DRAINAGE REPORT
VENTANA RANCH SUBDIVISION
TRACTS 28A, 28B & 25B

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RECEIVED
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HYDROLOGY SECTION

I hereby certify that I am a registered professional engineer licensed to practice in the State of New Mexico, that this report was prepared by me or under my supervision and is true and accurate to the best of my knowledge and belief.

3/8/99

Kerry L. Davis, P.E. # 9984 Date

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I. INTRODUCTION

This report presents the drainage management plan for Tract 28 and Tract 25B of the Ventana Ranch Subdivision. Tract 28 consists of 108 single family detached residential lots on approximately 20.0 acres to be developed in two phases. Tract 28A consists of 79 lots on approximately 13.7 acres and Tract 28B consists of 29 units on approximately 6.3 acres. Tract 25B consists of 41 single family detached residential lots on approximately 9.5 acres. Please refer to the location map included as Figure 1 following the text.

II. PURPOSE OF REPORT

The purpose of this report is to present the drainage management plan for preliminary plat and Development Review Board (DRB) grading plan approval for the proposed Tract 28 and Tract 25B subdivision of Ventana Ranch.

III. METHODOLOGIES AND REFERENCES

The Drainage Ordinance and the Development Process Manual (DPM) were utilized to develop this plan. The modified rational method contained within the July 1997 edition of the Development Process Manual (DPM) was utilized to determine the hydrologic discharges and volumes generated by this development. Hydraulic analysis of the typical street sections is performed utilizing Manning's Equation for proposed street slopes. This analysis identifies the street flow capacities allowed within the typical street sections, as well as in proposed storm sewer inlets required to intercept street flow from the surface.

Existing approved drainage reports referenced in the preparation of this plan include the "Las Ventanas Subdivision Drainage Master Plan" prepared by Bohannan Huston (dated October

1995). This report identifies downstream drainage improvements, including the AMAFCA Las Ventanas Drainage Facility #1, which is currently under construction by AMAFCA, to which developed flows from this tract will drain. See Appendix A for excerpts from this report.

The "Addendum No. 3 for the Design Analysis Report for Ventana Ranch Subdivision Drainage Facilities" prepared by Bohannan Huston (submitted concurrently with this report) is referenced herein to provide an analysis of the West Branch Calabacillas Diversion Storm Sewer. This proposed storm sewer diverts the vast majority of developed flows from that portion of Ventana Ranch that previously drained to the West Branch of the Calabacillas Arroyo to the Las Ventanas Dam.

Also referenced herein are two drainage reports for adjoining approved subdivisions, including the "Drainage Report - Ventana Ranch Subdivision Tract 27A," prepared by Bohannan Huston (originally dated December 5, 1997 and updated April 1, 1998) and the "Drainage Report for Bradford Hills Subdivision, Tract 25A, Ventana Ranch." See Appendix A for excerpts from these reports.

IV. SUMMARY OF RELATED PLATTING / SITE DEVELOPMENT PLAN ACTIONS

A copy of the preliminary plat is included as Plate 4. The preliminary plat will be submitted concurrently with this drainage report for review and approval by the Development Review Board. The construction plans for the public infrastructure, which will be reviewed by the Development Review Committee, are currently being developed. These tracts are contained within Tract X as shown on the original plat of Ventana Ranch filed 11/30/95. Subsequent platting actions have included the bulk land plat for Tracts 26A-1, 27A-1, and X-1, Ventana Ranch, which adjusted tract boundaries, and the bulk land plat for Tracts 25A, 25B, 26B-1-A, and X-1-A, which created Tract 25A from which the Bradford Hills Subdivision was later created.

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V. SITE LOCATION AND CHARACTERISTICS

Ventana Ranch is a 940-acre development located west of Paradise Hills between Paseo del Norte and Irving Boulevards. Tract 28A, 28B and 25B are located near the north central area of the Ventana Ranch Master Plan. The tracts are bound by Universe Boulevard to the east, existing Tract 25A, Bradford Hills Subdivision, and Tract 26A-1, a proposed school site, to the west, future Tract 29 to the north and existing Tract 26B, reserved for a future park site, to the south. The site will be accessible from a new subdivision entrance at Universe Boulevard.

In its existing condition, the site consists of undulating terrain with slopes from 14% to less than 1%. Existing drainage patterns direct runoff to the northeast to the West Branch of the Calabacillas Arroyo.

VI. EXISTING HYDRAULIC AND HYDROLOGIC CONDITIONS

The existing conditions maps from the "Las Ventanas Drainage Master Plan" (Plate 2) shows that the tracts lie primarily within existing Basin 503 which drains north toward Irving Boulevard and ultimately to the West Branch of Calabacillas Arroyo. The West Branch is located approximately one-quarter mile north of the site

Existing drainage facilities adjacent to and downstream of these tracts include the AMAFCA Las Ventanas Detention Dam, which is currently under construction, and the Las Ventanas Dam Outfall Storm Sewer, which was completed by AMAFCA in 1998.

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VII. PROPOSED HYDRAULIC AND HYDROLOGIC CONDITIONS

The vast majority of this development will be graded to convey runoff toward the south and east. Tract 28A, 28B, and 25B will be graded according to the grading plans in Plate 1. Runoff will be collected by and diverted to the proposed Las Ventanas Detention Dam by the West Branch Calabacillas Arroyo Storm Sewer. The storm drain system, including all drainage subbasins and flow rates, is shown on Plate 3, the Drainage Plan for the subdivision.

The "Addendum #2 for the Design Analysis Report for Ventana Ranch Subdivision Drainage Facilities, dated December 2, 1997 originally proposed a large diameter storm sewer in lieu of a channel for the Calabacillas Arroyo West Branch Diversion. The "Addendum #3," submitted concurrently with this report reanalyzes that storm sewer system and adjusts the drainage basins discharging to it. The alignment of this large storm sewer follows the proposed Ventana Hills Road through Tracts 28A and 25B. Construction of this storm sewer will coincide with development of Tracts 28A and 25B.

Discharge generated by Tract 28A, 28B, and 25B will be collected by and flow through the internal streets when fully developed. As shown on Plate 3, the Drainage Plan, Basins 1-A, 1-B, 1-C and 1-D all discharge into Country Sage Drive. The 33.2cfs street flow contributed by these basins will flow south on Country Sage Drive were it will be collected by storm drain inlets at the south end of the cul-de-sac. This runoff is collected in a closed basin because the cu-de-sac is lower than the adjacent street, which effectively eliminates an emergency overflow. Therefore, the outfall, including the inlets and connected pipes, are designed for twice the 100-year drainage as required by the DPM.

Basins 2-A, 2-B, and 2-C discharge into Country Meadows Drive while Basin 4-A discharges into Ventana Hills Road and then into Country Meadows Drive. The 38.3cfs street flow contributed by these basin will be collected by storm drain inlets at a low point on Country Meadows Drive just north of Ventana Hills Road.

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The 17.5cfs discharge from Basin 3-B and the offsite Basin A1-a will discharge into storm drain inlets at a low point on Deerbourne just west of Ventana Hills Road. The 22.22cfs discharge from Basin 3-C and the offsite Basin A2-a will discharge into storm drain inlets at a low point on Brushfield just west of Ventana Hills Road.

The proposed Basin 5A will discharge north to the future West Branch Calabacillas Arroyo outfall system identified with "Addendum #3." Basins 5B and 5C will discharge to Universe Boulevard and be collected by storm drain inlets at a low point just north of Ventana Hills Road.

The proposed storm drain in Ventana Hills Road will convey developed runoff from Tracts 23, 24, 25, 26, and 28 to the Las Ventanas Dam as identified and analyzed with Addendum #3 to the Ventana Ranch Drainage Master Plan. It will also carry the flow from the future Las Ventanas Road storm drain, which will provide a drainage outfall for Tracts 12, 13, 14, 15, and 22 and portions of Rainbow Boulevard. Preliminary design of the Ventana Hills Road storm drain, which was based on projected developed flows from these areas, is provided in the "Addendum No. 3 for the Design Analysis Report for Ventana Ranch Subdivision Drainage Facilities" (see excerpts in Appendix A). The storm drain analysis herein assumes that all developed flow from the contributing areas is collected into the storm drain.

VIII. CONCLUSION

The development of Tract 28 of the Ventana Ranch Subdivision is governed by the "Las Ventanas Subdivision Drainage Master Plan" (originally dated April 1995 and updated October 1995). The "Las Ventanas Subdivision Interim Drainage Facilities Plan" (originally dated October 1995) provides further guidance about interim facilities and phasing of subdivision development. This includes the construction of the downstream storm sewer system such as the Las Ventanas Dam and the outfall storm sewer from the dam to the West Branch of the Calabacillas Arroyo. Addenda #2 and #3 identify and analyze the major storm sewer system that carries runoff from and through this tract to the Las Ventanas Dam. Addendum #3 is submitted concurrently with this report, and provides design criteria and hydraulic analysis of the West Branch Diversion System.

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Increases in runoff, depth and velocity due to proposed development are within anticipated parameters for this area and can be safely conveyed by the improvements proposed in this drainage plan to drainage facilities existing, planned, or currently under construction which have adequate capacity to accept such runoff. Erosion and dust control, consisting of erosion control berms, snow fencing and sedimentation basins, are proposed to prevent soil washing or blowing into paved streets, storm sewers, and existing development areas.

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TRACT 28 & TRACT 25B @ VENTANA RANCH

BASIN I.D.	AREA (AC)	UNITS #	% LAND TREATMENT A	B	C	D	RUNOFF (AC-FT) 10 YR	100 YR	DISCHARGE (CFS) 10 YR	100YR
HYRDOLOGICAL VOLUMETRIC & DISCHARGE DATA (EXISTING)										
	29.06		98.0%	0.0%	2.0%	0.0%	1.92	3.42	8.0	37.8
HYRDOLOGICAL VOLUMETRIC & DISCHARGE DATA (DEVELOPED)										
1-A	2.56	12	0.0%	24.5%	24.5%	51.0%	0.17	0.30	5.2	8.8
1-B	2.21	15	0.0%	24.5%	24.5%	51.0%	0.15	0.26	4.5	7.6
1-C	2.40	16	0.0%	24.5%	24.5%	51.0%	0.16	0.28	4.8	8.2
1-D	2.50	15	0.0%	24.5%	24.5%	51.0%	0.17	0.29	5.0	8.6
2-A	3.27	18	0.0%	24.5%	24.5%	51.0%	0.22	0.38	6.6	11.2
2-B	2.22	15	0.0%	24.5%	24.5%	51.0%	0.15	0.26	4.5	7.6
2-C	2.33	12	0.0%	24.5%	24.5%	51.0%	0.15	0.27	4.7	8.0
3-A	1.30	6	0.0%	24.5%	24.5%	51.0%	0.09	0.15	2.6	4.5
3-B	1.40	6	0.0%	24.5%	24.5%	51.0%	0.09	0.16	2.8	4.8
4-A	3.36	18	0.0%	24.5%	24.5%	51.0%	0.22	0.40	6.8	11.5
4-B	4.29	13	0.0%	24.5%	24.5%	51.0%	0.28	0.50	8.7	14.7
SUBTOTAL	27.84	146								
5A	0.59	3	0.0%	30.0%	30.0%	40.0%	0.04	0.07	1.1	1.9
5B	1.79	0	0.0%	0.0%	10.0%	90.0%	0.12	0.21	4.9	7.6
5C	1.26	0	0.0%	0.0%	10.0%	90.0%	0.08	0.15	3.5	5.3
TOTAL	**31.5**	**149**					**2.09**	**3.71**	**65.7**	**110.2**

NOTES: 1) In the "Las Ventanas Subdivision Drainage Master Plan," Basis 1-A, 1-B, 2-A, 3-A, & 5A lie primarily within Basin 503E, Basins 1-C, 1-D, 2-B, and 4-A lie primarily within Basin 316NW. Basins 3-B, 3-C, & 4-B lie primarily in Basin 503M. Basins 5B and 5C lie primarily in Basin 320 and 316NW.

2) Impervious percentages were calculated from the DPM equation a-4. The remaining percentages were distributed evenly between land treatment types B and C, except for Basin 5B & 5C which was taken from Table A-5.

N=UNITS/ACRES = 5.2

%D= 7*SQRT((N*N)+(5*N)) = 51 %

R-2

ANALYSIS POINT	CONTRIBUTING BASINS	FLOW (CFS) 10 YEAR	FLOW (CFS) 100 YEAR	STREET NAME	WIDTH (feet)	SLOPE (%)	DEPTH of FLOW	ENGERGY HEAD
1	1-A	5.2	8.8	COUNTRY SAGE	32	0.65	0.38	0.43
2	1-A,1-B	9.7	16.4	COUNTRY SAGE	32	0.65	0.41	0.55
3	1-A,1-B,1-C	14.5	24.6	COUNTRY SAGE	32	0.65	0.47	0.64
4	1-A,1-B,1-C,1-D	19.5	33.2	COUNTRY SAGE	28	0.65	0.57	0.74
5	2-A	6.6	11.2	COUNTRY MEADOWS	32	2.30	0.33	0.51
6	2-A,2-B	11.1	18.8	COUNTRY MEADOWS	32	0.60	0.47	0.57
7	2-A,2-B,2-C,4-A	22.6	38.3	COUNTRY MEADOWS	32	0.60	0.59	0.77
8	3-A,A1-a(off)	10.5	17.5	DEERBOURNE	32	.50,1.95	0.47	0.55
9	3-B,A2-a(off)	13.3	22.2	BRUSHFIELD	32	.50,2.30	0.51	0.61
10	4-B	8.7	14.7	VENTANA HILLS	42,52	0.60	0.44	0.52
12	5-B	4.9	7.6	UNIVERSE	66	.65,1.26	0.44	0.52
13	5-C	3.5	5.3	UNIVERSE	66	.65,1.26	0.39	0.46

1. See attached street section hydraulic analysis

ANALYSIS OF AN INLET IN A SUMP CONDITION - **Pt 4**

INLET TYPE: Quad Grate Type "A" with curb opening wings on both sides on inlet.

WEIR: Q=C*L*H^1.5

Wing opening	Grate opeining
C= 3.0	C=3.0
L= 4.0 ft	L(double grate)=[2(2.67')+2(1.8')]=8.94 ft
Q=3.0(4.0')H**1.5= 12.0H**1.5	Q=3.0(8.94)H^1.5=26.82*H^1.5

ORIFICE: Q=C*A*(2*G*H)**0.5

Grate opening	Wing opening
C=0.6	C=0.6
A(double grate)=8.19 sf	A=2.0 sf
Q=4.194*(64.4*H)^0.5	Q=1.2*(64.4*H)^0.5

	WS ELEVATION	HEIGHT ABOVE INLET	Q (CFS) WEIR "A" OPENING	Q (CFS) WEIR DOUBLE GRATE	Q (CFS) ORIFICE DOUBLE GRATE	TOTAL Q (CFS) DOUBLE	Q (CFS) WEIR QUAD GRATE	Q (CFS) ORIFICE QUAD GRATE	TOTAL Q (CFS) QUAD	COMMENTS:
-FL @ INLET	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Flow at quad "A" inlet w/ two wing openings
	0.10	0.10	0.38	0.85	12.47	1.61	1.70	24.94	2.46	Weir controls on grate analysis
	0.20	0.20	1.07	2.40	17.64	4.55	4.80	35.27	6.94	
	0.30	0.30	1.97	4.41	21.60	8.35	8.81	43.20	12.76	
	0.40	0.40	3.04	6.78	24.94	12.86	13.57	49.88	19.64	
	0.50	0.50	4.24	9.48	27.88	17.97	18.96	55.77	27.45	
	0.60	0.60	5.58	12.46	30.55	23.62	24.93	61.09	36.08	Q(100 yr) = 33.2 cfs is provided at this depth
	0.70	0.70	7.03	15.71	32.99	29.76	31.41	65.99	45.47	
	0.80	0.80	8.59	19.19	35.27	36.36	38.38	70.54	55.55	
TOP OF CURB	0.90	0.90	10.25	22.90	37.41	43.39	45.80	74.82	66.29	Q(2x100 yr) = 66.4 cfs is provided at this depth
ROW LIMIT	1.00	1.00	12.00	26.82	39.43	50.82	53.64	78.87	77.64	

NOTE: The total runoff intercepted by the inlet at the low point in the road is:
Qr(100) = 2*[(runoff of the wing opening) + (the lesser of the weir or orifice amount taken by the double grate)].
THE 100 YR STORM EVENT = 15.9 CFS at the sump condition
THE 2 x 100 YR STORM EVENT = 31.8 CFS at the sump condition

ANALYSIS OF AN INLET IN A SUMP CONDITION - **Point 7 left side**

INLET TYPE: Double Grate Type "A" with curb opening wings on both sides on inlet.

WEIR: Q=C*L*H^1.5		ORIFICE: Q=C*A*(2*G*H)**0.5	
Wing opening	Grate opeining	Grate opening	Wing opening
C= 3.0	C=3.0	C=0.6	C=0.6
L= 4.0 ft	L(double grate)=[2(2.67')+2(1.8')]=8	A(double grate)=8.19 sf	A=2.0 sf
Q=3.0(4.0')H**1.5= 12.0H**1.5	Q=3.0(8.94)H^1.5=26.82*H^1.5	Q=4.194*(64.4*H)^0.5	Q=1.2*(64.4*H)^0.5

	WS ELEVATION	HEIGHT ABOVE INLET	Q (CFS) WEIR "A" OPENING	Q (CFS) WEIR DOUBLE GRATE	Q (CFS) ORIFICE DOUBLE GRATE	TOTAL Q (CFS)	COMMENTS:
~FL @ INLET	0.00	0.00	0.00	0.00	0.00	0.00	Flow at double "A" inlet w/ two wing openings
	0.10	0.10	0.38	0.85	12.47	1.61	Weir controls on grate analysis
	0.20	0.20	1.07	2.40	17.64	4.55	
	0.30	0.30	1.97	4.41	21.60	8.35	
	0.40	0.40	3.04	6.78	24.94	12.86	
	0.50	0.50	4.24	9.48	27.88	17.97	
	0.60	0.60	5.58	12.46	30.55	23.62	
TOP OF CURB	0.70	0.70	7.03	15.71	32.99	29.76	Q(100 yr) = 24.9 cfs is provided at this depth
	0.80	0.80	8.59	19.19	35.27	36.36	
	0.90	0.90	10.25	22.90	37.41	43.39	
ROW LIMIT	1.00	1.00	12.00	26.82	39.43	50.82	Q(2x100 yr) = 49.8 cfs is provided at this depth

NOTE: The total runoff intercepted by the inlet at the low point in the road is:
Qr(100) = 2*[(runoff of the wing opening) + (the lesser of the weir or orifice amount taken by the double grate)].
THE 100 YR STORM EVENT = 24.9 CFS at the sump condition
THE 2 x 100 YR STORM EVENT = 49.8 at the sump condition

ANALYSIS OF AN INLET IN A SUMP CONDITION - **Point 7 right side**

INLET TYPE: Double Grate Type "A" with curb opening wings on both sides on inlet.

WEIR: Q=C*L*H^1.5		ORIFICE: Q=C*A*(2*G*H)**0.5	
Wing opening	Grate opeining	Grate opening	Wing opening
C= 3.0	C=3.0	C=0.6	C=0.6
L= 4.0 ft	L(double grate)=[2(2.67')+2(1.8')]=8	A(double grate)=8.19 sf	A=2.0 sf
Q=3.0(4.0')H**1.5= 12.0H**1.5	Q=3.0(8.94)H^1.5=26.82*H^1.5	Q=4.194*(64.4*H)^0.5	Q=1.2*(64.4*H)^0.5

	WS ELEVATION	HEIGHT ABOVE INLET	Q (CFS) WEIR "A" OPENING	Q (CFS) WEIR DOUBLE GRATE	Q (CFS) ORIFICE DOUBLE GRATE	TOTAL Q (CFS)	COMMENTS:
~FL @ INLET	0.00	0.00	0.00	0.00	0.00	0.00	Flow at double "A" inlet w/ two wing openings
	0.10	0.10	0.38	0.85	12.47	1.61	Weir controls on grate analysis
	0.20	0.20	1.07	2.40	17.64	4.55	
	0.30	0.30	1.97	4.41	21.60	8.35	
	0.40	0.40	3.04	6.78	24.94	12.86	
	0.50	0.50	4.24	9.48	27.88	17.97	Q(100 yr) = 13.4 cfs is provided at this depth
	0.60	0.60	5.58	12.46	30.55	23.62	
TOP OF CURB	0.70	0.70	7.03	15.71	32.99	29.76	Q(2x100 yr) = 26.8 cfs is provided at this depth
	0.80	0.80	8.59	19.19	35.27	36.36	
	0.90	0.90	10.25	22.90	37.41	43.39	
ROW LIMIT	1.00	1.00	12.00	26.82	39.43	50.82	

NOTE: The total runoff intercepted by the inlet at the low point in the road is:
Qr(100) = 2*[(runoff of the wing opening) + (the lesser of the weir or orifice amount taken by the double grate)].
THE 100 YR STORM EVENT = 13.4 CFS at the sump condition
THE 2 x 100 YR STORM EVENT = 26.8 at the sump condition

ANALYSIS OF AN INLET IN A SUMP CONDITION - **Pt 8 on left and right side of Deerbourne**

INLET TYPE: Single Grate Type "A" with curb opening wings on both sides on inlet.

WEIR: Q=C*L*H^1.5

Wing opening	Grate opeining
C= 3.0	C=3.0
L= 4.0 ft	L(single grate)=[(2.67')+2(1.8')]=6.2
Q=3.0(4.0')H**1.5= 12.0H**1.5	Q=3.0(6.27)H^1.5=18.81*H^1.5

ORIFICE: Q=C*A*(2*G*H)**0.5

Grate opening	Wing opening
C=0.6	C=0.6
A(single grate)=4.09 sf	A=2.0 sf
Q=2.46*(64.4*H)^0.5	Q=1.2*(64.4*H)^0.5

	WS ELEVATION	HEIGHT ABOVE INLET	Q (CFS) WEIR WING OPENING	Q (CFS) WEIR SINGLE GRATE	Q (CFS) ORIFICE SINGLE GRATE	TOTAL Q (CFS)	COMMENTS:
~FL @ INLET	0.00	0.00	0.00	0.00	0.00	0.00	Flow at single "A" inlet w/ two wing openings
	0.10	0.10	0.38	0.59	6.24	1.35	Weir controls on grate analysis
	0.20	0.20	1.07	1.68	8.82	3.83	
	0.30	0.30	1.97	3.09	10.80	7.03	
	0.40	0.40	3.04	4.76	12.47	10.83	Q(100 yr) = 8.75 cfs is provided at this depth
	0.50	0.50	4.24	6.65	13.94	15.14	
	0.60	0.60	5.58	8.74	15.27	19.90	Q(2x100 yr) = 17.5 cfs is provided at this depth
TOP OF CURB	0.70	0.70	7.03	11.02	16.50	25.07	
	0.80	0.80	8.59	13.46	17.64	30.63	
	0.90	0.90	10.25	16.06	18.71	36.55	
ROW LIMIT	1.00	1.00	12.00	18.81	19.72	42.81	

NOTE: The total runoff intercepted by the inlet at the low point in the road is:
Q(100) = 2*[(runoff of the wing opening) + (the lesser of the weir or orifice amount taken by the double grate)].
THE 100 YR STORM EVENT = 8.75 CFS at the sump condition
THE 2 x 100 YR STORM EVENT = 17.5 CFS at the sump condition

C - 11s

ANALYSIS OF AN INLET IN A SUMP CONDITION - **Pt 9 left and right side of Brushfield**

INLET TYPE: Single Grate Type "A" with curb opening wings on both sides on inlet.

WEIR: Q=C*L*H^1.5		ORIFICE: Q=C*A*(2*G*H)**0.5	
Wing opening	Grate opeining	Grate opening	Wing opening
C= 3.0	C=3.0	C=0.6	C=0.6
L= 4.0 ft	L(single grate)=[(2.67')+2(1.8')]=6.2	A(single grate)=4.09 sf	A=2.0 sf
Q=3.0(4.0')H**1.5= 12.0H**1.5	Q=3.0(6.27)H^1.5=18.81*H^1.5	Q=2.46*(64.4*H)^0.5	Q=1.2*(64.4*H)^0.5

	WS ELEVATION	HEIGHT ABOVE INLET	Q (CFS) WEIR WING OPENING	Q (CFS) WEIR SINGLE GRATE	Q (CFS) ORIFICE SINGLE GRATE	TOTAL Q (CFS)	COMMENTS:
~FL @ INLET	0.00	0.00	0.00	0.00	0.00	0.00	Flow at single "A" inlet w/ two wing openings
	0.10	0.10	0.38	0.59	6.24	1.35	Weir controls on grate analysis
	0.20	0.20	1.07	1.68	8.82	3.83	
	0.30	0.30	1.97	3.09	10.80	7.03	
	0.40	0.40	3.04	4.76	12.47	10.83	
	0.50	0.50	4.24	6.65	13.94	15.14	Q(100 yr) = 11.1 cfs is provided at this depth
	0.60	0.60	5.58	8.74	15.27	19.90	
TOP OF CURB	0.70	0.70	7.03	11.02	16.50	25.07	Q(2x100 yr) = 22.2 cfs is provided at this depth
	0.80	0.80	8.59	13.46	17.64	30.63	
	0.90	0.90	10.25	16.06	18.71	36.55	
ROW LIMIT	1.00	1.00	12.00	18.81	19.72	42.81	

NOTE: The total runoff intercepted by the inlet at the low point in the road is:

Q(100) = 2*[(runoff of the wing opening) + (the lesser of the weir or orifice amount taken by the double grate)].

THE 100 YR STORM EVENT = 11.1 CFS at the sump condition

THE 2 x 100 YR STORM EVENT = 22.2 CFS at the sump condition

MASTER STORM DRAIN HYDROLOGIC VOLUMETRIC & DISCHARGE DATA

VENTANA HILLS RD

HYDRAULIC EVALUATION OF INLETS - HEC12 METHOD
10-YEAR STORM - RIGHT 1/2 STREET FLOWS W/ 20% CLOGGING FACTOR
15% REDUCTION IN ROUTED Q'S FOR ATTENUATION

Qi = Intercepted Flow
Qb = Bypass Flow
S = Longitudinal Slope
Sx = Cross Slope
Vo = Gutter Velocity where splash-over first occurs

Eo = Ratio of frontal flow to total gutter flow
Rf = Ratio of frontal flow intercepted to total frontal flow
Rs = Ratio of side flow intercepted to total side flow
E = Efficiency

Inlet ID	Total Rtd Q (cfs)	Inlet Width (ft)	Inlet Length (ft)	Ponding Width (ft)	Pond Depth (ft)	Qi (cfs)	Qb (cfs)	S (ft/ft)	Sx (ft/ft)	Vo (fps)	V (fps)	Eo	Rf	Rs	E
ANALYSIS POINT 10															
1	8.70	1.54	5.32	17.88	0.36	5.33	3.37	0.0060	0.0200	9.5	2.7	0.21	1.0	0.5	0.61
		Section Total Intercepted Flow:				*5.33*									
		Total Intercepted Flow:				*5.33*									

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MASTER STORM DRAIN HYDROLOGIC VOLUMETRIC & DISCHARGE DATA

VENTANA HILLS RD

HYDRAULIC EVALUATION OF INLETS - HEC12 METHOD
100-YEAR STORM - RIGHT 1/2 STREET FLOWS W/ 20% CLOGGING FACTOR
15% REDUCTION IN ROUTED Q'S FOR ATTENUATION

Qi = Intercepted Flow
Qb = Bypass Flow
S = Longitudinal Slope
Sx = Cross Slope
Vo = Gutter Velocity where splash-over first occurs

Eo = Ratio of frontal flow to total gutter flow
Rf = Ratio of frontal flow intercepted to total frontal flow
Rs = Ratio of side flow intercepted to total side flow
E = Efficiency

Inlet ID	Total Rtd Q (cfs)	Inlet Width (ft)	Inlet Length (ft)	Ponding Width (ft)	Pond Depth (ft)	Qi (cfs)	Qb (cfs)	S (ft/ft)	Sx (ft/ft)	Vo (fps)	V (fps)	Eo	Rf	Rs	E
ANALYSIS POINT 10															
1	14.70	1.54	5.32	21.76	0.44	8.03	6.67	0.0060	0.0200	9.5	3.1	0.18	1.0	0.4	0.55

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ANALYSIS OF AN INLET IN A SUMP CONDITION - **Universe Blvd. @ Analysis Point12**

INLET TYPE: Double Grate Type "A" with curb opening wings on both sides on inlet.

WEIR: Q=C*L*H^1.5		ORIFICE: Q=C*A*(2*G*H)**0.5	
Wing opening	Grate opeining	Grate opening	Wing opening
C= 3.0	C=3.0	C=0.6	C=0.6
L= 4.0 ft	L(double grate)=[2(2.67')+2(1.8')]=8	A(double grate)=8.19 sf	A=2.0 sf
Q=3.0(4.0')H**1.5= 12.0H**1.5	Q=3.0(8.94)H^1.5=26.82*H^1.5	Q=4.194*(64.4*H)^0.5	Q=1.2*(64.4*H)^0.5

	WS ELEVATION	HEIGHT ABOVE INLET	Q (CFS) WEIR "A" OPENING	Q (CFS) WEIR DOUBLE GRATE	Q (CFS) ORIFICE DOUBLE GRATE	TOTAL Q (CFS)	COMMENTS:
~FL @ INLET	0.00	0.00	0.00	0.00	0.00	0.00	Flow at double "A" inlet w/ two wing openings
	0.10	0.10	0.38	0.85	12.47	1.61	Weir controls on grate analysis
	0.20	0.20	1.07	2.40	17.64	4.55	
	0.30	0.30	1.97	4.41	21.60	8.35	
	0.40	0.40	3.04	6.78	24.94	12.86	
	0.50	0.50	4.24	9.48	27.88	17.97	Q(100 yr) = 16.07 cfs is provided at this depth
	0.60	0.60	5.58	12.46	30.55	23.62	
TOP OF CURB	0.70	0.70	7.03	15.71	32.99	29.76	
	0.80	0.80	8.59	19.19	35.27	36.36	Q(2x100 yr) = 32.14 cfs is provided at this depth
	0.90	0.90	10.25	22.90	37.41	43.39	
ROW LIMIT	1.00	1.00	12.00	26.82	39.43	50.82	

NOTE: The total runoff intercepted by the inlet at the low point in the road is:
Qr(100) = 2*[(runoff of the wing opening) + (the lesser of the weir or orifice amount taken by the double grate)].
THE 100 YR STORM EVENT = 16.07 CFS at the sump condition
THE 2 x 100 YR STORM EVENT = 32.14 at the sump condition

ANALYSIS OF AN INLET IN A SUMP CONDITION - **Universe @ Pt 13**

INLET TYPE: Single Grate Type "A" with curb opening wings on both sides on inlet.

WEIR: Q=C*L*H^1.5		ORIFICE: Q=C*A*(2*G*H)**0.5	
Wing opening	Grate opeining	Grate opening	Wing opening
C= 3.0	C=3.0	C=0.6	C=0.6
L= 4.0 ft	L(single grate)=[(2.67')+2(1.8')]=6.2	A(single grate)=4.09 sf	A=2.0 sf
Q=3.0(4.0')H**1.5= 12.0H**1.:	Q=3.0(6.27)H^1.5=18.81*H^1.5	Q=2.46*(64.4*H)^0.5	Q=1.2*(64.4*H)^0.5

	WS ELEVATION	HEIGHT ABOVE INLET	Q (CFS) WEIR WING OPENING	Q (CFS) WEIR SINGLE GRATE	Q (CFS) ORIFICE SINGLE GRATE	TOTAL Q (CFS)	COMMENTS:
~FL @ INLET	0.00	0.00	0.00	0.00	0.00	0.00	Flow at single "A" inlet w/ two wing openings
	0.10	0.10	0.38	0.59	6.24	1.35	Weir controls on grate analysis
	0.20	0.20	1.07	1.68	8.82	3.83	
	0.30	0.30	1.97	3.09	10.80	7.03	Q(100 yr) = 6.3 cfs is provided at this depth
	0.40	0.40	3.04	4.76	12.47	10.83	Q(2x100 yr) = 12.6 cfs is provided at this depth
	0.50	0.50	4.24	6.65	13.94	15.14	
	0.60	0.60	5.58	8.74	15.27	19.90	
TOP OF CURB	0.70	0.70	7.03	11.02	16.50	25.07	
	0.80	0.80	8.59	13.46	17.64	30.63	
	0.90	0.90	10.25	16.06	18.71	36.55	
ROW LIMIT	1.00	1.00	12.00	18.81	19.72	42.81	

NOTE: The total runoff intercepted by the inlet at the low point in the road is:
Q(100) = 2*[(runoff of the wing opening) + (the lesser of the weir or orifice amount taken by the double grate)].
THE 100 YR STORM EVENT = 6.3 CFS at the sump condition
THE 2 x 100 YR STORM EVENT = 12.6 CFS at the sump condition