DRAINAGE REPORT
FOR
CANTABELLA UNITS 2 AND 3
AT VENTANA RANCH

NOVEMBER 2, 2001

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APPENDICES

EXHIBITS

I. PURPOSE

The purpose of this report is to present the drainage management plan for Cantabella Subdivision Units 2 and 3 at Ventana Ranch and to obtain approval of the preliminary plat and grading plan by the Development Review Board (DRB). The proposed development of Tracts D-1-A and E-1 consists of 195 single family detached residential lots on approximately 38 acres producing a density of 5.1 DU/acre.

This report will reference the following City of Albuquerque and Albuquerque Metropolitan Arroyo Flood Control Authority (AMAFCA) approved studies prepared for the Ventana Ranch Subdivision development: 1) the *Las Ventanas Subdivision Drainage Master Plan*, dated April 1995 , updated in October, 1995, 2) the *Final Design Analysis Report for the Las Ventanas Detention Dam and Outfall Pipe*, and 3) the *Drainage Report for Sedona Subdivision Tract C at Ventana Ranch.* See appendix C, appendix D, and appendix E for excerpts from these reports.

The *Las Ventanas Subdivision Drainage Master Plan*, dated April 1995 and updated in October, 1995, identifies downstream drainage improvements including the AMAFCA Las Ventanas Drainage Facilities #1 and #2 and the pipe outfall diversion to the Calabacillas Arroyo. These improvements provide for the ultimate development of the Las Ventanas Subdivision. The Detention Facility #1 detains 2700 cfs and releases 49 cfs through a 42" storm drain. This pipe flows north and intercepts the outfall of Las Ventanas Detention Facility #2. This report identifies a total of 32 cfs discharge from the Las Ventanas Detention Facility #2 into a 36" pipe. The combined flow travels 1500 feet to outfall to the West Branch of the Calabacillas Arroyo.

Final Design Analysis Report for the Las Ventanas Detention Dam and Outfall Pipe, was prepared by Bohannan Huston and was utilized for the design of drainage facilities by AMAFCA. It details the spillway for the dam, the outfall pipe to the Calabacillas Arroyo, the outfall energy dissipation, and erosion control.

The *Drainage Report for Sedona Subdivision Tract C at Ventana Ranch* was prepared by Easterling & Associates. This report outlines the drainage concepts for the Cantabella subdivision Unit 1 located directly north and downstream of Cantabella Units 2 and 3. During the development

of this subdivision, a storm drain was designed and built to accommodate the drainage from the northern portion of Cantabella Units 2 and 3 and storm drain lines were extended into Unit 2.

II. METHODOLOGIES

Please refer to the above referenced reports for the specific methodologies used in preparing those individual reports or plans.

Site conditions will be analyzed for a 100-year, 6-hour storm event in accordance with the City of Albuquerque Drainage Ordinance and the Development Process Manual (DPM) Volume 2, Design Criteria, Section 22.2, Hydrology, for the City of Albuquerque, January 1993. The hydrology was analyzed using the AHYMO computer model. Output from this analysis is included in Appendix A.

III. SITE LOCATION AND CHARACTERISTICS

Ventana Ranch is a 940-acre development located west of Paradise Hills between Paseo del Norte and Irving Boulevards. Tracts D-1-A and E-1 are portions of Ventana Ranch Tract Z-2 and are located in the northeast corner of the Ventana Ranch Master Plan. The Cantabella Subdivision Unit 1 bounds the proposed subdivision to the north. A 300' drainage, utility, pedestrian, recreation, and access corridor separates the development from the existing Paradise Hills development to the east. The Las Ventanas Detention Dam is located to the south of the site and Universe Boulevard and the Country Meadows Subdivision are located to the west. The site will be accessible from existing Ventana Road.

IV. EXISTING HYDRAULIC AND HYDROLOGIC CONDITIONS

In its existing condition, the site consists of undulating terrain with slopes from 5% to less than 1%. Cantabella Unit 1 installed a storm drain system that was designed to accommodate the

drainage from the northern section of Units 2 and 3. This storm drain has been extended in three locations for future use by Cantabella Units 2 and 3. This storm drain conveys developed flow to the west branch of the Calabacillas Arroyo as planned in the *Las Ventanas Subdivision Drainage Master Plan*. When the Las Ventanas Detention Dam was built, a storm drain was installed to accommodate runoff from the southern portion of Cantabella Units 2 and 3. There are no recognized FEMA Floodplains within the proposed development.

V. PROPOSED HYDRAULIC AND HYDROLOGIC CONDITIONS

For additional assistance throughout this portion of the report, please refer to the Grading and Drainage Plan and the Proposed Conditions Basin Map enclosed in the Exhibit section of this report.

Discharge generated by Cantabella Units 2 and 3 will flow through the proposed internal streets to four major collection points; the low point of Calle Chulita and the northeastern termini of Calle Hermosa, Calle Chulita, and Calle Tesoro. This report conforms to the approved drainage plans listed above.

The proposed site is broken into sixteen (16) on-site basins. Runoff from Basins 1-5 will be conveyed in the residential streets to inlets at the northeast end of Calle Hermosa. These inlets will connect to the existing 24" storm drain stubbed from Calle de Vida in Cantabella Unit 1. Additional inlets were installed in Calle de Vida to collect runoff from Basin 6. A second stubout from the Calle de Vida storm drain was constructed into Calle Tesoro to collect runoff from Basin 7. A final storm drain with inlets was installed in Calle Chulita to collect runoff from Basin 15. The flow from these basins will be conveyed through Cantabella Unit 1 and discharged into the Las Ventanas Detention Facility #2. Runoff from Basins 8-14 will drain to inlets at the low point of Calle Chulita and will be conveyed to the Las Ventanas Detention Facility #1. These drainage patterns conform to the approved *Drainage Report for Sedona Subdivision Tract C at Ventana Ranch* (Cantabella Unit 1).

Basins 1-5 (11.28ac, Q_{100}=39.3cfs) encompass Calle Hermosa, Calle Placido, and Calle Bella, and consist of lots #140-187 and #1-11. The runoff from Basins 1-5 will be directed from

Calle Placido and Calle Bella into Calle Hermosa and will discharge into the existing 36" storm drain in Calle de Vida.

Basin 7 (2.6 ac, Q_{100}=9 cfs) encompasses half of Calle Tesoro and lots #18-27. Inlets will be connected to the existing 24" storm drain at the end of Calle Tesoro to collect runoff from this basin. Three single 'C' inlets will be installed. Each inlet will accept 3 cfs.

Basins 8-14 (16.83 ac, Q_{100}=58.7cfs) encompass most of Calle Chulita and all of Calle Dolce, Calle Allegro, and Calle Canta. These basins include lots #89-139, #35-63 and #188-195. Runoff will flow from these streets into Calle Chulita and be collected by the inlets east of Calle Canta and at the low point of Calle Chulita. East of Calle Canta, one single grate type 'A' inlet will be installed in series with one single grate type 'C' inlet on each side of Calle Chulita. Each type 'A' inlet will accept 7.4 cfs and each type 'C' inlet will accept 6.2 cfs. These four inlets remove 27.2 cfs from Calle Chulita. A bypass of 13.6 cfs continues down Calle Chulita. Calle Allegro conveys 13.4 cfs toward Calle Chulita. One single 'A' inlet will be installed at the intersection to remove 4 cfs from the street. A bypass of 9.4 cfs discharges into Calle Chulita. The 9.4 cfs combines with the 13.6 cfs in Calle Chulita and are accommodated by one double 'C' inlet and one single 'C' inlet at the low point of the street. The double grate inlet will accommodate 16.5 cfs and the single grate inlet will accept 11 cfs. These two inlets can accommodate 27.5 cfs. The new storm drain within Calle Chulita will connect to an existing storm and will be conveyed into the Las Ventanas Detention Dam.

Basin 15 (4.59 ac, Q_{100}=16 cfs) includes lots #64-88 on Calle Chulita. The flow from this basin travels north into the Cantabella Subdivision, Unit 1. Two single grate type 'A' inlets and one double grate type 'A' inlet were installed with Cantabella Unit 1 to accommodate the runoff from Basin 15. See appendix E for excerpts from the *Drainage Report for Sedona Subdivision Tract C at Ventana Ranch* (Cantabella Unit 1) and the storm drain construction plans for Cantabella Subdivision.

Basin 16 (1.25 ac, Q_{100}=3 cfs) contains all of the backyard ponds adjacent to the south boundary of the subdivision. These ponds retain the runoff from this basin. Therefore, basin 16 does not add to the discharge to the Las Ventanas Detention Dam.

VI. INTERIM STORM WATER MANAGEMENT

This site has been divided into two phases. The northeast portion of the site is Unit 2 and the southwest portion is Unit 3.The entire site will be graded at the same time and Unit 2 will be developed first. All of the storm drain required for both phases will be installed with Unit 2. Until Unit 3 is developed, the runoff will collect within the graded streets just upstream from Unit 2. Hay bales will be installed at the phase boundary to restrict the flow and to ensure storm water quality. A storm water pollution prevention plan will be created and followed during the development of Cantabella Unit 2.

VII. CONCLUSION

The drainage plan presented in this report follows the drainage concepts approved in the *Las Ventanas Subdivision Drainage Master Plan* and the *Drainage Report for Sedona Subdivision Tract C at Ventana Ranch.* The runoff from this subdivision can be safely conveyed by the improvements proposed in this drainage plan to existing drainage facilities. The existing storm drains and detention facilities were planned to accommodate this development, therefore, they have adequate capacity to accept the runoff produced by Cantabella Units 2 and 3.

Cantabella Subdivision Units 2 and 3
Fully Developed Drainage Conditions

HYRDOLOGICAL VOLUMETRIC & DISCHARGE DATA (DEVELOPED-ONSITE BASINS)
BASINS DISCHARGING NORTH TO CANTABELLA UNIT 1

BASIN I.D.	AREA (AC)	% LAND TREATMENT A	B	C	D	Q (100 YR) DISCHARGE
Basin 1	2.41	0.0%	22.0%	22.0%	56.0%	8.4
Basin 2	1.14	0.0%	22.0%	22.0%	56.0%	4.0
Basin 3	3.23	0.0%	22.0%	22.0%	56.0%	11.2
Basin 4	1.01	0.0%	22.0%	22.0%	56.0%	3.5
Basin 5	3.53	0.0%	22.0%	22.0%	56.0%	12.3
Basin 6	1.89	0.0%	22.0%	22.0%	56.0%	6.6
Basin 7	2.58	0.0%	22.0%	22.0%	56.0%	9.0
Basin 15	4.32	0.0%	22.0%	22.0%	56.0%	15.1
	20.11					70.1

HYRDOLOGICAL VOLUMETRIC & DISCHARGE DATA (DEVELOPED-ONSITE BASINS)
BASINS DISCHARGING SOUTH TO LAS VENTANAS DETENTION DAM

BASIN I.D.	AREA (AC)	% LAND TREATMENT A	B	C	D	Q (100 YR) DISCHARGE
Basin 8	5.89	0.0%	22.0%	22.0%	56.0%	20.5
Basin 9	1.42	0.0%	22.0%	22.0%	56.0%	5.0
Basin 10	2.51	0.0%	22.0%	22.0%	56.0%	8.8
Basin 11	1.32	0.0%	22.0%	22.0%	56.0%	4.6
Basin 12	1.84	0.0%	22.0%	22.0%	56.0%	6.4
Basin 13	1.77	0.0%	22.0%	22.0%	56.0%	6.2
Basin 14	2.07	0.0%	22.0%	22.0%	56.0%	7.2
	16.82					58.7

HYRDOLOGICAL VOLUMETRIC & DISCHARGE DATA (DEVELOPED-ONSITE BASINS)
BACKYARD PONDS RETAIN RUNOFF ONSITE

BASIN I.D.	AREA (AC)	% LAND TREATMENT A	B	C	D	Q (100 YR) DISCHARGE
Basin BY	1.25	0.0%	50.0%	50.0%	0.0%	3.1

AHYMO SUMMARY TABLE (AHYMO194) - AMAFCA Hydrologic Model - January, 1994 RUN DATE (MON/DAY/YR) =11/01/2001
INPUT FILE =020009in.TXT USER NO.= BOHN_HNM.STE

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 Developed Tracts D and E											
START										TIME=	.00
*S INPUT FILE=020009/CDP/HYDRO/020009in.TXT										RAIN6=	2.200
RAINFALL TYPE= 1											
*S****ONSITE BASINS											
COMPUTE NM HYD	1.00	-	1	.00376	8.39	.293	1.46064	1.500	3.486	PER IMP=	56.00
COMPUTE NM HYD	2.00	-	2	.00178	3.98	.139	1.46064	1.500	3.493	PER IMP=	56.00
COMPUTE NM HYD	3.00	-	3	.00500	11.15	.390	1.46063	1.500	3.485	PER IMP=	56.00
COMPUTE NM HYD	4.00	-	4	.00158	3.53	.123	1.46064	1.500	3.495	PER IMP=	56.00
COMPUTE NM HYD	5.00	-	5	.00550	12.26	.428	1.46064	1.500	3.484	PER IMP=	56.00
COMPUTE NM HYD	6.00	-	6	.00295	6.59	.230	1.46064	1.500	3.488	PER IMP=	56.00
COMPUTE NM HYD	7.00	-	7	.00404	9.01	.315	1.46064	1.500	3.486	PER IMP=	56.00
COMPUTE NM HYD	8.00	-	8	.00920	20.51	.717	1.46064	1.500	3.483	PER IMP=	56.00
COMPUTE NM HYD	9.00	-	9	.00222	4.96	.173	1.46064	1.500	3.490	PER IMP=	56.00
COMPUTE NM HYD	10.00	-	10	.00393	8.77	.306	1.46064	1.500	3.486	PER IMP=	56.00
COMPUTE NM HYD	11.00	-	11	.00206	4.60	.160	1.46064	1.500	3.492	PER IMP=	56.00
COMPUTE NM HYD	12.00	-	12	.00288	6.43	.224	1.46064	1.500	3.488	PER IMP=	56.00
COMPUTE NM HYD	13.00	-	13	.00276	6.16	.215	1.46064	1.500	3.488	PER IMP=	56.00
COMPUTE NM HYD	14.00	-	14	.00324	7.23	.252	1.46064	1.500	3.488	PER IMP=	56.00
*S AP #10											
COMPUTE NM HYD	15.00	-	15	.00675	15.05	.526	1.46064	1.500	3.484	PER IMP=	56.00
*S BACKYARDS RETAIN RUNOFF											
COMPUTE NM HYD	BY	-	16	.00196	3.07	.085	.81541	1.500	2.443	PER IMP=	.00
*S AP #1											
ADD HYD	12.00	1& 2	30	.00554	12.37	.432	1.46053	1.500	3.488		
*S AP #2											
ADD HYD	45.00	4& 5	32	.00708	15.80	.552	1.46055	1.500	3.487		
ADD HYD	453.00	32& 3	34	.01208	26.95	.941	1.46056	1.500	3.486		
*S AP #3 OUTFALL TO CALLE DE VIDA											
ADD HYD	12345.00	30&34	36	.01762	39.32	1.373	1.46055	1.500	3.487		
*S AP #6											
ADD HYD	89.00	8& 9	38	.01142	25.47	.890	1.46059	1.500	3.484		
ADD HYD	8910.00	38&10	40	.01535	34.24	1.196	1.46058	1.500	3.485		
*S AP #7											
ADD HYD	8TO11	40&11	42	.01741	38.84	1.356	1.46057	1.500	3.486		
ADD HYD	8TO12	42&12	44	.02029	45.27	1.581	1.46057	1.500	3.486		
*S AP #8											
ADD HYD	AP8	13&14	46	.00600	13.39	.467	1.46054	1.500	3.488		
*S AP #9											
*S OUTFALL TO LAS VENTANAS DETENTION DAM											
ADD HYD	AP9	44&46	48	.02629	58.66	2.048	1.46056	1.500	3.486		
FINISH											

SUMMARY OF ROADWAY CAPACITY ANALYSIS FOR CANTABELLA SUBDIVISION UNITS 2 AND 3

Calle Hermosa

Roadway Grade (%)	Basin #	Q at Analysis Pt. (cfs)	Curb Type	Depth of Water (ft)	Velocity (ft/s)	Velocity Head V^2/2g	EGL	Comments
3.96	1, 2	12.4	roll	0.31	4.0	0.26	0.60	ok
0.6	1 to 5	39.3	std	0.61	3.5	28.5	0.79	ok

Calle Placido

Roadway Grade (%)	Basin #	Q at Analysis Pt. (cfs)	Curb Type	Depth of Water (ft)	Velocity (ft/s)	Velocity Head V^2/2g	EGL	Comments
1.46	2	4	roll	0.26	2.2	0.1	0.33	ok
2.78	2	4	roll	0.24	2.9	0.13	0.38	ok

Calle Bella

Roadway Grade (%)	Basin #	Q at Analysis Pt. (cfs)	Curb Type	Depth of Water (ft)	Velocity (ft/s)	Velocity Head V^2/2g	EGL	Comments
0.6	4, 5	15.8	std	0.45	2.3	0.09	0.54	ok
1.76	4, 5	15.8	std	0.38	3.2	0.17	0.55	ok
0.79	9	5	std	0.31	1.9	0.05	0.36	ok

Calle Dolce

Roadway Grade (%)	Basin #	Q at Analysis Pt. (cfs)	Curb Type	Depth of Water (ft)	Velocity (ft/s)	Velocity Head V^2/2g	EGL	Comments
0.6	13	6.2	std	0.34	1.7	0.05	0.39	ok

Calle Allegro

Roadway Grade (%)	Basin #	Q at Analysis Pt. (cfs)	Curb Type	Depth of Water (ft)	Velocity (ft/s)	Velocity Head V^2/2g	EGL	Comments
0.6	13, 14	13.4	std	0.42	2.3	0.08	0.50	ok

Calle Canta

Roadway Grade (%)	Basin #	Q at Analysis Pt. (cfs)	Curb Type	Depth of Water (ft)	Velocity (ft/s)	Velocity Head V^2/2g	EGL	Comments
0.93	11	4.6	std	0.30	2.0	0.06	0.36	ok

Calle Chulita

Roadway Grade (%)	Basin #	Q at Analysis Pt. (cfs)	Curb Type	Depth of Water (ft)	Velocity (ft/s)	Velocity Head V^2/2g	EGL	Comments
0.6	8, 9, 10	34.3	std	0.57	3.2	0.16	0.73	ok
0.6	8 to 11	38.84	std	0.60	3.4	0.18	0.78	ok

Calle Tesoro

Roadway Grade (%)	Basin #	Q at Analysis Pt. (cfs)	Curb Type	Depth of Water (ft)	Velocity (ft/s)	Velocity Head V^2/2g	EGL	Comments
1.64	7	9	std	0.33	2.8	24	0.45	ok
3	6	6.6	std	0.27	3.3	0.18	0.44	ok

Table 1

Flowrates for Existing and Developed Conditions

Flow Into Las Ventanas Subdivision

EXISTING			DEVELOPED		
Analysis ID	Drainage Area (sq mi)	Flow (cfs)	Analysis ID	Drainage Area (sq mi)	Flow (cfs)
501	.273	135	501.0	.273	432
502.0	.034	20	502.0	.034	76
318A	.043	21	318A	.043	96
319A	.572	215	319A	.572	959
601.0	.020	17	601.0	.020	45
317A	.017	7	317A	.017	38

Flow Out of Las Ventanas Subdivision

EXISTING			DEVELOPED		
Analysis ID	Drainage Area (sq mi)	Flow (cfs)	Analysis ID	Drainage Area (sq mi)	Flow (cfs)
503.4	.739	198	503E.1	.080	115
505.0	.022	20	505.2	2.28	92
320.0	.190	69	320.0	.190	0
314B.2	1.35	38	314BS	.023	34
315B	.047	43	315B.1	.047	39*
602.2	.084	37	602.2	.084	0

*Developed flow = 0 cfs if a retention pond is used in Basin 315B.
Developed flow = 39 cfs if a detention pond is used.

- At the southwest corner of Las Ventanas, offsite flows are routed east down Paseo del Norte as street flows. At the intersection of Paseo del Norte and Universe Boulevard, these street flows are routed north down Universe and added to the North Branch Piedras Marcadas Channel.

- At the intersection of Universe Boulevard and North Branch Piedras Marcadas Channel, the channel increases to 8' deep and flows east 800 feet before discharging to the west side of LVD&R Facility No. 1.

7.3.3 Outfall to the Calabacillas Summary (Includes Las Ventanas Drainage & Recreation Facilities No. 1 and No. 2)

- LVD&R Facility No. 1 is a detention pond with 142 ac-ft of storage that occupies over 34 acres of land. This pond accommodates all of the flows discharged to it from the West Branch Calabacillas Diversion Channel and the North Branch Piedras Marcadas Channel. Total peak inflow in the 100-year storm is 2700 cfs, which is attenuated to a peak outflow of 49 cfs.

- The outfall from Facility No. 1 is a 42" storm drain (Reach 6) that flows north 2250 feet to where it intercepts the outfall of LVD&R Facility No. 2.

- LVD&R Facility No. 2 is a detention pond with a storage of less than 10 ac-ft and accommodates local flows from the region north of LVD&R Facility No. 1. Total peak inflow in the 100-year storm is 294 cfs, which is attenuated to a peak outflow of 32 cfs. This pond outfalls to a 36" pipe (Reach 7) that flows eastward a distance of 150 feet.

- At the confluence of the outfall from LVD&R Facility No. 2, the 42" outfall pipe from LVDR No. 1 increases to a 54" pipe (Reach 8).

- Over a distance of 1500 feet, the 54" pipe gathers local flows from the northeast region of Las Ventanas, crosses Irving Boulevard, and outfalls to the West Branch of the Calabacillas Arroyo.

- The outfall discharges through a drainage easement to the West Branch of the Calabacillas, directly north of the northeast corner of Las Ventanas. This is to be a joint trench with a waterline being installed by New Mexico Utilities, Inc. (NMUI). In addition to the original 25' drainage easement, NMUI has acquired a 20' easement and AMAFCA has dedicated 15', for a total easement width of 60 feet.

- A USBR Type IV baffle-wall energy dissipator is proposed to reduce the velocity of the 91 cfs where it exits to the natural arroyo.

7.4 Development Phasing

Infrastructure and home construction is anticipated to begin in 1996. The current development phasing strategy calls for multiple phases, tentatively starting near the intersection of Paseo del Norte and Rainbow Boulevard and expanding outward from south to north, and west of Universe Boulevard.

7.5 Drainage Infrastructure Phasing

A formal phasing plan for construction of drainage facilities has not yet been devised. Phasing of the infrastructure to support the development is planned to track with lot sales rates.

LVD&R Facility No. 1, the AMAFCA detention pond, is proposed to be built when developed flows exceed the existing playa's storage capacity. Storage of the existing playa without any improvements is estimated from FEMA mapping to be 26 ac-ft.

- Tributary "A" and Tributary "B" Channels join at a confluence located in the park at the well site. This confluence will need to be analyzed and modeled in the future during design. From here, the channel becomes the North Branch Piedras Marcadas Channel, a 7-foot deep channel.

- The North Branch Piedras Marcadas Channel flows east across Las Ventanas paralleling an existing water line easement, crossing Rainbow Boulevard and the Loop Road. It travels 3200 feet, gathering local flows and off-site flows from the southwest corner of Las Ventanas before reaching Universe Boulevard.

- At the intersection of Universe Boulevard and North Branch Piedras Marcadas Channel, the channel increases to 8' deep and flows east 800 feet before discharging to the west side of LVDF No. 1.

7.3.3 Outfall to the Calabacillas Summary (Includes Las Ventanas Drainage Facilities No. 1 and No. 2 and Reaches 6, 7, and 8)

- LVDF No. 1 is a detention pond with 143 ac-ft of storage that occupies over 34 acres of land. This pond accommodates all of the flows discharged to it from the West Branch Calabacillas Diversion Channel and the North Branch Piedras Marcadas Channel, and will be sized for 5-year sediment accumulation. Total peak inflow in the 100-year storm is 2998 cfs, which is attenuated to a peak outflow of 49 cfs.

- The outfall from Facility No. 1 is a 42" storm drain (Reach 6) that flows north 2250 feet to where it intercepts the outfall of LVDF No. 2.

- LVDF No. 2 is a detention pond with a storage of less than 10 ac-ft and accommodates local flows from the region north of LVDF No. 1. Total

peak inflow in the 100-year storm is 293 cfs, which is attenuated to a peak outflow of 32 cfs. This pond outfalls to a 36" pipe (Reach 7) that flows eastward a distance of 150 feet.

- At the confluence of the outfall from LVDF No. 2, the 42" outfall pipe from LVDF No. 1 increases to a 60" pipe (utilizing the 60" pipe that was salvaged from Golf Course Road) (Reach 8).

- Over a distance of 1500 feet, the 60" pipe gathers local flows from the northeast region of Las Ventanas, crosses Irving Boulevard, and outfalls to the West Branch of the Calabacillas Arroyo.

- The outfall discharges through a drainage easement to the West Branch of the Calabacillas, directly north of the northeast corner of Las Ventanas. This is to be a joint trench with a waterline being installed by New Mexico Utilities, Inc. (NMUI). In addition to the original 25' drainage easement, NMUI has acquired a 20' easement, and Sandia is obtaining an additional 15' easement for AMAFCA, for a total easement width of 60 feet.

- A USBR Type IV baffle-wall energy dissipator is proposed to reduce the velocity of the 92 cfs flows where it exits to the natural arroyo.

7.4 Development and Infrastructure Phasing

This section describes the anticipated project phasing with respect to the permanent and interior construction of the AMAFCA outfall facilities. The interior drainage facilities are described in a separate report entitled "Las Ventanas Subdivision Interim Drainage Facilities." Dedication of temporary and permanent easements will occur at platting.

filename: trtnew2.wk4
Las Ventanas Land Treatment Types

Existing Conditions

Basin ID	Percentage Treatment Type A	B	C	D
314B	96	0	2	2
315B	98	0	2	0
316	98	0	2	0
317A	98	0	2	0
317B	98	0	2	0
318A	96	0	2	2
318B	96	0	2	2
319A	98	0	2	0
319B	98	0	2	0
320	98	0	2	0
501	98	0	2	0
502	98	0	2	0
503	98	0	2	0
504	98	0	2	0
505	96	0	4	0
601	98	0	2	0
602	98	0	2	0

Developed Conditions

Basin ID	Percentage Treatment Type A	B	C	D
314BN	10	70	10	10
314BS	10	70	10	10
315B	2	18	20	60
316NW	2	33	15	50
316NE	5	33	15	47
316SW	2	20	18	60
316SE	2	23	10	65
317B	4	20	22	54
317A	7	14	20	59
318A	7	14	20	59
318BE	4	20	25	51
318BW	7	14	20	59
319A	7	14	20	59
319B	5	20	25	50
320	7	22	22	49
501	7	14	20	59
502	7	14	20	59
503E	4	20	30	46
503M	4	20	30	46
503W	4	20	30	46
504E	4	20	30	46
504W	4	20	30	46
505	7	53	20	20
601	7	14	20	59
602	5	18	20	57

IX. PRINCIPAL SPILLWAY DESIGN

The principal spillway for LVDD will be located along the east embankment of the dam. At the inlet of the spillway will be an 12' high concrete riser tower feeding a 42" diameter concrete cylinder pipe principal spillway with an invert elevation of 5395.00. A 32" orifice plate attached to the front of the 42" outfall pipe will limit flow from the facility to a maximum of 79 cfs during the 100-year storm and 89 cfs during the ½ PMF (see Appendix IV for riser and orifice design calculations).

The concrete cylinder principal spillway pipe will have an average slope of 1.24% over 169 feet and will be connected to a downstream manhole (manhole #2). At this manhole the outfall will turn north toward the Calabacillas Arroyo. The outfall downstream of this manhole will be reinforced concrete pipe (RCP). Seven anti-seep collars will be constructed around the concrete cylinder pipe at twenty foot intervals to prevent piping (concentrated seepage) along the conduit. The seepage collars will extend 24" beyond the outside of the concrete cylinder pipe or to basalt if the pipe lies within the basalt layer.

X. OUTFALL TO CALABACILLAS ARROYO

The outfall pipe to the West Branch of the Calabacillas Arroyo is divided into three distinct reaches: Reach #6, #7 and #8 (see "Plans for Construction of Las Ventanas Detention Dam Outfall ", BHI, June 1996 for details).

Reach #8 consists of 42" Class III, RCP at a constant slope of 0.56% from station 40+00, just north of manhole #11, to manhole #8 at station 26+07.43 (see Appendix V for Pipe Class Calculations for each reach). The outfall pipe from the detention dam will connect to Reach #8 at the stubout north of manhole #11.

Reach #7 will carry flow from the LVDD #2 to manhole #8 and will be designed and constructed at a later date.

Reach #6 consists of Class III, RCP ranging in size from 54 to 66 inches. This reach carries the combined flow from the LVDD and LVDF #2, as well as runoff from the future extension of Irving Boulevard, into the West Branch of the Calabacillas Arroyo. The pipe slope of Reach #6 varies from 0.43% to 0.60% from manhole #8 to manhole #2 at station 13+80. It then drops steeply at a slope of 15.54% to manhole #1 located at the top slope of the West Branch of the Calabacillas Arroyo at station 12+52. Reach #6 continues to drop at a slope of 22.59% from manhole #1 to the outfall located at the base of the arroyo. Erosion is controlled at the outfall by a 6' thick derrick stone apron. Hydraulic grade lines were calculated for Reach #6 and #8 using a spreadsheet program (see Appendix VI), the results of which are shown on the construction plans. A summary of the pertinent pipe parameters and flows for Reach #6, #7 and #8 are shown in Table 2.

TABLE 2
PIPE DATA FOR REACH #6, #7, AND #8

Reach #	Pipe Size(s)	Type & Class	Slope	Length	100-Year Flow
6	54" to 66"	RCP, Class III	0.43% to 22.59%	1523.43 ft.	149 cfs
7	TBD*	TBD	TBD	TBD	32 cfs
8	41"	RCP, Class III	0.56%	1392.57 ft.	73 cfs

* *Pipe size, type, class and length of Reach #7 will be determined at a later date when LVDF #2 is designed.*

A. OUTFALL ENERGY DISSIPATION AND EROSION CONTROL

Due to the steep slope of the outfall pipe entering the West Branch of the Calabacillas Arroyo, a dumped rock outlet apron is necessary to minimize erosion in the arroyo. The dumped rock outlet apron will consist of derrick stone approximately 6' deep and 40' wide by 37.5 fee long (see construction plans for details).

Station	Structure	Diam.	Q	Area	Vel.	K	Sf	Length	Dia.	Angle	Hf	Hb	Hj	Hmh	Ht	Losses	HGL(dn)	HGL(up)	Point	HV	EGL(dn)	EGL(up)
10+84	OUTLET								0	0		0.00	0.00	0.00	0.00	0.00		5327.18	5327.18	0.61	5327.79	5327.79
		66	149	23.76	6.27	3358	0.0020	12.00			0.02					0.02						
11+00	VERT. BEND								5.5	13		0.01	0.00	0.01	0.00	0.02	5327.20	5327.22	5327.5	0.61	5327.81	5327.83
		66	149	23.76	6.27	3358	0.0020	152.00			0.30					0.30						
12+52	MH #1								8	23		0.06	0.00	0.03	0.00	0.09	5357.67	5357.67	5371.04	0.61	5358.28	5358.28
		66	149	23.76	6.27	3358	0.0020	128.01			0.25					0.25						
13+80	MH #2								8	0		0.00	0.00	0.03	0.00	0.03	5377.65	5377.65	5391.23	0.61	5378.26	5378.26
		66	149	23.76	6.27	3358	0.0020	183.47			0.36					0.36						
15+63.47	MH #3								8	90		0.15	0.00	0.04	0.01	0.19	5380.93	5380.65	5394.01	0.89	5381.54	5381.54
		60	149	19.63	7.59	2604	0.0033	94.86			0.31					0.31						
16+58.32	MH #4								8	54		0.11	0.00	0.03	0.00	0.14	5380.96	5381.49	5392.01	0.51	5381.85	5382.00
		60	112	19.63	5.70	2604	0.0018	70.59			0.13					0.13						
17+28.91	MH #5								8	10		0.03	0.00	0.03	0.00	0.06	5382.61	5381.90	5391.57	0.51	5382.13	5382.18
		60	112	19.63	5.70	2604	0.0018	206.73			0.38					0.38						
19+35.63	MH #6								8	10		0.04	0.00	0.03	0.01	0.08	5382.06	5381.88	5390.08	0.77	5382.57	5382.65
		54	112	15.90	7.04	1966	0.0032	335.56			1.09					1.09						
22+71.18	MH #7								8	0		0.00	0.00	0.04	0.00	0.04	5382.96	5383.00	5388.45	0.77	5383.73	5383.77
		54	112	15.90	7.04	1966	0.0032	336.25			1.09					1.09						
26+07.43	MH #8								8	0		0.00	0.00	0.05	0.01	0.05	5384.09	5383.84	5390.01	1.07	5384.86	5384.91
		42	80	9.62	8.32	1006	0.0063	500.00			3.16					3.16						
31+07.43	MH #9								8	10		0.07	0.00	0.05	0.00	0.13	5387.00	5387.13	5397.15	1.07	5388.08	5388.20
		42	80	9.62	8.32	1006	0.0063	433.95			2.74					2.74						
35+41.37	MH #10								8	10		0.07	0.00	0.05	0.00	0.13	5389.87	5390.00	5401.01	1.07	5390.94	5391.07
		42	80	9.62	8.32	1006	0.0063	491.47			3.11					3.11						
40+32.84	MH #11								8	10		0.07	0.00	0.05	0.00	0.13	5393.10	5393.23	5401.78	1.07	5394.18	5394.30
		42	80	9.62	8.32	1006	0.0063	500.00			3.16					3.16						
45+32.84	MH #12								8	45		0.15	0.00	0.05	0.00	0.21	5396.39	5396.60	5402.23	1.07	5397.46	5397.67
		42	80	9.62	8.32	1006	0.0063	12.00			0.08					0.08						
45+48.84	E.O.P.								0	0		0.00	0.00	0.00	0.00	0.00	5396.67	5397.75	5402.23	0.00	5397.75	5397.75
		42	0.000	9.62	0.00	1006	0.0000	0.00			0.00					0.00						