



KLH ENGINEERING CONSULTANTS, INC.

ENGINEERING • SURVEYING • PLANNING • CONSTRUCTION MANAGEMENT
206-208 Sutton Lane • Colorado Springs, Colorado 80907 • (303) 594-4200

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COLORADO SPRINGS, COLO.

September 12, 1984
KLH # 83 554 00
84 524 00

FEB 06 1985

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AM PM

City of Colorado Springs
Engineering Division
30 S. Nevada Ave. - Suite 403
Colorado Springs, CO 80903

Attention: Dave Lethbridge

Subject: Master Drainage Study for Sunrise Development and
Drainage Report for Sundown Subdivision Filing No. 3.

Dear Dave:

The purpose of this letter is to amend the Master Drainage Study for Sunrise Development and the Drainage Report for Sundown Subdivision Filing No. 3. The Master Drainage Study for Sunrise Development was signed by the City Engineer in May, 1984, and the final Drainage Report for Sundown Subdivision Filing No. 3 was signed by the City Engineer in July, 1984. Storm drain facilities will be continued in that portion of Rangewood Drive from Saddle Rock Road to Vickers Drive in order to eliminate the temporary outfall which was originally proposed in said Master Drainage Study.

Basin C has been revised to include the additional sub-basins tributary to Rangewood Drive (see Amendment to Drainage Plans for Sunrise Development and Sundown Subdivision Filing No. 3). Runoff from these sub-basins will flow overland across lots, into the streets, and down the streets as gutter flow to catch basins in the proposed extension of Saddle Rock Road and in Rangewood Drive. This storm drain facility will tap into the existing 72-inch R.C.P. culvert which crosses under Rangewood Drive at the "Nor'wood Trail" drainage way. During the 5 year storm, approximately 5 c.f.s. will continue as gutter flow on the North side of Rangewood Drive to the intersection of Rangewood Drive and Vickers Drive, at which point it will be picked up by the existing sumped 12' D-10R (see Drainage Plan for Prominence Subdivision Filing No. 1). The complex horizontal layout of the storm drain system at the intersection of Rangewood Drive and Saddle Rock Road is required to provide clearance between the storm drain and the existing waterlines at this intersection.

Basin D has been revised to include all of the area which contributes runoff to the inlet of the existing 72-inch R.C.P. culvert. This 72-inch R.C.P. culvert was sized so that the HW/D value for the 5 year flow does not exceed 1.0, and so that flow from Basin D will not enter Rangewood Drive during the 100 year storm. For the 5 year design flow of 124 c.f.s., the HW/D value for the 72-inch R.C.P. is 0.74, and for the 100 year design

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flow of 274 c.f.s., the HW/D value is 1.2. Since the flow line elevation of the 72-inch R.C.P. is approximately 18 feet below Rangewood Drive at the inlet, runoff from Basin D will not flow into Rangewood Drive during the 100 year storm.

Vertical curb and gutter will be required on both sides of Rangewood Drive. The 5 year street flow quantities calculated will be contained within the curbs for all streets.

Please find the following attached to this letter: twelve (12) prints of the Amendment to Drainage Plans for Sunrise Development and Sundown Subdivision Filing No. 3; six (6) prints of the revised Sheet 1 of the Sunrise Development Master Drainage Plan; six (6) prints of the revised Sundown Subdivision Filing No. 3 Drainage Plan; twelve (12) copies of the additional hydrologic calculations; and twelve (12) copies of the Engineer's Certification and Developer's Compliance Statement. Following are the Revised Drainage Facilities Cost Estimates:

REVISED DRAINAGE FACILITIES COST ESTIMATE FOR SUNRISE DEVELOPMENT:

18" R.C.P.	665 L.F.	@ \$ 23./L.F.	=	\$ 15,295.
21" R.C.P.	1900 L.F.	@ \$ 30./L.F.	=	57,000.
24" R.C.P.	605 L.F.	@ \$ 35./L.F.	=	21,175.
27" R.C.P.	910 L.F.	@ \$ 40./L.F.	=	36,400.
30" R.C.P.	855 L.F.	@ \$ 42./L.F.	=	35,910.
36" R.C.P.	1810 L.F.	@ \$ 50./L.F.	=	90,500.
42" R.C.P.	2030 L.F.	@ \$ 63./L.F.	=	127,890.
48" R.C.P.	1280 L.F.	@ \$ 74./L.F.	=	94,720.
72" R.C.P.	290 L.F.	@ \$ 162./L.F.	=	46,980.
19"x30" Horiz. Elliptical R.C.P.	130 L.F.	@ \$ 45./L.F.	=	5,850.
72" Flared End Section	2 Each	@ \$1500./Ea.	=	3,000.
Trap. Channel b=5',z=1.5,d=4.2'	440 L.F.	@ \$ 93./L.F.	=	40,920.
Trap. Channel b=1',z=1,d=2'	30 L.F.	@ \$ 21./L.F.	=	630.
Manholes	27 Each	@ \$1000./Ea.	=	27,000.
6' D-10R	10 Each	@ \$1800./Ea.	=	18,000.
8' D-10R	21 Each	@ \$2200./Ea.	=	46,200.
10' D-10R	4 Each	@ \$2500./Ea.	=	10,000.
14' D-10R	3 Each	@ \$3500./Ea.	=	10,500.
2'x2' Area Drain	1 Each	@ \$ 800./Ea.	=	800.
Curb Inlet	1 Each	@ \$1500./Ea.	=	1,500.
Curb Outlet	1 Each	@ \$1500./Ea.	=	1,500.
Rip-Rap	65 C.Y.	@ \$ 45./C.Y.	=	<u>2,925.</u>
				\$ 694,695.
10% Engineering & Contingency			=	<u>\$ 69,470.</u>
TOTAL			=	\$ 764,165.

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REVISED DRAINAGE FACILITIES COST ESTIMATE FOR
SUNDOWN SUBDIVISION FILING NO. 3:

Public Reimbursable:

6' D-10R	1 Each @ \$1800./Ea.	=	\$ 1,800.
8' D-10R	9 Each @ \$2200./Ea.	=	19,800.
10' D-10R	4 Each @ \$2500./Ea.	=	10,000.
14' D-10R	2 Each @ \$3500./Ea.	=	7,000.
18" R.C.P.	365 L.F. @ \$ 23./L.F.	=	8,395.
21" R.C.P.	10 L.F. @ \$ 30./L.F.	=	300.
24" R.C.P.	720 L.F. @ \$ 35./L.F.	=	25,200.
30" R.C.P.	995 L.F. @ \$ 42./L.F.	=	41,790.
36" R.C.P.	500 L.F. @ \$ 50./L.F.	=	25,000.
72" R.C.P.	290 L.F. @ \$ 162./L.F.	=	46,980.
19"x30" Horiz. Elliptical R.C.P.	130 L.F. @ \$ 45./L.F.	=	5,850.
72" Flared End Section	2 Each @ \$1500./Ea.	=	3,000.
Manholes	9 Each @ \$1000./Ea.	=	9,000.
8' Curb Inlet	1 Each @ \$1500./Ea.	=	1,500.
8' Curb Outlet	1 Each @ \$1500./Ea.	=	1,500.
Trap. Channel b=1',z=1,d=2'	30 L.F. @ \$ 21./L.F.	=	630.
Rip-Rap	45 C.Y. @ \$ 45./C.Y.	=	<u>2,025.</u>
TOTAL		=	\$ 209,770.

This letter, compliance statement, additional hydrologic calculation pages, and enclosed amendment and applicable revised drainage plan shall become a part of each of the existing approved drainage reports (Master Drainage Study for Sunrise Development and Drainage Report for Sundown Subdivision Filing No. 3), and should be attached to said documents. Both the drainage plan for Sundown Subdivision Filing No. 3 and Sheet 1 of the drainage plan for Sunrise Development in the report pockets should be voided or discarded.

If there are any questions concerning this revision, please call me.

Sincerely,

K L H Engineering Consultants, Inc.

Robert W. Leach

Robert W. Leach, P.E.

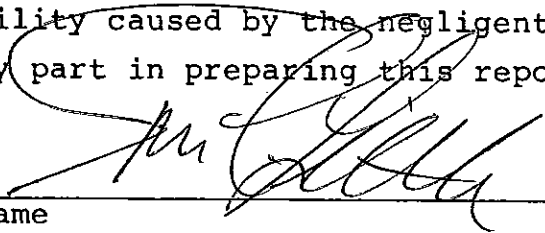
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Enc:

DRAINAGE REPORT STATEMENTS

Engineer's Statement:

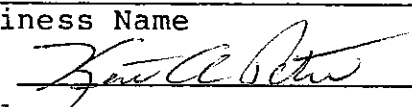
The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by the City for drainage reports and said report is in conformity with the master plan of the drainage basin. I accept responsibility for any liability caused by the negligent acts, errors or omissions on my part in preparing this report.


Name _____



Developer's Statement:

The developer has read and will comply with all of the requirements specified in this drainage report.

NOR'WOOD DEVELOPMENT CORPORATION
Business Name
By: 
Title: PRESIDENT
Address: P.O. BOX 552,
MANITOU SPRINGS, CO 80829

City of Colorado Springs:

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


City Engineer

2/22/85
Date

Conditions:

Amendment - July 1984

BASIN

Sunr C- 7 REVISED

ACREAGE	SQ. MI.	LAND USE	SOIL	CN	%	% x CN
3.8		COMMERTIAL	A	89	77.6	6902.0
1.1		STREETS & WALKS	A	98	22.4	2200.0
4.9	.008				100.0	9102.0

WEIGHTED CN = 91.0

FLOW TYPE	L(ft)	H(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
OVERLAND	240	12	.029			
STREET	1200	60	.042			
	1440	72	.071	1.25	1300	12.5 (5yr FLOW)
				2.54		25.3 (100yr FLOW)

BASIN

Sunr C- 8

ACREAGE	SQ. MI.	LAND USE	SOIL	CN	%	% x CN
4.0		COMMERTIAL	B	92	100.0	9200.0
4.0	.006				100.0	9200.0

WEIGHTED CN = 92.0

FLOW TYPE	L(ft)	H(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
OVERLAND	560	28	.068			
	560	28	.068	1.33	1300	10.8 (5yr FLOW)
				2.64		21.4 (100yr FLOW)

BASIN

Sunr C- 9

ACREAGE	SQ. MI.	LAND USE	SOIL	CN	%	% x CN
8.4		COMMERTIAL	B	92	84.8	7806.1
1.0		COMMERTIAL	A	89	10.1	899.0
.5		STREETS & WALKS	A	98	5.1	494.9
9.9	.015				100.0	9200.0

WEIGHTED CN = 92.0

FLOW TYPE	L(ft)	H(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
OVERLAND	750	15	.139			
STREET	340	20	.010			
	1090	35	.149	1.33	1150	23.6 (5yr FLOW)
				2.64		46.9 (100yr FLOW)

Amendment - July 1984

BASIN

Sunr C-10

ACREAGE	SQ. MI.	LAND USE	SOIL	CN	%	% x CN	
4.6		RESIDENTIAL 1/4Ac	D	87	80.7	7021.1	
1.1		STREETS & WALKS	D	98	19.3	1891.2	
5.7	.009				100.0	8912.3	WEIGHTED CN = 89.1

FLOW TYPE	L(ft)	H(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
OVERLAND	110	7	.016			
STREET	1600	80	.040			
	1710	87	.056	1.12 2.37	1300	13.0 (5yr FLOW) 27.4 (100yr FLOW)

BASIN

Sunr C-11

ACREAGE	SQ. MI.	LAND USE	SOIL	CN	%	% x CN	
6.7		P.U.D.	D	92	88.2	8110.5	
.9		STREETS & WALKS	D	98	11.8	1160.5	
7.6	.012				100.0	9271.1	WEIGHTED CN = 92.7

FLOW TYPE	L(ft)	H(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
OVERLAND	350	16	.061			
STREET	1300	65	.040			
	1650	81	.101	1.38 2.71	1270	20.9 (5yr FLOW) 40.8 (100yr FLOW)

Amendment - July 1984

BASINS

Sunr C- 7 , 8 , 9

ACREAGE	SQ. MI.	LAND USE	SOIL	CN	%	% x CN
4.8		COMMERTIAL	A	89	25.5	2272.3
12.4		COMMERTIAL	B	92	66.0	6068.1
1.6		STREETS & WALKS	A	98	8.5	834.0
18.8	.029				100.0	9174.5

WEIGHTED CN = 91.7

FLOW TYPE	L(ft)	H(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
OVERLAND	750	15	.139			
STREET	340	20	.010			
PIPE	200	7	.003			
	1290	42	.152	1.31	1150	44.2 (5yr FLOW)
				2.61		88.2 (100yr FLOW)

BASINS

Sunr C- 1 , 2 , 3 , 4 , 5 , 6 , 7 , 8 , 9

ACREAGE	SQ. MI.	LAND USE	SOIL	CN	%	% x CN
1.0		RESIDENTIAL 1/5Ac	A	65	1.6	102.2
34.2		RESIDENTIAL 1/5Ac	B	78	53.8	4194.3
4.8		COMMERTIAL	A	89	7.5	671.7
12.4		COMMERTIAL	B	92	19.5	1793.7
2.8		PARK	B	61	4.4	268.6
1.6		STREETS & WALKS	A	98	2.5	246.5
6.8		STREETS & WALKS	B	98	10.7	1047.8
63.6	.099				100.0	8324.8

WEIGHTED CN = 83.2

FLOW TYPE	L(ft)	H(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
OVERLAND	220	24	.010			
STREET	2400	82	.175			
PIPE	250	7	.005			
	2870	113	.190	.78	1080	83.4 (5yr FLOW)
				1.88		201.5 (100yr FLOW)

Amendment - July 1984

BASINS

Sunr C- 1 ,2 ,3 ,4 ,5 ,6 ,7 ,8 ,9 ,10,11

ACREAGE	SQ.MI.	LAND USE	SOIL	CN	%	% x CN
6.7		P.U.D.	D	92	8.7	801.6
1.0		RESIDENTIAL 1/5Ac	A	65	1.3	84.5
34.2		RESIDENTIAL 1/5Ac	B	78	44.5	3468.9
4.6		RESIDENTIAL 1/4Ac	D	87	6.0	520.4
4.8		COMMERTIAL	A	89	6.2	555.5
12.4		COMMERTIAL	B	92	16.1	1483.5
2.8		PARK	B	61	3.6	222.1
1.6		STREETS & WALKS	A	98	2.1	203.9
6.8		STREETS & WALKS	B	98	8.8	866.6
2.0		STREETS & WALKS	D	98	2.6	254.9
76.9	.120				100.0	8461.9

WEIGHTED CN = 84.6

FLOW TYPE	L(ft)	H(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
OVERLAND	220	24	.010			
STREET	2400	82	.175			
PIPE	250	7	.005			
PIPE	1350	34	.022			
	4220	147	.212	.85	1050	107.0 (5yr FLOW)
				1.99		250.5 (100yr FLOW)

Amendment - July 1984

BASIN

Sunr D- 1

ACREAGE	SQ. MI.	LAND USE	SOIL	CN	%	% x CN
9.2		RESIDENTIAL 1/5Ac	B	78	73.6	5740.8
1.7		PARK	B	69	13.6	938.4
1.6		STREETS & WALKS	B	98	12.8	1254.4
12.5	.020				100.0	7933.6

WEIGHTED CN = 79.3

FLOW TYPE	L(ft)	H(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
OVERLAND	110	9	.015			
STREET	970	43	.075			
PIPE	120	13	.002			
	1200	65	.092	.60	1300	15.1 (5yr FLOW)
				1.59		40.4 (100yr FLOW)

BASIN

Sunr D- 2

ACREAGE	SQ. MI.	LAND USE	SOIL	CN	%	% x CN
6.3		RESIDENTIAL 1/5Ac	D	89	9.7	862.6
33.7		P.U.D.	D	92	51.8	4769.8
25.0		OPEN SPACE	D	80	38.5	3076.9
65.0	.102				100.0	8709.4

WEIGHTED CN = 87.1

FLOW TYPE	L(ft)	H(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
CREEK	3650	130	.116			
	3650	130	.116	.99	1230	123.7 (5yr FLOW)
				2.19		273.6 (100yr FLOW)

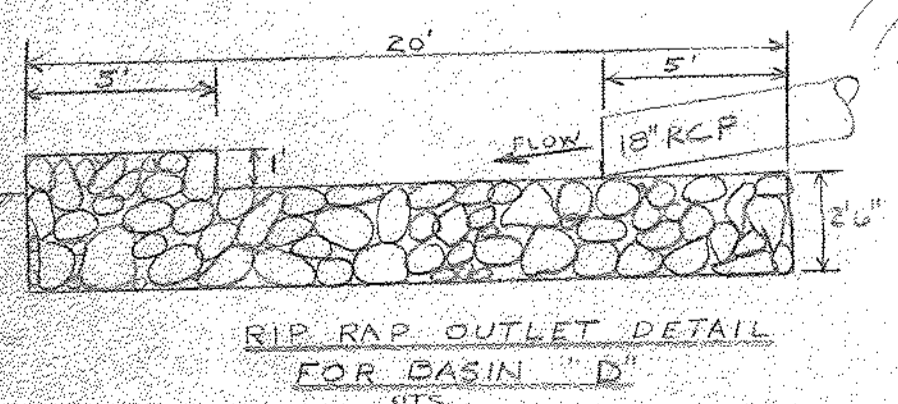
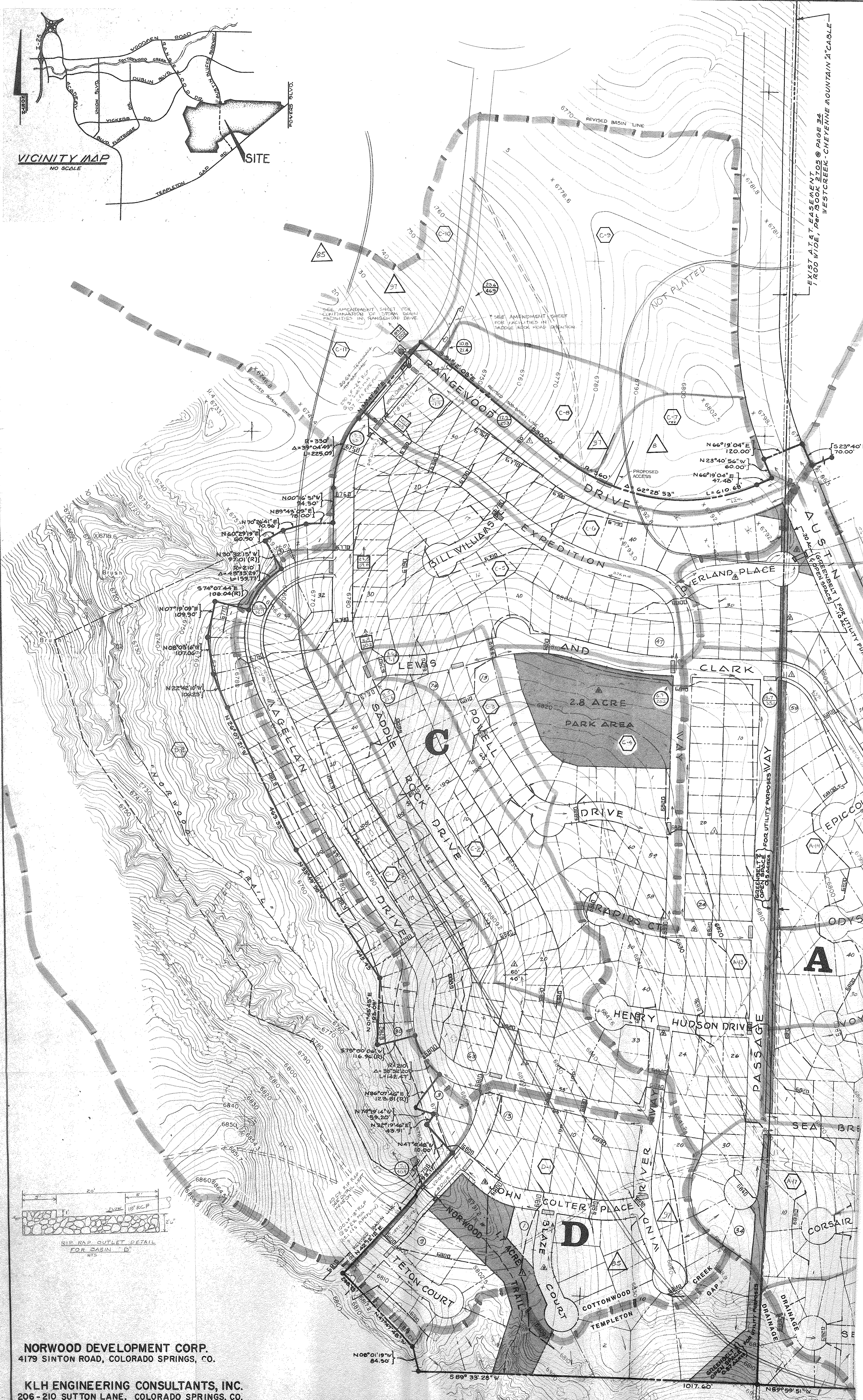
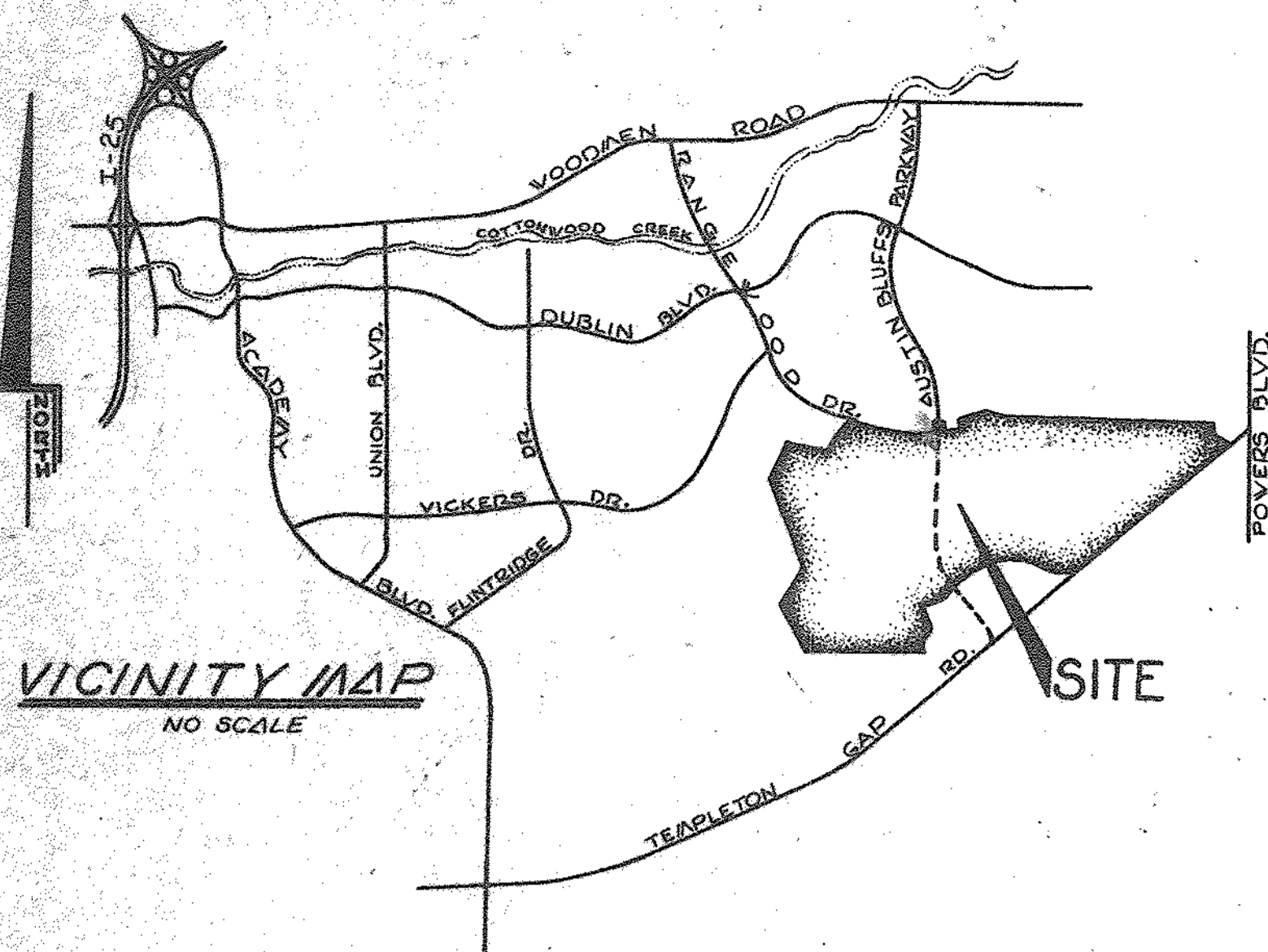
Sunr D- 1 ,2

ACREAGE	SQ. MI.	LAND USE	SOIL	CN	%	% x CN	
25.0		OPEN SPACE	D	80	32.3	2580.6	
33.7		P.U.D.	D	92	43.5	4000.5	
9.2		RESIDENTIAL 1/5Ac	B	78	11.9	925.9	
6.3		RESIDENTIAL 1/5Ac	D	89	8.1	723.5	
1.7		PARK	B	69	2.2	151.4	
1.6		STREETS & WALKS	B	98	2.1	202.3	
77.5	.121				100.0	8584.3	WEIGHTED CN = 85.8

FLOW TYPE	L(ft)	H(ft)	Tc(hrs)	RUNOFF(in)	qp(CSM/in)	Q (cfs)
OVERLAND	110	9	.015			
STREET	970	43	.075			
PIPE	120	13	.002			
CREEK	3650	130	.116			
	4850	195	.208	.92	1050	116.5 (5yr FLOW) *
				2.09		265.1 (100yr FLOW)

* 5-YEAR FLOW FROM SUB-BASIN D-2 IS HIGHER

•• USE 124 CFS FOR COMBINED 5-YEAR FLOW PEAK.

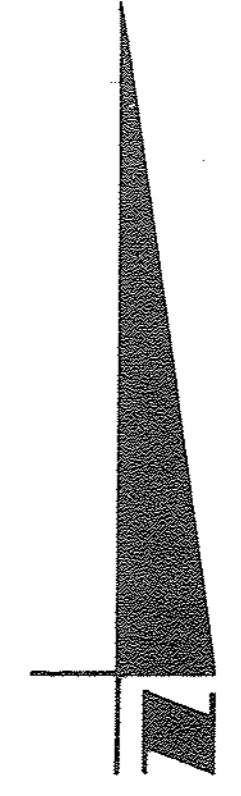


NORWOOD DEVELOPMENT CORP.
4179 SINTON ROAD, COLORADO SPRINGS, CO.

KLH ENGINEERING CONSULTANTS, INC.
206-210 SUTTON LANE, COLORADO SPRINGS, CO.

SUNRISE DRAINAGE PLAN

MARCH 1984
REVISED JULY, 1984



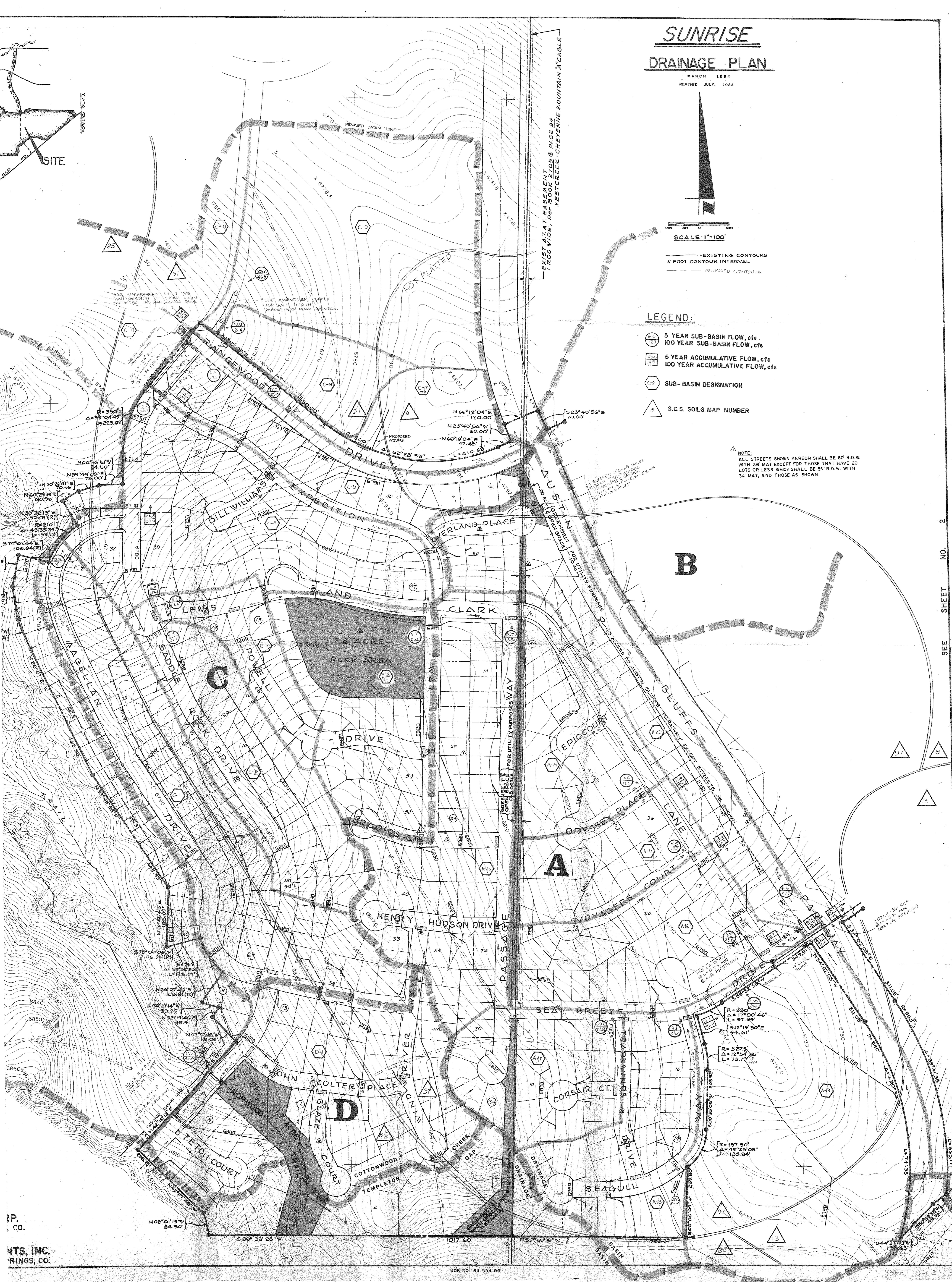
SCALE: 1"=100'

EXISTING CONTOURS
2 FOOT CONTOUR INTERVAL
PROPOSED CONTOURS

LEGEND:

- 5 YEAR SUB-BASIN FLOW, cfs
- 100 YEAR SUB-BASIN FLOW, cfs
- 5 YEAR ACCUMULATIVE FLOW, cfs
- 100 YEAR ACCUMULATIVE FLOW, cfs
- SUB-BASIN DESIGNATION
- S.C.S. SOILS MAP NUMBER

NOTE:
ALL STREETS SHOWN HEREON SHALL BE 60' R.O.W.
WITH 36' MAT EXCEPT FOR THOSE THAT HAVE 20
LOTS OR LESS WHICH SHALL BE 55' R.O.W. WITH
34' MAT, AND THOSE AS SHOWN.



P. CO.

NTS, INC.
RINGS, CO.

SEE SHEET NO. 2