DRAINAGE REPORT

For

THE BOULDERS PHASE II SUBDIVISION
ALBUQUERQUE, NEW MEXICO

Prepared by

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Prepared for

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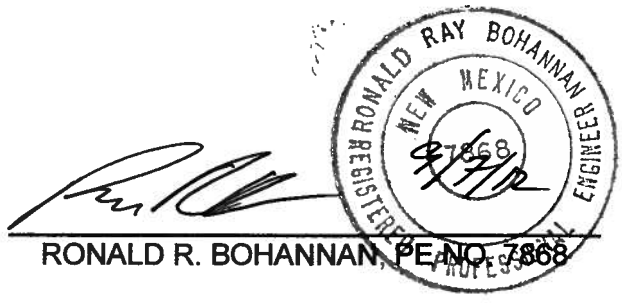
September 07, 2012 Revised 10-24-12



RONALD R. BOHANNAN, PE NO. 7868

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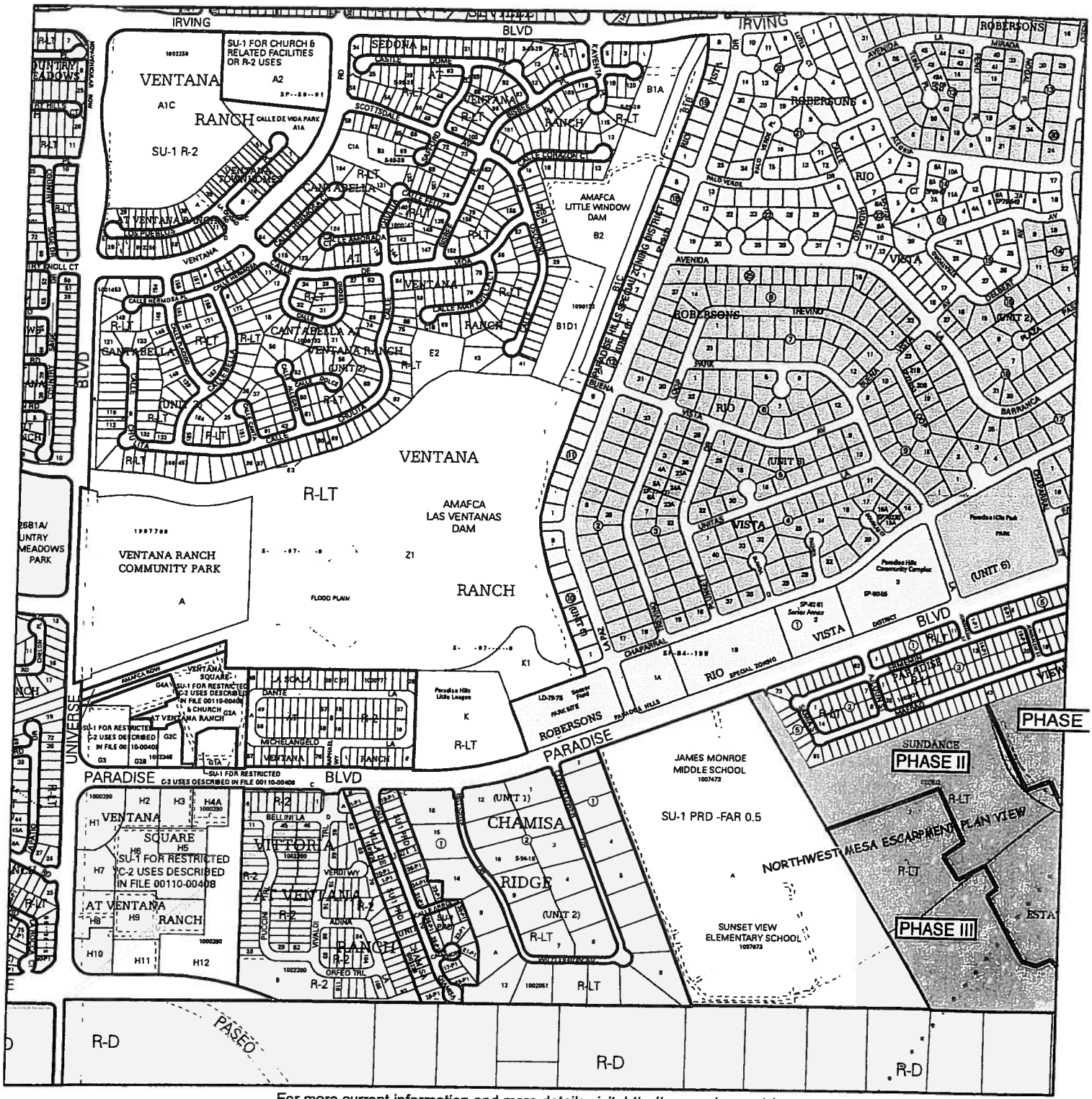
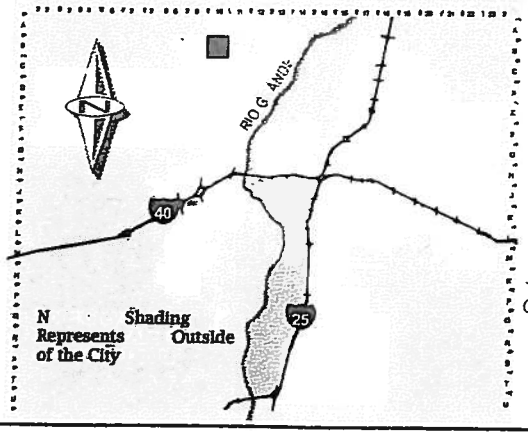


For more current information and more details visit: http://www.cabq.gov/gis

Albuquerque Geographic Information System

Map amended through: 2/4/2010



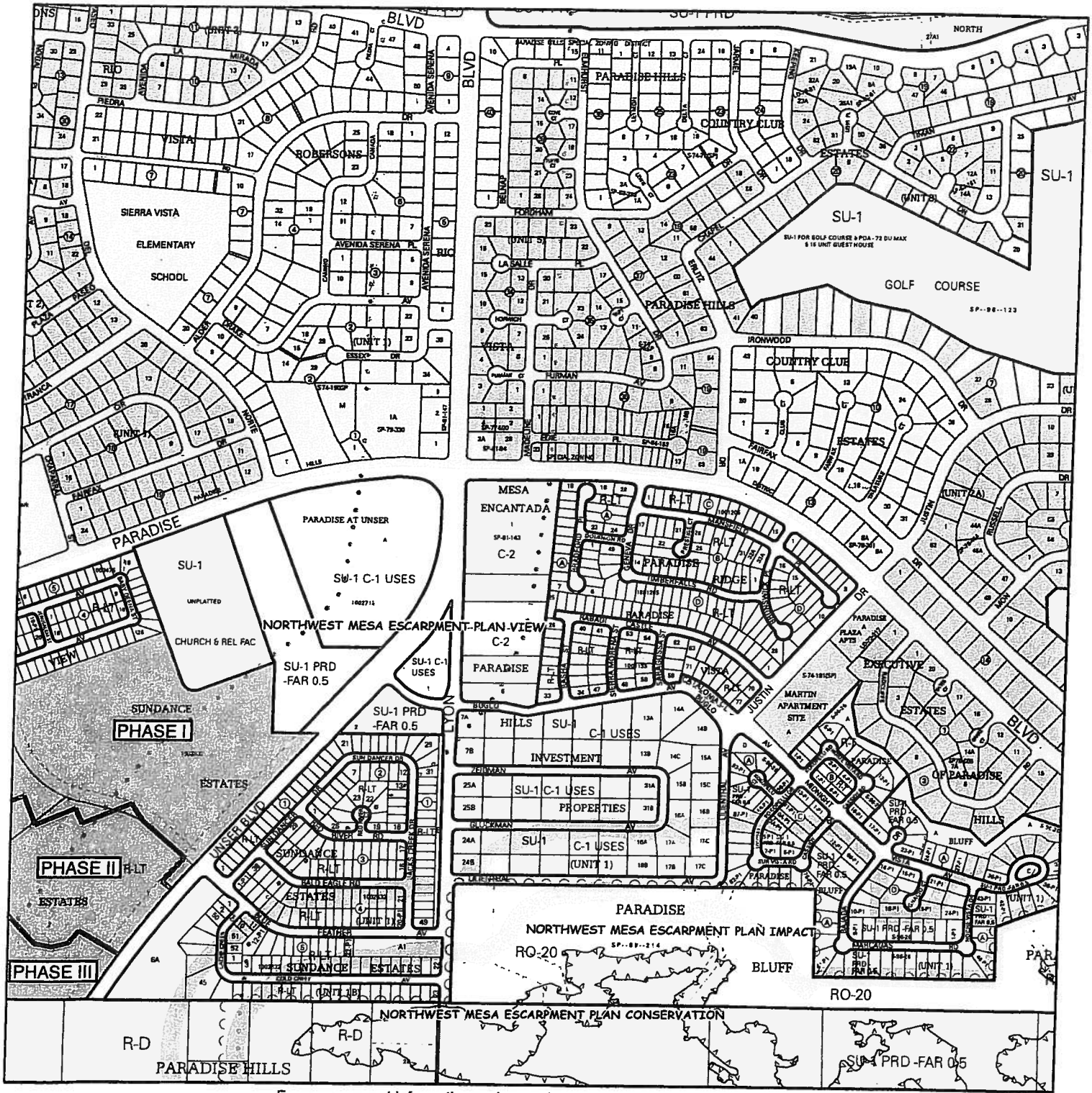
Zone Atlas Page:

B-10-Z

Selected Symbols

SECTOR PLANS
Design Overlay Zones
City Historic Zones
H-1 Buffer Zone
Petroglyph Mon.
Escarpment
2 Mile Airport Zone
Airport Noise Contours
Wall Overlay Zone

0 750 1,500 Feet



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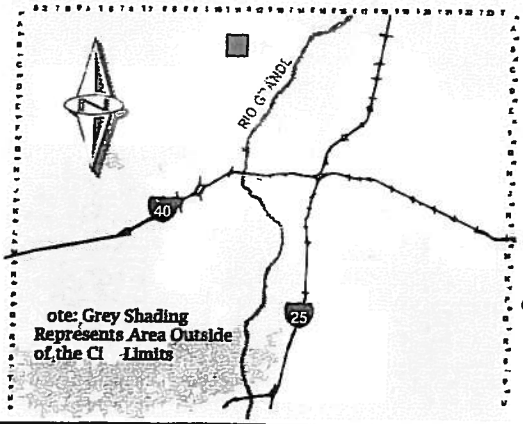


Zone Atlas Page:

B-11-Z

Selected Symbols

SECTOR PLANS
Design Overlay Zones
City Historic Zones
H-1 Buffer Zone
Petroglyph Mon.
Escarpment
2 Mile Airport Zone
Airport Noise Contours
Wall Overlay Zone

0 750 1,500 Feet

LOCATION

The proposed residential subdivision, The Boulders Phase II, is comprised of approximately 24 acres zoned RLT and is located in the City of Albuquerque, in Bernalillo County. The site is bordered by Unser Boulevard to the east, Paradise View Subdivision to the north, private undeveloped property to the south and Albuquerque Public Schools property to the west. The Phase I of the property is currently developed with residential lots and Phase II of the undeveloped is currently undeveloped with some grading in Phase II occurring with Phase I construction.

This report represents a drainage management and grading plan for approval by the City of Albuquerque, for grading and Preliminary Plat submittal.

DRAINAGE BASIN DESIGNATION

The drainage basins for proposed conditions are as indicated on the BASIN MAP included in this report. Under historic conditions the entire site drained across the site from northwest to southeast and into the Piedras Marcadas Arroyo. Developed flows from the subdivision to the north, Paradise View, were detained in existing detention ponds on site. Under proposed conditions, all proposed residential lots will flow to the fronting residential streets and no cross lot drainage is anticipated. Also under proposed conditions, the temporary ponds and associated cmp's required for Paradise View will be removed. Tract 6A contains a proposed permanent pond that will be retention in the interim and detention ultimately, when the Chamisa Storm Drain is constructed to Paradise Blvd. There is an upstream basin consisting of a portion of a residential subdivision (Paradise View Subdivision) that drains its runoff through the Boulders Subdivision Phases I and II as shown on the basin map.

EXISTING DRAINGE CONDITIONS

The majority of the site historically drains from northwest to southeast to the Petroglyph National Monument located south and east of the proposed subdivision. Runoff under undeveloped conditions surface flows off the site, through the monument

and eventually into the Piedras Marcadas Dam. Originally, the undeveloped flows from onsite, as well as developed and undeveloped flows from offsite basins were partially detained in a natural playa that existed at the southeast corner of the proposed subdivision, at the end of Lyons Boulevard. Previously, the playa discharged into the Monument at a number of locations. An earthen and rock berm was temporarily constructed to convey the flows to a single point of discharge to control erosion in the Monument.

The existing subdivision located east of Unser across from the proposed Boulders Phase I, Sundance Estates I & IB were constructed to drain to a permanent detention pond at the corner of Blue Feather and Lyon. The flows are detained in the pond and released at a controlled rate into the Monument via an existing storm drain.

Developed flows from the exist portion of Unser drain to an existing temporary retention pond at the southeast corner of Blue Feather and Unser Blvd.

FIRM MAP AND SOIL CONDITIONS

Phase II of the Boulders Subdivision is not located in a designated Flood Hazard Zone per FEMA – (Firm Map 35001C0104 – See Attached Map). Per the USDA Soil Conservation Services (SCS), the soils type for this site is Alameda sandy loam and consists largely of undulating soil on old basalt flows. Numerous basalt rock outcrops are present. Runoff is medium, the hazard of soil blowing is moderate and the hazard of water erosion is slight.

DESIGN-CRITERIA

The drainage plan presented in this report was prepared in accordance with the City of Albuquerque Drainage Ordinances and Chapter 22 of the Development Process Manual DPM. The hydrological analysis is based on the 100-year frequency, 6-hour duration storm, as Represented in Section 22, Part A, Hydrology, of the Development Process Manual. Storage detention ponds are sized for the 100-year, 24-hour storm and ultimately will drain in less than 24 hours. Storage retention ponds are sized for the

100-year, 10-day storm. In addition, it is the intent to demonstrate existing conditions will be improved by decreasing erosion in the Monument by reducing flows that enter the Monument, by redirecting the majority of the developed runoff to the proposed Paradise Boulevard and Lyons Boulevard storm drain that are programmed to convey flows north to the Calabacillas Arroyo.

Rainfall intensities per this report are as follows:

FREQ	ZONE	P60	P360	P1440
100YR	1	1.87	2.20	2.66

Land Treatments:

Proposed Subdivision:

The proposed subdivision land use values were calculated as follows:

Residential DPM-Eqn a-4, pg 22-n)

n=Residential Units/Acre = 5.0 DU / Acre

A = 0 (Under fully developed conditions, no undisturbed naturally vegetated areas will remain.)

B = 25 % Approx. assuming ½ remaining lot will be grass lawns

C = 25 % Approx. since ½ of lot will be gravel and Xeriscaping

D= 7 * SQ RT [(n)(n) + 5(n)] = 7* SQ RT [(5) (5) + 5(5]

= 49.5 ---- use 50%

DEVELOPED-DRAINAGE CONDITIONS

The Boulders Subdivision was proposed to be developed in approximately three equal phases. The first of these phases consists of approximately 26 acres in Phase I with 23.5 acres in the Phase II and 18.6 acres in Phase III. All three phases will flow via the proposed streets and storm drains to a permanent detention pond located to the east and adjacent to Unser Blvd, under ultimate conditions. The pond outfall will ultimately be to the north via the Chamisa Storm Drain connection to the Lyon Storm Drain which conveys the flows to the Calabacillas Arroyo. In the interim, the Unser pond will act as a retention pond for the flows from Phase I and a portion of Phase II, including the flows from the eastern half of Paradise View Subdivision which is an upland basin to the north. The pond, which was completed with Phase I had a total retention capacity of 9.247 Acre-Feet with a 2 foot free board. A temporary pond will be constructed in the southeast corner of the site, within the proposed Phase III area, on the west side of Unser to handle flows under interim conditions as a supplement to the permanent pond located in Tract 6A on the east side of Unser. The total runoff (design storm equal to 100-year, 10-day) for Phase I developed and Phases II & III rough graded that will be channeled to the two ponds is less than the capacity amount of the ponds.

The volume of the pond in Tract 6A will be increased to 11.391 Acre-Feet by slightly lowering the pond invert to allow for increased retention capacity as an interim condition. This lowering of the pond bottom will be reversed when the ultimate outfall storm drain is connected to the existing Lyon storm drain at Paradise Blvd. The temporary pond west of Unser will be modified in location and volume to allow for the construction of Phase II residential lots and infrastructure improvements. The volume of the new temporary pond will be 7.352 Acre Feet.

The detention pond adjacent to Unser is a regional pond that is part of the proposed Chamisa master storm drain. The Chamisa drain is proposed to divert approximately 671 cfs from approximately 240 acres to the Calabacillas Arroyo. This area historically drained through the Petroglyph Monument to the Piedras Marcadas Arroyo and eventually to the Piedras Marcadas Dam. The proposed diversion involves a cooperative agreement between several local developers, AMAFCA, the City of

Albuquerque and Albuquerque Public Schools in an attempt to reduce the impact of flows channeled through the Monument as well as a method of maintaining the integrity and capacity capabilities of the Piedras Marcadas Dam.

SUMMARY

Phase II of the proposed Boulders Subdivision is a 24-acre residential project with a planned Unser alignment and two interim retention ponds with the pond in Tract 6A being a permanent detention pond under ultimate conditions. The single family detached homes will be constructed in lots that meet the RLT zoning ordinances. No adverse impact will result due to developed conditions from the proposed Phases I and II of the Boulders Subdivision. Onsite developed flows will be routed via surface flow in the streets and supplemented by a storm sewer to the proposed retention ponds for the interim, which will become one detention pond in Tract 6A under ultimate conditions. Emergency overflow structures will be provided in the ponds. The overflow will be directed toward the northeast and will not impact the lots within the proposed or existing subdivisions.

THE BOULDERS

Weighted E Method

Zone #1

PHASE ONE AND TWO DEVELOPED AND PHASE THREE ROUGH GRADED

Developed Basins

Basin	Area (sf)	Area (acres)	Area (sq miles)	Treatment A %	Treatment A (acres)	Treatment B %	Treatment B (acres)	Treatment C %	Treatment C (acres)	Treatment D %	Treatment D (acres)	100-Year Weighted E (ac-ft)	100-Year Volume (ac-ft)	100-Year Flow cfs	10-Year Weighted E (ac-ft)	10-Year Volume (ac-ft)	10-Year Flow cfs	2-Year Weighted E (ac-ft)	2-Year Volume (ac-ft)	2-Year Flow cfs
Upland East-34	578790.00	13.287	0.02076	0%	0	17%	2.259	18%	2.391694	85%	8.637	1.573	1.741	49.19	0.923	1.022	30.24	0.491	0.544	15.79
3	197187.00	4.527	0.00707	0%	0	24%	1.095	25%	1.131698	49%	2.227	1.379	0.520	15.20	0.773	0.292	8.96	0.387	0.146	4.33
4	96049.00	2.205	0.00345	0%	0	24%	0.534	25%	0.551245	49%	1.085	1.379	0.253	7.41	0.773	0.142	4.36	0.387	0.071	2.11
5	52992.00	1.217	0.00190	0%	0	24%	0.294	25%	0.304132	49%	0.599	1.379	0.140	4.09	0.773	0.078	2.41	0.387	0.039	1.18
7	78936.00	1.812	0.00283	0%	0	52%	0.942	0%	0	48%	0.870	1.294	0.195	5.71	0.710	0.107	3.23	0.351	0.053	1.50
8	81003.00	1.860	0.00291	0%	0	50%	0.930	15%	0.278936	35%	0.651	1.173	0.182	5.53	0.610	0.095	3.00	0.275	0.043	1.26
9	51672.00	1.186	0.00185	0%	0	24%	0.287	25%	0.296556	49%	0.584	1.379	0.136	3.98	0.773	0.076	2.35	0.387	0.038	1.13
10	169241.00	3.885	0.00607	0%	0	24%	0.940	25%	0.97131	49%	1.912	1.379	0.446	13.05	0.773	0.250	7.69	0.387	0.125	3.72
11	61236.00	1.406	0.00220	0%	0	24%	0.340	25%	0.351446	49%	0.692	1.379	0.162	4.72	0.773	0.091	2.78	0.387	0.045	1.34
12	47531.00	1.091	0.00170	0%	0	81%	0.884	6%	0.06547	13%	0.142	0.858	0.078	2.60	0.366	0.033	1.18	0.109	0.010	0.30
13	20308.00	0.466	0.00073	100%	0.466208	0%	0.000	0%	0	0%	0.000	0.440	0.017	0.60	0.080	0.003	0.11	0.000	0.000	0.00
14	65898.00	1.513	0.00236	100%	1.51281	0%	0.000	0%	0	0%	0.000	0.440	0.055	1.95	0.080	0.010	0.36	0.000	0.000	0.00
35	75972.00	1.744	0.00273	0%	0	88%	1.535	4%	0.069763	8%	0.140	0.787	0.114	3.93	0.310	0.045	1.67	0.071	0.010	0.31
36	75972.00	1.744	0.00273	0%	0	24%	0.422	25%	0.436019	49%	0.858	1.379	0.200	5.86	0.773	0.112	3.45	0.387	0.056	1.67
37	72150.00	1.656	0.00259	0%	0	24%	0.401	25%	0.414084	49%	0.815	1.379	0.190	5.56	0.773	0.107	3.26	0.387	0.053	1.58
38	162616.00	3.733	0.00583	0%	0	0%	0.000	100%	3.73315	0%	0.000	0.990	0.308	10.71	0.440	0.137	5.56	0.120	0.037	1.75
1	169318.00	3.887	0.00607	0%	0	24%	0.941	25%	0.971752	49%	1.912	1.379	0.447	13.06	0.773	0.250	7.69	0.387	0.125	3.72
2	145603.00	3.343	0.00522	0%	0	24%	0.809	25%	0.835646	49%	1.645	1.379	0.384	11.23	0.773	0.215	6.61	0.387	0.108	3.20
6	33682.00	0.773	0.00121	0%	0	24%	0.187	25%	0.193308	49%	0.380	1.379	0.089	2.60	0.773	0.050	1.53	0.387	0.025	0.74
15	38938.00	0.894	0.00140	0%	0	24%	0.215	25%	0.223473	49%	0.438	1.374	0.102	2.99	0.770	0.057	1.76	0.385	0.029	0.85
16	60009.00	1.378	0.00215	0%	0	24%	0.331	25%	0.344404	49%	0.675	1.374	0.158	4.81	0.770	0.088	2.72	0.385	0.044	1.31
17	110232.00	2.531	0.00395	0%	0	24%	0.607	25%	0.632645	49%	1.240	1.374	0.290	8.47	0.770	0.162	4.99	0.385	0.081	2.41
18	50442.00	1.158	0.00181	0%	0	24%	0.278	25%	0.289497	49%	0.567	1.374	0.133	3.87	0.770	0.074	2.28	0.385	0.037	1.10
28	83113.00	1.908	0.00298	0%	0	24%	0.458	25%	0.477003	49%	0.935	1.374	0.218	6.38	0.770	0.122	3.76	0.385	0.061	1.82
Subtotals	2578890.00	59.20	0.09			Tract 6A Permanent Pond:				SUBTOTAL: 100-year, 6-Hour			6.560	Acre-feet						
										100-year, 10-Day			10.942	Acre-feet						
Upland West-33	399950.00	9.182	0.01435	0%	0	17%	1.561	18%	1.652686	65%	5.968	1.573	1.203	33.99	0.923	0.706	20.90	0.491	0.376	10.91
19	80203.00	1.841	0.00288	0%	0	43%	0.792	25%	0.460302	32%	0.589	1.166	0.179	5.50	0.601	0.092	2.99	0.265	0.041	1.24
20	130280.00	2.991	0.00467	0%	0	24%	0.718	25%	0.747704	49%	1.466	1.374	0.342	10.01	0.770	0.192	5.89	0.385	0.096	2.85
21	90980.00	2.089	0.00326	0%	0	24%	0.501	25%	0.522153	49%	1.023	1.374	0.239	6.99	0.770	0.134	4.12	0.385	0.067	1.99
22	76127.00	1.748	0.00273	0%	0	24%	0.419	25%	0.436909	49%	0.856	1.374	0.200	5.85	0.770	0.112	3.44	0.385	0.056	1.87
30	186578.00	4.283	0.00669	0%	0	24%	1.028	25%	1.07081	49%	2.099	1.374	0.490	14.33	0.770	0.275	8.44	0.385	0.137	4.08
32A	9648.00	0.221	0.00035	0%	0	24%	0.053	25%	0.055372	49%	0.109	1.374	0.025	0.74	0.770	0.014	0.44	0.385	0.007	0.21
32B	52563.00	1.207	0.00189	0%	0	24%	0.290	25%	0.30167	49%	0.591	1.374	0.138	4.04	0.770	0.077	2.38	0.385	0.039	1.15
23	36207.00	0.830	0.00130	0%	0	0%	0.000	100%	0.83	0%	0.000	0.990	0.068	2.38	0.440	0.030	1.24	0.120	0.008	0.39
24	111374.00	2.557	0.00399	0%	0	0%	0.000	100%	2.556795	0%	0.000	0.990	0.211	7.34	0.440	0.094	3.81	0.120	0.026	1.20
25	122135.00	2.804	0.00438	0%	0	0%	0.000	100%	2.803834	0%	0.000	0.990	0.231	8.05	0.440	0.103	4.18	0.120	0.028	1.32
26	214497.00	4.924	0.00769	0%	0	0%	0.000	100%	4.924174	0%	0.000	0.990	0.406	14.13	0.440	0.181	7.34	0.120	0.049	2.31
27	183799.00	4.219	0.00659	0%	0	0%	0.000	100%	4.219444	0%	0.000	0.990	0.348	12.11	0.440	0.155	8.29	0.120	0.042	1.98
29	35570.00	0.817	0.00128	0%	0	100%	0.817	0%	0	0%	0.000	0.670	0.046	1.66	0.220	0.015	0.62	0.010	0.001	0.02
31	146690.00	3.368	0.00526	0%	0	0%	0.000	100%	3.367539	0%	0.000	0.990	0.278	9.66	0.440	0.123	5.02	0.120	0.034	1.58
Subtotals	1876601.00	43.08	0.07			Temporary Pond West of Unser:				Total: 100-year, 6-hour			4.41	Acre-feet		5.93	189.06		2.79	86.01
										Total: 100-year, 10-day			7.349	Acre-feet						

Equations:

Weighted E = Ea*Aa + Eb*Ab + Ec*Ac + Ed*Ad / (Total Area)

Volume = Weighted D * Total Area

Flow = Qa * Aa + Qb * Ab + Qc * Ac + Qd * Ad

Boulders Phase II Pond Volume Calculation Sheet

Unser Pond
(Temporary Retention Volume)

Elev	Area	Elev	Avg			
		Change	Area	Volume	Cumulative Volume	
	SF	FT	SF	CU.FT.	CU.FT.	ACRE-FT
32.77	45190					
33	72813	0.23	59001.5	13570.34	13570.345	0.311532
34	90054	1	81433.5	81433.5	95003.845	2.180988
35	99036	1	94545	94545	189548.845	4.351443
36	105211	1	102123.5	102123.5	291672.345	6.695876
37	107596	1	106403.5	106403.5	398075.845	9.138564
37.91	108085	0.91	107840.5	98134.85	496210.7	11.39143

Onsite Pond
(Temporary Retention Volume)

Elev	Area	Elev	Avg			
		Change	Area	Volume	Cumulative Volume	
	SF	FT	SF	CU.FT.	CU.FT.	ACRE-FT
47	75444					
50.8	93105	3.8	84274.5	320243.1	320243.1	7.35177

Unser Pond
(Permanent Detention Volume)

Elev	Area	Elev	Avg			
		Change	Area	Volume	Cumulative Volume	
	SF	FT	SF	CU.FT.	CU.FT.	ACRE-FT
32.77	0					
33	24230	0.23	12115	2786.45	2786.45	0.063968
34	45485	1	34857.5	34857.5	37643.95	0.864186
35	85287	1	65386	65386	103029.95	2.365242
36	105211	1	95249	95249	198278.95	4.551858
37	107596	1	106403.5	106403.5	304682.45	6.994547
37.91	108085	0.91	107840.5	98134.85	402817.305	9.247413

Pipe Capacity

Pipe No.	D (in)	Slope (%)	Area (ft^2)	R	Q Required (cfs)	Q Provided (cfs)	Velocity (ft/s)
1	24	2.3	3.14	0.5	34	34.40	10.95
2	24	2.3	3.14	0.5	34	34.40	10.95
3	24	2.3	3.14	0.5	34	34.40	10.95
4	24	2.3	3.14	0.5	34	34.40	10.95
5	30	1.4	4.91	0.625	48.4	48.66	9.91
6	36	0.9	7.07	0.75	60.4	63.45	8.98
7	36	0.8	7.07	0.75	56.79	59.82	8.46
8	42	1.57	9.62	0.875	126.29	126.40	13.14
9	42	1.84	9.62	0.875	136.79	136.84	14.22
10	42	1.84	9.62	0.875	136.79	136.84	14.22
11	24	1.25	3.14	0.5	8.4	25.36	8.07
12	24	3.16	3.14	0.5	12.8	40.32	12.84
13	30	3.63	4.91	0.625	21.2	78.36	15.96

$Q = (1.5/N)*A*(R)^{2/3}*(S)^{1/2}$

Area N=.013
D/4 R=A/P
S= Slope
N= 0.013

TIERRA WEST, LLC

Project BOULDERS PHASE II Date

Project No.

Meeting Purpose Sheet No of

Attendees

SUMP INLET CAPACITY ANALYSIS

GRATE OPENING (AREA) (PER CoA STD DWG # 2220, SINGLE GRATE)

GROSS AREA PER 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
USE GRATE AREA OPENING @ 50% CLOGGING FACTOR =	2.35 sf

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

$C = 0.67$ $g = 32.2\ ft/sec^2$

$A = 2.35\ ft^2$ h = height of WATER ABOVE GRATE

WHERE $h = 0.67$ ft $Q_{CAPACITY} = 0.67(2.35)[2(32.2)(0.67)]^{1/2} = 10.34$ cfs

5571 Midway Park Place NE • Albuquerque, NM 87109 • (505) 858-3100 • (505) 858-1118 Fax • 1-800-245-3102 • twllc@tierrawestllc.com

Street Capacity Calculations

AP-11
DI's # 10&11
Slope= 0.0071

For water depths less than 0.125 feet
Y= Water depth
Area = 8*Y^2
P= SQRT(257*Y^2) + Y
n= 0.017

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.01	0.00	0.17	0.00	0.00	0.00	0.21	0.00	0.36	0.0021769
0.02	0.00	0.34	0.01	0.00	0.00	0.33	0.01	0.41	0.0052836
0.04	0.01	0.68	0.02	0.01	0.01	0.52	0.02	0.46	0.0127604
0.06	0.03	1.02	0.03	0.02	0.04	0.68	0.04	0.49	0.0213226
0.08	0.05	1.36	0.04	0.04	0.08	0.83	0.07	0.51	0.0306606
0.1	0.08	1.70	0.05	0.08	0.15	0.96	0.10	0.53	0.0406135
0.12	0.12	2.04	0.06	0.12	0.25	1.08	0.13	0.55	0.0510804
0.125	0.13	2.13	0.06	0.14	0.28	1.11	0.14	0.55	0.0537687

For water depths greater than 0.125 ft but less than 0.365 ft
Y1= Y-0.125
A2= A1 + 2*Y1 + 25*Y1^2
P2= P1 + SQRT(2501*Y1^2)+Y1

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.13	0.14	2.38	0.06	0.15	0.30	1.09	0.14	0.53	0.0525141
0.16	0.23	3.91	0.06	0.25	0.50	1.10	0.18	0.48	0.0556631
0.2	0.42	5.95	0.07	0.52	1.04	1.25	0.25	0.49	0.0713681
0.24	0.69	8.00	0.09	0.98	1.96	1.43	0.34	0.52	0.0920904
0.2804	1.04	10.06	0.10	1.69	3.37	1.62	0.45	0.54	0.1157211
0.303	1.27	11.21	0.11	2.20	4.40	1.73	0.52	0.55	0.1297686
0.3551	1.91	13.87	0.14	3.75	7.50	1.96	0.70	0.58	0.1638784
0.365	2.05	14.37	0.14	4.11	8.21	2.01	0.73	0.59	0.1705926

For water depths greater than 0.365 ft but less than 0.667 ft
Y2= Y - 0.365
A3= A2 + Y2*14
P3= P2 + Y2

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.3864	2.34	14.39	0.16	5.15	10.30	2.20	0.85	0.62	0.1981598
0.4278	2.92	14.43	0.20	7.43	14.86	2.54	1.09	0.68	0.2522207 ← DI's 10 & 11
0.4553	3.31	14.46	0.23	9.12	18.24	2.76	1.25	0.72	0.2886325
0.5205	4.22	14.53	0.29	13.64	27.29	3.23	1.68	0.79	0.3764388
0.551	4.65	14.56	0.32	16.00	32.00	3.44	1.90	0.82	0.4181762
0.6244	5.68	14.63	0.39	22.24	44.48	3.92	2.45	0.87	0.5201796
0.631	5.77	14.64	0.39	22.84	45.68	3.96	2.50	0.88	0.5294524
0.667	6.27	14.67	0.43	26.22	52.44	4.18	2.79	0.90	0.5803041

For water depths greater than 0.667 ft but less than 0.847 ft
Y3= Y - 0.667
A4= A3 + 14 * Y3 + 25 * Y3^2
P4= P3 + SQRT(2501 * Y3^2)

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.7	6.76	16.32	0.41	27.68	55.36	4.09	2.87	0.86	0.5724401
0.72	7.09	17.32	0.41	28.75	57.51	4.06	2.92	0.84	0.5706555
0.74	7.43	18.32	0.41	29.97	59.94	4.03	2.99	0.83	0.570741
0.76	7.79	19.32	0.40	31.32	62.64	4.02	3.06	0.81	0.5724519
0.78	8.17	20.32	0.40	32.80	65.61	4.01	3.13	0.80	0.5755864
0.8	8.58	21.32	0.40	34.42	68.85	4.01	3.21	0.79	0.579977
0.847	9.60	23.68	0.41	38.76	77.51	4.04	3.42	0.77	0.5944767

Street Capacity Calculations

AP-11

DI's # 8&9

Slope= 0.0287

For water depths less than 0.125 feet

Y= Water depth

Area = 8*Y^2

P= SQRT(257*Y^2) + Y

n= 0.017

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.01	0.00	0.17	0.00	0.00	0.00	0.42	0.00	0.73	0.0064956
0.02	0.00	0.34	0.01	0.00	0.00	0.66	0.01	0.82	0.0152982
0.04	0.01	0.68	0.02	0.01	0.03	1.05	0.04	0.92	0.0358696
0.06	0.03	1.02	0.03	0.04	0.08	1.37	0.08	0.99	0.0589342
0.08	0.05	1.36	0.04	0.09	0.17	1.66	0.13	1.04	0.0837541
0.1	0.08	1.70	0.05	0.15	0.31	1.93	0.19	1.07	0.1099517
0.12	0.12	2.04	0.06	0.25	0.50	2.18	0.26	1.11	0.1372933
0.125	0.13	2.13	0.06	0.28	0.56	2.24	0.28	1.12	0.1442875

For water depths greater than 0.125 ft but less than 0.365 ft

Y1= Y-0.125

A2= A1 + 2*Y1 + 25*Y1^2

P2= P1 + SQRT(2501*Y1^2)+Y1

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.13	0.14	2.38	0.06	0.30	0.59	2.19	0.28	1.07	0.1422877
0.16	0.23	3.91	0.06	0.50	1.00	2.21	0.35	0.97	0.1543612
0.2	0.42	5.95	0.07	1.04	2.09	2.51	0.50	0.99	0.1971302
0.24	0.69	8.00	0.09	1.97	3.95	2.88	0.69	1.04	0.2515125
0.2804	1.04	10.06	0.10	3.39	6.78	3.26	0.91	1.09	0.3125153
0.303	1.27	11.21	0.11	4.42	8.84	3.47	1.05	1.11	0.3484644
0.3551	1.91	13.87	0.14	7.54	15.07	3.95	1.40	1.17	0.4350797
0.365	2.05	14.37	0.14	8.25	16.51	4.04	1.47	1.18	0.4520387

For water depths greater than 0.365 ft but less than 0.667 ft

Y2= Y - 0.365

A3= A2 + Y2*14

P3= P2 + Y2

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.3864	2.34	14.39	0.16	10.36	20.71	4.42	1.71	1.25	0.5178315
0.4274	2.92	14.43	0.20	14.89	29.78	5.10	2.18	1.38	0.6445453 ← DI 8&9
0.4553	3.31	14.46	0.23	18.33	36.67	5.54	2.52	1.45	0.7314066
0.5205	4.22	14.53	0.29	27.43	54.86	6.50	3.38	1.59	0.936649
0.551	4.65	14.56	0.32	32.17	64.33	6.92	3.81	1.64	1.0337634
0.6244	5.68	14.63	0.39	44.72	89.44	7.88	4.92	1.76	1.2702582
0.631	5.77	14.64	0.39	45.92	91.85	7.96	5.02	1.77	1.2917082
0.667	6.27	14.67	0.43	52.72	105.43	8.40	5.61	1.81	1.4092188

For water depths greater than 0.667 ft but less than 0.847 ft

Y3= Y - 0.667

A4= A3 + 14 * Y3 + 25 * Y3^2

P4= P3 + SQRT(2501 * Y3^2)

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.7	6.76	16.32	0.41	55.65	111.30	8.23	5.76	1.73	1.4012453
0.72	7.09	17.32	0.41	57.81	115.62	8.16	5.87	1.69	1.4026114
0.74	7.43	18.32	0.41	60.25	120.50	8.11	6.00	1.66	1.4078876
0.76	7.79	19.32	0.40	62.97	125.94	8.08	6.14	1.63	1.4165767
0.78	8.17	20.32	0.40	65.95	131.91	8.07	6.29	1.61	1.4282676
0.8	8.58	21.32	0.40	69.21	138.42	8.07	6.46	1.59	1.4426169
0.847	9.60	23.68	0.41	77.92	155.84	8.11	6.87	1.55	1.4852318

Street Capacity Calculations

AP-11

28' F-F Street Section with 8" curb

Slope= 0.0287

For water depths less than 0.125 feet

Y= Water depth

Area = 8*Y^2

P= SQRT(257*Y^2) + Y

n= 0.017

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.01	0.00	0.17	0.00	0.00	0.00	0.42	0.00	0.73	0.0064956
0.02	0.00	0.34	0.01	0.00	0.00	0.66	0.01	0.82	0.0152982
0.04	0.01	0.68	0.02	0.01	0.03	1.05	0.04	0.92	0.0358696
0.06	0.03	1.02	0.03	0.04	0.08	1.37	0.08	0.99	0.0589342
0.08	0.05	1.36	0.04	0.09	0.17	1.66	0.13	1.04	0.0837541
0.1	0.08	1.70	0.05	0.15	0.31	1.93	0.19	1.07	0.1099517
0.12	0.12	2.04	0.06	0.25	0.50	2.18	0.26	1.11	0.1372933
0.125	0.13	2.13	0.06	0.28	0.56	2.24	0.28	1.12	0.1442875

For water depths greater than 0.125 ft but less than 0.365 ft

Y1= Y-0.125

A2= A1 + 2*Y1 + 25*Y1^2

P2= P1 + SQRT(2501*Y1^2)+Y1

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.13	0.14	2.38	0.06	0.30	0.59	2.19	0.28	1.07	0.1422877
0.16	0.23	3.91	0.06	0.50	1.00	2.21	0.35	0.97	0.1543612
0.2	0.42	5.95	0.07	1.04	2.09	2.51	0.50	0.99	0.1971302
0.24	0.69	8.00	0.09	1.97	3.95	2.88	0.69	1.04	0.2515125
0.2804	1.04	10.06	0.10	3.39	6.78	3.26	0.91	1.09	0.3125153
0.303	1.27	11.21	0.11	4.42	8.84	3.47	1.05	1.11	0.3484644
0.3551	1.91	13.87	0.14	7.54	15.07	3.95	1.40	1.17	0.4350797
0.365	2.05	14.37	0.14	8.25	16.51	4.04	1.47	1.18	0.4520387

For water depths greater than 0.365 ft but less than 0.667 ft

Y2= Y - 0.365

A3= A2 + Y2*14

P3= P2 + Y2

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.3864	2.34	14.39	0.16	10.36	20.71	4.42	1.71	1.25	0.5178315
0.435	**3.03**	**14.44**	**0.21**	**15.80**	**31.60**	**5.22**	**2.27**	**1.40**	**0.6681518**
0.4553	3.31	14.46	0.23	18.33	36.67	5.54	2.52	1.45	0.7314066
0.5205	4.22	14.53	0.29	27.43	54.86	6.50	3.38	1.59	0.936649
0.551	4.65	14.56	0.32	32.17	64.33	6.92	3.81	1.64	1.0337634
0.6244	5.68	14.63	0.39	44.72	89.44	7.88	4.92	1.76	1.2702582
0.631	5.77	14.64	0.39	45.92	91.85	7.96	5.02	1.77	1.2917082
0.667	6.27	14.67	0.43	52.72	105.43	8.40	5.61	1.81	1.4092188

STREET CAPACITY

For water depths greater than 0.667 ft but less than 0.847 ft

Y3= Y - 0.667

A4= A3 + 14 * Y3 + 25 * Y3^2

P4= P3 + SQRT(2501 * Y3^2)

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.7	6.76	16.32	0.41	55.65	111.30	8.23	5.76	1.73	1.4012453
0.72	7.09	17.32	0.41	57.81	115.62	8.16	5.87	1.69	1.4026114
0.74	7.43	18.32	0.41	60.25	120.50	8.11	6.00	1.66	1.4078876
0.76	7.79	19.32	0.40	62.97	125.94	8.08	6.14	1.63	1.4165767
0.78	8.17	20.32	0.40	65.95	131.91	8.07	6.29	1.61	1.4282676
0.8	8.58	21.32	0.40	69.21	138.42	8.07	6.46	1.59	1.4426169
0.847	9.60	23.68	0.41	77.92	155.84	8.11	6.87	1.55	1.4852318

Street Capacity Calculations

AP16

28' F-F Street Section with 8" curb

Slope= 0.0075

For water depths less than 0.125 feet

Y= Water depth

Area = 8*Y^2

P= SQRT(257*Y^2) + Y

n= 0.017

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.01	0.00	0.17	0.00	0.00	0.00	0.21	0.00	0.37	0.0022802
0.02	0.00	0.34	0.01	0.00	0.00	0.34	0.01	0.42	0.0055279
0.04	0.01	0.68	0.02	0.01	0.01	0.54	0.02	0.47	0.0133342
0.06	0.03	1.02	0.03	0.02	0.04	0.70	0.04	0.50	0.0222656
0.08	0.05	1.36	0.04	0.04	0.09	0.85	0.07	0.53	0.0320005
0.1	0.08	1.70	0.05	0.08	0.16	0.99	0.10	0.55	0.0423718
0.12	0.12	2.04	0.06	0.13	0.26	1.11	0.13	0.57	0.0532748
0.125	0.13	2.13	0.06	0.14	0.29	1.14	0.14	0.57	0.0560746

For water depths greater than 0.125 ft but less than 0.365 ft

Y1= Y-0.125

A2= A1 + 2*Y1 + 25*Y1^2

P2= P1 + SQRT(2501*Y1^2)+Y1

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.13	0.14	2.38	0.06	0.15	0.30	1.12	0.15	0.55	0.0547895
0.16	0.23	3.91	0.06	0.25	0.51	1.13	0.18	0.50	0.0581332
0.2	0.42	5.95	0.07	0.53	1.07	1.28	0.26	0.51	0.0745225
0.24	0.69	8.00	0.09	1.01	2.02	1.47	0.35	0.53	0.096114
0.2804	1.04	10.06	0.10	1.73	3.47	1.67	0.47	0.55	0.1207178
0.303	1.27	11.21	0.11	2.26	4.52	1.78	0.54	0.57	0.1353379
0.3551	1.91	13.87	0.14	3.85	7.71	2.02	0.72	0.60	0.1708246
0.365	2.05	14.37	0.14	4.22	8.44	2.06	0.75	0.60	0.177808

For water depths greater than 0.365 ft but less than 0.667 ft

Y2= Y - 0.365

A3= A2 + Y2*14

P3= P2 + Y2

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.3999	2.53	14.41	0.18	6.02	12.04	2.38	0.95	0.66	0.2245882
0.409	2.66	14.42	0.18	6.53	13.06	2.45	1.00	0.68	0.2368985
0.44	3.10	14.45	0.21	8.39	16.78	2.71	1.19	0.72	0.2791698
0.53	4.36	14.54	0.30	14.76	29.52	3.39	1.80	0.82	0.4046293
0.542	4.52	14.55	0.31	15.71	31.43	3.47	1.88	0.83	0.4216424
0.6244	5.68	14.63	0.39	22.86	45.72	4.03	2.51	0.90	0.5400903
0.631	5.77	14.64	0.39	23.48	46.95	4.07	2.57	0.90	0.549693
0.667	**6.27**	**14.67**	**0.43**	**26.95**	**53.90**	**4.30**	**2.87**	**0.93**	**0.6023506**

← CAPACITY = 53.9 cfs

For water depths greater than 0.667 ft but less than 0.847 ft

Y3= Y - 0.667

A4= A3 + 14 * Y3 + 25 * Y3^2

P4= P3 + SQRT(2501 * Y3^2)

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.7	6.76	16.32	0.41	28.45	56.89	4.21	2.94	0.89	0.5944216
0.72	7.09	17.32	0.41	29.55	59.10	4.17	3.00	0.87	0.5926876
0.74	7.43	18.32	0.41	30.80	61.60	4.15	3.07	0.85	0.592881
0.76	7.79	19.32	0.40	32.19	64.38	4.13	3.14	0.84	0.5947498
0.78	8.17	20.32	0.40	33.72	67.43	4.12	3.22	0.82	0.5980867
0.8	8.58	21.32	0.40	35.38	70.76	4.12	3.30	0.81	0.6027189
0.847	9.60	23.68	0.41	39.83	79.67	4.15	3.51	0.79	0.6179192

Street Capacity Calculations

DI's # 1 thru #6

28' F-F Street Section with 8" curb

Slope= 0.0162

For water depths less than 0.125 feet

Y= Water depth

Area = 8*Y^2

P= SQRT(257*Y^2) + Y

n= 0.017

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.01	0.00	0.17	0.00	0.00	0.00	0.31	0.00	0.55	0.0042456
0.02	0.00	0.34	0.01	0.00	0.00	0.50	0.01	0.62	0.0101198
0.04	0.01	0.68	0.02	0.01	0.02	0.79	0.03	0.69	0.0240015
0.06	0.03	1.02	0.03	0.03	0.06	1.03	0.06	0.74	0.0396884
0.08	0.05	1.36	0.04	0.06	0.13	1.25	0.10	0.78	0.056652
0.1	0.08	1.70	0.05	0.12	0.23	1.45	0.14	0.81	0.0746206
0.12	0.12	2.04	0.06	0.19	0.38	1.64	0.20	0.83	0.0934254
0.125	0.13	2.13	0.06	0.21	0.42	1.68	0.21	0.84	0.0982428

For water depths greater than 0.125 ft but less than 0.365 ft

Y1= Y-0.125

A2= A1 + 2*Y1 + 25*Y1^2

P2= P1 + SQRT(2501*Y1^2)+Y1

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.13	0.14	2.38	0.06	0.22	0.45	1.65	0.21	0.80	0.0965363
0.16	0.23	3.91	0.06	0.37	0.75	1.66	0.27	0.73	0.1038219
0.2	0.42	5.95	0.07	0.78	1.57	1.89	0.38	0.74	0.1327864
0.24	0.69	8.00	0.09	1.48	2.97	2.16	0.52	0.78	0.1701369
0.2804	1.04	10.06	0.10	2.55	5.09	2.45	0.69	0.82	0.2122879
0.303	1.27	11.21	0.11	3.32	6.64	2.61	0.79	0.84	0.2372049
0.3551	1.91	13.87	0.14	5.66	11.32	2.97	1.05	0.88	0.297403
0.365	2.05	14.37	0.14	6.20	12.40	3.03	1.11	0.88	0.3092113

For water depths greater than 0.365 ft but less than 0.667 ft

Y2= Y - 0.365

A3= A2 + Y2*14

P3= P2 + Y2

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)	
0.3864	2.34	14.39	0.16	7.78	15.56	3.32	1.28	0.94	0.3560074	← DI's # 5 & 6
0.409	2.66	14.42	0.18	9.60	19.20	3.61	1.48	0.99	0.4056861	
0.4553	3.31	14.46	0.23	13.77	27.55	4.16	1.90	1.09	0.5083908	← DI's # 3 & 4
0.5205	**4.22**	**14.53**	**0.29**	**20.61**	**41.22**	**4.88**	**2.54**	**1.19**	**0.6552422**	← DI's # 1 & 2
0.551	4.65	14.56	0.32	24.17	48.33	5.20	2.86	1.23	0.7248191	
0.6244	5.68	14.63	0.39	33.60	67.19	5.92	3.70	1.32	0.8944306	
0.631	5.77	14.64	0.39	34.50	69.01	5.98	3.77	1.33	0.9098247	
0.667	6.27	14.67	0.43	39.61	79.21	6.31	4.21	1.36	0.9941842	

For water depths greater than 0.667 ft but less than 0.847 ft

Y3= Y - 0.667

A4= A3 + 14 * Y3 + 25 * Y3^2

P4= P3 + SQRT(2501 * Y3^2)

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.7	6.76	16.32	0.41	41.81	83.62	6.18	4.33	1.30	0.9858418
0.72	7.09	17.32	0.41	43.43	86.87	6.13	4.41	1.27	0.9854031
0.74	7.43	18.32	0.41	45.27	90.54	6.09	4.51	1.25	0.9878726
0.76	7.79	19.32	0.40	47.31	94.62	6.07	4.61	1.23	0.9928774
0.78	8.17	20.32	0.40	49.55	99.10	6.06	4.73	1.21	1.0001097
0.8	8.58	21.32	0.40	52.00	104.00	6.06	4.85	1.19	1.0093125
0.847	9.60	23.68	0.41	58.54	117.09	6.10	5.16	1.17	1.0375229

Street Capacity Calculations

AP17

28' F-F Street Section with 8" curb

Slope= 0.0153

For water depths less than 0.125 feet

Y= Water depth

Area = 8*Y^2

P= SQRT(257*Y^2) + Y

n= 0.017

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.01	0.00	0.17	0.00	0.00	0.00	0.30	0.00	0.53	0.0040621
0.02	0.00	0.34	0.01	0.00	0.00	0.48	0.01	0.60	0.0096945
0.04	0.01	0.68	0.02	0.01	0.02	0.76	0.03	0.67	0.0230208
0.06	0.03	1.02	0.03	0.03	0.06	1.00	0.06	0.72	0.038093
0.08	0.05	1.36	0.04	0.06	0.12	1.21	0.10	0.76	0.0544008
0.1	0.08	1.70	0.05	0.11	0.23	1.41	0.14	0.78	0.0716815
0.12	0.12	2.04	0.06	0.18	0.37	1.59	0.19	0.81	0.0897718
0.125	0.13	2.13	0.06	0.20	0.41	1.63	0.20	0.81	0.094407

For water depths greater than 0.125 ft but less than 0.365 ft

Y1= Y-0.125

A2= A1 + 2*Y1 + 25*Y1^2

P2= P1 + SQRT(2501*Y1^2)+Y1

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.13	0.14	2.38	0.06	0.22	0.43	1.60	0.21	0.78	0.0927309
0.16	0.23	3.91	0.06	0.36	0.73	1.61	0.26	0.71	0.0996352
0.2	0.42	5.95	0.07	0.76	1.52	1.83	0.37	0.72	0.1274523
0.24	0.69	8.00	0.09	1.44	2.88	2.10	0.50	0.76	0.1633774
0.2804	1.04	10.06	0.10	2.48	4.95	2.38	0.67	0.79	0.2039468
0.303	1.27	11.21	0.11	3.23	6.46	2.54	0.77	0.81	0.2279373
0.3551	1.91	13.87	0.14	5.50	11.01	2.88	1.02	0.85	0.2859146
0.365	2.05	14.37	0.14	6.03	12.05	2.95	1.08	0.86	0.2972897

For water depths greater than 0.365 ft but less than 0.667 ft

Y2= Y - 0.365

A3= A2 + Y2*14

P3= P2 + Y2

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.3999	2.53	14.41	0.18	8.60	17.20	3.39	1.36	0.95	0.3710978
0.409	2.66	14.42	0.18	9.33	18.66	3.51	1.43	0.97	0.39045
0.44	3.10	14.45	0.21	11.98	23.96	3.87	1.70	1.03	0.4567361
0.53	4.36	14.54	0.30	21.08	42.17	4.84	2.57	1.17	0.6524469
0.542	**4.52**	**14.55**	**0.31**	**22.44**	**44.89**	**4.96**	**2.69**	**1.19**	**0.6789044**
0.6244	5.68	14.63	0.39	32.65	65.30	5.75	3.59	1.28	0.8627408
0.631	5.77	14.64	0.39	33.53	67.06	5.81	3.67	1.29	0.8776213
0.667	6.27	14.67	0.43	38.49	76.98	6.14	4.09	1.32	0.9591694

← CAPACITY = 44.89cfs

For water depths greater than 0.667 ft but less than 0.847 ft

Y3= Y - 0.667

A4= A3 + 14 * Y3 + 25 * Y3^2

P4= P3 + SQRT(2501 * Y3^2)

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.7	6.76	16.32	0.41	40.63	81.26	6.01	4.21	1.27	0.9508234
0.72	7.09	17.32	0.41	42.21	84.42	5.96	4.29	1.24	0.9502473
0.74	7.43	18.32	0.41	43.99	87.98	5.92	4.38	1.21	0.9524935
0.76	7.79	19.32	0.40	45.98	91.95	5.90	4.48	1.19	0.9572
0.78	8.17	20.32	0.40	48.16	96.31	5.89	4.60	1.18	0.9640676
0.8	8.58	21.32	0.40	50.53	101.07	5.89	4.71	1.16	0.9728468
0.847	9.60	23.68	0.41	56.89	113.79	5.92	5.02	1.13	0.9998635

Street Capacity Calculations

AP18

28' F-F Street Section with 8" curb

Slope= 0.0195

For water depths less than 0.125 feet

Y= Water depth

Area = 8*Y^2

P= SQRT(257*Y^2) + Y

n= 0.017

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.01	0.00	0.17	0.00	0.00	0.00	0.34	0.00	0.60	0.0048895
0.02	0.00	0.34	0.01	0.00	0.00	0.54	0.01	0.68	0.0116078
0.04	0.01	0.68	0.02	0.01	0.02	0.86	0.03	0.76	0.0274241
0.06	0.03	1.02	0.03	0.03	0.07	1.13	0.07	0.81	0.045249
0.08	0.05	1.36	0.04	0.07	0.14	1.37	0.11	0.85	0.0644921
0.1	0.08	1.70	0.05	0.13	0.25	1.59	0.16	0.89	0.0848504
0.12	0.12	2.04	0.06	0.21	0.41	1.79	0.22	0.91	0.1061357
0.125	0.13	2.13	0.06	0.23	0.46	1.84	0.23	0.92	0.1115858

For water depths greater than 0.125 ft but less than 0.365 ft

Y1= Y-0.125

A2= A1 + 2*Y1 + 25*Y1^2

P2= P1 + SQRT(2501*Y1^2)+Y1

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.13	0.14	2.38	0.06	0.24	0.49	1.81	0.23	0.88	0.1097821
0.16	0.23	3.91	0.06	0.41	0.82	1.82	0.29	0.80	0.1184189
0.2	0.42	5.95	0.07	0.86	1.72	2.07	0.41	0.82	0.1513784
0.24	0.69	8.00	0.09	1.63	3.25	2.37	0.57	0.85	0.1936777
0.2804	1.04	10.06	0.10	2.79	5.59	2.69	0.75	0.89	0.2413146
0.303	1.27	11.21	0.11	3.64	7.29	2.86	0.87	0.92	0.2694441
0.3551	1.91	13.87	0.14	6.21	12.42	3.25	1.16	0.96	0.3373387
0.365	2.05	14.37	0.14	6.80	13.61	3.33	1.21	0.97	0.3506481

For water depths greater than 0.365 ft but less than 0.667 ft

Y2= Y - 0.365

A3= A2 + Y2*14

P3= P2 + Y2

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.3999	2.53	14.41	0.18	9.71	19.42	3.83	1.53	1.07	0.4361609
0.409	2.66	14.42	0.18	10.53	21.06	3.96	1.62	1.09	0.458563
0.44	3.10	14.45	0.21	13.53	27.05	4.37	1.92	1.16	0.5352504
0.495	**3.87**	**14.50**	**0.27**	**20.53**	**41.06**	**5.31**	**2.63**	**1.33**	**0.6734209**
0.542	4.52	14.55	0.31	25.34	50.67	5.60	3.04	1.34	0.7919456
0.6244	5.68	14.63	0.39	36.86	73.72	6.49	4.05	1.45	1.0041155
0.631	5.77	14.64	0.39	37.85	75.71	6.56	4.14	1.46	1.021283
0.667	6.27	14.67	0.43	43.45	86.91	6.93	4.62	1.49	1.1153501

← CAPACITY = 41.06 CFS

For water depths greater than 0.667 ft but less than 0.847 ft

Y3= Y - 0.667

A4= A3 + 14 * Y3 + 25 * Y3^2

P4= P3 + SQRT(2501 * Y3^2)

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.7	6.76	16.32	0.41	45.87	91.74	6.78	4.75	1.43	1.1070599
0.72	7.09	17.32	0.41	47.65	95.30	6.73	4.84	1.40	1.1071181
0.74	7.43	18.32	0.41	49.66	99.33	6.69	4.95	1.37	1.1103795
0.76	7.79	19.32	0.40	51.90	103.81	6.66	5.06	1.35	1.1164347
0.78	8.17	20.32	0.40	54.36	108.73	6.65	5.19	1.33	1.1249454
0.8	8.58	21.32	0.40	57.05	114.10	6.65	5.32	1.31	1.1356294
0.847	9.60	23.68	0.41	64.23	128.46	6.69	5.67	1.28	1.1680013

Street Capacity Calculations

AP19

28' F-F Street Section with 8" curb

Slope= 0.0162

For water depths less than 0.125 feet

Y= Water depth

Area = 8*Y^2

P= SQRT(257*Y^2) + Y

n= 0.017

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.01	0.00	0.17	0.00	0.00	0.00	0.31	0.00	0.55	0.0042456
0.02	0.00	0.34	0.01	0.00	0.00	0.50	0.01	0.62	0.0101198
0.04	0.01	0.68	0.02	0.01	0.02	0.79	0.03	0.69	0.0240015
0.06	0.03	1.02	0.03	0.03	0.06	1.03	0.06	0.74	0.0396884
0.08	0.05	1.36	0.04	0.06	0.13	1.25	0.10	0.78	0.056652
0.1	0.08	1.70	0.05	0.12	0.23	1.45	0.14	0.81	0.0746206
0.12	0.12	2.04	0.06	0.19	0.38	1.64	0.20	0.83	0.0934254
0.125	0.13	2.13	0.06	0.21	0.42	1.68	0.21	0.84	0.0982428

For water depths greater than 0.125 ft but less than 0.365 ft

Y1= Y-0.125

A2= A1 + 2*Y1 + 25*Y1^2

P2= P1 + SQRT(2501*Y1^2)+Y1

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.13	0.14	2.38	0.06	0.22	0.45	1.65	0.21	0.80	0.0965363
0.16	0.23	3.91	0.06	0.37	0.75	1.66	0.27	0.73	0.1038219
0.2	0.42	5.95	0.07	0.78	1.57	1.89	0.38	0.74	0.1327864
0.24	0.69	8.00	0.09	1.48	2.97	2.16	0.52	0.78	0.1701369
0.2804	1.04	10.06	0.10	2.55	5.09	2.45	0.69	0.82	0.2122879
0.303	1.27	11.21	0.11	3.32	6.64	2.61	0.79	0.84	0.2372049
0.3551	1.91	13.87	0.14	5.66	11.32	2.97	1.05	0.88	0.297403
0.365	2.05	14.37	0.14	6.20	12.40	3.03	1.11	0.88	0.3092113

For water depths greater than 0.365 ft but less than 0.667 ft

Y2= Y - 0.365

A3= A2 + Y2*14

P3= P2 + Y2

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.3999	2.53	14.41	0.18	8.85	17.70	3.49	1.40	0.97	0.3856487
0.409	2.66	14.42	0.18	9.60	19.20	3.61	1.48	0.99	0.4056861
0.44	3.10	14.45	0.21	12.33	24.66	3.98	1.75	1.06	0.4743084
0.53	**4.36**	**14.54**	**0.30**	**21.69**	**43.39**	**4.98**	**2.64**	**1.21**	**0.6768547**
0.542	4.52	14.55	0.31	23.09	46.19	5.11	2.77	1.22	0.7042312
0.6244	5.68	14.63	0.39	33.60	67.19	5.92	3.70	1.32	0.8944306
0.631	5.77	14.64	0.39	34.50	69.01	5.98	3.77	1.33	0.9098247
0.667	6.27	14.67	0.43	39.61	79.21	6.31	4.21	1.36	0.9941842

← CAPACITY = 43.39 cfs

For water depths greater than 0.667 ft but less than 0.847 ft

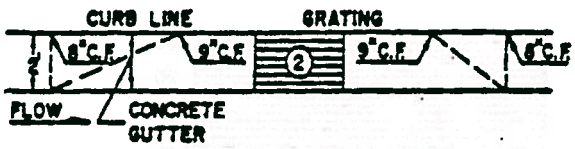
Y3= Y - 0.667

A4= A3 + 14 * Y3 + 25 * Y3^2

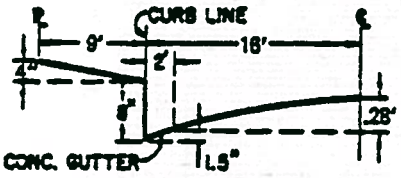
P4= P3 + SQRT(2501 * Y3^2)

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.7	6.76	16.32	0.41	41.81	83.62	6.18	4.33	1.30	0.9858418
0.72	7.09	17.32	0.41	43.43	86.87	6.13	4.41	1.27	0.9854031
0.74	7.43	18.32	0.41	45.27	90.54	6.09	4.51	1.25	0.9878726
0.76	7.79	19.32	0.40	47.31	94.62	6.07	4.61	1.23	0.9928774
0.78	8.17	20.32	0.40	49.55	99.10	6.06	4.73	1.21	1.0001097
0.8	8.58	21.32	0.40	52.00	104.00	6.06	4.85	1.19	1.0093125
0.847	9.60	23.68	0.41	58.54	117.09	6.10	5.16	1.17	1.0375229

GRATING CAPACITIES FOR TYPE "A" , "C" and "D"



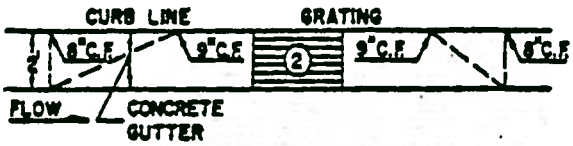
GRATING & GUTTER PLAN



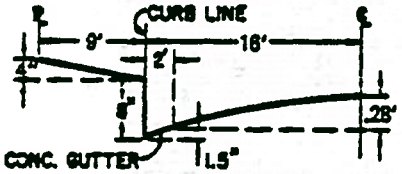
TYPICAL HALF STREET SECTION
(ABOVE BASIN)

PLATE 22.3 D-5

GRATING CAPACITIES FOR TYPE 'A' , 'C' and 'D'



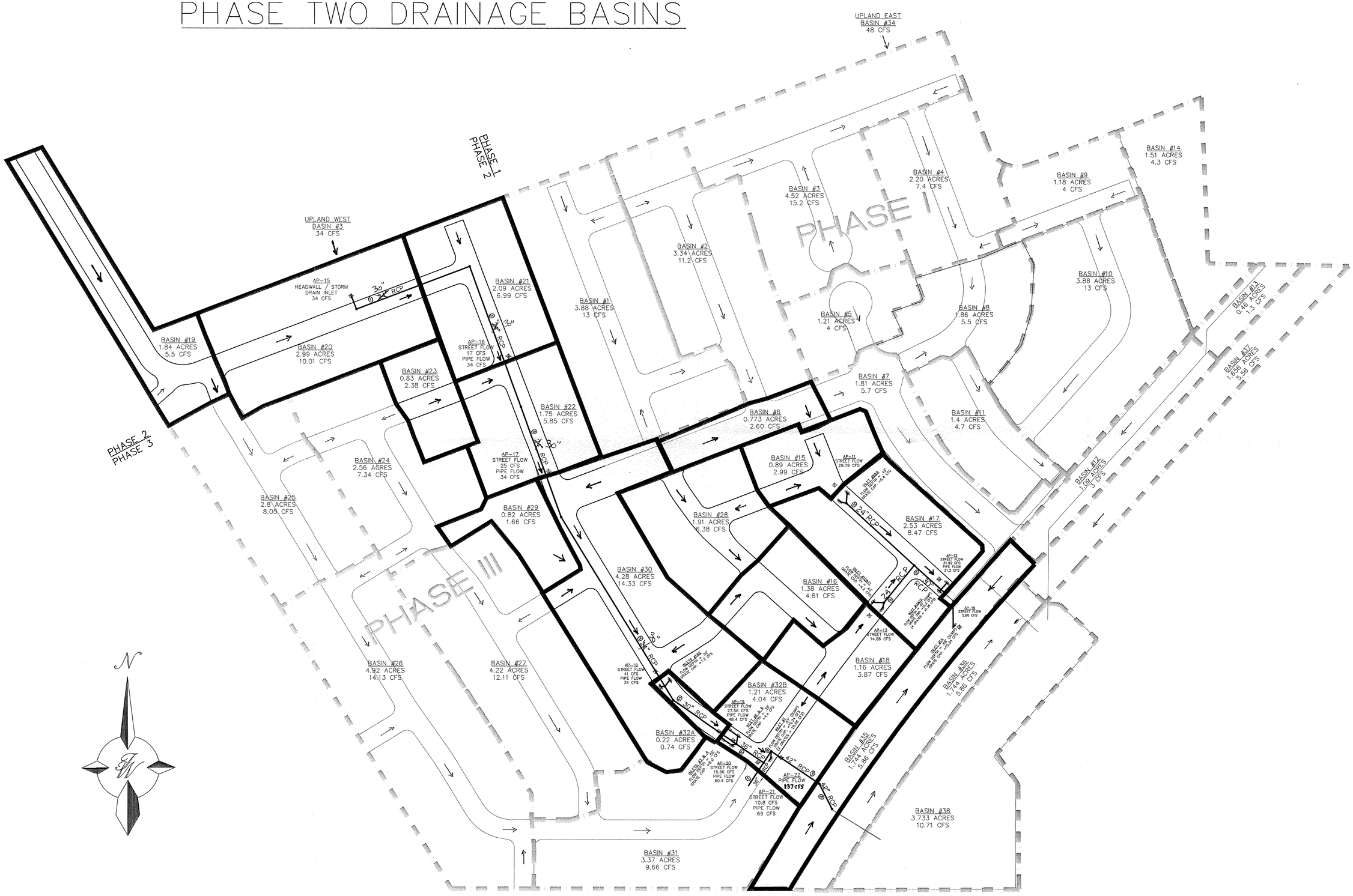
GRATING & GUTTER PLAN

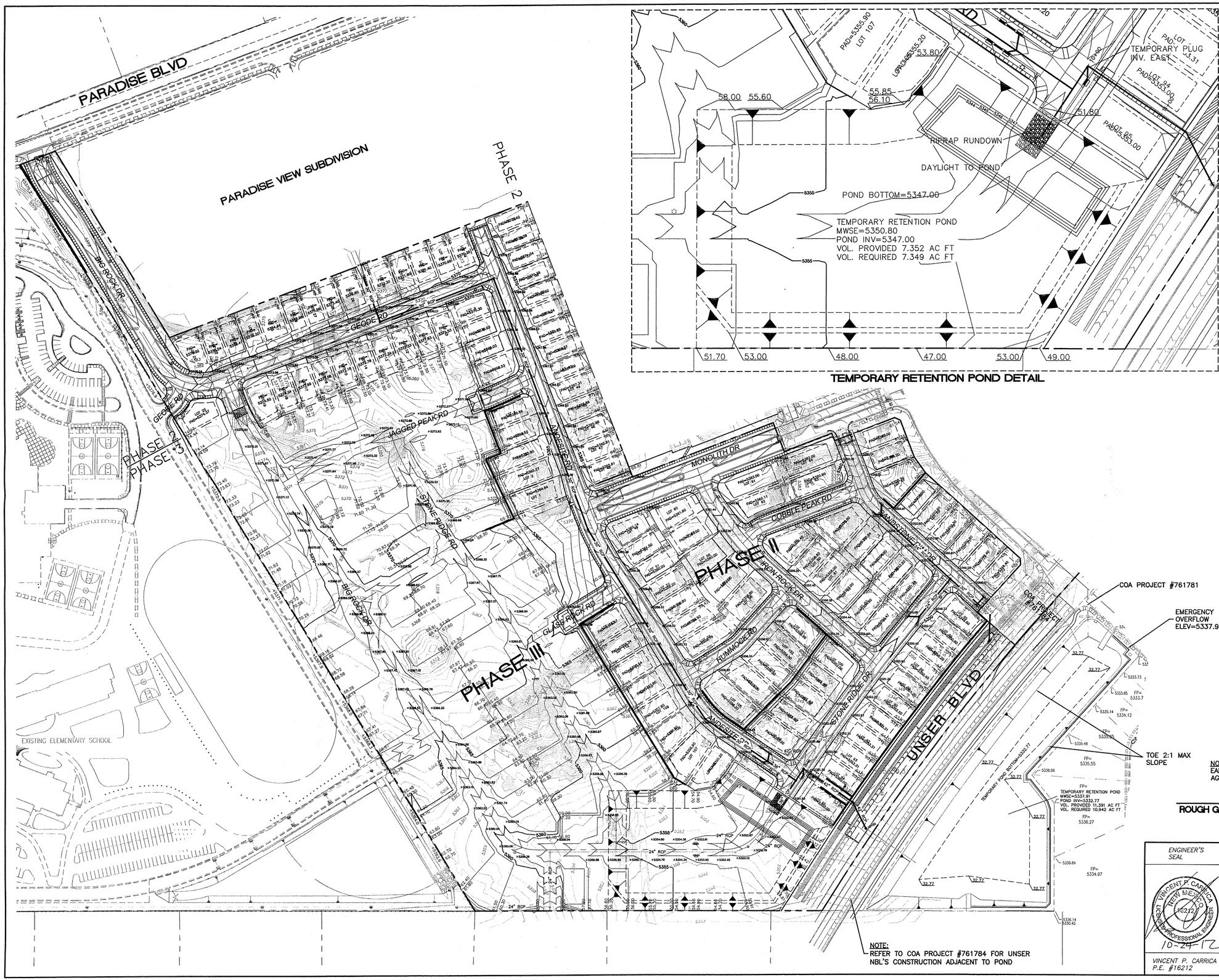


TYPICAL HALF STREET SECTION
(ABOVE BASIN)

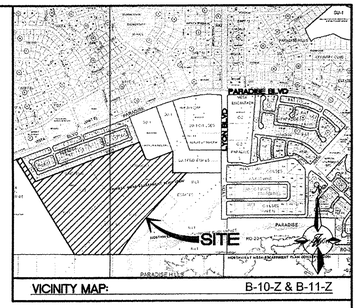
PLATE 22.3 D-5

THE BOULDERS SUBDIVISION
PHASE TWO DRAINAGE BASINS





TEMPORARY RETENTION POND DETAIL



VICINITY MAP: B-10-Z & B-11-Z

N

GRAPHIC SCALE

100 0 50 100

(IN FEET)
1 inch = 100 ft.

LEGEND

- CURB & GUTTER
- BOUNDARY LINE
- EASEMENT
- CENTERLINE
- RIGHT-OF-WAY
- BUILDING
- SIDEWALK
- RETAINING WALL
- SCREEN WALL
- 5010 CONTOUR MAJOR
- 5011 CONTOUR MINOR
- x 5048.25 SPOT ELEVATION
- FLOW ARROW
- EXISTING CURB & GUTTER
- EXISTING BOUNDARY LINE
- 5010 EXISTING CONTOUR MAJOR
- 5011 EXISTING CONTOUR MINOR
- x 5048.25 EXISTING SPOT ELEVATION
- DESILTING POND
- RIPRAP (D50=6")

NOTE:
EARTHEN SLOPES 3:1 OR LESS REQUIRES AGGREGATE SURFACING FOR EROSION PROTECTION

ROUGH GRADING APPROVAL DATE

ENGINEER'S SEAL

VINCENT P. CARRICA NEW MEXICO 16212 REGISTERED PROFESSIONAL ENGINEER

10-24-12

VINCENT P. CARRICA P.E. #16212

THE BOULDERS PHASE 2

GRADING AND DRAINAGE PLAN

TIERRA WEST, LLC
5571 MIDWAY PARK PLACE NE
ALBUQUERQUE, NM 87109
(505) 858-3100
tierrawestllc.com

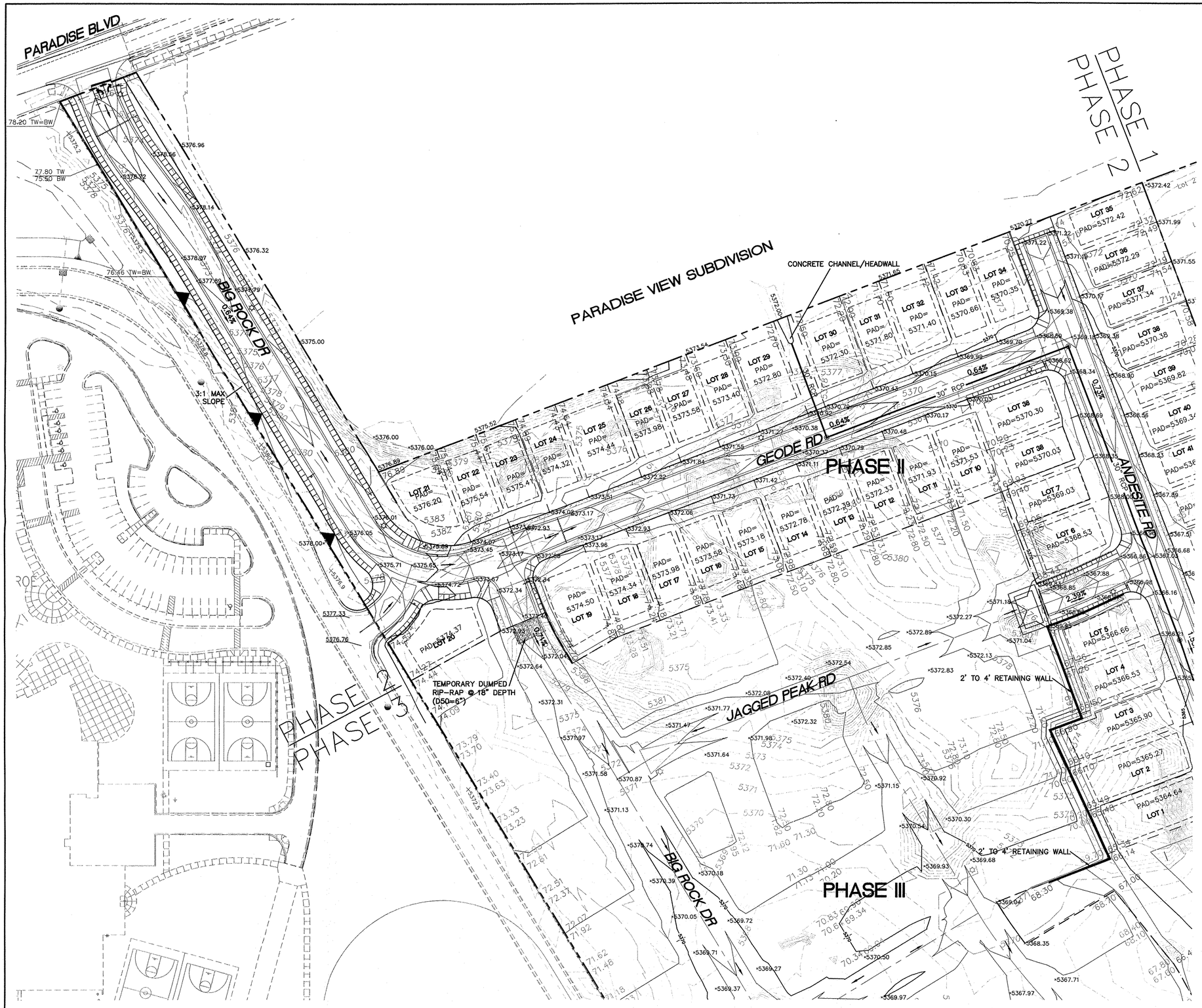
DRAWN BY: DY

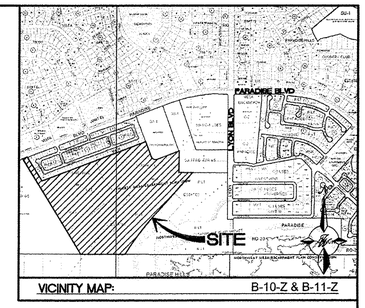
DATE: 9-06-12

DRAWING: OVERALL GRADING

SHEET #: 1

JOB #: 2011005





N

GRAPHIC SCALE

50 0 25 50

(IN FEET)
1 inch = 50 ft.

LEGEND

- CURB & GUTTER
- BOUNDARY LINE
- EASEMENT
- CENTERLINE
- RIGHT-OF-WAY
- BUILDING
- SIDEWALK
- RETAINING WALL
- SCREEN WALL
- 5010 CONTOUR MAJOR
- 5011 CONTOUR MINOR
- x 5048.25 SPOT ELEVATION
- FLOW ARROW
- EXISTING CURB & GUTTER
- EXISTING BOUNDARY LINE
- 5010 EXISTING CONTOUR MAJOR
- 5011 EXISTING CONTOUR MINOR
- x 5048.25 EXISTING SPOT ELEVATION
- DESILTING POND
- RIPRAP (D50=6")

NOTE:
EARTHEN SLOPES 3:1 OR LESS REQUIRES AGGREGATE SURFACING FOR EROSION PROTECTION

ROUGH GRADING APPROVAL DATE

ENGINEER'S SEAL

VINCENT P. CARRICA NEW MEXICO 16212 PROFESSIONAL ENGINEER

10-24-12

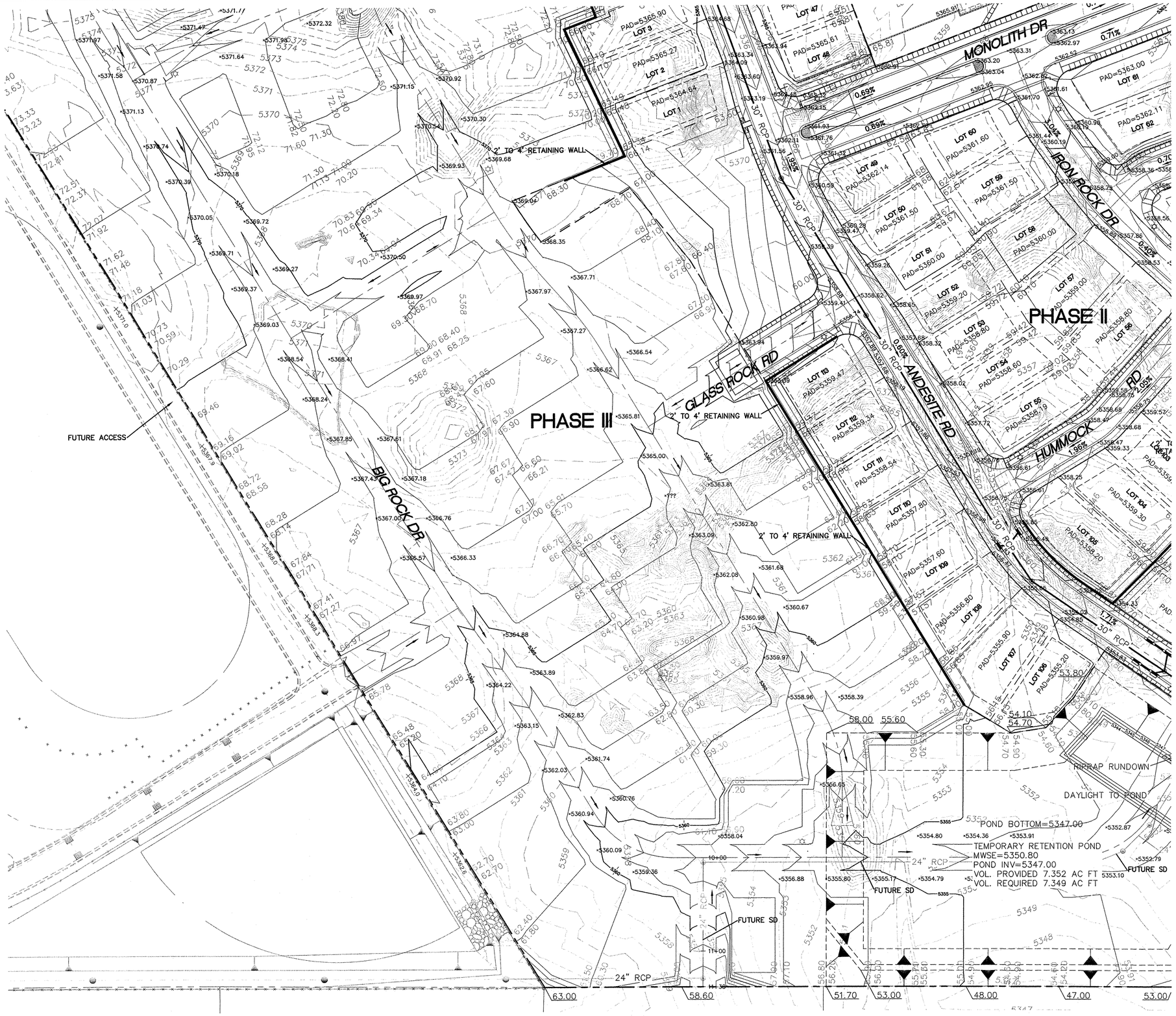
VINCENT P. CARRICA
P.E. #16212

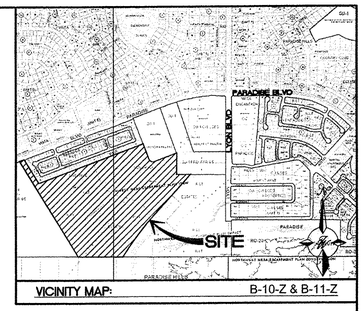
THE BOULDERS PHASE 2

GRADING AND DRAINAGE PLAN

TIERRA WEST, LLC
5571 MIDWAY PARK PLACE NE
ALBUQUERQUE, NM 87109
(505) 858-3100
tierrawestllc.com

DRAWN BY: DY
DATE: 9-06-12
DRAWING: OVERALL GRADING
SHEET #: 2
JOB #: 2011005





N

GRAPHIC SCALE

50 0 25 50

(IN FEET)
1 inch = 50 ft.

LEGEND

- CURB & GUTTER
- BOUNDARY LINE
- EASEMENT
- CENTERLINE
- RIGHT-OF-WAY
- BUILDING
- SIDEWALK
- RETAINING WALL
- SCREEN WALL
- 5010 CONTOUR MAJOR
- 5011 CONTOUR MINOR
- x 5048.25 SPOT ELEVATION
- FLOW ARROW
- EXISTING CURB & GUTTER
- EXISTING BOUNDARY LINE
- 5010 EXISTING CONTOUR MAJOR
- 5011 EXISTING CONTOUR MINOR
- x 5048.25 EXISTING SPOT ELEVATION
- DESILTING POND
- RIPRAP (D50=6")

NOTE:
EARTHEN SLOPES 3:1 OR LESS REQUIRES AGGREGATE SURFACING FOR EROSION PROTECTION

ROUGH GRADING APPROVAL DATE

ENGINEER'S SEAL

VINCENT P. CARRICA NEW MEXICO 16212 REGISTERED PROFESSIONAL ENGINEER

10-24-12

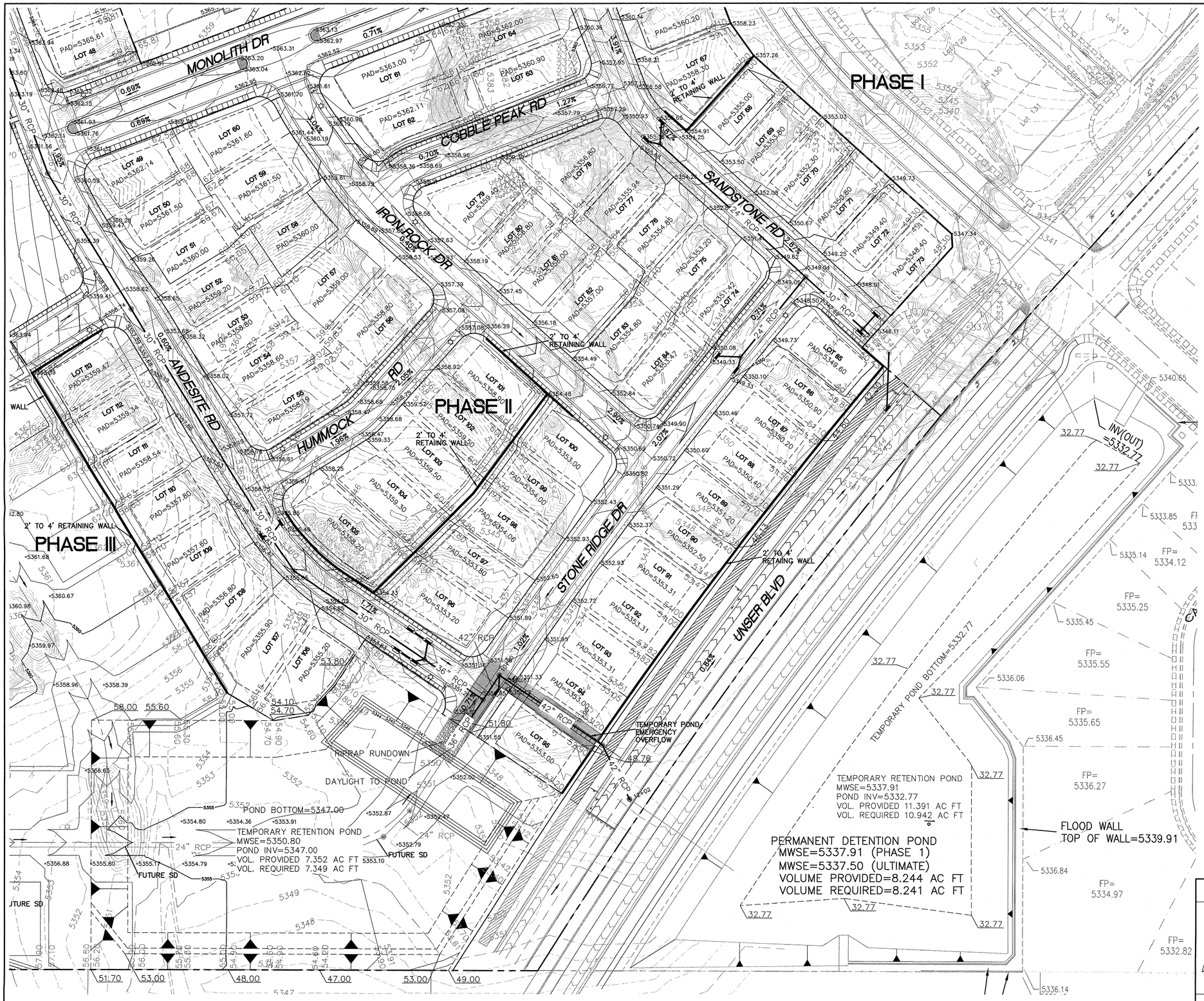
VINCENT P. CARRICA
P.E. #16212

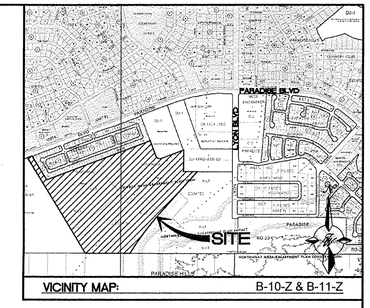
THE BOULDERS PHASE 2

GRADING AND DRAINAGE PLAN

TIERRA WEST, LLC
5571 MIDWAY PARK PLACE NE
ALBUQUERQUE, NM 87109
(505) 858-3100
tierrawestllc.com

DRAWN BY: DY
DATE: 9-06-12
DRAWING: OVERALL GRADING
SHEET #: 3
JOB #: 2011005





N

GRAPHIC SCALE

50 0 25 50

(IN FEET)
1 inch = 50 ft.

LEGEND

- CURB & GUTTER
- BOUNDARY LINE
- EASEMENT
- CENTERLINE
- RIGHT-OF-WAY
- BUILDING
- SIDEWALK
- RETAINING WALL
- SCREEN WALL
- 5010 CONTOUR MAJOR
- 5011 CONTOUR MINOR
- × 5048.25 SPOT ELEVATION
- FLOW ARROW
- EXISTING CURB & GUTTER
- EXISTING BOUNDARY LINE
- 5010 EXISTING CONTOUR MAJOR
- 5011 EXISTING CONTOUR MINOR
- × 5048.25 EXISTING SPOT ELEVATION
- DESILTING POND
- RIPRAP (D50=6")

NOTE:
EARTHEN SLOPES 3:1 OR LESS REQUIRES AGGREGATE SURFACING FOR EROSION PROTECTION

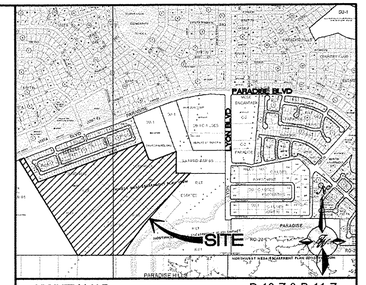
ROUGH GRADING APPROVAL DATE

ENGINEER'S SEAL
VINCENT P. CARRICA
NEW MEXICO
16212
PROFESSIONAL ENGINEER
10-24-12
VINCENT P. CARRICA
P.E. #16212

THE BOULDERS PHASE 2
GRADING AND DRAINAGE PLAN

TIERRA WEST, LLC
5571 MIDWAY PARK PLACE NE
ALBUQUERQUE, NM 87109
(505) 858-3100
tierrawestllc.com

DRAWN BY: DY
DATE: 9-06-12
DRAWING: OVERALL GRADING
SHEET #: 4
JOB #: 2011005



VICINITY MAP: B-10-Z & B-11-Z

N

GRAPHIC SCALE

50 0 25 50

(IN FEET)
1 inch = 50 ft.

LEGEND

- CURB & GUTTER
- BOUNDARY LINE
- EASEMENT
- CENTERLINE
- RIGHT-OF-WAY
- BUILDING
- SIDEWALK
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- SCREEN WALL
- 5010 CONTOUR MAJOR
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NOTE:
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ROUGH GRADING APPROVAL DATE

ENGINEER'S SEAL

VINCENT P. CARRICA
NEW MEXICO
16212
PROFESSIONAL ENGINEER

10-24-12

VINCENT P. CARRICA
P.E. #16212

THE BOULDERS PHASE 2

GRADING AND DRAINAGE PLAN

TIERRA WEST, LLC
5571 MIDWAY PARK PLACE NE
ALBUQUERQUE, NM 87109
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tierrawestllc.com

DRAWN BY: DY
DATE: 9-06-12
DRAWING: OVERALL GRADING
SHEET #: 5
JOB #: 2011005

PARADISE BLVD

PARADISE VIEW SUBDIVISION

PHASE 2

PHASE 3

PHASE II

PHASE III

78.20 TW=BW

77.80 TW
75.50 BW

79.29 TW=BW

78.98 TW=BW

BIG ROCK DR

GEODE RD

JAGGED PEAK RD

STONE RIDGE RD

ANDESITE RD

GLASS ROCK RD

MONOLITH DR

COBBLE PEAK RD

SANDSTONE RIDGE DR

IRON ROCK DR

HUMMOCK RD

UNSER BLVD

EXISTING ELEMENTARY SCHOOL

68.30 TW
66.50 BW

69.91 TW
67.21 BW

71.70 TW
66.90 BW

69.30 TW
66.00 BW

69.70 TW
64.54 BW

69.80 TW
68.30 BW

60.97 TW
59.47 BW

65.17 TW
59.37 BW

63.90 TW
55.96 BW

51.00 TW
55.10 BW

58.40 TW
56.40 BW

56.15 TW
54.70 BW

58.20 TW
56.00 BW

57.33 TW
55.83 BW

57.89 TW
54.89 BW

59.80 TW
58.30 BW

60.27 TW
55.20 BW

59.01 TW
54.51 BW

58.10 TW
56.60 BW

58.58 TW
54.30 BW

58.90 TW
53.70 BW

52.09 TW
BW

57.00 TW
BW

53.51 TW
47.63 BW

53.20 TW
48.76 BW

52.90 TW
48.76 BW

53.20 TW
53.46 BW

49.90 TW
48.56 BW

50.20 TW
42.30 BW

50.40 TW
42.30 BW

51.20 TW
44.88 BW

51.20 TW
44.88 BW

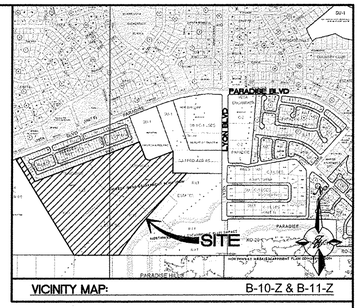
52.40 TW
46.13 BW

10+00

11+00

11+36

10' 00"



VICINITY MAP: B-10-Z & B-11-Z

N

GRAPHIC SCALE

100 0 50 100

(IN FEET)
1 inch = 100 ft.

LEGEND

- CURB & GUTTER
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- x 5048.25 EXISTING SPOT ELEVATION

ROUGH GRADING APPROVAL DATE

ENGINEER'S SEAL

VINCENT P. CARRICA
NEW MEXICO
16212
REGISTERED PROFESSIONAL ENGINEER
10-24-12

VINCENT P. CARRICA
P.E. #16212

THE BOULDERS PHASE 2

WALL GRADES

DRAWN BY: DY

DATE: 9-06-12

DRAWING: OVERALL GRADING

SHEET #: 6

JOB #: 2011005

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