

Approved RAA
7/26/73

(REVISED)
DRIANAGE REPORT
SUNRISE SUBDIVISION--
MASTER PLAN
Jun 11, 1973

COX SURVEYING COMPANY

P.O. BOX 5151 • 3053 DELTA • SECURITY, COLORADO 80931 • PHONE 392-7198

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June 12, 1973

Mr. DeWitt Miller
Director of Public Works
City Hall
Colorado Springs, Colorado

Mr. Miller:


Transmitted herewith is the revised Master Drainage Report of Sunrise Development area.

This area is generally bounded by Valley Hi Golf Course on the north, Academy Boulevard on the east, Fountain Boulevard on the south and Chelton Road on the west.

This study pertains to the quantities of surface runoff of each subbasin, together with the design of drainage facilities and their estimated cost.

Should any questions arise regarding this study, please contact me at your convenience.

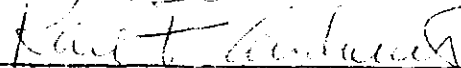
Respectfully submitted,



Keith Martin, P. E.

KM/tg


"The developer has read and will comply with all of the requirements specified in this Drainage Report as approved by the City Engineer.

By 

Title Director of Public Works, Inc.

ENGINEER'S CERTIFICATE

I, KEITH MARTIN, A REGISTERED ENGINEER IN THE
STATE OF COLORADO, HEREBY CERTIFY THAT THE
ATTACHED DRAINAGE PLAN AND REPORT 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 AND
SPECIFICATIONS AND CRITERIA.



COLORADO P. E. NUMBER 5497

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MASTER DRAINAGE PLAN

SUNRISE

GENERAL DESCRIPTION:

The Sunrise Development is located in Section 22, Township 14 South, Range 66 West of the 6th P.M., situated in the City of Colorado Springs, El Paso County, Colorado. The entire Sunrise Development contains 118.79 acres of land. This includes Sunrise Filing Number 1 (25.477 acres), Sunrise Filing Number 2 (1.48 acres) and Country Club Heights Subdivision Filing Number 1 (10.77 acres). This Drainage Report will pertain to the remaining 81.05 acres of unplatted land within the Sunrise Development. (Phase # 2 of attached Drainage Plan).

This Drainage Report was accomplished to determine the volume, directional flow and intensity of surface runoff during a storm occurring in and around the Sunrise Development area.

Surface runoff will be so directed as to eliminate excessive surface water from the proposed street system.

The existing terrain of the Sunrise area slopes gently to the northwest on an approximate slope of three percent.

The majority of surface runoff is to be conveyed to the Spring Creek Drainageway which is located along the north boundary line and parallel to Tracts 6 and 9.

The Sunrise Development area is located within Subbasins Number 21, 22, 23 and 25 of the Spring Creek Drainage Study, dated March, 1968, prepared by Lincoln-DeVore Testing Laboratory.

INTERIOR DRAINAGE:

The Sunrise Development has been divided into ten (10) subbasins. The detailed Drainage Plan (Phase # 2 revised), indicated both the amount and direction of flow of surface water runoff. Drainage details for Phase # 1 of this development are contained in the Drainage Reports for Sunrise Subdivision Filing Number 1, Number 2, Kasbah P.U.D. and Country Club Heights Subdivision Filing Number 1.

SUBBASIN DESCRIPTIONS:

Subbasin Number 1

Subbasin Number 1 contains 6.61 acres and will drain 10.88 C.F.S. northwesterly into existing Spring Creek.

Subbasin Number 2

Subbasin Number 2 contains 3.50 acres and will drain 6.03 C.F.S. northerly into existing Spring Creek.

Subbasin Number 3

Subbasin Number 3 contains 3.08 acres and will drain 5.26 C.F.S. northerly into existing Spring Creek.

Subbasin Number 4

Subbasin Number 4 contains 3.85 acres and will drain 6.34 C.F.S. northerly into existing Spring Creek.

Subbasin Number 5

Subbasin Number 5 contains 3.70 acres and will drain 6.24 C.F.S. northerly to the proposed drainage ditch along the north boundary of this development; thence westerly to Sand Creek.

Subbasin Number 6

Subbasin Number 6 contains 15.22 acres and will drain 24.15 C.F.S. northerly to the proposed drainage ditch along the north boundary of this development; thence westerly to Sand Creek.

SURBASIN DESCRIPTIONS (continued):

Subbasin Number 7

Subbasin Number 7 contains 6.66 acres and will drain 10.98 C.F.S. northwesterly to proposed Wentworth Drive. Surface runoff will be conveyed in Wentworth Drive to the proposed catch basins; thence northwesterly in a storm sewer system to the proposed drainage ditch along the north boundary of this development; thence westerly to Sand Creek.

Subbasin Number 8

Subbasin Number 8 contains 11.00 acres and will drain 18.2 C.F.S. westerly to proposed Wentworth Drive. Surface runoff will be conveyed in Wentworth Drive to catch basins; thence in a storm sewer system to the proposed drainage ditch along the north boundary of this development; thence westerly to Spring Creek.

Subbasin Number 9

Subbasin Number 9 contains 6.36 acres and will drain 10.76 C.F.S. northerly to proposed Avenida Del Sol. Surface runoff will be conveyed in Avenida Del Sol to catch basins; thence in a proposed drainage ditch to the proposed drainage ditch along the north boundary of this development; thence westerly to Spring Creek.

Subbasin Number 10

Subbasin Number 10 contains 22.22 acres and will drain 33.59 C.F.S. northwesterly to Avenida Del Sol. Surface runoff will be conveyed in Avenida Del Sol to catch basins; thence in an existing 33" R.C.P. to Spring Creek

(Offsite) Subbasin Number 6A

Offsite Subbasin Number 6A contains 61.18 acres and will drain 99.68 C.F.S. northwesterly to Academy Boulevard; thence thru a 42" Smooth Flow Steel Pipe to the proposed

SUBBASIN DESCRIPTIONS (continued):

drainage ditch along the north boundary of this development; thence westerly to Spring Creek.

Subbasin Number 6B (Accumulation Point)

Subbasin Number 6B contains 76.40 acres and will drain 123.88 C.F.S. at this accumulation point. The intersection of a proposed drainage ditch (Sect. A-A) and (Sect. B-B). The existing 18" C.M.P. across Academy Boulevard to flow into the proposed (Sect. A-A) ditch.

EXTERIOR DBAINAGE:

External water will enter the development from the east as noted on the drainage plan, under subbasin Six A.

RECOMMENDATIONS:

The specifications of the City of Colorado Springs indicate that water runoff is not desired in the streets, particularly arterial streets. However, the use of streets for drainage flow must be allowed up to a point. It is therefore recommended that the streets within this development be used as drainageways in-so-far as possible under City regulations. At a point in which streets are being overloaded with surface runoff, drainage ditches and storm sewers have been designed and recommended in this report. The storm sewer which is recommended in Meadow Hills Drive may be extended into the parking areas within the High Rise and P.B.C. area to accomodate surface runoff from parking ramps. The specific recommendations in this report are shown in the attached tables and drainage plan. The greenbelt right-of-ways are specified along with general ditch and storm sewer sizes. Most drainage channels and ditches follow the existing drainage ditches. It is recommended that the drainage swale along Academy Boulevard be maintained until curb and

gutter is installed and that a 18" C.M.P. be installed at the intersection of Sunrise Boulevard and Academy Boulevard to accomodate the surface runoff in the drainage swale.

Meadow Hills Drive will be a 40 foot standard collector street with a minimum of two (2) percent grade from the City Park area to the two 10' (changed from 8') Catch Basins as specified in the Drainage Report for Sunrise Subdivision Filing Number 1.

DRAINAGE REPORT

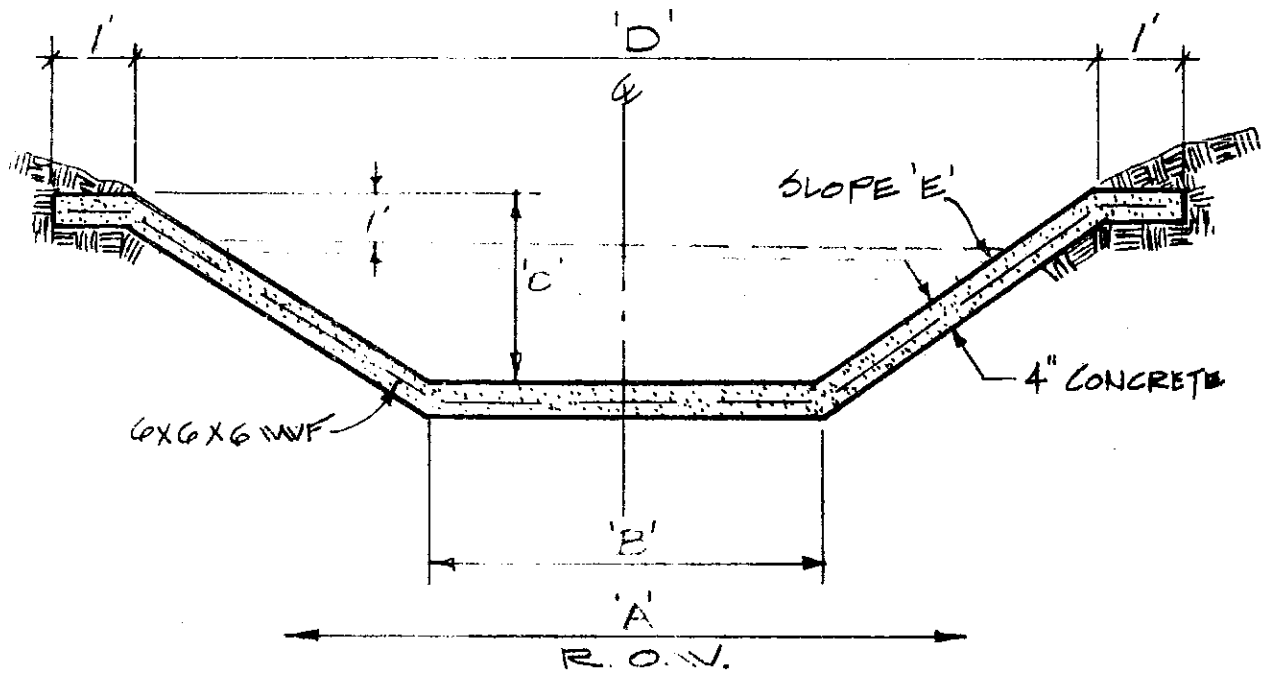
SURVEY STATION: Sunrise (revised)

Cox Surveying Co.

$$QP = \frac{(484)(A)(Q)}{T_r}; A = \text{Sq. Mi.}; T_r = \frac{D}{2} + (0.6 \times TC); \frac{D}{2} = 0.5; Q = 1.4$$

BASIN	AREA (AC)	SQ. MI.	L (FT)	H (FT)	TC (hrs)	TP (HRS)	QP (CFS)
1	6.61	.0103	770	30	.075	.55	12.69
2	3.50	.0055	600	32	.055	.53	7.02
3	3.08	.0048	500	25	.048	.53	6.14
4	3.85	.0060	700	28	.08	.55	7.39
5	3.70	.0058	550	22	.06	.54	7.28
6	15.22	.0237	1150	45	.11	.57	28.17
7	6.66	.0104	730	18	.09	.55	12.81
8	11.00	.0172	900	40	.08	.55	21.19
9	6.36	.0100	700	38	.06	.54	12.55
10	22.22	.0347	1790	58	.16	.60	39.19
11	2.7	.0042	SUNRISE SUB # 1 DRAINAGE REPORT				5.72
12	7.3	.0122	900	32	.09	.55	15.03
13	4.1	.0064	500	10	.08	.55	7.88
18	0.52	.0008	300	3	.06	.53	0.66
5A	42.94	.0671	2240	80	.17	.60	75.78
6A	39.21	OFFSITE					99.68
6B	39.24	.0613	2040	90	.18	.61	68.09
6C	82.15	.1253	(OFF PROJECT PLUS 6A OFFSITE)				175.46

DRAINAGE DITCH SECTIONS

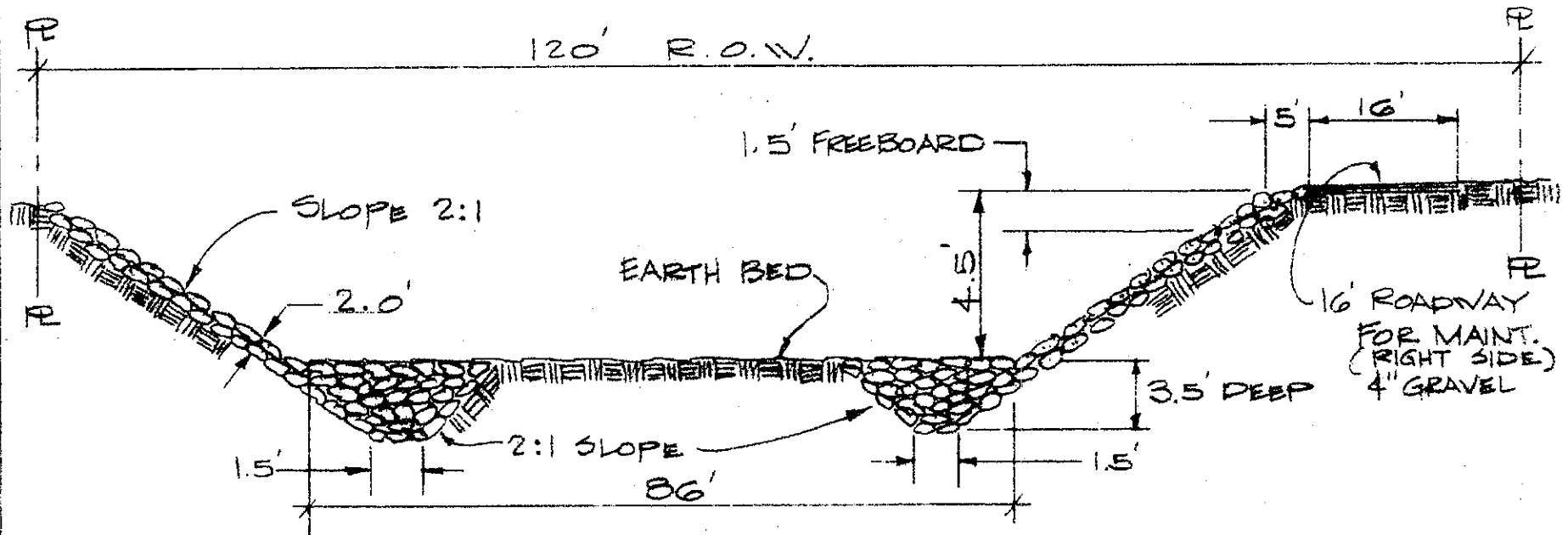


DITCH SECTION	R.O.W 'A'	BOTTOM 'B'	HEIGHT 'C'	WIDTH 'D'	SLOPE 'E'	GRADE
A-A	20'	4'-0"	3'-0"	13'-0"	1/2:1	.5%
B-B	20'	6'-0"	3'-0"	15'-0"	1/2:1	.5%
C-C	14'	1'-0"	3'-0"	10'-0"	1/2:1	1.0%

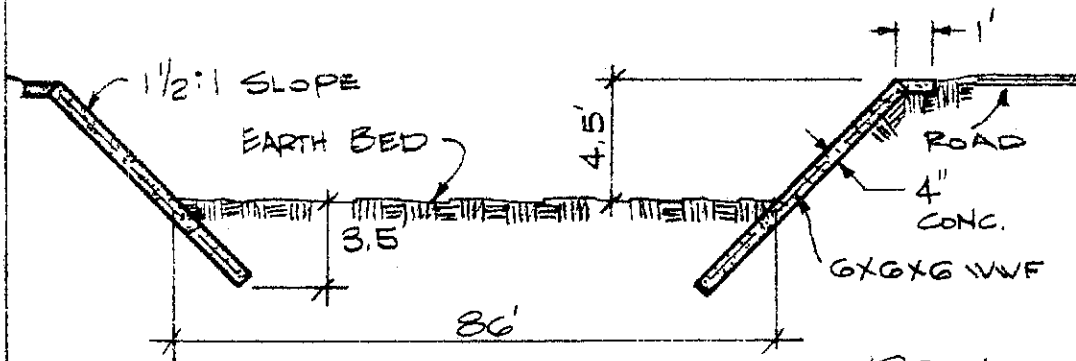
All sections subject to access
7. Road

SPRING CREEK CHANNEL SECTION

NO SCALE



ALTERNATE DESIGN: CONCRETE SECTION



NOTE:
RIP RAP ROCK: AVERAGE DENSITY OF 165 LBS PER CUBIC FOOT - MAXIMUM DIAMETER - 16 INCHES - LAYER NOT LESS THAN 24 INCHES.

DRAINAGE DITCH SIZE & SPECIFICATIONS
RE: SPRING CREEK DRAINAGE STUDY - MAR 7, 1968

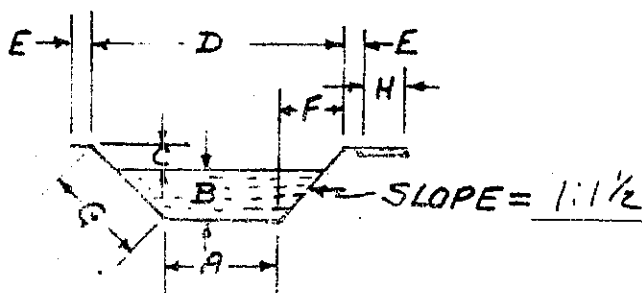
CHANNEL SECTION VALUES

SUNRISE

CHANNEL DEMENSIONS

N R DITCH
1st 360 ft.

- 1 $A = \underline{4}$
- 2 $B = \underline{2}$ $B + C = \text{TOTAL DEPTH} = \underline{3}$
- 3 $C = \underline{1}$ = FREEBOARD (0.3 B, MIN.)
- 4 $D = \underline{13}$
- 5 $E = \underline{0.5}$
- 6 $F = \underline{4.5}$
- 7 $G = \underline{5.4}$
- 8 $H = \underline{N.A.}$



9 CROSS SECTIONAL AREA = 25.5

CHANNEL HYDRAULIC DIMENSIONS

- 11 (S) FLOW-LINE GRADIENT = 0.5 %
- 12 (A) BOTTOM WIDTH = 4
- 13 (B) VERT. DIST. ON SLOPE = 2
- 14 (F) HOR. DIST. ON SLOPE = 3
- 15 (G) WETTED SLOPE DIST. = 3.6
- 16 (W_p) WETTED PERIMETER = 11.22
- 17 CROSS SECTIONAL AREA (WATER) = 14.00

MANNING FORMUAL

19 $(Q = \frac{1.486}{n} \times A \times R^{\frac{2}{3}} \times S^{\frac{1}{2}})$

20 DESIGN Q $(123.88) \times 1.25 = \underline{154.85 \text{ C.F.S.}}$

21 n FACTOR = .013 $(\frac{1.486}{n} = 114.3077)$

22 $A(17) \div W_p(16) = R = \underline{4} \div \underline{11.22} = \underline{1.2478}$

23 $R = \underline{1.2478}$

24 $R^{\frac{2}{3}} = \underline{1.1590}$

25 $S = \underline{0.005}$

$S^{\frac{1}{2}} = \underline{0.0707}$

$A(17) \times \frac{1.486}{n}(21) = \underline{1600.31}$

28 $(27) \times R^{\frac{2}{3}}(24) = \underline{1854.76}$ EQUIVALENT PIPE SIZE = 54"

29 $(28) \times S^{\frac{1}{2}}(26) = Q = \underline{131.13 \text{ C.F.S.}}$

30 MEAN VELOCITY $\frac{Q}{A} = V = \underline{9.37 \text{ F.P.S.}}$

31 BOTTOM VELOCITY $0.7 \times V = \underline{6.56 \text{ F.P.S.}}$

CHANNEL SECTION VALUES

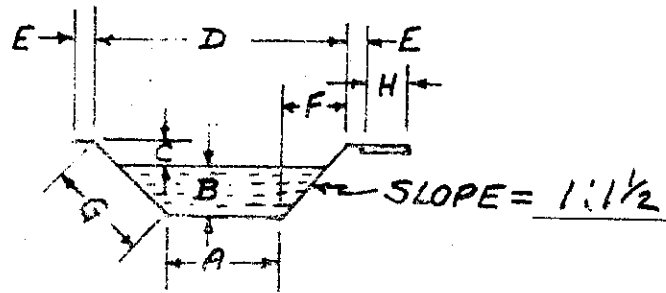
— SUNRISE —

CHANNEL DEMENSIONS

N R DITCH

2nd 650 ft.

- 1 $A = \underline{6}$
- 2 $B = \underline{2}$ $B+C = \text{TOTAL DEPTH} = \underline{3}$
- 3 $C = \underline{1} = \text{FREEBOARD (0.3 B, MIN.)}$
- 4 $D = \underline{1.5}$
- 5 $E = \underline{0.5}$
- 6 $F = \underline{4.5}$
- 7 $G = \underline{5.4}$
- 8 $H = \underline{N.A.}$



- 9 $\text{CROSS SECTIONAL AREA} = \underline{30}$

CHANNEL HYDRAULIC DEMENSIONS

- 11 (S) FLOW-LINE GRADIENT = 0.5 %
- 12 (A) BOTTOM WIDTH = 6
- 13 (B) VERT. DIST. ON SLOPE = 2
- 14 (F) HOR. DIST. ON SLOPE = 3
- 15 (G) WETTED SLOPE DIST. = 3.61
- 16 (W_p) WETTED PERIMETER = 13.22
- 17 $\text{CROSS SECTIONAL AREA (WATER)} = \underline{18.00}$

MANNING FORMUAL

$$19 \left(Q = \frac{1.486}{n} \times A \times R^{\frac{2}{3}} \times S^{\frac{1}{2}} \right)$$

$$20 \text{ DESIGN } Q (164.88) \times 1.25 = \underline{206.10 \text{ C.F.S.}}$$

$$21 n \text{ FACTOR} = \underline{.013} \left(\frac{1.486}{n} = 114.3077 \right)$$

$$22 A(17) \div W_p(16) = R = \underline{18} \div \underline{13.22} = \underline{1.3616}$$

$$23 R = \underline{1.3616}$$

$$24 R^{\frac{2}{3}} = \underline{1.2285}$$

$$25 S = \underline{0.005}$$

$$S^{\frac{1}{2}} = \underline{0.0707}$$

$$A(17) \times \frac{1.486}{n}(21) = \underline{2057.54}$$

$$28 (27) \times R^{\frac{2}{3}}(24) = \underline{2527.69} \text{ EQUIVALENT PIPE SIZE} = \underline{60''}$$

$$29 (28) \times S^{\frac{1}{2}}(26) = Q = \underline{178.71 \text{ C.F.S.}}$$

$$30 \text{ MEAN VELOCITY } \frac{Q}{A} = V = \underline{9.93 \text{ F.P.S.}}$$

$$31 \text{ BOTTOM VELOCITY } 0.7 \times V = \underline{6.95 \text{ F.P.S.}}$$

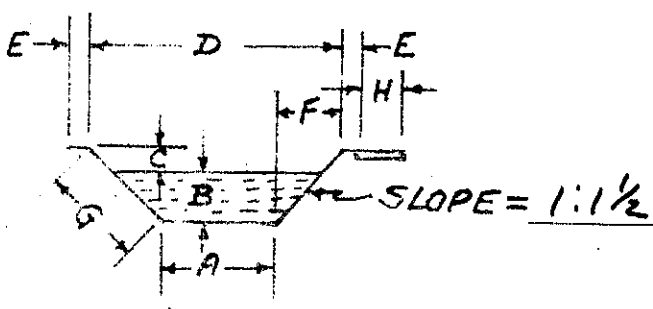
CHANNEL SECTION VALUES

— SUNRISE —

CHANNEL DEMENSIONS

Ditch Bet Parcels 10 & 12

- 1 $A = \underline{1}$
- 2 $B = \underline{2}$ $B + C = \text{TOTAL DEPTH} = \underline{3}$
- 3 $C = \underline{1}$ = FREEBOARD (0.3 B, MIN.)
- 4 $D = \underline{10}$
- 5 $E = \underline{0.5}$
- 6 $F = \underline{4.5}$
- 7 $G = \underline{5.4}$
- 8 $H = \underline{N.A.}$



9 CROSS SECTIONAL AREA = 16.50

CHANNEL HYDRAULIC DEMENSIONS

- 11 (S) FLOW-LINE GRADIENT = 1.0 %
- 12 (A) BOTTOM WIDTH = 1
- 13 (B) VERT. DIST. ON SLOPE = 2
- 14 (F) HOR. DIST. ON SLOPE = 3
- 15 (G) WETTED SLOPE DIST. = 3.61
- 16 (W_p) WETTED PERIMETER = 10.22
- 17 CROSS SECTIONAL AREA (WATER) = 8.0

MANNING FORMUAL

19 $(Q = \frac{1.486}{n} \times A \times R^{\frac{2}{3}} \times S^{\frac{1}{2}})$

20 DESIGN Q (.40) $\times 1.25 = \underline{50}$ C.F.S.

21 n FACTOR = .013 ($\frac{1.486}{n} = 114.3077$)

22 $A(17) \div W_p(16) = R = \underline{8} \div 10.22 = \underline{0.7828}$

23 $R = \underline{0.7828}$

24 $R^{\frac{2}{3}} = \underline{0.8494}$

25 $S = \underline{0.001}$

$S^{\frac{1}{2}} = \underline{0.1000}$

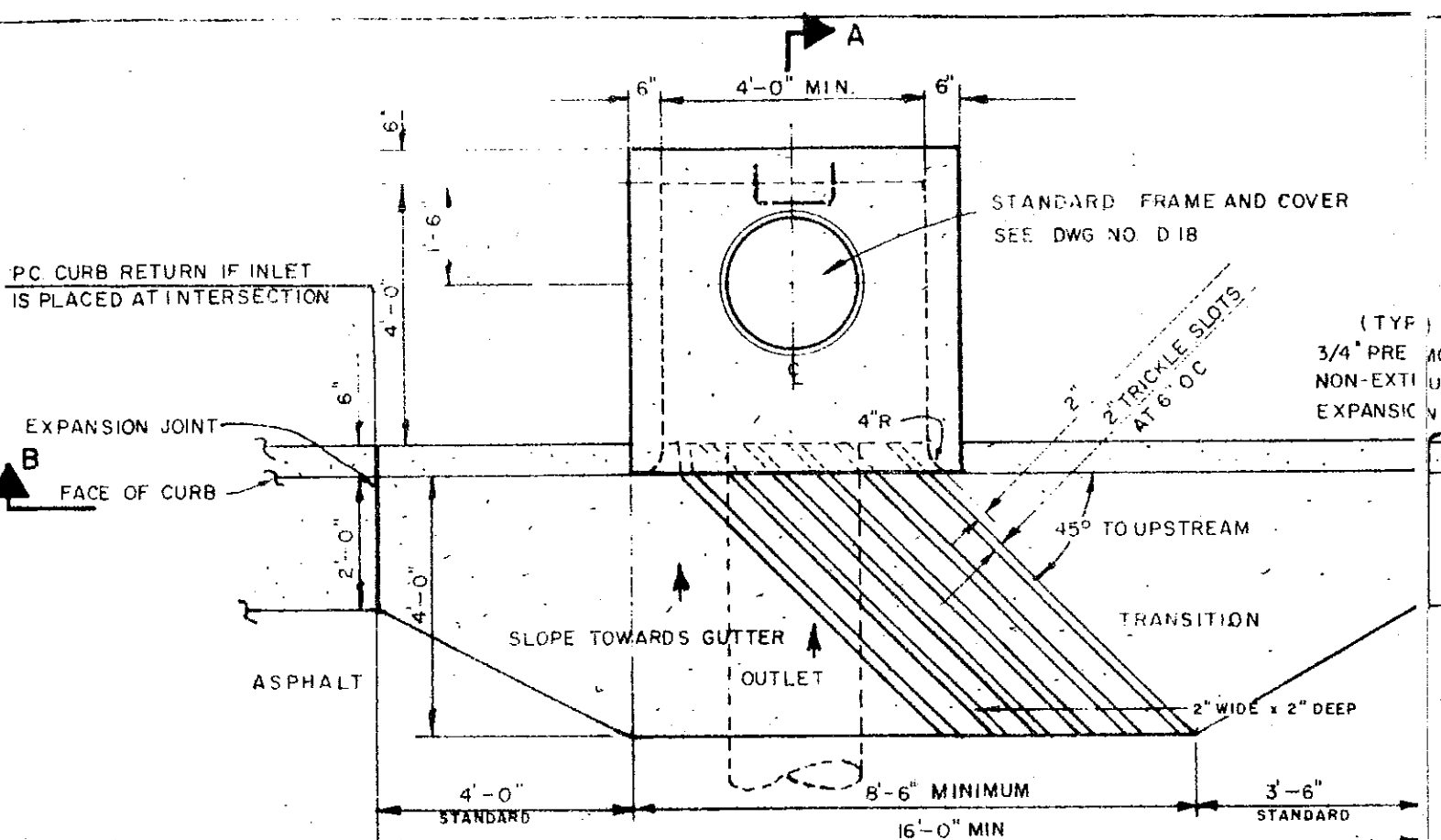
$A(17) \times \frac{1.486}{n}(21) = \underline{914.46}$

28 $(27) \times R^{\frac{2}{3}}(24) = \underline{776.74}$ EQUIVALENT PIPE SIZE = 36"

29 $(28) \times S^{\frac{1}{2}}(26) = Q = \underline{77.67}$ C.F.S.

30 MEAN VELOCITY $\frac{Q}{A} = V = \underline{9.71}$ F.P.S.

31 BOTTOM VELOCITY $0.7 \times V = \underline{6.80}$ F.P.S.



PC CURB RETURN IF INLET IS PLACED AT INTERSECTION

EXPANSION JOINT

FACE OF CURB

STANDARD FRAME AND COVER SEE DWG NO D 18

(TYP) 3/4" PRE MOLDED NON-EXTENDING EXPANSION JOINT

SLOPE TOWARDS GUTTER

TRANSITION

OUTLET

2" WIDE x 2" DEEP

4'-0" STANDARD

8'-6" MINIMUM

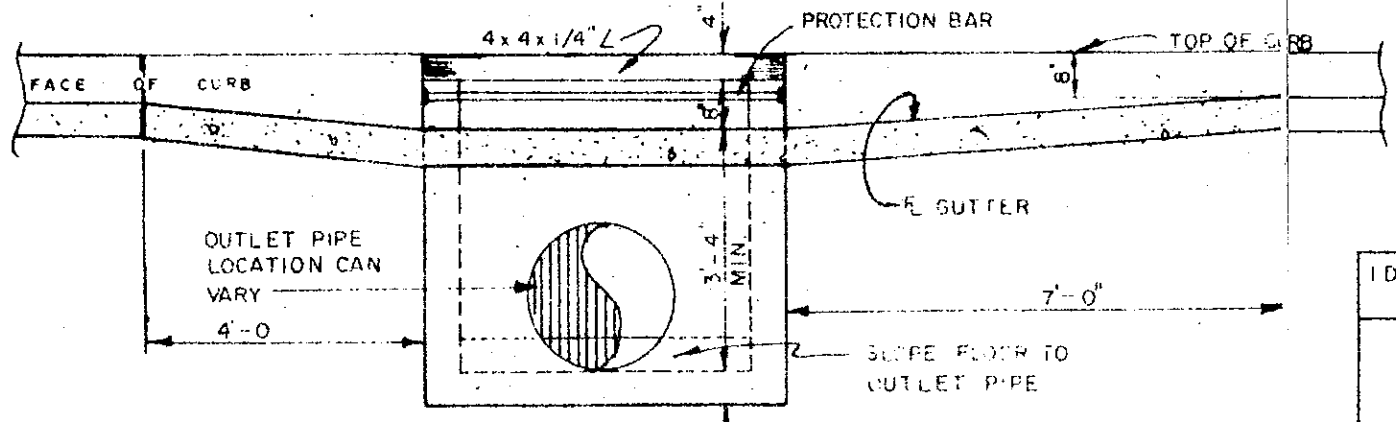
3'-6" STANDARD

PLAN VIEW

3/8" = 1'-0"

NOTES

CONNECTION PIPE OR OUTLET PIPE MAY VARY AS TO LOCATION WITHIN INLET CURVATURE OF LIP AT GUTTER AND SIDE OPENINGS SHALL BE MADE WITH CURVED FORMS DEPTH AND LENGTH OF INLET MAY VARY LENGTH SHOULD VARY BY INCREMENTS OF 2'-0" WALL THICKNESS SHOULD INCREASE TO 8" IF DEPTH IS GREATER THAN 4'-0" AND TO 10" AT DEPTHS OVER 8'-0" FLOOR OF INLET SHALL BE TROWELED TO A SMOOTH HARD SURFACE AND WILL SLOPE TOWARDS OUTLET MANHOLE SHOULD BE LOCATED AS SHOWN ALONG BACK WALL OUTLET PIPE TO BE TRIMMED TO FINAL SHAPE AND SET IN PLACE BEFORE INLET IS POURED PROTECTION BAR REQUIRED, 6" TO 0 FROM FLOW LINE OF GUTTER WHEN DEPTH IS GREATER THAN 4'-0" STEPS WILL BE PLACED 17" APART WITH TOP STEP 6" BELOW INSIDE COVER STEPS WILL BE 3/4" PLAIN ROUND GALV 2'-6" LONG BENT TO DIMENSIONS SHOWN ON PLAN WALL AND FLOOR REINFORCING AS PER DWG D-26 CONCRETE SHALL BE OF 3000 P.S.I. AT 28 DAYS STRENGTH IF OPENING IS GREATER THAN 4'-0" SUPPORT BARS WILL BE REQUIRED AT 3' INTERVALS SEE D-19 SURFACE OF ALL EXPOSED CONCRETE SHALL CONFORM IN SLOPE, GRADE, COLOR FINISH AND SCORING TO EXIST OR PROPOSED SURFACES



SECTIONAL ELEVATION B-B

3/8" = 1'-0"

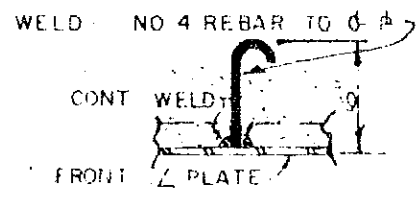
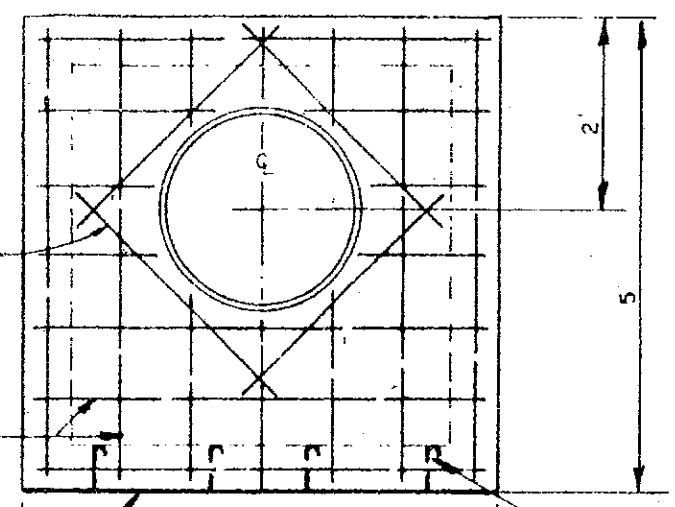


PLATE ANCHOR

NO 4 TIES

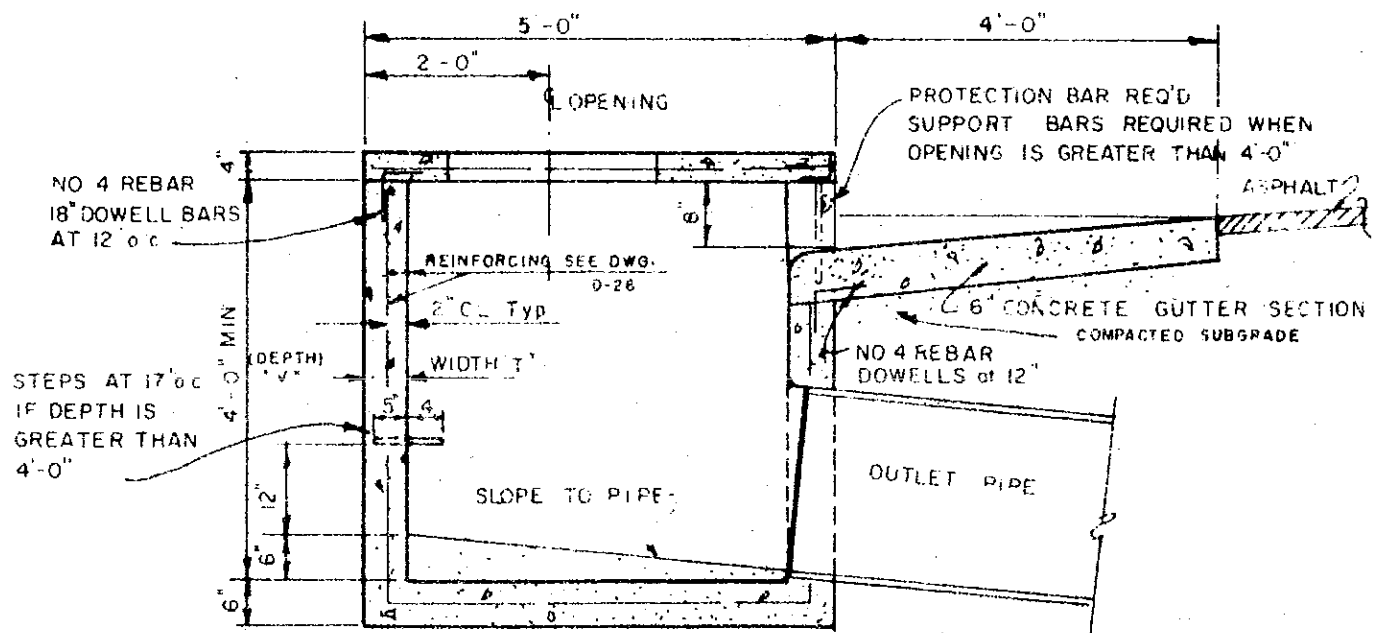
NO 4 or 9" E/W

PROTECTION BARS 4 x 4 x 1/4" L 5' LONG SET IN CONCRETE



COVER DETAIL

1/2" = 1'-0"



SECTION A-A

1/2" = 1'-0"

THIS DWG REPLACES CATCH BASIN NO'S 12 B 3 AS SHOWN ON DWG'S D-10, D-11 & D-12

ID OUTLET IN.	CAPACITY CMP	RCP	BOX REQ'D FT	THREAT OPENING
18	56	10	4	4' x 8"
21	84	155	6	6' x 8"
24	12	22	8	8' x 8"
27	16	30	10	10' x 8"
30	22	40	12	12' x 8"
36	35	51	16	16' x 8"
42	52	—	16	16' x 8"

CITY OF COLORADO SPRINGS, COLO.

STANDARD CATCH BASIN DETAILS

APPROVED BY *Keith Tractor* CITY ENGINEER

SCALE: AS SHOWN DATE: JAN 1970 DWN BY: R & MARTIN DWG NO: D-10R

SUNRISE DEVELOPMENT AREA
COST ESTIMATE (LESS SUNRISE FILING NO. 1)

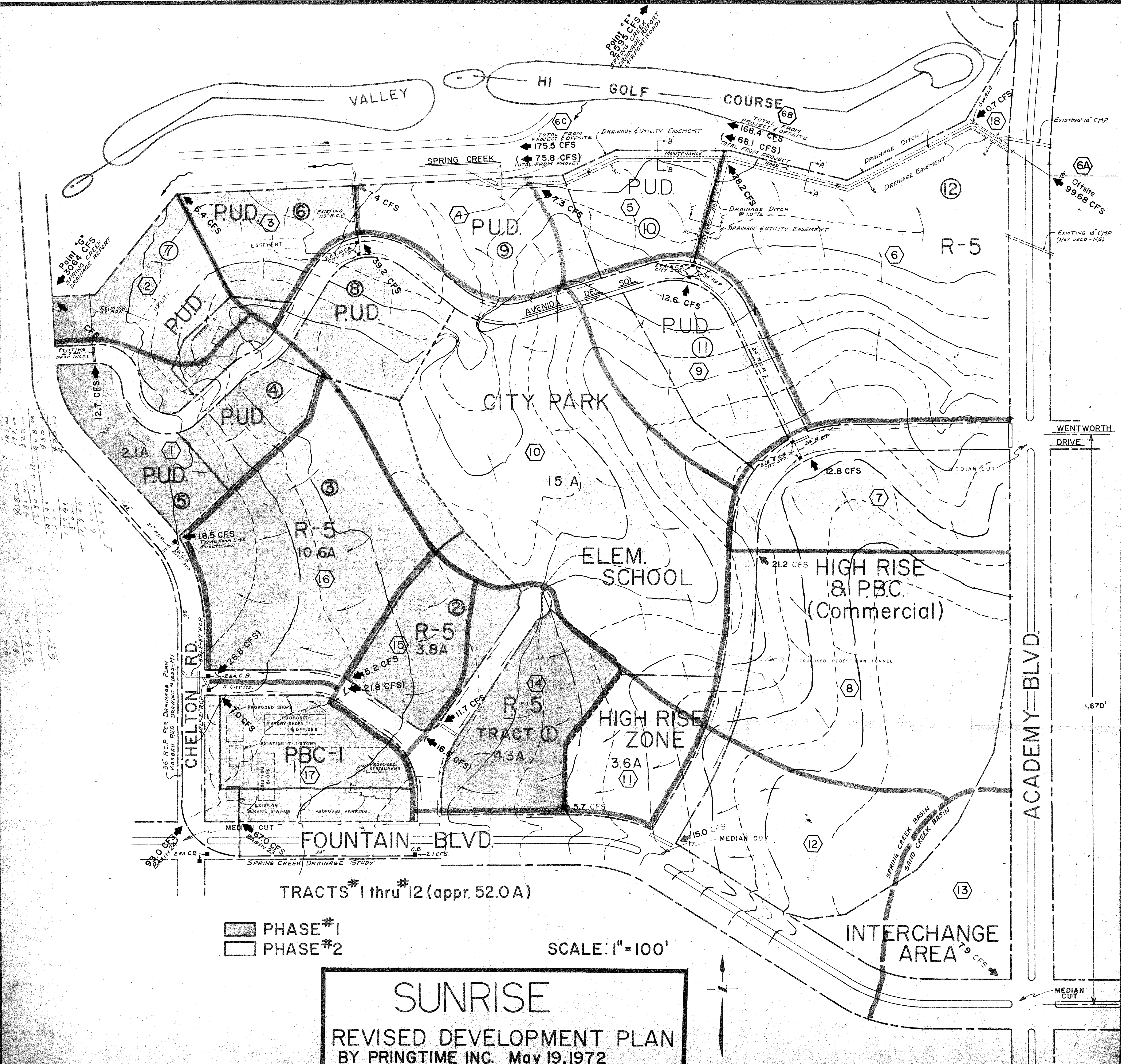
DRAINAGE FACILITIES

ITEM & DESCRIPTION	QUANTITIES	UNIT	UNIT PRICE	TOTAL COST
1 Drainage Ditch (Sect. A-A, 4' B)	960	L.F.	15.00	\$14,400.00
2 Drainage Ditch (Sect. R-B, 6' B)	650	L.F.	14.25	9,262.50
3 Drainage Ditch (Sect. C-C, 1' B)	325	L.F.	13.88	4,511.00
4 24" R.C.P. (Storm Sewer)	483	L.F.	16.00	7,808.00
5 30" R.C.P. (Storm Sewer)	40	L.F.	18.00	720.00
6 6' Catch Basin (City Std)	3	Ea.	800.00	2,400.00
7 8' Catch Basin (City Std)	2	Ea.	950.00	1,900.00
8 10' Catch Basin (City Std)	2	Ea.	1100.00	2,200.00
*9 Spring Creek Ditch (Rip Rap, one side)	480	L.F.	12.40	<u>5,952.00</u>
		Sub Total		\$49,153.50
10 Engineering Fees				<u>4,915.35</u>
		TOTAL		<u>\$54,068.85</u>
*9 Spring Creek Ditch (Concrete, one side)	480	L.F.	18.00	8,640.00
				<u>54,068.85</u>
				<u>\$62,708.85</u>
				56,756.85

Drainage Fees for Spring Creek Drainage Basin

(1) As of September 27, 1972 Drainage Report
31.05 Acres @ \$758.00 per Acre = \$23,742.46

(2) As of June 11, 1973 Drainage Report
39.37 Acres @ \$841.00 per Acre = \$33,160.17



TRACTS #1 thru #12 (appr. 52.0A)

- PHASE #1
- PHASE #2

SCALE: 1" = 100'

SUNRISE
 REVISED DEVELOPMENT PLAN
 BY PRINGTIME INC. May 19, 1972