CITY OF
Albuquerque

October 15, 1997

Martin J. Chávez, Mayor

Ronald R. Bohannan, P.E.
Tierra West Development Management Services
4421 McLeod Road NE, Suite D
Albuquerque, New Mexico 87109

RE: Engineer's Grading and Drainage Certification for Quail Springs Estates Subdivision, (C19/D15) Submitted for Release of Financial Guarantees, Engineer's Stamp Dated 8/25/97.

Dear Mr. Bohannan:

The Grading and Drainage Certification for the above referenced subdivision is acceptable for release of Financial Guarantees as required by the Infrastructure List dated October 15, 1996.

If you should have any questions, or if I may be of further assistance to you, please call me at 924-3982.

Sincerely,

Susan Calongne

Susan M. Calongne, P.E.
City/County Floodplain Administrator

c: Terry Martin, Work Order #559081
File

CITY OF
Albuquerque
Public Works Department

Martin J. Chávez, Mayor | January 31, 1997 | Robert E. Gurulé, Director

Ronald R. Bohannan, P.E.
Tierra West Development Management Services
4421 McLeod Road NE, Suite D
Albuquerque, New Mexico 87109

RE: REVISED GRADING AND DRAINAGE PLAN FOR QUAIL SPRINGS SUBDIVISION, (C19/D15) SUBMITTED FOR FINAL PLAT APPROVAL AND GRADING PERMIT APPROVAL, ENGINEER'S STAMP DATED 1/20/97.

Dear Mr. Bohannan:

Based on the information provided in the submittal of January 22, 1997, the above referenced revised Grading and Drainage plan is approved subject to DRB approval. The Engineer's Certification of the approved plan is required prior to release of financial guarantees.

As you are aware, the top-soil disturbance permit must be obtained before any grading may occur.

The request for the Letter of Map Revision (LOMR) for the La Cueva arroyo has been sent to FEMA for review. Since it is not known when FEMA may issue the LOMR, the Final Plat must acknowledge the existing FEMA floodplain.

If you should have any questions, please call me at 924-3982.

Sincerely,

Susan Calongne

Susan M. Calongne, P.E.
City/County Floodplain Administrator

c: Larry Caudill, Environmental Health
File

DRAINAGE REPORT

for

Quail Springs Subdivision

Prepared by

Tierra West Development Management Sevices
4421 McLeod Road NE, Suite D
Albuquerque, New Mexico 87109

Prepared for

Ron Spradlin
Helmick-Spradlin Development Partnership
6303 Fourth Street, NW Suite 10
Albuquerque, New Mexico 87107

September 1996

Ronald R. Bohannan P.E. No. 7868

RONALD RAY BOHANNAN
NEW MEXICO
7868
REGISTERED PROFESSIONAL ENGINEER

9-19-96
10-14-96
11-12-96

Location

Quail Springs is a proposed 60 unit single family subdivision. It is located south of Oakland Avenue, N.E. between Louisiana and Wyoming as shown on the attached Zone Atlas Map C-19. The site is identified as Lots 2-11 Block 3 Tract 2 Unit 3 of North Albuquerque Acres and contains approximately 8.85 acres. The purpose of this report is to provide the drainage analysis and management plan for the subdivision.

Existing Drainage Conditions

The site is currently undeveloped. The site lies within one existing basin and contributes a runoff flow of 23.18 cfs which sheet flows west. There is an offsite basin, with a flow of 4.33 cfs, located to the east of the site that will be diverted to the north and south by a flood proofed wall located on the east side of the site.

The proposed drainage management plan will divert part of the flow that currently drains to an existing arroyo located to the south of the site. This will reduce the amount of flow in the southern arroyo.

The City of Albuquerque has not prepared any overall Conceptual Drainage Collection Master Plan to date. This report analyzes and makes preliminary recommendations for a collection system. The collection system uses the City policy of collecting the major flows in the arterial streets and diverting the flows to proposed arroyos. Recommendations to divert these flows are included under the Conceptual Master Plan.

FEMA Map and Soil Conditions

The site is located on FEMA Map section 350002 panel 10 as shown on the attached excerpt. The map shows that the site is located within a 100 year flood plain. However, upstream improvements have been built since the FEMA Map study was completed. There is a letter of map revision (LOMR) request completed by Bohannan Huston Inc. (for AMAFCA) for the area. Although the site is in no actual danger of flooding, the residents will be required to have flood insurance until the LOMR is granted.

The LOMR submitted by Bohannan Huston Inc. removes most of the flood plain from the site. There is an existing arroyo to the south of the site that was not removed with the LOMR. The small piece of flood plain was left off the LOMR because of upstream flow from La Cueva High School which contributed to the flow in the arroyo. There is flow coming off the high school through a pipe located at the corner of Alameda and Wyoming. The pipe discharges 7.56 cfs of flow and is a violation of the approved grading and drainage plan (C19-D4). This flow then enters the arroyo and directly impacts the Quail Springs site. The approved grading and drainage plan for La Cueva High School (C19-D4) only calls out drainage outlets from the on-site detention pond located at the corner of Wilshire and Wyoming. Once the flow enters Wyoming it flows south and would not impact the site. After Albuquerque Public Schools corrects the situation and the drainage follows the approved plan, the arroyo will no longer impact the site. The flow in the arroyo will be reduced from 28.05 cfs to 20.49 cfs and will no longer flood during a 100 year storm. The HEC-RAS output and AHYMO runs are shown in the section titled "Flood plain."

The site contains one soil from the Soil Conservation Soil Survey of Bernalillo County. It is a Embudo-Tijeras complex. These soils have a moderate hazard of water erosion and medium runoff.

On-Site Drainage Management Plan

The proposed drainage management plan is to collect the developed flows from the subdivision in Quail Springs Place and convey the flows to a proposed storm drain system located in Oakland Avenue. These flows will then be conveyed to a proposed storm drain in Louisiana Boulevard. The proposed storm drain in Louisiana will also collect the developed flows from Eagle Rock and Alameda and convey the runoff north. The proposed storm drain system is shown in the Conceptual Master Plan Storm Sewer Collection System section of this report.

There is one proposed basin on the site with a developed runoff flow of 37.55 cfs. A temporary solution until the proposed storm drain in Oakland is built will collect the developed flows from the subdivision in Quail Springs Place and convey these flows to lots 58, 59 and 60 where they will be detained in a retention pond. The flows in Oakland will be picked up in the 30" storm drain and routed to the temporary drainage pond. This pond can be removed once the master storm line in Oakland is built. The proposed retention pond was designed using a 10-day storm and will not discharge any water. Two double 'A' drop inlets with sweepers will collect the flows and a 30" RCP pipe will convey the runoff to the temporary ponding area located in lots 58, 59 and 60. The 30" RCP will convey the flows to the permanent storm sewer system in Oakland when it is built. The east entrance to the subdivision will act as an emergency overflow in case of an emergency or an event larger than a 100-year storm.

Conceptual Master Plan Storm Sewer Collection System

There are three major basins in the Master Plan. These three basin have been divided into eight sub-basins for ease in street capacity calculations. Basin 1 contains the lots draining to Eagle Rock Avenue with a developed runoff flow of 82.72 cfs. A 30" RCP pipe will carry the flows to Louisiana Boulevard. Basin 2, which includes Quail Springs Subdivision, consists of the area draining to Oakland Avenue. This basin has a developed runoff flow of 135.76 cfs. A 15" RCP pipe, which will limit the flow to 12.12 cfs, will carry the flow from the first series of catch basins. A 24" pipe, which will limit the flow through the catch basins to 30.32 cfs, will convey the flows from the second series of catch basins. After the third series of catch basins and the flows from Quail Springs Place join Oakland Avenue the pipe size will increase to a 36" RCP pipe until Louisiana Boulevard. Basin 3 will contain the lots draining to Alameda Avenue. This basin has a developed runoff flow of 142.45 cfs. A 30" RCP pipe will convey the flows to Louisiana Boulevard. Louisiana will contain a 48" RCP pipe between Alameda and Oakland in order to convey the flows from Alameda. From Oakland to Eagle Rock, Louisiana will contain a 66" RCP pipe in order to carry the combined flows from Alameda and Oakland. After Eagle Rock, Louisiana will contain a 72" RCP in order to carry the combined developed flow of 360.93 cfs from Alameda, Oakland, and Eagle Rock. The storm drain in Louisiana Boulevard will convey the developed flows north to the La Cueva Arroyo. The storm sewer in Oakland Avenue will be built on the north side of the street. When the line is built we will pay one half of the cost of the storm drain line to the City.

Summary

There is one on-site basin with a runoff flow of 37.55 cfs. There is one off-site basin with a runoff flow of 4.33 cfs that will diverted to north and south of the site. The on-site basin will drain to Quail Springs Place which will convey the flow to a proposed storm drain line. The storm drain line will take the flow to a temporary retention pond located in lots 58, 59, and 60. A proposed storm drain system in Oakland Avenue, as outlined in the Conceptual Master Plan, will eventually replace the pond.

RUNOFF CALCULATIONS

The site is @ Zone 3

LAND TREATMENT

Proposed
B = 20 %
C = 20 %
D = 60 %

Existing
B = 100 %

DEPTH (INCHES) @ 100-YEAR STORM

P_{60} = 2.14 inches

P_{360} = 2.60 inches

P_{1440} = 3.10 inches

DEPTH (INCHES) @ 10-YEAR STORM

P_{60} = 2.14 x 0.667
= 1.43 inches

P_{360} = 1.73

P_{1440} = 2.07

See the summary output from AHYMO calculations.

Also see the following summary tables.

DRAINAGE BASINS

BASIN	AREA (SF)	AREA (AC)	AREA (MI^2)
1 (Eagle Rock)	849269.27	19.4965	0.030463
2 (Oakland)	1393907.36	31.9997	0.050000
3 (Alameda)	1462546.74	33.5755	0.052462

RUNOFF CALCULATION RESULTS

EXISTING

BASIN	Q-100 CFS	Q-10 CFS	V-100 AC-FT	V-10 AC-FT
1	51.06	22.95	1.498	0.578
2	83.80	37.67	2.458	0.949
3	87.92	39.52	2.579	0.996

PROPOSED

BASIN	Q-100 CFS	Q-10 CFS	V-100 AC-FT	V-10 AC-FT
1	82.72	51.30	3.004	1.761
2	135.76	84.19	4.931	2.890
3	142.45	88.33	5.174	3.033

DRAINAGE SUB-BASINS

SUB-BASIN	AREA (SF)	AREA (AC)	AREA (MI^2)
1A	348480.00	8.0000	0.012500
1B	500679.78	11.4940	0.017959
2A	385400.00	8.8476	0.013824
2B	435587.36	9.9997	0.015625
2C	485512.05	11.1458	0.017415
2D	87094.73	1.9994	0.003124
3A	731261.14	16.7874	0.026230
3B	731261.14	16.7874	0.026230

RUNOFF CALCULATION RESULTS

EXISTING

BASIN	Q-100 CFS	Q-10 CFS	V-100 AC-FT	V-10 AC-FT
1A	20.96	9.42	0.615	0.237
1B	30.10	13.53	0.883	0.341
2A	23.18	10.42	0.680	0.262
2B	26.19	11.77	0.768	0.297
2C	29.19	13.12	0.856	0.331
2D	5.24	2.36	0.154	0.059
3A	43.96	19.76	1.290	0.498
3B	43.96	19.76	1.290	0.498

PROPOSED

BASIN	Q-100 CFS	Q-10 CFS	V-100 AC-FT	V-10 AC-FT
1A	33.96	21.06	1.233	0.723
1B	48.78	30.25	1.771	1.038
2A	37.55	23.28	1.363	0.799
2B	42.44	26.32	1.541	0.903
2C	47.30	29.33	1.718	1.007
2D	8.50	5.27	0.308	0.181
3A	71.23	44.17	2.587	1.516
3B	71.23	44.17	2.587	1.516

STORM DROP INLET (EFFECTIVE AREA-IN PONDING SECTION)

(DBL-A @ the ponding section w/ sweepers on each side)

Area @ the Grate:

L $= 88\ 3/4" - 2(6"_{\text{ENDS}}) - 6"_{\text{CENTER PIECE}} - 14\ (1/2"_{\text{MIDDLE BARS}})$

$= 63\ 3/4" = 5.3125'$

W $= 25\ 1/2" - 13\ (1/2"_{\text{MIDDLE BARS}})$

$= 19" = 1.5833'$

Area $= 5.3125 \times 8.41$
$= 8.41$ SF

Effective area $= 8.41 - .5\ (8.41)_{\text{Clogging Factor}}$

$= 4.21$ SF @ the Grate

Area @ the Throat:

L = 13.50'

H $= 10\ 3/4" - 4\ 1/2"$
$= 6\ 1/4" = 0.5208'$

Area $= 13.50 \times 0.5208$
$= 7.03$ SF @ the Throat

Total Area

Area $= 4.21_{\text{Grate}} + 7.03_{\text{Throat}}$
$= 11.24$ SF

DROP INLET CALCULATIONS

ORIFICE EQUATION

Q = CA sqrt(2gH)

C = 0.6

g = 32.2

Catch Basin	Type of Inlet	Area (SF)	Q (CFS)	Depth Required (FT)	Depth Provided (FT)
1	Double 'A'	11.24	18.78	0.1204	0.17
2	Double 'A'	11.24	18.78	0.1204	0.17

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name:

Comment: PIPE CONNECTING DROP INLETS

Solve For Actual Depth

Given Input Data:

Diameter..........	2.00 ft
Slope.............	0.0100 ft/ft
Manning's n.......	0.013
Discharge.........	18.78 cfs

Computed Results:

Depth.............	1.39 ft
Velocity..........	8.05 fps
Flow Area.........	2.33 sf
Critical Depth....	1.56 ft
Critical Slope....	0.0076 ft/ft
Percent Full......	69.55 %
Full Capacity.....	22.62 cfs
QMAX @.94D........	24.34 cfs
Froude Number.....	1.26 (flow is Supercritical)

Open Channel Flow Module, Version 3.12 (c) 1990
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Street Capacity Calculations

QUAIL SPRINGS PL
28' F-F Street Section with 8" curb

For water depths less than 0.125 feet

Y=	Water depth
Area =	8*Y^2
P=	SQRT(257*Y^2) + Y
n=	0.017
Slope=	0.0373

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.01	0.0008	0.170312	0.004697	0.000379	0.000758	0.473501	0.004735	0.834435	0.007816
0.02	0.0032	0.340624	0.009395	0.002405	0.00481	0.751635	0.015033	0.936622	0.018316
0.04	0.0128	0.681249	0.018789	0.015272	0.030545	1.193147	0.047726	1.051322	0.042745
0.06	0.0288	1.021873	0.028184	0.045028	0.090056	1.563464	0.093808	1.124824	0.070048
0.08	0.0512	1.362498	0.037578	0.096973	0.193946	1.894002	0.15152	1.180069	0.099373
0.1	0.08	1.703122	0.046973	0.175824	0.351647	2.197795	0.219779	1.224783	0.130283
0.12	0.1152	2.043746	0.056367	0.285909	0.571817	2.481845	0.297821	1.262572	0.162508
0.125	0.125	2.128902	0.058716	0.318789	0.637579	2.550315	0.318789	1.271191	0.170747

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	0.135625	2.383952	0.056891	0.338682	0.677364	2.497195	0.324635	1.220542	0.168619
0.16	0.225625	3.914252	0.057642	0.568378	1.136756	2.519126	0.40306	1.109844	0.183564
0.2	0.415625	5.954652	0.069798	1.189477	2.378954	2.8619	0.57238	1.127747	0.234283
0.24	0.685625	7.995052	0.085756	2.250891	4.501782	3.282977	0.787915	1.180958	0.298408
0.3045	1.289506	11.2852	0.114265	5.126142	10.25228	3.975275	1.210471	1.269538	0.415253
0.32	1.465625	12.07585	0.121368	6.065276	12.13055	4.138354	1.324273	1.289213	0.444973
0.36	1.975625	14.11625	0.139954	8.990535	17.98107	4.55073	1.638263	1.336601	0.52389
0.365	2.045	14.3713	0.142297	9.409844	18.81969	4.601391	1.679508	1.342192	0.533957

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)
0.37	2.115	14.3763	0.147117	9.950467	19.90093	4.704713	1.740744	1.363026	0.551819
0.41	2.675	14.4163	0.185554	14.69134	29.38268	5.492089	2.251757	1.511533	0.695085
0.442	**3.123**	**14.4483**	**0.21615**	**18.9889**	**37.97779**	**6.080338**	**2.68751**	**1.611717**	**0.810411**
0.49	3.795	14.4963	0.261791	26.21838	52.43675	6.908663	3.385245	1.739274	0.984905
0.54	4.495	14.5463	0.309013	34.68476	69.36953	7.716299	4.166801	1.850479	1.168727
0.59	5.195	14.5963	0.355912	44.04585	88.0917	8.478508	5.00232	1.945206	1.354644
0.63	5.755	14.6363	0.3932	52.14495	104.2899	9.060808	5.708309	2.011726	1.504826
0.667	6.273	14.6733	0.427511	60.09863	120.1973	9.580524	6.390209	2.067276	1.644833

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	6.762225	16.32363	0.41426	63.4399	126.8798	9.381512	6.567059	1.976041	1.637245
0.72	7.085225	17.32383	0.408987	65.9049	131.8098	9.301738	6.697251	1.931834	1.63973
0.74	7.428225	18.32403	0.405382	68.68871	137.3774	9.246988	6.842771	1.894334	1.646687
0.76	7.791225	19.32423	0.403184	71.78478	143.5696	9.213542	7.002292	1.862481	1.657547
0.78	8.174225	20.32443	0.402187	75.18935	150.3787	9.198346	7.17471	1.835416	1.671843
0.8	8.577225	21.32463	0.402221	78.90078	157.8016	9.19887	7.359096	1.812431	1.689182
0.847	9.603	23.6751	0.405616	88.83306	177.6661	9.250553	7.835218	1.771324	1.740113

FINDING STREET CAPACITY - 28 F-F CROSS-SECTION FOR 8" CURB

Q = 1.49/n A R^(2/3) S^½
n = 0.017
SLOPE = STREET SLOPE
R^2/3 = (A/P)^2/3
D2 = WATER DEPTH AFTER HYDRAULIC JUMP = D1/2 [SQRT $(1 + 8Fr^2) - 1$]
E = $V^2 / 2g$

HALF STREET CALCULATIONS

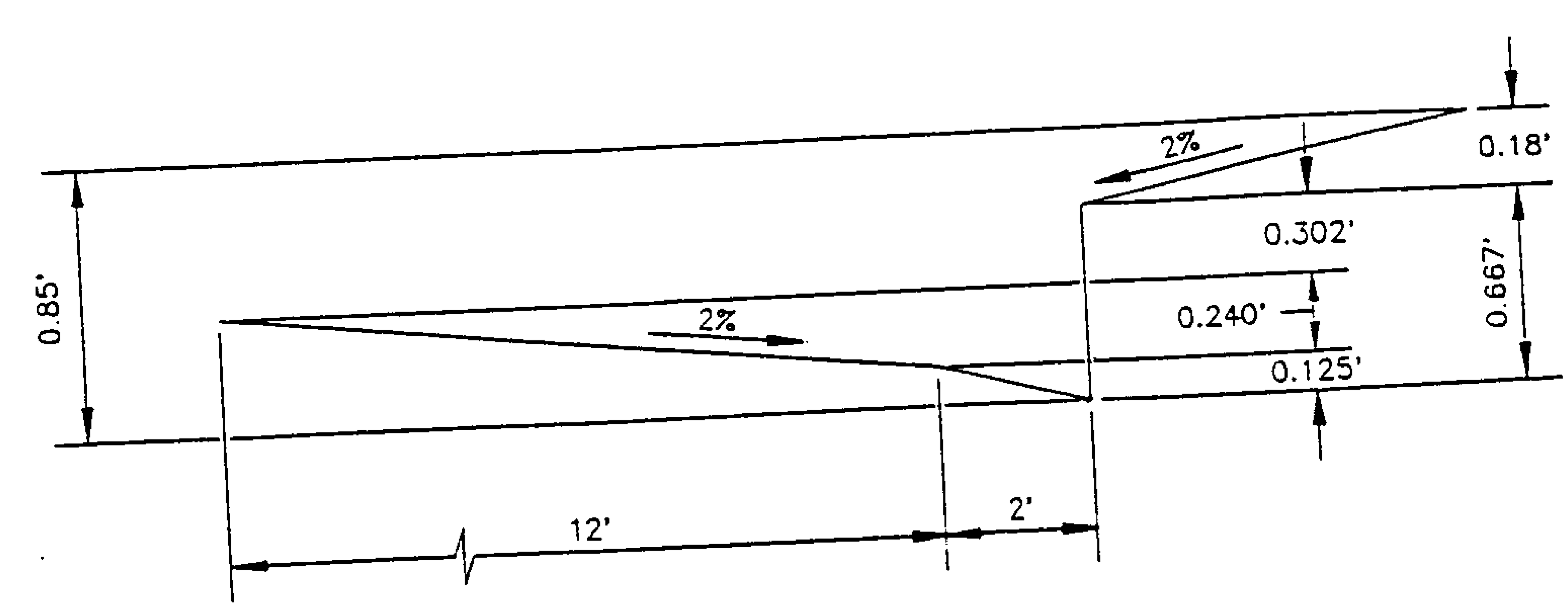
@Y < = 0.125
A1 = ½ Y (Y/0.0625) = $8Y^2$
P1 = SQRT[Y^2 + $(Y/0.0625)^2$] + Y = SQRT(257 Y^2) + Y

@ 0.125 < Y < = 0.365 & Y1 = Y - 0.125
A2 = A1 + ½Y1 (Y1/0.02) + 2Y1 = A1 + $25Y1^2$ + 2Y1
P2 = P1 + SQRT[$Y1^2$ + $(Y1/0.02)^2$] + Y1 = P1 + SQRT(2501 $Y1^2$) + Y1

@ 0.365 < Y < = 0.667 & Y2 = Y - 0.365
A3 = A2 + 14Y2 + ½Y2[Y2/(0.02)] = A2 + 14 Y2
P3 = P2 + SQRT($Y2^2$ + $[Y2/(0.02)]^2$) = P2 + Y2

@ 0.667 < Y < = 0.847 & Y3 = Y - 0.667
A4 = A3 + 14Y3 + ½Y3[Y3/(0.02)] = A3 + 14 Y3 + 25 $Y3^2$
P4 = P3 + SQRT($Y3^2$ + $[Y3/(0.02)]^2$) = P3 + SQRT(2501 $Y3^2$)

SEE THE FOLLOWING SHEET FOR INPUT AND OUTPUT FILE FOR CALCULATION RESULTS FROM COMPUTER PROGRAM USING THE EQUATION SHOWN ABOVE



28' F—F
8" CURB

NOT TO SCALE

VOLUME CALCULATIONS FOR 10-DAY STORM

ZONE = 3

DRAINAGE BASINS

BASIN	AREA (SF)	AREA (AC-FT)	AREA (MI^2)
On-site and Off-site	426400.00	9.78880	0.015295

$$E = \frac{EA(AA) + EB(AB) + EC(AC) + ED(AD)}{AA + AB + AC + AD}$$

V-360 = E (AA + AB + AC + AD) / 12 in/ft

V-10 Day = V-360 + AD (P-10 Day - P-360) / 12 in/ft

EA = 0.66
EB = 0.92
EC = 1.29
ED = 2.36

AA = 0.00%
AB = 20.00%
AC = 20.00%
AD = 60.00%

P-60 = 2.14
P-360 = 2.60
P-1440 = 3.10
P-10 Day = 4.90

E =	**1.8580**	**IN**
V-360 =	**1.5156**	**AC-FT**
AD =	**5.8733**	**AC**
V-10 Day =	**2.6413**	**AC-FT**
V-10 Day =	**115056.93**	**CF**

POND VOLUME

Area of Top of Pond = 12160.25
Area of Bottom of Pond = 7067.71
Depth of Pond = 12 feet

Volume = (Top + Bottom)/2 *Depth

Volume = (12160.25 + 7067.71)/2 * 12
= 115367.76 CF

115367.76 CF > 115056.93 CF

Street Capacity Calculations

OAKLAND
32' F-F Street Section with 8" curb

For water depths less than 0.125 feet

Y= Water depth
Area = 8*Y^2
P= SQRT(257*Y^2) + Y
n= 0.017
Slope= 0.035

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.01	0.0008	0.170312	0.004697	0.000367	0.000734	0.45867	0.004587	0.808299	0.007477
0.02	0.0032	0.340624	0.009395	0.00233	0.00466	0.728093	0.014562	0.907285	0.017541
0.04	0.0128	0.681249	0.018789	0.014794	0.029588	1.155775	0.046231	1.018393	0.040982
0.06	0.0288	1.021873	0.028184	0.043617	0.087235	1.514494	0.09087	1.089592	0.0672
0.08	0.0512	1.362498	0.037578	0.093936	0.187871	1.834679	0.146774	1.143108	0.095372
0.1	0.08	1.703122	0.046973	0.170316	0.340633	2.128956	0.212896	1.186421	0.125077
0.12	0.1152	2.043746	0.056367	0.276953	0.553907	2.404109	0.288493	1.223026	0.156053
0.125	0.125	2.128902	0.058716	0.308804	0.617609	2.470435	0.308804	1.231375	0.163973

For water depths greater than 0.125 ft but less than 0.405 ft

Y1= Y-0.125
A2= A1 + 2*Y1 + 25*Y1^2
P2= P1 + SQRT(2501*Y1^2)

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.13	0.135625	2.383952	0.056891	0.328074	0.656148	2.418979	0.314467	1.182313	0.161876
0.16	0.225625	3.914252	0.057642	0.550575	1.101151	2.440223	0.390436	1.075082	0.17608
0.196	0.393025	5.750612	0.068345	1.074389	2.148778	2.73364	0.535793	1.088141	0.219139
0.246	**0.733025**	**8.301112**	**0.088304**	**2.377083**	**4.754166**	**3.24284**	**0.797739**	**1.152206**	**0.296295**
0.28	1.035625	10.03545	0.103197	3.726063	7.452125	3.597888	1.007409	1.198231	0.354699
0.32	1.465625	12.07585	0.121368	5.875301	11.7506	4.008734	1.282795	1.248833	0.427369
0.36	1.975625	14.11625	0.139954	8.708937	17.41787	4.408193	1.58695	1.294737	0.503307
0.395	2.4875	15.9016	0.156431	11.80996	23.61992	4.747723	1.875351	1.331248	0.571933
0.405	2.645	16.4117	0.161165	12.80986	25.61971	4.843046	1.961434	1.341106	0.591871

For water depths greater than 0.405 ft but less than 0.667 ft

Y2= Y - 0.405
A3= A2 + Y2*16
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)
0.41	2.725	16.4167	0.165989	13.45935	26.9187	4.939212	2.025077	1.35937	0.609423
0.43	3.045	16.4367	0.185256	16.18228	32.36455	5.314376	2.285182	1.428204	0.679724
0.48	3.845	16.4867	0.233218	23.82367	47.64734	6.196012	2.974086	1.576027	0.856432
0.53	4.645	16.5367	0.28089	32.57973	65.15946	7.013936	3.717386	1.697837	1.034884
0.55	4.965	16.5567	0.299879	36.37643	72.75287	7.326573	4.029615	1.740971	1.106799
0.59	5.605	16.5967	0.337718	44.45105	88.90211	7.930607	4.679058	1.819502	1.251563
0.61	5.925	16.6167	0.356569	48.72157	97.44314	8.22305	5.01606	1.855411	1.324408
0.667	6.837	16.6737	0.410047	61.71042	123.4208	9.02595	6.020309	1.94761	1.533668

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

Y3= Y - 0.667
A4= A3 + 16 * 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	7.392225	18.32403	0.403417	66.0007	132.0014	8.928394	6.249876	1.8806	1.544313
0.73	7.944225	19.82433	0.400731	70.61399	141.228	8.88872	6.488766	1.833369	1.562599
0.75	8.337225	20.82453	0.400356	74.06101	148.122	8.883172	6.662379	1.80763	1.57861
0.77	8.750225	21.82473	0.400932	77.80425	155.6085	8.891686	6.846598	1.78571	1.597285
0.8	9.407225	23.32503	0.40331	83.9766	167.9532	8.92682	7.141456	1.75883	1.629694
0.82	9.870225	24.32523	0.405761	88.46626	176.9325	8.962943	7.349613	1.744278	1.653895
0.85	10.60223	25.82553	0.410533	95.77072	191.5414	9.033078	7.678116	1.726626	1.693611

12" Pipe

Manning's Equation:

$$Q = \frac{1.49}{n} A R^{2/3} S^{1/2}$$

n = 0.013
A = Area
WP = wetted perimeter
R = A/WP
S = 0.02

$$A = 1.0^2 * \frac{\pi}{4} = 0.785$$

$$R = D/4 = \frac{1.0}{4} = 0.25$$

Manning's Equation:

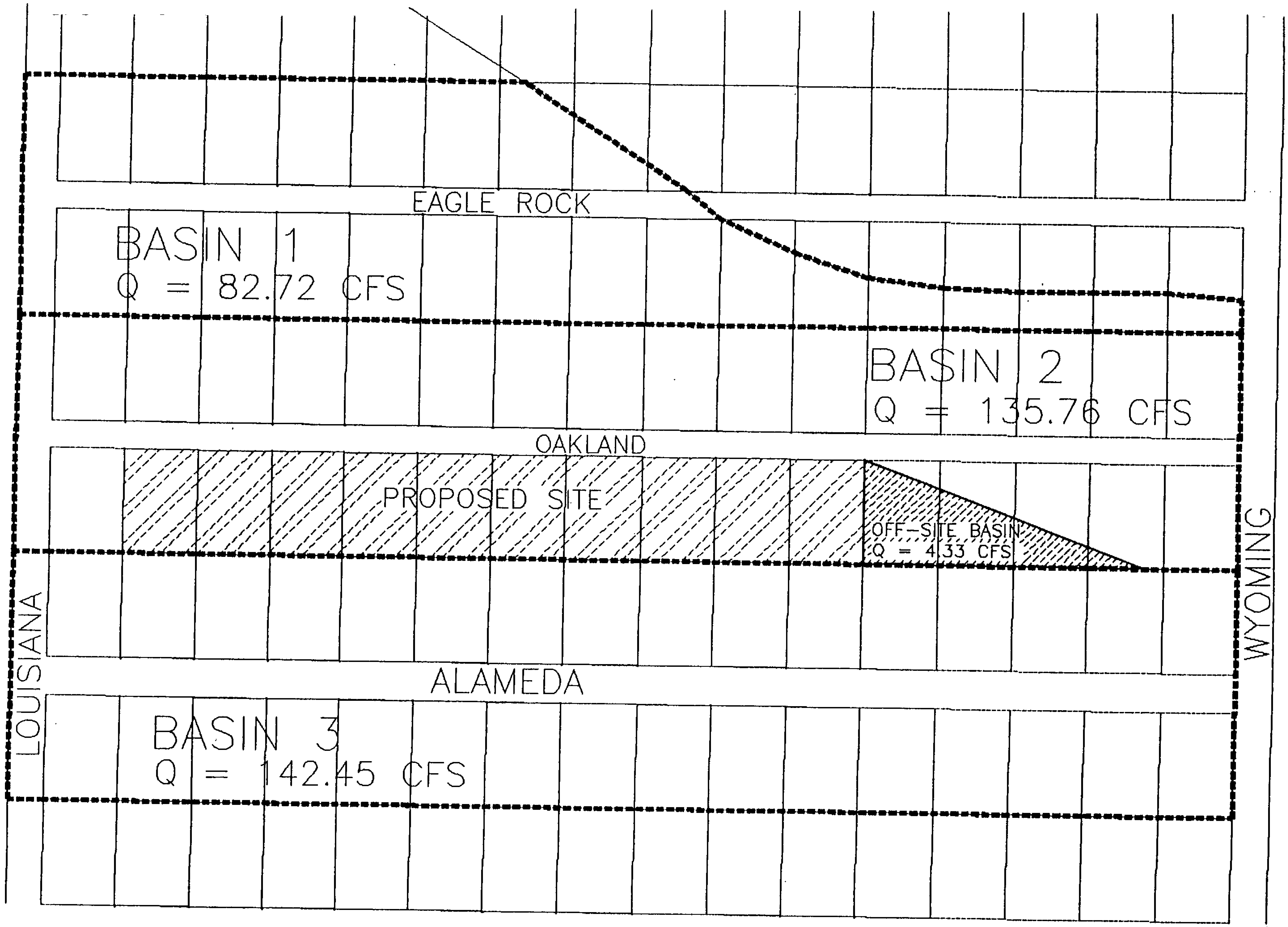
$$Q = \frac{1.49}{0.013} * 0.785 * 0.25^{2/3} * 0.02^{1/2}$$

$$Q = 5.05\ cfs$$

5.05 cfs > 4.75 cfs

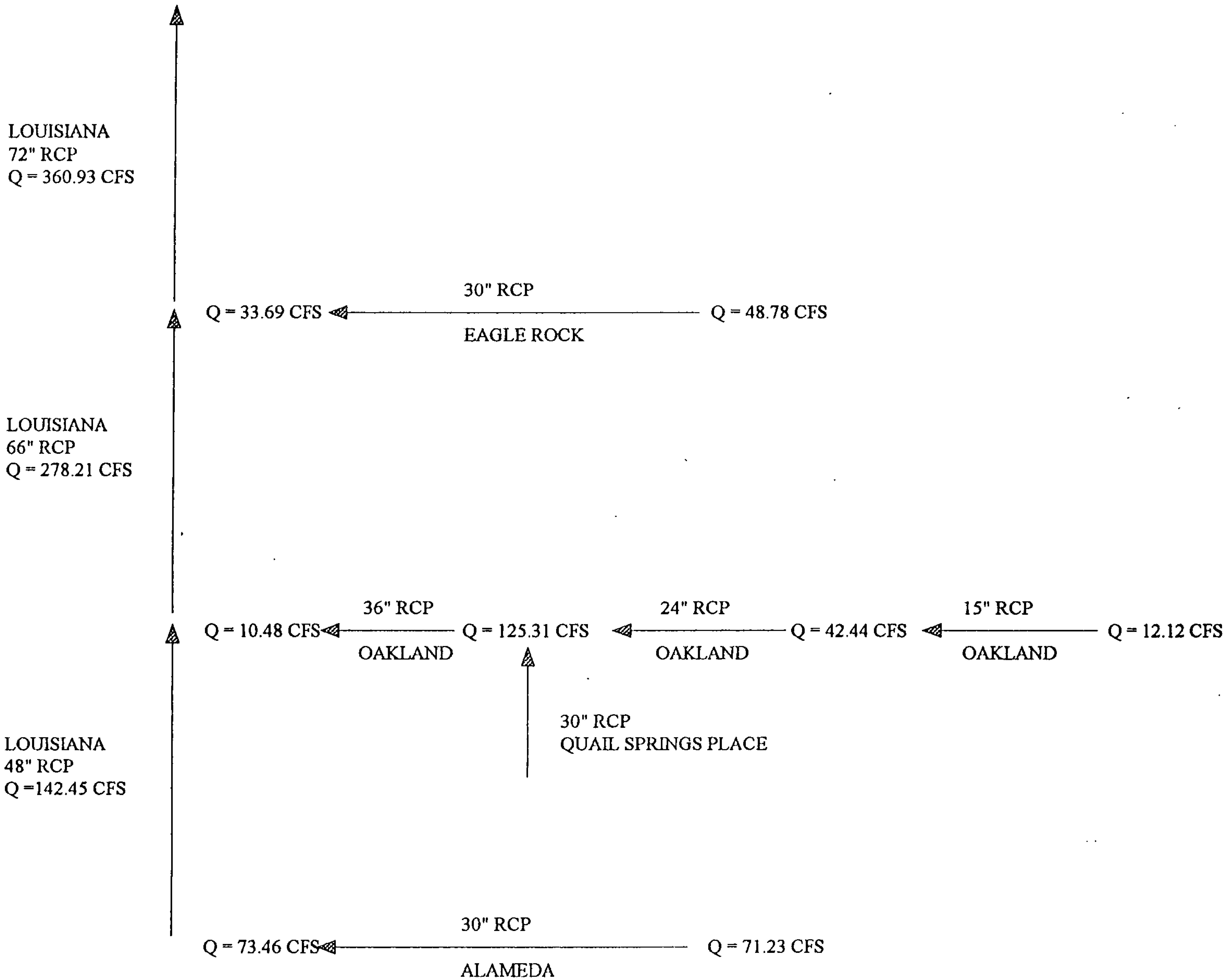
HEC-RAS Plan: Plan 03 Reach: LA CUEVA 11/11/96

River Sta.	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width
	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)
18	20.49	88.00	88.76	88.76	88.96	0.018779	3.55	5.77	15.20
17	20.49	85.00	85.40	85.49	85.69	0.066509	4.34	4.72	23.80
16	20.49	81.00	81.48	81.51	81.64	0.027541	3.19	6.43	26.59
15	20.49	77.25	77.65	77.72	77.88	0.053491	3.90	5.26	26.48
14	20.49	73.00	73.63	73.69	73.90	0.032907	4.14	4.95	15.73
13	20.49	70.00	70.26	70.29	70.40	0.035139	2.99	6.84	37.37
12	20.49	67.00	67.55	67.55	67.69	0.021615	3.06	6.70	24.55
11	20.49	63.00	63.42	63.55	63.84	0.088115	5.18	3.95	18.86
10	20.49	59.29	59.89	59.90	60.05	0.021425	3.24	6.32	21.10
9	20.49	57.00	57.47	57.49	57.62	0.028444	3.16	6.49	27.91
8	20.49	53.67	53.97	54.01	54.11	0.048645	3.06	6.69	45.02
7	20.49	51.43	51.81	51.81	51.91	0.022841	2.48	8.27	43.43
6	20.49	48.20	48.75	48.82	49.01	0.037673	4.06	5.04	18.34
5	20.49	45.00	45.49	45.53	45.67	0.029457	3.35	6.12	24.74
4	20.49	41.50	41.89	41.94	42.06	0.039405	3.32	6.17	31.42
3	20.49	37.57	37.98	38.03	38.17	0.039517	3.44	5.96	28.83
2	20.49	36.00	36.46	36.47	36.60	0.025218	2.96	6.93	30.01
1	20.49	33.29	33.62	33.75	34.07	0.129946	5.36	3.82	23.20


EAGLE ROCK
BASIN 1
Q = 82.72 CFS
BASIN 2
Q = 135.76 CFS
OAKLAND
PROPOSED SITE
OFF-SITE BASIN
Q = 4.33 CFS
LOUISIANA
WYOMING
ALAMEDA
BASIN 3
Q = 142.45 CFS

BASIN MAP

RUNOFF FLOW PATH



SUMMARY OF DROP INLET CAPACITY

Eagle Rock

	Q passing catchbasin (cfs)	Capacity of Catch Basins
1B	48.78	51.4
1A	33.96	35.4

Oakland

	Q passing catchbasin(cfs)	Capacity of Catch Basins
2B	42.44	30 *
2C	46.08	31 **
2C	45.32	49.8
2D	10.98	13.6

Alameda

	Q passing catchbasin (cfs)	Capacity of Catch Basins
3B	71.23	69
3A	73.46	74

* NOTE: Flow is limited by the capacity of the pipe to 12.12 cfs.
** NOTE: Flow is limited by the capacity of the pipe to 30.32 cfs.

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name:

Comment: EAGLE ROCK STORM DRAIN SYSTEM

Solve For Full Flow Diameter

Given Input Data:

Slope.............	0.0350 ft/ft
Manning's n.......	0.013
Discharge.........	42.44 cfs

Computed Results:

Full Flow Diameter.....	2.00 ft
Full Flow Depth........	2.00 ft
Velocity..........	13.48 fps
Flow Area.........	3.15 sf
Critical Depth....	1.96 ft
Critical Slope....	0.0314 ft/ft
Percent Full......	100.00 %
Full Capacity.....	42.44 cfs
QMAX @.94D........	45.65 cfs
Froude Number.....	FULL

Open Channel Flow Module, Version 3.12 (c) 1990
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name:

Comment: ALAMEDA STORM DRAIN SYSTEM

Solve For Full Flow Diameter

Given Input Data:

Slope.............	0.0300 ft/ft
Manning's n.......	0.013
Discharge.........	71.23 cfs

Computed Results:

Full Flow Diameter.....	2.50 ft
Full Flow Depth........	2.50 ft
Velocity..........	14.48 fps
Flow Area.........	4.92 sf
Critical Depth....	2.45 ft
Critical Slope....	0.0267 ft/ft
Percent Full......	100.00 %
Full Capacity.....	71.23 cfs
QMAX @.94D........	76.62 cfs
Froude Number.....	FULL

Open Channel Flow Module, Version 3.12 (c) 1990
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name:

Comment: LOUISIANA BETWEEN ALAMEDA AND OAKLAND

Solve For Full Flow Diameter

Given Input Data:

Slope.............	0.0100 ft/ft
Manning's n.......	0.013
Discharge.........	142.45 cfs

Computed Results:

Full Flow Diameter.....	3.99 ft
Full Flow Depth........	3.99 ft
Velocity..........	11.41 fps
Flow Area.........	12.49 sf
Critical Depth....	3.53 ft
Critical Slope....	0.0089 ft/ft
Percent Full......	100.00 %
Full Capacity.....	142.45 cfs
QMAX @.94D........	153.23 cfs
Froude Number.....	FULL

Open Channel Flow Module, Version 3.12 (c) 1990
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name:

Comment: LOUISIANA BETWEEN OAKLAND AND EAGLE ROCK

Solve For Full Flow Diameter

Given Input Data:

Slope.............	0.0100 ft/ft
Manning's n.......	0.013
Discharge.........	278.21 cfs

Computed Results:

Full Flow Diameter.....	5.13 ft
Full Flow Depth........	5.13 ft
Velocity..........	13.48 fps
Flow Area.........	20.63 sf
Critical Depth....	4.60 ft
Critical Slope....	0.0088 ft/ft
Percent Full......	100.00 %
Full Capacity.....	278.21 cfs
QMAX @.94D........	299.27 cfs
Froude Number.....	FULL

Open Channel Flow Module, Version 3.12 (c) 1990
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name:

Comment: LOUISIANA AFTER EAGLE ROCK

Solve For Full Flow Diameter

Given Input Data:

Slope.............	0.0100 ft/ft
Manning's n.......	0.013
Discharge.........	360.93 cfs

Computed Results:

Full Flow Diameter.....	5.65 ft
Full Flow Depth........	5.65 ft
Velocity..........	14.39 fps
Flow Area.........	25.08 sf
Critical Depth....	5.10 ft
Critical Slope....	0.0088 ft/ft
Percent Full......	100.00 %
Full Capacity.....	360.93 cfs
QMAX @.94D........	388.25 cfs
Froude Number.....	FULL

Open Channel Flow Module, Version 3.12 (c) 1990
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Pipe Capacity
Oakland

D (in)	A (ft^2)	R	Q (cfs)
12	0.79	0.25	6.68
15	1.23	0.3125	12.12
18	1.77	0.375	19.70
24	3.14	0.5	42.44
30	4.91	0.625	76.94
36	7.07	0.75	125.12

Manning's Equation:

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

A = Area
R = D/4
Slope = 0.035
n = 0.013

Street Capacity Calculations

EAGLE ROCK

32' F-F Street Section with 8" curb

For water depths less than 0.125 feet

Y=	Water depth
Area =	8*Y^2
P=	SQRT(257*Y^2) + Y
n=	0.017
Slope=	0.03

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.01	0.0008	0.170312	0.004697	0.00034	0.000679	0.424646	0.004246	0.74834	0.006705
0.02	0.0032	0.340624	0.009395	0.002157	0.004314	0.674083	0.013482	0.839983	0.015777
0.04	0.0128	0.681249	0.018789	0.013697	0.027393	1.07004	0.042802	0.942849	0.036962
0.06	0.0288	1.021873	0.028184	0.040382	0.080764	1.402149	0.084129	1.008766	0.060702
0.08	0.0512	1.362498	0.037578	0.086967	0.173935	1.698583	0.135887	1.058312	0.086239
0.1	0.08	1.703122	0.046973	0.157682	0.315365	1.97103	0.197103	1.098412	0.113188
0.12	0.1152	2.043746	0.056367	0.256409	0.512818	2.225773	0.267093	1.132302	0.141307
0.125	0.125	2.128902	0.058716	0.285897	0.571795	2.287178	0.285897	1.140032	0.1485

For water depths greater than 0.125 ft but less than 0.405 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	0.135625	2.383952	0.056891	0.303737	0.607475	2.239539	0.29114	1.094609	0.146478
0.16	0.225625	3.914252	0.057642	0.509734	1.019467	2.259207	0.361473	0.995332	0.159005
0.2	0.415625	5.954652	0.069798	1.066749	2.133498	2.566615	0.513323	1.011388	0.203039
0.24	0.685625	7.995052	0.085756	2.018649	4.037297	2.944246	0.706619	1.059109	0.258974
0.3045	1.289506	11.2852	0.114265	4.597236	9.194473	3.565114	1.085577	1.138549	0.361136
0.32	1.465625	12.07585	0.121368	5.439472	10.87894	3.711367	1.187637	1.156195	0.387151
0.328	**1.561225**	**12.48393**	**0.125059**	**5.911151**	**11.8223**	**3.786226**	**1.241882**	**1.165042**	**0.400755**
0.4	2.565625	16.15665	0.158797	11.39073	22.78146	4.439749	1.775899	1.237088	0.527821
0.405	2.645	16.4117	0.161165	11.85962	23.71925	4.483789	1.815935	1.241623	0.536917

For water depths greater than 0.405 ft but less than 0.667 ft

Y2=	Y - 0.405
A3=	A2 + Y2*16
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)
0.41	2.725	16.4167	0.165989	12.46094	24.92188	4.572821	1.874857	1.258532	0.55298
45	716.165	61.0067	11.73912	56005.92	112011.8	78.20254	3519.114	2.054408	110.1637
0.495	**4.085**	**16.5017**	**0.24755**	**24.38362**	**48.76723**	**5.969062**	**2.954685**	**1.495118**	**0.828001**
0.53	4.645	16.5367	0.28089	30.16297	60.32594	6.493643	3.441631	1.571891	0.942619
0.55	4.965	16.5567	0.299879	33.67803	67.35607	6.783088	3.730698	1.611826	1.008513
0.59	5.605	16.5967	0.337718	41.15368	82.30736	7.342316	4.331966	1.684531	1.141173
0.63	6.245	16.6367	0.375375	49.20091	98.40181	7.878448	4.963422	1.749212	1.274984
0.667	6.837	16.6737	0.410047	57.13275	114.2655	8.356406	5.573723	1.803137	1.399751

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

Y3=	Y - 0.667
A4=	A3 + 16 * 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	7.392225	18.32403	0.403417	61.10477	122.2095	8.266086	5.78626	1.741097	1.408775
0.73	7.944225	19.82433	0.400731	65.37585	130.7517	8.229356	6.00743	1.69737	1.424934
0.75	8.337225	20.82453	0.400356	68.56717	137.1343	8.22422	6.168165	1.67354	1.439236
0.77	8.750225	21.82473	0.400932	72.03274	144.0655	8.232101	6.338718	1.653246	1.455999
0.8	9.407225	23.32503	0.40331	77.74723	155.4945	8.264629	6.611703	1.62836	1.485204
0.82	9.870225	24.32523	0.405761	81.90384	163.8077	8.298072	6.804419	1.614888	1.507069
0.85	10.60223	25.82553	0.410533	88.66646	177.3329	8.363005	7.108554	1.598545	1.54302

Street Capacity Calculations

EAGLE ROCK
32' F-F Street Section with 8" curb

For water depths less than 0.125 feet

Y= Water depth
Area = 8*Y^2
P= SQRT(257*Y^2) + Y
n= 0.017
Slope= 0.03

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.01	0.0008	0.170312	0.004697	0.00034	0.000679	0.424646	0.004246	0.74834	0.006705
0.02	0.0032	0.340624	0.009395	0.002157	0.004314	0.674083	0.013482	0.839983	0.015777
0.04	0.0128	0.681249	0.018789	0.013697	0.027393	1.07004	0.042802	0.942849	0.036962
0.06	0.0288	1.021873	0.028184	0.040382	0.080764	1.402149	0.084129	1.008766	0.060702
0.08	0.0512	1.362498	0.037578	0.086967	0.173935	1.698583	0.135887	1.058312	0.086239
0.1	0.08	1.703122	0.046973	0.157682	0.315365	1.97103	0.197103	1.098412	0.113188
0.12	0.1152	2.043746	0.056367	0.256409	0.512818	2.225773	0.267093	1.132302	0.141307
0.125	0.125	2.128902	0.058716	0.285897	0.571795	2.287178	0.285897	1.140032	0.1485

For water depths greater than 0.125 ft but less than 0.405 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	0.135625	2.383952	0.056891	0.303737	0.607475	2.239539	0.29114	1.094609	0.146478
0.16	0.225625	3.914252	0.057642	0.509734	1.019467	2.259207	0.361473	0.995332	0.159005
0.2	0.415625	5.954652	0.069798	1.066749	2.133498	2.566615	0.513323	1.011388	0.203039
0.24	0.685625	7.995052	0.085756	2.018649	4.037297	2.944246	0.706619	1.059109	0.258974
0.268	**0.922225**	**9.423332**	**0.097866**	**2.965211**	**5.930423**	**3.21528**	**0.861695**	**1.094519**	**0.301938**
0.32	1.465625	12.07585	0.121368	5.439472	10.87894	3.711367	1.187637	1.156195	0.387151
0.328	1.561225	12.48393	0.125059	5.911151	11.8223	3.786226	1.241882	1.165042	0.400755
0.4	2.565625	16.15665	0.158797	11.39073	22.78146	4.439749	1.775899	1.237088	0.527821
0.405	2.645	16.4117	0.161165	11.85962	23.71925	4.483789	1.815935	1.241623	0.536917

For water depths greater than 0.405 ft but less than 0.667 ft

Y2= Y - 0.405
A3= A2 + Y2*16
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)
0.41	2.725	16.4167	0.165989	12.46094	24.92188	4.572821	1.874857	1.258532	0.55298
0.445	**3.285**	**16.4517**	**0.199675**	**16.99087**	**33.98174**	**5.172258**	**2.301655**	**1.366382**	**0.665718**
0.495	4.085	16.5017	0.24755	24.38362	48.76723	5.969062	2.954685	1.495118	0.828001
0.53	4.645	16.5367	0.28089	30.16297	60.32594	6.493643	3.441631	1.571891	0.942619
0.55	4.965	16.5567	0.299879	33.67803	67.35607	6.783088	3.730698	1.611826	1.008513
0.59	5.605	16.5967	0.337718	41.15368	82.30736	7.342316	4.331966	1.684531	1.141173
0.63	6.245	16.6367	0.375375	49.20091	98.40181	7.878448	4.963422	1.749212	1.274984
0.667	6.837	16.6737	0.410047	57.13275	114.2655	8.356406	5.573723	1.803137	1.399751

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

Y3= Y - 0.667
A4= A3 + 16 * 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	7.392225	18.32403	0.403417	61.10477	122.2095	8.266086	5.78626	1.741097	1.408775
0.73	7.944225	19.82433	0.400731	65.37585	130.7517	8.229356	6.00743	1.69737	1.424934
0.75	8.337225	20.82453	0.400356	68.56717	137.1343	8.22422	6.168165	1.67354	1.439236
0.77	8.750225	21.82473	0.400932	72.03274	144.0655	8.232101	6.338718	1.653246	1.455999
0.8	9.407225	23.32503	0.40331	77.74723	155.4945	8.264629	6.611703	1.62836	1.485204
0.82	9.870225	24.32523	0.405761	81.90384	163.8077	8.298072	6.804419	1.614888	1.507069
0.85	10.60223	25.82553	0.410533	88.66646	177.3329	8.363005	7.108554	1.598545	1.54302

Street Capacity Calculations

OAKLAND
32' F-F Street Section with 8" curb

<u>For water depths less than 0.125 feet</u>

Y= Water depth
Area = 8*Y^2
P= SQRT(257*Y^2) + Y
n= 0.017
Slope= 0.035

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.01	0.0008	0.170312	0.004697	0.000367	0.000734	0.45867	0.004587	0.808299	0.007477
0.02	0.0032	0.340624	0.009395	0.00233	0.00466	0.728093	0.014562	0.907285	0.017541
0.04	0.0128	0.681249	0.018789	0.014794	0.029588	1.155775	0.046231	1.018393	0.040982
0.06	0.0288	1.021873	0.028184	0.043617	0.087235	1.514494	0.09087	1.089592	0.0672
0.08	0.0512	1.362498	0.037578	0.093936	0.187871	1.834679	0.146774	1.143108	0.095372
0.1	0.08	1.703122	0.046973	0.170316	0.340633	2.128956	0.212896	1.186421	0.125077
0.12	0.1152	2.043746	0.056367	0.276953	0.553907	2.404109	0.288493	1.223026	0.156053
0.125	0.125	2.128902	0.058716	0.308804	0.617609	2.470435	0.308804	1.231375	0.163973

<u>For water depths greater than 0.125 ft but less than 0.405 ft</u>

Y1= Y-0.125
A2= A1 + 2*Y1 + 25*Y1^2
P2= P1 + SQRT(2501*Y1^2)

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.13	0.135625	2.383952	0.056891	0.328074	0.656148	2.418979	0.314467	1.182313	0.161876
0.16	0.225625	3.914252	0.057642	0.550575	1.101151	2.440223	0.390436	1.075082	0.17608
0.196	0.393025	5.750612	0.068345	1.074389	2.148778	2.73364	0.535793	1.088141	0.219139
0.24	0.685625	7.995052	0.085756	2.18039	4.360779	3.180149	0.763236	1.143968	0.286396
0.2735	0.973306	9.703887	0.100301	3.436022	6.872044	3.530258	0.965526	1.189597	0.343262
0.32	1.465625	12.07585	0.121368	5.875301	11.7506	4.008734	1.282795	1.248833	0.427369
0.36	1.975625	14.11625	0.139954	8.708937	17.41787	4.408193	1.58695	1.294737	0.503307
0.395	2.4875	15.9016	0.156431	11.80996	23.61992	4.747723	1.875351	1.331248	0.571933
0.405	2.645	16.4117	0.161165	12.80986	25.61971	4.843046	1.961434	1.341106	0.591871

<u>For water depths greater than 0.405 ft but less than 0.667 ft</u>

Y2= Y - 0.405
A3= A2 + Y2*16
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)
0.41	2.725	16.4167	0.165989	13.45935	26.9187	4.939212	2.025077	1.35937	0.609423
0.43	3.045	16.4367	0.185256	16.18228	32.36455	5.314376	2.285182	1.428204	0.679724
0.464	**3.589**	**16.4707**	**0.217902**	**21.2529**	**42.50581**	**5.921678**	**2.747659**	**1.531997**	**0.799712**
0.53	4.645	16.5367	0.28089	32.57973	65.15946	7.013936	3.717386	1.697837	1.034884
0.55	4.965	16.5567	0.299879	36.37643	72.75287	7.326573	4.029615	1.740971	1.106799
0.59	5.605	16.5967	0.337718	44.45105	88.90211	7.930607	4.679058	1.819502	1.251563
0.61	5.925	16.6167	0.356569	48.72157	97.44314	8.22305	5.01606	1.855411	1.324408
0.667	6.837	16.6737	0.410047	61.71042	123.4208	9.02595	6.020309	1.94761	1.533668

<u>For water depths greater than 0.667 ft but less than 0.847 ft</u>

Y3= Y - 0.667
A4= A3 + 16 * 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	7.392225	18.32403	0.403417	66.0007	132.0014	8.928394	6.249876	1.8806	1.544313
0.73	7.944225	19.82433	0.400731	70.61399	141.228	8.88872	6.488766	1.833369	1.562599
0.75	8.337225	20.82453	0.400356	74.06101	148.122	8.883172	6.662379	1.80763	1.57861
0.77	8.750225	21.82473	0.400932	77.80425	155.6085	8.891686	6.846598	1.78571	1.597285
0.8	9.407225	23.32503	0.40331	83.9766	167.9532	8.92682	7.141456	1.75883	1.629694
0.82	9.870225	24.32523	0.405761	88.46626	176.9325	8.962943	7.349613	1.744278	1.653895
0.85	10.60223	25.82553	0.410533	95.77072	191.5414	9.033078	7.678116	1.726626	1.693611

Street Capacity Calculations

OAKLAND
32' F-F Street Section with 8" curb

For water depths less than 0.125 feet

Y=	Water depth
Area =	8*Y^2
P=	SQRT(257*Y^2) + Y
n=	0.017
Slope=	0.035

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.01	0.0008	0.170312	0.004697	0.000367	0.000734	0.45867	0.004587	0.808299	0.007477
0.02	0.0032	0.340624	0.009395	0.00233	0.00466	0.728093	0.014562	0.907285	0.017541
0.04	0.0128	0.681249	0.018789	0.014794	0.029588	1.155775	0.046231	1.018393	0.040982
0.06	0.0288	1.021873	0.028184	0.043617	0.087235	1.514494	0.09087	1.089592	0.0672
0.08	0.0512	1.362498	0.037578	0.093936	0.187871	1.834679	0.146774	1.143108	0.095372
0.1	0.08	1.703122	0.046973	0.170316	0.340633	2.128956	0.212896	1.186421	0.125077
0.12	0.1152	2.043746	0.056367	0.276953	0.553907	2.404109	0.288493	1.223026	0.156053
0.125	0.125	2.128902	0.058716	0.308804	0.617609	2.470435	0.308804	1.231375	0.163973

For water depths greater than 0.125 ft but less than 0.405 ft

Y1=	Y-0.125
A2=	A1 + 2*Y1 + 25*Y1^2
P2=	P1 + SQRT(2501*Y1^2)

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.13	0.135625	2.383952	0.056891	0.328074	0.656148	2.418979	0.314467	1.182313	0.161876
0.16	0.225625	3.914252	0.057642	0.550575	1.101151	2.440223	0.390436	1.075082	0.17608
0.196	0.393025	5.750612	0.068345	1.074389	2.148778	2.73364	0.535793	1.088141	0.219139
0.24	0.685625	7.995052	0.085756	2.18039	4.360779	3.180149	0.763236	1.143968	0.286396
0.2735	0.973306	9.703887	0.100301	3.436022	6.872044	3.530258	0.965526	1.189597	0.343262
0.32	1.465625	12.07585	0.121368	5.875301	11.7506	4.008734	1.282795	1.248833	0.427369
0.36	1.975625	14.11625	0.139954	8.708937	17.41787	4.408193	1.58695	1.294737	0.503307
0.395	2.4875	15.9016	0.156431	11.80996	23.61992	4.747723	1.875351	1.331248	0.571933
0.405	2.645	16.4117	0.161165	12.80986	25.61971	4.843046	1.961434	1.341106	0.591871

For water depths greater than 0.405 ft but less than 0.667 ft

Y2=	Y - 0.405
A3=	A2 + Y2*16
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)
0.41	2.725	16.4167	0.165989	13.45935	26.9187	4.939212	2.025077	1.35937	0.609423
0.43	3.045	16.4367	0.185256	16.18228	32.36455	5.314376	2.285182	1.428204	0.679724
0.475	**3.765**	**16.4817**	**0.228435**	**23.00793**	**46.01586**	**6.111003**	**2.902727**	**1.562564**	**0.838688**
0.53	4.645	16.5367	0.28089	32.57973	65.15946	7.013936	3.717386	1.697837	1.034884
0.55	4.965	16.5567	0.299879	36.37643	72.75287	7.326573	4.029615	1.740971	1.106799
0.59	5.605	16.5967	0.337718	44.45105	88.90211	7.930607	4.679058	1.819502	1.251563
0.61	5.925	16.6167	0.356569	48.72157	97.44314	8.22305	5.01606	1.855411	1.324408
0.667	6.837	16.6737	0.410047	61.71042	123.4208	9.02595	6.020309	1.94761	1.533668

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

Y3=	Y - 0.667
A4=	A3 + 16 * 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	7.392225	18.32403	0.403417	66.0007	132.0014	8.928394	6.249876	1.8806	1.544313
0.73	7.944225	19.82433	0.400731	70.61399	141.228	8.88872	6.488766	1.833369	1.562599
0.75	8.337225	20.82453	0.400356	74.06101	148.122	8.883172	6.662379	1.80763	1.57861
0.77	8.750225	21.82473	0.400932	77.80425	155.6085	8.891686	6.846598	1.78571	1.597285
0.8	9.407225	23.32503	0.40331	83.9766	167.9532	8.92682	7.141456	1.75883	1.629694
0.82	9.870225	24.32523	0.405761	88.46626	176.9325	8.962943	7.349613	1.744278	1.653895
0.85	10.60223	25.82553	0.410533	95.77072	191.5414	9.033078	7.678116	1.726626	1.693611

Street Capacity Calculations

OAKLAND

32' F-F Street Section with 8" curb

For water depths less than 0.125 feet

Y=	Water depth
Area =	8*Y^2
P=	SQRT(257*Y^2) + Y
n=	0.017
Slope=	0.035

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.01	0.0008	0.170312	0.004697	0.000367	0.000734	0.45867	0.004587	0.808299	0.007477
0.02	0.0032	0.340624	0.009395	0.00233	0.00466	0.728093	0.014562	0.907285	0.017541
0.04	0.0128	0.681249	0.018789	0.014794	0.029588	1.155775	0.046231	1.018393	0.040982
0.06	0.0288	1.021873	0.028184	0.043617	0.087235	1.514494	0.09087	1.089592	0.0672
0.08	0.0512	1.362498	0.037578	0.093936	0.187871	1.834679	0.146774	1.143108	0.095372
0.1	0.08	1.703122	0.046973	0.170316	0.340633	2.128956	0.212896	1.186421	0.125077
0.12	0.1152	2.043746	0.056367	0.276953	0.553907	2.404109	0.288493	1.223026	0.156053
0.125	0.125	2.128902	0.058716	0.308804	0.617609	2.470435	0.308804	1.231375	0.163973

For water depths greater than 0.125 ft but less than 0.405 ft

Y1=	Y-0.125
A2=	A1 + 2*Y1 + 25*Y1^2
P2=	P1 + SQRT(2501*Y1^2)

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.13	0.135625	2.383952	0.056891	0.328074	0.656148	2.418979	0.314467	1.182313	0.161876
0.16	0.225625	3.914252	0.057642	0.550575	1.101151	2.440223	0.390436	1.075082	0.17608
0.196	0.393025	5.750612	0.068345	1.074389	2.148778	2.73364	0.535793	1.088141	0.219139
0.24	0.685625	7.995052	0.085756	2.18039	4.360779	3.180149	0.763236	1.143968	0.286396
0.308	**1.328225**	**11.46373**	**0.115863**	**5.162253**	**10.32451**	**3.88658**	**1.197067**	**1.23414**	**0.405188**
0.32	1.465625	12.07585	0.121368	5.875301	11.7506	4.008734	1.282795	1.248833	0.427369
0.36	1.975625	14.11625	0.139954	8.708937	17.41787	4.408193	1.58695	1.294737	0.503307
0.395	2.4875	15.9016	0.156431	11.80996	23.61992	4.747723	1.875351	1.331248	0.571933
0.405	2.645	16.4117	0.161165	12.80986	25.61971	4.843046	1.961434	1.341106	0.591871

For water depths greater than 0.405 ft but less than 0.667 ft

Y2=	Y - 0.405
A3=	A2 + Y2*16
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)
0.41	2.725	16.4167	0.165989	13.45935	26.9187	4.939212	2.025077	1.35937	0.609423
0.43	3.045	16.4367	0.185256	16.18228	32.36455	5.314376	2.285182	1.428204	0.679724
0.473	**3.733**	**16.4797**	**0.226521**	**22.68477**	**45.36953**	**6.076819**	**2.874336**	**1.557105**	**0.831595**
0.53	4.645	16.5367	0.28089	32.57973	65.15946	7.013936	3.717386	1.697837	1.034884
0.55	4.965	16.5567	0.299879	36.37643	72.75287	7.326573	4.029615	1.740971	1.106799
0.59	5.605	16.5967	0.337718	44.45105	88.90211	7.930607	4.679058	1.819502	1.251563
0.61	5.925	16.6167	0.356569	48.72157	97.44314	8.22305	5.01606	1.855411	1.324408
0.667	6.837	16.6737	0.410047	61.71042	123.4208	9.02595	6.020309	1.94761	1.533668

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

Y3=	Y - 0.667
A4=	A3 + 16 * 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	7.392225	18.32403	0.403417	66.0007	132.0014	8.928394	6.249876	1.8806	1.544313
0.73	7.944225	19.82433	0.400731	70.61399	141.228	8.88872	6.488766	1.833369	1.562599
0.75	8.337225	20.82453	0.400356	74.06101	148.122	8.883172	6.662379	1.80763	1.57861
0.77	8.750225	21.82473	0.400932	77.80425	155.6085	8.891686	6.846598	1.78571	1.597285
0.8	9.407225	23.32503	0.40331	83.9766	167.9532	8.92682	7.141456	1.75883	1.629694
0.82	9.870225	24.32523	0.405761	88.46626	176.9325	8.962943	7.349613	1.744278	1.653895
0.85	10.60223	25.82553	0.410533	95.77072	191.5414	9.033078	7.678116	1.726626	1.693611

Street Capacity Calculations

OAKLAND

32' F-F Street Section with 8" curb

For water depths less than 0.125 feet

Y=	Water depth
Area =	8*Y^2
P=	SQRT(257*Y^2) + Y
n=	0.017
Slope=	0.035

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.01	0.0008	0.170312	0.004697	0.000367	0.000734	0.45867	0.004587	0.808299	0.007477
0.02	0.0032	0.340624	0.009395	0.00233	0.00466	0.728093	0.014562	0.907285	0.017541
0.04	0.0128	0.681249	0.018789	0.014794	0.029588	1.155775	0.046231	1.018393	0.040982
0.06	0.0288	1.021873	0.028184	0.043617	0.087235	1.514494	0.09087	1.089592	0.0672
0.08	0.0512	1.362498	0.037578	0.093936	0.187871	1.834679	0.146774	1.143108	0.095372
0.1	0.08	1.703122	0.046973	0.170316	0.340633	2.128956	0.212896	1.186421	0.125077
0.12	0.1152	2.043746	0.056367	0.276953	0.553907	2.404109	0.288493	1.223026	0.156053
0.125	0.125	2.128902	0.058716	0.308804	0.617609	2.470435	0.308804	1.231375	0.163973

For water depths greater than 0.125 ft but less than 0.405 ft

Y1=	Y-0.125
A2=	A1 + 2*Y1 + 25*Y1^2
P2=	P1 + SQRT(2501*Y1^2)

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.13	0.135625	2.383952	0.056891	0.328074	0.656148	2.418979	0.314467	1.182313	0.161876
0.16	0.225625	3.914252	0.057642	0.550575	1.101151	2.440223	0.390436	1.075082	0.17608
0.196	0.393025	5.750612	0.068345	1.074389	2.148778	2.73364	0.535793	1.088141	0.219139
0.24	0.685625	7.995052	0.085756	2.18039	4.360779	3.180149	0.763236	1.143968	0.286396
0.3095	**1.345006**	**11.54025**	**0.116549**	**5.248087**	**10.49617**	**3.901905**	**1.20764**	**1.236**	**0.407944**
0.32	1.465625	12.07585	0.121368	5.875301	11.7506	4.008734	1.282795	1.248833	0.427369
0.36	1.975625	14.11625	0.139954	8.708937	17.41787	4.408193	1.58695	1.294737	0.503307
0.395	2.4875	15.9016	0.156431	11.80996	23.61992	4.747723	1.875351	1.331248	0.571933
0.405	2.645	16.4117	0.161165	12.80986	25.61971	4.843046	1.961434	1.341106	0.591871

For water depths greater than 0.405 ft but less than 0.667 ft

Y2=	Y - 0.405
A3=	A2 + Y2*16
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)
0.41	2.725	16.4167	0.165989	13.45935	26.9187	4.939212	2.025077	1.35937	0.609423
0.43	3.045	16.4367	0.185256	16.18228	32.36455	5.314376	2.285182	1.428204	0.679724
0.48	3.845	16.4867	0.233218	23.82367	47.64734	6.196012	2.974086	1.576027	0.856432
0.53	4.645	16.5367	0.28089	32.57973	65.15946	7.013936	3.717386	1.697837	1.034884
0.55	4.965	16.5567	0.299879	36.37643	72.75287	7.326573	4.029615	1.740971	1.106799
0.59	5.605	16.5967	0.337718	44.45105	88.90211	7.930607	4.679058	1.819502	1.251563
0.61	5.925	16.6167	0.356569	48.72157	97.44314	8.22305	5.01606	1.855411	1.324408
0.667	6.837	16.6737	0.410047	61.71042	123.4208	9.02595	6.020309	1.94761	1.533668

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

Y3=	Y - 0.667
A4=	A3 + 16 * 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	7.392225	18.32403	0.403417	66.0007	132.0014	8.928394	6.249876	1.8806	1.544313
0.73	7.944225	19.82433	0.400731	70.61399	141.228	8.88872	6.488766	1.833369	1.562599
0.75	8.337225	20.82453	0.400356	74.06101	148.122	8.883172	6.662379	1.80763	1.57861
0.77	8.750225	21.82473	0.400932	77.80425	155.6085	8.891686	6.846598	1.78571	1.597285
0.8	9.407225	23.32503	0.40331	83.9766	167.9532	8.92682	7.141456	1.75883	1.629694
0.82	9.870225	24.32523	0.405761	88.46626	176.9325	8.962943	7.349613	1.744278	1.653895
0.85	10.60223	25.82553	0.410533	95.77072	191.5414	9.033078	7.678116	1.726626	1.693611

Street Capacity Calculations

ALAMEDA

Two 24' Street Sections with a 10' median and 8" curb

For water depths less than 0.125 feet

Y=	Water depth
Area =	8*Y^2
P=	SQRT(257*Y^2) + Y
n=	0.017
Slope=	0.035

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.01	0.0016	0.340624	0.004697	0.000734	0.001468	0.45867	0.004587	0.808299	0.007477
0.02	0.0064	0.681249	0.009395	0.00466	0.00932	0.728093	0.014562	0.907285	0.017541
0.04	0.0256	1.362498	0.018789	0.029588	0.059176	1.155775	0.046231	1.018393	0.040982
0.06	0.0576	2.043746	0.028184	0.087235	0.17447	1.514494	0.09087	1.089592	0.0672
0.08	0.1024	2.724995	0.037578	0.187871	0.375742	1.834679	0.146774	1.143108	0.095372
0.1	0.16	3.406244	0.046973	0.340633	0.681266	2.128956	0.212896	1.186421	0.125077
0.12	0.2304	4.087493	0.056367	0.553907	1.107814	2.404109	0.288493	1.223026	0.156053
0.125	0.25	4.257805	0.058716	0.617609	1.235217	2.470435	0.308804	1.231375	0.163973

For water depths greater than 0.125 ft but less than 0.325 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	0.27125	4.767905	0.056891	0.656148	1.312296	2.418979	0.314467	1.182313	0.161876
0.16	0.45125	7.828505	0.057642	1.101151	2.202301	2.440223	0.390436	1.075082	0.17608
0.19	0.72125	10.8891	0.066236	1.930866	3.861732	2.677111	0.508651	1.082335	0.210947
0.22	1.08125	13.9497	0.077511	3.214431	6.428862	2.972884	0.654035	1.116963	0.254511
0.265	**1.79**	**18.5406**	**0.096545**	**6.160411**	**12.32082**	**3.44157**	**0.912016**	**1.178164**	**0.328489**
0.28	2.07125	20.0709	0.103197	7.452125	14.90425	3.597888	1.007409	1.198231	0.354699
0.3	2.48125	22.1113	0.112216	9.440142	18.88028	3.804591	1.141377	1.224107	0.390573
0.325	3.05	24.6618	0.123673	12.38094	24.76189	4.059326	1.319281	1.254828	0.436699

For water depths greater than 0.325 ft but less than 0.667 ft

Y2=	Y - 0.325
A3=	A2 + Y2*12
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)
0.328	3.122	24.6678	0.126562	12.8698	25.7396	4.122293	1.352112	1.268452	0.446815
0.358	**3.842**	**24.7278**	**0.155372**	**18.15833**	**36.31665**	**4.726269**	**1.692004**	**1.392031**	**0.548146**
0.39	4.61	24.7918	0.185949	24.56028	49.12057	5.32761	2.077768	1.503392	0.656806
0.42	5.33	24.8518	0.214471	31.23038	62.46077	5.859359	2.460931	1.5933	0.759391
0.439	**5.786**	**24.8898**	**0.232465**	**35.77286**	**71.54572**	**6.182658**	**2.714187**	**1.644429**	**0.824756**
0.48	6.77	24.9718	0.271106	46.37512	92.75025	6.850092	3.288044	1.7424	0.966884
0.51	7.49	25.0318	0.299219	54.79558	109.5912	7.315831	3.731074	1.805305	1.071809
0.54	8.21	25.0918	0.327198	63.75113	127.5023	7.765059	4.193132	1.862173	1.1775
0.567	8.858	25.1458	0.352266	72.25252	144.505	8.156753	4.624879	1.908965	1.273252
0.6	9.65	25.2118	0.382757	83.19173	166.3835	8.620904	5.172543	1.961324	1.391062
0.63	10.37	25.2718	0.410339	93.64351	187.287	9.030232	5.689046	2.004937	1.498869
0.667	11.258	25.3458	0.444176	107.1771	214.3542	9.520082	6.349895	2.054234	1.632708

For water depths greater than 0.667 ft but less than 0.85 ft

Y3=	Y - 0.667
A4=	A3 +12 * 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	12.10445	28.64646	0.422546	111.4632	222.9265	9.208451	6.445916	1.939589	1.601734
0.73	12.96845	31.64706	0.409784	117.0025	234.005	9.022087	6.586123	1.860877	1.590491
0.75	13.59445	33.64746	0.404026	121.4987	242.9975	8.937378	6.703033	1.81866	1.590093
0.77	14.26045	35.64786	0.400037	126.6107	253.2213	8.878448	6.836405	1.783051	1.594445
0.8	15.33445	38.64846	0.396767	135.4034	270.8067	8.83001	7.064008	1.739756	1.608542
0.82	16.10045	40.64886	0.396086	142.0044	284.0087	8.8199	7.232318	1.716441	1.622267
0.85	17.32445	43.64946	0.396899	153.009	306.0181	8.83197	7.507175	1.688186	1.648363

Street Capacity Calculations

ALAMEDA

Two 24' Street Sections with a 10' median and 8" curb

For water depths less than 0.125 feet

Y=	Water depth
Area =	8*Y^2
P=	SQRT(257*Y^2) + Y
n=	0.017
Slope=	0.035

Depth (ft)	Area (ft^2)	P (ft)	R (A/P)	Q (cfs)	2Q (cfs)	Vel (ft/s)	D*V	Fr	D2 (ft)
0.01	0.0016	0.340624	0.004697	0.000734	0.001468	0.45867	0.004587	0.808299	0.007477
0.02	0.0064	0.681249	0.009395	0.00466	0.00932	0.728093	0.014562	0.907285	0.017541
0.04	0.0256	1.362498	0.018789	0.029588	0.059176	1.155775	0.046231	1.018393	0.040982
0.06	0.0576	2.043746	0.028184	0.087235	0.17447	1.514494	0.09087	1.089592	0.0672
0.08	0.1024	2.724995	0.037578	0.187871	0.375742	1.834679	0.146774	1.143108	0.095372
0.1	0.16	3.406244	0.046973	0.340633	0.681266	2.128956	0.212896	1.186421	0.125077
0.12	0.2304	4.087493	0.056367	0.553907	1.107814	2.404109	0.288493	1.223026	0.156053
0.125	0.25	4.257805	0.058716	0.617609	1.235217	2.470435	0.308804	1.231375	0.163973

For water depths greater than 0.125 ft but less than 0.325 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	0.27125	4.767905	0.056891	0.656148	1.312296	2.418979	0.314467	1.182313	0.161876
0.16	0.45125	7.828505	0.057642	1.101151	2.202301	2.440223	0.390436	1.075082	0.17608
0.19	0.72125	10.8891	0.066236	1.930866	3.861732	2.677111	0.508651	1.082335	0.210947
0.22	1.08125	13.9497	0.077511	3.214431	6.428862	2.972884	0.654035	1.116963	0.254511
0.272	**1.91845**	**19.25474**	**0.099635**	**6.742633**	**13.48527**	**3.514626**	**0.955978**	**1.18759**	**0.34064**
0.28	2.07125	20.0709	0.103197	7.452125	14.90425	3.597888	1.007409	1.198231	0.354699
0.3	2.48125	22.1113	0.112216	9.440142	18.88028	3.804591	1.141377	1.224107	0.390573
0.325	3.05	24.6618	0.123673	12.38094	24.76189	4.059326	1.319281	1.254828	0.436699

For water depths greater than 0.325 ft but less than 0.667 ft

Y2=	Y - 0.325
A3=	A2 + Y2*12
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)
0.328	3.122	24.6678	0.126562	12.8698	25.7396	4.122293	1.352112	1.268452	0.446815
0.358	**3.842**	**24.7278**	**0.155372**	**18.15833**	**36.31665**	**4.726269**	**1.692004**	**1.392031**	**0.548146**
0.39	4.61	24.7918	0.185949	24.56028	49.12057	5.32761	2.077768	1.503392	0.656806
0.42	5.33	24.8518	0.214471	31.23038	62.46077	5.859359	2.460931	1.5933	0.759391
0.443	**5.882**	**24.8978**	**0.236246**	**36.75967**	**73.51934**	**6.249518**	**2.768537**	**1.65469**	**0.838558**
0.48	6.77	24.9718	0.271106	46.37512	92.75025	6.850092	3.288044	1.7424	0.966884
0.51	7.49	25.0318	0.299219	54.79558	109.5912	7.315831	3.731074	1.805305	1.071809
0.54	8.21	25.0918	0.327198	63.75113	127.5023	7.765059	4.193132	1.862173	1.1775
0.567	8.858	25.1458	0.352266	72.25252	144.505	8.156753	4.624879	1.908965	1.273252
0.6	9.65	25.2118	0.382757	83.19173	166.3835	8.620904	5.172543	1.961324	1.391062
0.63	10.37	25.2718	0.410339	93.64351	187.287	9.030232	5.689046	2.004937	1.498869
0.667	11.258	25.3458	0.444176	107.1771	214.3542	9.520082	6.349895	2.054234	1.632708

For water depths greater than 0.667 ft but less than 0.85 ft

Y3=	Y - 0.667
A4=	A3 +12 * 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	12.10445	28.64646	0.422546	111.4632	222.9265	9.208451	6.445916	1.939589	1.601734
0.73	12.96845	31.64706	0.409784	117.0025	234.005	9.022087	6.586123	1.860877	1.590491
0.75	13.59445	33.64746	0.404026	121.4987	242.9975	8.937378	6.703033	1.81866	1.590093
0.77	14.26045	35.64786	0.400037	126.6107	253.2213	8.878448	6.836405	1.783051	1.594445
0.8	15.33445	38.64846	0.396767	135.4034	270.8067	8.83001	7.064008	1.739756	1.608542
0.82	16.10045	40.64886	0.396086	142.0044	284.0087	8.8199	7.232318	1.716441	1.622267
0.85	17.32445	43.64946	0.396899	153.009	306.0181	8.83197	7.507175	1.688186	1.648363

FINDING STREET CAPACITY – 32 F–F CROSS–SECTION FOR 8" CURB

$Q = 1.49/n\ A\ R\verb|^|(2/3)\ S\verb|^|\frac{1}{2}$
n = 0.017
SLOPE = STREET SLOPE
$R\verb|^|2/3 = (A/P)\verb|^|2/3$
D2 = WATER DEPTH AFTER HYDRAULIC JUMP = $D1/2\ [SQRT\ (1 + 8Fr^2) - 1]$
$E = V^2 / 2g$

<u>HALF STREET CALCULATIONS</u>

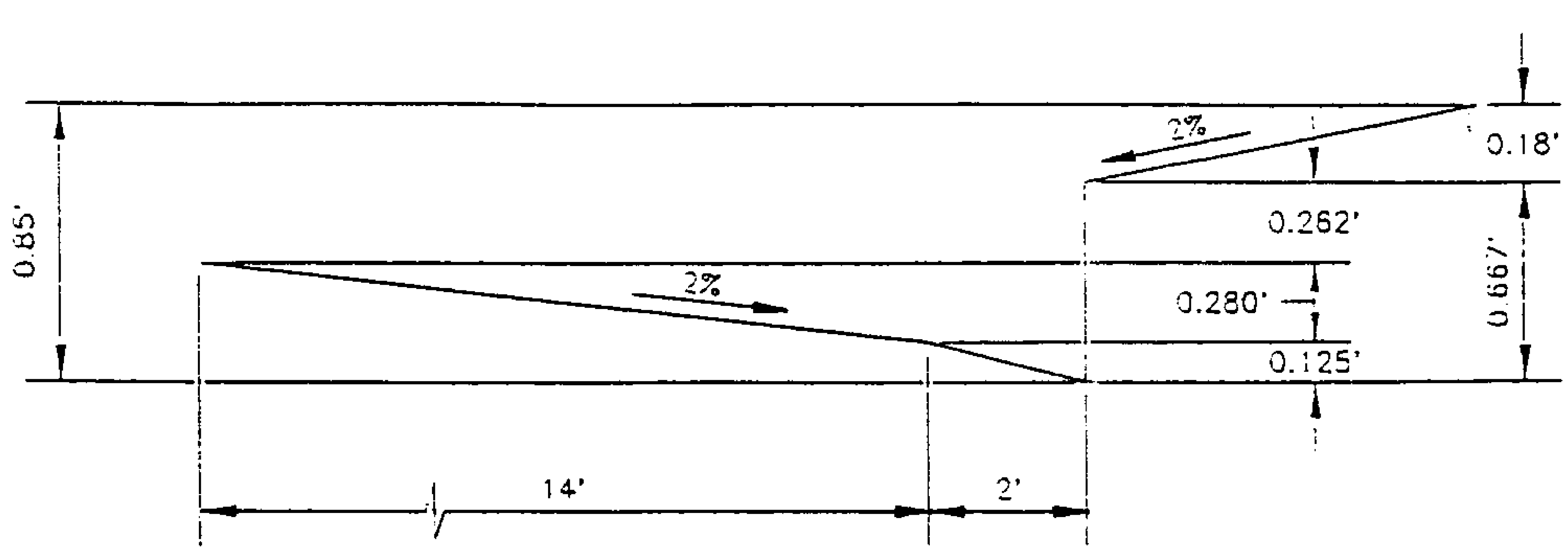
$@Y \le 0.125$
$A1 = \frac{1}{2} Y\ (Y/0.0625) = 8Y^2$
$P1 = SQRT[Y^2 + (Y/0.0625)^2] + Y = SQRT(257\ Y^2) + Y$

$@\ 0.125 < Y \le 0.405\ \ \&\ \ Y1 = Y - 0.125$
$A2 = A1 + \frac{1}{2}Y1\ (Y1/0.02) + 2Y1 = A1 + 25Y1^2 + 2Y1$
$P2 = P1 + SQRT[Y1^2 + (Y1/0.02)^2] + Y1 = P1 + SQRT(2501\ Y1^2) + Y1$

$@\ 0.405 < Y \le 0.667\ \ \&\ \ Y2 = Y - 0.405$
$A3 = A2 + 16Y2 + \frac{1}{2}Y2[Y2/(0.02)] = A2 + 16\ Y2$
$P3 = P2 + SQRT(Y2^2 + [Y2/(0.02)]^2) = P2 + Y2$

$@\ 0.667 < Y \le 0.847\ \ \&\ \ Y3 = Y - 0.667$
$A4 = A3 + 16Y3 + \frac{1}{2}Y3[Y3/(0.02)] = A3 + 16\ Y3 + 25\ Y3^2$
$P4 = P3 + SQRT(Y3^2 + [Y3/(0.02)]^2) = P3 + SQRT(2501\ Y3^2)$

SEE THE FOLLOWING SHEET FOR INPUT AND OUTPUT FILE FOR CALCULAITON RESULTS FROM COMPUTER PROGRAM USING THE EQUATION SHWON ABOVE



32' F–F
8" CURB

NOT TO SCALE

AHYMO SUMMARY TABLE (AHYMO194) - AMAFCA Hydrologic Model - January, 1994 RUN DATE (MON/DAY/YR) =09/09/1996

INPUT FILE = A:E.DAT USER NO.= R_BOHANN.I01

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	PAGE = 1 NOTATION
START										TIME= .00
RAINFALL TYPE= 1										RAIN6= 2.600
COMPUTE NM HYD	100.10	-	1	.03046	51.06	1.498	.92188	1.510	2.619	PER IMP= .00
COMPUTE NM HYD	100.20	-	1	.05000	83.80	2.458	.92188	1.510	2.619	PER IMP= .00
COMPUTE NM HYD	100.30	-	1	.05246	87.92	2.579	.92188	1.510	2.619	PER IMP= .00
START										TIME= .00
RAINFALL TYPE= 1										RAIN6= 1.730
COMPUTE NM HYD	110.10	-	1	.03046	22.95	.578	.35586	1.532	1.177	PER IMP= .00
COMPUTE NM HYD	110.20	-	1	.05000	37.67	.949	.35586	1.532	1.177	PER IMP= .00
COMPUTE NM HYD	110.30	-	1	.05246	39.52	.996	.35586	1.532	1.177	PER IMP= .00
FINISH										

AHYMO SUMMARY TABLE (AHYMO194) - AMAFCA Hydrologic Model - January, 1994 RUN DATE (MON/DAY/YR) =09/09/1996
INPUT FILE = A:P.DAT USER NO.= R_BOHANN.I01

PAGE = 1

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	NOTATION
START										TIME= .00
RAINFALL TYPE= 1										RAIN6= 2.600
COMPUTE NM HYD	100.10	-	1	.03046	82.72	3.004	1.84918	1.510	4.243	PER IMP= 60.00
COMPUTE NM HYD	100.20	-	1	.05000	135.76	4.931	1.84918	1.510	4.243	PER IMP= 60.00
COMPUTE NM HYD	100.30	-	1	.05246	142.45	5.174	1.84919	1.510	4.243	PER IMP= 60.00
START										TIME= .00
RAINFALL TYPE= 1										RAIN6= 1.730
COMPUTE NM HYD	110.10	-	1	.03046	51.30	1.761	1.08384	1.510	2.631	PER IMP= 60.00
COMPUTE NM HYD	110.20	-	1	.05000	84.19	2.890	1.08384	1.510	2.631	PER IMP= 60.00
COMPUTE NM HYD	110.30	-	1	.05246	88.33	3.033	1.08384	1.510	2.631	PER IMP= 60.00
FINISH										

AHYMO SUMMARY TABLE (AHYMO194) - AMAFCA Hydrologic Model - January, 1994 RUN DATE (MON/DAY/YR) =09/09/1996
INPUT FILE = A:ESUB.DAT USER NO.= R_BOHANN.I01

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	PAGE = 1 NOTATION
START										TIME= .00
RAINFALL TYPE= 1										RAIN6= 2.600
COMPUTE NM HYD	100.1A	-	1	.01250	20.96	.615	.92188	1.510	2.620	PER IMP= .00
COMPUTE NM HYD	100.1B	-	1	.01796	30.10	.883	.92188	1.510	2.619	PER IMP= .00
COMPUTE NM HYD	100.2A	-	1	.01382	23.18	.680	.92188	1.510	2.620	PER IMP= .00
COMPUTE NM HYD	100.2B	-	1	.01563	26.19	.768	.92188	1.510	2.619	PER IMP= .00
COMPUTE NM HYD	100.2C	-	1	.01742	29.19	.856	.92188	1.510	2.619	PER IMP= .00
COMPUTE NM HYD	100.2D	-	1	.00312	5.24	.154	.92188	1.510	2.623	PER IMP= .00
COMPUTE NM HYD	100.3A	-	1	.02623	43.96	1.290	.92188	1.510	2.619	PER IMP= .00
COMPUTE NM HYD	100.3B	-	1	.02623	43.96	1.290	.92188	1.510	2.619	PER IMP= .00
START										TIME= .00
RAINFALL TYPE= 1										RAIN6= 1.730
COMPUTE NM HYD	110.1A	-	1	.01250	9.42	.237	.35586	1.532	1.178	PER IMP= .00
COMPUTE NM HYD	110.1B	-	1	.01796	13.53	.341	.35586	1.532	1.177	PER IMP= .00
COMPUTE NM HYD	110.2A	-	1	.01382	10.42	.262	.35586	1.532	1.178	PER IMP= .00
COMPUTE NM HYD	110.2B	-	1	.01563	11.77	.297	.35586	1.532	1.177	PER IMP= .00
COMPUTE NM HYD	110.2C	-	1	.01742	13.12	.331	.35586	1.532	1.177	PER IMP= .00
COMPUTE NM HYD	110.2D	-	1	.00312	2.36	.059	.35586	1.532	1.179	PER IMP= .00
COMPUTE NM HYD	110.3A	-	1	.02623	19.76	.498	.35586	1.532	1.177	PER IMP= .00
COMPUTE NM HYD	110.3B	-	1	.02623	19.76	.498	.35586	1.532	1.177	PER IMP= .00
FINISH										

AHYMO SUMMARY TABLE (AHYMO194) - AMAFCA Hydrologic Model - January, 1994 RUN DATE (MON/DAY/YR) =09/09/1996
INPUT FILE = A:PSUB.DAT USER NO.= R_BOHANN.I01

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	PAGE = 1 NOTATION
START										TIME= .00
RAINFALL TYPE= 1										RAIN6= 2.600
COMPUTE NM HYD	100.1A	-	1	.01250	33.96	1.233	1.84918	1.510	4.245	PER IMP= 60.00
COMPUTE NM HYD	100.1B	-	1	.01796	48.78	1.771	1.84919	1.510	4.244	PER IMP= 60.00
COMPUTE NM HYD	100.2A	-	1	.01382	37.55	1.363	1.84918	1.510	4.244	PER IMP= 60.00
COMPUTE NM HYD	100.2B	-	1	.01563	42.44	1.541	1.84919	1.510	4.244	PER IMP= 60.00
COMPUTE NM HYD	100.2C	-	1	.01742	47.30	1.718	1.84919	1.510	4.244	PER IMP= 60.00
COMPUTE NM HYD	100.2D	-	1	.00312	8.50	.308	1.84919	1.510	4.252	PER IMP= 60.00
COMPUTE NM HYD	100.30	-	1	.02623	71.23	2.587	1.84918	1.510	4.243	PER IMP= 60.00
COMPUTE NM HYD	100.30	-	1	.02623	71.23	2.587	1.84918	1.510	4.243	PER IMP= 60.00
START										TIME= .00
RAINFALL TYPE= 1										RAIN6= 1.730
COMPUTE NM HYD	110.1A	-	1	.01250	21.06	.723	1.08384	1.510	2.632	PER IMP= 60.00
COMPUTE NM HYD	110.1B	-	1	.01796	30.25	1.038	1.08384	1.510	2.631	PER IMP= 60.00
COMPUTE NM HYD	100.2A	-	1	.01382	23.28	.799	1.08384	1.510	2.632	PER IMP= 60.00
COMPUTE NM HYD	100.2B	-	1	.01563	26.32	.903	1.08384	1.510	2.632	PER IMP= 60.00
COMPUTE NM HYD	100.2C	-	1	.01742	29.33	1.007	1.08384	1.510	2.631	PER IMP= 60.00
COMPUTE NM HYD	100.2D	-	1	.00312	5.27	.181	1.08384	1.510	2.636	PER IMP= 60.00
COMPUTE NM HYD	100.3A	-	1	.02623	44.17	1.516	1.08384	1.510	2.631	PER IMP= 60.00
COMPUTE NM HYD	100.3B	-	1	.02623	44.17	1.516	1.08384	1.510	2.631	PER IMP= 60.00
FINISH										

P 97029222 0502 #559081 C-19/D015

AGREEMENT AND COVENANT

This Agreement and Covenant, between the City of Albuquerque, New Mexico ("City") and Newman Homes Inc., ("User") is made in Albuquerque, New Mexico and is entered into as of the date of recording this Agreement with the Bernalillo County Clerk.

1. Recital. The User is the owner of certain real property ("User's Property") located at S. of Oakland near Wyoming, in Albuquerque, New Mexico, and more particularly described as:

NORTH ALBUQUERQUE ACRES, UNIT 3, TRACT 2, BLK 3, LOTS 2-11 FILED SEPT. 10, 1931 VOL. D1 FOLIO 20 IN BERNALILLO COUNTY CLERK'S OFFICE N.M.

The City is the owner of certain real property, easement or public right-of-way ("City's Property") in the vicinity of, contiguous to, abutting or within User's Property, and more particularly described as: Drainage easement located on lots 58, 59, and 60. QUAIL SPRINGS SUBD

The User wishes to construct upon, improve or repair and to maintain the following "Improvement" on the City's Property (or already has done so): Retention pond

A sketch of the proposed or existing Improvement is attached as Exhibit A and made a part of this Agreement.

The City agrees to permit the Improvement to exist on the City's Property provided the User complies with the terms of this Agreement.

2. City Use of City's Property and City Liability. The City has the right to enter upon the City's Property at any time and perform whatever inspection, installation, maintenance, repair, modification or removal ("Work") it deems appropriate without liability to the User. If the Work affects the Improvement the City will not be financially or otherwise responsible for rebuilding or repairing the Improvement. The User promptly will repair the Improvement to the City's satisfaction. The cost of repairing the Improvement will be paid by User.

3. User's Responsibility for Improvement. The User will be solely responsible for constructing, maintaining, repairing and, if required, removing the Improvement, all in accordance with standards required by the City as per the approved Grading and Drainage Plan C19-D15 on file at City Hydrology. The User will be solely responsible for paying all related costs. The User will not permit the Improvement to constitute a hazard to the health or safety of the general public or to interfere with the City's use of the City's Property. The User will conform with all

applicable laws, ordinances and regulations.

4. Use of the Improvement. If the City's Property is a public right-of-way, it shall be open to the use of the general public at all times, subject to reasonable curtailment during periods of construction, maintenance or repair.

5. Demand for Repair, Modification or Removal. The City may send written notice ("Notice") to the User requiring the User to repair, modify or remove the Improvement within __ days ("Deadline") and the User will comply promptly with the requirements of the Notice. If removal is demanded, the City also may require the User to return the City's Property to its original condition by the Deadline. The User will perform all required work by the Deadline, at User's sole expense.

6. Failure to Perform by User and Emergency Work by City. If the User fails to comply with the terms of the Notice by the Deadline stated, or, if the City determines that an emergency condition exists, the City may perform the work itself. The City then may assess the User for the cost of the work and for any other expenses or damages which result from User's failure to perform. The User agrees promptly to pay the City the amount assessed. If the User fails to pay the City within thirty (30) days after the City gives the User written notice of the amount due, the City may impose a lien against User's Property for the total resulting amount.

7. Cancellation of Agreement and Release of Covenant. This Agreement may be cancelled and User's covenants released by the City at will by the City's mailing to the User notice of the City's intention to record a Cancellation and Release with the Bernalillo County Clerk. The Cancellation and Release will be effective thirty (30) days after the date of mailing the notice to the User unless a later date is stated in the notice or the Cancellation and Release. After the effective date, the City will record the Cancellation and Release with the Bernalillo County Clerk.

8. Condemnation. If any part of the User's Property is ever condemned by the City, the User will forego all claims to compensation for any portion of User's structure which encroaches on City Property and for severance damage to the remaining portion of User's structure on User's Property.

9. Assessment. Nothing in this Agreement shall be construed to relieve the User, his heirs, assigns and successors from an assessment against User's Property for improvements to the City Property under a duly authorized and approved Special Assessment District. The parties specifically agree that the value of the Improvement will not reduce the amount assessed by the City.

10. Notice. For purposes of giving formal written notice to the User, User's address is:

Newman Homes Inc.
P.O. Box 21490
Albuquerque, NM 87154

Notice may be given to the User either in person or by mailing the notice by regular U.S. mail, postage paid. Notice will be considered to have been received by the User within 3 days after the notice is mailed if there is no actual evidence of receipt. The User may change User's address by giving written notice of the change by certified mail, return receipt requested, to the City Engineer at P.O. Box 1293, Albuquerque, New Mexico 87103.

11. Indemnification. The User agrees to defend, indemnify and hold harmless the City, its officials, agents and employees from and against any and all claims, actions, suits or proceedings of any kind brought against said parties as a result of User's use of the City's Property. To the extent, if at all, Section 56-7-1 NMSA 1978 is applicable to this Agreement, this Agreement to indemnify will not extend to liability, claims, damages, losses or expenses, including attorney's fees, arising out of (1) the preparation or approval of maps, drawings, opinions, reports, surveys, change orders, designs or specifications by the indemnitee, or the agents or employees of the indemnitee; or (2) the giving of or the failure to give direction or instructions by the indemnitee, where such giving or failure to give directions or instructions is the primary cause of bodily injury to persons or damage to property.

12. Term. This Agreement shall continue until revoked by the City pursuant to Section 7 above.

13. Binding on User's Property. The covenants and obligations of the User set forth herein shall be binding on User, his heirs, assigns and successors and on User's Property and constitute covenants running with User's Property until released by the City.

14. Entire Agreement. This Agreement contains the entire agreement of the parties and supersedes any and all other agreements or understandings, oral or written, whether previous to the execution hereof or contemporaneous herewith.

15. Changes of Agreement. Changes to this Agreement are not binding unless made in writing, signed by both parties.

Approved as to form by
Legal Department 2/23/95

16. Construction and Severability. If any part of this Agreement is held to be invalid or unenforceable, the remainder of the Agreement will remain valid and enforceable if the remainder is reasonably capable of completion.

17. Captions. The captions to the sections or paragraphs of this Agreement are not part of this Agreement and will not affect the meaning or construction of any of its provisions.

CITY OF ALBUQUERQUE

By: ______________________
Lawrence Rael
Chief Administrative Officer
Dated: 3-20-97

USER:

By: ______________________
Its: PRESIDENT

Dated: 3/4/97

APPROVED:

____
Robert E. Gurule, Director
Public Works Department
3/14/97

Reviewed by:

____
~~Rick Royval~~, City Engineer
Construction Management/PWD
3/11/97

CITY'S ACKNOWLEDGEMENTS

STATE OF NEW MEXICO)
) ss
COUNTY OF BERNALILLO)

This instrument was acknowledged before me on 3/20, 1997, by Lawrence Rael, Chief Administrative Officer for the City of Albuquerque, a New Mexico municipal corporation, on behalf of the corporation.

OFFICIAL SEAL
Karmela Levingston
NOTARY PUBLIC
STATE OF NEW MEXICO
My Commission Expires:

____
Notary Public

My Commission Expires:

1/17/2001

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Approved as to form by
Legal Department 2/23/95

STATE OF NEW MEXICO)
) ss
COUNTY OF BERNALILLO)

This instrument was acknowledged before me on March 18, 1997, by Robert E. Gurule, Director, Public Works Department for the City of Albuquerque, a New Mexico municipal corporation, on behalf of the corporation.

[signature]
Notary Public

My Commission Expires:

1-30-98

USER'S ACKNOWLEDGEMENT

STATE OF NEW MEXICO)
) ss.
COUNTY OF BERNALILLO)

This instrument was acknowledged before me on March 4, 1997, by Raymond Paul Newman President, on behalf of Newman Homes Inc.

Donna J. Bohannan
Notary Public

My Commission Expires:

March 26, 2000

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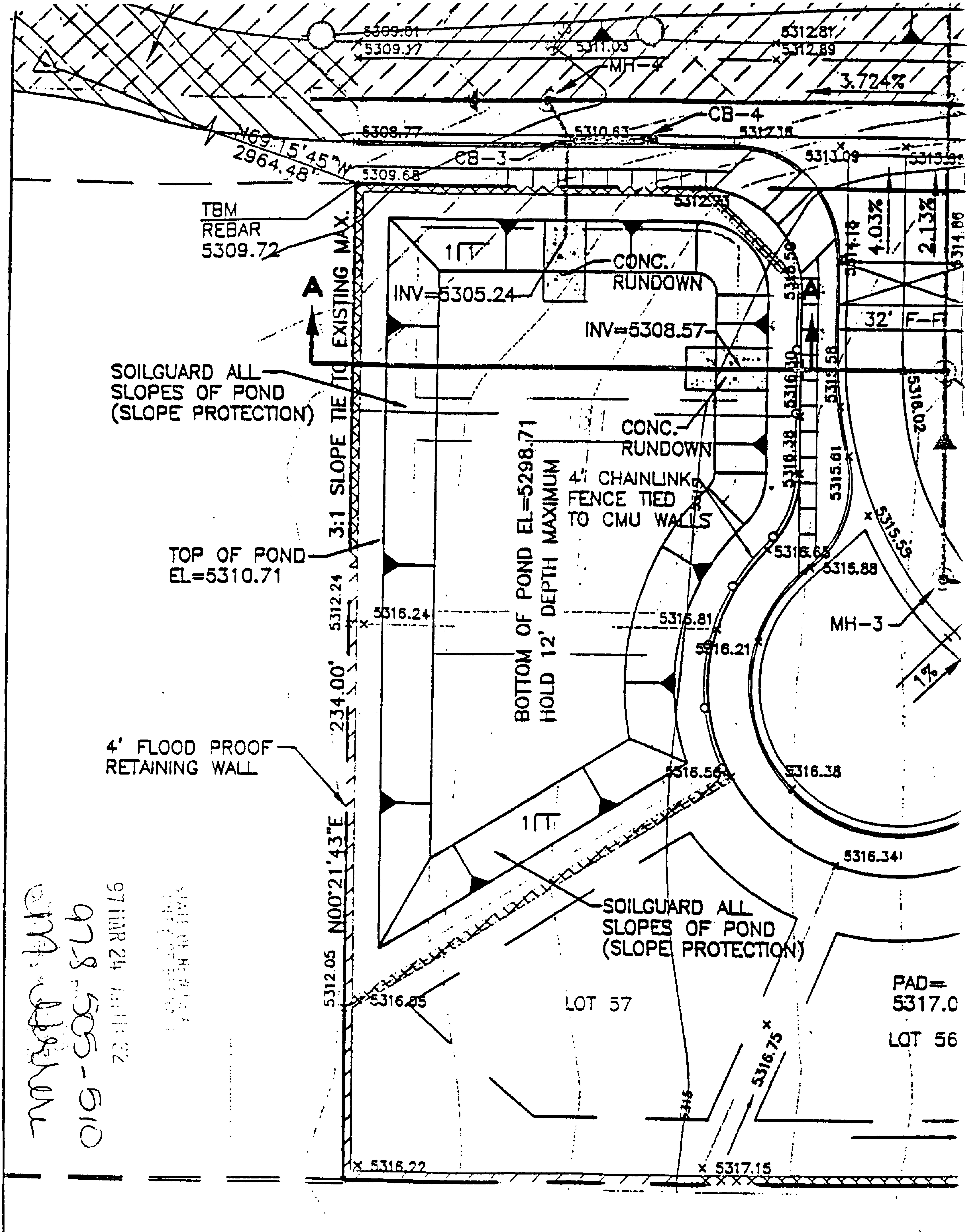
Approved as to form by
Legal Department 2/23/95



5309.01
5309.17
5311.03
MH-4
5312.81
5312.89
3.724%
CB-4
5308.77
5310.63
5312.18
N69°15'45"W
2964.48'
CB-3
5309.68
5313.09
TBM
REBAR
5309.72
5312.93
4.03%
2.13%
3:1 SLOPE TIE TO EXISTING MAX.
1:1
CONC.
RUNDOWN
INV=5305.24
A
32' F-F
INV=5308.57
SOILGUARD ALL
SLOPES OF POND
(SLOPE PROTECTION)
CONC.
RUNDOWN
BOTTOM OF POND EL=5298.71
HOLD 12' DEPTH MAXIMUM
4' CHAINLINK
FENCE TIED
TO CMU WALLS
5315.61
5315.53
5316.65
5315.88
TOP OF POND
EL=5310.71
5312.24
5316.24
5316.81
5316.21
MH-3
1%
234.00'
4' FLOOD PROOF
RETAINING WALL
5316.56
5316.38
1:1
N00°21'43"E
5316.34
SOILGUARD ALL
SLOPES OF POND
(SLOPE PROTECTION)
5312.05
5316.85
LOT 57
PAD=
5317.0
LOT 56
5316.75
5316.22
5317.15

EXHIBIT "A"

PRELIMINARY REVIEW

Contact Person Terri Martin
Phone No. 924-3997
(File w/SIA)

Project # 559081
CCN # 9701214
New or Ext. #

Type of Agreement: Agreement and Covenant

Description/Project: Quail Springs Subd
Public Works/Div.: Project Review Section
Developer: Newman Homes, Inc.
Contract Amount $ -0-
Contract Amount $

SIA Contract Period: 3/20/97 - (See SIA)
SW'S Contract Period: -
Project Completed Date:

DRAFT CONTRACT:
Rec'd by Legal:
Rejected/Returned to Dept.: 3/12/97
Returned to Legal:
Approved:
Initials:

FINANCIAL GUARANTY:
Letter of Credit No.: Date: Attached: Yes__ No__ Initial__
Other: Type Date: Attached: Yes__ No__ Initial__

FINAL CONTRACT REVIEW

APPROVALS REQUIRED:

	Date Delivered	Returned to Dept.	Approved By	Approval Date:
Purchasing:				
Asst. City Attorney:	3-11-97 TBL		[signature]	3/14/97
CAO	3-18-97 TBL			
City Attorney:			[signature]	3-20-97
PWD Director	3-17-97 TBL			3-18-97
Other:				
Council:	EC No.	Approved:	Date:	

DISTRIBUTION:

	Date:	By:
Department		
Vendor		
City Clerk	4/1/97 TBL	[signature]
Treasury		

Revised 9/6/95 WP+125805/ts!