
80% RESIDENTIAL (1.5 Ac.)
20% STREETS

T_c = 0.16 (FIG II)
= 9.6 min

	%	CN	PRODUCT
RESIDENTIAL	80	75	6000
STREETS	20	98	1960
	100%		7960

WEIGHTED CN = 79.6

Q = 0.60 in (TABLE 1)

q_p = 1130 CSM/in (FIG I)

PEAK DISCHARGE = $q_p(A)Q$

$(1130)\left(\frac{17 AC}{640 AC/sq.\ mi}\right)(0.60)$

= 18.0 c.f.s.

DREXEL, BARRELL & CO. LAND SURVEYORS CIVIL ENGINEERS

Project: CHEYENNE MEADOWS BLVD STORM SEWER — Job No: E-2214

Client: GATES LAND COMPANY — By: R.P. — Date: 22 AUG 80

REV 8 OCT 80

SUB BASIN C1

HYD. GROUP (A) & (C)

5 YR - 6 HR STORM

AREA = 5.7 AC.

80% RESIDENTIAL (1/5 AC)

10% STREETS

10% SCHOOL

T_c = 0.10 (FIG II)

= 6 min

	%	CN	PRODUCT
RESIDENTIAL	80	75	6000
STREET	10	98	980
SCHOOL	10	69	690
	100		7670

WEIGHTED CN = 77

Q = 0.51 in. (TABLE 1)

q_p = 1280 CSM/in. (FIG I)

PEAK DISCHARGE = q_p (A) Q

$= 1280 \left(\frac{5.7 \text{ Ac}}{640 \text{ Ac/sq. mi.}} \right) 0.51$

= 5.8 c.f.s.

Project: CHEYENNE MEADOWS BLVD STORM SEWER | Job No: E-2214

Client: GATES LAND COMPANY | By: R.P. | Date: 22 AUG 80

REV 8 OCT 80

BASIN C

HYD. GROUP (A) & (C)

5YR-6HR STORM

AREA = 20.3 Ac.

85% RESIDENTIAL (1/8 Ac)

10% STREETS

5% PARKS (OPEN)

T_c = 0.20 (FIG II)

= 12 min

	%	CN	PRODUCT
RESIDENTIAL	85	75	6375
STREETS	10	98	980
PARK	5	57	285
	100		7640

WEIGHTED CN = 76

Q = 0.47 in. (TABLE 1)

q_p = 1070 CSM/in (FIG I)

PEAK DISCHARGE = q_p (A) Q

$= (1070) \frac{20.3 \text{ Ac}}{640 \text{ Ac/sq mi.}} (0.47)$

= 16.0 cfs

Project: CHEYENNE MEADOWS BLVD STORM SEWER | Job No: E-2214

Client: GATES LAND COMPANY | By: R.P. | Date: 22 AUG 80

REV 8 OCT 80

BASIN D

HYD. GROUP (A) & (C)

5 YR - 6 HR STORM

AREA = 12.4 AC.

25% RESIDENTIAL (1/2 AC)
25% RESIDENTIAL (1/5 AC)
20% STREETS
30% OPEN

T_c = 0.12 (FIG II)
= 7.2 min

	%	CN	PRODUCT
RESIDENTIAL	25	75	1875
	25	67	1675
STREETS	20	98	1960
OPEN	55	57	1710
	100%		7220

WEIGHTED CN = 727

Q = 0.27 in. (TABLE 1)

q_p = 1220 CSM/in. (FIG I)

PEAK DISCHARGE = $q_p(A)\,Q$

$= 1220\left(\frac{12.4\ Ac.}{640\ Ac/sq\ mi}\right) 0.34$

$= \underline{8.0\ c.f.s.}$

Project: CHEYENNE MEADOWS BLVD STORM SEWER | Job No: E-2214

Client: GATES LAND COMPANY | By: R.P. | Date: 22 AUG 80

BASIN E

HYD. GROUP (A) & (C)

5YR-6 HR STORM
AREA = 2.7 Ac.

20% STREET
80% OPEN

T_c = 0.08 (FIG. II)
5 MIN

	%	CN	PRODUCT
STREET	20	98	1960
OPEN	80	57	4560
	100%		6520

WEIGHTED 65.2
Q = 0.16 (TABLE 1)
qP = 1280 CSM/in (FIG I)

PEAK DISCHARGE = qP (A) Q.

$$1280 \left(\frac{2.7 \text{ Ac}}{640 \text{ Ac/sq mi}} \right) 0.16 =$$

= 0.9 cfs

DREXEL, BARRELL & CO. LAND SURVEYORS CIVIL ENGINEERS

Project	Job No
CHEYENNE MEADOWS BLVD STORM SEWER	E-2214

Client	By	Date
GATES LAND COMPANY	R.P.	22 AUG 80

SOILS CLASSIFICATION INFORMATION FROM SOIL CONSERVATION SERVICE AUG 28, 1979

AREA SOUTH & WEST OF HIGHWAY 85-87:

HYD. SOIL GROUP { SCHAMBER (A)
RAZOR (C)

1700 38TH STREET (303) 442-4338
DENVER, COLORADO 80201

3405 N. EL PASO STREET (303) 633-5029
COLORADO SPRINGS, COLORADO 80907

Project: Cheyenne Meadows Blvd. Storm Sewer | Job No: E-2214

Client: Gates Land Company | By: R.P | Date: 2 Sept. 80

REV 2 OCT 80
REV 8 OCT 80

INLET SIZING ALONG CHEY. MEAD. BLVD.

INLET (A) AREA (A), NORTHWESTERLY SIDE STREET:

STREET GRADE = 3.8%

FLOW TO INLET = A_1 + A_3 = 12.9

(12.9)(0.60) = 7.7 cfs, 5.2 cfs overflow

USE 5' INLET

INLET (F) AREA (C1), NORTHWESTERLY SIDE STREET:

STREET GRADE = 3.6%

FLOW TO INLET = 5.8 cfs + 5.2 cfs, FROM INLET, AREA (A)
= 11.0 cfs ASSUME T_c's ARE EQUAL (CONSERVATIVE)

(11.0)(.60) = 6.6 cfs, 4.4 cfs OVERFLOW

USE 5' INLET

AREA (C), NORTWESTERLY SIDE STREET (CHECK STREET CAPACITY)

STREET GRADE = 1.50% min.

2.5 Ac. FROM AREA (C), T_c = 6 min, ASSUME T_c's ARE EQUAL.

ASSUME CN = 93.9

Q = 1.49, $_{8.1}$ = 1270 $\quad (1270)\left(\frac{2.5}{640}\right)(1.49) = 7.4$ cfs

FLOW TO INTERSECTION = 7.4 cfs + 5.1 cfs, FROM INLET, AREA (C)
= 12.5 cfs

< 26.1 cfs (CAPACITY, TABLE 5) OK

Project: CHEYENNE MEADOWS BLVD STORM SEWER | Job No: E-2214

Client: Gates LAND Company | By: R.P. | Date: 3 Sept. 80

REV 20 OCT 80
REV 8 OCT 80

INLET SIZING ALONG CHEY. MEAD. BLVD.

INLET AREA (B), SOUTHEASTERLY SIDE STREET

STREET GRADE = 3.8%

FLOW TO INLET = .18

(.18)(.60) = 10.8 cfs, 7.2 OVERFLOW

USE 6' INLET

INLET (G) AREA (D), SOUTHEASTERLY SIDE STREET

STREET GRADE = 3.60%

FLOW TO INLET = 8.0 cfs + 7.2 OVERFLOW FROM INLET AREA (B)

= 15.2

(15.2)(.60) = 9.1 cfs, 6.1 cfs OVERFLOW.

USE 6' INLET

AREA (E), SOUTHEASTERLY SIDE STREET

STREET GRADE = 1.50% min.

FLOW = 1.0 + 6.1 cfs OVERFLOW, FROM AREA (D) INLET

= 7.1 cfs

< 26.1 cfs (CAPACITY, TABLE 5) OK

DREXEL, BARRELL & CO.
LAND SURVEYORS
CIVIL ENGINEERS

Project: CHEYENNE MEADOWS BLVD STORM SEWER
Job No: E-2214
Client: GATES LAND COMPANY
By: R.P.
Date: 3 Sept 80

REV 2 OCT 80
REV 8 OCT 80

PIPE SIZING IN CHEY. MEAD. BLVD
assume Tc equal → add flows

INLET (A) FLOW = 7.7

30" RCP @ 1.0% INTO INLET (A), 18.8 (page 1) + 7.7 (page 8) = 26.5 cfs

USE 30" RCP @ 3.21 %

MH (C) FLOW = 26.5 cfs + 10.8 cfs = 37.3 cfs

USE 30" RCP @ 3.68% –

INLET (F) & (G) = 37.3 cfs + 6.6 + 9.1

53 cfs

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Project: Cheyenne Meadows Blvd - Storm Sewer | Job Nº E-2214

Client: Gates | By BNW | Date 10/8/80

Hydraulic Grade Line

assume: $n = 0.013$

$Q = 1.49 A R^{2/3} S^{1/2} / n$

friction loss thru M.H./inlet = 0.3' min

M.H. J to end $Q = 53$ cfs $D = 36"$

@ $S = 2.0\%$ normal depth = .73(3) = 2.2'

MH H to MH J $Q = 53$ cfs $D = 36"$

@ $S = 0.8\%$ normal depth = .97(3')

assume pipe flowing full

Inlet F to MH $Q = 53$ cfs $D = 36"$

@ $S = 1.0\%$ normal depth = .94(3')

assume pipe flowing full

MH E to Inlet F $Q = 37$ cfs $D = 30"$

@ $S = 4.5\%$ normal depth = .45(2.5) = 1.1'

MH D to MH E $Q = 37$ cfs $D = 30"$

@ $S = 3.6\%$ normal depth = .48(2.5) = 1.2'

MH C to MH D $Q = 37$ cfs $D = 30"$

@ $S = 4.7\%$ normal depth = .45(2.5) = 1.1'

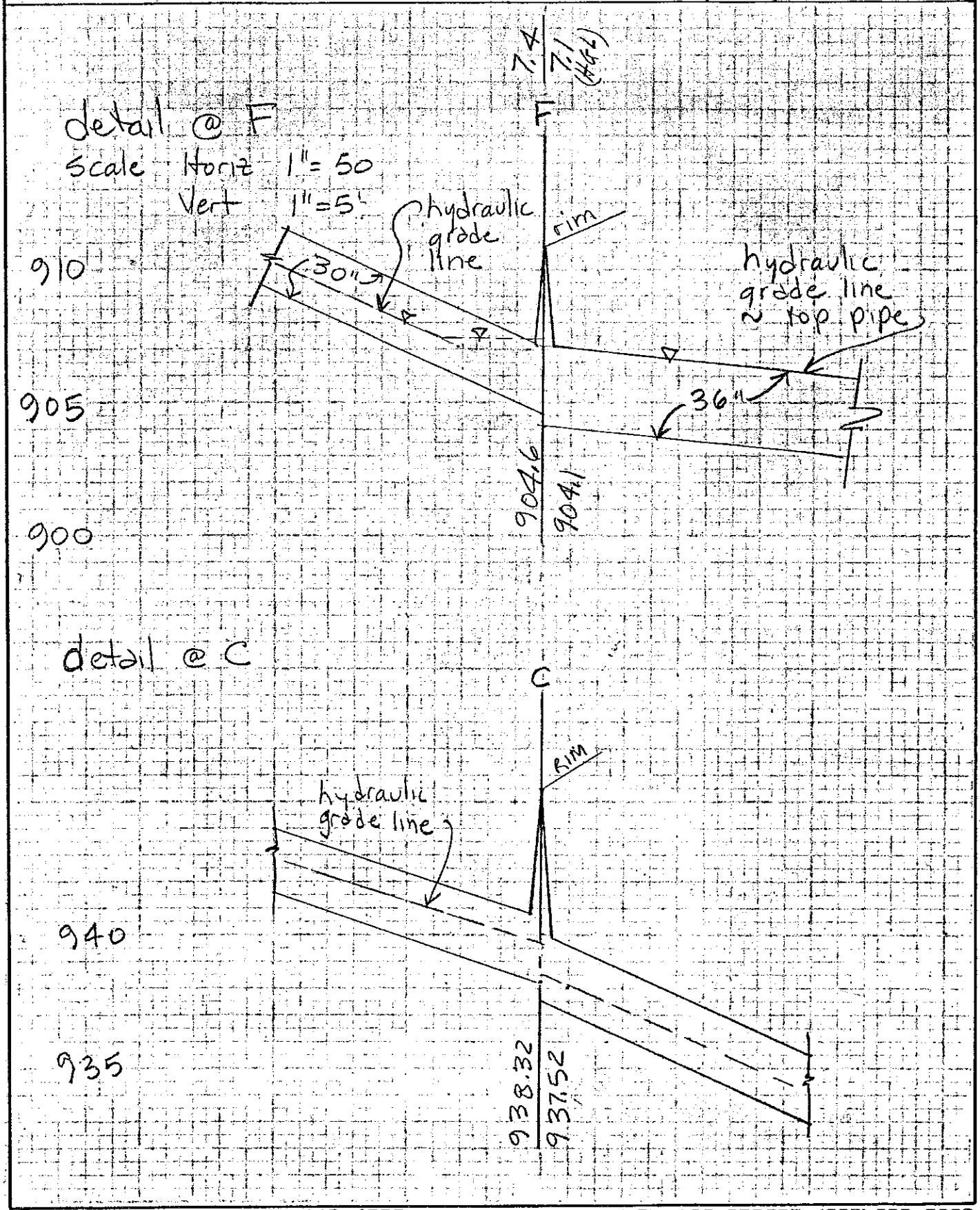
Inlet to MH C $Q = 26.5$ cfs $D = 30"$

@ $S = 3.2\%$ normal depth = .54(2.5) = 1.4'

DREXEL, BARRELL & CO. LAND SURVEYORS CIVIL ENGINEERS

Project: Cheyenne Meadows Blvd - Storm | Job No: E-2214

Client: Gates | By: BNW | Date: 10/8/80



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