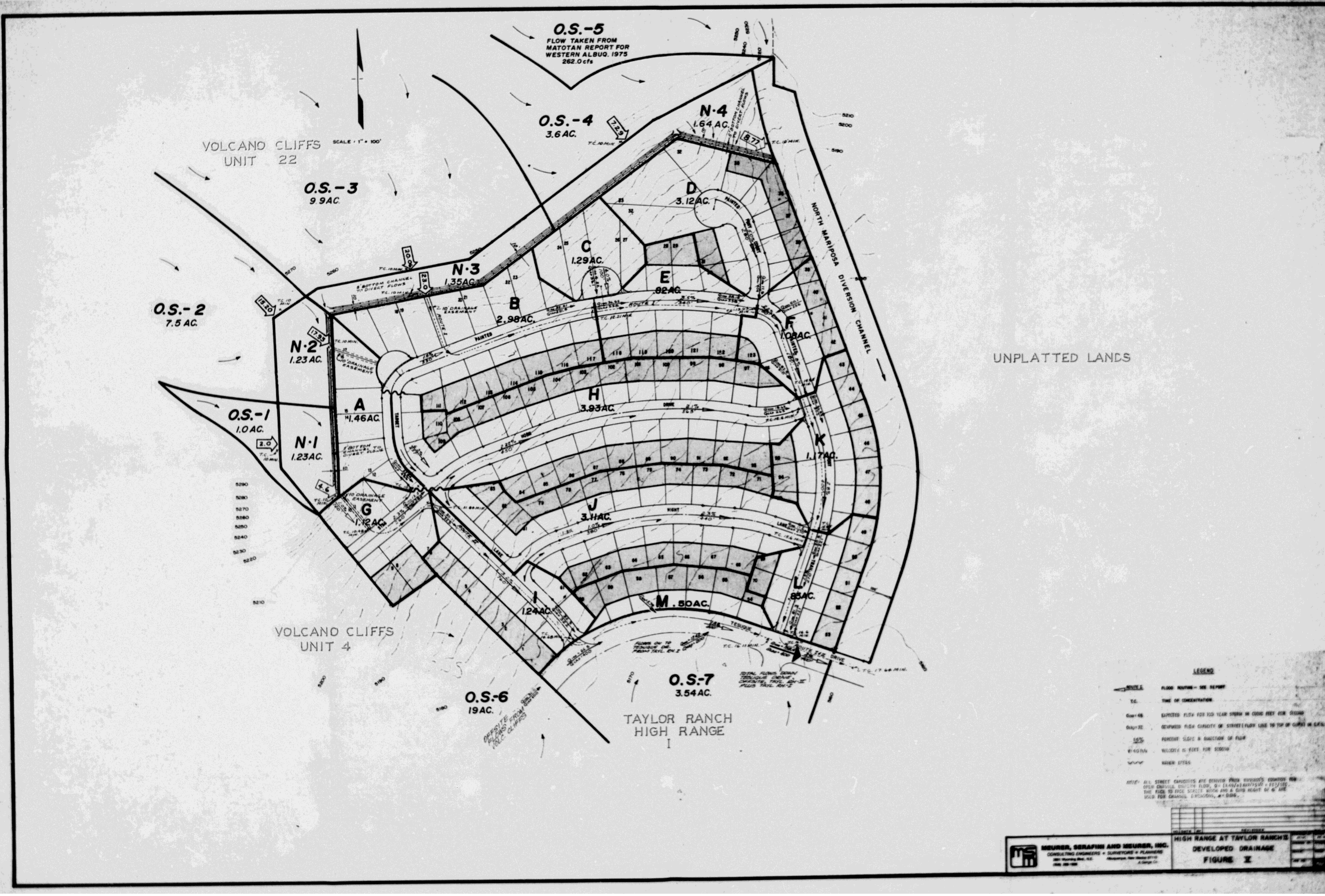
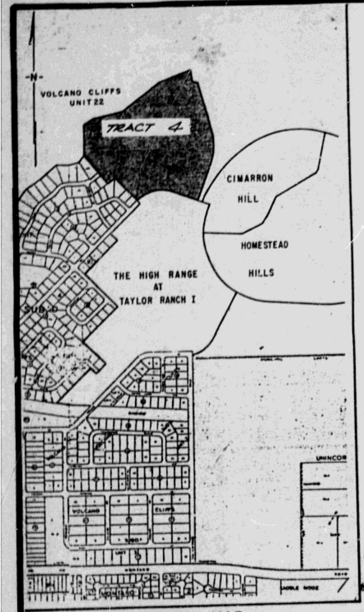
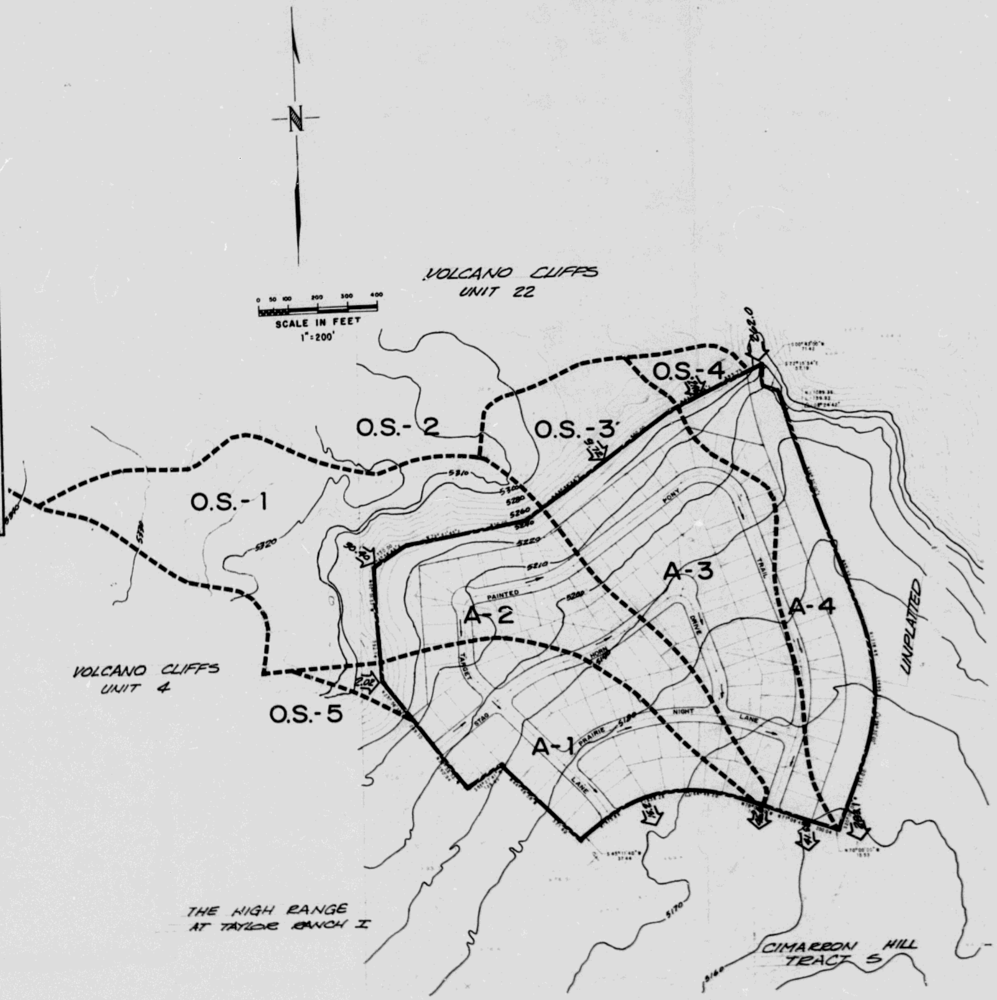

O.S.-5
FLOW TAKEN FROM MATOTAN REPORT FOR WESTERN ALBUQ. 1975
262.0 cfs
VOLCANO CLIFFS UNIT 22
SCALE: 1" = 100'
O.S.-4
3.6 AC.
O.S.-3
9.9 AC.
O.S.-2
7.5 AC.
O.S.-1
1.0 AC.
N·4
1.64 AC.
N·3
1.35 AC.
N·2
1.23 AC.
N·1
1.23 AC.
A
1.46 AC.
B
2.98 AC.
C
1.29 AC.
D
3.12 AC.
E
.82 AC.
F
1.04 AC.
G
1.12 AC.
H
3.93 AC.
I
1.24 AC.
J
3.11 AC.
K
1.17 AC.
L
.85 AC.
M
.50 AC.
NORTH MARIPOSA DIVERSION CHANNEL
UNPLATTED LANDS
VOLCANO CLIFFS UNIT 4
O.S.-6
19 AC.
OFFSITE FLOWS FROM VOLC. CLIFFS
O.S.-7
3.54 AC.
TAYLOR RANCH HIGH RANGE I
LEGEND
ROUTE I — FLOOD ROUTING - SEE REPORT
T.C. — TIME OF CONCENTRATION
Q100=46 — EXPECTED FLOW FOR 100 YEAR STORM IN CUBIC FEET PER SECOND
Qcap=32 — COMPUTED FLOW CAPACITY OF STREET (FLOW LINE TO TOP OF CURB) IN C.F.S.
1.6% — PERCENT SLOPE & DIRECTION OF FLOW
V=4.0 ft/s — VELOCITY IN FEET PER SECOND
WATER BREAK
NOTE: ALL STREET CAPACITIES ARE DERIVED FROM MANNING'S EQUATION FOR OPEN CHANNEL UNIFORM FLOW, Q = (1.49/n) AR2/3 S1/2 = FT3/SEC. THE FACE TO FACE STREET WIDTH AND A CURB HEIGHT OF 6" ARE USED FOR CHANNEL DIMENSIONS, n = 0.016.
NO. DATE BY REVISIONS
MEURER, SERAFINI AND MEURER, INC.
CONSULTING ENGINEERS • SURVEYORS • PLANNERS
HIGH RANGE AT TAYLOR RANCH II
DEVELOPED DRAINAGE
FIGURE V



VICINITY MAP
Scale: 1" = 800' (Approx.)



LEGEND

⇦ 12.8	Q_{100} (VOLUME AND DIRECTION OF FLOW FOR DEVELOPED RUNOFF AT POINT INDICATED IN C.F.S.)
▬ ▬ ▬	WATERSHED BOUNDARY.
▬▬ ▬▬	Project Boundary

Nº	DATE	BY	REVISIONS

Designed By	Drawn By KW	Checked By	Approved By

MURRAY-McCORMICK, INC.
ENVIRONMENTAL DESIGN
ENGINEERING·PLANNING·SURVEYING
2601 WYOMING BLVD. N.E. SUITE F / ALBUQUERQUE NEW MEXICO 87110 / 505-292-1600

AMBELL

THE HIGH RANGE AT
TAYLOR RANCH 2

FIGURE II
UNDEVELOPED DRAINAGE CHARACTERISTICS
TRACT 4

DATE	SCALE 1" = 200'	SHEET

OMA 5:15
448 6:30
UNITED
OS-1
OS-2
OS-3
OS-4
OS-5
OS-6
RIDGE
RIDGE
DIVERSION DITCH
DIVERSION WALL
DIVERSION WALL
TESUQUE
DRIVE
CIRCLE
HOMESTEAD
DRAINAGE
ROW
PAINTED
PONY
TRAIL
PRAIRIE
QUARTER HORSE LN
TARGET LANE
RUSTLER
ROAD
CAMPFIRE LN
MOJAVE
ST
TRACT
CLIFFS
NO. DATE BY
REVISIONS
Designed By
Drawn By
Checked By
Approved By
MURRAY-McCORMICK, INC.
ENVIRONMENTAL DESIGN
ENGINEERING-PLANNING-SURVEYING
BELLAMAH CORPORATION
THE HIGH RANGE AT
TAYLOR RANCH - I
OFF-SITE DRAINAGE
CHARACTERISTICS
DATE
SCALE
SHEET
OF

FIGURE V

Nº	DATE	BY	REVISIONS

Designed By	Drawn By	Checked By	Approved By

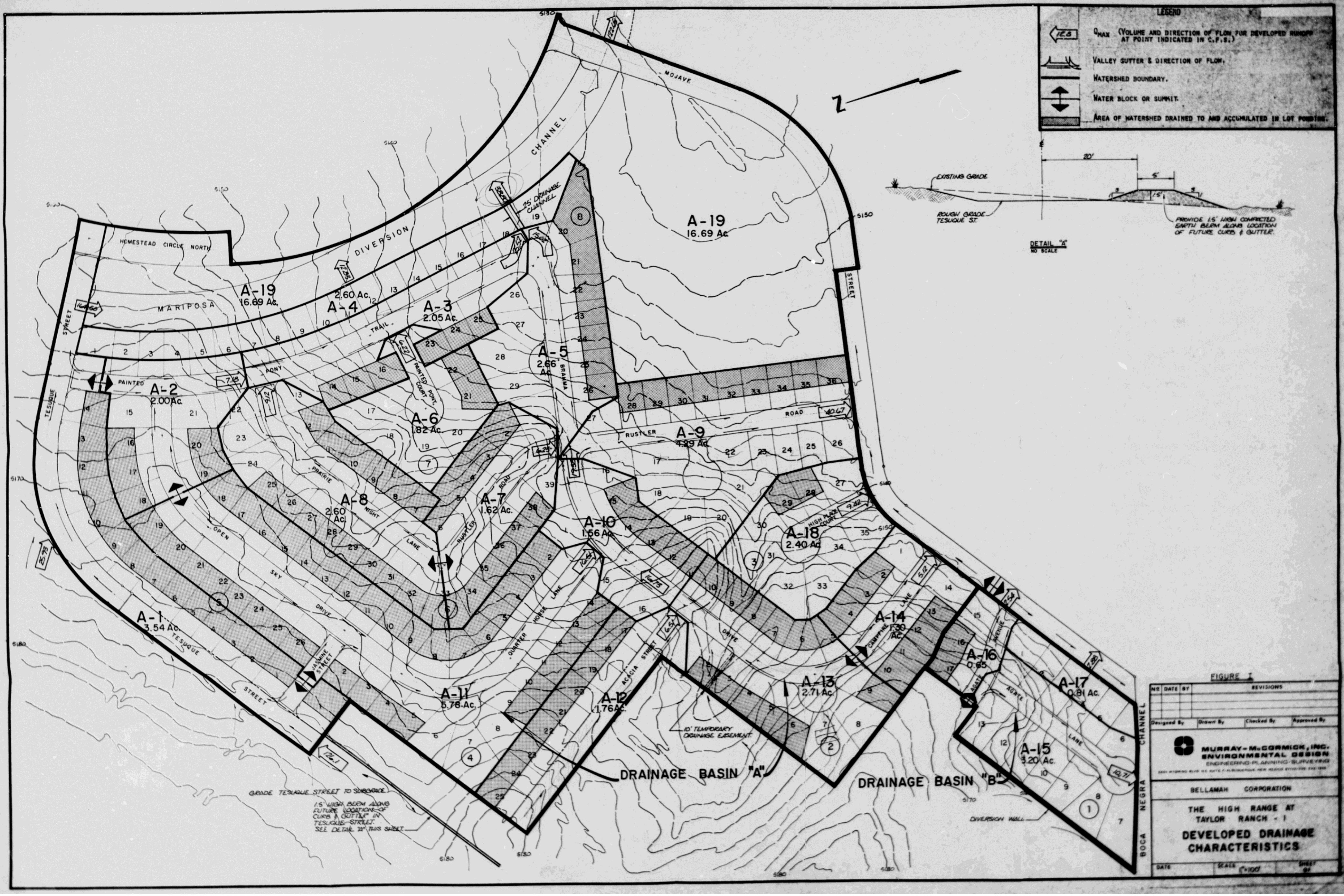
MURRAY-McCORMICK, INC.
ENVIRONMENTAL DESIGN

BELLAMAH CORPORATION

THE HIGH RANGE AT
TAYLOR RANCH - I

OFF-SITE AND UNDEVELOPED DRAINAGE CHARACTERISTICS

DATE	SCALE	SHEET OF
	1" = 200'	



LEGEND
Q_{MAX} (VOLUME AND DIRECTION OF FLOW FOR DEVELOPED RUNOFF AT POINT INDICATED IN C.F.S.)
VALLEY GUTTER & DIRECTION OF FLOW.
WATERSHED BOUNDARY.
WATER BLOCK OR SUMMIT.
AREA OF WATERSHED DRAINED TO AND ACCUMULATED IN LOT PONDING.
EXISTING GRADE
ROUGH GRADE TESUQUE ST.
PROVIDE 1.5' HIGH COMPACTED EARTH BERM ALONG LOCATION OF FUTURE CURB & GUTTER.
DETAIL "A"
NO SCALE
A-1 3.54 Ac.
A-2 2.00 Ac.
A-3 2.05 Ac.
A-4 2.60 Ac.
A-5 2.66 Ac.
A-6 1.82 Ac.
A-7 1.62 Ac.
A-8 2.60 Ac.
A-9 4.29 Ac.
A-10 1.56 Ac.
A-11 5.78 Ac.
A-12 1.76 Ac.
A-13 2.71 Ac.
A-14 1.39 Ac.
A-15 3.20 Ac.
A-16 0.65
A-17 0.81 Ac.
A-18 2.40 Ac.
A-19 16.69 Ac.
DIVERSION CHANNEL
MOJAVE
MARIPOSA TRAIL
HOMESTEAD CIRCLE NORTH
PAINTED PONY
PAINTED PONY COURT
BRAHMA
RUSTLER ROAD
PRAIRIE NIGHT LANE
OPEN SKY DRIVE
QUARTER HORSE LANE
ACACIA STREET
JASMINE STREET
TESUQUE STREET
HIGH PLAZA COURT
CAMPFIRE LANE
AGATE LANE
BOCA NEGRA CHANNEL
25' DRAINAGE CHANNEL
10' TEMPORARY DRAINAGE EASEMENT
DRAINAGE BASIN "A"
DRAINAGE BASIN "B"
DIVERSION WALL
GRADE TESUQUE STREET TO SUBGRADE
1.5' HIGH BERM ALONG FUTURE LOCATION OF CURB & GUTTER IN TESUQUE STREET. SEE DETAIL "A" THIS SHEET.
FIGURE 1
REVISIONS
MURRAY-McCORMICK, INC.
ENVIRONMENTAL DESIGN
ENGINEERING-PLANNING-SURVEYING
BELLAMAH CORPORATION
THE HIGH RANGE AT TAYLOR RANCH - I
DEVELOPED DRAINAGE CHARACTERISTICS

DRAINAGE REPORT

FOR

THE HIGH RANGE AT TAYLOR RANCH
ALBUQUERQUE, NEW MEXICO

MURRAY-McCORMICK, INC.
ENVIRONMENTAL DESIGN

ECOSYSTEMS ANALYSIS · PLANNING · LAND SURVEYS · ENGINEERING

2601 WYOMING BLVD. NE. SUITE F / ALBUQUERQUE, N.M. 87110 / 505-292-1936

DRAINAGE REPORT

FOR

THE HIGH RANGE AT TAYLOR RANCH
ALBUQUERQUE, NEW MEXICO

Prepared By

Genge/Murray-McCormick
2601 Wyoming Boulevard N.E.
Albuquerque, New Mexico 87110
(505) 292-1936

August 8, 1977

DRAINAGE REPORT

FOR

THE HIGH RANGE AT TAYLOR RANCH
ALBUQUERQUE, NEW MEXICO

Prepared By

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TABLE OF CONTENTS

	Page No.
PURPOSE AND SCOPE	1
SITE LOCATION & TOPOGRAPHY	1
DESIGN CRITERIA	2
ESTIMATED RUNOFF UNDEVELOPED STATE	2
ESTIMATED RUNOFF DEVELOPED STATE	4
EXPLANATION OF RESULTS	7
RECOMMENDATIONS	8
SUMMARY	9

APPENDIX

Appendix 1	Composite Runoff Coefficient
Appendix 2	Ponding Requirement
Appendix 3	Runoff Computations
Appendix 4	Frequency Factor
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	Offsite & Undeveloped Drainage

DRAINAGE REPORT

HOMESTEAD HILLS

PURPOSE AND SCOPE

AMBELL, a joint venture of AMDEC and Dale Bellamah Land Company, is currently developing lands located on the western Albuquerque Metropolitan Area known as Taylor Ranch. Taylor Ranch is a many faceted development, master planned concept which includes single family, multi-family, parks, schools, and commercial areas. The High Range at Taylor Ranch is a single family subdivision.

The purpose of this report is to present a plan for controlling surface runoff from the said subdivision in a manner acceptable to the Albuquerque Metropolitan Arroyo Flood Control Authority and the Albuquerque City Engineer's office.

SITE LOCATION AND TOPOGRAPHY

The High Range at Taylor Ranch is located within Section 23, Township 11 North, Range 2 East, N.M.P.M. The surrounding terrain is generally partially developed land on all sides. The proposed North La Mariposa Diversion Channel is located on the east side of the proposed subdivision.

The soil of the site is generally comprised of eolian sand. The natural ground slopes from northwest to southeast with several small swales. Ground cover consists mainly of rabbitbrush, yucca, and cacti.

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, derived from a Tc 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.

ESTIMATED RUNOFF UNDEVELOPED STATE:

Drainage within the boundary of the site is basically overland flow with some small swales. Most of the drainage naturally exits the area at the southeast end of the property. The uphill area to the northwest of the site is a portion of the partially developed Volcano Cliffs subdivision. This has been developed to the point

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

where all the streets have been graded, with deep roadside ditches along both sides. A portion of the runoff in the offsite area is diverted from its direct downhill path. Exactly where the 100 yr storm is diverted is beyond the scope of this report. Offsite flows generated in the uphill areas have been developed assuming no development exists in Volcano Cliffs, for comparative purposes only.

However, according to the drainage report approved by the City of Albuquerque in 1973 for the Volcano Cliffs subdivision, there is no offsite runoff that flows onto the subject site, except at the very northern position of Tesuque. Effectively, then, all the offsite runoff uphill of the site is collected and diverted either south to the Boca Negra channel, or north to Tesuque. The amount of offsite runoff entering Tesuque is undeterminable for reasons stated in the previous paragraph. However, it will be assumed conservatively to be equal to the sum of the undeveloped runoffs from offsite areas 1, 2, and 3.

The total runoff in the undeveloped state forms the basis for comparison with 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							
A-1	26	1120	10	5.4	0.38	6.56	13.46
A-2	68	2000	10	5.4	0.38	28.86	59.22
A-3	72	1960	10	5.4	0.38	19.8	40.62
A-4	70	1700	10	5.4	0.38	13.62	27.94
A-5	28	250	10	5.4	0.38	6.0	12.31
Σ A1-A5							153.52
OFFSITE*							
O-S-1	146	1665	10	5.4	0.38	12.64	25.98
O-S-2	170	2500	10	5.4	0.38	36.57	75.04
O-S-3	156	1930	10	5.4	0.38	24.97	51.23
O-S-4	191	3500	12.5	5.4	0.38	53.78	102.99
O-S-5	38	750	10	5.4	0.38	3.67	7.53

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

2. See Appendix 1.

* These offsite flow figures are based on the assumption that the uphill property is undeveloped. These figures are shown only for the sake of comparison, and cannot represent a true value, since the uphill property is already partially developed.

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 not exceed the runoff rate from the tract in its natural state.

The runoff coefficient 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 = 0.38

TABLE 2[3]

RUNOFF IN DEVELOPED STATE

Drainage Basin	Area Ac.	C^3	$I_{100\ year}$ In./Hr.	Q C.F.S.
<u>ONSITE</u>				
A-1	3.54	.78	4.52	12.47
A-2	2.0	.76	4.72	7.18
A-3	2.05	.70	4.80	6.91
A-4	3.60	.66	5.40	12.83
A-5	2.66	.74	4.98	9.77
A-6	1.82	.66	5.17	6.22
A-7	1.62	.76	5.11	6.23
A-8	2.60	.76	4.64	9.12
A-9	4.29	.73	4.67	14.61
A-10	1.56	.72	4.79	5.36
A-11	5.78	.76	3.75	16.51
A-12	1.76	.74	4.98	6.51
A-13	2.71	.76	4.81	9.90
A-14	1.30	.76	5.21	5.12
A-15	3.20	.66	5.07	10.71
A-16	0.65	.74	5.26	2.54
A-17	0.81	.66	5.40	2.88
A-18	2.40	.75	5.21	9.42
A-19	16.69	.42	5.40	37.80
A1-A19				133.23

3. See Appendix 3.

EXPLANATION OF RESULTS:

Undeveloped Runoff:

Onsite

Total Flow = 153.52 c.f.s.

Developed Runoff:

Onsite

Total Flow = 133.23 c.f.s.

As shown above, the development of this project, including the lot ponding, will not increase the storm runoff over that occurring in the natural undeveloped state.

At the time that The High Range at Taylor Ranch is developed, it is probable that Volcano Cliffs to the northwest will not yet be fully developed. In the meantime, then, runoff from offsite areas OS-1, OS-2 and OS-3 will flow into the North La Mariposa Diversion Channel via Tesuque Street, thereby never entering the subdivision proper. Runoff from OS-1 will flow directly into Tesuque in a sheet flow pattern; runoff from OS-2 will also flow into Tesuque, which at that point will be half paved and half graded; runoff from OS-3 will flow into Tesuque and be diverted to the paved portion of Tesuque by means of a 1 1/2 foot high berm centered on the future location of the curb and gutter. Tesuque at this point will be graded to subgrade to allow flows to be directed to the paved portion of the street.

Runoff from OS-4 will collect at the property line in a natural swale, then be transported through a 10' wide drainage easement into Brahma Drive. Drainage from OS-5 will be diverted along the back lot line walls for eventual disposal into the Boca Negra Channel. A small portion of the flow will run into Acacia Street then into Mojave Street, with little effect on the subdivision.

According to the approved drainage study, however, at such time that Volcano Cliffs is fully developed, there will be no offsite flows entering the "High Range" in areas OS-5, OS-4, and OS-3 due to water blocks in Acacia, Agate, and Jasmine Streets. All the developed runoff from above the "High Range" will be diverted either to the Boca Negra Channel, or into Tesuque for subsequent disposal into the Mariposa Diversion Channel.

RECOMMENDATIONS

The following recommendations are made to enable the developer on this site and the local government to complete this project within the design criteria:

1. The ponding areas in each backyard would be best situated toward the rear of the yard. There should be a minimum of five foot (5') buffer zone between the rear property lines and the edge of the pond. This will protect any walls which might be constructed. In no case should ponded waters be allowed to stand against the wall or house foundation.
2. Ponds should average 6" deep and the minimum surface area should not be less than 17%[4] of the total area drained into the pond. All lots on the site have been ponded wherever it is practical.
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 that 0.5% slope in order to insure adequate carrying capacities.

4. See Appendix-2.

4. Temporary runoffs from Areas OS-1, OS-2, and OS-3 will be diverted to the North La Mariposa Diversion Channel via Tesuque Street. Runoffs from OS-4 and OS-5 will be temporarily carried through the "High Range" and eventually be diverted away from the site into the Boca Negra Channel.
5. Runoffs from Areas A-15, A-16 and A-17 will be drained into the Boca Negra Channel. All the remaining areas will drain into the North La Mariposa Diversion Channel. See Figure I.
6. A temporary diversion berm and grading of Tesuque to subgrade is recommended to keep flows from OS-3 from leaving the right-of-way of Tesuque and entering the site. This berm will not be necessary when Volcano Cliffs is fully developed. Said berm will be sufficient to carry the offsite flows in Tesuque, while still providing access to adjacent lots.

SUMMARY

The subject property, by utilizing backyard ponding on all lots will contribute no more surface runoff to surrounding areas than that which existed before development.

In conclusion, the development of this site should have a beneficial effect on the drainage characteristics of this area, and can be developed safely with no harm to life or property.

Respectfully submitted,

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

BIBLIOGRAPHY OF REFERENCES

(1) Herkennoff, 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.

APPENDIX

APPENDIX-1

COMPOSITE RUNOFF COEFFICIENTS

Undeveloped Land

$C = 0.31^{1} \times 1.25^{2} = 0.38$

Developed Land

Typical Lot Area

Gross Area		54.83 Ac.
Less: Area in Streets	12.39 Ac.	
Area in Lots		42.44 Ac.
Average Lot Area (220 Lots)		8,404 sq.ft.
Typical Lot Width		65 ft.

Ponded Lots

C = 0.80	Streets & Walk Area	20x65	1,300 sq.ft.
	Roof Area	25x55	1,375 sq.ft.
	Driveway	30x15	450 sq.ft.
	Total Impervious Area		3,125 sq.ft.
C = 0.30	Front and Side Yards	65x55	3,575 sq.ft.
	Less Roof Area	55x25	-1,375 sq.ft.
	Less Driveway	30x15	-450 sq.ft.
	Total Pervious Area		1,750 sq.ft.

Impervious Area	3,125 sq.ft.	0.60% @ 0.80	0.51
Pervious Area	1,750 sq.ft.	0.36% @ 0.30	0.11
Total Area	4,875 sq.ft.	100%	0.62

Composite Runoff Coefficient - $C \times C_f = 0.62 \times 1.25 = 0.78$

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

Non-Ponded Lots

C = 0.80	Streets & Walk Area	20x65	1,300 sq.ft.
	Roof Area	40x55	2,750 sq.ft.
	Driveway	30x15	450 sq.ft.
	Total Impervious Area		4,500 sq.ft.
C = 0.38	Total Lot Area		8,404 sq.ft.
	Less Roof Area		-2,750 sq.ft.
	Less Driveway		-450 sq.ft.
	Total Pervious Area		5,204 sq.ft.

Impervious Area	4,500 sq.ft.	0.46% @ 0.80	0.37
Pervious Area	5,204 sq.ft.	0.54% @ 0.30	0.16
Total Area	9,704 sq.ft.	100%	0.53

Composite Runoff Coefficient - $C \times C_f = 0.53 \times 1.25 = 0.66$

APPENDIX-2

Ponding Requirements

Average Lot Area		8,404 sq.ft.
1/2 roof area	25x55	1,375 sq.ft.
Patio area	10x10	100 sq.ft.
Rear Lawn area		3,429 sq.ft.
Total Area Draining to Pond		5,154 sq.ft.

Runoff Coefficient

Impervious Area:

$$C = 0.80 \frac{1475}{5154} = 0.23$$

Pervious Area:

$$C = 0.30 \frac{3679}{5154} = \underline{0.21}$$

$$0.44$$

$$C \times C_f = 0.44 \times 1.25 = 0.56$$

Pond Volume Requirements:

100 year 6-hour precipitation = 2.2 inch

Volume = Runoff Coefficient x Area x Precipitation

$V = 2.2/12 \times .56 \times 5154 = 529 \text{ ft.}^3$

Depth of Pond 0.50 ft. (6")

Minimum Area of Pond = 1058 ft.^2

Pond area as a percentage of area drained = 21%

APPENDIX 3

Runoff Computations

BDIVISION *High Range*
CATION
NO.
SIGN STORM *100* YR. RECURRENCE INTERVAL
JOR STORM *100* YR.
MPUTATIONS BY ______ DATE ______

DEVELOPED RUNOFF

RUNOFF COMPUTATIONS
(Rational Method)

Area Designation	A (Acres)	c	c_f	$\bar{c}$ = (c×c_f)	A·$\bar{c}$	ΣA·$\bar{c}$	tc (min)	I (in/hr)	Q = (ΣA·$\bar{c}$)×I cfs	Street capacity cfs	Flow in Pipe cfs	Pipe Dia. in.	Slope %	Length ft	VEL. V fps	Δt (min)	
A13	2.71		1.25 ↓	.76	2.05		16.25	3.81	7.79								13% unponded cf = .76
A12	1.76			.74	1.31		12.01	4.96	6.51								18% unponded cf = .74
ΣA13-A12						3.36	16.25	4.98	16.73								
A10	1.56			.72	1.12		14.44	4.79	5.36								50% unponded cf = .72
ΣA13-A10						4.48	15.60	4.32	19.38								
A11	5.78			.76	4.39		25.29	3.75	16.51								13% unponded cf = .76
ΣA13-A11						8.87	25.20	3.75	33.33								
A9	4.29			.73	3.12		15.42	4.67	14.61							5.62	13% unponded cf = .73
ΣA13-A9						11.99	30.71	3.39	40.67								
A14	1.30			.76	.98		11.27	5.21	5.12								20% cf = .70
A18	2.4		↑	.75	1.81		11.27	5.21	9.42								12% unponded cf = .75

SUBDIVISION
LOCATION
JOB NO.
DESIGN STORM ______ YR. RECURRENCE INTERVAL
MAJOR STORM ______ YR.
COMPUTATIONS BY ______ DATE ______

RUNOFF COMPUTATIONS
(Rational Method)

Area Designation	A (Acres)	c	c_f	C= (c×c_f)	A·C	ΣA·C	tc (min)	I (in/hr)	Q= (ΣA·C)xI cfs	Street capacity cfs	Flow in Pipe cfs	Pipe Dia. in.	Slope %	Length ft	VEL V fps	Δt (min)	% unponded cf =
ΣA13-A18						16.78	30.71	3.35	50.10								
A16	.65			.74	.48		10.89	5.26	2.54								33% unponded cf = .74
A15	3.20			.66	2.11		12.27	5.07	10.71		DRAINAGE BASIN B						100% cf = .60
A17	.81			.66	.53		10	5.4	2.88								100 cf = .66
ΣA16-A17						3.12	12.27	5.07	15.82								
A7	1.62			.76	1.22	7.	11.97	5.11	6.23								17% cf = .76
A5	2.66			.74	1.95		12.90	4.98	9.77							2.90	30% cf = .74
ΣA7-A5						3.17	16.87	4.74	15.02								
A2	2.0		1.25	.76	1.51		16.96	4.72	7.18								10% cf = .76

BDIVISION__________
CATION__________
) NO.__________
SIGN STORM______ YR. RECURRENCE INTERVAL
JOR STORM______ YR.
MPUTATIONS BY__________ DATE__________

RUNOFF COMPUTATIONS
(Rational Method)

Area Designation	A (Acres)	C	C_f	C* (CxC_f)	A·C	ΣA·C	tc (min)	I (in/hr)	Q* (ΣA·C)xI cfs	Street capacity cfs	Flow in Pipe cfs	Pipe Dia. in.	Slope %	Length ft	VEL V fps	Δt (min)	
A8	2.6		1.25	.76	1.95		15.68	4.64	9.12								21% cf = .76
ΣA2-A8						3.46	15.68	4.64	1605								
A3	2.05			.70	1.43		16.33	4.80	6.91							4.33	68% cf = .70
ΣA2-A3						4.89	20.01	4.19	20.53								
A6	1.82			.66	1.20		11.50	5.17	6.22								100% cf = .66
ΣA2-A6						6.09	20.01	4.19	25.52								
ΣA7-A6						9.26	20.01	4.19	38.80								
A4	3.6			.66	2.38		10	5.4	12.83								100% cf = .66
A1	3.54		1.25	.78	2.76		16.85	4.52	12.47								0% cf = .78

DIVISION ______
ATION ______
NO. ______
ION STORM ______ YR. RECURRENCE INTERVAL
OR STORM ______ YR.
PUTATIONS BY ______ DATE ______

RUNOFF COMPUTATIONS
(Rational Method)

Area Designation	A (Acres)	C	C_f	C= (CxCf)	A·C	ΣA·C	tc (min)	I (in/hr)	Q= (ΣA·C)xI cfs	Street capacity cfs	Flow in Pipe cfs	Pipe Dia. in.	Slope %	Length ft.	VEL V fps	Δt (min)	
A19	16.60		1.25	.42	7.0		10	5.4	37.8							611	
A7-A19						21.6	20.01	4.19	89.67								
A18-A19						36.18	30.71	3.39	122.65								
A13-A17						39.3	30.71	3.39	133.23								Drainage Basin A+B

DIVISION High Ranch & Taylor Ranch
TION West Mesa
NO.
GN STORM 100 YR. RECURRENCE INTERVAL
R STORM 100 YR.
PUTATIONS BY ______ DATE ______

UNDEVELOPED RUNOFF

RUNOFF COMPUTATIONS
(Rational Method)

PAGE 1 OF 1

Area Designation	A (Acres)	c	c_f	$\bar{c}$ = (c×c_f)	A·$\bar{c}$	ΣA·$\bar{c}$	tc (min)	I (in/hr)	Q = (ΣA·$\bar{c}$)×I cfs	Street capacity cfs	Flow in Pipe cfs	Pipe Dia. in.	Slope %	Length ft.	VEL V fps	Δt (min)	
A1	6.56	.30	1.25	.38	2.49	2.49	10	5.4	13.46								
A2	28.86		1.25	.38	10.97	10.97	10	5.4	59.22								
A3	19.8		1.25	.38	7.52	7.52	10	5.4	40.62								
A4	13.62		1.25	.38	5.17	5.17	10	5.4	27.74								
A5	6.0		1.25	.38	2.28	2.28	10	5.4	12.31								
A1-A5						28.43	10	5.4	153.52								

RUNOFF COMPUTATIONS

Sheet No. ____________

Project: ________________________

Drainage Area No. A1

Area = ____________________ acres

Maximum Overland Flow: L = ____________ S = ____________

Maximum Channel Flow:

Channel No. 1 L = 80 S = 1.0

Channel No. 2 L = 650 S = 0.72

Channel No. 3 L = ____________ S = ____________

Accumulation Time

Overland Flow or Inlet Time: 10 min.

Channel No. 1 Flow:

Velocity = 2 ft/sec; Time = 80 / (2 X 60) = .67 min.

Channel No. 2 Flow:

Velocity = 1.75 ft/sec; Time = 650 / (1.75 X 60) = 6.19 min.

Channel No. 3 Flow:

Velocity = ________ ft/sec; Time = ________ / X 60 = ________ min.

Total Accumulation Time: T = 16.85 min.

I = ____________ = ____________ = ____________

Q = CIA = (   ) (   ) (   ) = ________________ c.f.s.

Date: ________________________

Comp. by: ________________________

Checked by: ________________________

RUNOFF COMPUTATIONS

Sheet No.__________

Project:____________________

Drainage Area No. A2

Area = __________________ acres.

Maximum Overland Flow: L = __________ S = __________

Maximum Channel Flow:

Channel No. 1 L = 275 S = 2.0%

Channel No. 2 L = 225 S = 0.5%

Channel No. 3 L = __________ S = __________

Accumulation Time

Overland Flow or Inlet Time: 10 min.

Channel No. 1 Flow:

Velocity = 2.0 ft/sec; Time = $\frac{275}{2 \times 60}$ = 2.29 min.

Channel No. 2 Flow:

Velocity = 1.6 ft/sec; Time = $\frac{225}{1.6 \times 60}$ = 2.67 min.

Channel No. 3 Flow:

Velocity = ______ ft/sec; Time = $\frac{\quad}{X\ 60}$ = ______ min.

Total Accumulation Time: T = 14.96 min.

I = __ ________ = ________ = ________

Q = CIA = ( ) ( ) ( ) = ____________ c.f.s.

Date:____________________

Comp. by:____________________

Checked by:____________________

RUNOFF COMPUTATIONS

Sheet No.__________

Project:____________________

Drainage Area No. A3

Area = ____________ acres

Maximum Overland Flow. L = ________ S = ________

Maximum Channel Flow:

Channel No. 1 L = 525 S = 3.13

Channel No. 2 L = 275 S = 1.52

Channel No. 3 L = ________ S = ________

Accumulation Time

Overland Flow or Inlet Time: 10 min.

Channel No. 1 Flow:

Velocity = 3.5 ft/sec; Time = $\frac{525}{3.5 \times 60}$ = 2.5 min.

Channel No. 2 Flow:

Velocity = 2.5 ft/sec; Time = $\frac{275}{2.5 \times 60}$ = 1.83 min.

Channel No. 3 Flow:

Velocity = ______ ft/sec; Time = $\frac{\quad}{\times 60}$ = ______ min.

Total Accumulation Time: T = 14.33 min.

I = __________ = __________ = __________

Q = CIA = (   ) (   ) (   ) = __________ c.f.s.

Date:______________________

Comp. by:______________________

Checked by:______________________

RUNOFF COMPUTATIONS

Sheet No.__________

Project:____________________

Drainage Area No. A4

Area = ____________________ acres

Maximum Overland Flow: L = 150' S = 10%

Maximum Channel Flow:

Channel No. 1 L = __________ S = __________

Channel No. 2 L = __________ S = __________

Channel No. 3 L = __________ S = __________

Accumulation Time

Overland Flow or Inlet Time: 10 min.

Channel No. 1 Flow:

Velocity = ______ ft/sec; Time = ______ / X 60 = ______ min.

Channel No. 2 Flow:

Velocity = ______ ft/sec; Time = ______ / X 60 = ______ min.

Channel No. 3 Flow:

Velocity = ______ ft/sec; Time = ______ / X 60 = ______ min.

Total Accumulation Time: T = 10 min.

I = __________ = __________ = __________

Q = CIA = ( ) ( ) ( ) = _______________ c.f.s.

Date:____________________

Comp. by:____________________

Checked by:____________________

RUNOFF COMPUTATIONS

Sheet No.__________

Project: ____________________

Drainage Area No. A6

Area = ____________________ acres

Maximum Overland Flow: L = __________ S = __________

Maximum Channel Flow:

Channel No. 1 L = 325 S = 4.0

Channel No. 2 L = 270 S = 2.21

Channel No. 3 L = __________ S = __________

Accumulation Time

Overland Flow or Inlet Time: 10 min.

Channel No. 1 Flow:

Velocity = 4.0 ft/sec; Time = 325 / 4 X 60 = 1.35 min.

Channel No. 2 Flow:

Velocity = 2.9 ft/sec; Time = 270 / 2.9 X 60 = 1.55 min.

Channel No. 3 Flow:

Velocity = ______ ft/sec; Time = ______ / X 60 = ______ min.

Total Accumulation Time: T = 12.90 min.

I = __________ = __________ = __________

Q = CIA = ( ) ( ) ( ) = ______________ c.f.s.

Date: ____________________

Comp. by: ____________________

Checked by: ____________________

RUNOFF COMPUTATIONS

Sheet No. ________

Project: ____________________

Drainage Area No. A6

Area = ____________ acres

Maximum Overland Flow: L = ________ S = ________

Maximum Channel Flow:

Channel No. 1 L = 250 S = 1.80

Channel No. 2 L = ________ S = ________

Channel No. 3 L = ________ S = ________

Accumulation Time

Overland Flow or Inlet Time: 10 min.

Channel No. 1 Flow:

Velocity = 2.75 ft/sec; Time = 250 / 2.75 X 60 = 1.5 min.

Channel No. 2 Flow:

Velocity = ______ ft/sec; Time = ______ / X 60 = ______ min.

Channel No. 3 Flow:

Velocity = ______ ft/sec; Time = ______ / X 60 = ______ min.

Total Accumulation Time: T = 11.50 min.

I = ________ = ________ = ________

Q = CIA = (   ) (   ) (   ) = ____________ c.f.s.

Date: ____________

Comp. by: ____________

Checked by: ____________

RUNOFF COMPUTATIONS

Sheet No.________

Project:________

Drainage Area No. A7

Area = ________ acres

Maximum Overland Flow: L = ________ S = ________

Maximum Channel Flow:

Channel No. 1 L = 450 S = 3.8%

Channel No. 2 L = ________ S = ________

Channel No. 3 L = ________ S = ________

Accumulation Time

Overland Flow or Inlet Time: 10 min.

Channel No. 1 Flow:

Velocity = 3.8 ft/sec; Time = $\frac{450}{3.8 \times 60}$ = 1.97 min.

Channel No. 2 Flow:

Velocity = ________ ft/sec; Time = $\frac{\quad}{\times 60}$ = ________ min.

Channel No. 3 Flow:

Velocity = ________ ft/sec; Time = $\frac{\quad}{\times 60}$ = ________ min.

Total Accumulation Time: T = 11.97 min.

I = ________ = ________ = ________

Q = CIA = (   ) (   ) (   ) = ________ c.f.s.

Date:________

Comp. by:________

Checked by:________

RUNOFF COMPUTATIONS

Sheet No. ____________

Project: ____________________

Drainage Area No. A8

Area = ____________ acres

Maximum Overland Flow: L = ____________ S = ____________

Maximum Channel Flow:

Channel No. 1 L = 320 S = 0.5

Channel No. 2 L = 350 S = 2.4

Channel No. 3 L = ____________ S = ____________

Accumulation Time

Overland Flow or Inlet Time: 10 min.

Channel No. 1 Flow:

Velocity = 1.4 ft/sec; Time = 320 / (1.4 X 60) = 3.8 min.

Channel No. 2 Flow:

Velocity = 3.1 ft/sec; Time = 350 / (3.1 X 60) = 1.88 min.

Channel No. 3 Flow:

Velocity = ______ ft/sec; Time = ______ / X 60 = ______ min.

Total Accumulation Time: T = 15.68 min.

I = ____________ = ____________ = ____________

Q = CIA = (   ) (   ) (   ) = ____________ c.f.s.

Date: ____________________

Comp. by: ____________________

Checked by: ____________________

RUNOFF COMPUTATIONS

Sheet No. ______

Project: ______________________

Drainage Area No. A9

Area = ______________ acres

Maximum Overland Flow: L = 270 S = ______

Maximum Channel Flow:

Channel No. 1 L = 350 S = 3.28

Channel No. 2 L = 410 S = 0.78

Channel No. 3 L = ______ S = ______

Accumulation Time

Overland Flow or Inlet Time: 10 min.

Channel No. 1 Flow:

Velocity = 3.6 ft/sec; Time = $\frac{350}{3.6 \times 60}$ = 1.62 min.

Channel No. 2 Flow:

Velocity = 1.8 ft/sec; Time = $\frac{410}{1.8 \times 60}$ = 3.8 min.

Channel No. 3 Flow:

Velocity = ______ ft/sec; Time = $\frac{\quad}{\times 60}$ = ______ min.

Total Accumulation Time: T = 15.42 min.

I = ______ = ______ = ______

Q = CIA = (   ) (   ) (   ) = ______________ c.f.s.

Date: ______________________

Comp. by: ______________________

Checked by: ______________________

RUNOFF COMPUTATIONS

Sheet No. ____________

Project: ____________________

Drainage Area No. A10

Area = ____________________ acres

Maximum Overland Flow: L = ____________ S = ____________

Maximum Channel Flow:

Channel No. 1 L = 275 S = 2.6

Channel No. 2 L = 225 S = 8.38

Channel No. 3 L = ____________ S = ____________

Accumulation Time

Overland Flow or Inlet Time: ________ min.

Channel No. 1 Flow:

Velocity = 1.4 ft/sec; Time = $\frac{275}{1.4 \times 60}$ = 3.27 min.

Channel No. 2 Flow:

Velocity = 3.2 ft/sec; Time = $\frac{225}{3.2 \times 60}$ = 1.17 min.

Channel No. 3 Flow:

Velocity = ______ ft/sec; Time = $\frac{\quad}{\times 60}$ = ______ min.

Total Accumulation Time: T = 4.44 min.

I = __________ = __________ = __________

Q = CIA = (   ) (   ) (   ) = ______________ c.f.s.

Date: ______________________

Comp. by: ______________________

Checked by: ______________________

RUNOFF COMPUTATIONS

Sheet No. ________

Project: ________

Drainage Area No. All

Area = ________ acres

Maximum Overland Flow: L = ________ S = ________

Maximum Channel Flow:

Channel No. 1 L = 1200 S = 0.5%

Channel No. 2 L = 275 S = 3.32

Channel No. 3 L = ________ S = ________

Accumulation Time

Overland Flow or Inlet Time: 10 min.

Channel No. 1 Flow:

Velocity = 1.4 ft/sec; Time = 1200 / 1.4 X 60 = 14.29 min.

Channel No. 2 Flow:

Velocity = 3.7 ft/sec; Time = 275 / 3.7 X 60 = 1.01 min.

Channel No. 3 Flow:

Velocity = ________ ft/sec; Time = ____ / X 60 = ________ min.

Total Accumulation Time: T = 25.29 min.

I = ________ = ________ = ________

Q = CIA = (   ) (   ) (   ) = ________ c.f.s.

Date: ________

Comp. by: ________

Checked by: ________

RUNOFF COMPUTATIONS

Sheet No.__________

Project:____________________

Drainage Area No. All

Area = ____________________ acres

Maximum Overland Flow: L = __________ S = __________

Maximum Channel Flow:

Channel No. 1 L = 1200' S = 0.5%

Channel No. 2 L = 275 S = 3.39

Channel No. 3 L = __________ S = __________

Accumulation Time

Overland Flow or Inlet Time: 10 min.

Channel No. 1 Flow:

Velocity = 1.4 ft/sec; Time = $\frac{1200}{1.4 \times 60}$ = 14.29 min.

Channel No. 2 Flow:

Velocity = 3.7 ft/sec; Time = $\frac{275}{3.7 \times 60}$ = 1.01 min.

Channel No. 3 Flow:

Velocity = ______ ft/sec; Time = $\frac{\quad}{\times 60}$ = ______ min.

Total Accumulation Time: T = 25.29 min.

I = __________ = __________ = __________

Q = CIA = ( ) ( ) ( ) = ________________ c.f.s.

Date:____________________

Comp. by:____________________

Checked by:____________________

RUNOFF COMPUTATIONS

Sheet No.___________

Project:______________________

Drainage Area No. A12

Area = ______________________ acres

Maximum Overland Flow: L = ______________ S = ______________

Maximum Channel Flow:

Channel No. 1 L = 440 S = 3.43

Channel No. 2 L = 250 S = 4.16

Channel No. 3 L = ______________ S = ______________

Accumulation Time

Overland Flow or Inlet Time: 10 min.

Channel No. 1 Flow:

Velocity = 4.1 ft/sec; Time = $\frac{440}{4.1 \times 60}$ = 1.79 min.

Channel No. 2 Flow:

Velocity = 3.7 ft/sec; Time = $\frac{250}{3.7 \times 60}$ = 1.13 min.

Channel No. 3 Flow:

Velocity = ______ ft/sec; Time = $\frac{\_\_\_\_}{\times 60}$ = ______ min.

Total Accumulation Time: T = 12.91 min.

I = ___________ = ___________ = ___________

Q = CIA = (   ) (   ) (   ) = ________________ c.f.s.

Date:______________________________

Comp. by:__________________________

Checked by:________________________

RUNOFF COMPUTATIONS

Sheet No.________

Project:________

Drainage Area No. A13

Area = ________ acres

Maximum Overland Flow: L = 30' S = 1%

Maximum Channel Flow:

Channel No. 1 L = 225 S = 3.18

Channel No. 2 L = 270 S = 0.5%

Channel No. 3 L = ____ S = ____

Accumulation Time

Overland Flow or Inlet Time: 10 min.

Channel No. 1 Flow:

Velocity = 3.6 ft/sec; Time = $\frac{225}{3.6 \times 60}$ = 1.04 min.

Channel No. 2 Flow:

Velocity = 1.6 ft/sec; Time = $\frac{270}{1.6 \times 60}$ = 3.21 min.

Channel No. 3 Flow:

Velocity = ____ ft/sec; Time = $\frac{\quad}{\times 60}$ = ____ min.

Total Accumulation Time: T = 16.25 min.

I = ____ = ____ = ____

Q = CIA = (   ) (   ) (   ) = ____ c.f.s.

Date:________

Comp. by:________

Checked by:________

RUNOFF COMPUTATIONS

Sheet No.__________

Project:____________________

Drainage Area No. A16

Area = ________________ acres

Maximum Overland Flow: L = __________ S = __________

Maximum Channel Flow:

Channel No. 1 L = 350 S = 5.23

Channel No. 2 L = __________ S = __________

Channel No. 3 L = __________ S = __________

Accumulation Time

Overland Flow or Inlet Time: 10 min.

Channel No. 1 Flow:

Velocity = 4.6 ft/sec; Time = 350 / (4.6 X 60) = 1.27 min.

Channel No. 2 Flow:

Velocity = ______ ft/sec; Time = ______ / X 60 = ______ min.

Channel No. 3 Flow:

Velocity = ______ ft/sec; Time = ______ / X 60 = ______ min.

Total Accumulation Time: T = 11.27 min.

I = ________ = ________ = ________

Q = CIA = ( ) ( ) ( ) = ____________ c.f.s.

Date:____________________

Comp. by:____________________

Checked by:____________________

RUNOFF COMPUTATIONS

Sheet No.________

Project:________________

Drainage Area No. A15

Area = ____________ acres.

Maximum Overland Flow: L = ________ S = ________

Maximum Channel Flow:

Channel No. 1 L = 250 S = 4.17

Channel No. 2 L = 200 S = 1.57

Channel No. 3 L = \\ S = ________

Accumulation Time

Overland Flow or Inlet Time: 10 min.

Channel No. 1 Flow:

Velocity = 4.2 ft/sec; Time = 250 / 4.2 X 60 = 1.00 min.

Channel No. 2 Flow:

Velocity = 2.6 ft/sec; Time = 200 / 2.6 X 60 = 1.28 min.

Channel No. 3 Flow:

Velocity = ______ ft/sec; Time = ______ / X 60 = ______ min.

Total Accumulation Time: T = 12.27 min.

I = ________ = ________ = ________

Q = CIA = ( ) ( ) ( ) = ____________ c.f.s.

Date:________________

Comp. by:________________

Checked by:________________

RUNOFF COMPUTATIONS

Sheet No.__________

Project:__________________

Drainage Area No. A16

Area = ________________ acres

Maximum Overland Flow: L = __________ S = __________

Maximum Channel Flow:

Channel No. 1 L = 250 S = 5.36

Channel No. 2 L = __________ S = __________

Channel No. 3 L = __________ S = __________

Accumulation Time

Overland Flow or Inlet Time: 10 min.

Channel No. 1 Flow:

Velocity = 4.7 ft/sec; Time = $\frac{250}{4.7 \times 60}$ = .89 min.

Channel No. 2 Flow:

Velocity = ______ ft/sec; Time = $\frac{\_\_\_\_}{X\ 60}$ = ______ min.

Channel No. 3 Flow:

Velocity = ______ ft/sec; Time = $\frac{\_\_\_\_}{X\ 60}$ = ______ min.

Total Accumulation Time: T = 10.89 min.

I = ________ = ________ = ________

Q = CIA = (   ) (   ) (   ) = ____________ c.f.s.

Date:__________________

Comp. by:__________________

Checked by:__________________

RUNOFF COMPUTATIONS

Sheet No. ____________

Project: ____________________

Drainage Area No. A17

Area = ____________________ acres

Maximum Overland Flow: L = 10' S = 1.0%

Maximum Channel Flow:

Channel No. 1 L = __________ S = __________

Channel No. 2 L = __________ S = __________

Channel No. 3 L = __________ S = __________

Accumulation Time

Overland Flow or Inlet Time: 10 min.

Channel No. 1 Flow:

Velocity = ______ ft/sec; Time = ______ / X 60 = ______ min.

Channel No. 2 Flow:

Velocity = ______ ft/sec; Time = ______ / X 60 = ______ min.

Channel No. 3 Flow:

Velocity = ______ ft/sec; Time = ______ / X 60 = ______ min.

Total Accumulation Time: T = 10.0 min.

I = __________ = __________ = __________

Q = CIA = ( ) ( ) ( ) = ______________ c.f.s.

Date: ____________________

Comp. by: ____________________

Checked by: ____________________

RUNOFF COMPUTATIONS

Sheet No.__________

Project: ____________________

Drainage Area No. 418

Area = ____________________ acres

Maximum Overland Flow: L = __________ S = __________

Maximum Channel Flow:

Channel No. 1 L = 275 S = 3.10%

Channel No. 2 L = __________ S = __________

Channel No. 3 L = __________ S = __________

Accumulation Time

Overland Flow or Inlet Time: 10 min.

Channel No. 1 Flow:

Velocity = 3.6 ft/sec; Time = 275 / 3.6 X 60 = 1.27 min.

Channel No. 2 Flow:

Velocity = ______ ft/sec; Time = ______ / X 60 = ______ min.

Channel No. 3 Flow:

Velocity = ______ ft/sec; Time = ______ / X 60 = ______ min.

Total Accumulation Time: T = 11.27 min.

I = ________ = ________ = ________

Q = CIA = (   ) (   ) (   ) = __________ c.f.s.

Date: ____________________

Comp. by: ____________________

Checked by: ____________________

RUNOFF COMPUTATIONS

Sheet No.________

Project:________________

Drainage Area No. A19

Area = 16.694 acres

Maximum Overland Flow: L = 900' S = 1.3%

Maximum Channel Flow:

Channel No. 1 L = ______ S = ______

Channel No. 2 L = ______ S = ______

Channel No. 3 L = ______ S = ______

Accumulation Time

Overland Flow or Inlet Time: 10 min.

Channel No. 1 Flow:

Velocity = ____ ft/sec; Time = ____ / X 60 = ____ min.

Channel No. 2 Flow:

Velocity = ____ ft/sec; Time = ____ / X 60 = ____ min.

Channel No. 3 Flow:

Velocity = ____ ft/sec; Time = ____ / X 60 = ____ min.

Total Accumulation Time: T = 10 min.

I = ______ = ______ = ______

Q = CIA = ( ) ( ) ( ) = ______ c.f.s.

Date:________

Comp. by:________

Checked by:________

APPENDIX 4

Frequency Factors

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

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.

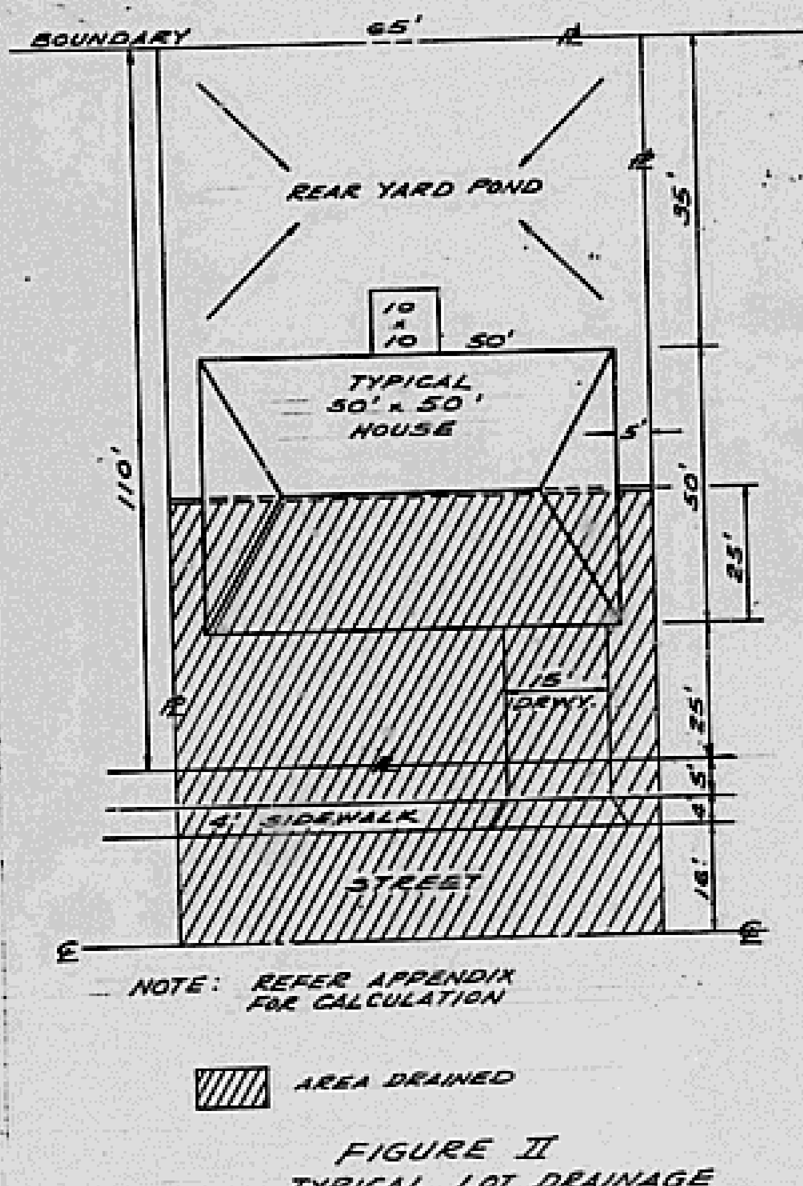
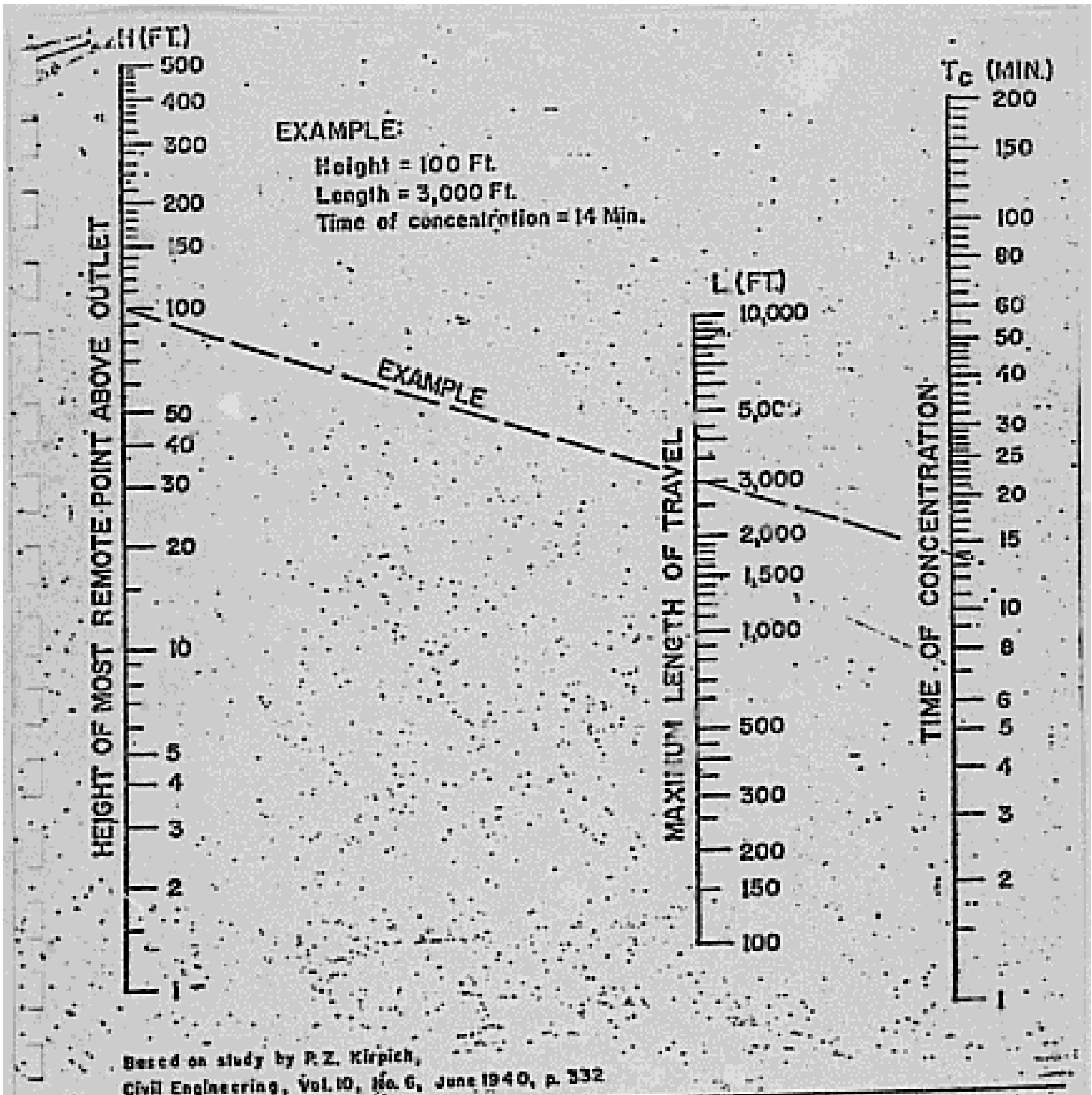


FIGURE II

TYPICAL LOT DRAINAGE

MURRAY-McCORMICK, INC.
ENVIRONMENTAL DESIGN
ENGINEERING·PLANNING·SURVEYING

JOB NO. ______ DATE ______
PROJECT ______
SCALE ______



TIME OF CONCENTRATION OF SMALL DRAINAGE BASINS

FIG. III

Reprinted from "Design of Roadside Drainage Channels - Hydraulic Engineering Circular No. 6", April 1962, U. S. Dept.

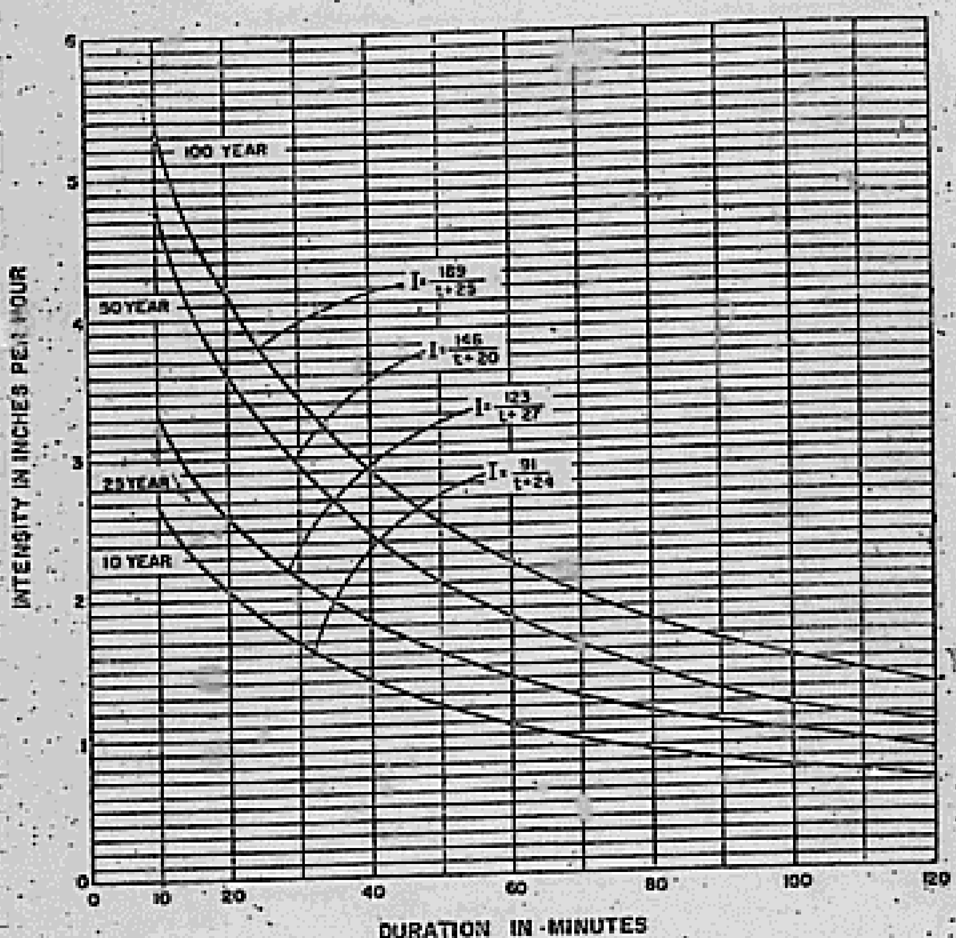


FIGURE IV

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

INTENSITY DURATION
FREQUENCY CURVES

(ALBUQUERQUE AREA - 1960)

GORDON HERKENHOFF & ASSOC.
CONSULTING ENGINEERS

CHART 1

DRAINAGE REPORT

FOR

THE HIGH RANGE AT TAYLOR RANCH II

(TRACT 4)

ALBUQUERQUE, NEW MEXICO

MEURER, SERAFINI AND MEURER, INC. *CONSULTING ENGINEERS*

2601 WYOMING BOULEVARD N.E. • SUITE F • ALBUQUERQUE, NEW MEXICO 87110 • 505/292-1936

DRAINAGE REPORT

FOR

THE HIGH RANGE AT TAYLOR RANCH II

(TRACT 4)

ALBUQUERQUE, NEW MEXICO

Prepared by

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October 1977

Revised February 1978

TABLE OF CONTENTS

	Page No.
PURPOSE AND SCOPE	1
SITE LOCATION & TOPOGRAPHY	1
DESIGN CRITERIA	2
ESTIMATED RUNOFF UNDEVELOPED STATE	2
ESTIMATED RUNOFF DEVELOPED STATE	4
EXPLANATION OF RESULTS	7
RECOMMENDATIONS	8
SUMMARY	9

APPENDIX

Appendix 1	Composite Runoff Coefficient
Appendix 2	Ponding Requirement
Appendix 3	Runoff Computations
Appendix 4	Frequency Factor
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	Offsite & Undeveloped Drainage

DRAINAGE REPORT

HIGH RANGE AT TAYLOR RANCH II
(Tract 4)

PURPOSE AND SCOPE

AMBELL, a joint venture of AMDEC and Dale Bellamah Land Company, is currently developing lands located on the western Albuquerque Metropolitan Area known as Taylor Ranch. Taylor Ranch is a many faceted development, master planned concept which includes single family, multi-family, parks, schools, and commercial areas. High Range at Taylor Ranch II is a single family subdivision.

The purpose of this report is to present a plan for controlling surface runoff from the said subdivision in a manner acceptable to the Albuquerque Metropolitan Arroyo Flood Control Authority and the Albuquerque City Engineer's office.

SITE LOCATION AND TOPOGRAPHY

High Range at Taylor Ranch II is located within Section 28, Township 11 North, Range 2 East, N.M.P.M. The surrounding terrain is generally partially developed land on all sides. The proposed North Mariposa Diversion Channel is located on the east and north side of the proposed subdivision.

The soil of the site is generally comprised of eolian sand. The natural ground slopes from northwest to southeast with several small swales. Ground cover consists mainly of rabbitbrush, yucca, and cactus.

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, derived from a Tc 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.

ESTIMATED RUNOFF UNDEVELOPED STATE:

Drainage within the boundary of the site is basically overland flow with some small swales. Most of the drainage naturally exits the area at the southeast end of the property. The uphill area to the northwest of the site is a portion of the partially developed Volcano Cliffs subdivision. This has been developed to the point where some of the streets have been graded.

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

According to the drainage report approved by the City of Albuquerque in 1973 for the Volcano Cliffs Subdivision, there is no offsite runoff that flows onto the site, except at the very eastern edge, where the flows concentrate in the North Mariposa Diversion Channel. This situation will only occur when Volcano Cliffs is fully developed.

For the purposes of this report, then, offsite flows into Tract 4 have been developed assuming no development exists in Volcano Cliffs. Provisions will be made to carry these offsite flows through Tract 4 until they can be diverted away from the site by full uphill development.

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

TABLE 1

RUNOFF IN UNDEVELOPED STATE

Drainage Basin	Elev. Diff.	Length of Flow	Tc Min.	I100 yr. In./Hr.	C[2].	Area Ac.	Q C.F.S.
ONSITE							
A-1	106	1300'	10	5.4	0.38	6.51	13.34
A-2	106	1600'	10	5.4	0.38	8.0	16.42
A-3	86	1600'	10	5.4	0.38	15.72	32.26
A-4	91	1640'	10	5.4	0.38	4.1	8.41
A-5	70	1600'	10	5.4	0.38	5.0	10.26
ΣA1-A5							80.69
OFFSITE*							
O-S-1	60	350	10	5.4	0.38	1.00	2.00
O-S-2	100	1170	10	5.4	0.38	7.5	15.20
O-S-3	118	450	10	5.4	0.38	9.9	20.06
O-S-4	118	300	10	5.4	0.38	3.6	7.29
O-S-5	As Per Matotan Report						262.0

2. See Appendix 1.

*These offsite flow figures are based on the assumption that the uphill property is undeveloped. These figures are shown only for the sake of comparison, and cannot represent a true value, since the uphill property is already partially developed.

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 A.M.A.F.C.A.'s requirement that the runoff rate from the developed tract not exceed the runoff rate from the tract in its natural state.

The runoff coefficient for various surfaces prior to C_f factor are as follows:

Streets, Walks and Drives	C = 0.80
Roofs	C = 0.80
Lawns, Sandy Soils (Average-2 to 7%)	C = 0.30

Table 2

RUNOFF IN DEVELOPED STATE

Drainage Basin	$\bar{c}$	$A\text{-}\bar{c}$	$A\text{-}\bar{c}$	I100 In./Hr.	Q(cfs)	ΣQ cfs
Onsite	Route I					
N-3	.38	.51		5.4	2.8	
B	.70	2.09		5.08	10.62	
ΣN-3 - B			2.60	5.08		13.21
C	.64	.83		5.08	4.22	
ΣN3 - C			3.43	5.08		17.42
E	.75	.62		4.89	3.00	
ΣN3 - E			4.05	4.89		19.80
D	.78	2.43		4.89	11.90	
ΣN3 - D			6.48	4.89		31.69
F	.78	.84		4.74	4.00	
ΣN3 - F			7.32	4.74		34.70
H	.78	3.06		4.74	18.63	
ΣN3 - H			10.38	4.74		49.20
K	.78	.91		4.62	4.20	
ΣN3 - K			11.29	4.62		52.16
J	.78	2.42		4.62	11.20	
ΣN3 - J			13.71	4.62		63.34
L	.78	.65		4.5	2.92	
ΣN3 - L			14.36	4.5		64.62

Table 2

RUNOFF IN DEVELOPED STATE

Drainage Basin	$\bar{c}$	A-$\bar{c}$	A-$\bar{c}$	I100 In./Hr.	Q(cfs)	[illegible]cfs
Onsite	Route II					
N-2	.38	0.47		5.4	2.52	
A	.64	.93		5.28	4.91	
£N2 - A			1.40	5.28		7.3[illegible]
N-1	.38	.47		5.28	2.48	
G	.69	.77		5.13	4.00	
£N2 - G			2.64	5.13		13.[illegible]
I	.74	.92		4.76	4.38	
£N2 - I			3.56	4.76		16.[illegible]5
M	.78	.39		4.5	1.76	
N2 - M			3.95	4.5		17[illegible]78
N-4	.38	.62		5.4	3.35	3[illegible]35
Route I		14.36				
Route II		3.95				
N-4		.62				
Total Runoff			18.93	4.5		85.[illegible]

EXPLANATION OF RESULTS:

Undeveloped Runoff:

Onsite - Total Flow = 80.69 c.f.s.

Developed Runoff:

Onsite - Total Flow = 85.20 c.f.s.

As shown above, the development of this project, including the lot ponding, will not substantially increase the storm runoff over that occurring in the natural undeveloped state.

At the time that High Range at Taylor Ranch II is developed, it is probable that Volcano Cliffs to the northwest will not yet be fully developed. In the meantime, then, runoff from offsite area O-S-4 will flow into the North Mariposa Diversion Channel via a diversion ditch at the north end of Tract 4, thereby never entering the subdivision proper. Flow from O-S-5 and N-4 will directly enter the north end of the channel, bypassing the developed site.

Runoff from O-S-1, O-S-2, N-1 and N-2 will be diverted at the property line by a diversion ditch, then be transported through two 10' wide drainage easements that drain into Painted Pony Trail. Runoff from O-S-2 + N-3 will be diverted by diversion wall and carried by drainage ditch to a 10' wide improved drainage right-of-way. Drainage from these areas will be carried through the subdivision by the streets, eventually being collected by Tesuque Street, which subsequently discharges its runoff into the North Mariposa Diversion Channel at the southern end of the property. Runoff from these areas will cease upon development of Volcano Cliffs.

All the developed runoff from the High Range at Taylor Ranch II will be collected by the streets within the development and be transported to the southeast, then collected by Tesuque Street. The runoff in Tesuque will then flow into the North Mariposa Diversion Channel.

RECOMMENDATIONS

The following recommendations are made to enable the developer on this site and the local government to complete this project within the design criteria:

1. The ponding areas in each backyard would be best situated toward the rear of the yard. There should be a minimum of five foot (5') buffer zone between the rear property lines and the edge of the pond. This will protect any walls which might be constructed. In no case should ponded waters be allowed to stand against the wall or house foundation.
2. Ponds should average 6" deep and the minimum surface area should not be less than 18%[4.] of the total area drained into the pond. All lots on the site have been ponded wherever it is practical.
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 0.4% slope in order to insure adequate carrying capacities.

---

4. See Appendix-2.

4. Temporary runoff from O-S-4 and O-S-5 will be diverted to the North Mariposa Diversion Channel by a diversion ditch. Runoff from O-S-1 and O-S-2 will be carried into the High Range at Taylor Ranch II by a drainage easement, and through the site by the streets for eventual disposal in the La Mariposa Diversion Channel. Runoff from O-S-3 will be allowed to enter the site via a 10' drainage right-of-way, then carried by the streets into the North Mariposa Diversion Channel.

5. Runoffs from onsite areas A through H will be drained into Tesuque Street and then into the La Mariposa Diversion Channel.

SUMMARY

The subject property, by utilizing backyard ponding, will essentially contribute no more surface runoff to surrounding areas than that which existed before development.

In conclusion, the development of this site should have a beneficial effect on the drainage characteristics of this area, and can be developed safely with no harm to life or property.

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STATE OF NEW MEXICO
REGISTERED PROFESSIONAL ENGINEER

BIBLIOGRAPHY OF REFERENCES

(1) Herkennoff, 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.

APPENDIX

APPENDIX-1

COMPOSITE RUNOFF COEFFICIENTS

Undeveloped Land

$C = 0.31^{1.} \times 1.25^{2.} = 0.38$

Developed Land

Typical Lot Area

Gross Area		39.57 Ac.
Less: Area in Streets	6.47 Ac.	
Area in Lots		33.10 Ac.
Average Lot Area (130 Lots)		11,091 Sq.Ft.
Typical Lot Width		70 Ft.

Ponded Lots

C = 0.80	Streets & Walk Area	20x70	1,400 sq.ft.
	Roof Area	25x50	1,250 sq.ft.
	Driveway	30x15	450 sq.ft.
	Total Impervious Area		3,100 sq.ft.
C = 0.30	Front and Side Yards	70x55	3,850 sq.ft.
	Less Roof Area	25x50	-1,250 sq.ft.
	Less Driveway	30x15	-450 sq.ft.
	Total Pervious Area		2,150 sq.ft.

Impervious Area	3,100 sq.ft.	0.59% @ 0.80	0.482
Pervious Area	2,150 sq.ft.	0.41% @ 0.30	0.123
Total Area	5,250 sq.ft.	100%	0.60

Composite Runoff Coefficient - $C \times C_f = 0.60 \times 1.25 =$ 0.74

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

Non-Ponded Lots

C =	0.80 Streets & Walk Area	20x70	1,400 Sq.Ft.
	Roof Area	50x50	2,500 Sq.Ft.
	Driveway	30x15	450 Sq.Ft.
	Total Impervious Area		4,350 Sq.Ft.
C =	0.38 Total Lot Area		11,091 Sq.Ft.
	Less Roof Area		-2,500 Sq.Ft.
	Less Driveway		-450 Sq.Ft.
	Total Pervious Area		8,141 Sq.Ft.

Impervious Area	4,350 sq.ft.	0.35% @ 0.80	0.28
Pervious Area	8,141 sq.ft.	0.65% @ 0.30	0.20
Total Area	12,491 sq.ft.	100%	0.48

Composite Runoff Coefficient - $C \times C_f = 0.48 \times 1.25 = 0.60$

APPENDIX-2

Ponding Requirements

Average Lot Area		11,091 sq.ft.
1/2 roof area	25x50	1,250 sq.ft.
Patio area	10x10	100 sq.ft.
Rear Lawn area		6,241 sq.ft.
Total Area Draining to Pond		7,591 sq.ft.

Runoff Coefficient

Impervious Area:

$$C = 0.80 \ \frac{1350}{7591} = 0.14$$

Pervious Area:

$$C = 0.30 \ \frac{6241}{7591} = \underline{0.25}$$

$$0.39$$

$$C \times C_f = 0.39 \times 1.25 = 0.49$$

Pond Volume Requirements:

100-year 6-hour precipitation = 2.2 inches

Volume = Runoff Coefficient x Area x Precipitation

$V = 2.2/12 \times 0.49 \times 7591 = 682 \text{ ft.}^3$

Depth of Pond 0.50 ft. (6")

Minimum area of pond - 1364 ft.^2

Pond area as a percentage of area drained = .18%

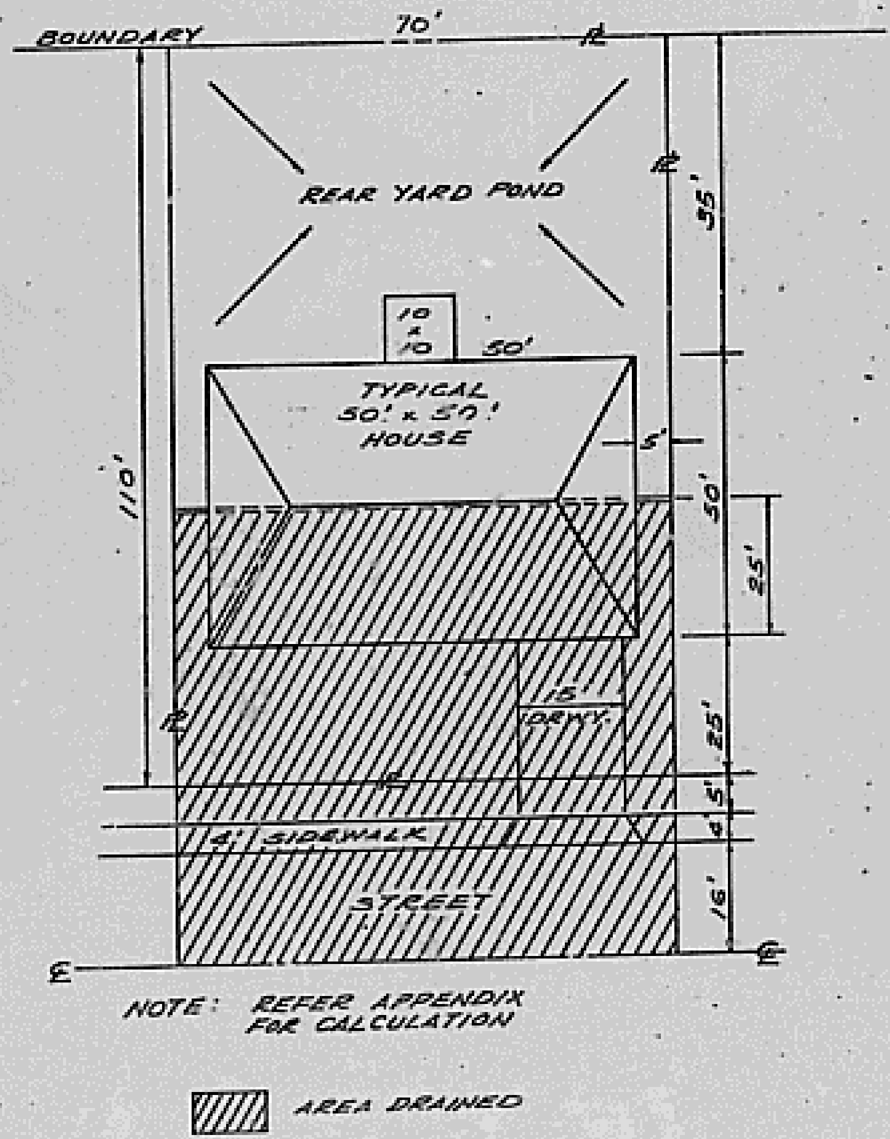


FIGURE II

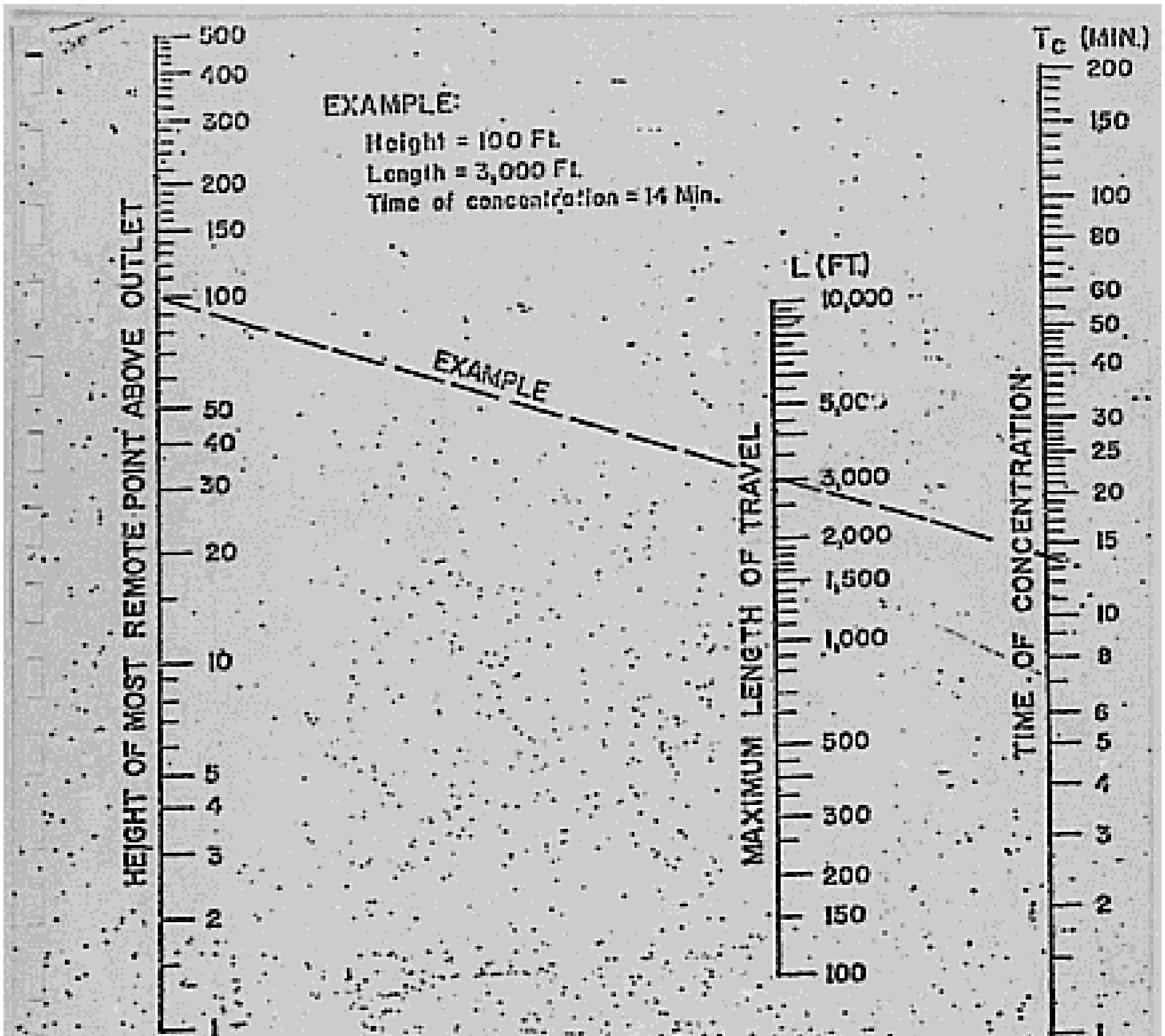
TYPICAL LOT DRAINAGE

MURRAY-McCORMICK, INC.
ENVIRONMENTAL DESIGN
ENGINEERING · PLANNING · SURVEYING

JOB NO. ______ DATE ______
PROJECT ______
SCALE ______

APPENDIX 3

Runoff Computations



Based on study by P.Z. Kirpich, Civil Engineering, Vol. 10, No. 6, June 1940, p. 332

TIME OF CONCENTRATION OF SMALL DRAINAGE BASINS

FIG. III

Reprinted from "Design of Roadside Drainage Channels - Hydraulic Engineering Circular No. 6", April 1962, U. S. Dept.

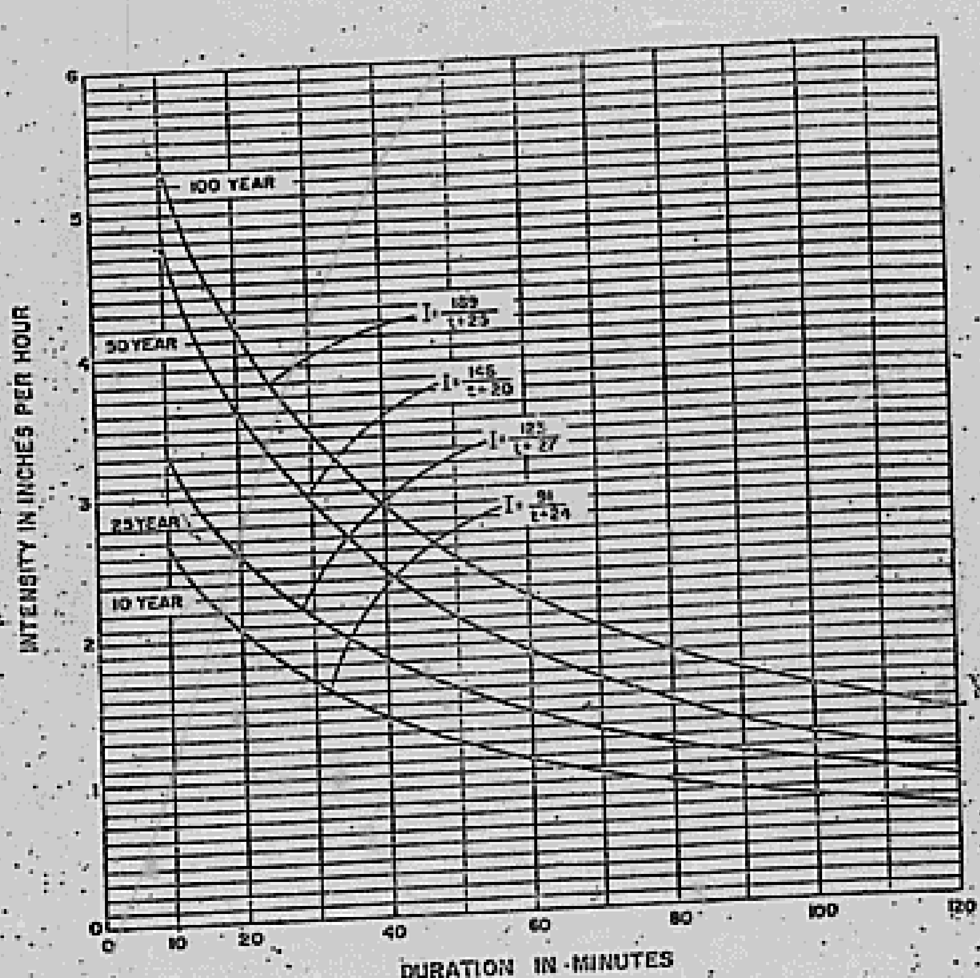


FIGURE IV

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

INTENSITY DURATION
FREQUENCY CURVES

(ALBUQUERQUE AREA-[illegible])

GORDON HERKENHOFF & ASSOC
CONSULTING ENGINEERS
ALBUQUERQUE, NEW MEXICO

CHART 1

FIG. G-INTENSITY EXPECTATION FOR ONE-HOUR RAINFALL.*

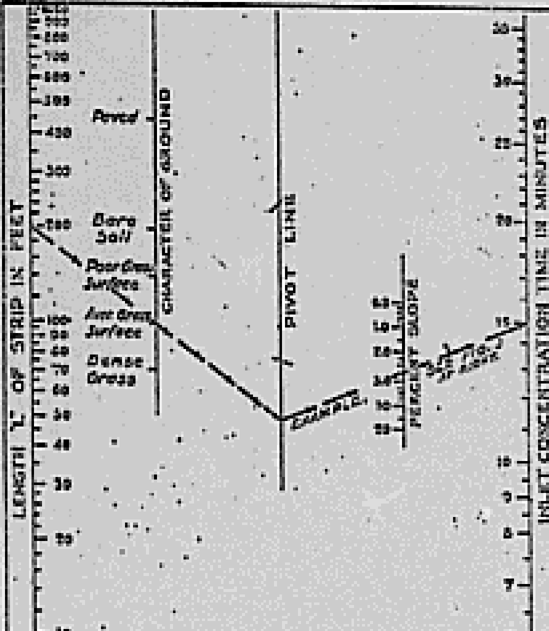


FIG. H-OVERLAND FLOW TIME.

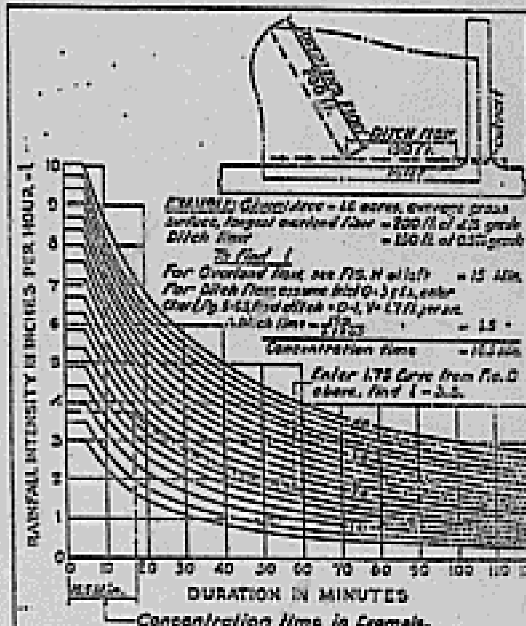


FIG. J-VALUES OF I
RAINFALL INTENSITY-DURATION.+

*Reproduced from Miscellaneous Publication No. 204, U.S. Dept. of Agriculture, by David L. Yarnell.
+Adapted from Engineering Manual of the War Department, Part XIII, Chap. I, Dec. '45.

UBDIVISION Taylor Ranch Tract 4
OCATION West Mesa
OB NO.
ESIGN STORM 100 YR. RECURRENCE INTERVAL
AJOR STORM 100 YR.
OMPUTATIONS BY D Ward DATE Oct 4 1978

Undeveloped Drainage
Tract 4

RUNOFF COMPUTATIONS
(Rational Method)

PAGE 3 OF

Area Designation	A (Acres)	c	c_f	$\bar{c}$ = (c+cf)	A·$\bar{c}$	ΣA·$\bar{c}$	tc (min)	I (in/hr)	Q = (ΣA·$\bar{c}$)xI cfs	Street capacity cfs	Flow in Pipe cfs	Pipe Dia. in.	Slope %	Length ft.	VEL V fps	Δt (min)	
A-1	6.5	.30	.125	.375	2.44		10	5.4	13.15								
A-2	8.0	↓	↓	↓	3.0		↓	↓	16.20								
A-3	15.72				5.89				31.86								
A-4	9.1				3.46				18.67								
ΣA₁-A₄	39.32	↓	↓	↓			↓	↓	79.7								

UBDIVISION Taylor Ranch Tract 4
OCATION
OG NO
DESIGN STORM 100 YR. RECURRENCE INTERVAL
MAJOR STORM 100 YR.
COMPUTATIONS BY D. Ward DATE Oct 4 1977

Undeveloped Drainage
Tract 4
offsite

RUNOFF COMPUTATIONS
(Rational Method)

PAGE 4

Area Designation	A (Acres)	c	c_f	$\bar{c}$ = (c×c_f)	A·$\bar{c}$	ΣA·$\bar{c}$	tc (min)	I (in/hr)	Q = (ΣA·$\bar{c}$)×I cfs	Street capacity cfs	Flow in Pipe cfs	Pipe Dia. in.	Slope %	Length ft.	VEL. V fps	∆t (min)	
0.5. 1	15.2	.30	1.25	.375	5.63		10	5.4	30.40								
0.5. 2	14.2				~~[illegible]~~		~~[illegible]~~	~~5.4~~	2[illegible]								
0.5. 3	4.9				1.80		10	5.4	9.72								
0.5. 4	1.2				0.45		10	5.4	2.43								
0.5. 5	1.0				0.30		10	5.4	2.02								
Σ 0.5 1 - 0.5 5									70[illegible]								

BDIVISION: High Range II
CATION TAYLOR RANCH Alley West Mesa
B NO.
ESIGN STORM: 100 YR. RECURRENCE INTERVAL
AJOR STORM: 100 YR.
OMPUTATIONS BY Doug Wood DATE Feb-23-78

TOTAL STREET FLOW
OFFSITE + ONSITE

ROUTE 1

RUNOFF COMPUTATIONS
(Rational Method)

PAGE 1

Area Designation	A (Acres)	C	C_f	Ce (cxcf)	A·C	ΣA·C	tc (min)	I (in/hr)	Q=(ΣA·C)xI cfs	Street capacity cfs	Flow in Pipe cfs	Pipe Dia. In.	Slope %	Length ft.	VEL. V fps	Δt (min)	
0.5. -3	9.9	.30	1.25	.38	3.76		10	5.4	[illegible]								
N-3	1.35	.30		.38	0.51		10	[illegible]	[illegible]								
Σ 0.5.3 + N-3						4.27	[illegible]	[illegible]	[illegible]								
B	2.98	.56		.70	2.09	-	[illegible]	[illegible]	[illegible]				1.5%	530	4.0	[illegible]	[illegible] Flow
Σ 0.5.3+N3 +B						6.36	[illegible]	[illegible]	[illegible]	[illegible]			[illegible]				Total Flow out of B
C	1.29	.51		.64	0.83		[illegible]	[illegible]	[illegible]	[illegible]			[illegible]	[illegible]	4.0		[illegible] Flow
Σ 0.5-3 → C						7.19	[illegible]	[illegible]	[illegible]	[illegible]			[illegible]				Total Flow into E
E	0.82	.60		.75	.62		[illegible]	[illegible]	[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Σ 0.5-3 → E						7.81	[illegible]	[illegible]	[illegible]								[illegible]
D	3.12	.63		.78	2.43		[illegible]	[illegible]	[illegible]	[illegible]							

SUBDIVISION: High Range II
LOCATION: Taylor Ranch Albq. West Mesa
NO.
DESIGN STORM: 100 YR. RECURRENCE INTERVAL
MAJOR STORM: 100 YR.
COMPUTATIONS BY: Doug Wood DATE: Feb-22-78

DEVELOPED RUNOFF
TOTAL STREET FLOWS.

RUNOFF COMPUTATIONS
(Rational Method)

ROUTE 1

Area Designation	A (Acres)	c	c_f	C = (c x c_f)	A·C	ΣA·C	tc (min)	I (in/hr)	Q = (ΣA·C) x I cfs	Street capacity cfs	Flow in Pipe cfs	Pipe Dia. in.	Slope %	Length ft.	VEL V fps	Δt (min)	
05-3 → E			1.25			10.24	13.63	[illegible]	50.1								
F	1.08	.62		.78	.84		14.85	[illegible]	[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	
Σ 0-5-3 → F						11.08	14.85	[illegible]	[illegible]	[illegible]							[illegible]
H	3.93	.62		.78	3.06		[illegible]	[illegible]	[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Σ 0-5-3 + H						14.1	[illegible]	[illegible]	[illegible]	[illegible]							[illegible]
K	1.17	.62		.78	.91		[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	7.0	[illegible]	[illegible]
Σ 0-5-3 - K						15.0	[illegible]	[illegible]	[illegible]								[illegible]
J	3.11	.62		.78	2.42		[illegible]	[illegible]	[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Σ 05-3 → J						17.42	[illegible]	[illegible]	[illegible]								
L	.83	.62		0.78	0.65		[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Σ 05-3-L Route 1						18.07	15.6	[illegible]	[illegible]								[illegible]

EDIVISION
CATION
NO.
SIGN STORM ___ YR. RECURRENCE INTERVAL
JOR STORM ___ YR.
MPUTATIONS BY ____________ DATE ____

TOTAL STREET FLOW
OFFSITE + ONSITE

ROUTE II

RUNOFF COMPUTATIONS
(Rational Method)

Area Designation	A (Acres)	C	Cf	C* (CxCf)	A·C	ΣA·C	tc (min)	I (in/hr)	Q= (ΣA·C)xI cfs	Street capacity cfs	Flow in Pipe cfs	Pipe Dia. in.	Slope %	Length ft.	VEL. V fps	Δt (min)	
O.S.-2	7.5	.30	1.25	.38	2.85		[illegible]	[illegible]	[illegible]								[illegible]
N-2	1.23	.30		.38	0.47		[illegible]	5.4	[illegible]								
OS-2 Σ N-2						[illegible]	[illegible]	[illegible]	[illegible]								
A	1.46	.51		0.64	0.93	-	[illegible]	[illegible]	[illegible]	[illegible]			[illegible]	[illegible]	5.5	.73	[illegible]
Σ OS-2-A						4.25	[illegible]	[illegible]	[illegible]	[illegible]							
OS.1	1.0	.30		.38	.39												
N.1	1.23	.30		.38	.47												[illegible]
				OS-1 + N-1		[illegible]	10	5.4	[illegible]								
G	1.12	.55		0.69	0.77		11.84	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]	
													[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
OS-2 → G						[illegible]	11.84	[illegible]	[illegible]								
I	1.24	.59		.74	.42		[illegible]	4.75	[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	

DIVISION High Range II
ATION
NO.
SIGN STORM ___ YR. RECURRENCE INTERVAL
OR STORM ___ YR.
MPUTATIONS BY ___ DATE ___

TOTAL STREET FLOW
OFFSITE + ONSITE

RUNOFF COMPUTATIONS
(Rational Method)

Route II

PAGE 4 OF

Area designation	A (Acres)	C	C_f	C = (C×Cf)	A·C	ΣA·C	tc (min)	I (in/hr)	Q = (ΣA·C)×I cfs	Street capacity cfs	Flow in Pipe cfs	Pipe Dia. in.	Slope %	Length ft.	VEL V fps	Δt (min)	
0S-2 → I			1.25			[illegible]	[illegible]	[illegible]	[illegible]								
M	.50	.62		0.78	[illegible]		[illegible]	[illegible]	[illegible]							[illegible]	
0S-2 → M Route II						[illegible]	[illegible]	[illegible]									
0.S.6	19.0	.30		.38	7.2		[illegible]	[illegible]	[illegible]								
0.S.7	3.54	.62		0.78	2.76		[illegible]		[illegible]		[illegible]	[illegible]	[illegible]		[illegible]		[illegible]
Σ0S-2 + M Route II						17.14	[illegible]	[illegible]	[illegible]								
Route I					18.07												
Route I+II				7.18 + 18.07 =		25.26	[illegible]	[illegible]	[illegible]								
Total Flow onto Torque				[illegible] + 18.07 =		[illegible]	[illegible]	[illegible]	[illegible]								

SUBDIVISION ____
LOCATION ____
JOB NO. ____
DESIGN STORM ____ YR. RECURRENCE INTERVAL
MAJOR STORM ____ YR.
COMPUTATIONS BY Doug Wood DATE 11-22-78

ONSITE FLOW ONLY

RUNOFF COMPUTATIONS
(Rational Method)

PAGE 5

Area Designation	A (Acres)	C	C_f	$\bar{C}$ = (CxCf)	A·$\bar{C}$	ΣA·$\bar{C}$	tc (min)	I (in/hr)	Q = (ΣA·$\bar{C}$)xI cfs	Street capacity cfs	Flow in Pipe cfs	Pipe Dia. in.	Slope %	Length ft.	VEL V fps	Δt (min)
B	2.98	.56	1.25	.70	2.09		[illegible]	[illegible]	[illegible]							
C	1.29	.51		.64	0.83		[illegible]	[illegible]	[illegible]							
E	0.82	.60		.75	.62		[illegible]	[illegible]	[illegible]							
D	3.12	.63		.78	2.43		[illegible]	[illegible]	[illegible]							
F	1.08	.62		.78	.84		[illegible]	[illegible]	[illegible]							
H	3.93	.62		.78	3.06		[illegible]	[illegible]	[illegible]							
K	1.17	.62		.78	.91		[illegible]	[illegible]	[illegible]							
J	3.11	.62		.78	2.42		[illegible]	[illegible]	[illegible]							
L	.83	.62		.78	.65		[illegible]	[illegible]	[illegible]							
A	1.46	.51		0.64	0.93		[illegible]	[illegible]	[illegible]							

LBC SID ½% Calc. I
LOCATION Taylor Ranch Tract 1B
JOB NO.
DESIGN STORM 100 YR. RECURRENCE INTERVAL
MAJOR STORM 100 YR.
COMPUTATIONS BY [illegible] DATE [illegible]

ON SITE FLOW ONLY
DEVELOPED RUNOFF

RUNOFF COMPUTATIONS
(Rational Method)

Area Designation	A (Acres)	C	C_f	B = (exp)	A·B	ΣA·B	t_c (min)	I (in/hr)	Q = (ΣA·B) x I cfs	Street capacity cfs	Flow in Pipe cfs	Pipe Dia. in.	Slope %	Length ft.	VEL V fps	Δt (min)
G	1.12	.55	1.25 ↓	0.69	0.77		[illegible]	[illegible]	[illegible]							
I	1.24	.59		.74	.92		[illegible]	[illegible]	[illegible]							
M	.50	.62		0.78	.39		16.[illegible]	4.5	[illegible]							
N.1	1.23	.30		.38	0.47		13	5.4	[illegible]							
N.2	1.23	.30		.38	0.47		13	5.4	[illegible]							
N.3	1.35	.30		.38	0.51		13	5.4	[illegible]							
N.4	1.64	.30		.38	0.62		10	[illegible]	[illegible]							
Σ onsite runoff						18.93	16.[illegible]	4.5	85.[illegible]							

SUBDIVISION ______

LOCATION Albuq. West Mesa

JOB NO. ______

DESIGN STORM 100 YR. RECURRENCE INTERVAL

MAJOR STORM 100 YR.

COMPUTATIONS BY Doug Wood DATE Feb-24-78

ONSITE FLOW
ROUTE II

RUNOFF COMPUTATIONS
(Rational Method)

Area Designation	A (Acres)	C	C_f	C = (exc)	A·C	ΣA·C	tc (min)	I (in/hr)	Q = (ΣA·C)xI cfs	Street capacity cfs	Flow in Pipe cfs	Pipe Dia. in.	Slope %	Length ft.	VEL V fps	Δt (min)	
I	[illegible]	[illegible]	1.25	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]								
[illegible]		.51		[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]						[illegible]	[illegible]	[illegible]	[illegible]	[illegible]							
[illegible]	[illegible]	[illegible]		.58	.87		[illegible]	[illegible]	[illegible]								
G	3.12	.55		[illegible]	[illegible]		11.74	[illegible]	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]						[illegible]	[illegible]	[illegible]	[illegible]								
I	1.24	[illegible]		.74	.92		14.68	[illegible]	[illegible]	[illegible]			[illegible]	[illegible]	4.4	2.84	[illegible]
[illegible]						5.56	[illegible]	[illegible]	[illegible]	[illegible]			1.5%	[illegible]	7.0	1.45	
III	.50	[illegible]		0.75	[illegible]		[illegible]	[illegible]	1.1								
[illegible]						[illegible]	[illegible]	[illegible]	[illegible]								
[illegible]					[illegible]	10.93	[illegible]	[illegible]	[illegible]								[illegible]

APPENDIX 4

Frequency Factors

TABLE 3-2 (B)

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.

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

DALE BELLAMAH CORPORATION

Land Division

August 3, 1978

RECEIVED

AUG 07 1978

CITY ENGINEERS

Mr. Bruno Canigliano
Assistant City Engineer, Hydrology
City of Albuquerque
P. O. Box 1293
Albuquerque, New Mexico 87103

Dear Bruno:

Per your request, please find attached the High Range II plat with the easement shown for the drainage channel.

If you have any questions, please do not hesitate to call.

Very truly yours,

AMBELL, A Partnership
DALE BELLAMAH LAND CO., INC., A Partner

Donald F. Greene /csh

Donald F. Greene
Development Engineer

DFG/csh

Attachment

DALE BELLAMAH CORPORATION

POST OFFICE BOX 3333
6400 UPTOWN BOULEVARD, N.E.
EAST TOWER, SUITE 600

ALBUQUERQUE, NEW MEXICO 87110
TELEPHONE (505) 883-3000

February 2, 1978

Bruno Conigliano, Asst. City Engineer
City of Albuquerque
P. O. Box 1293
Albuquerque, NM 87103

Re: La Mariposa North Diversion Channel adjacent to High Range I & High Range II at Taylor Ranch

Dear Bruno:

In accordance with our meeting of January 31, 1978, in your office, the design of the La Mariposa North Diversion Channel adjacent to Tracts 3 and 4 in Taylor Ranch meets the City's requirements with three exceptions:

1. The intersections of Tesuque and Mojave shall be revised.
2. The upstream drop structure shall be revised so that it shall be better protected.
3. The channel shall be revised to better accept incoming water.

Subject to these three conditions, it is my understanding that the design of the La Mariposa Diversion Channel North is acceptable to the City of Albuquerque. If you agree, please sign below.

Very truly yours,

AMBELL/DALE BELLAMAH LAND CO., INC.
A Partner

Donald F. Greene
Development Engineer

Accepted: ______________________

Bruno Conigliano, Asst. City Engineer
for Hydrology

DFG/kb

MEURER, SERAFINI AND MEURER, INC. CONSULTING ENGINEERS • SURVEYORS • PLANNERS

3901 WYOMING BLVD., N.E., SUITE F • ALBUQUERQUE, NEW MEXICO 87110 • (505) 292-1836

November 1, 1977

RECEIVED
NOV 04 1977
CITY ENGINEERS

Bruno

Mr. V. M. Kimmick, City Engineer
City of Albuquerque
P. O. Box 1293
Albuquerque, New Mexico 87103

Re: High Range at Taylor Ranch I (Tract 3)

Dear Mr. Kimmick:

This is an addendum to the drainage study for "High Range at Taylor Ranch I" dated August 1977. This is being transmitted for your review and approval.

Upon a more detailed field investigation and additional design surveys, it has been determined that offsite area O.S.-4 is not as large as originally calculated. The natural terrain west of the westerly street (Stag Horn) in Volcano Cliffs, Unit 4, actually discharges runoff into a natural swale west of and adjacent to Stag Horn and the flow is carried south until it intersects with existing ditches along Stag Horn. Approximately 31.6 acres which was thought to contribute to O.S.-4 actually discharges into a separate drainage basin. Therefore, the original O.S.-4 has been changed to O.S.-6 and reduced to 22.13 acres which is discharging 45.41 cfs into Brahma Drive.

The runoff (45.41 cfs) entering Brahma Drive will be conveyed between two lots in a bituminous concrete drainage right-of-way. The lots adjacent to the drainage right-of-way and across the street will be graded high in order to further protect the houses from any possible inundation.

This runoff in Brahma Drive, when it reaches the intersection at Rustler Drive, will split, with approximately 40% of the runoff flowing into Rustler Drive and the remaining 60% continuing on in Brahma Drive.

The total combined flows in Mojave Street, including the 40% of the runoff from O.S.-6 in Brahma, will be 43.46 cfs. Likewise, the runoff entering the Mariposa Diversion Channel from Pony Trail including 60% of the runoff from O.S.-6 will be 73.62 cfs. Neither of these flows will exceed the capacity of the street and drainage channel, respectively.

As a further protective measure, it is recommended that the ditch along the westerly side of Stag Horn be cleaned out to allow a smooth, uninterrupted flow of water along Stag Horn.

Very truly yours,

MEURER, SERAFINI AND MEURER, INC.

Carl A. Tebbens

Carl A. Tebbens, P.E.
Vice President

CAT:dw

cc: Bruno Conegliano
Don Greene