HYDROLOGY

F20/D2
3 PLANS

F20/D2

3 PLANS

ACADEMY

TRACT 'C' ALBUQUERQUE ACADEMY CAMPUS 5.02Ac.

LANDS OF OTHERS 20.07Ac.

66.87Ac.

UNIT 7

SU-1 11.04Ac. 8 D.U./Ac.

ACADEMY ESTATES UNIT 1

OFFSITE DRAINAGE BOUNDARY

WATER BLOCK

OFFSITE DRAINAGE AREA-1

OFFSITE DRAINAGE AREA-2

TRACT 'D' ALBUQUERQUE ACADEMY CAMPUS 9.03Ac.

O.S.A-2 3 C.F.S.

DRAINAGE SUB. AREA A-1

(PHASE B) FUTURE APT. COMPLEX

R-2 DUPLEX

UNIT 5

O.S.A-1 33 C.F.S.

AREA A-1 2 C.F.S.

(PHASE A) SITE 9.51 Ac.

CAMINO DEL SOL

FLOWS CONTAINED IN CAMINO DEL SOL

LUNA DE ORO ROAD NE

UNIT 4

AVENIDA DE LUNA

SU-1 12.06Ac. 8 D.U./Ac.

SPAIN ROAD

AREA A-2 16 C.F.S.

DRAINAGE SUB.- AREA A-2

R-3 12.90Ac.

CAMINO OSITO

UNIT 2

CHAMBERS PLACE

SU-1 UNIT 3

OSUNA ROAD

NORTHRIDGE UNIT 7

UNIT 9

MUNICIPAL ADDITION NO. 10

SCALE 1"=200'
C.I. = 2

LEGEND

- AREA-1 / (10 C.F.S.) — FLOW RATE CONCENTRATION AT POINT OF EXIT FOR DESIGNATED AREA.
- RUNOFF FLOW DIRECTION
- DRAINAGE SUB. — AREA BOUNDARY
- AREA A-1 or O.S.A.-1 — DRAINAGE SUB. — BASIN DESIGNATION
- SITE PHASE 'A'
- PHASE 'B' (FUTURE)

No	DATE	BY	REVISIONS

Designed By | Drawn By JG | Checked By | Approved By

MURRAY-McCORMICK, INC.
ENVIRONMENTAL DESIGN
ENGINEERING · PLANNING · SURVEYING
2601 WYOMING BLVD. N.E. SUITE F ALBUQUERQUE, NEW MEXICO 87110 505 292-1936

ACADEMY DEVELOPMENT COMPANY

VALLE GRANDE APARTMENTS
PHASE A
UNDEVELOPED FLOW PATTERNS
FIGURE III

DATE | SCALE AS SHOWN | SHEET OF

CANDLELIGHT HILLS UNIT 1

ESTRELLITA

DEL NORTE N.E.

UNPLATED LAND

GALAXIA WAY

PLANETA COURT N.E.

COMETA CAMINO N.E.

3:1 SLOPE

MATCH LINE

MATCH LINE

ACADEMY ESTATES UNIT 4

SCALE IN FEET
1"=50'

F.F.448 AS BUILT F.F. & PAD ELEVATIONS AS INDICATED

GENERAL NOTES

GRADING PLAN:

1. All lot grading shall be in accordance with the FHA MPS and all applicable requirements of Data Sheet 79G.
2. Pond areas where used, shall be level and shall be a minimum of 15% of the area drained (400 S.F. min.). The ponding area shall be held at a minimum of 5'-0" away from building foundations.
3. Diversion walls, water retention walls and retaining walls shall be constructed where required to meet lot grading requirements and in conformance with the recorded Protective Covenants.

No	DATE	BY	REVISIONS
2	9/19/77	dh	RELOCATION OF 18" WATER MAIN IN MOON STREET.
1	9/12/77	dh	AS PER CITY REVIEW

Designed By | Drawn By DMC | Checked By | Approved By

JOB NO. 2520039
MURRAY-McCORMICK, INC.
ENVIRONMENTAL DESIGN
ENGINEERING · PLANNING · SURVEYING
2601 WYOMING BLVD. N.E. SUITE F/ALBUQUERQUE, NEW MEXICO 87110/505-292-1936

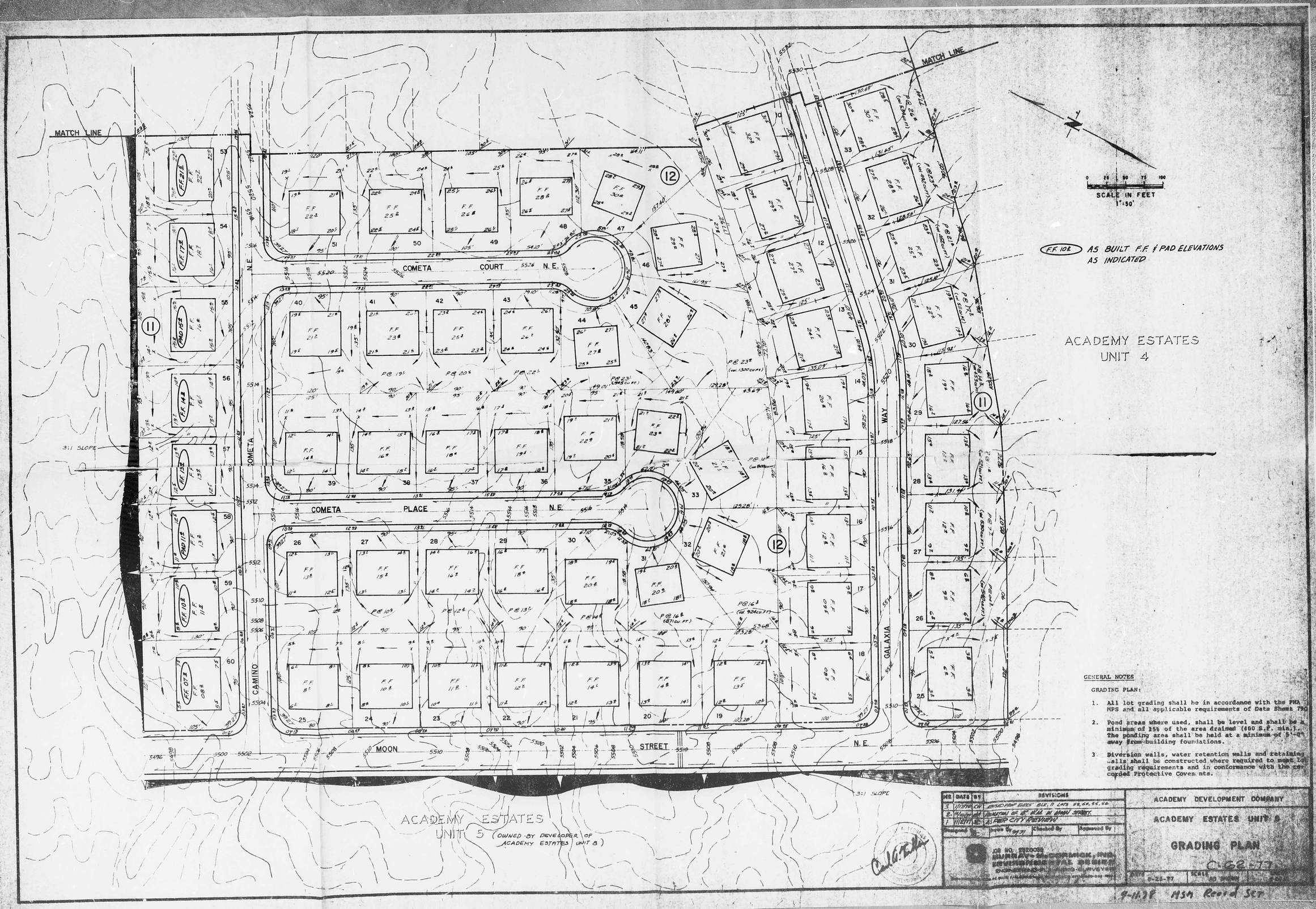
ACADEMY DEVELOPMENT COMPANY

ACADEMY ESTATES UNIT 8

GRADING PLAN

C-62-77

DATE	SCALE	SHEET
8/25/77	AS SHOWN	3 OF 12



GENERAL NOTES

GRADING PLAN:

1. All lot grading shall be in accordance with the FHA MPS and all applicable requirements of Data Sheet 790
2. Pond areas where used, shall be level and shall be a minimum of 25% of the area drained (400 S.F. min.). The ponding area shall be held at a minimum of 5'-0" away from building foundations.
3. Diversion walls, water retention walls and retaining walls shall be constructed where required to meet lot grading requirements and in conformance with the recorded Protective Covenants.

NO	DATE	BY	REVISIONS
3	11/17/78	CW	REVISED FROM BLOCK 8, LOTS 52, 53, 54, 55
2	9/26/78	CW	ADDITIONAL LOT 56 AREA IN BRASH STREET
1	9/18/78	CW	AS PER CITY REVIEW

Designed By | Drawn By CW/JT | Checked By | Approved By

JOB NO. 278008
MURRAY-BLECKSMITH, INC.
ENGINEERS & LAND SURVEYORS
SALT LAKE CITY, UTAH

ACADEMY DEVELOPMENT COMPANY

ACADEMY ESTATES UNIT 8

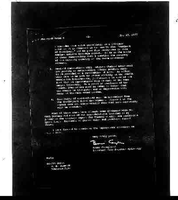
GRADING PLAN

C-62-77

DATE 8-25-77 | SCALE AS SHOWN | SHT

9-11-78 HSA Record Set

HYDROLOGY ○ F20/D2 ○ 3 PLANS



DRAINAGE REPORT

FOR

ACADEMY ESTATES, UNIT 8

ALBUQUERQUE, NEW MEXICO

Prepared By

Genge/Murray-McCormick, Inc.
2601 Wyoming Boulevard N.E.
Albuquerque, New Mexico 87110

(505) 292-1936

April 1977

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APPENDIX

Appendix 1	Composite Runoff Coefficient
Appendix 2	Ponding Requirement
Appendix 3	Runoff Computations
Appendix 4	Frequency Factor
Appendix 5	Street Carrying Capacities
Figure I	Developed Drainage Conditions
Figure II	Typical Lot Drainage
Figure III	Time of Concentration of Small Drainage Basins
Figure IV	Intensity Duration Frequency Curves
Figure V	Overland Flow Time
Figure VI	Velocities for Method of Estimating Tc

Non-Ponded Lots

C = 0.80	Streets & Walk Area	20x90	1,800 Sq.Ft.
	Roof Area	50x65	3,250 Sq.Ft.
	Driveway	30x20	600 Sq.Ft.
	Total Impervious Area		5,650 Sq.Ft.
C = 0.12	Total Lot Area		13,100 Sq.Ft.
	Less Roof Area		-3,250 Sq.Ft.
	Less Driveway		-600 Sq.Ft.
	Total Pervious Area		9,250 Sq.Ft.

Impervious Area	5,650 Sq.Ft.	37.9% @ 0.80	0.30
Pervious Area	9,250 Sq.Ft.	62.1% @ 0.12	0.070
Total Area	14,900 Sq.Ft.	100%	0.37

Composite Runoff Coefficient - $C \times C_f = 0.37 \times 1.25 = 0.46$

APPENDIX-2

Ponding Requirements

Average Lot Area		13,100 Sq.Ft.
1/2 Roof Area	25x65	1,625 Sq.Ft.
Patio Area	15x15	225 Sq.Ft.
Rear Lawn Area		5,350 Sq.Ft.
Total Area Draining to Pond		7,200 Sq.Ft.

Runoff Coefficient

Impervious Area:

$$C = 0.80 \ \frac{1850}{7200} = 0.26$$

Pervious Area:

$$C = 0.12 \ \frac{5350}{7200} = \frac{0.09}{0.35}$$

$C \times C_f = 0.35 \times 1.25 = 0.44$

Pond Volume Requirements:

100 year 6-hour precipitation = 2.2 inch

Volume = Runoff Coefficient x Area X Precipitation

$V = 2.2/12 \times 0.44 \times 7200 = 580.8 \text{ ft.}^3$

Depth of Pond 0.50 ft. (6")

Minimum Area of Pond = 1162 ft.^2

Pond area as a percentage of area drained - 16.2%

$V = 16.2 \times 7200 \times 0.5 = 357 \text{ ft.}^3$ area of pond = 584 ft.^2 @ 0.5' deep.

DRAINAGE REPORT

ACADEMY ESTATES, UNIT 8

GENERAL

This report will present the data, analysis and calculations resulting from the drainage study of the proposed single family subdivision, titled: "Academy Estates Unit 8." The lands for the proposed development were recently annexed to the City of Albuquerque. It is situated partly in Section 29 and 32, Township 11 North, Range 4 East, N.M.P.M.

The property encompasses 38.1 acres and is subdivided into 108 large (90'x130' typical size) single family lots. More precise information can be found in Figure 1.

The natural ground is covered with the grasses and shrubs native to the central New Mexico region, and slopes gently to the west approximately 3% to 4%. The site shows undulating terrain with minor swales and a well defined, natural channel of the Bear Canyon Tributary along the north boundary. It is intended that the cut and fill grading will intercept the minor flow patterns and allow the runoff to be conveyed in the street.

The site is bounded on the north by the Bear Canyon Tributary and on the east by Estrellita del Norte, N.E. The west boundary of the property is Moon Street N.E., and south boundary is Academy Estates Unit 4.

According to the Rice Report the Bear Canyon Tributary to the north of Moon Street, N.E., has an interpolated 100-year flow of 1345 cfs adjacent to the project.

SUBDIVISION ACADEMY ESTATES UNIT-8
LOCATION ALBUQUERQUE, N.M.
JOB NO.
DESIGN STORM 100 YR. RECURRENCE INTERVAL
MAJOR STORM 100 YR.
COMPUTATIONS BY S.S. DATE 3/29/77

RUNOFF COMPUTATIONS
(Rational Method)

APPENDIX - 3

Area Designation	A (Acres)	c	c_f	$\bar{c}$ = (c x c_f)	A·$\bar{c}$	ΣA·$\bar{c}$	tc (min)	I (in/hr)	Q = (ΣA·$\bar{c}$) x I cfs	Street capacity cfs	Flow in Pipe cfs	Pipe Dia. in.	Slope %	Length ft.	VEL V fps	Δt (min)	'C'
A-1	9.76	0.08 0.32	1.25	0.50	4.88	4.88	23.7	3.88	18.9	120	-	-	2.28	1840	3.0	10.2	14.29% P @ 0.5 85.71% NP @ 0.3
A-2	3.4	0.14 0.27	1.25	0.51	1.73	1.73	15.4	4.68	8.1	139	-	-	3.0	400	3.5	1.9	27.27% P @ 0.5 72.73% NP @ 0.3
A-3	3.84	0.15 0.26	1.25	0.51	1.96	1.96	15.8	4.63	9.1	135	-	-	2.9	480	3.4	2.3	28.57% P @ 0.5 71.43% NP @ 0.3
A-4	4.04	0.19 0.24	1.25	0.54	2.18	2.18	15.8	4.63	10.1	98	-	-	1.5	550	2.45	3.7	35.71% P @ 0.5 64.29% NP @ 0.
B-1	9.58	0.37	1.25	0.46	4.41	4.41	24.0	3.86	17.0	133	-	-	2.75	1300	2.7	8.0	-
C-1	1.30	0.37	1.25	0.46	0.60	0.60	14.2	4.82	2.9	98	-	-	1.5	400	2.5	2.7	-
D-1	1.0	0.44	1.25	0.55	0.55	0.50	14.8	4.75	2.6	89	-	-	1.25	640	2.2	4.8	83.33% P @ 0.5 16.67% NP @ 0.3
E-1	0.33	0.53	1.25	0.66	0.22	0.20	11.4	5.19	1.1	139	-	-	3.0	300	3.5	1.4	Ponded Lots @ 0.53
A-1 → A-4	21.04	0.13 0.28	1.25	0.51	10.73	10.73	23.7	3.88	41.6	120	-	-	2.28	1840	3.0	10.2	24.62% P @ 0.5 75.38% NP @ 0.
A-1 → E-1	33.25		1.25	0.50	16.63	16.63	24.0	3.86	64.0	133	-	-	2.75	1840	2.7	10.2	23.15% P @ 0.5 76.85% NP @ 0.3

Offsite flows from the east are intercepted and directed away from the proposed site by Estrellita del Norte, N.E., leaving the site free from offsite flows.

DESIGN CRITERIA

In analyzing the storm runoff, the Rational Formula, $Q = CIA\ C_f$, is used.[1].

Where:

Q = Runoff quantity in cubic feet/second.

A = Contributing area in acres.

C_f = Frequency factor for Rational Formula

I = Intensity in inches/hour for a duration equal to the time of accumulation (duration) measured in minutes and obtained from Figure IV, Intensity Duration Frequency Curves, Albuquerque Area 1961. (Note: Where a Time Concentration [Tc] is less than ten minutes from Figure III, the intensity value equal to ten minutes is employed.)

C = Runoff Coefficient (No Unit). This coefficient represents the integrated effects of infiltration, detention storage, evaporation, retention, flow routing, and interception which all affect the time distribution and peak rate of runoff.

1. See Bibliography, Item (2), Paragraph 3.7., Appendix -4.

3.6 Continued

TABLE 3-2 (8)

RATIONAL METHOD RUNOFF COEFFICIENTS FOR COMPOSITE ANALYSIS

Character of Surface	Runoff Coefficients
Streets:	
Asphaltic	0.70 to 0.95
Concrete	0.80 to 0.95
Drives and Walks	0.75 to 0.85
Roofs	0.75 to 0.95
Lawns, Sandy Soil:	
Flat, 2%	0.05 to 0.10
Average, 2 to 7%	0.10 to 0.15
Steep, 7%	0.15 to 0.20
Lawns, Heavy Soil:	
Flat, 2%	0.15 to 0.20
Average, 2 to 7%	0.20 to 0.25
Steep, 7%	0.25 to 0.35

The coefficients in these two tabulations are applicable for storms of 5-year to 10-year frequencies. Less frequent higher-intensity storms will require modification of the coefficient because infiltration and other losses have a proportionally smaller effect on runoff, as given in the following section.

3.7 Adjustment for Infrequent Storms

The adjustment of the Rational Method for use with major storms can be made by multiplying the right side of the Rational Formula by a frequency factor C_f, which is used to account for antecedent precipitation conditions. The Rational Formula now becomes:

$$Q = CIAC_f \qquad (3\text{-}2)$$

The following table of C_f values can be used. The product of C times C_f should not exceed 1.0.

1-15-69

ESTIMATED RUNOFF UNDEVELOPED STATE:

Drainage within the boundary of the site is basically overland flow with some small swales. There are no offsite flows entering the site.

The total runoff in the undeveloped site forms the basis for comparison with the flow in the developed state.

TABLE 1

RUNOFF IN UNDEVELOPED STATE

Drainage Basin	Elev. Diff.	Length of Flow	Tc Min.	I_{100} yr. In./Hr.	$C^{2.}$	Area Ac.	Q C.F.S.
ONSITE	50	1500	10	5.4	0.38	38.1	78

ESTIMATED RUNOFF DEVELOPED STATE

As development occurs, the area of impervious surfaces increases and thereby the amount of runoff also increases. To offset this increase, onsite restrictions of flows must be incorporated into the development. While this can take different forms, the most practical solution for this type of development is to utilize on-lot ponding. The contributing area to the backyard ponding includes the backyard, sideyard, and in a majority of cases, one-half of the roof area due to the popularity of the pitched roof concept. The area drained to the street includes the front yard, driveway, sidewalk-parkway areas, and one-half the roof area. This approach will satisfy AMAFCA's requirement that the runoff rate from the developed tract will not exceed the runoff rate from the tract in its natural state.

2. See Appendix 1.

3.7 Continued

TABLE 3-3

FREQUENCY FACTORS FOR RATIONAL FORMULA

Recurrence Interval (years)	C_f
2 to 10	1.0
25	1.1
50	1.2
100	1.25

The runoff coefficients, prior to the C_f adjustment, for various surfaces are as follows:

Streets, Walks and Drives	C = 0.80
Roofs	C = 0.80
Lawns, Sandy Soil (Average - 2 to 7%)	C = 0.12

TABLE 2[3].

RUNOFF IN DEVELOPED STATE

Drainage Basin	Area Ac.	C[3].	I_{100} year In./Hr.	Q C.F.S.
ONSITE				
A-1	9.76	0.5	3.88	19
A-2	3.40	0.51	4.68	8
A-3	3.84	0.51	4.63	9
A-4	4.04	0.54	4.63	10
A-1, A-2, A-3, A-4	21.04	0.51	3.88	42
B-1	9.58	0.46	3.86	17
C-1	1.30	0.46	4.82	3
D-1	1.00	0.55	4.75	3
E-1	0.33	0.66	5.19	1
A-1 thru E-1	33.25	0.50	3.86	64

EXPLANATION OF RESULTS:

Runoff Before Development - On Site: 78 cfs

Runoff After Development - On Site: 64 cfs

3. See Appendix 3.

```
FACE TO FACE = ? 32
CURB = ? 6
CROSS =  ? 6
```

N	A	P	S	S1/2	R	R2/3	V	Q
.0150	7.1111	33.3703	.0050	.0707	.2131	.3568	2.4998	17.7719
.0150	7.1111	33.3703	.0100	.1000	.2131	.3568	3.5344	25.1333
.0150	7.1111	33.3703	.0150	.1225	.2131	.3568	4.3287	30.7819
.0150	7.1111	33.3703	.0200	.1414	.2131	.3568	4.9984	35.5439
.0150	7.1111	33.3703	.0250	.1581	.2131	.3568	5.5883	39.7392
.0150	7.1111	33.3703	.0300	.1732	.2131	.3568	6.1217	43.5322
.0150	7.1111	33.3703	.0350	.1871	.2131	.3568	6.6122	47.0201
.0150	7.1111	33.3703	.0400	.2000	.2131	.3568	7.0687	50.2666

```
FACE TO FACE = ? 32
CURB = ? 8
CROSS =  ? 6
```

N	A	P	S	S1/2	R	R2/3	V	Q
.0150	10.6667	33.3542	.0050	.0707	.3198	.4676	3.2759	34.9430
.0150	10.6667	33.3542	.0100	.1000	.3198	.4676	4.6328	49.4169
.0150	10.6667	33.3542	.0150	.1225	.3198	.4676	5.6740	60.5831
.0150	10.6667	33.3542	.0200	.1414	.3198	.4676	6.5518	69.8860
.0150	10.6667	33.3542	.0250	.1581	.3198	.4676	7.3252	78.1350
.0150	10.6667	33.3542	.0300	.1732	.3198	.4676	8.0243	85.5926
.0150	10.6667	33.3542	.0350	.1871	.3198	.4676	8.6672	92.4505
.0150	10.6667	33.3542	.0400	.2000	.3198	.4676	9.2657	98.8338

```
FACE TO FACE = ? 32
CURB = ? 8
CROSS =  ? 4
```

N	A	P	S	S1/2	R	R2/3	V	Q
.0150	14.2222	33.3426	.0050	.0707	.4265	.5666	3.9694	56.4537
.0150	14.2222	33.3426	.0100	.1000	.4265	.5666	5.6136	79.8375
.0150	14.2222	33.3426	.0150	.1225	.4265	.5666	6.8752	97.7906
.0150	14.2222	33.3426	.0200	.1414	.4265	.5666	7.9388	112.9073
.0150	14.2222	33.3426	.0250	.1581	.4265	.5666	8.8752	126.2342
.0150	14.2222	33.3426	.0300	.1732	.4265	.5666	9.7230	138.2827
.0150	14.2222	33.3426	.0350	.1871	.4265	.5666	10.5020	149.3693
.0150	14.2222	33.3426	.0400	.2000	.4265	.5666	11.2272	159.6751

```
FACE TO FACE = ? 32
CURB = ? 8
CROSS =  ? 2
```

N	A	P	S	S1/2	R	R2/3	V	Q
.0150	17.7778	33.3356	.0050	.0707	.5333	.6576	4.6067	81.8972
.0150	17.7778	33.3356	.0100	.1000	.5333	.6576	6.5149	115.8201
.0150	17.7778	33.3356	.0150	.1225	.5333	.6576	7.9791	141.8501
.0150	17.7778	33.3356	.0200	.1414	.5333	.6576	9.2134	163.7944
.0150	17.7778	33.3356	.0250	.1581	.5333	.6576	10.3009	183.1277
.0150	17.7778	33.3356	.0300	.1732	.5333	.6576	11.2841	200.6064
.0150	17.7778	33.3356	.0350	.1871	.5333	.6576	12.1882	216.6796
.0150	17.7778	33.3356	.0400	.2000	.5333	.6576	13.0298	231.6403

FACE

The net runoff result is a decrease of 14 cfs from the undeveloped state to developed state.

In the developed state, no offsite flows contribute to the site. Street carrying capacities are adequate to handle the 100-year storm runoff generated by the site.

Bear Canyon Tributary which receives much of this runoff is subject to some minor grading. The Bear Canyon Tributary has a 100-year flood hazard line, which encroaches slightly along the northerly boundary of Lots 24, 54 and 55, Block 11, based on the Rice Report. This encroachment is delineated on Figure 1. With a small amount of regrading in the form of a fill on the lots adjacent to the Bear Canyon Tributary the 100-year flood hazard will not affect said lots. Because of the very minor filling of the present flood hazard area, the flood plain will not be shifted significantly; therefore, it is recommended to leave the arroyo natural.

Runoff from Area C-1 (3.0 cfs) crosses Moon Street N.E., and drains onto the adjacent land (Academy Estates Unit 5).

Runoff from Areas A-1, A-2, A-3, and A-4 drain north into Bear Canyon Tributary. Flows from B-1 will be diverted eventually into Bear Canyon Arroyo via Moon Street. Also, storm runoff from Areas D-1 and E-1 shall be discharged onto Estrellita Del Norte, N.E.

Ponding areas, shown in Figure II, adequately retain the necessary runoff.

Ponding areas, where called for in backyards, would be best situated toward the rear of the yard. There should be a minimum of a five foot buffer zone between the rear property lines and the edge of the pond. This buffer will protect any walls which might be constructed. In no case should ponded waters be allowed to stand against the wall.

RECOMMENDATIONS

The following is a summary of the recommendations which must be incorporated in the construction drawings and field inspections at the time of construction:

1. The lots shown as ponded should be graded to store water in the rear yard.
2. Ponds should average 6" deep and the minimum surface area should not be less than 16%[4] of the total area which is drained into the pond.
3. Flows within the streets of the development are distributed enough so that no one street assumes a critical burden in carrying capacities. However, no street should be graded at less than 0.5% slope in order to insure adequate carrying capacities.
4. The Bear Canyon Tributary should have the south embankment defined by minor grading on Lots 24, 54, and 55, Block 11, to avoid flooding these lots.

4. See Appendix-2

FACE TO FACE = ? 40
CURB = ? 6
CROWN = ? 2

N	A	P	S	S1/2	R	R2/3	V	Q
.0150	8.8889	41.3629	.0050	.0707	.2149	.3588	2.5133	22.3400
.0150	8.8889	41.3629	.0100	.1000	.2149	.3588	3.5543	31.5936
.0150	8.8889	41.3629	.0150	.1225	.2149	.3588	4.3531	38.6941
.0150	8.8889	41.3629	.0200	.1414	.2149	.3588	5.0265	44.6801
.0150	8.8889	41.3629	.0250	.1581	.2149	.3588	5.6198	49.9539
.0150	8.8889	41.3629	.0300	.1732	.2149	.3588	6.1562	54.7217
.0150	8.8889	41.3629	.0350	.1871	.2149	.3588	6.6494	59.1062
.0150	8.8889	41.3629	.0400	.2000	.2149	.3588	7.1086	63.1878

FACE TO FACE = ? 40
CURB = ? 6
CROWN = ? 6

N	A	P	S	S1/2	R	R2/3	V	Q
.0150	13.3333	41.3500	.0050	.0707	.3225	.4702	3.2940	43.9198
.0150	13.3333	41.3500	.0100	.1000	.3225	.4702	4.6584	62.1119
.0150	13.3333	41.3500	.0150	.1225	.3225	.4702	5.7053	76.0713
.0150	13.3333	41.3500	.0200	.1414	.3225	.4702	6.5880	87.8396
.0150	13.3333	41.3500	.0250	.1581	.3225	.4702	7.3656	98.2076
.0150	13.3333	41.3500	.0300	.1732	.3225	.4702	8.0686	107.5810
.0150	13.3333	41.3500	.0350	.1871	.3225	.4702	8.7151	116.2008
.0150	13.3333	41.3500	.0400	.2000	.3225	.4702	9.3168	124.2239

FACE TO FACE = ? 40
CURB = ? 6
CROWN = ? 4

N	A	P	S	S1/2	R	R2/3	V	Q
.0150	17.7778	41.3407	.0050	.0707	.4300	.5697	3.9510	70.9506
.0150	17.7778	41.3407	.0100	.1000	.4300	.5697	5.6441	100.3393
.0150	17.7778	41.3407	.0150	.1225	.4300	.5697	6.9126	122.8901
.0150	17.7778	41.3407	.0200	.1414	.4300	.5697	7.9819	141.9012
.0150	17.7778	41.3407	.0250	.1581	.4300	.5697	8.9241	158.6504
.0150	17.7778	41.3407	.0300	.1732	.4300	.5697	9.7758	173.7928
.0150	17.7778	41.3407	.0350	.1871	.4300	.5697	10.5591	187.7177
.0150	17.7778	41.3407	.0400	.2000	.4300	.5697	11.2882	200.6787

FACE TO FACE = ? 40
CURB = ? 6
CROWN = ? 2

N	A	P	S	S1/2	R	R2/3	V	Q
.0150	22.2222	41.3352	.0050	.0707	.5376	.6612	4.6315	102.9828
.0150	22.2222	41.3352	.0100	.1000	.5376	.6612	6.5500	145.5549
.0150	22.2222	41.3352	.0150	.1225	.5376	.6612	8.0220	178.2676
.0150	22.2222	41.3352	.0200	.1414	.5376	.6612	9.2631	205.8457
.0150	22.2222	41.3352	.0250	.1581	.5376	.6612	10.3564	230.1425
.0150	22.2222	41.3352	.0300	.1732	.5376	.6612	11.3449	252.1064
.0150	22.2222	41.3352	.0350	.1871	.5376	.6612	12.2539	272.3082
.0150	22.2222	41.3352	.0400	.2000	.5376	.6612	13.0999	291.1098

0.655 / 1.215 / 3

CROWN = ? 4

N	A	P	S	S1/2	R	R2/3	V	Q
.0150	9.7778	45.3603	.0050	.0707	.2156	.3595	2.5184	22.6640
.0150	9.7778	45.3603	.0100	.1000	.2156	.3595	3.5615	32.0533
.0150	9.7778	45.3603	.0150	.1225	.2156	.3595	4.3620	39.2584
.0150	9.7778	45.3603	.0200	.1414	.2156	.3595	5.0368	45.3314
.0150	9.7778	45.3603	.0250	.1581	.2156	.3595	5.6313	50.6814
.0150	9.7778	45.3603	.0300	.1732	.2156	.3595	6.1688	55.5158
.0150	9.7778	45.3603	.0350	.1871	.2156	.3595	6.6630	59.9668
.0150	9.7778	45.3603	.0400	.2000	.2156	.3595	7.1231	64.1078

FACE TO FACE = ? 44
CURB = ? 6
CROWN = ? 6

N	A	P	S	S1/2	R	R2/3	V	Q
.0150	14.6667	45.3485	.0050	.0707	.3234	.4712	3.3006	48.4087
.0150	14.6667	45.3485	.0100	.1000	.3234	.4712	4.6677	68.4602
.0150	14.6667	45.3485	.0150	.1225	.3234	.4712	5.7168	83.8463
.0150	14.6667	45.3485	.0200	.1414	.3234	.4712	6.6012	96.8173
.0150	14.6667	45.3485	.0250	.1581	.3234	.4712	7.3803	108.2451
.0150	14.6667	45.3485	.0300	.1732	.3234	.4712	8.0848	118.5765
.0150	14.6667	45.3485	.0350	.1871	.3234	.4712	8.7325	128.0773
.0150	14.6667	45.3485	.0400	.2000	.3234	.4712	9.3355	136.9204

FACE TO FACE = ? 44
CURB = ? 6
CROWN = ? 4

N	A	P	S	S1/2	R	R2/3	V	Q
.0150	19.5556	45.3401	.0050	.0707	.4313	.5709	3.9989	78.2002
.0150	19.5556	45.3401	.0100	.1000	.4313	.5709	5.6553	110.5918
.0150	19.5556	45.3401	.0150	.1225	.4313	.5709	6.9263	135.4468
.0150	19.5556	45.3401	.0200	.1414	.4313	.5709	7.9978	156.4005
.0150	19.5556	45.3401	.0250	.1581	.4313	.5709	8.9418	174.8610
.0150	19.5556	45.3401	.0300	.1732	.4313	.5709	9.7958	191.5507
.0150	19.5556	45.3401	.0350	.1871	.4313	.5709	10.5800	206.8984
.0150	19.5556	45.3401	.0400	.2000	.4313	.5709	11.3105	221.1837

FACE TO FACE = ? 44
CURB = ? 6
CROWN = ? 2

N	A	P	S	S1/2	R	R2/3	V	Q
.0150	24.4444	45.3350	.0050	.0707	.5392	.6685	4.6406	113.4376
.0150	24.4444	45.3350	.0100	.1000	.5392	.6685	6.5626	160.4250
.0150	24.4444	45.3350	.0150	.1225	.5392	.6685	8.0378	196.4797
.0150	24.4444	45.3350	.0200	.1414	.5392	.6685	9.2813	226.8752
.0150	24.4444	45.3350	.0250	.1581	.5392	.6685	10.3768	253.6548
.0150	24.4444	45.3350	.0300	.1732	.5392	.6685	11.3672	277.8662
.0150	24.4444	45.3350	.0350	.1871	.5392	.6685	12.2779	300.1276
.0150	24.4444	45.3350	.0400	.2000	.5392	.6685	13.1257	320.8530

0.669 / 1.227 / 3

5. Flows from Areas A-1, A-2, A-3 and A-4 shall follow street patterns and discharge north on Moon Street N.E., then discharge into Bear Canyon Tributary.

6. Runoff from Area B-1 shall drain south on Moon Street N.E., then eventually discharge into Bear Canyon Arroyo.

7. Flows leaving Area C-1 shall cross Moon Street N.E., and discharge via a valley gutter onto adjacent land known as Academy Estates Unit 5.

8. Area D-1 drains onto Estrellita Del Norte which will convey runoff into Bear Canyon Tributary.

9. Area E-1 discharges runoff onto Estrellita Del Norte going south then turning west on Camino del Sol. Runoff will discharge into the Bear Canyon Arroyo.

Respectfully submitted,

Carl A. Tebbens
N.M.P.E. No. 6309

CARL A. TEBBENS 6309 NEW MEXICO REGISTERED PROFESSIONAL ENGINEER

FACE TO FACE = ? 48
CORE = ? 8
CROSS = ? 6

N	A	P	S	S1/2	R	R2/3	V	Q
.0150	16.0000	49.3472	.0050	.0707	.3242	.4720	3.3061	59.9978
.0150	16.0000	49.3472	.0100	.1000	.3242	.4720	4.6755	74.8088
.0150	16.0000	49.3472	.0150	.1225	.3242	.4720	5.7264	91.6216
.0150	16.0000	49.3472	.0200	.1414	.3242	.4720	6.6122	105.7955
.0150	16.0000	49.3472	.0250	.1581	.3242	.4720	7.3927	118.2830
.0150	16.0000	49.3472	.0300	.1732	.3242	.4720	8.0983	129.5726
.0150	16.0000	49.3472	.0350	.1871	.3242	.4720	8.7471	139.9544
.0150	16.0000	49.3472	.0400	.2000	.3242	.4720	9.3511	149.6175

FACE TO FACE = ? 48
CORE = ? 8
CROSS = ? 4

N	A	P	S	S1/2	R	R2/3	V	Q
.0150	21.3333	49.3395	.0050	.0707	.4324	.5718	4.0055	85.4504
.0150	21.3333	49.3395	.0100	.1000	.4324	.5718	5.3646	114.4451
.0150	21.3333	49.3395	.0150	.1225	.4324	.5718	6.4371	137.3044
.0150	21.3333	49.3395	.0200	.1414	.4324	.5718	7.3110	155.9007
.0150	21.3333	49.3395	.0250	.1581	.4324	.5718	8.0565	171.7828
.0150	21.3333	49.3395	.0300	.1732	.4324	.5718	8.7114	185.7698
.0150	21.3333	49.3395	.0350	.1871	.4324	.5718	9.5975	204.7804
.0150	21.3333	49.3395	.0400	.2000	.4324	.5718	11.3292	241.6901

FACE TO FACE = ? 48
CORE = ? 8
CROSS = ? 2

N	A	P	S	S1/2	R	R2/3	V	Q
.0150	26.6667	49.3349	.0050	.0707	.5405	.6636	4.6482	123.9532
.0150	26.6667	49.3349	.0100	.1000	.5405	.6636	6.5736	175.2963
.0150	26.6667	49.3349	.0150	.1225	.5405	.6636	8.0510	214.6932
.0150	26.6667	49.3349	.0200	.1414	.5405	.6636	9.2965	247.9064
.0150	26.6667	49.3349	.0250	.1581	.5405	.6636	10.3938	277.1478
.0150	26.6667	49.3349	.0300	.1732	.5405	.6636	11.3858	303.6221
.0150	26.6667	49.3349	.0350	.1871	.5405	.6636	12.2981	327.9493
.0150	26.6667	49.3349	.0400	.2000	.5405	.6636	13.1472	350.5926

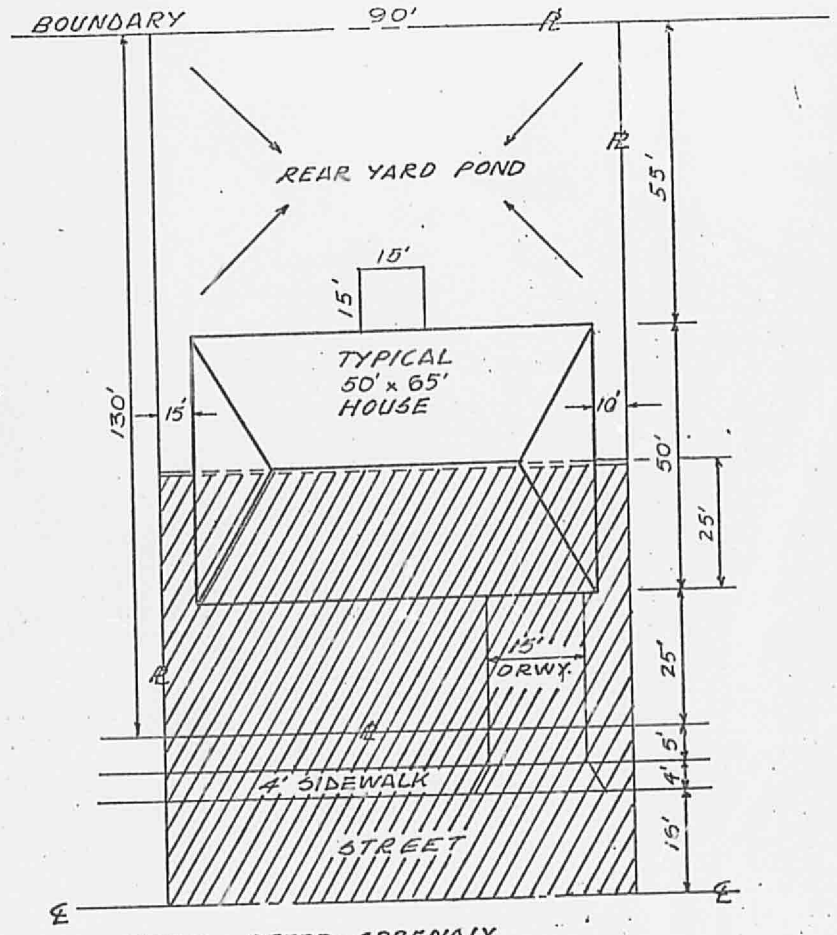
0.663 / 1.229 / 3

BIBLIOGRAPHY OF REFERENCES

(1) Herkenhoff, Gordon & Associates, "Master Plan of Drainage City of Albuquerque, New Mexico and Environs, 1963". Albuquerque; Gordon Herkenhoff & Associates, Consulting Engineers.

(2) Wright-McLaughlin Engineers, "Urban Storm Drainage Criteria Manual, Volume 1", Denver, Colorado: Wright-McLaughlin Engineers, 1969.

(3) U.S. Department of Commerce, "Technical Paper, No. 40, Rainfall Frequency Atlas of the United States", Washington, D.C., U.S. Government Printing Office, 1963.



NOTE: REFER APPENDIX FOR CALCULATION

AREA DRAINED

FIGURE II
TYPICAL LOT DRAINAGE

MURRAY-McCORMICK, INC.
ENVIRONMENTAL DESIGN
ENGINEERING·PLANNING·SURVEYING
2601 WYOMING BLVD NE SUITE F/ALBUQUERQUE, NEW MEXICO 87110/505-292-1935

JOB NO. _____ DATE _____
PROJECT _____
SCALE _____

APPENDIX

APPENDIX

APPENDIX-1

COMPOSITE RUNOFF COEFFICIENTS

Undeveloped Land

C = 0.31[1.] x 1.25[2.] = 0.38

Developed Land

Typical Lot Area

Gross Area		38.1 Ac.
Less: Area in Streets	5.6 Ac.	
Area in Lots		32.5 Ac.
Average Lot Area (108 Lots)		13,100 Sq.Ft.
Typical Lot Width		90 Ft.

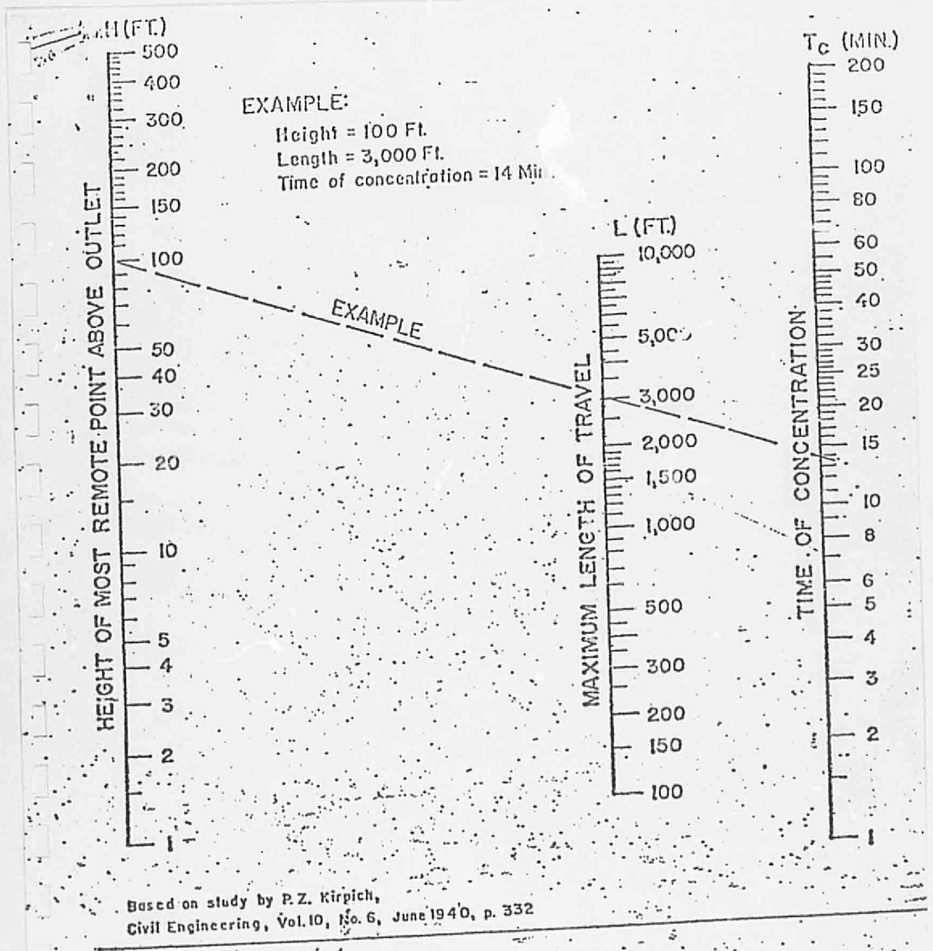
Ponded Lots

C = 0.80	Streets & Walk Area	20x90	1,800 Sq.Ft.
	Roof Area	25x65	1,625 Sq.Ft.
	Driveway	30x20	600 Sq.Ft.
	Total Impervious Area		4,025 Sq.Ft.
C = 0.12	Front and Side Yares	90x55	4,950 Sq.Ft.
	Less Roof Area	25x65	-1,625 Sq.Ft.
	Less Driveway	30x20	-600 Sq.Ft.
	Total Pervious Area		2,725 Sq.Ft.

Impervious Area	4,025 Sq.Ft.	59.6% @ 0.80	0.48
Pervious Area	2,725 Sq.Ft.	40.4% @ 0.12	0.05
Total Area	6,750 Sq.Ft.	100%	0.53

Composite Runoff Coefficient - C x C_f = 0.53 x 1.25 - 0.66

1. See Bibliography, Item (1) Table XII
2. See Bibliography, Item (4) Article 3.7, Appendix-4



TIME OF CONCENTRATION OF SMALL DRAINAGE BASINS

FIG. III

Reprinted from "Design of Roadside Drainage Channels - Hydraulic Engineering

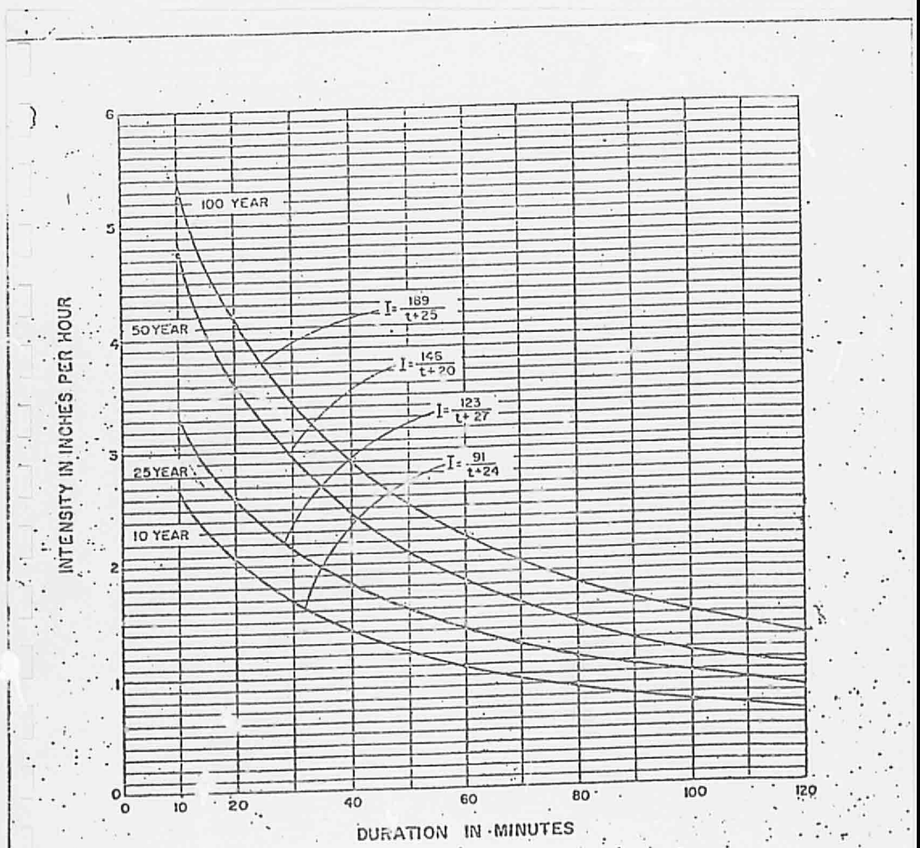


FIGURE IV

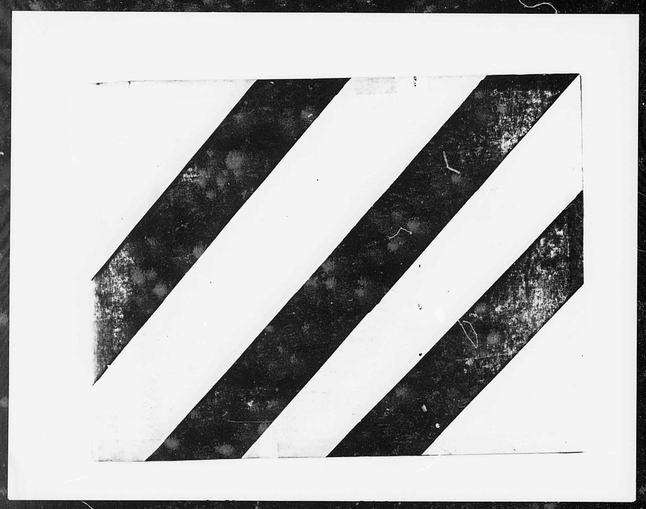
MASTER PLAN OF DRAINAGE
CITY OF ALBUQUERQUE - NEW MEXICO AND ENVIRONS

INTENSITY DURATION FREQUENCY CURVES

(ALBUQUERQUE AREA-1961)

GORDON HERKENHOFF & ASSOC. CONSULTING ENGINEERS | CHART 1

n 3 6 7



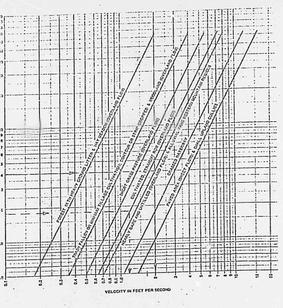


FIGURE VI
Velocities for upland method of estimating T_c

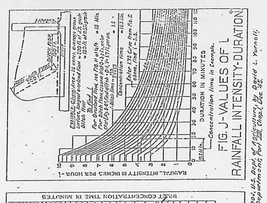


FIG. J-VALUES OF I
RAINFALL INTENSITY-DURATION

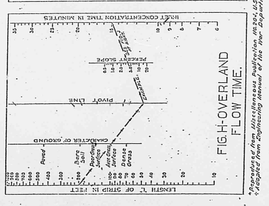


FIG. H-OVERLAND
FLOW TIME.

*Standard of Practice, Hydrology Section, Preparation, 10 Jan. 1955, Rev. 6, Engineering Div. Regional Office, Albuquerque, New Mexico, Bureau of Reclamation, Dept. of the Interior, Adjustments Made Per Figure 1, Memo.

FIGURE V

MURRAY-McCORMICK, INC.
ENVIRONMENTAL DESIGN
ENGINEERING-PLANNING-SURVEYING
6501 WINDING BLVD., NE, SUITE F / ALBUQUERQUE, NEW MEXICO 87109 / 505-345-1555

JOB NO. _____ DATE _____
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