DRAINAGE REPORT

FOR

VISTA DE ARENAL UNIT III AT VENTANA RANCH

(TRACTS 29B AND 29D)

MARCH 19, 2004

Prepared for:

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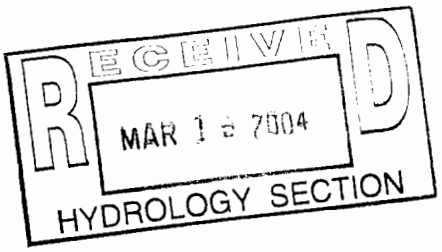

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APPENDICES

EXHIBITS

I. PURPOSE

The purpose of this report is to present the drainage management plan for Vista De Arenal Unit III Subdivision at Ventana Ranch (Tracts 29B and 29D) and to obtain approval of the preliminary/final plat and grading plan by the Development Review Board (DRB). The proposed development of the Vista De Arenal Unit III Subdivision consists of 78 single family detached residential lots on approximately 13.23 acres.

II. METHODOLOGIES

Drainage conditions were analyzed utilizing 10-year, 6-hour and 100-year, 6-hour storm events 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 site, as described in the 'Site Location and Characteristics' section below, is approximately 13.23 acres. Therefore, Part A of the DPM, Section 22.2 was used, which provides a simplified procedure for projects with sub-basins smaller than 40 acres.

This report will reference the following City of Albuquerque and the Albuquerque Metropolitan Arroyo Flood Control Authority (AMAFCA) approved studies prepared for the Ventana Ranch Subdivision development:

1) *Las Ventanas Subdivision Drainage Master Plan*, dated April 1995
2) *Final Addendum No. 4 For The Design Analysis Report For Ventana Ranch Subdivision Drainage Facilities*, dated July 2000
3) *Drainage Report for Tract 23 At Ventana Ranch,* dated January 17, 2002
4) *Drainage Report for Tract 24 at Ventana Ranch*, dated March 30, 2001
5) *Drainage Report for Country Meadows Unit III at Ventana Ranch*, dated April 19, 2002
6) *Drainage Report for Country Meadows Unit IV at Ventana Ranch*, dated January 14, 2004
7) *Drainage Report for Canta Cielo at Ventana Ranch*, dated September 5, 2003
8) *Drainage Report for Vista de Arenal Unit II at Ventana Ranch*, dated July 18, 2003.

The *Las Ventanas Subdivision Drainage Master Plan*, (LVDMP) prepared by Bohannan Huston (originally dated April 1995 and updated October 1995).dated April 1995 (hereafter referred to as the LVSDMP), was prepared to summarize the findings of a hydrologic analysis of existing and developed drainage conditions for the proposed Las Ventanas Subdivision and formulates a drainage master plan for the development of the property. The report evaluated drainage in Las Ventanas Subdivision based on the Piedras Marcadas Hydrologic model prepared by Molzen-Corbin & Associates in 1993, and provided a conceptual plan for drainage in order to determine drainage facilities sizes and total costs. In addition, it provided drainage outfall alternatives for the Las Ventanas Subdivision. Additional information was provided in "The Final Addendum No. 4 for The Design Analysis Report for Ventana Ranch Subdivision Drainage Facilities" prepared by Bohannan Huston dated Decernber 1997. This report identifies downstream drainage improvements and confirms that the storm drain hydraulics for the North Outfall or the West Branch Calabacillas Storm Drain Diversion presented in Addendum 3, have not been changed. The developed flows from this tract will ultimately drain into the West Branch Calabacillas Storm Drain.

The Final Addendum No. 4 For the Design Analysis Report For Ventana Ranch Subdivision Drainage Facilities, approved by the City of Albuquerque July 2000, was prepared to re-evaluate the hydrology and hydraulics for drainage outfall options for tracts in the north central portion of Ventana Ranch, a subdivision in the northwest Albuquerque. In addition, this report confirmed that the proposed changes in the subdivision and the resulting changes in the hydrology do not change the storm drain hydraulics for the North Outfall or the West Branch Calabacillas Storm Drain diversion, as presented in Addendum No. 3. Addendum No. 3 was approved by the City of Albuquerque and by AMAFCA. Using the revised hydrology, the hydraulics for the North Outfall and the West Branch Calabacillas Storm Drain Diversion were checked to assure adequate capacity for the revised flow rates.

The *Drainage Report For Travilla Subdivision (Tract 23) At Ventana Ranch,* dated January 17, 2002 was prepared to present the drainage management plan for Tract 23 of the Ventana Ranch Subdivision for preliminary plat and grading plan approval by the Development Review Board (DRB).

The *Drainage Report for Tract 24 at Ventana Ranch*, dated March 30, 2001 was prepared to present the drainage management plan for Tract 24 of the Ventana Ranch Subdivision for preliminary plat and grading plan approval by the Development Review Board (DRB).

The *Drainage Report for Country Meadows Unit III at Ventana Ranch (A Portion of Tract A, Travilla Subdivision)*, dated April 19, 2002 was prepared to present the drainage management plan for a portion of Tract A, Travilla Subdivision of the Ventana Ranch Subdivision for preliminary plat and grading plan approval by the Development Review Board (DRB).

The *Drainage Report for Country Meadows Unit IV at Ventana Ranch*, dated January 14, 2004 was prepared to present the drainage management plan for Tract 29E of the Ventana Ranch Subdivision for preliminary plat and grading plan approval by the Development Review Board (DRB).

The *Drainage Report for Canta Cielo at Ventana Ranch* , dated September 5, 2003 was prepared to present the drainage management plan for Tract 29C of the Ventana Ranch Subdivision for preliminary plat and grading plan approval by the Development Review Board (DRB).

The Drainage Report for Vista De Arenal Unit II at Ventana Ranch *(Tract 29C)*, dated July 18, 2003 was prepared to present the drainage management plan for Tract 29C of the Ventana Ranch Subdivision for preliminary plat and grading plan approval by the Development Review Board (DRB).

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

III. SITE LOCATION AND CHARACTERISTICS

Ventana Ranch is a 940-acre development located west of Paradise Hills between Paseo del Norte and Irving Boulevards. Vista De Arenal Unit III (Tracts 29B and 29D) is located in the

northeastern quadrant of the Ventana Ranch Master Plan. The proposed subdivision is bounded by Irving Blvd. to the north, Country Meadows Unit IV (Tract 29E) to the east, Travilla (Tract 23) and Vista De Arenal Unit II (Tract 29C) to the south, and Rainbow Blvd. to the west. The subdivision consists of 78 lots and will be accessible from Irving Blvd.

IV. EXISTING HYDRAULIC AND HYDROLOGIC CONDITIONS

For additional assistance throughout this portion of the report, please refer to the Existing Drainage Basin Map enclosed in the Exhibit section of this report.

The proposed subdivision is located within existing Basin 1 (13.23 ac, Q100=37.93 cfs) and consists of mass graded terrain with gradual slopes ranging 1% to 5%. The soil throughout this region has a Hydrologic Soil Group (HSG) classification of Type "A". Types "A" soils are known to have high infiltration rates and are typically found in desert climates similar to that of Ventana Ranch. Existing drainage patterns direct the runoff to a lowpoint within Paese Place. At this lowpoint, the 8' storm drain manholes, which were built with Vista de Arenal Unit 2, have been built with beehive grates to accept this flow. This lowpoint collects flows from Travilla and Vista De Arenal Unit II Subdivisions. There are no recognized FEMA Floodplains within the proposed development.

V. ULTIMATE HYDRAULIC AND HYDROLOGIC CONDITIONS

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

The developed flow from Travilla (Q_{100}=6.42 cfs) and Vista de Arenal Unit III (Q_{100}=46.88 cfs) will be collected by inlets along Paese Place and a lowpoint in Vendaval Avenue just south of Paese Place. The residual flow (Q_{100}=8.51 cfs) will continue east into Country Meadows IV on Paese Place. The flow (Q_{100}=30.31 cfs) from Vista De Arenal II will be collected at the same lowpoint on Vendaval Avenue. The flow will be carried via storm drain north through the Canta Cielo Subdivision and discharge into the West Branch Calabacillas Arroyo.

A. Onsite Basins

The proposed site is comprised of one large basin, broken into six (6) basins (Basins A - F). Four of the six basins have been divided into sub-basins for analysis reasons. The major basins are discussed in detail below. For sub-basin data see Appendix A at the end of this report.

Basin A-1 (1.19 ac, Q_{100}=4.19cfs) encompasses eight (8) lots, #53-60 and the southern half of Paese Place from the west Cul-de-sac to Salerno Street. Basin A-2 (2.82 ac, Q_{100}=9.94 cfs) encompasses eighteen (18) lots, #61-78 and the northern half of Paese Place from the west Cul-de-sac to Catania Street. Basin A-3 (0.60 ac, Q_{100}=2.11 cfs) encompasses three (3) lots, #50-52 and the western half of Salerno Street. Basin A-4 (1.22 ac, Q_{100}=4.30 cfs) encompasses seven (7) lots, #43-49 and the eastern half of Salerno Street. Basin B-1 (0.17 ac, Q_{100}=.72 cfs) encompasses the southern half of Paese Place from Salerno Street to Trieste Court. Basin B-2 (1.78 ac, Q_{100}=6.27 cfs) encompasses nine (9) lots, #34-42 including Trieste Court. Basin D-1 (2.18 ac, Q_{100}=7.68 cfs) encompasses thirteen (13) lots #21-33 and the southern half of Paese Place from Trieste Court to Basin D-2. Basin E-1 (1.15 ac, Q_{100}=4.05 cfs) encompasses eight (8) lots, #1-8 and the northern half of Paese Place from Catania Street to Basin E-2. The combined flow from Basin A, Basin B, Basin D-1, and Basin E-1 will travel east on Paese Place and will be collected by inlets 1 (8.49 collected, 11.14 bypassed), and 2 (8.49 collected, 11.14 bypassed). (For inlet names see Appendix C: Inlet Analysis).

Basin E-2 (0.42 ac, Q_{100}=1.48 cfs) encompasses three (3) lots, #9-11 and the northern half of Paese Place from Basin E-1 to Basin E-3. Basin D-2 (0.45 ac, Q_{100}=1.59 cfs) encompasses three (3) lots, #18-20 and the southern half of Paese Place from Basin D-1 to Vendaval Avenue. Combined with the residual flows from inlets 1 and 2 (Q_{res}=22.28), the additional runoff from Basin E-2 and D-2 will be collected by inlets 3 (6.42 collected, 6.26 bypassed) and 4(6.42 collected, 6.26 bypassed).

Basin E-3 (0.64 ac, Q_{100}=2.25 cfs) encompasses four (4) lots, #12-15 and the northern half of Paese Place from Basin E-2 to the eastern boundary of Vista De Arenal Unit III. Residual flow from inlet 3 (Q_{100}=6.26 cfs) on the northern half of Paese Place will combine with the flow from Basin E-3 (Q_{100}=2.25 cfs) and travel east to the low point on

Paese Place in Country Meadows IV. This flow (Q_{100}=8.51 cfs) was taken into account when the lowpoint in Country Meadows IV on Paese Place was designed.

Basin F (0.39 ac, Q_{100}=1.37 cfs) encompasses two (2) lots, #16-17 and Vendaval Avenue from Paese Place to the southern boundary of Vista De Arenal Unit III. The residual flow from inlet 4 (Q_{100}=6.26 cfs) on the southern half of Paese Place will combine with the flow from Basin F as well as the flow from Vista De Arenal Unit II (Q_{100}=30.31) and will be collected at the low point on Vendaval Avenue. Inlets 5 and 6 at the low point are both Double Wing, Double Grate Type "A" inlets. These two inlets also accommodate the 2 x 100yr combined flow of 75.88cfs (37.94cfs each) since there is no emergency spillway.

B. Offsite Basins

Basin C (0.22 ac, Q_{100}=0.93 cfs) encompasses the entrance into the subdivision. Approximately seventy-five percent (75%) (Q_{100}=0.70 cfs) the developed flow from this basin will flow north out of the subdivision and be captured downstream by inlets on Irving Boulevard. The remaining twenty five percent (Q_{100}=0.23 cfs) will flow east on Paese Place and be collected at the lowpoint in Vendaval Avenue.

VI. CONCLUSION

The Final Addendum No. 4 governs the development of Vista De Arenal Unit III (Tracts 29B and 29D) of the Ventana Ranch Subdivision. Increases in runoff, depth and velocity due to proposed development are within parameters anticipated within the previously approved Master Drainage Plan for this area. These flows can be safely conveyed by the improvements proposed in this drainage plan to existing drainage facilities, 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 drains, and existing development areas. This report supports the preliminary/final plat and grading plan submittals and should be approved as requested.

BASIN SUMMARY FOR VISTA DE ARENAL UNIT III AT VENATNA RANCH

HYRDOLOGICAL VOLUMETRIC & DISCHARGE DATA

	BASIN I.D.	AREA (AC)	UNITS #		% LAND TREATMENT A	B	C	D		DISCHARGE (CFS) 10 YR	100YR
	EXISTING CONDITIONS										
Onsite	1	13.23			0.0%	0.0%	100.0%	0.00%		**19.52**	**37.93**
	PROPOSED CONDITIONS										
	A-1	1.19	8		0.0%	22.0%	22.0%	56.0%		2.51	4.19
	A-2	2.82	18		0.0%	22.0%	22.0%	56.0%		5.95	9.94
	A-3	0.60	3		0.0%	22.0%	22.0%	56.0%		1.26	2.11
	A-4	1.22	7		0.0%	22.0%	22.0%	56.0%		2.57	4.30
	B-1	0.17	0		0.0%	0.0%	10.0%	90.0%		0.47	0.72
	B-2	1.78	9		0.0%	22.0%	22.0%	56.0%		3.75	6.27
	C	0.22	0		0.0%	0.0%	10.0%	90.0%		0.60	0.93
	D-1	2.18	13		0.0%	22.0%	22.0%	56.0%		4.60	7.68
	D-2	0.45	3		0.0%	22.0%	22.0%	56.0%		0.95	1.59
	E-1	1.15	8		0.0%	22.0%	22.0%	56.0%		2.42	4.05
	E-2	0.42	3		0.0%	22.0%	22.0%	56.0%		0.89	1.48
	E-3	0.64	4		0.0%	22.0%	22.0%	56.0%		1.35	2.25
	F	0.39	2		0.0%	22.0%	22.0%	56.0%		0.82	1.37
Onsite	**TOTAL**	**13.23**	**78**							**28.14**	**46.88**

NOTES: Impervious percentages were calculated from the DPM equation A-**4**, with the remaining percentages distributed to land treatment type B, due to the relatively flat terrain

N=UNITS/ACRES = 5.9

%D= 7*SQRT((N*N)+(5*N)) = 56.1 %

*Table A-4

**Table A-11

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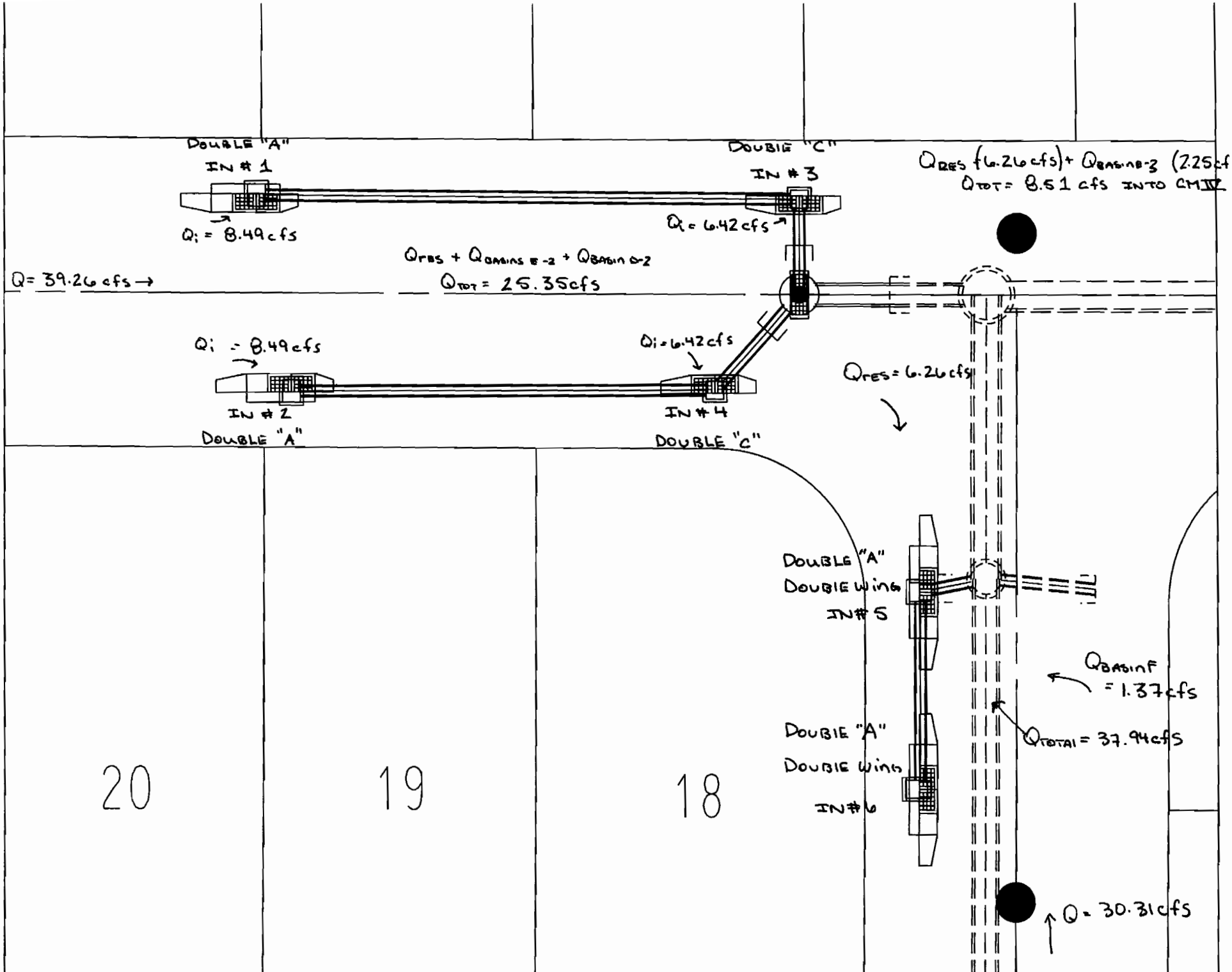

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ANALYSIS OF AN INLET IN A SUMP CONDITION - **Vendaval Avenue LT.**

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

WEIR: Q=C*L*H^1.5

Wing opening
C= 3.0
L= 4.0 ft
Q=3.0(4.0')H**1.5= 12.0H**1.5

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

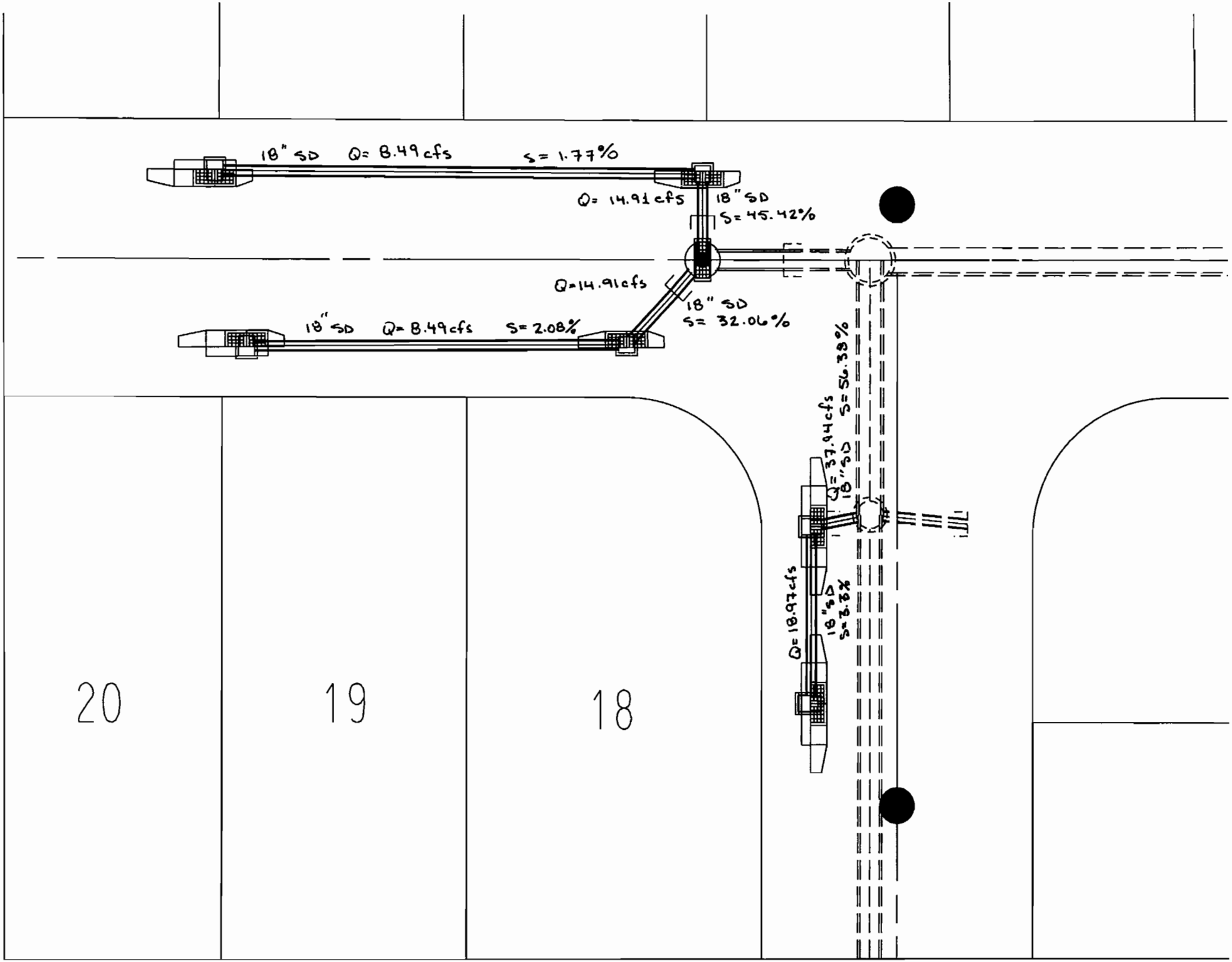
ORIFICE: Q=C*A*(2*G*H)**0.5

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

Wing opening
C=0.6
A=2.0 sf
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	Q(100 yr) = 18.97 cfs is provided at this depth
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	
	0.90	0.90	10.25	22.90	37.41	43.39	Q(2*100 yr) = 37.94 cfs is provided at this depth
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 = 18.97 CFS at the sump condition
THE 2 x 100 YR STORM EVENT = 37.94 at the sump condition



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