Appendix G

Hydraulic Report and Stormwater Control Plan

PRELIMINARY
HYDRAULIC REPORT

FOR

NORTH WILLOW SPRINGS
APN: 073-060-031, 032, 033, 034, 035, 036, 037, 038, 039, 040, 041, 042 & 043

CLIENT: The Towbes Group, Inc.
21 East Victoria Street, Suite 200
Santa Barbara, CA 93101
(805) 962-2121

PREPARED BY: Dale W. Weber
MAC Design Associates
1933 Cliff Drive, Suite 6
Santa Barbara, CA 93109
(805) 957-4748

DALE W. WEBER
RCE 53753
EXPIRES 6/30/15

W.O. 0343

DATE: August 27, 2014

MAC DESIGN ASSOCIATES

INDEX

PURPOSE OF REPORT

The purpose of this report is to summarize the stormwater runoff from the North Willow Springs project site and to describe how the project design will meet the flood control standards of the City of Goleta.

EXISTING CONDITIONS

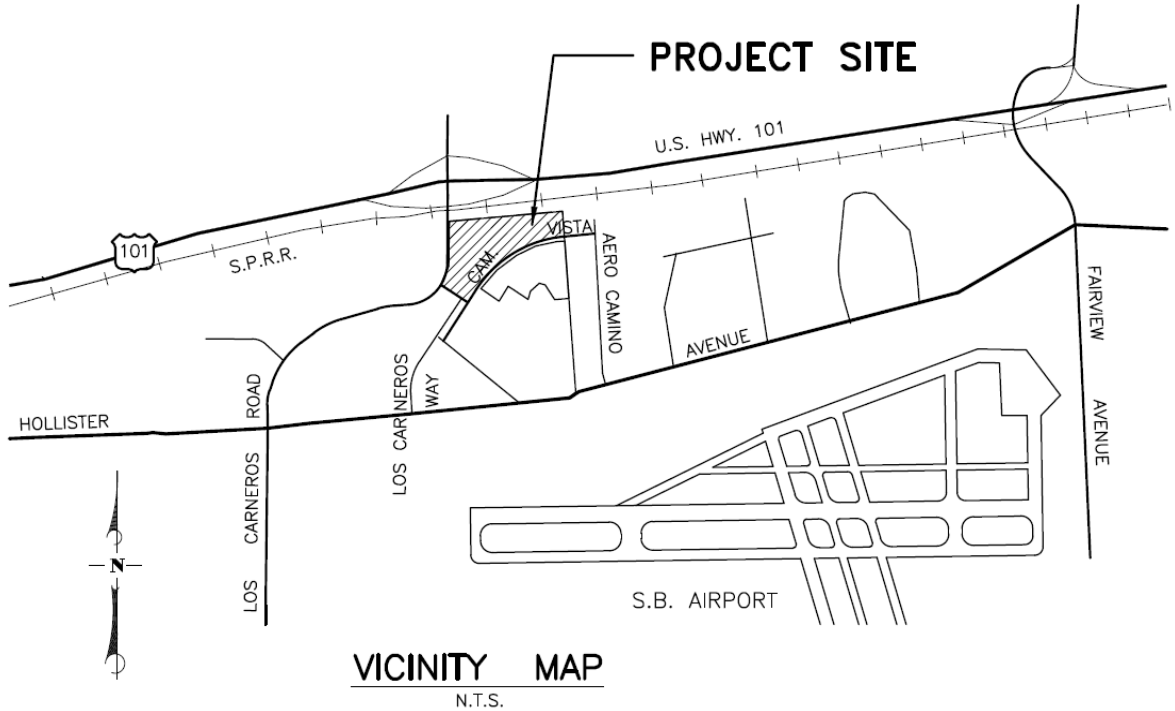
The project site is currently thirteen (13) undeveloped lots adjacent to currently under construction Willow Springs II development, and previously developed Willow Springs I development.

PROPOSED DEVELOPMENT

North Willow Springs is a voluntary merger of thirteen (13) existing lots into a two (2) lot residential subdivision and a one (1) lot public park of two acres in size. North Willow Springs is a 360 unit residential apartment project consisting of eight (8) buildings containing the units and two (2) recreation buildings. The western portion of the project will designated as Senior Housing and is comprised two (2) residential buildings with a total of 132 units, and one (1) recreation building. The eastern portion of the project will be designated as Work Force Housing and is comprised of six (6) residential buildings with a total of 228 units, and one (1) recreation building.

LOCATION OF SITE

North Willow Springs is the northern portion (approximately 16.2 acres) of Tract 13,646, and is located on APN's 073-060-031 through 043, in Goleta, California. The tract is located near the intersection of Los Carneros Road and Calle Koral, and is immediately adjacent to the previously approved and developed Willow Springs I & II projects. A vicinity map is shown on Figure 1.



VICINITY MAP
N.T.S.

FIGURE 1

I. HYDROLOGY/HYDRAULICS

Drainage from the proposed North Willow Springs development is tributary to the previously constructed Willow Springs I & II developments. Therefore, storm drains that are constructed as a part of North Willow Springs will tie to the existing storm drains within Willow Springs I & II and ultimately drain to the existing retention basin located along the southwest boundary of Willow Springs I. The Willow Springs I & II projects accounted for the future phased development of North Willow Springs in the design of its storm drains and retention basin. The Willow Springs I & II hydraulic reports have been attached to this report for reference.

In the attached Willow Springs I & II hydraulic reports, the anticipated storm water runoff from North Willow Springs was calculated assuming commercial development would take place. However, since North Willow Springs is now proposed to be a residential development with a 2 acre public park, it can rightly be assumed that the Willow Springs I & II hydraulic reports over-estimated the runoff that North Willow Springs would contribute to the Willow Springs I & II storm drains and detention basin. Therefore, the Willow Springs I & II storm drains and retention basin have more than adequate capacity to accept drainage from Willow Springs II.

As mentioned, the on-site retention basin is located southwest of the Willow Springs I development. This area will be maintained in perpetuity as a wetland in accordance with the Army Corps of Engineers (ACOE) 404 permit. The wetland mitigation plan which was approved by the ACOE recommended that this area be used to retain storm water runoff to improve wetland hydrology.

Retention Basin calculations were performed as part of the approved Final Willow Springs I Hydraulic Report and accounted for developed runoff from North Willow Springs and Willow Springs II. The Willow Springs I Hydraulic Report has been attached. The outflow from the retention basin is controlled through use of a Cipolletti (trapezoidal) weir.

Post-development hydrographs for the 10, 25, 50 and 100 year rainfall events were routed through the retention basin using the Santa Barbara County Flood Control Urban Hydrograph method (SBUH) and compared with the Pre-development hydrographs. Results of the pre. vs post development calculations routed through the retention basin are summarized in Table 1.

Table 1

Return Period	Pre-Development Runoff, cfs	Post-Development Runoff, cfs	Difference, cfs
100	95.3	90	-5.3
50	83.0	80	-3.0
25	70.8	69	-1.8
10	56.3	56	0

CONCLUSIONS

The construction of the drainage improvements outlined in this report will result in post-development peak runoff rates equal or less than the expected runoff rates for the same return periods from the pre-development peak runoff rates.

STORMDRAIN CALCULATIONS

The anticipated storm water runoff was calculated using Santa Barbara County Flood Control District (SBCFCD) computer programs and design charts assuming a 25 year return period. Coefficients of runoff were determined for apartments. A time of concentration of 12 minutes (minimum) was established for the various drainage areas to determine runoff intensity. Outlines of the drainage areas are shown on the Preliminary Drainage Plan which is attached as Appendix A.

Roadway and parking lot catch basins are standard Santa Barbara County Public Works (SBCPW) Type "A" Drop Inlets. Other catch basins consist of standard precast concrete catch basins and Caltrans standard grated concrete pipes (GCP).

All input parameters are in accordance with the City of Goleta and Santa Barbara County Flood Control District (SBCFCD) standards.

North Willow Springs will tie to and extend existing Willow Springs I & II storm drain lines "A" and "C". Hydraulic calculations have been updated to reflect these tie in's and extensions and are provided below.

HYDROLOGY TABLE
Storm Drain "A"

Drainage Area	Area, Ac	Land Use	Q10, cfs	Q25, cfs	Q50, cfs	Q100, cfs
A1	**6.6**	**Apt.**	**12**	**15.5**	**18.7**	**21**
			Tc=12 min C_{Apt}=0.70 i=2.61	Tc=12 min C_{Apt}=0.74 i=3.18	Tc=12 min C_{Apt}=0.77 i=3.68	Tc=12 min C_{Apt}=0.79 i=4.03
WILLOW SPRINGS I & II						
A2a	0.72	Apt.	1.3	1.7	2.1	2.3
A2b	0.23	Apt.	0.4	0.5	0.7	0.7
A2c	0.47	Apt.	0.9	1.1	1.3	1.5
A3	0.2	Comm.	0.3	0.4	0.4	0.5
A4	0.3	Comm.	0.3	0.6	0.7	0.8
A5	0.3	Comm.	0.3	0.6	0.4	0.5
A6	0.3	Comm.	0.3	0.6	0.7	0.8
A7	0.5	Comm.	0.8	1.0	1.1	1.3
A8	3.4	Comm.	5.2	6.5	7.6	8.6
V	8.6	Comm.	13.1	16.5	19.3	21.9
	21.6			**45.0**		

HYDROLOGY TABLE
Storm Drain "C"

Drainage Area	Area, Ac	Land Use	Q10, cfs	Q25, cfs	Q50, cfs	Q100, cfs
C1	**10.4**	**Apt.**	**19**	**24.5**	**29.5**	**33**
			Tc=12 min CApt=0.70 i=2.61	Tc=12 min CApt=0.74 i=3.18	Tc=12 min CApt=0.77 i=3.68	Tc=12 min CApt=0.79 i=4.03
WILLOW SPRINGS I & II						
C2a	0.70	Apt.	1	2	2	2
C2b	0.43	Apt.	1	1	1	1
C2c	0.22	Apt.	0	1	1	1
C2d	1.39	Apt.	3	3	4	4
C2e	0.38	Apt.	1	1	1	1
C2f	1.64	Apt.	3	4	5	5
C2g	1.10	Apt.	2	3	3	4
C2h	0.32	Apt.	1	1	1	1
C11	1.0	Ag.	1.7	2.1	2.5	2.8
C12	0.6	Apt.	1.0	1.3	1.5	1.7
C13	0.9	Apt.	1.5	1.9	2.2	2.6
C14	0.4	Apt.	0.7	0.8	1.0	1.1
C15	0.7	Apt.	1.2	1.5	1.7	2.0
C16	0.4	Apt.	0.7	0.8	1.0	1.1
	20.6			**48.9**		

APPENDIX A

PRELIMINARY DRAINAGE PLAN
FOR
NORTH WILLOW SPRINGS

MAC DESIGN ASSOCIATES

03430RN1.DWG 04/16/14 08:30:21 AM PDT

NO.	DATE	REVISION	APPD.

MAC Design Associates
CIVIL ENGINEERING • LAND PLANNING • BRIDGE DESIGN
1933 CLIFF DRIVE, SUITE 6, SANTA BARBARA, CALIF. 93109 (805) 957-4748

DESIGN DWW CHECKED MAC
DRAWN TLA
DALE W. WEBER DATE: 04-16-14
PROJECT ENGINEER
R.C.E. 53753 (EXP. 06-30-15)

CITY OF GOLETA, CALIFORNIA
REVIEWED BY: ______ DATE ______
FOR

PRELIMINARY DRAINAGE PLAN

NORTH WILLOW SPRINGS
CITY OF GOLETA

SHEET 1 OF 1
GOLETA CITY FILE
NO.

APPENDIX B

WILLOW SPRINGS I & II
FINAL HYDRAULIC REPORTS
OCTOBER 24, 2012 AND JANUARY 2, 2002

FINAL
HYDRAULIC REPORT

FOR

WILLOW SPRINGS II
APN: 073-060-44, -45, -46, -47, -48

CLIENT: The Towbes Group, Inc.
21 East Victoria Street, Suite 200
Santa Barbara, CA 93101
(805) 962-2121

PREPARED BY: Dale W. Weber
MAC Design Associates
1933 Cliff Drive, Suite 6
Santa Barbara, CA 93109
(805) 957-4748

DALE W. WEBER
RCE 53753
EXPIRES 6/30/13

W.O. 0219

DATE: October 24, 2012

MAC DESIGN ASSOCIATES

INDEX

PURPOSE OF REPORT

The purpose of this report is to summarize the runoff from the Willow Springs II project site and to describe how the project design will meet the flood control and water quality standards of the City of Goleta.

EXISTING CONDITIONS

The project site is currently five (5) undeveloped lots adjacent to previously developed Willow Springs development.

PROPOSED DEVELOPMENT

Willow Springs II is a voluntary merger of five (5) lots and a subsequent one (1) lot residential subdivision for condominium purposes. Willow Springs II is a 100 unit residential apartment project consisting of ten (10) buildings containing the units.

LOCATION OF SITE

Willow Springs II is the center portion (approximately 5 acres) of Tract 13,646, and is located on APN's 073-060-044 through 048, in Goleta, California. The tract is located near the intersection of Hollister Avenue and Los Carneros Road, and is immediately adjacent to the previously approved and developed Willow Springs project. A vicinity map is shown on Figure 1.

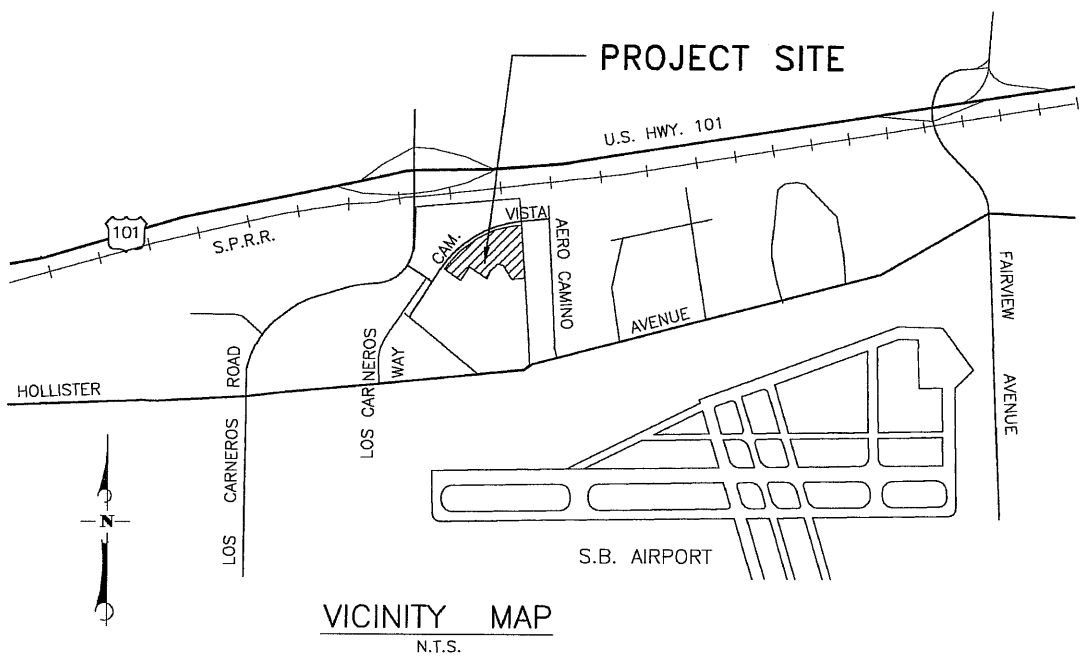


FIGURE 1

I. HYDROLOGY/HYDRAULICS

Drainage from the proposed Willow Springs II development is tributary to the previously constructed Willow Springs development. Therefore, storm drains that are constructed as a part of Willow Springs II will tie to the existing storm drains within Willow Springs and ultimately drain to the existing detention basin located along the southern boundary of Willow Springs. The Willow Springs project accounted for the future phased development of Willow Springs II in the design of its storm drains and detention basin. The Willow Springs hydraulic report has been attached to this report for reference.

In the attached Willow Springs hydraulic report, the anticipated storm water runoff from Willow Springs II was calculated assuming commercial development would take place. However, since Willow Springs II is now proposed to be a residential development, it can rightly be assumed that the Willow Springs hydraulic report over-estimated the runoff that Willow Springs II would contribute to the Willow Springs storm drains and detention basin. Therefore, the Willow Springs storm drains and detention basin have more than adequate capacity to accept drainage from Willow Springs II.

The anticipated storm water runoff was calculated using Santa Barbara County Flood Control District (SBCFCD) computer programs and design charts assuming a 25 year return period. Coefficients of runoff were determined for apartments. A time of concentration of 12 minutes (minimum) was established for the various drainage areas to determine runoff intensity. Outlines of the drainage areas are shown on the Preliminary Drainage Plan which is attached as Appendix A.

Roadway and parking lot catch basins are standard Santa Barbara County Public Works (SBCPW) Type "A" Drop Inlets. Other catch basins consist of standard precast concrete catch basins and Caltrans standard grated concrete pipes (GCP).

All input parameters are in accordance with the City of Goleta and Santa Barbara County Flood Control District (SBCFCD) standards. Water quality calculations are in accordance with the City of Goleta Draft Hydromodification Control Standards.

Willow Springs II will tie to and extend existing Willow Springs storm drain lines "A" and "C". Hydraulic calculations have been updated to reflect these tie in's and extentions and are provided below. The new section of Camino Vista will include two type"A" curbside drainage inlets. The areas tributary to these new inlets will be areas C2h and a 0.53 acre portion of area C2g. The 10-year storm event will result in a gutter flow of approximately 1cfs to these inlets. The calculation below indicates that 100% of this flow will be intercepted by the 8' and 9' windows proposed, and the spread will be 5.2 feet.

Retention Basin calculations were performed as part of the Willow Springs Hydraulic Report and accounted for developed runoff from Willow Springs II. The Willow Springs Hydraulic Report has been attached.

HYDROLOGY TABLE
Storm Drain "A"

Drainage Area	Area, Ac	Land Use	Q10, cfs	Q25, cfs	Q50, cfs	Q100, cfs
A2a	**0.72**	**Apt.**	**1**	**2**	**2**	**2**
A2b	**0.23**	**Apt.**	**0**	**1**	**1**	**1**
A2c	**0.47**	**Apt.**	**1**	**1**	**1**	**1**
			Tc=12 min CApt=0.70 i=2.61	Tc=12 min CApt=0.74 i=3.18	Tc=12 min CApt=0.77 i=3.68	Tc=12 min CApt=0.79 i=4.03
WILLOW SPRINGS I						
A1	8.4	Comm.	12.8	16.2	18.9	21.3
A3	0.2	Comm.	0.3	0.4	0.4	0.5
A4	0.3	Comm.	0.3	0.6	0.7	0.8
A5	0.2	Comm.	0.3	0.4	0.4	0.5
A6	0.3	Comm.	0.3	0.6	0.7	0.8
A7	0.5	Comm.	0.8	1.0	1.1	1.3
A8	3.4	Comm.	5.2	6.5	7.6	8.6
V	8.6	Comm.	13.1	16.5	19.3	21.9
	23.3			**45.2**		

HYDROLOGY TABLE
Storm Drain "C"

Drainage Area	Area, Ac	Land Use	Q10, cfs	Q25, cfs	Q50, cfs	Q100, cfs
C1	8.89	Apt.	16	21	25	28
C2a	0.70	Apt.	1	2	2	2
C2b	0.43	Apt.	1	1	1	1
C2c	0.22	Apt.	0	1	1	1
C2d	1.39	Apt.	3	3	4	4
C2e	0.38	Apt.	1	1	1	1
C2f	1.64	Apt.	3	4	5	5
C2g	1.10	Apt.	2	3	3	4
C2h	0.32	Apt.	1	1	1	1
			Tc=12 min CApt=0.70 i=2.61	Tc=12 min CApt=0.74 i=3.18	Tc=12 min CApt=0.77 i=3.68	Tc=12 min CApt=0.79 i=4.03
WILLOW SPRINGS I						
C3	0.3	Apt.	0.5	0.6	0.7	0.9
C4	0.8	Apt.	1.3	1.7	2.0	2.3
C5	0.1	Apt.	0.2	0.2	0.2	0.3
C6	0.2	Apt.	0.3	0.4	0.5	0.6
C7	0.5	Apt.	0.8	1.1	1.2	1.4
C8	0.3	Apt.	0.5	0.6	0.7	0.9
C9	0.1	Apt.	0.2	0.2	0.2	0.3
C10	0.8	Apt.	1.3	1.7	2.0	2.3
C11	1.0	Ag.	1.7	2.1	2.5	2.8
C12	0.6	Apt.	1.0	1.3	1.5	1.7
C13	0.9	Apt.	1.5	1.9	2.2	2.6
C14	0.4	Apt.	0.7	0.8	1.0	1.1
C15	0.7	Apt.	1.2	1.5	1.7	2.0
C16	0.4	Apt.	0.7	0.8	1.0	1.1
	22.17			**51.9**		

Hydraulic properties of a Street Half-Section

n = .015 Street X-section Properties
Z(0)=99.00/ Gutter= 1.5 Z(1)=0.050/ L(2)=23.5 Z(2)=0.020/ L(3)= 0.0 Z(3)=0.020
Street half-width from gutter flow line to center line is 25 ft
Crown height is .545 ft
Inlet Capacities Based on 3 inch Local Depression.
Slope = 0.040000

D	Q	V	V	Spread	ITTE Curb Opening Inlet		City of L A Lengths
ft	cfs	Avg	Gutter	ft	100%	75%	for % Intercep
0.15	1.00	3.35	4.28	5.2	8.0	5.5	

$Q_{10} = (0.70)(2.61)(0.53)$

$= 0.97 \text{ CFS}$

$= 1 \text{ CFS}$

Santa Barbara County Flood Control and Water Conservation District

Program Rational - XL

User Data:

Project Name:	Willow Springs II	**Project Number:**	0219
Date of Run:	10/24/2012	**Run By:**	DW
Notes:	A2a		

Input Data:

Location:	South Coast	Land Use Type:	Condo - Apartments
Area (Acres):	.72	Time of Concentration (Min.):	12

	Q10:	Q25:	Q50:	Q100:
Calculated Runnoff Coefficient:	0.70	0.74	0.77	0.79
User Selected Runoff Coefficient (Optional):				

Calculate

For Large Lot Subdivisions (>10,000 sq. ft.):

	Low Value:	High Value:	User Selected:
Q10:			
Q25:			
Q50:			
Q100:			

Enter Selection

Results:

	Rainfall Intensity:	Runoff Coef:	Q (cfs):
Q10:	**2.61**	**0.70**	**1**
Q25:	**3.18**	**0.74**	**2**
Q50:	**3.68**	**0.77**	**2**
Q100:	**4.03**	**0.79**	**2**

View RI Curves

View RC Curves

Print

Exit

Santa Barbara County Flood Control and Water Conservation District

Program Rational - XL

User Data:

Project Name:	Willow Springs II	**Project Number:**	0219
Date of Run:	10/24/2012	**Run By:**	DW
Notes:	A2b		

Input Data:

Location:	South Coast	Land Use Type:	Condo - Apartments
Area (Acres):	.23	Time of Concentration (Min.):	12

	Q10:	Q25:	Q50:	Q100:
Calculated Runnoff Coefficient:	0.70	0.74	0.77	0.79
User Selected Runoff Coefficient (Optional):				

Calculate

For Large Lot Subdivisions (>10,000 sq. ft.):

	Low Value:	High Value:	User Selected:
Q10:			
Q25:			
Q50:			
Q100:			

Enter Selection

Results:

	Rainfall Intensity:	Runoff Coef:	Q (cfs):
Q10:	**2.61**	**0.70**	**0**
Q25:	**3.18**	**0.74**	**1**
Q50:	**3.68**	**0.77**	**1**
Q100:	**4.03**	**0.79**	**1**

View RI Curves

Print

View RC Curves

Exit

Santa Barbara County Flood Control and Water Conservation District

Program Rational - XL

User Data:

Project Name:	Willow Springs II	**Project Number:**	0219
Date of Run:	10/24/2012	**Run By:**	DW
Notes:	A2c		

Input Data:

Location:	South Coast	Land Use Type:	Condo - Apartments
Area (Acres):	.47	Time of Concentration (Min.):	12

	Q10:	Q25:	Q50:	Q100:
Calculated Runnoff Coefficient:	0.70	0.74	0.77	0.79
User Selected Runoff Coefficient (Optional):				

Calculate

For Large Lot Subdivisions (>10,000 sq. ft.):

	Low Value:	High Value:	User Selected:
Q10:			
Q25:			
Q50:			
Q100:			

Enter Selection

Results:

	Rainfall Intensity:	Runoff Coef:	Q (cfs):
Q10:	**2.61**	**0.70**	**1**
Q25:	**3.18**	**0.74**	**1**
Q50:	**3.68**	**0.77**	**1**
Q100:	**4.03**	**0.79**	**1**

View RI Curves

View RC Curves

Print

Exit

8" PVC Pipe @ 0.5%

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.010	
Channel Slope	0.00500	ft/ft
Diameter	0.67	ft
Discharge	1.00	ft³/s

Results

Normal Depth	0.49	ft
Flow Area	0.28	ft²
Wetted Perimeter	1.38	ft
Top Width	0.59	ft
Critical Depth	0.47	ft
Percent Full	73.3	%
Critical Slope	0.00548	ft/ft
Velocity	3.61	ft/s
Velocity Head	0.20	ft
Specific Energy	0.69	ft
Froude Number	0.93	
Maximum Discharge	1.21	ft³/s
Discharge Full	1.13	ft³/s
Slope Full	0.00395	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	73.35	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s

8" PVC Pipe @ 0.5%

GVF Output Data

Normal Depth	0.49	ft
Critical Depth	0.47	ft
Channel Slope	0.00500	ft/ft
Critical Slope	0.00548	ft/ft

8" PVC Pipe @ 1.0%

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.010	
Channel Slope	0.01000	ft/ft
Diameter	0.67	ft
Discharge	1.50	ft³/s

Results

Normal Depth	0.52	ft
Flow Area	0.29	ft²
Wetted Perimeter	1.44	ft
Top Width	0.56	ft
Critical Depth	0.57	ft
Percent Full	77.2	%
Critical Slope	0.00829	ft/ft
Velocity	5.13	ft/s
Velocity Head	0.41	ft
Specific Energy	0.93	ft
Froude Number	1.26	
Maximum Discharge	1.71	ft³/s
Discharge Full	1.59	ft³/s
Slope Full	0.00888	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	77.22	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s

8" PVC Pipe @ 1.0%

GVF Output Data

Normal Depth	0.52	ft
Critical Depth	0.57	ft
Channel Slope	0.01000	ft/ft
Critical Slope	0.00829	ft/ft

8" PVC Pipe @ 6.0%

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.010	
Channel Slope	0.06000	ft/ft
Diameter	0.67	ft
Discharge	1.50	ft³/s

Results

Normal Depth	0.29	ft
Flow Area	0.15	ft²
Wetted Perimeter	0.96	ft
Top Width	0.66	ft
Critical Depth	0.57	ft
Percent Full	43.0	%
Critical Slope	0.00829	ft/ft
Velocity	10.34	ft/s
Velocity Head	1.66	ft
Specific Energy	1.95	ft
Froude Number	3.90	
Maximum Discharge	4.19	ft³/s
Discharge Full	3.90	ft³/s
Slope Full	0.00888	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	43.02	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s

8" PVC Pipe @ 6.0%

GVF Output Data

Normal Depth	0.29	ft
Critical Depth	0.57	ft
Channel Slope	0.06000	ft/ft
Critical Slope	0.00829	ft/ft

HYDROLOGY TABLE
Storm Drain "C"

Drainage Area	Area, Ac	Land Use	Q10, cfs	Q25, cfs	Q50, cfs	Q100, cfs
C1	8.89	Apt.	16	21	25	28
C2a	0.70	Apt.	1	2	2	2
C2b	0.43	Apt.	1	1	1	1
C2c	0.22	Apt.	0	1	1	1
C2d	1.39	Apt.	3	3	4	4
C2e	0.38	Apt.	1	1	1	1
C2f	1.64	Apt.	3	4	5	5
C2g	1.10	Apt.	2	3	3	4
C2h	0.32	Apt.	1	1	1	1
			Tc=12 min C_{Apt}=0.70 i=2.61	Tc=12 min C_{Apt}=0.74 i=3.18	Tc=12 min C_{Apt}=0.77 i=3.68	Tc=12 min C_{Apt}=0.79 i=4.03
WILLOW SPRINGS I						
C3	0.3	Apt.	0.5	0.6	0.7	0.9
C4	0.8	Apt.	1.3	1.7	2.0	2.3
C5	0.1	Apt.	0.2	0.2	0.2	0.3
C6	0.2	Apt.	0.3	0.4	0.5	0.6
C7	0.5	Apt.	0.8	1.1	1.2	1.4
C8	0.3	Apt.	0.5	0.6	0.7	0.9
C9	0.1	Apt.	0.2	0.2	0.2	0.3
C10	0.8	Apt.	1.3	1.7	2.0	2.3
C11	1.0	Ag.	1.7	2.1	2.5	2.8
C12	0.6	Apt.	1.0	1.3	1.5	1.7
C13	0.9	Apt.	1.5	1.9	2.2	2.6
C14	0.4	Apt.	0.7	0.8	1.0	1.1
C15	0.7	Apt.	1.2	1.5	1.7	2.0
C16	0.4	Apt.	0.7	0.8	1.0	1.1
	22.17			**51.9**		

Program - S T O R M D R A . E X E 10-04-2012

Project: Willow Springs II - Storm Drain "C" by DW

SANTA BARBARA COUNTY FLOOD CONTROL DISTRICT FULL FLOW STORMDRAIN PIPE HYDRAULICS

Licensed to MAC Design Associates

Station (ft)	Pipe Length	PipeD (in)	n	Flow (cfs)	Vel (ft/sec)	H(v) (ft)	S(f) (ft/ft)	HGL (ft)	EL (ft)
Tailwater [Downstream HGL]								12.00	
0								12.00	12.45
	40	42	0.010	51.9	5.39	0.45	0.00157		
40								12.06	12.51
Junction								Loss by Energy	
40								12.56	12.58
	3	99	0.010	51.9	0.97	0.01	0.00002		
43								12.56	12.58
Junction		Side Inflow Pipe =		24 in @ 90 deg,				Loss by Momentum	
43								12.35	12.78
	50	42	0.010	50.3	5.23	0.42	0.00148		
93								12.43	12.85
Junction								Loss by Energy	
93								12.89	12.91
	3	99	0.010	50.3	0.94	0.01	0.00002		
96								12.89	12.91
Junction		Side Inflow Pipe =		24 in @ 90 deg,				Loss by Momentum	
96								12.70	13.10
	158	42	0.010	48.8	5.07	0.40	0.00139		
254								12.92	13.32
Junction								Loss by Energy	
254								13.36	13.37
	3	99	0.010	48.8	0.91	0.01	0.00001		
257								13.36	13.37
Junction		Side Inflow Pipe =		24 in @ 90 deg,				Loss by Momentum	
257								13.21	13.52
	95	42	0.010	43.3	4.50	0.31	0.00110		
352								13.31	13.63
Junction								Loss by Energy	
352								13.66	13.67
	3	99	0.010	43.3	0.81	0.01	0.00001		
355								13.66	13.67
Junction		Side Inflow Pipe =		24 in @ 90 deg,				Loss by Momentum	
355								13.50	13.82
	124	42	0.010	43.1	4.48	0.31	0.00109		
479								13.64	13.95
Junction								Loss by Energy	
479								13.98	13.99
	3	99	0.010	43.1	0.81	0.01	0.00001		
482								13.98	13.99
Junction		Side Inflow Pipe =		24 in @ 90 deg,				Loss by Momentum	
482								13.83	14.14
	35	42	0.010	42.7	4.44	0.31	0.00107		
517								13.87	14.17
Junction								Loss by Energy	
517								14.20	14.21

3	99	0.010	42.7	0.80	0.01	0.00001
					14.20	14.21
Junction	Side Inflow Pipe =			24 in @ 90 deg,	Loss by Momentum	
520					14.05	14.36
137	42	0.010	42.5	4.42	0.30	0.00106
657					14.20	14.50
Junction					Loss by Energy	
657					14.53	14.54
3	99	0.010	42.5	0.80	0.01	0.00001
660					14.53	14.54
Junction	Side Inflow Pipe =			24 in @ 90 deg,	Loss by Momentum	
660					14.42	14.66
162	42	0.010	37.6	3.91	0.24	0.00083
822					14.55	14.79
Junction					Loss by Energy	
822					14.81	14.82
3	99	0.010	37.6	0.70	0.01	0.00001
825					14.81	14.82
Junction	Side Inflow Pipe =			12 in @ 90 deg,	Loss by Momentum	
825					14.66	15.04
105	36	0.010	35.0	4.95	0.38	0.00163
930					14.84	15.22
Junction					Loss by Energy	
930					15.27	15.27
3	99	0.010	35.0	0.65	0.01	0.00001
933					15.27	15.27
Junction	Side Inflow Pipe =			12 in @ 90 deg,	Loss by Momentum	
933					15.12	15.48
18	36	0.010	34.0	4.81	0.36	0.00154
951					15.15	15.51
Junction					Loss by Energy	
951					15.56	15.56
3	99	0.010	34.0	0.64	0.01	0.00001
954					15.56	15.56
Junction	Side Inflow Pipe =			12 in @ 90 deg,	Loss by Momentum	
954					15.42	15.76
73	36	0.010	33.0	4.67	0.34	0.00145
1,027					15.53	15.87
Junction					Loss by Energy	
1,027					15.91	15.92
3	99	0.010	33.0	0.62	0.01	0.00001
1,030					15.91	15.92
Junction	Side Inflow Pipe =			12 in @ 90 deg,	Loss by Momentum	
1,030					15.80	16.08
106	36	0.010	30.0	4.24	0.28	0.00120
1,136					15.93	16.21
Junction					Loss by Energy	
1,136					16.24	16.25
3	99	0.010	30.0	0.56	0.00	0.00001
1,139					16.24	16.25
Junction	Side Inflow Pipe =			12 in @ 90 deg,	Loss by Momentum	
1,139					16.14	16.40
168	36	0.010	29.0	4.10	0.26	0.00112
1,307					16.33	16.59
Junction					Loss by Energy	
1,307					16.62	16.63

Project: Willow Springs II - Storm Drain "C" (Cont.) by DW

SANTA BARBARA COUNTY FLOOD CONTROL DISTRICT FULL FLOW STORMDRAIN PIPE HYDRAULICS

Licensed to MAC Design Associates

Station (ft)	Pipe Length	PipeD (in)	n	Flow (cfs)	Vel (ft/sec)	H(v) (ft)	S(f) (ft/ft)	HGL (ft)	EL (ft)
Tailwater		Downstream HGL						16.14	
1,139								16.14	16.40
	168	36	0.010	29.0	4.10	0.26	0.00112		
1,307								16.33	16.59
Junction								Loss by Energy	
1,307								16.62	16.63
	3	99	0.010	29.0	0.54	0.00	0.00001		
1,310								**16.62**	**16.63**
Junction		Side Inflow Pipe =		12 in @ 90 deg,				Loss by Momentum	
1,310								16.55	16.74
	54	36	0.010	25.0	3.54	0.19	0.00083		
1,364								16.59	16.79
Junction								Loss by Energy	
1,364								16.81	16.82
	3	99	0.010	25.0	0.47	0.00	0.00000		
1,367								16.81	16.82
Manhole,								Loss by Momentum	
1,367								16.74	16.93
	38	36	0.010	25.0	3.54	0.19	0.00083		
1,405								**16.77**	**16.96**
Junction								Loss by Energy	
1,405								16.99	16.99
	3	99	0.010	25.0	0.47	0.00	0.00000		
1,408								16.99	16.99
Manhole,								Loss by Momentum	
1,408								16.91	17.10
	139	36	0.010	25.0	3.54	0.19	0.00083		
1,547								17.02	17.22
Junction								Loss by Energy	
1,547								17.24	17.25
	3	99	0.010	25.0	0.47	0.00	0.00000		
1,550								**17.24**	**17.25**
Junction		Side Inflow Pipe =		12 in @ 180 deg,				Loss by Momentum	
1,550								17.20	17.35
	52	36	0.010	22.0	3.11	0.15	0.00064		
1,602								17.23	17.38
Junction								Loss by Energy	
1,602								17.40	17.40
	3	99	0.010	22.0	0.41	0.00	0.00000		
1,605								17.40	17.40
Junction		Side Inflow Pipe =		18 in @ 90 deg,				Loss by Momentum	
1,605								17.35	17.48
	14	36	0.010	21.0	2.97	0.14	0.00059		
1,619								17.36	17.49
End of Run @ Headwater								17.52	17.52

Santa Barbara County Flood Control and Water Conservation District

Program Rational - XL

User Data:

Project Name:	Willow Springs II	**Project Number:**	0219
Date of Run:	9/27/2012	**Run By:**	DW
Notes:	Area C1		

Input Data:

Location:	South Coast	Land Use Type:	Condo - Apartments
Area (Acres):	8.89	Time of Concentration (Min.):	12

	Q10:	Q25:	Q50:	Q100:
Calculated Runnoff Coefficient:	0.70	0.74	0.77	0.79
User Selected Runoff Coefficient (Optional):				

Calculate

For Large Lot Subdivisions (>10,000 sq. ft.):

	Low Value:	High Value:	User Selected:
Q10:			
Q25:			
Q50:			
Q100:			

Enter Selection

Results:

	Rainfall Intensity:	Runoff Coef:	Q (cfs):
Q10:	**2.61**	**0.70**	**16**
Q25:	**3.18**	**0.74**	**21**
Q50:	**3.68**	**0.77**	**25**
Q100:	**4.03**	**0.79**	**28**

View RI Curves

View RC Curves

Print

Exit

Santa Barbara County Flood Control and Water Conservation District

Program Rational - XL

User Data:

Project Name: Willow Springs II

Project Number: 0219

Date of Run: 9/27/2012

Run By: DW

Notes: Area C2a

Input Data:

Location: South Coast

Land Use Type: Condo - Apartments

Area (Acres): 0.70

Time of Concentration (Min.): 12

	Q10:	Q25:	Q50:	Q100:
Calculated Runnoff Coefficient:	0.70	0.74	0.77	0.79
User Selected Runoff Coefficient (Optional):				

Calculate

For Large Lot Subdivisions (>10,000 sq. ft.):

	Low Value:	High Value:	User Selected:
Q10:			
Q25:			
Q50:			
Q100:			

Enter Selection

Results:

	Rainfall Intensity:	Runoff Coef:	Q (cfs):
Q10:	**2.61**	**0.70**	**1**
Q25:	**3.18**	**0.74**	**2**
Q50:	**3.68**	**0.77**	**2**
Q100:	**4.03**	**0.79**	**2**

View RI Curves

View RC Curves

Print

Exit

Santa Barbara County Flood Control and Water Conservation District

Program Rational - XL

User Data:

Project Name:	Willow Springs II	**Project Number:**	0219
Date of Run:	9/25/2012	**Run By:**	DW
Notes:	Area C2b		

Input Data:

Location:	South Coast	Land Use Type:	Condo - Apartments
Area (Acres):	0.43	Time of Concentration (Min.):	12

	Q10:	Q25:	Q50:	Q100:
Calculated Runnoff Coefficient:	0.70	0.74	0.77	0.79
User Selected Runoff Coefficient (Optional):				

Calculate

For Large Lot Subdivisions (>10,000 sq. ft.):

	Low Value:	High Value:	User Selected:
Q10:			
Q25:			
Q50:			
Q100:			

Enter Selection

Results:

	Rainfall Intensity:	Runoff Coef:	Q (cfs):
Q10:	**2.61**	**0.70**	**1**
Q25:	**3.18**	**0.74**	**1**
Q50:	**3.68**	**0.77**	**1**
Q100:	**4.03**	**0.79**	**1**

View RI Curves

View RC Curves

Print

Exit

Santa Barbara County Flood Control and Water Conservation District

Program Rational - XL

User Data:

Project Name:	Willow Springs II	**Project Number:**	0219
Date of Run:	9/25/2012	**Run By:**	DW
Notes:	Area C2c		

Input Data:

Location:	South Coast	Land Use Type:	Condo - Apartments
Area (Acres):	0.22	Time of Concentration (Min.):	12

	Q10:	Q25:	Q50:	Q100:	
Calculated Runnoff Coefficient:	0.70	0.74	0.77	0.79	Calculate
User Selected Runoff Coefficient (Optional):					

For Large Lot Subdivisions (>10,000 sq. ft.):

	Low Value:	High Value:	User Selected:	
Q10:				
Q25:				Enter Selection
Q50:				
Q100:				

Results:

	Rainfall Intensity:	Runoff Coef:	Q (cfs):		
Q10:	**2.61**	**0.70**	**0**	View RI Curves	Print
Q25:	**3.18**	**0.74**	**1**		
Q50:	**3.68**	**0.77**	**1**	View RC Curves	Exit
Q100:	**4.03**	**0.79**	**1**		

Santa Barbara County Flood Control and Water Conservation District

Program Rational - XL

User Data:

Project Name:	Willow Springs II	**Project Number:**	0219
Date of Run:	9/25/2012	**Run By:**	DW
Notes:	Area C2d		

Input Data:

Location:	South Coast	Land Use Type:	Condo - Apartments
Area (Acres):	1.39	Time of Concentration (Min.):	12

	Q10:	Q25:	Q50:	Q100:
Calculated Runnoff Coefficient:	0.70	0.74	0.77	0.79
User Selected Runoff Coefficient (Optional):				

Calculate

For Large Lot Subdivisions (>10,000 sq. ft.):

	Low Value:	High Value:	User Selected:
Q10:			
Q25:			
Q50:			
Q100:			

Enter Selection

Results:

	Rainfall Intensity:	Runoff Coef:	Q (cfs):
Q10:	**2.61**	**0.70**	**3**
Q25:	**3.18**	**0.74**	**3**
Q50:	**3.68**	**0.77**	**4**
Q100:	**4.03**	**0.79**	**4**

View RI Curves

Print

View RC Curves

Exit

Santa Barbara County Flood Control and Water Conservation District

Program Rational - XL

User Data:

Project Name:	Willow Springs II	**Project Number:**	0219
Date of Run:	9/25/2012	**Run By:**	DW
Notes:	Area C2e		

Input Data:

Location:	South Coast	Land Use Type:	Condo - Apartments
Area (Acres):	0.38	Time of Concentration (Min.):	12

	Q10:	Q25:	Q50:	Q100:
Calculated Runnoff Coefficient:	0.70	0.74	0.77	0.79
User Selected Runoff Coefficient (Optional):				

Calculate

For Large Lot Subdivisions (>10,000 sq. ft.):

	Low Value:	High Value:	User Selected:
Q10:			
Q25:			
Q50:			
Q100:			

Enter Selection

Results:

	Rainfall Intensity:	Runoff Coef:	Q (cfs):
Q10:	**2.61**	**0.70**	**1**
Q25:	**3.18**	**0.74**	**1**
Q50:	**3.68**	**0.77**	**1**
Q100:	**4.03**	**0.79**	**1**

View RI Curves

View RC Curves

Print

Exit

Santa Barbara County Flood Control and Water Conservation District

Program Rational - XL

User Data:

Project Name: Willow Springs II

Project Number: 0219

Date of Run: 9/25/2012

Run By: DW

Notes: Area C2f

Input Data:

Location: South Coast

Land Use Type: Condo - Apartments

Area (Acres): 1.64

Time of Concentration (Min.): 12

	Q10:	Q25:	Q50:	Q100:
Calculated Runnoff Coefficient:	0.70	0.74	0.77	0.79
User Selected Runoff Coefficient (Optional):				

Calculate

For Large Lot Subdivisions (>10,000 sq. ft.):

	Low Value:	High Value:	User Selected:
Q10:			
Q25:			
Q50:			
Q100:			

Enter Selection

Results:

	Rainfall Intensity:	Runoff Coef:	Q (cfs):
Q10:	**2.61**	**0.70**	**3**
Q25:	**3.18**	**0.74**	**4**
Q50:	**3.68**	**0.77**	**5**
Q100:	**4.03**	**0.79**	**5**

View RI Curves

View RC Curves

Print

Exit

Santa Barbara County Flood Control and Water Conservation District

Program Rational - XL

User Data:

Project Name:	Willow Springs II	**Project Number:**	0219
Date of Run:	9/25/2012	**Run By:**	DW
Notes:	Area C2g		

Input Data:

Location:	South Coast	Land Use Type:	Condo - Apartments
Area (Acres):	1.1	Time of Concentration (Min.):	12

	Q10:	Q25:	Q50:	Q100:
Calculated Runnoff Coefficient:	0.70	0.74	0.77	0.79
User Selected Runoff Coefficient (Optional):				

Calculate

For Large Lot Subdivisions (>10,000 sq. ft.):

	Low Value:	High Value:	User Selected:
Q10:			
Q25:			
Q50:			
Q100:			

Enter Selection

Results:

	Rainfall Intensity:	Runoff Coef:	Q (cfs):
Q10:	**2.61**	**0.70**	**2**
Q25:	**3.18**	**0.74**	**3**
Q50:	**3.68**	**0.77**	**3**
Q100:	**4.03**	**0.79**	**4**

View RI Curves

Print

View RC Curves

Exit

Santa Barbara County Flood Control and Water Conservation District

Program Rational - XL

User Data:

Project Name:	Willow Springs II	**Project Number:**	0219
Date of Run:	9/25/2012	**Run By:**	DW
Notes:	Area C2h		

Input Data:

Location:	South Coast	Land Use Type:	Condo - Apartments
Area (Acres):	0.32	Time of Concentration (Min.):	12

	Q10:	Q25:	Q50:	Q100:	
Calculated Runnoff Coefficient:	0.70	0.74	0.77	0.79	Calculate
User Selected Runoff Coefficient (Optional):					

For Large Lot Subdivisions (>10,000 sq. ft.):

	Low Value:	High Value:	User Selected:	
Q10:				Enter Selection
Q25:				
Q50:				
Q100:				

Results:

	Rainfall Intensity:	Runoff Coef:	Q (cfs):		
Q10:	**2.61**	**0.70**	**1**	View RI Curves	Print
Q25:	**3.18**	**0.74**	**1**		
Q50:	**3.68**	**0.77**	**1**	View RC Curves	Exit
Q100:	**4.03**	**0.79**	**1**		

II. HYDROMODIFICATION

The City of Goleta requires that projects hold back the increase in runoff volume due to development for the 1"-24 hour storm event.

The entire Willow Springs II project will drain to the existing on-site vegetated open space wetland basin. Runoff from this basin is controlled by a Cipoletti weir structure with an existing weir elevation of 7.1 feet above sea level.

The calculations which follow, indicate that the increased volume due to development of Willow Springs II during the 1"-24 hour storm event is approximately 0.25 acre-feet.

Therefore, as supported by the calculations which follow, this project will raise the elevation of the weir from 7.10' to 7.35' (3 inches) to completely store the increased runoff from development during the 1"-24 hour storm event in the basin, and satisfy the City of Goleta Hydromodification Standards.

WILLOW SPRINGS II – UNDEVELOPED

1"-24HOUR STORM EVENT

MAC DESIGN ASSOCIATES

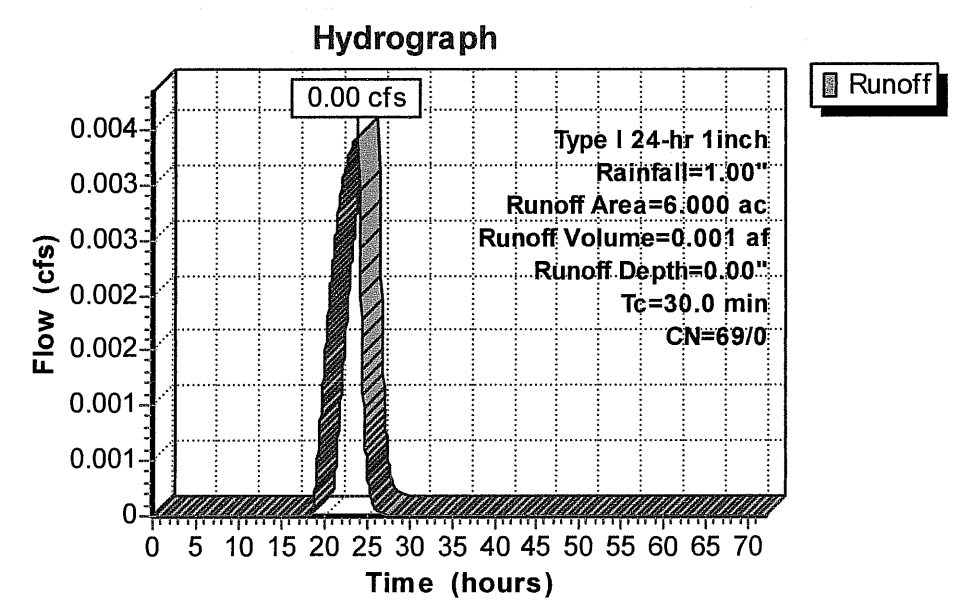
Summary for Subcatchment 18S: WSII undeveloped

Runoff = 0.00 cfs @ 24.00 hrs, Volume= 0.001 af, Depth= 0.00"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type I 24-hr 1inch Rainfall=1.00"

Area (ac)	CN	Description
6.000	69	Pasture/grassland/range, Fair, HSG B
6.000	69	Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.0					**Direct Entry,**



Summary for Pond 21P: Wetland/Basin

Inflow Area = 6.000 ac, 0.00% Impervious, Inflow Depth = 0.00" for 1inch event
Inflow = 0.00 cfs @ 24.00 hrs, Volume= 0.001 af
Outflow = 0.00 cfs @ 24.00 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 24.00 hrs, Volume= 0.001 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 7.10' @24.00 hrs Surf.Area= 0.001 ac Storage= 0.000 af

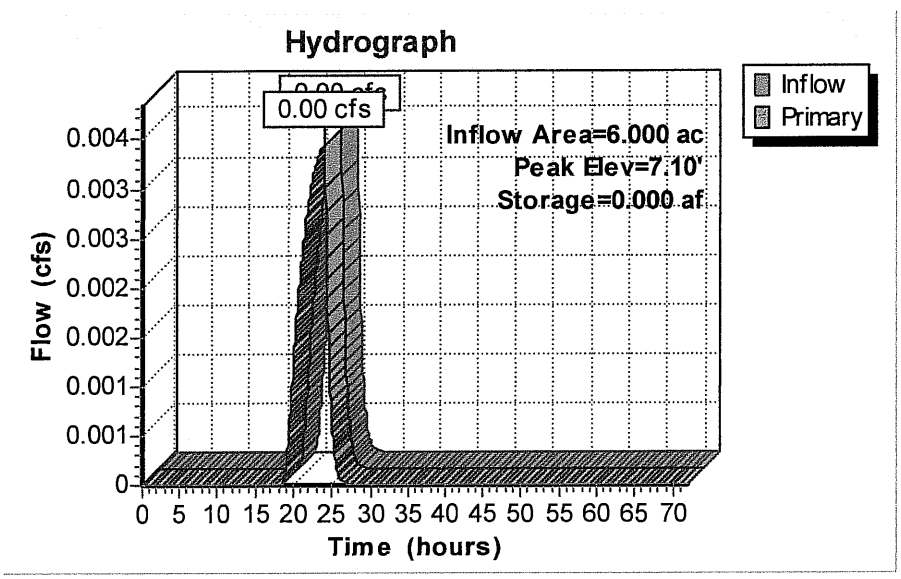
Plug-Flow detention time= 4.3 min calculated for 0.001 af (100% of inflow)
Center-of-Mass det. time= 4.3 min (1,348.1 - 1,343.9)

Volume	Invert	Avail.Storage	Storage Description
#1	7.10'	8.365 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
7.10	0.000	0.000	0.000
8.00	2.000	0.900	0.900
9.00	4.310	3.155	4.055
10.00	4.310	4.310	8.365

Device	Routing	Invert	Outlet Devices
#1	Primary	7.10'	**28.0 deg x 10.0' long x 3.00' rise Sharp-Crested Vee/Trap Weir** C= 2.62

Primary OutFlow Max=0.00 cfs @24.00 hrs HW=7.10' (Free Discharge)
↑**1=Sharp-Crested Vee/Trap Weir** (Weir Controls 0.00 cfs @0.08 fps)



WILLOW SPRINGS II – DEVELOPED

1"-24HOUR STORM EVENT

MAC DESIGN ASSOCIATES

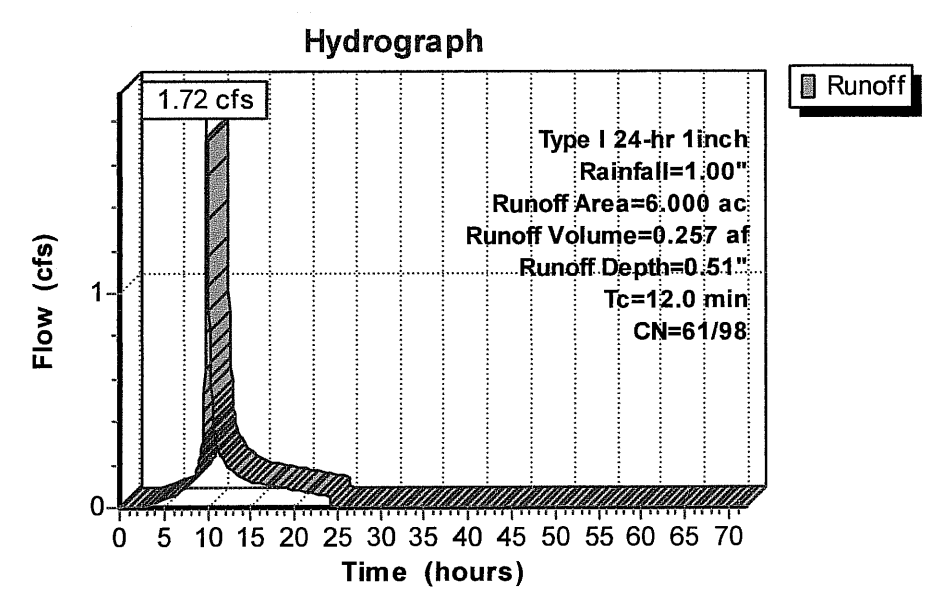
Summary for Subcatchment 19S: WSII developed

Runoff = 1.72 cfs @ 9.98 hrs, Volume= 0.257 af, Depth= 0.51"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type I 24-hr 1inch Rainfall=1.00"

Area (ac)	CN	Description
6.000	85	1/8 acre lots, 65% imp, HSG B
2.100	61	Pervious Area
3.900	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0					Direct Entry,



Summary for Pond 20P: Wetland/Basin

Inflow Area = 6.000 ac, 65.00% Impervious, Inflow Depth = 0.51" for 1inch event
Inflow = 1.72 cfs @ 9.98 hrs, Volume= 0.257 af
Outflow = 0.18 cfs @ 12.68 hrs, Volume= 0.135 af, Atten= 90%, Lag= 161.9 min
Primary = 0.18 cfs @ 12.68 hrs, Volume= 0.135 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 7.38' @ 12.68 hrs Surf.Area= 0.758 ac Storage= 0.144 af

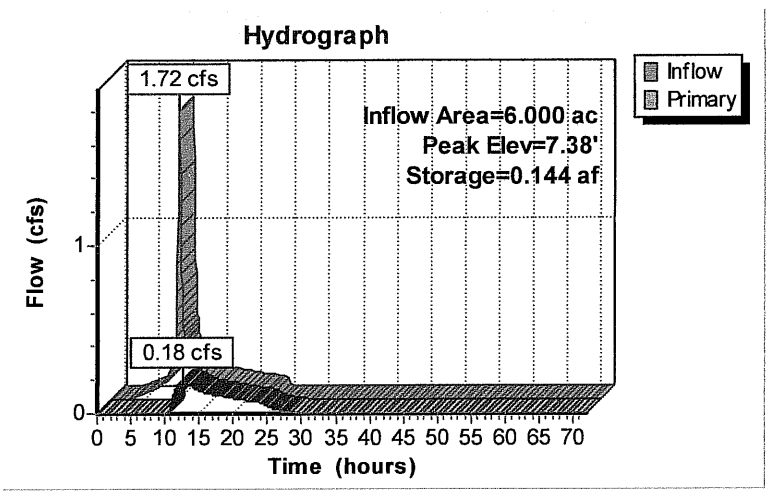
Plug-Flow detention time= 471.2 min calculated for 0.135 af (52% of inflow)
Center-of-Mass det. time= 281.8 min (1,033.7 - 752.0)

Volume	Invert	Avail.Storage	Storage Description
#1	7.00'	8.465 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
7.00	0.000	0.000	0.000
8.00	2.000	1.000	1.000
9.00	4.310	3.155	4.155
10.00	4.310	4.310	8.465

Device	Routing	Invert	Outlet Devices
#1	Primary	7.35'	**28.0 deg x 10.0' long x 3.00' rise Sharp-Crested Vee/Trap Weir** C= 2.62

Primary OutFlow Max=0.16 cfs @ 12.68 hrs HW=7.38' (Free Discharge)
↑1=Sharp-Crested Vee/Trap Weir (Weir Controls 0.16 cfs @ 0.56 fps)



WILLOW SPRINGS II – DEVELOPED

1"-24HOUR STORM EVENT W/ EXFILTRATION

MAC DESIGN ASSOCIATES

Summary for Pond 20P: Wetland/Basin

Inflow Area =	6.000 ac, 65.00% Impervious, Inflow Depth =	0.51"	for 1inch event	
Inflow =	1.72 cfs @	9.98 hrs, Volume=	0.257 af	
Outflow =	0.14 cfs @	13.78 hrs, Volume=	0.257 af, Atten= 92%, Lag= 227.8 min	
Discarded =	0.14 cfs @	13.78 hrs, Volume=	0.257 af	
Primary =	0.00 cfs @	0.00 hrs, Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 7.35' @ 13.78 hrs Surf.Area= 0.694 ac Storage= 0.120 af

Plug-Flow detention time= 483.6 min calculated for 0.257 af (100% of inflow)
Center-of-Mass det. time= 484.1 min (1,236.0 - 752.0)

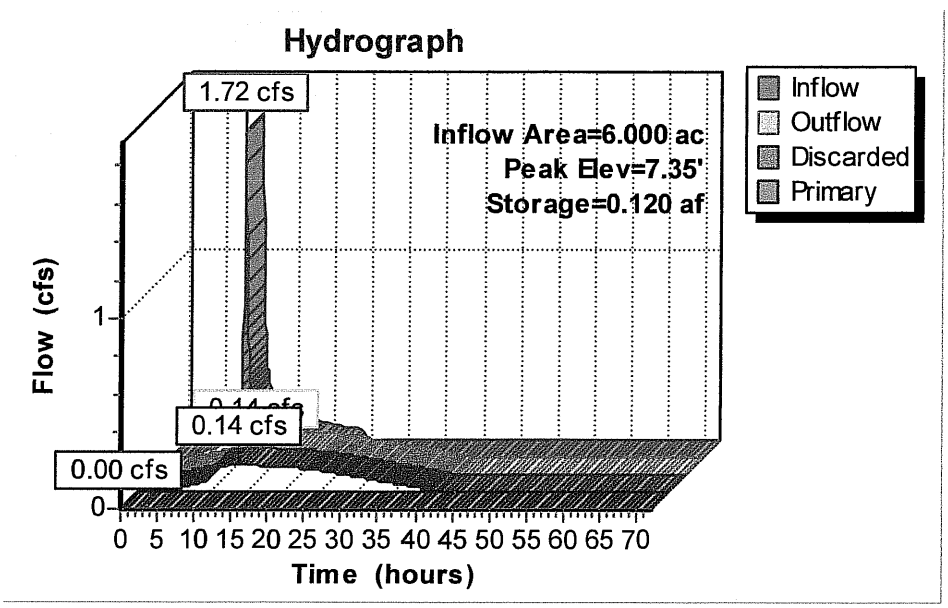
Volume	Invert	Avail.Storage	Storage Description
#1	7.00'	8.465 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
7.00	0.000	0.000	0.000
8.00	2.000	1.000	1.000
9.00	4.310	3.155	4.155
10.00	4.310	4.310	8.465

Device	Routing	Invert	Outlet Devices
#1	Primary	7.35'	**28.0 deg x 10.0' long x 3.00' rise Sharp-Crested Vee/Trap Weir** C= 2.62
#2	Discarded	7.00'	**0.200 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.14 cfs @ 13.78 hrs HW=7.35' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.14 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=7.00' (Free Discharge)
└**1=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)



III. WATER QUALITY

The Willow Springs project site includes a vegetated open space of approximately 7.25 acres, which serves as an on-site retention basin and bio-filter. All project storm drains ultimately drain to this vegetated open space. Runoff exiting storm drain line "A" will drain through over 500' of vegetated open space, and runoff exiting storm drain line "C" will drain through over 950' of vegetated open space. Therefore, since all site runoff will be drained and treated through the vegetated open space before leaving the property, there is 0% Effective Impervious Area.

The primary potential pollutant source that may affect the quality of storm water discharges is considered to be oil and grease from vehicles. With this in mind, the proposed treatment measures will be primarily focused at mitigating for vehicle impacts.

The Willow Springs II project is designed with low-impact development (LID) design components. These design components include the following:

- Fossil Filters will be installed on the drainage inlets.
- Runoff from a portion of the parking lots will be drained through an on-site vegetated bio-swale located along the east property line.
- Storm drains will outlet to bio-swales that drain to and from the on-site vegetated open space. Therefore, runoff will flow across vegetated bio-swales for more than the City of Goleta minimum of 100' before leaving the property. As mentioned above, runoff will flow across vegetated bio-swales for over 500' feet and over 950' feet before leaving the property.
- Runoff from the on-site vegetated open space is metered off-site with a Cipoletti Weir so that post-development flows are at or below pre-development flows.

The required flow rate for flow-through based storm water quality treatment facilities was calculated using the guidelines in the City of Goleta's Draft Hydromodification Control Standards for New Development Projects.

For Flow-Through Facilities: $WQFR = (0.05 + 0.9 \times IMP) \times 0.3 \times A$

This flow rate is based upon the occurrence of a storm event with a rainfall intensity of 0.33 inches per hour over a 4 hour time period (BMP storm).

Through the use of these LID design components, contact times that exceed the minimum requirement of 10 minutes during the occurrence of the BMP storm will be easily achieved.

Drainage area "A"

Area = 23.3 Acres
IMP = 0.70

Flow-Through Based: WQFR = 4.75 cfs

As shown in the calculation below, the contact time for a WQFR of 4.75 cfs through a bio-swale 10 feet wide by 1 foot deep by 950 feet long at an average slope of 0.58%, is 86.3 minutes. This exceeds the minimum requirement of 10 minutes. The on-site vegetated open space provides a flow area much wider than the 10 feet used in this calculation, and thus will provide a greater contact time than that calculated.

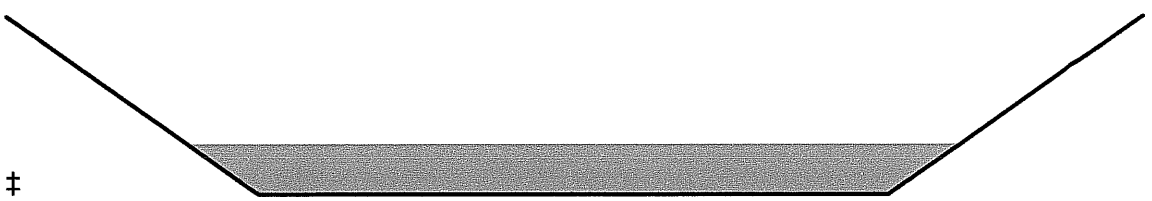
Summary for Reach 5R: (new Reach)

Inflow Area = 23.320 ac, 70.00% Impervious, Inflow Depth = 0.17" for BMP event
Inflow = 4.78 cfs @ 1.75 hrs, Volume= 0.329 af
Outflow = 2.90 cfs @ 1.98 hrs, Volume= 0.329 af, Atten= 39%, Lag= 14.1 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.91 fps, Min. Travel Time= 17.3 min
Avg. Velocity = 0.18 fps, Avg. Travel Time= 86.3 min

Peak Storage= 3,012 cf @ 1.98 hrs, Average Depth at Peak Storage= 0.28'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 26.53 cfs

10.00' x 1.00' deep channel, n= 0.050 Scattered brush, heavy weeds
Side Slope Z-value= 4.0 '/' Top Width= 18.00'
Length= 950.0' Slope= 0.0058 '/'
Inlet Invert= 12.50', Outlet Invert= 7.00'



‡

Drainage area "C"

Area = 22 Acres
IMP = 0.70

Flow-Through Based: WQFR = 4.49 cfs

As shown in the calculation below, the contact time for a WQFR of 4.49 cfs through a bio-swale 10 feet wide by 1 foot deep by 527 feet long at an average slope of 0.19%, is 75.3 minutes. This exceeds the minimum requirement of 10 minutes. The on-site vegetated open space provides a flow area much wider than the 10 feet used in this calculation, and thus will provide a greater contact time than that calculated.

Summary for Reach 3R: (new Reach)

Inflow Area = 22.000 ac, 70.00% Impervious, Inflow Depth = 0.17" for BMP event
Inflow = 4.51 cfs @ 1.75 hrs, Volume= 0.311 af
Outflow = 3.00 cfs @ 1.94 hrs, Volume= 0.311 af, Atten= 34%, Lag= 11.6 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.64 fps, Min. Travel Time= 13.7 min
Avg. Velocity = 0.12 fps, Avg. Travel Time= 75.3 min

Peak Storage= 2,455 cf @ 1.94 hrs, Average Depth at Peak Storage= 0.40'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 15.19 cfs

10.00' x 1.00' deep channel, n= 0.050 Scattered brush, heavy weeds
Side Slope Z-value= 4.0 '/' Top Width= 18.00'
Length= 527.0' Slope= 0.0019 '/'
Inlet Invert= 8.00', Outlet Invert= 7.00'

‡

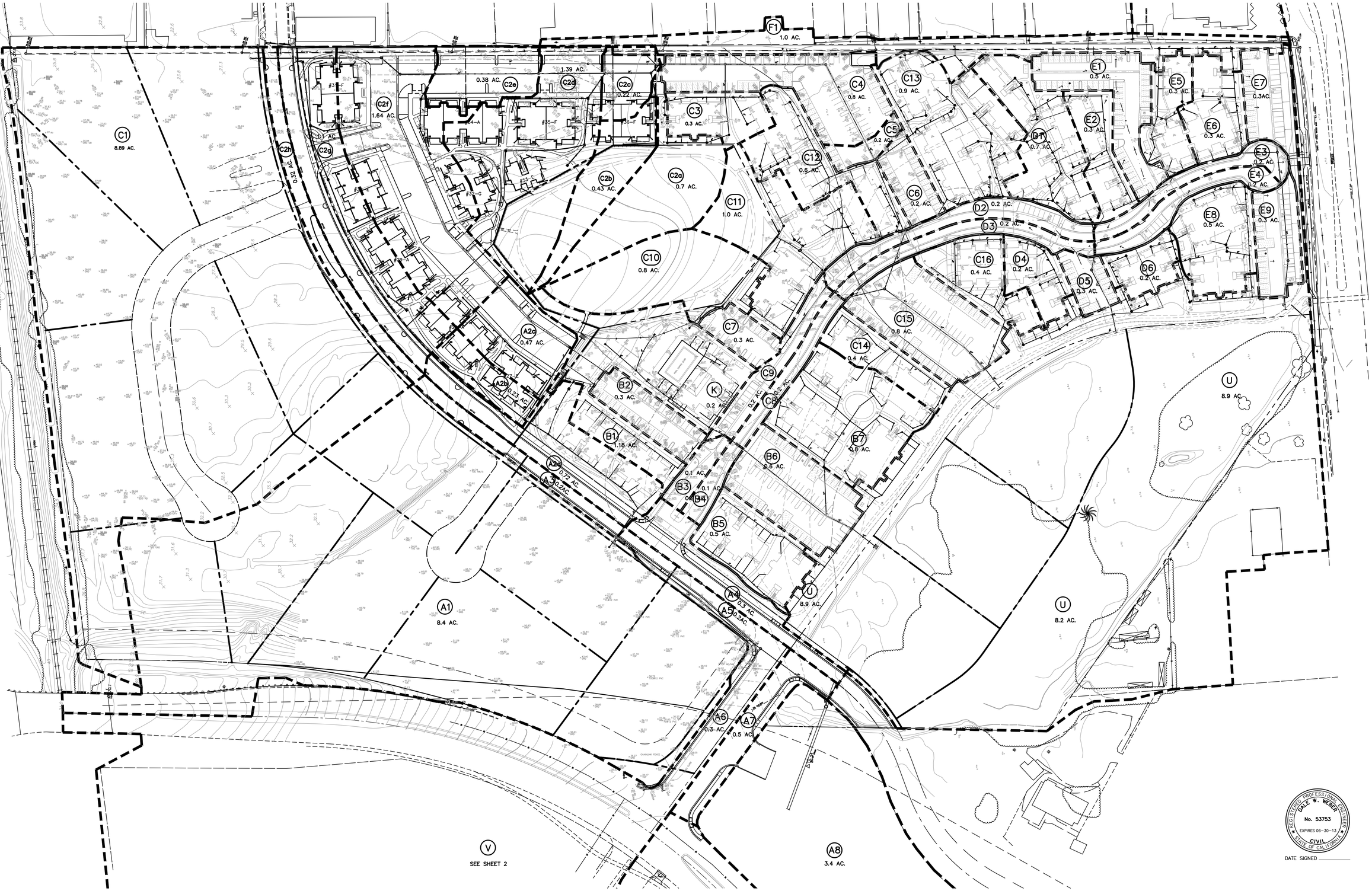
APPENDIX A

FINAL DRAINAGE PLAN
&
STORM DRAIN PLAN & PROFILE

FOR

WILLOW SPRINGS II

MAC DESIGN ASSOCIATES



DATE SIGNED _____

SCALE: 1"=60'

0 60 120 180 240

NO.	DATE	REVISION	APPD.

MAC Design Associates
CIVIL ENGINEERING * LAND PLANNING * BRIDGE DESIGN
1933 CLIFF DRIVE, SUITE 6, SANTA BARBARA, CALIF. 93109 (805) 957-4748

DESIGN DWW CHECKED MAC
DRAWN TLA
DALE W. WEBER DATE: 09-17-12
PROJECT ENGINEER
R.C.E. 53753 (EXP. 06-30-13)

CITY OF GOLETA, CALIFORNIA
REVIEWED BY:
_____ DATE _____
FOR

FINAL DRAINAGE PLAN

WILLOW SPRINGS II
CITY OF GOLETA

SHEET 1 OF 1
GOLETA CITY FILE NO.

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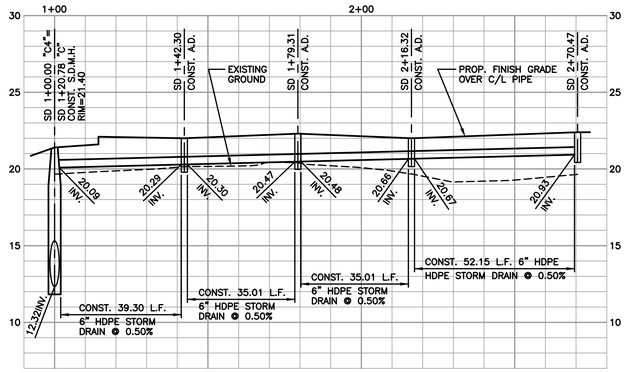
CONSTRUCTION NOTES

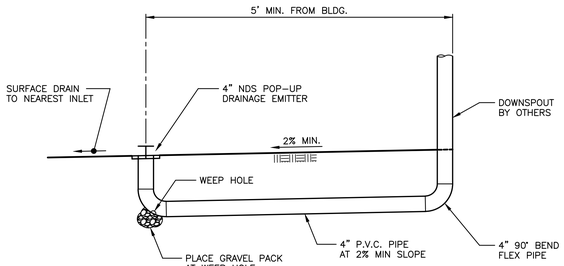
1. CONSTRUCT 12"x12" PRECAST CONC. CATCH BASIN W/TRAFFIC GRATE AND FILTER INSERT (TYPE TO BE ACCEPTABLE BY CITY OF GOLETA).
2. CONSTRUCT 12"X12" PRECAST CONC. CATCH BASIN W/ PARKWAY GRATE.
3. CONSTRUCT TYPE S (SMOOTH BORE) HDPE STORM DRAIN.
4. CONSTRUCT STANDARD STORM DRAIN MANHOLE.
5. CONSTRUCT AREA DRAIN.
6. CONSTRUCT G.C.P. INLET PER CALTRANS STD. PLAN D75B.
7. CONSTRUCT TYPE "A" DROP INLET.
8. CONSTRUCT 4" POP-UP DRAINAGE EMITTER PER DETAIL THIS SHEET. CONNECT TO ALL DOWNSPOUTS WITH 4" P.V.C. PIPE.
9. REMOVE EXISTING 36" STORM DRAIN.



PROFILE – STORM DRAIN "C4"

SCALE: HORIZ. 1" = 20'
VERT. 1" = 4'

NOTE:
SEE SHEET C5 FOR ALL
OTHER STORM DRAIN PROFILES



POP-UP DRAINAGE EMITTER DETAIL

SCALE: 1"=1'-0"

REGISTERED PROFESSIONAL ENGINEER
DALE W. WEBER
No. 53753
EXPIRES 06-30-13
CIVIL
STATE OF CALIFORNIA

DATE SIGNED _____

WDID NO. **

2nd PLAN CHECK SUBMITTAL – NOT FOR CONSTRUCTION

SCALE: 1"=30'
0 30 60 90 120

NO.	DATE	REVISION	APPD.

MAC Design Associates
CIVIL ENGINEERING * LAND PLANNING * BRIDGE DESIGN
1933 CLIFF DRIVE, SUITE 6, SANTA BARBARA, CALIF. 93109 (805) 957-4748

DESIGN DWW CHECKED MAC
DRAWN TLA
DALE W. WEBER DATE: 10-02-12
PROJECT ENGINEER
R.C.E. 53753 (EXP. 06-30-13)

CITY OF GOLETA, CALIFORNIA
REVIEWED BY:
_____ DATE _____
FOR

UTILITY PLAN
·
WILLOW SPRINGS II
CITY OF GOLETA

SHEET C4 OF 14
GOLETA CITY FILE NO.

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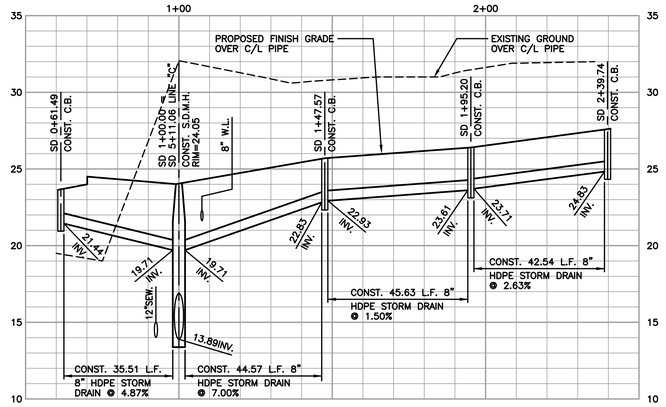
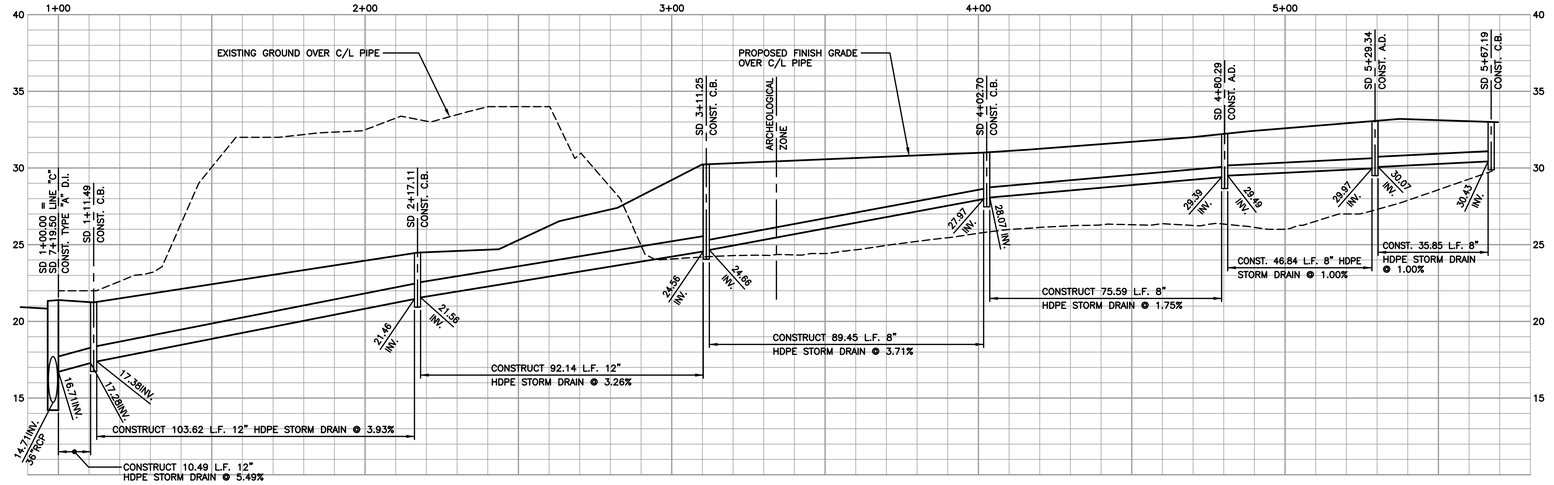


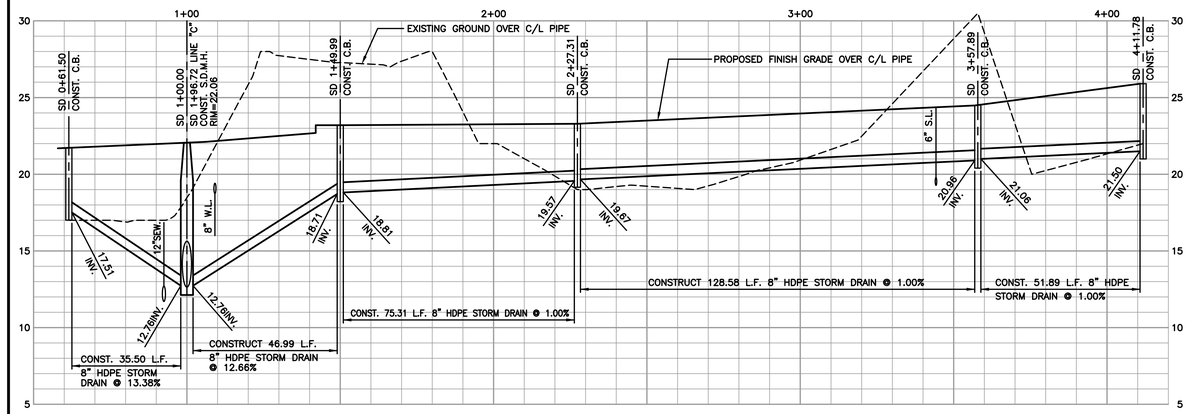
PROFILE – STORM DRAIN "C6"

SCALE: HORIZ. 1" = 20'
VERT. 1" = 4'



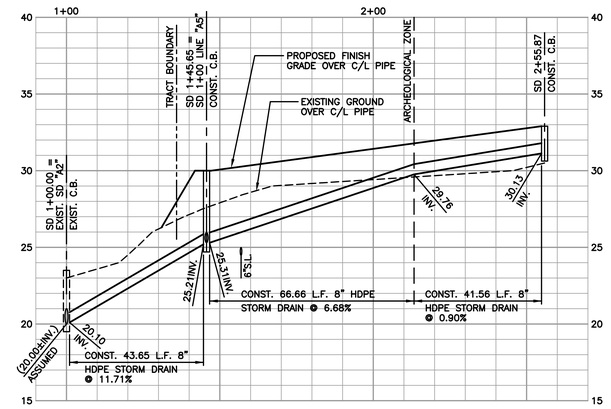
PROFILE – STORM DRAIN "C7"

SCALE: HORIZ. 1" = 20'
VERT. 1" = 4'



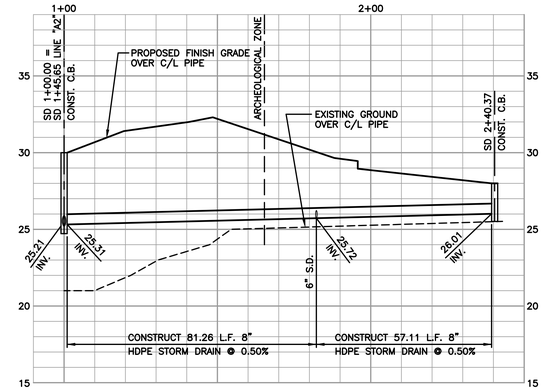
PROFILE – STORM DRAIN "C5"

SCALE: HORIZ. 1" = 20'
VERT. 1" = 4'



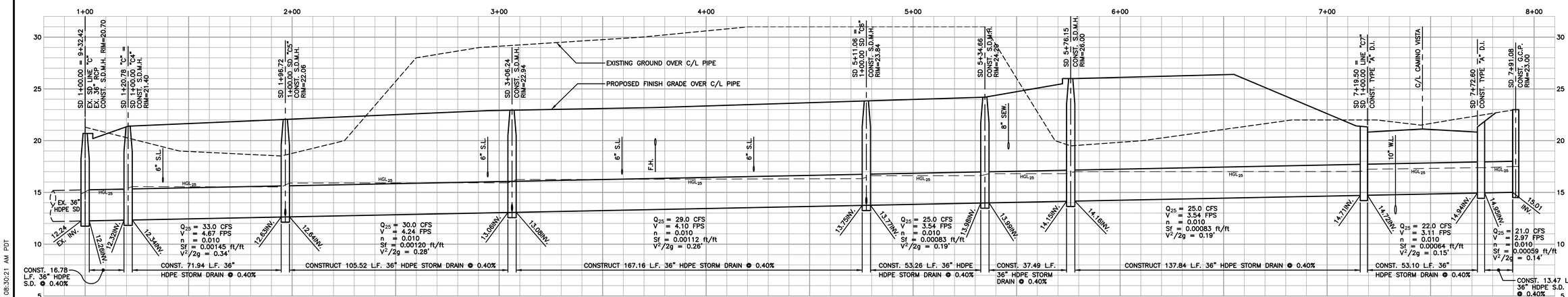
PROFILE – STORM DRAIN "A2"

SCALE: HORIZ. 1" = 20'
VERT. 1" = 4'



PROFILE – STORM DRAIN "A5"

SCALE: HORIZ. 1" = 20'
VERT. 1" = 4'



PROFILE – STORM DRAIN "C"

SCALE: HORIZ. 1" = 20'
VERT. 1" = 4'

REGISTERED PROFESSIONAL ENGINEER DALE W. WEBER No. 53753 EXPIRES 06-30-13 CIVIL STATE OF CALIFORNIA

DATE SIGNED _____

WDID NO. **

2nd PLAN CHECK SUBMITTAL – NOT FOR CONSTRUCTION

NO.	DATE	REVISION	APPD.

MAC Design Associates
CIVIL ENGINEERING * LAND PLANNING * BRIDGE DESIGN
1933 CLIFF DRIVE, SUITE 6, SANTA BARBARA, CALIF. 93109 (805) 957-4748

DESIGN DWW CHECKED MAC
DRAWN TLA
DALE W. WEBER DATE: 10-02-12
PROJECT ENGINEER
R.C.E. 53753 (EXP. 06-30-13)

CITY OF GOLETA, CALIFORNIA
REVIEWED BY:
_____ DATE _____
FOR

STORM DRAIN PROFILES
•
WILLOW SPRINGS II
CITY OF GOLETA

SHEET C5 OF 14
GOLETA CITY FILE
NO.

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APPENDIX B

WILLOW SPRINGS I
FINAL HYDRAULIC REPORT
JANUARY 2, 2002

MAC DESIGN ASSOCIATES

FINAL
HYDRAULIC REPORT

FOR

WILLOW SPRINGS
APN 73-070-42

CLIENT: The Towbes Group, Inc.
21 East Victoria Street, Suite 200
Santa Barbara, CA 93101
(805) 962-2121

PREPARED BY: Michael A. Caccese
MAC Design Associates
1933 Cliff Drive, Suite 6
Santa Barbara, CA 93109
(805) 957-4748

MICHAEL A. CACCESE
RCE 26887
EXPIRES 3/31/01

W.O. 0032

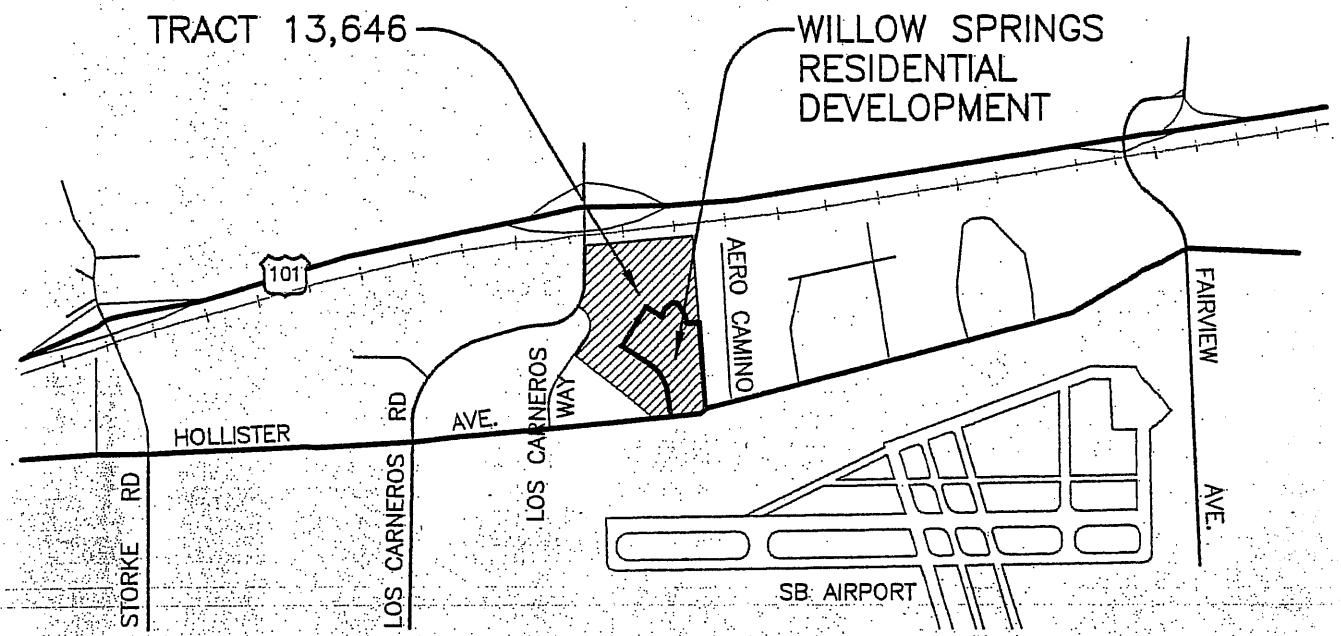
DATE: January 2, 2002

PURPOSE OF REPORT

The purpose of this report is twofold. The first being to calculate the size of storm drain pipes, storm drain inlets and catch basins for the Willow Springs development in accordance with the standards of the Santa Barbara County Flood Control District and the Santa Barbara County Public Works Department. In addition, this report will determine the increase in storm water runoff caused by the proposed Willow Springs development and determine the size of detention basin required to maintain pre-development runoff levels after the Willow Springs development is completed.

LOCATION OF SITE

Willow Springs is the southerly portion (approximately 20 acres) of Tract 13,646. The tract is located in the Goleta Valley of Santa Barbara County near the intersection of Hollister Avenue and Los Carneros Road. A vicinity map is shown on Figure 1.



N NO SCALE

VICINITY MAP

FIGURE 1

MAC Design Associates
CIVIL ENGINEERING * LAND PLANNING * BRIDGE DESIGN
1933 CLIFF DRIVE, SUITE 8, SANTA BARBARA, CALIF. 93109 (805) 957-4748

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I. HYDROLOGY/HYDRAULICS

METHODOLOGY

The anticipated storm water runoff was calculated using Santa Barbara County Flood Control (SBCFD) computer programs and design charts assuming a 25 year return period. Coefficients of runoff were determined for commercial, apartment and open space (agriculture). A time of concentration was established for the various drainage areas to determine runoff intensity. For the most part, the time of concentration was at the minimum (12 minutes). Outlines of the drainage areas are shown on the Final Drainage Plan which is attached as Appendix A.

Roadway and parking lot catch basins are standard Santa Barbara County Public Works (SBCPW) Type "A" Drop Inlets. Other catch basins consist of standard precast concrete catch basins and Caltrans standard grated concrete pipes (GCP).

HYDROLOGY

The following tables contain the hydrology calculations for the proposed residential development. As stated previously, the time of concentration for the most part was at the minimum (12 minutes). The only exceptions to this were the time of concentration for the existing 8' x 2' reinforced concrete box culvert (RCB) which was determined to be 30 minutes and the time of concentration for the pipe system on the southerly portion of Camino Vista (Storm Drain "A") which drains water from the easterly portion of the Raytheon property, which was determined to be 15 minutes.

HYDROLOGY TABLE
Storm Drain "A"

Drainage Area	Area, Ac	Land Use	Q10, cfs	Q25, cfs	Q50, cfs	Q100, cfs
A1	8.4	Comm.	12.8	16.2	18.9	21.3
A2	0.2	Comm.	0.3	0.4	0.4	0.5
A3	0.2	Comm.	0.3	0.4	0.4	0.5
A4	0.3	Comm.	0.3	0.6	0.7	0.8
A5	0.2	Comm.	0.3	0.4	0.4	0.5
A6	0.3	Comm.	0.3	0.6	0.7	0.8
A7	0.5	Comm.	0.8	1.0	1.1	1.3
A8	3.4	Comm.	5.2	6.5	7.6	8.6
V	8.6	Comm.	13.1	16.5	19.3	21.9
			Tc=15 min CComm=0.71 i=2.14	Tc=15 min CComm=0.74 i=2.6	Tc=15 min CComm=0.76 i=2.96	Tc=15 min CComm=0.77 i=3.30

HYDROLOGY TABLE
Storm Drain "B"

Drainage Area	Area, Ac	Land Use	Q10, cfs	Q25, cfs	Q50, cfs	Q100, cfs
B1	2.3	Apt.	3.8	4.9	5.7	6.6
B2	0.3	Apt.	0.5	0.6	0.7	0.9
B3	0.1	Apt.	0.2	0.2	0.2	0.3
B4	0.1	Apt.	0.2	0.2	0.2	0.3
B5	0.5	Apt.	0.8	1.1	1.2	1.4
B6	0.6	Apt.	1.0	1.3	1.5	1.7
B7	0.8	Apt.	1.3	1.7	2.0	2.3
			Tc=12 min CApt=0.69 i=2.40	Tc=12 min CApt=0.73 i=2.9	Tc=12 min CApt=0.75 i=3.3	Tc=12 min CApt=0.77 i=3.70

HYDROLOGY TABLE
Storm Drain "C"

Drainage Area	Area, Ac	Land Use	Q10, cfs	Q25, cfs	Q50, cfs	Q100, cfs
C1	9.0	Comm.	15.6	19.6	22.9	26.3
C2	5.8	Comm.	10.0	12.6	14.7	17.0
C3	0.3	Apt.	0.5	0.6	0.7	0.9
C4	0.8	Apt.	1.3	1.7	2.0	2.3
C5	0.1	Apt.	0.2	0.2	0.2	0.3
C6	0.2	Apt.	0.3	0.4	0.5	0.6
C7	0.5	Apt.	0.8	1.1	1.2	1.4
C8	0.3	Apt.	0.5	0.6	0.7	0.9
C9	0.1	Apt.	0.2	0.2	0.2	0.3
C10	0.8	Apt.	1.3	1.7	2.0	2.3
C11	1.0	Ag.	1.7	2.1	2.5	2.8
C12	0.6	Apt.	1.0	1.3	1.5	1.7
C13	0.9	Apt.	1.5	1.9	2.2	2.6
C14	0.4	Apt.	0.7	0.8	1.0	1.1
C15	0.7	Apt.	1.2	1.5	1.7	2.0
C16	0.4	Apt.	0.7	0.8	1.0	1.1
			Tc=12 min Ccomm=0.72 CApt=0.69 i=2.40	Tc=12 min Ccomm=0.75 CApt=0.73 i=2.9	Tc=12 min Ccomm=0.77 CApt=0.75 i=3.3	Tc=12 min Ccomm=0.79 CApt=0.77 i=3.70

HYDROLOGY TABLE

Storm Drain "D"

Drainage Area	Area, Ac	Land Use	Q10, cfs	Q25, cfs	Q50, cfs	Q100, cfs
D1	0.7	Apt.	1.2	1.5	1.7	2.0
D2	0.2	Apt.	0.3	0.4	0.5	0.6
D3	0.3	Apt.	0.5	0.6	0.7	0.9
D4	0.2	Apt.	0.3	0.4	0.5	0.6
D5	0.3	Apt.	0.5	0.6	0.7	0.9
D6	0.2	Apt.	0.3	0.4	0.5	0.6
			Tc=12 min CApt=0.69 i=2.40	Tc=12 min CApt=0.73 i=2.9	Tc=12 min CApt=0.75 i=3.3	Tc=12 min CApt=0.77 i=3.70

HYDROLOGY TABLE
Storm Drain "E"

Drainage Area	Area, Ac	Land Use	Q10, cfs	Q25, cfs	Q50, cfs	Q100, cfs
E1	0.5	Apt.	0.8	1.1	1.2	1.4
E2	0.3	Apt.	0.5	0.6	0.7	0.9
E3	0.2	Apt.	0.3	0.4	0.5	0.6
E4	0.2	Apt.	0.3	0.4	0.5	0.6
E5	0.3	Apt.	0.5	0.6	0.7	0.9
E6	0.3	Apt.	0.5	0.6	0.7	0.9
E7	0.3	Apt.	0.5	0.6	0.7	0.9
E8	0.5	Apt.	0.8	1.1	1.2	1.4
E9	0.3	Apt.	0.5	0.6	0.7	0.9
			Tc=12 min C_{Apt}=0.69 i=2.40	Tc=12 min C_{Apt}=0.73 i=2.9	Tc=12 min C_{Apt}=0.75 i=3.3	Tc=12 min C_{Apt}=0.77 i=3.70

HYDROLOGY TABLE
Drainage Ditch "A"

Drainage Area	Area, Ac	Land Use	Q10, cfs	Q25, cfs	Q50, cfs	Q100, cfs
F1	1.0	Comm.	1.7	2.2	2.5	2.8
F2	0.9	Comm.	1.6	2.0	2.3	2.6
			Tc=12 min Ccomm=0.72 i=2.40	Tc=12 min Ccomm=0.72 i=2.9	Tc=12 min Ccomm=0.72 i=3.3	Tc=12 min Ccomm=0.72 i=3.70

HYDRAULICS

Storm Drain System "A"

This facility will convey the storm runoff from Drainage Area "A1" through "A8" and "V" to the wetland site. A area located southeast of the Camino Vista / Calle Koral intersection. This storm drain system will be public as it lies within the public rights – of – way of Camino Vista and Calle Koral cast-in-place concrete endwall will be used at the outlet end of this HDPE pipe. The attached SBCFCD full flow storm drain pipe hydraulics printout indicates the various sizes of smooth bore HDPE pipe required to carry the Q_{25}.

Program - S T O R M D R A . E X E 12-31-2001

Project: Willow Springs - Storm Drain "A" by MAC

SANTA BARBARA COUNTY FLOOD CONTROL DISTRICT FULL FLOW STORMDRAIN PIPE HYDRAULICS

Licensed to MAC Design Associates

Station (ft)	Pipe Length	PipeD (in)	n	Flow (cfs)	Vel (ft/sec)	H(v) (ft)	S(f) (ft/ft)	HGL (ft)	EL (ft)
Tailwater [Downstream HGL]								14.50	
0								14.50	14.68
	8	48	0.013	42.6	3.39	0.18	0.00088		
8								14.51	14.69
Junction								Loss by Energy	
8								14.70	14.71
	3	99	0.013	42.6	0.80	0.01	0.00002		
11								14.70	14.71
Junction	Side Inflow Pipe =			18 in @ 90 deg,				Loss by Momentum	
11								14.60	14.77
	47	48	0.013	42.0	3.34	0.17	0.00085		
58								14.64	14.81
Junction								Loss by Energy	
58								14.82	14.83
	3	99	0.013	42.0	0.79	0.01	0.00002		
61								14.82	14.83
Junction	Side Inflow Pipe =			24 in @ 90 deg,				Loss by Momentum	
61								14.81	14.86
	25	48	0.013	23.0	1.83	0.05	0.00026		
86								14.82	14.87
End of Run @ Headwater								14.88	14.88

Program - S T O R M D R A . E X E 12-31-2001

Project: Willow Springs - Storm Drain "A1" by MAC

SANTA BARBARA COUNTY FLOOD CONTROL DISTRICT FULL FLOW STORMDRAIN PIPE HYDRAULICS

Licensed to MAC Design Associates

Station (ft)	Pipe Length	PipeD (in)	n	Flow (cfs)	Vel (ft/sec)	H(v) (ft)	S(f) (ft/ft)	HGL (ft)	EL (ft)
Tailwater [Downstream HGL]								14.82	
0								14.82	15.42
	133	24	0.013	19.6	6.24	0.60	0.00750		
133								15.82	16.42
Junction Loss by Energy									
133								16.53	16.53
	4	99	0.013	19.6	0.37	0.00	0.00000		
137								16.53	16.53
Junction Side Inflow Pipe = 18 in @ 90 deg, Loss by Momentum									
137								16.41	16.98
	22	24	0.013	19.0	6.05	0.57	0.00705		
159								16.56	17.13
Junction Loss by Energy									
159								17.23	17.23
	4	99	0.013	19.0	0.36	0.00	0.00000		
163								17.23	17.23
Junction Side Inflow Pipe = 18 in @ 90 deg, Loss by Momentum									
163								17.12	17.66
	270	24	0.013	18.6	5.92	0.54	0.00676		
433								18.94	19.49
End of Run @ Headwater								19.60	19.60

45

55

19

W

W

W

14+00

13+00

12+00

28

18

20

CAMINO VISTA

LINE A1

D

SDMH

LINE A3

LINE A1

LINE A

LLE KORAL

H

X 12.4

X 13.2

CONST. TYPE "A" DROP INLET WITH FILTER

40

45

55

19

W

W

W

S

S

16+00

15+00

14+00

13+

LINE A2

D

S

18"

D

S

4"

CAMINO VISTA

D

LINE A1

21

22

CONST. TYPE "A" DROP INLET WITH FILTER

Storm Drain System "B"

This facility will convey the storm runoff from Drainage Areas "B1" through "B7" to the wetland area located southeast of the Camino Vista / Calle Koral intersection. This storm drain system will be private as it lies within the development area. A cast-in-place concrete endwall will be used at the outlet end of this HDPE pipe. The attached SBCFCD full flow storm drain pipe hydraulics printout indicates the various size of smooth bore HDPE pipe required to carry the Q25.

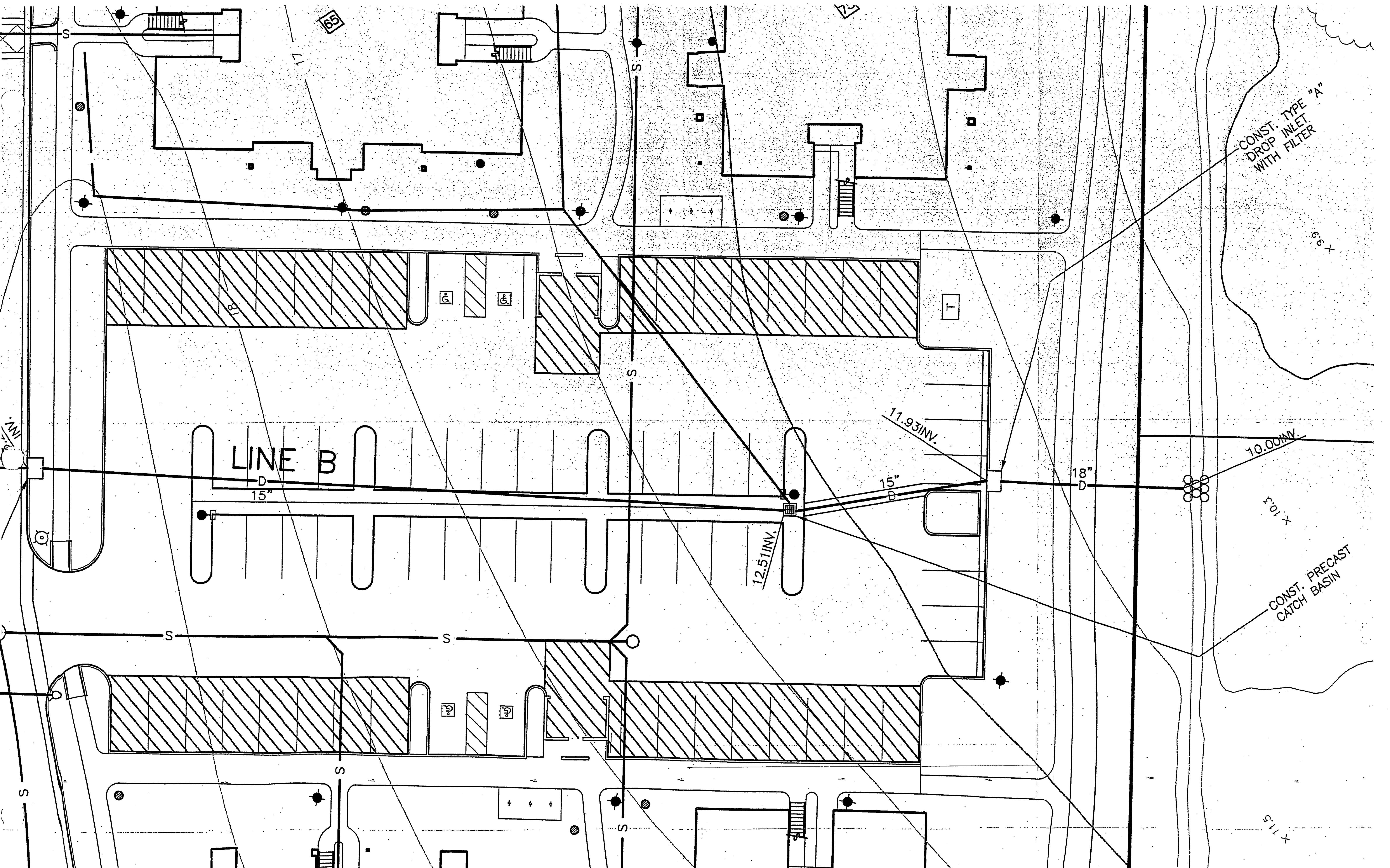
Program - S T O R M D R A . E X E 12-31-2001

Project: Willow Springs - Storm Drain "B" by MAC

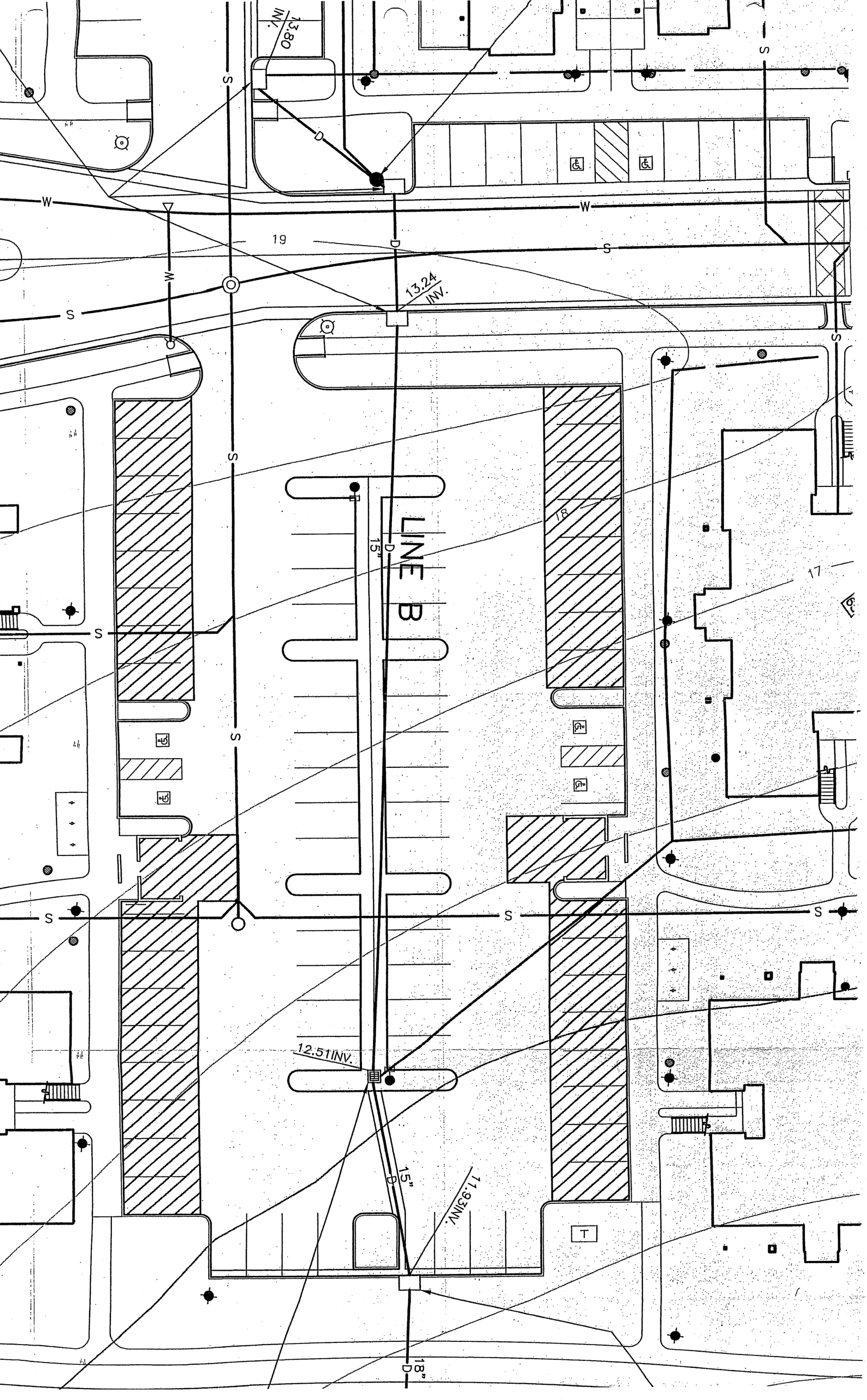
SANTA BARBARA COUNTY FLOOD CONTROL DISTRICT FULL FLOW STORMDRAIN PIPE HYDRAULICS

Licensed to MAC Design Associates

Station (ft)	Pipe Length	PipeD (in)	n	Flow (cfs)	Vel (ft/sec)	H(v) (ft)	S(f) (ft/ft)	HGL (ft)	EL (ft)
Tailwater [Downstream HGL]								12.00	
0								12.00	12.50
	46	18	0.013	10.0	5.66	0.50	0.00906		
46								12.42	12.91
Junction								Loss by Energy	
46								13.01	13.01
	3	99	0.013	10.0	0.19	0.00	0.00000		
49								13.01	13.01
Junction	Side Inflow Pipe =			12 in @ 90 deg,				Loss by Momentum	
49								12.96	13.35
	47	18	0.013	8.9	5.04	0.39	0.00718		
96								13.30	13.69
Junction								Loss by Energy	
96								13.76	13.76
	3	99	0.013	8.9	0.17	0.00	0.00000		
99								13.76	13.76
Junction	Side Inflow Pipe =			12 in @ 90 deg,				Loss by Momentum	
99								13.73	14.09
	179	15	0.013	5.9	4.81	0.36	0.00834		
278								15.22	15.58
Junction								Loss by Energy	
278								15.65	15.65
	3	99	0.013	5.9	0.11	0.00	0.00000		
281								15.65	15.65
Junction	Side Inflow Pipe =			12 in @ 90 deg,				Loss by Momentum	
281								15.62	15.96
	30	15	0.013	5.7	4.64	0.33	0.00778		
311								15.86	16.19
Junction								Loss by Energy	
311								16.25	16.26
	3	99	0.013	5.7	0.11	0.00	0.00000		
314								16.25	16.26
Junction	Side Inflow Pipe =			12 in @ 90 deg,				Loss by Momentum	
314								16.23	16.54
	24	15	0.013	5.5	4.48	0.31	0.00725		
338								16.40	16.71
End of Run @ Headwater								16.78	16.78



LINE B
15"
D
12.51INV.
11.93INV.
15"
18"
10.00INV.
CONST. TYPE "A" DROP INLET WITH FILTER
CONST. PRECAST CATCH BASIN
S
T
65
17
18
X 9.9
X 10.3
X 11.5


LINE B
15"
D
18"
D
15"
D
13.80
INV.
13.24
INV.
12.51INV.
11.93INV.
19
18
17
W
S
D
T

Storm Drain System "C"

This facility will convey the storm runoff from Drainage Areas "C" through "C16" to the wetland area located southeast of the Camino Vista / Calle Koral intersection. This storm drain system will be private as it lies within the development area. A cast-in-place concrete endwall will be used at the outlet end of this HDPE pipe. The attached SBCFCD full flow storm drain pipe hydraulics printout indicates the various size of smooth bore HDPE pipe required to carry the Q25.

Program - S T O R M D R A . E X E 12-31-2001

Project: Willow Springs - Storm Drain "C" by MAC

SANTA BARBARA COUNTY FLOOD CONTROL DISTRICT FULL FLOW STORMDRAIN PIPE HYDRAULICS

Licensed to MAC Design Associates

Station (ft)	Pipe Length	PipeD (in)	n	Flow (cfs)	Vel (ft/sec)	H(v) (ft)	S(f) (ft/ft)	HGL (ft)	EL (ft)
Tailwater [Downstream HGL]								12.00	
0								12.00	12.37
	40	42	0.013	47.1	4.90	0.37	0.00219		
40								12.09	12.46
Junction								Loss by Energy	
40								12.50	12.51
	3	99	0.013	47.1	0.88	0.01	0.00002		
43								12.50	12.51
Junction	Side Inflow Pipe =			24 in @ 90 deg,				Loss by Momentum	
43								12.33	12.67
	50	42	0.013	45.5	4.73	0.35	0.00204		
93								12.43	12.78
Junction								Loss by Energy	
93								12.81	12.82
	3	99	0.013	45.5	0.85	0.01	0.00002		
96								12.81	12.82
Junction	Side Inflow Pipe =			24 in @ 90 deg,				Loss by Momentum	
96								12.65	12.98
	158	42	0.013	44.0	4.57	0.32	0.00191		
254								12.95	13.28
Junction								Loss by Energy	
254								13.31	13.32
	3	99	0.013	44.0	0.82	0.01	0.00002		
257								13.31	13.32
Junction	Side Inflow Pipe =			24 in @ 90 deg,				Loss by Momentum	
257								13.20	13.44
	95	42	0.013	38.5	4.00	0.25	0.00146		
352								13.33	13.58
Junction								Loss by Energy	
352								13.61	13.62
	3	99	0.013	38.5	0.72	0.01	0.00002		
355								13.61	13.62
Junction	Side Inflow Pipe =			24 in @ 90 deg,				Loss by Momentum	
355								13.49	13.73
	124	42	0.013	38.3	3.98	0.25	0.00145		

Junction							Loss by Energy	
479							13.94	13.94
3	99	0.013	38.3	0.72	0.01	0.00001		
482							13.94	13.95

Junction	Side Inflow Pipe =			24 in @ 90 deg,			Loss by Momentum	
482							13.82	14.06
35	42	0.013	37.9	3.94	0.24	0.00142		
517							13.87	14.11
Junction							Loss by Energy	
517							14.13	14.14
3	99	0.013	37.9	0.71	0.01	0.00001		
520							14.13	14.14

Junction	Side Inflow Pipe =			24 in @ 90 deg,			Loss by Momentum	
520							14.01	14.25
137	42	0.013	37.7	3.92	0.24	0.00140		
657							14.21	14.44
Junction							Loss by Energy	
657							14.47	14.48
3	99	0.013	37.7	0.71	0.01	0.00001		
660							14.47	14.48

Junction	Side Inflow Pipe =			24 in @ 90 deg,			Loss by Momentum	
660							14.34	14.67
162	36	0.013	32.8	4.64	0.33	0.00242		
822							14.73	15.07
Junction							Loss by Energy	
822							15.11	15.12
3	99	0.013	32.8	0.61	0.01	0.00001		
825							15.11	15.12

Junction	Side Inflow Pipe =			24 in @ 90 deg,			Loss by Momentum	
825							14.98	15.30
223	36	0.013	32.2	4.56	0.32	0.00233		
1,048							15.50	15.82
Junction							Loss by Energy	
1,048							15.86	15.87
3	99	0.013	32.2	0.60	0.01	0.00001		
1,051							15.86	15.87

Junction	Side Inflow Pipe =			24 in @ 90 deg,			Loss by Momentum	
1,051							15.80	16.05
565	30	0.013	19.6	3.99	0.25	0.00228		
1,616							17.09	17.34

End of Run @ Headwater	17.39	17.39

Program - S T O R M D R A . E X E 12-31-2001

Project: Willow Springs - Storm Drain "C1" by MAC

SANTA BARBARA COUNTY FLOOD CONTROL DISTRICT FULL FLOW STORMDRAIN PIPE HYDRAULICS

Licensed to MAC Design Associates

Station (ft)	Pipe Length	PipeD (in)	n	Flow (cfs)	Vel (ft/sec)	H(v) (ft)	S(f) (ft/ft)	HGL (ft)	EL (ft)
Tailwater	[Downstream HGL]							13.31	
0								13.31	13.62
	70	15	0.013	5.5	4.48	0.31	0.00725		
70								13.82	14.13
Junction								Loss by Energy	
70								14.19	14.19
	3	99	0.013	5.5	0.10	0.00	0.00000		
73								14.19	14.19
Junction	Side Inflow Pipe =		12 in @ 90 deg,					Loss by Momentum	
73								14.17	14.41
	29	15	0.013	4.9	3.99	0.25	0.00575		
102								14.33	14.58
Junction								Loss by Energy	
102								14.63	14.63
	3	99	0.013	4.9	0.09	0.00	0.00000		
105								14.63	14.63
Junction	Side Inflow Pipe =		12 in @ 90 deg,					Loss by Momentum	
105								14.63	14.66
	130	12	0.013	1.1	1.40	0.03	0.00095		
235								14.75	14.78
End of Run @ Headwater								14.79	14.79

CONST. TYPE "A" DROP INLET WITH FILTER

22.5

18.0 GB

22.0 TOP

18.6 GB

22.5

1.8 +

12

CONST. TYPE "A" DROP INLET WITH FILTER

9.50 INV.

36" D

36" D

9.30 INV.

36" D

LINE C

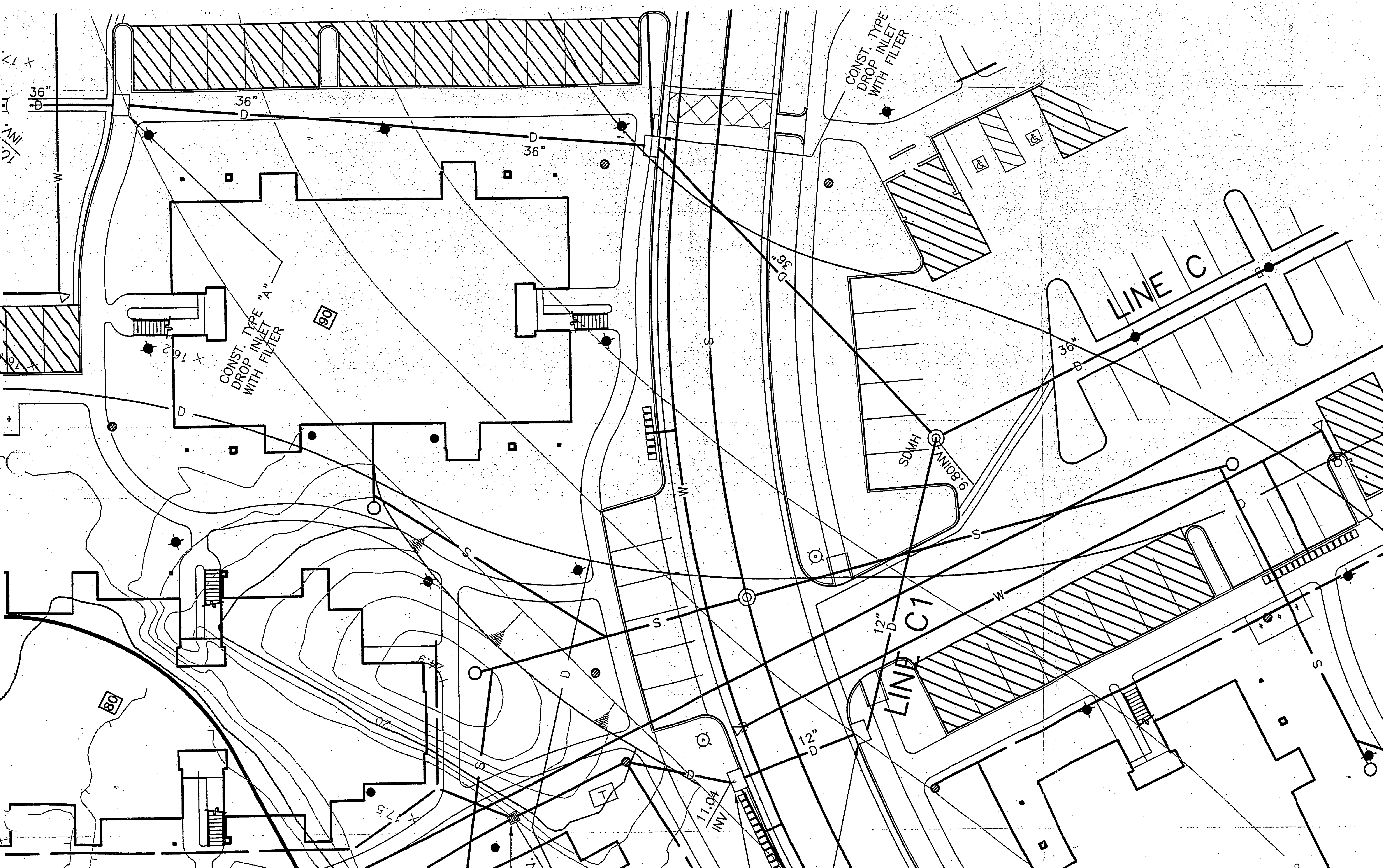
CONST. PRECAST CATCH BASIN

100.6 INV.

8.00 INV.

14

13



CONST. TYPE DROP INLET WITH FILTER
CONST. TYPE "A" DROP INLET WITH FILTER
90
80
36"
LINE C
LINE C1
SDMH
12"
11.04 INV.

SDMH
11.10
INV.
36"
D
S
W
14.2
14.22 F
8.22 R
4.1
16.3
17.6
17.5
17.9
17.7
17.4
16.2
15.4
14.3
16.1
15.1
10.80
INV.
CONST.
PRECAST
CATCH
BASIN
LINE C
120
84

LINE C

36"
D

16.8
X

17.3
X

16.4
X

7.06 RIM
6.28 INV.

11.57
INV.

36"
D

SDMH

18.3
X

W

S

W

12"
D

16.2
X

17.1
X

17.5
X

17.9
X

17.9
X

17.2
X

17.4
X

16

86

17.50INV.

15.4
X

84

14.3
X

LINE C

CONST. G.C.P. PER CALTRANS STDS.

VIA LUISA

14

15

24.26 RIM
17.26 INV.

20.7

22.7

20.57 RIM
13.78 INV.

16.8

17.2

17.9

17.4

19.2

23.2

23.4

Storm Drain System "D"

This facility will convey the storm runoff from Drainage Areas "D1" through "D6" to the wetland area located southeast of the Camino Vista / Calle Koral intersection. This storm drain system will be private as it lies within the development area. A cast-in-place concrete endwall will be used at the outlet end of this HDPE pipe. The attached SBCFCD full flow storm drain pipe hydraulics printout indicates the various size of smooth bore HDPE pipe required to carry the Q25.

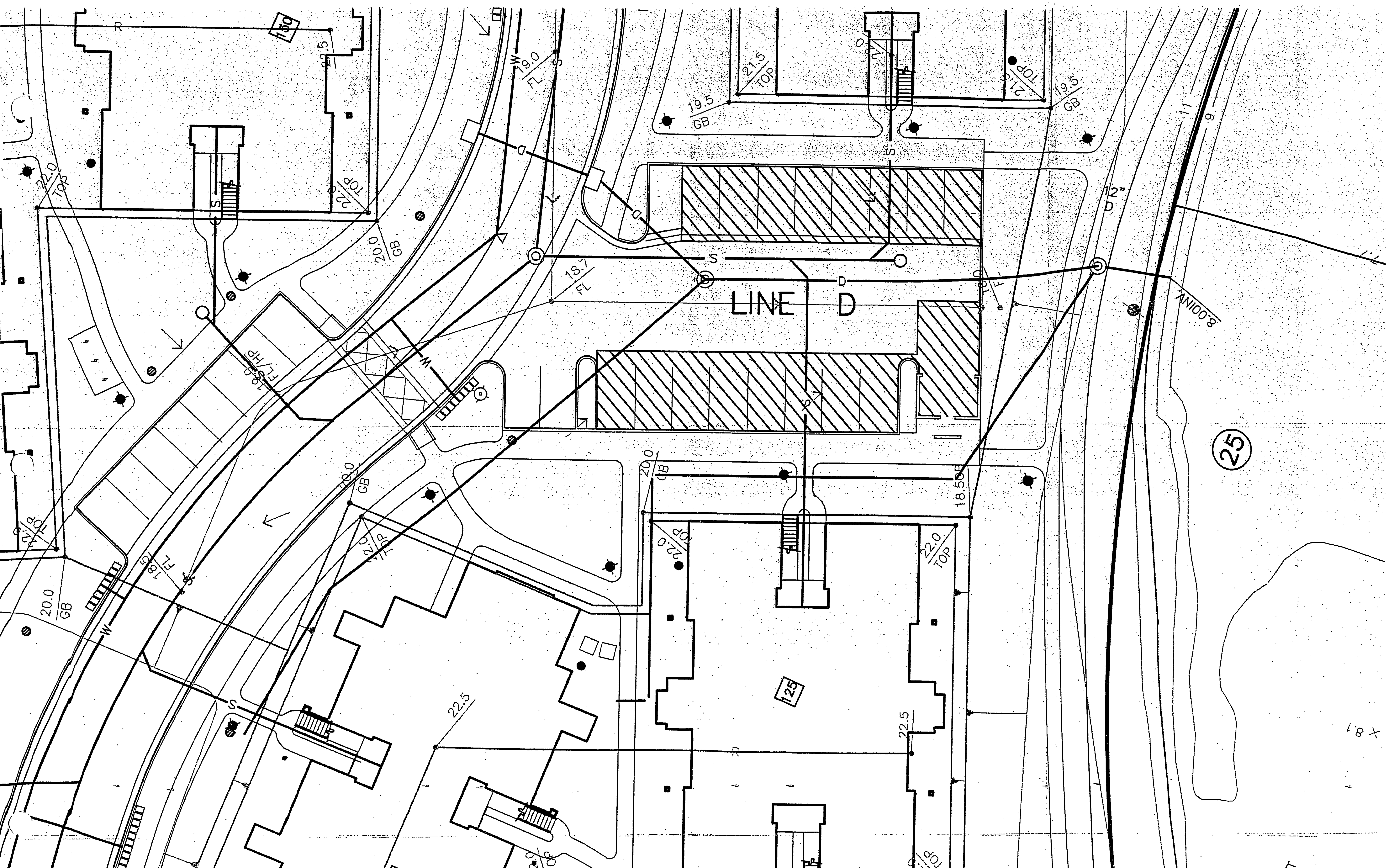
Program - S T O R M D R A . E X E 12-31-2001

Project: Willow Springs - Storm Drain "D" by MAC

SANTA BARBARA COUNTY FLOOD CONTROL DISTRICT FULL FLOW STORMDRAIN PIPE HYDRAULICS

Licensed to MAC Design Associates

Station (ft)	Pipe Length	PipeD (in)	n	Flow (cfs)	Vel (ft/sec)	H(v) (ft)	S(f) (ft/ft)	HGL (ft)	EL (ft)
Tailwater [Downstream HGL]								9.00	
0								9.00	9.38
	17	12	0.013	3.9	4.97	0.38	0.01198		
17								9.20	9.59
Junction Loss by Energy									
17								9.66	9.66
	3	99	0.013	3.9	0.07	0.00	0.00000		
20								9.66	9.66
Junction Side Inflow Pipe = 12 in @ 90 deg, Loss by Momentum									
20								9.65	9.81
	95	12	0.013	2.5	3.18	0.16	0.00492		
115								10.12	10.28
Junction Loss by Energy									
15								10.31	10.31
	3	99	0.013	2.5	0.05	0.00	0.00000		
118								10.31	10.31
Junction Side Inflow Pipe = 12 in @ 90 deg, Loss by Momentum									
118								10.30	10.43
	26	12	0.013	2.3	2.93	0.13	0.00417		
144								10.41	10.54
Junction Loss by Energy									
144								10.57	10.57
	3	99	0.013	2.3	0.04	0.00	0.00000		
147								10.57	10.57
Junction Side Inflow Pipe = 12 in @ 90 deg, Loss by Momentum									
147								10.56	10.65
	29	12	0.013	1.9	2.42	0.09	0.00284		
176								10.64	10.74
End of Run @ Headwater								10.75	10.75



LINE D
12" D
8.00INV.
25
125
150

Storm Drain System "E"

This facility will convey the storm runoff from Drainage Areas "E1" through "E9" to the wetland area located southeast of the Camino Vista / Calle Koral intersection. This storm drain system will be private as it lies within the development area. A cast-in-place concrete endwall will be used at the outlet end of this HDPE pipe. The attached SBCFCD full flow storm drain pipe hydraulics printout indicates the various size of smooth bore HDPE pipe required to carry the Q25.

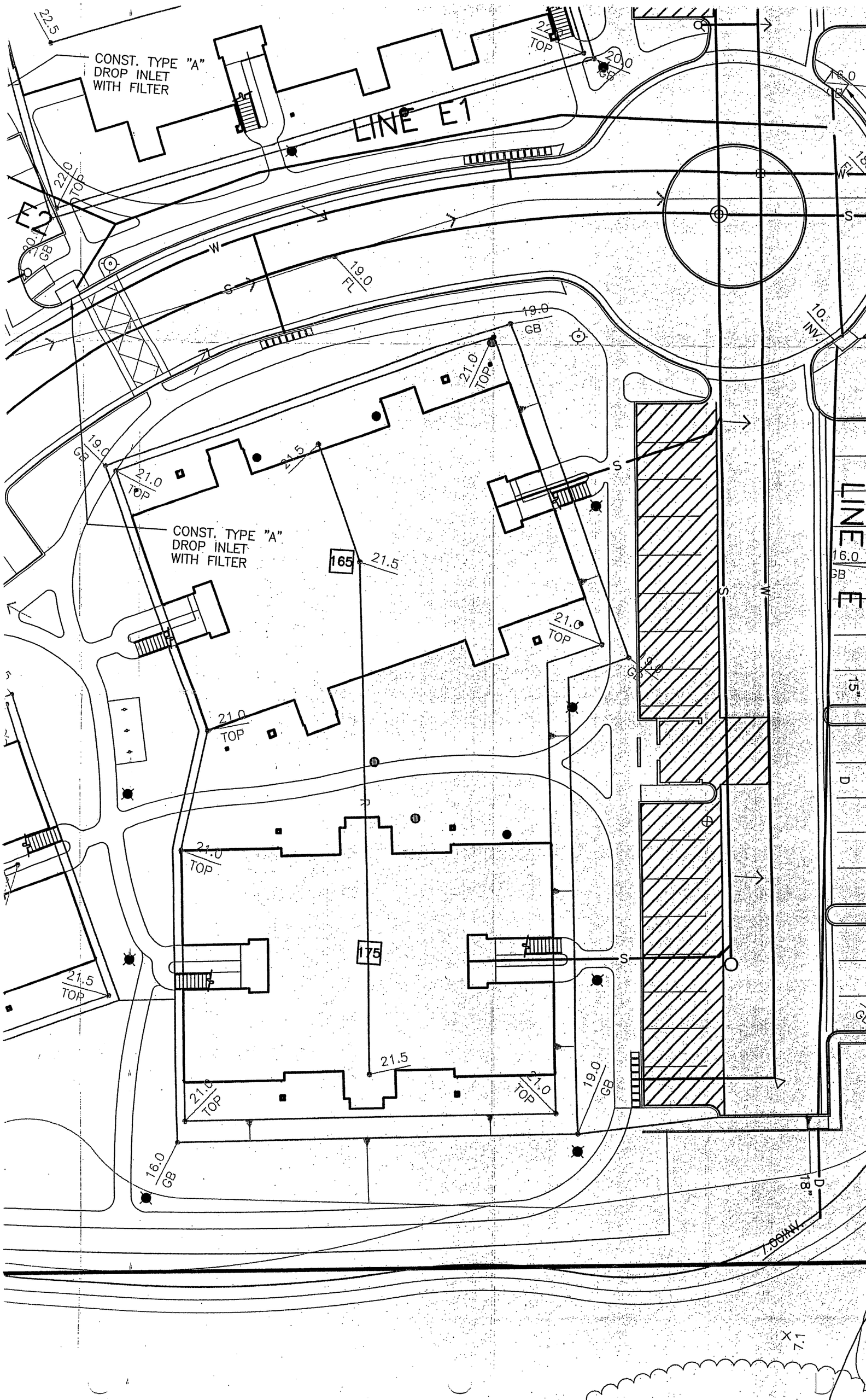
Program - S T O R M D R A . E X E 12-31-2001

Project: Willow Springs - Storm Drain "E" by MAC

SANTA BARBARA COUNTY FLOOD CONTROL DISTRICT FULL FLOW STORMDRAIN PIPE HYDRAULICS

Licensed to MAC Design Associates

Station (ft)	Pipe Length	PipeD (in)	n	Flow (cfs)	Vel (ft/sec)	H(v) (ft)	S(f) (ft/ft)	HGL (ft)	EL (ft)
Tailwater [Downstream HGL]								8.25	
0								8.25	8.62
	22	15	0.013	6.0	4.89	0.37	0.00862		
22								8.44	8.81
Junction Loss by Energy									
22								8.88	8.88
	3	99	0.013	6.0	0.11	0.00	0.00000		
25								8.88	8.88
Junction Side Inflow Pipe = 12 in @ 90 deg, Loss by Momentum									
25								8.87	9.06
	183	15	0.013	4.3	3.50	0.19	0.00443		
208								9.68	9.87
Junction Loss by Energy									
208								9.90	9.90
	3	99	0.013	4.3	0.08	0.00	0.00000		
211								9.90	9.90
Junction Side Inflow Pipe = 12 in @ 90 deg, Loss by Momentum									
211								9.89	10.05
	47	15	0.013	3.9	3.18	0.16	0.00364		
258								10.06	10.22
Junction Loss by Energy									
258								10.25	10.25
	3	99	0.013	3.9	0.07	0.00	0.00000		
261								10.25	10.25
Junction Side Inflow Pipe = -1 in @ 90 deg, Loss by Momentum									
261								10.24	10.36
	7	12	0.013	2.2	2.80	0.12	0.00381		
268								10.27	10.39
End of Run @ Headwater								10.41	10.41


CONST. TYPE "A"
DROP INLET
WITH FILTER
LINE E1
22.5
22.0
TOP
20.0
GB
E2
W
S
19.0
FL
19.0
GB
21.0
TOP
21.5
165
175
16.0
GB
LINE E
10"
INV.
15"
D
18"
7.00HW.

CONST. TYPE "A"
DROP INLET
WITH FILTER

LINE E1

LINE E2

LINE

170

19.0
FL

22.5

20.0
GB

22.0
TOP

21.0
TOP

19.0
GB

18.3
FL

16.0
GB

10.
INV.

W

S

P

Drainage Ditch "A"

This feature runs along the easterly property line and drains Area F1. The attached SBCFCD open channel flow hydraulics printout indicates that a concrete channel with a one (1) foot bottom vertical sides and a slope of 0.006 feet/foot will carry the Q25 of 2.2 cfs and the Q100 of 2.8 cfs generated by Area F1.

SANTA BARBARA COUNTY FLOOD CONTROL DISTRICT - OPEN CHANNEL FLOW HYDRAULICS

Program: C H A N N E L . B A S

Licensed to MAC Design Associates

PROJECT: Willow Springs-Drainage Ditch"A" BY: MAC DATE: 01-03-2002

Flow in RECTANGULAR Channel

Q = 2 cfs, b = 1.0 ft, z = 0.00, n = 0.013 So = 0.00600

Normal Depth	=	0.59 ft
Normal Vel	=	3.71 ft/sec
V*V/2G	=	0.21 ft
V*V/2G+Depth	=	0.81 ft
P + M	=	0 cu-ft
Froude Nr.	=	0.85
Critical Depth	=	0.53 ft

Mild Slope, 'M' Profiles
Flow is in Unstable Zone. S(O)/S(C) = 0.75
Wave Height = 0.04 ft, D(n)+Wave = 0.63 ft

SANTA BARBARA COUNTY FLOOD CONTROL DISTRICT - OPEN CHANNEL FLOW HYDRAULICS

Program: C H A N N E L . B A S

Licensed to MAC Design Associates

PROJECT: _____ BY: _____ DATE: 01-03-2002

Flow in RECTANGULAR Channel

Q = 3 cfs, b = 1.0 ft, z = 0.00, n = 0.013 So = 0.00600

Normal Depth	=	0.71 ft
Normal Vel	=	3.92 ft/sec
V*V/2G	=	0.24 ft
V*V/2G+Depth	=	0.95 ft
P + M	=	1 cu-ft
Froude Nr.	=	0.82
Critical Depth	=	0.62 ft

Mild Slope, 'M' Profiles
Flow is in Unstable Zone. S(O)/S(C) = 0.71
Wave Height = 0.01 ft, D(n)+Wave = 0.72 ft

14.8 TF
14.2 TF
13.6 TF
13.0 TF
CL
14.22 RIM
8.52 INV
14.4
4.1
SMH
18.38FL
18.88TC
18.34FL
18.84TC
17.80FL
18.30TC
14.2
17.76FL
18.26TC
17.70FL
18.20TC
FF=17.9
SDMH
17.43
FL
18.22
FL
17.66FL
18.16TC
17.20FL
17.25FL
17.75TC
17.6
17.16FL
18.28TC
21.00
FG
21.0
16.74FL
7.7
17.9
17.20FL
17.70TC
17.5
16.66FL
17.16TC
TC
17.5
17.50
FG
17.96
FG
16.3
17.6
FF=18.0
120
17.5
17.96
FG
17.5
17.50
FG

EXISTING SEWER

11.18 RIM
5.95 INV.

11.2 TF

10.6 TF

10.0 TF

10.2

14.15FL
14.65TC

14.11FL
14.61TC

20.0
GB

22.0
TOP

22.5

14.5

22.0
TOP

22.5

FF = 15.0

180

14.96
FG

14.50FG

14.96
FG

14.50FG

14.5

14.5

22.0
TOP

22.5

22.0
TOP

14.00
FG

14.25FL
14.75TC

13.43FL
13.93TC

13.30FL
13.80TC

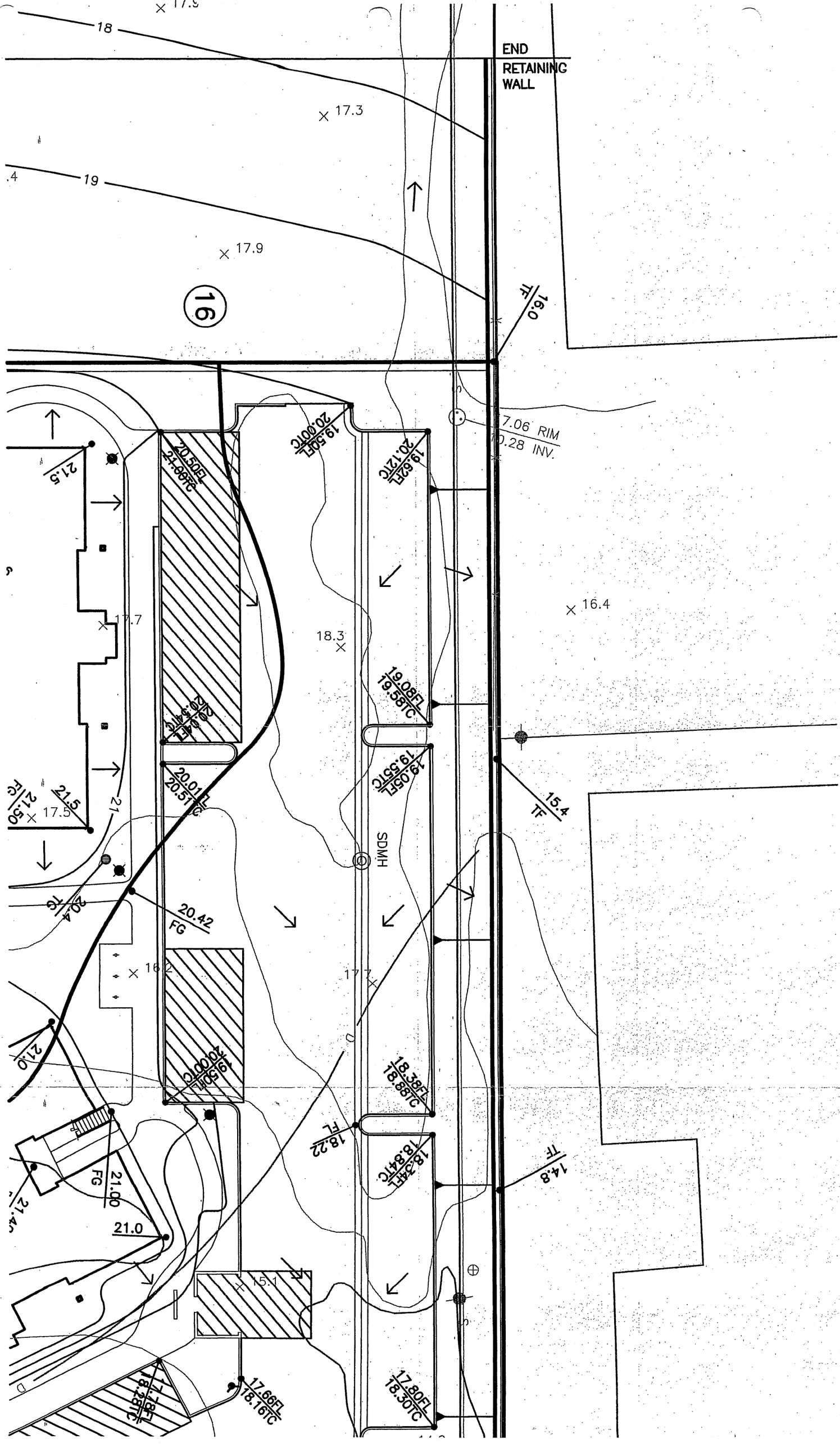
12.94FL
13.44TC

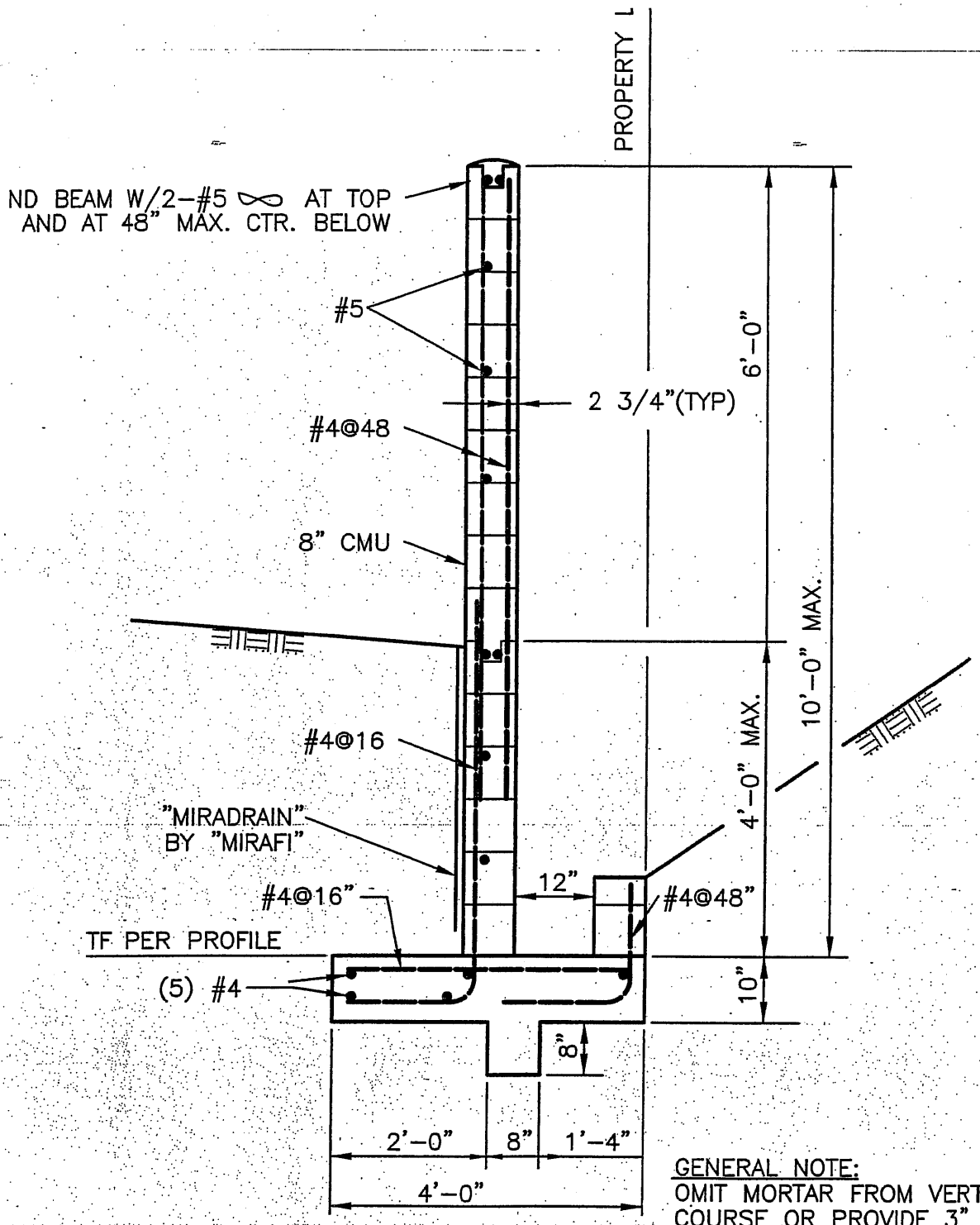
13.17FL
13.67TC

16.0
GB

12.90FL
13.40TC

12.66FL
13.16TC


END
RETAINING
WALL
18
19
17.3
17.9
16
16.0 TF
7.06 RIM
0.28 INV.
19.50FL
20.00TC
19.62FL
20.12TC
20.50FL
21.00TC
21.5
17.7
18.3
16.4
19.08FL
19.58TC
19.05FL
19.55TC
20.01
20.51
21.50 FG
21.5
17.5
15.4 TF
SDMH
20.4 TG
20.42 FG
16.2
17.7
21.0
19.50FL
20.00TC
18.38FL
18.88TC
18.2 FL
18.23FL
18.84TC
14.8 TF
21.00 FG
21.0
15.1
17.66FL
18.16TC
17.80FL
18.30TC



GENERAL NOTE:
OMIT MORTAR FROM VERTICAL JOINT IN FIRST COURSE OR PROVIDE 3" DIA. PIPE ABOVE GROUND LINE AT 32" CENTERS FOR WEEP HOLES. FILL ALL CELLS W/GROUT.

LOOKING NORTH

PRIVACY/RETAINING WALL TYPICAL SECTION ALONG EASTERLY PROPERTY LINE

7
15

SCALE: 1" = 2'

II. DETENTION BASIN

BACKGROUND

Willow Springs is the southerly portion of Tract 13,464 and comprises approximately 20 acres. (See Figure 1) This 235 unit residential project was approved in 1986 and improvement plans for mass grading, road construction and drainage were reviewed and approved by the County. The approved improvement plans included the construction of a storm drain system which carried a Q25 runoff of 74.0 cfs to the existing 8' x 2' reinforced concrete box culvert (RCB) under Hollister Avenue.

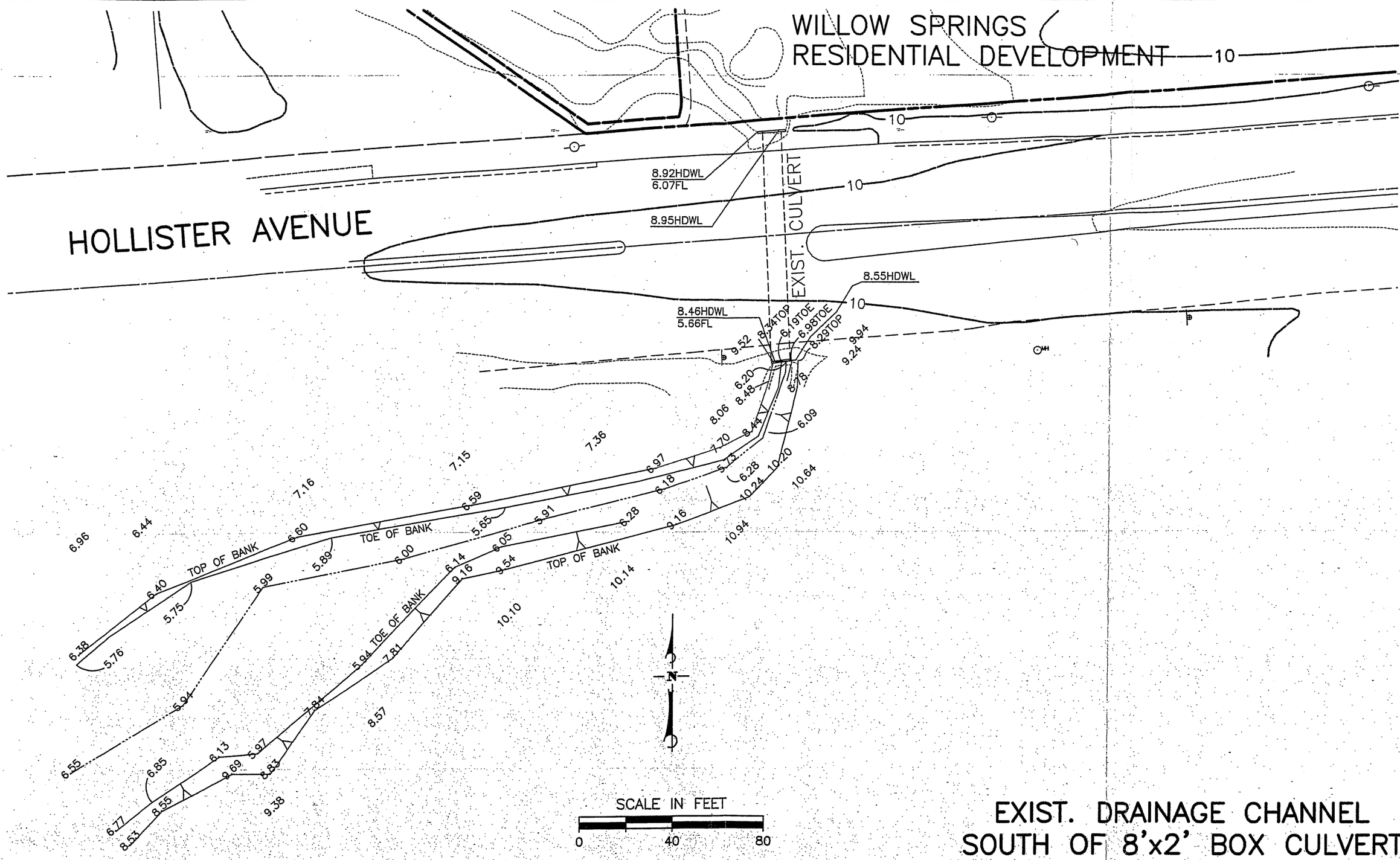
This RCB drains into an earth channel which carries the runoff to Carneros Creek across Santa Barbara Airport property. (See Figure 1A) The approved drainage plans do not include any improvement to the earth channel. The approved residential project was not constructed and the site has been undeveloped since that time.

The Airport has not and does not maintain the earth channel from the RCB to Carneros Creek. This lack of any maintenance has resulted in the following:

1. Deposition of silt in the channel flowline has eliminated positive drainage flow from the RCB to Carneros Creek. The flowline of the channel is actually higher than the RCB flowline which results in storm water runoff backing up through the RCB to the north side of Hollister Avenue.

2. Vegetation growing in the channel has clogged the waterway and significantly reduced the capacity of the channel.

If this channel had been properly maintained with an 8' bottom and 2:1 side slopes, its capacity would be sufficient to handle runoff from the drainage area tributary to the RCB.



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EXIST. DRAINAGE CHANNEL SOUTH OF 8'x2' BOX CULVERT

COUNTY OF SANTA BARBARA

JANUARY 1999 FIGURE 1A

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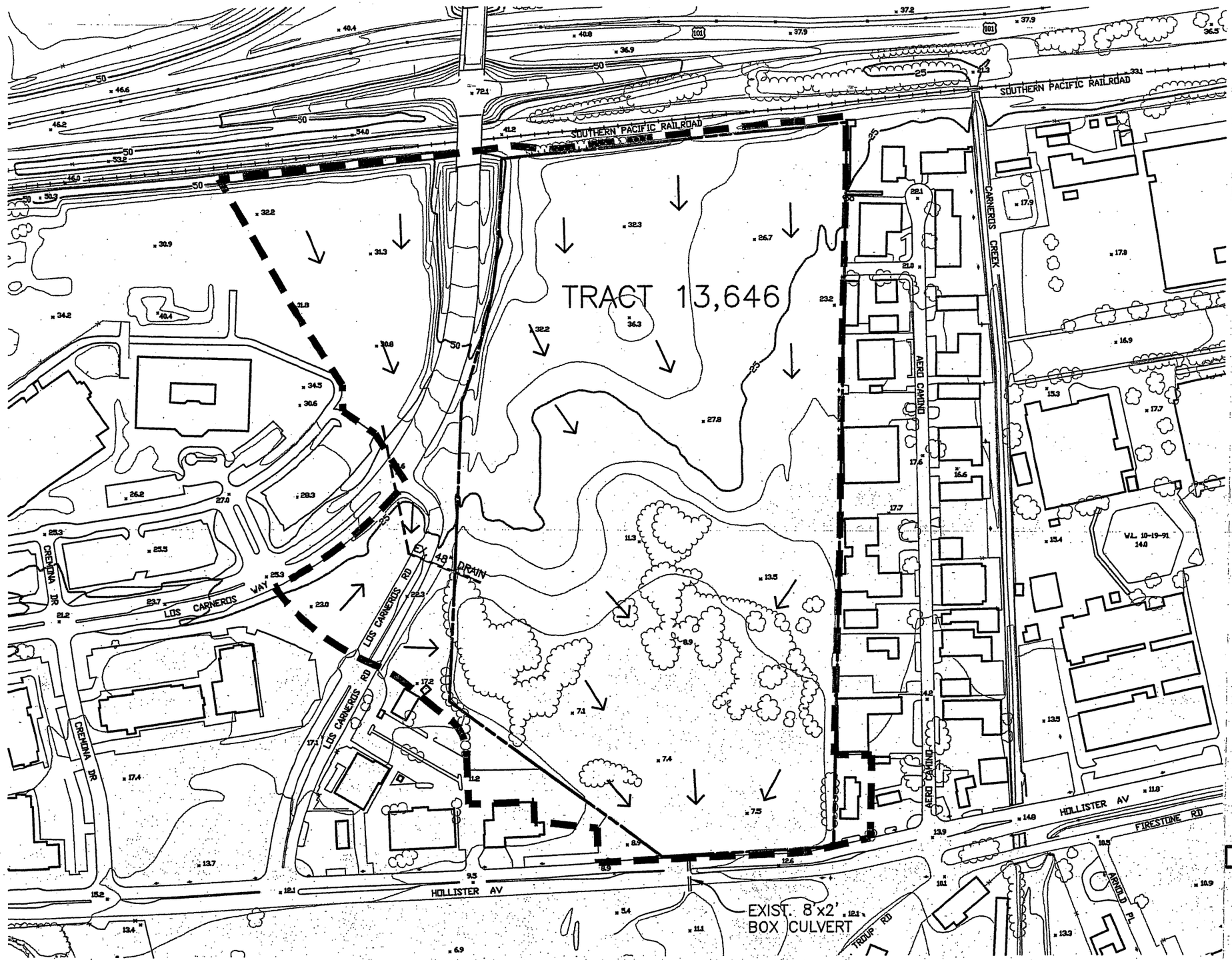
PRE-DEVELOPMENT DRAINAGE CONDITIONS

All of the storm water runoff from Tract 13,646 including the Willow Springs development currently drains to the RCB under Hollister Avenue. In addition, approximately 12.0 acres west of the site currently drain to the site through a 48" RCP under Los Carneros Road and Los Carneros Way. Figure 2 is a map delineating the
pre-development drainage conditions and indicates that an area of 62.2 acres drains to the RCB. The following copy of the Santa Barbara County Flood Control Urban Hydrograph (SBCUH) computer printout shows the 10, 25, 50 and 100 year runoff to the RCB. The time of concentration was determined to be 30 minutes (See Preliminary Hydraulic Report dated September 9,1 998) and 10% of the total area was considered impervious. These factors are indicative of the undeveloped nature of the tributary area.



SCALE IN FEET

0 300 600

N

TRIBUTARY AREA
= 62.2 ACRES

PRE-DEVELOPMENT DRAINAGE CONDITIONS

FOR

WILLOW SPRINGS

COUNTY OF SANTA BARBARA

JANUARY 1999 FIGURE 2

MAC Design Associates

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C:\DWG\0032\0032DRN2.DWG

PRE-DEVELOPMENT DRAINAGE

SANTA BARBARA COUNTY FC&WCD URBAN HYDROGRAPH, Version 1.2.1
12-29-1998
Licensed to MAC Design Associates

COMPUTATION of a Runoff Hydrograph

Hyd Num	Return Period	Drainage Area	--24 hr Rain-- 100yr	Used	Imper-vious	Loss in/hr	T(c) min	Runoff Depth	Vol ac-ft	Peak Flow	Unit q
1	100yrs	62.2ac	8.20in	8.20in	0.10	0.28	30.0	3.84in	19.9	95.3cfs	1.53

SANTA BARBARA COUNTY FC&WCD URBAN HYDROGRAPH, Version 1.2.1
12-29-1998
Licensed to MAC Design Associates

COMPUTATION of a Runoff Hydrograph

Hyd Num	Return Period	Drainage Area	--24 hr Rain-- 100yr	Used	Imper-vious	Loss in/hr	T(c) min	Runoff Depth	Vol ac-ft	Peak Flow	Unit q
2	50yrs	62.2ac	8.20in	7.38in	0.10	0.30	30.0	3.12in	16.2	83.0cfs	1.34

SANTA BARBARA COUNTY FC&WCD URBAN HYDROGRAPH, Version 1.2.1
12-29-1998
Licensed to MAC Design Associates

COMPUTATION of a Runoff Hydrograph

Hyd Num	Return Period	Drainage Area	--24 hr Rain-- 100yr	Used	Imper-vious	Loss in/hr	T(c) min	Runoff Depth	Vol ac-ft	Peak Flow	Unit q
3	25yrs	62.2ac	8.20in	6.56in	0.10	0.32	30.0	2.47in	12.8	70.8cfs	1.14

SANTA BARBARA COUNTY FC&WCD URBAN HYDROGRAPH, Version 1.2.1
12-29-1998
Licensed to MAC Design Associates

COMPUTATION of a Runoff Hydrograph

Hyd Num	Return Period	Drainage Area	--24 hr Rain-- 100yr	Used	Imper-vious	Loss in/hr	T(c) min	Runoff Depth	Vol ac-ft	Peak Flow	Unit q
4	10yrs	62.2ac	8.20in	5.58in	0.10	0.34	30.0	1.74in	9.0	56.3cfs	0.91

POST-DEVELOPMENT DRAINAGE CONDITIONS

The development of Tract 13,646 and Willow Springs will not increase or decrease the tributary area which drains to the RCB, but it will increase the percent of impervious area. Figure 3 is a map delineating the post-development drainage condition and indicates that the pre-development area of 62.2 acres will still drain to Hollister Avenue. The following copy of the SBCUH computer printout shows the 10, 25, 50 and 100 year runoff to the RCB. The time of concentration was again determined to be 30 minutes and 50% of the total area was considered impervious. The 50% impervious figure was estimated by evaluating the open space (wetland area, resource conservation area, etc.) which will remain in perpetuity after development of the entire tributary area.

The following table illustrates the runoff increase due to development.

TABLE 1

Return Period	Pre-Development Runoff, cfs	Post-Development Runoff, cfs	Increase, cfs
100	95.3	102.3	7.0
50	83.0	90.6	7.6
25	70.8	78.8	8.0
10	56.3	64.9	8.6

SCALE IN FEET

0 300 600

N

TRACT 13,646

WILLOW SPRINGS RESIDENTIAL - SEE PRELIMINARY HYDRAULIC REPORT DATED 9-9-98 FOR DRAINAGE DETAILS IN THIS AREA

SOUTHERN PACIFIC RAILROAD

CARNEROS CREEK

AERO CAMINO

LOS CARNEROS RD

LOS CARNEROS WAY

CREMONA DR

HOLLISTER AV

FIRESTONE RD

TROUP RD

ARNOLD PL

EX. 48" DRAIN

EXIST. 8'x2' BOX CULVERT

V.L. 10-19-91

TRIBUTARY AREA
= 62.2 ACRES

POST-DEVELOPMENT DRAINAGE CONDITIONS

FOR

WILLOW SPRINGS

COUNTY OF SANTA BARBARA

JANUARY 1999 FIGURE 3

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POST-DEVELOPMENT DRAINAGE

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COMPUTATION of a Runoff Hydrograph

Hyd Num	Return Period	Drainage Area	--24 hr Rain-- 100yr	Used	Imper-vious	Loss in/hr	T(c) min	Runoff Depth	Vol ac-ft	Peak Flow	Unit q
5	100yrs	62.2ac	8.20in	8.20in	0.50	0.28	30.0	5.78in	30.0	102.3cfs	1.64

SANTA BARBARA COUNTY FC&WCD URBAN HYDROGRAPH, Version 1.2.1
12-29-1998
Licensed to MAC Design Associates

COMPUTATION of a Runoff Hydrograph

Hyd Num	Return Period	Drainage Area	--24 hr Rain-- 100yr	Used	Imper-vious	Loss in/hr	T(c) min	Runoff Depth	Vol ac-ft	Peak Flow	Unit q
6	50yrs	62.2ac	8.20in	7.38in	0.50	0.30	30.0	5.01in	26.0	90.6cfs	1.46

SANTA BARBARA COUNTY FC&WCD URBAN HYDROGRAPH, Version 1.2.1
12-29-1998
Licensed to MAC Design Associates

COMPUTATION of a Runoff Hydrograph

Hyd Num	Return Period	Drainage Area	--24 hr Rain-- 100yr	Used	Imper-vious	Loss in/hr	T(c) min	Runoff Depth	Vol ac-ft	Peak Flow	Unit q
7	25yrs	62.2ac	8.20in	6.56in	0.50	0.32	30.0	4.29in	22.2	78.8cfs	1.27

SANTA BARBARA COUNTY FC&WCD URBAN HYDROGRAPH, Version 1.2.1
12-29-1998
Licensed to MAC Design Associates

COMPUTATION of a Runoff Hydrograph

Hyd Num	Return Period	Drainage Area	--24 hr Rain-- 100yr	Used	Imper-vious	Loss in/hr	T(c) min	Runoff Depth	Vol ac-ft	Peak Flow	Unit q
8	10yrs	62.2ac	8.20in	5.58in	0.50	0.34	30.0	3.45in	17.9	64.9cfs	1.04

APPROVED PROJECT DRAINAGE CONDITIONS

The approved project consisted of a 235 unit residential development and construction of the following roads:

1. Calle Koral (formerly Road "A" and Via Las Flores) from Hollister Avenue to Los Carneros Road.

2. Camino Vista from the easterly tract boundary to the westerly tract boundary.

3. Via Maya, Via Luisa and Via Lilia to serve the parcels created as Tract 13,464.

The approved project would drain the same tributary area to the RCB but would increase the impervious surface due to the construction of Calle Koral from Hollister Avenue to Camino Vista. The following copy of the SBCUH computer printout shows the 10, 25, 50 and 100 year runoff to the RCB. The time of concentration was determined to be 30 minutes and 55% of the total area was considered impervious. Please note that the major difference between the post-development project and the approved project is the elimination of Calle Koral from Hollister Avenue to Camino Vista for the post-development project.

The following table illustrates the runoff relative to pre-development, post-development and approved project conditions.

TABLE 2

Return Period	Pre-Development Runoff, cfs	Post-Development Runoff, cfs	Approved Project, Runoff, cfs
100	95.3	102.3	103.2
50	83.0	90.6	91.5
25	70.8	78.8	79.8
10	56.3	64.9	65.9

This table clearly indicates that the approved project will generate more peak flows from the 100, 50, 25 and 10 year rainfall events than the post-development project.

APPROVED PROJECT DRAINAGE

SANTA BARBARA COUNTY FC&WCD URBAN HYDROGRAPH, Version 1.2.1
01-12-1999
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COMPUTATION of a Runoff Hydrograph

Hyd Num	Return Period	Drainage Area	--24 hr Rain-- 100yr	Used	Imper-vious	Loss in/hr	T(c) min	Runoff Depth	Vol ac-ft	Peak Flow	Unit q
1	100yrs	62.2ac	8.20in	8.20in	0.55	0.28	30.0	6.02in	31.2	103.2cfs	1.66

SANTA BARBARA COUNTY FC&WCD URBAN HYDROGRAPH, Version 1.2.1
01-12-1999
Licensed to MAC Design Associates

COMPUTATION of a Runoff Hydrograph

Hyd Num	Return Period	Drainage Area	--24 hr Rain-- 100yr	Used	Imper-vious	Loss in/hr	T(c) min	Runoff Depth	Vol ac-ft	Peak Flow	Unit q
2	50yrs	62.2ac	8.20in	7.38in	0.55	0.30	30.0	5.25in	27.2	91.5cfs	1.47

SANTA BARBARA COUNTY FC&WCD URBAN HYDROGRAPH, Version 1.2.1
01-12-1999
Licensed to MAC Design Associates

COMPUTATION of a Runoff Hydrograph

Hyd Num	Return Period	Drainage Area	--24 hr Rain-- 100yr	Used	Imper-vious	Loss in/hr	T(c) min	Runoff Depth	Vol ac-ft	Peak Flow	Unit q
3	25yrs	62.2ac	8.20in	6.56in	0.55	0.32	30.0	4.52in	23.4	79.8cfs	1.28

SANTA BARBARA COUNTY FC&WCD URBAN HYDROGRAPH, Version 1.2.1
01-12-1999
Licensed to MAC Design Associates

COMPUTATION of a Runoff Hydrograph

Hyd Num	Return Period	Drainage Area	--24 hr Rain-- 100yr	Used	Imper-vious	Loss in/hr	T(c) min	Runoff Depth	Vol ac-ft	Peak Flow	Unit q
4	10yrs	62.2ac	8.20in	5.58in	0.55	0.34	30.0	3.66in	19.0	65.9cfs	1.06

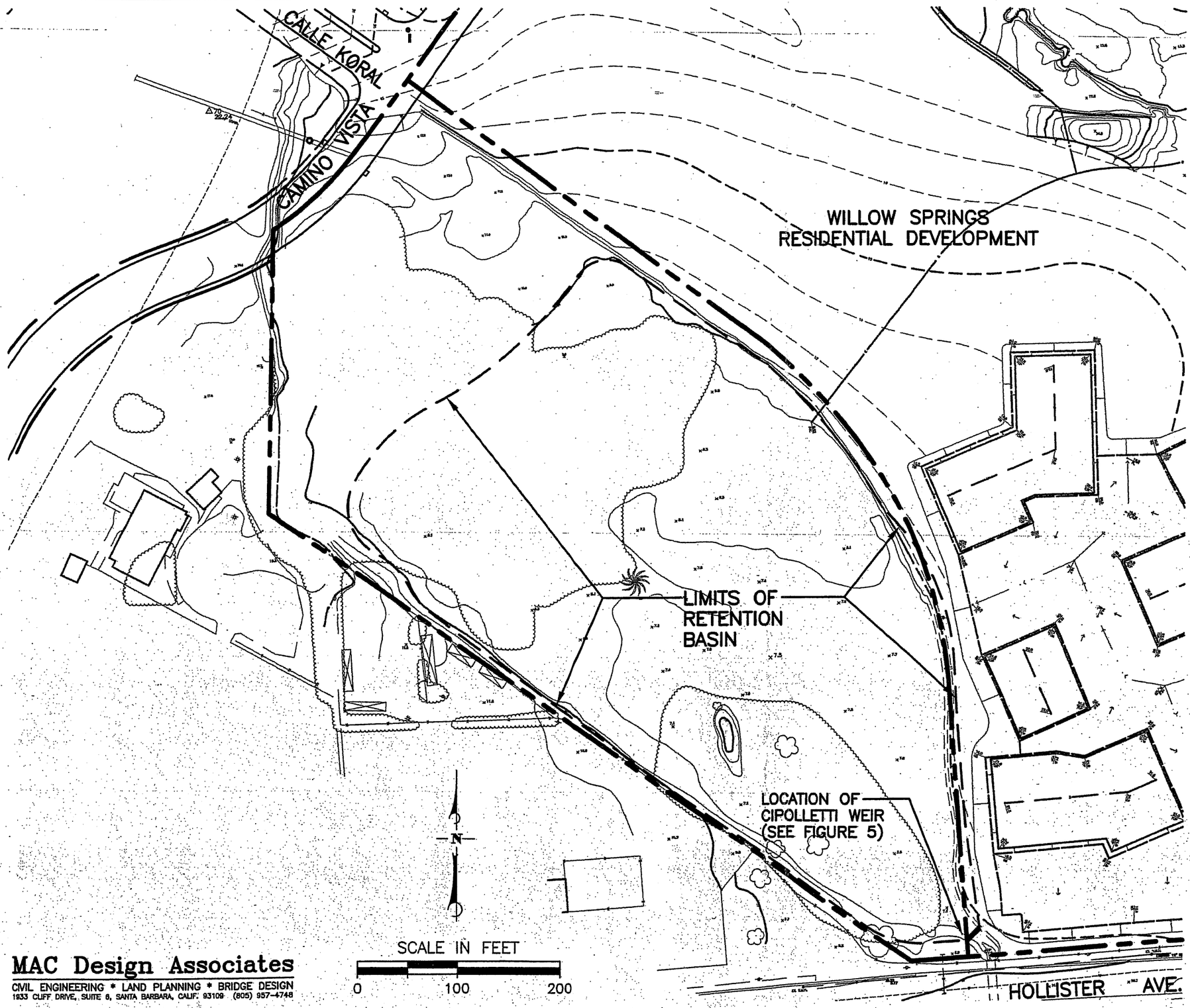
RETENTION BASIN DESIGN

The area available for use on-site as a retention basin is located southwest of the Willow Springs development. This area will be maintained in perpetuity as a wetland in accordance with the Army Corps of Engineers (ACOE) 404 permit. The wetland mitigation plan which was approved by the ACOE recommended that this area be used to retain storm water runoff to improve wetland hydrology.

Figure 4 shows the area available for retention and represents approximately 5.2 acres with a storage volume of approximately 7.6 acre feet.

Outflow from the retention basin will be controlled through use of a Cipolletti (trapezoidal) weir (See Figure 5). Design of the weir is shown on the following calculation sheets.

Post-development hydrographs for the 10, 25, 50 and 100 year rainfall events were routed through a basin using the Santa Barbara County Flood Control Urban Hydrograph computer program and the results are shown on the following sheets. A review of this data indicates that the proposed retention basin contains almost 400% more storage volume than required to detain the 100 year return period runoff event.



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RETENTION BASIN AREA
WILLOW SPRINGS
COUNTY OF SANTA BARBARA

JANUARY 1999 FIGURE 4

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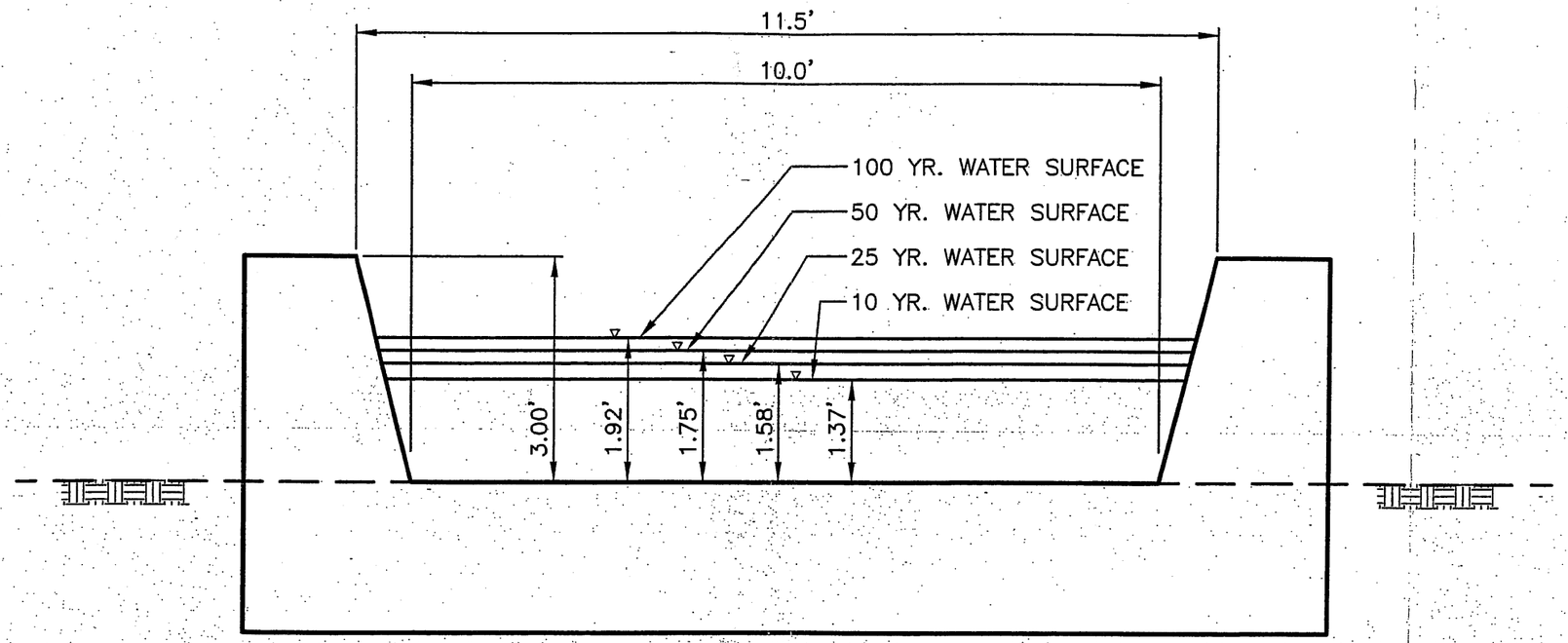

CIPOLLETTI WEIR
WILLOW SPRINGS

COUNTY OF SANTA BARBARA

JANUARY 1999 FIGURE 5

MAC Design Associates
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1933 CLIFF DRIVE, SUITE 6, SANTA BARBARA, CALIF. 93109 (805) 957-4748

WEIR DESIGN

REFERENCES

1. HANDBOOK OF HYDRAULICS, KING & BRATER, FIFTH EDITION
2. CIVIL ENGINEERING HANDBOOK, URQUHART, FOURTH EDITION

TYPE

A TRAPEZOIDAL WEIR WITH 1:4 SIDES IS CALLED A CIPOLLETTI WEIR AND WILL BE USED TO RETAIN STORM WATER RUNOFF FROM THE WILLOW SPRINGS DEVELOPMENT

DISCHARGE Q

$$Q = 3.367 L H^{3/2}$$

(EQ 106, PG 4-53 REF. 2)

Q = DISCHARGE, CFS

L = WEIR LENGTH, FT

H = HEAD, FT

TRY $L = 10'$

$$Q_{e_1} = (3.367)(10)(1)^{3/2}$$

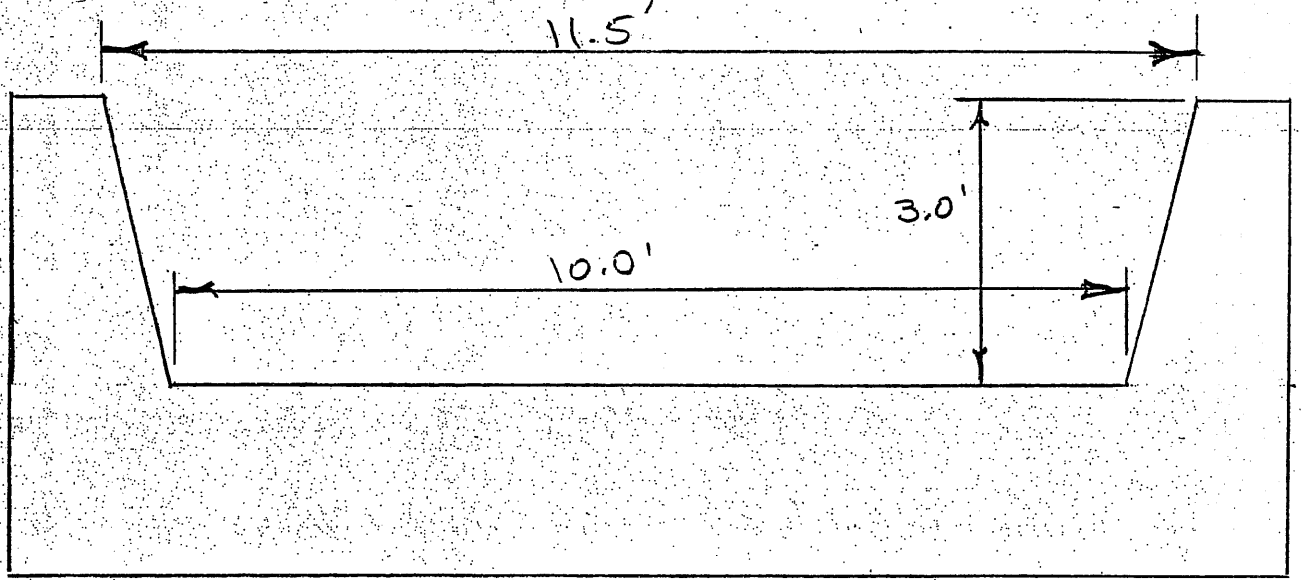
$$Q_{e_1} = 33.70 \text{ CFS}$$

$$Q_{@2'} = (3.367)(10)(2)^{3/2}$$

$$= (33.67)(2.83)$$

$$Q_{@2'} = 95.3 \text{ cfs}$$

AT A HEAD OF 2' THE PROPOSED CIPOLLETTI WEIR WILL PASS THE STORM WATER RUNOFF FROM A PRE-DEVELOPMENT 100 YEAR EVENT (SEE HYDROGRAPH #1 RESULTS)



POST-DEVELOPMENT Q100

SANTA BARBARA COUNTY FC&WCD URBAN HYDROGRAPH, Version 1.2.1
Licensed to MAC Design Associates
ROUTING Hydrograph 5 [Hydgph] thru a Basin, Outflow Hydrograph is 9

Outflow data entered from keyboard

HW Depth (ft)	Total Q (cfs)
0	0.0
1	33.7
2	95.3

Storage data entered from keyboard

Depth (ft)	Storage Volume (cu ft)	(ac-ft)
1	47,189	1.08
2	96,301	2.21

<<< Summary of Results >>>

Max INFLOW = 102 cfs at 14.00 hrs
Max OUTFLOW = 90 cfs at 14.00 hrs
Max STORAGE = 2.12 ac-ft at 14.00 hrs
Max DEPTH = 1.92 ft at 14.00 hrs
Total INFLOW Volume = 29.92 ac-ft
Total OUTFLOW Volume = 29.88 ac-ft
Storage at end of 24 hours = 0.05 ac-ft

Hydrograph # 9 Calced

SANTA BARBARA COUNTY FC&WCD URBAN HYDROGRAPH, Version 1.2.1
12-29-1998
Licensed to MAC Design Associates

COMPUTATION of a Runoff Hydrograph

Hyd Num	Return Period	Drainage Area	--24 hr Rain-- 100yr	Used	Imper- vious	Loss in/hr	T(c) min	Runoff Depth	Vol ac-ft	Peak Flow	Unit q
5	100yrs	62.2ac	8.20in	8.20in	0.50	0.28	30.0	5.78in	30.0	102.3cfs	1.64

POST-DEVELOPMENT Q50

SANTA BARBARA COUNTY FC&WCD URBAN HYDROGRAPH, Version 1.2.1
Licensed to MAC Design Associates
ROUTING Hydrograph 6 [Hydgph] thru a Basin, Outflow Hydrograph is 10

Outflow data entered from keyboard

HW Depth (ft)	Total Q (cfs)
0	0.0
1	33.7
2	95.3

Storage data entered from keyboard

Depth (ft)	Storage Volume (cu ft)	(ac-ft)
1	47,189	1.08
2	96,301	2.21

<<< Summary of Results >>>

Max INFLOW = 91 cfs at 14.00 hrs
Max OUTFLOW = 80 cfs at 14.00 hrs
Max STORAGE = 1.93 ac-ft at 14.00 hrs
Max DEPTH = 1.75 ft at 14.00 hrs
Total INFLOW Volume = 25.95 ac-ft
Total OUTFLOW Volume = 25.91 ac-ft
Storage at end of 24 hours = 0.04 ac-ft

Hydrograph # 10 Calced

SANTA BARBARA COUNTY FC&WCD URBAN HYDROGRAPH, Version 1.2.1
12-29-1998
Licensed to MAC Design Associates

COMPUTATION of a Runoff Hydrograph

Hyd Num	Return Period	Drainage Area	--24 hr Rain-- 100yr	Used	Imper- vious	Loss in/hr	T(c) min	Runoff Depth	Vol ac-ft	Peak Flow	Unit q
6	50yrs	62.2ac	8.20in	7.38in	0.50	0.30	30.0	5.01in	26.0	90.6cfs	1.46

POST-DEVELOPMENT Q25

SANTA BARBARA COUNTY FC&WCD URBAN HYDROGRAPH, Version 1.2.1
Licensed to MAC Design Associates
ROUTING Hydrograph 7 [Hydgph] thru a Basin, Outflow Hydrograph is 11

Outflow data entered from keyboard

HW Depth (ft)	Total Q (cfs)
0	0.0
1	33.7
2	95.3

Storage data entered from keyboard

Depth (ft)	Storage Volume (cu ft)	(ac-ft)
1	47,189	1.08
2	96,301	2.21

<<< Summary of Results >>>

Max INFLOW = 79 cfs at 14.00 hrs
Max OUTFLOW = 69 cfs at 14.00 hrs
Max STORAGE = 1.74 ac-ft at 14.00 hrs
Max DEPTH = 1.58 ft at 14.00 hrs
Total INFLOW Volume = 22.20 ac-ft
Total OUTFLOW Volume = 22.16 ac-ft
Storage at end of 24 hours = 0.04 ac-ft

Hydrograph # 11 Calced

SANTA BARBARA COUNTY FC&WCD URBAN HYDROGRAPH, Version 1.2.1
12-29-1998
Licensed to MAC Design Associates

COMPUTATION of a Runoff Hydrograph

Hyd Num	Return Period	Drainage Area	--24 hr Rain-- 100yr	Used	Imper- vious	Loss in/hr	T(c) min	Runoff Depth	Vol ac-ft	Peak Flow	Unit q
7	25yrs	62.2ac	8.20in	6.56in	0.50	0.32	30.0	4.29in	22.2	78.8cfs	1.27

POST-DEVELOPMENT Q10

```
SANTA BARBARA COUNTY FC&WCD URBAN HYDROGRAPH, Version 1.2.1
Licensed to MAC Design Associates
ROUTING Hydrograph 8   [  Hydgph] thru a Basin, Outflow Hydrograph is 12

Outflow data entered from keyboard
     HW Depth     Total Q
       (ft)        (cfs)
        0           0.0
        1          33.7
        2          95.3


Storage data entered from keyboard
Depth          Storage Volume
 (ft)       (cu ft)       (ac-ft)
    1        47,189          1.08
    2        96,301          2.21


            <<< Summary of Results >>>

          Max INFLOW    =      65 cfs    at 14.00 hrs
          Max OUTFLOW   =      56 cfs    at 14.00 hrs
          Max STORAGE   =    1.50 ac-ft at 14.00 hrs
          Max DEPTH     =    1.37 ft at 14.00 hrs
          Total INFLOW Volume          =   17.84 ac-ft
          Total OUTFLOW Volume         =   17.81 ac-ft
          Storage at end of 24 hours =     0.03 ac-ft

Hydrograph # 12 Calced

SANTA BARBARA COUNTY FC&WCD URBAN HYDROGRAPH, Version 1.2.1
12-29-1998
Licensed to MAC Design Associates

COMPUTATION of a Runoff Hydrograph

Hyd Return Drainage --24 hr Rain-- Imper-  Loss T(c) Runoff    Vol    Peak Unit
Num Period   Area   100yr    Used   vious in/hr  min  Depth   ac-ft   Flow   q

  8  10yrs   62.2ac  8.20in  5.58in  0.50  0.34 30.0  3.45in  17.9  64.9cfs 1.04
```

CONCLUSIONS

Construction of the drainage improvements outlined in this report will result in post-development peak runoff flow rates equal to or less than the expected runoff rates for the same return periods from the pre-development peak runoff rates. The following table is a summary of the peak flow rates for the various runoff events with the retention basin.

TABLE 3

Return Period	Pre-Development Runoff, cfs	Post-Development Runoff, cfs	Difference, cfs
100	95.3	90	-5.3
50	83.0	80	-3.0
25	70.8	69	-1.8
10	56.3	56	0

Based on this information, it appears that the post-development runoff will not exceed pre-development runoff.

APPENDIX A

FINAL DRAINAGE PLAN

TRIBUTARY AREAS

CAMINO VISTA

VIA LUISA

SOUTHERN PACIFIC RAILROAD

HOLLISTER AVENUE

LOS CARNEROS ROAD

CALLE KORAL

C1 9.0 AC.

C2 5.8 AC.

F1 1.0 AC.

F2 0.9 AC.

C10 0.8 AC.

C11 1.0 AC.

B1 2.3 AC.

U 8.9 AC.

U 8.2 AC.

A1 8.4 AC.

A8 3.4 AC.

V SEE SHEET 2

CONST. G.C.P. PER CALTRANS STDS.

CONST. PRECAST CATCH BASIN

CONST. TYPE "A" DROP INLET WITH FILTER

CONST. 30FT. "A" DROP INLET W/FILTER

P.C. CONC. HEADWALL

CONST. WEIR

TYPE "A" D.I.

SCALE IN FEET

0 60 120 180 240

NOTES

1. ALL STORM DRAIN PIPE WILL BE SMOOTH BORE WITH RIBS HIGH DENSITY POLYETHYLENE (HDPE).
2. G.C.P. ARE GRATED CONCRETE PIPES PER CALTRANS STANDARDS.
3. TYPE "A" DROP INLETS (D.I.) CONFORM TO S.B.CO. PUBLIC WORKS STANDARDS.
4. C.B. ARE PRECAST CONCRETE CATCH BASINS.

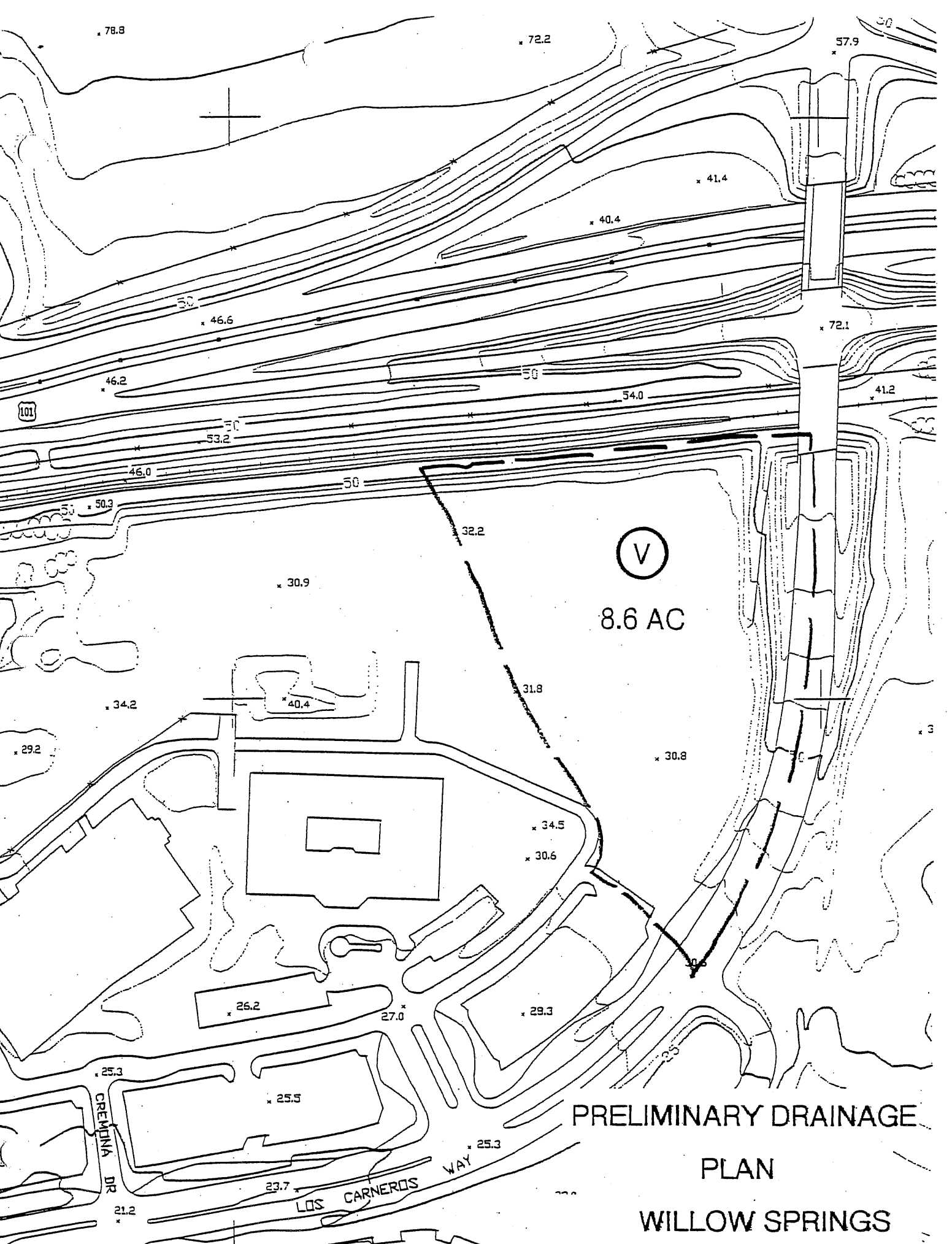
FINAL DRAINAGE PLAN

WILLOW SPRINGS

COUNTY OF SANTA BARBARA
DECEMBER 20, 2001

MAC Design Associates
CIVIL ENGINEERING * LAND PLANNING * BRIDGE DESIGN
1933 CLIFF DRIVE, SUITE 6, SANTA BARBARA, CALIF. 93109 (805) 957-4748

C:\DWG\0032\0032DRN1.DWG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50.3
32.2
V
8.6 AC
30.9
31.8
34.2
40.4
29.2
30.8
34.5
30.6
26.2
27.0
29.3
25.3
25.5
25.3
23.7
21.2
CREMONA DR
LOS CARNEROS WAY
101
PRELIMINARY DRAINAGE
PLAN
WILLOW SPRINGS

PRELIMINARY
STORMWATER CONTROL PLAN
FOR
HERITAGE RIDGE

Prepared for:

The Towbes Group, Inc.
21 East Victoria Street, Suite 200
Santa Barbara, CA 93101
(805) 962-2121

Prepared by:

Dale W. Weber
MAC Design Associates
1933 Cliff Drive, Suite 6
Santa Barbara, CA 93109

W.O. 0343

Date: February 2, 2016

MAC Design Associates

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Attachments

Central Coast Region Stormwater Control Measure Sizing Calculator
Hydrocad Calculations for ADS Stormtech Chambers
Stormwater Control Plan
Preliminary Grading & Drainage Plan

Appendices

I. Project Data

Table 1. Project Data

Project Name/Number	Heritage Ridge
Application Submittal Date	
Project Location	APN: 073-060-031, 032, 033, 034, 035, 036, 037, 038, 039, 040, 041, 042 & 043
Project Phase No.	N/A
Project Type and Description	360 unit residential apartment project consisting of 8 buildings containing the units and 2 recreation buildings. Two of the buildings will be Senior Housing, containing 132 units. The remaining 6 buildings, containing 228 units, will be Work Force Housing.
Total Project Site Area (acres)	16.2 Acres
Total New Impervious Surface Area	303,578 Square Feet
Total Replaced Impervious Surface Area	N/A
Total Pre-Project Impervious Surface Area	0
Total Post-Project Impervious Surface Area	303,578 Square Feet
Net Impervious Area	303,578 Square Feet
Watershed Management Zone(s)	WMZ 1
Design Storm Frequency and Depth	95th Percentile = 2.2 inches
Urban Sustainability Area	N/A

II. Setting

II.A. Project Location and Description

North Willow Springs is the northern portion of Tract 13,646, is located on APN's 073-060-031 through 043, in Goleta, California, and is approximately 16.2 acres. The Tract is located near the intersection of Los Carneros Road and Calle Koral, and is immediately adjacent to the previously approved and developed Willow Springs I & II projects. A vicinity map may is shown on Figure 1.

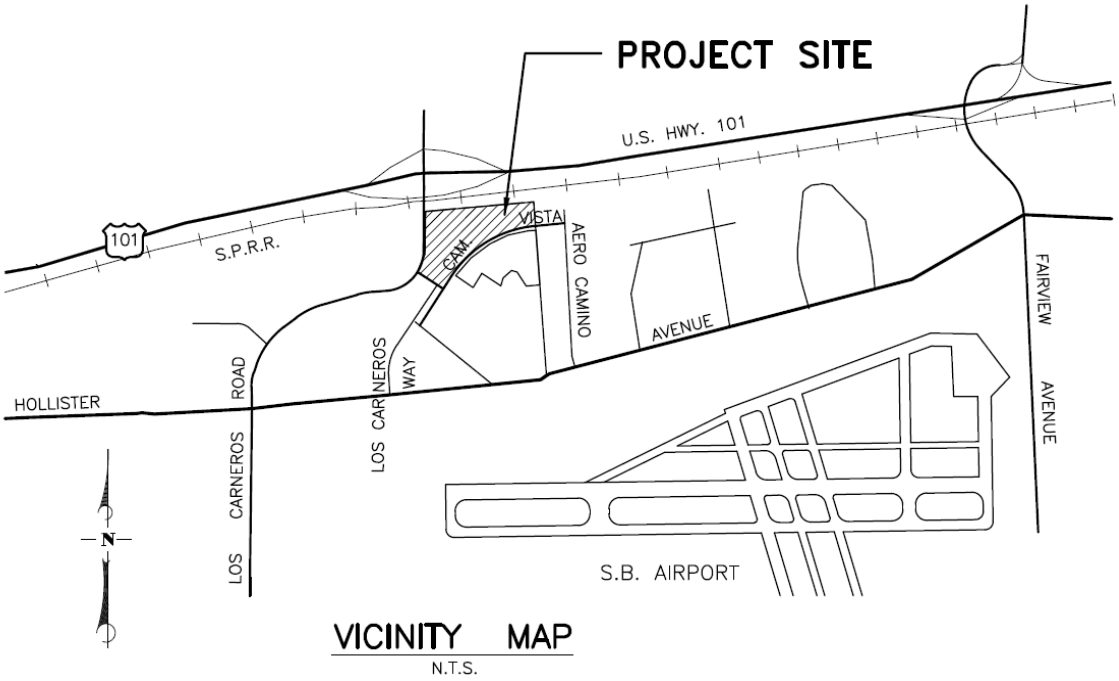


FIGURE 1

II.A.1. Existing Site Features and Conditions

The project site is currently thirteen (13) undeveloped lots adjacent to Willow Springs I and II. Currently there are 2 large soils stockpiles on-site with an unpaved access road. One stockpile is at the west side of the project near Calle Koral and another that runs along the north & east property lines. Currently the highest elevations occur at the top of the westerly stockpile. The center portion of the site is an archaeologically sensitive area and is currently fenced and undisturbed. Once the stockpiles are removed and the site is regraded this center portion of the site will have the highest elevations on the property and will form a ridge that divides the site drainage, with approximately half the site draining in a westerly direction and half the site draining in an easterly direction. Ultimately, all runoff from the property drains through existing storm drains and into a 7.25 acre treatment wetland located on the Willow Springs property. Runoff entering the treatment wetland

will drain across 500 feet (storm drain "A") and 950 feet (storm drain "C") of wetland vegetation before leaving the property at Hollister Avenue. Vegetative cover on the property is highly variable and dependent upon the activity of the stockpile. The hydrologic soils group is mapped as both soil type B and soil type D, as shown on the attached map included in the appendix.

II.A.2. Opportunities and Constraints for Stormwater Control

Opportunities for stormwater control exist along the perimeter of the 2 acre park, at the southeast corner of the project, under parking stall and drive aisles, and in landscaped areas throughout the project.

Constraints occur in the center park area due to higher elevations and underlying soils that are considered archaeologically sensitive. Drive aisle are constrained due to the proposed underground utility lines necessary to serve the project. Landscaped areas adjacent to the buildings are constrained due to seismic/liquefaction and settlement concerns expressed by the project Soils Engineer due to high ground water elevations.

III. Low Impact Development Design Strategies

III.A. Optimization of Site Layout

III.A.1. Limitation of development envelope

The project proposes multi-story buildings which will reduce the over building footprint.

III.A.2. Preservation of natural drainage features

No natural drainage features exist on-site, all drainage is currently sheet flow in nature.

III.A.3. Setbacks from creeks, wetlands, and riparian habitats

This is not applicable to this project site, no creeks, wetlands, or riparian habitats exist on-site.

III.A.4. Minimization of imperviousness

Preservation of the 2-acre park in the center of the project, the use of permeable pavements, and use of multistory buildings will serve to minimize the amount of imperviousness.

III.A.5. Use of drainage as a design element

Bioretention basins, vegetated swales, permeable pavements set on a gravel reservoir, and a subsurface ADS Stormtech Chamber system, will be used as Stormwater Control Measures.

III.B. Use of Permeable Pavements

Uncovered parking stalls throughout the project will be constructed with permeable pavements set on a gravel base. Some walkways and patio area will also be constructed with permeable pavements.

III.C. Dispersal of Runoff to Pervious Areas

Runoff from roof areas will be directed to landscape and pervious areas where possible.

III.D. Stormwater Control Measures

Biorention basins, vegetated swales, permeable pavements set on a gravel reservoir, and a subsurface ADS Stormtech Chamber system, will be used as Stormwater Control Measures.

IV. Documentation of Drainage Design

IV.A. Descriptions of each Drainage Management Area

IV.A.1. Table of Drainage Management Areas

Table 2 – DMA's

DMA Name	Surface Type	Area (Square Feet)
DMA 1A	Roof	2704
DMA 1B	Roof	2241
DMA 1C	Roof	1050
DMA 1D	Roof	1600
DMA 1E	Roof	1888
DMA 1F	Roof	3914
DMA 1G	Roof	5021
DMA 3	Landscape	4,202
DMA 7	Sidewalk	1,315
DMA 9	Landscape	270
DMA 11	Landscape	776
DMA 13	Sidewalk	833
DMA 15	Landscape	735
DMA 17	Landscape	427
DMA 19	Landscape	587
DMA 21	Asphalt	270
DMA 23	Asphalt	1,148
DMA 25	Landscape	605

DMA 27	Sidewalk	531
DMA 29	Landscape	922
DMA 31	Permeable Pavement	2,287
DMA 33	Roof	610
DMA 35	Asphalt	704
DMA 39	Roof	1,291
DMA 41	Landscape	182
DMA 43	Landscape	4,958
DMA 45	Roof	1,485
DMA 47	Permeable Pavement	2,201
DMA 49	Landscape	715
DMA 50	Permeable Pavement	438
DMA 51	Landscape	269
DMA 52	Permeable Pavement	461
DMA 53	Permeable Pavement	782
DMA 54	Sidewalk	918
DMA 55	Landscape	2,781
DMA 56	Sidewalk	221
DMA 57	Landscape	5,664
DMA 59	Roof	7,867
DMA 60	Roof	6,722
DMA 61	Roof	4,992
DMA 62	Roof	5,456
DMA 63	Sidewalk	739
DMA 65	Landscape	1,091
DMA 67	Landscape	1,410
DMA 69	Roof	2,766
DMA 71	Landscape	250
DMA 73	Landscape	838

DMA 74	Sidewalk	1,558
DMA 75	Pavers/Concrete	682
DMA 77	Permeable Pavement	2,076
DMA 79	Pavers/Concrete	226
DMA 80	Permeable Pavement	2,537
DMA 81	Landscape	348
DMA 82	Landscape	589
DMA 83	Permeable Pavement	2,542
DMA 85	Landscape	952
DMA 91	Permeable Pavement	783
DMA 92	Roof	891
DMA 93	Permeable Pavement	914
DMA 94	Roof	891
DMA 95	Permeable Pavement	1,044
DMA 96	Roof	1,188
DMA 97	Landscape	583
DMA 98	Roof	891
DMA 100	Roof	891
DMA 101	Asphalt/Roof	33,159
DMA 102	Roof	891
DMA 103	Landscape	34,606
DMA 104	Roof	1,188
DMA 105	Landscape	13,469
DMA 106	Roof	891
DMA 107	Sidewalk	493
DMA 109	Landscape	8,804
DMA 111	Landscape	8,168
DMA 113	Asphalt	1,078
DMA 115	Permeable Pavement	3,687

DMA 117	Permeable Pavement	596
DMA 119	Permeable Pavement	596
DMA 121	Permeable Pavement	744
DMA 123	Permeable Pavement	1,233
DMA 125	Asphalt/Roof	19,716
DMA 127	Permeable Pavement	1,507
DMA 129	Landscape	334
DMA 131	Permeable Pavement	522
DMA 133	Landscape	983
DMA 135	Landscape	1,300
DMA 137	Landscape	738
DMA 139	Landscape	635
DMA 141	Permeable Pavement	783
DMA 143	Permeable Pavement	783
DMA 145	Landscape	749
DMA 147	Landscape	634
DMA 149	Landscape	2,199
DMA 151	Roof	6,909
DMA 153	Roof	6,909
DMA 155	Permeable Pavement	522
DMA 157	Landscape	1,126
DMA 159	Landscape	589
DMA 161	Landscape	1,169
DMA 163	Roof	5,351
DMA 165	Roof	5,351
DMA 167	Landscape	9,456
DMA 169	Landscape	805
DMA 171	Landscape	392
DMA 173	Permeable Pavement	1,044

DMA 175	Landscape	575
DMA 177	Asphalt/Roof	24,841
DMA 179	Permeable Pavement	1,044
DMA 181	Landscape	1,103
DMA 183	Landscape	580
DMA 185	Landscape	1,394
DMA 187	Landscape	1,078
DMA 189	Landscape	1,128
DMA 191	Permeable Pavement	1,175
DMA 193	Landscape	575
DMA 195	Roof	5,351
DMA 197	Roof	5,351
DMA 199	Landscape	553
DMA 201	Permeable Pavement	1,044
DMA 203	Landscape	904
DMA 205	Landscape	650
DMA 207	Landscape	234
DMA 209	Landscape	390
DMA 211	Permeable Pavement	1,062
DMA 213	Asphalt/Roof	5,936
DMA 215	Landscape	196
DMA 221	Permeable Pavement	1,709
DMA 223	Landscape	893
DMA 225	Landscape	1,627
DMA 227	Permeable Pavement	1,044
DMA 229	Landscape	550
DMA 231	Permeable Pavement	522
DMA 233	Roof	13,953
DMA 235	Landscape	1,198

DMA 237	Landscape	355
DMA 239	Permeable Pavement	1,350
DMA 241	Landscape	1,142
DMA 243	Landscape	3,056
DMA 245	Asphalt/Roof	28,008
DMA 247	Roof	24,468
DMA 249	Landscape	2,721
DMA 251	Landscape	1,738
DMA 253	Landscape	3,331
DMA 255	Permeable Pavement	1,041
DMA 257	Permeable Pavement	653
DMA 258	Landscape	690
DMA 259	Roof	4,751
DMA 261	Landscape	2,666
DMA 263	Permeable Pavement	5,681
DMA 265	Pavers/Concrete	946
DMA 267	Landscape	1,768
DMA 269	Permeable Pavement	522
DMA 271	Permeable Pavement	1,044
DMA 273	Asphalt/Roof	26,042
DMA 275	Permeable Pavement	783
DMA 277	Sidewalk	1,385
DMA 278	Sidewalk	685
DMA 279	Landscape	395
DMA 281	Permeable Pavement	653
DMA 283	Roof	15,050
DMA 285	Landscape	529
DMA 287	Permeable Pavement	1,305
DMA 289	Sidewalk	1,371

DMA 291	Permeable Pavement	522
DMA 295	Landscape	883
DMA 300	Landscape	80,554

IV.A.2. Drainage Management Area Descriptions

DMA area and surface type are described in the previous Table.

IV.B. Tabulation and Sizing Calculations

DMA type and connection are described in the Project Clean Water SCM Sizing Calculator attached below.

V. Source Control Measures

V.A. Site activities and potential sources of pollutants

V.B. Source Control Table

Table 3

Potential source of runoff pollutants	Permanent source control BMPs	Operational source control BMPs
Inlets	Mark inlets with words "No Dumping"	Maintain and periodically replace inlet markings
Landscape Pesticide Use	Integrated Pest Management Plan	
Pools & Spas	Plumb to Sanitary Sewer	
Refuse Areas	Enclosed area with lids and roof structure	Service by local hauler
Sidewalks and Parking Lots		Sweep regularly

V.C. Features, Materials, and Methods of Construction of Source Control BMPs

See Grading & Drainage Plans, and Landscape Plans for details and methods of construction.

VI. Stormwater Facility Maintenance

VI.A. Ownership and Responsibility for Maintenance in Perpetuity

The Owner shall enter into Maintenance Agreement that runs with the land, with the City of Goleta, accepting responsibility for operation and maintenance of the on-site Post Construction Stormwater Facilities shown and referenced in the project plans and reports.

The applicant accepts responsibility for the operation and maintenance of stormwater treatment and flow-control facilities for the life of the project. Any future change or alteration, or the failure to maintain any feature described herein can result in penalties including but not limited to fines, property liens, and other actions for enforcement of a civil judgement.

VI.B. Summary of Maintenance Requirements for Each Stormwater Facility

An Operations and Maintenance Plan (O&M) will prepared and submitted for City of Goleta approval as a part of final project approval. The Owner shall designate the Person(s) responsible for maintenance of Stormwater Control Measures, keeping of inspection records, and correspondence with the City of Goleta. This person will manage all contractors and employees who will work on or maintain the Stormwater Control Measures, and will be the point of contact for problems such as clogged drains, broken irrigation lines, etc.

VII. Construction Checklist

Table 4 – Construction Checklist

Stormwater Control Plan Page #	BMP Description	See Plan Sheet #s
1	Self Treating Landscape Areas	C3
1	Self Retaining Landscape Areas	C3
1	Self Retaining Permeable Pavement Areas	C3
1	Bioretention/Bioswale Areas	C3
1	Stormtech Chambers	C3
1	Storm Drain Inlets	C3

VIII. Certifications

The preliminary design of stormwater treatment facilities and other stormwater pollution control measures in this plan are in accordance with the current edition of the Santa Barbara County Project Clean Water's Stormwater Technical Guide.

CENTRAL COAST REGION
STORMWATER CONTROL MEASURE
SIZING CALCULATOR

Central Coast Region Stormwater Control Measure Sizing Calculator

Version: 2/26/2014

1. Project Information

Project name:	North Willow Springs
Project location:	City of Goleta
Tier 2/Tier 3:	Tier 3 - Retention
Design rainfall depth (in):	2.2
Total project area (ft2):	705,672
Total new impervious area (ft2):	303,578
Total replaced impervious in a USA (ft2):	N/A
Total replaced impervious not in a USA (ft2):	N/A
Total pervious/landscape area (ft2):	402,094

2. DMA Characterization

Name	DMA Type	Area (ft2)	Surface Type	New, Replaced?	Connection
DMA 1A	Drains to Self-Retaining	2704	Roof		DMA 3
DMA 1B	Drains to Self-Retaining	2241	Roof		DMA 3
DMA 1C	Drains to Self-Retaining	1050	Roof		DMA 11
DMA 1D	Drains to Self-Retaining	1600	Roof		DMA 15
DMA 1E	Drains to Self-Retaining	1888	Roof		DMA 29
DMA 3	Self-Retaining	4202			
DMA 7	Drains to SCM	1315	Concrete or asphalt	New	SCM 1
DMA 9	Self-Treating	270			
DMA 11	Self-Retaining	776			
DMA 13	Drains to Self-Retaining	833	Concrete or asphalt		DMA 19
DMA 15	Self-Retaining	735			
DMA 17	Self-Retaining	427			
DMA 19	Self-Retaining	587			
DMA 21	Drains to SCM	270	Concrete or asphalt	New	SCM 1
DMA 23	Drains to Self-Retaining	1148	Concrete or asphalt		DMA 31
DMA 25	Self-Retaining	605			
DMA 27	Drains to Self-Retaining	531	Concrete or asphalt		DMA 25
DMA 29	Self-Retaining	922			
DMA 31	Self-Retaining	2287			
DMA 33	Drains to SCM	610	Roof	New	SCM 4
DMA 35	Drains to Self-Retaining	704	Concrete or asphalt		DMA 31
DMA 39	Drains to SCM	1291	Roof	New	SCM 4
DMA 41	Self-Retaining	182			
DMA 43	Self-Retaining	4958			
DMA 45	Drains to Self-Retaining	1485	Roof		DMA 47
DMA 47	Self-Retaining	2201			
DMA 49	Self-Retaining	715			
DMA 50	Self-Retaining	438			
DMA 51	Self-Retaining	269			
DMA 52	Self-Retaining	461			
DMA 53	Self-Retaining	782			
DMA 54	Drains to Self-Retaining	918	Concrete or asphalt		DMA 53
DMA 55	Self-Retaining	2781			
DMA 56	Drains to Self-Retaining	221	Concrete or asphalt		DMA 52
DMA 57	Self-Retaining	5664			
DMA 59	Drains to SCM	7867	Roof	New	SCM 3
DMA 60	Drains to SCM	6722	Roof	New	SCM 6
DMA 61	Drains to SCM	4992	Roof	New	SCM 8

DMA 62	Drains to Self-Retaining	5456	Roof		DMA 109
DMA 63	Drains to Self-Retaining	739	Concrete or asphalt		DMA 67
DMA 65	Self-Retaining	1091			
DMA 67	Self-Retaining	1410			
DMA 69	Drains to Self-Retaining	2766	Roof		DMA 67
DMA 71	Self-Retaining	250			
DMA 73	Self-Retaining	838			
DMA 74	Drains to Self-Retaining	1558	Concrete or asphalt		DMA 93
DMA 75	Drains to Self-Retaining	682	Concrete or asphalt		DMA 77
DMA 77	Self-Retaining	2076			
DMA 79	Drains to Self-Retaining	226	Concrete or asphalt		DMA 77
DMA 80	Self-Retaining	2537			
DMA 81	Self-Retaining	348			
DMA 82	Self-Retaining	589			
DMA 83	Self-Retaining	2542			
DMA 85	Self-Retaining	952			
DMA 91	Self-Retaining	783			
DMA 92	Drains to SCM	891	Roof	New	SCM 7
DMA 93	Self-Retaining	914			
DMA 94	Drains to SCM	891	Roof	New	SCM 7
DMA 95	Self-Retaining	1044			
DMA 96	Drains to SCM	1188	Roof	New	SCM 7
DMA 97	Self-Retaining	583			
DMA 98	Drains to SCM	891	Roof	New	SCM 7
DMA 100	Drains to SCM	891	Roof	New	SCM 7
DMA 101	Drains to SCM	33159	Concrete or asphalt	New	SCM 5
DMA 102	Drains to SCM	891	Roof	New	SCM 7
DMA 103	Self-Treating	34606			
DMA 104	Drains to SCM	1188	Roof	New	SCM 7
DMA 105	Self-Retaining	13469			
DMA 106	Drains to SCM	891	Roof	New	SCM 7
DMA 107	Drains to Self-Retaining	493	Concrete or asphalt		DMA 97
DMA 109	Self-Retaining	8804			
DMA 111	Self-Retaining	8168			
DMA 113	Drains to Self-Retaining	1078	Concrete or asphalt		DMA 115
DMA 115	Self-Retaining	3687			
DMA 117	Self-Retaining	596			
DMA 119	Self-Retaining	596			
DMA 121	Self-Retaining	744			
DMA 123	Self-Retaining	1233			
DMA 125	Drains to SCM	19716	Concrete or asphalt	New	SCM 5
DMA 127	Self-Retaining	1507			
DMA 129	Self-Retaining	334			
DMA 131	Self-Retaining	522			
DMA 133	Self-Retaining	983			
DMA 135	Self-Retaining	1300			
DMA 137	Self-Retaining	738			
DMA 139	Self-Retaining	635			
DMA 141	Self-Retaining	783			
DMA 143	Self-Retaining	783			
DMA 145	Self-Retaining	749			
DMA 147	Self-Retaining	634			
DMA 149	Self-Retaining	2199			
DMA 151	Drains to SCM	6909	Roof	New	SCM 9
DMA 153	Drains to SCM	6909	Roof	New	SCM 9
DMA 155	Self-Retaining	522			
DMA 157	Self-Retaining	1126			
DMA 159	Self-Retaining	589			
DMA 161	Self-Retaining	1169			

DMA 163	Drains to SCM	5351	Roof	New	SCM 10
DMA 165	Drains to SCM	5351	Roof	New	SCM 10
DMA 167	Self-Treating	9456			
DMA 169	Self-Retaining	805			
DMA 171	Self-Retaining	392			
DMA 173	Self-Retaining	1044			
DMA 175	Self-Retaining	575			
DMA 177	Drains to SCM	24841	Concrete or asphalt	New	SCM 11
DMA 179	Self-Retaining	1044			
DMA 181	Self-Retaining	1103			
DMA 183	Self-Retaining	580			
DMA 185	Self-Retaining	1394			
DMA 187	Self-Retaining	1078			
DMA 189	Self-Retaining	1128			
DMA 191	Self-Retaining	1175			
DMA 193	Self-Retaining	575			
DMA 195	Drains to SCM	5351	Roof	New	SCM 11
DMA 197	Drains to SCM	5351	Roof	New	SCM 11
DMA 199	Self-Retaining	553			
DMA 201	Self-Retaining	1044			
DMA 203	Self-Retaining	904			
DMA 205	Self-Retaining	650			
DMA 207	Self-Retaining	234			
DMA 209	Self-Retaining	390			
DMA 211	Self-Retaining	1062			
DMA 213	Drains to SCM	5936	Concrete or asphalt	New	SCM 11
DMA 215	Self-Retaining	196			
DMA 221	Self-Retaining	1709			
DMA 223	Self-Retaining	893			
DMA 225	Self-Retaining	1627			
DMA 227	Self-Retaining	1044			
DMA 229	Self-Retaining	550			
DMA 231	Self-Retaining	522			
DMA 233	Drains to SCM	13953	Roof	New	SCM 15
DMA 235	Self-Retaining	1198			
DMA 237	Self-Retaining	355			
DMA 239	Self-Retaining	1350			
DMA 241	Self-Retaining	1142			
DMA 243	Self-Retaining	3056			
DMA 245	Drains to SCM	28008	Concrete or asphalt	New	SCM 15
DMA 247	Drains to SCM	24468	Roof	New	SCM 15
DMA 249	Self-Retaining	2721			
DMA 251	Self-Retaining	1738			
DMA 253	Self-Retaining	3331			
DMA 255	Self-Retaining	1041			
DMA 257	Self-Retaining	653			
DMA 258	Self-Retaining	690			
DMA 259	Drains to SCM	4751	Roof	New	SCM 15
DMA 261	Self-Retaining	2666			
DMA 263	Self-Retaining	5681			
DMA 265	Drains to Self-Retaining	946	Concrete or asphalt		DMA 263
DMA 267	Self-Retaining	1768			
DMA 269	Self-Retaining	522			
DMA 271	Self-Retaining	1044			
DMA 273	Drains to SCM	26042	Concrete or asphalt	New	SCM 15
DMA 275	Self-Retaining	783			
DMA 277	Drains to Self-Retaining	1385	Concrete or asphalt		DMA 275
DMA 278	Drains to SCM	685	Concrete or asphalt	New	SCM 15
DMA 279	Self-Retaining	395			

DMA 281	Self-Retaining	653			
DMA 283	Drains to SCM	15050	Roof	New	SCM 13
DMA 285	Self-Retaining	529			
DMA 287	Self-Retaining	1305			
DMA 289	Drains to Self-Retaining	1371	Concrete or asphalt		DMA 287
DMA 291	Self-Retaining	522			
DMA 295	Self-Retaining	883			
DMA 300	Self-Treating	80554			
DMA 1F	Drains to Self-Retaining	3914	Roof		DMA 43
DMA 1G	Drains to Self-Retaining	5021	Roof		DMA 43

DMA Summary Area	
Total project impervious area (ft2):	303578
New impervious area (ft2):	262620
Replaced impervious within a USA (ft2):	0
Replaced impervious not in a USA (ft2):	0
Total pervious/landscape area (ft2):	0

3. SCM Characterization

Name	SCM Type	Safety Factor	SCM Soil Type	Infilt. Rate (in/hr)	Area (ft2)
SCM 1	Bioretention	1	HSG C/D	0.25	1248
SCM 3	Bioretention	1	HSG C/D	0.25	1147
SCM 5	Direct Infiltration	2	HSG C/D	0.25	6739
SCM 7	Bioretention	1	HSG C/D	0.25	2648
SCM 9	Bioretention	1	HSG C/D	0.25	2733
SCM 11	Bioretention	1	HSG C/D	0.25	8248
SCM 13	Bioretention	1	HSG C/D	0.25	4724
SCM 15	Bioretention	1	HSG C/D	0.25	14907
SCM 4	Bioretention	1	HSG C/D	0.25	714
SCM 6	Bioretention	1	HSG C/D	0.25	1004
SCM 8	Bioretention	1	HSG C/D	0.25	517
SCM 10	Bioretention	1	HSG C/D	0.25	6272

4. Run SBUH Model

5. SCM Minimum Sizing Requirements

SCM Name	Min. Required Storage Vol. (ft3)	Depth Below Underdrain (ft)	Drain Time (hours)
SCM 1	144	0.29	0.0
SCM 3	978	2.13	40.9
SCM 5	16356	6.07	48.5
SCM 7	745	0.70	11.4
SCM 9	1556	1.42	27.2
SCM 11	4662	1.41	27.0
SCM 13	1482	0.78	13.3
SCM 15	12012	2.01	38.7
SCM 4	180	0.63	9.5
SCM 6	829	2.07	39.7
SCM 8	809	3.91	62.6
SCM 10	965	0.38	2.9

6. Self-Retaining Area Sizing Checks

Self-Retaining DMA Name	Self-Retaining DMA Area (ft2)	Tributary DMA Name	Tributary DMA Area (ft2)	Tributary / SRA Area Ratio
DMA 3	4202	DMA 1A; DMA 1B	4945	1.18

DMA 11	776	DMA 1C	1050	1.35
DMA 15	735	DMA 1D	1600	2.18
DMA 17	427		0	0.00
DMA 19	587	DMA 13	833	1.42
DMA 25	605	DMA 27	531	0.88
DMA 29	922	DMA 1E	1888	2.05
DMA 31	2287	DMA 23; DMA 35	1852	0.81
DMA 41	182		0	0.00
DMA 43	4958	DMA 1F; DMA 1G	8935	1.80
DMA 47	2201	DMA 45	1485	0.67
DMA 49	715		0	0.00
DMA 50	438		0	0.00
DMA 51	269		0	0.00
DMA 52	461	DMA 56	221	0.48
DMA 53	782	DMA 54	918	1.17
DMA 55	2781		0	0.00
DMA 57	5664		0	0.00
DMA 65	1091		0	0.00
DMA 67	1410	DMA 63; DMA 69	3505	2.49
DMA 71	250		0	0.00
DMA 73	838		0	0.00
DMA 77	2076	DMA 75; DMA 79	908	0.44
DMA 80	2537		0	0.00
DMA 81	348		0	0.00
DMA 82	589		0	0.00
DMA 83	2542		0	0.00
DMA 85	952		0	0.00
DMA 91	783		0	0.00
DMA 93	914	DMA 74	1558	1.70
DMA 95	1044		0	0.00
DMA 97	583	DMA 107	493	0.85
DMA 105	13469		0	0.00
DMA 109	8804	DMA 62	5456	0.62
DMA 111	8168		0	0.00
DMA 115	3687	DMA 113	1078	0.29
DMA 117	596		0	0.00
DMA 119	596		0	0.00
DMA 121	744		0	0.00
DMA 123	1233		0	0.00
DMA 127	1507		0	0.00
DMA 129	334		0	0.00
DMA 131	522		0	0.00
DMA 133	983		0	0.00
DMA 135	1300		0	0.00
DMA 137	738		0	0.00
DMA 139	635		0	0.00
DMA 141	783		0	0.00
DMA 143	783		0	0.00
DMA 145	749		0	0.00
DMA 147	634		0	0.00
DMA 149	2199		0	0.00
DMA 155	522		0	0.00
DMA 157	1126		0	0.00
DMA 159	589		0	0.00
DMA 161	1169		0	0.00
DMA 169	805		0	0.00
DMA 171	392		0	0.00
DMA 173	1044		0	0.00
DMA 175	575		0	0.00

DMA 179	1044		0	0.00
DMA 181	1103		0	0.00
DMA 183	580		0	0.00
DMA 185	1394		0	0.00
DMA 187	1078		0	0.00
DMA 189	1128		0	0.00
DMA 191	1175		0	0.00
DMA 193	575		0	0.00
DMA 199	553		0	0.00
DMA 201	1044		0	0.00
DMA 203	904		0	0.00
DMA 205	650		0	0.00
DMA 207	234		0	0.00
DMA 209	390		0	0.00
DMA 211	1062		0	0.00
DMA 215	196		0	0.00
DMA 221	1709		0	0.00
DMA 223	893		0	0.00
DMA 225	1627		0	0.00
DMA 227	1044		0	0.00
DMA 229	550		0	0.00
DMA 231	522		0	0.00
DMA 235	1198		0	0.00
DMA 237	355		0	0.00
DMA 239	1350		0	0.00
DMA 241	1142		0	0.00
DMA 243	3056		0	0.00
DMA 249	2721		0	0.00
DMA 251	1738		0	0.00
DMA 253	3331		0	0.00
DMA 255	1041		0	0.00
DMA 257	653		0	0.00
DMA 258	690		0	0.00
DMA 261	2666		0	0.00
DMA 263	5681	DMA 265	946	0.17
DMA 267	1768		0	0.00
DMA 269	522		0	0.00
DMA 271	1044		0	0.00
DMA 275	783	DMA 277	1385	1.77
DMA 279	395		0	0.00
DMA 281	653		0	0.00
DMA 285	529		0	0.00
DMA 287	1305	DMA 289	1371	1.05
DMA 291	522		0	0.00
DMA 295	883		0	0.00

HYDROCAD CALCULATIONS
FOR
ADS STORMTECH CHAMBERS

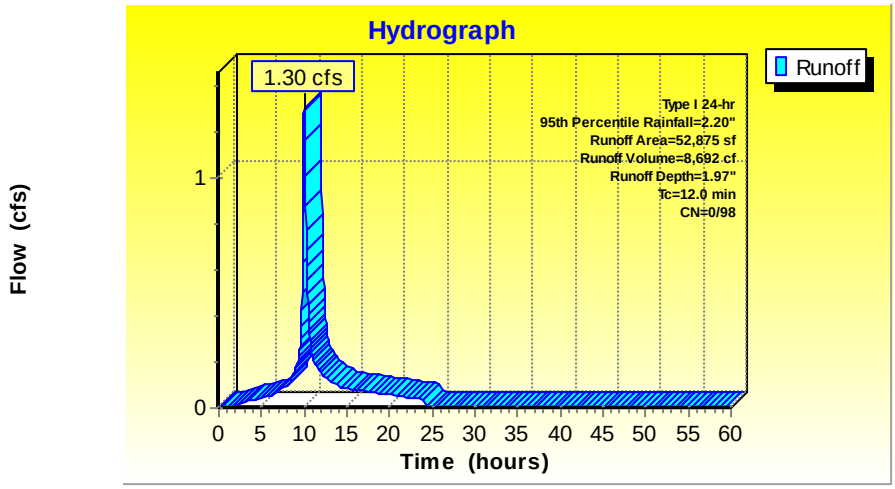
Summary for Subcatchment 22S: Area A (Post-Development)

Runoff = 1.30 cfs @ 9.98 hrs, Volume= 8,692 cf, Depth= 1.97"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type I 24-hr 95th Percentile Rainfall=2.20"

Area (sf)	CN	Description
52,875	98	Paved parking, HSG D
52,875		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0					**Direct Entry,**



Events for Subcatchment 22S: Area A (Post-Development)

Event	Runoff (cfs)	Volume (cubic-feet)	Depth (inches)
1inch-24hr	0.54	3,485	0.79
2year	1.92	13,075	2.97
5year	2.80	19,272	4.37
10year	3.38	23,408	5.31
25year	4.09	28,514	6.47
50year	4.62	32,256	7.32
95th Percentile	1.30	8,692	1.97
100year	**5.12**	**35,867**	**8.14**

Summary for Pond 8P: StormTech Basin

Inflow Area = 52,875 sf,100.00% Impervious, Inflow Depth = 1.97" for 95th Percentile event
Inflow = 1.30 cfs @ 9.98 hrs, Volume= 8,692 cf
Outflow = 0.04 cfs @ 5.45 hrs, Volume= 7,822 cf, Atten= 97%, Lag= 0.0 min
Discarded = 0.04 cfs @ 5.45 hrs, Volume= 7,822 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Peak Elev= 1.56' @ 23.52 hrs Surf.Area= 0.153 ac Storage= 0.134 af

Plug-Flow detention time= 1,249.7 min calculated for 7,822 cf (90% of inflow)
Center-of-Mass det. time= 1,186.6 min (1,908.6 - 722.0)

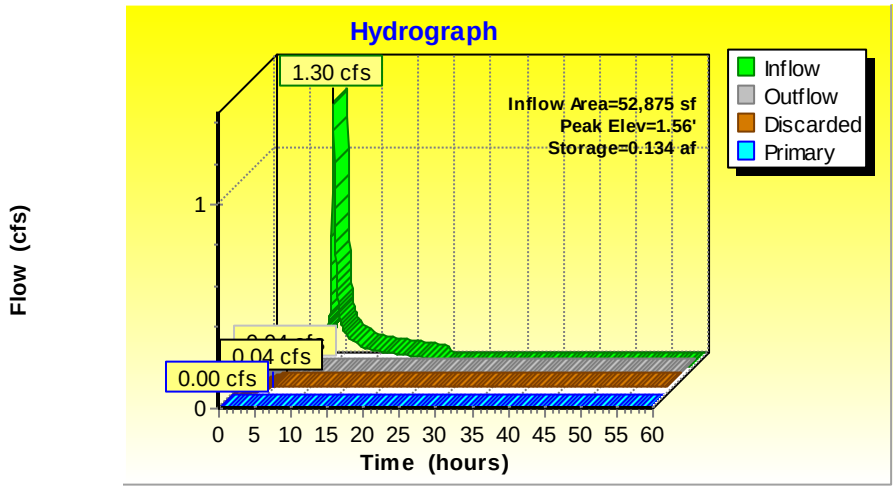
Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	0.229 af	**22.75'W x 292.57'L x 5.75'H Field A**
			0.879 af Overall - 0.305 af Embedded = 0.574 af x 40.0% Voids
#2A	1.00'	0.305 af	**ADS_StormTech MC-3500 c +Cap** x 120 Inside #1
			Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf
			Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
			3 Rows of 40 Chambers
			Cap Storage= +15.6 cf x 2 x 3 rows = 93.6 cf
		0.534 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	3.25'	**18.0" Vert. Orifice/Grate** C= 0.600
#2	Discarded	0.00'	**0.250 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.04 cfs @ 5.45 hrs HW=0.06' (Free Discharge)
2=Exfiltration (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=0.00' (Free Discharge)
1=Orifice/Grate (Controls 0.00 cfs)



Events for Pond 8P: StormTech Basin

Event	Inflow (cfs)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)	Elevation (feet)	Storage (acre-feet)
1inch-24hr	0.54	0.04	**0.04**	0.00	0.57	0.035
2year	1.92	0.04	0.04	0.00	2.33	0.231
5year	2.80	0.10	0.04	0.06	3.36	0.350
10year	3.38	0.21	0.04	0.17	3.43	0.358
25year	4.09	0.46	0.04	0.42	3.53	0.369
50year	4.62	0.78	0.04	0.74	3.63	0.379
95th Percentile	1.30	0.04	0.04	0.00	1.56	0.134
100year	**5.12**	**1.33**	0.04	**1.29**	**3.76**	**0.393**

HYDROLOGIC SOIL GROUP


Hydrologic Soil Group—Santa Barbara County, California, South Coastal Part
(North Willow Springs)
119° 51' 22" W
119° 50' 47" W
34° 26' 16" N
34° 25' 57" N
237590
237680
237770
237860
237950
238040
238130
238220
238310
238400
3814380
3814290
3814200
3814110
3814020
3813930
3813840
101
Us Hwy 101
DaC
MeE2
GcA
MeC
Via Luisa
MeC
XA
Los Carneros
Via Maya
AC
Driveway
Camino Vis
N Los Carneros Rd
Ca
Map Scale: 1:4,120 if printed on A landscape (11" x 8.5") sheet.
N
Meters
0 50 100 200 300
Feet
0 200 400 800 1200
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84
USDA
Natural Resources
Conservation Service
Web Soil Survey
National Cooperative Soil Survey
12/22/2013
Page 1 of 4

Hydrologic Soil Group—Santa Barbara County, California, South Coastal Part
(North Willow Springs)

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Santa Barbara County, California, South Coastal Part
Survey Area Data: Version 5, Jan 3, 2008

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 28, 2013—Sep 14, 2013

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Santa Barbara County, California, South Coastal Part (CA673)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
AC	AQUENTS, FILL AREAS	C	8.1	9.7%
Ca	CAMARILLO FINE SANDY LOAM	C	2.7	3.2%
DaC	DIABLO CLAY, 2 TO 9 PERCENT SLOPES	D	0.1	0.2%
GcA	GOLETA FINE SANDY LOAM, 0 TO 2 PERCENT SLOPES	B	18.4	22.0%
MeC	MILPITAS-POSITAS FINE SANDY LOAMS, 2 TO 9 PERCENT SLOPES	D	32.5	38.7%
MeE2	MILPITAS-POSITAS FINE SANDY LOAMS, 15 TO 30 PERCENT SLOPES, ERODED	D	0.3	0.3%
XA	XERORTHENTS, CUT AND FILL AREAS		21.7	25.9%
Totals for Area of Interest			**83.8**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher

STORMWATER CONTROL PLAN

&

PRELIMINARY GRADING & DRAINAGE PLAN

LEGEND

- PERMEABLE PAVEMENT
- BIORETENTION AREA
- CARPORT

REGISTERED PROFESSIONAL ENGINEER
DALE W. WEBER
No. 53753
EXPIRES 06-30-15
CIVIL
STATE OF CALIFORNIA

DATE SIGNED _____

NO.	DATE	REVISION	APPD.

MAC Design Associates
CIVIL ENGINEERING • LAND PLANNING • BRIDGE DESIGN
1933 CLIFF DRIVE, SUITE 6, SANTA BARBARA, CALIF. 93109 (805) 957-4748

DESIGN DWW CHECKED MAC
DRAWN TLA
DALE W. WEBER DATE: 7-27-14
PROJECT ENGINEER
R.C.E. 53753 (EXP. 6-30-15)

CITY OF GOLETA, CALIFORNIA
REVIEWED BY:
_____ DATE _____
FOR

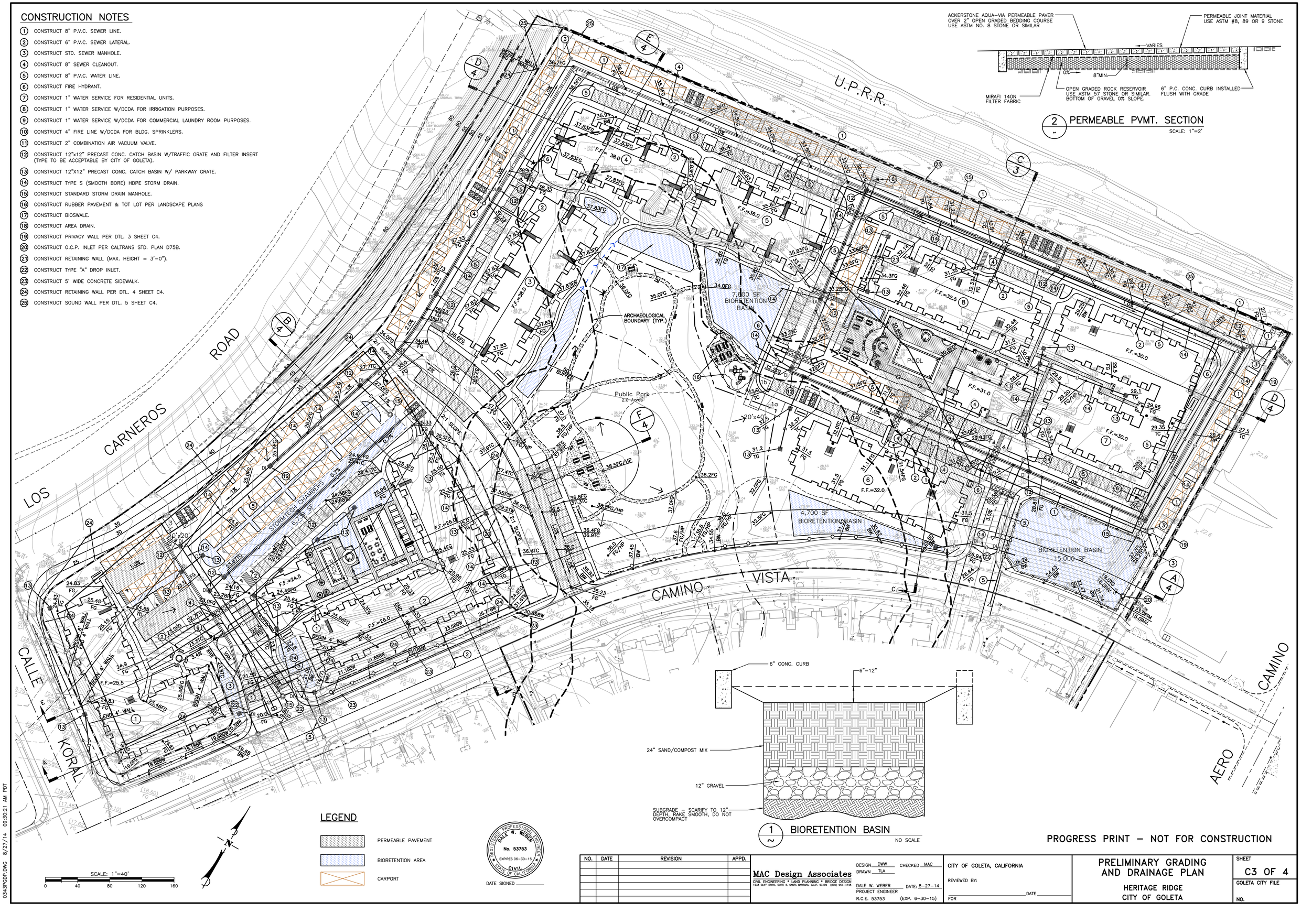
PRELIMINARY STORMWATER CONTROL PLAN

HERITAGE RIDGE
CITY OF GOLETA

SHEET 1 OF 1
GOLETA CITY FILE NO.

CONSTRUCTION NOTES

1. CONSTRUCT 8" P.V.C. SEWER LINE.
2. CONSTRUCT 6" P.V.C. SEWER LATERAL.
3. CONSTRUCT STD. SEWER MANHOLE.
4. CONSTRUCT 8" SEWER CLEANOUT.
5. CONSTRUCT 8" P.V.C. WATER LINE.
6. CONSTRUCT FIRE HYDRANT.
7. CONSTRUCT 1" WATER SERVICE FOR RESIDENTIAL UNITS.
8. CONSTRUCT 1" WATER SERVICE W/DCDA FOR IRRIGATION PURPOSES.
9. CONSTRUCT 1" WATER SERVICE W/DCDA FOR COMMERCIAL LAUNDRY ROOM PURPOSES.
10. CONSTRUCT 4" FIRE LINE W/DCDA FOR BLDG. SPRINKLERS.
11. CONSTRUCT 2" COMBINATION AIR VACUUM VALVE.
12. CONSTRUCT 12"x12" PRECAST CONC. CATCH BASIN W/TRAFFIC GRATE AND FILTER INSERT (TYPE TO BE ACCEPTABLE BY CITY OF GOLETA).
13. CONSTRUCT 12"X12" PRECAST CONC. CATCH BASIN W/ PARKWAY GRATE.
14. CONSTRUCT TYPE S (SMOOTH BORE) HDPE STORM DRAIN.
15. CONSTRUCT STANDARD STORM DRAIN MANHOLE.
16. CONSTRUCT RUBBER PAVEMENT & TOT LOT PER LANDSCAPE PLANS
17. CONSTRUCT BIOSWALE.
18. CONSTRUCT AREA DRAIN.
19. CONSTRUCT PRIVACY WALL PER DTL. 3 SHEET C4.
20. CONSTRUCT O.C.P. INLET PER CALTRANS STD. PLAN D75B.
21. CONSTRUCT RETAINING WALL (MAX. HEIGHT = 3'-0").
22. CONSTRUCT TYPE "A" DROP INLET.
23. CONSTRUCT 5' WIDE CONCRETE SIDEWALK.
24. CONSTRUCT RETAINING WALL PER DTL. 4 SHEET C4.
25. CONSTRUCT SOUND WALL PER DTL. 5 SHEET C4.



2 PERMEABLE PVMT. SECTION
SCALE: 1"=2'

1 BIORETENTION BASIN
NO SCALE

LEGEND

- PERMEABLE PAVEMENT
- BIORETENTION AREA
- CARPORT

REGISTERED PROFESSIONAL ENGINEER DALE W. WEBER No. 53753 EXPIRES 06-30-15 CIVIL STATE OF CALIFORNIA

DATE SIGNED _____

PROGRESS PRINT - NOT FOR CONSTRUCTION

NO.	DATE	REVISION	APPD.

MAC Design Associates
CIVIL ENGINEERING • LAND PLANNING • BRIDGE DESIGN
1533 CLIFF DRIVE, SUITE 6, SANTA BARBARA, CALIF. 93109 (805) 957-4748

DESIGN DWW CHECKED MAC
DRAWN TLA
DALE W. WEBER DATE: 8-27-14
PROJECT ENGINEER
R.C.E. 53753 (EXP. 6-30-15)

CITY OF GOLETA, CALIFORNIA
REVIEWED BY:
_____ DATE _____
FOR

PRELIMINARY GRADING AND DRAINAGE PLAN
HERITAGE RIDGE
CITY OF GOLETA

SHEET C3 OF 4
GOLETA CITY FILE NO.

034.3PGDP.DWG 8/27/14 09:30:21 AM PDT