City of Albuquerque

P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

December 19, 2000

Timothy D. Simmons, P.E.
URS
5971 Jefferson Blvd NE Suite 101
Albuquerque, NM 87109

Re: Grading and Drainage Certification –IHOP Restaurant (C-19/D011D3)
Engineer's Stamp dated 9/21/2000

Engineering Certification dated 12/18/2000

Dear Mr. Simmons:

Based upon the information provided in your submittal dated 12-18-2000, the above referenced site is approved for Certificate of Occupancy.

If I can be of further assistance, you can contact me at 924-3986.

Sincerely,

Bradley L. Bingham

Bradley L. Bingham, PE
Senior Civil Engineer, PWD

C: Teresa Martin
File

City of Albuquerque
P.O. BOX 1293 ALBUQUERQUE, NEW MEXICO 87103

June 16, 2000

Timothy Simmons, P.E.
URS Corporation
5971 Jefferson Street NE
Suite 101
Albuquerque, NM 87109

Attn: Karen Stearns, P.E.

RE: IHOP RESTAURANT @ WYOMING & PASEO DEL NORTE (C19-D11D3). Revised Conceptual GRADING AND DRAINAGE PLAN FOR SITE DEVELOPMENT PLAN FOR BUILDING PERMIT APPROVAL. ENGINEER'S STAMP DATED JUNE 12, 2000.

Dear Mr. Simmons:

Based on the information provided on your June 13, 2000 submittal, the above referenced project is approved for Site Development Plan for Building Permit.

If I can be of further assistance, please feel free to contact me at 924-3984.

Sincerely,

John P. Murray, P.E.
Hydrology

c: Whitney Reierson
File

DRAINAGE REPORT

for

IHOP at La Cueva Town Center
Albuquerque, New Mexico

September, 2000

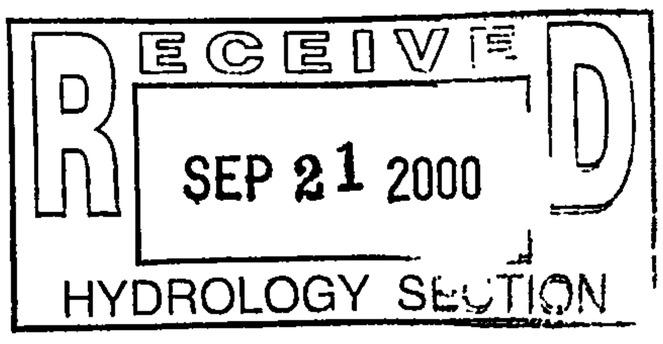
Prepared by

URS Corporation
5971 Jefferson Street NE
Suite 101
Albuquerque, New Mexico 87109

Prepared for

Schuss-Clark
An Architectural Corporation
9474 Kearny Villa Road
Suite 215
San Diego, California 92126

Timothy D. Simmons
NMPE No. 12722



INTRODUCTION

This site contains 0.7187 acres within La Cueva Town Center at the northeast corner of Wyoming Blvd and Paseo del Norte. La Cueva Town Center is a retail development with a mix of rough-graded lots and fully developed lots. This site (lot 7-A) is located between lots 6-A and 8 at the southeast corner of La Cueva Town Center. Lots 6-A, 7-A and 8 are all rough-graded lots currently processing plans for development. The grades shown along the property lines have been coordinated with development of adjacent lots.

This property is zoned C-2 – Including All Permissive And Conditional Uses. The Site Plan For Building Permit for the La Cueva Town Center was approved by the Environmental Planning Commission (EPC) on August 20, 1998 (EPC Case # Z98-98, DRB Case # 98-402). This site is within the Window G Sector Development Plan of North Albuquerque Acres.

FLOOD ZONE

As shown on panel 141 of the Flood Insurance Rate Map (map no. 35001C0141 D), this site lies within flood zone AO (1-ft depth). This flood zone is associated with the arroyo that used to traverse this site. The Albuquerque Metropolitan Arroyo Flood Control Authority (AMAFCA) received approval on a Conditional Letter of Map Revision (CLOMR) submitted to Federal Emergency Management Agency (FEMA) for La Cueva Town Center. AMAFCA will be requesting a Letter Of Map Revision (LOMR), removing the flood zone.

HYDROLOGY METHODOLOGY

The hydrology is calculated in accordance with the city of Albuquerque Development Process Manual, Volume 2, Section 22.2, "Hydrology," Part A – Procedure For 40 Acre And Smaller Basins. This site is located within Precipitation Zone 3.

EXISTING DRAINAGE CONDITIONS

This site was rough-graded with the development of La Cueva Town Center and contains no vegetation. There is an asphalt curb and silt fence along the north property line between this site and La Cueva Town Center parking lot. Lots 6-A and 8 are adjacent lots to the west and east, respectively. There is a silt fence along the south property line between this site and Paseo del Norte right-of-way. Runoff sheet flows east to west from lot 8, across lot 7-A and to lot 6-A. The slope across this site ranges from 3% to 4%.

BASIN	BASIN AREA	LAND TREATMENT	10-YR, 6-HR STORM				100-YR, 6-HR STORM			
			PEAK DISCHARGE		E	V	PEAK DISCHARGE		E	V
	AC		CFS/AC	CFS	INCH	AC-FT	CFS/AC	CFS	INCH	AC-FT
7-A	0.7187	100% B	1.19	0.86	0.36	0.0216	2.60	1.87	0.92	0.0551
8	1.14	100% B	1.19	1.36	0.36	0.0342	2.60	2.96	0.92	0.0874

LA CUEVA TOWN CENTER DRAINAGE PLAN

The drainage report for La Cueva Town Center was prepared in April 1999 by Ron Bohannan of Tierra West. This site is part of basin "A" for La Cueva Town Center. Based on the drainage report for La Cueva Town Center, the planned hydrologic conditions are tabulated below. Runoff from basin "A" is

captured by the onsite storm drain system, which includes a desiltation pond and outfall to the Wyoming storm drain.

BASIN	BASIN AREA	LAND TREATMENT	10-YR, 6-HR STORM				100-YR, 6-HR STORM			
			PEAK DISCHARGE		E	V	PEAK DISCHARGE		E	V
	ac		cfs/ac	cfs	inch	ac-ft	cfs/ac	cfs	inch	ac-ft
A	12.466	15% B 85% D	3.06	38.15	1.33	1.3806	4.66	58.05	2.14	2.2272
7-A	0.7187	15% B 85% D	3.06	2.20	1.33	0.0796	4.66	3.35	2.14	0.1284

PROPOSED DRAINAGE CONDITIONS

Based on the site layout shown on this plan, the hydrologic conditions for this proposed development are tabulated below. This site will continue to accept runoff from lot 8 and surface discharge runoff to lot 6-A and La Cueva Town Center parking area. Both peak discharge and volumetric runoff for the 100-yr, 6-hr storm are lower than originally planned for La Cueva Town Center. The data used for lot 8 is based on the Revised Drainage Report Lot 8 Retail Pad at La Cueva Town Center prepared by Tierra West in March 2000. Only part of lot 8 will drain directly to lot 7-A.

BASIN	BASIN AREA	LAND TREATMENT	10-YR, 6-HR STORM				100-YR, 6-HR STORM			
			PEAK DISCHARGE		E	V	PEAK DISCHARGE		E	V
	ac		cfs/ac	cfs	inch	ac-ft	cfs/ac	cfs	inch	ac-ft
7-A	0.7187	21% B 79% D	2.92	2.10	1.26	0.0752	4.50	3.23	2.05	0.1228
8	0.45	31% B 69% D	2.71	1.22	1.15	0.0430	4.27	1.92	1.91	0.0717

CONCLUSION

This site is a rough-graded lot within the La Cueva Town Center. This site will be developed with less impervious area and more landscape area than assumed in the La Cueva Town Center drainage report. Therefore, this site will produce less runoff than originally assumed for the design of the storm drain system for La Cueva Town Center.

URS

5971 Jefferson St. NE, Suite 101
Albuquerque, New Mexico 87109
(505) 345-3999(505) 345-8393 (fax)

HYDROLOGY CALCULATIONS

Page: ___ *of* ___
Sheet: ___ *of* ___

Computed by: Karen Stearns *Date:* 04/25/00
Checked by: Leroy Jaramillo *Date:* 04/25/00

Project Name: IHOP at La Cueva Town Center ***Project No:*** E300001558.02
Project Location: Lot 7, La Cueva Town Center, NE of Wyoming and Paseo del Norte

Calculation Description: To calculate the hydrologic conditions of the project. This calculation is in accordance with the City of Albuquerque Development Process Manual, Volume 2, Section 22.2, "Hydrology", Part A - Procedure for 40 Acre and Smaller Basins.

PRECIPITATION ZONE: 3

DEPTH AT 100-YEAR DESIGN STORM:

P_{60}	P_{360}	P_{1440}	$P_{4\ days}$	$P_{10\ days}$
2.14 inches	2.60 inches	3.10 inches	3.95 inches	4.90 inches

ONSITE RUNOFF CALCULATIONS (EXISTING, UNDEVELOPED CONDITIONS):

BASIN AREA AND LAND TREATMENT

TOTAL AREA	
(ft^2)	(acres)
31,307	0.7187

LAND TREATMENT TYPE			
A	B	C	D
(ft^2)	(ft^2)	(ft^2)	(ft^2)
0	31,307	0	0
0.0%	100.0%	0.0%	0.0%

WEIGHTED EXCESS PRECIPITATION, E, & VOLUMETRIC RUNOFF, V:

	EXCESS PRECIPITATION, E (inches)					VOLUMETRIC RUNOFF
	LAND TREATMENT TYPE				Weighted	V
	A	B	C	D	E	(acre-feet)
2-YR	0.00	0.06	0.20	0.89	0.06	0.0036
10-YR	0.19	0.36	0.62	1.50	0.36	0.0216
100-YR	0.66	0.92	1.29	2.36	0.92	0.0551

WEIGHTED PEAK DISCHARGE, q, & PEAK RATE OF DISCHARGE, Q:

	PEAK DISCHARGE, q (cfs/acre)					PEAK RATE OF DISCHARGE
	LAND TREATMENT TYPE				Weighted	Q
	A	B	C	D	q	(cfs)
2-YR	0.00	0.21	0.78	2.04	0.21	0.15
10-YR	0.58	1.19	2.00	3.39	1.19	0.86
100-YR	1.87	2.60	3.45	5.02	2.60	1.87

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Project Location: Lot 7, La Cueva Town Center, NE of Wyoming and Paseo del Norte

Calculation Description: To calculate the hydrologic conditions of the project. This calculation is in accordance with the City of Albuquerque Development Process Manual, Volume 2, Section 22.2, "Hydrology", Part A - Procedure for 40 Acre and Smaller Basins.

PRECIPITATION ZONE: 3

DEPTH AT 100-YEAR DESIGN STORM:

P_{60}	P_{360}	P_{1440}	$P_{4\ days}$	$P_{10\ days}$
2.14 inches	2.60 inches	3.10 inches	3.95 inches	4.90 inches

OFFSITE RUNOFF CALCULATIONS (EXISTING, UNDEVELOPED CONDITIONS):

BASIN AREA AND LAND TREATMENT

TOTAL AREA (acres)
1.14

LAND TREATMENT TYPE			
A	B	C	D
(acres)	(acres)	(acres)	(acres)
0.00	1.14	0.00	0.00
0.0%	100.0%	0.0%	0.0%

WEIGHTED EXCESS PRECIPITATION, E, & VOLUMETRIC RUNOFF, V:

	EXCESS PRECIPITATION, E (inches)					VOLUMETRIC RUNOFF
	LAND TREATMENT TYPE				Weighted	V
	A	B	C	D	E	(acre-feet)
2-YR	0.00	0.06	0.20	0.89	0.06	0.0057
10-YR	0.19	0.36	0.62	1.50	0.36	0.0342
100-YR	0.66	0.92	1.29	2.36	0.92	0.0874

WEIGHTED PEAK DISCHARGE, q, & PEAK RATE OF DISCHARGE, Q:

	PEAK DISCHARGE, q (cfs/acre)					PEAK RATE OF DISCHARGE
	LAND TREATMENT TYPE				Weighted	Q
	A	B	C	D	q	(cfs)
2-YR	0.00	0.21	0.78	2.04	0.21	0.24
10-YR	0.58	1.19	2.00	3.39	1.19	1.36
100-YR	1.87	2.60	3.45	5.02	2.60	2.96

RUNOFF SUMMARY TABLE -DEVELOPED CONDITIONS

ONSITE BASINS

BASIN	AREA (SF)	AREA (AC)	AREA (MI^2)
A	42315	12.466	0.0015178
B	113944	3.302	0.0040872
C	602691	3.403	0.0216186
D	272485	0.920	0.0097740
E	11825	0.272	0.0004241

BASIN	DEVELOPED Q100 (CFS)	DEVELOPED V100 (CF)
A	58.054	97019
B	15.378	25700
C	15.849	26487
D	4.284	7160
E	1.266	2116

BASIN	AREA (SF)	AREA (AC)	AREA (MI^2)
F	42297	0.971	0.0015172
G	113953	2.616	0.0040875

BASIN	DEVELOPED Q100 (CFS)	DEVELOPED V100 (CF)
F	4.521	7555
G	12.184	20362

TIERRA WEST LLC
4421 McLeod Road NE, Suite D, Albuquerque, NM 87109 Phone (505) 883-7592 - Fax (505) 883-7034

RUNOFF CALCULATIONS

Date: Jan. 29, 1999 Project: La Cueva Town Center Zone Atlas: C-19

This procedure is in accordance with the City of Albuquerque Development Process Manual, Volume 2, Section 22.2, "Hydrology", peak discharge rate for small watersheds less than forty acres in size.

Precipitation Zone from Figure A-1: 3
Land treatment descriptions are in Table A-4.

1. RUNOFF RATE COMPUTATION

Use Equation A-10: $Q_P = Q_{PA} A_A + Q_{PB} A_B + Q_{PC} A_C + Q_{PD} A_D$
Values of Q_{pi} are from Table A-9, and are in CFS/acre. Area values are in acres.

EXISTING CONDITIONS (CFS)

BASIN	Q_{PA}	A_A	Q_{PB}	A_B	Q_{PC}	A_C	Q_{PD}	A_D	Q_P
Basin 1	1.870	6.026	2.600	0.000	3.450	0.000	5.020	0.000	11.269
Basin 2	1.870	5.922	2.600	0.000	3.450	0.000	5.020	0.000	11.074
Basin 3	1.870	8.415	2.600	0.000	3.450	0.000	5.020	0.000	15.736
Total									**38.079**
OFFSITE FLOWS - EXISTING CONDITIONS (CFS)									
Basin 4	1.870	2.616	2.600	0.000	3.450	0.000	5.020	0.000	4.892
Basin 5	1.870	0.971	2.600	0.000	3.450	0.000	5.020	0.000	1.816
Total									**6.708**
DEVELOPED RATE OF RUNOFF (CFS)									
Basin A	1.870	0.000	2.600	1.870	3.450	0.000	5.020	10.596	58.054
Basin B	1.870	0.000	2.600	0.495	3.450	0.000	5.020	2.807	15.378
Basin C	1.870	0.000	2.600	0.510	3.450	0.000	5.020	2.893	15.849
Basin D	1.870	0.000	2.600	0.138	3.450	0.000	5.020	0.782	4.284
Basin E	1.870	0.000	2.600	0.041	3.450	0.000	5.020	0.231	1.266
									94.831
Basin F	1.870	0.000	2.600	0.146	3.450	0.000	5.020	0.825	4.521
Basin G	1.870	0.000	2.600	0.392	3.450	0.000	5.020	2.224	12.184
Total									**16.705**

2. RUNOFF VOLUME COMPUTATION

Use Equation A-5 to compute weighted excess precipitation:

Weighted E = "E" = $(E_A A_A + E_B A_B + E_C A_C + E_D A_D)/(A_A + A_B + A_C + A_D)$

$(A_A + A_B + A_C + A_D) = \sum A_i$

Use Equation A-6 to compute the volume:

V_{360} = "E" x $(A_A + A_B + A_C + A_D)$ x 3630 feet^3/acre·inch

Values of E_i are from Table A-8, and are in inches. Area values are in acres.

BASIN	E_A	A_A	E_B	A_B	E_C	A_C	E_D	A_D	$\sum A_i$	"E"	V_{360}
ONSITE EXISTING VOLUME OF RUNOFF (CF)											
Basin 1	0.66	6.026	0.92	0.000	1.29	0.000	2.36	0.000	6.026	0.660	14437.0
Basin 2	0.66	5.922	0.92	0.000	1.29	0.000	2.36	0.000	5.922	0.660	14188.0
Basin 3	0.66	8.415	0.92	0.000	1.29	0.000	2.36	0.000	8.415	0.660	20161.0
Total											**48786.0**
OFFSITE BASINS EXISTING VOLUME OF RUNOFF (CF)											
Basin 4	0.66	2.616	0.92	0.000	1.29	0.000	2.36	0.000	2.616	0.660	6267.0
Basin 5	0.66	0.971	0.92	0.000	1.29	0.000	2.36	0.000	0.971	0.660	2326.0
Total											**8593.0**
DEVELOPED VOLUME OF RUNOFF (CUBIC FEET)											
ONSITE EXISTING VOLUME OF RUNOFF (CF)											
Basin A	0.66	0.000	0.92	1.870	1.29	0.000	2.36	10.596	12.466	2.144	97019.0
Basin B	0.66	0.000	0.92	0.495	1.29	0.000	2.36	2.807	3.302	2.144	25700.0
Basin C	0.66	0.000	0.92	0.510	1.29	0.000	2.36	2.893	3.403	2.144	26487.0
Basin D	0.66	0.000	0.92	0.138	1.29	0.000	2.36	0.782	0.920	2.144	7160.0
Basin E	0.66	0.000	0.92	0.041	1.29	0.000	2.36	0.231	0.272	2.144	2116.0
Total											**158482.0**
ONSITE BASINS DEVELOPED VOLUME OF RUNOFF (CF)											
Basin F	0.66	0.000	0.92	0.146	1.29	0.000	2.36	0.825	0.971	2.144	7555.0
Basin G	0.66	0.000	0.92	0.392	1.29	0.000	2.36	2.224	2.616	2.144	20362.0
Total											**27917.0**

URS

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Checked by: Leroy Jaramillo *Date:* 04/25/00

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Project Location: Lot 7, La Cueva Town Center, NE of Wyoming and Paseo del Norte

Calculation Description: To calculate the hydrologic conditions of the project. This calculation is in accordance with the City of Albuquerque Development Process Manual, Volume 2, Section 22.2, "Hydrology", Part A - Procedure for 40 Acre and Smaller Basins.

PRECIPITATION ZONE: 3

DEPTH AT 100-YEAR DESIGN STORM:

P_{60}	P_{360}	P_{1440}	$P_{4\ days}$	$P_{10\ days}$
2.14 inches	2.60 inches	3.10 inches	3.95 inches	4.90 inches

BASIN "A" RUNOFF CALCULATIONS (PROPOSED, DEVELOPED CONDITIONS):

BASIN AREA AND LAND TREATMENT

TOTAL AREA (acres)
12.466

LAND TREATMENT TYPE			
A	B	C	D
(acres)	(acres)	(acres)	(acres)
0.000	1.870	0.000	10.596
0.0%	15.0%	0.0%	85.0%

WEIGHTED EXCESS PRECIPITATION, E, & VOLUMETRIC RUNOFF, V:

	EXCESS PRECIPITATION, E (inches)					VOLUMETRIC RUNOFF
	LAND TREATMENT TYPE				Weighted	V
	A	B	C	D	E	(acre-feet)
2-YR	0.00	0.06	0.20	0.89	0.77	0.7952
10-YR	0.19	0.36	0.62	1.50	1.33	1.3806
100-YR	0.66	0.92	1.29	2.36	2.14	2.2272

WEIGHTED PEAK DISCHARGE, q, & PEAK RATE OF DISCHARGE, Q:

	PEAK DISCHARGE, q (cfs/acre)					PEAK RATE OF DISCHARGE
	LAND TREATMENT TYPE				Weighted	Q
	A	B	C	D	q	(cfs)
2-YR	0.00	0.21	0.78	2.04	1.77	22.01
10-YR	0.58	1.19	2.00	3.39	3.06	38.15
100-YR	1.87	2.60	3.45	5.02	4.66	58.05

E-1

ALLOWABLE ONSITE RUNOFF CALCULATIONS (PROPOSED, DEVELOPED CONDITIONS):

BASIN AREA AND LAND TREATMENT

TOTAL AREA (acres)
0.7187

LAND TREATMENT TYPE			
A	B	C	D
(acres)	(acres)	(acres)	(acres)
0.0000	0.1078	0.0000	0.6109
0.0%	15.0%	0.0%	85.0%

WEIGHTED EXCESS PRECIPITATION, E, & VOLUMETRIC RUNOFF, V:

	EXCESS PRECIPITATION, E (inches)					VOLUMETRIC RUNOFF
	LAND TREATMENT TYPE				Weighted	V
	A	B	C	D	E	(acre-feet)
2-YR	0.00	0.06	0.20	0.89	0.77	0.0458
10-YR	0.19	0.36	0.62	1.50	1.33	0.0796
100-YR	0.66	0.92	1.29	2.36	2.14	0.1284

WEIGHTED PEAK DISCHARGE, q, & PEAK RATE OF DISCHARGE, Q:

	PEAK DISCHARGE, q (cfs/acre)					PEAK RATE OF DISCHARGE
	LAND TREATMENT TYPE				Weighted	Q
	A	B	C	D	q	(cfs)
2-YR	0.00	0.21	0.78	2.04	1.77	1.27
10-YR	0.58	1.19	2.00	3.39	3.06	2.20
100-YR	1.87	2.60	3.45	5.02	4.66	3.35

E-2

URS

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PRECIPITATION ZONE: 3

DEPTH AT 100-YEAR DESIGN STORM:

P_{60}	P_{360}	P_{1440}	$P_{4\ days}$	$P_{10\ days}$
2.14 inches	2.60 inches	3.10 inches	3.95 inches	4.90 inches

ONSITE RUNOFF CALCULATIONS (PROPOSED, DEVELOPED CONDITIONS):

BASIN AREA AND LAND TREATMENT

TOTAL AREA	
(ft^2)	(acres)
31,307	0.7187

LAND TREATMENT TYPE			
A	B	C	D
(ft^2)	(ft^2)	(ft^2)	(ft^2)
0	6,720	0	24,587
0.0%	21.5%	0.0%	78.5%

WEIGHTED EXCESS PRECIPITATION, E, & VOLUMETRIC RUNOFF, V:

	EXCESS PRECIPITATION, E (inches)					VOLUMETRIC RUNOFF
	LAND TREATMENT TYPE				Weighted	V
	A	B	C	D	E	(acre-feet)
2-YR	0.00	0.06	0.20	0.89	0.71	0.0426
10-YR	0.19	0.36	0.62	1.50	1.26	0.0752
100-YR	0.66	0.92	1.29	2.36	2.05	0.1228

WEIGHTED PEAK DISCHARGE, q, & PEAK RATE OF DISCHARGE, Q:

	PEAK DISCHARGE, q (cfs/acre)					PEAK RATE OF DISCHARGE
	LAND TREATMENT TYPE				Weighted	Q
	A	B	C	D	q	(cfs)
2-YR	0.00	0.21	0.78	2.04	1.65	1.18
10-YR	0.58	1.19	2.00	3.39	2.92	2.10
100-YR	1.87	2.60	3.45	5.02	4.50	3.23

E3

URS

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Project Name: IHOP at La Cueva Town Center ***Project No:*** E300001558.02
Project Location: Lot 7, La Cueva Town Center, NE of Wyoming and Paseo del Norte

Calculation Description: To calculate the hydrologic conditions of the project. This calculation is in accordance with the City of Albuquerque Development Process Manual, Volume 2, Section 22.2, "Hydrology", Part A - Procedure for 40 Acre and Smaller Basins.

PRECIPITATION ZONE: 3

DEPTH AT 100-YEAR DESIGN STORM:

P_{60}	P_{360}	P_{1440}	$P_{4\ days}$	$P_{10\ days}$
2.14 inches	2.60 inches	3.10 inches	3.95 inches	4.90 inches

OFFSITE RUNOFF CALCULATIONS (PROPOSED, DEVELOPED CONDITIONS):

BASIN AREA AND LAND TREATMENT

TOTAL AREA (acres)
0.45

LAND TREATMENT TYPE			
A	B	C	D
(acres)	(acres)	(acres)	(acres)
0.00	0.14	0.00	0.31
0.0%	31.1%	0.0%	68.9%

WEIGHTED EXCESS PRECIPITATION, E, & VOLUMETRIC RUNOFF, V:

	EXCESS PRECIPITATION, E (inches)					VOLUMETRIC RUNOFF
	LAND TREATMENT TYPE				Weighted	V
	A	B	C	D	E	(acre-feet)
2-YR	0.00	0.06	0.20	0.89	0.63	0.0237
10-YR	0.19	0.36	0.62	1.50	1.15	0.0430
100-YR	0.66	0.92	1.29	2.36	1.91	0.0717

WEIGHTED PEAK DISCHARGE, q, & PEAK RATE OF DISCHARGE, Q:

	PEAK DISCHARGE, q (cfs/acre)					PEAK RATE OF DISCHARGE
	LAND TREATMENT TYPE				Weighted	Q
	A	B	C	D	q	(cfs)
2-YR	0.00	0.21	0.78	2.04	1.47	0.66
10-YR	0.58	1.19	2.00	3.39	2.71	1.22
100-YR	1.87	2.60	3.45	5.02	4.27	1.92

E-4

URS

5971 Jefferson St. NE, Suite 101
Albuquerque, New Mexico 87109
(505) 345-3999(505) 345-8393 (fax)

HYDROLOGY CALCULATIONS

Page: ___ of ___
Sheet: ___ of ___

Reference: City of Albuquerque Development Process Manual, Volume 2, Section 22.2, "Hydrology", Part A - Procedure for 40 Acre and Smaller Basins.

TABLE A-1: BERNALILLO COUNTY PRECIPITATION ZONES

Zone	Location
1	West of the Rio Grande.
2	Between the Rio Grande and San Mateo.
3	Between San Mateo and Eubank, north of Interstate 40; and between San Mateo and the east boundary of Range 4 East, south of Interstate 40.
4	East of Eubank, north of interstate 40; and east of the east boundary of Range 4 East, south of Interstate 40.

TABLE A-2: DEPTH (INCHES) AT 100-YEAR STORM

Zone	P_{60}	P_{360}	P_{1440}	$P_{4\ days}$	$P_{10\ days}$
1	1.87	2.20	2.66	3.12	3.67
2	2.01	2.35	2.75	3.30	3.95
3	2.14	2.60	3.10	3.95	4.90
4	2.23	2.90	3.65	4.70	5.95

TABLE A-3: RETURN PERIOD FACTORS

Return Period (years)	Factor
50	0.900
25	0.800
10	0.667
5	0.567
2	0.434

TABLE A-4: LAND TREATMENTS

Type	Land Condition
A	Soil uncompacted by human activity with 0 to 10 percent slopes. Native grasses, weeds and shrubs in typical densities with minimal disturbance to grading, groundcover and infiltration capacity.
B	Irrigated lawns, parks and golf courses with 0 to 10 percent slopes. Native grasses, weeds and shrubs, and soil uncompacted by human activity with slopes greater than 10 percent and less than 20 percent.
C	Soil compacted by human activity. Minimal vegetation. Unpaved parking, roads, trails. Most vacant lots. Gravel or rock on plastic (desert landscaping). Irrigated lawns and parks with slopes greater than 10 percent. Native grasses, weeds and shrubs, and soil uncompacted by human activity with slopes at 20 percent or greater. Native grass, weed and shrub areas with clay or clay loam soils and other soils of very low permeability as classified by SCS Hydrologic Soil Group D.
D	Impervious areas, pavement and roofs.

TABLE A-8: EXCESS PRECIPITATION, E (INCHES) - 6 HOUR STORM

Zone	Land Treatment Type											
	A			B			C			D		
	$A_{2\text{-}YR}$	$A_{10\text{-}YR}$	$A_{100\text{-}YR}$	$B_{2\text{-}YR}$	$B_{10\text{-}YR}$	$B_{100\text{-}YR}$	$C_{2\text{-}YR}$	$C_{10\text{-}YR}$	$C_{100\text{-}YR}$	$D_{2\text{-}YR}$	$D_{10\text{-}YR}$	$D_{100\text{-}YR}$
1	0.00	0.08	0.44	0.01	0.22	0.67	0.12	0.44	0.99	0.72	1.24	1.97
2	0.00	0.13	0.53	0.02	0.28	0.78	0.15	0.52	1.13	0.79	1.34	2.12
3	0.00	0.19	0.66	0.06	0.36	0.92	0.20	0.62	1.29	0.89	1.50	2.36
4	0.02	0.28	0.80	0.11	0.46	1.08	0.27	0.73	1.46	1.01	1.69	2.64

TABLE A-9: PEAK DISCHARGE (CFS/ACRE)

Zone	Land Treatment Type											
	A			B			C			D		
	$A_{2\text{-}YR}$	$A_{10\text{-}YR}$	$A_{100\text{-}YR}$	$B_{2\text{-}YR}$	$B_{10\text{-}YR}$	$B_{100\text{-}YR}$	$C_{2\text{-}YR}$	$C_{10\text{-}YR}$	$C_{100\text{-}YR}$	$D_{2\text{-}YR}$	$D_{10\text{-}YR}$	$D_{100\text{-}YR}$
1	0.00	0.24	1.29	0.03	0.76	2.03	0.47	1.49	2.87	1.69	2.89	4.37
2	0.00	0.38	1.56	0.08	0.95	2.28	0.60	1.71	3.14	1.86	3.14	4.70
3	0.00	0.58	1.87	0.21	1.19	2.60	0.78	2.00	3.45	2.04	3.39	5.02
4	0.05	0.87	2.20	0.38	1.45	2.92	1.00	2.26	3.73	2.17	3.57	5.25

TIERRA WEST LLC
4421 McLeod Road NE, Suite D, Albuquerque, NM 87109 Phone (505) 883-7592 - Fax (505) 883-7034

RUNOFF CALCULATIONS

Date: February 9, 200 Project: LOT 8-LA CUEVA TOWN CENTER Zone Atlas: C-19

This procedure is in accordance with the City of Albuquerque Development Process Manual, Volume 2, Section 22.2, "Hydrology", peak discharge rate for small watersheds less than forty acres in size.

Precipitation Zone from Figure A-1: 3
Land treatment descriptions are in Table A-4.

RUNOFF RATE COMPUTATION

Use Equation A-10: $Q_P = Q_{PA} A_A + Q_{PB} A_B + Q_{PC} A_C + Q_{PD} A_D$
Values of Q_{pi} are from Table A-9, and are in CFS/acre. Area values are in acres.

DEVELOPED RATE OF RUNOFF (CFS)									
BASIN	Q_{PA}	A_A	Q_{PB}	A_B	Q_{PC}	A_C	Q_{PD}	A_D	
Basin A	1.87	0.00	2.60	0.15	3.45	0.00	5.02	0.54	3.10
Basin B	1.87	0.00	2.60	0.14	3.45	0.00	5.02	0.31	1.92
Total									5.02

Curb opening to pond

Weir Equation:

$$Q = CLH^{3/2}$$

Q= flow (cfs)
C = 2.95
H = Curb Height (ft)
L = width of opening

$$Q_{max} = 2.95(2)(.5)^{3/2} = 2.09 \text{ cfs}$$

Q_{req}= 1.92 cfs

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Channel Capacity

	Top Width	Bottom Width	Depth	Area	WP	R	Slope	Q Provided	Q Required	Velocity
	(ft)	(ft)	(ft)	(ft^2)	(ft)		(%)	(cfs)	(cfs)	(ft/s)
V-ditch	6	0	1	3.00	6.32	0.474342	3	27.70	1.92	0.64

Manning's Equation:

Q = 1.49/n * A * R^(2/3) * S^(1/2)

A = Area

R = A/WP

S = Slope

n = 0.017