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

March 5, 2004

Scott McGee, PE
Isaacson & Arfman
128 Monroe St NE
Albuquerque, NM 87108

Re: Ventana Ranch Apartments Drainage Report
Engineer's Stamp dated 1-13-04 (B10/D5)

Dear Mr. McGee,

Based upon the information provided in your resubmittal dated 1-13-04, the above referenced plan is approved for Building Permit. Please attach a copy of this approved plan to the construction sets prior to sign-off by Hydrology.

Prior to Certificate of Occupancy release, Engineer Certification per the DPM checklist will be required.

If you have any questions, you can contact me at 924-3986.

Sincerely,

Bradley L. Bingham, PE
Principal Engineer, Planning Dept.
Development and Building Services

C: file

DRAINAGE REPORT

FOR

VENTANA RANCH APARTMENTS

ALBUQUERQUE, NEW MEXICO
JANUARY 2004

Prepared by:

ISAACSON & ARFMAN, P.A.
128 Monroe Street, NE
Albuquerque, NM 87108
(505) 268-8828

Scott M McGee 01/13/04

Scott M. McGee, PE **Date**

TABLE OF CONTENTS

APPENDICES

POCKET

INTRODUCTION

This site is Tract A-1-C, Ventana Ranch, located south of Irving Blvd and east of Universe Blvd. The parcel to the south of the site (Tract A-1-B) will be developed as a residential subdivision, and the area to the east (Tract A-1-A) is dedicated as a park.

The site has been mass-graded and re-vegetated and drains to a temporary pond located at the south end of the site (in the proposed residential area).

According to a Master Drainage Study prepared by Bohannan-Huston, Inc. (See Appendix E for excerpts), the site is allowed to discharge 4 cfs into the storm drain system in Universe Blvd (near the intersection with Irving Blvd) and 3.5 cfs into the storm drain system in Ventana Rd.

I. PROJECT INFORMATION

LEGAL DESCRIPTION: Tract A-1-C, Ventana Ranch

ENGINEER: Isaacson & Arfman, P.A.
128 Monroe Street NE
Albuquerque, NM 87108
(505) 268-8828
Attn: Scott M. McGee

SURVEYOR: Surv-Tek, Inc.
Attn: Russ Hugg
(505) 897-3366

BENCHMARK: ACS Monument "2-B10" (SLD 1929)
Elevation: 5429.35

TOTAL PROJECT AREA: 13.45 Acres

FLOOD PLAIN: Zone X
Outside the 100-year flood plain based on
FIRM Map--Panel 103 of 825.
Revised September 11, 1998

II. SITE CHARACTERISTICS

EXISTING CONDITIONS: The site has been mass-graded and re-vegetated, and there are two basaltic rock outcroppings at the south end of the site. The site slopes to the southeast between 1-5%, and the runoff is collected in a temporary pond located at the southeast corner of the site.

PROPOSED CONDITIONS: The proposed development on the site consists of 14 apartment buildings, 11 garage buildings, an office and a swimming pool. The remainder of the site will be paved access drives, parking areas, walkways, and landscaped areas.

The Drainage Basin Map on the following page shows the drainage basins for the site, along with the 100-year, 24-hour flows for each basin--see summary below and Appendix A for detailed AHYMO input and output files.

- Basin 200 at the northwest corner of the site will discharge 3.4 cfs to Universe Blvd, which is less than the allowable 4 cfs per the Master Drainage Study.
- Basin 100 will discharge 9.4 cfs to an earthen swale at the south end of the basin to an inlet at the south end of Basin 103.
- Basin 101 and 101.1 drains to Pond A, which outflows at a rate of 2 cfs through 2-8" pipes to Pond B.
- Basin 102 drains to Pond B, which ouflows at a rate of 3.9 cfs to Basin 103.
- Basin 103 flows are combined with the flows from the earthen swale at the south end of the basin. The flows will be conveyed in a 24" RCP storm drain to Pond E in Basin 104.
- Basin 104 drains to Pond E where all flows from the site are combined and collected in a manhole with a beehive grate. An orifice plate will limit the discharge to the allowable rate of 3.5 cfs in the 18" RCP storm drain which will discharge into an offsite pond located in Tract A-1-B.

Curb openings, sidewalk culverts and drain pipes throughout the site are shown on the exhibit in Appendix B. Capacity calculations are also included. Appendix C contains calculations for the earthen swale, pond volumes and orifice plate. Hydraflow Storm Sewer Calculations for the 24" RCP storm drain from Basin 103 to Pond E are shown in Appendix D.

III. SUMMARY

This report conforms to the Master Drainage Study by Bohannan-Huston, Inc. Basin 200 will discharge 3.4 cfs (less than the allowable 4 cfs) into the storm drain system in Universe Blvd. The flows from the remainder of the site (Basins 100-104) will be routed through detention ponds and an earthen swale and be combined in Pond E. An orifice plate will limit the discharge to the offsite pond in Tract A-1-B to the allowable 3.5 cfs.

AHYMO SUMMARY TABLE (AHYMO194) - AMAFCA Hydrologic Model - January, 1994 RUN DATE (MON/DAY/YR) =07/24/2003
INPUT FILE = 1248r2.dat USER NO.= ISCARFNM.I01

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	NOTATION
*S**********										PAGE = 1
*S	VENTANA RANCH APARTMENTS									
*S										
*S	DEVELOPED CONDITIONS									
*S										
*S**********										
START										TIME= .00
RAINFALL TYPE= 2										RAIN24= 2.670
*S BASIN 100										
COMPUTE NM HYD	100.00	-	1	.00384	9.40	.401	1.96066	1.500	3.824	PER IMP= 67.00
*S BASIN 101 (TO POND 'A')										
COMPUTE NM HYD	101.00	-	3	.00267	6.03	.252	1.76761	1.500	3.530	PER IMP= 59.00
*S BASIN 101.1 (TO POND 'A')										
COMPUTE NM HYD	101.10	-	4	.00097	2.38	.101	1.94622	1.500	3.827	PER IMP= 66.00
*S ADD BASINS 101 AND 101.1 = 101.2										
ADD HYD	101.20	3& 4	5	.00364	8.41	.353	1.81515	1.500	3.609	
*S POND 'A' OUTFLOW--2-8" PIPES = 101.A										
ROUTE RESERVOIR	101.A	5	6	.00364	2.00	.353	1.81510	1.950	.856	AC-FT= .172
*S BASIN 102 (TO POND 'B')										
COMPUTE NM HYD	102.00	-	7	.00536	12.22	.507	1.77575	1.500	3.565	PER IMP= 58.00
*S ADD 101.A (POND 'A' OUTFLOW) AND 102 = 102.1										
ADD HYD	102.10	6& 7	8	.00900	13.17	.860	1.79148	1.500	2.287	
*S POND 'B' OUTFLOW--3-8" PIPES										
ROUTE RESERVOIR	102.B	8	9	.00900	3.92	.860	1.79143	2.100	.681	AC-FT= .299
*S ROUTE POND 'B' OUTFLOW THROUGH 24' PARKING DRIVE IN BASIN 103										
ROUTE	102.20	9	10	.00900	3.92	.860	1.79139	2.100	.681	
*S BASIN 103										
COMPUTE NM HYD	103.00	-	11	.00435	11.02	.487	2.10114	1.500	3.960	PER IMP= 77.00
*S ADD 102.2 (ROUTED POND 'B' OUTFLOW) AND 103 = 103.1										
ADD HYD	103.10	10&11	12	.01335	12.20	1.347	1.89224	1.500	1.428	
*S ADD FLOWS AT BASIN 103										
ADD HYD	103.20	1&12	14	.01719	21.59	1.748	1.90751	1.500	1.963	
*S ROUTE FLOWS MH 1 IN 24" PIPE										
ROUTE	103.30	14	15	.01719	21.57	1.748	1.90754	1.500	1.961	
*S BASIN 104 (TO POND 'E')										
COMPUTE NM HYD	104.00	-	16	.00207	4.53	.172	1.55630	1.500	3.423	PER IMP= 39.00
*S ADD 103.3 TO BASIN 104 = 104.1										
ADD HYD	104.10	15&16	17	.01925	26.10	1.920	1.86978	1.500	2.118	
*S POND 'E' OUTFLOW--MANHOLE W/ ORIFICE PLATE ACCEPTING 3.5 CFS										
ROUTE RESERVOIR	104.E	17	18	.01925	3.48	1.920	1.86977	2.700	.282	AC-FT= .831
*S BASIN 200 (TO IRVING BLVD)										
COMPUTE NM HYD	200.00	-	19	.00144	3.37	.137	1.78736	1.500	3.660	PER IMP= 55.00
FINISH										

CURB OPENING
CAPACITY CALCULATION

Weir equation: $Q=CLH^{3/2}$

C=3.3 H=0.5'

L=1'	**Q= 1.2 cfs**	
L=2'	**Q= 2.3 cfs**	
L=3'	**Q= 3.5 cfs**	
L=4'	**Q= 4.7 cfs**	
L=5'	**Q= 5.8 cfs**	← C01
L=6'	**Q= 7.0 cfs**	
L=7'	**Q= 8.2 cfs**	
L=8'	**Q= 9.3 cfs**	
L=9'	**Q= 10.5 cfs**	
L=10'	**Q= 11.7 cfs**	
L=11'	**Q= 12.8 cfs**	← C02

0.5' Sidewalk Culvert @ 1.25%
Worksheet for Rectangular Channel

Project Description	
Project File	m:\active\genny\haestad\fmw\1248.fm2
Worksheet	2-foot Sidewalk Culvert
Flow Element	Rectangular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.012500	ft/ft
Depth	0.50	ft
Bottom Width	0.50	ft

Results		
Discharge	0.97	cfs
Flow Area	0.25	ft²
Wetted Perimeter	1.50	ft
Top Width	0.50	ft
Critical Depth	0.49	ft
Critical Slope	0.013250	ft/ft
Velocity	3.87	ft/s
Velocity Head	0.23	ft
Specific Energy	0.73	ft
Froude Number	0.96	
Flow is subcritical.		

4" PVC Drain Pipe @ 1%

Given Input Data:

Shape ..... Circular
Solving for ..... Flowrate
Diameter ..... 0.3333 ft
Depth ..... 0.3333 ft
Slope ..... 0.0100 ft/ft
Manning's n 0.0090

Computed Results:

Flowrate ..... 0.2748 cfs
Area 0.0872 ft2
Wetted Area 0.0872 ft2
Wetted Perimeter ..... 1.0471 ft
Perimeter ..... 1.0471 ft
Velocity ..... 3.1499 fps
Hydraulic Radius ..... 0.0833 ft
Percent Full ..... 100.0000 %
Full flow Flowrate ..... 0.2748 cfs
Full flow velocity ..... 3.1499 fps

4" PVC Drain Pipe @ 1.25%

Given Input Data:

Shape ..... Circular
Solving for ..... Flowrate
Diameter ..... 0.3333 ft
Depth ..... 0.3333 ft
Slope ..... 0.0125 ft/ft
Manning's n 0.0090

Computed Results:

Flowrate ..... 0.3073 cfs
Area 0.0872 ft2
Wetted Area 0.0872 ft2
Wetted Perimeter ..... 1.0471 ft
Perimeter ..... 1.0471 ft
Velocity ..... 3.5217 fps
Hydraulic Radius ..... 0.0833 ft
Percent Full ..... 100.0000 %
Full flow Flowrate ..... 0.3073 cfs
Full flow velocity ..... 3.5217 fps

6" PVC Drain Pipe @ 1%

Given Input Data:

- Shape ..... Circular
- Solving for ..... Flowrate
- Diameter ..... 0.5000 ft
- Depth ..... 0.5000 ft
- Slope ..... 0.0100 ft/ft
- Manning's n 0.0090

Computed Results:

- Flowrate ..... 0.8105 cfs
- Area 0.1963 ft2
- Wetted Area 0.1963 ft2
- Wetted Perimeter ..... 1.5708 ft
- Perimeter ..... 1.5708 ft
- Velocity ..... 4.1278 fps
- Hydraulic Radius ..... 0.1250 ft
- Percent Full ..... 100.0000 %
- Full flow Flowrate ..... 0.8105 cfs
- Full flow velocity ..... 4.1278 fps

6" PVC Drain Pipe @ 2%

Given Input Data:

- Shape ..... Circular
- Solving for ..... Flowrate
- Diameter ..... 0.5000 ft
- Depth ..... 0.5000 ft
- Slope ..... 0.0200 ft/ft
- Manning's n 0.0090

Computed Results:

- Flowrate ..... 1.1462 cfs
- Area 0.1963 ft2
- Wetted Area 0.1963 ft2
- Wetted Perimeter ..... 1.5708 ft
- Perimeter ..... 1.5708 ft
- Velocity ..... 5.8376 fps
- Hydraulic Radius ..... 0.1250 ft
- Percent Full ..... 100.0000 %
- Full flow Flowrate ..... 1.1462 cfs
- Full flow velocity ..... 5.8376 fps

8" PVC Drain Pipe @ 1%

Given Input Data:

- Shape ..... Circular
- Solving for ..... Flowrate
- Diameter ..... 0.6700 ft
- Depth ..... 0.6700 ft
- Slope ..... 0.0100 ft/ft
- Manning's n 0.0090

Computed Results:

- Flowrate ..... 1.7689 cfs
- Area 0.3526 ft2
- Wetted Area 0.3526 ft2
- Wetted Perimeter ..... 2.1049 ft
- Perimeter ..... 2.1049 ft
- Velocity ..... 5.0171 fps
- Hydraulic Radius ..... 0.1675 ft
- Percent Full ..... 100.0000 %
- Full flow Flowrate ..... 1.7689 cfs
- Full flow velocity ..... 5.0171 fps

8" PVC Drain Pipe @ 2%

Given Input Data:

- Shape ..... Circular
- Solving for ..... Flowrate
- Diameter ..... 0.6700 ft
- Depth ..... 0.6700 ft
- Slope ..... 0.0200 ft/ft
- Manning's n 0.0090

Computed Results:

- Flowrate ..... 2.5015 cfs
- Area 0.3526 ft2
- Wetted Area 0.3526 ft2
- Wetted Perimeter ..... 2.1049 ft
- Perimeter ..... 2.1049 ft
- Velocity ..... 7.0953 fps
- Hydraulic Radius ..... 0.1675 ft
- Percent Full ..... 100.0000 %
- Full flow Flowrate ..... 2.5015 cfs
- Full flow velocity ..... 7.0953 fps

12" PVC Drain Pipe @ 1%

Given Input Data:

- Shape ..... Circular
- Solving for ..... Flowrate
- Diameter ..... 1.0000 ft
- Depth ..... 1.0000 ft
- Slope ..... 0.0100 ft/ft
- Manning's n 0.0090

Computed Results:

- Flowrate ..... 5.1463 cfs
- Area 0.7854 ft2
- Wetted Area 0.7854 ft2
- Wetted Perimeter ..... 3.1416 ft
- Perimeter ..... 3.1416 ft
- Velocity ..... 6.5524 fps
- Hydraulic Radius ..... 0.2500 ft
- Percent Full ..... 100.0000 %
- Full flow Flowrate ..... 5.1463 cfs
- Full flow velocity ..... 6.5524 fps

PROJECT NAME: **VENTANA RANCH APARTMENTS**

JOB NUMBER: 1248

PRECIP ZONE	Q_{100} RUNOFF RATES (cfs/Ac)			
	A	B	C	D
1	1.29	2.03	2.87	4.37
2	1.56	2.28	3.14	4.70
3	1.87	2.60	3.45	5.02
4	2.20	2.92	3.73	5.25

% LAND TREATMENTS				
	TREAT TYPE 1	TREAT TYPE 2	TREAT TYPE 3	TREAT TYPE 4
A				
B				
C			50	
D		100	50	
∑% =		100	100	0

PRECIPITATION ZONE: 1

TREATMENT TYPE 2							
DRAIN #	LAND TREATMENT AREAS (Ac)					Q_{100} (cfs)	REMARKS
	A_{TOTAL}	A_A	A_B	A_C	A_D		
A/~~#13~~	0.2214	0	0	0	0.22	**1.0**	
H	0.1895	0	0	0	0.19	**0.8**	
3/B	0.8005	0	0	0	0.80	**3.5**	
C	1.0898	0	0	0	1.09	**4.8**	
6	1.728	0	0	0	1.73	**7.6**	
7/D	0.5915	0	0	0	0.59	**2.6**	
E	0.2433	0	0	0	0.24	**1.1**	
F	0.1728	0	0	0	0.17	**0.8**	
2	0.06398	0	0	0	0.06	**0.3**	
CO-1	1.228	0	0	0	1.23	**5.4**	

TREATMENT TYPE 3							
DRAIN #	LAND TREATMENT AREAS (Ac)					Q_{100} (cfs)	REMARKS
	A_{TOTAL}	A_A	A_B	A_C	A_D		
4	0.271	0	0	0.14	0.14	**1.0**	
9	0.7757	0	0	0.39	0.39	**2.8**	

C1--8" Pipe at Pond 'A'

Depth=1'

ENTRANCE
- Scale Decsription ..... GROOVE END ENTRANCE, PIPE PROJECTING FROM FILL
- Overtopping ..... Off
- Flowrate ..... 1.5000 cfs
- Manning's n 0.0090
- Roadway Elevation ..... 1.7000 ft
- Inlet Elevation ..... 0.6000 ft
- Outlet Elevation ..... 0.0000 ft
- Diameter ..... 0.6700 ft
- Length ..... 21.0000 ft
- Entrance Loss 0.0000
- Tailwater Elev..... 1.0000 ft

Computed Results:
- Headwater Elev..... 1.6265 ft Inlet Control
- Slope ..... 0.0286 ft/ft
- **Velocity ..... 8.4951 fps**

C2--8" Pipe at Pond 'B'

Depth=1'

ENTRANCE
- Scale Description ..... GROOVE END ENTRANCE, PIPE PROJECTING FROM FILL
- Overtopping ..... Off
- Flowrate ..... 1.5000 cfs
- Manning's n 0.0090
- Roadway Elevation ..... 1.5000 ft
- Inlet Elevation ..... 0.4000 ft
- Outlet Elevation ..... 0.0000 ft
- Diameter ..... 0.6700 ft
- Length ..... 12.0000 ft
- Entrance Loss 0.0000
- Tailwater Elev..... 1.0000 ft

Computed Results:
- Headwater Elev..... 1.4249 ft Inlet Control
- Slope ..... 0.0333 ft/ft
- Velocity ..... 8.9922 fps

Earthen Swale Calculations

Given Input Data:

- Shape ..... Trapezoidal
- Solving for ..... Depth of Flow
- Flowrate ..... 9.5000 cfs
- Slope ..... 0.0100 ft/ft
- Manning's n 0.0200
- Height ..... 1.0000 ft
- Bottom width ..... 0.0000 ft
- Left slope ..... 0.3333 ft/ft (V/H)
- Right slope ..... 0.3333 ft/ft (V/H)

Computed Results:

- Depth ..... 0.8751 ft
- Velocity ..... 4.1346 fps
- Full Flowrate ..... 13.5587 cfs
- Flow area 2.2977 ft2
- Flow perimeter ..... 5.5352 ft
- Hydraulic radius ..... 0.4151 ft
- Top width ..... 5.2512 ft
- Area 3.0003 ft2
- Perimeter ..... 6.3251 ft
- Percent full ..... 87.5115 %

VENTANA RANCH APARTMENTS

POND VOLUMES

Pond 'A'

Elev	Area (sf)	Cumulative Volume (cf)	Depth (ft)	Cumulative Volume (ac-ft)	C1--2-8" Pipes Ouflow (cfs)	Max Pond WSEL
21	9829					
		11241	1	0.2581	3	21.66
22	12653					

Pond 'B'

Elev	Area (sf)	Cumulative Volume (cf)	Depth (ft)	Cumulative Volume (ac-ft)	C2--3-8" Pipes Ouflow (cfs)	Max Pond WSEL
20	13936					
		14953	1	0.3433	4.5	20.87
21	15969					

Pond 'E'

Elev	Area (sf)	Cumulative Volume (cf)	Depth (ft)	Cumulative Volume (ac-ft)	MH w/ Orifice Plate Ouflow (cfs)	Max Pond WSEL
8	3249.0					
		3788	1	0.08695		
9	4326.1					
		8528	2	0.19577		
10	5154					
		14144	3	0.3247		
11	6077					
		20714	4	0.4755		
12	7063					
		28300	5	0.6497		
13	8109					
		37019	6	0.8498		13.92
14	9330					
		47030	7	1.0796		
15	10692					

Orifice Plate Calculations

Orifice Diameter @ Max Q=3.5 cfs

Pond 'E' :

Top of Pond = 15.0
Water Surface Elevation = 14.0
Pond Bottom Elevation = 8.0
Manhole Invert = 5.0

$$Q = CA(2gH)^{.5}$$
$$Q = (C(\Pi D^2/4)/(2gH))^{.5}$$
$$D = (4Q/(*\Pi C(2gH)^{.5})^{.5}$$

Q =	flow rate	3.5 cfs
C =	orifice coefficient	0.67
H =	depth at orifice	9 ft
A =	area of orifice opening	
D =	orifice diameter	

D=	**0.53**	**ft =**	**6.3 in.**
A=	0.22	ft	

Flowrate (Q) at 1-Foot increments of Water Depth			
Water Surface Elevation	Depth--H (ft)	Flowrate--Q (cfs)	
5414	9	3.50	
5413	8	3.30	
5412	7	3.09	
5411	6	2.86	
5410	5	2.61	
5409	4	2.33	
5408	3	0	← Pond Bottom Elev
5407	2	0	
5406	1	0	
5405	0	0	← MH Invert