MASTER DEVELOPMENT DRAINAGE PLAN

FOR

WOODMEN MEADOWS

MAY, 1991

Prepared for:

First National Bank of Colorado Springs

Prepared by:

KLH Engineering, Inc.
206-208 Sutton Lane
Colorado Springs, CO 80907

KLH No. 90 531 02

KLH
ENGINEERING, INC.

MASTER DEVELOPMENT DRAINAGE PLAN

WOODMEN MEADOWS

JANUARY 7, 1991

REVISED MARCH 4, 1991

for

FIRST NATIONAL BANK OF COLORADO SPRINGS

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ENGINEERING, INC.

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206-208 Sutton Lane • P.O. Box 49235 • Colorado Springs, Colorado 80949 • (719) 594-4200

Jan. 7, 1991
KLH #90 531 02

Mr. Chris Smith
City of Colorado Springs
Dept. of Public Works - Land Development
101 W. Costilla
Colorado Springs, CO 80903

Re: Woodmen Meadows
Master Development Drainage Plan

Dear Chris;

Transmitted herewith for review and approval is the master development drainage plan for Woodmen Meadows Development.

This master development drainage plan will be followed by preliminary and final drainage reports consistent with the phased development of the entire site. There is insufficient information available for an in-depth analysis of the treatment required for Cottonwood Creek at this time. That drainage basin is currently under study and it is anticipated that updated information will be available at the time of development of the sites adjacent to Cottonwood Creek.

No detention is anticipated for this site as runoff will be discharged directly into Cottonwood Creek.

Thank you for your assistance on this project.

Sincerely,

KLH ENGINEERING, INC.

Richard S. Willis, P. E.

RSW:tjm

encl.

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/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.

Richard S. Willis

Richard S. Willis, P.E.

DEVELOPER'S STATEMENT:

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

FIRST NATIONAL BANK OF COLORADO SPRINGS

BY: _____
Jack D. Hood

TITLE: Vice President
First National Bank of Colorado Springs

ADDRESS: P. O. Box 1699

Colorado Springs, CO 80942

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 Engr.
CITY ENGINEER

5-24-91
DATE

MASTER DEVELOPMENT DRAINAGE REPORT

WOODMEN MEADOWS

Location and Description:

Woodmen Meadows is located in a portion of the northeast quarter of the southeast quarter of Section 9, Township 13 South, Range 66 West of the 6th P.M. of the City of Colorado Springs, County of El Paso, Colorado. Specifically, this site is the southwest corner of the intersection of Woodmen Road and Union Blvd.

In addition to the above mentioned streets, this site is bordered on the south by Cottonwood Creek and on the west by Cottonwood Creek Subdivision, Filing No. 1, an apartment complex.

Cottonwood Creek, adjacent to this property, is an unimproved natural channel. There is an existing culvert to convey Cottonwood Creek under Union Blvd. at the southeast corner of the site.

The site contains 16.34 acres which includes half of a 200 foot wide drainage easement for Cottonwood Creek. Approximately 75% of the site is currently zoned PBC-2 and the remainder is zoned OC. The site is being rezoned such that the entire site will be zoned PBC-2. It is anticipated that this entire development will be commercial. The development will be phased as necessitated by economic conditions in the area.

The existing ground cover is natural grasses and weeds with a few small pines along Woodmen Road and small cottonwoods along the west property line. The northern portion of the site slopes downward to the south at 6-8% and drops off steeply (24% $\pm$) in the southern part of the property.

The Soil Survey of El Paso County Area, Colorado catagorizes soils on this site as Blakeland loamy sand and Blendon sandy loam, in soil groups A & B. However, as significant amount of fill has been imported in recent years, drainage calculations were performed using "c" factors for soil groups C & D.

The only major drainageway involved with this site is Cottonwood Creek to the south. There are no irrigation facilities on this property.

There are numerous utilities in the rights-of-way of Union Blvd. and Woodmen Road which are available to but do not restrict this property. There is a 10-foot electric easement which runs the entire length of the west property line.

Drainage Basins and Sub-Basins

There is a drainage basin planning study in existence for the Cottonwood Creek drainage basin. However, the entire drainage basin is currently being restudied by URS Engineers. It is anticipated that this study will be completed within the next 4-6 months.

With the detention plan presently being considered by URS in that study, the current thinking is to riprap line both sides of the creek and

locate drop structures as needed in the channel bed. These structures would not exceed 4' in height and would limit the velocities to approximately 5 fps.

The existing FEMA Flood Insurance Maps indicate a portion of the southeast part of this site is within the 100-year flood plain. However, the flood plain elevations referenced therein do not coincide with the flood plain delineation. There has been significant fill on this site in past years and that could be a factor. A CLOMR and a LOMR will be required when the portions of the site within the current flood plain are developed. A 404 Permit will probably be required also.

The flood plain limits of the entire length of Cottonwood Creek is to be addressed in the current drainage basin planning study. We recommend waiting for completion of that study before continuing an analysis of the effect of the 100-year flood plain on this site. Because of the flood plain elevations given in the existing FEMA Flood Insurance Maps, historic downcutting of the Cottonwood Creek bed and past filling on this site, we feel that the 100-year storm will be contained within the channel west of Union Blvd.

The runoff from this site and some off-site drainage to the north of Woodmen Road and Woodmen Road itself currently sheet flows across the site, forming some minor concentrations of flow, to Cottonwood Creek. Drainage from Union Blvd. adjacent to the site is carried, within the street, directly to Cottonwood Creek. The required deceleration lane for this site will be sloped in such a way as to contain street drainage within Union Blvd. and not introduce any surface drainage from the site onto Union Blvd. Drainage from a portion of the south side of Woodmen Road flows into a closed conduit storm drain system and through this site. The on-site drainage will be designed to accommodate these flows. Drainage from the remainder of the south side of Woodmen Road will be contained within the street and channeled westward.

Some flows from Union Blvd. north of Woodmen Road and a portion of the development in the northwest corner of the intersection of Union Blvd. and Woodmen Road flow into an existing 18" RCP and cross under Woodmen Road onto this site. When the north side of Woodmen Road is improved in accordance with plans currently being prepared by the City, this drainage will be intercepted by the planned curb and gutter. As the flows at that point are well within the current drainage criteria limitations for street flow, we recommend that the existing 18" RCP be abandoned (it would have to be relaid deeper if it remained in service) and this flow carried on west as a part of that drainage system.

Drainage Design Criteria

The criteria as set forth in the City of Colorado Springs and El Paso County Drainage Criteria Manual was used exclusively for the preparation of this plan. As the site contains only 16.34 acres and the area of off-site runoff consisted of 11.1 acres, the Rational Method was used for this entire site. The criteria guidelines and requirements were followed strictly with the exception of using C & D soils instead of A & B soils because of fill introduced to the site in past years.

All streets, on and off-site, were evaluated for the 10 and 100-year storm runoffs and determined to be in accordance with the Drainage Criteria requirements or improvements made to ensure such compliance. As runoff is to be discharged directly into Cottonwood Creek, we feel, in concurrence with the requirements of the Design Criteria Manual, that

detention facilities should not be installed as a part of the proposed site improvements for any part of this property.

Drainage Facility Design

Off-site runoff quantities were calculated and drainage facilities designed to accommodate these flows were required in accordance with the attached Master Development Drainage Plan map and as previously referenced in this document. There are anticipated to be three (3) discharge points from the fully developed site. All will discharge directly into Cottonwood Creek. Drainage sub-basins and flow patterns are shown on the attached map.

All off-site and on-site flows are to be conveyed to Cottonwood Creek in one of three ways. These are: 1) sheet flow within individual sites, 2) gutter flow in streets and within the limits of the Drainage Criteria Manual, and 3) collection of flows by use of D-10-R inlets and transport by way of reinforced concrete pipe. All drainage facilities are directly accessible for maintenance by proposed paved roads.

The culvert conveying Cottonwood Creek under Union Blvd. consists of 7 cells of 6' x 12' RCB. The culverts and the entrance to the culverts appears to be sound and in good condition. The discharge end has received riprap rubble treatment in an attempt to stabilize it. This effort is somewhat effective for low flows, but it does not appear it would maintain its integrity during a major storm. In addition, the culvert has a capacity of approximately 5500 cfs which is 4348 cfs less than the current 100-year runoff projected by URS Engineers in their current study of the Cottonwood Creek Basin. Construction will be required on this culvert to bring it to the design capacity in the form of additional cells, adding to the height of some of the existing cells or removal of all cells and construction of a bridge. In any case, this work would be a capital improvements project and not the responsibility of this developer. Channel lining and check structures below the culvert and through this property would be the responsibility of this developer to construct. However, these improvements would be public and eligible for reimbursement.

The flood plain, as currently mapped by FEMA, does not affect this site except in the southeast corner. It is believed that this mapping is inaccurate and the appropriate submittals will be made to FEMA and COE to rectify this situation. However, until the creek passage under Union is brought up to capacity, the 100-year flood will continue to encroach on the drive at the southeast corner of this site.

Drainage Fees and Improvement Costs:

This site is located within the Cottonwood Creek drainage basin which has a per acre Drainage Fee of $3,633.00 and Bridge Fee of $220.00.

Drainage Fee:

16.34 Ac. @ $3,633.00/Ac.	=	$59,363.22

Bridge Fee:

16.34 Ac. @ $220.00/Ac.	=	3,594.80
TOTAL FEES		$62,958.02

Construction Cost Estimate:

1. Eligible Drainage Costs: (Public)

Item	Quantity	Unit Cost	Cost
18" RCP	745 LF	$ 26.00	$ 19,370.00
5' D-10-R Catch Basin	1 EA	1,750.00	1,750.00
Channel Improvements	LS	789,000.00	789,000.00*
Energy Dissipator	LS	900.00	900.00
4' Diameter Manhole	1 EA	1,000.00	1,000.00
Sub-Total Eligible Costs**			$ 812,020.00

*Includes bank protection and concrete and riprap drop structures in basic conformance with "Feasibility Study for Cottonwood Creek from West Side of Union Bridge to 1100 feet West" by Centennial Engineering, Inc., dated May, 1991.

2. Ineligible Drainage Costs: (Private)

Item	Quantity	Unit Cost	Cost
18" RCP	30 LF	$ 26.00	$ 780.00
21" RCP	60 LF	30.00	1,800.00
10' D-10-R Catch Basin	2 EA	2,500.00	5,000.00
15' D-10-R Catch Basin	1 EA	3,600.00	3,600.00
Energy Dissipator	3 EA	900.00	2,700.00
Total Ineligible Drainage Costs:			$13,880.00

Flood Plain:

This site is shown on FEMA Flood Insurance Rate Map, Panel No. 080059 0154C. Evaluation of this panel with our recent topographic survey indicates there is a discrepancy between the pictorial representation of the 100-year flood plain and that defined by the elevations shown at various sections on the panel. This may possibly be due to the filling that has occurred in past years. This issue will hopefully be resolved with the Cottonwood Creek Drainage Basin Planning Study currently being prepared by URS. The 100-year storm flow at this point on Cottonwood Creek per FEMA is 9187 cfs. That projected flow by URS for the preliminary detention scheme being considered at this time is 9848 cfs for fully developed conditions.

HYDRAULIC CALCS

Basin A-7 (Ex. inlet NW corner Union and Shrider)

Q_{10} = 5.03 cfs, Q_{100} = 8.65 cfs

Full curb height flow = 24.75 cfs
Therefore street good for 100-year flow

T_{10} = 11.1'

T_{100} = 13.79'

Inlet capture (6' length)

Qi/Qt = 0.33 capture rate (10-year)

Q_{10} = 5.03 (0.33) = 1.66 cfs ⇒ 3.37 cfs by-pass

Qi/Qt = 0.25 capture rate (100-year)

Q_{100} = 8.65 (0.25) = 2.16 cfs ⇒ 6.49 cfs by-pass

Part of existing storm sewer system in Union Blvd.

Basin A-4 (Ex. inlet NW corner of Union and Woodmen)

Q_{10} = 3.80 + 3.37 (By-pass from A-7) = 7.17 cfs

Q_{100} = 6.57 + 6.49 (By-pass from A-7) = 13.06

Full curb height flow = Q = 38.07 cfs

T_{10} at 7.17 cfs = 12.08'

T_{100} at 13.06 cfs = 15.32'

Inlet Capture

Q_{10} = 1.43 cfs ⇒ 5.74 cfs by-pass

5' length gives 0.20 Q_i/Q_t capture rate

Q_{100} = 2.35 cfs ⇒ 10.71 cfs by-pass

5' length gives 0.18 Q_i/Q_t capture rate

S = 0.04

Part of existing storm sewer system in Union Blvd.

Basin A-7 + A-4 + A-1

Q_{10} = 5.74 + 4.01 = 9.75 cfs

Q_{100} = 10.71 + 8.48 = 19.19 cfs

Full curb flow height = 27.85 cfs
Therefore street good for 100-year flow

T_{10} = 14.38' @ 9.75 cfs

T_{100} = 17.98' @ 19.19 cfs

Inlet capture (try 10' length)

For 10-year storm

10' length gives 0.52 $Qi/_{Qt}$ capture rate

Q_{10} = 9.75 (0.52) = 5.07 cfs ⇒ 4.68 cfs by-pass

For 100-year storm

10' length gives 0.28 $Qi/_{Qt}$ capture rate

Q_{100} = 19.19 (0.28) = 5.37 cfs ⇒ 13.82 cfs by-pass

S = 0.038

At proposed 10' inlet NE corner Woodmen Road and Cindy Place

Basin A-7 + A-4 + A-1 + A-2

Q_{10} = 5.69 + 4.68 = 10.37 cfs
Q_{100} = 11.86 + 13.82 = 25.68 cfs

Full curb flow height = 27.85 cfs
Therefore street good for 100-year storm

T_{10} at 10.37 cfs = 13.50'
T_{100} at 25.68 cfs = 20.11'

Inlet capture (use 10' length)
$Q_{10} = Qi/Qt = 0.51 \Rightarrow Q_i = 5.29$ cfs $\Rightarrow$ 5.08 cfs by-pass

$Q_{100} = Qi/Qt = 0.24 \Rightarrow Q_i = 6.16$ cfs $\Rightarrow$ 19.52 cfs by-pass

S = 0.038

At proposed 10' inlet north side of Woodmen Road between Cindy Place and Ruth Place.

Basin A-3 (new sump inlet west of east drive)

Q_{10} = 4.75
Q_{100} = 5.47

Full curb height flow = 26.08 cfs
Therefore 100-year flow contained

T_{10} at 4.75 cfs = 8.62'

T_{100} at 5.47 cfs = 9.15'

Try 5' sump inlet

Q_i = 8.0 cfs

8.0 cfs > 5.47 cfs

Therefore, use 5' sump inlet

Basin A-5

Q_{10} = 5.40 cfs

Q_{100} = 9.58 cfs

S = 0.0723

T_{10} = 9.53'

T_{100} = 12.05'

Full curb flow height = 16.64 cfs
Therefore street good for 100-year flow

Basin A-6

Q_{10} = 7.29 cfs

Q_{100} = 12.83 cfs

S = 0.01 (at 8' inlet)

T_{10} = 16.0'

T_{100} = 19.91

Inlet capture (existing 8' inlet)

For 10-year storm

8' length gives 0.50 Q_i/Q_t capture rate

Q_{10} = 7.29 (0.50) = 3.65 cfs ⇒ 3.65 cfs by-pass rate

For 100-year storm

8' length gives 0.36 Q_i/Q_t capture rate

Q_{100} = 12.83 (0.36) = 4.62 cfs ⇒ 8.21 cfs by-pass rate

Basins A-5 and A-6

Q_{10} = 9.05 cfs

Q_{100} = 17.79 cfs

Existing 8' inlet in place in sump condition

$$Q_i = 1.7\ (L_i+1.8W)(d_{max} + \frac{w}{12})^{1.85}$$

$$= 1.7(8 + 1.8[2])(1.0 + \frac{2}{12})^{1.85} = 26.23 \text{ cfs}$$

26.23 cfs $>$ 17.79 cfs, therefore existing facilities are adequate

Basin B-2

Q_{10} = 1.03 cfs

Q_{100} = 1.62 cfs

T_{max} = 27.33 cfs

Therefore no drainage facilities required.

Basins B-4 and B-5

Q_{10} = 7.11 cfs

Q_{100} = 12.87 cfs

T_{max} = 23.11 cfs

Therefore no drainage facilities required.

Basins B-2, B-3, B-4 and B-5

Q_{10} = 14.66 cfs

Q_{100} = 25.65 cfs

T_{max} = 27.36 cfs

Therefore no drainage facilities required.

Basins B-2, B-3, B-4, B-5 and B-6

Q_{10} = 17.75 cfs

Q_{100} = 30.79 cfs

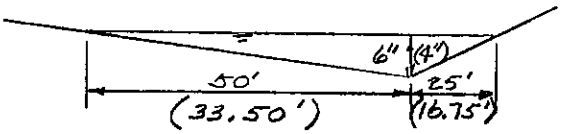
Last basin enters road at low point
(Elev. 95.3)
use cross pan

Locate inlet on south side of road

10' inlet capacity = 30.5 cfs $\approxeq$ 30.79 cfs w/d_{max} = 12'

Therefore use 10' inlet

Basin C-1



Total Capacity

$T = 75'$, $d = .5'$

$z = \frac{T}{d} = \frac{75}{.5} = 150$

$\frac{z}{n} = \frac{150}{0.016} = 9375$

$Q_{cap} = 80$ cfs @ 1.0% pan slope

Therefore, pan will convey Basin D-1 within limits of criteria.

Flow at 100-year storm

$T = 50.25$, $d = .33'$

$z = \frac{T}{d} = \frac{50.25}{.33} = 152.27'$

$\frac{z}{n} = \frac{152.27}{0.016} = 9517$

$Q = 26.5$ cfs @ 1% cross slope

$Q_{10} = 15.34$ cfs, $T = 11.35'$

$Q_{100} = 26.56$ cfs, $T = 13.81'$

T_{max} (15') carries 32.73 cfs

Therefore, no drainage facilities required.

$S = 0.07$

The cross section shown is a pan in the east-west road at the intersection in the northeast corner of Basin C-2.

Basins C-1 and C-2

Q_{10} = 25.34 cfs

All 10-year flow from Basin C-1 can be carried in west side of street and carried to this sump.

Q_{100} - 32.74 cfs

15' inlet w/d_{max} = 12" has capacity of 42.0 cfs

Therefore, use 15' inlet at low point behind grocery store.

10.20 cfs of 100-year storm from Basin C-1 will flow down east side of street and be carried to eastern most sump.

Basin D-1

Q_{10} = 12.11 cfs

Q_{100} = 31.27 cfs

Q_{100} (from Basin C-1) = 10.20 cfs (included above)

T_{max} on 1.0% road will carry 12.37 cfs

Therefore, no drainage facility required except inlet at sump.

10' inlet has sump capacity of 30.5 cfs

Therefore, use 10' sump inlet

MAJOR BASIN	SUB BASIN	AREA		BASIN		Tc Min.	I	SOIL GROUP	DEV. TYPE	C	FLOW Q	RETURN PERIOD
		PLANIMETER READING	Ac.	LENGTH	HEIGHT							
A	offsite A-1		3.46	887	80	26 / 22	2.9 / 4.9	C & D	Res-3	0.40 / 0.50	4.01 / 8.48	10 / 100
	offsite A-2		5.93	1460	110	36 / 32	2.4 / 4.0	C & D	Res-3	0.40 / 0.50	5.69 / 11.86	10 / 100
	offsite A-3		0.96	700	37	7 / 5	5.5 / 6.0	C & D	Street	0.90 / 0.95	4.75 / 5.47	10 / 100
	offsite A-4		0.96	1300	80	12 / 9	4.4 / 7.2	C & D	Street	0.90 / 0.95	3.80 / 6.57	10 / 100
	offsite A-7		1.30	1260	55	12 / 10	4.3 / 7.0	C & D	Street	0.90 / 0.95	5.03 / 8.65	10 / 100
	offsite A-5		1.20	940	68	8 / 6	5.0 / 8.4	C & D	Street	0.90 / 0.95	5.40 / 9.58	10 / 100
	offsite A-6		1.50	1637	91	7 / 5	5.4 / 9.0	C & D	Street	0.90 / 0.95	7.29 / 12.83	10 / 100
						/	/			/	/	/
B	offsite B-1		0.24	200	9	3 / 3	6.0 / 9.0	C & D	Street	0.90 / 0.95	1.30 / 2.05	10 / 100
	B-2		0.19	270	14	4 / 3	6.0 / 9.0	C & D	Street	0.90 / 0.95	1.03 / 1.62	10 / 100
	B-3		1.09	310	21	9.0 / 7.5	/	C & D	Com.	0.85 / 0.90	/	10 / 100
	B-4/B-5		2.20	640	25	8 / 7	4.9 / 8.1	C & D	Com.	0.85 / 0.90	9.16 / 16.04	10 / 100
			3.48	640	25	8 / 7	4.9 / 8.1	C & D	Com.	0.86 / 0.91	14.66 / 25.65	10 / 100
	B-6		1.38	430	18	4 / 3	/	C & D	Com.	0.75 / 0.80	/	10 / 100
			4.86	920	45	11 / 9	4.4 / 7.2	C & D	Com.	0.83 / 0.88	17.75 / 30.79	10 / 100
	B-7		0.36	480	28	18 / 14.5	3.6 / 6.0	C & D	Grass	0.30 / 0.45	0.39 / 0.97	10 / 100

HYDROLOGIC COMPUTATION – BASIC DATA
RATIONAL METHOD Q=CIA

PAGE ___ of ___

KLH Engineering Consultants, Inc.

PROJECT: _____

By: _____
Date: _____

MAJOR BASIN	SUB BASIN	AREA		BASIN		Tc Min.	I	SOIL GROUP	DEV. TYPE	C	FLOW Q	RETURN PERIOD
		PLANIMETER READING	Ac.	LENGTH	HEIGHT							
C	C-1		3.86	470	41	7 / 6	5.3 / 8.6	C & D	Com	0.75 / 0.80	15.34 / 26.56	10 / 100
	C-2		2.38	320	25	6 / 5.5	5.6 / 8.6	C & D	Com	0.75 / 0.80	10.0 / 16.37	10 / 100
D	D-1		3.22	580	24	9 / 7.5	4.7 / 7.7	C & D	Com.	0.80 / 0.85	12.11 / 21.07	10 / 100
EXIST. COND.			14.68	800	67	19 / 17	3.4 / 5.6	C & D	Undev	0.35 / 0.45	17.47 / 36.99	10 / 100

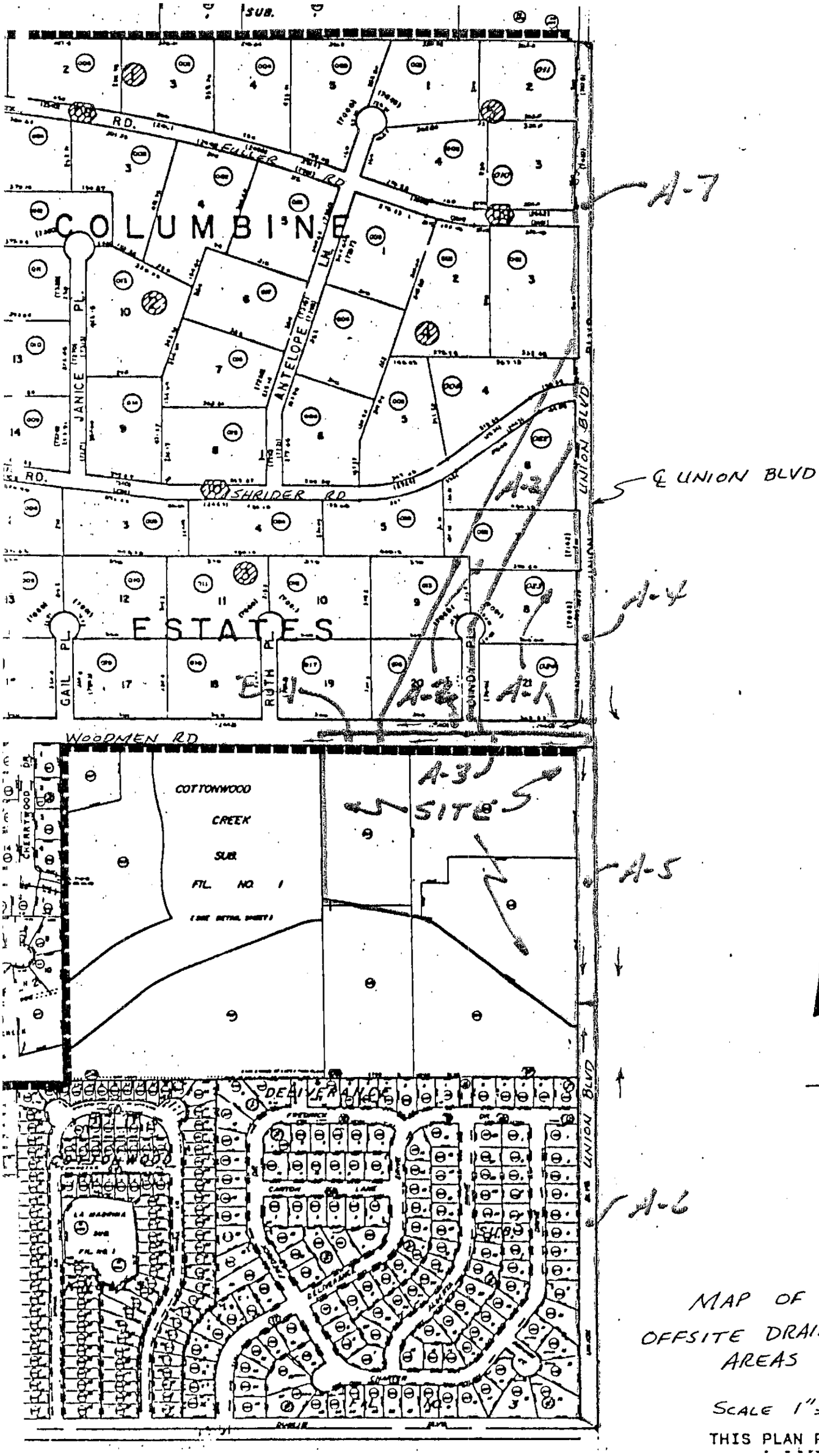
HYDROLOGIC COMPUTATION – BASIC DATA
RATIONAL METHOD Q=CIA

PAGE ___ of ___

KLH Engineering Consultants, Inc.
PROJECT: _____

By: _____
Date: _____

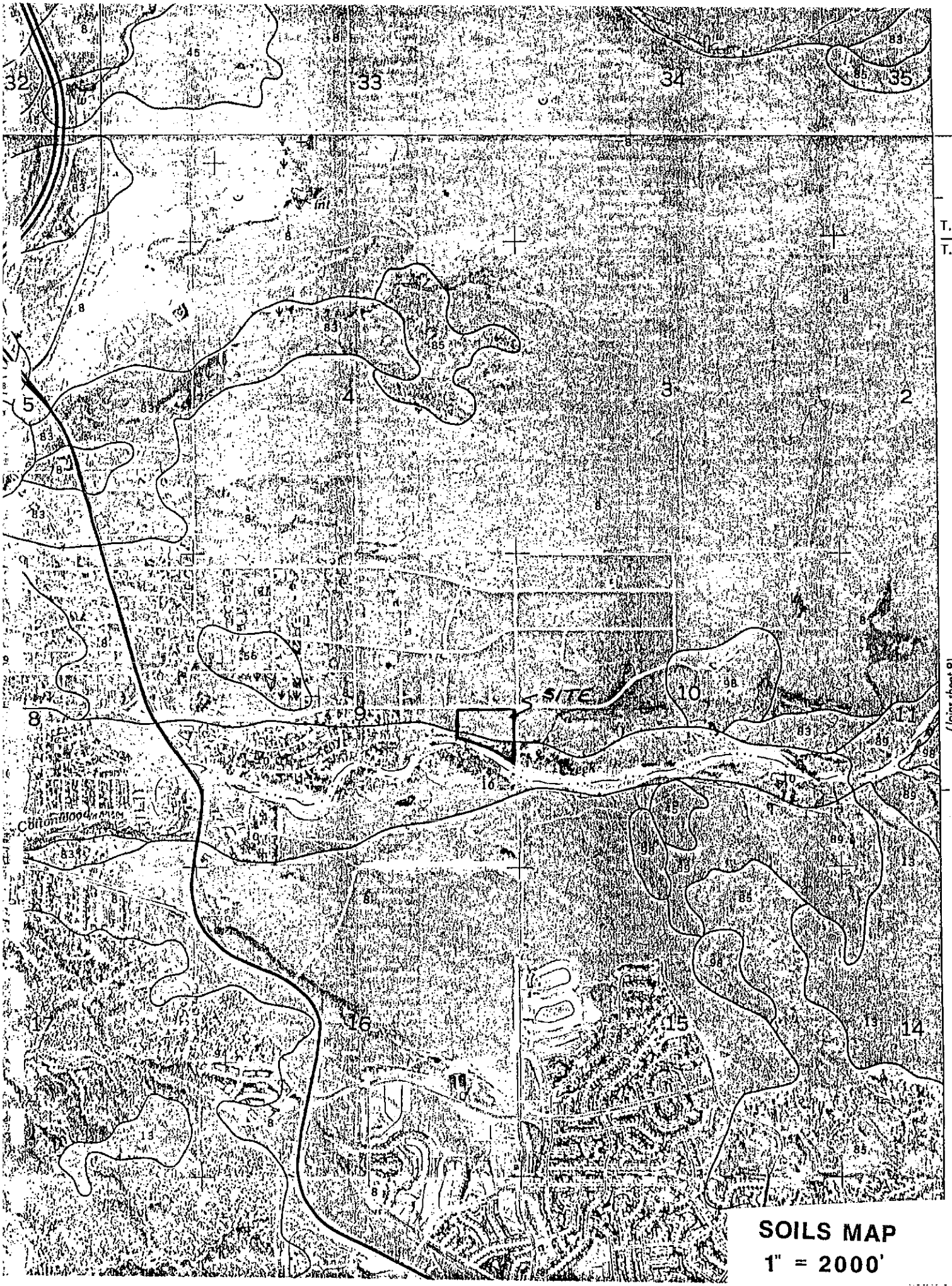

AQUEDUCT
Gravel
Park
Chapel Hill Mall
High Plains School
UNION BLVD
RAINWOOD DRIVE
AQUEDUCT
BELAIRGATE
Substa
BLVD
6767
6780
6600
6400
WOODMEN ROAD
Parking
Parking
Cottonwood Creek
DUBLIN BLVD
6566
6500
6700
Park
Rock Park
Pulpit Rock
6565
6622
VICKERS DRIVE
6598
6611
FLINTRIDGE DRIVE
COLORADO SPRINGS CORPORATE BOUNDARY
Austin Bluffs
Reservoir
LOCATION MAP
1" = 2000'



MAP OF OFFSITE DRAINAGE AREAS

SCALE 1" = 400'

THIS PLAN PREPARED



SOILS MAP
1" = 2000'

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
1	Alamosa loam, 1 to 3 percent slopes	2,440	0.2
2	Ascalon sandy loam, 1 to 3 percent slopes	30,470	2.4
3	Ascalon sandy loam, 3 to 9 percent slopes	28,740	2.3
4	Badland	3,720	0.3
5	Bijou loamy sand, 1 to 8 percent slopes	18,800	1.5
6	Bijou sandy loam, 1 to 3 percent slopes	14,910	1.2
7	Bijou sandy loam, 3 to 8 percent slopes	18,770	1.5
8	Blakeland loamy sand, 1 to 9 percent slopes	77,410	6.2
9	Blakeland complex, 1 to 9 percent slopes	6,560	0.5
10	Blendon sandy loam, 0 to 3 percent slopes	12,380	1.0
11	Bresser sandy loam, 0 to 3 percent slopes	25,670	2.0
12	Bresser sandy loam, 3 to 5 percent slopes	40,950	3.3
13	Bresser sandy loam, 5 to 9 percent slopes	6,530	0.5
14	Brussett loam, 1 to 3 percent slopes	1,080	0.1
15	Brussett loam, 3 to 5 percent slopes	4,570	0.4
16	Chaseville gravelly sandy loam, 1 to 8 percent slopes	4,130	0.3
17	Chaseville gravelly sandy loam, 8 to 40 percent slopes	1,720	0.1
18	Chaseville-Midway complex	5,170	0.4
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	26,380	2.1
20	Connerton-Rock outcrop complex, 8 to 90 percent slopes	4,500	0.4
21	Cruckton sandy loam, 1 to 9 percent slopes	1,790	0.1
22	Cushman loam, 1 to 5 percent slopes	5,640	0.4
23	Cushman loam, 5 to 15 percent slopes	4,060	0.3
24	Cushman-Kutch complex, 3 to 12 percent slopes	6,120	0.5
25	Elbeth sandy loam, 3 to 8 percent slopes	6,590	0.5
26	Elbeth sandy loam, 8 to 15 percent slopes	8,080	0.6
27	Elbeth-Pring complex, 5 to 30 percent slopes	2,870	0.2
28	Ellicott loamy coarse sand, 0 to 5 percent slopes	27,220	2.2
29	Fluvaquentic Haplaquolls, nearly level	4,130	0.3
30	Fort Collins loam, 0 to 3 percent slopes	11,090	0.9
31	Fort Collins loam, 3 to 8 percent slopes	8,120	0.6
32	Fortwingate-Rock outcrop complex, 15 to 60 percent slopes	4,160	0.3
33	Heldt clay loam, 0 to 3 percent slopes	6,760	0.5
34	Holderness loam, 1 to 5 percent slopes	1,260	0.1
35	Holderness loam, 5 to 8 percent slopes	740	0.1
36	Holderness loam, 8 to 15 percent slopes	810	0.1
37	Jarre gravelly sandy loam, 1 to 8 percent slopes	1,520	0.1
38	Jarre-Tecolote complex, 8 to 65 percent slopes	12,950	1.0
39	Keith silt loam, 0 to 3 percent slopes	5,380	0.4
40	Kettle gravelly loamy sand, 3 to 8 percent slopes	13,830	1.1
41	Kettle gravelly loamy sand, 8 to 40 percent slopes	23,600	1.9
42	Kettle-Rock outcrop complex	6,390	0.5
43	Kim loam, 1 to 8 percent slopes	3,860	0.3
44	Kutch clay loam, 3 to 5 percent slopes	2,810	0.2
45	Kutch clay loam, 5 to 20 percent slopes	2,030	0.2
46	Kutler-Broadmoor-Rock outcrop complex, 25 to 90 percent slopes	9,600	0.8
47	Limon clay, 0 to 3 percent slopes	10,110	0.8
48	Louviers silty clay loam, 3 to 18 percent slopes	2,540	0.2
49	Louviers cobbly clay loam, 5 to 40 percent slopes	610	(1)
50	Manvel loam, 3 to 9 percent slopes	1,420	0.1
51	Manzanola clay loam, 0 to 1 percent slopes	2,030	0.2
52	Manzanola clay loam, 1 to 3 percent slopes	8,080	0.6
53	Manzanola clay loam, 3 to 9 percent slopes	2,200	0.2
54	Midway clay loam, 3 to 25 percent slopes	8,660	0.7
55	Nederland cobbly sandy loam, 9 to 25 percent slopes	4,060	0.3
56	Nelson-Tassel fine sandy loams, 3 to 18 percent slopes	11,940	1.0
57	Neville fine sandy loam, 3 to 9 percent slopes	3,480	0.3
58	Neville-Rednun complex, 3 to 9 percent slopes	2,430	0.2
59	Nunn clay loam, 0 to 3 percent slopes	7,610	0.6
60	Olney sandy loam, 0 to 3 percent slopes	44,100	3.5
61	Olney sandy loam, 3 to 5 percent slopes	25,500	2.0
62	Olney and Vona soils, eroded	18,020	1.4
63	Paunsaugunt-Rock outcrop complex, 15 to 65 percent slopes	1,390	0.1
64	Penrose-Manvel complex, 3 to 45 percent slopes	3,180	0.3
65	Perrypark gravelly sandy loam, 3 to 9 percent slopes	980	0.1
66	Peyton sandy loam, 1 to 5 percent slopes	1,320	0.1
67	Peyton sandy loam, 5 to 9 percent slopes	5,740	0.5
68	Peyton-Pring complex, 3 to 8 percent slopes	17,210	1.4
69	Peyton-Pring complex, 8 to 15 percent slopes	12,850	1.0
70	Pits, gravel	140	(1)

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES

[Absence of an entry indicates the feature is not a concern. See "flooding" in Glossary for definition of terms as "rare," "brief," and "very brief." The symbol > means greater than]

Soil name and map symbol	Hydrologic group	Flooding			Bedrock		Potential frost action
		Frequency	Duration	Months	Depth	Hardness	
					In		
Alamosa: 1	C	Frequent	Brief	May-Jun	>60	---	High.
Ascalon: 2, 3	B	None	---	---	>60	---	Moderate.
Badland: 4	D	---	---	---	---	---	---
Bijou: 5, 6, 7	B	None	---	---	>60	---	Low.
Blakeland: 8	A	None	---	---	>60	---	Low.
[1]9: Blakeland part	A	None	---	---	>60	---	Low.
Fluvaquentic Haplaquolls part	D	Common	Very brief	Mar-Aug	>60	---	High.
Blendon: 10	B	None	---	---	>60	---	Moderate.
Bresser: 11, 12, 13	B	None	---	---	>60	---	Low.
Brussett: 14, 15	B	None	---	---	>60	---	Moderate.
Chaseville: 16, 17	A	None	---	---	>60	---	Low.
[1]18: Chaseville part	A	None	---	---	>60	---	Low.
Midway part	D	None	---	---	10-20	Rippable	Moderate.
Columbine: 19	A	None to rare	---	---	>60	---	Low.
Connerton: [1]20: Connerton part	B	None	---	---	>60	---	High.
Rock outcrop part	D	---	---	---	---	---	---
Cruckton: 21	B	None	---	---	>60	---	Moderate.
Cushman: 22, 23	C	None	---	---	20-40	Rippable	Moderate.
[1]24: Cushman part	C	None	---	---	20-40	Rippable	Moderate.
Kutch part	C	None	---	---	20-40	Rippable	Moderate.
Elbeth: 25, 26	B	None	---	---	>60	---	Moderate.
[1]27: Elbeth part	B	None	---	---	>60	---	Moderate.

See footnote at end of table.

TABLE 6-1

Allowable Use of Roads and Streets

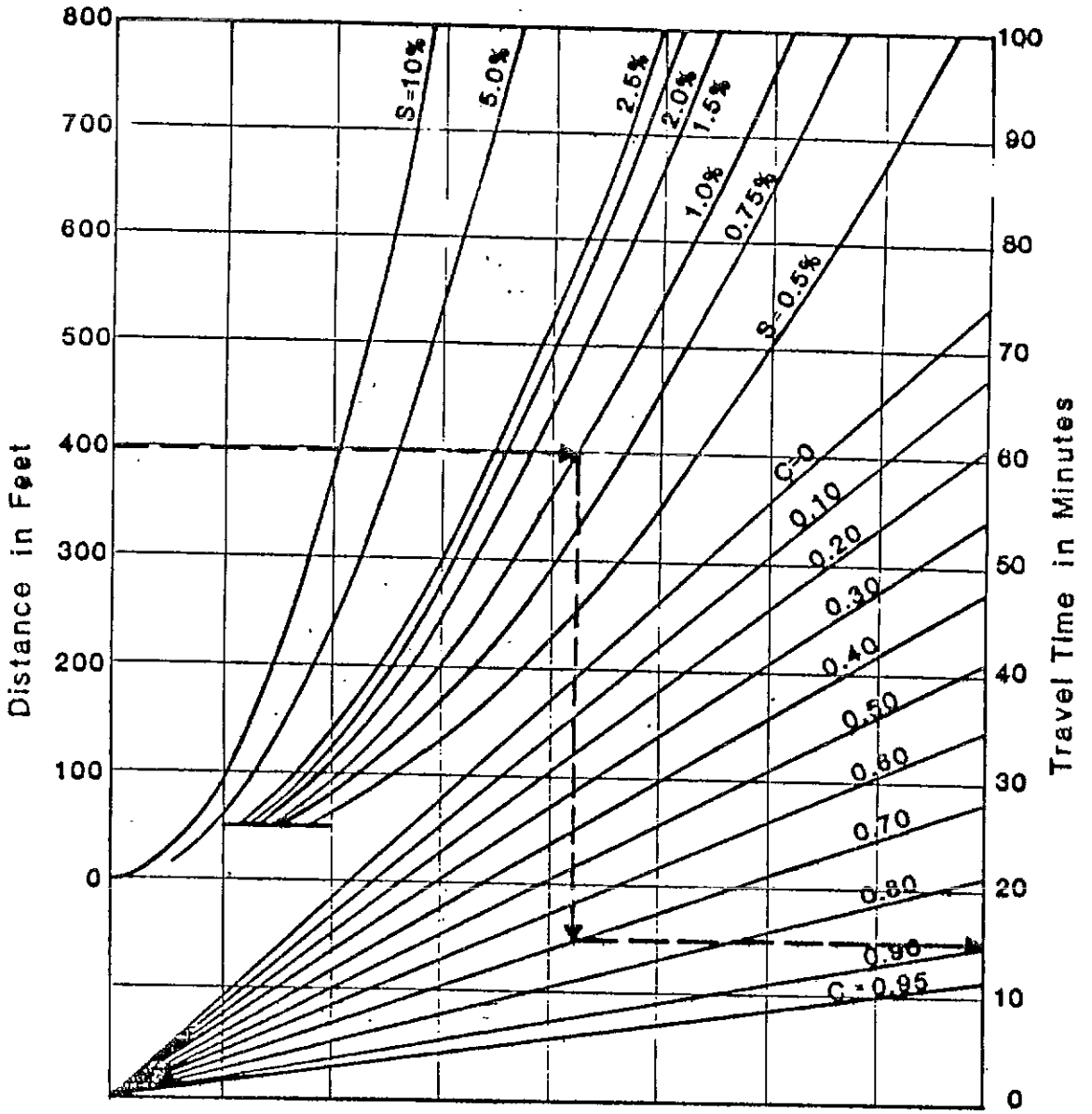
Street Classification	Use of Streets for Initial and Major Storms		Cross Flow In Streets For Initial and Major Storms	
	Initial Storm	Major Storm	Initial Storm	Major Storm
Hillside Residential (Less Than 32' F/C to F/C)	No curb overtopping, maximum street flow = 25 cfs, whichever is most limiting.	Same as Type A (Local/ Residential) below.	Same as Type A (Local/ Residential) below.	Same as Type A (Local/ Residential) below.
Type A (Local/Residential)	No curb overtopping, flow may spread to crown of street or top of curb, whichever is the most limiting.	Residential dwellings, public, commercial and industrial buildings shall not be inundated at the ground line. The depth of water at the gutter flow line shall not exceed 12 inches.	6 inches of depth in cross pan or gutter flow line	12 inches of depth at gutter flow line
Type A (Local with Roadside Ditch)	Flow must not encroach upon street shoulder area.	Residential dwellings, public, commercial and industrial buildings shall not be inundated at the ground line. The depth of flow shall not exceed 6 inches at the shoulder.	Requires culvert. Flow shall not encroach upon street shoulder.	Requires culvert, depth of flow shall not exceed 6 inches at the street shoulder.
Type B (Collector or Minor Arterial)	No curb overtopping. Flow spread must be limited to a maximum 20 foot spread from each curb face.	Same as Type A (Local/ Residential) above.	Where cross pans are allowed, depth of flow shall not exceed 6 inches at flow line	12 inches of depth at gutter flow line
Type B (Collector or Minor Arterial with Roadside Ditch)	Flow must not encroach upon street shoulder area.	Same as Type A (Local with Roadside Ditch) above.	Requires culvert. Flow shall not encroach upon street shoulder.	Requires culvert. Depth of flow shall not exceed 6 inches at the street shoulder.
Type C (Arterial)	No curb overtopping. Flow may encroach only onto one outside lane in each direction and must leave at least one 12 foot lane free of water in each direction.	Residential dwellings, public, commercial and industrial buildings shall not be inundated at the ground line. The depth of water shall not exceed 8 inches at the gutter flow line with no curb overtopping.	No allowable cross flow	No allowable cross flow
Type C (Arterial with Roadside Ditch)	Flow must not encroach upon street shoulder.	Residential dwellings, public, commercial and industrial buildings shall not be inundated at the ground line. Depth of flow shall not encroach upon street shoulder.	Requires culvert. Flow shall not encroach upon street shoulder.	Requires Culvert. Depth of flow shall not encroach upon street shoulder
Type D (Highway/Freeway)	No encroachment is allowed on any traffic lanes.	No encroachment on any traffic lanes.	No allowable cross flow	No allowable cross flow

TABLE 5-1

RECOMMENDED AVERAGE RUNOFF COEFFICIENTS AND PERCENT IMPERVIOUS

LAND USE OR SURFACE CHARACTERISTICS	PERCENT IMPERVIOUS	"C" FREQUENCY 10 A&B*	10 C&D*	100 A&B*	100 C&D*
Business					
Commercial Areas	95	0.90	0.90	0.90	0.90
Neighborhood Areas	70	0.75	0.75	0.80	0.80
Residential					
1/8 Acre or less	65	0.55	0.65	0.65	0.75
1/4 Acre	40	0.50	0.60	0.60	0.70
1/3 Acre	30	0.40	0.50	0.55	0.60
1/2 Acre	25	0.35	0.45	0.45	0.55
1 Acre	20	0.30	0.40	0.40	0.50
Industrial					
Light Areas	80	0.70	0.70	0.80	0.80
Heavy Areas	90	0.80	0.80	0.90	0.90
Parks and Cemeteries	7	0.30	0.35	0.55	0.60
Playgrounds	13	0.30	0.35	0.60	0.65
Railroad Yard Areas	40	0.50	0.55	0.60	0.65
Undeveloped Areas					
Historic Flow Analysis- Greenbelts, Agricultural	2	0.15	0.25	0.20	0.30
Pasture/Meadow	0	0.25	0.30	0.35	0.45
Forest	0	0.10	0.15	0.15	0.20
Exposed Rock	100	0.90	0.90	0.95	0.95
Offsite Flow Analysis (when land use not defined)	45	0.55	0.60	0.65	0.70
Streets					
Paved	100	0.90	0.90	0.95	0.95
Gravel	80	0.80	0.80	0.85	0.85
Drive and Walks	100	0.90	0.90	0.95	0.95
Roofs	90	0.90	0.90	0.95	0.95
Lawns	0	0.25	0.30	0.35	0.45

* Hydrologic Soil Group



REFERENCE : Wright - McLaughlin Engineers, Urban Storm Drainage Criteria Manual, Vol. 1, Denver Regional Council of Governments, Denver, Co. 1977

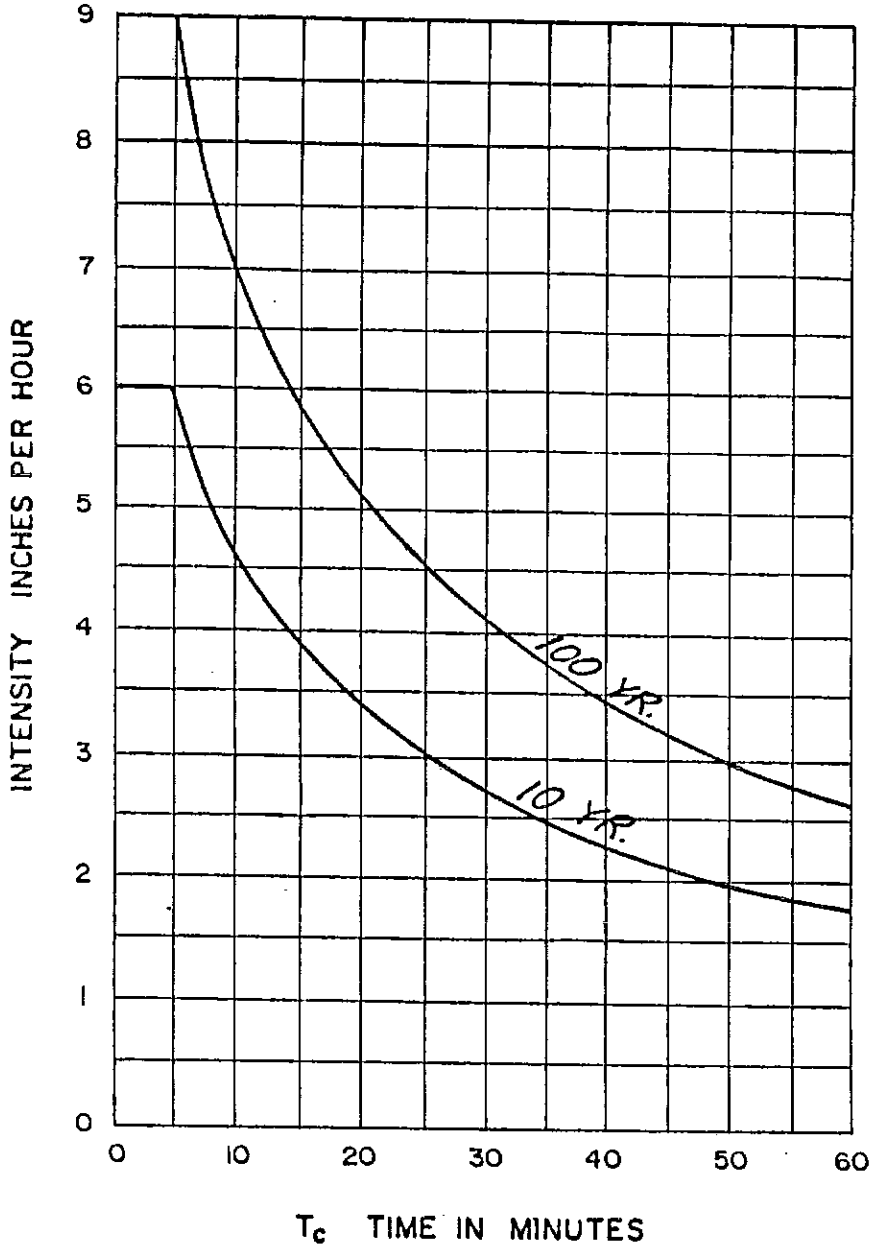
HDR Infrastructure, Inc.
A Centerra Company

The City of Colorado Springs / El Paso County
Drainage Criteria Manual

Overland Flow Curves

Date: OCT. 1987

Figure: 5-2



RE: Based upon Pikes Peak area council of governments/ areawide urban runoff control manual.

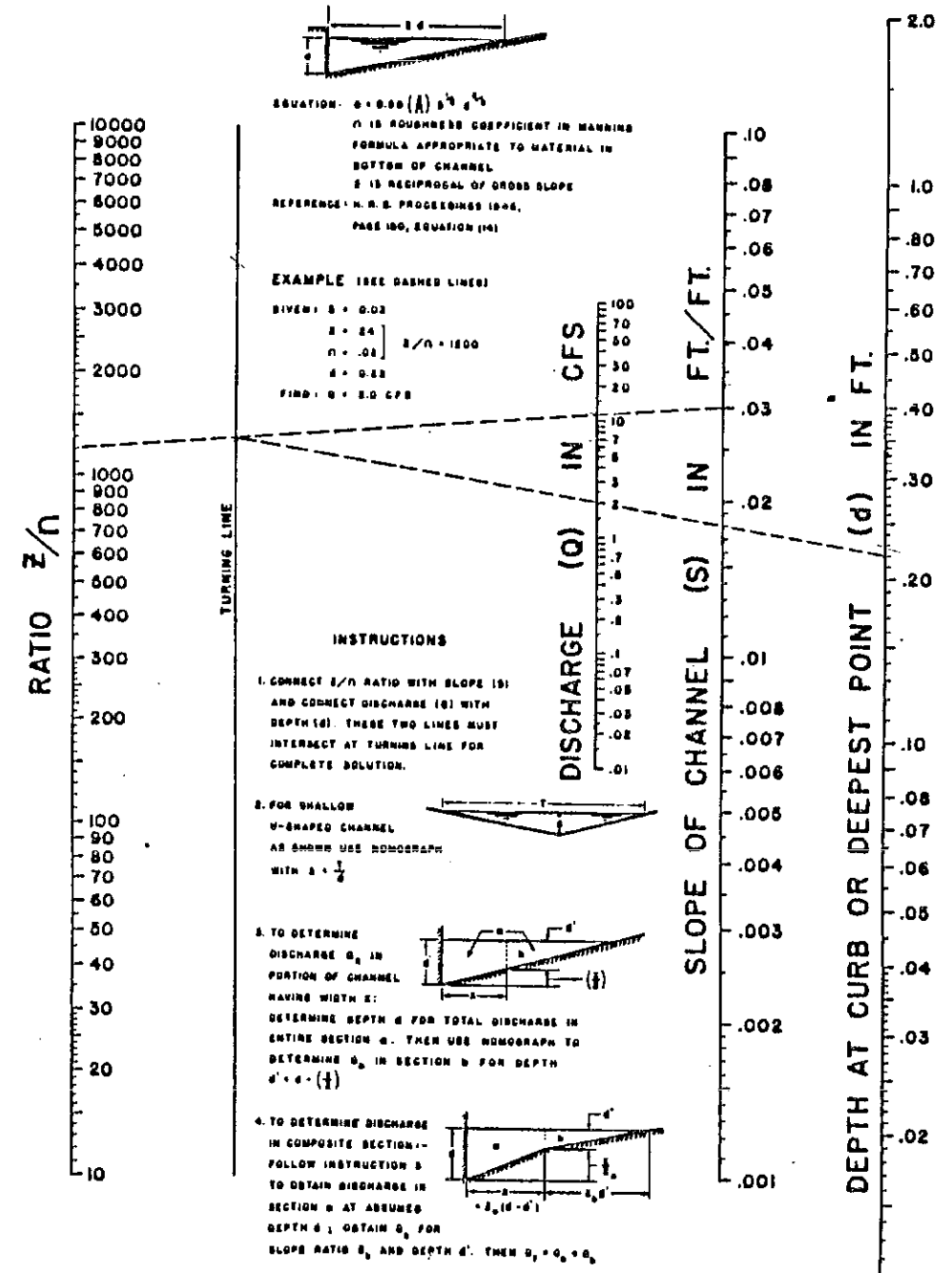
HDR Infrastructure, Inc.
A Centerra Company

The City of Colorado Springs / El Paso County
Drainage Criteria Manual

Storm Rainfall
Time Intensity-Frequency Curves

Date
OCT. 1987

Figure
5 - 1



11-15-68

Denver Regional Council of Governments

HDR Infrastructure, Inc.
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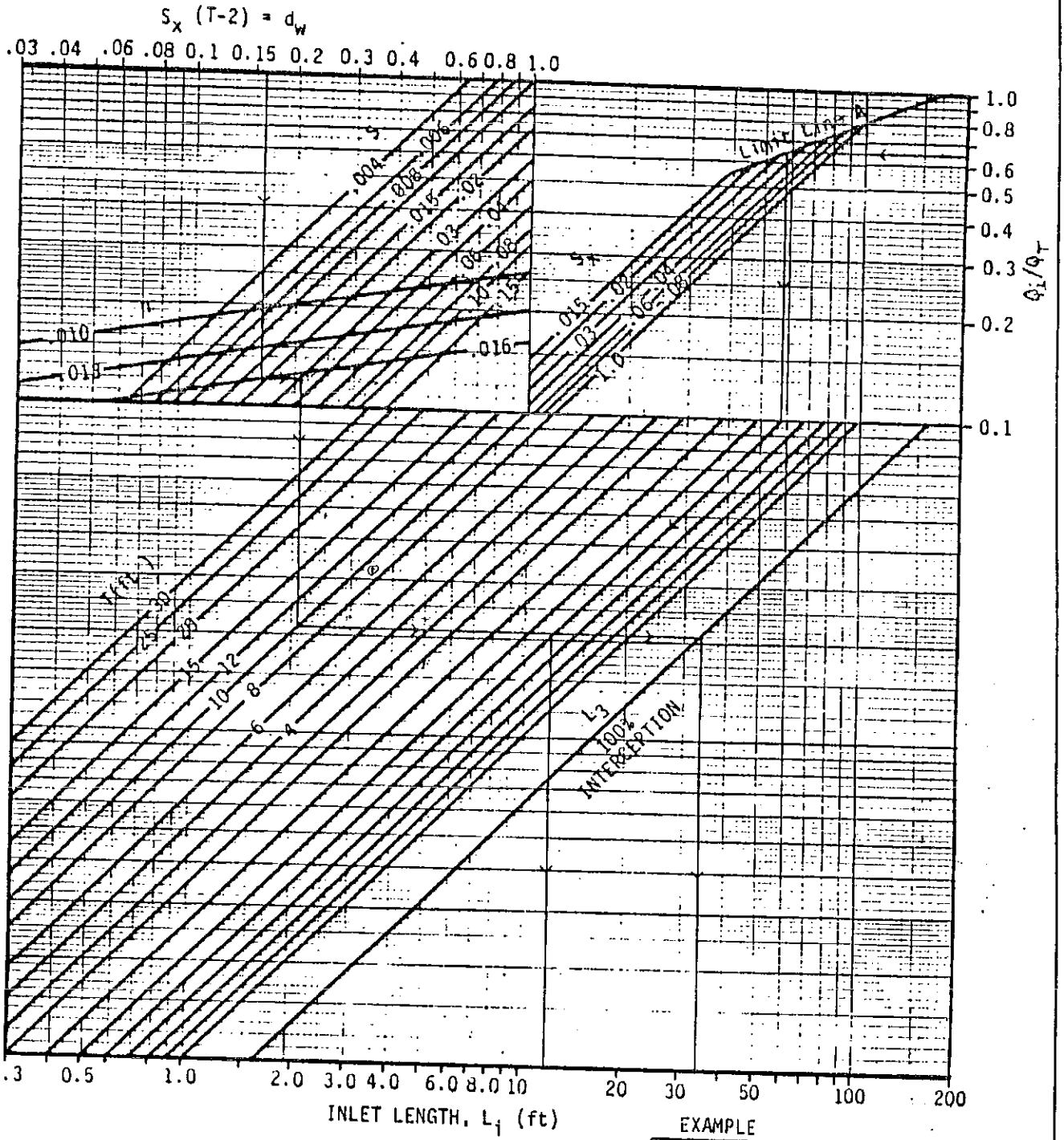
The City of Colorado Springs / El Paso County
Drainage Criteria Manual

NOMOGRAPH FOR FLOW IN TRIANGULAR GUTTERS.

Date: OCT. 1987

Figure: 7 - 2



This chart assumes, w=2 ft., a = 2" and h=6in.

REFERENCE :

Izzard, Carl. f., Report presented at the Annual Meeting of the National Transportation Board, January 1977; Simplified Method For Design of Curb-opening Inlets

EXAMPLE

Given — S_x = 0.02 ft/ft
T = 10 ft.
S = 0.03 ft/ft

Find — L_i = 11.8 ft L_i = 34 ft.
Q_i/Q= 0.65 Q_i/Q=1.0

Standard Curb-Opening Inlet Chart

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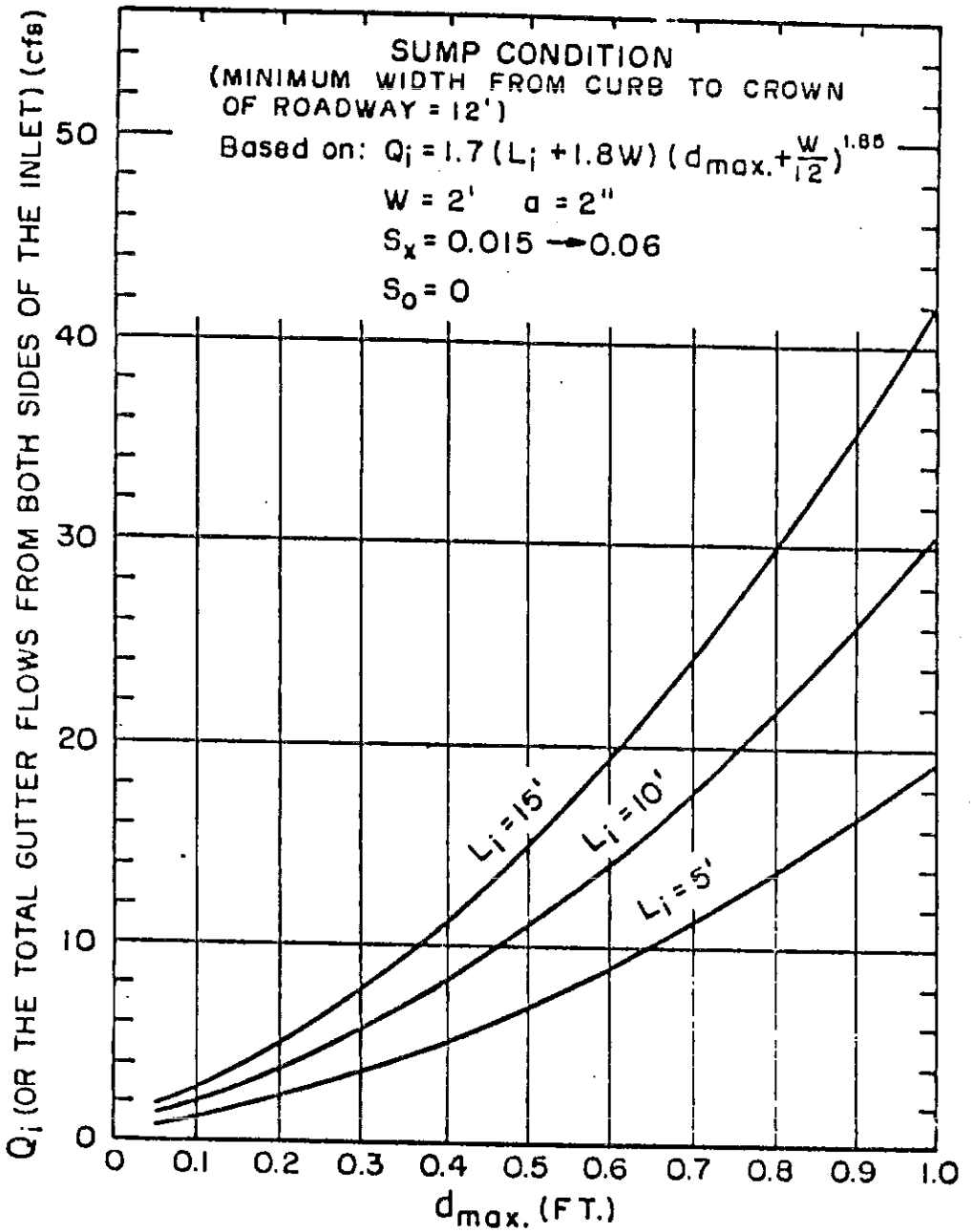
The City of Colorado Springs / El Paso County
Drainage Criteria Manual

Date
OCT. 1987

Figure
7 - 9



REFERENCE : Izzard, Carl. f., Report presented at the Annual Meeting of the National Transportation Board, January 1977; Simplified Method For Design of Curb-opening Inlets

Sump Capacity for Curb-opening Inlets

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The City of Colorado Springs / El Paso County
Drainage Criteria Manual

Date
OCT. 1987

Figure
7 - ~~11~~ 12

CENTENNIAL ENGINEERING INC

(719) 590-8999 FAX 1-719-590-1070
1935 JAMBOREE DRIVE, SUITE 202 • COLORADO SPRINGS, COLORADO 80920

May 9, 1991

Mr. Jack Hood
First National Bank of Colorado Springs
P.O. Box 1699
Colorado Springs, CO 80942

RE: Woodmen Meadows
Cottonwood Creek Improvements Feasibility Study

Dear Mr. Hood:

CEI is pleased to submit the attached feasibility study for your consideration. The main purpose of the study is to discuss the preliminary design that has already been accomplished for the Cottonwood Creek channel improvements from the west side of Union Blvd to approximately 1100 ft downstream. This section of channel is adjacent to the southern boundary of the Woodmen Meadows tract. This study also includes an updated quantity/cost estimate and a discussion of several design issues that have not been resolved yet and therefore will probably affect the final design of the proposed channel improvements.

As we have discussed, I have worked on this project since it's inception. It has been through several owners, as well as several engineering firms. I am excited to see that the site may be developed in the near future.

If after your review of the report, you have any questions, please do not hesitate to call. If we can be of service in the design of the final drainage facilities, we would be pleased to submit a formal proposal for those services.

Respectfully submitted,

CENTENNIAL ENGINEERING, INC.

Kenneth C. Harrison, P.E.

KCH:jd

Enclosure

FEASIBILITY STUDY
FOR
COTTONWOOD CREEK
FROM
WEST SIDE OF UNION BRIDGE TO 1100 FT. WEST

PREPARED FOR
FIRST NATIONAL BANK OF COLORADO SPRINGS

PREPARED BY
CENTENNIAL ENGINEERING, INC.
1935 JAMBOREE DRIVE
COLORADO SPRINGS, COLORADO

CEI PROJECT NO.

MAY 1991

TABLE OF CONTENTS

I. Report Progress

The purpose of this report is to review the following:

- current status of the design of the channel improvements
- unresolved design issues
- quantity/cost estimate for the preliminary design based on current unit prices
- summary of various discussions with the City of Colorado Springs
- recommendations regarding future activities

The main purpose of this report is to review what has transpired regarding the design of the improvements required for Cottonwood Creek from the downstream end of the Union Blvd. bridge to approximately 1100 ft. downstream. This section of channel is adjacent to and south of the Woodmen Meadows project.

II. Current Project Status

A. Design Status

A preliminary design was prepared and reviewed by the City of Colorado Springs in March of 1988. Final design has never been completed due to financial problems encountered by the developer. The preliminary design included the following design elements:

- Concrete directional vanes were located at the downstream end of the existing bridge. These were required in order to direct the flow away from the southerly channel bank.

- A concrete baffle chute drop structure was located approximately 250 ft. downstream of the existing bridge. The structure was required in order to safely drop the design flow from the bridge elevation to the proposed channel flow line elevation. This elevation difference is approximately 12 ft.

- Two riprap drop structures were located downstream of the concrete drop structure. These structures were required in order to maintain stable subcritical flow in the channel.

- A gravel maintenance road was located along the south side of the channel. This was required by the City of Colorado Springs so that the channel could be accessed for future maintenance.

- A temporary concrete structure was designed in order to protect the existing channel from erosion should the Union Bridge be "overtopped".

The preliminary design was prepared using the hydrology presented in the "Engineering Study of Cottonwood Creek Drainage Basin, Colorado Springs, Colorado," Lincoln Devore, August, 1979. A design flow of 9400 cfs was used.

A major design issue concerning the limited capacity of the Union Bridge to handle to design flow remains unresolved. Currently, the structure can only accommodate a portion of the flow. The remainder of the flow overtops the road and enters the Woodmen Meadows project at the existing curb cut located across from Woodland Hills Drive.

At the time of the preliminary design review, the City of Colorado Springs had no plans to replace the undersized bridge. To replace this bridge would require the relocation of a 20 inch and 42 inch waterline located in Union Blvd.

B. Preliminary Drainage Report

A preliminary drainage report and plan has already been submitted to and reviewed by the City of Colorado Springs. This report was prepared by United Planning & Engineering in March of 1988.

C. Permits

An Army Corp. of Engineers Nationwide 404 Permit was prepared, reviewed, and granted for the project. However, it has currently expired due to the time that has lapsed since its issuance.

D. Final Design and Drainage Report

No progress was made for these items due to financial difficulties encountered by the owner which halted progress on the project.

E. Anticipated Changes to Preliminary Design

Changes to the preliminary design are anticipated due to changes in the City of Colorado Springs drainage criteria and due to new requirements defined in the recent Cottonwood Creek Master Drainage Basin Planning Study, This study is currently being prepared by URS Consultants. The following changes are anticipated:

- re-analysis of the existing flow and water surface profile at the bridge due to a reduction in the historical flow.

- re-analysis of the Union Bridge overflow. Replacement of this bridge has been classified as a City of Colorado Springs Capital Improvements Project. Therefore, the overflow will be a temporary condition until such time that the existing structure is replaced.

- re-analysis of the proposed concrete drop structure in order to accommodate the future bridge replacement.

- minimal changes to the channel downstream of the concrete drop structure are anticipated since the developed flow specified in the Cottonwood Creek re-study (9348 cfs) is not significantly different from that which was used in the original design.

III. Design Focus

A. Union Blvd Bridge over Cottonwood Creek

The existing bridge consists of seven 6 ft. by 12 ft. reinforced concrete box culverts. The boxes will only accommodate approximately 5700 cfs. The remainder of the flow overtops Union Blvd., travels east through the Woodmen Meadows project and re-enters Cottonwood Creek over the existing bank. During a fully developed 100 year event the overflow has the potential of causing considerable damage due to bank erosion and the undermining of existing structures.

Based on conversations with the City of Colorado Springs, the Union Bridge replacement is considered a Capital Improvements Project. However, there is no timetable for the replacement.

Any design of downstream facilities will have to accommodate future improvements proposed for the bridge.

B. Channel Right-Of-Way

It appears that additional Right-Of-Way will be required in order to accommodate the proposed improvements. It also appears that the centerline of the existing right-of-way does not coincide with the centerline of the proposed channel.

C. Utility Entanglements

There are several water lines and utility lines under the existing bridge. Relocation of these utilities will be required when the Union Bridge is replaced by the City of Colorado Springs. Since this replacement is a City of Colorado Springs capital improvements project, it is anticipated that the developer of Woodmen Meadows will not be required to relocate these lines.

D. Geotechnical Investigation

Currently no geotechnical investigation along the channel bottom has been performed. It is anticipated that bedrock is close to the existing channel flowline. Should this be the case, construction costs could be reduced due to a reduction in the amount of riprap required for each sloping riprap drop structure.

E. Maintenance Road Requirements

It is anticipated that a gravel maintenance road will be required. The preliminary design plans show the road located along the south side of the channel.

F. Construction Phasing

It is anticipated that the drop structure and directional vanes immediately downstream of the exiting bridge will have to be constructed during the initial phase. It is also anticipated that whatever improvements are constructed along the channel bank adjacent to the Woodmen Meadows project will have to be duplicated along the south side as well. This is required in order for the channel to function hydraulically as designed.

G. FEMA Involvement

A Letter of Map Revision will be required upon completion of the channel improvements since the existing 100 year Base Flood Elevation will be substantially affected. However, based on conversations with the City of Colorado Springs, it is anticipated that this will be accomplished by the City of Colorado Springs upon completion of the Cottonwood Creek Drainage Basin Re-Study.

Due to the overtopping of Union Blvd., the 100 year floodplain and floodway leaves the existing channel banks and traverses across the southeast corner of the Woodmen Meadows project. Building construction in this zone will be severely limited until such time that the bridge is replaced and the floodplain and floodway are confined to within the channel banks.

H. Army Corp of Engineers (ACOE) 404 Permit

It is anticipated that minimal additional involvement with the ACOE will be required since a 404 Permit has been previously granted. However, even though a 404 Permit has been granted in the past, there is no guarantee that a similar one will be issued in the future. However, due to the project constraints both upstream and downstream and due to the minimal impact on existing wetland areas, it is anticipated that obtaining a permit will not be a major issue.

IV. Channel Cost Estimate

The attached cost estimate is based on the preliminary design that was prepared by United Planning and Engineering in March of 1988. The cost estimate is based on the channel improvement only and does not include the following:

- structures (i.e. retaining walls, piles, etc.) adjacent to the channel to accommodate the Woodmen Meadows development or grading plans.

- modifications to the existing bridge.

- earthwork outside the channel right-of-way to accommodate channel improvements

- rock excavation

- easement or Right-Of-Way acquisition

- mobilization costs for phased construction

Changes to the cost estimate are expected due to the following reasons:

- modification to the design of the outfall concrete drop structure.

- modifications to the proposed sloping riprap drop structures

- modifications to the temporary overflow structure design (if required).

- professional services fees for design and coordination.

iminary Cost Estimate
onwood Creek Improvements from Union Blvd. to 1200' West
: May 8, 1991
Centennial Engineering Corp.
ect No.: 1036.00, (Cottonwd.wk1)

Description	Approx Quant	Unit	Unit Price	Total Price
Channel Construction				
Unclassified Excavation	45500	CY	$1.50	$68,250.00
Riprap - 12" D50	4270	CY	$23.00	$98,210.00
Riprap - 18" D50	1060	CY	$23.00	$24,380.00
Type II Granular Bedding - 8"	1650	CY	$18.00	$29,700.00
Filter Fabric	7350	SY	$1.00	$7,350.00
Concrete Drop Structure				
Select Fill	13350	CY	$3.00	$40,050.00
Concrete - Directional Vanes	160	CY	$225.00	$36,000.00
Concrete - Baffle Chute	550	CY	$225.00	$123,750.00
Guardrail	260	LF	$15.00	$3,900.00
Sloping Riprap Drop Structure (*1)				
Concrete CUt-off Walls (4)	110	CY	$225.00	$24,750.00
Grouted Riprap - 36" D50	2175	CY	$65.00	$141,375.00
Riprap - 18" D50	1756	CY	$23.00	$40,388.00
Riprap - 9" D50	725	CY	$23.00	$16,675.00
Type II Granular Bedding - 8"	900	CY	$18.00	$16,200.00
Filter Fabric	4000	SY	$1.00	$4,000.00
Union Bridge Overflow (*2)				
Concrete Slab	190	CY	$200.00	$38,000.00
Concrete Cut-off Walls	20	CY	$225.00	$4,500.00
Sub-total				$717,478.00
Contingencies (10%)				$71,522.00
Grand Total				$789,000.00

uantities may change upon geotechnical investigation regarding location of bedrock.
uantity may change upon final analysis of overflow structure.
uantities are based on preliminary design only.
rand total does not include fees for professional services.

V. Summary and Recommendations

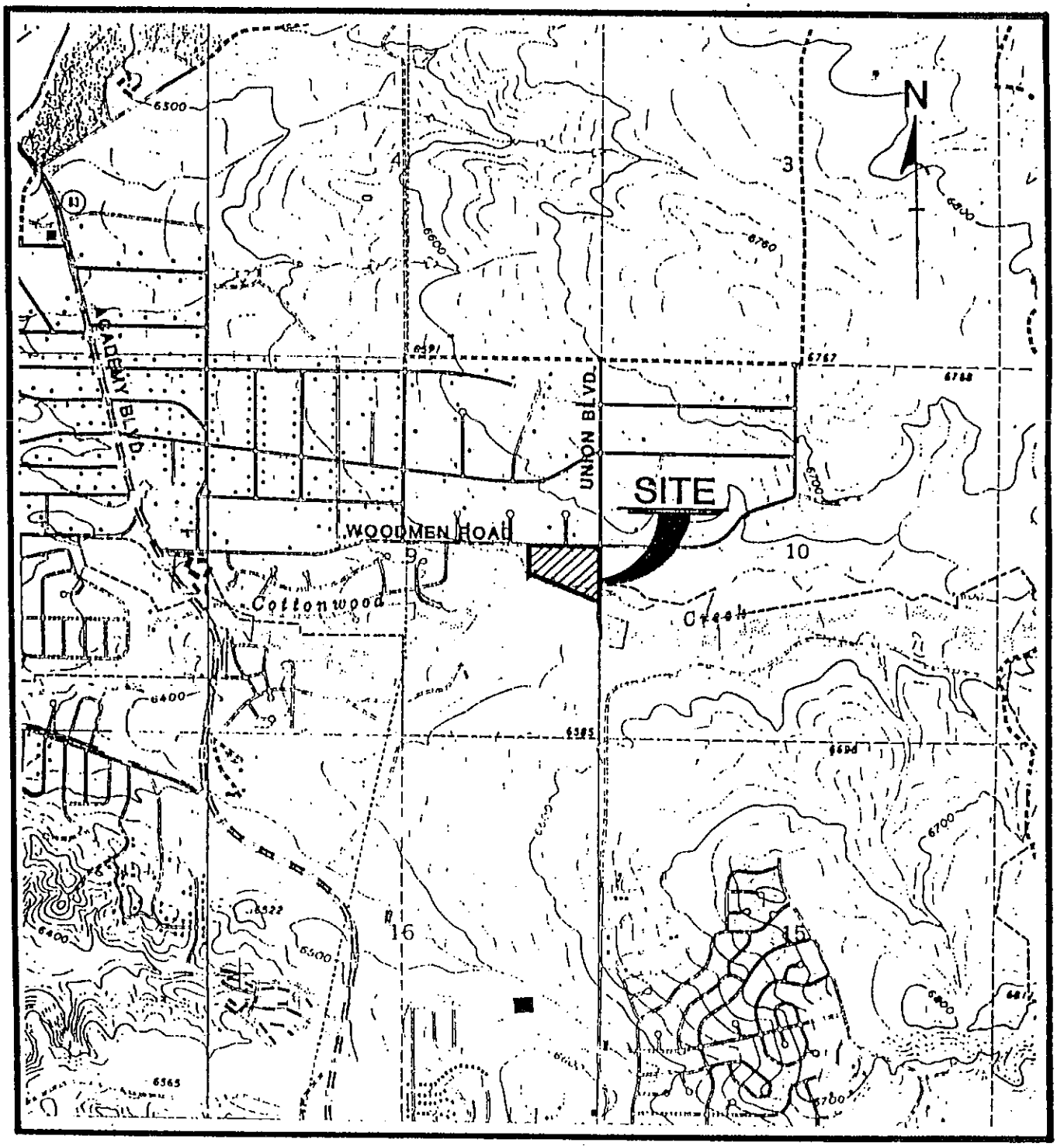
This report is based on information obtained from the preliminary design prepared in March of 1988. Since that time several changes have occurred in the drainage criteria and the Cottonwood Creek Drainage Basin which will affect the final design of the channel improvements. However, minimal changes are anticipated since the design flow has not changed significantly.

The following is a list of recommendations should it be decided to move forward with the project:

- Perform a geotechnical investigation of the channel bottom and channel banks.
- Obtain a topo map for the channel reach.
- Coordinate with the City of Colorado Springs regarding future plans for the replacement of Union Bridge.
- Coordinate with the City of Colorado Springs regarding the new developed and historic flows at the Union Bridge crossing.
- Prepare a revised set of preliminary plans for the channel improvements and a preliminary drainage report for submittal and review by the City of Colorado Springs.
- Coordinate with ACOE regarding obtaining a Nationwide 404 Permit. This activity should be started as early as possible due to the time involved in obtaining the permit.
- Evaluate the preliminary design with respect to the proposed development plans with regards to grading, structure requirements, maintenance road considerations, and floodplain encroachment.
- Evaluate the preliminary design with respect to additional right-of-way acquisition.
- Prepare final plans, specifications and final drainage report.

This report is meant to be informative, reviewing the remaining design issues and project status. It is not meant to be exhaustive in its coverage of the project. Therefore, it is anticipated that additional issues will arise throughout the course of the project.

EAST CREEK DEVELOPMENT

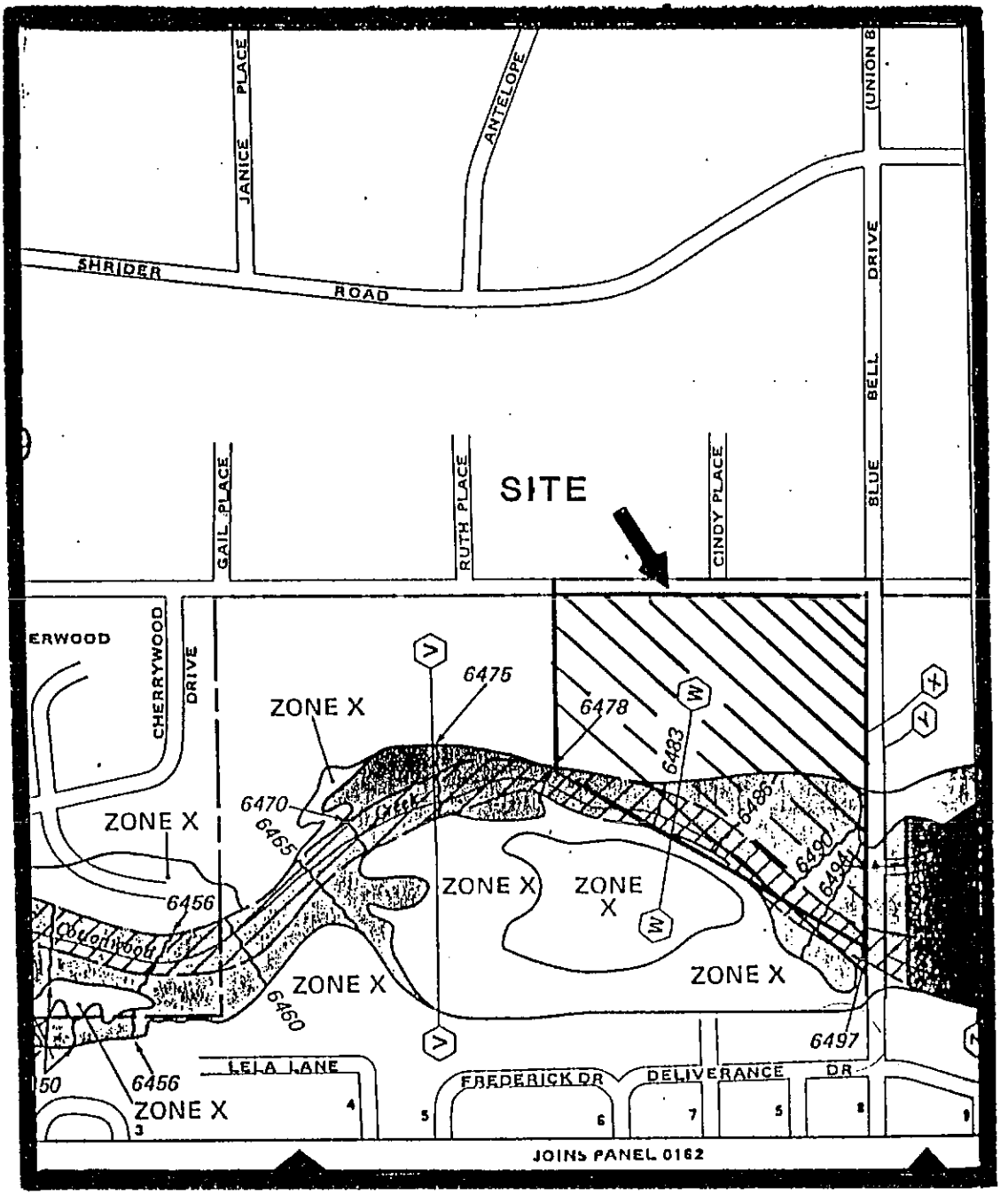


VICINITY MAP

SCALE 1"=2000'

PIKEVIEW QUAD
SECTION 9
T 13 S, R 66 W

FIGURE 1



FEMA FLOOD PLAIN MAP

FIGURE 2