Hydrology E11/D8 Saddle Ridge West

E11 / D8

SADDLE RIDGE
WEST

2 PLANS

A DRAINAGE REPORT

FOR

SADDLE RIDGE WEST

A Joint Venture Between

AMDEC

and

Dale Bellamah Land Co., Inc.

May 1978

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REGISTERED PROFESSIONAL ENGINEER AND LAND SURVEYOR
NO. 8895
NEW MEXICO
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INTRODUCTION

The purpose of this study is to analyze the 100-year storm drainage characteristics of a proposed development called Saddle Ridge West, a joint venture between AMDEC and the Dale Bellamah Corporation. The development is a proposed R-1 area and is located in Section 26, T11N, R2E, within the city limits of Albuquerque, New Mexico.

General information concerning the site is as follows: the land within the Saddle Ridge Subdivision lies at the outlet of a large drainage basin, and is in fact, part of a natural ponding area. This ponding basin originally had no natural outlet. Presently, however, the area drains into an AMAFCA interceptor channel which borders the southeast side of the site. The outlet section of the AMAFCA channel has not been completed to the south, and as such, the present excavated portion is now serving the area as a giant retention pond.

Natural off-site sheet flow patterns previously affecting the site will be restricted to defined outlets because of present or proposed development around the site.

Off-site flows will enter the site at two proposed street locations on the north property line[1]. The point of departure for all flows into the AMAFCA channel occur at the southeast corner of the site.

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[1]Montano West Subdivision Unit 3, Engineering Plans submitted to City by T.T. Burnett, 4-78.

DRAINAGE RESULTS

If the reader will refer to Figure 1, the flow patterns for the area will become apparent. Offsite flows enter the site from two areas, OS-2 and OS-3, and pass along the south boundary from the OS-1 area. Flows from OS-1 come from a portion of Volcano Cliffs Subdivision and collect at Golden Avenue and Dellyne Avenue before traveling east to the AMAFCA channel via Dellyne Avenue. Flows from OS-2 enter the site at a center point on the north boundary via Sweetwater Drive. Flows from OS-3 enter the site in the area of the northeast corner of the site via Hayes Drive. Both OS-2 and OS-3 flows follow their respective streets to a common outlet point at the southeast corner of the site.

Internal flows originating within the site travel the following pattern: Area 1 and 1-A drains to Dellyne Ave.; Area 5 is comprised of Dellyne Ave., and as such, drains to the AMAFCA channel; Areas 2, 3, and 4 all drain to a common outlet point at the southeast corner of the site; Area 6 has been previously accounted for in the drainage report for Saddle Ridge #1. It is referred to in that report as "Area 4", at Discharge Point "C". This area was included in this plat because the street in Saddle Ridge #1 was replatted at the point it intersects the east boundary of Saddle Ridge West.

RECOMMENDATIONS

Lot Grading

1. The Developer plans to leave the grade of each lot as natural as possible, with the exception of the house pad area. Each house pad should be raised up a minimum of one foot above natural ground or have a minimum one percent grade to the rear pond area. If the Developer elects not to provide positive slope of the front yard to the street for certain lots, provisions must be taken to either provide a front pond area, or provide positive drainage from the front yard to the rear pond.

2. Rear yard ponding will require a minimum of 12 percent of the area drained to the pond, where the front area of the lot drains to the streets[2]. For situations where the entire lot ponds, actual pond width will have to be pro-rated according to the variance of actual lot area from the assumed rear drainage area of 90' x 80' (see Appendix calculations). The limits of the ponded waters should be kept a minimum distance of five feet away from any walls and 20 feet away from any house foundations[3].

3. The off-site flows entering the site from OS-2 via Sweetwater Drive are estimated to flow above the top of curb for a 100-year storm occurrence (0.5 feet above top of curb). The existing ground of several lots bordering this street is lower than the proposed street grade. If the street did overflow, these lots could

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[2]All street flows shown on Figure 1 reflect front yard drainage to the street. These are maximum values that would occur. If Developer ponds front yards, street flows would correspondingly be reduced by smaller contributing area.

[3]These general recommendations are only intended to call the Developer's attention to potential settlement problems in the area. A qualified soils engineer should prepare specific guidelines for ponding waters around structures.

flooded. Therefore, it is recommended that the entire lot area of the following lots be raised a minimum of one foot above the proposed top of curb elevations: Lots 16, 17, 22, 58, 23, 26, and 50. Furthermore, it is recommended that the house pads of the following lots be raised a minimum of one foot above top of curb with positive front yard drainage to the street: Lots 15, 59, 18, 19, 20, 21, 24, 25, 57, 56, 55, 54, and 53.

4. The runoff from Sweetwater Street flows through a 20 foot drainage right-of-way at the southeast corner of the site. However, there is a backwater effect created where the street narrows into the channel. The net effect of this is a potential water depth of 2.1 feet at the channel entrance. At the proposed street slope of 0.5%, the effect of this increase in depth above the projected water elevations in the street will be dissipated approximately 200 feet back from the channel entrance. Therefore, it will be necessary to raise the entire lot area of lots 27 and 46 a minimum of 1.5 feet above top of curb. The house pads of lots 49, 48, 47, 28, 29, 39, and 45 should be raised a minimum of 1.5 feet above top of curb with positive front yard drainage to the street.

Street Design

1. Roll type curb and gutter is proposed for the streets draining areas 1, 2, and 6. At 0.5 percent slope, the streets have capacity for the estimated flows. The remaining streets will require standard curb and gutter because of the estimated runoff rates. The street draining Area 3 will have to have a two inch crown to keep the overflow to a minimum. Flow depth for this street is estimated at 1.2 feet deep at 0.5% slope. It is recommended that the crown be

reduced to a no crown section 100 feet upstream from the channel entrance to help offset the backwater effect.

Channel Design

1. The channel design between lots 41 and 42 has been covered in the report for Saddle Ridge #1 Drainage Report. This channel was constructed with the subdivision improvements for Saddle Ridge #1.

2. The proposed channel between lots 46 and 47 shall be constructed as per City Standard Drawing P-19. The estimated depth of flow in the channel, plus the effect of superelevation along the outside radius, plus freeboard, will require a minimum wall height of two feet. The wall depth at the entrance should be a minimum of 2.5 feet for the first 25 feet past the entrance. The surface for the concrete channel bottom should be finished smooth, rather than allow a "broom" finish.

3. Where the flow leaves the channel, erosion control or a paved rundown shall be constructed to prevent the undermining of the channel at its outfall point.

4. Flows from Area 1-A are to be removed to Dellyne via a proposed lined channel located between lots 69 and 70. See Appendix for typical section and calculations.

This concludes the recommendations for Saddle Ridge West Subdivision. The following section, the Appendix, contains the design criteria, calculations, and graphs and plats used in arriving at the conclusions presented here.

APPENDIX

DESIGN CRITERIA

In analyzing the storm runoff to determine the runoff basis of flow generated on the developed site, the Rational Formula, Q = CIA, was used.

Where:

Q = Runoff quantity in cubic feet/second (liters/sec).

A = Contributing area in acres (Hectares)

I = Intensity in inches/hour (cm/hr.)

For a duration equal to the time of accumulation (duration) measured in minutes and obatined from Figure 2 - Intensity Durations Frequency Curves. (Note: Where the Time of Concentration (Tc) is less than 10 minutes, the intensity value equal to ten minutes was used as shown on the curve for a 100-year storm in Figure 2.)

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

For the proposed developed areas, it was desirable to develop a composite runoff coefficient based on the percentage of different types of surface in each sub-drainage area.

Different coefficients with respect to surface type are given below[1].

Streets, walks and drives	C = 0.90
Roofs	C = 0.90
Lawns, heavy soils, 2 to 7%	C = 0.20

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[1]Table 3-2, Urban Storm Drainage Criteria Manual Volume I, Denver Regional Council of Governments.

The following table (Table I) is a summary of the composite "C" values for the developed subdivision. Following the summary, calculations are shown in table form for the composite "C" values for the flows leaving the site at the AMAFCA channel. These exit points represent the runoff flows where several areas have combined to form a single drainage basin.

TABLE I

SADDLE RIDGE WEST
COMPOSITE "C"

Section	Area (Acres)	By Area C = 0.20 (Acres)	By Area C = 0.90 (Acres)	Composite "C" Factor (No Unit)
1& 1-A	2.41	1.12	1.29	0.57
2	2.48	1.27	1.21	0.54
3	3.42	1.84	1.58	0.52
4	2.62	1.37	1.25	0.53
5	0.81	0	0.81	0.90

Outflow Pt.	Area	% Total Area		Individual Composite "C"		Overall Composite "C"
Dellyne Ave. at AMAFCA Channel	OS-1	12.6/15.82	=	0.80 x 0.43	=	0.34
	1& 1-A	2.41/15.82	=	0.15 x 0.57	=	0.09
	5	0.81/15.82	=	0.05 x 0.90	=	0.05
						0.48
20' Drainage Right-of-Way at AMAFCA Channel	OS-2	82.73/105.73	=	0.78 x 0.46	=	0.36
	OS-3	14.48/105.73	=	0.14 x 0.62	=	0.09
	2	2.48/105.73	=	0.02 x 0.54	=	0.01
	3	3.42/105.73	=	0.03 x 0.52	=	0.02
	4	2.62/105.73	=	0.03 x 0.53	=	0.02
						0.49

The following table summarizes flow rates from their respective areas. For a graphical presentation of the flow rates and their respective departure points, refer to Figure I.

TABLE II

SADDLE RIDGE WEST

ESTIMATED FLOWS - DEVELOPED SITE

Drainage Area	Tc (Min.)	I ("/Hr.)	C (No Unit)	Area (Acres)	Q (cfs)	Discharge Point
OS-1	19	4.3	0.43	1[illegible].6	23	Golden Ave. at Dellyne Ave.
OS-2*	21	4.11	0.46	82.73	156	Sweetwater at N. Site Property Line
OS-3*	15	4.73	0.62	14.48	42	Hayes Drive at N. Site Property Line
1-A	13	4.97	0.57	1.49	4	Dellyne Ave.
1	13	4.97	0.57	0.92	3	Dellyne Ave.
2	15	4.73	0.54	2.48	6	Sweetwater Drive
3	15	4.73	0.52	3.42	8	AMAFCA Channel
4	13	4.97	0.53	2.62	7	Drainage R/W Between Lots 46 & 47
5	10	5.40	0.90	0.81	4	AMAFCA Channel
6+	--	--	--	--	8	AMAFCA Channel
OS-1, 1,5	24	3.86	0.48	15.82	29	AMAFCA Channel
OS-2, OS-3 2,3,4	36	3.10	0.49	105.73	161	AMAFCA Channel

*From Montano West II Drainage Report. Adjusted values relfect existing conditions north of Montano Road, revised "C" factors, and revised plat layout, now called Montano West Unit 3.

+From Saddle Ridge #1 Drainage Report, discharge from Area 4, at Point C.

RUNOFF COMPUTATIONS

Sheet No. A-4

Saddle Ridge West
PROJECT

Drainage Area No. 1

Area = 0.92 Acres

_____ Hectares

C = 0.57

Maximum Overland Flow: L = 50 feet S = 1%

= _____ meters

H = 0.5 feet

= _____ meters

Maximum Channel Flow: L = 400 feet S = 0.5%

= _____ meters

H = 2 feet

= _____ meters

Accumulation Time

Overland Flow: (Figure 2) = 10 min.

Channel Flow:

Velocity = 2.5 ft/sec Time = $\frac{400 \text{ feet}}{2.5 \text{ feet/sec} \times 60}$ = 3 min.

= _____ m/sec. = $\frac{\text{meters}}{\text{m/sec} \times 60}$

Total Accumulated Time = 13 min.

$I = \frac{189}{t+25} = \frac{189}{38} = 4.97$ "/hr.

= _____ cm/hr.

Q = CIA = (0.57)(4.97)(0.92) = 3 cfs

= _____ Liters/sec

Date 4-26-78

Com. by CLW Ck. by _____

RUNOFF COMPUTATIONS

Sheet No. A-5

Saddle Ridge West
PROJECT

Drainage Area No. 1-A

Area = 1.49 Acres

_____ Hectares

C = 0.57

Maximum Overland Flow: L = 50 feet S = 1%

= _____ meters

H = 0.5 feet

= _____ meters

Maximum Channel Flow: L = 400 feet S = 0.5%

= _____ meters

H = 2 feet

= _____ meters

Accumulation Time

Overland Flow: (Figure 2) = 10 min.

Channel Flow:

Velocity = 2.5 ft/sec Time = $\frac{400 \text{ feet}}{2.5 \text{ feet/sec} \times 60}$ = 3 min.

= _____ m/sec. = $\frac{\text{meters}}{\text{m/sec} \times 60}$

Total Accumulated Time = 13 min.

$I = \frac{189}{t+25} = \frac{189}{38} = 4.97$ "/hr.

= _____ cm/hr.

Q = CIA = (0.57)(4.97)(1.49) = 4 cfs

= _____ Liters/sec

Date 4-26-78

Com. by CW Ck. by _____

RUNOFF COMPUTATIONS

Sheet No. A-6

Saddle Ridge West
PROJECT

Drainage Area No. 2

Area = 2.48 Acres

_____ Hectares

C = 0.54

Maximum Overland Flow: L = 50 feet S = 1%

= _____ meters

H = 0.5 feet

= _____ meters

Maximum Channel Flow: L = 750 feet S = 0.6%

= _____ meters

H = 5 feet

= _____ meters

Accumulation Time

Overland Flow: (Figure 2) = 10 min.

Channel Flow:

Velocity = 2.7 ft/sec Time = $\frac{750 \text{ feet}}{2.7 \text{ feet/sec} \times 60}$ = 5 min.

= _____ m/sec. = $\frac{\text{meters}}{\text{m/sec} \times 60}$

Total Accumulated Time = 15 min.

$I = \frac{189}{t+25} = \frac{189}{40} = 4.73$ "/hr.

= _____ cm/hr.

Q = CIA = (0.54)(4.73)(2.48) = 6 cfs

= _____ Liters/sec

Date 4-26-78

Com. by CLW Ck. by _____

RUNOFF COMPUTATIONS

Sheet No. A-7

Saddle Ridge West
PROJECT

Drainage Area No. 3

Area = 3.42 Acres

_____ Hectares

C = 0.52

Maximum Overland Flow: L = 50 feet S = 1%

= _____ meters

H = 0.5 feet

= _____ meters

Maximum Channel Flow: L = 1050 feet S = 0.5%

= _____ meters

H = 5 feet

= _____ meters

Accumulation Time

Overland Flow: (Figure 2) = 10 min.

Channel Flow:

Velocity = 3.6 ft/sec Time = $\frac{1050 \text{ feet}}{3.6 \text{ feet/sec} \times 60}$ = 5 min.

= _____ m/sec. = $\frac{\text{meters}}{\text{m/sec} \times 60}$

Total Accumulated Time = 15 min.

$I = \frac{189}{t+25} = \frac{189}{40} = 4.73$ "/hr.

= _____ cm/hr.

Q = CIA = (0.52)(4.73)(3.42) = 8 cfs

= _____ Liters/sec

Date 4-26-78

Com. by CLW Ck. by _____

RUNOFF COMPUTATIONS

Sheet No. A-8

Saddle Ridge West
PROJECT

Drainage Area No. 4

Area = 2.62 Acres

_____ Hectares

C = 0.53

Maximum Overland Flow: L = 50 feet

= _____ meters

S = 1%

H = 0.5 feet

= _____ meters

Maximum Channel Flow: L = 680 feet

= _____ meters

S = 0.5%

H = 4 feet

= _____ meters

Accumulation Time

Overland Flow: (Figure 2) = 10 min.

Channel Flow:

Velocity = 4.1 ft/sec Time = $\frac{680 \text{ feet}}{4.1 \text{ feet/sec} \times 60}$ = 3 min.

= _____ m/sec. = $\frac{\text{meters}}{\text{m/sec} \times 60}$

Total Accumulated Time = 13 min.

$I = \frac{189}{t+25} = \frac{189}{38} = 4.97$ "/hr.

= _____ cm/hr.

Q = CIA = (0.53)(4.97)(2.62) = 7 cfs

= _____ Liters/sec

Date 12-26-78

Com. by CLW Ck. by _____

RUNOFF COMPUTATIONS

Sheet No. A-9

Saddle Ridge West
PROJECT

Drainage Area No. O.S.-1

Area = 12.6 Acres

_____ Hectares

C = 0.43

Maximum Overland Flow: L = 120 feet S = 1%

= _____ meters

H = 1.2 feet

= _____ meters

Maximum Channel Flow: L = 800' feet S = 0.5%

= _____ meters

H = 4 feet

= _____ meters

Accumulation Time

Overland Flow: (Figure 2) = 16 min.

Channel Flow:

Velocity = 4.1 ft/sec Time = $\frac{800 \text{ feet}}{4.1 \text{ feet/sec} \times 60}$ = 3 min.

= _____ m/sec. = $\frac{\text{meters}}{\text{m/sec} \times 60}$

Total Accumulated Time = 19 min.

$I = \frac{189}{t+25} = \frac{189}{44} = 4.3$ "/hr.

= _____ cm/hr.

Q = CIA = (0.43)(4.3)(12.6) = 23 cfs

= _____ Liters/sec

Date 4-26-78

Com. by CLW Ck. by _____

RUNOFF COMPUTATIONS

Sheet No. A-10

Saddle Ridge West
PROJECT

Drainage Area No. OS-1, 1, 5

Area = 15.82 Acres

_____ Hectares

C = 0.48

Maximum Overland Flow: L = 120 feet S = 1%

= _____ meters

H = 1.2 feet

= _____ meters

Maximum Channel Flow: L = 2000 feet S = 0.5%

= _____ meters

H = 10 feet

= _____ meters

Accumulation Time

Overland Flow: (Figure 2) = 16 min.

Channel Flow:

Velocity = 4.1 ft/sec Time = $\frac{2000 \text{ feet}}{4.1 \text{ feet/sec} \times 60}$ = 8 min.

= _____ m/sec. = $\frac{\text{meters}}{\text{m/sec} \times 60}$

Total Accumulated Time = 24 min.

$I = \frac{189}{t+25} = \frac{189}{49} = 3.86$ "/hr.

= _____ cm/hr.

Q = CIA = (0.48)(3.86)(15.82) = 29 cfs

= _____ Liters/sec

Date 4-26-78

Com. by CLW Ck. by _____

RUNOFF COMPUTATIONS

Sheet No. A-11

Saddle Ridge West
PROJECT

Drainage Area No. O.S.-2, O.S-3, 2, 3, 4

Area = 105.73 Acres

_____ Hectares

C = 0.49

Maximum Overland Flow: L = 120 feet S = 1%

= _____ meters

H = 1.2 feet

= _____ meters

Maximum Channel Flow: L = 4850 feet S = 0.5%

= _____ meters

H = 25 feet

= _____ meters

Accumulation Time

Overland Flow: (Figure 2) = 16 min.

Channel Flow:

Velocity = 4.1 ft/sec Time = $\frac{4850 \text{ feet}}{4.1 \text{ feet/sec} \times 60}$ = 20 min.

= _____ m/sec. = $\frac{\text{meters}}{\text{m/sec} \times 60}$

Total Accumulated Time = 36 min.

$I = \frac{189}{t+25} = \frac{189}{61} = 3.10$ "/hr.

= _____ cm/hr.

Q = CIA = (0.49)(3.10)(105.73) = 161 cfs

= _____ Liters/sec

Date 4-26-78

Com. by CLW Ck. by _____

DRAINAGE CHANNEL CALCULATIONS

(BETWEEN LOTS 46 AND 47)

A. Find normal depth, yn, by Maning Formula, $Q = \frac{1.486}{n} \frac{a^{5/3}}{p^{2/3}} S^{1/2}$, for a given constant.

Discharge Q = 161 cfs, assuming the flow is uniform.

Channel Data
R/W = 20 ft.
Bottom Width = 18 ft.
Vertical Sideslopes
Channel Slope = 0.005 ft./ft.
n = 0.013 (concrete)

Normal depth, yn = 1.1 ft., typical at any section downstream from channel entrance where surface is a straight line parallel to channel bottom.

B. Determine whether flow is subcritical, or supercritical, by the Froude Number.

$F + \frac{v}{\sqrt{gy}}$ (Eq.1)

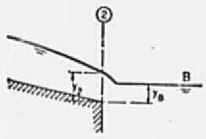
Where v = avg. velocity at yn,

v = Q/A = 161/20.01 = 8.1 ft./sec., then,

Eq 1, $F = \frac{8.1}{\sqrt{(32.2)(1.11)}} = 1.4 > 1$. Therefore, the channel flow is supercritical, where the Froude number is unity at critical flow.

C. Determine Outlet and Entrance Conditions.

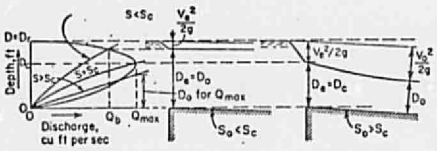
1. Outlet - Drainage channel empties into existing AMAFCA reservoir, and as such, the outflow is accompanied by a hydraulic drop. If $y_B < y_2$, the depth y_2 is equal to the critical depth y_c of Section 2, irrespective of the pool level position B.



[2]Open Channel Hydraulic, Ven Te Chow.

2. Free Entrance - When water enters a mild-slope canal freely, the depth De is related to the static pool level Dr by law of energy, or

$$Dr = De + Ve^2/2g \quad (Eq2)$$



3.

For supercritical flow, So > Sc, the flow at De = Dc

Find critical depth, Dc

$$Dc = \left[\frac{q^2}{g}\right]^{-1/3}$$, where q = discharge per unit width = 161/18 = 8.94 cfs/ft.

$$Dc = \left[\frac{8.94^2}{32.2}\right]^{-1/3} = 1.4 \text{ ft.}$$

$$Vc = \sqrt{gyc} = \sqrt{(32.2)(1.35)}$$

$$= 6.6 \text{ ft./sec.}$$

Then, Eq 2;

$$\text{Then, } Dr = 1.4 \text{ ft.} + \frac{(6.6)^2}{2(32.2)}$$

$$= 1.4 + 0.7 \text{ ft.}$$

= 2.1 ft. at channel entrance

D. Find Discharge at Critical Depth

Qc = Ac x Vc
= (24.30)(6.6)
= 160 cfs

E. Determine effect of superelevation in curved channel.

Apply Newton's second law of motion to the centrifugal action in the curve, where the transverse surface profile is a logarithmic curve and that the superelevation is:

---

[3] H.B. Of Hydraulics, King.

$$\Delta h = 2.30 \frac{V_z^2}{g} \text{Log} \frac{ro}{ri}$$ [4]

Where centerline radius = 180 ft.
V = 8.1 ft./sec., b = 18 ft.

Δh = 0.2 ft., $\Delta h/2$ for each side = 0.1 ft.

Where normal depth = 1.1 ft., superelevation depth = 1.2 ft. against outside wall.

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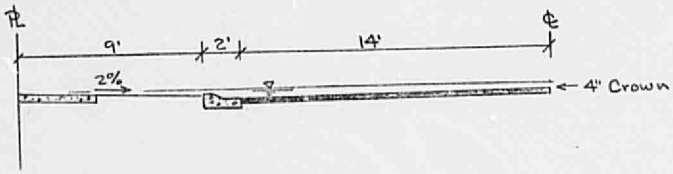
[4] Open Channel Hydraulics, Ven Te Chow.

STREET CAPACITIES

A. Roll type curb

Street Section = 32 ft. FF. 4" Crown, 0.2 ft. Overflow



Areas

1. Outside curb: 1/2 x 0.2 x 9 = 0.9 ft.^{2}

2. Area above curb = 0.82 ft.^{2}

3. Area inside curb

$$14 \left[\frac{(0.22 + 0.2)+(0.09)}{2}\right] = 3.57 \text{ ft.}^2$$

1/2 Street = 5.29 ft.^{2}

Total Street = 10.58 ft.^{2}

Wetted Parameter = 50 ft., n = 0.015
Q = 370.26 x $S^{1/2}$

Street Capacity Table

Slope (%)	Street Capacity (cfs)	Velocity (fps)
0.4	23	2.2
0.5	26	2.5
0.6	28	2.7
0.8	33	3.1
1.0	37	3.5

B. Standard 8" Curb

Street Section = 32 FF, 4" Crown, no overflow

Area = $\frac{(0.67 + 0.28)}{2}$ x 16 ft. x 2 sides = 15.2 ft.^{2}

WP = 16.67 x 2 = 33.34

u = 0.015

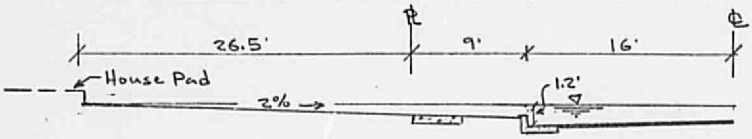
Q = 889.65 x $S^{1/2}$

Street Capacity Table

Slope (%)	Street Capacity (cfs)	Velocity (ft/sec)
0.4	56	3.7
0.5	63	4.1
0.6	69	4.5
0.7	74	4.9
0.8	80	5.2
0.9	84	5.6
1.0	89	5.9

C. Standard 8" Crown

Street Section = 32 ft. FF, 2" Crown, 0.5 ft. Overflow



Area A-1	(26.5)(0.53)(1/2)(2)	=	14.1
A-2	$\frac{1.20 + 0.97}{2}$ x 16 x 2	=	34.7
			48.8
WP = 85 + 2 (0.67)		=	86.3

n = 0.020

Q = 2474.70 $S^{1/2}$

Street Capacity Table

Slope %	Street Capacity cfs	Velocity ft/sec
0.4	157	3.2
0.5	175	3.6
0.6	192	3.9
0.7	207	4.2

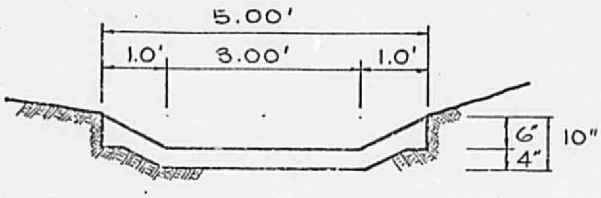
Check effects of superelevation in curved street

$\Delta h = 2.30 \frac{V^2 z}{g} \text{Log} \frac{ro}{ri}$ where centerline R = 400 ft.
V = 3.6 ft./sec.

Δh = 0.4 in.

The effect of superelevation is negligible.

Drainage Channel Between Lots 69 and 70.



Typcial Section

A = 2.00 ¢ P = 5.24 R = .382
$R^{2/3}$ = .527

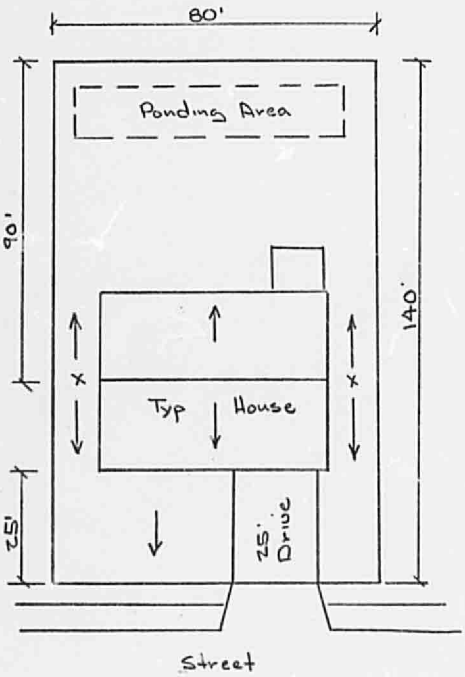
MIN. S_o = 0.0400 S½ = .2000
Q = 2.00 x 99.07 x .527 x .2000 = 20.9 C.F.S.

Q = 104.42 S½

Proposed Slope - 0.5% min.
Q = 104.42 $(0.005)^{1/2}$ = 7 cfs > 4 cfs from Area 1-A.

Rear Yard Pond Calculations

Typical Lot Size = 80 x 140



Area Draining to Rear Yard =
90 x 80 = 7200

Roof Area = 50 x 25
= 1250 ft.^{2}

Patio (typ) = 10 ft.^{2} = 100 ft.^{2}

Composite "C"

$0.9 \left(\frac{1350}{7200}\right) = 0.17$

$0.2 \left(\frac{5850}{7200}\right) = \underline{0.16}$

0.33

Volume of Runoff*
(Area)(2.2/12)(c) =

$(7200)\left(\frac{2.2}{12}\right)(0.33) = 436$

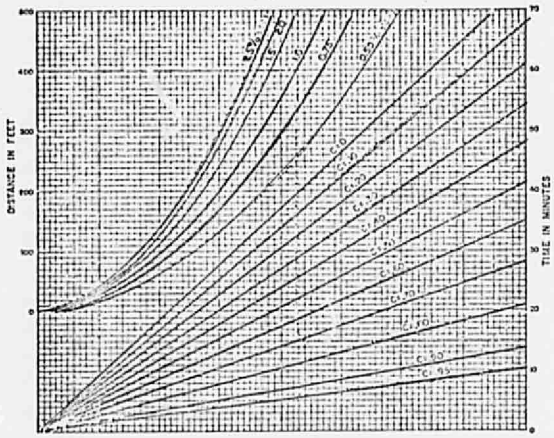
at 0.5 ft. in depth in Pond Surface,

Area Required = 872 ft.^{2}

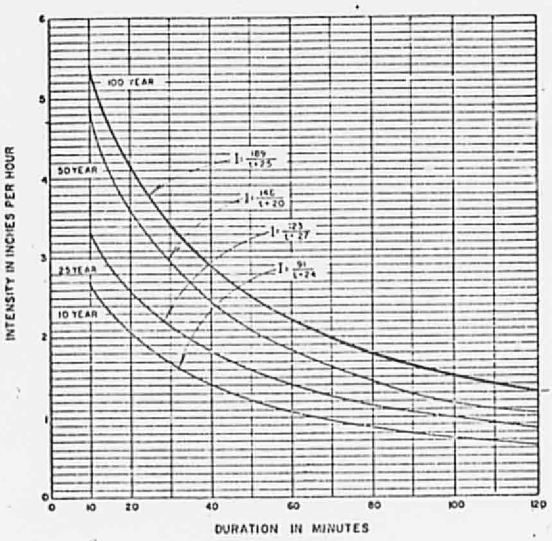
Typical Pond Size = 15' wide x 60' long

% of Area = 12%

*Precipitation for 100-year 6-hour storm = 2.2".



OVERLAND TIME OF FLOW CURVES(7)



INTENSITY DURATION
FREQUENCY CURVES

ALBUQUERQUE AREA-1968

FIGURE 2

BIBLIOGRAPHY OF REFERENCES

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DALE BELLAMAH CORPORATION

Land Division

Std letter

RECEIVED
JUN 30 1978
CITY ENGINEERS

June 28, 1978

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

Re: Request for Turnkey Procedure - Saddle Ridge West
and Taylor Ranch Drive north of Montano

Dear Mr. Kimmick:

AMBELL would like to request permission for turnkey procedure for Saddle Ridge West and the east one-half of Taylor Ranch Drive north of Montano, both located in Taylor Ranch. Saddle Ridge West includes new subdivision streets, drainage, and utility improvements while Taylor Ranch Drive incorporates only paving the east one-half of the street.

Saddle Ridge West plans have been submitted to the City for final approval and the Taylor Ranch Drive plans have already been approved. We request that Meurer, Serafini and Meurer be contracted as the engineer for these projects as they are performing the turnkey inspections for Cimarron Hill and High Range at Taylor Ranch II.

With your approval of this request, we will proceed to execute the turnkey agreements as set forth in test procedures for turnkey projects dated March 13, 1978.

Because engineering of these projects has been completed, we would request your cooperation in approving the turnkey steps as expeditiously as possible. Thank you for your cooperation.

Very truly yours,

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

Donald F. Greene

Donald F. Greene
Development Engineer

DFG/ch

6400 Uptown Boulevard, NE • P.O. Box 3325 • Albuquerque, New Mexico 87190 • (505) 883-3000

City of Albuquerque
P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

Date: June 30, 1978

E11-08

Mr. Donald F. Greene
Development Engineer
Dale Bellamah Corporation
P. O. Box 3325
Albuq. N.M. 87190

SUBJECT: SUBDIVISION REQUEST FOR USE OF TEST TURNKEY PROCEDURE

Dear Mr. Greene:

We are in receipt of your letter of June 28, 1978 requesting the use of the Test Turnkey Procedures. Enclosed is a copy of the "Test Turnkey Project Flow Chart and Test Turnkey Operational Instructions" which will be followed in using this test procedure.

A very important element in this procedure and one which must be rigidly observed is the "Start of Construction Work" stage following Steps 18,19,20 and 21. No field work may commence under this test procedure until this point.

Therefore, your request to design and construct this subdivision is approved, subject to following the procedures enclosed.

Sincerely,

V. M. Rimmick, P.E.
City Engineer

Copy to: H. R. Orr
Q. R. Kielich
Dwayne Sheppard
LaMonte Urban
Bruno Conegliano

Enclosures

8-28-78

Revised Lot No's due to plat change ~ Saddle Ridge West Drainage Report

flooded. Therefore, it is recommended that the entire lot area of the following lots be raised a minimum of one foot above the proposed top of curb elevations: Lots 16, 17, 22, ~~58~~ 53, 23, 26, and ~~50~~ 45. Furthermore, it is recommended that the house pads of the following lots be raised a minimum of one foot above top of curb with positive front yard drainage to the street: Lots 15, ~~59~~ 54, 18, 19, 20, 21, 24, 25, ~~52~~ 52, ~~56~~ 51, ~~55~~ 50, ~~54~~ 49, and ~~53~~ 48.

4. The runoff from Sweetwater Street flows through a 20 foot drainage right-of-way at the southeast corner of the site. However, there is a backwater effect created where the street narrows into the channel. The net effect of this is a potential water depth of 2.1 feet at the channel entrance. At the proposed street slope of 0.5%, the effect of this increase in depth above the projected water elevations in the street will be dissipated approximately 200 feet back from the channel entrance. Therefore, it will be necessary to raise the entire lot area of lots 27 and ~~46~~ 41 a minimum of 1.5 feet above top of curb. The house pads of lots ~~49~~ 44, ~~48~~ 43, ~~47~~ 42, 28, 29, 39, and ~~45~~ 40 should be raised a minimum of 1.5 feet above top of curb with positive front yard drainage to the street.

Street Design

1. Roll type curb and gutter is proposed for the streets draining areas 1, 2, and 6. At 0.5 percent slope, the streets have capacity for the estimated flows. The remaining streets will require standard curb and gutter because of the estimated runoff rates. The street draining Area 3 will have to have a two inch crown to keep the overflow to a minimum. Flow depth for this street is estimated at 1.2 feet deep at 0.5% slope. It is recommended that the crown be

City of Albuquerque
P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

November 14, 1978

E11-D8

Mr. Donald F. Greene
Development Engineer
Dale Bellamah Corporation
P. O. Box 3325
Albuquerque, New Mexico 87190

Re: Test Turnkey Project Work Authorization #T-23
SADDLE RIDGE WEST ADDITION

Dear Mr. Greene:

Under the provisions of the Test Turnkey Project procedures, this letter is the Work Authorization to begin field work on the project.

Sincerely,

Richard S. Heller

Richard S. Heller
City Engineer

RSH/fs

cc - H. R. Orr
Co-Con Inc.
Ray Dawson
Water Resources
Dwayne Sheppard
Bob Kielich
LaMonte Urban
Bruno Conegliano
Bill Mueller
Jim Wilson - Traffic Engineering

Academy Engineering, Inc.

July 15, 1982

E10-11

E11-08a

Mr. Brian G. Burnett
Civil Engineer/Hydrology Dept.
City of Albuquerque
P.O. Box 1293
Albuquerque, NM 87103

Dear Brian

Enclosed is a drainage report pertaining to Saratoga Sub formerly known as Saddle Ridge West. A report by CCIC was submitted and approved in May of 1978.

As we discussed on 7-14-82, we are not increasing the runoff to the street but decreasing it slightly as noted in our calculations. The remainder of the runoff will be ponded in rear yard ponds. Our forthcoming grading plan will reflect these conditions.

If you concur with this concept, please sign this letter and return to us.

Thank you.

Sincerely,

ACADEMY ENGINEERING, INC.

Jerry DeMerritt

Approved by _____ Date _____

(505) 821-8008
ALBUQUERQUE, N.M. 87109
5351 WYOMING BLVD. NE SUITE 1

SARATOGA SUB DRAINAGE CALCULATIONS

Lot Size - 140 X 80 as per original study

Rear: 90 X 80 = 7200 sq. ft.
Roof: 50 X 25 = 1250 sq. ft.
Patio: 10 X 10 = 100 sq. ft.

Composite "C"

$$.9 \times \frac{1350}{7200} = .17$$

$$.4 \times \frac{5850}{7200} = \underline{.33}$$

$$.50$$

Volume of runoff:

$$A \times (2.2/12) \times C = 7200 \times .18 \times .50 = 660 \text{ cf}$$

$$Q = CIA = .50 \times 5.4 \times \frac{7200}{43560} = .45 \text{ cfs}$$

Front: 50 X 80 = 4000
Roof: 50 X 25 = 1250 sq. ft.
Driveway: 25 X 18 = 450 sq. ft.
1700 sq. ft.

Composite "C"

$$.9 \times \frac{1700}{4000} = .38$$

$$.4 \times \frac{2300}{4000} = \underline{.23}$$

$$.61$$

$$\text{Volume} = 4000 \times .18 \times .61 = 439 \text{ cf}$$

$$Q = \frac{4000}{43560} \times 5.4 \times .61 = .30 \text{ cfs}$$

SARATOGA SUB DRAINAGE CALCULATIONS

Lot size 140 X 40 as per new plat and zone change

Size of front yard required to meet $\frac{.30 \text{ cfs}}{2}$ as per approved study.

.30/2 = .15 cfs discharge per lot

Study area size 40' X ?
Trial and error = 40' X 40'

Driveway	20' X 18'	= 360
Roof Area	28' X 20'	= 560
Grassed Area	22' X 20'	= 440
Side Yard	20' X 12'	= 240
		1600 sq. ft. ÷ 40 = 40'

Composite C = $.9 \times \frac{920}{1600} = .52$

$.4 \times \frac{680}{1600} = .17$

.69

Q = CIA
1600/43560 X 5.4 X .69 = .14 cfs

Q desired = .15 Q obtained = .14

Rear yard drainage basin = 100' X 40" = 4000 sq. ft.

Roof size 48 X 28 = 1344 sq. ft.

Composite C

$.9 \times \frac{1344}{4000} = .30$

$.4 \times \frac{2656}{4000} = .26$

.56

Volume = ARC

$4000 \times \frac{2.2}{12} \times .56 = 403$ cf

Pond size for 403 cubic feet .7' deep = 576 sq. ft. Size of pond = 25' X 23' X .7'

City of Albuquerque E-11/D8
P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

July 19, 1982

Mr. Jerry DeMerritt
Academy Engineering, Inc.
5353 Wyoming Blvd. NE Suite 3
Albuquerque, N.M. 87109

RE: LETTER OF JULY 15, 1982 CONCERNING DRAINAGE FOR SARATOGA SUBDIVISION

Dear Jerry:

Based on the assumptions and design criteria listed in the May 1978 drainage report, I see no reason why the concept of rear-lot ponding cannot be used for the townhouses. However, it has been our experience that the ponds tend to "disappear" once the home is occupied. Do you know if the purchase covenant addresses maintenance of the ponds? Who is developing the project?

Please supply this office with a copy of the final grading for a brief review.

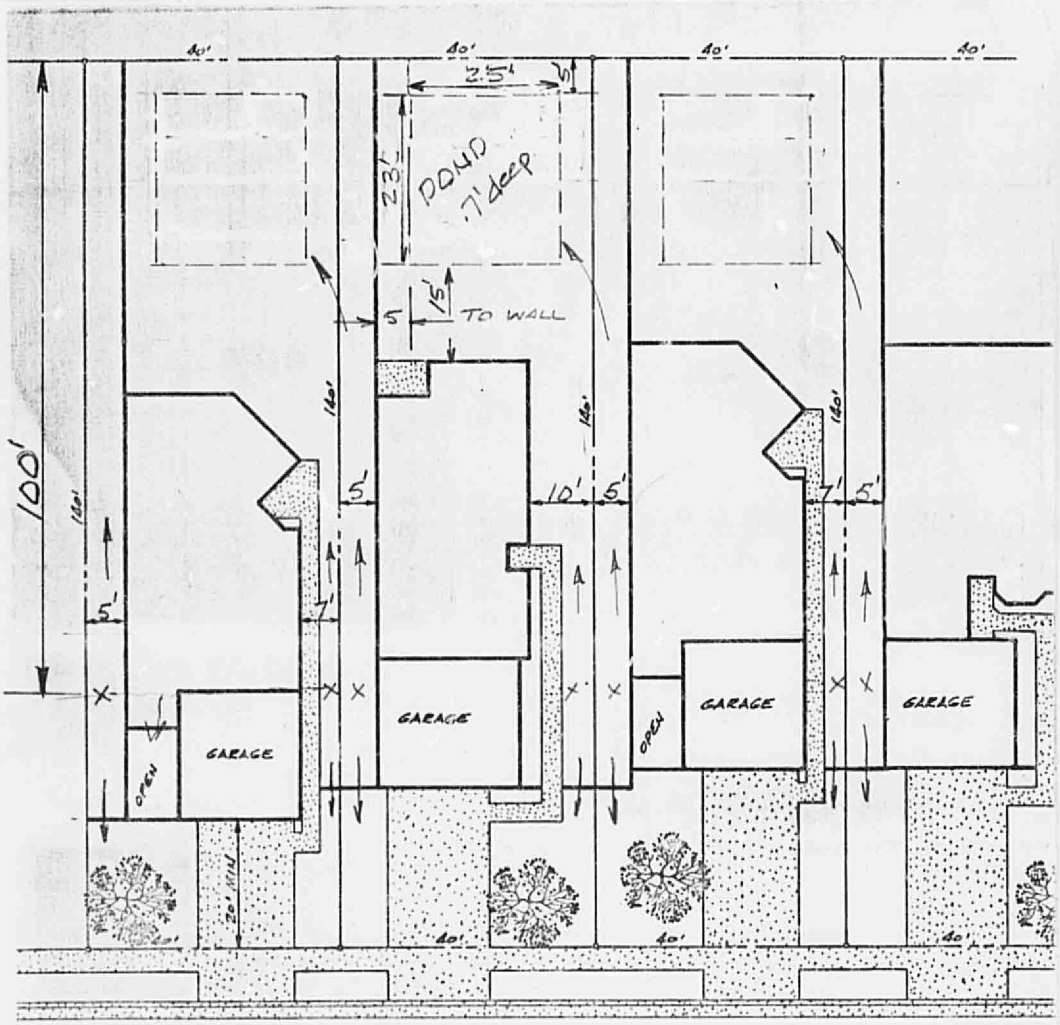
If I can answer any questions concerning these matters, please call.

Very truly yours,

Brian G. Burnett

Brian G. Burnett
Civil Engineer/Hydrology

BGB/tsl



TYPICAL LOT PONDING
SARATOGA SUB.