MASTER DEVELOPMENT DRAINAGE PLAN

FOR

CREEKSIDE ESTATES

November, 1993

Job No. 8535.00

Prepared For:

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Prepared By:

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MASTER DEVELOPMENT DRAINAGE PLAN
CREEKSIDE ESTATES

DRAINAGE REPORT STATEMENT

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 any negligent acts, errors, or omissions on my part in preparing this report.

COLORADO REGISTERED JOSEPH W DESJARDIN 24207 PROFESSIONAL ENGINEER

Joseph W. DesJardin, Colorado P.E. #24207
For and On Behalf of JR Engineering, LLC

12.22.93
Date

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

Business Name: Creekside Venture, L.L.C.

By: Raymond F. O'Sullivan 12-20-93
Raymond O'Sullivan

Title: Manager

Address: 1405 N. Potter, Ste. 103
Colorado Springs, Co 80909

CITY OF COLORADO SPRINGS ONLY:
Filed in accordance with Section 15-3-906 of the Code of the City of Colorado Springs, 1980, as amended.

City Engineer

1/7/94
Date

Conditions:

MASTER DEVELOPMENT DRAINAGE PLAN
CREEKSIDE ESTATES

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MASTER DEVELOPMENT DRAINAGE PLAN

CREEKSIDE ESTATES

November, 1993

PURPOSE:

The purpose of this Master Development Drainage Plan is to identify major drainageways, ponding/detention facilities, and locations of drainage facilities/areas tributary to a proposed development. This report analyzes routing for developed flows and the ability of downstream facilities to convey developed runoff from the proposed developments and tributary areas.

GENERAL DESCRIPTION:

Creekside Estates proposed development contains approximately 60 acres. It is located between Lexington Drive and Otero Avenue along Old Ranch Road. This subdivision is divided into two areas. Approximately 20 acres north and adjacent to Old Ranch Road and approximately 40 acres south and adjacent to Old Ranch Road. Tributary areas covered in this study include the following:

- Approximately 60 acres east of the proposed subdivision and south of Old Ranch Road.
- Approximately 10 acres east of the proposed subdivision and north of Old Ranch Road.

Total area covered in this study is.....

- Approximately 101 acres south of Old Ranch Road.
- Approximately 30 acres north of Old Ranch Road.

For further information regarding tributary areas, please reference the enclosed Drainage Map and Land Use Summaries.

As of this writing, there is no "Drainage Basin Planning Study" in place for Kettle Creek. To obtain approval for the proposed development of Creekside Estates an understanding was reached with the City of Colorado Springs Engineering Division and El Paso County Department of Public Works where the basin occupied by Creekside Estates and tributary areas, which historically discharge to Kettle Creek, should be analyzed within this M.D.D.P. The areas studied within this M.D.D.P constitute a small portion of the total area which would be studied within a D.P.B.S. for Kettle Creek. A preliminary analysis of this tributary Kettle Creek Drainage Basin has been prepared by JR Engineering, Ltd., which shows the location, historic flows, and approximate size of the drainage basin occupied by Creekside Estates. This drainage basin is referred to as Basin "C" in this report. The analysis and location of Basin "C" are included within this M.D.D.P. as exhibit "C", (a drainage map,) and Appendix I.E., (a H.E.C-1 computer analysis of historic runoff).

SOIL TYPE:

Soil type information was obtained from the S.C.S. "Soil Survey of El Paso County Area, Colorado." That report indicates the study area has portions of Stapleton-Bernal sandy loams, Truckton sandy loams, and Truckton-Blakeland complex. Composition and hydrologic soil groups associated with the above soil groups are as follows:

Stapleton-Bernal: (25% of Total)	60% Stapleton Soil 40% Bernal Soil	Group 'B' Group 'D'
Truckton: (25% of Total)	100% Truckton Soil	Group 'B'
Truckton-Blakeland: (50% of Total)	60% Truckton Soil 25% Blakeland Soil 15% Miscellaneous	Group 'B' Group 'A'

For this report, hydrologic soil group 'A/B' will be used.

HYDROLOGIC CRITERIA/CHARACTERISTICS:

The methodology and hydrologic basin characteristics used in this report conform with standards as set forth in the "City of Colorado Springs and County of El Paso Drainage Criteria Manual."

Runoff flows for storm sewer facilities were calculated using the Rational Method. Design storms are of 24-hour duration with recurrence intervals of 10 years and 100 years. Basin hydrologic characteristics are detailed later in this report. See also Basin Summaries and Land Use Summaries, Appendices 1A and 1B.

Some basins defined within this study have no preliminary layouts for interior streets or building designs. The only controls available are the approximate property lines, land use designations, existing terrain, and adjacent Pine Creek Basin limits.

BASIN OUTFALLS:

Historic runoff patterns indicate two outfalls to Kettle Creek within the study area. One north of the existing bridge in Old Ranch Road and another south of this bridge. Areas south of Old Ranch Road, Basins 1 and 2, and a portion of Basins 7 and 10 are collected within an existing graded ditch adjacent to and flowing west along the south side of Old Ranch Road. Basins 4 and 5, and a portion of Basin 6 collect within an existing natural channel which begins at a low point in Lexington Drive and join the above mentioned basins flowing westerly along Old Ranch Road to cross underneath the road within an existing 36" C.M.P. These flows then combine with runoff from Basins 8, 9, 15, and 16 to discharge into the outfall north of the existing bridge within Old Ranch Road. Historic runoff from a portion of Basin 6 and Basins 11, 12, 13, and 14 sheet flow to two wide channels which discharge to an existing pond which in turn discharges to Kettle Creek via an existing 24" C.M.P.

From H.E.C.-1 analysis of historic flows, the following discharges occur at the north and south outfalls into Kettle Creek:

North Outfall - 100-yr event runoff of **130 c.f.s.**

South Outfall - 100-yr. event runoff of **73 c.f.s.**

Old Ranch Road has been classified as a minor arterial with an 84' R.O.W. With future improvements to this road, curb and gutter will collect flows which historically have been carried within graded ditches along the sides of the road.

BASIN SUMMARY:

SOUTH OUTFALL

Developed flows from Basin 1, Q_{10}=19 c.f.s and Q_{100}=34 c.f.s @ T_c=27.9 minutes, can be collected with a 10' sump inlet. This runoff can be routed to an 8' on-grade inlet

located along the south curbline of Old Ranch Road where runoff from Basin 2, Q_{10}=6 c.f.s and Q_{100}=10 c.f.s. @ T_c=5.8 minutes, can be totally intercepted. The storm sewer runoff can then be routed north across Old Ranch Road to an 8' on-grade inlet located along the north curbline of Old Ranch Road where runoff from Basin 3, Q_{10}=5 c.f.s. and Q_{100}=8 c.f.s. @ T_c=5.8 minutes, can be totally intercepted. This runoff, combined with runoff from Basins 1 and 2, can then be routed north to a proposed pond north of Old Ranch Road via storm sewer. This will represent the ultimate build-out of Basins 1 through 3. Improvements at the intersection of Lexington Drive and Old Ranch Road would include removal of the existing 36" C.M.P. which channels current flows from Basins 1 and 2 underneath Lexington Drive west into the graded ditch along Lexington Drive. Please note, the existing 36" C.M.P. currently does not function due to significant sedimentation within the pipe and flows are historically shown to cross Old Ranch Road and flow to the north.

A portion of runoff from Basin No. 4, Q_{10}=14 and Q_{100}=14 c.f.s., must be intercepted on site within an 8' sump inlet. This runoff can then be channeled via 18" storm sewer to the sump location within Lexington Drive where the remaining runoff from Basin 4 and runoff from Basin 5 will collect within a pair of 14' sump curb inlets located on each side of Lexington Drive. Improvements at this location will include removal of an existing grated inlet and 24" C.M.P. Future development with Basin No. 6 will require interception of this discharge with a storm sewer system to prevent further erosion within the natural existing stream channel. The intercepted runoff can be routed to an 18' sump inlet where developed runoff from Basin 6, Q_{10}=31 c.f.s. and Q_{100}=57 c.f.s. @ T_c=19.4 minutes, can be collected. This runoff can be routed via storm sewer north towards Old Ranch Road where it can combine with developed runoff from Basin 7, Q_{10}=4 c.f.s and Q_{100}=8 c.f.s. @ T_c=16.0 minutes, collected within an 8' on-grade inlet. This developed runoff can then be routed via storm sewer westerly within Old Ranch Road to a 20' on-grade inlet within the south curbline of Old Ranch Road which can intercept Q_{10}=11 c.f.s and Q_{100}=16 c.f.s. @ T_c=15.0 minutes from Basin 10A, and a 20' on-grade curb inlet within the north curbline of Old Ranch Road which can intercept Q_{10}=14 c.f.s. and Q_{100}=21c.f.s. at T_c=15.9 minutes from Basins 8 and 9A. This collected runoff can then be routed within storm sewer west to a 20' at grade inlet which can collect a portion of the remaining runoff within the south curbline of Old Ranch Road, (flowby from the upstream 20' inlet and Basin 10B, of Q_{10}=9 c.f.s. and Q_{100}=14 c.f.s. @ T_c=16.8 minutes) and a 20' at grade inlet to collect remaining runoff within the north curbline of Old Ranch Road, (flowby from the upstream 20' inlet and Basin 9B, of Q_{10}=10 c.f.s. and Q_{100}=18 c.f.s.). Note, developed runoff within the north curbline of Q_{10}=2 and Q_{100}=8 c.f.s. will flowby to the existing rip-rap outlet adjacent to the bridge, and developed runoff within the south curbline of Q_{10}=2 and Q_{100}=5 c.f.s. to the existing C.M.P. culvert inlet. Collected runoff within Old Ranch Road can then be routed southerly to the existing Kettle Creek outfall.

Developed runoff from Basin 11, Q_{10}=18 c.f.s and Q_{100}=33 c.f.s.@ T_c=14.1 minutes, can be collected within a 10' sump inlet. This runoff can be routed north via storm sewer to a 4' sump inlet which can collect Q_{10}=4 c.f.s and Q_{100}=8 c.f.s @ T_c=14.7 minutes from Basin 12. The developed runoff can then be routed north via storm sewer and discharged to the existing natural channel which in turn discharges into the existing south Kettle Creek outfall.

Developed runoff from Basin 13 can be partially collected with two 8' on-grade inlets, Q_{10}=12 c.f.s and Q_{100}=17 c.f.s @ T_c=17.9 minutes, and the resulting flowby routed west to a 4' sump curb inlet where Q_{10}=7 c.f.s. and Q_{100}=17 c.f.s @ T_c=17.9 minutes can be collected. This collected runoff can then be routed south via storm sewer to the existing south Kettle Creek outfall.

The following developed runoff will be discharged at the south outfall into Kettle Creek:

Total Area	= 95.7 Acres
Time of Concentration	= 21.1 minutes
CA_{10}	= 49.03
CA_{100}	= 56.83
I_{10} = 3.4, I_{100}	= 5.1
Q_{10} = 167 c.f.s, Q_{100}	= 290 c.f.s

NORTH OUTFALL

Developed runoff from Basin 15 can be collected within two 10' sump curb inlets, Q_{10}=31 c.f.s and Q_{100}=56 c.f.s @ T_c=11.5 minutes. This collected runoff can be routed via storm sewer west to the existing stream which will collect runoff, from the natural ground, within Basin 16.

The following runoff will be discharged at the north outfall into Kettle Creek:

Total Area	= 17.4 Acres
Time of Concentration	= 15.0 minutes
CA_{10}	= 8.02
CA_{100}	= 9.59
I_{10} = 4.0, I_{100}	= 6.0
Q_{10} = 32 c.f.s, Q_{100}	= 58 c.f.s

SUMMARY/CONCLUSIONS

Runoff from historic and developed flows are summarized as follows:

NORTH OUTFALL (North of the existing bridge within Old Ranch Road)

Historic Runoff.....Q_{100}=130 c.f.s

Developed Runoff.....Q_{100}=58 c.f.s

SOUTH OUTFALL (South of the existing bridge within Old Ranch Road)

Historic Runoff.....Q_{100}=73 c.f.s

Developed Runoff.....Q_{100}=290 c.f.s

Developed runoff discharged to the existing northerly outfall is significantly less than runoff which has historically discharged to Kettle Creek; therefore, the developed runoff can be discharged directly to Kettle Creek provided adequate erosion control measures are in place.

Developed runoff discharged to the existing southerly outfall will be greater than runoff which historically discharged to Kettle Creek. The amount of runoff greater than historic, 217 c.f.s., will have to be detained and released at the historic rate of 73 c.f.s. peak discharge. Dual release of Q_{10} and Q_{100} flows must also be accounted for.

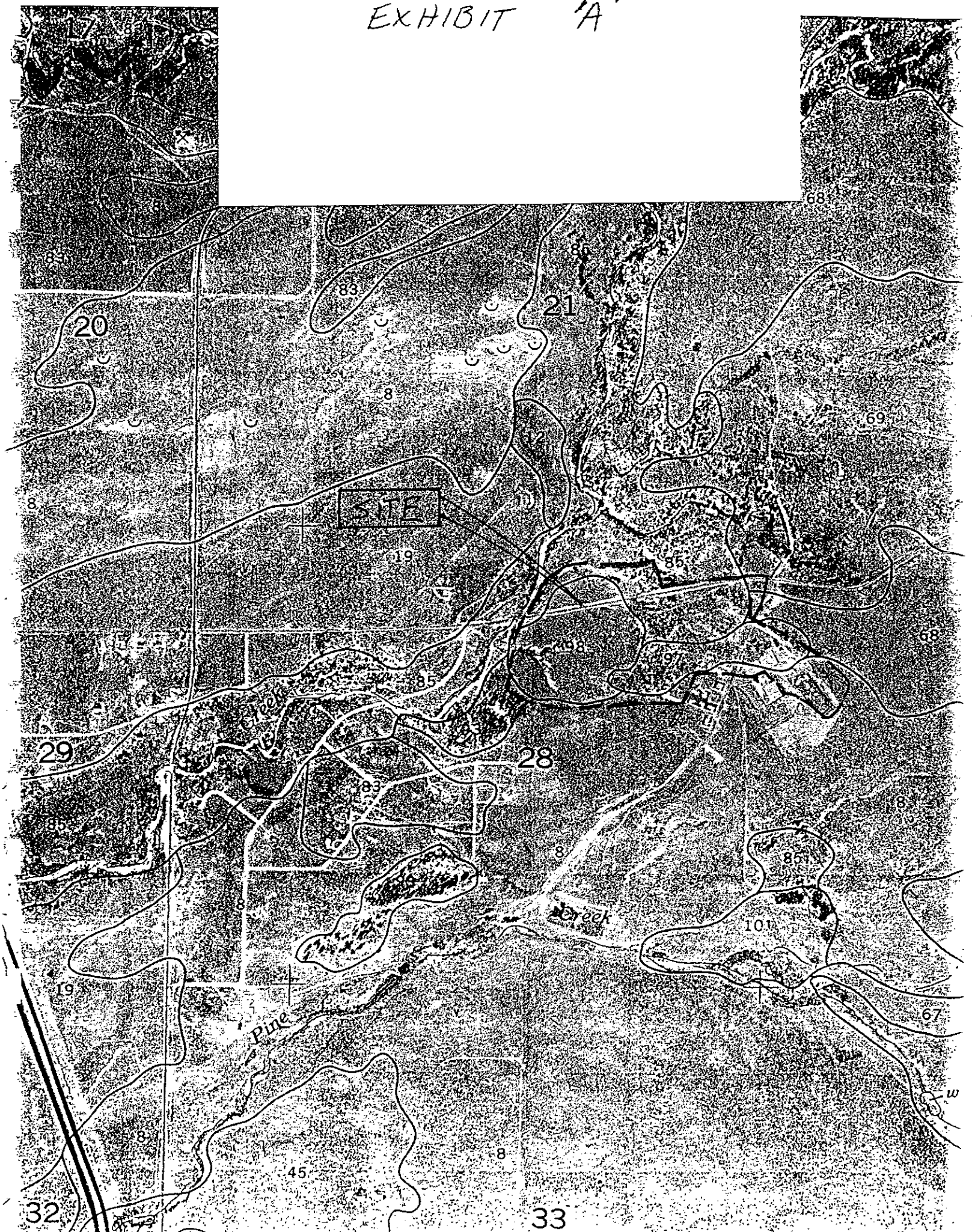
There are two options for the location of a detention pond south of Old Ranch Road. One option is to utilize the existing pond located directly west of proposed Creekside Estates. This existing pond would require upgrades to account for low flows, release of Q_{10} and Q_{100} flows, stability analysis of the existing dam structure and public drainage easements. The other option would be to construct a pond at the westerly property line of proposed Creekside Estates and detain the flows within Creekside Estates.

Development adjacent to Kettle Creek will require rip-rap bank stabilization. The location and extent of these improvements will be detailed within the Preliminary and Final Drainage Reports prior to platting of those properties.

EXHIBIT A

SOIL MAP (S.C.S. SURVEY)

EXHIBIT 'A'



APPENDICES

APPENDIX I.A

LAND USE SUMMARY

CREEK SIDE ESTATES - M.D.D.P.

BASIN	LAND USE	C(10)	C(100)
1	SINGLE FAMILY / PARK	0.45	0.55
2	MINOR ARTERIAL / LANDSCAPING	0.60	0.65
3	MINOR ARTERIAL	0.90	0.95
4	SINGLE FAMILY (LIGHT - MEDIUM)	0.55	0.65
5	SCHOOL / LANDSCAPING	0.50	0.65
6	1/4 ACRE LOTS	0.50	0.60
7	1/4 ACRE LOTS	0.50	0.60
8	1/4 ACRE LOTS	0.50	0.60
9A	MINOR ARTERIAL / LANDSCAPING	0.70	0.80
9B	MINOR ARTERIAL / LANDSCAPING	0.70	0.80
10A	MINOR ARTERIAL / LANDSCAPING	0.65	0.70
10B	MINOR ARTERIAL / LANDSCAPING	0.65	0.70
11	1/6 ACRE LOTS	0.53	0.63
12	1/6 ACRE LOTS	0.53	0.63
13	1/6 ACRE LOTS	0.53	0.63
14	OPEN SPACE / NATURAL GROUND	0.30	0.35
15	1/4 ACRE LOTS	0.50	0.60
16	NATURAL GROUND / BACKYARDS	0.30	0.35

WEIGHTED 'C' FOR BASIN 5 - PORTION OF SCHOOL SITE
C(10) = (1.85/6.45)(0.90) + (4.6/6.45)(0.30) = 0.47 SAY 0.50
C(100)= (1.85/6.45)(0.90) + (4.6/6.45)(0.55) = 0.65

WEIGHTED 'C' FOR BASIN 1 - PARK / RESIDENTIAL
C(10) = (3.4/14.2)(0.30) + (10.8/14.2)(0.50) = 0.45
C(100)= (3.4/14.2)(0.35) + (10.8/14.2)(0.60) = 0.55

WEIGHTED 'C' FOR BASIN 2 - MINOR ARTERIAL / LANDSCAPING
C(10) = (0.9/1.8)(0.90) + (0.9/1.8)(0.25) = 0.60
C(100)= (0.9/1.8)(0.95) + (0.9/1.8)(0.35) = 0.65

WEIGHTED 'C' FOR BASIN NO. 9A & 9B - INCLUDES BACKYARDS, SLOPES, STREET SECTIONS AND LANDSCAPING FOR NORTHERLY HALF OF O.R.R.
C(10) = (2.8/5.6)(0.50) + (2.8/5.6)(0.90) = 0.70
C(100)= (2.8/5.6)(0.60) + (2.8/5.6)(0.95) = 0.78 SAY 0.80

WEIGHTED 'C' FOR BASIN NO. 10A & 10B - INCLUDES BACKYARDS, SLOPES, STREET SECTIONS AND LANDSCAPING FOR SOUTHERLY HALF OF O.R.R.
C(10) = (5.9/8.7)(0.50) + (2.8/8.7)(0.90) = 0.63 SAY 0.65
C(100)= (5.9/8.7)(0.60) + (2.8/8.7)(0.95) = 0.71 SAY 0.70

APPENDIX	I.B

- BASIN SUMMARY / CREEKSIDE ESTATES / M.D.D.P. -

BASIN	AREA (Ac)	C(10)	C(100)	OVER LAND HEIGHT (ft.)	OVER LAND LENGTH (ft.)	Tc (min.)	STREET FLOW SLOPE (ft./ft.)	STREET FLOW LENGTH (ft.)	Tc (min.)	TOTAL Tc (min.)	I(10) (in./hr.)	I(100) (in./hr.)	Q(10) (c.f.s.)	Q(100) (c.f.s.)
1	14.2	0.45	0.55	12	500	25.1	0.0280	1000	2.8	27.9	2.9	4.4	19	34
2	1.8	0.60	0.65	-	-	-	0.0250	950	2.9	5.0	5.8	8.8	6	10
3	0.9	0.90	0.95	-	-	-	0.0250	950	2.9	5.0	5.8	8.8	5	8
4	14.9	0.55	0.65	14	320	11.3	-	-	-	11.3	4.4	6.7	36	65
5	6.5	0.50	0.65	16	300	11.2	-	-	-	11.2	4.5	6.7	14	28
6	17.8	0.50	0.60	4	180	16.4	0.0600 0.0200	620 540	1.2 1.8	19.4	3.5	5.3	31	57
7	2.3	0.50	0.60	0.75	75	13.8	0.0400 0.0800 0.0400 0.0100	75 200 160 280	0.2 0.3 0.4 1.3	16.0	3.9	5.8	4	8
8	6.4	0.50	0.60	2	100	12.6	0.0500 0.0250 0.0100	400 300 100	0.9 0.9 0.5	14.9	4.0	6.0	13	23
9A	3.3	0.70	0.80	1	50	8.9	0.0200 0.0550	300 1380	1.0 2.8	12.8	4.2	6.4	10	17
10A	5.8	0.65	0.70	2	100	12.6	0.0300 0.0550	300 750	0.8 1.5	15.0	4.0	6.0	15	24
9B	2.3	0.70	0.80	-	-	12.8	0.0550 0.0400 0.0250	800 250 100	1.6 0.6 0.3	15.3	3.9	5.9	6	11
10B	2.9	0.65	0.70	-	-	15.0	0.0550 0.0400 0.0250	450 250 100	0.9 0.6 0.3	16.8	3.8	5.7	7	12

(CONT.)

APPENDIX	I.B

- BASIN SUMMARY / CREEKSIDE ESTATES / M.D.D.P. -

BASIN	AREA (Ac)	C(10)	C(100)	OVER LAND HEIGHT (ft.)	OVER LAND LENGTH (ft.)	Tc (min.)	STREET FLOW SLOPE (ft./ft.)	STREET FLOW LENGTH (ft.)	Tc (min.)	TOTAL Tc (min.)	I(10) (in./hr.)	I(100) (in./hr.)	Q(10) (c.f.s.)	Q(100) (c.f.s.)
11	8.5	0.53	0.63	2	100	12.6	0.0200	430	1.4	14.1	4.1	6.1	18	33
12	2.1	0.53	0.63	2	100	12.6	0.0200 0.0400	430 250	1.4 0.6	14.7	4.0	6.0	4	8
13	14.6	0.53	0.63	2	100	12.6	0.0600 0.0200 0.0300 0.0600 0.0100	100 350 350 810 290	0.2 1.2 1.0 1.6 1.4	17.9	3.7	5.5	28	51
14	8.3	0.30	0.35	40 30	370 280	9.8 8.6	-	-	-	18.4	3.6	5.5	9	16
15	14.0	0.50	0.60	2	100	8.9	0.0600 0.0300	950 280	1.8 0.8	11.5	4.4	6.7	31	56
16	3.4	0.30	0.35	10 10	230 75	10.5 4.1	-	-	-	14.6	4.0	6.1	4	7

TOTAL CONTRIBUTION TO NORTHERLY OUTFALL (17.4 Acres)

CA(10) = 8.02 T(c) = 12.0 min.
CA(100)= 9.59

TOTAL CONTRIBUTION TO SOUTHERLY OUTFALL (95.7 Acres)

CA(10) = 49.03 T(c) = 21.1 min.
CA(100)= 56.83

APPENDIX	I.C

SURFACE ROUTING

CONTRIBUTING BASINS	CA(10) (Ac)	CA(100) (Ac)	TRAVEL Tc (min.)	BASIN Tc (min.)	TOTAL CONCENTRATION TIME	I(10) (in./hr.)	I(100) (in./hr.)	Q(10) (c.f.s.)	Q(100) (c.f.s.)
1	6.39	7.81	-	25.1	25.1	3.1	4.7	20	36
---- SIZE AN 8' SUMP INLET.									
2	1.08	1.17	-	5.0	5	5.8	8.8	6	10
---- SIZE AN 8' AT GRADE INLET. NO FLOWBY.									
3	0.81	0.86	-	5.0	5	5.8	8.8	5	8
---- SIZE AN 8' AT GRADE INLET. NO FLOWBY.									
POR. 4	3.18	2.09	-	11.3	11.3	4.4	6.7	14	14
---- SIZE AN 8' SUMP INLET TO INTERCEPT RUNOFF PRIOR TO LEXINGTON DRIVE. NOTE: Q(10) FLOWS WILL EXCEED THE MAXIMUM AS DESIGNATED FOR A MINOR ARTERIAL.									
POR. 4,5	8.27	11.82	-	11.3	11.3	4.4	6.7	37	79
---- SIZE A 14' SUMP CURB INLET ON BOTH SIDES OF LEXINGTON DRIVE.									
6	8.90	10.68	-	19.4	19.4	3.5	5.3	31	57
---- SIZE AN 18' CURB INLET WITHIN A SUMP.									
7	1.15	1.38	-	13.8	13.8	4.1	6.2	5	9
---- SIZE AN 8' CURB INLET AT GRADE. NO FLOWBY.									
8,9A	5.51	6.48	1.0	14.9	15.9	3.9	5.8	21	38
---- SIZE A 20' INLET AT GRADE. FLOWBY - Q(10)=7 / Q(100)=17 EQUIV. CA(10)=1.79 / CA(100)=2.93									
FB,9B	3.40	4.77	2.5	15.9	18.4	3.6	5.5	12	26
---- SIZE A 20' INLET AT GRADE. FLOWBY - Q(10)=2 / Q(100)=8.									
10A	3.77	4.06	-	15.0	15.0	4.0	6.0	15	24
---- SIZE A 20' INLET AT GRADE. FLOWBY - Q(10)=4 / Q(100)=8 EQUIV. CA(10)=1.00 / CA(100)=1.33									
FB,10B	2.89	3.36	1.8	15.0	16.8	3.8	5.7	11	19
---- SIZE A 20' INLET AT GRADE. FLOWBY Q(10)=2 / Q(100)=5.									
11	4.51	5.36	-	14.1	14.1	4.1	6.1	18	33
---- SIZE AN 8' CURB INLET WITHIN A SUMP.									

(cont.)

APPENDIX	I.C

SURFACE ROUTING

CONTRIBUTING BASINS	CA(10) (Ac)	CA(100) (Ac)	TRAVEL Tc (min.)	BASIN Tc (min.)	TOTAL CONCENTRATION TIME	I(10) (in./hr.)	I(100) (in./hr.)	Q(10) (c.f.s.)	Q(100) (c.f.s.)
12	1.11	1.32	-	14.7	14.7	4.0	6.0	4	8
---- SIZE A 4' CURB INLET WITHIN A SUMP.									
13	7.74	9.20	-	16.5	16.5	3.8	5.7	29	53
---- SIZE AN 8' INLET AT GRADE. FLOWBY - Q(10)=4 / Q(100)=16 EQUIV. CA(10)=0.0 / CA(100)=0.88									
FB(13)	1.08	2.90	1.4	16.5	17.9	3.7	5.5	4	16
---- SIZE A 4' CURB INLET WITHIN A SUMP.									
15	7.00	8.40	-	11.5	11.5	4.4	6.7	31	56
---- SIZE (2) - 10' CURB INLETS WITHIN A SUMP.									

APPENDIX I.E

pg 1/4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LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

    1     ID    KETTLE CREEK MDDP-SOUTH TRIBUTARY, BASIN C (SOUTH OF RANCH ROAD)
    2     ID    HYDROLOGIC MODEL OF HISTORIC BASIN
    3     ID    HEC1 (SCS) 100-YEAR RUNOFF     HISTORIC
          *DIAGRAM
    4     IT       5       0       0     300
    5     IO       5
    6     PG       2     4.4
    7     PG       1       0
    8     IN      15
    9     PC  .0005   .0015   .0030   .0045   .0060   .0080   .0100   .0120   .0143   .0165
   10     PC  .0188   .0210   .0233   .0255   .0278   .0320   .0390   .0460   .0530   .0600
   11     PC  .0750   .1000   .4000   .7000   .7250   .7500   .7650   .7800   .7900   .8000
   12     PC  .8100   .8200   .8250   .8300   .8350   .8400   .8450   .8500   .8550   .8600
   13     PC  .8638   .8675   .8713   .8750   .8788   .8825   .8863   .8900   .8938   .8975
   14     PC  .9013   .9050   .9083   .9115   .9146   .9180   .9210   .9240   .9270   .9300
   15     PC  .9325   .9350   .9375   .9400   .9425   .9450   .9475   .9500   .9525   .9550
   16     PC  .9575   .9600   .9625   .9650   .9675   .9700   .9725   .9750   .9775   .9800
   17     PC  .9813   .9825   .9838   .9850   .9863   .9875   .9888   .9900   .9913   .9925
   18     PC  .9938   .9950   .9963   .9975  1.0000

   19     KK   SBC-1
   20     KM        RUNOFF FROM SBC-1
   21     BA 0.0309
   22     PR       1
   23     PW       1
   24     PT       2
   25     PW       1
   26     LS       0      74
   27     UD    0.38

   28     KK    DP2C
   29     KM        ROUTE SBC-1 TO DP2C
   30     RK    1400  0.0643   0.045       0    TRAP       5       8

   31     KK   SBC-2
   32     KM        RUNOFF FROM SBC-2
   33     BA 0.0394
   34     PR       1
   35     PW       1
   36     PT       2
   37     PW       1
   38     LS       0      74
   39     UD    0.30

   40     KK    DP2C
   41     KM        COMBINE FLOWS AT DP2C
   42     HC       2

   43     KK    DP3C
   44     KM        ROUTE DP2C TO DP3C
   45     RK    1400  0.0643   0.045       0    TRAP       5       6
```



```
LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

   46     KK   SBC-3
   47     KM        RUNOFF FROM SBC-3
   48     BA 0.0544
```

APPENDIX	I.D

PIPE ROUTING

CONTRIBUTING BASINS	CA(10) (Ac)	CA(100) (Ac)	TRAVEL Tc (min.)	BASIN Tc (min.)	TOTAL CONCENTRATION TIME	I(10) (in./hr.)	I(100) (in./hr.)	Q(10) (c.f.s.)	Q(100) (c.f.s.)
1,2	7.47	8.98	-	27.9	27.9	2.9	4.4	22	40
---- SIZE 80' - 18" R.C.P. @ 1.0%									
\/									
3	8.28	9.84	-	27.9	27.9	2.9	4.4	24	43
---- SIZE 150' - 18" R.C.P. @ 1.0%									
POR. 4	3.18	2.09	-	11.3	11.3	4.4	6.7	14	14
---- SIZE 350' - 18" R.C.P. @ 3.0% ----									
\/									
1/2 POR.4,5	7.32	8.00	0.7	11.3	12.0	4.3	6.6	32	52
---- SIZE 80' - 30" R.C.P. @ 2.0% ----									
\/									
1/2 POR.4,5	11.45	13.91	-	12.0	12.0	4.3	6.6	50	91
---- SIZE 500' - 30" R.C.P. @ 5.0% ----									
\/									
7	12.60	15.47	-	16.0	16.0	3.9	5.8	49	90
---- SIZE 50' - 36" R.C.P. @ 2.0%									
\/									
6	21.50	26.15	-	19.4	19.4	3.5	5.3	76	139
---- SIZE 850' - 36" R.C.P. @ 4.5%									
\/									
8,9A,10A (20' INLETS)	27.99	32.43	1.2	19.4	20.6	3.4	5.2	96	168
---- SIZE 1,070' - 42" R.C.P. @ 3.0%									
\/									
FB,9B,10B (20' INLETS)	33.20	38.23	-	20.6	20.6	3.4	5.2	114	198
---- SIZE 430' - 48" R.C.P. @ 2.0% , TO PONDING AREA									
11	4.51	5.36	-	14.1	14.1	4.1	6.1	18	33
---- SIZE 250' - 18" R.C.P. @ 2.0% ----									
\/									
11,12	5.62	6.68	-	14.7	14.7	4.0	6.0	22	40
---- SIZE 150' - 18" R.C.P. @ 2.0% , TO PONDING AREA									
13 (2 - 8' INLETS)	6.66	6.30	-	16.5	16.5	3.8	5.7	25	36
---- SIZE 250' - 30" R.C.P. @ 1.0 %									
\/									
FB (4' INLET)	7.74	9.20	-	17.9	17.9	3.7	5.5	28	51
---- SIZE 30" R.C.P. TO PONDING AREA									
15 (2 - 10' INLETS)	7.00	8.40	-	11.5	11.5	4.4	6.7	31	56
---- SIZE 150' - 30" R.C.P. @ 2.0% TO EXISTING STREAM									

```
50          PW        1
51          PT        2
52          PW        1
53          LS        0       74
54          UD     0.32

55          KK    DP3C
56          KM          COMBINE FLOWS AT DP3C
57          HC        2
58          KM          OUTFALL TO KETTLE CREEK AT DP3C
59          KM          RUNOFF CALCULATION FOR SUBBASIN C-4

60          KK    SBC-4
61          KM          RUNOFF FROM SBC-4
62          BA   0.0653
63          PR        1
64          PW        1
65          PT        2
66          PW        1
67          LS        0       74
68          UD     0.32
69          KM          OUTFALL TO KETTLE CREEK AT DP4C FOR SUBBASIN C-4 ONLY
70          ZZ      ;
```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT LINE

(V) ROUTING (---->) DIVERSION OR PUMP FLOW

NO. (.) CONNECTOR (<----) RETURN OF DIVERTED OR PUMPED FLOW

```
 19        SBC-1
             V
             V
 28        DP2C
             .
             .
 31             .        SBC-2
                .          .
                .          .
 40        DP2C.............
             V
             V
 43        DP3C
             .
             .
 46             .        SBC-3
                .          .
                .          .
 55        DP3C.............
             .
             .
 60             .        SBC-4
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

1

****

FLOOD HYDROGRAPH PACKAGE HEC-1 (IBM XT 512K VERSION) -FEB 1,1985

U.S. ARMY CORPS OF ENGINEERS, THE HYDROLOGIC ENGINEERING CENTER, 609 SECOND STREET, DAVIS, CA. 95616

****

KETTLE CREEK MDDP-SOUTH TRIBUTARY, BASIN C (SOUTH OF RANCH ROAD)
HYDROLOGIC MODEL OF HISTORIC BASIN
HEC1 (SCS) 100-YEAR RUNOFF HISTORIC

	IPRNT	5 PRINT CONTROL
	IPLOT	0 PLOT CONTROL
	QSCAL	0. HYDROGRAPH PLOT SCALE

IT HYDROGRAPH TIME DATA

NMIN		5 MINUTES IN COMPUTATION INTERVAL
IDATE	1	0 STARTING DATE
ITIME		0000 STARTING TIME
NQ		300 NUMBER OF HYDROGRAPH ORDINATES
NDATE	2	0 ENDING DATE
NDTIME		0055 ENDING TIME

COMPUTATION INTERVAL .08 HOURS
TOTAL TIME BASE 24.92 HOURS

ENGLISH UNITS

1

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

+	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	SBC-1	31.	6.00	5.	2.	2.	.03		
+	ROUTED TO	DP2C	31.	6.08	5.	2.	2.	.03		
+	HYDROGRAPH AT	SBC-2	46.	5.92	8.	3.	2.	.04		
+	2 COMBINED AT	DP2C	73.	6.00	11.	4.	3.	.07		
+	ROUTED TO	DP3C	71.	6.00	11.	4.	3.	.07		
+	HYDROGRAPH AT	SBC-3	61.	5.92	9.	3.	3.	.05		
+	2 COMBINED AT	DP3C	130.	6.00	20.	6.	6.	.12		
+	HYDROGRAPH AT	SBC-4	73.	5.92	11.	3.	3.	.07		

1 HEC-1 INPUT PAGE 1

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

*** WARNING *** ZZ-CARD MISSING
1
2 ZZ

1 ****
FLOOD HYDROGRAPH PACKAGE HEC-1 (IBM XT 512K VERSION) -FEB 1.1985
U.S. ARMY CORPS OF ENGINEERS, THE HYDROLOGIC ENGINEERING CENTER, 609 SECOND STREET, DAVIS, CA. 95616
****

IT

HYDROGRAPH TIME DATA

NMIN		5	MINUTES IN COMPUTATION INTERVAL
IDATE	1	0	STARTING DATE
ITIME		0000	STARTING TIME
NQ		300	NUMBER OF HYDROGRAPH ORDINATES
NDDATE	2	0	ENDING DATE
NDTIME		0055	ENDING TIME

COMPUTATION INTERVAL .08 HOURS
TOTAL TIME BASE 24.92 HOURS

ENGLISH UNITS

SUBBASIN RUNOFF DATA

0 BA SUBBASIN CHARACTERISTICS
TAREA .00 SUBBASIN AREA

PRECIPITATION DATA

0 PT TOTAL STORM STATIONS 2
0 PW WEIGHTS 1.00

0 PR RECORDING STATIONS 1
0 PW WEIGHTS 1.00

0 UD SCS DIMENSIONLESS UNITGRAPH
TLAG .32 LAG

***

PRECIPITATION STATION DATA

	STATION	TOTAL	AVG. ANNUAL	WEIGHT
ERROR 20	2			