N-08/D4 El Rancho Grande, Unit 16 417 D4/D5

DRAINAGE REPORT

FOR

EL RANCHO GRANDE
UNIT 16

A 159-LOT SINGLE FAMILY RESIDENTIAL SUBDIVISION

ALBUQUERQUE, NEW MEXICO
APRIL 2005

ISAACSON & ARFMAN, P.A.

Consulting Engineering Associates

Albuquerque, NM

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Prepared by:

ISAACSON & ARFMAN, P.A.
128 Monroe Street NE
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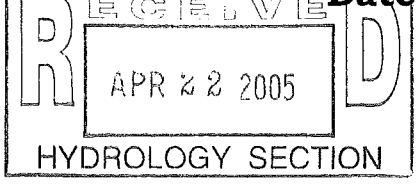
Fred C. Arfman 04/21/05

Fred C. Arfman, PE **Date**



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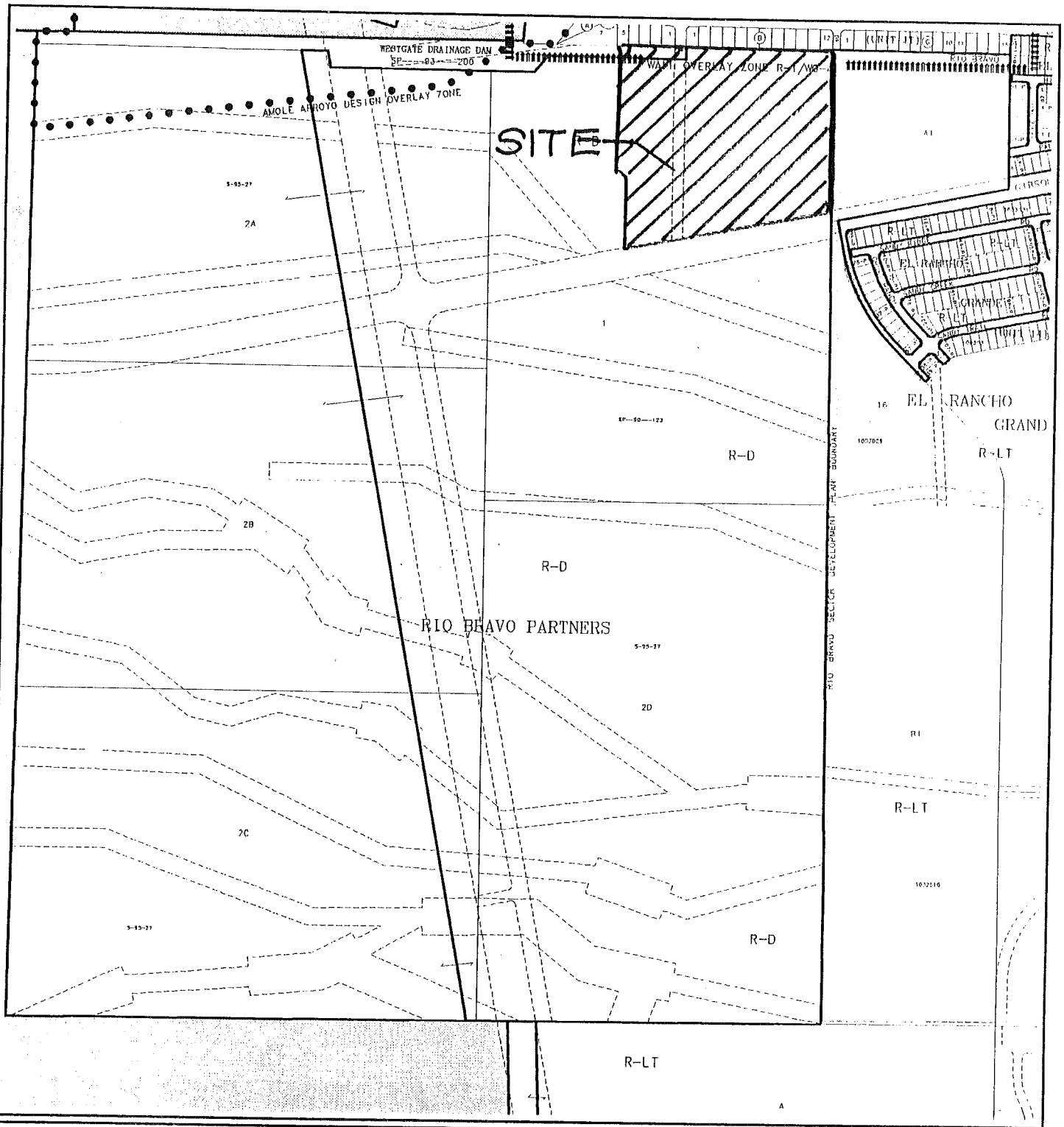

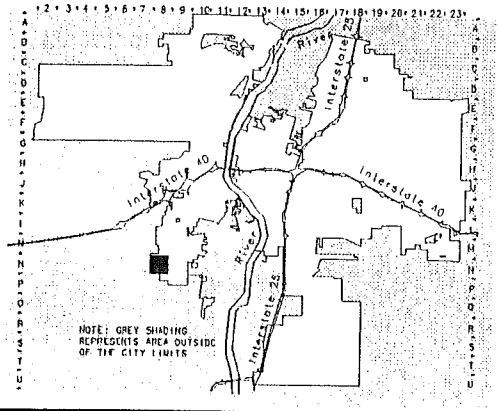

CITY OF ALBUQUERQUE · NEW MEXICO · 1706

GRAPHIC SCALE IN FEET

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Zone Atlas Page

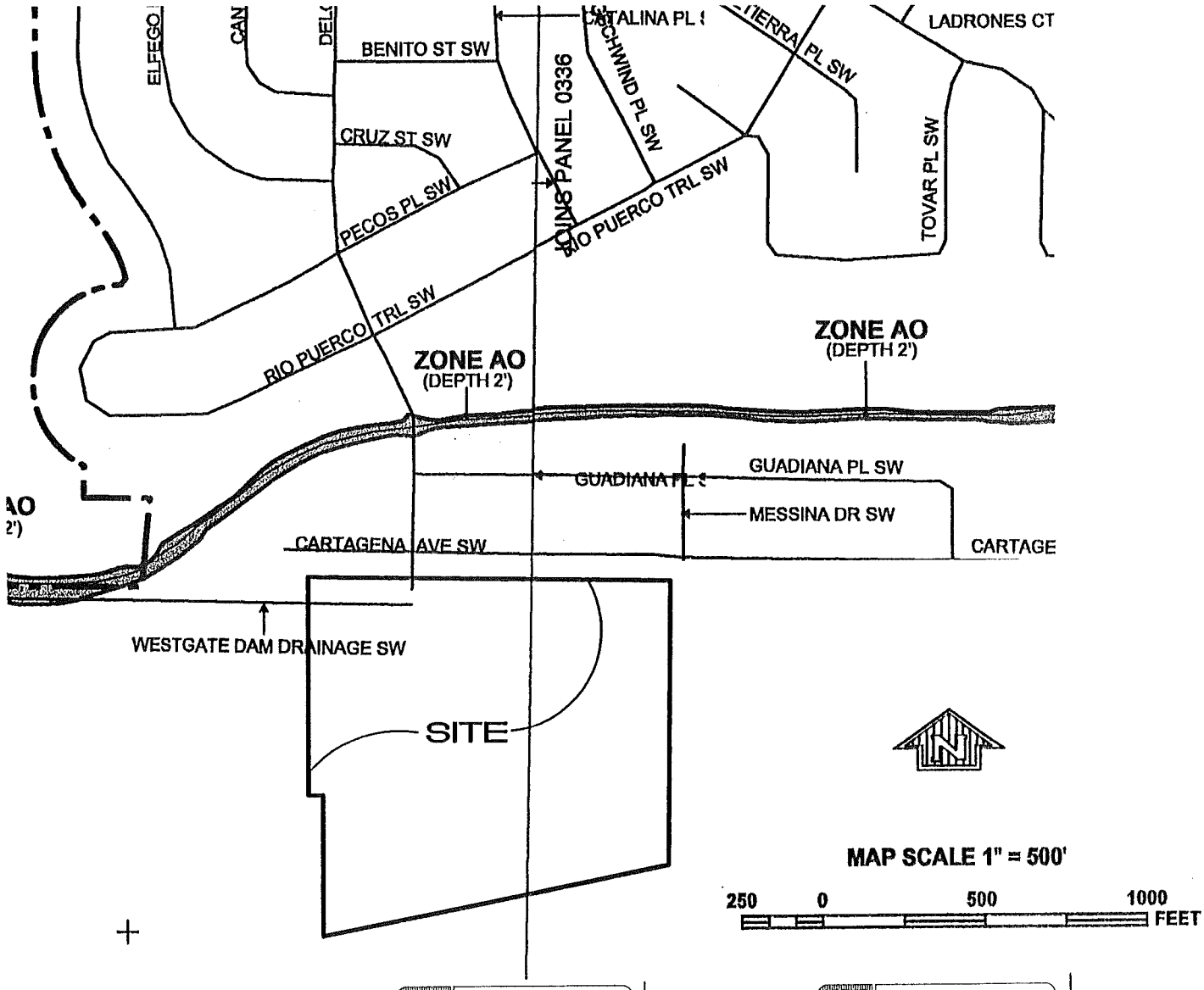
N-8-Z

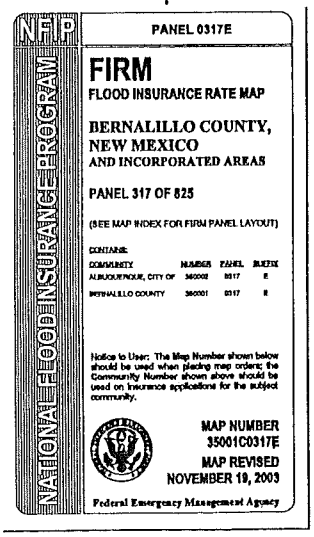
Map Amended through September 02, 2004

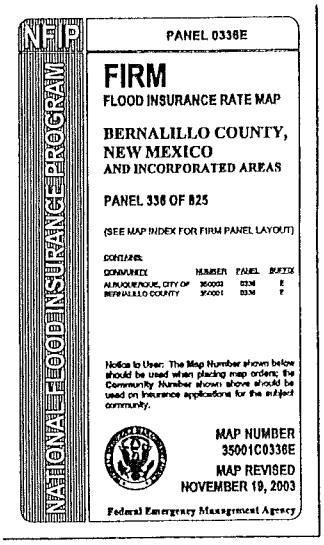
Albuquerque Geographic Information System

PLANNING DEPARTMENT

FLOODPLAIN MAP







1349FEMA.DWGanw 1/7/05

PROJECT INFORMATION

PROPOSED LEGAL DESCRIPTION:
El Rancho Grande Subdivision, Unit 16

EXISTING LEGAL DESCRIPTION:
All of Tract 16E and a portion of Tract 16-F
of Bulk Land Plat for El Rancho Grande
(Filed 1/31/05 in Book 2005C, Pg. 41)

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

SURVEYOR: Aldrich Land Surveying
(505) 884-1990
Attn: Tim Aldrich, NMPLS No. 7719

DEVELOPER: Curb, Inc
c/o Bokay Construction
(505) 899-9656
Attn: Bo Johnson

NUMBER OF PROPOSED LOTS: 159

TOTAL AREA: 24.776 Acres

FLOOD PLAIN: Zone X
This site lies outside the 100-year flood (Zone X) based on Firm Maps #35001C0317 and #35001C0336, dated November 19, 2003

II. INTRODUCTION

El Rancho Grande Subdivision, Unit 16, is a 159-lot, single-family residential subdivision. The proposed site is located northwest of the intersection of Messina Drive and Gibson Blvd., south of the existing Westgate Heights Subdivision, west of El Rancho Grande, Unit 11, and undeveloped land to the west (Parcel 2-A, Lands of Rio Bravo Partners), and north of future Gibson Boulevard.

This report also includes drainage recommendations for the future units to the west of this site (referred to as Future Unit 17 in this report). The site falls within AMAFCA's Amole-Hubbell Drainage Management Plan (Amole-Hubbell DMP), prepared by Leedshill-Hirkenhoff, dated July 22, 1999, as modified by the Design Report for Amole Arroyo, prepared by Isaacson & Arfman, P.A., dated August 2003.

III. EXISTING CONDITIONS

ONSITE:

The proposed Unit 16 along with future Unit 17 is a 44.2-acre undeveloped tract of land, with native grasses and scrub brush. The site slopes to the east toward Messina Drive and southeast to Gibson Blvd. at 4-5%.

OFFSITE:

Approximately 156 cfs of offsite flows enter Unit 16 from the west, east of Westgate Dam and north of the future Gibson Blvd alignment. A portion of the Sacate Blanco Basin 60104, as defined in the Amole-Hubbel DMP, was added to the Amole Arroyo basin by the Amole Arroyo Design Report. However, until that land is developed, these flows will continue to discharge onto the proposed El Rancho Grande, Unit 16. See Appendix A for offsite basin maps and runoff and volume calculations.

IV. PROPOSED CONDITIONS

Grading & Drainage Plan for the proposed Unit 16 is in the pocket at the back of this report. Land treatments for the development are as follows:

Type A	0%	(See Land Treatment Detail in
Type B	19%	Appendix B.)
Type C	19%	
Type D	62%	

The Overall Basin Map in Appendix B shows the 100-year flows from each master basin. The flows will be intercepted by storm drain systems in Messina Drive and Gibson Blvd and be conveyed via a 54" storm drain south in Messina Drive to a pond located in the proposed development to the south--Sierra Ranch Subdivision, which is being designed by Bohannan-Huston, Inc. The storm drain was designed to carry developed flows from El Rancho Grande, Future Unit 17, Parcel 2-A and a portion of 118th Street.

The following table summarizes the total flows from onsite basins A-H and offsite flows that enter Messina and Gibson.

Basin ID	Q-100 (cfs) to Messina	Q-100 (cfs) to Gibson
A	33.3	
B	35.7	
C	27.1	
D		5.1
E		4.5
F		14.6
G		19.9
H		18.7
I (Messina)	3.9	
J (Gibson)		27.6
K (Offsite from 118th St)		13.5
L (Delgado Entrance)		2.0
2-A (Parcel 2-A)		55.7
Total Q-100 (cfs)	100	161.6

The master basins were divided into sub-basins to obtain Analysis Points (AP) at critical locations to determine street flow depths and inlet capacities. (See back pocket)

The street flow depth summary table in Appendix C shows the flow depths at the various analysis points. All streets will have mountable curb except in the locations listed below (and at storm drain inlet locations).

Unit 16	Standard Curb
• Crandall Rd	Delgado-Messina
• Denton Rd	West Property Line-Messina
• Golinda Rd	Delgado to Messina
• Delgado Dr	Gibson to Crandall Road & Crandall Road to North Property Line
• Panola St	Lots 16/17, Bl. G to South End
• Messina	Gibson to North Property Line
• Gibson	West Property Line to Messina
•	

Future Unit 17	Standard Curb
• Denton Rd	Lots 9/10, Bl. C to Unit 16 Property Line
• Street 'N'	South Line of Lot 15, Bl. A
• Street 'K2'	Lots 10/11, Bl. F to East End
• Gibson	West Property Line to Unit 16

The storm drain system for the ultimate build-out scenario is shown on the Sub-Basin and Storm Drain Plan in the back pocket. The inlets and manholes are numbered to correspond with the storm drain calculations (see Hydraflow Storm Drain Calculations in Appendix E). A model of the future storm drain for Future Unit 17, Parcel 2-A and 118th Street was also included in the Hydraflow Storm Drain Calculations. According to the preliminary plans for the Anderson Heights Development by Mark Goodwin & Assoc., there will be inlets in 118th Street and a storm drain connecting to the Gibson Blvd storm drain.

The main line storm drain sizes and locations are summarized below.

Unit 16	Storm Drain Size
• Gibson Blvd	42"-36"
• Messina Dr	42"-24"
• Golinda Rd	24"
• Denton Rd	24"

Future Unit 17	Storm Drain Size
• Gibson Blvd	36"-30"
• Street 'N'	24"

Capacities for the inlets on-grade were determined from DPM Plates 22.3 D-5 (Single Types 'A' and 'C' inlets) and 22.3 D-6 (double Type 'C' inlets) using the flow depths from the Street Depth Summary Table (Appendix C) at the corresponding analysis points. The inlet types and capacities are listed on the Sub-Basin and Storm Drain Plan.

There are three sump inlets proposed at the ends of Panola Street and Garland Court adjacent to Gibson Blvd and Future Street 'K2' adjacent to Delgado Drive (See Appendix E for sump inlet calculations). In order to provide an outlet for the flows in case of an emergency overflow, openings shall be provided in the wall at Gibson and in the future wall in Delgado.

Following is a summary of inlet locations.

Unit 16	# of Inlets
• Delgado Entrance	1
• Denton Rd Lots 12/13, Bl. J	4
• Golinda Rd at Garland Ct	4
• Panola St at south end	1 (sump)
• Garland Ct at south end	1 (sump)
• Gibson adjacent to Panola St	1
• Gibson adjacent to Garland Ct	4
• Messina south of Golinda Rd	4
• Messina north of Denton Rd	4

Future Unit 17	# of Inlets
• Street 'N' Entrance	4
• Street 'K2' (at Delgado)	1 (sump)

In Unit 16, a 10-foot concrete rundown is proposed at the end of Odessa Court. The flows will be discharged to Gibson through a sidewalk culvert. See Sheet 5 of the Grading & Drainage Plan for Unit 16 in the back pocket for a section of the rundown.

See Appendix D for Rundown and Sidewalk Culvert Capacity Calculations.

TEMPORARY PONDS

Three temporary ponds will handle the offsite flows (156 cfs) from the west. Pond 1accepts 58.2 cfs from Basin OFF-1B and is a desiltation pond with an overflow to the Amole Arroyo. The flows outfall to the Amole Arroyo at 0.83% and then enters the channel bank which has 3:1 slope. At the outfall location, the channel banks in the Amole Arroyo are lined 2/3 of the way up. The velocity of the flows entering the channel is 2.3 fps at the 0.83% slope and 6.1 fps at the channel bank (see Appendix F for Amole Arroyo outfall calculations). No additional riprap is proposed in this location.

Pond 2 accepts 10.7 cfs from Basin OFF-2B, and Pond 3, which is located at the southwest corner of Future Unit 17, accepts 81.5 cfs. A temporary PVC standpipe will collect 5.4 cfs from Basin OFF-4B at the southeast corner of Future Unit 17 and will discharge these flows into the storm drain system in Delgado Drive.

The ponds and standpipe are shown on Sheet 4 of the Grading Plan in the back pocket. Also, see Appendix A for an offsite basin map and runoff calculations and Appendix F for standpipe calculations.

V. SUMMARY & CONCLUSIONS

Based on information in previous sections, it is recommended that the following items be constructed:

Unit 16:

1. Mountable curb on all street except as listed below:

• Crandall Rd	Delgado-Messina
• Denton Rd	West Property Line-Messina
• Golinda Rd	Delgado to Messina
• Delgado Dr	Gibson to Crandall Road & Crandall Road to North Property Line
• Panola St	Lots 16/17, Bl. G to South End
• Messina	Gibson to North Property Line
• Gibson	West Property Line to Messina

2. Main Line Storm Drains and Inlets

Location	Storm Drain Size
• Gibson Blvd	42"-36"
• Messina Dr	42"-24"
• Golinda Rd	24"
• Denton Rd	24"

Location	# of Inlets
• Delgado Entrance	1
• Denton Rd Lots 12/13, Bl. J	4
• Golinda Rd at Garland Ct	4
• Panola St at south end	1 (sump)
• Garland Ct at south end	1 (sump)
• Gibson adjacent to Panola St	1
• Gibson adjacent to Garland Ct	4
• Messina south of Golinda Rd	4
• Messina north of Denton Rd	4

3. 10' Concrete Rundown

Location	# Sidewalk Culverts
• Odessa Ct to Gibson	1-2'

4. Three temporary retention ponds and one temporary standpipe in Future Unit 17.

Future Unit 17:

1. Mountable curb on all streets except as listed below.

Location	Standard Curb
• Denton Rd	Lots 9/10, Bl. C to Unit 16 Property Line
• Street 'N'	South Line of Lot 15, Bl. A
• Street 'K2'	Lots 10/11, Bl. F to East End
• Gibson Blvd	West Property Line to Unit 16

2. Main line storm drains as listed.

Location	Storm Drain Size
• Gibson Blvd	36"-30"
• Street 'N'	24"

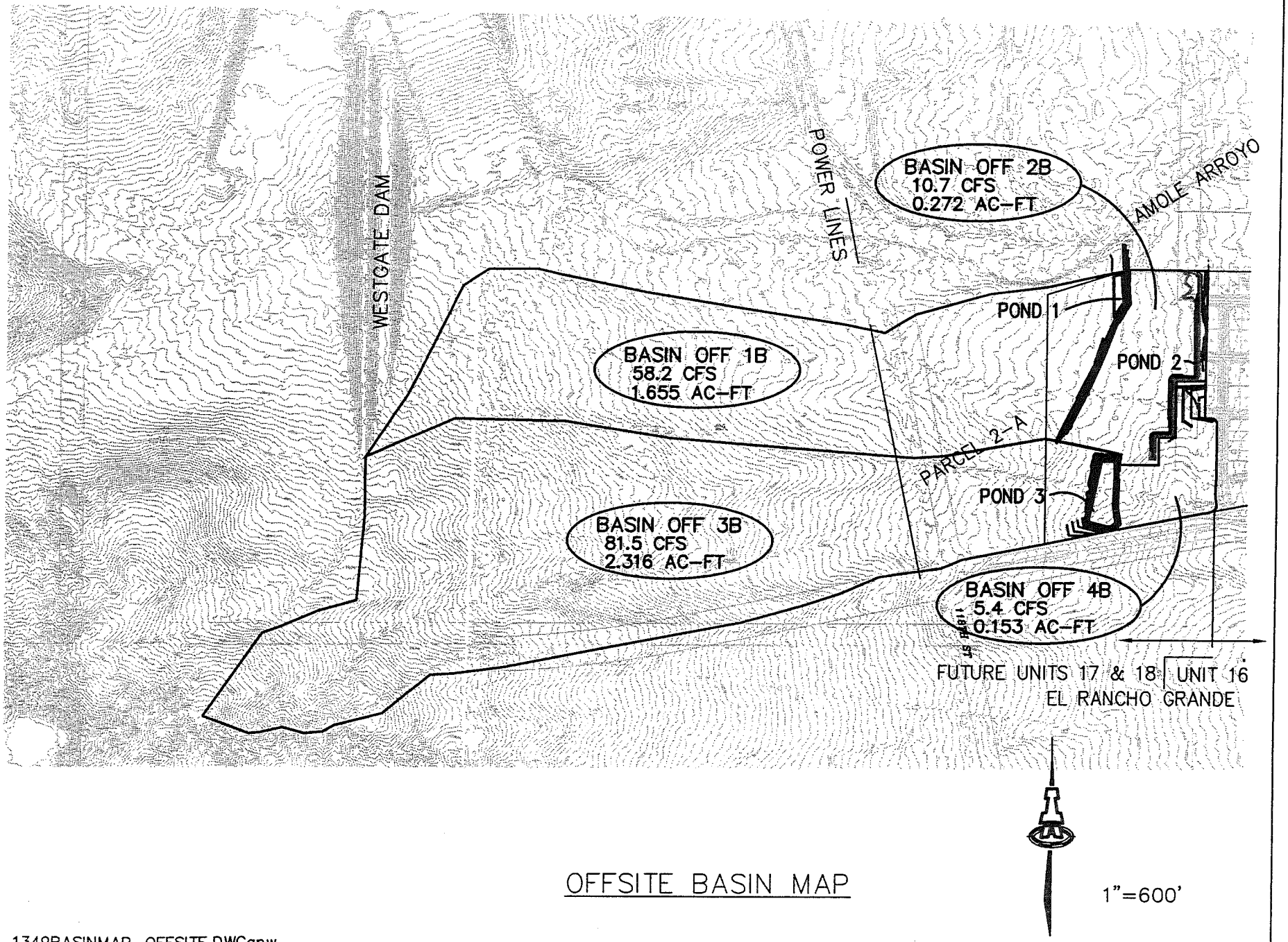
Location	# of Inlets
• Street 'N' Entrance	4
• End of Street 'K2' (sump)	

3. 10' Rundown

Location
• Between stubs at St. 'M2'

APPENDIX A

Offsite Flows



OFFSITE BASIN MAP

1"=600'

1349BASINMAP-OFFSITE.DWGanw
4/15/05

RUNOFF CALCULATIONS FOR EXISTING CONDITIONS (Q_{100})

100-YEAR, 6-HOUR STORM

Per the City of Albuquerque D.P.M. Section 22.2

PROJECT NAME: **EL RANCHO GRANDE, UNITS 16 & FUTURE 17 & 18**

JOB NUMBER: 1349

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	100			
B	0			
C	0			
D	0			
S% =	100	0	0	0

PRECIPITATION ZONE: 1

TREATMENT TYPE 1							
BASIN #	LAND TREATMENT AREAS (Ac)					Q_{100} (cfs)	REMARKS
	A_{TOTAL}	A_A	A_B	A_C	A_D		
OFF2B	8.264	8.26	0	0	0	**10.7**	OFFSITE FUTURE UNIT 17
OFF 1B	45.141	45.14	0	0	0	**58.2**	OFFSITE WEST OF FUTURE UNITS TO AMOLE ARROYO
OFF 3B	63.153	63.15	0	0	0	**81.5**	OFFSITE WEST OF FUTURE UNITS TO POND 3
OFF 4B	4.161	4.16	0	0	0	**5.4**	OFFSITE FUTURE UNIT 18 TO STAND PIPE

* FUTURE INTERIM CONDITIONS--UNIT 17 DEVELOPMENT WITH POWERLINE PONDS IN PLACE

** INTERIM CONDITIONS--UNIT 16 DEVELOPMENT WITH POWERLINE PONDS IN PLACE

*** INTERIM CONDITIONS--UNIT 16 DEVELOPMENT WITHOUT POWERLINE PONDS IN PLACE

VOLUME CALCULATIONS FOR EXISTING CONDITIONS (V_{100})

100-YEAR, 6-HOUR STORM

Per the City of Albuquerque D.P.M. Section 22.2

PROJECT NAME: **EL RANCHO GRANDE, UNITS 16 & FUTURE 17 & 18**

JOB NUMBER: 1349

PRECIP ZONE	E_{360} EXCESS PRECIPITATION (in.)			
	A	B	C	D
1	0.44	0.67	0.99	1.97
2	0.53	0.78	1.13	2.12
3	0.66	0.92	1.29	2.36
4	0.80	1.08	1.46	2.64

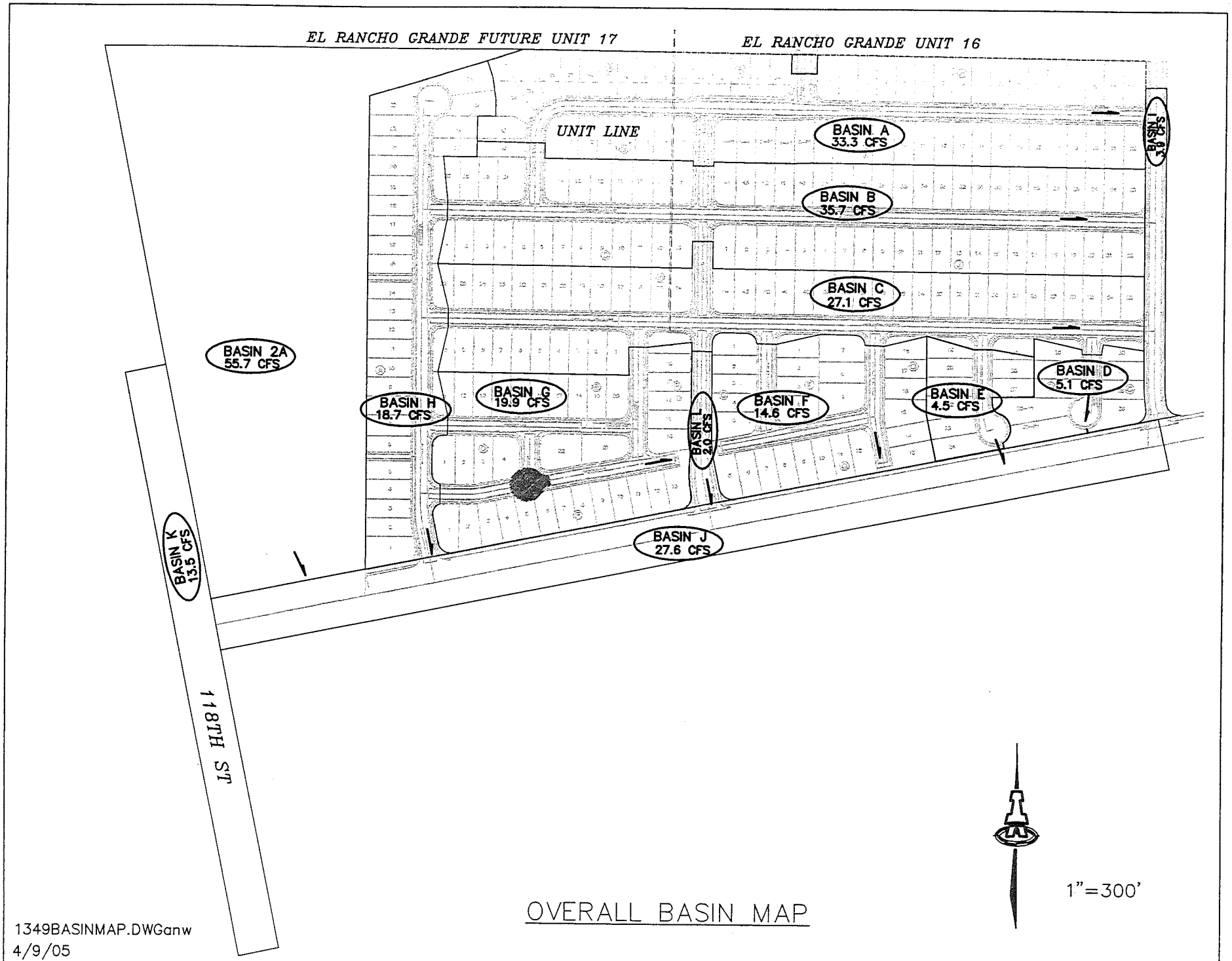
	% LAND TREATMENTS			
	TREAT TYPE 1	TREAT TYPE 2	TREAT TYPE 3	TREAT TYPE 4
A	100	0	0	0
B	0	0	0	0
C	0	0	0	0
D	0	0	0	0
S% =	100	0	0	0

PRECIPITATION ZONE: 1

TREATMENT TYPE 1								
BASIN #	LAND TREATMENT AREAS (Ac)					V_{100} (Ac ft)	V_{100} (cu.ft.)	REMARKS
	A_{TOTAL}	A_A	A_B	A_C	A_D			
OFF2B	8.264	8.26	0	0	0	**0.303**	**13199.3**	OFFSITE FUTURE UNIT 17
OFF 1B	45.141	45.14	0	0	0	**1.655**	**72099.2**	OFFSITE WEST OF FUTURE UNITS TO AMOLE ARROYO
OFF 3B	63.153	63.15	0	0	0	**2.316**	**100868.0**	OFFSITE WEST OF FUTURE UNITS TO POND 3
OFF 4B	4.161	4.16	0	0	0	**0.153**	**6645.9**	OFFSITE FUTURE UNIT 18 TO STAND PIPE

APPENDIX B

Proposed Conditions



OVERALL BASIN MAP

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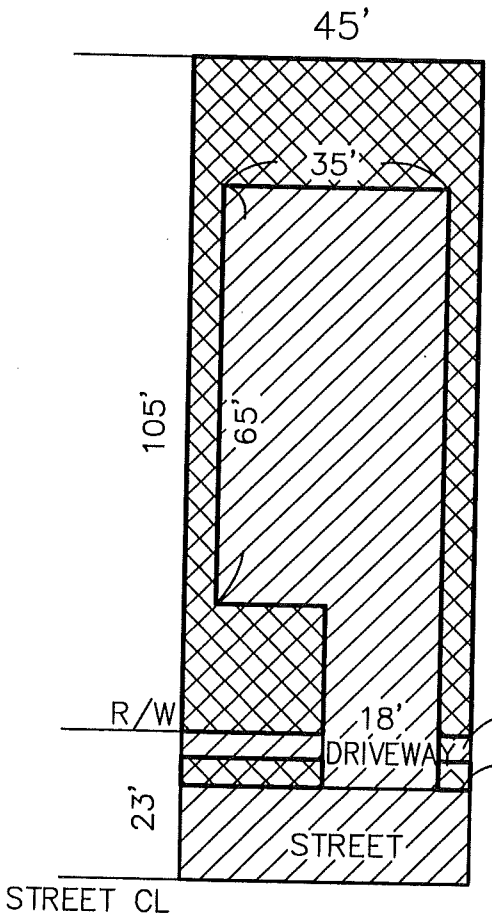
4/9/05



PERVIOUS AREA

IMPERVIOUS AREA

TOTAL LOT AREA INCL. HALF STREET: 5760 SF

TOTAL PERVIOUS AREA: 2208 SF
TOTAL IMPERVIOUS AREA: 3552 SF

LAND TREATMENTS
TYPE B = 19%
TYPE C = 19%
TYPE D = 62%

LAND TREATMENT DETAIL

1"=30'

1349LAND TREATMENT DETAIL.DWGanw 4/8/05

RUNOFF CALCULATIONS FOR DEVELOPED CONDITIONS (Q_{100})

MASTER BASINS

100-YEAR, 6-HOUR STORM

Per the City of Albuquerque D.P.M. Section 22.2

PROJECT NAME: **EL RANCHO GRANDE, UNITS 16 & FUTURE 17**

JOB NUMBER: 1349

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	0	0		
B	0	19		
C	10	19		
D	90	62		
S% =	100	100	0	0

PRECIPITATION ZONE: 1

TREATMENT TYPE 1							
BASIN #	LAND TREATMENT AREAS (Ac)					Q_{100} (cfs)	REMARKS
	A_{TOTAL}	A_A	A_B	A_C	A_D		
I	0.9165	0	0	0.09	0.82	**3.9**	MESSINA
J	6.5326	0	0	0.65	5.88	**27.6**	GIBSON
K	3.2082	0	0	0.32	2.89	**13.5**	OFFSITE FROM 118TH ST
L	0.4648	0	0	0.05	0.42	**2.0**	DELGADO ENTRANCE

TREATMENT TYPE 2							
BASIN #	LAND TREATMENT AREAS (Ac)					Q_{100} (cfs)	REMARKS
	A_{TOTAL}	A_A	A_B	A_C	A_D		
A	9.1551	0	1.74	1.74	5.68	**33.3**	
B	9.8077	0	1.86	1.86	6.08	**35.7**	
C	7.4412	0	1.41	1.41	4.61	**27.1**	
D	1.4117	0	0.27	0.27	0.88	**5.1**	
E	1.2392	0	0.24	0.24	0.77	**4.5**	
F	4.0136	0	0.76	0.76	2.49	**14.6**	
G	5.4592	0	1.04	1.04	3.38	**19.9**	
H	5.1307	0	0.97	0.97	3.18	**18.7**	
2-A	15.2906	0	2.91	2.91	9.48	**55.7**	PARCEL 2-A

	S =Q_{100}	**S BASIN AREAS =**
ONSITE BASINS A-H	158.9	43.6584
DELGADO ENTRANCE--BASIN L	2.0	0.4648
GIBSON--BASIN J	27.6	6.5326
MESSINA--BASIN I	3.9	0.9165
OFFSITE 118TH--BASIN K	13.5	3.2082
OFFSITE PARCEL 2-A DEV.--BASIN 2-A	55.7	15.2906
TOTAL	**261.5 CFS**	**70.0711 AC**

RUNOFF CALCULATIONS FOR DEVELOPED CONDITIONS (Q_{100})

SUB-BASINS

100-YEAR, 6-HOUR STORM

Per the City of Albuquerque D.P.M. Section 22.2

PROJECT NAME: **EL RANCHO GRANDE, UNITS 16 & FUTURE 17**

JOB NUMBER: 1349

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	0	0		
B	0	19		
C	10	19		
D	90	62		
S% =	100	100	0	0

PRECIPITATION ZONE: 1

TREATMENT TYPE 1							
BASIN #	LAND TREATMENT AREAS (Ac)					Q_{100} (cfs)	REMARKS
	A_{TOTAL}	A_A	A_B	A_C	A_D		
I1	0.224	0	0	0.02	0.20	**0.9**	
I2	0.097	0	0	0.01	0.09	**0.4**	
I3	0.397	0	0	0.04	0.36	**1.7**	
I4	0.066	0	0	0.01	0.06	**0.3**	
I5	0.132	0	0	0.01	0.12	**0.6**	
J1	4.713	0	0	0.47	4.24	**19.9**	
J2	1.307	0	0	0.13	1.18	**5.5**	
J3	0.125	0	0	0.01	0.11	**0.5**	
J4	0.388	0	0	0.04	0.35	**1.6**	
L1	0.3061	0	0	0.03	0.28	**1.3**	
L2	0.1587	0	0	0.02	0.14	**0.7**	

TREATMENT TYPE 2							
BASIN #	LAND TREATMENT AREAS (Ac)					Q_{100} (cfs)	REMARKS
	A_{TOTAL}	A_A	A_B	A_C	A_D		
A1	3.0725	0	0.58	0.58	1.90	**11.2**	
A2	3.6135	0	0.69	0.69	2.24	**13.1**	
A3	1.4553	0	0.28	0.28	0.90	**5.3**	
A4	1.0137	0	0.19	0.19	0.63	**3.7**	
B1	3.0407	0	0.58	0.58	1.89	**11.1**	
B2	4.0682	0	0.77	0.77	2.52	**14.8**	
B3	0.5288	0	0.10	0.10	0.33	**1.9**	
B4	2.1699	0	0.41	0.41	1.35	**7.9**	
C1	3.2196	0	0.61	0.61	2.00	**11.7**	
C2	3.6093	0	0.69	0.69	2.24	**13.1**	
C3	0.6123	0	0.12	0.12	0.38	**2.2**	
D1	1.4117	0	0.27	0.27	0.88	**5.1**	
E1	1.2392	0	0.24	0.24	0.77	**4.5**	
F1	2.9949	0	0.57	0.57	1.86	**10.9**	
F2	1.0187	0	0.19	0.19	0.63	**3.7**	
G1	2.5424	0	0.48	0.48	1.58	**9.3**	
G2	2.3839	0	0.45	0.45	1.48	**8.7**	
G3	0.5330	0	0.10	0.10	0.33	**1.9**	
H1	2.3511	0	0.45	0.45	1.46	**8.6**	
H2	2.3614	0	0.45	0.45	1.46	**8.6**	
H3	0.4182	0	0.08	0.08	0.26	**1.5**	

APPENDIX C

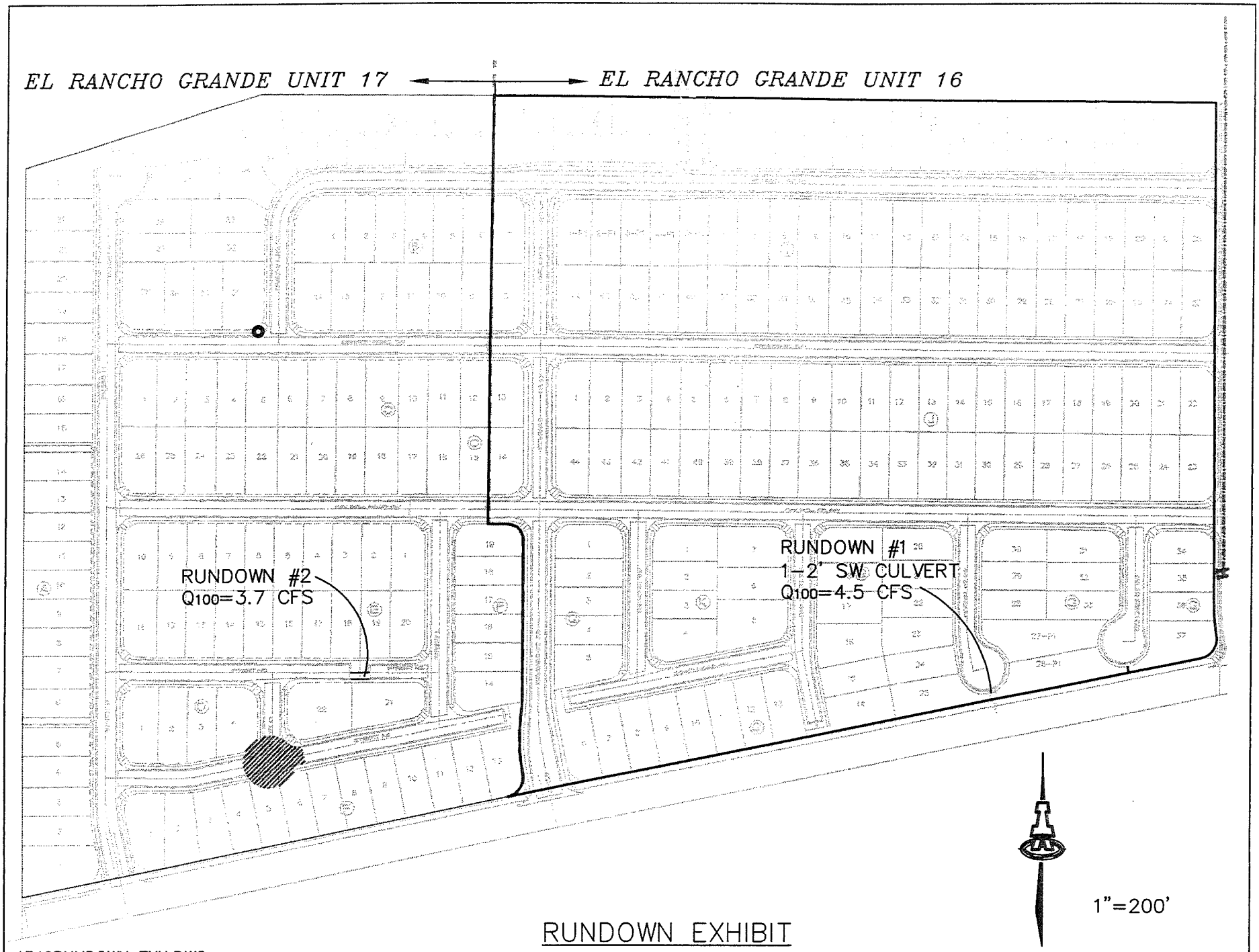
Street Flow Capacity

STREET FLOW DEPTH SUMMARY

STREET	LOCATION	STREET WIDTH	CURB TYPE	SLOPE (ft/ft)	Q_{100} (cfs)	DEPTH (ft)
CRANDALL RD	AP A1	28' F-F	MTBL	0.033	11.2	0.24
CRANDALL RD	AP A2	28' F-F	STD	0.041	25.3	0.39
CRANDALL RD	AP A3	28' F-F	STD	0.035	29.6	0.41
CRANDALL RD	AP A4	28' F-F	STD	0.018	33.3	0.48
DENTON RD	AP B1	28' F-F	MTBL	0.040	11.1	0.23
DENTON RD	AP B2--INLETS 1 & 2	28' F-F	STD	0.041	25.9	0.39
DENTON RD	AP B3--INLETS 3 & 4	28' F-F	STD	0.043	14.2	0.33
GOLINDA RD	AP C1	28' F-F	MTBL	0.009	11.7	0.31
GOLINDA RD	AP C2--INLETS 5 & 6	28' F-F	STD	0.045	24.8	0.38
GOLINDA RD	AP C3--INLETS 7 & 8	28' F-F	STD	0.025	13.5	0.35
L	AP G1	28' F-F	MTBL	0.035	9.3	0.22
K2	AP G2	28' F-F	MTBL	0.037	8.7	0.22
K2	AP G3	28' F-F	STD	0.017	19.9	0.41
N	AP H1	28' F-F	MTBL	0.018	8.6	0.25
N	AP H2--INLETS 17 & 18	36' F-F	STD	0.021	17.2	0.39
N	AP H3--INLETS 19 & 20	36' F-F	STD	0.026	6.9	0.29
DELGADO DR	AP L1--INLET 22	36' F-F	STD	0.026	1.3	0.18
MESSINA	AP I1--INLETS 9 & 10	32' F-F	STD	0.012	34.2	0.51
MESSINA	AP I2--INLETS 11 & 12	32' F-F	STD	0.012	20.6	0.44
MESSINA	AP I3--INLETS 13 & 14	32' F-F	STD	0.014	24.1	0.45
MESSINA	AP I4--INLETS 15 & 16	32' F-F	STD	0.014	12.4	0.37
GIBSON	AP J1-- NORTH SIDE INLET 27	60' F-F	STD	0.031	23.2	0.40
GIBSON	AP J2--SOUTH SIDE INLET 26	60' F-F	STD	0.031	25.4	0.41
GIBSON	AP J2-- NORTH SIDE INLET 29	60' F-F	STD	0.031	24.0	0.41
GIBSON	AP J3-- SOUTH SIDE INLET 31	60' F-F	STD	0.031	12.4	0.33
GIBSON	AP J3-- NORTH SIDE INLET 30	60' F-F	STD	0.031	10.8	0.32
BOWIE RD	AP F1	28' F-F	MTBL	0.039	10.9	0.23
PANOLA ST	AP F2--INLET 25	28' F-F	STD	0.024	14.6	0.36

APPENDIX D

Rundowns and Sidewalk Culverts



RUNDOWN EXHIBIT

1349RUNDOWN EXH.DWGanw
4/15/05

UNIT 16
RUNDOWN #1

Channel Calculator

Given Input Data:

Shape	Rectangular
Solving for	Depth of Flow
Flowrate	4.5000 cfs
Slope	0.0400 ft/ft
Manning's n	0.0130
Height	0.6700 ft
Bottom width	10.0000 ft

Computed Results:

Depth	0.0954 ft
Velocity	4.7148 fps
Full Flowrate	107.8503 cfs
Flow area	0.9544 ft2
Flow perimeter	10.1909 ft
Hydraulic radius	0.0937 ft
Top width	10.0000 ft
Area	6.7000 ft2
Perimeter	11.3400 ft
Percent full	14.2454 %

Critical Information

Critical depth	0.1846 ft
Critical slope	0.0045 ft/ft
Critical velocity	2.4373 fps
Critical area	1.8463 ft2
Critical perimeter	10.3693 ft
Critical hydraulic radius	0.1781 ft
Critical top width	10.0000 ft
Specific energy	0.4409 ft
Minimum energy	0.2769 ft
Froude number	2.6905
Flow condition	Supercritical

FUTURE UNIT 17
RUNDOWN #2

Channel Calculator

Given Input Data:

Shape	Rectangular
Solving for	Depth of Flow
Flowrate	3.7000 cfs
Slope	0.0460 ft/ft
Manning's n	0.0130
Height	0.6700 ft
Bottom width	10.0000 ft

Computed Results:

Depth	0.0813 ft
Velocity	4.5515 fps
Full Flowrate	115.6566 cfs
Flow area	0.8129 ft2
Flow perimeter	10.1626 ft
Hydraulic radius	0.0800 ft
Top width	10.0000 ft
Area	6.7000 ft2
Perimeter	11.3400 ft
Percent full	12.1332 %

Critical Information

Critical depth	0.1620 ft
Critical slope	0.0047 ft/ft
Critical velocity	2.2833 fps
Critical area	1.6204 ft2
Critical perimeter	10.3241 ft
Critical hydraulic radius	0.1570 ft
Critical top width	10.0000 ft
Specific energy	0.4032 ft
Minimum energy	0.2431 ft
Froude number	2.8143
Flow condition	Supercritical

2' SIDEWALK CULVERT
Channel Calculator

Given Input Data:

Shape	Rectangular
Solving for	Flowrate
Slope	0.0200 ft/ft
Manning's n	0.0130
Depth	0.4290 ft
Height	0.6700 ft
Bottom width	2.0000 ft

Computed Results:

Flowrate	6.2186 cfs
Velocity	7.2478 fps
Full Flowrate	11.7833 cfs
Flow area	0.8580 ft2
Flow perimeter	2.8580 ft
Hydraulic radius	0.3002 ft
Top width	2.0000 ft
Area	1.3400 ft2
Perimeter	3.3400 ft
Percent full	64.0299 %

Critical Information

Critical depth	0.6698 ft
Critical slope	0.0056 ft/ft
Critical velocity	4.6422 fps
Critical area	1.3396 ft2
Critical perimeter	3.3396 ft
Critical hydraulic radius	0.4011 ft
Critical top width	2.0000 ft
Specific energy	1.2454 ft
Minimum energy	1.0047 ft
Froude number	1.9509
Flow condition	Supercritical

APPENDIX E

Storm Drain Calculations

SUMP INLETS CALCULATIONS

GRATE OPEN AREA:
(per COA std dwg #2220, single grate)

GROSS AREA FOR ONE GRATE =	(25 in/12)(40 in/12) =	6.94 SF
LESS BEARING BARS =	(0.5 in/12)(3.33 ft)(13) =	1.80 SF
LESS CROSS BARS =	(0.5 in/12)(7)[(25 in/12)-(13)(0.5 in/12)] =	0.45 SF
	NET GRATE OPEN AREA =	**4.69 SF**
	GRATE OPEN AREA (assuming 50% clogging factor) =	***2.35 SF***

ORIFICE EQUATION:

$$Q = CA(2gh)^{1/2}$$

Where:

C = 0.67
A = 2.35 ft^2
g = 32.2 ft/sec^2
h = height of the water surface above the grate

CAPACITY CALCULATIONS:

INLET # 25
LOCATION: PANOLA STREET

h = 0.67 ft
$Q_{(capacity)}$ = 10.32 cfs
REQUIRED Q = 14.6 cfs

NUMBER OF GRATES REQUIRED = 2

INLET # 28
LOCATION: GARLAND COURT

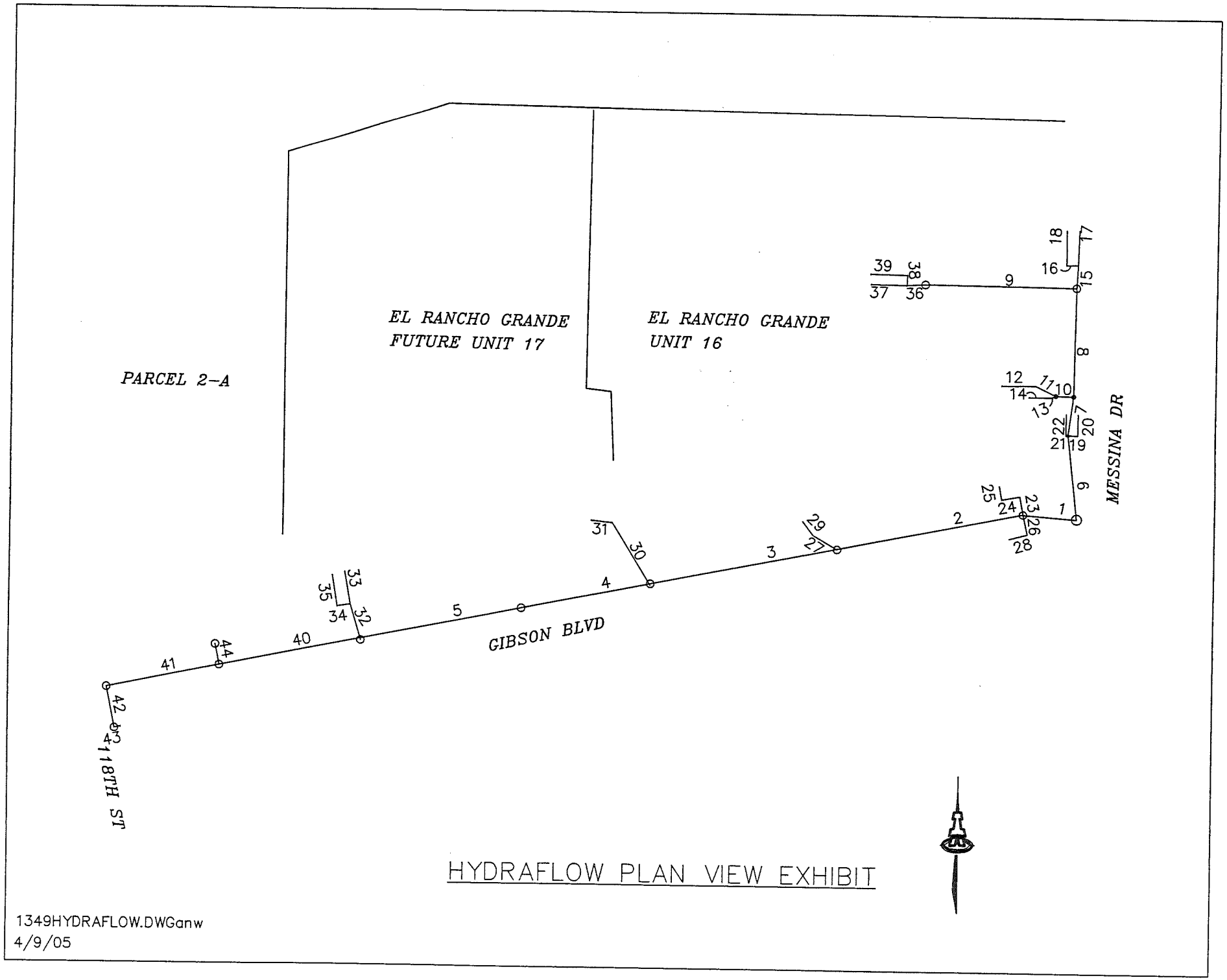
h = 0.67 ft
$Q_{(capacity)}$ = 10.32273 cfs
REQUIRED Q = 5.1 cfs

NUMBER OF GRATES REQUIRED = 1

INLET # 21
LOCATION: FUTURE STREET K2

h = 0.67 ft
$Q_{(capacity)}$ = 10.32273 cfs
REQUIRED Q = 19.9 cfs

NUMBER OF GRATES REQUIRED = 2



HYDRAFLOW PLAN VIEW EXHIBIT

1349HYDRAFLOW.DWGanw
4/9/05

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
1	MH 0-1	158.2	42 c	128.0	5196.10	5201.10	3.906	5199.51	5204.51	n/a	5204.51	End
2	MH 1-2	129.6	42 c	450.0	5201.20	5217.50	3.622	5205.95	5220.81	2.21	5220.81	1
3	MH 2-3	108.2	36 c	450.0	5217.60	5228.75	2.478	5220.81*	5232.66*	3.46	5236.12	2
4	MH 3-4	87.60	36 c	310.0	5228.85	5239.15	3.323	5237.38*	5242.73*	0.36	5243.09	3
5	MH 4-5	87.60	36 c	390.0	5239.25	5253.10	3.551	5243.09	5255.93	2.37	5255.93	4
6	MH 0-6	96.20	42 c	205.0	5196.10	5197.33	0.600	5199.13*	5201.21*	1.55	5202.77	End
7	MH 6-7	75.00	36 c	95.0	5197.43	5199.05	1.705	5202.77*	5203.97*	1.75	5205.72	6
8	MH 7-8	50.60	36 c	256.0	5199.15	5201.45	0.899	5206.67*	5208.15*	0.80	5208.94	7
9	MH 8-9	24.20	24 c	365.0	5201.55	5217.39	4.340	5208.94	5219.13	n/a	5219.13 j	8
10	MH 7-10	24.40	24 c	47.0	5199.15	5200.40	2.660	5206.53*	5207.08*	0.87	5207.95	7
11	INLET 8	11.80	18 c	52.0	5200.70	5203.80	5.961	5208.19*	5208.85*	0.97	5209.82	10
12	INLET 5	6.80	18 c	85.3	5204.00	5208.40	5.158	5210.29*	5210.64*	0.23	5210.87	11
13	INLET 7	12.60	18 c	7.0	5204.00	5208.30	61.426	5208.10	5209.64	n/a	5209.64	10
14	INLET 6	6.80	18 c	49.0	5208.50	5209.80	2.653	5210.30	5210.80	n/a	5210.80 j	13
15	INLET 11	26.40	24 c	53.0	5202.45	5208.20	10.849	5208.94	5210.00	1.84	5210.00	8
16	INLET 12	13.20	24 c	28.0	5208.40	5208.80	1.428	5210.95*	5211.04*	0.41	5211.46	15
17	INLET 9	7.00	18 c	78.0	5209.00	5212.10	3.974	5210.98	5213.11	n/a	5213.11 j	15
18	INLET 10	7.00	18 c	78.0	5208.40	5212.10	4.744	5211.49	5213.11	n/a	5213.11 j	16
19	INLET 16	10.60	18 c	23.0	5198.93	5202.70	16.391	5203.76	5203.94	n/a	5203.94	6
20	INLET 14	6.00	18 c	50.0	5202.90	5206.70	7.601	5204.48	5207.64	n/a	5207.64 j	19
21	INLET 15	10.60	18 c	5.0	5200.33	5205.90	111.397	5203.76	5207.14	n/a	5207.14	6
22	INLET 13	6.00	18 c	50.0	5206.10	5206.70	1.200	5207.68	5207.72	0.34	5208.06	21
23	INLET 30	16.30	24 c	44.0	5202.70	5206.10	7.727	5208.35*	5208.58*	0.63	5209.21	1
24	INLET 29	11.90	24 c	37.0	5206.30	5206.80	1.351	5209.41*	5209.51*	0.33	5209.84	23
25	INLET 28	5.10	18 c	33.0	5207.00	5207.50	1.515	5209.94*	5210.02*	0.13	5210.14	24
26	INLET 31	12.30	18 c	50.0	5202.70	5207.60	9.800	5208.02	5208.93	n/a	5208.93	1
27	INLET 27	21.40	24 c	70.0	5221.90	5223.10	1.715	5223.16	5224.82	0.43	5225.25	2
28	INLET 26	6.80	18 c	37.0	5207.80	5209.20	3.785	5209.56	5210.20	n/a	5210.20 j	26
29	INLET 25	14.60	18 c	39.0	5223.30	5224.00	1.795	5225.25*	5226.01*	1.06	5227.07	27
30	INLET 22	20.60	24 c	177.0	5228.85	5233.40	2.571	5239.10*	5240.57*	0.84	5241.40	3
31	INLET 21	19.90	24 c	37.0	5233.60	5238.80	14.053	5241.45*	5241.73*	0.62	5242.36	30
32	INLET 19	18.40	24 c	84.0	5253.20	5254.50	1.547	5257.90*	5258.45*	0.75	5259.20	5

Project File: 1349 SD-R3.stm | Number of lines: 44 | Run Date: 04-19-2005

NOTES: c = clr; e = ellip; b = box; Return period = 100 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.
33	INLET 18	5.90	18 c	77.0	5254.70	5260.30	7.272	5259.56	5261.23	n/a	5261.23 j	32
34	INLET 20	8.90	18 c	32.0	5254.70	5255.10	1.250	5259.34*	5259.57*	0.59	5260.16	32
35	INLET 17	5.90	18 c	74.0	5255.30	5260.20	6.622	5260.38	5261.13	n/a	5261.13 j	34
36	INLET 3	24.20	24 c	36.0	5217.89	5223.50	15.583	5219.29	5225.24	n/a	5225.24 j	9
37	INLET 2	6.80	18 c	84.0	5225.50	5230.40	5.833	5226.09	5231.40	n/a	5231.40 j	36
38	INLET 4	12.10	18 c	24.0	5223.70	5224.00	1.249	5225.59*	5225.91*	1.09	5227.00	36
39	INLET 1	6.80	18 c	84.0	5226.00	5230.40	5.238	5227.50	5231.40	n/a	5231.40 j	38
40	MH 5- FUT MH 1	69.20	30 c	365.0	5253.20	5264.61	3.126	5255.93	5267.05	3.13	5267.05	5
41	FUT MH1-2	13.50	24 c	275.0	5264.71	5268.30	1.305	5269.89*	5270.87*	0.29	5271.16	40
42	FUT MH2-3	13.50	24 c	100.0	5268.40	5270.00	1.600	5271.16	5271.35	0.56	5271.91	41
43	FUT INLET 118TH	13.50	18 c	15.0	5270.10	5275.00	32.666	5271.91	5276.37	n/a	5276.37 j	42
44	FUT MH1-2-A	55.70	30 c	50.0	5264.71	5274.00	18.580	5268.18	5276.36	2.09	5276.36	40

Project File: 1349 SD-R3.stm | Number of lines: 44 | Run Date: 04-19-2005

NOTES: c = cir; e = ellip; b = box; Return period = 100 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	128.0	0.00	0.00	0.00	0.00	0.00	0.0	3.9	0.0	158.2	198.8	16.56	42	3.91	5201.10	5196.10	5204.51	5199.51	5213.56	5208.65	MH 0-1
2	1	450.0	0.00	0.00	0.00	0.00	0.00	0.0	3.4	0.0	129.6	191.5	13.61	42	3.62	5217.50	5201.20	5220.81	5205.95	5227.43	5213.56	MH 1-2
3	2	450.0	0.00	0.00	0.00	0.00	0.00	0.0	2.9	0.0	108.2	105.0	15.31	36	2.48	5228.75	5217.60	5232.66	5220.81	5240.64	5227.43	MH 2-3
4	3	310.0	0.00	0.00	0.00	0.00	0.00	0.0	2.4	0.0	87.60	121.6	12.39	36	3.32	5239.15	5228.85	5242.73	5237.38	5248.46	5240.64	MH 3-4
5	4	390.0	0.00	0.00	0.00	0.00	0.00	0.0	1.9	0.0	87.60	125.7	12.53	36	3.55	5253.10	5239.25	5255.93	5243.09	5262.65	5248.46	MH 4-5
6	End	205.0	0.00	0.00	0.00	0.00	0.00	0.0	2.0	0.0	96.20	77.93	10.44	42	0.60	5197.33	5196.10	5201.21	5199.13	5210.35	5208.65	MH 0-6
7	6	95.0	0.00	0.00	0.00	0.00	0.00	0.0	1.9	0.0	75.00	87.08	10.61	36	1.70	5199.05	5197.43	5203.97	5202.77	5211.67	5210.35	MH 6-7
8	7	256.0	0.00	0.00	0.00	0.00	0.00	0.0	1.3	0.0	50.60	63.22	7.16	36	0.90	5201.45	5199.15	5208.15	5206.67	5214.82	5211.67	MH 7-8
9	8	365.0	0.00	0.00	0.00	0.00	0.00	0.0	0.5	0.0	24.20	47.12	8.01	24	4.34	5217.39	5201.55	5219.13	5208.94	5229.12	5214.82	MH 8-9
10	7	47.0	0.00	0.00	0.00	0.00	0.00	0.0	0.5	0.0	24.40	36.89	7.77	24	2.66	5200.40	5199.15	5207.08	5206.53	5212.12	5211.67	MH 7-10
11	10	52.0	0.00	0.00	0.00	0.00	0.00	0.0	0.4	0.0	11.80	25.64	6.68	18	5.96	5203.80	5200.70	5208.85	5208.19	5213.04	5212.12	INLET 8
12	11	85.3	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	6.80	23.85	3.85	18	5.16	5208.40	5204.00	5210.64	5210.29	5215.41	5213.04	INLET 5
13	10	7.0	0.00	0.00	0.00	0.00	0.00	0.0	0.2	0.0	12.60	82.30	7.35	18	61.43	5208.30	5204.00	5209.64	5208.10	5212.22	5212.12	INLET 7
14	13	49.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	6.80	17.10	4.66	18	2.65	5209.80	5208.50	5210.80	5210.30	5213.45	5212.22	INLET 6
15	8	53.0	0.00	0.00	0.00	0.00	0.00	0.0	0.4	0.0	26.40	74.50	8.64	24	10.85	5208.20	5202.45	5210.00	5208.94	5215.05	5214.82	INLET 11
16	15	28.0	0.00	0.00	0.00	0.00	0.00	0.0	0.3	0.0	13.20	27.03	4.20	24	1.43	5208.80	5208.40	5211.04	5210.95	5215.05	5215.05	INLET 12
17	15	78.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	7.00	20.94	4.75	18	3.97	5212.10	5209.00	5213.11	5210.98	5216.05	5215.05	INLET 9
18	16	78.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	7.00	22.87	4.75	18	4.74	5212.10	5208.40	5213.11	5211.49	5216.05	5215.05	INLET 10
19	6	23.0	0.00	0.00	0.00	0.00	0.00	0.0	0.2	0.0	10.60	42.52	6.39	18	16.39	5202.70	5198.93	5203.94	5203.76	5209.90	5210.35	INLET 16
20	19	50.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	6.00	28.95	4.29	18	7.60	5206.70	5202.90	5207.64	5204.48	5210.71	5209.90	INLET 14
21	6	5.0	0.00	0.00	0.00	0.00	0.00	0.0	0.2	0.0	10.60	110.8	6.39	18	111.40	5205.90	5200.33	5207.14	5203.76	5209.90	5210.35	INLET 15

Project File: 1349 SD-R3.stm | Number of lines: 44 | Run Date: 04-19-2005

NOTES: Intensity = 127.16 / (Inlet time + 17.80) ^ 0.82; Return period = 100 Yrs.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
22	21	50.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	6.00	11.50	4.04	18	1.20	5206.70	5206.10	5207.72	5207.68	5210.71	5209.90	INLET 13
23	1	44.0	0.00	0.00	0.00	0.00	0.00	0.0	0.4	0.0	16.30	62.87	5.19	24	7.73	5206.10	5202.70	5208.58	5208.35	5211.94	5213.56	INLET 30
24	23	37.0	0.00	0.00	0.00	0.00	0.00	0.0	0.2	0.0	11.90	26.29	3.79	24	1.35	5206.80	5206.30	5209.51	5209.41	5213.42	5211.94	INLET 29
25	24	33.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	5.10	12.93	2.89	18	1.52	5207.50	5207.00	5210.02	5209.94	5211.19	5213.42	INLET 28
26	1	50.0	0.00	0.00	0.00	0.00	0.00	0.0	0.2	0.0	12.30	32.87	7.20	18	9.80	5207.60	5202.70	5208.93	5208.02	5211.83	5213.56	INLET 31
27	2	70.0	0.00	0.00	0.00	0.00	0.00	0.0	0.1	0.0	21.40	29.62	8.84	24	1.71	5223.10	5221.90	5224.82	5223.16	5228.14	5227.43	INLET 27
28	26	37.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	6.80	20.43	4.66	18	3.78	5209.20	5207.80	5210.20	5209.56	5213.15	5211.83	INLET 26
29	27	39.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	14.60	14.07	8.26	18	1.80	5224.00	5223.30	5226.01	5225.25	5228.00	5228.14	INLET 25
30	3	177.0	0.00	0.00	0.00	0.00	0.00	0.0	0.1	0.0	20.60	36.26	6.56	24	2.57	5233.40	5228.85	5240.57	5239.10	5243.96	5240.64	INLET 22
31	30	37.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	19.90	84.79	6.33	24	14.05	5238.80	5233.60	5241.73	5241.45	5243.57	5243.96	INLET 21
32	5	84.0	0.00	0.00	0.00	0.00	0.00	0.0	0.5	0.0	18.40	28.14	5.86	24	1.55	5254.50	5253.20	5258.45	5257.90	5263.05	5262.65	INLET 19
33	32	77.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	5.90	28.32	4.24	18	7.27	5260.30	5254.70	5261.23	5259.56	5263.88	5263.05	INLET 18
34	32	32.0	0.00	0.00	0.00	0.00	0.00	0.0	0.4	0.0	8.90	11.74	5.04	18	1.25	5255.10	5254.70	5259.57	5259.34	5263.06	5263.05	INLET 20
35	34	74.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	5.90	27.02	4.24	18	6.62	5260.20	5255.30	5261.13	5260.38	5263.78	5263.06	INLET 17
36	9	36.0	0.00	0.00	0.00	0.00	0.00	0.0	0.4	0.0	24.20	89.28	9.32	24	15.58	5223.50	5217.89	5225.24	5219.29	5230.33	5229.12	INLET 3
37	36	84.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	6.80	25.36	7.99	18	5.83	5230.40	5225.50	5231.40	5226.09	5234.06	5230.33	INLET 2
38	36	24.0	0.00	0.00	0.00	0.00	0.00	0.0	0.4	0.0	12.10	11.74	6.85	18	1.25	5224.00	5223.70	5225.91	5225.59	5230.33	5230.33	INLET 4
39	38	84.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	6.80	24.03	4.66	18	5.24	5230.40	5226.00	5231.40	5227.50	5234.06	5230.33	INLET 1
40	5	365.0	0.00	0.00	0.00	0.00	0.00	0.0	1.5	0.0	69.20	72.51	14.14	30	3.13	5264.61	5253.20	5267.05	5255.93	5272.00	5262.65	MH 5- FUT MH 1
41	40	275.0	0.00	0.00	0.00	0.00	0.00	0.0	0.4	0.0	13.50	25.84	4.30	24	1.31	5268.30	5264.71	5270.87	5269.89	5280.60	5272.00	FUT MH1-2
42	41	100.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	13.50	28.61	5.14	24	1.60	5270.00	5268.40	5271.35	5271.16	5279.80	5280.60	FUT MH2-3

Project File: 1349 SD-R3.stm | Number of lines: 44 | Run Date: 04-19-2005

NOTES: Intensity = 127.16 / (Inlet time + 17.80) ^ 0.82; Return period = 100 Yrs.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
43	42	15.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	13.50	60.02	7.81	18	32.67	5275.00	5270.10	5276.37	5271.91	5279.50	5279.80	FUT INLET 118T
44	40	50.0	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	55.70	176.8	11.47	30	18.58	5274.00	5264.71	5276.36	5268.18	5282.00	5272.00	FUT MH1-2-A

Project File: 1349 SD-R3.stm | Number of lines: 44 | Run Date: 04-19-2005

NOTES: Intensity = 127.16 / (Inlet time + 17.80) ^ 0.82; Return period = 100 Yrs.

APPENDIX F

Pond Volume, Standpipe and Amole Arroyo Outfall Calculations

POND VOLUMES
EL RANCHO GRANDE, UNIT 16
POND 1
4/18/2005

ELEV	AREA (SF)	VOLUME (CF)	VOLUME (Ac-ft)	SUM VOL (Ac-ft)
5270	6598			
		7505	0.172	
5271	8411			0.172
		11581	0.266	
5272	14750			0.438

V10-DAY=1.655 Ac-ft
WSEL=5272.0

OUTFLOW TO AMOLE ARROYO=1.217 Ac-Ft
Q_{100}=58.2 cfs

POND VOLUMES
EL RANCHO GRANDE, UNIT 16
POND 2
4/15/2005

ELEV	AREA (SF)	VOLUME (CF)	VOLUME (Ac-ft)	SUM VOL (Ac-ft)
5256	0			
		2965	0.068	
5257	5930			0.068
		10108	0.232	
5258	14287			0.300
		8731	0.200	
5258.5	20637.91			0.501 ✓
			REQ'D VOL=0.303 Ac-ft ✓	
			WSEL=5258.0	

POND VOLUMES
EL RANCHO GRANDE, UNIT 16
POND 3
4/15/2005

ELEV	AREA (SF)	VOLUME (CF)	VOLUME (Ac-ft)	SUM VOL (Ac-ft)
5255	26803.25			
		29972	0.688	
5256	29913.91			0.688
		31527	0.724	
5257	33140.28			1.412
		34811	0.799	
5258	36482.37			2.211
		38211	0.877	
5259	39940.18			3.088
		REQ'D VOL=2.316 Ac-ft		
			WSEL=5258.1	

12" TEMPORARY PVC STAND PIPE

PERFORATIONS

3" DIA. HOLES — AREA (A) = ΠD^2/4 = 0.05 SF

ORIFICE EQ'UATION — Q = CA(2gH)^1/2

ORIFICE COEFFICIENT = C = 0.6

WSEL	H	# OF HOLES	Q (CFS)
5246	0.5 1.0	4	0.67
	1.5	4	1.16 ✓
			1.83 cfs
			2.14

TOP OF STAND PIPE

PERIMETER (L)= ΠD = 3.14 FT

WEIR EQUATION — Q =CLH^(3/2)

WEIR COEFFICIENT = C = 3.33

WSEL	H	Q (CFS)
5246	0.5	**11.96 cfs**

TOTAL CAPACITY

(PERFORATIONS + TOP OF STAND PIPE) * 0.5

0.5 = 50% CLOGGING FACTOR **6.89 cfs**

$Q_{req'd} = 5.4$ CFS ok

AMOLE ARROYO OUTFALL--S=0.83%

Channel Calculator

Given Input Data:

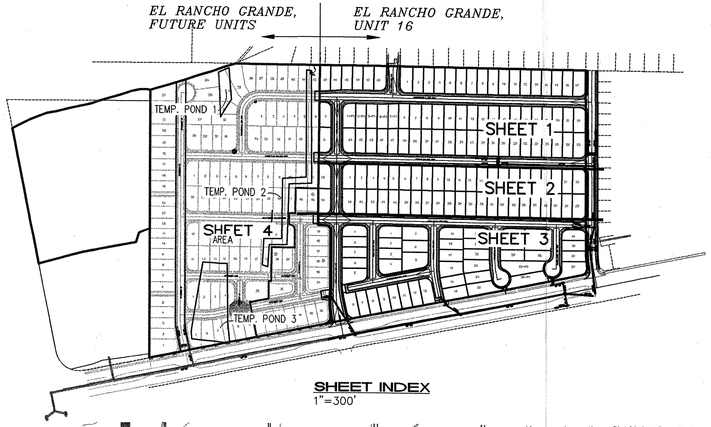
Shape	Trapezoidal
Solving for	Depth of Flow
Flowrate	58.2000 cfs
Slope	0.0083 ft/ft
Manning's n	0.0300
Height	3.0000 ft
Bottom width	50.0000 ft
Left slope	0.0400 ft/ft (V/H)
Right slope	0.0400 ft/ft (V/H)

Computed Results:

Depth	0.4217 ft
Velocity	2.2797 fps
Full Flowrate	2572.1431 cfs
Flow area	25.5295 ft2
Flow perimeter	71.1010 ft
Hydraulic radius	0.3591 ft
Top width	71.0841 ft
Area	375.0000 ft2
Perimeter	200.1200 ft
Percent full	14.0561 %

Critical Information

Critical depth	0.3285 ft
Critical slope	0.0199 ft/ft
Critical velocity	3.0434 fps
Critical area	19.1231 ft2
Critical perimeter	66.4383 ft
Critical hydraulic radius	0.2878 ft
Critical top width	66.4252 ft
Specific energy	0.5024 ft
Minimum energy	0.4928 ft
Froude number	0.6706
Flow condition	Subcritical



SHEET INDEX
1"=300'

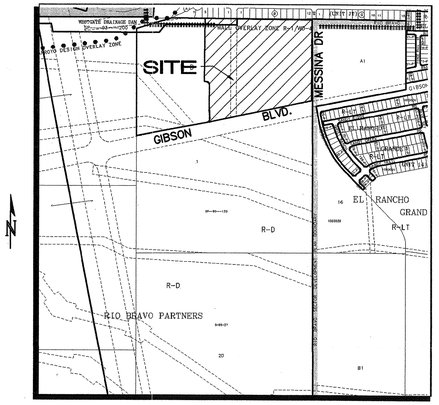
LEGEND

5260	EXISTING CONTOUR
55	PROPOSED CONTOUR
78.3	PROPOSED SPOT ELEVATION
	WATER BAR
PG=5462.3	PAD GRADE ELEVATION
TC=60.40	TOP OF CURB ELEVATION
FL=60.67	FLOWLINE ELEVATION
2.00%	STREET GRADE BREAK W/ SLOPE
	PROPOSED RETAINING WALL
	STORM DRAIN W/ MANHOLE
	STORM DRAIN INLET

SCALE: 1"=40'

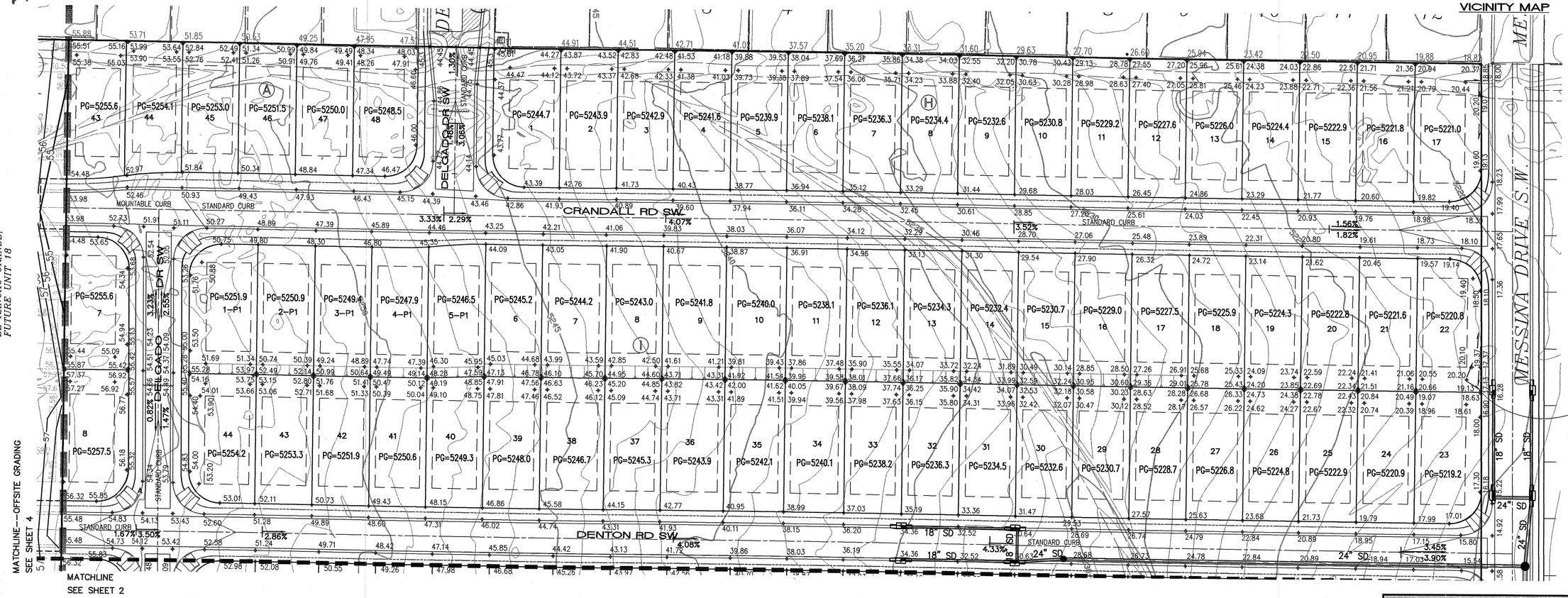
40 30 20 10 0 40 80

NOTE:
FACE OF CURB GRADES ARE AT FLOWLINE.



1"=750'±

VICINITY MAP



BENCHMARK
ACS MONUMENT
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Y=1471822.67
X=354899.45
G-G=0.99967921
Δα=-00°16'42"
CENTRAL ZONE
ELEVATION=5118.370
NAD 1927/SLD 1929

ISAACSON & ARFMAN, P.A.
Consulting Engineering Associates
128 Monroe Street N.E.
Albuquerque, New Mexico 87108
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FRED C. ARFMAN NEW MEXICO 7322 LICENSED PROFESSIONAL ENGINEER 04-21-05

1349GRD.DWGanw 4/18/05

EL RANCHO GRANDE UNIT 16

CURB, INC.

GRADING & DRAINAGE PLAN

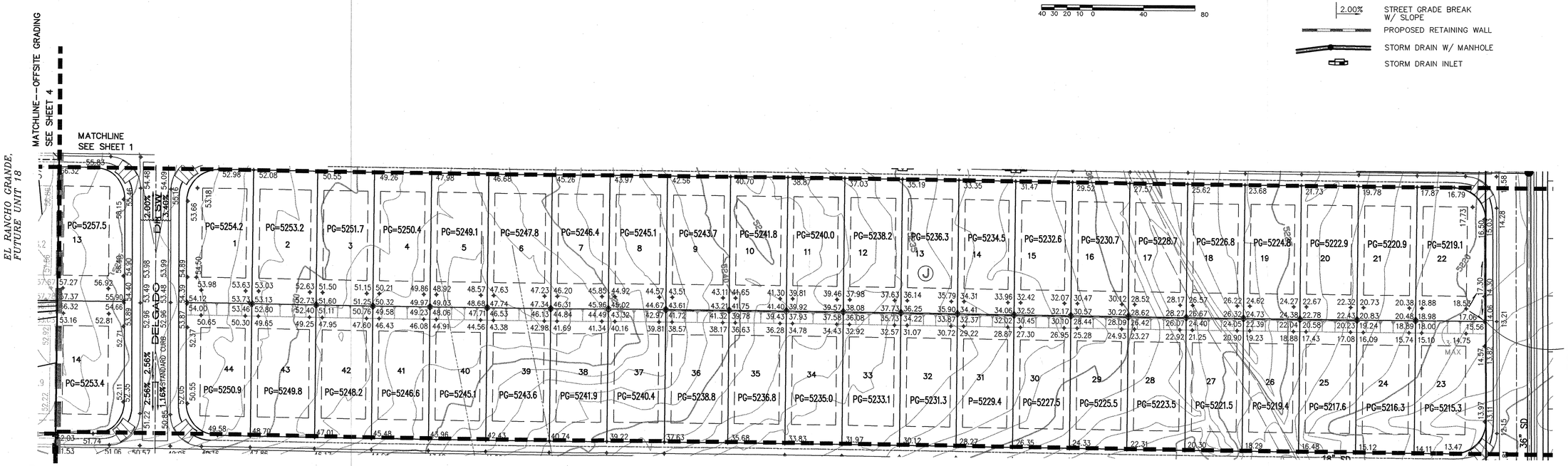
Checked By:	Drawn By:	No.	Revisions	
FCA	ANW			
Date:	Job Number:			SH. 1 OF 5
4/05	1349			

NOTE:
FACE OF CURB GRADES ARE AT FLOWLINE.

LEGEND

5260	EXISTING CONTOUR
55	PROPOSED CONTOUR
◆78.3	PROPOSED SPOT ELEVATION
	WATER BAR
PG=5462.3	PAD GRADE ELEVATION
TC=60.40	TOP OF CURB ELEVATION
FL=60.67	FLOWLINE ELEVATION
2.00%	STREET GRADE BREAK W/ SLOPE
	PROPOSED RETAINING WALL
	STORM DRAIN W/ MANHOLE
	STORM DRAIN INLET

SCALE:
1"=40'
40 30 20 10 0 40 80



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Δα=-00°16'42"
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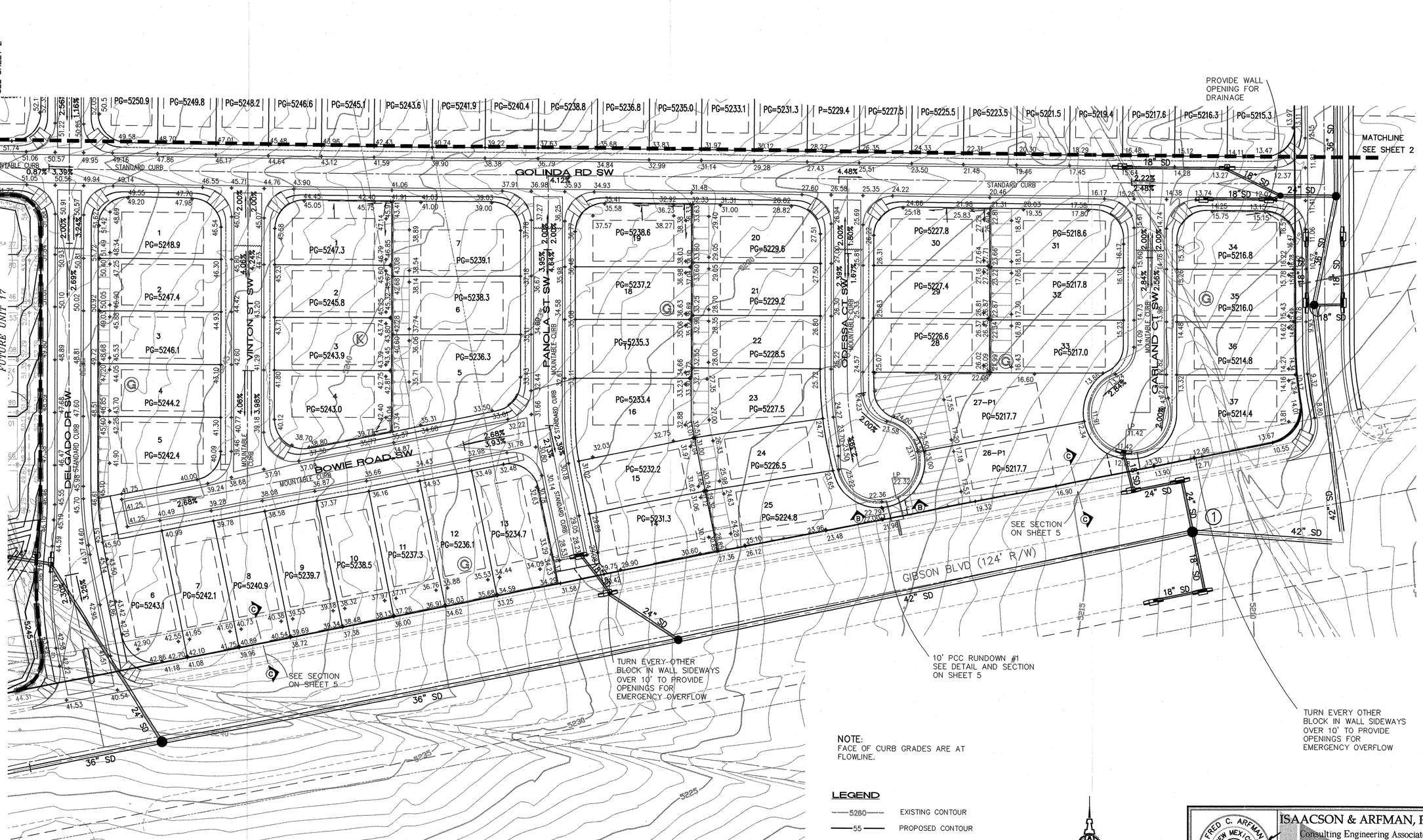
EL RANCHO GRANDE UNIT 16

CURB, INC.

GRADING & DRAINAGE PLAN

Checked By:	Drawn By:	No.	Revision	
FCA	ANW			
Date:	Job Number:			
4/05	1349			SH. 2 OF 5



NOTE:
FACE OF CURB GRADES ARE AT FLOWLINE.

LEGEND

5260	EXISTING CONTOUR
55	PROPOSED CONTOUR
78.3	PROPOSED SPOT ELEVATION
	WATER BAR
PG=5462.3	PAD GRADE ELEVATION
TC=60.40	TOP OF CURB ELEVATION
FL=60.67	FLOWLINE ELEVATION
2.00%	STREET GRADE BREAK W/ SLOPE
	PROPOSED RETAINING WALL
	STORM DRAIN W/ MANHOLE
	STORM DRAIN INLET

SCALE: 1"=40'

40 30 20 10 0 40

BENCHMARK

ACS MONUMENT "TRANS"
Y=1471822.67
X=354899.45
G-G=0.99967921
$\Delta\alpha$=-00°16'42"
CENTRAL ZONE
ELEVATION=5118.370
NAD 1927/SLD 1929

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04.21.05

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CURB, INC.

GRADING & DRAINAGE PLAN

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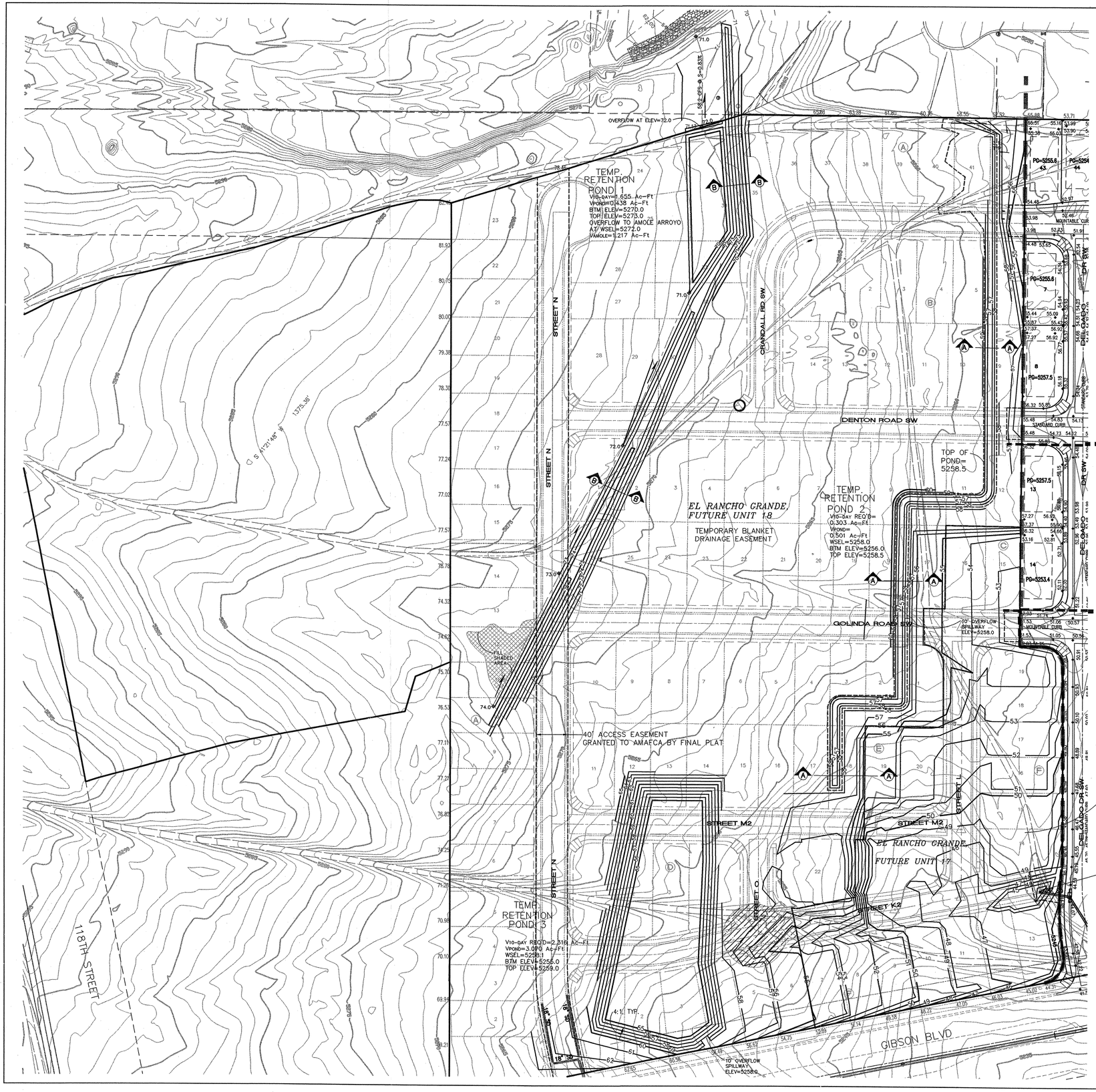
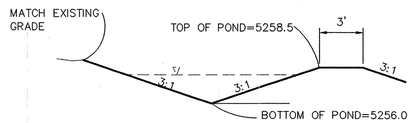
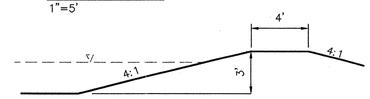
FCA	ANW			
Date:	Job Number:			SH. 3 OF 5
4/05	1349			

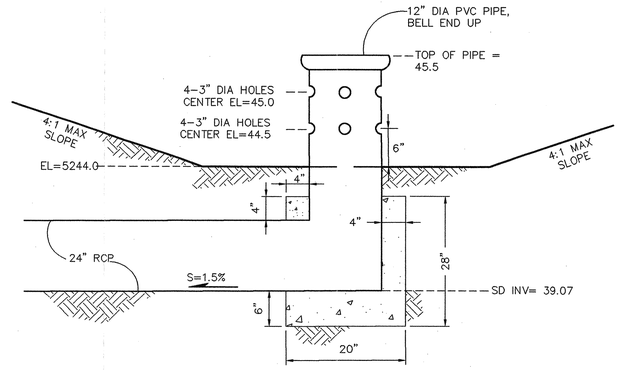




SECTION A-A
1"=5'



SECTION B-B
1"=5'



TEMPORARY STANDPIPE INLET DETAIL
NTS

LEGEND

5280	EXISTING CONTOUR
55	PROPOSED CONTOUR
78.3	PROPOSED SPOT ELEVATION
	WATER BAR
PG=5462.3	PAD GRADE ELEVATION
TC=60.40	TOP OF CURB ELEVATION
FL=60.67	FLOWLINE ELEVATION
2.00%	STREET GRADE BREAK W/ SLOPE
	PROPOSED RETAINING WALL
	STORM DRAIN W/ MANHOLE
	STORM DRAIN INLET

BENCHMARK
ACS MONUMENT "TRANS"
Y=1471822.67
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G-G=0.99967921
Δα=-00°16'42"
CENTRAL ZONE
ELEVATION=5118.370
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1349GRD.DWGanw 4/18/05

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GRADING & DRAINAGE PLAN

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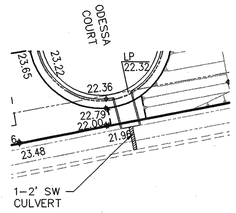
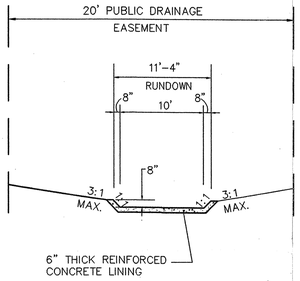
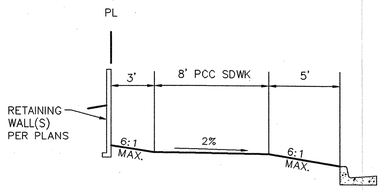
4/05	1349			



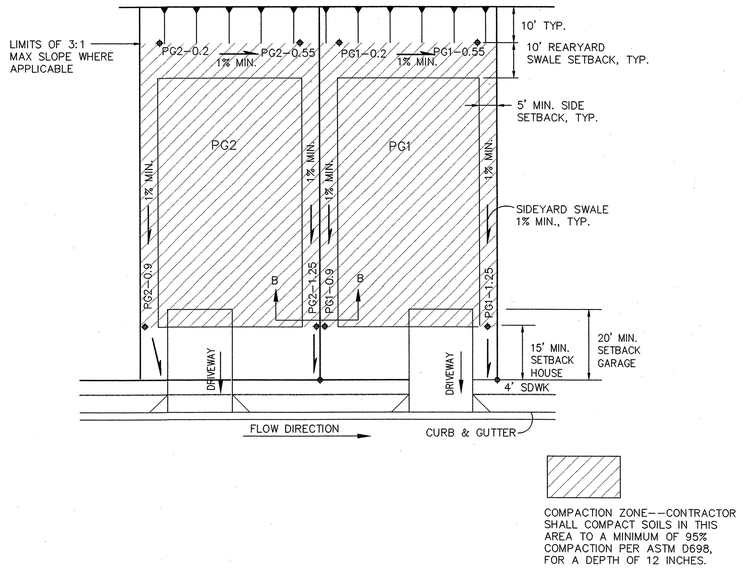
PCC RUNDOWN #1
ODESSA CT
1"=5'



PCC RUNDOWN
SECTION B-B
NTS



GIBSON BLVD
SECTION C-C
1"=5'

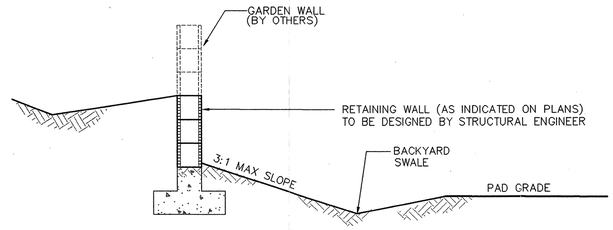


TYPICAL LOT GRADING
SCALE: 1"=20'

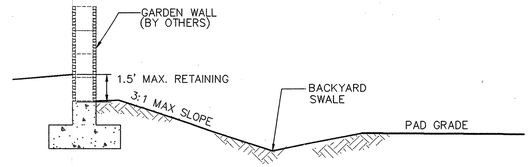
COMPACTION ZONE--CONTRACTOR SHALL COMPACT SOILS IN THIS AREA TO A MINIMUM OF 95% COMPACTION PER ASTM D698, FOR A DEPTH OF 12 INCHES.

GRADING NOTES:

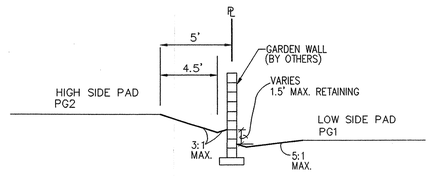
1. ALL TRASH, DEBRIS, & SURFACE VEGETATION SHALL BE CLEARED AND LEGALLY DISPOSED OFFSITE.
2. ALL SUBGRADE AND FILL SHALL BE COMPACTED TO A MINIMUM OF 90% ASTM D-1557.
3. EXCAVATION IS UNCLASSIFIED AND INCLUDES EXCAVATION TO SUBGRADE ELEVATIONS INDICATED, REGARDLESS OF CHARACTER OF MATERIALS ENCOUNTERED.
4. CONFORM TO ELEVATIONS AND DIMENSIONS SHOWN ON PLANS WITHIN A TOLERANCE OF 0.3± FEET.
5. SCARIFY AND COMPACT SUBGRADE FOR FILLS. PLACE FILL MATERIALS IN LAYERS NOT MORE THAN 8" IN LOOSE DEPTH. MOISTEN AS NECESSARY TO PROVIDE OPTIMUM MOISTURE (±2%) CONTENT.
6. UNIFORMLY GRADE AREAS WITHIN LIMITS OF GRADING AS SHOWN ON PLAN. SMOOTH FINISHED SURFACE WITHIN SPECIFIED TOLERANCE, COMPACT WITH UNIFORM SLOPES BETWEEN POINTS WHERE ELEVATIONS ARE INDICATED.
7. MAXIMUM SLOPES SHALL BE 3:1 MINIMUM SLOPES SHALL BE 1%.
8. TWO (2) WORKING DAYS PRIOR TO ANY EXCAVATION, CONTRACTOR MUST CONTACT NEW MEXICO ONE CALL SYSTEM, 260-1990, FOR LOCATION OF EXISTING UTILITIES.
9. IF ANY UTILITY LINES, PIPELINES, OR UNDERGROUND UTILITY LINES ARE SHOWN ON THESE DRAWINGS, THEY ARE SHOWN IN AN APPROXIMATE MANNER ONLY, AND SUCH LINES MAY EXIST WHERE NONE ARE SHOWN. IF ANY SUCH EXISTING LINES ARE SHOWN, THE LOCATION IS BASED UPON INFORMATION PROVIDED BY THE OWNER OF SAID UTILITY, AND THE INFORMATION MAY BE INCOMPLETE, OR MAY BE OBSOLETE BY THE TIME CONSTRUCTION COMMENCES. THE ENGINEER HAS CONDUCTED ONLY PRELIMINARY INVESTIGATION OF THE LOCATION, DEPTH, SIZE OR TYPE OF EXISTING UTILITY LINES, PIPELINES, OR UNDERGROUND UTILITY LINES. THIS INVESTIGATIONS IS NOT CONCLUSIVE, AND MAY NOT BE COMPLETE, THEREFORE, MAKES NO REPRESENTATION PERTAINING THERETO, AND ASSUMES NO RESPONSIBILITY OR LIABILITY THEREFORE. THE CONTRACTOR SHALL INFORM ITSELF OF THE LOCATION OF ANY UTILITY LINE, PIPELINE, OR UNDERGROUND UTILITY LINE IN OR NEAR THE AREA OF THE WORK IN ADVANCE OF AND DURING EXCAVATION WORK. THE CONTRACTOR IS FULLY RESPONSIBLE FOR ANY AND ALL DAMAGE CAUSED BY ITS FAILURE TO LOCATE, IDENTIFY AND PRESERVE ANY AND ALL EXISTING UTILITIES, PIPELINES, AND UNDERGROUND UTILITY LINES. IN PLANNING AND CONDUCTING EXCAVATION, THE CONTRACTOR SHALL COMPLY WITH STATE STATUES, MUNICIPAL AND LOCAL ORDINANCES, RULES AND REGULATIONS, IF ANY, PERTAINING TO THE LOCATION OF THESE LINES AND FACILITIES.
10. OWNER WILL PROVIDE SOIL TESTING AND INSPECTION SERVICES DURING EARTHWORK OPERATIONS. CONTRACTOR SHALL ALLOW TESTING SERVICE TO INSPECT AND APPROVE COMPACTED SUBGRADES AND FILL LAYERS BEFORE FURTHER CONSTRUCTION WORK IS DONE. SHOULD COMPACTION TESTS INDICATE INADEQUATE DENSITY, CONTRACTOR SHALL PROVIDE ADDITIONAL COMPACTION AND TESTING AT NO ADDITIONAL EXPENSE.
11. OWNER HAS ESTABLISHED SUBDIVISION BOUNDARY CORNERS. CONTRACTOR SHALL PROVIDE ALL OTHER CONSTRUCTION STAKING INCLUDING TRACT CORNERS. CONTRACTOR SHALL LOCATE AND PRESERVE ALL BOUNDARY CORNERS AND REPLACE ANY LOST OR DISTURBED CORNERS.
12. OWNER WILL PROVIDE A STORM WATER POLLUTION PREVENTION PLAN (SWPPP) AND INSPECTION. CONTRACTOR SHALL COMPLY WITH THE BEST MANAGEMENT PRACTICES (BMP'S) AS SPECIFIED IN THE SWPPP, AND WITH ALL FEDERAL, STATE, AND LOCAL REGULATIONS.



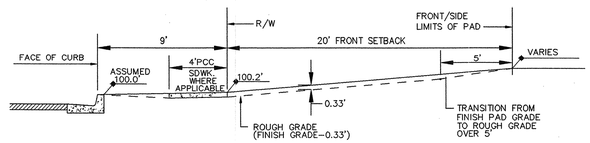
TYPICAL BACKYARD SLOPE WITH RETAINING WALLS
SCALE: 1"=5'-0"



TYPICAL BACKYARD SLOPE WITH GARDEN WALL RETAINAGE
SCALE: 1"=5'-0"



SECTION B-B
TYPICAL SIDEYARD GRADING
SCALE: 1"=5'



FRONT/SIDE YARD GRADING
SCALE: 1"=5'-0"

FRED C. ARFMAN NEW MEXICO 7322 REGISTERED PROFESSIONAL ENGINEER
4-21-05
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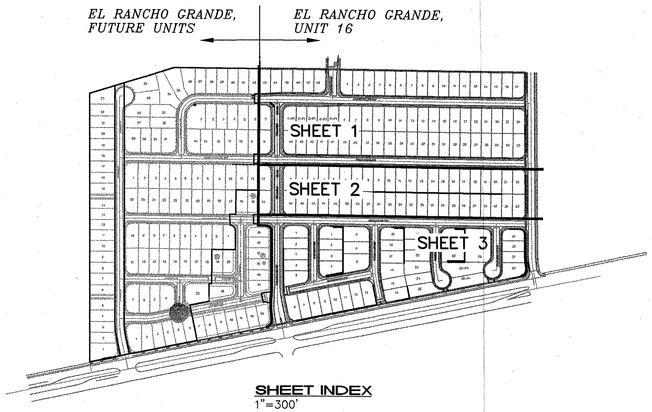
Ph. 505-268-8828 Fax. 505-268-2632
1349GRD.DWGanw 4/18/05

EL RANCHO GRANDE
UNIT 16
CURB, INC.

GRADING & DRAINAGE PLAN

Checked By:	Drawn By:	No.	Revision	
FCA	ANW			
Date:	Job Number:			SH. 5 OF 5
4/05	1349			



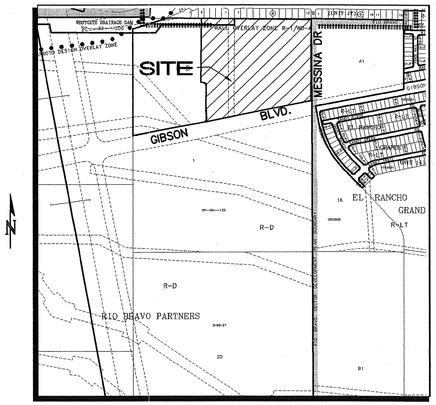
SHEET INDEX
1"=300'

LEGEND

- PROPOSED RETAINING WALL
- GARDEN WALL
- TW= / BW= — TOP OF RETAINING WALL / BOTTOM OF RETAINING WALL — ELEVATION
- TGW= / BGW= — TOP OF GARDEN WALL / BOTTOM OF GARDEN WALL — ELEVATION
- △ 2.0' — RETAINED HEIGHT

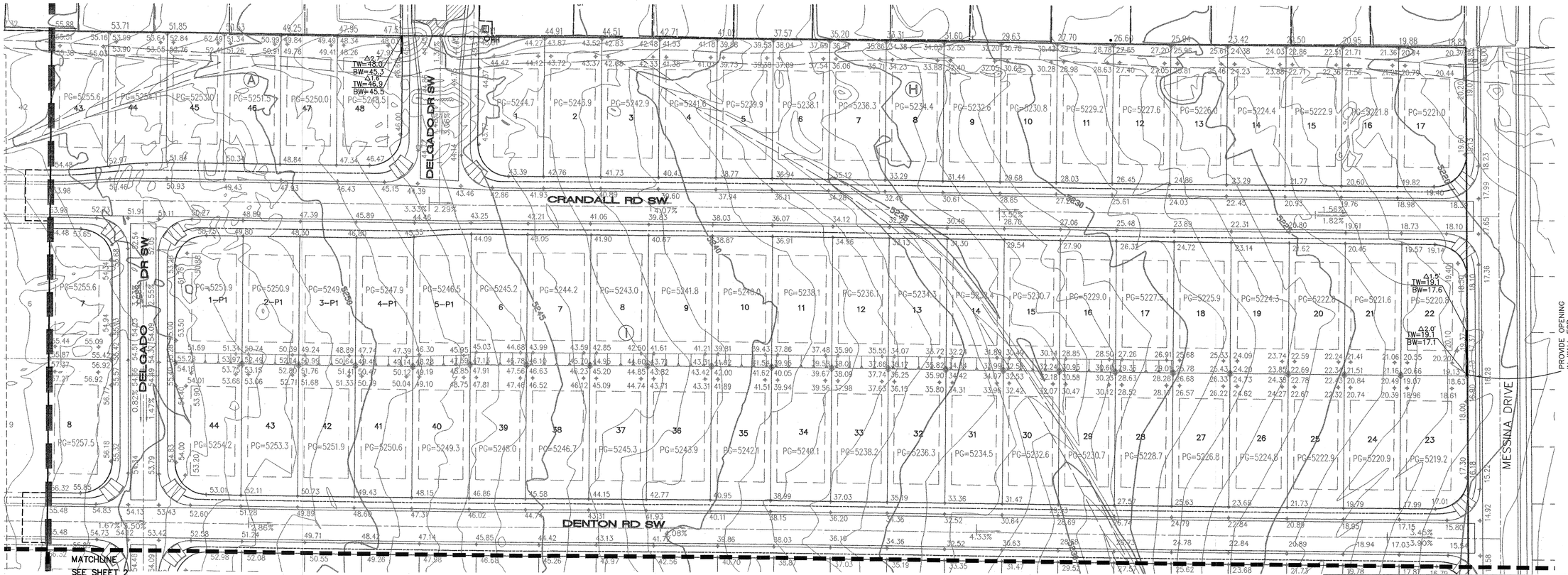
SCALE: 1"=40'

40 30 20 10 0 40 80



N-8 1"=750'±

VICINITY MAP



EL RANCHO GRANDE, FUTURE UNIT 18

BENCHMARK
ACS MONUMENT
"TRANS"
Y=1471822.67
X=354899.45
G-G=0.99967921
Δα=-0016'42"
CENTRAL ZONE
ELEVATION=5118.370
NAD 1927/SLD 1929

ISAACSON & ARFMAN, P.A.
Consulting Engineering Associates
128 Monroe Street N.E.
Albuquerque, New Mexico 87108
Ph: 505-268-8828 Fax. 505-268-2632
1349RETWALL.DWGanw 4/6/05

FRED C. ARFMAN NEW MEXICO 7322 LICENSED PROFESSIONAL ENGINEER 4-6-05

EL RANCHO GRANDE UNIT 16

CURB, INC.

RETAINING WALL PLAN

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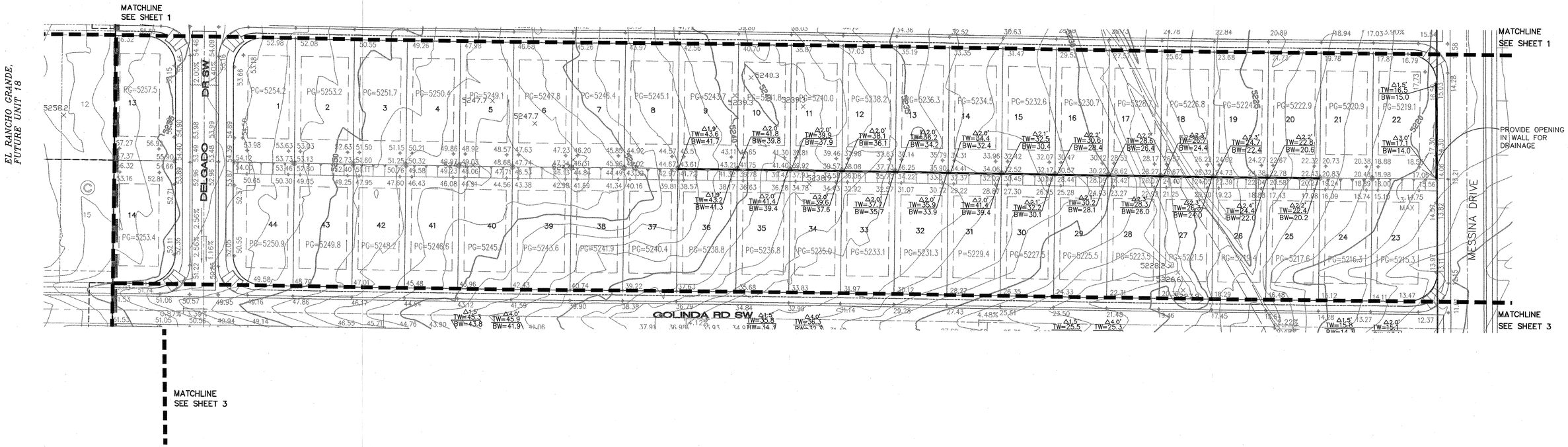
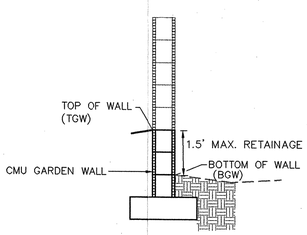
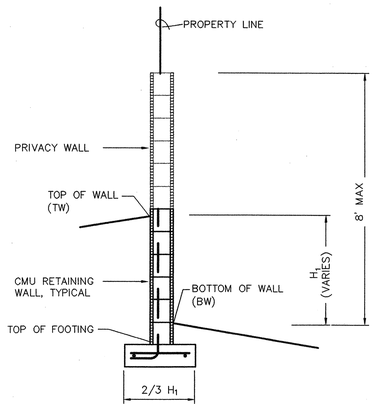
FCA	ANW			
Date:	Job Number:			SH. 1 OF 3
4/05	1349			





TYPICAL GARDEN WALL DETAIL

NTS



TYPICAL RETAINING WALL DETAIL

NTS

NOTE:

RETAINING WALLS SHALL BE DESIGNED BY A STRUCTURAL ENGINEER.

SCALE:
1"=40'

40 30 20 10 0 40 80

LEGEND

PROPOSED RETAINING WALL

GARDEN WALL

TW= / BW= — TOP OF RETAINING WALL ELEVATION / BOTTOM OF RETAINING WALL

TGW= / BGW= — TOP OF GARDEN WALL ELEVATION / BOTTOM OF GARDEN WALL

△ 2.0' — RETAINED HEIGHT

BENCHMARK

ACS MONUMENT
"TRANS"
Y=1471822.67
X=354899.45
G-G=0.99967921
Δα=-00°16'42"
CENTRAL ZONE
ELEVATION=5118.370
NAD 1927/SLD 1929

FRED C. ARFMAN
NEW MEXICO
7322
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1349RETWALL.DWGanw 4/6/05

EL RANCHO GRANDE UNIT 16

CURB, INC.

RETAINING WALL PLAN

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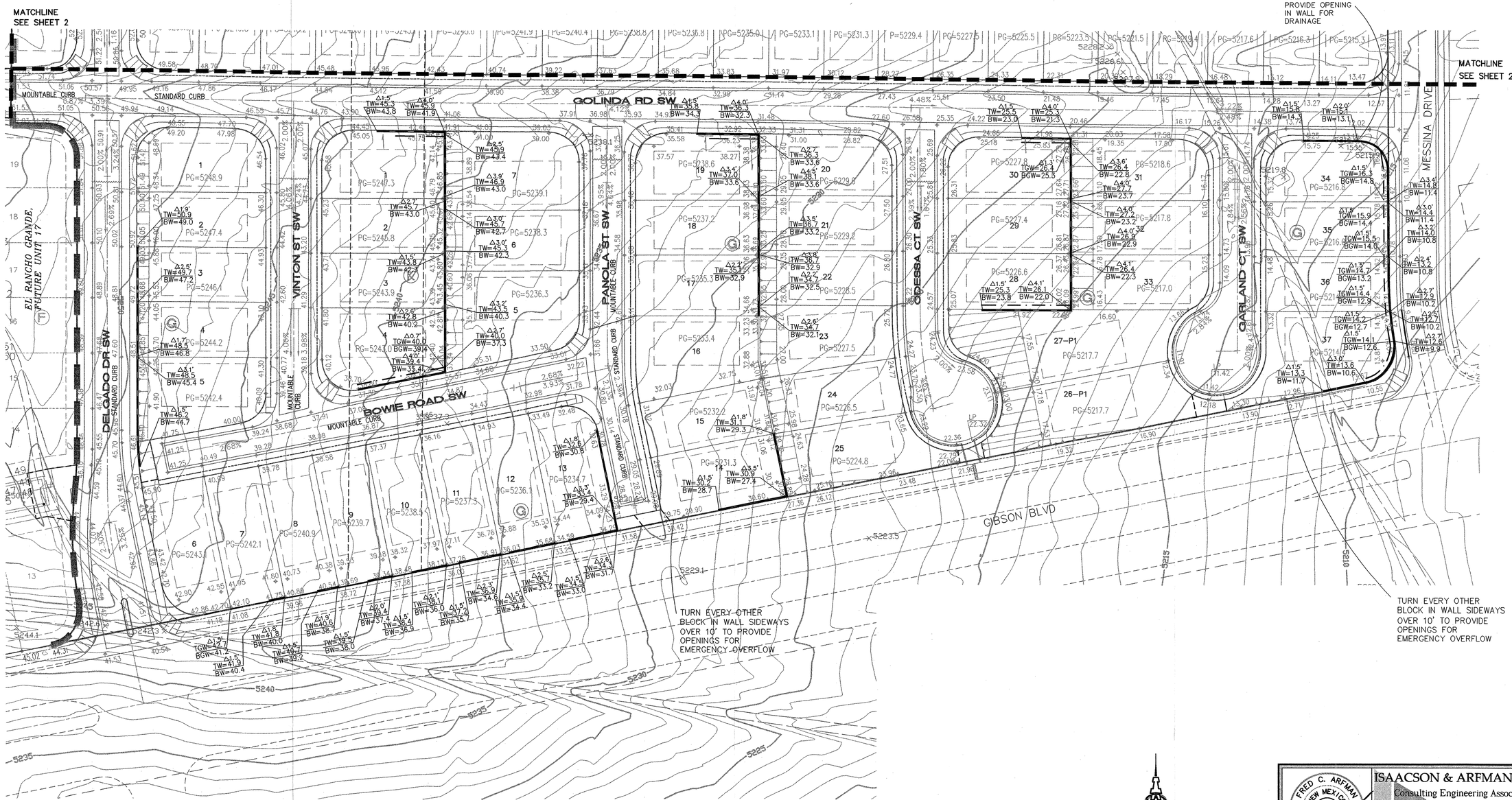

LEGEND

PROPOSED RETAINING WALL

GARDEN WALL

TW= TOP OF RETAINING WALL ELEVATION
BW= BOTTOM OF RETAINING WALL

TGW= TOP OF GARDEN WALL ELEVATION
BGW= BOTTOM OF GARDEN WALL

△ 2.0' RETAINED HEIGHT

SCALE:
1"=40'

40 30 20 10 0 40 80

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RETAINING WALL PLAN

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FCA	ANW			
Date:	Job Number:			SH. 3 OF 3
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