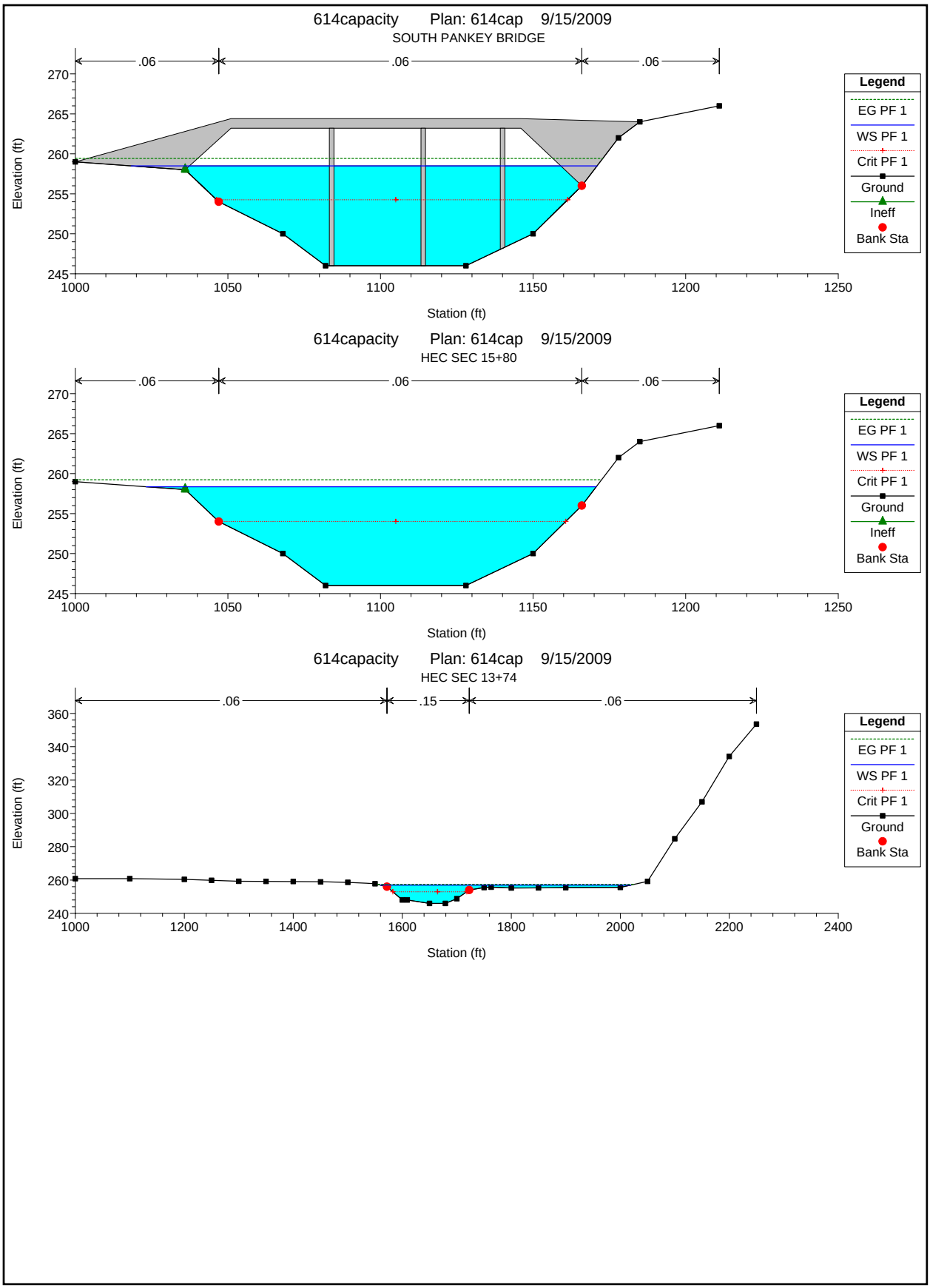
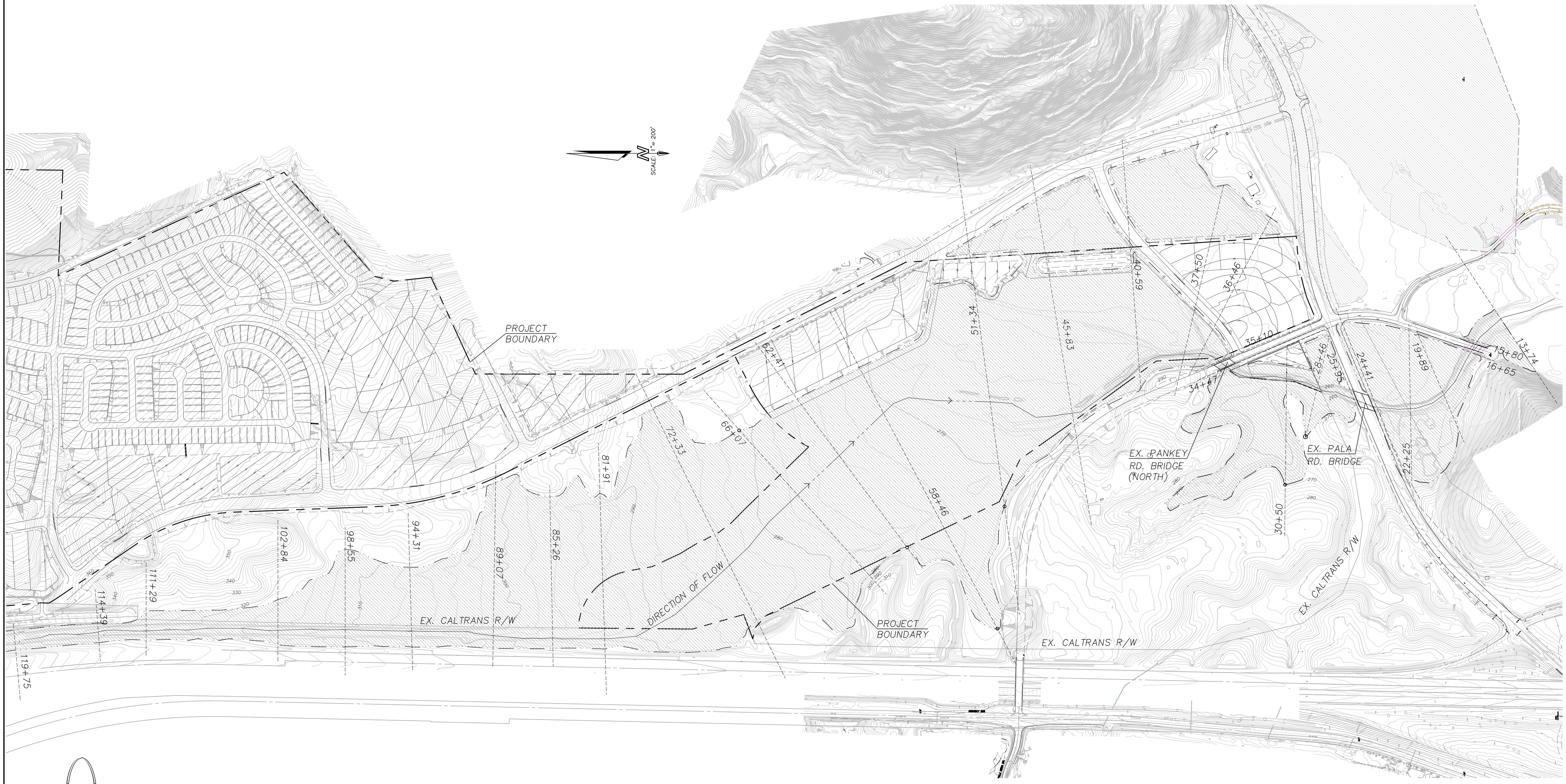

614capacity Plan: 614cap 9/15/2009
SOUTH PANKEY BRIDGE
.06
.06
.06
Elevation (ft)
270
265
260
255
250
245
1000
1050
1100
1150
1200
1250
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
614capacity Plan: 614cap 9/15/2009
HEC SEC 15+80
.06
.06
.06
Elevation (ft)
270
265
260
255
250
245
1000
1050
1100
1150
1200
1250
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
614capacity Plan: 614cap 9/15/2009
HEC SEC 13+74
.06
.15
.06
Elevation (ft)
360
340
320
300
280
260
240
1000
1200
1400
1600
1800
2000
2200
2400
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta

CAMPUS PARK
HECRAS SECTIONS & FLOOD LIMITS
POST-DEVELOPMENT CAPACITY CONDITIONS



SECTION 9D:
EXISTING CULVERT/BRIDGE HYDRAULIC CALCS

The existing 5’x8’ culvert’s flow line elevations as well as the internal bridge cross sections of the Pankey Road (north and south) are obtain from recent field survey shots on the NGVD 29 vertical datum. Also, as-built plans were obtained from Caltrans for reference as well.

Plan: 614capacity HRC 1 RS: 3476 Profile: PF 1

E.G. US. (ft)	273.21	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	272.50	E.G. Elev (ft)	273.13	272.88
Q Total (cfs)	8800.00	W.S. Elev (ft)	272.21	271.66
Q Bridge (cfs)	8800.00	Crit W.S. (ft)	267.25	266.11
Q Weir (cfs)		Max Chl Dpth (ft)	16.81	16.36
Weir Sta Lft (ft)		Vel Total (ft/s)	7.42	7.60
Weir Sta Rgt (ft)		Flow Area (sq ft)	1186.32	1157.36
Weir Submerg		Froude # Chl	0.32	0.33
Weir Max Depth (ft)		Specif Force (cu ft)	9511.39	9539.94
Min El Weir Flow (ft)	273.41	Hydr Depth (ft)	11.86	11.20
Min El Prs (ft)	273.50	W.P. Total (ft)	192.37	185.15
Delta EG (ft)	0.71	Conv. Total (cfs)	201387.1	119079.7
Delta WS (ft)	0.94	Top Width (ft)	100.01	103.35
BR Open Area (sq ft)	1313.45	Frctn Loss (ft)	0.15	0.25
BR Open Vel (ft/s)	7.60	C & E Loss (ft)	0.09	0.14
Coef of Q		Shear Total (lb/sq ft)	0.74	2.13
Br Sel Method	Energy only	Power Total (lb/ft s)	5.45	16.20

Plan: 614capacity HRC 1 RS: 2525 Profile: PF 1

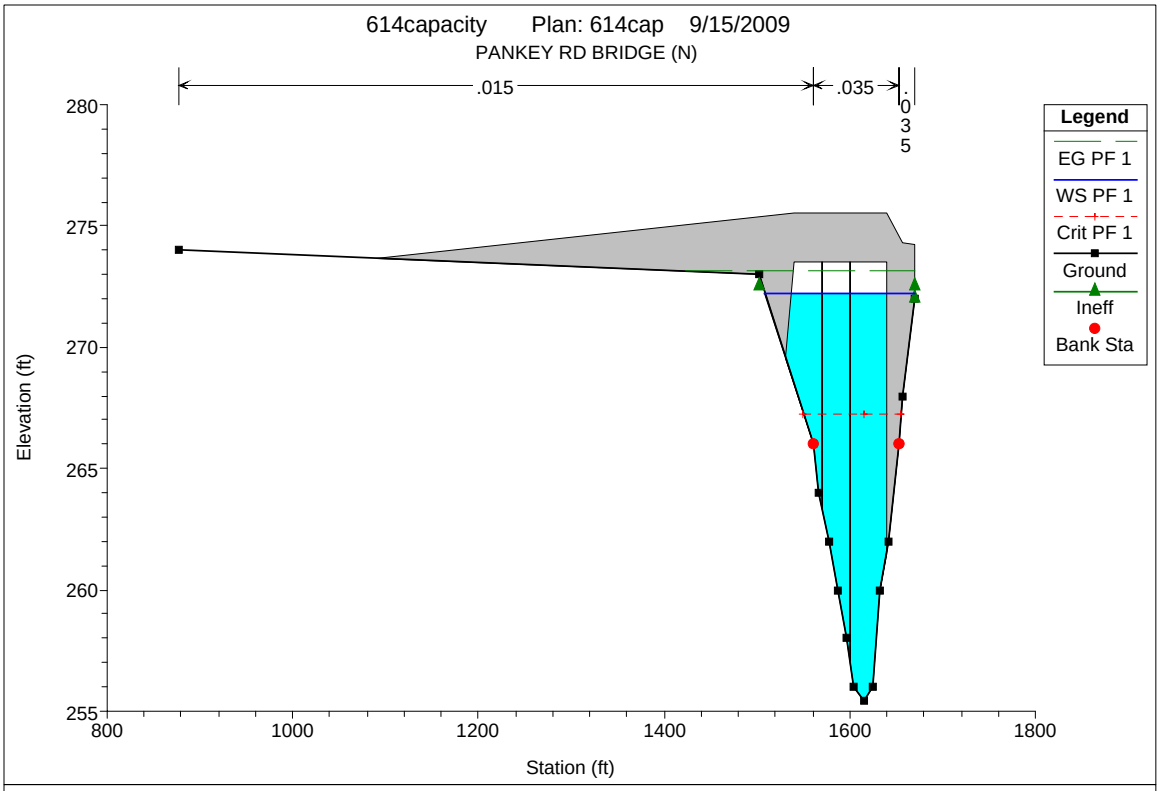
E.G. US. (ft)	266.80	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	265.91	E.G. Elev (ft)	266.68	266.08
Q Total (cfs)	8800.00	W.S. Elev (ft)	265.70	265.16
Q Bridge (cfs)	8800.00	Crit W.S. (ft)	260.98	260.22
Q Weir (cfs)		Max Chl Dpth (ft)	14.30	15.86
Weir Sta Lft (ft)		Vel Total (ft/s)	7.97	7.11
Weir Sta Rgt (ft)		Flow Area (sq ft)	1103.82	1238.53
Weir Submerg		Froude # Chl	0.46	0.31
Weir Max Depth (ft)		Specif Force (cu ft)	8489.47	8804.53
Min El Weir Flow (ft)	266.01	Hydr Depth (ft)	9.34	8.53
Min El Prs (ft)	267.00	W.P. Total (ft)	166.84	268.02
Delta EG (ft)	1.24	Conv. Total (cfs)	96340.7	109723.4
Delta WS (ft)	0.60	Top Width (ft)	118.22	145.14
BR Open Area (sq ft)	1252.04	Frctn Loss (ft)	0.57	0.19
BR Open Vel (ft/s)	7.97	C & E Loss (ft)	0.04	0.33
Coef of Q		Shear Total (lb/sq ft)	3.45	1.86
Br Sel Method	Energy only	Power Total (lb/ft s)	27.47	13.18

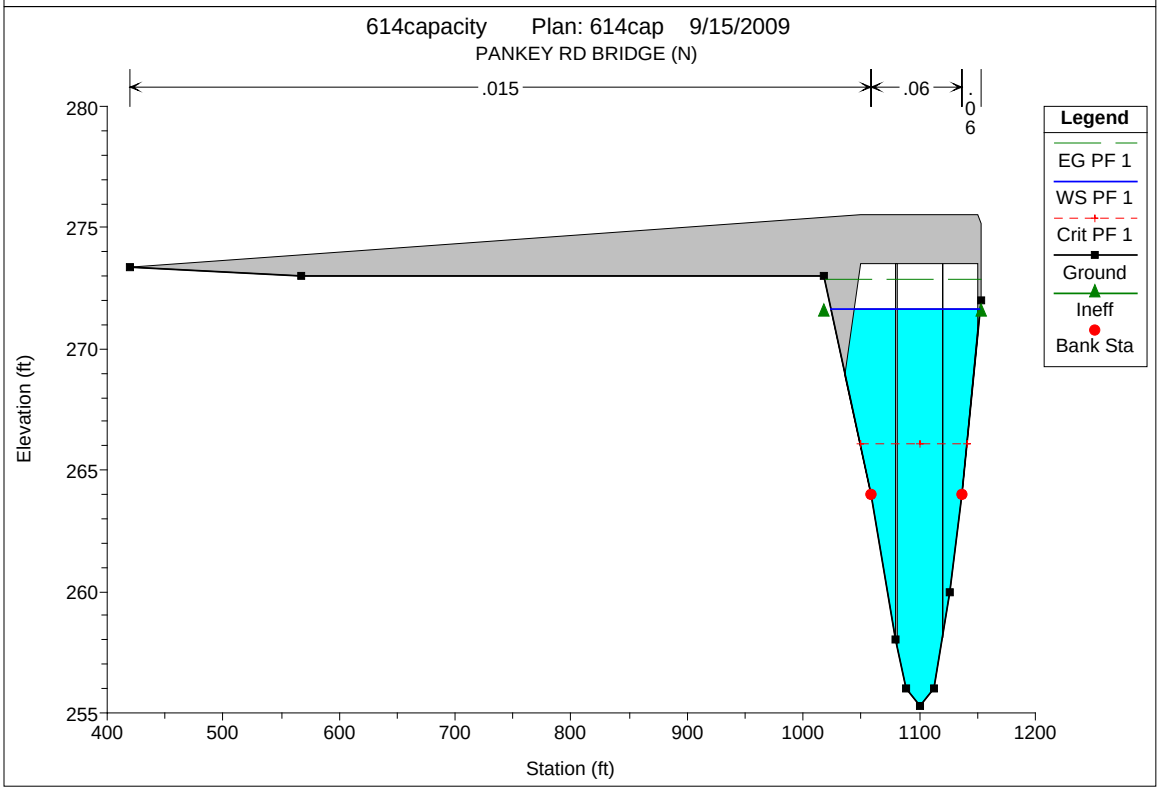
Plan: 614capacity HRC 1 RS: 1624 Profile: PF 1

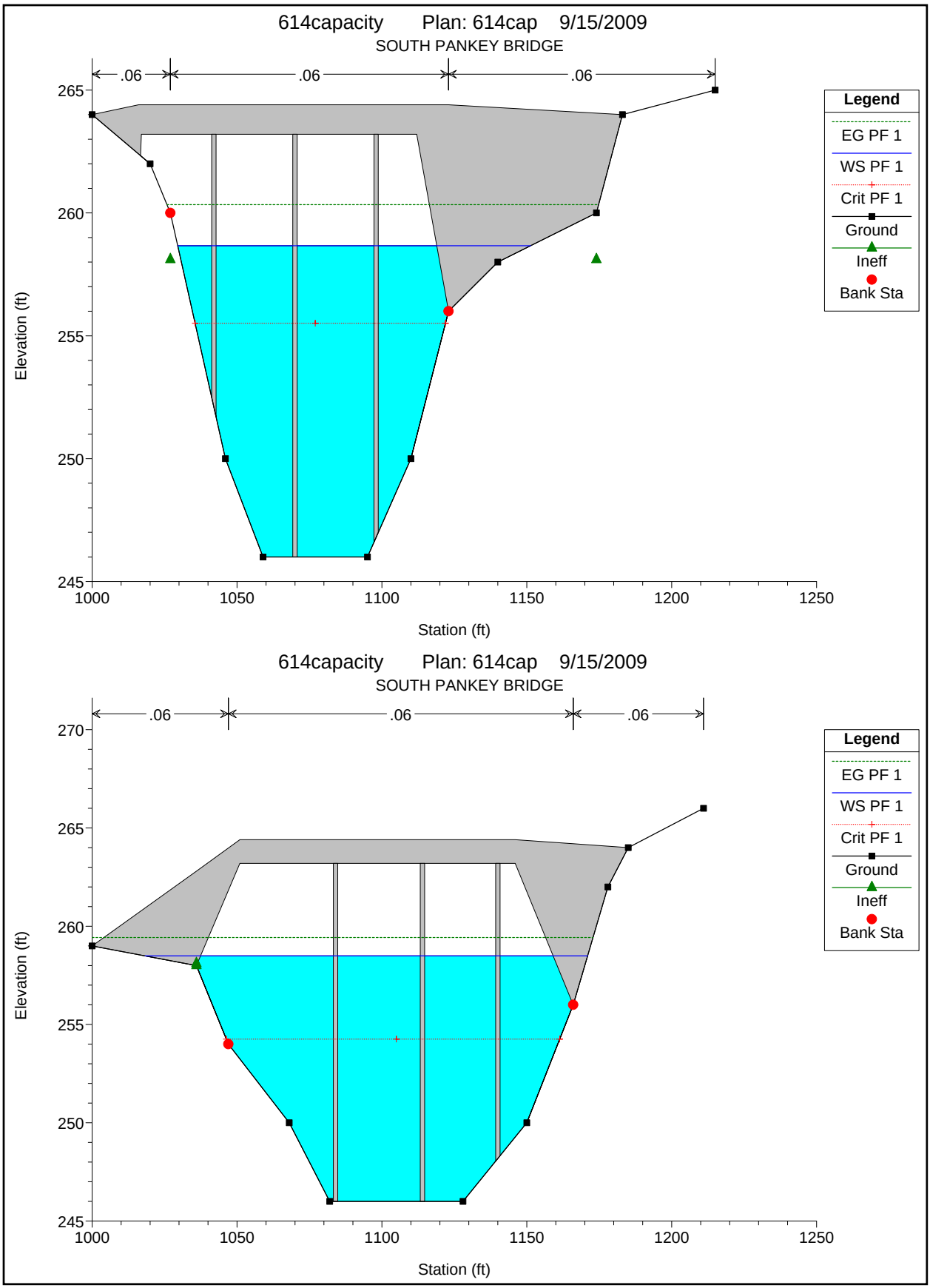
E.G. US. (ft)	260.66	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	259.46	E.G. Elev (ft)	260.34	259.43
Q Total (cfs)	8800.00	W.S. Elev (ft)	258.66	258.49
Q Bridge (cfs)	8800.00	Crit W.S. (ft)	255.51	254.25
Q Weir (cfs)		Max Chl Dpth (ft)	12.66	12.49
Weir Sta Lft (ft)		Vel Total (ft/s)	10.38	7.71
Weir Sta Rgt (ft)		Flow Area (sq ft)	847.40	1142.03
Weir Submerg		Froude # Chl	0.51	0.38
Weir Max Depth (ft)		Specif Force (cu ft)	7506.73	8154.92
Min El Weir Flow (ft)	264.01	Hydr Depth (ft)	9.98	9.75
Min El Prs (ft)	263.20	W.P. Total (ft)	160.34	208.01
Delta EG (ft)	1.43	Conv. Total (cfs)	63675.0	89432.6
Delta WS (ft)	1.10	Top Width (ft)	84.89	117.16
BR Open Area (sq ft)	1245.23	Frctn Loss (ft)	0.54	0.17
BR Open Vel (ft/s)	10.38	C & E Loss (ft)	0.37	0.03

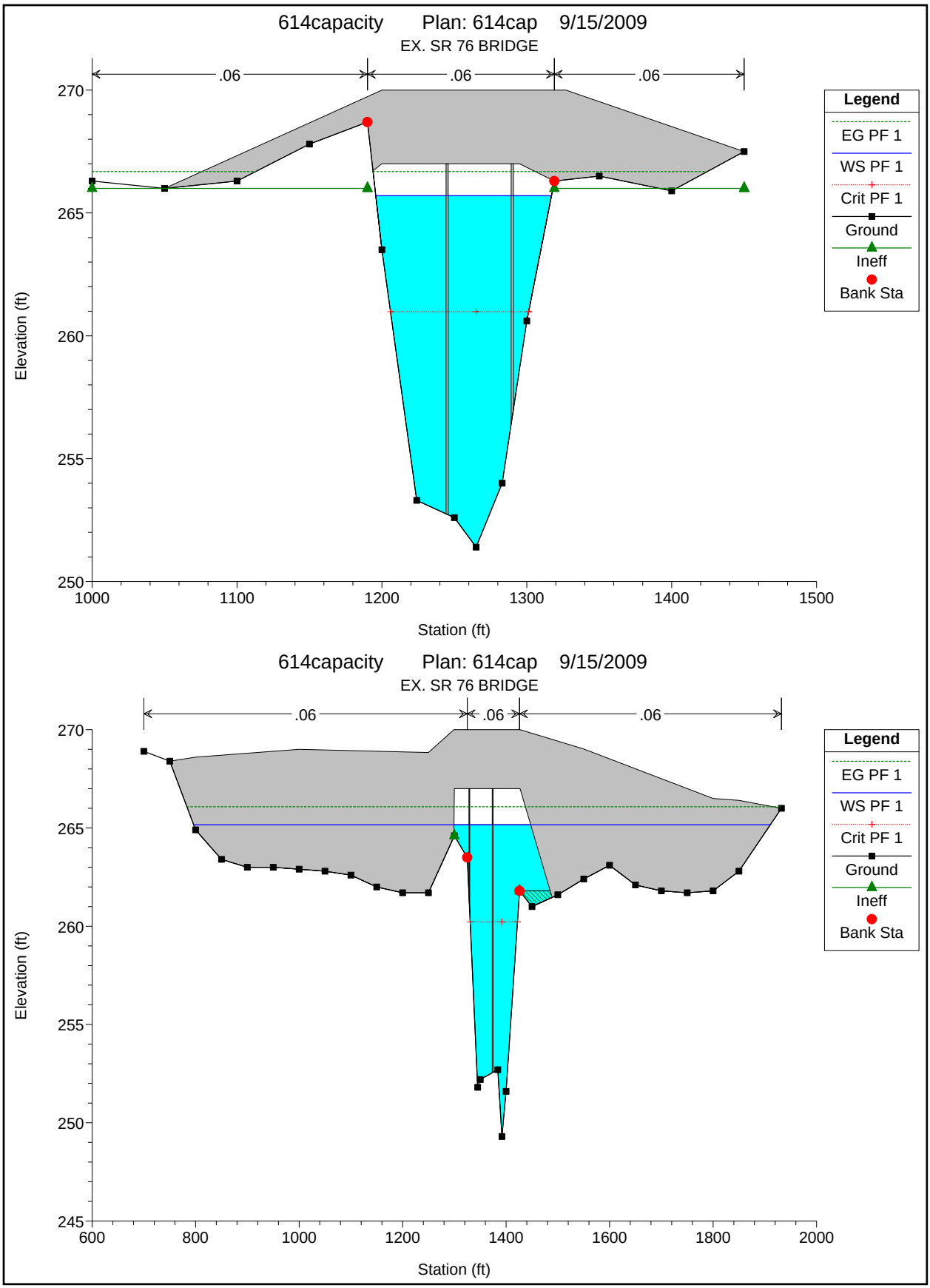
Plan: 614capacity HRC 1 RS: 1624 Profile: PF 1 (Continued)

Coef of Q		Shear Total (lb/sq ft)	6.30	3.32
Br Sel Method	Energy only	Power Total (lb/ft s)	65.44	25.57


614capacity Plan: 614cap 9/15/2009
PANKEY RD BRIDGE (N)
.015
.035
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
280
275
270
265
260
255
800
1000
1200
1400
1600
1800
Station (ft)


614capacity Plan: 614cap 9/15/2009
PANKEY RD BRIDGE (N)
.015
.06
.06
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
280
275
270
265
260
255
400
500
600
700
800
900
1000
1100
1200
Station (ft)


614capacity Plan: 614cap 9/15/2009
SOUTH PANKEY BRIDGE
.06
.06
.06
265
260
255
250
245
1000
1050
1100
1150
1200
1250
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
614capacity Plan: 614cap 9/15/2009
SOUTH PANKEY BRIDGE
.06
.06
.06
270
265
260
255
250
245
1000
1050
1100
1150
1200
1250
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta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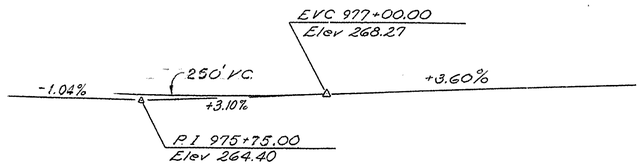
EX. SR 76 BRIDGE
.06
.06
.06
270
265
260
255
250
1000
1100
1200
1300
1400
1500
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
614capacity Plan: 614cap 9/15/2009
EX. SR 76 BRIDGE
.06
.06
.06
270
265
260
255
250
245
600
800
1000
1200
1400
1600
1800
2000
Elevation (ft)
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta

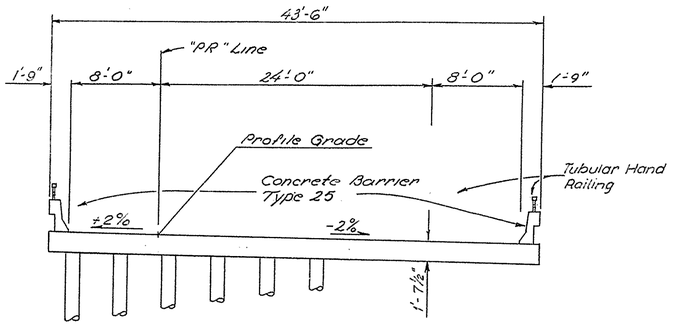
DIST.	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
11	SD	15	R45.9/R48.1	158	208

R C Hasslam — CHIEF, OFFICE OF STRUCTURES DESIGN — 9017 — REGISTERED CIVIL ENGINEER NUMBER

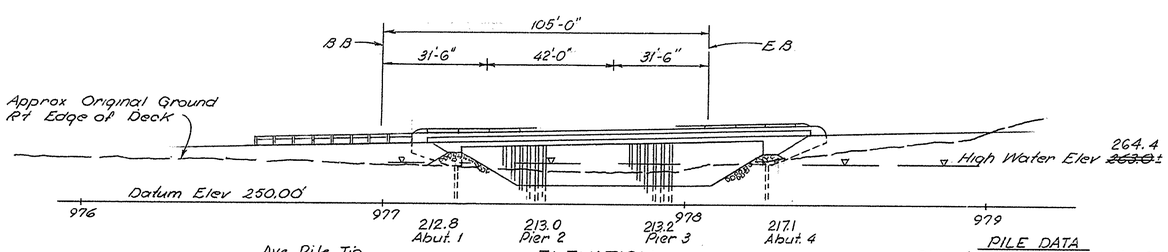
DATE APPROVED February 5, 1979



PROFILE GRADE
NO SCALE

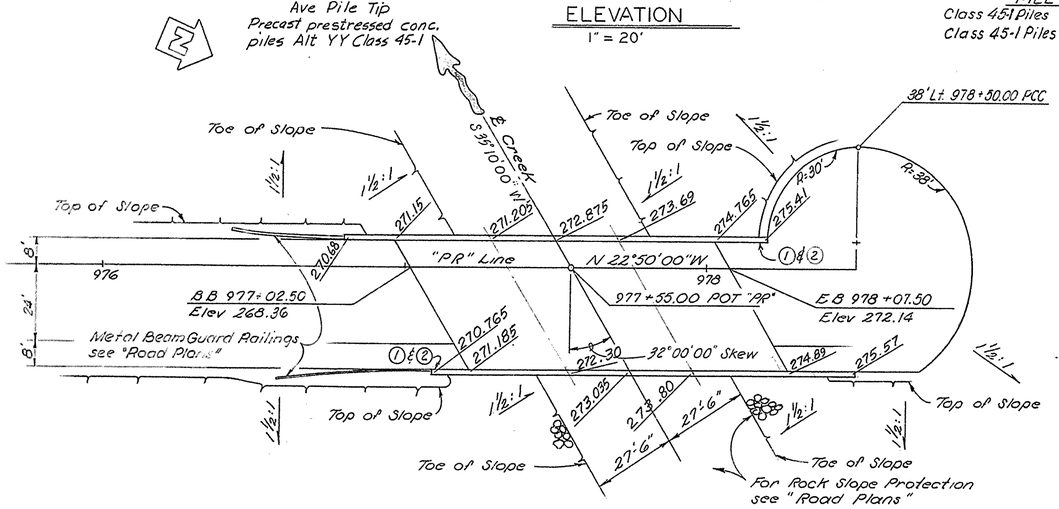


TYPICAL SECTION
3/16" = 1'-0"



ELEVATION
1" = 20'

PILE DATA
Class 45-1 Piles Specified Tip 213.0 - Abut 1, Pier 2 & Pier 3
Class 45-1 Piles Specified Tip 220.0 - Abut 5



ELEVATION
1" = 20'

Note
① = Paint "Horse Ranch Creek Bridge."
② = Paint "57C-323" & Year Constructed.

Standard Plan Sheet No.
Detail No.

FOR GENERAL NOTES SEE "Deck Contour" sheet

LIVE LOADING HS20-44 AND ALTERNATIVE AND PERMIT DESIGN LOADING

APPROXIMATE QUANTITIES

FURNISH PILING (CLASS 45-1)	1,703 LF
DRIVE PILE (CLASS 45)	32 EA
TUBULAR HANDRAILING	275 LF
CONCRETE BARRIER (TYPE 25)	275 LF

FINAL PAY QUANTITIES

STRUCTURE EXCAVATION (BRIDGE)	102 CY
STRUCTURE BACKFILL (BRIDGE)	64 CY
STRUCTURAL CONCRETE, BRIDGE	348 CY
BAR REINFORCING STEEL (BRIDGE)	61,000 LB

INDEX TO PLANS

SHEET NO.	TITLE
1	GENERAL PLAN
2	DECK CONTOURS
3	FOUNDATION PLAN
4	ABUTMENT & PIER DETAILS
5	PIER PILE DETAILS - CLASS 45-1
6	SLAB SECTION & REINFORCEMENT DETAILS
7	SLAB REINFORCEMENT DETAILS
8	LOG OF TEST BORINGS

STANDARD PLANS DATED MARCH, 1977

A62-DB	EXCAVATION AND BACKFILL - LIMITS OF PAYMENT (BRIDGE)
BO-1	BRIDGE DETAILS
B11-51	TUBULAR HAND RAILING.
B11-53	CONCRETE BARRIER TYPE 25.

DATUM: NGVD 29

AS BUILT
CORRECTIONS BY John T. Day R.E. 12781
CONTRACT NO. 11-095094
DATE 6-15-81

BRIDGE DEPARTMENT
DESIGN SECTION 8
Section Supervisor FRO Lyza 10/78 8909
Project Engineer A.M.S. Ashraay 9604

DESIGN	By Gonzalez 2-79	Checked	3/79
DETAILS	By Vern Groth 2-79	Checked	3/79
LAYOUT	By Gonzalez 2-79	Checked	3/79
QUANTITIES	By [illegible] 4-78	Checked	F.H. Eshen 9-78
SPECIFICATIONS	By [illegible]	Field and Rowe Completed	HKJ 1/79

Approval Recommended by Ralph C. Hansen, Design Engineer — Registered Civil Engr. License No. 8158

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

HORSE RANCH CREEK BRIDGE
PANKEY(NORTH)
GENERAL PLAN

BRIDGE NO.	POST MILE	DRAWING NO.	SHEET	OF
57C-323	CO. RD.		1	8

REVISION DATES (PRELIMINARY STAGE ONLY)
3/1/83

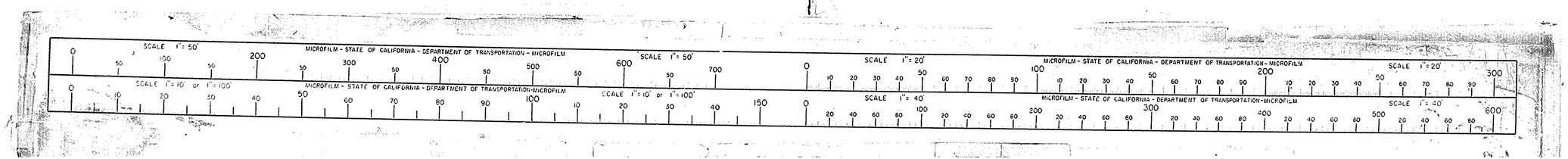
Disregard prints bearing earlier revision dates →

WO 095091
CU 11203

158

AS BUILT PLANS
Contract No. 11-095094
Date Completed
Document No.

I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF TRANSPORTATION.
DATE 1-19-82 SIGNATURE Donald Bloedford TITLE SUPERVISOR OF MICROFILM SERVICES
DAS-53-78



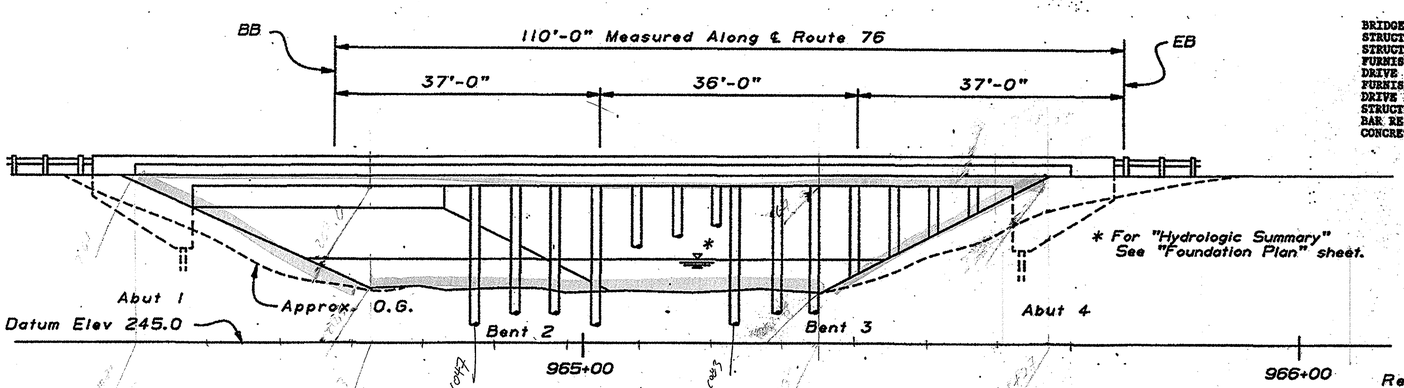
962+00 V.P.I.
Elev 267.46

+0.259%

969+00 V.P.I.
Elev 269.27

PROFILE GRADE

No Scale



ELEVATION

1"=10'-0"

PILE DATA

Location	Design Loading (Service Load)	Specified Tip Elev.	Probable Tip Elev.
Abutment 1	45 ton	218.0	212.0
Bent 2	70 ton	194.0	188.0
Bent 3	70 ton	192.0	186.0
Abutment 4	45 ton	197.0	191.0

Precased Prestressed option used

QUANTITIES

BRIDGE REMOVAL	LUMP SUM
STRUCTURE EXCAVATION (BRIDGE)	242 CY
STRUCTURE BACKFILL (BRIDGE)	116 CY
FURNISH PILING (CLASS 70)	1,030 LF
DRIVE PILE (CLASS 70)	14 EA
FURNISH PILING (CLASS 45)	686 LF
DRIVE PILE (CLASS 45)	14 EA
STRUCTURAL CONCRETE, BRIDGE	404 CY
BAR REINFORCING STEEL (BRIDGE)	67,600 LB
CONCRETE BARRIER (TYPE 25)	280 LF

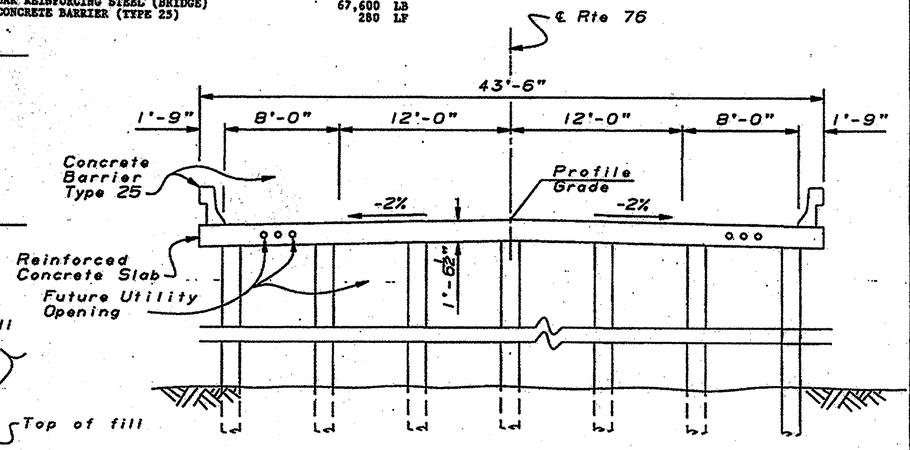
DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
11	SD	76	17.8	26	35

Norbert Gee
REGISTERED ENGINEER - CIVIL

REGISTERED PROFESSIONAL ENGINEER — No. 47306 — Exp. 12-31-95 — CIVIL — STATE OF CALIFORNIA

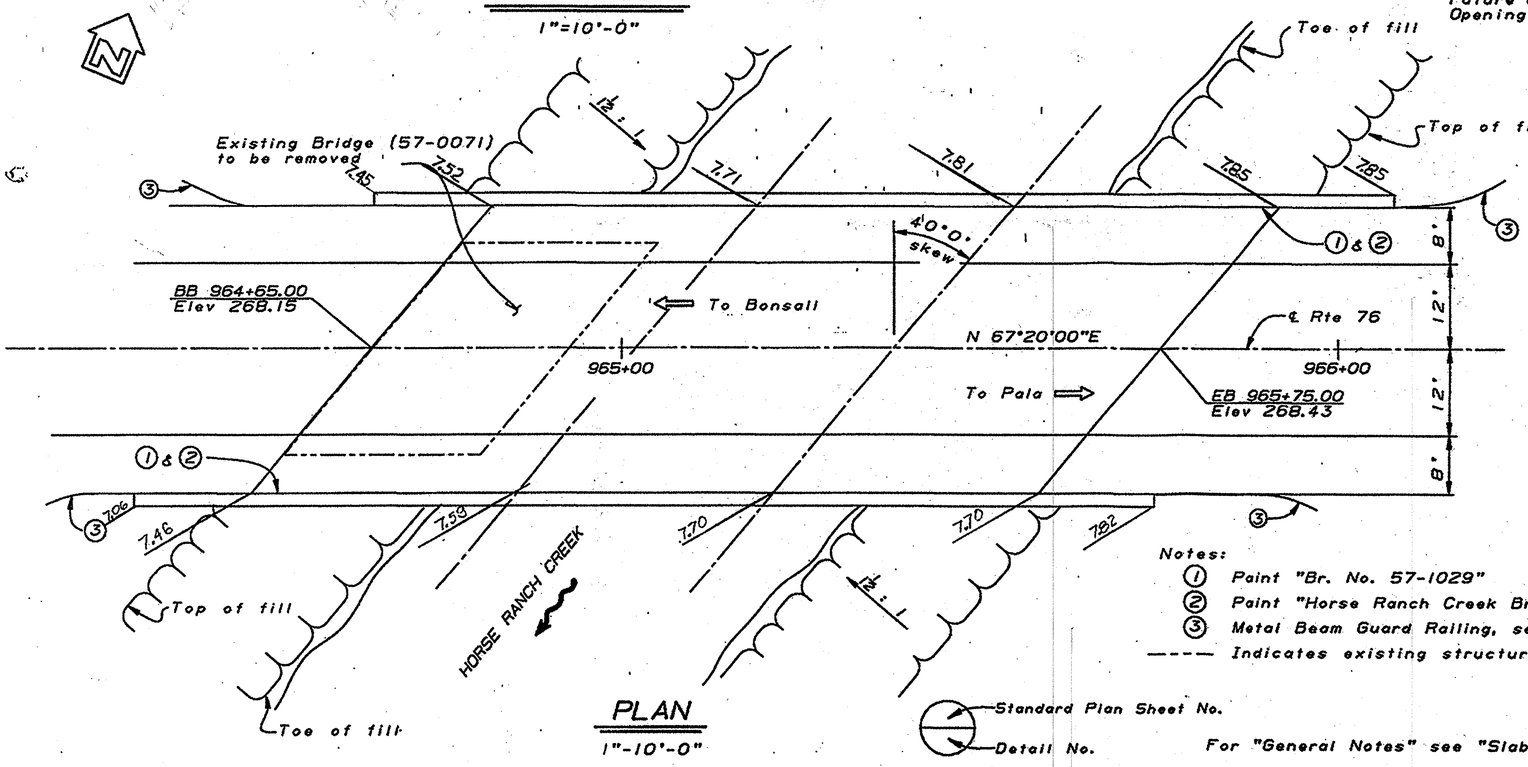
7-10-95
PLANS APPROVAL DATE

The State of California or its officers or agents shall not be responsible for the accuracy or completeness of electronic copies of this plan sheet.



TYPICAL SECTION

1"=5'-0"



PLAN

1"=10'-0"

Notes:
1. Paint "Br. No. 57-1029"
2. Paint "Horse Ranch Creek Bridge"
3. Metal Beam Guard Railing, see "Road Plans"

----- Indicates existing structure

Standard Plan Sheet No.
Detail No.

For "General Notes" see "Slab Reinforcement Details" sheet

NO AS BUILT CHANGES
AS BUILT
CORRECTIONS BY Mohamed Fouad
CONTRACT NO. 11-055301
DATE 6-17-96

INDEX TO PLANS

SHEET NO.	TITLE
1	GENERAL PLAN
2	DECK CONTOURS
3	FOUNDATION PLAN
4	ABUTMENT DETAILS
5	BENT DETAILS & TYPICAL SECTION
6	TOP & BOTTOM SLAB REINFORCEMENT
7	SLAB BRIDGE PILE DETAILS
8	SLAB REINFORCEMENT DETAILS
9	LOG OF TEST BORINGS 1 OF 2
10	LOG OF TEST BORINGS 2 OF 2

STANDARD PLANS DATED JULY 1992

A10A	ABBREVIATIONS
A62C	LIMITS OF PAYMENT FOR EXCAVATION AND BACKFILL - BRIDGE
B0-1	BRIDGE DETAILS
B0-3	BRIDGE DETAILS
B2-5	PILE DETAILS CLASS 45 AND CLASS 70
B11-53	CONCRETE BARRIER TYPE 25

(360 Ac)

E. G. Gee
DESIGN ENGINEER

DESIGN	BY Ed Warren	CHECKED N. Gee	LOAD FACTOR DESIGN	LIVE LOADING: HS20-44 AND ALTERNATIVE AND PERMIT DESIGN LOAD	
DETAILS	BY Bruno Jenko 10-93	CHECKED N. Gee	LAYOUT	BY Ed Warren	CHECKED N. Gee
QUANTITIES	BY M.K. Brady	CHECKED Ed Warren	SPECIFICATIONS	BY	PLANS AND SPECS CHAPTER

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DIVISION OF STRUCTURES
STRUCTURE DESIGN 7

CU 11
EA 055301

BRIDGE NO. 57-1029
POST MILE 17.75

HORSE RANCH CREEK BRIDGE
GENERAL PLAN

DS OSD 2138 (CADD 4/89)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY)
10-28-93 | 12-27-93 | 2-7-94 | 10-28-94 | 8-22-94 | 9-19-94 | 9-29-94 | 3-1-95

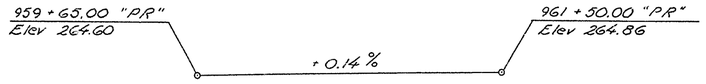
SHEET 1 OF 10

PDF - www.fastio.com

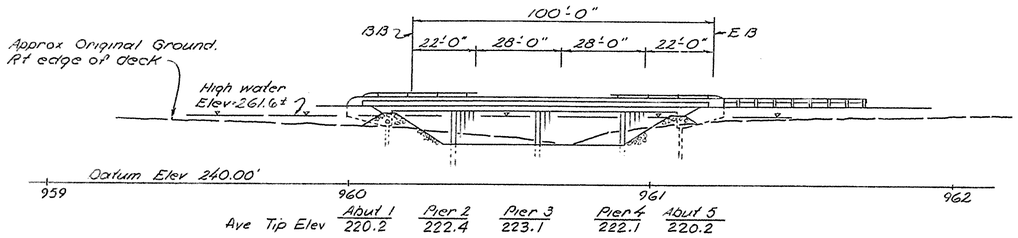
DIST.	COUNTY	ROUTE	POST MILES—TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
11	SD	15	R45.9/R48.1	166	208

R.C. Cassidy 9017
CHIEF, OFFICE OF STRUCTURES DESIGN — REGISTERED CIVIL ENGINEER NUMBER

DATE APPROVED February 5, 1979

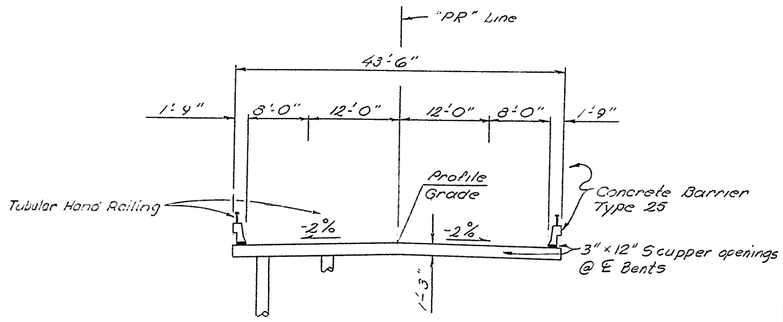


PROFILE GRADE
NO SCALE

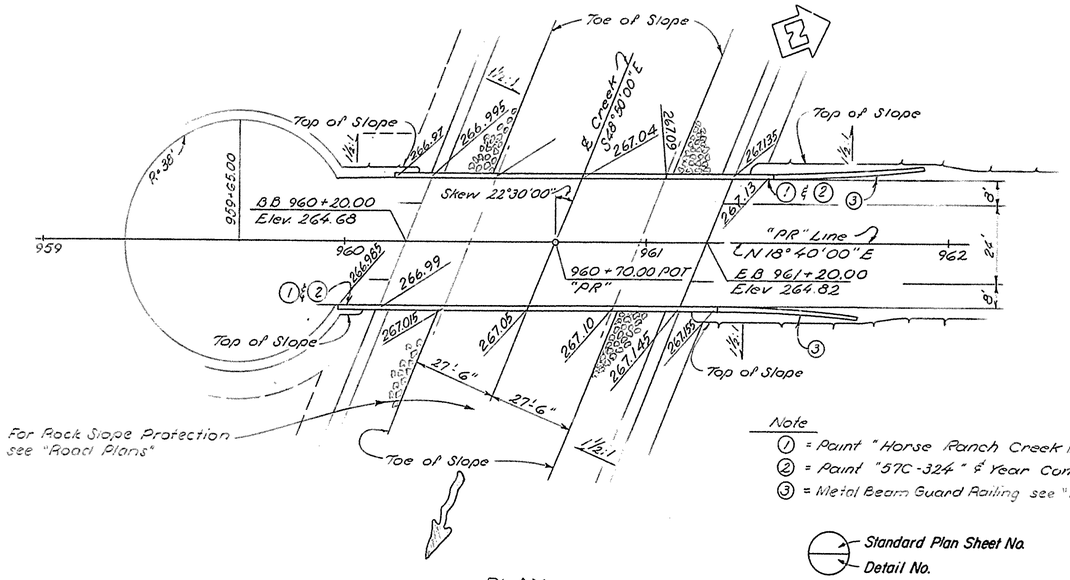


PILE DATA
Class 45-1 Piles Specified Tip 220.0
Precast prestressed Alt YY

ELEVATION
1" = 20'



TYPICAL SECTION
1/8" = 1'-0"



PLAN
1" = 20'

Note
① = Paint "Horse Ranch Creek Bridge"
② = Paint "57C-324" & Year Constructed
③ = Metal Beam Guard Railing see "Road Plans"

Standard Plan Sheet No.
Detail No.

INDEX TO PLANS

SHEET NO.	TITLE
1	GENERAL PLAN
2	DECK CONTOURS
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5	PIER PILE DETAILS - CLASS 45-1
6	SLAB SECTION AND REINFORCEMENT DETAILS
7	SLAB REINFORCEMENT DETAILS
8	LOG OF TEST BORINGS

STANDARD PLANS DATED MARCH, 1977

A62-BB	EXCAVATION AND BACKFILL - LIMITS OF PAYMENT (BRIDGE)
B0-1	BRIDGE DETAILS
B11-51	TUBULAR HAND RAILING
B11-53	CONCRETE BARRIER TYPE 25

APPROXIMATE QUANTITIES

FURNISH PILING (CLASS 45-1)	1,136 LF
DRIVE PILE (CLASS 45)	28 EA
TUBULAR HANDRAILING	253 LF
CONCRETE BARRIER (TYPE 25)	253 LF

FINAL PAY QUANTITIES

STRUCTURE EXCAVATION (BRIDGE)	118 CY
STRUCTURE BACKFILL (BRIDGE)	63 CY
STRUCTURAL CONCRETE, BRIDGE	277 CY
BAR REINFORCING STEEL (BRIDGE)	54,500 LB

DATUM: NGVD 29

AS BUILT
CORRECTED BY John T. Day P.E. 12781
CONTRACT NO. 11-095094
DATE 6-15-81

BRIDGE DEPARTMENT
··· DESIGN SECTION ··· 8
Section Supervisor Fred Lang 10/78 8929
Project Engineer C.M. Gilmore 9600

DESIGN	By Jim Murphy 2-78	Checked	Hayda 9/78
DETAILS	By Vern Groth 3-78	Checked	Hayda 9/78
LAYOUT	By Jim Murphy 3-78	Checked	Hayda 9/78
QUANTITIES	By J.Z. Sales 9/78	Checked	M. Murphy 9/78
SPECIFICATIONS	By R.D. Swanson 10/78	Plans and Specs Completed	11-79
Approval Recommended by	Deputy Engineer	Registered Civil Engr. License No.	8158

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

HORSE RANCH CREEK BRIDGE
PANKEY(SOUTH)

GENERAL PLAN

BRIDGE NO.	POST MILE CO. RD.	DRAWING NO.	SHEET	OF
57C-324			1	8

WO 095091
CU 11203

Disregard prints bearing earlier revision dates →

REVISION DATES (PRELIMINARY STAGE ONLY)														
3/1/79														

For General Notes See "Deck Contours" sheet

Live Loading HS20-44 and Alternative
And Permit Design Loading

166

AS BUILT PLANS
Contract No. 11-095094
Date Completed
Document No.

I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF TRANSPORTATION.

DATE 1-19-82 SIGNATURE Donald Blackford TITLE CHIEF, OFFICE OF MICROFILM SERVICES

CA-55-74

SECTION 9E:
HEC-RAS ROUGHNESS COEFFICIENT ANALYSIS

HECRAS ANALYSIS ROUGHNESS COEFFICIENT (n)

The roughness coefficient of the Horse Ranch Creek has significant effect on the efficiency and capacity of the creek to convey the peak discharge. Based on field observations and the current aerial photo available from the County of San Diego, the roughness coefficient distribution along Horse Ranch Creek in accordance to San Diego County Drainage Design Manual, Tables A-4 and A-5, is as follows:

Manning's n Values					
River Station	Frctn (n)	LB	CHNL	RB	CHANNEL DESCRIPTION
119+75	n	0.035	0.035	0.035	Grass-lined (well maintained)
114+39	n	0.035	0.035	0.035	Grass-lined (well maintained)
111+29	n	0.035	0.035	0.035	Grass-lined (well maintained)
102+84	n	0.035	0.035	0.035	Grass-lined (well maintained)
98+55	n	0.045	0.045	0.045	Grass-lined (not maintained)
94+31	n	0.05	0.045	0.045	Grass-lined (not maintained), scattered brush on LB
89+07	n	0.05	0.045	0.045	Grass-lined (not maintained), scattered brush on LB
85+26	n	0.06	0.045	0.05	Grass-lined (not maintained), Light brush and trees on LB, scattered brush on RB
81+91	n	0.06	0.06	0.06	Light brush and trees
72+33	n	0.06	0.06	0.06	Light brush and trees
66+07	n	0.06	0.06	0.06	Light brush and trees
62+41	n	0.06	0.06	0.06	Light brush and trees
58+46	n	0.06	0.06	0.06	Light brush and trees
51+34	n	0.06	0.06	0.06	Light brush and trees
45+83	n	0.06	0.06	0.06	Light brush and trees
40+59	n	0.06	0.06	0.06	Light brush and trees
37+50	n	0.06	0.06	0.06	Light brush and trees
36+46	n	0.06	0.06	0.06	Light brush and trees
35+10	n	0.06	0.06	0.06	Light brush and trees
34+76	Bridge				
34+47	n	0.06	0.06	0.06	Light brush and trees
30+50	n	0.06	0.06	0.06	Light brush and trees
28+46	n	0.06	0.06	0.06	Light brush and trees
25+95	n	0.06	0.06	0.06	Light brush and trees
25+25	Bridge				
24+41	n	0.06	0.06	0.06	Light brush and trees
22+25	n	0.06	0.06	0.06	Light brush and trees
19+89	n	0.06	0.06	0.06	Light brush and trees
16+65	n	0.06	0.06	0.06	Light brush and trees
16+24	Bridge				
15+80	n	0.06	0.06	0.06	Light brush and trees
13+74	n	0.06	0.06	0.06	Light brush and trees

HECRAS ANALYSIS ROUGHNESS COEFFICIENT (n) CAPACITY CONDITIONS

The roughness coefficient within the channel is increased to 0.15 as expected during the life time of the channel, the bank

Manning's n Values					
River Station	Frctn (n)	LB	CHNL	RB	CHANNEL DESCRIPTION
119+75	n	0.035	0.035	0.035	Grass-lined (well maintained)
114+39	n	0.035	0.035	0.035	Grass-lined (well maintained)
111+29	n	0.035	0.035	0.035	Grass-lined (well maintained)
102+84	n	0.035	0.035	0.035	Grass-lined (well maintained)
98+55	n	0.045	0.045	0.045	Grass-lined (not maintained)
94+31	n	0.05	0.045	0.045	Grass-lined (not maintained), scattered brush on LB
89+07	n	0.05	0.045	0.045	Grass-lined (not maintained), scattered brush on LB
85+26	n brush on RB	0.06	0.045	0.05	Grass-lined (not maintained), Light brush and trees on LB, scattered
81+91	n	0.06	0.06	0.06	Light brush and trees
72+33	n	0.06	0.06	0.06	Light brush and trees
66+07	n	0.06	0.06	0.06	Light brush and trees
62+41	n	0.06	0.15	0.06	Light brush and trees on banks and dense trees within channel
58+46	n	0.06	0.15	0.06	Light brush and trees on banks and dense trees within channel
51+34	n	0.06	0.15	0.06	Light brush and trees on banks and dense trees within channel
45+83	n	0.06	0.15	0.06	Light brush and trees on banks and dense trees within channel
40+59	n	0.06	0.15	0.06	Light brush and trees on banks and dense trees within channel
37+50	n	0.06	0.15	0.06	Light brush and trees on banks and dense trees within channel
36+46	n	0.06	0.15	0.06	Light brush and trees on banks and dense trees within channel
35+10	n	0.06	0.06	0.06	Light brush and trees*
34+76	Bridge				
34+47	n	0.06	0.06	0.06	Light brush and trees*
30+50	n	0.06	0.15	0.06	Light brush and trees on banks and dense trees within channel
28+46	n	0.06	0.15	0.06	Light brush and trees on banks and dense trees within channel
25+95	n	0.06	0.06	0.06	Light brush and trees*
25+25	Bridge				
24+41	n	0.06	0.06	0.06	Light brush and trees*
22+25	n	0.06	0.15	0.06	Light brush and trees on banks and dense trees within channel
19+89	n	0.06	0.15	0.06	Light brush and trees on banks and dense trees within channel
16+65	n	0.06	0.06	0.06	Light brush and trees*
16+24	Bridge				
15+80	n	0.06	0.06	0.06	Light brush and trees*
13+74	n	0.06	0.15	0.06	Light brush and trees on banks and dense trees within channel

*** The channel immediately up and downstream of the bridges will be maintained such that no excessive overgrowth will block the entrance and exit of the bridges.**

SECTION 10:
DETENTION BASIN ANALYSIS

HEC-HMS was used to model the entire watershed for both the pre-development and post-development conditions.

Under the post-development conditions, a detention basin is proposed to mitigate the anticipated increase in runoff as a result of the proposed development. The detention basin was modeled in the post-development scenario using HEC-HMS as part of the entire watershed. Then Pondpack‘s Pond Routing analysis was performed in the post-development detention basin simulation.

Pond Routing is a mathematical procedure that models a detention pond (basin)’s response to a given storm event. The pond volume was simulated by entering the design depth versus volume. By routing the On-Site Area in the post-development scenario hydrograph through the proposed basin, the water surface elevation, outflow and storage values can be determined. The inflow hydrograph was developed based on the Rational Method analysis results (see Section 6E) using RatHydro software published by Rich Engineering Company and distributed by the County of San Diego. The hydrograph is imported into Pondpack model and routed through the modeled detention basin.

The detention basin outlet outfall water surface elevation is determined using Pondpack’s Pond Route tail water analysis based on the downstream channel water surface elevation obtained from HEC-RAS analysis in Section 9, the downstream section is Section 45+83, the 100-year water surface elevation is 273.19.

As presented in Section 8 of this report, the post-development peak flow reaching the existing Pankey Road Bridge (north) is less than that under the pre-development conditions. The proposed development will increase the impervious areas and storm conveyance systems that are more efficient such that the time of concentration is less under the post-development conditions. Due to the length of the entire watershed and the fact that the project site is located at the lower end of the watershed, a reduced time of concentration would allow the on-site peak discharge to leave the site sooner than the pre-development conditions, thus, the overall peak flow at the existing bridge decreases slightly under the post-development conditions.

SECTION 10A
DETENTION BASIN ROUTING CALCS

RATIONAL METHOD HYDROGRAPH PROGRAM
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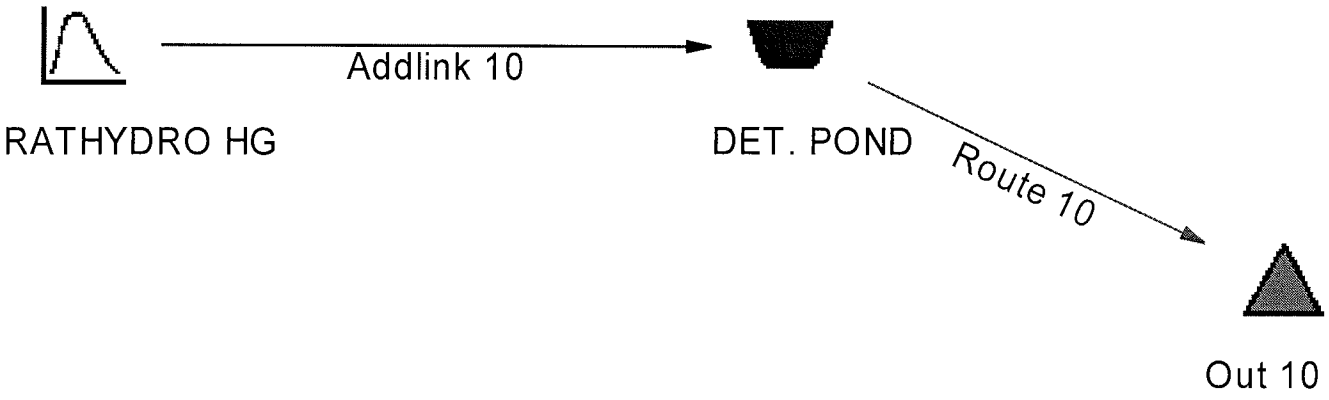
RUN DATE 9/15/2009
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 18 MIN.
6 HOUR RAINFALL 3.4 INCHES
BASIN AREA 374.1 ACRES
RUNOFF COEFFICIENT 0.54
PEAK DISCHARGE 842.03 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 18	DISCHARGE (CFS) = 41.4
TIME (MIN) = 36	DISCHARGE (CFS) = 44.4
TIME (MIN) = 54	DISCHARGE (CFS) = 46.1
TIME (MIN) = 72	DISCHARGE (CFS) = 50.1
TIME (MIN) = 90	DISCHARGE (CFS) = 52.5
TIME (MIN) = 108	DISCHARGE (CFS) = 58.2
TIME (MIN) = 126	DISCHARGE (CFS) = 61.7
TIME (MIN) = 144	DISCHARGE (CFS) = 70.8
TIME (MIN) = 162	DISCHARGE (CFS) = 76.7
TIME (MIN) = 180	DISCHARGE (CFS) = 93.8
TIME (MIN) = 198	DISCHARGE (CFS) = 106.8
TIME (MIN) = 216	DISCHARGE (CFS) = 156.8
TIME (MIN) = 234	DISCHARGE (CFS) = 171.1
TIME (MIN) = 252	DISCHARGE (CFS) = 842.03
TIME (MIN) = 270	DISCHARGE (CFS) = 125.8
TIME (MIN) = 288	DISCHARGE (CFS) = 84.2
TIME (MIN) = 306	DISCHARGE (CFS) = 65.9
TIME (MIN) = 324	DISCHARGE (CFS) = 55.2
TIME (MIN) = 342	DISCHARGE (CFS) = 48
TIME (MIN) = 360	DISCHARGE (CFS) = 42.8
TIME (MIN) = 378	DISCHARGE (CFS) = 0


Addlink 10
RATHYDRO HG
DET. POND
Route 10
Out 10

==========
JOB TITLE
==========

Project Date: 5/12/2009
Project Engineer: DY
Project Title: CAMPUS PARK
Project Comments:
DETENTION BASIN ROUTING USING AES PEAK FLOW DATA

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MASTER DESIGN STORM SUMMARY

Hydrograph Queue Only Network

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method
Hydrograph File Import Option Used For 1 node(s)

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
DET. POND	IN	POND 100	57.827	R	4.2750	830.29		
DET. POND	OUT	POND 100	47.462	L	4.2750	829.46	275.24	12.005
DET. POND	OUT	POND 100	-.115	L	2.5250	-4.00 (-Q)		
*OUT 10		JCT 100	47.462	L	4.2750	829.46		
*OUT 10		JCT 100	-.001	L	.0000	.00 (-Q)		
RATHYDRO HG		HYG 100	57.832		4.2700	842.03		

NETWORK SUMMARY -- NODES
(Trun.= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left & Rt)

Node ID		Type	HYG Vol ac-ft	Trun.	Qpeak hrs	Qpeak cfs	Max WSEL ft
DET. POND	IN	POND	57.827	R	4.2750	830.29	
DET. POND	OUT	POND	47.462	L	4.2750	829.46	275.24
DET. POND	OUT	POND	-.115	L	2.5250	-4.00 (-Q)	
Outfall OUT 10		JCT	47.462	L	4.2750	829.46	
Outfall OUT 10		JCT	-.001	L	.0000	.00 (-Q)	
RATHYDRO HG		HYG	57.832		4.2700	842.03	

NETWORK SUMMARY -- LINKS
(UN=Upstream Node; DL=DNstream End of Link; DN=DNstream Node)
(Trun.= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left & Rt)

Link ID	Type		HYG Vol ac-ft	Trun.	Peak Time hrs	Peak Q cfs	End Points	
ADDLINK 10	ADD	UN	57.832		4.2700	842.03	RATHYDRO HG	
		DL	57.832		4.2700	842.03		
		DN	57.827	R	4.2750	830.29	DET. POND	IN
ROUTE 10	PONDrt	UN	57.827	R	4.2750	830.29	DET. POND	IN
ROUTE 10			47.462	L	4.2750	829.46	DET. POND	OUT
ROUTE 10	(-Q)		-.115	L	2.5250	-4.00	DET. POND	OUT
		DL	47.462	L	4.2750	829.46		
	(-Q)	DL	-.001	L	.0000	.00		
		DN	47.462	L	4.2750	829.46	OUT 10	
	(-Q)	DN	-.001	L	.0000	.00	OUT 10	

NETWORK RUNOFF NODE SEQUENCE

Runoff Data	Apply to Node	Receiving Link
Read HYGRATHYDRO HG	HYG Qin RATHYDRO HG	Add Hyd RATHYDRO HG

NETWORK ROUTING SEQUENCE

Link Operation	UPstream Node	DNstream Node
Add Hyd ADDLINK 10	HYG Qin RATHYDRO HG	Pond DET. POND IN
POND ROUTE TOTAL OUTFLOW...		
Total Pond Outflow	Pond DET. POND IN	Outflow DET. POND OUT
SET POND ROUTING LINK TO TOTAL POND OUTFLOW...		
Outlet ROUTE 10	Outflow DET. POND OUT	Jct OUT 10

HYG file =
HYG ID = HYG 1
HYG Tag = 100

Peak Discharge = 842.03 cfs
Time to Peak = 4.2700 hrs
HYG Volume = 57.832 ac-ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .3050 hrs
Time on left represents time for first value in each row.

Time hrs					
.0000	.00	41.40	44.40	46.10	50.10
1.5250	52.50	58.20	61.70	70.80	76.70
3.0500	93.80	106.80	156.80	171.10	842.03
4.5750	125.80	84.20	65.90	55.20	48.00
6.1000	42.80	.00			

SUMMARY FOR HYDROGRAPH ADDITION
at Node: OUT 10

HYG Directory: F:\06-14\hydro\pondpack\

Upstream Link ID	Upstream Node ID	HYG file	HYG ID	HYG tag
ROUTE 10	DET. POND IN	work_pad.hyg	ROUTE 10	100

INFLOWS TO: OUT 10

HYG file	HYG ID	HYG tag	Volume ac-ft	Peak Time hrs	Peak Flow cfs
work_pad.hyg	ROUTE 10	100	47.462	4.2750	829.46

TOTAL FLOW INTO: OUT 10

HYG file	HYG ID	HYG tag	Volume ac-ft	Peak Time hrs	Peak Flow cfs
work_pad.hyg	OUT 10	100	47.462	4.2750	829.46

TOTAL NODE INFLOW...
HYG file = F:\06-14\hydro\pondpack\work_pad.hyg
HYG ID = OUT 10
HYG Tag = 100

Peak Discharge = 829.46 cfs
Time to Peak = 4.2750 hrs
HYG Volume = 47.462 ac-ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .0250 hrs
Time on left represents time for first value in each row.

Time hrs					
2.5250	-4.00	8.65	16.36	20.83	24.68
2.6500	28.05	31.04	33.83	36.38	38.80
2.7750	41.10	43.34	45.51	47.62	49.69
2.9000	51.72	53.70	76.62	97.32	85.47
3.0250	95.98	91.12	96.54	94.62	97.73
3.1500	97.39	99.42	99.82	101.35	102.10
3.2750	103.38	104.30	105.46	106.46	109.62
3.4000	113.94	117.92	122.11	126.14	130.29
3.5250	134.35	138.47	142.55	146.67	150.75
3.6500	154.86	157.47	158.57	159.80	160.93
3.7750	162.13	163.28	164.47	165.63	166.81
3.9000	167.97	169.15	170.32	190.59	244.29
4.0250	300.85	354.95	410.95	465.32	521.10
4.1500	575.56	631.54	688.26	741.64	798.20
4.2750	829.46	773.60	712.20	656.12	596.41
4.4000	540.31	479.61	422.79	362.75	305.45
4.5250	246.01	188.49	129.82	119.85	121.31
4.6500	114.29	113.55	108.25	106.22	101.86
4.7750	99.10	95.25	92.14	88.52	85.26
4.9000	83.04	81.71	80.09	78.67	77.12
5.0250	75.71	74.24	72.72	71.23	69.73
5.1500	68.23	66.73	65.52	64.63	63.76
5.2750	62.87	62.00	61.12	60.24	59.37
5.4000	58.49	57.61	56.74	55.86	55.07
5.5250	54.82	54.78	54.71	54.60	54.47
5.6500	54.31	54.13	53.92	53.69	53.44
5.7750	53.17	52.88	52.58	52.28	51.96
5.9000	51.64	51.32	50.98	50.65	50.30
6.0250	49.96	49.60	49.24	48.88	48.43
6.1500	47.80	47.00	46.04	44.93	43.68
6.2750	42.29	40.77	39.13	37.34	35.46

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .0250 hrs
Time hrs | Time on left represents time for first value in each row.

Time hrs					
6.4000	33.44	31.35	29.39	27.46	25.61
6.5250	23.88	22.20	20.47	18.87	17.40
6.6500	16.04	14.15	12.40	10.86	9.52
6.7750	8.34	7.30	6.40	5.60	4.91
6.9000	4.12	3.32	2.67	2.15	1.73
7.0250	1.39	1.12	.90	.73	.58
7.1500	.47	.38	.30	.24	.20
7.2750	.16	.13	.10	.08	.07
7.4000	.05	.04	.03	.03	.02
7.5250	.02	.01	.01	.01	.01
7.6500	.01	.00	.00	.00	.00

TIME vs. ELEVATION (ft)

Time hrs	Output Time increment = .0250 hrs Time on left represents time for first value in each row.				
.0000	264.00	264.67	264.70	264.76	264.83
.1250	264.92	265.04	265.18	265.33	265.51
.2500	265.71	265.93	266.06	266.16	266.26
.3750	266.36	266.46	266.56	266.66	266.76
.5000	266.86	266.96	267.06	267.17	267.27
.6250	267.38	267.48	267.59	267.69	267.80
.7500	267.90	268.01	268.07	268.14	268.21
.8750	268.28	268.35	268.42	268.49	268.56
1.0000	268.63	268.70	268.78	268.85	268.92
1.1250	269.00	269.07	269.14	269.22	269.29
1.2500	269.37	269.44	269.52	269.60	269.67
1.3750	269.75	269.83	269.90	269.98	270.05
1.5000	270.12	270.18	270.25	270.31	270.38
1.6250	270.45	270.52	270.59	270.66	270.73
1.7500	270.80	270.87	270.94	271.01	271.09
1.8750	271.16	271.23	271.31	271.38	271.46
2.0000	271.53	271.61	271.68	271.76	271.84
2.1250	271.91	271.99	272.06	272.14	272.21
2.2500	272.28	272.36	272.44	272.51	272.59
2.3750	272.67	272.75	272.83	272.91	272.99
2.5000	273.08	273.15	273.24	273.31	273.37
2.6250	273.43	273.49	273.54	273.59	273.64
2.7500	273.69	273.73	273.77	273.82	273.86
2.8750	273.90	273.94	273.98	274.10	274.16
3.0000	274.13	274.16	274.14	274.16	274.15
3.1250	274.16	274.16	274.17	274.17	274.17
3.2500	274.17	274.18	274.18	274.18	274.19
3.3750	274.20	274.21	274.22	274.23	274.23
3.5000	274.24	274.25	274.26	274.27	274.28
3.6250	274.29	274.30	274.31	274.31	274.31
3.7500	274.31	274.31	274.32	274.32	274.32
3.8750	274.32	274.33	274.33	274.33	274.37
4.0000	274.47	274.56	274.64	274.72	274.80
4.1250	274.87	274.94	275.01	275.08	275.14
4.2500	275.20	275.24	275.17	275.10	275.04
4.3750	274.97	274.90	274.82	274.74	274.66
4.5000	274.57	274.47	274.37	274.24	274.22
4.6250	274.22	274.21	274.21	274.19	274.19
4.7500	274.17	274.17	274.15	274.15	274.14
4.8750	274.13	274.12	274.12	274.11	274.11
5.0000	274.10	274.10	274.09	274.08	274.08
5.1250	274.07	274.06	274.06	274.05	274.05
5.2500	274.04	274.04	274.03	274.03	274.03

TIME vs. ELEVATION (ft)

Output Time increment = .0250 hrs
Time hrs | Time on left represents time for first value in each row.

Time hrs					
5.3750	274.02	274.02	274.01	274.01	274.00
5.5000	274.00	274.00	274.00	274.00	274.00
5.6250	273.99	273.99	273.99	273.98	273.98
5.7500	273.97	273.97	273.96	273.96	273.95
5.8750	273.94	273.94	273.93	273.92	273.92
6.0000	273.91	273.90	273.90	273.89	273.88
6.1250	273.87	273.86	273.85	273.83	273.81
6.2500	273.78	273.75	273.72	273.69	273.66
6.3750	273.62	273.59	273.55	273.51	273.48
6.5000	273.45	273.42	273.39	273.37	273.34
6.6250	273.32	273.30	273.28	273.27	273.26
6.7500	273.24	273.23	273.22	273.22	273.21
6.8750	273.20	273.20	273.19	273.19	273.19
7.0000	273.18	273.18	273.18	273.18	273.18
7.1250	273.18	273.18	273.18	273.18	273.18
7.2500	273.18	273.18	273.18	273.18	273.18
7.3750	273.18	273.18	273.18	273.18	273.18
7.5000	273.18	273.18	273.18	273.18	273.18
7.6250	273.18	273.18	273.18	273.18	273.18
7.7500	273.18				

TIME vs. VOLUME (ac-ft)

Time hrs	Output Time increment = .0250 hrs Time on left represents time for first value in each row.				
.0000	.000	.224	.234	.252	.276
.1250	.307	.346	.391	.443	.502
.2500	.568	.641	.721	.806	.892
.3750	.979	1.065	1.153	1.241	1.329
.5000	1.418	1.508	1.598	1.688	1.779
.6250	1.871	1.962	2.054	2.147	2.239
.7500	2.332	2.425	2.519	2.613	2.707
.8750	2.801	2.896	2.991	3.087	3.183
1.0000	3.280	3.377	3.476	3.575	3.674
1.1250	3.775	3.875	3.976	4.078	4.180
1.2500	4.283	4.387	4.490	4.594	4.699
1.3750	4.804	4.909	5.014	5.120	5.227
1.5000	5.334	5.441	5.549	5.658	5.768
1.6250	5.879	5.991	6.104	6.217	6.332
1.7500	6.448	6.564	6.682	6.800	6.919
1.8750	7.039	7.160	7.280	7.402	7.524
2.0000	7.647	7.770	7.894	8.018	8.143
2.1250	8.268	8.394	8.522	8.651	8.781
2.2500	8.913	9.047	9.181	9.318	9.455
2.3750	9.594	9.735	9.876	10.019	10.162
2.5000	10.305	10.442	10.588	10.713	10.827
2.6250	10.933	11.033	11.127	11.216	11.301
2.7500	11.381	11.459	11.535	11.610	11.683
2.8750	11.754	11.825	11.894	11.940	11.944
3.0000	11.941	11.943	11.943	11.944	11.943
3.1250	11.944	11.944	11.944	11.944	11.945
3.2500	11.945	11.945	11.945	11.945	11.946
3.3750	11.946	11.947	11.947	11.948	11.949
3.5000	11.949	11.950	11.951	11.951	11.952
3.6250	11.952	11.953	11.953	11.954	11.954
3.7500	11.954	11.954	11.954	11.954	11.955
3.8750	11.955	11.955	11.955	11.955	11.958
4.0000	11.964	11.971	11.976	11.982	11.987
4.1250	11.991	11.996	12.000	12.002	12.003
4.2500	12.004	12.005	12.003	12.002	12.001
4.3750	11.998	11.993	11.988	11.983	11.977
4.5000	11.971	11.965	11.958	11.949	11.948
4.6250	11.948	11.947	11.947	11.946	11.945
4.7500	11.945	11.944	11.943	11.943	11.942
4.8750	11.941	11.941	11.941	11.940	11.940
5.0000	11.940	11.940	11.939	11.939	11.938
5.1250	11.938	11.937	11.937	11.936	11.936
5.2500	11.936	11.936	11.935	11.935	11.935

TIME vs. VOLUME (ac-ft)

Output Time increment = .0250 hrs

Time hrs | Time on left represents time for first value in each row.

Time hrs					
5.3750	11.934	11.934	11.934	11.934	11.933
5.5000	11.933	11.933	11.931	11.928	11.925
5.6250	11.920	11.915	11.908	11.901	11.893
5.7500	11.884	11.875	11.865	11.855	11.844
5.8750	11.833	11.822	11.811	11.799	11.787
6.0000	11.776	11.763	11.751	11.739	11.726
6.1250	11.711	11.689	11.661	11.628	11.590
6.2500	11.547	11.500	11.448	11.392	11.333
6.3750	11.270	11.204	11.137	11.074	11.015
6.5000	10.960	10.909	10.862	10.818	10.777
6.6250	10.740	10.705	10.674	10.646	10.622
6.7500	10.601	10.583	10.567	10.553	10.540
6.8750	10.529	10.520	10.512	10.506	10.501
7.0000	10.497	10.494	10.491	10.489	10.488
7.1250	10.486	10.485	10.484	10.484	10.483
7.2500	10.482	10.482	10.482	10.482	10.481
7.3750	10.481	10.481	10.481	10.481	10.481
7.5000	10.481	10.481	10.481	10.481	10.481
7.6250	10.481	10.481	10.481	10.481	10.481
7.7500	10.481				

USER DEFINED VOLUME RATING TABLE

Elevation (ft)	Volume (ac-ft)
264.00	.000
266.00	.665
268.00	2.418
270.00	5.145
272.00	8.412
274.00	11.933
275.00	12.000
275.50	12.010
276.00	12.020

REQUESTED POND WS ELEVATIONS:

Min. Elev.= 264.00 ft
Increment = .10 ft
Max. Elev.= 276.00 ft

****
OUTLET CONNECTIVITY
****

---> Forward Flow Only (UpStream to DnStream)
<--- Reverse Flow Only (DnStream to UpStream)
<---> Forward and Reverse Both Allowed

Structure	No.		Outfall	E1, ft	E2, ft
Orifice-Circular	O1	<--->	TW	267.870	276.000
Stand Pipe	R0	--->	TW	273.200	276.000
Orifice-Circular	O0	<--->	TW	264.000	276.000
Weir-Rectangular	W0	--->	TW	274.000	276.000

TW SETUP, DS Channel

OUTLET STRUCTURE INPUT DATA

Structure ID = O1
Structure Type = Orifice-Circular

# of Openings = 1
Invert Elev. = 267.87 ft
Diameter = 2.2500 ft
Orifice Coeff. = 1.000

Structure ID = R0
Structure Type = Stand Pipe

# of Openings = 1
Invert Elev. = 273.20 ft
Diameter = 7.0000 ft
Orifice Area = 38.4845 sq.ft
Orifice Coeff. = 1.000
Weir Length = 21.99 ft
Weir Coeff. = .850
K, Reverse = 1.000
Mannings n = .0000
Kev,Charged Riser = .000
Weir Submergence = No
Orifice H to crest= Yes

Structure ID = O0
Structure Type = Orifice-Circular

# of Openings = 1
Invert Elev. = 264.00 ft
Diameter = 1.5000 ft
Orifice Coeff. = 1.000

OUTLET STRUCTURE INPUT DATA

Structure ID = W0
Structure Type = Weir-Rectangular

# of Openings = 1
Crest Elev. = 274.00 ft
Weir Length = 600.00 ft
Weir Coeff. = .860000

Weir TW effects Table File:
Weir TW effects Table ID: New Element

WEIR SUBMERGENCE TABLE

dHW/dTW	Multiply Q by
1.0030	1.0000

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = O1 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
DNstream ID = TW (Pond Outfall)

WS Elev, ft	Device Q, cfs	Tail Water TW Elev, ft	Converge +/-ft	Notes Computation Messages
264.00	-65.33	273.19	.000	
	REVERSE: H =4.20			
264.10	-65.33	273.19	.000	
	REVERSE: H =4.20			
264.20	-65.33	273.19	.000	
	REVERSE: H =4.20			
264.30	-65.33	273.19	.000	
	REVERSE: H =4.20			
264.40	-65.33	273.19	.000	
	REVERSE: H =4.20			
264.50	-65.33	273.19	.000	
	REVERSE: H =4.20			
264.60	-65.33	273.19	.000	
	REVERSE: H =4.20			
264.70	-65.33	273.19	.000	
	REVERSE: H =4.20			
264.80	-65.33	273.19	.000	
	REVERSE: H =4.20			
264.90	-65.33	273.19	.000	
	REVERSE: H =4.20			
265.00	-65.33	273.19	.000	
	REVERSE: H =4.20			
265.10	-65.33	273.19	.000	
	REVERSE: H =4.20			
265.20	-65.33	273.19	.000	
	REVERSE: H =4.20			
265.30	-65.33	273.19	.000	
	REVERSE: H =4.20			
265.40	-65.33	273.19	.000	
	REVERSE: H =4.20			
265.50	-65.33	273.19	.000	
	REVERSE: H =4.20			
265.60	-65.33	273.19	.000	
	REVERSE: H =4.20			

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = O1 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
DNstream ID = TW (Pond Outfall)

WS Elev, ft	Device Q, cfs	Tail Water TW Elev, ft	Converge +/-ft	Notes Computation Messages
265.70	-65.33	273.19	.000	
	REVERSE: H =4.20			
265.80	-65.33	273.19	.000	
	REVERSE: H =4.20			
265.90	-65.33	273.19	.000	
	REVERSE: H =4.20			
266.00	-65.33	273.19	.000	
	REVERSE: H =4.20			
266.10	-65.33	273.19	.000	
	REVERSE: H =4.20			
266.20	-65.33	273.19	.000	
	REVERSE: H =4.20			
266.30	-65.33	273.19	.000	
	REVERSE: H =4.20			
266.40	-65.33	273.19	.000	
	REVERSE: H =4.20			
266.50	-65.33	273.19	.000	
	REVERSE: H =4.20			
266.60	-65.33	273.19	.000	
	REVERSE: H =4.20			
266.70	-65.33	273.19	.000	
	REVERSE: H =4.20			
266.80	-65.33	273.19	.000	
	REVERSE: H =4.20			
266.90	-65.33	273.19	.000	
	REVERSE: H =4.20			
267.00	-65.33	273.19	.000	
	REVERSE: H =4.20			
267.10	-65.33	273.19	.000	
	REVERSE: H =4.20			
267.20	-65.33	273.19	.000	
	REVERSE: H =4.20			
267.30	-65.33	273.19	.000	
	REVERSE: H =4.20			

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = O1 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
DNstream ID = TW (Pond Outfall)

WS Elev, Device Q	Tail Water	Notes
WS Elev. ft	Q cfs	TW Elev ft	Converge +/-ft	Computation Messages
267.40	-65.33	273.19	.000	
	REVERSE: H =4.20			
267.50	-65.33	273.19	.000	
	REVERSE: H =4.20			
267.60	-65.33	273.19	.000	
	REVERSE: H =4.20			
267.70	-65.33	273.19	.000	
	REVERSE: H =4.20			
267.80	-65.33	273.19	.000	
	REVERSE: H =4.20			
267.87	-65.33	273.19	.000	
	REVERSE: H =4.20			
267.90	-65.33	273.19	.000	
	REVERSE: H =4.20			
268.00	-65.33	273.19	.000	
	REVERSE: H =4.20			
268.10	-65.33	273.19	.000	
	REVERSE: H =4.20			
268.20	-65.33	273.19	.000	
	REVERSE: H =4.20			
268.30	-65.33	273.19	.000	
	REVERSE: H =4.20			
268.40	-65.33	273.19	.000	
	REVERSE: H =4.20			
268.50	-65.33	273.19	.000	
	REVERSE: H =4.20			
268.60	-65.33	273.19	.000	
	REVERSE: H =4.20			
268.70	-65.33	273.19	.000	
	REVERSE: H =4.20			
268.80	-65.33	273.19	.000	
	REVERSE: H =4.20			
268.90	-65.33	273.19	.000	
	REVERSE: H =4.20			

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = O1 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
DNstream ID = TW (Pond Outfall)

WS Elev, ft	Device Q, cfs	Tail Water TW Elev, ft	Converge +/-ft	Notes Computation Messages
269.00	-65.29	273.19	.000	
	REVERSE: H =4.19			
269.10	-64.50	273.19	.000	
	REVERSE: H =4.09			
269.20	-63.71	273.19	.000	
	REVERSE: H =3.99			
269.30	-62.91	273.19	.000	
	REVERSE: H =3.89			
269.40	-62.09	273.19	.000	
	REVERSE: H =3.79			
269.50	-61.27	273.19	.000	
	REVERSE: H =3.69			
269.60	-60.43	273.19	.000	
	REVERSE: H =3.59			
269.70	-59.58	273.19	.000	
	REVERSE: H =3.49			
269.80	-58.73	273.19	.000	
	REVERSE: H =3.39			
269.90	-57.85	273.19	.000	
	REVERSE: H =3.29			
270.00	-56.97	273.19	.000	
	REVERSE: H =3.19			
270.10	-56.07	273.19	.000	
	REVERSE: H =3.09			
270.20	-55.15	273.19	.000	
	REVERSE: H =2.99			
270.30	-54.22	273.19	.000	
	REVERSE: H =2.89			
270.40	-53.28	273.19	.000	
	REVERSE: H =2.79			
270.50	-52.31	273.19	.000	
	REVERSE: H =2.69			
270.60	-51.33	273.19	.000	
	REVERSE: H =2.59			

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = O1 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
DNstream ID = TW (Pond Outfall)

WS Elev, Device Q	Tail Water	Notes
WS Elev. ft	Q cfs	TW Elev ft	Converge +/-ft	Computation Messages
270.70	-50.33	273.19	.000	
	REVERSE: H =2.49			
270.80	-49.31	273.19	.000	
	REVERSE: H =2.39			
270.90	-48.27	273.19	.000	
	REVERSE: H =2.29			
271.00	-47.20	273.19	.000	
	REVERSE: H =2.19			
271.10	-46.11	273.19	.000	
	REVERSE: H =2.09			
271.20	-44.99	273.19	.000	
	REVERSE: H =1.99			
271.30	-43.85	273.19	.000	
	REVERSE: H =1.89			
271.40	-42.67	273.19	.000	
	REVERSE: H =1.79			
271.50	-41.46	273.19	.000	
	REVERSE: H =1.69			
271.60	-40.22	273.19	.000	
	REVERSE: H =1.59			
271.70	-38.93	273.19	.000	
	REVERSE: H =1.49			
271.80	-37.60	273.19	.000	
	REVERSE: H =1.39			
271.90	-36.23	273.19	.000	
	REVERSE: H =1.29			
272.00	-34.79	273.19	.000	
	REVERSE: H =1.19			
272.10	-33.30	273.19	.000	
	REVERSE: H =1.09			
272.20	-31.73	273.19	.000	
	REVERSE: H =.99			
272.30	-30.09	273.19	.000	
	REVERSE: H =.89			

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = O1 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
DNstream ID = TW (Pond Outfall)

WS Elev, ft	Device Q, cfs	Tail Water TW Elev, ft	Converge +/-ft	Notes / Computation Messages
272.40	-28.35	273.19	.000	REVERSE: H =.79
272.50	-26.49	273.19	.000	REVERSE: H =.69
272.60	-24.50	273.19	.000	REVERSE: H =.59
272.70	-22.33	273.19	.000	REVERSE: H =.49
272.80	-19.92	273.19	.000	REVERSE: H =.39
272.90	-17.18	273.19	.000	REVERSE: H =.29
273.00	-13.90	273.19	.000	REVERSE: H =.19
273.10	-9.57	273.19	.000	REVERSE: H =.09
273.20	3.19	273.19	.000	H =.01
273.30	10.58	273.19	.000	H =.11
273.40	14.62	273.19	.000	H =.21
273.50	17.76	273.19	.000	H =.31
273.60	20.42	273.19	.000	H =.41
273.70	22.78	273.19	.000	H =.51
273.80	24.91	273.19	.000	H =.61
273.90	26.88	273.19	.000	H =.71
274.00	28.71	273.19	.000	H =.81

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = O1 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
DNstream ID = TW (Pond Outfall)

WS Elev,Device Q		Tail Water		Notes
WS Elev. ft	Q cfs	TW Elev ft	Converge +/-ft	Computation Messages
274.10	30.43	273.19	.000	
	H =.91			
274.20	32.05	273.19	.000	
	H =1.01			
274.30	33.60	273.19	.000	
	H =1.11			
274.40	35.08	273.19	.000	
	H =1.21			
274.50	36.51	273.19	.000	
	H =1.31			
274.60	37.87	273.19	.000	
	H =1.41			
274.70	39.19	273.19	.000	
	H =1.51			
274.80	40.47	273.19	.000	
	H =1.61			
274.90	41.71	273.19	.000	
	H =1.71			
275.00	42.91	273.19	.000	
	H =1.81			
275.10	44.08	273.19	.000	
	H =1.91			
275.20	45.22	273.19	.000	
	H =2.01			
275.30	46.33	273.19	.000	
	H =2.11			
275.40	47.42	273.19	.000	
	H =2.21			
275.50	48.48	273.19	.000	
	H =2.31			
275.60	49.51	273.19	.000	
	H =2.41			
275.70	50.53	273.19	.000	
	H =2.51			

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = O1 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
DNstream ID = TW (Pond Outfall)

WS Elev, ft	Device Q, cfs	Tail Water TW Elev, ft	Converge +/-ft	Notes Computation Messages
275.80	51.53	273.19	.000	
	H =2.61			
275.90	52.51	273.19	.000	
	H =2.71			
276.00	53.47	273.19	.000	
	H =2.81			

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = R0 (Stand Pipe)

Upstream ID = (Pond Water Surface)
DNstream ID = TW (Pond Outfall)

WS Elev, ft	Device Q, cfs	Tail Water TW Elev, ft	Converge +/-ft	Notes Computation Messages
264.00	.00	REVERSE: Flow is closed off		
264.10	.00	REVERSE: Flow is closed off		
264.20	.00	REVERSE: Flow is closed off		
264.30	.00	REVERSE: Flow is closed off		
264.40	.00	REVERSE: Flow is closed off		
264.50	.00	REVERSE: Flow is closed off		
264.60	.00	REVERSE: Flow is closed off		
264.70	.00	REVERSE: Flow is closed off		
264.80	.00	REVERSE: Flow is closed off		
264.90	.00	REVERSE: Flow is closed off		
265.00	.00	REVERSE: Flow is closed off		
265.10	.00	REVERSE: Flow is closed off		
265.20	.00	REVERSE: Flow is closed off		
265.30	.00	REVERSE: Flow is closed off		
265.40	.00	REVERSE: Flow is closed off		
265.50	.00	REVERSE: Flow is closed off		
265.60	.00	REVERSE: Flow is closed off		
265.70	.00	REVERSE: Flow is closed off		
265.80	.00	REVERSE: Flow is closed off		
265.90	.00	REVERSE: Flow is closed off		
266.00	.00	REVERSE: Flow is closed off		
266.10	.00	REVERSE: Flow is closed off		
266.20	.00	REVERSE: Flow is closed off		
266.30	.00	REVERSE: Flow is closed off		
266.40	.00	REVERSE: Flow is closed off		
266.50	.00	REVERSE: Flow is closed off		
266.60	.00	REVERSE: Flow is closed off		
266.70	.00	REVERSE: Flow is closed off		
266.80	.00	REVERSE: Flow is closed off		
266.90	.00	REVERSE: Flow is closed off		
267.00	.00	REVERSE: Flow is closed off		
267.10	.00	REVERSE: Flow is closed off		
267.20	.00	REVERSE: Flow is closed off		
267.30	.00	REVERSE: Flow is closed off		

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = R0 (Stand Pipe)

Upstream ID = (Pond Water Surface)
DNstream ID = TW (Pond Outfall)

WS Elev, ft	Device Q, cfs	Tail Water TW Elev, ft	Converge +/-ft	Notes Computation Messages
267.40	.00	REVERSE: Flow is closed off		
267.50	.00	REVERSE: Flow is closed off		
267.60	.00	REVERSE: Flow is closed off		
267.70	.00	REVERSE: Flow is closed off		
267.80	.00	REVERSE: Flow is closed off		
267.87	.00	REVERSE: Flow is closed off		
267.90	.00	REVERSE: Flow is closed off		
268.00	.00	REVERSE: Flow is closed off		
268.10	.00	REVERSE: Flow is closed off		
268.20	.00	REVERSE: Flow is closed off		
268.30	.00	REVERSE: Flow is closed off		
268.40	.00	REVERSE: Flow is closed off		
268.50	.00	REVERSE: Flow is closed off		
268.60	.00	REVERSE: Flow is closed off		
268.70	.00	REVERSE: Flow is closed off		
268.80	.00	REVERSE: Flow is closed off		
268.90	.00	REVERSE: Flow is closed off		
269.00	.00	REVERSE: Flow is closed off		
269.10	.00	REVERSE: Flow is closed off		
269.20	.00	REVERSE: Flow is closed off		
269.30	.00	REVERSE: Flow is closed off		
269.40	.00	REVERSE: Flow is closed off		
269.50	.00	REVERSE: Flow is closed off		
269.60	.00	REVERSE: Flow is closed off		
269.70	.00	REVERSE: Flow is closed off		
269.80	.00	REVERSE: Flow is closed off		
269.90	.00	REVERSE: Flow is closed off		
270.00	.00	REVERSE: Flow is closed off		
270.10	.00	REVERSE: Flow is closed off		
270.20	.00	REVERSE: Flow is closed off		
270.30	.00	REVERSE: Flow is closed off		
270.40	.00	REVERSE: Flow is closed off		
270.50	.00	REVERSE: Flow is closed off		
270.60	.00	REVERSE: Flow is closed off		

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = R0 (Stand Pipe)

Upstream ID = (Pond Water Surface)
DNstream ID = TW (Pond Outfall)

WS Elev, ft	Device Q, cfs	Tail Water TW Elev, ft	Converge +/-ft	Notes / Computation Messages
270.70	.00			REVERSE: Flow is closed off
270.80	.00			REVERSE: Flow is closed off
270.90	.00			REVERSE: Flow is closed off
271.00	.00			REVERSE: Flow is closed off
271.10	.00			REVERSE: Flow is closed off
271.20	.00			REVERSE: Flow is closed off
271.30	.00			REVERSE: Flow is closed off
271.40	.00			REVERSE: Flow is closed off
271.50	.00			REVERSE: Flow is closed off
271.60	.00			REVERSE: Flow is closed off
271.70	.00			REVERSE: Flow is closed off
271.80	.00			REVERSE: Flow is closed off
271.90	.00			REVERSE: Flow is closed off
272.00	.00			REVERSE: Flow is closed off
272.10	.00			REVERSE: Flow is closed off
272.20	.00			REVERSE: Flow is closed off
272.30	.00			REVERSE: Flow is closed off
272.40	.00			REVERSE: Flow is closed off
272.50	.00			REVERSE: Flow is closed off
272.60	.00			REVERSE: Flow is closed off
272.70	.00			REVERSE: Flow is closed off
272.80	.00			REVERSE: Flow is closed off
272.90	.00			REVERSE: Flow is closed off
273.00	.00			REVERSE: Flow is closed off
273.10	.00			REVERSE: Flow is closed off
273.20	.00	273.19	.000	
				Weir: H =.00ft
273.30	.59	273.19	.000	
				Weir: H =.10ft
273.40	1.67	273.19	.000	
				Weir: H =.20ft
273.50	3.07	273.19	.000	
				Weir: H =.30ft
273.60	4.73	273.19	.000	
				Weir: H =.40ft

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = R0 (Stand Pipe)

Upstream ID = (Pond Water Surface)
DNstream ID = TW (Pond Outfall)

WS Elev, ft	Device Q, cfs	Tail Water TW Elev, ft	Converge +/-ft	Notes Computation Messages
273.70	6.61	273.19	.000	Weir: H =.50ft
273.80	8.69	273.19	.000	Weir: H =.60ft
273.90	10.95	273.19	.000	Weir: H =.70ft
274.00	13.37	273.19	.000	Weir: H =.80ft
274.10	15.96	273.19	.000	Weir: H =.90ft
274.20	18.69	273.19	.000	Weir: H =1.00ft
274.30	21.56	273.19	.000	Weir: H =1.10ft
274.40	24.57	273.19	.000	Weir: H =1.20ft
274.50	27.71	273.19	.000	Weir: H =1.30ft
274.60	30.96	273.19	.000	Weir: H =1.40ft
274.70	34.34	273.19	.000	Weir: H =1.50ft
274.80	37.83	273.19	.000	Weir: H =1.60ft
274.90	41.43	273.19	.000	Weir: H =1.70ft
275.00	45.14	273.19	.000	Weir: H =1.80ft
275.10	48.95	273.19	.000	Weir: H =1.90ft
275.20	52.87	273.19	.000	Weir: H =2.00ft
275.30	56.88	273.19	.000	Weir: H =2.10ft

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = R0 (Stand Pipe)

Upstream ID = (Pond Water Surface)
DNstream ID = TW (Pond Outfall)

WS Elev, Device Q	Tail Water	Notes
WS Elev. ft	Q cfs	TW Elev Converge ft	+/-ft	Computation Messages
275.40	61.00	273.19	.000	Weir: H =2.20ft
275.50	65.20	273.19	.000	Weir: H =2.30ft
275.60	69.50	273.19	.000	Weir: H =2.40ft
275.70	73.89	273.19	.000	Weir: H =2.50ft
275.80	78.36	273.19	.000	Weir: H =2.60ft
275.90	82.93	273.19	.000	Weir: H =2.70ft
276.00	87.58	273.19	.000	Weir: H =2.80ft

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = O0 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
DNstream ID = TW (Pond Outfall)

WS Elev, Device Q	Tail Water	Notes
WS Elev. ft	Q cfs	TW Elev ft	Converge +/-ft	Computation Messages
264.00	-41.18	273.19	.000	
	REVERSE: H =8.44			
264.10	-41.18	273.19	.000	
	REVERSE: H =8.44			
264.20	-41.18	273.19	.000	
	REVERSE: H =8.44			
264.30	-41.18	273.19	.000	
	REVERSE: H =8.44			
264.40	-41.18	273.19	.000	
	REVERSE: H =8.44			
264.50	-41.18	273.19	.000	
	REVERSE: H =8.44			
264.60	-41.18	273.19	.000	
	REVERSE: H =8.44			
264.70	-41.18	273.19	.000	
	REVERSE: H =8.44			
264.80	-41.06	273.19	.000	
	REVERSE: H =8.39			
264.90	-40.81	273.19	.000	
	REVERSE: H =8.29			
265.00	-40.57	273.19	.000	
	REVERSE: H =8.19			
265.10	-40.32	273.19	.000	
	REVERSE: H =8.09			
265.20	-40.07	273.19	.000	
	REVERSE: H =7.99			
265.30	-39.82	273.19	.000	
	REVERSE: H =7.89			
265.40	-39.56	273.19	.000	
	REVERSE: H =7.79			
265.50	-39.31	273.19	.000	
	REVERSE: H =7.69			
265.60	-39.05	273.19	.000	
	REVERSE: H =7.59			

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = O0 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
DNstream ID = TW (Pond Outfall)

WS Elev, Device Q	Tail Water	Notes
WS Elev. ft	Q cfs	TW Elev ft	Converge +/-ft	Computation Messages
265.70	-38.80	273.19	.000	
	REVERSE: H =7.49			
265.80	-38.54	273.19	.000	
	REVERSE: H =7.39			
265.90	-38.27	273.19	.000	
	REVERSE: H =7.29			
266.00	-38.01	273.19	.000	
	REVERSE: H =7.19			
266.10	-37.75	273.19	.000	
	REVERSE: H =7.09			
266.20	-37.48	273.19	.000	
	REVERSE: H =6.99			
266.30	-37.21	273.19	.000	
	REVERSE: H =6.89			
266.40	-36.94	273.19	.000	
	REVERSE: H =6.79			
266.50	-36.67	273.19	.000	
	REVERSE: H =6.69			
266.60	-36.39	273.19	.000	
	REVERSE: H =6.59			
266.70	-36.11	273.19	.000	
	REVERSE: H =6.49			
266.80	-35.83	273.19	.000	
	REVERSE: H =6.39			
266.90	-35.55	273.19	.000	
	REVERSE: H =6.29			
267.00	-35.27	273.19	.000	
	REVERSE: H =6.19			
267.10	-34.98	273.19	.000	
	REVERSE: H =6.09			
267.20	-34.69	273.19	.000	
	REVERSE: H =5.99			
267.30	-34.40	273.19	.000	
	REVERSE: H =5.89			

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = O0 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
DNstream ID = TW (Pond Outfall)

WS Elev, ft	Device Q, cfs	Tail Water TW Elev, ft	Converge +/-ft	Notes / Computation Messages
267.40	-34.11	273.19	.000	
		REVERSE: H =5.79		
267.50	-33.81	273.19	.000	
		REVERSE: H =5.69		
267.60	-33.52	273.19	.000	
		REVERSE: H =5.59		
267.70	-33.21	273.19	.000	
		REVERSE: H =5.49		
267.80	-32.91	273.19	.000	
		REVERSE: H =5.39		
267.87	-32.70	273.19	.000	
		REVERSE: H =5.32		
267.90	-32.60	273.19	.000	
		REVERSE: H =5.29		
268.00	-32.29	273.19	.000	
		REVERSE: H =5.19		
268.10	-31.98	273.19	.000	
		REVERSE: H =5.09		
268.20	-31.67	273.19	.000	
		REVERSE: H =4.99		
268.30	-31.35	273.19	.000	
		REVERSE: H =4.89		
268.40	-31.02	273.19	.000	
		REVERSE: H =4.79		
268.50	-30.70	273.19	.000	
		REVERSE: H =4.69		
268.60	-30.37	273.19	.000	
		REVERSE: H =4.59		
268.70	-30.04	273.19	.000	
		REVERSE: H =4.49		
268.80	-29.70	273.19	.000	
		REVERSE: H =4.39		
268.90	-29.36	273.19	.000	
		REVERSE: H =4.29		

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = O0 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
DNstream ID = TW (Pond Outfall)

WS Elev, ft	Device Q, cfs	Tail Water TW Elev, ft	Converge +/-ft	Notes Computation Messages
269.00	-29.02	273.19	.000	
	REVERSE: H =4.19			
269.10	-28.67	273.19	.000	
	REVERSE: H =4.09			
269.20	-28.32	273.19	.000	
	REVERSE: H =3.99			
269.30	-27.96	273.19	.000	
	REVERSE: H =3.89			
269.40	-27.60	273.19	.000	
	REVERSE: H =3.79			
269.50	-27.23	273.19	.000	
	REVERSE: H =3.69			
269.60	-26.86	273.19	.000	
	REVERSE: H =3.59			
269.70	-26.48	273.19	.000	
	REVERSE: H =3.49			
269.80	-26.10	273.19	.000	
	REVERSE: H =3.39			
269.90	-25.71	273.19	.000	
	REVERSE: H =3.29			
270.00	-25.32	273.19	.000	
	REVERSE: H =3.19			
270.10	-24.92	273.19	.000	
	REVERSE: H =3.09			
270.20	-24.51	273.19	.000	
	REVERSE: H =2.99			
270.30	-24.10	273.19	.000	
	REVERSE: H =2.89			
270.40	-23.68	273.19	.000	
	REVERSE: H =2.79			
270.50	-23.25	273.19	.000	
	REVERSE: H =2.69			
270.60	-22.81	273.19	.000	
	REVERSE: H =2.59			

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = O0 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
DNstream ID = TW (Pond Outfall)

WS Elev, ft	Device Q, cfs	Tail Water TW Elev, ft	Converge +/-ft	Notes / Computation Messages
270.70	-22.37	273.19	.000	REVERSE: H =2.49
270.80	-21.91	273.19	.000	REVERSE: H =2.39
270.90	-21.45	273.19	.000	REVERSE: H =2.29
271.00	-20.98	273.19	.000	REVERSE: H =2.19
271.10	-20.49	273.19	.000	REVERSE: H =2.09
271.20	-20.00	273.19	.000	REVERSE: H =1.99
271.30	-19.49	273.19	.000	REVERSE: H =1.89
271.40	-18.97	273.19	.000	REVERSE: H =1.79
271.50	-18.43	273.19	.000	REVERSE: H =1.69
271.60	-17.87	273.19	.000	REVERSE: H =1.59
271.70	-17.30	273.19	.000	REVERSE: H =1.49
271.80	-16.71	273.19	.000	REVERSE: H =1.39
271.90	-16.10	273.19	.000	REVERSE: H =1.29
272.00	-15.46	273.19	.000	REVERSE: H =1.19
272.10	-14.80	273.19	.000	REVERSE: H =1.09
272.20	-14.10	273.19	.000	REVERSE: H =.99
272.30	-13.37	273.19	.000	REVERSE: H =.89

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = O0 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
DNstream ID = TW (Pond Outfall)

WS Elev, ft	Device Q, cfs	Tail Water TW Elev, ft	Converge +/-ft	Notes / Computation Messages
272.40	-12.60	273.19	.000	REVERSE: H =.79
272.50	-11.78	273.19	.000	REVERSE: H =.69
272.60	-10.89	273.19	.000	REVERSE: H =.59
272.70	-9.92	273.19	.000	REVERSE: H =.49
272.80	-8.85	273.19	.000	REVERSE: H =.39
272.90	-7.63	273.19	.000	REVERSE: H =.29
273.00	-6.18	273.19	.000	REVERSE: H =.19
273.10	-4.25	273.19	.000	REVERSE: H =.09
273.20	1.42	273.19	.000	H =.01
273.30	4.70	273.19	.000	H =.11
273.40	6.50	273.19	.000	H =.21
273.50	7.89	273.19	.000	H =.31
273.60	9.08	273.19	.000	H =.41
273.70	10.12	273.19	.000	H =.51
273.80	11.07	273.19	.000	H =.61
273.90	11.94	273.19	.000	H =.71
274.00	12.76	273.19	.000	H =.81

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = O0 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
DNstream ID = TW (Pond Outfall)

WS Elev, Device Q	Tail Water	Notes
WS Elev. ft	Q cfs	TW Elev Converge ft	+/-ft	Computation Messages
274.10	13.52	273.19	.000	
	H =.91			
274.20	14.25	273.19	.000	
	H =1.01			
274.30	14.93	273.19	.000	
	H =1.11			
274.40	15.59	273.19	.000	
	H =1.21			
274.50	16.22	273.19	.000	
	H =1.31			
274.60	16.83	273.19	.000	
	H =1.41			
274.70	17.42	273.19	.000	
	H =1.51			
274.80	17.99	273.19	.000	
	H =1.61			
274.90	18.54	273.19	.000	
	H =1.71			
275.00	19.07	273.19	.000	
	H =1.81			
275.10	19.59	273.19	.000	
	H =1.91			
275.20	20.10	273.19	.000	
	H =2.01			
275.30	20.59	273.19	.000	
	H =2.11			
275.40	21.07	273.19	.000	
	H =2.21			
275.50	21.54	273.19	.000	
	H =2.31			
275.60	22.01	273.19	.000	
	H =2.41			
275.70	22.46	273.19	.000	
	H =2.51			

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = O0 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
DNstream ID = TW (Pond Outfall)

WS Elev, ft	Device Q, cfs	Tail Water TW Elev, ft	Converge +/-ft	Notes Computation Messages
275.80	22.90	273.19	.000	
	H =2.61			
275.90	23.34	273.19	.000	
	H =2.71			
276.00	23.76	273.19	.000	
	H =2.81			

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = W0 (Weir-Rectangular)

Upstream ID = (Pond Water Surface)
DNstream ID = TW (Pond Outfall)

WS Elev, Device Q		Tail Water		Notes
WS Elev. ft	Q cfs	TW Elev ft	Converge +/-ft	Computation Messages
264.00	.00	REVERSE: Flow is closed off		
264.10	.00	REVERSE: Flow is closed off		
264.20	.00	REVERSE: Flow is closed off		
264.30	.00	REVERSE: Flow is closed off		
264.40	.00	REVERSE: Flow is closed off		
264.50	.00	REVERSE: Flow is closed off		
264.60	.00	REVERSE: Flow is closed off		
264.70	.00	REVERSE: Flow is closed off		
264.80	.00	REVERSE: Flow is closed off		
264.90	.00	REVERSE: Flow is closed off		
265.00	.00	REVERSE: Flow is closed off		
265.10	.00	REVERSE: Flow is closed off		
265.20	.00	REVERSE: Flow is closed off		
265.30	.00	REVERSE: Flow is closed off		
265.40	.00	REVERSE: Flow is closed off		
265.50	.00	REVERSE: Flow is closed off		
265.60	.00	REVERSE: Flow is closed off		
265.70	.00	REVERSE: Flow is closed off		
265.80	.00	REVERSE: Flow is closed off		
265.90	.00	REVERSE: Flow is closed off		
266.00	.00	REVERSE: Flow is closed off		
266.10	.00	REVERSE: Flow is closed off		
266.20	.00	REVERSE: Flow is closed off		
266.30	.00	REVERSE: Flow is closed off		
266.40	.00	REVERSE: Flow is closed off		
266.50	.00	REVERSE: Flow is closed off		
266.60	.00	REVERSE: Flow is closed off		
266.70	.00	REVERSE: Flow is closed off		
266.80	.00	REVERSE: Flow is closed off		
266.90	.00	REVERSE: Flow is closed off		
267.00	.00	REVERSE: Flow is closed off		
267.10	.00	REVERSE: Flow is closed off		
267.20	.00	REVERSE: Flow is closed off		
267.30	.00	REVERSE: Flow is closed off		

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = W0 (Weir-Rectangular)

Upstream ID = (Pond Water Surface)
DNstream ID = TW (Pond Outfall)

WS Elev, Device Q		Tail Water		Notes
WS Elev. ft	Q cfs	TW Elev ft	Converge +/-ft	Computation Messages
267.40	.00	REVERSE: Flow is closed off		
267.50	.00	REVERSE: Flow is closed off		
267.60	.00	REVERSE: Flow is closed off		
267.70	.00	REVERSE: Flow is closed off		
267.80	.00	REVERSE: Flow is closed off		
267.87	.00	REVERSE: Flow is closed off		
267.90	.00	REVERSE: Flow is closed off		
268.00	.00	REVERSE: Flow is closed off		
268.10	.00	REVERSE: Flow is closed off		
268.20	.00	REVERSE: Flow is closed off		
268.30	.00	REVERSE: Flow is closed off		
268.40	.00	REVERSE: Flow is closed off		
268.50	.00	REVERSE: Flow is closed off		
268.60	.00	REVERSE: Flow is closed off		
268.70	.00	REVERSE: Flow is closed off		
268.80	.00	REVERSE: Flow is closed off		
268.90	.00	REVERSE: Flow is closed off		
269.00	.00	REVERSE: Flow is closed off		
269.10	.00	REVERSE: Flow is closed off		
269.20	.00	REVERSE: Flow is closed off		
269.30	.00	REVERSE: Flow is closed off		
269.40	.00	REVERSE: Flow is closed off		
269.50	.00	REVERSE: Flow is closed off		
269.60	.00	REVERSE: Flow is closed off		
269.70	.00	REVERSE: Flow is closed off		
269.80	.00	REVERSE: Flow is closed off		
269.90	.00	REVERSE: Flow is closed off		
270.00	.00	REVERSE: Flow is closed off		
270.10	.00	REVERSE: Flow is closed off		
270.20	.00	REVERSE: Flow is closed off		
270.30	.00	REVERSE: Flow is closed off		
270.40	.00	REVERSE: Flow is closed off		
270.50	.00	REVERSE: Flow is closed off		
270.60	.00	REVERSE: Flow is closed off		

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = W0 (Weir-Rectangular)

Upstream ID = (Pond Water Surface)
DNstream ID = TW (Pond Outfall)

WS Elev, Device Q	Tail Water	Notes
WS Elev. ft	Q cfs	TW Elev ft	Converge +/-ft	Computation Messages
270.70	.00	REVERSE: Flow is closed off
270.80	.00	REVERSE: Flow is closed off
270.90	.00	REVERSE: Flow is closed off
271.00	.00	REVERSE: Flow is closed off
271.10	.00	REVERSE: Flow is closed off
271.20	.00	REVERSE: Flow is closed off
271.30	.00	REVERSE: Flow is closed off
271.40	.00	REVERSE: Flow is closed off
271.50	.00	REVERSE: Flow is closed off
271.60	.00	REVERSE: Flow is closed off
271.70	.00	REVERSE: Flow is closed off
271.80	.00	REVERSE: Flow is closed off
271.90	.00	REVERSE: Flow is closed off
272.00	.00	REVERSE: Flow is closed off
272.10	.00	REVERSE: Flow is closed off
272.20	.00	REVERSE: Flow is closed off
272.30	.00	REVERSE: Flow is closed off
272.40	.00	REVERSE: Flow is closed off
272.50	.00	REVERSE: Flow is closed off
272.60	.00	REVERSE: Flow is closed off
272.70	.00	REVERSE: Flow is closed off
272.80	.00	REVERSE: Flow is closed off
272.90	.00	REVERSE: Flow is closed off
273.00	.00	REVERSE: Flow is closed off
273.10	.00	REVERSE: Flow is closed off
273.20	.00	273.19 .000 HW & TW below Inv.El.=274.000
273.30	.00	273.19 .000 HW & TW below Inv.El.=274.000
273.40	.00	273.19 .000 HW & TW below Inv.El.=274.000
273.50	.00	273.19 .000 HW & TW below Inv.El.=274.000
273.60	.00	273.19 .000 HW & TW below Inv.El.=274.000

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = W0 (Weir-Rectangular)

Upstream ID = (Pond Water Surface)
DNstream ID = TW (Pond Outfall)

WS Elev, ft	Device Q, cfs	Tail Water TW Elev, ft	Converge +/-ft	Notes Computation Messages
273.70	.00	273.19	.000	HW & TW below Inv.El.=274.000
273.80	.00	273.19	.000	HW & TW below Inv.El.=274.000
273.90	.00	273.19	.000	HW & TW below Inv.El.=274.000
274.00	.00	273.19	.000	H=.00; Htw=.00; Qfree=.00; K=1.000
274.10	16.32	273.19	.000	H=.10; Htw=.00; Qfree=16.32; K=1.000
274.20	46.16	273.19	.000	H=.20; Htw=.00; Qfree=46.16; K=1.000
274.30	84.78	273.19	.000	H=.30; Htw=.00; Qfree=84.78; K=1.000
274.40	130.54	273.19	.000	H=.40; Htw=.00; Qfree=130.54; K=1.000
274.50	182.43	273.19	.000	H=.50; Htw=.00; Qfree=182.43; K=1.000
274.60	239.82	273.19	.000	H=.60; Htw=.00; Qfree=239.82; K=1.000
274.70	302.21	273.19	.000	H=.70; Htw=.00; Qfree=302.21; K=1.000
274.80	369.21	273.19	.000	H=.80; Htw=.00; Qfree=369.21; K=1.000
274.90	440.56	273.19	.000	H=.90; Htw=.00; Qfree=440.56; K=1.000
275.00	516.00	273.19	.000	H=1.00; Htw=.00; Qfree=516.00; K=1.000
275.10	595.31	273.19	.000	H=1.10; Htw=.00; Qfree=595.31; K=1.000
275.20	678.31	273.19	.000	H=1.20; Htw=.00; Qfree=678.31; K=1.000
275.30	764.82	273.19	.000	H=1.30; Htw=.00; Qfree=764.82; K=1.000

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = W0 (Weir-Rectangular)

Upstream ID = (Pond Water Surface)
DNstream ID = TW (Pond Outfall)

WS Elev, ft	Device Q, cfs	Tail Water TW Elev, ft	Converge +/-ft	Notes Computation Messages
275.40	854.75	273.19	.000	H=1.40; Htw=.00; Qfree=854.75; K=1.000
275.50	947.95	273.19	.000	H=1.50; Htw=.00; Qfree=947.95; K=1.000
275.60	1044.32	273.19	.000	H=1.60; Htw=.00; Qfree=1044.32; K=1.000
275.70	1143.74	273.19	.000	H=1.70; Htw=.00; Qfree=1143.74; K=1.000
275.80	1246.10	273.19	.000	H=1.80; Htw=.00; Qfree=1246.10; K=1.000
275.90	1351.38	273.19	.000	H=1.90; Htw=.00; Qfree=1351.38; K=1.000
276.00	1459.47	273.19	.000	H=2.00; Htw=.00; Qfree=1459.47; K=1.000

***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .000 (+/- ft)

WS Elev, Total Q		Converge		Notes
Elev. ft	Q cfs	TW Elev ft	Error +/-ft	Contributing Structures
264.00	-106.51	273.19	.000	O1 +O0
264.10	-106.51	273.19	.000	O1 +O0
264.20	-106.51	273.19	.000	O1 +O0
264.30	-106.51	273.19	.000	O1 +O0
264.40	-106.51	273.19	.000	O1 +O0
264.50	-106.51	273.19	.000	O1 +O0
264.60	-106.51	273.19	.000	O1 +O0
264.70	-106.51	273.19	.000	O1 +O0
264.80	-106.39	273.19	.000	O1 +O0
264.90	-106.14	273.19	.000	O1 +O0
265.00	-105.89	273.19	.000	O1 +O0
265.10	-105.65	273.19	.000	O1 +O0
265.20	-105.40	273.19	.000	O1 +O0
265.30	-105.14	273.19	.000	O1 +O0
265.40	-104.89	273.19	.000	O1 +O0
265.50	-104.64	273.19	.000	O1 +O0
265.60	-104.38	273.19	.000	O1 +O0
265.70	-104.12	273.19	.000	O1 +O0
265.80	-103.86	273.19	.000	O1 +O0
265.90	-103.60	273.19	.000	O1 +O0
266.00	-103.34	273.19	.000	O1 +O0
266.10	-103.07	273.19	.000	O1 +O0
266.20	-102.80	273.19	.000	O1 +O0
266.30	-102.54	273.19	.000	O1 +O0
266.40	-102.26	273.19	.000	O1 +O0
266.50	-101.99	273.19	.000	O1 +O0
266.60	-101.72	273.19	.000	O1 +O0
266.70	-101.44	273.19	.000	O1 +O0
266.80	-101.16	273.19	.000	O1 +O0
266.90	-100.88	273.19	.000	O1 +O0
267.00	-100.59	273.19	.000	O1 +O0
267.10	-100.31	273.19	.000	O1 +O0
267.20	-100.02	273.19	.000	O1 +O0
267.30	-99.73	273.19	.000	O1 +O0
267.40	-99.44	273.19	.000	O1 +O0
267.50	-99.14	273.19	.000	O1 +O0

***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .000 (+/- ft)

WS Elev, Total Q		Converge		Notes
Elev. ft	Q cfs	TW Elev ft	Error +/-ft	Contributing Structures
267.60	-98.84	273.19	.000	O1 +O0
267.70	-98.54	273.19	.000	O1 +O0
267.80	-98.24	273.19	.000	O1 +O0
267.87	-98.02	273.19	.000	O1 +O0
267.90	-97.93	273.19	.000	O1 +O0
268.00	-97.62	273.19	.000	O1 +O0
268.10	-97.31	273.19	.000	O1 +O0
268.20	-96.99	273.19	.000	O1 +O0
268.30	-96.67	273.19	.000	O1 +O0
268.40	-96.35	273.19	.000	O1 +O0
268.50	-96.03	273.19	.000	O1 +O0
268.60	-95.70	273.19	.000	O1 +O0
268.70	-95.36	273.19	.000	O1 +O0
268.80	-95.03	273.19	.000	O1 +O0
268.90	-94.69	273.19	.000	O1 +O0
269.00	-94.30	273.19	.000	O1 +O0
269.10	-93.17	273.19	.000	O1 +O0
269.20	-92.03	273.19	.000	O1 +O0
269.30	-90.87	273.19	.000	O1 +O0
269.40	-89.69	273.19	.000	O1 +O0
269.50	-88.50	273.19	.000	O1 +O0
269.60	-87.29	273.19	.000	O1 +O0
269.70	-86.07	273.19	.000	O1 +O0
269.80	-84.83	273.19	.000	O1 +O0
269.90	-83.56	273.19	.000	O1 +O0
270.00	-82.28	273.19	.000	O1 +O0
270.10	-80.98	273.19	.000	O1 +O0
270.20	-79.66	273.19	.000	O1 +O0
270.30	-78.32	273.19	.000	O1 +O0
270.40	-76.95	273.19	.000	O1 +O0
270.50	-75.56	273.19	.000	O1 +O0
270.60	-74.14	273.19	.000	O1 +O0
270.70	-72.70	273.19	.000	O1 +O0
270.80	-71.22	273.19	.000	O1 +O0
270.90	-69.72	273.19	.000	O1 +O0
271.00	-68.18	273.19	.000	O1 +O0

***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .000 (+/- ft)

WS Elev, Total Q		Notes		
		Converge		
Elev. ft	Q cfs	TW Elev ft	Error +/-ft	Contributing Structures
271.10	-66.60	273.19	.000	O1 +O0
271.20	-64.99	273.19	.000	O1 +O0
271.30	-63.34	273.19	.000	O1 +O0
271.40	-61.64	273.19	.000	O1 +O0
271.50	-59.89	273.19	.000	O1 +O0
271.60	-58.09	273.19	.000	O1 +O0
271.70	-56.24	273.19	.000	O1 +O0
271.80	-54.32	273.19	.000	O1 +O0
271.90	-52.33	273.19	.000	O1 +O0
272.00	-50.26	273.19	.000	O1 +O0
272.10	-48.10	273.19	.000	O1 +O0
272.20	-45.84	273.19	.000	O1 +O0
272.30	-43.46	273.19	.000	O1 +O0
272.40	-40.95	273.19	.000	O1 +O0
272.50	-38.27	273.19	.000	O1 +O0
272.60	-35.39	273.19	.000	O1 +O0
272.70	-32.25	273.19	.000	O1 +O0
272.80	-28.77	273.19	.000	O1 +O0
272.90	-24.81	273.19	.000	O1 +O0
273.00	-20.08	273.19	.000	O1 +O0
273.10	-13.82	273.19	.000	O1 +O0
273.20	4.61	273.19	.000	O1 +R0 +O0
273.30	15.87	273.19	.000	O1 +R0 +O0
273.40	22.78	273.19	.000	O1 +R0 +O0
273.50	28.72	273.19	.000	O1 +R0 +O0
273.60	34.23	273.19	.000	O1 +R0 +O0
273.70	39.51	273.19	.000	O1 +R0 +O0
273.80	44.67	273.19	.000	O1 +R0 +O0
273.90	49.77	273.19	.000	O1 +R0 +O0
274.00	54.84	273.19	.000	O1 +R0 +O0 +W0
274.10	76.23	273.19	.000	O1 +R0 +O0 +W0
274.20	111.15	273.19	.000	O1 +R0 +O0 +W0
274.30	154.88	273.19	.000	O1 +R0 +O0 +W0
274.40	205.78	273.19	.000	O1 +R0 +O0 +W0
274.50	262.87	273.19	.000	O1 +R0 +O0 +W0
274.60	325.49	273.19	.000	O1 +R0 +O0 +W0

***** COMPOSITE OUTFLOW SUMMARY ****

CUMULATIVE HGL CONVERGENCE ERROR .000 (+/- ft)

WS Elev, Total Q		Converge		Notes
Elev. ft	Q cfs	TW Elev ft	Error +/-ft	Contributing Structures
274.70	393.16	273.19	.000	O1 +R0 +O0 +W0
274.80	465.50	273.19	.000	O1 +R0 +O0 +W0
274.90	542.24	273.19	.000	O1 +R0 +O0 +W0
275.00	623.12	273.19	.000	O1 +R0 +O0 +W0
275.10	707.93	273.19	.000	O1 +R0 +O0 +W0
275.20	796.50	273.19	.000	O1 +R0 +O0 +W0
275.30	888.62	273.19	.000	O1 +R0 +O0 +W0
275.40	984.23	273.19	.000	O1 +R0 +O0 +W0
275.50	1083.18	273.19	.000	O1 +R0 +O0 +W0
275.60	1185.34	273.19	.000	O1 +R0 +O0 +W0
275.70	1290.62	273.19	.000	O1 +R0 +O0 +W0
275.80	1398.90	273.19	.000	O1 +R0 +O0 +W0
275.90	1510.15	273.19	.000	O1 +R0 +O0 +W0
276.00	1624.28	273.19	.000	O1 +R0 +O0 +W0

LEVEL POOL ROUTING DATA

HYG Dir = F:\06-14\hydro\pondpack\
Inflow HYG file = work_pad.hyg - DET. POND IN 100
Outflow HYG file = work_pad.hyg - DET. POND OUT 100

Pond Node Data = DET. POND
Pond Volume Data = DET. POND
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	= 264.00 ft
Starting Volume	= .000 ac-ft
Starting Outflow	= -106.51 cfs
Starting Infiltr.	= .00 cfs
Starting Total Qout	= -106.51 cfs
Time Increment	= .0250 hrs

Elevation ft	Outflow cfs	Storage ac-ft	Infilt. cfs	Q Total cfs	2S/t + O cfs
264.00	-106.51	.000	.00	-106.51	-106.51
264.10	-106.51	.033	.00	-106.51	-74.32
264.20	-106.51	.067	.00	-106.51	-42.13
264.30	-106.51	.100	.00	-106.51	-9.95
264.40	-106.51	.133	.00	-106.51	22.23
264.50	-106.51	.166	.00	-106.51	54.42
264.60	-106.51	.200	.00	-106.51	86.61
264.70	-106.51	.233	.00	-106.51	118.80
264.80	-106.39	.266	.00	-106.39	151.10
264.90	-106.14	.299	.00	-106.14	183.53
265.00	-105.89	.333	.00	-105.89	215.97
265.10	-105.65	.366	.00	-105.65	248.40
265.20	-105.40	.399	.00	-105.40	280.84
265.30	-105.14	.432	.00	-105.14	313.27
265.40	-104.89	.465	.00	-104.89	345.71
265.50	-104.64	.499	.00	-104.64	378.15
265.60	-104.38	.532	.00	-104.38	410.60
265.70	-104.12	.565	.00	-104.12	443.04
265.80	-103.86	.598	.00	-103.86	475.48
265.90	-103.60	.632	.00	-103.60	507.93

LEVEL POOL ROUTING DATA

HYG Dir = F:\06-14\hydro\pondpack\
Inflow HYG file = work_pad.hyg - DET. POND IN 100
Outflow HYG file = work_pad.hyg - DET. POND OUT 100

Pond Node Data = DET. POND
Pond Volume Data = DET. POND
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	= 264.00 ft
Starting Volume	= .000 ac-ft
Starting Outflow	= -106.51 cfs
Starting Infiltr.	= .00 cfs
Starting Total Qout	= -106.51 cfs
Time Increment	= .0250 hrs

Elevation ft	Outflow cfs	Storage ac-ft	Infilt. cfs	Q Total cfs	2S/t + O cfs
266.00	-103.34	.665	.00	-103.34	540.38
266.10	-103.07	.753	.00	-103.07	625.50
266.20	-102.80	.840	.00	-102.80	710.62
266.30	-102.54	.928	.00	-102.54	795.71
266.40	-102.26	1.016	.00	-102.26	880.83
266.50	-101.99	1.103	.00	-101.99	965.95
266.60	-101.72	1.191	.00	-101.72	1051.08
266.70	-101.44	1.279	.00	-101.44	1136.21
266.80	-101.16	1.366	.00	-101.16	1221.31
266.90	-100.88	1.454	.00	-100.88	1306.44
267.00	-100.59	1.542	.00	-100.59	1391.58
267.10	-100.31	1.629	.00	-100.31	1476.71
267.20	-100.02	1.717	.00	-100.02	1561.85
267.30	-99.73	1.804	.00	-99.73	1646.97
267.40	-99.44	1.892	.00	-99.44	1732.11
267.50	-99.14	1.980	.00	-99.14	1817.26
267.60	-98.84	2.067	.00	-98.84	1902.41
267.70	-98.54	2.155	.00	-98.54	1987.56
267.80	-98.24	2.243	.00	-98.24	2072.69
267.87	-98.02	2.304	.00	-98.02	2132.30

LEVEL POOL ROUTING DATA

HYG Dir = F:\06-14\hydro\pondpack\
Inflow HYG file = work_pad.hyg - DET. POND IN 100
Outflow HYG file = work_pad.hyg - DET. POND OUT 100

Pond Node Data = DET. POND
Pond Volume Data = DET. POND
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev = 264.00 ft
Starting Volume = .000 ac-ft
Starting Outflow = -106.51 cfs
Starting Infiltr. = .00 cfs
Starting Total Qout= -106.51 cfs
Time Increment = .0250 hrs

Elevation ft	Outflow cfs	Storage ac-ft	Infilt. cfs	Q Total cfs	2S/t + O cfs
267.90	-97.93	2.330	.00	-97.93	2157.84
268.00	-97.62	2.418	.00	-97.62	2243.00
268.10	-97.31	2.554	.00	-97.31	2375.31
268.20	-96.99	2.691	.00	-96.99	2507.62
268.30	-96.67	2.827	.00	-96.67	2639.90
268.40	-96.35	2.963	.00	-96.35	2772.21
268.50	-96.03	3.100	.00	-96.03	2904.53
268.60	-95.70	3.236	.00	-95.70	3036.86
268.70	-95.36	3.372	.00	-95.36	3169.18
268.80	-95.03	3.509	.00	-95.03	3301.48
268.90	-94.69	3.645	.00	-94.69	3433.81
269.00	-94.30	3.782	.00	-94.30	3566.19
269.10	-93.17	3.918	.00	-93.17	3699.32
269.20	-92.03	4.054	.00	-92.03	3832.46
269.30	-90.87	4.191	.00	-90.87	3965.57
269.40	-89.69	4.327	.00	-89.69	4098.74
269.50	-88.50	4.463	.00	-88.50	4231.93
269.60	-87.29	4.600	.00	-87.29	4365.13
269.70	-86.07	4.736	.00	-86.07	4498.35
269.80	-84.83	4.872	.00	-84.83	4631.55

LEVEL POOL ROUTING DATA

HYG Dir = F:\06-14\hydro\pondpack\
Inflow HYG file = work_pad.hyg - DET. POND IN 100
Outflow HYG file = work_pad.hyg - DET. POND OUT 100

Pond Node Data = DET. POND
Pond Volume Data = DET. POND
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev = 264.00 ft
Starting Volume = .000 ac-ft
Starting Outflow = -106.51 cfs
Starting Infiltr. = .00 cfs
Starting Total Qout= -106.51 cfs
Time Increment = .0250 hrs

Elevation ft	Outflow cfs	Storage ac-ft	Infilt. cfs	Q Total cfs	2S/t + O cfs
269.90	-83.56	5.009	.00	-83.56	4764.80
270.00	-82.28	5.145	.00	-82.28	4898.08
270.10	-80.98	5.308	.00	-80.98	5057.51
270.20	-79.66	5.472	.00	-79.66	5216.96
270.30	-78.32	5.635	.00	-78.32	5376.39
270.40	-76.95	5.798	.00	-76.95	5535.89
270.50	-75.56	5.962	.00	-75.56	5695.41
270.60	-74.14	6.125	.00	-74.14	5854.96
270.70	-72.70	6.288	.00	-72.70	6014.54
270.80	-71.22	6.452	.00	-71.22	6174.10
270.90	-69.72	6.615	.00	-69.72	6333.74
271.00	-68.18	6.779	.00	-68.18	6493.41
271.10	-66.60	6.942	.00	-66.60	6653.12
271.20	-64.99	7.105	.00	-64.99	6812.86
271.30	-63.34	7.269	.00	-63.34	6972.60
271.40	-61.64	7.432	.00	-61.64	7132.43
271.50	-59.89	7.595	.00	-59.89	7292.31
271.60	-58.09	7.759	.00	-58.09	7452.24
271.70	-56.24	7.922	.00	-56.24	7612.23
271.80	-54.32	8.085	.00	-54.32	7772.23

LEVEL POOL ROUTING DATA

HYG Dir = F:\06-14\hydro\pondpack\
Inflow HYG file = work_pad.hyg - DET. POND IN 100
Outflow HYG file = work_pad.hyg - DET. POND OUT 100

Pond Node Data = DET. POND
Pond Volume Data = DET. POND
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev = 264.00 ft
Starting Volume = .000 ac-ft
Starting Outflow = -106.51 cfs
Starting Infiltr. = .00 cfs
Starting Total Qout= -106.51 cfs
Time Increment = .0250 hrs

Elevation ft	Outflow cfs	Storage ac-ft	Infilt. cfs	Q Total cfs	2S/t + O cfs
271.90	-52.33	8.249	.00	-52.33	7932.36
272.00	-50.26	8.412	.00	-50.26	8092.56
272.10	-48.10	8.588	.00	-48.10	8265.15
272.20	-45.84	8.764	.00	-45.84	8437.83
272.30	-43.46	8.940	.00	-43.46	8610.58
272.40	-40.95	9.116	.00	-40.95	8783.52
272.50	-38.27	9.292	.00	-38.27	8956.63
272.60	-35.39	9.468	.00	-35.39	9129.94
272.70	-32.25	9.644	.00	-32.25	9303.50
272.80	-28.77	9.820	.00	-28.77	9477.35
272.90	-24.81	9.996	.00	-24.81	9651.74
273.00	-20.08	10.173	.00	-20.08	9826.90
273.10	-13.82	10.349	.00	-13.82	10003.59
273.20	4.61	10.525	.00	4.61	10192.44
273.30	15.87	10.701	.00	15.87	10374.08
273.40	22.78	10.877	.00	22.78	10551.42
273.50	28.72	11.053	.00	28.72	10727.78
273.60	34.23	11.229	.00	34.23	10903.72
273.70	39.51	11.405	.00	39.51	11079.42
273.80	44.67	11.581	.00	44.67	11254.96

LEVEL POOL ROUTING DATA

HYG Dir = F:\06-14\hydro\pondpack\
Inflow HYG file = work_pad.hyg - DET. POND IN 100
Outflow HYG file = work_pad.hyg - DET. POND OUT 100

Pond Node Data = DET. POND
Pond Volume Data = DET. POND
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev = 264.00 ft
Starting Volume = .000 ac-ft
Starting Outflow = -106.51 cfs
Starting Infiltr. = .00 cfs
Starting Total Qout= -106.51 cfs
Time Increment = .0250 hrs

Elevation ft	Outflow cfs	Storage ac-ft	Infilt. cfs	Q Total cfs	2S/t + O cfs
273.90	49.77	11.757	.00	49.77	11430.48
274.00	54.84	11.933	.00	54.84	11605.98
274.10	76.23	11.940	.00	76.23	11633.86
274.20	111.15	11.946	.00	111.15	11675.27
274.30	154.88	11.953	.00	154.88	11725.48
274.40	205.78	11.960	.00	205.78	11782.87
274.50	262.87	11.967	.00	262.87	11846.44
274.60	325.49	11.973	.00	325.49	11915.55
274.70	393.16	11.980	.00	393.16	11989.71
274.80	465.50	11.987	.00	465.50	12068.53
274.90	542.24	11.993	.00	542.24	12151.75
275.00	623.12	12.000	.00	623.12	12239.12
275.10	707.93	12.002	.00	707.93	12325.87
275.20	796.50	12.004	.00	796.50	12416.37
275.30	888.62	12.006	.00	888.62	12510.43
275.40	984.23	12.008	.00	984.23	12607.98
275.50	1083.18	12.010	.00	1083.18	12708.86
275.60	1185.34	12.012	.00	1185.34	12812.95
275.70	1290.62	12.014	.00	1290.62	12920.17
275.80	1398.90	12.016	.00	1398.90	13030.38

LEVEL POOL ROUTING DATA

HYG Dir = F:\06-14\hydro\pondpack\
Inflow HYG file = work_pad.hyg - DET. POND IN 100
Outflow HYG file = work_pad.hyg - DET. POND OUT 100

Pond Node Data = DET. POND
Pond Volume Data = DET. POND
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	264.00 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	-106.51 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	-106.51 cfs
Time Increment	=	.0250 hrs

Elevation ft	Outflow cfs	Storage ac-ft	Infilt. cfs	Q Total cfs	2S/t + O cfs
275.90	1510.15	12.018	.00	1510.15	13143.58
276.00	1624.28	12.020	.00	1624.28	13259.64

SUMMARY FOR HYDROGRAPH ADDITION
at Node: DET. POND IN

HYG Directory: F:\06-14\hydro\pondpack\

Upstream Link ID	Upstream Node ID	HYG file	HYG ID	HYG tag
WARNING: Missed peak when adding hydrograph...				
ADDLINK 10	RATHYDRO HG	work_pad.hyg	HYG 1	100

INFLOWS TO: DET. POND IN

HYG file	HYG ID	HYG tag	Volume ac-ft	Peak Time hrs	Peak Flow cfs
work_pad.hyg	HYG 1	100	57.832	4.2700	842.03

TOTAL FLOW INTO: DET. POND IN

HYG file	HYG ID	HYG tag	Volume ac-ft	Peak Time hrs	Peak Flow cfs
work_pad.hyg	DET. POND IN	100	57.827	4.2750	830.29

TOTAL NODE INFLOW...
HYG file = F:\06-14\hydro\pondpack\work_pad.hyg
HYG ID = DET. POND IN
HYG Tag = 100

Peak Discharge = 830.29 cfs
Time to Peak = 4.2750 hrs
HYG Volume = 57.827 ac-ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .0250 hrs
Time on left represents time for first value in each row.

Time hrs					
.0000	.00	3.39	6.79	10.18	13.57
.1250	16.97	20.36	23.75	27.15	30.54
.2500	33.93	37.33	40.72	41.60	41.84
.3750	42.09	42.33	42.58	42.83	43.07
.5000	43.32	43.56	43.81	44.06	44.30
.6250	44.48	44.62	44.76	44.90	45.04
.7500	45.18	45.32	45.46	45.60	45.74
.8750	45.88	46.02	46.23	46.56	46.89
1.0000	47.21	47.54	47.87	48.20	48.53
1.1250	48.85	49.18	49.51	49.84	50.14
1.2500	50.34	50.53	50.73	50.93	51.12
1.3750	51.32	51.52	51.71	51.91	52.11
1.5000	52.30	52.50	52.97	53.43	53.90
1.6250	54.37	54.84	55.30	55.77	56.24
1.7500	56.70	57.17	57.64	58.11	58.43
1.8750	58.72	59.00	59.29	59.58	59.86
2.0000	60.15	60.44	60.72	61.01	61.30
2.1250	61.59	62.15	62.89	63.64	64.39
2.2500	65.13	65.88	66.62	67.37	68.11
2.3750	68.86	69.61	70.35	70.99	71.48
2.5000	71.96	72.44	72.93	73.41	73.90
2.6250	74.38	74.86	75.35	75.83	76.31
2.7500	76.98	78.38	79.78	81.19	82.59
2.8750	83.99	85.39	86.79	88.19	89.60
3.0000	91.00	92.40	93.80	94.87	95.93
3.1250	97.00	98.06	99.13	100.19	101.26
3.2500	102.32	103.39	104.46	105.52	106.59
3.3750	110.08	114.18	118.28	122.37	126.47
3.5000	130.57	134.67	138.77	142.87	146.96
3.6250	151.06	155.16	157.50	158.68	159.85
3.7500	161.02	162.19	163.36	164.54	165.71

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .0250 hrs
Time on left represents time for first value in each row.

Time hrs					
3.8750	166.88	168.05	169.22	170.40	193.10
4.0000	248.09	303.09	358.08	413.08	468.07
4.1250	523.06	578.06	633.05	688.05	743.04
4.2500	798.03	830.29	771.58	712.87	654.17
4.3750	595.46	536.75	478.04	419.34	360.63
4.5000	301.92	243.22	184.51	125.80	122.39
4.6250	118.98	115.57	112.16	108.75	105.34
4.7500	101.93	98.52	95.11	91.70	88.29
4.8750	84.88	83.00	81.50	80.00	78.50
5.0000	77.00	75.50	74.00	72.50	71.00
5.1250	69.50	68.00	66.50	65.37	64.50
5.2500	63.62	62.74	61.87	60.99	60.11
5.3750	59.23	58.36	57.48	56.60	55.73
5.5000	54.96	54.37	53.78	53.19	52.60
5.6250	52.01	51.42	50.83	50.24	49.65
5.7500	49.06	48.47	47.91	47.49	47.06
5.8750	46.64	46.21	45.78	45.36	44.93
6.0000	44.50	44.08	43.65	43.23	42.80
6.1250	39.29	35.78	32.28	28.77	25.26
6.2500	21.75	18.24	14.73	11.23	7.72
6.3750	4.21	.70			

LEVEL POOL ROUTING SUMMARY

HYG Dir = F:\06-14\hydro\pondpack\
Inflow HYG file = work_pad.hyg - DET. POND IN 100
Outflow HYG file = work_pad.hyg - DET. POND OUT 100

Pond Node Data = DET. POND
Pond Volume Data = DET. POND
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	264.00 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	-106.51 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	-106.51 cfs
Time Increment	=	.0250 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	830.29 cfs	at	4.2750 hrs
Peak Outflow	=	829.46 cfs	at	4.2750 hrs
Peak Elevation	=	275.24 ft		
Peak Storage	=	12.005 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	57.827
- Infiltration	=	.000
- HYG Vol OUT	=	47.462
- Retained Vol	=	10.481
Unrouted Vol	=	.115 ac-ft (.200% of Inflow Volume)

WARNING: Inflow hydrograph truncated on right side.

DETENTION TIMES SUMMARY

HYG Dir = F:\06-14\hydro\pondpack\
Inflow HYG file = work_pad.hyg - DET. POND IN 100
Outflow HYG file = work_pad.hyg - DET. POND OUT 100

Pond Node Data = DET. POND
Pond Volume Data = DET. POND
Pond Outlet Data = Outlet 1

No Infiltration

APPROXIMATE DETENTION TIME

Tp, Outflow + Infilt.	=	4.2750 hrs
Tp, Total Inflow	=	4.2750 hrs
Peak to Peak	=	.0000 hrs

POND ROUTED TOTAL OUTFLOW HYG...
HYG file = F:\06-14\hydro\pondpack\work_pad.hyg
HYG ID = DET. POND OUT
HYG Tag = 100

POSITIVE FLOW		NEGATIVE FLOW	
Peak Discharge =	829.46 cfs	Peak Discharge =	-4.00 cfs
Time to Peak =	4.2750 hrs	Time to Peak =	2.5250 hrs
HYG Volume =	47.462 ac-ft	HYG Volume =	-.115 ac-ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .0250 hrs
Time on left represents time for first value in each row.

Time hrs					
.0000	-106.51	.00	.00	.00	.00
.1250	.00	.00	.00	.00	.00
.2500	.00	.00	.00	.00	.00
.3750	.00	.00	.00	.00	.00
.5000	.00	.00	.00	.00	.00
.6250	.00	.00	.00	.00	.00
.7500	.00	.00	.00	.00	.00
.8750	.00	.00	.00	.00	.00
1.0000	.00	.00	.00	.00	.00
1.1250	.00	.00	.00	.00	.00
1.2500	.00	.00	.00	.00	.00
1.3750	.00	.00	.00	.00	.00
1.5000	.00	.00	.00	.00	.00
1.6250	.00	.00	.00	.00	.00
1.7500	.00	.00	.00	.00	.00
1.8750	.00	.00	.00	.00	.00
2.0000	.00	.00	.00	.00	.00
2.1250	.00	.00	.00	.00	.00
2.2500	.00	.00	.00	.00	.00
2.3750	.00	.00	.00	.00	.00
2.5000	.00	-4.00	8.65	16.36	20.83
2.6250	24.68	28.05	31.04	33.83	36.38
2.7500	38.80	41.10	43.34	45.51	47.62
2.8750	49.69	51.72	53.70	76.62	97.32
3.0000	85.47	95.98	91.12	96.54	94.62
3.1250	97.73	97.39	99.42	99.82	101.35
3.2500	102.10	103.38	104.30	105.46	106.46
3.3750	109.62	113.94	117.92	122.11	126.14

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .0250 hrs
Time hrs | Time on left represents time for first value in each row.

Time hrs					
3.5000	130.29	134.35	138.47	142.55	146.67
3.6250	150.75	154.86	157.47	158.57	159.80
3.7500	160.93	162.13	163.28	164.47	165.63
3.8750	166.81	167.97	169.15	170.32	190.59
4.0000	244.29	300.85	354.95	410.95	465.32
4.1250	521.10	575.56	631.54	688.26	741.64
4.2500	798.20	829.46	773.60	712.20	656.12
4.3750	596.41	540.31	479.61	422.79	362.75
4.5000	305.45	246.01	188.49	129.82	119.85
4.6250	121.31	114.29	113.55	108.25	106.22
4.7500	101.86	99.10	95.25	92.14	88.52
4.8750	85.26	83.04	81.71	80.09	78.67
5.0000	77.12	75.71	74.24	72.72	71.23
5.1250	69.73	68.23	66.73	65.52	64.63
5.2500	63.76	62.87	62.00	61.12	60.24
5.3750	59.37	58.49	57.61	56.74	55.86
5.5000	55.07	54.82	54.78	54.71	54.60
5.6250	54.47	54.31	54.13	53.92	53.69
5.7500	53.44	53.17	52.88	52.58	52.28
5.8750	51.96	51.64	51.32	50.98	50.65
6.0000	50.30	49.96	49.60	49.24	48.88
6.1250	48.43	47.80	47.00	46.04	44.93
6.2500	43.68	42.29	40.77	39.13	37.34
6.3750	35.46	33.44	31.35	29.39	27.46
6.5000	25.61	23.88	22.20	20.47	18.87
6.6250	17.40	16.04	14.15	12.40	10.86
6.7500	9.52	8.34	7.30	6.40	5.60
6.8750	4.91	4.12	3.32	2.67	2.15
7.0000	1.73	1.39	1.12	.90	.73
7.1250	.58	.47	.38	.30	.24
7.2500	.20	.16	.13	.10	.08
7.3750	.07	.05	.04	.03	.03
7.5000	.02	.02	.01	.01	.01
7.6250	.01	.01	.00	.00	.00
7.7500	.00				

DIVERTED HYDROGRAPH...
HYG file = F:\06-14\hydro\pondpack\work_pad.hyg
HYG ID = ROUTE 10
HYG Tag = 100

Peak Discharge = 829.46 cfs
Time to Peak = 4.2750 hrs
HYG Volume = 47.462 ac-ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .0250 hrs
Time on left represents time for first value in each row.

Time hrs					
2.5250	-4.00	8.65	16.36	20.83	24.68
2.6500	28.05	31.04	33.83	36.38	38.80
2.7750	41.10	43.34	45.51	47.62	49.69
2.9000	51.72	53.70	76.62	97.32	85.47
3.0250	95.98	91.12	96.54	94.62	97.73
3.1500	97.39	99.42	99.82	101.35	102.10
3.2750	103.38	104.30	105.46	106.46	109.62
3.4000	113.94	117.92	122.11	126.14	130.29
3.5250	134.35	138.47	142.55	146.67	150.75
3.6500	154.86	157.47	158.57	159.80	160.93
3.7750	162.13	163.28	164.47	165.63	166.81
3.9000	167.97	169.15	170.32	190.59	244.29
4.0250	300.85	354.95	410.95	465.32	521.10
4.1500	575.56	631.54	688.26	741.64	798.20
4.2750	829.46	773.60	712.20	656.12	596.41
4.4000	540.31	479.61	422.79	362.75	305.45
4.5250	246.01	188.49	129.82	119.85	121.31
4.6500	114.29	113.55	108.25	106.22	101.86
4.7750	99.10	95.25	92.14	88.52	85.26
4.9000	83.04	81.71	80.09	78.67	77.12
5.0250	75.71	74.24	72.72	71.23	69.73
5.1500	68.23	66.73	65.52	64.63	63.76
5.2750	62.87	62.00	61.12	60.24	59.37
5.4000	58.49	57.61	56.74	55.86	55.07
5.5250	54.82	54.78	54.71	54.60	54.47
5.6500	54.31	54.13	53.92	53.69	53.44
5.7750	53.17	52.88	52.58	52.28	51.96
5.9000	51.64	51.32	50.98	50.65	50.30
6.0250	49.96	49.60	49.24	48.88	48.43
6.1500	47.80	47.00	46.04	44.93	43.68
6.2750	42.29	40.77	39.13	37.34	35.46

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .0250 hrs
Time on left represents time for first value in each row.

Time hrs					
6.4000	33.44	31.35	29.39	27.46	25.61
6.5250	23.88	22.20	20.47	18.87	17.40
6.6500	16.04	14.15	12.40	10.86	9.52
6.7750	8.34	7.30	6.40	5.60	4.91
6.9000	4.12	3.32	2.67	2.15	1.73
7.0250	1.39	1.12	.90	.73	.58
7.1500	.47	.38	.30	.24	.20
7.2750	.16	.13	.10	.08	.07
7.4000	.05	.04	.03	.03	.02
7.5250	.02	.01	.01	.01	.01
7.6500	.01	.00	.00	.00	.00

Index of Starting Page Numbers for ID Names

----- D -----
DET. POND... 7.01, 9.01
DET. POND IN 100... 9.08
DET. POND OUT 100... 5.01, 6.01,
9.11, 9.12, 9.13

----- O -----
OUT 10 100... 4.01
Outlet 1... 8.01, 8.04, 8.30

----- R -----
RATHYDRO HG 100... 3.01
ROUTE 10 100... 9.15

----- W -----
Watershed... 1.01, 2.01, 2.02, 2.03

SECTION 10B:
DETENTION BASIN OUTLET HYDRAULIC CALCS

BASIN OUTLET PIPE
Worksheet for Pressure Pipe

Project Description	
Worksheet	DET BASIN OUTLET 1
Flow Element	Pressure Pipe
Method	Hazen-Williams Formula
Solve For	Discharge

Input Data		
Pressure at 1	10.00	feet H20
Pressure at 2	9.40	feet H20
Elevation at 1	264.00	ft
Elevation at 2	262.60	ft
Length	72.00	ft
C Coefficient	140.0	
Diameter	36.0	in

Results		
Discharge	157.13	cfs
Headloss	2.00	ft
Energy Grade at 1	281.68	ft
Energy Grade at 2	279.68	ft
Hydraulic Grade at 1	274.00	ft
Hydraulic Grade at 2	272.00	ft
Flow Area	7.1	ft^2
Wetted Perimeter	9.42	ft
Velocity	22.23	ft/s
Velocity Head	7.68	ft
Friction Slope	2.78	%

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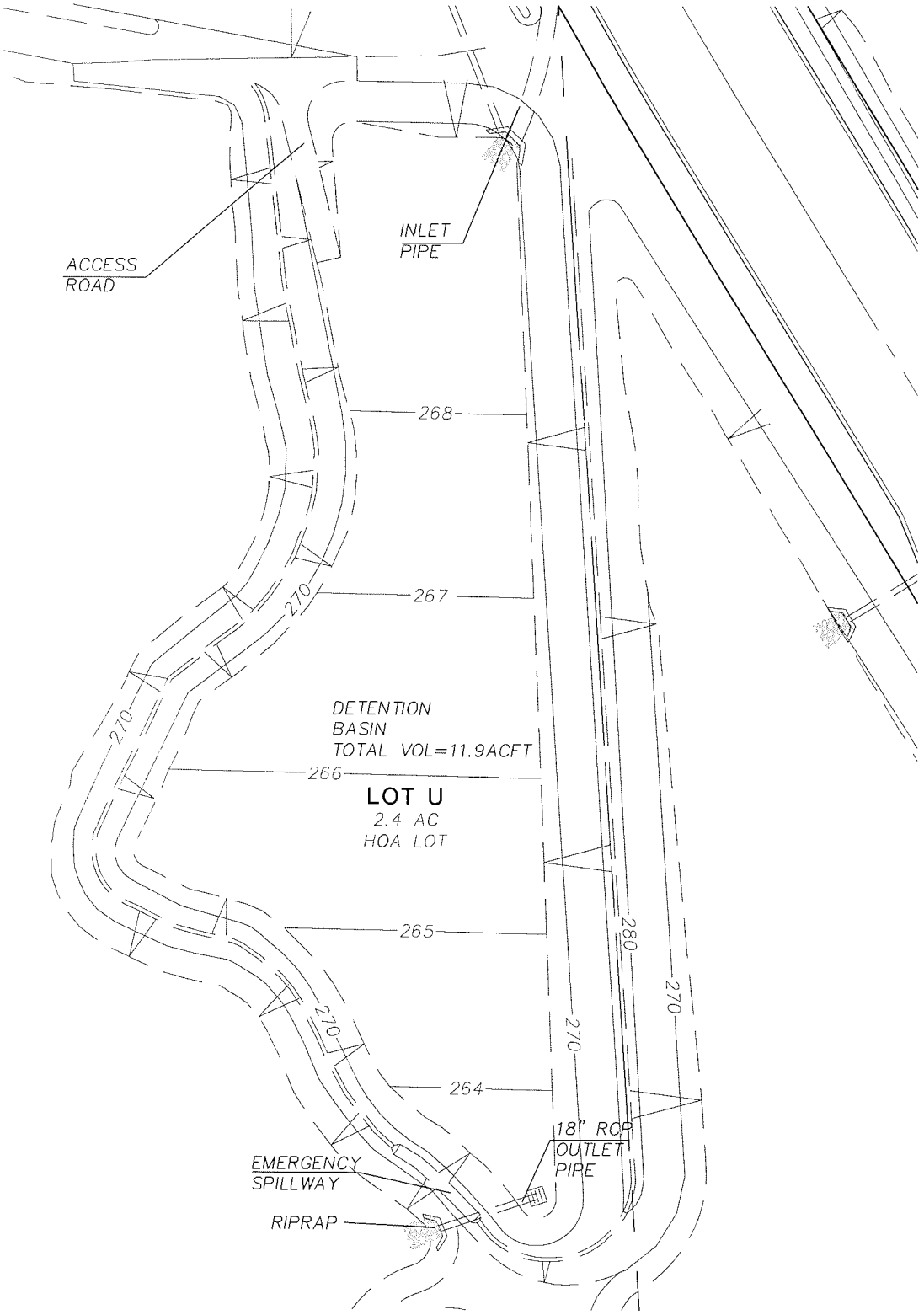
Landmark Consulting
37 Brookside Road Waterbury, CT 06708 USA +1-203-755-1666

SECTION 10C:
PRELIMINARY DETENTION BASIN DESIGN

PRELIMINARY DETENTION BASIN DESIGN



J.N.:

SECTION 11:
SUMMARY

STORMWATER VOLUMES AT POINTS OF DISCHARGE & INTEREST (see Hydrology Maps for Node locations):

DISCHARGE FROM PROJECT SITE PER AES RATIONAL ANALYSIS AND PONDPACK DETENTION BASIN ANALYSIS (SECTIONS 4, 5, 6 & 10)

DIS-CHARGE POINT	PRE-DEVELOPMENT CONDITIONS						DIS-CHARGE POINT	POST-DEVELOPMENT CONDITIONS						PROPOSED MITIGATION
	C	Tc	I	A	V	Q		C	Tc	I	A	V	Q	
Node 108 Upstream of ex. 5'x8' culvert crossing Pankey Rd, (north)	0.35	18.3	4.0	287.6	5.1	420.9	Node 170 Upstream of ex. 5'x8' culvert crossing Pankey Rd, (north)	0.41	16.1	4.4	148.2	9.8	270.9	Discharge into existing lined culvert, runoff rate decreased, no mitigation required.
Node 204	0.35	15.3	4.5	56.1	5.2	88.1	Node 407	0.35	13.7	5.2	105.3	25.9	212.2	Riprap will be placed at outlet to minimize erosion and to dissipate flows. The increase in runoff is due to a temporary diversion of flows to this point. Further mitigation to increased runoff to occur downstream at proposed detention basin.
Node 303	0.35	17.2	4.1	32.1	5.0	46.6	N/A*							
Node 402	0.35	21.8	3.6	142.9	6.1	178.3	N/A*							
Node 502	0.35	21.8	3.6	86.7	6.1	108.3	N/A*							
Node 601	0.35	19.4	3.8	106.5	5.6	147.0	327	0.35	14.3	4.7	21.2	9.0	35.2	Riprap will be placed at outlet to minimize erosion and to dissipate flows. The decrease in runoff is due to a temporary diversion of flows to this point. The diverted runoff is carried in the proposed storm drain main in Horse Ranch Road and into the proposed detention basin
Node 703	0.35	25.8	3.2	14.6	4.1	16.3	N/A*							

* The remainder of the post-development on-site runoff is diverted within the proposed storm drain system in Horse Ranch Creek Road, through the proposed detention basin and discharges offsite upstream of the existing Pankey Road (N) bridge and confluences with the runoff in Horse Ranch Creek. See Section 8 for detailed hydrology analysis of the entire Horse Ranch Creek watershed.

DISCHARGE FROM PROJECT SITE COMBINED WITH HORSE RANCH CREEK RUNOFF PER HEC HMS ANALYSIS (SECTION 8)

DIS-CHARGE POINT	PRE-DEVELOPMENT CONDITIONS						POST-DEVELOPMENT CONDITIONS						PROPOSED MITIGATION
	CN	Peak time (hr.)		A (ac)	V* (fps)	Q (sfc)	Cn			A	V*	Q	
Downstream of ex. 5'x8' culvert crossing Pankey Rd, (north)	88.6	16:45		5850	13.1	8111	88.7	16:45		5848	13.1	8168	Discharge into existing lined culvert, no mitigation required.
Upstream of existing Pankey Road (N) Bridge	86.4	17:05		7343.4	0.84	8802	89.7	17:05		7343.4	7.6	8800	Discharge into existing natural channel,. runoff rate decreased, no mitigation required
Upstream of existing Pala Road Bridge	86.4	17:05		7343.4	8.0	8802	89.7	17:05		7343.4	7.9	8800	Discharge into existing unlined channel, runoff rate decreased, no mitigation required.
Upstream of existing Pankey Road (S) Bridge	86.4	17:05		7343.4	9.4	8802	89.7	17:05		7343.4	9.3	8800	Discharge into existing unlined channel, runoff rate decreased, no mitigation required.

*** Per HECRAS analysis (Section 9)**

As previously discussed, it was assumed and expected that any development upstream from this project (which contributes to Horse Ranch Creek) would have to detain, treat and release the post-development 100-year storm waters such that the quantity, quality and discharge rate, time, location & concentration would substantially resemble the pre-development conditions.

It is expected that the proposed surrounding developments (TM 5354 and TM 5424 and proposed Palomar College) would adhere to the regulation set forth by the San Diego County Drainage Design Manual Section 6.2.1, " ..a detention basin may be required to reduce peak flows to the capacity of the existing downstream facility." The County of San Diego has further stipulated that no increase in runoff is allowed to be discharged from a proposed development and that detention facilities are required for any development to regulate the discharge rate to that under the pre-development conditions. Thus, it is anticipated that the surrounding developments will design their own detention facilities on-site to mitigate their overall discharge such that no adverse affect will occur to downstream drainage facilities, particularly, the existing culvert under Pankey Road (north) and the existing bridge under crossing on Pankey Road (north/south) & SR-76.

Therefore, we did not analyze the post-development conditions for the upstream watersheds – only the existing upstream conditions were considered. Due to our assumption that the proposed upstream projects would have to mitigate any increases in peak runoff back to pre-development levels, it was assumed that any increase in post-development runoff from the three proposed surrounding developments (TM 5354, TM 5424, and proposed Palomar College) would be insignificant and, therefore, was not considered in this report.

At the first discharge point exiting this project (at the existing 5'x8' box culvert under Pankey Road), the pre-development runoff at Node 108 (i.e. 420.8 cfs) is significantly greater than the post-development runoff at Node 107 (i.e. 270.9 cfs). This was primarily due to the temporary diversion of a portion of the watershed

upstream of the box culvert (Bypass Basin 400) that was diverted around the box culvert for water quality consideration. Due to the fact that this existing box culvert was operating under pressure during the existing 100-year runoff storm, this diversion actually allows the existing box culvert to flow under capacity (see the post-development condition pressure flow analysis and headwater depth nomograph in Section 9). Since the diversion only occurs within the project boundary and for only 465' before it joins the historical flow pattern, the impacts are minimal and require no mitigation. Based upon the tail water analysis (in Section 9D), the existing culvert has a capacity of 2136 cfs, even with the outlet under water. The tail water surface elevation is per the HECRAS analysis in Section 9. The required water depth at upstream is 3.3 feet, the upstream water surface elevation is 348.3 which is approximately 7.3'-which is approximately 10.4' lower than the proposed Horse Ranch Creek Road street elevation.

As the runoff exits the existing 5'x8'box culvert, it confluences with the existing upstream Horse Ranch Creek watershed. As mentioned previously, the pre and post-development runoff rates used for Horse Ranch Creek were based upon the HEC HMS program calculations from Section 8 of this report. Based upon this program, the post-development runoff volumes at this point of interest are only 9 cfs more than the pre-development due to the above referenced temporary diversion, thereby, offsetting the increased runoff due to the increased impervious areas upstream of the box culvert. Based upon the HEC-RAS analysis of the existing Horse Ranch Creek channel (constructed by Caltrans), this portion of the existing channel is adequate to handle both the pre and post-development runoff volumes without exceeding the capacity of the channel. Therefore, there are virtually no impacts from the proposed project to this section of the existing channel and the defined channel appears to convey the proposed runoff effectively without harm to surrounding properties.

Based upon the HEC-RAS analysis of the pre and post-development conditions for Horse Ranch Creek (from Stations 62+41 thru 119+75), the water surface elevation and floodplain limits are nearly the same through this section of Horse Ranch Creek. The existing Caltrans channel can adequately handle both the pre and post–development runoff volumes to Section 102+84 where it gradually starts to lose capacity. The runoff breaches the left bank and sheet flows onto the Horse Ranch Creek flood plain. The Caltrans' channel ends approximately 1600 feet further to the south and the runoff is discharged onto the Horse Ranch Creek flood plain. The HECRAS analysis demonstrates that the Caltrans channel gradually loses capacity towards the end of the channel under the pre-development conditions. The post development runoff at the section of the channel where the breach happens is slightly less than that of the pre-development conditions due to the temporary on-site diversion of discharge into the channel along the proposed Horse Ranch Creek Road where most of the on-site discharge is conveyed in the proposed storm drain system in the proposed roadway and discharged into the proposed detention basin analyzed in Section 10. Therefore, the proposed project has no significant impacts to this section of the existing channel and will not alter the existing drainage and hydraulics of the existing channel. Thus no mitigation is required.

As the existing defined channel of Horse Ranch Creek flows further south from the existing 8'x5' culvert (for about 4,000'), the channel banks flatten out and Horse Ranch Creek re-enters the project boundary spreading out across a wide, shallow section of the creek. The majority of the runoff from proposed Basin 200, which historically sheet-flowed westerly over a wide reach of the creek, is diverted in the proposed underground storm drain system to the most southwesterly corner of Basin 200 (at Node 2185) and then, discharges into the creek. The diversion caused by the proposed storm drain system only occurs on-site and will not adversely impact surrounding properties. The post-development condition and capacity condition do not cause an noticeable increase in the water surface elevation until downstream of Station 81+91. The grading proposed in the post-development condition will constrict the floodplain width and, thereby, cause the Horse Ranch Creek water surface elevation to increase between Stations 34+47 and 81+91 under the post-development conditions. The maximum water surface elevation increase is about 4.36' that occurs at section 45+83 as the runoff is backup by the raised Pankey (N) bridge and constricted by the proposed Pankey Place and the berms of the proposed detention basin and percolation pond. This water surface elevation increase will cause additional flooding in the adjacent westerly properties. However, this property is currently vacant and the proposed project planned for this area (Campus Park West - TM 5424) would not be adversely affected by this additional flooding. To

mitigate for this additional flooding, this project will obtain permission from the property owners to allow this additional flooding. No flooding will occur to any existing or proposed streets. No further mitigation measures are proposed for the additional flooding in this area.

In order to mitigate for the overall project's increased runoff volumes, the 100-year peak runoff will be detained in a proposed detention basin just south of the Multi-family-1 site (Lot 539). Based on the Pondpack detention basin analysis in Section 10, the proposed detention basin provides approximately 12.0 acre-feet of storage volume. The basin overtops at the spillway at around 3.1 hours at the peak time. Based on the HEC HMS watershed and flood routing analysis in Section 8, the detention basin will reduce the overall discharge from the site that reaches the downstream Pankey Road and Pala Road Bridges to 8800 cfs, 2 cfs less than the pre-development conditions' 8802 cfs.

Also, based upon the HEC-RAS calculations in Section 9, the post-development water surface elevation essentially returns to pre-development water surface elevation levels at Station 28+46, down stream of the Pankey Bridge (north) prior to Horse Ranch Creek leaving the project boundary. Based upon the HECRAS bridge hydraulics analysis in Section 9A, the Pankey (N) bridge is overtopping under the pre-development conditions. The runoff from Horse Ranch Creek will overtop the bridge and flow across the southerly portions of the the existing Pankey Road. The bridge deck and roadway will be raised to accommodate the peak discharge through the bridge opening without overtopping the roadway. The Pankey (N) bridge will be raised to have a bottom deck elevation of 273.5. Per the capacity analysis in Section 9C and bridge hydraulic analysis in Section 9D, the water surface elevation at the upstream of the bridge is 272.5, the bridge deck will have a 1' of free board.

Although this project requires some grading within the Horse Ranch Creek floodplain (with the construction of MF-3 site, MF-4, Pankey Place, etc.), the negative impacts of that grading can be mitigated in several ways. The grading operation in the floodplain should not occur during the rainy season so that the grading and storm drainage facilities can be constructed without floodwater intrusion. Once the grading operation is completed, the exposed dirt should be immediately hydroseeded, planted and irrigated to allow the most time for soil stabilization and to minimize erosion and silt from leaving the project site. Riprap slope protection (or equivalent) should be installed to one foot above proposed 100-year water surface elevations immediately after the grading within the floodplain to protect manufactured slope embankments which are exposed to flood waters within Horse Ranch Creek.

During construction, there is always the likelihood of erosion and siltation within existing drainage courses. To mitigate for this likelihood, the amount of disturbed areas should be limited so that proper erosions control measures can be installed and any soil movement can be contained. The perimeter of the disturbed area should be contained with silt fences and/or gravel bags to prevent the movement of soil away from the disturbed areas. After every storm event, the erosion control measures should be checked and cleaned of any debris so that they operate efficiently for the next storm event. All erosion control personnel should be properly trained. If construction BMP's and water quality procedures (as outlined in the County's current codes) are followed, the impacts due to construction activities should be properly mitigated for.

Post-construction, all finished slopes should be planted and irrigated as soon as possible after they are completed and all pad areas should be properly stabilized with bonded fiber matrix or similar products. Compliance with the requirements outlined in the County's current grading ordinance should adequately mitigate for these potential impacts. Where underground storm drain pipes outlet into natural terrain, riprap energy dissipaters (or similar devices) should be installed at the pipe outlet to dissipate and slow down concentrated storm water in order to prevent erosion of soil in front of the outlet points and to return the concentrate flows to their pre-development flow patterns as quickly as possible. Also, riprap slope protection (or equivalent) should be placed behind culverts at least one foot above the required headwater depth and at least one foot above floodwater depths on slopes facing floodplains. The riprap slope protection will mitigate any potential soil loss from slope scowering from floodwaters.

There is an existing, off-site, public 12" sewer main (maintained by the Rainbow Municipal Water District) along the westerly boundary of this project which currently sits within the limits of the existing and proposed Horse Ranch Creek floodplain limits. To mitigate for the impacts of the floodplain, watertight manhole covers should be installed (unless they already have them). However, since this project does not propose to utilize this sewer main and is not exposing more of the sewer main to flood waters, the Rainbow Municipal Water District should be responsible for these upgrades.

FLOOD PLAIN:

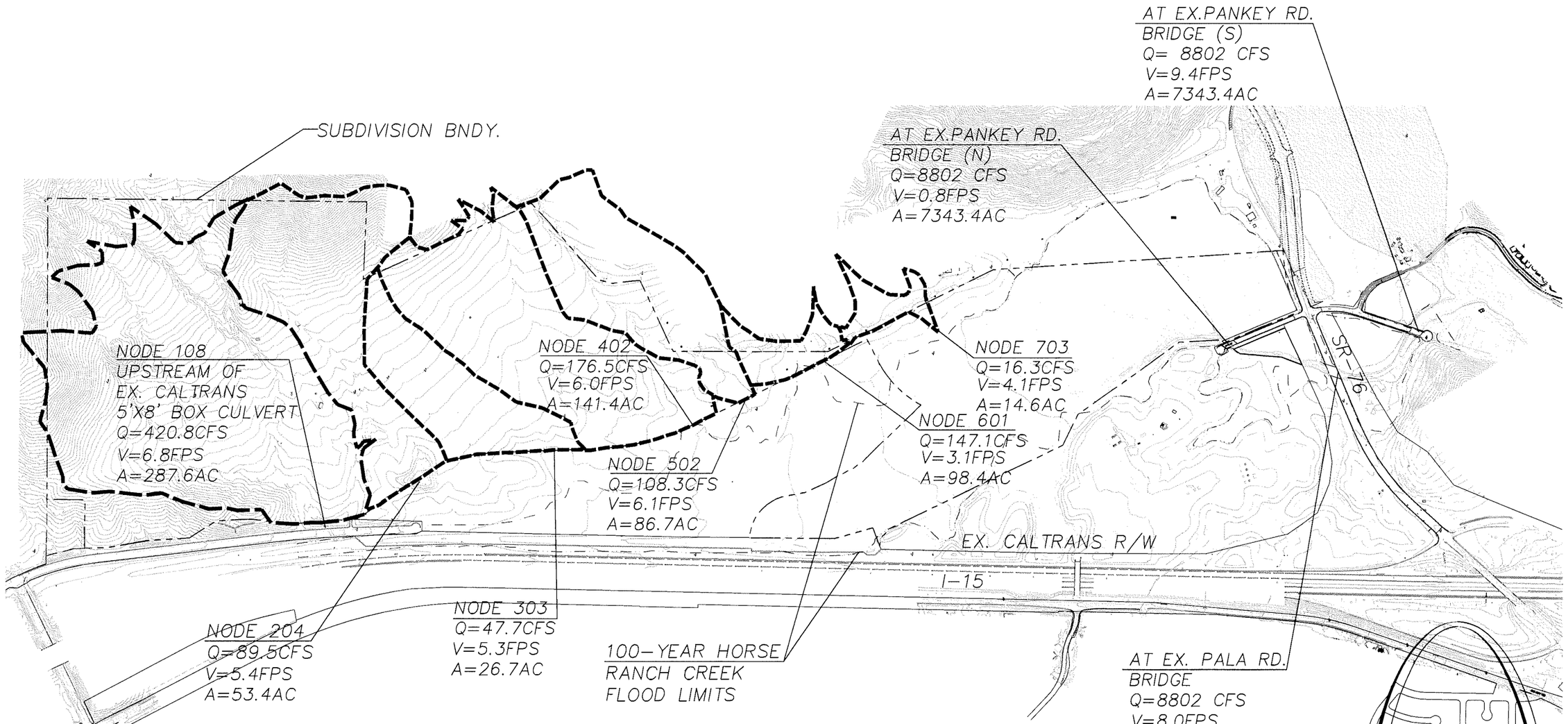
Based on the HEC-RAS analysis presented in Section 9 of this report, from cross sections 51+34 to 36+46, ineffective flood areas were modeled for the areas between the easterly project boundary and the proposed Horse Ranch Creek Road, northerly and southerly of the proposed Pankey Place. The two areas will remain undisturbed.

The area northerly of proposed Pankey Place will be flooded once the flood water in Horse Ranch Creek reaches the 20' wide gap between the proposed berms of the detention basin and perc pond. The area southerly of proposed Pankey Place will also be flooded once the flood water from Horse Ranch Creek floods the northerly area. A proposed culvert crossing under Pankey Place will allow the flood water from the northerly area to flow into the southerly area. Although this will flow will be reverse from normal, it will occur due to the water surface elevation differential on each side of Pankey Place. As the flood water in Horse Ranch Creek recedes, the floodwaters in these two areas will slowly drain out into the Horse Ranch Creek through this proposed culvert crossing and the through the proposed 20' gap between the detention basin & perc pond. Even though the easterly portion of the proposed Pankey Place, between Horse Ranch Creek Road and the detention basin/perc pond, will effectively hold back flood water from Horse Ranch Creek, it is not considered a levee since this condition will be temporary until the water surface elevation on each side of Pankey Place balances through the proposed culvert crossing. Per the technical memorandum in the Appendix, dated September 10, 2008, the Federal Highway Administration (FHWA) states that certifying or, otherwise, designating roadway embankments as levees is not acceptable since the embankment of the roadway, in this case, Pankey Place, is not designed to perform as a levee or other flood control facility. In the unlikely event that the roadway fails due to flooding from Horse Ranch Creek, the flood water will breach the roadway and flood an natural area that was already inundated under the pre-development conditions.

Furthermore, these areas northerly and southerly of Pankey Place, between Horse Ranch Creek and the detention basin/perc pond, will be designated as within the 100-year flood limits under both the pre and post conditions (even though the only represent ineffective flow areas). Therefore, any future development within these two areas will have to conform to the regulations and ordinances governing land development within floodplains and there should be no harm to any people or property.

SECTION 11A:
PRE AND POST DEVELOPMENT PROJECT DISCHARGE POINT SUMMARY EXHIBITS

PROJECT DISCHARGE POINT SUMMARY EXHIBIT
CAMPUS PARK

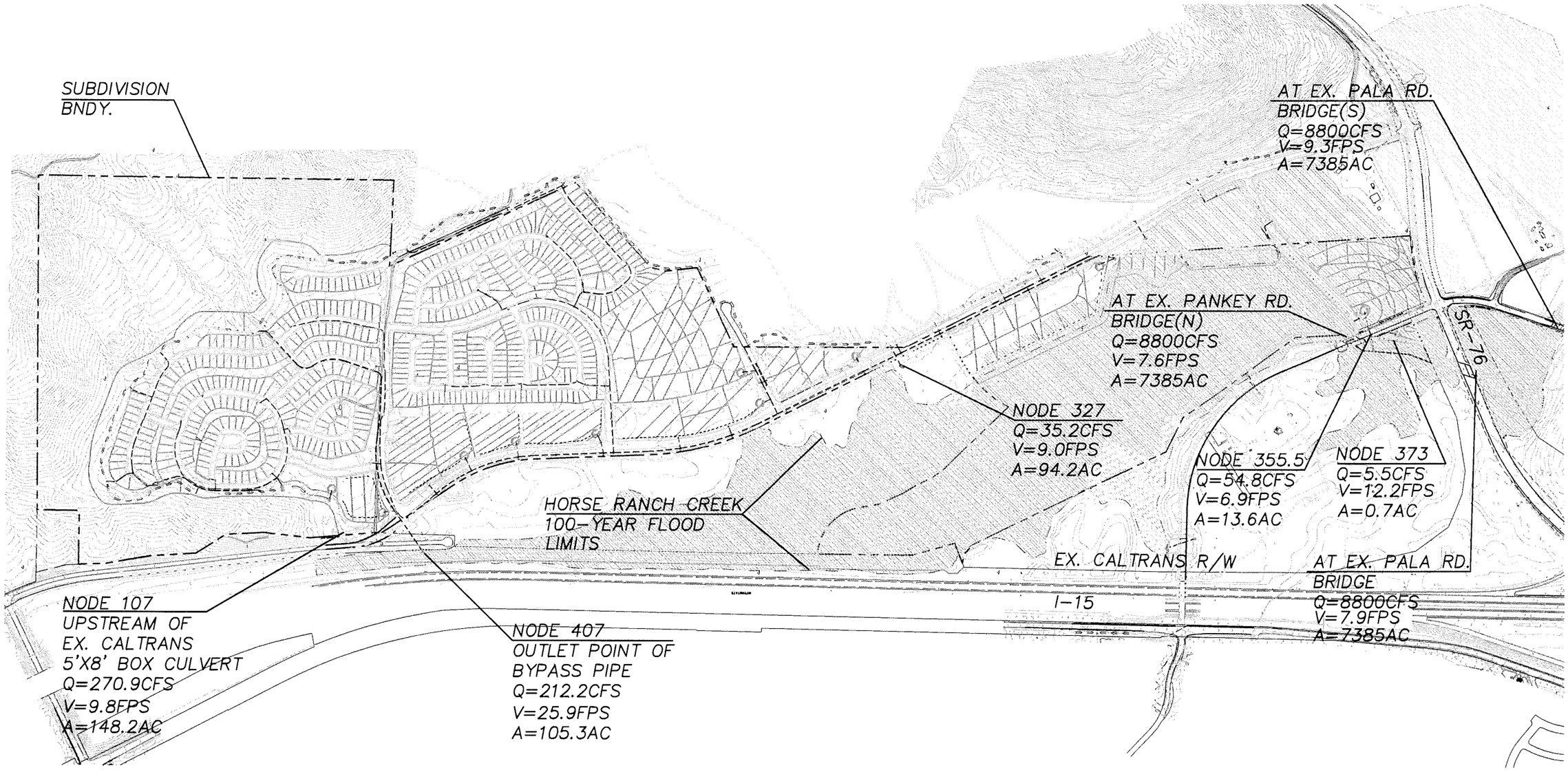


PRE-DEVELOPMENT CONDITIONS

LANDMARK
CONSULTING
PLANNING•ENGINEERING•SURVEYING
9555 GENESEE AVENUE, STE. 200
SAN DIEGO, CA 92121, 858.587.8070

J.N.:

PROJECT DISCHARGE POINT SUMMARY
CAMPUS PARK



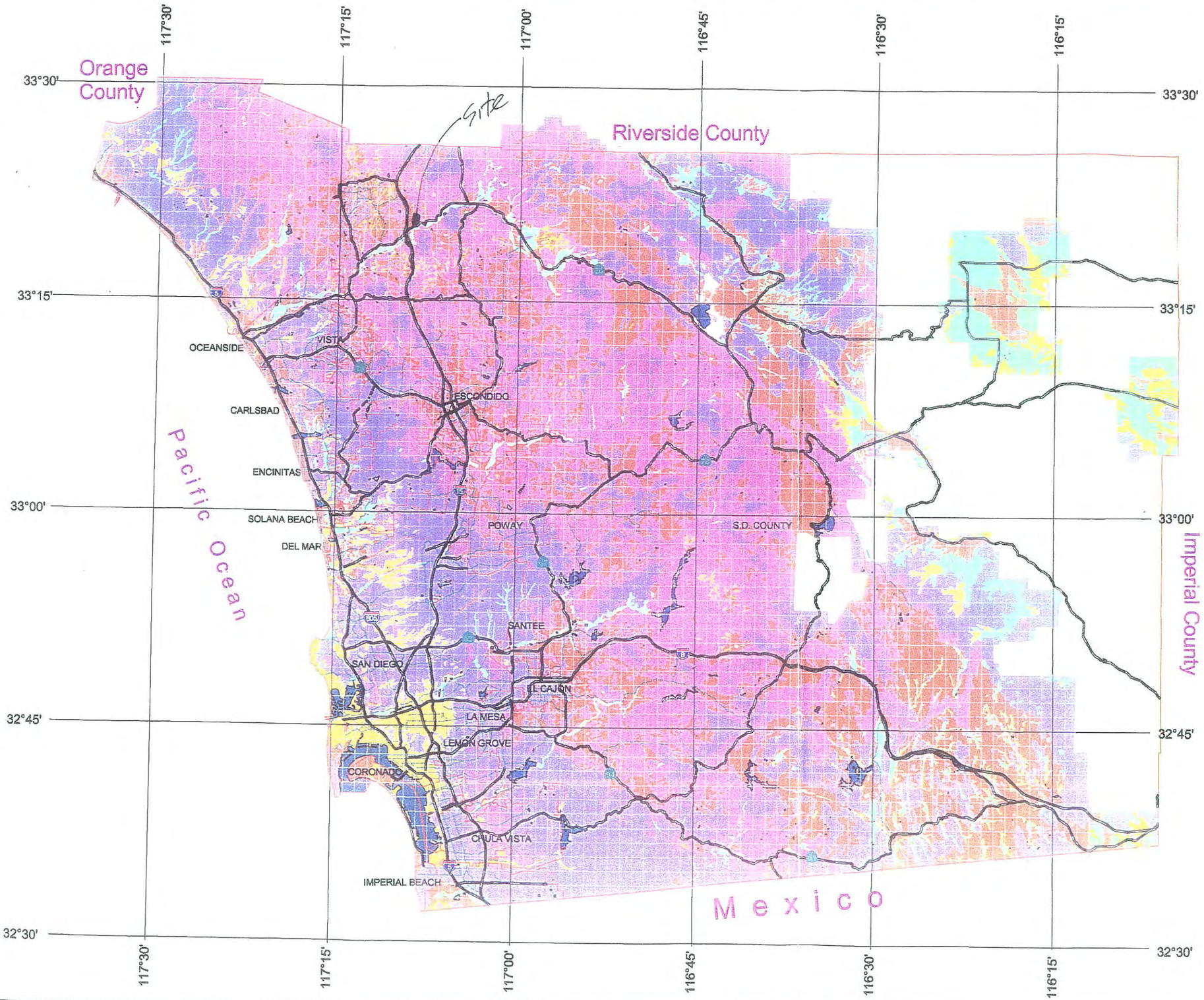
POST-DEVELOPMENT CONDITIONS

J.N.:

SECTION 12:
APPENDIX

County of San Diego Hydrology Manual

Soil Hydrologic Groups



Legend

Soil Groups

- Group A
- Group B
- Group C
- Group D
- Undetermined
- Data Unavailable

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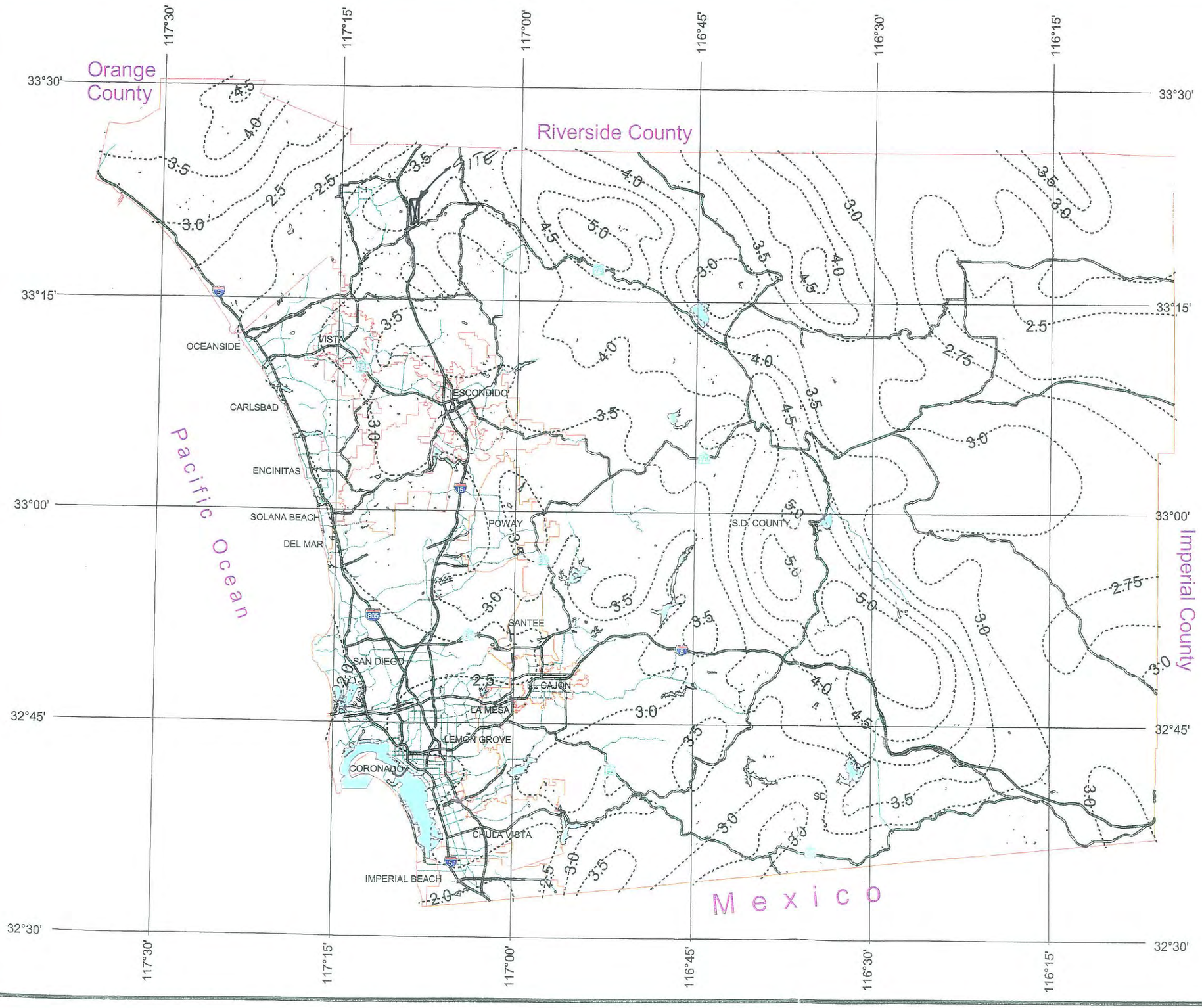
3 0 3 Miles

County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

Isopluvial (inches)



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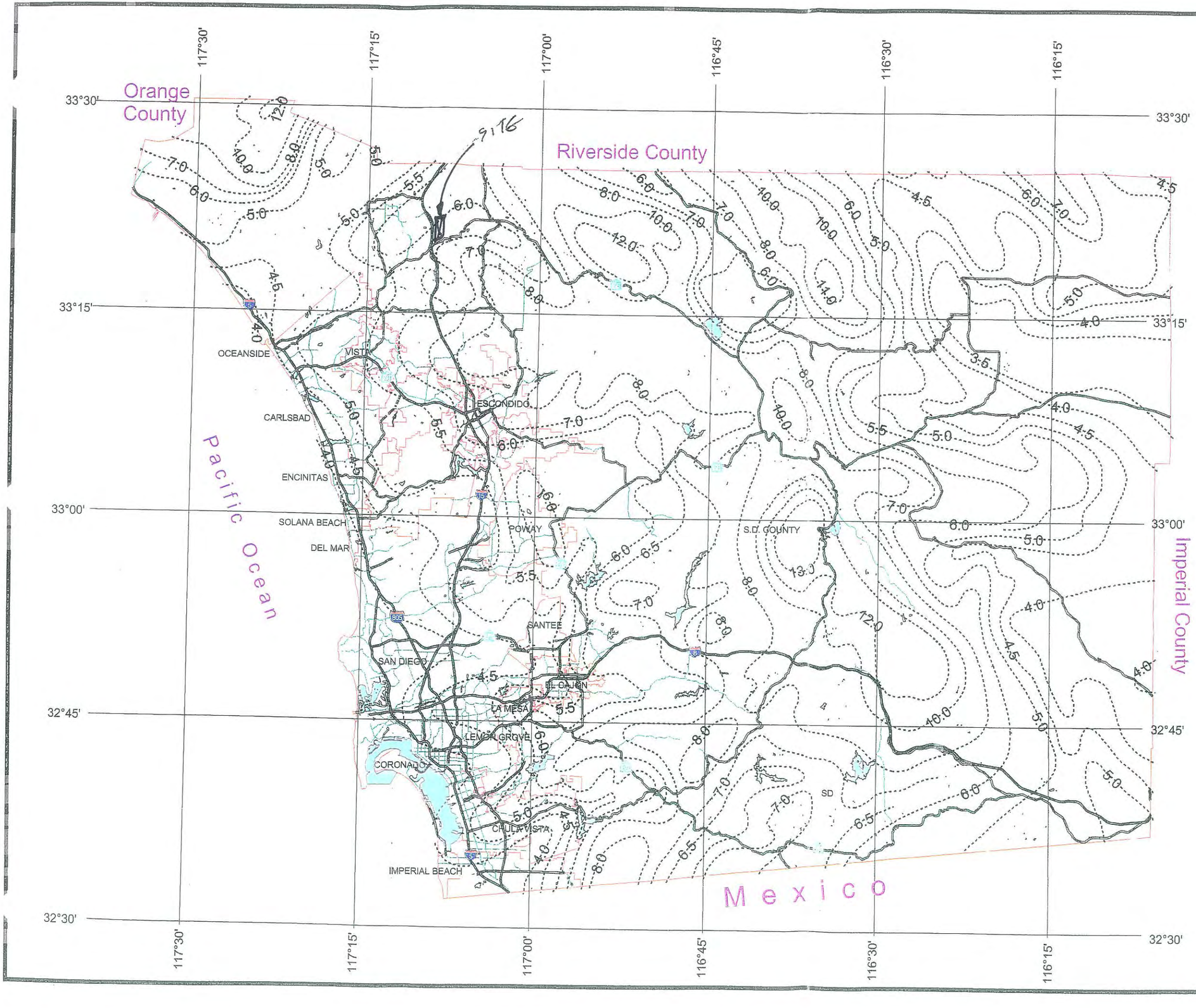
3 0 3 Miles

County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 24 Hours

Isopluvial (inches)



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3 0 3 Miles

Table 3-1
RUNOFF COEFFICIENTS FOR URBAN AREAS

Land Use		Runoff Coefficient "C"				
			Soil Type			
NRCS Elements	County Elements	% IMPER.	A	B	C	D
Undisturbed Natural Terrain (Natural)	Permanent Open Space	0*	0.20	0.25	0.30	0.35
Low Density Residential (LDR)	Residential, 1.0 DU/A or less	10	0.27	0.32	0.36	0.41
Low Density Residential (LDR)	Residential, 2.0 DU/A or less	20	0.34	0.38	0.42	0.46
Low Density Residential (LDR)	Residential, 2.9 DU/A or less	25	0.38	0.41	0.45	0.49
Medium Density Residential (MDR)	Residential, 4.3 DU/A or less	30	0.41	0.45	0.48	0.52
Medium Density Residential (MDR)	Residential, 7.3 DU/A or less	40	0.48	0.51	0.54	0.57
Medium Density Residential (MDR)	Residential, 10.9 DU/A or less	45	0.52	0.54	0.57	0.60
Medium Density Residential (MDR)	Residential, 14.5 DU/A or less	50	0.55	0.58	0.60	0.63
High Density Residential (HDR)	Residential, 24.0 DU/A or less	65	0.66	0.67	0.69	0.71
High Density Residential (HDR)	Residential, 43.0 DU/A or less	80	0.76	0.77	0.78	0.79
Commercial/Industrial (N. Com)	Neighborhood Commercial	80	0.76	0.77	0.78	0.79
Commercial/Industrial (G. Com)	General Commercial	85	0.80	0.80	0.81	0.82
Commercial/Industrial (O.P. Com)	Office Professional/Commercial	90	0.83	0.84	0.84	0.85
Commercial/Industrial (Limited I.)	Limited Industrial	90	0.83	0.84	0.84	0.85
Commercial/Industrial (General I.)	General Industrial	95	0.87	0.87	0.87	0.87

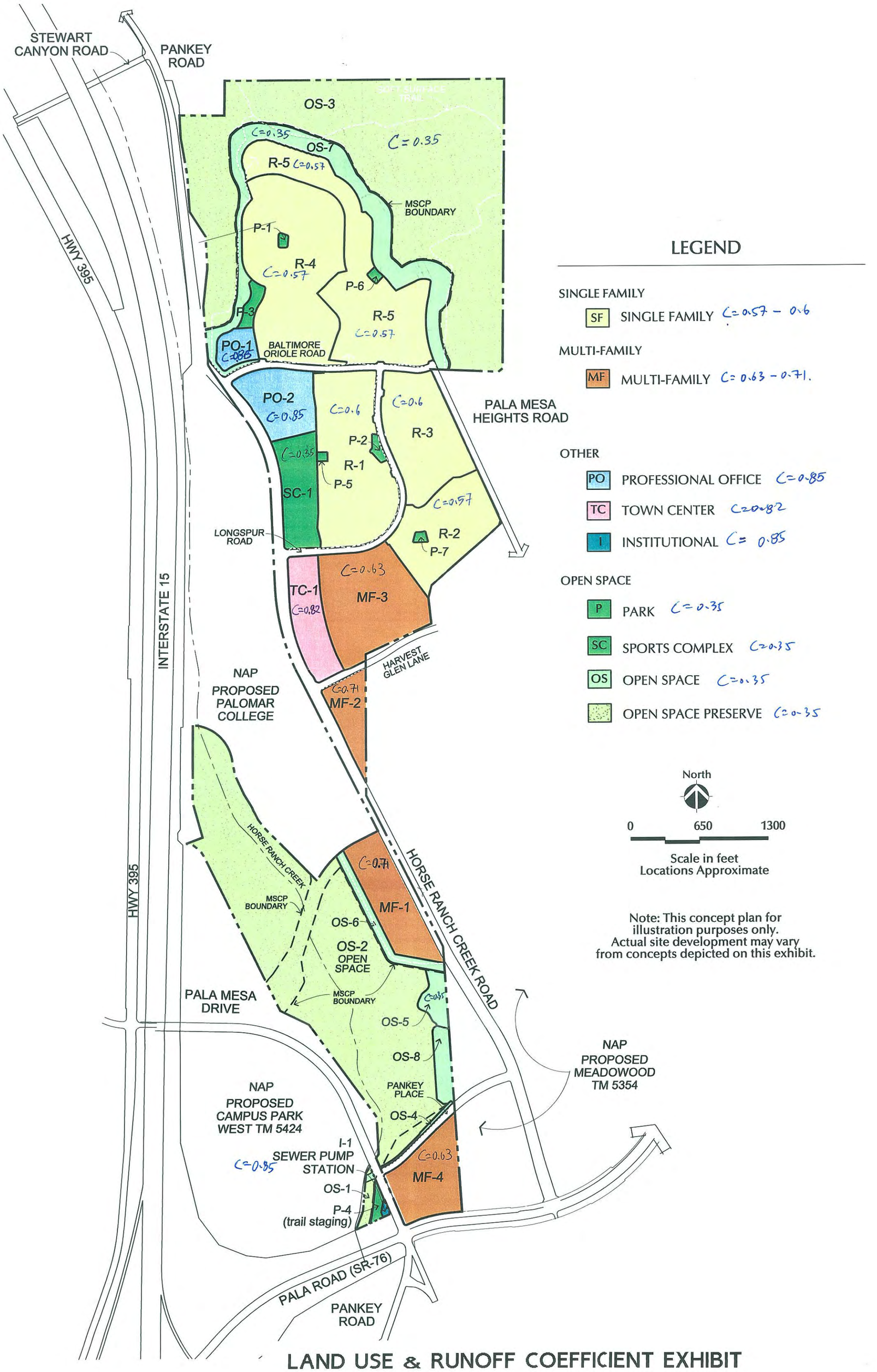
*The values associated with 0% impervious may be used for direct calculation of the runoff coefficient as described in Section 3.1.2 (representing the pervious runoff coefficient, Cp, for the soil type), or for areas that will remain undisturbed in perpetuity. Justification must be given that the area will remain natural forever (e.g., the area is located in Cleveland National Forest).
DU/A = dwelling units per acre
NRCS = National Resources Conservation Service

LANDUSE SUMMARY AND C VALUE CHART

Land Use	Planning Area	Description	Acreage (gross)	Acreage (net)	Units	Gross Density (Du/Ac.)
Single Family						
Single Family	R-1	Single Family	23.4		136	5.8
Single Family	R-2	Single Family	14.7		75	5.1
Single Family	R-3	Single Family	16.7		64	3.8
Single Family	R-4	Single Family	31.8		122	3.8
Single Family	R-5	Single Family	27.2		124	4.6
	Subtotal Single Family		**113.8**		**521**	
Multi-Family						
Multi-Family	MF-1	Multi Family	10.8	9.5	192	17.8
Multi-Family	MF-2	Multi Family	5.3	4.2	66	12.5
Multi-Family	MF-3	Multi Family	19.0	16.9	189	9.9
Multi-Family	MF-4	Multi Family	10.3	9.3	108	10.5
	Subtotal Multi Family		**45.4**	**39.9**	**555**	
	Total Residential		**159.2**		**1,076**	
Commercial						
Town Center	TC-1	Town Center	8.1	6.7		62,000
	Subtotal Commercial		**8.1**	**6.7**		**62,000**
Professional Office						
Professional Office	PO-1	Professional Office	2.7	2.6		40,000
Professional Office	PO-2	Professional Office	8.8	7.4		117,000
	Subtotal Professional Office		**11.5**	**10.00**		**157000**
Parks and Open Space						
Park	P-1	Park (HOA)	0.3			
Park	P-2	Park (HOA)	0.5			
Park	P-3	Park (HOA)	1.2			
Park	P-4	Trail Staging Area	0.6			
Park	P-5	Park (HOA)	0.2			
Park	P-6	Park (HOA)	0.3			
Park	P-7	Park (HOA)	0.3			
Sports Complex	SC-1	Active Sports Park	8.5			
Open Space	OS-1	Open Space Preserve	1.1			
Open Space	OS-2	Open Space Preserve	81.0			
Open Space	OS-3	Open Space Preserve	93.7			
Open Space	OS-4	Open Space	0.5			
Open Space	OS-5	Detention Basin	2.4			
Open Space	OS-6	Open Space	3.1			
Open Space	OS-7	Open Space	19.1			
Open Space	OS-8	Detention Basin	2.6			
	Subtotal Parks & Open Space		**215.4**			
Other						
Institutional	I-1	Sewer Pump Station	0.2			
Major Circulation		Roads	21.7			
	Subtotal Other		**21.9**			
	Grand Total		***416.1***			

Notes:
1. Includes HOA open space lots shown on T.M.
2. Gross acreage includes internal neighborhood streets
3. A portion of OS-1 (.1 acres) contains an access easement to adjoining property to west

SITE	REQUIRED C VALUE	USED C VALUE
MF1	0.71	0.71
MF2	0.63	0.71
MF3	0.6	0.63
MF4	0.6	0.63
R1	0.57	0.6
R2	0.57	0.57
R3	0.52	0.6
R4	0.52	0.57
R5	0.57	0.57
PROFESSIONAL OFFICE	0.85	0.85
TOWN CENTER	0.79	0.82
PUMP STATION	0.85	0.85
PARK	0.35	0.35
SPORTS COMPLEX	0.35	0.35
OPEN SPACE	0.35	0.35
OPEN SPACE PRESERVE	0.35	0.35



LAND USE & RUNOFF COEFFICIENT EXHIBIT

Project	Campus Park	**Date**	5/12/09
Client	Landmark Consulting		
Subject	Basin Lag Calculations		

$$T_l = 24 \cdot \bar{n} \cdot \left(\frac{L \cdot L_c}{s^{0.5}} \right)^m$$

Where: T_l = Army Corps of Engineers' Lag Time (hrs)
n = Average Manning's n for watercourse
L = Length of longest watercourse (miles)
L_c = Length along longest watercourse to point opposite centroid (miles)
s = Overall slope of drainage area (feet per mile)
m = Regional constant, equal to 0.38 for San Diego County

Lag Time Calculations

Basin	Upper Elev. (ft)	Lower Elev. (ft)	Length (ft)	Length (mi)	Slope (ft/mi)	Length to Centroid (ft)	Length to Centroid (mi)	Basin "n" Value*	Lag (min)
A	Rational Method Tc at Node 115 (Offsite Study) = 84.2 min, Lag=80% of Tc (Eq 4-24) =								67.4
	1930	340	27171	5.15	309	9854	1.87	0.059	67.4
C	880	270	10603	2.01	304	3403	0.64	0.050	26.8

Onsite	Rational Method Tc at Node 322 (Onsite Study) = 18.3 min, Lag=80% of Tc (Eq 4-24) =	14.6

(*) Note: Basin "n" value for AB was determined so that the Lag was equal to the Rational Method based Lag. Rational Method time of concentration was determined using Manning's "n" of 0.08 for winding channels with weeds and brush for upper reaches, and lower values through golf course. Upper reaches of C are similar to AB, but lower portion is golf course, leading to a lower Basin "n". Lag for Basin C, pre- and post-development was assumed to be equal.

Table A-3

Table A-3 Average Manning Roughness Coefficients for Small Open Channels Conveying Less than 50 cfs[4]

	Design Flow Depth		
Lining Type	**0 – 0.5 ft**	**0.5 – 2.0 ft**	**> 2.0 ft**
Concrete (Poured)	0.015	0.013	0.013
Air Blown Concrete	0.023	0.019	0.016
Grouted Riprap	0.040	0.030	0.028
Stone Masonry	0.042	0.032	0.030
Soil Cement	0.025	0.022	0.020
Bare Soil	0.023	0.020	0.020
Rock Cut	0.045	0.035	0.025
Rock Riprap	Based on Rock Size (See Section 5.7.2)		

Table A-4

Table A-4 Average Manning Roughness Coefficients for Larger Open Channels

Unlined Channels	
Clay Loam	0.023
Sand	0.020
Lined Channels	
Grass Lined (Well-Maintained)	0.035
Grass Lined (Not Maintained)	0.045
Wetland-Bottom Channels (New Channel)	0.023
Wetland-Bottom Channels (Mature Channel)	See Table A-5
Riprap-Lined Channels	See Section 5.7.2
Concrete (Poured)	0.014
Air Blown Mortar (Gunite or Shotcrete)[5]	0.016
Asphaltic Concrete or Bituminous Plant Mix	0.018

For channels with revetments or multiple lining types, use composite Manning roughness coefficient based on component lining materials.

[4] Based on materials and workmanship required by standard specifications.

[5] For air-blown concrete, use n=0.012 (if troweled) and n=0.025 if purposely roughened.

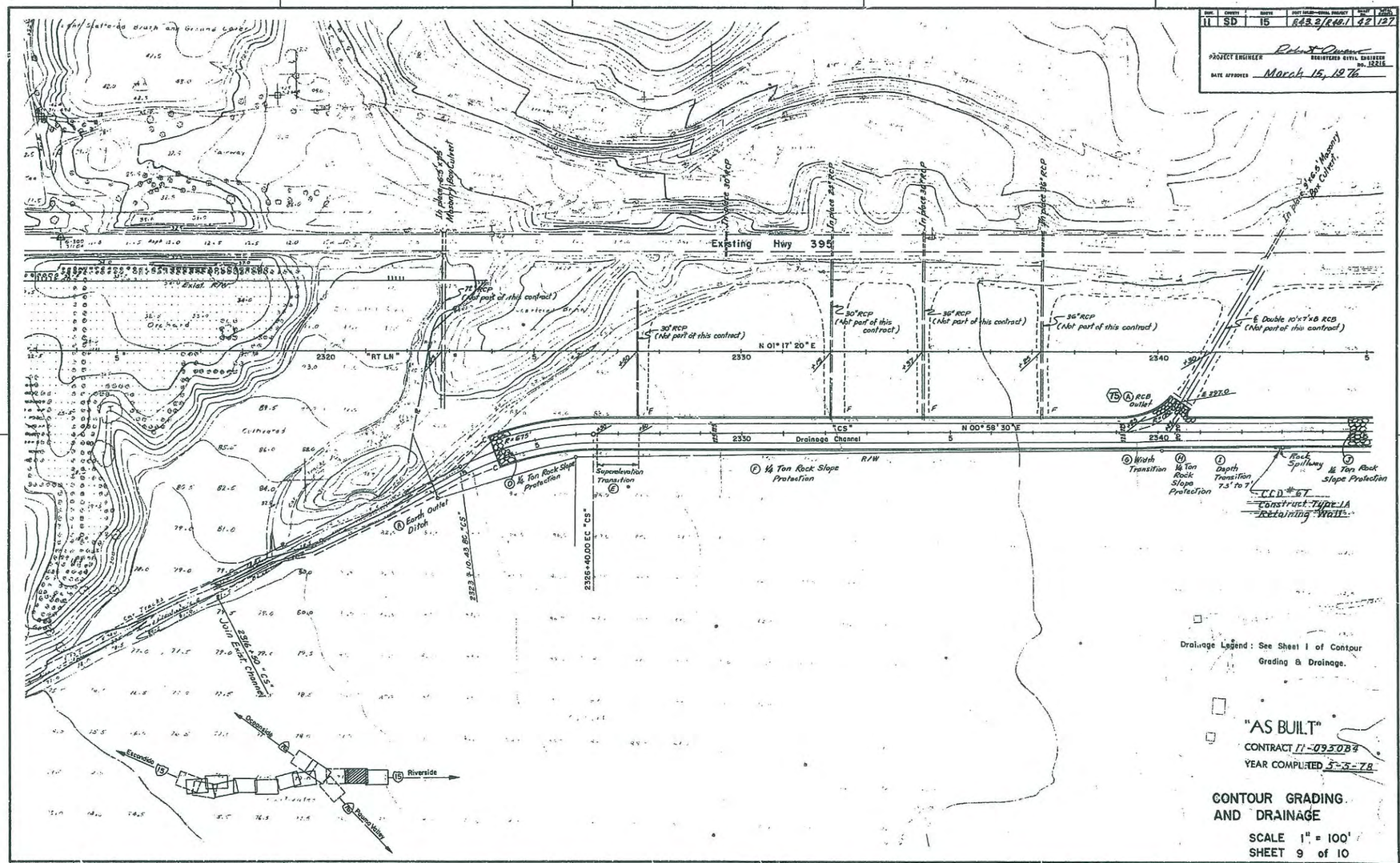
Table A-5 Average Manning Roughness Coefficients for Natural Channels

Minor Streams (Surface Width at Flood Stage < 100 ft)	
Fairly Regular Section	
(A) Some Grass and Weeds, Little or No Brush	0.030
(B) Dense Growth of Weeds, Depth of Flow Materially Greater Than Weed Height	0.040
(C) Some Weeds, Light Brush on Banks	0.040
(D) Some Weeds, Heavy Brush on Banks	0.060
(E) For Trees within Channel with Branches Submerged at High Stage, Increase All Above Values By	0.015
Irregular Section, with Pools, Slight Channel Meander	
Channels (A) to (E) Above, Increase All Values By	0.015
Mountain Streams; No Vegetation in Channel, Banks Usually Steep, Trees and Brush along Banks Submerged at High Stage	
(A) Bottom, Gravel, Cobbles and Few Boulders	0.050
(B) Bottom, Cobbles with Large Boulders	0.060
Flood Plains (Adjacent To Natural Streams)	
Pasture, No Brush	
(A) Short Grass	0.030
(B) High Grass	0.040
Cultivated Areas	
(A) No Crop	0.040
(B) Mature Row Crops	0.040
(C) Mature Field Crops	0.050
Heavy Weeds, Scattered Brush	0.050
Light Brush and Trees	0.060
Medium To Dense Brush	0.090
Dense Willows	0.170
Cleared Land with Tree Stumps, 100-150 Per Acre	0.060
Heavy Stand of Timber, Little Undergrowth	
(A) Flood Depth below Branches	0.110
(B) Flood Depth Reaches Branches	0.140

DIST.	COUNTY	ROUTE	POST MILES—REAL PROJECT	SHEET NO.	TOTAL SHEETS
11	SD	15	843.2/848.1	42	127

PROJECT ENGINEER Robert Owens REGISTERED CIVIL ENGINEER No. 13216

DATE APPROVED March 15, 1976



Drainage Legend : See Sheet 1 of Contour Grading & Drainage.

"AS BUILT"
CONTRACT 11-095084
YEAR COMPLETED 5-5-78

CONTOUR GRADING AND DRAINAGE

SCALE 1" = 100'
SHEET 9 of 10

Project Engineer	Date	Design Engineer	Date	Approval Recommended by	Date
R. Owens		J.M. Damberger		J. O. Grasberger	

FORM WH23A-P7

AS BUILT PLANS
Contract No. 11-095084
Date Completed 5-5-78
Document No. F 000 6535

I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF TRANSPORTATION.

DATE 2-28-79 SIGNATURE [illegible] TITLE [illegible]

MICROFILM - STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION - MICROFILM
SCALE 1"= 50'
SCALE 1"= 10' or 1"= 100'
SCALE 1"= 20'
SCALE 1"= 40'

42

CMNL.

EX CALTRANS C

DIST.	CO.	ROUTE	POST MILE	DETAIL SHEET NO.	TOTAL SHEETS
11	SD	15	R43.2/R48.1	43	127

Robert Owens
PROJECT ENGINEER — REGISTERED CIVIL ENGINEER NO. 12216

DATE APPROVED March 15, 1976

Pala Mesa Golf Course

Existing Hwy 395

24" RCP (Not Part of this Contract.)

"RT LN"

End of Work Sta. 2353+00 "RT LN"

N 00° 58' 30" E

Drainage Channel

+50 Join Estd. Ground

¼ Ton Rock Slope Protection

Delete ¼ Ton Rock Slope Protection From Sta. 2349+00 to 2349+50 "CS" CCO #28

2353+00 "CS" End Channel Grading

Escondido

Riverside

Rincon Valley

Drainage Legend : See Sheet 1 of Contour Grading & Drainage.

"AS BUILT"
CONTRACT 11-095084
YEAR COMPLETED 5-5-78

CONTOUR GRADING AND DRAINAGE

SCALE 1" = 100'
SHEET 10 of 10

Project Engineer	Date	Design Engineer	Date	Approval Recommended By	Date
R. Owens		J.M. Damberger		J.O. Grasberger	

FORM WH23A-77

AS BUILT PLANS
Contract No. 11-095084
Date Completed 5-5-78
Document No. 4000535

I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF TRANSPORTATION.

DATE 11/28/00 SIGNATURE TITLE

MICROFILM - STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION - MICROFILM

U.S. Department of Transportation
Federal Highway Administration

Memorandum

Subject: **ACTION**: Highway Embankments versus Levees and other Flood Control Structures

Date: September 10, 2008

In Reply Refer To: HIBT-20

/s/ Original Signed by
From: King W. Gee
Associate Administrator for Infrastructure

To: Associate Administrator for Federal Lands
Highway Programs
Directors of Field Services
Acting Resource Center Director
Division Administrators

This memorandum provides guidance to our field offices on the distinctions between highway embankments, levees, and other flood control structures. The memorandum also provides background of why these distinctions are important and recommendations in the event that the FHWA encounters questions or issues in this area.

Background:

The Federal Emergency Management Agency (FEMA), primarily through the National Flood Insurance Program (NFIP), works with communities to determine floodplain areas threatened by flood damages and sets appropriate insurance rates for property owners within those areas. The primary means to determine the locations of these flood prone areas are through flood insurance studies (FIS) and associated flood insurance rate maps. By the time the FEMA and the communities began conducting these FIS, much of our Nation's highway system had already been constructed, including embankments within some floodplains.

Recent FEMA map modernization and levee certification initiatives have revealed that for many years some highway embankments may have been either inadvertently or incorrectly designated as levees or other flood control structures. Also, some NFIP communities incorrectly assumed that these embankments provided some level of protection. Until recently, the FHWA was unaware of such assumptions.

Furthermore, there have been recent instances where the FEMA, other floodplain regulators, and communities (hereafter referred to as 'entities') have approached State departments of transportation (DOTs) to request DOT certification of these highway embankments as levees or flood control structures. Some entities have suggested that DOTs need to retrofit these embankments into levees and do so using Federal-aid highway funds, thus allowing for certification. Many times these entities cite significant economic hardship for the community should the DOT not take such actions.

MOVING THE AMERICAN ECONOMY

The FHWA, Floodplains, and Flood Control

For over 50 years, the FHWA has been involved in the planning, design, and construction of the Interstate and other portions of the National Highway System. At times, this required placing highway embankments adjacent to or within floodplains. While the FHWA long recognized that the highway system would cross and interact with floodplains, the system was not designed or intended to serve in a flood control role.

As a consequence, the FHWA does not have flood control standards for highway embankments. However, the FHWA does have regulations and design standards that relate to the interaction of highways and bridges with floodplains. These regulations are found in 23 CFR 650 Subpart A: "Location and Hydraulic Design of Encroachments on Flood Plains."

Design of Highway Embankments

Both new and existing highway embankments reflect the following typical design philosophy and approach:

- Highway embankments do not include design features, such as an internal impervious core and freeboard, required for a levee or other flood control structures;
- The fill material used in the construction of a typical highway embankment is not a sufficient barrier against water; therefore, a highway embankment is subject to piping, seepage, and infiltration; and
- Typical highway embankment construction does not require the same level of geotechnical engineering analysis as required for flood control structures.

Role of FHWA Floodplain Regulations

The FHWA floodplain policies and regulations (23 CFR 650 Subpart A) attempt to keep encroachments (embankments) entirely out of floodplains. Where this was not feasible, regulations and practice required most Interstate embankments to be sufficiently elevated to avoid overtopping by a flood with a 2 percent chance of being exceeded in any given year. This requirement does not imply an embankment provides an additional flood control role. Instead, the intent is to prevent loss of the embankment as a result of overtopping flows associated with smaller floods.

Further differentiating how the FHWA's floodplain interaction function is distinct from a flood control role, the FHWA floodplain regulations require highway project design flows to consider potential effects on any existing flood control channels, levees, and reservoirs. In doing so, the FHWA recognizes the importance of flood control missions performed by other entities, but clearly avoids undertaking and involvement in such a mission. Typically, the Federal Agencies with such a flood control and mitigation mission and authority are the FEMA and the U.S. Army Corps of Engineers.

Risk of Failure

In developing the floodplain regulations, the FHWA did not intend that highway embankments act as a flood control structure. To the contrary, the FHWA believes that assuming such a role poses a significant risk of embankment failure.

An additional concern is that highway engineers cannot quantify the risk of failure of these embankments during a flood event. There are no cost effective means to ascertain the potential of failure associated with any given highway embankment or even relative to similarly designed highway embankments in different areas. Nor does a history of some individual embankment acting in a "flood protection" mode imply that the design is adequate for a flood control role.

Embankments and Permanent Dams

The FHWA floodplain regulations do recognize that there are times when embankments may interact with or function as permanent dams. In these cases, the FHWA has no design standards. Instead the FHWA regulations require the design have the approval of the State or Federal Agency responsible for the safety of dams or like structures within the State. Even in this case, the FHWA floodplain regulations distinguish between permanent structures and those affected during floods.

Guidance on Highway Embankments

Staff from the FHWA's Office of Bridge Technology have carefully studied the points discussed in this memorandum and believe that certifying or otherwise designating highway embankments as levees is not an acceptable practice and should be opposed for the following reasons:

- Most existing highway embankments were not designed and constructed for (and thus are ill-suited to) performing as a levee or other flood control facility;
- In such a role, highway embankments could pose a significant and unacceptable risk to the public; and subject a DOT and FHWA to an untenable position with respect to costs, liability and damages;
- Certification requires conducting a thorough engineering evaluation by groups with experience in analysis and design of flood control structures and applying standards and obtaining approval of agencies responsible for flood control structures; and
- This situation indirectly places the FHWA into a flood control role for its Federal-aid highway program. For nearly all projects, the FHWA does not have the authority to engage in flood control activities.

Therefore, the FHWA discourages DOTs in certifying highway embankments as levees or allowing any such certification by any entity. Additionally, the FHWA discourages any type of retrofit efforts as DOTs and the FHWA are not in a position to assume such a role for statutory, financial, liability, and engineering reasons.

We recommend that you and your corresponding DOT decline any certification request from any entity that may contact you on this subject. Additionally, we recommend informing the FHWA's Office of Bridge Technology, Hydraulics and Geotechnical Team (HIBT-20) of the request. The HIBT-20 staff will be available to serve as the FHWA's lead in providing assistance and guidance to your office in resolving such requests. The HIBT-20 staff has also met with FEMA headquarters staff on this issue and can provide liaison services as needed.

Please share this memorandum with your appropriate staff and with all appropriate DOT and local transportation management officials within your State.

If you have any questions or need additional information, please contact Mr. Joe Krolak at (202) 366-4611 (joe.krolak@dot.gov) or Mr. Jorge Pagán-Ortiz at (202) 366-4604 (jorge.pagan@dot.gov).

STORM WATER MANAGEMENT PLAN

Storm Water Management Plan
For Priority Projects
(Major SWMP)

The Major Stormwater Management Plan (Major SWMP) must be completed in its entirety and accompany applications to the County for a permit or approval associated with certain types of development projects. To determine whether your project is required to submit a Major or Minor SWMP, please reference the County's Stormwater Intake Form for Development Projects.

Project Name:	Campus Park – TM & Preliminary Grading Plan
Permit Number (Land Development Projects):	TM 5338 RPL6
Work Authorization Number (**CIP only**):	
Applicant:	Passerelle, LLC
Applicant's Address:	402 W. Broadway, Suite ~~2175~~ 1320 San Diego, Ca 92101
Plan Prepare By (*Leave blank if same as applicant*):	Landmark Consulting
Date:	10-14-05
Revision Date (If applicable):	~~1-24-08~~3-3-09

The County of San Diego Watershed Protection, Storm Water Management, an

d Discharge Control Ordinance (WPO) (Ordinance No. 9424) requires all applications for a permit or approval associated with a Land Disturbance Activity to be accompanied by a Storm Water Management Plan (SWMP) (section 67.806.b). The purpose of the SWMP is to describe how the project will minimize the short and long-term impacts on receiving water quality. Projects that meet the criteria for a priority development project are required to prepare a Major SWMP.

Since the SWMP is a living document, revisions may be necessary during various stages of approval by the County. Please provide the approval information requested below.

Project Stages	Does the SWMP need revisions?		If YES, Provide Revision Date
	YES	NO	
5	X		1-24-08
6	X		8-26-08
7	X		3-3-09

Instructions for a Major SWMP can be downloaded at http://www.co.sandiego.ca.us/dpw/stormwater/susmp.html.

Completion of the following checklists and attachments will fulfill the requirements of a Major SWMP for the project listed above.

PROJECT DESCRIPTION

The project is located on the northerly side of Pala Road, east of Interstate 15, west of Rice Canyon Road and south of Stewart Canyon Road, in the County of San Diego, State of California. The surrounding land uses around the project are as follows: westerly is Interstate 15, southerly is Pala Road (SR-76)/agricultural, easterly is agricultural/vacant/large parcel SFR, northerly is agricultural/large parcel SFR.

Attachment A is a vicinity map showing the general property location. The site is located on a north to south sloping topography. The terrains along the northerly and easterly boundaries are steep sloping, the mid-portion of the project is moderately sloping and the southerly end of the project is very gently sloping. The project site is located at the downstream end of an approximately 7,500 acre upstream drainage basin. An existing Caltrans channel conveys runoff from this upstream basin southerly along a portion of the westerly boundary of this project. The runoff from this upstream basin creates the Horse Ranch Creek and floodplain which eventually confluence with the San Luis Rey River to the south.

~~The project consists of approximately 415.8 areas of mixed development including 73.6 acres of single family dwelling units, 44.8 acres of multi-family dwelling units, 7.8 acres of town center development, 10.9 acres of professional office development, 0.7 acres of trail staging area, 0.1 acres of pump station area, 10.4 acres of park area, 49.8 acres of streets and 217.7 acres of open space area.~~

The project consists of approximately 416.1 acres of mixed-use development including 113.8 acres of single family dwelling units, 45.4 acres of multi-family dwelling units, 11.5 acres of professional office development, 8.1 acres of town center, 215.4 acres of parks and open space, 0.2 acres of pump station area as well as 21.7 acres of major circulation roads.

Horse Ranch Creek flows from along the westerly boundary of the project site. The upstream of the Horse Ranch Creek watershed consists of commercial and industrial developments, low-density residential developments, and the vast majority of the watershed consists of either natural or agricultural developments and existing roadways. The Horse Ranch Creek is not listed in the latest 303d list, based on the upstream development types, the anticipated pollutants are: sediments, nutrients, heavy metals, organic compounds, trash & debris, oxygen demanding substances, oil & grease, bacteria and viruses and pesticides. With the proposed on-site BMP measures, the project will not contribute additional pollutants to Horse Ranch Creek. The water quality of Horse Ranch Creek will remain the same as the pre-development conditions.

PRIORITY DEVELOPMENT PROJECT DETERMINATION

Please check the box that best describes the project. Does the project meet one of the following criteria?

Table 1

PRIORITY DEVELOPMENT PROJECT	YES	NO
Redevelopment that creates or adds at least 5,000 net square feet of additional impervious surface area	X	
Residential development of more than 10 units	X	
Commercial developments with a land area for development of greater than 1 acre	X	
Heavy industrial development with a land area for development of greater than 1 acre		X
Automotive repair shop(s)		X
Restaurants, where the land area for development is greater than 5,000 square feet	X	
Hillside development, in an area with known erosive soil conditions, where there will be grading on any natural slope that is twenty-five percent or greater, if the development creates 5,000 square feet or more of impervious surface	X	
Environmentally Sensitive Areas (ESA): All development located within or directly adjacent to or discharging directly to an ESA (where discharges from the development or redevelopment will enter receiving waters within the ESA), which either creates 2,500 square feet of impervious surface on a proposed project site or increases the area of imperviousness of a proposed project site to 10% or more of its naturally occurring condition. "Directly adjacent" means situated within 200 feet of the ESA. "Discharging directly to" means outflow from a drainage conveyance system that is composed entirely of flows from the subject development or redevelopment site, and not commingled with flows from adjacent lands.	X	
Parking Lots 5,000 square feet or more or with 15 parking spaces or more and potentially exposed to urban runoff	X	
Streets, roads, highways, and freeways which would create a new paved surface that is 5,000 square feet or greater	X	
Retail Gasoline Outlets (RGO) that meet the following criteria: (a) 5,000 square feet or more or (b) a projected Average Daily Traffic (ADT) of 100 or more vehicles per day.	X	

Limited Exclusion: Trenching and resurfacing work associated with utility projects are not considered Priority Development Projects. Parking lots, buildings and other structures associated with utility projects are subject to the WPO requirements if one or more of the criteria above are met.

If you answered **NO** to all the questions, then **STOP**. Please complete a Minor SWMP for your project. If you answered **YES** to any of the questions, please continue.

HYDROMODIFICATION DETERMINATION

The following questions provide a guide to collecting information relevant to hydromodification management issues.

Table 2

	QUESTIONS	YES	NO	Information
1.	Will the proposed project disturb 50 or more acres of land? (Including all phases of development)	X		If YES, continue to 2. If NO, go to 6.
2.	Would the project site discharge directly into channels that are concrete-lined or significantly hardened such as with rip-rap, sackcrete, etc, downstream to their outfall into bays or the ocean?		X	If NO, continue to 3. If YES, go to 6.
3.	Would the project site discharge directly into underground storm drains discharging directly to bays or the ocean?		X	If NO, continue to 4. If YES, go to 6.
4.	Would the project site discharge directly to a channel (lined or un-lined) and the combined impervious surfaces downstream from the project site to discharge at the ocean or bay are 70% or greater?		X	If NO, continue to 5. If YES, go to 6.
5.	Project is required to manage hydromodification impacts.	X		Hydromodification Management Required as described in Section 67.812 b(4) of the WPO.
6.	Project is not required to manage hydromodification impacts.			Hydromodification Exempt. Keep on file.

An exemption is potentially available for projects that are required (No. 5. in Table 2 above) to manage hydromodification impacts: The project proponent may conduct an independent geomorphic study to determine the project's full hydromodification impact. The study must incorporate sediment transport modeling across the range of geomorphically-significant flows and demonstrate to the County's satisfaction that the project flows and sediment reductions will not detrimentally affect the receiving water to qualify for the exemption.

STORMWATER QUALITY DETERMINATION

The following questions provide a guide to collecting information relevant to project stormwater quality issues. Please provide the following information in a printed report accompanying this form.

Table 3

	QUESTIONS	COMPLETED	N/A
1.	Describe the topography of the project area.	The site is located on a north to south sloping topography. The terrains along the northerly and easterly boundaries are steep sloping, the mid-portion of the project is moderately sloping and the southerly end of the project is very gently sloping.	
2.	Describe the local land use within the project area and adjacent areas.	The proposed land use for the site is a mix development, with 73.6 acres of single family dwelling units, 44.8 acres of multi-family dwelling units, 7.8 acres of town center development, 10.9 acres of professional office development, 0.8 acres of trail staging area, 0.1 acres of pump station area, 10.4 acres of park areas, 49.8 acres of streets and 217.7 acres of open space area. The adjacent area is of rural and vacant land.	
3.	Evaluate the presence of dry weather flow.	No dry weather flow is evident.	
4.	Determine the receiving waters that may be affected by the project throughout all phases of development (i.e., construction, maintenance and operation).	Horse Ranch Creek and San Luis Rey River and Pacific Ocean	
5.	For the project limits, list the 303(d) impaired receiving water bodies and their constituents of concern.	Pacific Ocean shoreline, San Luis Rey River. Stressor: Bacteria Indicators	
6.	Determine if there are any High Risk Areas (which is defined by the presence of municipal or domestic water supply reservoirs or groundwater percolation facilities) within the project limits.	No	X
7.	Determine the Regional Board special requirements, including TMDLs, effluent limits, etc.		X
8.	Determine the general climate of the project area. Identify annual rainfall and rainfall intensity curves.	The project area is located in climate Zone 10. The annual rainfall is 24".	
9.	If considering Treatment BMPs, determine the soil classification, permeability, erodibility, and	Type 'D' soil, low permeability when soil is thoroughly wetted. Moderate to low erodibility. No groundwater was encountered.	

	depth to groundwater.		
10.	Determine contaminated or hazardous soils within the project area.	There are no evidence of contaminated or hazardous soils within the project area.	
11.	Determine if this project is within environmentally sensitive areas as defined on the maps in Appendix A of the *County of San Diego Standard Urban Storm Water Mitigation Plan for Land Development and Public Improvement Projects.*	Not Applicable	X
12.	Determine if this is an emergence project.	Not Applicable	X

WATERSHED

Please check the watershed(s) for the project.

San Juan 901	Santa Margarita 902	**San Luis Rey 903**	Carlsbad 904
San Dieguito 905	Penasquitos 906	San Diego 907	Sweetwater 909
Otay 910	Tijuana 911	Whitewater 719	Clark 720
West Salton 721	Anza Borrego 722	Imperial 723	

Please provide the hydrologic sub-area and number(s)

Number	Name
903.12	Bonsall

Please provide the beneficial uses for Inland Surface Waters and Ground Waters. Beneficial Uses can be obtained from the Water Quality Control Plan for the San Diego Basin, which is available at the Regional Board office or at http://www.waterboards.ca.gov/sandiego/water_issues/programs/basin_plan/index.shtml

SURFACE WATERS	Hydrologic Unit Basin Number	MUN	AGR	IND	PROC	GWR	FRESH	POW	REC1	REC2	BIOL	WARM	COLD	WILD	RARE	SPWN
Inland Surface Waters	903.12	X	X	X			X	X	X	X		X	X	X	X	
Ground Waters																

*** Excepted from Municipal**

X = Existing Beneficial Use
0 = Potential Beneficial Use

POLLUTANTS OF CONCERN

Using Table 4, identify pollutants that are anticipated to be generated from the proposed priority project categories. Pollutants associated with any hazardous material sites that have been remediated or are not threatened by the proposed project are not considered a pollutant of concern.

Table 4. Anticipated and Potential Pollutants Generated by Land Use Type

	General Pollutant Categories								
PDP Categories	Sediments	Nutrients	Heavy Metals	Organic Compounds	Trash & Debris	Oxygen Demanding Substances	Oil & Grease	Bacteria & Viruses	Pesticides
Detached Residential Development	**X**	**X**			**X**	**X**	**X**	**X**	**X**
Attached Residential Development	**X**	**X**			**X**	**P(1)**	**P(2)**	**P**	**X**
Commercial Development 1 acre or greater	**P(1)**	**P(1)**		**P(2)**	**X**	**P(5)**	**X**	**P(3)**	**P(5)**
Heavy industry /industrial development	X		X	X	X	X	X		
Automotive Repair Shops			X	X(4)(5)	X		X		
Restaurants					X	X	X	X	
Hillside Development >5,000 ft2	X	X			X	X	X		X
Parking Lots	**P(1)**	**P(1)**	**X**		**X**	**P(1)**	**X**		**P(1)**
Retail Gasoline Outlets			X	X	X	X	X		
Streets, Highways & Freeways	**X**	**P(1)**	**X**	**X(4)**	**X**	**P(5)**	**X**		

X = anticipated
P = potential
(1) A potential pollutant if landscaping exists on-site.
(2) A potential pollutant if the project includes uncovered parking areas.
(3) A potential pollutant if land use involves food or animal waste products.
(4) Including petroleum hydrocarbons.
(5) Including solvents.

Note: If other monitoring data that is relevant to the project is available, please include as Attachment C.

CONSTRUCTION BMPs

Please check the construction BMPs that may be implemented during construction of the project. The applicant will be responsible for the placement and maintenance of the BMPs incorporated into the final project design.

X	Silt Fence	X	Desilting Basin
X	Fiber Rolls	X	Gravel Bag Berm
X	Street Sweeping and Vacuuming	X	Sandbag Barrier
X	Storm Drain Inlet Protection	X	Material Delivery and Storage
X	Stockpile Management	X	Spill Prevention and Control
X	Solid Waste Management	X	Concrete Waste Management
X	Stabilized Construction Entrance/Exit	X	Water Conservation Practices
X	Dewatering Operations	X	Paving and Grinding Operations
X	Vehicle and Equipment Maintenance	X	Any minor slopes created incidental to construction and not subject to a major or minor grading permit shall be protected by covering with plastic or tarp prior to a rain event, and shall have vegetative cover reestablished within 180 days of completion of the slope and prior to final building approval.

EXCEPTIONAL THREAT TO WATER QUALITY DETERMINATION

Complete the checklist below to determine if a proposed project will pose an "exceptional threat to water quality," and therefore require Advanced Treatment Best Management Practices.

Table 5

No.	CRITERIA	YES	NO	INFORMATION
1.	Is all or part of the proposed project site within 200 feet of waters named on the Clean Water Act (CWA) Section 303(d) list of Water Quality Limited Segments as impaired for sedimentation and/or turbidity? Current 303d list may be obtained from the following site: http://www.swrcb.ca.gov/tmdl/docs/303dlists2006/approved/r9_06_303d_reqtmdls.pdf		X	If YES, continue to 2. If NO, go to 5.
2.	Will the project disturb more than 5 acres, including all phases of the development?	X		If YES, continue to 3. If NO, go to 5.
3.	Will the project disturb slopes that are steeper than 4:1 (horizontal: vertical) with at least 10 feet of relief, and that drain toward the 303(d) listed receiving water for sedimentation and/or turbidity?	X		If YES, continue to 4. If NO, go to 5.
4.	Will the project disturb soils with a predominance of USDA-NRCS Erosion factors k_f greater than or equal to 0.4?		X	If YES, continue to 6. If NO, go to 5.
5.	Project is not required to use Advanced Treatment BMPs.	X		Document for Project Files by referencing this checklist.
6.	Project poses an "exceptional threat to water quality" and is required to use Advanced Treatment BMPs.		X	Advanced Treatment BMPs must be consistent with WPO section 67.811(b)(20)(D) performance criteria

Exemption potentially available for projects that require advanced treatment:
Project proponent may perform a Revised Universal Soil Loss Equation, Version 2 (RUSLE 2), Modified Universal Soil Loss Equation (MUSLE), or similar analysis that shows to the County official's satisfaction that advanced treatment is not required

Now that the need for treatment BMPs has been determined, other information is needed to complete the SWMP.

SITE DESIGN

To minimize stormwater impacts, site design measures must be addressed. The following checklist provides options for avoiding or reducing potential impacts during project planning. If YES is checked, it is assumed that the measure was used for this project.

Table 6

	OPTIONS		YES	NO	N/A
1.	Has the project been located and road improvements aligned to avoid or minimize impacts to receiving waters or to increase the preservation of critical (or problematic) areas such as floodplains, steep slopes, wetlands, and areas with erosive or unstable soil conditions?		X		
2.	Is the project designed to minimize impervious footprint?		X		
3.	Is the project conserving natural areas where feasible?		X		
4.	Where landscape is proposed, are rooftops, impervious sidewalks, walkways, trails and patios be drained into adjacent landscaping?		X		
5.	For roadway projects, are structures and bridges be designed or located to reduce work in live streams and minimize construction impacts?		X		
6.	Can any of the following methods be utilized to minimize erosion from slopes:				
	6.a.	Disturbing existing slopes only when necessary?	X		
	6.b.	Minimize cut and fill areas to reduce slope lengths?	X		
	6.c.	Incorporating retaining walls to reduce steepness of slopes or to shorten slopes?	X		
	6.d.	Providing benches or terraces on high cut and fill slopes to reduce concentration of flows?			X
	6.e.	Rounding and shaping slopes to reduce concentrated flow?	X		
	6.f.	Collecting concentrated flows in stabilized drains and channels?	X		

LOW IMPACT DEVELOPMENT (LID)

Each numbered item below is a LID requirement of the WPO. Please check the box(s) under each number that best describes the Low Impact Development BMP(s) selected for this project.

Table 7

1.	Conserve natural Areas, Soils, and Vegetation-County LID Handbook 2.2.1
X	Preserve well draining soils (Type A or B)
X	Preserve Significant Trees
	Other. Description:
	1. Not feasible. State Reason:
2.	Minimize Disturbance to Natural Drainages-County LID Handbook 2.2.2
X	Set-back development envelope from drainages
	Restrict heavy construction equipment access to planned green/open space areas
	Other. Description:
	2. Not feasible. State Reason:
3.	Minimize and Disconnect Impervious Surfaces (see 5) -County LID Handbook 2.2.3
X	Clustered Lot Design
	Items checked in 5?
	Other. Description:
	3. Not feasible. State Reason:
4.	Minimize Soil Compaction-County LID Handbook 2.2.4
X	Restrict heavy construction equipment access to planned green/open space areas
X	Re-till soils compacted by construction vehicles/equipment
X	Collect & re-use upper soil layers of development site containing organic materials
	Other. Description:
	4. Not feasible. State Reason:
5.	Drain Runoff from Impervious Surfaces to Pervious Areas-County LID Handbook 2.2.5
	LID Street & Road Design
	Curb-cuts to landscaping
	Rural Swales
	Concave Median
	Cul-de-sac Landscaping Design
	Other. Description:
	LID Parking Lot Design
	Permeable Pavements
X	Curb-cuts to landscaping
	Other. Description:

	LID Driveway, Sidewalk, Bike-path Design
	Permeable Pavements
X	Pitch pavements toward landscaping
	Other. Description:
	LID Building Design
	Cisterns & Rain Barrels
X	Downspout to swale
	Vegetated Roofs
	Other. Description:
	LID Landscaping Design
X	Soil Amendments
X	Reuse of Native Soils
X	Smart Irrigation Systems
X	Street Trees
	Other. Description:
	5. Not feasible. State Reason:

CHANNELS & DRAINAGES

Complete the following checklist to determine if the project includes work in channels.

Table 8

No.	CRITERIA	YES	NO	N/A	COMMENTS
1.	Will the project include work in channels?	X			If YES go to 2 If NO go to 13.
2.	Will the project increase velocity or volume of downstream flow?		X		If YES go to 6.
3.	Will the project discharge to unlined channels?	X			If YES go to. 6.
4.	Will the project increase potential sediment load of downstream flow?	X			If YES go to 6.
5.	Will the project encroach, cross, realign, or cause other hydraulic changes to a stream that may affect downstream channel stability?		X		If YES go to 8.
6.	Review channel lining materials and design for stream bank erosion.	X			Continue to 7.
7.	Consider channel erosion control measures within the project limits as well as downstream. Consider scour velocity.	X			Continue to 8.
8.	Include, where appropriate, energy dissipation devices at culverts.	X			Continue to 9.
9.	Ensure all transitions between culvert outlets/headwalls/wingwalls and channels are smooth to reduce turbulence and scour.	X			Continue to 10.
10.	Include, if appropriate, detention facilities to reduce peak discharges.	X			
11.	"Hardening" natural downstream areas to prevent erosion is not an acceptable technique for protecting channel slopes, unless pre-development conditions are determined to be so erosive that hardening would be required even in the absence of the proposed development.		X		Continue to 12.
12.	Provide other design principles that are comparable and equally effective.	X			Continue to 13.
13.	End				

SOURCE CONTROL

Please complete the following checklist for Source Control BMPs. If the BMP is not applicable for this project, then check N/A only at the main category.

Table 9

	BMP		YES	NO	N/A
1.	**Provide Storm Drain System Stenciling and Signage**				
	1.a.	All storm drain inlets and catch basins within the project area shall have a stencil or tile placed with prohibitive language (such as: "NO DUMPING – DRAINS TO San Luis Rey River") and/or graphical icons to discourage illegal dumping.	X		
	1.b.	Signs and prohibitive language and/or graphical icons, which prohibit illegal dumping, must be posted at public access points along channels and creeks within the project area.	X		
2.	**Design Outdoors Material Storage Areas to Reduce Pollution Introduction**				
	2.a.	This is a detached single-family residential project. Therefore, personal storage areas are exempt from this requirement.			X
	2.b.	Hazardous materials with the potential to contaminate urban runoff shall either be: (1) placed in an enclosure such as, but not limited to, a cabinet, shed, or similar structure that prevents contact with runoff or spillage to the storm water conveyance system; or (2) protected by secondary containment structures such as berms, dikes, or curbs.	X		
	2.c.	The storage area shall be paved and sufficiently impervious to contain leaks and spills.	X		
	2.d.	The storage area shall have a roof or awning to minimize direct precipitation within the secondary containment area.	X		
3.	**Design Trash Storage Areas to Reduce Pollution Introduction**				
	3.a.	Paved with an impervious surface, designed not to allow run-on from adjoining areas, screened or walled to prevent off-site transport of trash; or,	X		
	3.b.	Provide attached lids on all trash containers that exclude rain, or roof or awning to minimize direct precipitation.	X		
4.	**Use Efficient Irrigation Systems & Landscape Design**				
	The following methods to reduce excessive irrigation runoff shall be considered, and incorporated and implemented where determined applicable and feasible.		X		
	4.a.	Employing rain shutoff devices to prevent irrigation after precipitation.	X		
	4.b.	Designing irrigation systems to each landscape area's specific water requirements.	X		
	4.c.	Using flow reducers or shutoff valves triggered by a pressure drop to control water loss in the event of broken sprinkler heads or lines.	X		
	4.d.	Employing other comparable, equally effective, methods to reduce irrigation water runoff.	X		
5.	**Private Roads**				

	BMP		YES	NO	N/A
	The design of private roadway drainage shall use at least one of the following				
	5.a.	Rural swale system: street sheet flows to vegetated swale or gravel shoulder, curbs at street corners, culverts under driveways and street crossings.			X
	5.b.	Urban curb/swale system: street slopes to curb, periodic swale inlets drain to vegetated swale/biofilter.			X
	5.c.	Dual drainage system: First flush captured in street catch basins and discharged to adjacent vegetated swale or gravel shoulder, high flows connect directly to storm water conveyance system.	X		
	5.d.	Other methods that are comparable and equally effective within the project.	X		
6.	**Residential Driveways & Guest Parking**				
	The design of driveways and private residential parking areas shall use one at least of the following features.				
	6.a.	Design driveways with shared access, flared (single lane at street) or wheelstrips (paving only under tires); or, drain into landscaping prior to discharging to the storm water conveyance system.			X
	6.b.	Uncovered temporary or guest parking on private residential lots may be: paved with a permeable surface; or, designed to drain into landscaping prior to discharging to the storm water conveyance system.	X		
	6.c.	Other features which are comparable and equally effective.	X		
7.	**Dock Areas**				
	Loading/unloading dock areas shall include the following.				
	7.a.	Cover loading dock areas, or design drainage to preclude urban run-on and runoff.	X		
	7.b.	Direct connections to storm drains from depressed loading docks (truck wells) are prohibited.	X		
	7.c.	Other features which are comparable and equally effective.	X		
8.	**Maintenance Bays**				
	Maintenance bays shall include the following.		X		
	8.a.	Repair/maintenance bays shall be indoors; or, designed to preclude urban run-on and runoff.	X		
	8.b.	Design a repair/maintenance bay drainage system to capture all wash water, leaks and spills. Connect drains to a sump for collection and disposal. Direct connection of the repair/maintenance bays to the storm drain system is prohibited. If required by local jurisdiction, obtain an Industrial Waste Discharge Permit.	X		
	8.c.	Other features which are comparable and equally effective.	X		
9.	**Vehicle Wash Areas**				
	Priority projects that include areas for washing/steam cleaning of vehicles shall use the following.		X		
	9.a.	Self-contained; or covered with a roof or overhang.	X		
	9.b.	Equipped with a clarifier or other pretreatment facility.	X		
	9.c.	Properly connected to a sanitary sewer.	X		
	9.d.	Other features which are comparable and equally effective.	X		

	BMP		YES	NO	N/A
10.	**Outdoor Processing Areas**				
	Outdoor process equipment operations, such as rock grinding or crushing, painting or coating, grinding or sanding, degreasing or parts cleaning, waste piles, and wastewater and solid waste treatment and disposal, and other operations determined to be a potential threat to water quality by the County shall adhere to the following requirements.				
	10.a.	Cover or enclose areas that would be the most significant source of pollutants; or, slope the area toward a dead-end sump; or, discharge to the sanitary sewer system following appropriate treatment in accordance with conditions established by the applicable sewer agency.	X		
	10.b.	Grade or berm area to prevent run-on from surrounding areas.	X		
	10.c.	Installation of storm drains in areas of equipment repair is prohibited.	X		
	10.d.	Other features which are comparable or equally effective.	X		
11.	**Equipment Wash Areas**				
	Outdoor equipment/accessory washing and steam cleaning activities shall be.				
	11.a.	Be self-contained; or covered with a roof or overhang.	X		
	11.b.	Be equipped with a clarifier, grease trap or other pretreatment facility, as appropriate	X		
	11.c.	Be properly connected to a sanitary sewer.	X		
	11.d.	Other features which are comparable or equally effective.	X		
12.	**Parking Areas**				
	The following design concepts shall be considered, and incorporated and implemented where determined applicable and feasible by the County.				
	12.a.	Where landscaping is proposed in parking areas, incorporate landscape areas into the drainage design.	X		
	12.b.	Overflow parking (parking stalls provided in excess of the County's minimum parking requirements) may be constructed with permeable paving.	X		
	12.c.	Other design concepts that are comparable and equally effective.	X		
13.	**Fueling Area**				
	Non-retail fuel dispensing areas shall contain the following.				
	13.a.	Overhanging roof structure or canopy. The cover's minimum dimensions must be equal to or greater than the area within the grade break. The cover must not drain onto the fuel dispensing area and the downspouts must be routed to prevent drainage across the fueling area. The fueling area shall drain to the project's treatment control BMP(s) prior to discharging to the storm water conveyance system.	X		
	13.b.	Paved with Portland cement concrete (or equivalent smooth impervious surface). The use of asphalt concrete shall be prohibited.	X		
	13.c.	Have an appropriate slope to prevent ponding, and must be separated from the rest of the site by a grade break that prevents run-on of urban runoff.	X		

		BMP	YES	NO	N/A
	13.d.	At a minimum, the concrete fuel dispensing area must extend 6.5 feet (2.0 meters) from the corner of each fuel dispenser, or the length at which the hose and nozzle assembly may be operated plus 1 foot (0.3 meter), whichever is less.	X		

Please list other project specific Source Control BMPs in the following box. Write **N/A** if there are none.

N/A

TREATMENT CONTROL

To select a structural treatment BMP using Treatment Control BMP Selection Matrix (Table 10), each priority project shall compare the list of pollutants for which the downstream receiving waters are impaired (if any), with the pollutants anticipated to be generated by the project (as identified in Table 4). Any pollutants identified by Table 4, which are also causing a Clean Water Act section 303(d) impairment of the receiving waters of the project, shall be considered primary pollutants of concern. Priority projects that are anticipated to generate a primary pollutant of concern shall select a single or combination of stormwater BMPs from Table 10, which **maximizes pollutant removal** for the particular primary pollutant(s) of concern.

Priority development projects that are **not** anticipated to generate a pollutant for which the receiving water is CWA 303(d) impaired shall select a single or combination of stormwater BMPs from Table 10, which are effective for pollutant removal of the identified secondary pollutants of concern, consistent with the "maximum extent practicable" standard.

Table 10. Treatment Control BMP Selection Matrix

Pollutants of Concern	**Bioretention Facilities (LID)***	**Settling Basins (Dry Ponds)**	Wet Ponds and Wetlands	**Infiltration Facilities or Practices (LID)***	**Media Filters**	High-rate biofilters	High-rate media filters	Trash Racks & Hydro - dynamic Devices
Coarse Sediment and Trash	**High**	**High**	High	**High**	**High**	High	High	High
Pollutants that tend to associate with fine particles during treatment	**High**	**High**	High	**High**	**High**	Medium	Medium	Low
Pollutants that tend to be dissolved following treatment	**Medium**	**Low**	Medium	**High**	**Low**	Low	Low	Low

*Additional information is available in the County of San Diego LID Handbook.

NOTES ON POLLUTANTS OF CONCERN:

In Table 11, Pollutants of Concern are grouped as gross pollutants, pollutants that tend to associate with fine particles, and pollutants that remain dissolved.

Table 11

Pollutant	Coarse Sediment and Trash	Pollutants that tend to associate with fine particles during treatment	Pollutants that tend to be dissolved following treatment
Sediment	X	X	
Nutrients		X	X
Heavy Metals		X	
Organic Compounds		X	
Trash & Debris	X		
Oxygen Demanding		X	
Bacteria		X	
Oil & Grease		X	
Pesticides		X	

A Treatment BMP must address runoff from developed areas. Please provide the post-construction water quality treatment volume or flow values for the selected project Treatment BMP(s). Guidelines for design calculations are located in Chapter 5, Section 4.3, Principle 8 of the County SUSMP. Label outfalls on the BMP map. The Water Quality peak rate of discharge flow (Qwq) and the Water Quality storage volume (Vwq) is dependent on the type of treatment BMP selected for the project.

Outfall	Tributary Area (acres)	Q_{wq} (cfs)	V_{wq} (ft3)
~~Node 348~~	~~1006.9~~	~~3209.7~~	~~140.5~~
Westerly of Frigate Bird Rd., on the proposed fill slope westerly of the Pool site. BMP: bioswale #1	32.5	3.7	N/A * no volume based permanent BMP proposed.
Northerly of proposed Pankey Place, at approximately the halfway point of the roadway. BMP: bioswale #2	0.8	0.1	N/A * no volume based permanent BMP proposed.
On the northwesterly fill slope of the Staging Area/Pump Station site, westerly of Pala Mesa Drive Pala Mesa Dr., approximately 560'northerly of intersection with ex. Pala Rd./SR76 BMP: bioswale #3	5.1	0.9	N/A * no volume based permanent BMP proposed.
Northerly of proposed Pala Mesa Dr., approximately 690' easterly of intersection with Old Hwy 395. BMP: bioswale #4	0.8	0.1	N/A * no volume based permanent BMP proposed.
At the westerly end of Belted Kingfisher Rd. BMP: bioswale #5	7.4	0.8	N/A * no volume based permanent BMP proposed.
Northerly of proposed Pala Mesa Dr., approximately 1600' northerly of intersection with ex. Pala Rd./SR76. BMP: bioswale #6	2.0	0.3	N/A * no volume based permanent BMP proposed.
Westerly of Horse Ranch Creek Rd. approximately 1700 northerly of intersection with SR76. BMP: bioswale #7	5.9	1.0	N/A * no volume based permanent BMP proposed.
Westerly of Horse Ranch Creek Rd. at the N/w corner of intersection with SR76. BMP: bioswale #8	4.7	0.8	N/A * no volume based permanent BMP proposed.
Entering proposed detention basin outlet	231.2	N/A * no flow based permanent BMP proposed	463,270

Please check the box(s) that best describes the Treatment BMP(s) selected for this project.

	Biofilters
X	Bioretention swale
	Vegetated filter strip
	Stormwater Planter Box (open-bottomed)
	Stormwater Flow-Through Planter (sealed bottom)
	Bioretention Area
	Vegetated Roofs/Modules/Walls
	Detention Basins
X	Extended/dry detention basin with grass/vegetated lining
	Extended/dry detention basin with impervious lining
	Infiltration Basins
	Infiltration basin
X	Infiltration trench
	Dry well
	Permeable Paving
	Gravel
	Permeable asphalt
	Pervious concrete
	Unit pavers, ungrouted, set on sand or gravel
	Subsurface reservoir bed
	Wet Ponds or Wetlands
	Wet pond/basin (permanent pool)
	Constructed wetland
	Filtration
	Media filtration
	Sand Filtration
	Hydrodynamic Separator Systems
	Swirl Concentrator
	Cyclone Separator
	Trash Racks and Screens

Include Treatment Datasheet as Attachment E. The datasheet should include the following:	**COMPLETED**	**NO**
1. Description of how treatment BMP was designed. Provide a description for each type of treatment BMP.	X	
2. Engineering calculations for the BMP(s)	X	

Please describe why the selected treatment BMP(s) was selected for this project. For projects utilizing a low performing BMP, please provide a detailed explanation.

The bio-swale at the most downstream ends of the underground storm drain pipes, will only function as a BMP device – see attached Post-Construction BMP Site Plan. Since the bio-swale is very long and flat, the runoff will settle and infiltrate into the ground, thus it will also function as a filtration trench.

Based on the land use of the tributary areas, the anticipated pollutants are: sediments, nutrients, heavy metals, organic compounds, trash & debris, oxygen demanding substances, oil & grease, bacteria & viruses and pesticides. The bio-swales/filtration trenches have combined adequacy efficiency to remove all the above mentioned pollutants.

Treatment BMP Engineering Calculations:

FLOW BASED BMPs:

BIO-SWALE #1

Westerly of Frigate Bird Rd., on the proposed fill slope westerly of the Pool site. A water quality low flow drop outlet will discharge the first flush water quality runoff into the proposed grass-lined bio-swale located in the proposed fill slope westerly of the Pool site. The disturbed tributary area is 32.5 Ac, the water quality flow is:

Qwq = C x I x A = 0.57 x 0.2in/hr x 32.5 Ac = 3.7 cfs

The bioswale will have a bottom width of 20', a depth of 1', with a 3:1 side slope, the top width is 26'. The design slope of the bio-swale is 0.1% to ensure a slow flow. The flow depth is at 4.2", the grass height should be maintained at 8". The first flush flow velocity is 0.50 fps, a swale length of 300 feet is required to achieve a 10-minute resident time.

BIO-SWALE #2

Northerly of proposed Pankey Place, approximately at the halfway point of the roadway. A water quality low flow drop outlet will located in the northerly curb inlet will discharge the first flush water quality runoff into the proposed grass-lined bio-swale located in the northerly proposed fill slope of Pankey Place. The tributary area is 0.8 acres, and the water quality flow is:

Qwq = C x I x A = 0.85 x 0.2in/hr x 0.8 Ac = 0.1 cfs

The bio-swale will have a bottom width of 5', a depth of 6", with a 3:1 side slope the top width is 8'. The flow depth is at 1.1", the grass height should be maintained at 6". The design slope of the bio-slope is 0.1 % to ensure a slow flow. The first flush flow velocity is 0.21fps, a swale length of 126 feet is required to achieve a 10-minute resident time.

BIO-SWALE #3

On the northwesterly fill slope of the Staging Area/Pump Station site, westerly of Pala Mesa Drive. A water quality low flow channel drain located at the entrance to each of the three curb inlets will discharge the first flush water quality runoff into the proposed grass-lined bio-swale via a low flow pipe. The westerly half of the proposed Pankey Place and the southerly 1600' of the Pala Mesa Drive (north of SR 76) contribute to the runoff entering the three curb inlets located at the intersection of Pala Mesa Drive and Pankey Place. The tributary area is 5.1 acres, and the water quality flow is:

Qwq = C x I x A = 0.85 x 0.2in/hr x 5.1 Ac = 0.9 cfs

The bio-swale will have a bottom width of 5.5', a depth of 6", with a 3:1 side slope the top width is 9'. The flow depth is at 3.8", the grass height should be maintained at 6". The design slope of the bio-slope is 0.1 % to ensure a slow flow. The first flush flow velocity is 0.44fps, a swale length of 264 feet is required to achieve a 10-minute resident time.

BIO-SWALE #4

Northerly side of Pala Mesa Drive, approximately 690' easterly of Old Hwy 395. A water quality low flow drop outlet located in the northerly curb inlet will discharge the first flush water quality runoff into the proposed grass-lined bio-swale located on the northerly fill slope. The tributary area is 0.8 acres, and the water quality flow is:

Qwq = C x I x A = 0.85 x 0.2in/hr x 0.8 Ac = 0.1 cfs

The bio-swale will have a bottom width of 3', a depth of 6", with a 3:1 side slope the top width is 6'. The flow depth is at 1.5", the grass height should be maintained at 6". The design slope of the bio-slope is 0.1 % to ensure a slow flow. The first flush flow velocity is 0.24fps, a swale length of 144 feet is required to achieve a 10-minute resident time.

BIO-SWALE #5

A water quality low flow mini channel drain, located at the opening of the curb inlets at the westerly end of Belted Kingfisher Road, will intercept the first flush flow from the street. A low flow outlet pipe will discharge the first flush flow onto a proposed grass-lined bio-swale located along the property line between Lots 57 and 58, and along the westerly property line of Lot 58. The tributary area is 7.4 acres, and the water quality flow is:

Qwq = C x I x A = 0.57 x 0.2 x 7.4 = 0.8 cfs

The bio-swale will have a bottom width of 5', a depth of 6", with a 3:1 side slope the top width is 8'. The flow depth is at 3.7", the grass height should be maintained at 6". The design slope of the bio-slope is 0.1 % to ensure a slow flow. The first flush flow velocity is 0.43 fps, a swale length of 258 feet is required to achieve a 10-minute resident time.

BIO-SWALE #6

Northerly of proposed Pala Mesa Dr., approximately 1600' northerly of intersection with ex. Pala Rd./SR76. A water quality low flow drop outlet located in the easterly curb inlet will discharge the first flush water quality runoff into the proposed grass-lined bio-swale located on the easterly fill slope. The tributary area is 2.0 acres, and the water quality flow is:

Qwq = C x I x A = 0.85 x 0.2 x 2.0 = 0.3 cfs

The bio-swale will have a bottom width of 1.5', a depth of 6", with a 3:1 side slope the top width is 4.5'. The flow depth is at 3.8", the grass height should be maintained at 6". The design slope of the bio-slope is 0.1 % to ensure a slow flow. The first flush flow velocity is 0.38 fps, a swale length of 228 feet is required to achieve a 10-minute resident time.

BIO-SWALE #7

Westerly of Horse Ranch Creek Rd. approximately 1700' northerly of intersection with SR76. A water quality low flow drop outlet located in the westerly curb inlet will discharge the first flush water quality runoff into the proposed grass-lined bio-swale located on the westerly fill slope. The tributary area is 5.9 acres, and the water quality flow is:

Qwq = C x I x A = 0.85 x 0.2 x 5.9 = 1.0 cfs

The bio-swale will have a bottom width of 5.5', a depth of 6", with a 3:1 side slope the top width is 8.5'. The flow depth is at 4", the grass height should be maintained at 6". The design slope of the bio-slope is 0.1 % to ensure a slow flow. The first flush flow velocity is 0.46 fps, a swale length of 276 feet is required to achieve a 10-minute resident time.

BIO-SWALE #8

Westerly of Horse Ranch Creek Rd. at the northwesterly corner of intersection with SR76. A water quality low flow channel drain located at the entrance of each curb inlet will discharge the first flush water quality runoff into the proposed grass-lined bio-swale via a low flow pipe. The tributary area is 4.7 acres, and the water quality flow is:

Qwq = C x I x A = 0.85 x 0.2 x 4.7 = 0.8 cfs

The bio-swale will have a bottom width of 4.5', a depth of 6", with a 3:1 side slope the top width is 7.5'. The flow depth is at 4", the grass height should be maintained at 6". The design slope of the bio-slope is 0.1 % to ensure a slow flow. The first flush flow velocity is 0.44 fps, a swale length of 264 feet is required to achieve a 10-minute resident time.

FLOW BASED BMPs:

Project Description	
Worksheet	BIO SWALE #1
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.045	
Channel Slope	0.10	%
Left Side Slope	3.00	H : V
Right Side Slope	3.00	H : V
Bottom Width	20.00	ft
Discharge	3.70	cfs

Results		
Depth	4.2	in
Flow Area	7.4	ft²
Wetted Perimeter	22.22	ft
Top Width	22.10	ft
Critical Depth	0.10	ft
Critical Slope	6.37	%
Velocity	0.50	ft/s
Velocity Head	0.00	ft
Specific Energy	4.3	in
Froude Number	0.15	
Flow Type	Subcritical	

Project Description	
Worksheet	BIO SWALE #2
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.045	
Channel Slope	0.10	%
Left Side Slope	3.00	H : V
Right Side Slope	3.00	H : V
Bottom Width	5.00	ft
Discharge	0.10	cfs

Results		
Depth	1.1	in
Flow Area	0.5	ft²
Wetted Perimeter	5.58	ft
Top Width	5.55	ft
Critical Depth	0.02	ft
Critical Slope	10.69	%
Velocity	0.21	ft/s
Velocity Head	0.00	ft
Specific Energy	1.1	in
Froude Number	0.12	
Flow Type	Subcritical	

Project Description	
Worksheet	BIO SWALE #3
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.045	
Channel Slope	0.10	%
Left Side Slope	3.00	H : V
Right Side Slope	3.00	H : V
Bottom Width	5.50	ft
Discharge	0.90	cfs

Results		
Depth	3.8	in
Flow Area	2.0	ft^2
Wetted Perimeter	7.51	ft
Top Width	7.41	ft
Critical Depth	0.09	ft
Critical Slope	6.67	%
Velocity	0.44	ft/s
Velocity Head	0.00	ft
Specific Energy	3.8	in
Froude Number	0.15	
Flow Type	Subcritical	

Project Description	
Worksheet	BIO SWALE #4
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.045	
Channel Slope	0.10	%
Left Side Slope	3.00	H : V
Right Side Slope	3.00	H : V
Bottom Width	3.00	ft
Discharge	0.10	cfs

Results		
Depth	1.5	in
Flow Area	0.4	ft²
Wetted Perimeter	3.78	ft
Top Width	3.74	ft
Critical Depth	0.03	ft
Critical Slope	9.43	%
Velocity	0.24	ft/s
Velocity Head	0.00	ft
Specific Energy	1.5	in
Froude Number	0.13	
Flow Type	Subcritical	

Project Description	
Worksheet	BIO SWALE #5
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.045	
Channel Slope	0.10	%
Left Side Slope	3.00	H : V
Right Side Slope	3.00	H : V
Bottom Width	5.00	ft
Discharge	0.80	cfs

Results		
Depth	3.7	in
Flow Area	1.9	ft²
Wetted Perimeter	6.97	ft
Top Width	6.87	ft
Critical Depth	0.09	ft
Critical Slope	6.71	%
Velocity	0.43	ft/s
Velocity Head	0.00	ft
Specific Energy	3.8	in
Froude Number	0.15	
Flow Type	Subcritical	

Project Description	
Worksheet	BIO SWALE #6
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.045	
Channel Slope	0.10	%
Left Side Slope	3.00	H : V
Right Side Slope	3.00	H : V
Bottom Width	1.50	ft
Discharge	0.30	cfs

Results		
Depth	3.8	in
Flow Area	0.8	ft²
Wetted Perimeter	3.51	ft
Top Width	3.41	ft
Critical Depth	0.10	ft
Critical Slope	6.83	%
Velocity	0.38	ft/s
Velocity Head	0.00	ft
Specific Energy	3.8	in
Froude Number	0.14	
Flow Type	Subcritical	

Project Description	
Worksheet	BIO SWALE #7
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.045	
Channel Slope	0.10	%
Left Side Slope	3.00	H : V
Right Side Slope	3.00	H : V
Bottom Width	5.50	ft
Discharge	1.00	cfs

Results		
Depth	4.0	in
Flow Area	2.2	ft^2
Wetted Perimeter	7.63	ft
Top Width	7.52	ft
Critical Depth	0.10	ft
Critical Slope	6.52	%
Velocity	0.46	ft/s
Velocity Head	0.00	ft
Specific Energy	4.1	in
Froude Number	0.15	
Flow Type	Subcritical	

Project Description	
Worksheet	BIO SWALE #8
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.045	
Channel Slope	0.10	%
Left Side Slope	3.00	H : V
Right Side Slope	3.00	H : V
Bottom Width	4.50	ft
Discharge	0.80	cfs

Results		
Depth	4.0	in
Flow Area	1.8	ft^2
Wetted Perimeter	6.59	ft
Top Width	6.48	ft
Critical Depth	0.10	ft
Critical Slope	6.59	%
Velocity	0.44	ft/s
Velocity Head	0.00	ft
Specific Energy	4.0	in
Froude Number	0.15	
Flow Type	Subcritical	

VOLUME BASED BMPs:

Sediment traps are proposed for each multi-family, professional office, town center, sports complex and pump station sites. These sites will be mass graded and specific site plans and BMPs will be designed per another document. Once each site plan is developed according to their approved "B" Designator Site Plans, these interim sediment traps will be removed and permanent BMPs will be built with the site development. See Section II of this report for the permanent BMP of each "B" Designator Site Plan. Per the County of San Diego Hydrology Manual, the 85th percentile storm for this area is 0.8 in.

The first flush water quality flood volume is:

Vwq = 0.8 in / 12 x C x A

Where C = runoff Coefficient = 0.71 (urban newly graded areas).

DETENTION BASIN AT LOT U:

The tributary area that drains into this detention basin is 231.2 acres, the weighted runoff coefficient C is 0.69**, thus, the water quality runoff volume entering the detention basin is:

Vwq = 0.8in/12 x 0.69 x 231.2 Acre x 43,560 sf/acre = **463,270 cf or 10.64 acre-ft.**

The required sediment traps volumes are tabulated for each of the sites:

LOT NO.	FUTURE DEV.	TRIBUTARY AREA (SF)	C	Vwq (CF)
537*	MULTI-FAMILY 3	811,653	0.71	**38,418**
551*	MULTI-FAMILY 2	208,006	0.71	**9,846**
567*	TOWN CENTER	344,959	0.71	**16,328**
569*	POOL SITE	54,830	0.71	**2,595**
574 (N)*	SPORTS COMPLEX (North)	150,650	0.71	**7,131**
574 (S)*	SPORTS COMPLEX (South)	201,685	0.71	**9,546**
566*	PROFESSIONAL OFFICE 2	366,176	0.71	**17,332**
563*	PROFESSIONAL OFFICE 1	98,829	0.71	**4,678**
527*	MULTI-FAMILY 1	449,099	0.71	**21,257**
559*	MULTI-FAMILY 4	413,361	0.71	**19,566**
576*	STAGING AREA/PUMP STATION	21,265	0.71	**1,007**
U**	DETENTION BASIN	231.2AC	0.69**	**463,270**

* The volume-based BMPs for these lots are not permanent BMPs for these site plans. See Section II of this report for permanent BMP of each "B" Designator Site Plan.
** The detention basin will be a permanent treatment facility. C value per weighted coefficient presented in the hydrology report titled "A CEQA Level Preliminary Hydrology & Hydraulics Study for Campus Park".

MAINTENANCE

Please check the box that best describes the maintenance mechanism(s) for this project. Guidelines for each category are located in Chapter 5, Section 5.2 of the County SUSMP.

CATEGORY	SELECTED	
	YES	NO
First	X	
Second	X	
Third	X	
Fourth		

(Note: Projects in Category 2 or 3 may choose to establish or be included in a Stormwater Maintenance Assessment District for the long-term maintenance of treatment BMPs).

The proposed long-term treatment BMP consists of bio-filtration swales around each individual single-family homes(first category) to be maintained by individual homeowners, the bio-filtration swales located in manufactured slopes along roads and streets will be maintained by the master HOA. The curb inlet low flow drop out boxes, the low flow channel drain inlets in front of some of the curb inlets and the low flow pipes leading to the bio-filtration swales will be maintained by the master HOA and are considered second category facilities. ~~de-silting basins and detention basin.~~ The master Homeowners' Association is primarily responsible for the BMPs located in the residential and park common areas. The Property Management Companies of the Town Center and Professional Office areas will be responsible for the BMPs on these properties. ~~The Homeowners' Association is primarily responsible for the BMPs located in the residential and park areas.~~ The sediment traps located on each multi-family, commercial, town center and recreation pads are second category and will be maintained by the developer until the sites are developed and maintenance responsibility is turned over to the site HOA's or Property Management Companies .The third category is selected for the detention basin where the master HOA (or and established landscape maintenance district) will have primary maintenance responsibility. However, due to the natural and size of this project, the County needs to assure ongoing maintenance. The County needs to be in a backup role to perform the BMP maintenance if the property owners, HOAs or Property Management Companies fail. The developer would provide the County with security to substantiate the maintenance agreement, which will remain in place for an interim period of 5 years. The amount of the security would equal to the cost of two years of maintenance activities. Security for "backup" maintenance after the interim period (5-years) would not be provided.

ATTACHMENTS

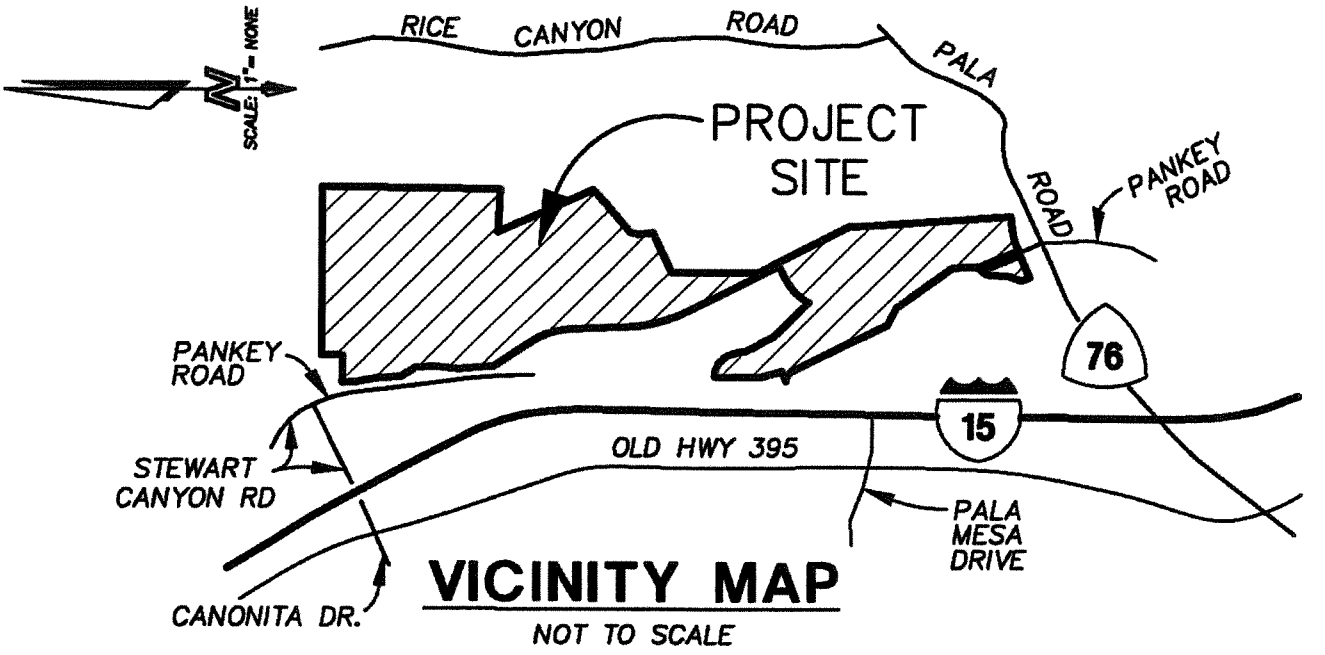
Please include the following attachments.

ATTACHMENT		COMPLETED	N/A
A	Project Location Map	X	
B	Site Map	X	
C	Relevant Monitoring Data		X
D	LID and Treatment BMP Location Map	X	
E	Treatment BMP Datasheets	X	
F	Operation and Maintenance Program for Treatment BMPs	X	
G	Fiscal Resources	X	
H	Engineer's Certification Sheet	X	
I	Addendum		X

Note: Attachments A and B may be combined.

ATTACHMENT A

PROJECT LOCATION MAP



ATTACHMENT B

SITE MAP

ATTACHMENT C

RELEVANT MONITORING DATA

(NOTE: PROVIDE RELEVANT WATER QUALITY MONITORING DATA IF AVAILABLE.)

N/A

ATTACHMENT D

LID AND TREATMENT BMP LOCATION MAP

OFF-SITE BYPASS PIPE

WATER QUALITY LOW FLOW DROP OUT BOX & LOW FLOW PIPE 2nd CATEGORY

GRASS-LINED BIO SWALE #7 1ST CATEGORY
A=5.8AC
Qwq=1.0CFS

GRASS-LINED BIO SWALE #8 1ST CATEGORY
A=4.7AC
Qwq=0.8CFS

WATER QUALITY INTERCEPTOR & WATER QUALITY LOWFLOW PIPE 2nd CATEGORY

WATER QUALITY LOW FLOW DROP OUT BOX & LOW FLOW PIPE 2nd CATEGORY

CURB INLET W/ WATER QUALITY INTERCEPTOR & WATER QUALITY LOW FLOW PIPE 2nd CATEGORY

GRASS-LINED DETENTION BASIN 3RD CATEGORY
A=231.2
Vwq=463,270CF

RIPRAP

GRASS-LINED BIO SWALE #2 1ST CATEGORY
A=0.8AC
Qwq=0.1CFS

GRASS-LINED BIO SWALE #6 1ST CATEGORY
A=2.0AC
Qwq=0.3CFS

GRASS-LINED BIO SWALE #3 1ST CATEGORY
A=5.4AC
Qwq=0.9CFS

WATER QUALITY LOW FLOW DROP BOX & WATER QUALITY LOW FLOW PIPE 2nd CATEGORY

WATER QUALITY LOW FLOW DROP OUT BOX & LOW FLOW PIPE 2nd CATEGORY

GRASS-LINED BIO SWALE #4 1ST CATEGORY
A=0.8AC
Qwq=0.1CFS

HORSE RANCH CREEK ROAD

PANKEY RD

EX. PANKEY ROAD

SEDIMENT TRAP (2ND CATEGORY) (TYP.)

OFF-SITE BYPASS PIPE

WATER QUALITY INTERCEPTOR & WATER QUALITY LOW FLOW, PIPE 2nd CATEGORY

GRASS-LINED BIO SWALE #1 1ST CAT.
A=32.5AC
Qwq=3.7CFS

GRASS-LINED BIO SWALE #5 1ST CAT.
A=7.4AC
Qwq=0.8CFS

INTERSTATE 15

SONG SPARROW DRIVE

MEADOWLARK ROAD

FIELD GROUSE ROAD

BUSHTIT WAY

TRICKSTER ROAD

OSTRICH WAY

FALCON WAY

FALCON STREET

FRIDAY ROAD

LONG SPUR ROAD

SNOW GOOSE COURT

SNOW WINGLET WAY

ORCHARD COURT

PARKSIDE DRIVE

PARK VISTA DRIVE

RAILROAD CROSSING

STEWART CANYON RD

NOTE:
ALL MANUFACTURED SLOPES TO BE HYDROSEEDED
ALL MULTI-FAMILY, COMMERCIAL AND PARK PADS TO HAVE INDIVIDUAL PERMANENT BMPS

SCALE: 1" = 250'

BMP SITE PLAN FOR:
CAMPUS PARK
POST-CONSTRUCTION

LANDMARK CONSULTING
PLANNING-ENGINEERING-SURVEYING
9555 GENESEE AVENUE, STE. 200
SAN DIEGO, CA 92121, 858.587.8070

ATTACHMENT E

TREATMENT BMP DATASHEET

*(**NOTE:** POSSIBLE SOURCE FOR DATASHEETS CAN BE FOUND AT WWW.CABMPHANDBOOKS.COM. INCLUDE ENGINEERING CALCULATIONS FOR SIZING THE TREATMENT BMP.)*

FOSSIL FILTER INSERTS

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Grate Inlet Skimmer Box

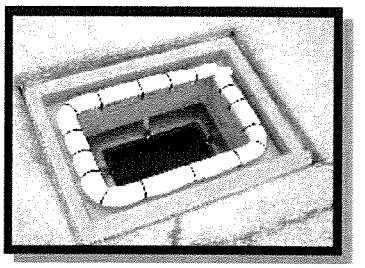
Grated Inlet Stormwater Treatment System

Since 1993

Built Strong To Last!

Engineered To Be Permanent Infrastructure





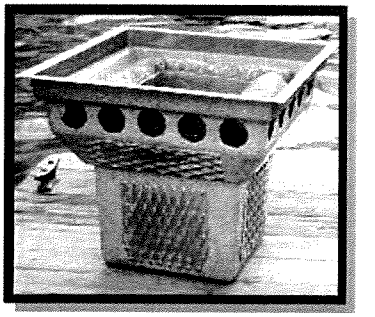
Installs Quickly

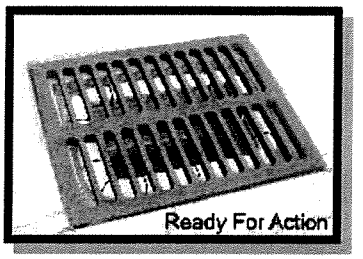
Step 1: **Remove the grate.**

Step 2: **Drop in the filter.**

Step 3: **Replace the grate.**

Custom Sizes... No Problem





Great For Retrofits...
Will Not Impede The Original Designed Flow Of The Inlet

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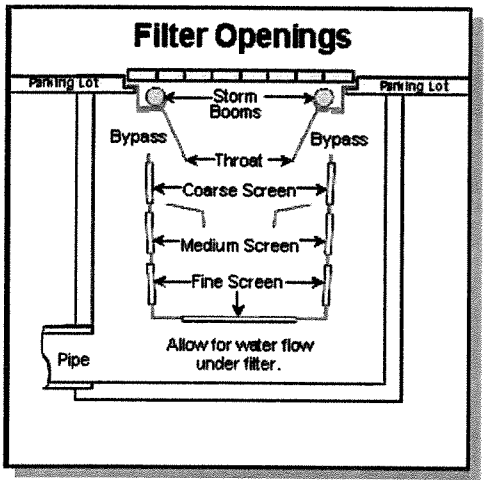
Grate Inlet Skimmer Box

Sizing and Flow Rates

Although certain sizes are recommended, The *Grate Inlet Skimmer Box* can be sized to fit any size inlet.

Custom Sizes No Problem

The **maximum flow rate** of a *Grate Inlet Skimmer Box* is determined by the amount of flow that can pass through the throat, the exception is found only in very large units



To determine the **minimum flow rate** of a *Grate Inlet Skimmer Box*, consider only the potential flow through the throat and bypass. If the potential flow through the throat is less than the potential flow through the bypass, then the then the throat determines the minimum flow. If the potential water flow through the bypass is less than that of the throat, then the bypass determines the minimum flow.

The table below represents the flow rates of 8 different sizes of Grate Inlet Skimmer Box.

Filtered Flow represents the potential flow rate through all screens, and does not include the potential flow through the bypass. Water flow through the bypass happens only when the flow rate through the grate exceeds the flow rate through all the screens.

Flow Rate Table						
	Dimensions of the flange around the top of the Grate Inlet Skimmer Box			Flow Rate (cubic feet per second)		
Model Number	Width (inches)	Length (inches)	Depth (inches)	Throat	Filtered Flow	Bypass Flow
GISB-I-24-24-25	24	24	25	4.4	14.9	6.7
GISB-A-24-37-25	24	37	25	10.2	21.1	8.7
GISB-C-28-37-25	28	37	25	12.2	19.4	7.4
GISB-J-24-41-25	24	41	25	12	24.6	10
GISB-NK-32-32-25	32	32	25	12.5	19.1	10.3
GISB-36-36-25	36	36	25	18.8	23.4	13.4
GISB-D-36-48-18	36	48	18	33.2	26.3	13.3
GISB-G-52-58-18	52	58	18	89.3	40.1	25
♦ The yellow blocks represent the minimum flow rates. ♦ Filtered flow is based on unobstructed screens.						

Drawings and flow specifications for any size Grate Inlet Skimmer Box is available upon request.

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Grate Inlet Skimmer Box

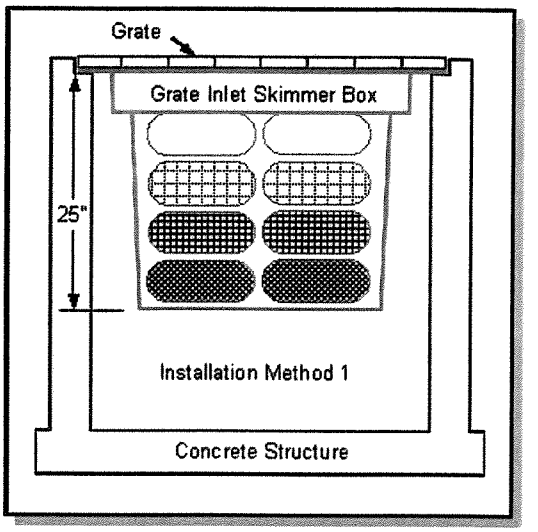
Installation

Although certain sizes are recommended, The *Grate Inlet Skimmer Box* can be sized to fit any size inlet.

Can Be Sized To Fit Any Inlet

Installation Method 1

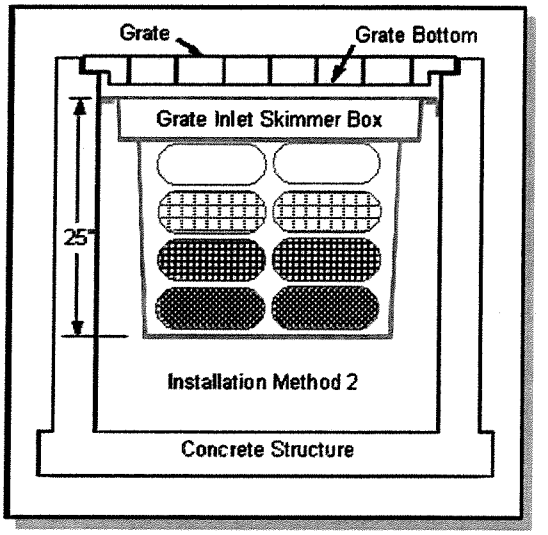
- Remove the grate.
- Place the *Grate Inlet Skimmer Box* into the catchbasin so that it rests on the same landing as the grate.
- Replace the grate so that the flange around the top of the *Grate Inlet Skimmer Box* is sandwiched between the grate and the landing.



A second method of installing a *Grate Inlet Skimmer Box* involves the use of an aluminum landing kit which is supplied separately. This method is used for installing larger units, and in catchbasins fitted with extra thick grates.

Installation Method 2

- Remove the grate.
- Attach the aluminum landing kit



to the catchbasin wall 2" below the grate bottom.

- Place the *Grate Inlet Skimmer Box* into the catchbasin so that it rests on the aluminum landing kit.
- Replace the grate.

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Grate Inlet Skimmer Box

Captured Debris

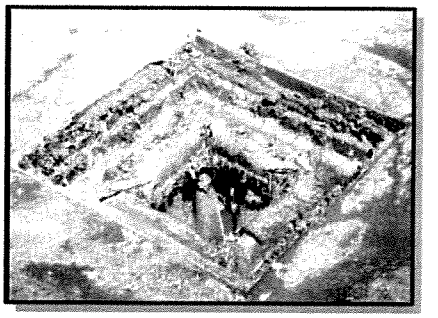
The Challenge...

Take On The Toughest Inlets...

Capture & Keep The Debris...

Keep The Inlet Flowing!

The picture to the right shows an inlet with a ***Grate Inlet Skimmer Box*** immediately after the grate was removed, just 45 days after it was installed. Because this inlet is adjacent to a wash down area, it experiences a simulated storm event everyday. The filter is full to capacity and has been operating in bypass mode for some time.

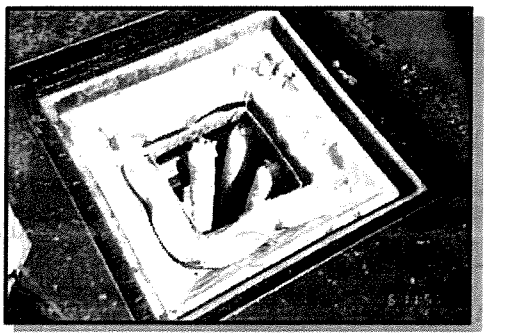




The picture to the left shows the ***Grate Inlet Skimmer Box*** immediately after the removal of booms and skimmer tray. Notice the bypass openings around the top are completely unobstructed. The filter is full to capacity and is operating bypass mode. Because this inlet experiences an extra heavy hydrocarbon pollutant load it is fitted with extra ***Storm Booms***.

Stainless Steel Screens are easily cleaned to restore the original unobstructed flow rates to the Grate Inlet Skimmer Box

Although the inlet is relatively small with a grate that measures 24" x 24", debris weighing 232 pounds with a volume of 78 quarts was removed during this servicing. To the right is a photo of the same *Grate Inlet Skimmer Box* after being serviced.



Ready For The Next Storm Event!

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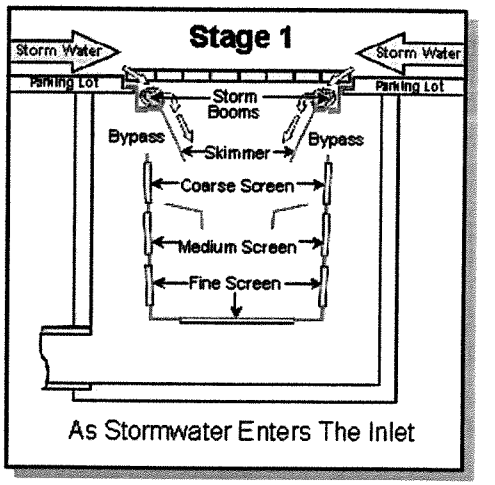
Grate Inlet Skimmer Box

Functional Description

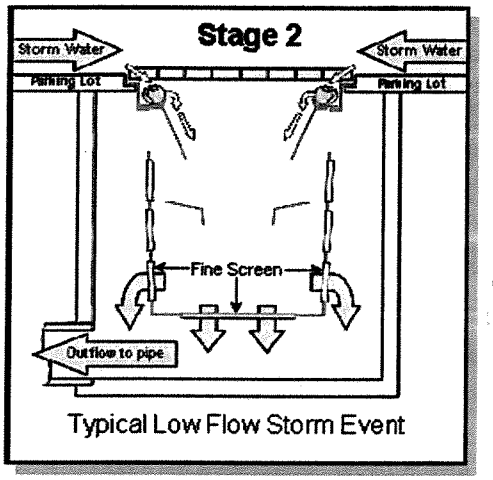
Multi-Stage Filtration Utilizes Screens Of Different Sieve Sizes Optimize Filtration And Water Flow

Stage 1: As stormwater enters the inlet through the grate it comes in contact with and passes through a ***Storm Boom*** located around the top perimeter of the ***Grate Inlet Skimmer Box***. After making contact with the ***Storm Boom***, the stormwater flows down into the lower filtration chamber which is equipped with 3 different sieve size filtration screens and bypass openings.

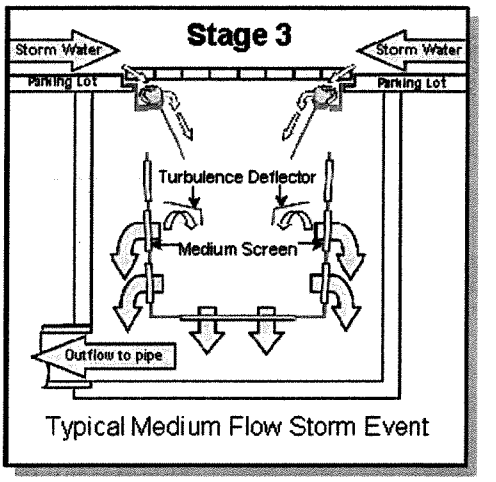


As Stormwater Enters The Inlet

Stage 2: Throughout the entire storm event, stormwater continues to come in contact with the ***Storm Boom*** and then flow into the lower filtration chamber, adjacent to the fine sieve size screens. The fines sieve size screens are sized to be able to capture sediment such as sand, clay, phosphates, etc. A sand filter quickly forms across the bottom which has the potential to capture the finest of particles.

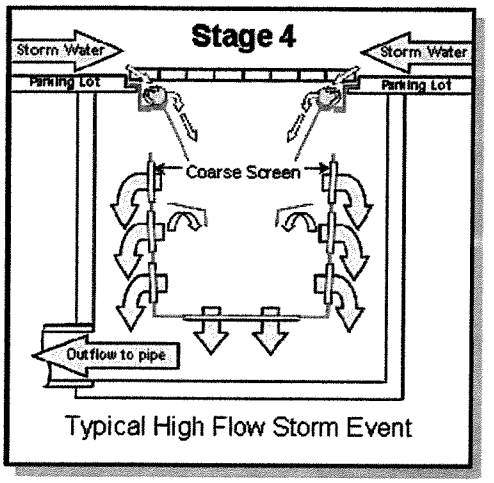


Stage 3: As the storm event increases in intensity the water level in the *Grate Inlet Skimmer box* rises to a level adjacent to the medium sieve size screens and the *turbulence deflector*. The medium screen provides additional flow with less chance of obstruction than the fine screen. The *turbulence deflector* dramatically reduces the turbulence in the lower filtration chamber, which allows sediment to continue to settle, without re-suspending sediment that has previously been captured.



Stage 4: As the storm event increases in intensity to that of high flow storm event, the water level in the *Grate Inlet Skimmer box* rises to a level adjacent to the coarse sieve size screens above *turbulence deflector*.

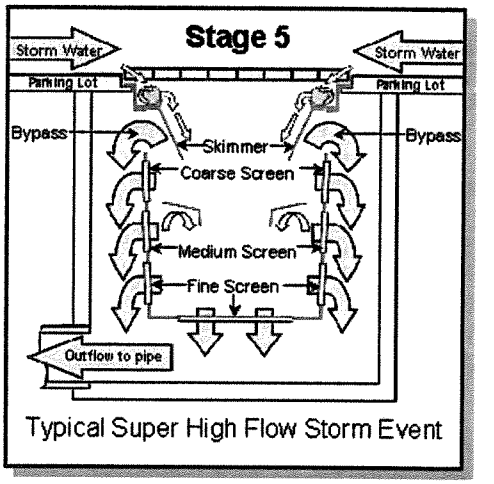
The coarse screen provides yet more additional filtered flow with less chance for obstruction than either the medium or fine screen. The coarse screen is sized to capture floatables like foliage and litter. At this stage water is flowing through all the different sieve size screens, the *turbulence deflector*



Typical High Flow Storm Event

continues to dramatically reduce the turbulence in the lower filtration chamber, and sediment continues to settle and collect toward the bottom.

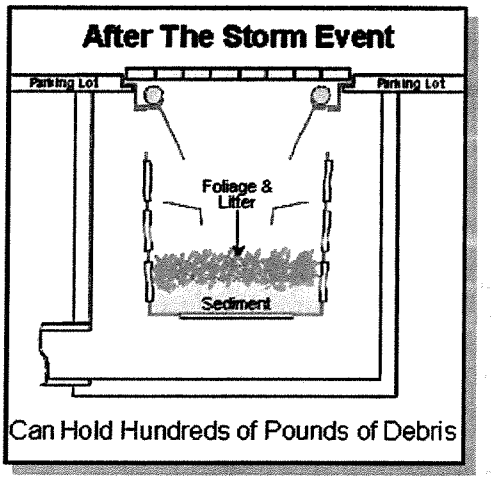
Stage 5: If the storm event creates an extremely high flow rate into the inlet which exceeds the flow through all the screens, the water flow can bypass the filtration screens through skimmer protected bypass openings near the top of the *Grate Inlet Skimmer Box*. As water flows through the bypass openings, it also continues to flow through all the other screens. Storm events that produce such high flow rates are rare and typically don't last very long.



Typical Super High Flow Storm Event

Drains Dry After Storm

After The Storm Event: The stormwater drains completely out of the *Grate Inlet Skimmer Box* after the storm event. The debris collected in the unit is stored in a dry state which helps to contain the nutrient pollutant load, prevents the filter from going septic, and prevents mosquitoes from breeding in the unit. After each storm event more debris is collected, which can ultimately weigh many hundreds of



pounds.

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Suntree Technologies Inc.

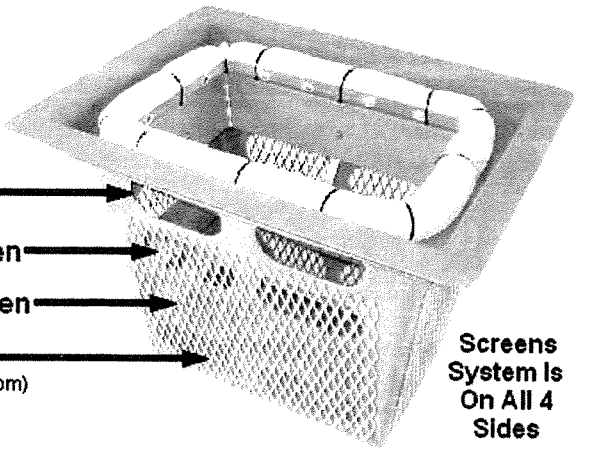
Grate Inlet Skimmer Box

Unique Features

Multi-Stage Filtration

Screens of Different Sieve Sizes Optimize Filtration And Water Flow

All Screens Are Stainless Steel



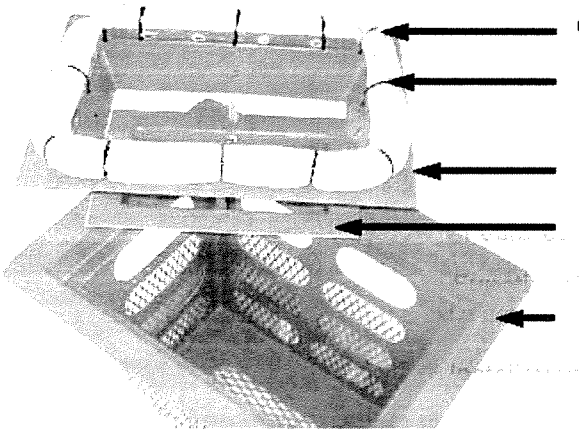
- Bypass Openings
- Coarse Sieve Size Screen
- Medium Sieve Size Screen
- Fine Sieve Size Screen
  (Fine Sieve Size Screen Also On Bottom)

Screens System Is On All 4 Sides

Interior components are easily removed to allow easy access to lower filtration chamber.

Fiberglass components have gelcoated finish with UV filter.

- Storm Boom — Absorbs Hydrocarbons
- Zip Tie
- Skimmer Tray
- Deflection Shield



Flange is reinforced
With knitted 1808 ± 45°
Biaxial fiberglass

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For More Information
on our Grate Inlet Skimmer Box
Please contact us directly:

Suntree Technologies, Inc.
798 Clearlake RD
Cocoa, FL 32922
Ph: (321) 637-7552
FAX: (321) 637-7554

Since 1993

Infrastructure Stormwater Filtration Systems

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Curb Inlet Basket

Patented

A stormwater filtration system for Curb Inlets where access to the catchbasin is through a manhole.



Captures Everything From Litter, Foliage, Sediment, To Hydrocarbons...Everything!

Will Not Impede The Water Flow Into The Inlet

- ***Fits any catchbasin***
- ***No need to enter the catchbasin to service.***
- ***No need to enter or lay in the street to service.***
- ***Filtration screens of different sieve sizes can be utilized to optimize filtration and water flow.***

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For more information on Curb Inlet Baskets, click on the Next Page button or the specific page links below.

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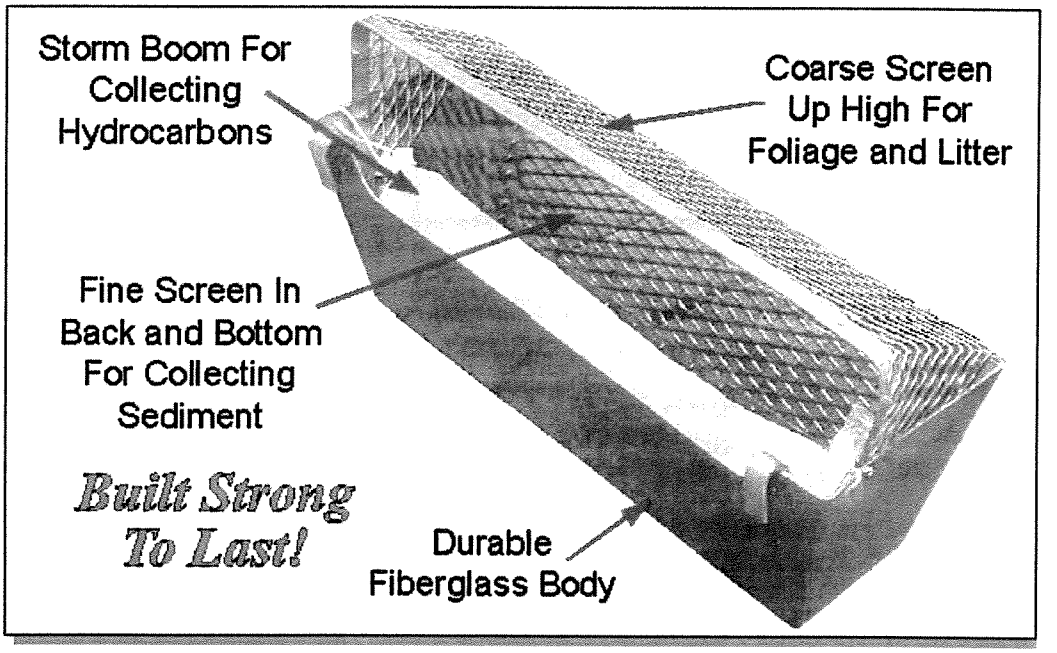
Curb Inlet Basket

Patented



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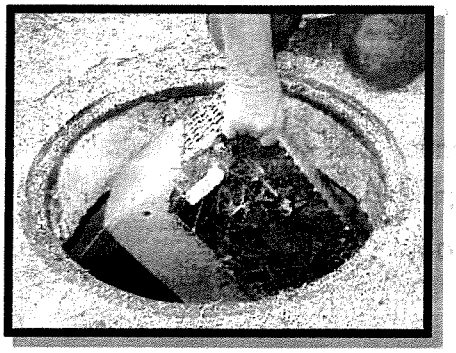


Curb Inlet Basket

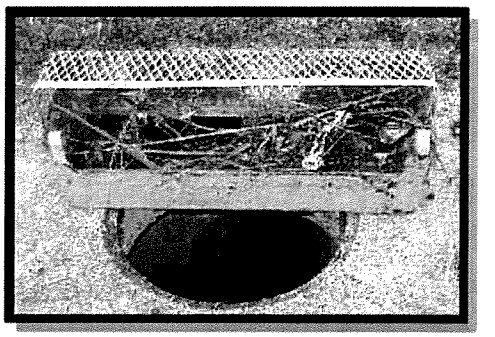
No Need To Enter The Confined Space Of The Catchbasin To Service

To Service:

- Remove the manhole lid
- Reach in with by hand or with a manhole hook and remove the basket
- Empty the contents of the basket and replace the Storm Boom
- Replace the basket and manhole lid

Heavy and Expensive Equipment Is Not Required To Do Service Work

Multi-stage Filtration Captures Everything From Hydrocarbons, To Sediment, To Grass Clippings, To Litter...Everything!



Once The Basket Is Removed From The Catchbasin It Can Be Easily Emptied.



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Curb Inlet Basket (CIB)

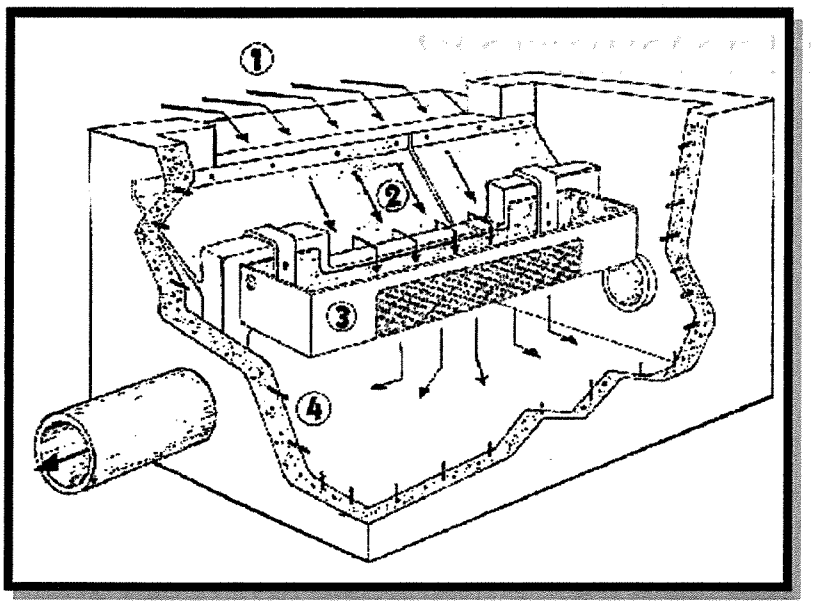
Functional Description

① Stormwater runoff carrying debris and pollutants enters curb inlet.

② Adjustable throat width funnels water to weir. The immediate drop in the throat elevation prevents head losses through the inlet. Sediment will collect along the incoming side of the weir.

③ Water flows over weir and into removable basket, filtering trash, leaves, yard clippings, sediment, etc.. If desired, a hydrocarbon absorption boom can be fitted along the incoming edge of the basket.

④ Cleaner water leaves basket and enters catchbasin, then flows down stream. The position of the CIB, high in the catch basin, avoids any restriction of up-stream pipes flowing through the catchbasin.



The CIB telescopes to change size so that it can fit almost any catchbasin. In addition, CIBs that fit a round catchbasin are also available.

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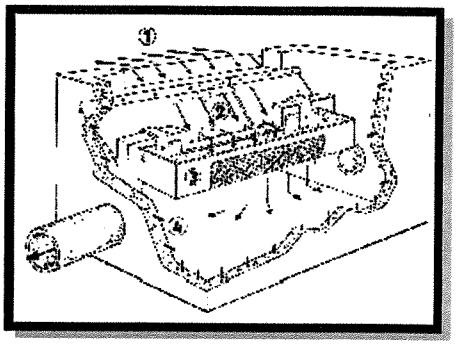
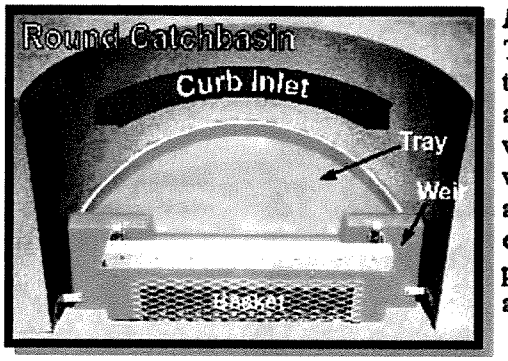
Curb Inlet Basket (CIB)

Installation

Square Catchbasin:
For installation into a square catchbasin, there is a left half and a right half that telescope together to adjust for size, which make up the main body of the CIB and mounts solid to the catchbasin wall with either drive pins or *Tap-Cons*. The non-removable portion consists of a tray area that directs the flow toward the weir, and a weir that channels the flow into the removable basket. The basket is placed on last, and is simply dropped in place and hangs from the top of the weir.





Round Catchbasin:
To install the CIB into a round catchbasin there are 3 main pieces; the weir, which attaches to the catch basin wall, the tray which attaches to the catchbasin wall and weir, and the removable basket. The weir and tray attach to the catchbasin wall with either *Tap-Cons* or drive pins. The basket is placed on last, and is just dropped in place and hangs from the top of the weir.

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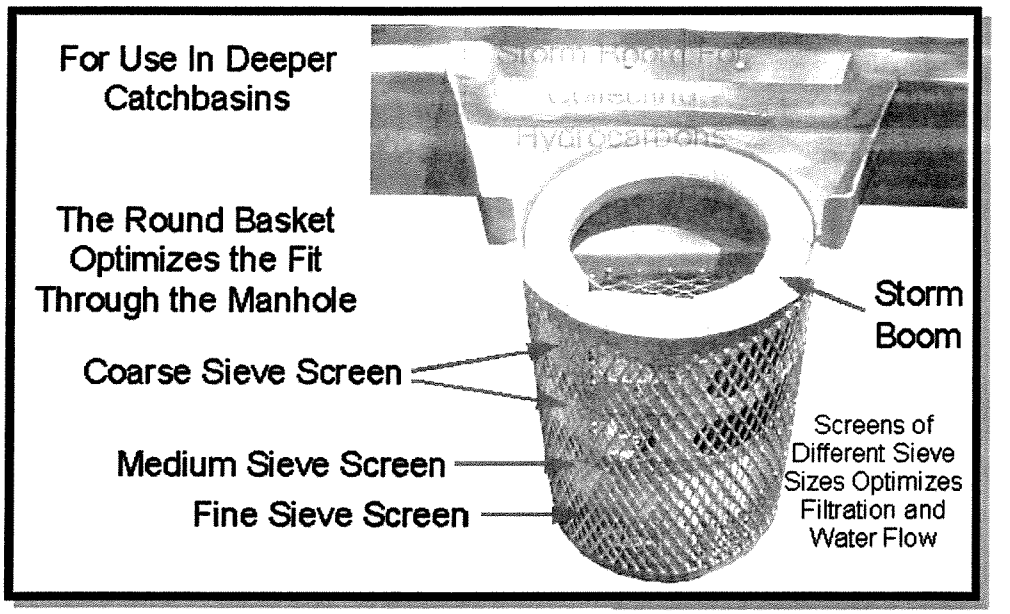
Suntree Technologies Inc.

High Capacity Curb Inlet Basket

Patented



Captures Everything From Litter, Foliage, Sediment, To Hydrocarbons...Everything!

Installation and servicing is similar to the standard Curb Inlet Basket

Built Strong To Last!



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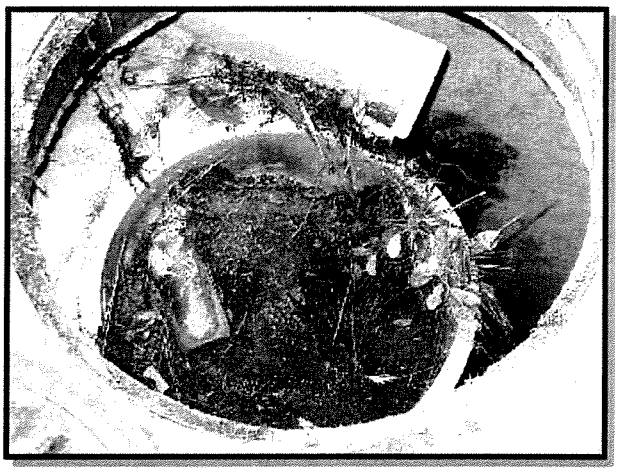
Suntree Technologies Inc.

High Capacity Curb Inlet Basket
In The Field

View of Debris In High Capacity Curb Inlet Basket Before Removal From Catchbasin



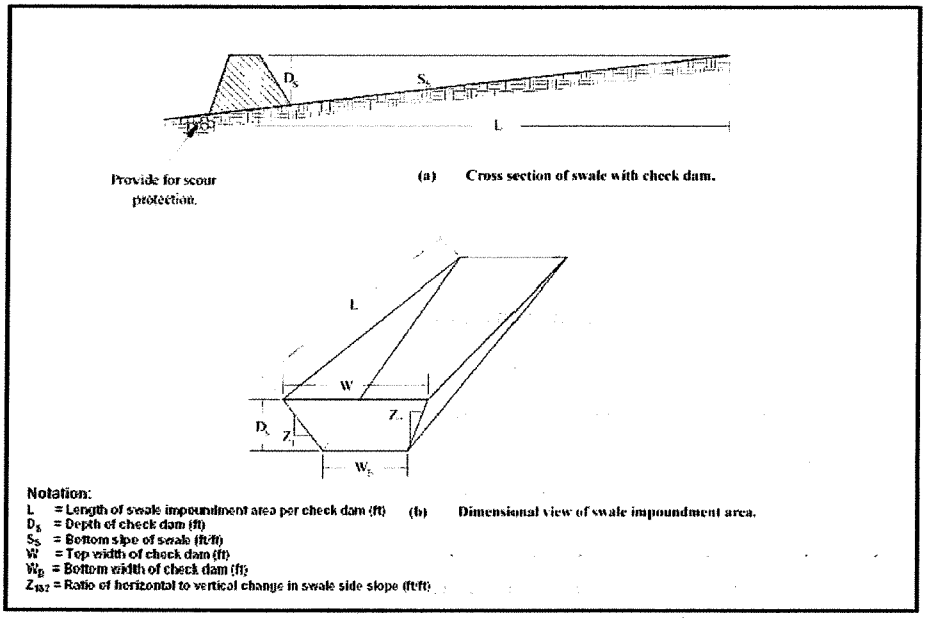
This unit did not utilize a Storm Boom.



Once Removed From The Catch Basin, The Collected Debris Was Emptied And The Basket Put Back.

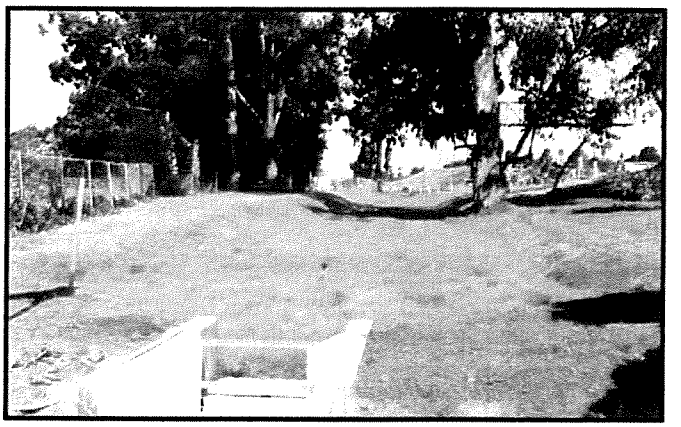
200 Pounds of Debris Was Emptied From This Curb Inlet Basket.

BIOFILTER/GRASS-LINED SWALE



Notation:
L = Length of swale impoundment area per check dam (ft)
D_s = Depth of check dam (ft)
S_S = Bottom slope of swale (ft/ft)
W = Top width of check dam (ft)
W_b = Bottom width of check dam (ft)
$Z_{1&2}$ = Ratio of horizontal to vertical change in swale side slope (ft/ft)

Vegetated Swale TC-30



Design Considerations

- Tributary Area
- Area Required
- Slope
- Water Availability

Description

Vegetated swales are open, shallow channels with vegetation covering the side slopes and bottom that collect and slowly convey runoff flow to downstream discharge points. They are designed to treat runoff through filtering by the vegetation in the channel, filtering through a subsoil matrix, and/or infiltration into the underlying soils. Swales can be natural or manmade. They trap particulate pollutants (suspended solids and trace metals), promote infiltration, and reduce the flow velocity of stormwater runoff. Vegetated swales can serve as part of a stormwater drainage system and can replace curbs, gutters and storm sewer systems.

Targeted Constituents

☑	Sediment	▲
☑	Nutrients	●
☑	Trash	●
☑	Metals	▲
☑	Bacteria	●
☑	Oil and Grease	▲
☑	Organics	▲

Legend ***(Removal Effectiveness)***

● Low ■ High

▲ Medium

California Experience

Caltrans constructed and monitored six vegetated swales in southern California. These swales were generally effective in reducing the volume and mass of pollutants in runoff. Even in the areas where the annual rainfall was only about 10 inches/yr, the vegetation did not require additional irrigation. One factor that strongly affected performance was the presence of large numbers of gophers at most of the sites. The gophers created earthen mounds, destroyed vegetation, and generally reduced the effectiveness of the controls for TSS reduction.

Advantages

- If properly designed, vegetated, and operated, swales can serve as an aesthetic, potentially inexpensive urban development or roadway drainage conveyance measure with significant collateral water quality benefits.

- Roadside ditches should be regarded as significant potential swale/buffer strip sites and should be utilized for this purpose whenever possible.

Limitations

- Can be difficult to avoid channelization.
- May not be appropriate for industrial sites or locations where spills may occur
- Grassed swales cannot treat a very large drainage area. Large areas may be divided and treated using multiple swales.
- A thick vegetative cover is needed for these practices to function properly.
- They are impractical in areas with steep topography.
- They are not effective and may even erode when flow velocities are high, if the grass cover is not properly maintained.
- In some places, their use is restricted by law: many local municipalities require curb and gutter systems in residential areas.
- Swales are mores susceptible to failure if not properly maintained than other treatment BMPs.

Design and Sizing Guidelines

- Flow rate based design determined by local requirements or sized so that 85% of the annual runoff volume is discharged at less than the design rainfall intensity.
- Swale should be designed so that the water level does not exceed 2/3rds the height of the grass or 4 inches, which ever is less, at the design treatment rate.
- Longitudinal slopes should not exceed 2.5%
- Trapezoidal channels are normally recommended but other configurations, such as parabolic, can also provide substantial water quality improvement and may be easier to mow than designs with sharp breaks in slope.
- Swales constructed in cut are preferred, or in fill areas that are far enough from an adjacent slope to minimize the potential for gopher damage. Do not use side slopes constructed of fill, which are prone to structural damage by gophers and other burrowing animals.
- A diverse selection of low growing, plants that thrive under the specific site, climatic, and watering conditions should be specified. Vegetation whose growing season corresponds to the wet season are preferred. Drought tolerant vegetation should be considered especially for swales that are not part of a regularly irrigated landscaped area.
- The width of the swale should be determined using Manning's Equation using a value of 0.25 for Manning's n.

Construction/Inspection Considerations

- Include directions in the specifications for use of appropriate fertilizer and soil amendments based on soil properties determined through testing and compared to the needs of the vegetation requirements.
- Install swales at the time of the year when there is a reasonable chance of successful establishment without irrigation; however, it is recognized that rainfall in a given year may not be sufficient and temporary irrigation may be used.
- If sod tiles must be used, they should be placed so that there are no gaps between the tiles; stagger the ends of the tiles to prevent the formation of channels along the swale or strip.
- Use a roller on the sod to ensure that no air pockets form between the sod and the soil.
- Where seeds are used, erosion controls will be necessary to protect seeds for at least 75 days after the first rainfall of the season.

Performance

The literature suggests that vegetated swales represent a practical and potentially effective technique for controlling urban runoff quality. While limited quantitative performance data exists for vegetated swales, it is known that check dams, slight slopes, permeable soils, dense grass cover, increased contact time, and small storm events all contribute to successful pollutant removal by the swale system. Factors decreasing the effectiveness of swales include compacted soils, short runoff contact time, large storm events, frozen ground, short grass heights, steep slopes, and high runoff velocities and discharge rates.

Conventional vegetated swale designs have achieved mixed results in removing particulate pollutants. A study performed by the Nationwide Urban Runoff Program (NURP) monitored three grass swales in the Washington, D.C., area and found no significant improvement in urban runoff quality for the pollutants analyzed. However, the weak performance of these swales was attributed to the high flow velocities in the swales, soil compaction, steep slopes, and short grass height.

Another project in Durham, NC, monitored the performance of a carefully designed artificial swale that received runoff from a commercial parking lot. The project tracked 11 storms and concluded that particulate concentrations of heavy metals (Cu, Pb, Zn, and Cd) were reduced by approximately 50 percent. However, the swale proved largely ineffective for removing soluble nutrients.

The effectiveness of vegetated swales can be enhanced by adding check dams at approximately 17 meter (50 foot) increments along their length (See Figure 1). These dams maximize the retention time within the swale, decrease flow velocities, and promote particulate settling. Finally, the incorporation of vegetated filter strips parallel to the top of the channel banks can help to treat sheet flows entering the swale.

Only 9 studies have been conducted on all grassed channels designed for water quality (Table 1). The data suggest relatively high removal rates for some pollutants, but negative removals for some bacteria, and fair performance for phosphorus.

Table 1 Grassed swale pollutant removal efficiency data

	Removal Efficiencies (% Removal)						
Study	TSS	TP	TN	NO_3	Metals	Bacteria	Type
Caltrans 2002	77	8	67	66	83-90	-33	dry swales
Goldberg 1993	67.8	4.5	-	31.4	42–62	-100	grassed channel
Seattle Metro and Washington Department of Ecology 1992	60	45	-	-25	2–16	-25	grassed channel
Seattle Metro and Washington Department of Ecology, 1992	83	29	-	-25	46–73	-25	grassed channel
Wang et al., 1981	80	-	-	-	70–80	-	dry swale
Dorman et al., 1989	98	18	-	45	37–81	-	dry swale
Harper, 1988	87	83	84	80	88–90	-	dry swale
Kercher et al., 1983	99	99	99	99	99	-	dry swale
Harper, 1988.	81	17	40	52	37–69	-	wet swale
Koon, 1995	67	39	-	9	-35 to 6	-	wet swale

While it is difficult to distinguish between different designs based on the small amount of available data, grassed channels generally have poorer removal rates than wet and dry swales, although some swales appear to export soluble phosphorus (Harper, 1988; Koon, 1995). It is not clear why swales export bacteria. One explanation is that bacteria thrive in the warm swale soils.

Siting Criteria

The suitability of a swale at a site will depend on land use, size of the area serviced, soil type, slope, imperviousness of the contributing watershed, and dimensions and slope of the swale system (Schueler et al., 1992). In general, swales can be used to serve areas of less than 10 acres, with slopes no greater than 5 %. Use of natural topographic lows is encouraged and natural drainage courses should be regarded as significant local resources to be kept in use (Young et al., 1996).

Selection Criteria (NCTCOG, 1993)

- Comparable performance to wet basins
- Limited to treating a few acres
- Availability of water during dry periods to maintain vegetation
- Sufficient available land area

Research in the Austin area indicates that vegetated controls are effective at removing pollutants even when dormant. Therefore, irrigation is not required to maintain growth during dry periods, but may be necessary only to prevent the vegetation from dying.

The topography of the site should permit the design of a channel with appropriate slope and cross-sectional area. Site topography may also dictate a need for additional structural controls. Recommendations for longitudinal slopes range between 2 and 6 percent. Flatter slopes can be used, if sufficient to provide adequate conveyance. Steep slopes increase flow velocity, decrease detention time, and may require energy dissipating and grade check. Steep slopes also can be managed using a series of check dams to terrace the swale and reduce the slope to within acceptable limits. The use of check dams with swales also promotes infiltration.

Additional Design Guidelines

Most of the design guidelines adopted for swale design specify a minimum hydraulic residence time of 9 minutes. This criterion is based on the results of a single study conducted in Seattle, Washington (Seattle Metro and Washington Department of Ecology, 1992), and is not well supported. Analysis of the data collected in that study indicates that pollutant removal at a residence time of 5 minutes was not significantly different, although there is more variability in that data. Therefore, additional research in the design criteria for swales is needed. Substantial pollutant removal has also been observed for vegetated controls designed solely for conveyance (Barrett et al, 1998); consequently, some flexibility in the design is warranted.

Many design guidelines recommend that grass be frequently mowed to maintain dense coverage near the ground surface. Recent research (Colwell et al., 2000) has shown mowing frequency or grass height has little or no effect on pollutant removal.

Summary of Design Recommendations

1) The swale should have a length that provides a minimum hydraulic residence time of at least 10 minutes. The maximum bottom width should not exceed 10 feet unless a dividing berm is provided. The depth of flow should not exceed 2/3rds the height of the grass at the peak of the water quality design storm intensity. The channel slope should not exceed 2.5%.

2) A design grass height of 6 inches is recommended.

3) Regardless of the recommended detention time, the swale should be not less than 100 feet in length.

4) The width of the swale should be determined using Manning's Equation, at the peak of the design storm, using a Manning's n of 0.25.

5) The swale can be sized as both a treatment facility for the design storm and as a conveyance system to pass the peak hydraulic flows of the 100-year storm if it is located "on-line." The side slopes should be no steeper than 3:1 (H:V).

6) Roadside ditches should be regarded as significant potential swale/buffer strip sites and should be utilized for this purpose whenever possible. If flow is to be introduced through curb cuts, place pavement slightly above the elevation of the vegetated areas. Curb cuts should be at least 12 inches wide to prevent clogging.

7) Swales must be vegetated in order to provide adequate treatment of runoff. It is important to maximize water contact with vegetation and the soil surface. For general purposes, select fine, close-growing, water-resistant grasses. If possible, divert runoff (other than necessary irrigation) during the period of vegetation

establishment. Where runoff diversion is not possible, cover graded and seeded areas with suitable erosion control materials.

Maintenance

The useful life of a vegetated swale system is directly proportional to its maintenance frequency. If properly designed and regularly maintained, vegetated swales can last indefinitely. The maintenance objectives for vegetated swale systems include keeping up the hydraulic and removal efficiency of the channel and maintaining a dense, healthy grass cover.

Maintenance activities should include periodic mowing (with grass never cut shorter than the design flow depth), weed control, watering during drought conditions, reseeding of bare areas, and clearing of debris and blockages. Cuttings should be removed from the channel and disposed in a local composting facility. Accumulated sediment should also be removed manually to avoid concentrated flows in the swale. The application of fertilizers and pesticides should be minimal.

Another aspect of a good maintenance plan is repairing damaged areas within a channel. For example, if the channel develops ruts or holes, it should be repaired utilizing a suitable soil that is properly tamped and seeded. The grass cover should be thick; if it is not, reseed as necessary. Any standing water removed during the maintenance operation must be disposed to a sanitary sewer at an approved discharge location. Residuals (e.g., silt, grass cuttings) must be disposed in accordance with local or State requirements. Maintenance of grassed swales mostly involves maintenance of the grass or wetland plant cover. Typical maintenance activities are summarized below:

- Inspect swales at least twice annually for erosion, damage to vegetation, and sediment and debris accumulation preferably at the end of the wet season to schedule summer maintenance and before major fall runoff to be sure the swale is ready for winter. However, additional inspection after periods of heavy runoff is desirable. The swale should be checked for debris and litter, and areas of sediment accumulation.
- Grass height and mowing frequency may not have a large impact on pollutant removal. Consequently, mowing may only be necessary once or twice a year for safety or aesthetics or to suppress weeds and woody vegetation.
- Trash tends to accumulate in swale areas, particularly along highways. The need for litter removal is determined through periodic inspection, but litter should always be removed prior to mowing.
- Sediment accumulating near culverts and in channels should be removed when it builds up to 75 mm (3 in.) at any spot, or covers vegetation.
- Regularly inspect swales for pools of standing water. Swales can become a nuisance due to mosquito breeding in standing water if obstructions develop (e.g. debris accumulation, invasive vegetation) and/or if proper drainage slopes are not implemented and maintained.

Cost

Construction Cost

Little data is available to estimate the difference in cost between various swale designs. One study (SWRPC, 1991) estimated the construction cost of grassed channels at approximately $0.25 per ft². This price does not include design costs or contingencies. Brown and Schueler (1997) estimate these costs at approximately 32 percent of construction costs for most stormwater management practices. For swales, however, these costs would probably be significantly higher since the construction costs are so low compared with other practices. A more realistic estimate would be a total cost of approximately $0.50 per ft², which compares favorably with other stormwater management practices.

Table 3 Estimated Maintenance Costs (SEWRPC, 1991)

Component	Unit Cost	Swale Size (Depth and Top Width)		Comment
		1.5 Foot Depth, One-Foot Bottom Width, 10-Foot Top Width	3-Foot Depth, 3-Foot Bottom Width, 21-Foot Top Width	
Lawn Mowing	$0.85 / 1,000 ft²/ mowing	$0.14 / linear foot	$0.21 / linear foot	Lawn maintenance area=(top width + 10 feet) x length. Mow eight times per year
General Lawn Care	$9.00 / 1,000 ft²/ year	$0.18 / linear foot	$0.26 / linear foot	Lawn maintenance area = (top width + 10 feet) x length
Swale Debris and Litter Removal	$0.10 / linear foot / year	$0.10 / linear foot	$0.10 / linear foot	--
Grass Reseeding with Mulch and Fertilizer	$0.30 / yd²	$0.01 / linear foot	$0.01 / linear foot	Area revegetated equals 1% of lawn maintenance area per year
Program Administration and Swale Inspection	$0.15 / linear foot / year, plus $25 / inspection	$0.15 / linear foot	$0.15 / linear foot	Inspect four times per year
Total	--	$0.58 / linear foot	$ 0.75 / linear foot	--

Maintenance Cost

Caltrans (2002) estimated the expected annual maintenance cost for a swale with a tributary area of approximately 2 ha at approximately $2,700. Since almost all maintenance consists of mowing, the cost is fundamentally a function of the mowing frequency. Unit costs developed by SEWRPC are shown in Table 3. In many cases vegetated channels would be used to convey runoff and would require periodic mowing as well, so there may be little additional cost for the water quality component. Since essentially all the activities are related to vegetation management, no special training is required for maintenance personnel.

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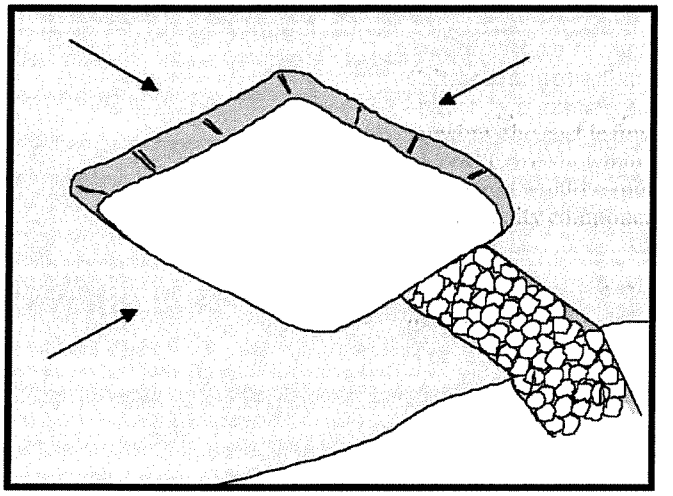
SEDIMENT TRAP

Sediment Trap SE-3



Description and Purpose

A sediment trap is a containment area where sediment-laden runoff is temporarily detained under quiescent conditions, allowing sediment to settle out or before the runoff is discharged. Sediment traps are formed by excavating or constructing an earthen embankment across a waterway or low drainage area.

Suitable Applications

Sediment traps should be considered for use:

- At the perimeter of the site at locations where sediment-laden runoff is discharged offsite.
- At multiple locations within the project site where sediment control is needed.
- Around or upslope from storm drain inlet protection measures.
- Sediment traps may be used on construction projects where the drainage area is less than 5 acres. Traps would be placed where sediment-laden stormwater may enter a storm drain or watercourse. SE-2, Sediment Basins, must be used for drainage areas greater than 5 acres.
- As a supplemental control, sediment traps provide additional protection for a water body or for reducing sediment before it enters a drainage system.

Objectives

EC	Erosion Control	
SE	Sediment Control	☑
TR	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ **Primary Objective**
☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	☑
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-2 Sediment Basin (for larger areas)

Limitations

- Requires large surface areas to permit infiltration and settling of sediment.
- Not appropriate for drainage areas greater than 5 acres.
- Only removes large and medium sized particles and requires upstream erosion control.
- Attractive and dangerous to children, requiring protective fencing.
- Conducive to vector production.
- Should not be located in live streams.

Implementation

Design

A sediment trap is a small temporary ponding area, usually with a gravel outlet, formed by excavation or by construction of an earthen embankment. Its purpose is to collect and store sediment from sites cleared or graded during construction. It is intended for use on small drainage areas with no unusual drainage features and projected for a quick build-out time. It should help in removing coarse sediment from runoff. The trap is a temporary measure with a design life of approximately six months to one year and is to be maintained until the site area is permanently protected against erosion by vegetation and/or structures.

Sediment traps should be used only for small drainage areas. If the contributing drainage area is greater than 5 acres, refer to SE-2, Sediment Basins, or subdivide the catchment area into smaller drainage basins.

Sediment usually must be removed from the trap after each rainfall event. The SWPPP should detail how this sediment is to be disposed of, such as in fill areas onsite, or removal to an approved offsite dump. Sediment traps used as perimeter controls should be installed before any land disturbance takes place in the drainage area.

Sediment traps are usually small enough that a failure of the structure would not result in a loss of life, damage to home or buildings, or interruption in the use of public roads or utilities. However, sediment traps are attractive to children and can be dangerous. The following recommendations should be implemented to reduce risks:

- Install continuous fencing around the sediment trap or pond. Consult local ordinances regarding requirements for maintaining health and safety.
- Restrict basin side slopes to 3:1 or flatter.

Sediment trap size depends on the type of soil, size of the drainage area, and desired sediment removal efficiency (see SE-2, Sediment Basin). As a rule of thumb, the larger the basin volume the greater the sediment removal efficiency. Sizing criteria are typically established under the local grading ordinance or equivalent. The runoff volume from a 2-year storm is a common design criteria for a sediment trap. The sizing criteria below assume that this runoff volume is 0.042 acre-ft/acre (0.5 in. of runoff). While the climatic, topographic, and soil type extremes make it difficult to establish a statewide standard, the following criteria should trap moderate to high amounts of sediment in most areas of California:

Sediment Trap SE-3

- Locate sediment traps as near as practical to areas producing the sediment.
- Trap should be situated according to the following criteria: (1) by excavating a suitable area or where a low embankment can be constructed across a swale, (2) where failure would not cause loss of life or property damage, and (3) to provide access for maintenance, including sediment removal and sediment stockpiling in a protected area.
- Trap should be sized to accommodate a settling zone and sediment storage zone with recommended minimum volumes of 67 yd^3/acre and 33 yd^3/acre of contributing drainage area, respectively, based on 0.5 in. of runoff volume over a 24-hour period. In many cases, the size of an individual trap is limited by available space. Multiple traps or additional volume may be required to accommodate specific rainfall, soil, and site conditions.
- Traps with an impounding levee greater than 4.5 ft tall, measured from the lowest point to the impounding area to the highest point of the levee, and traps capable of impounding more than 35,000 ft^3, should be designed by a Registered Civil Engineer. The design should include maintenance requirements, including sediment and vegetation removal, to ensure continuous function of the trap outlet and bypass structures.
- The outlet pipe or open spillway must be designed to convey anticipated peak flows.
- Use rock or vegetation to protect the trap outlets against erosion.
- Fencing should be provided to prevent unauthorized entry.

Installation

Sediment traps can be constructed by excavating a depression in the ground or creating an impoundment with a small embankment. Sediment traps should be installed outside the area being graded and should be built prior to the start of the grading activities or removal of vegetation. To minimize the area disturbed by them, sediment traps should be installed in natural depressions or in small swales or drainage ways. The following steps must be followed during installation:

- The area under the embankment must be cleared, grubbed, and stripped of any vegetation and root mat. The pool area should be cleared.
- The fill material for the embankment must be free of roots or other woody vegetation as well as oversized stones, rocks, organic material, or other objectionable material. The embankment may be compacted by traversing with equipment while it is being constructed.
- All cut-and-fill slopes should be 3:1 or flatter.
- When a riser is used, all pipe joints must be watertight.
- When a riser is used, at least the top two-thirds of the riser should be perforated with 0.5 in. diameter holes spaced 8 in. vertically and 10 to 12 in. horizontally. See SE-2, Sediment Basin.
- When an earth or stone outlet is used, the outlet crest elevation should be at least 1 ft below the top of the embankment.

- When crushed stone outlet is used, the crushed stone used in the outlet should meet AASHTO M43, size No. 2 or 24, or its equivalent such as MSHA No. 2. Gravel meeting the above gradation may be used if crushed stone is not available.

Costs

Average annual cost per installation and maintenance (18 month useful life) is $0.73 per ft^3 ($1,300 per drainage acre). Maintenance costs are approximately 20% of installation costs.

Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Inspect outlet area for erosion and stabilize if required.
- Inspect trap banks for seepage and structural soundness, repair as needed.
- Inspect outlet structure and spillway for any damage or obstructions. Repair damage and remove obstructions as needed.
- Inspect fencing for damage and repair as needed.
- Inspect the sediment trap for area of standing water during every visit. Corrective measures should be taken if the BMP does not dewater completely in 72 hours or less to prevent vector production.
- Sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the trap capacity. Sediment removed during maintenance may be incorporated into earthwork on the site or disposed of at an appropriate location.
- Remove vegetation from the sediment trap when first detected to prevent pools of standing water and subsequent vector production.
- BMPs that require dewatering shall be continuously attended while dewatering takes place. Dewatering BMPs shall be implemented at all times during dewatering activities.

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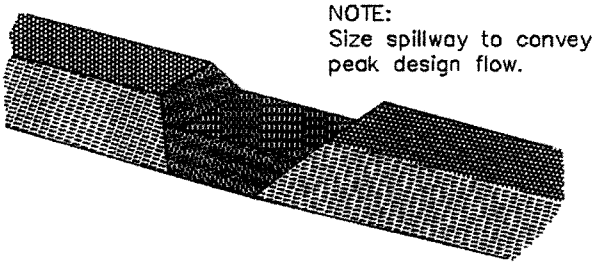
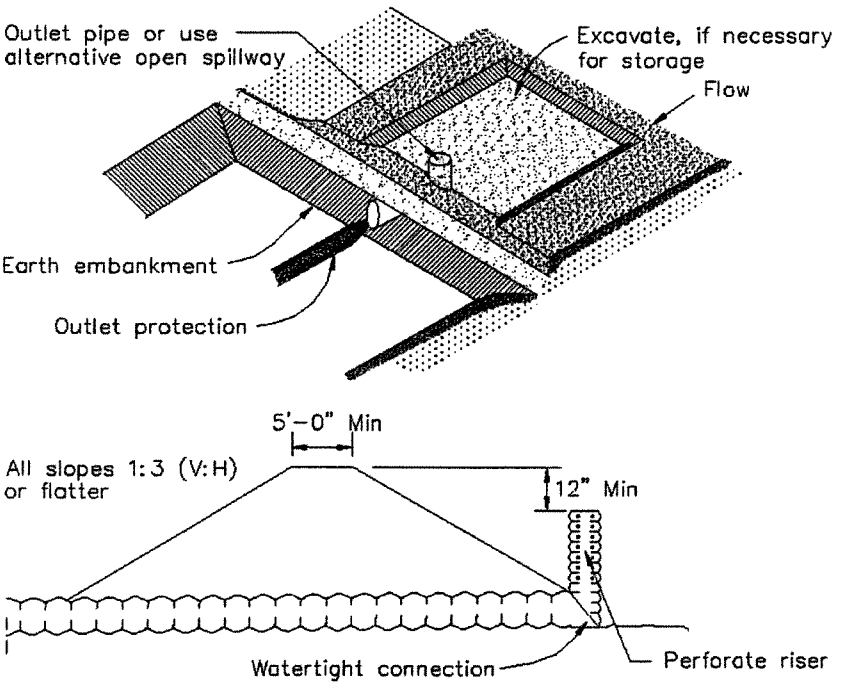


TYPICAL OPEN SPILLWAY



EMBANKMENT SECTION THRU RISER

TYPICAL SEDIMENT TRAP
NOT TO SCALE

SLOPETAME 2

Product Data Sheet - Slopetame²

Slopetame² (ST²) is a unique solution to age old problems - soil erosion and stabilization of soil on slopes and vegetated drainage channels.

The difficulty with most erosion control products are their lack of ability to keep soils in place until root systems are mature, and their potential to be undercut by rapid flow of storm water. These products are usually thin sheets of various materials, or open web-like matrices.

Other existing products act to "contain" various depths of fill materials by cellular constructions of fabrics or plastic sheets, but offer little resistance to water undercutting, or ability to interconnect cells of vegetation.

ST² System Description-
Each ST² unit is a 3-dimensional structure designed to isolate and contain small zones of soil over the entire slope surface, while at the same time preventing water from under cutting the unit and dislodging soil and roots.

ST² units consist of rigid upstanding rings connected with a flexible diagonal geogrid injection molded onto a geotextile fabric. The fabric acts to contain soil or gravel fill, while rows of bars and rings act to prevent erosion channels developing between rows of rings.

ST² Benefits-

- True 3-dimensional containment of fill.
- Rings and bars offer small scale confinement.
- Shallow depth of fill material needed.
- Strong diagonal grid to disperse loads across slopes.
- All units can be interlocked for continuous structure across slopes.
- Geotextile fabrics to strengthen root matrix.
- Fabrics act to slow speed of water infiltration and reduce chance of undercutting.
- Fabrics under gravel fill can prevent plant penetration from below and resist root penetration from above.
- Product is lightweight and easy to assemble.
- Recycled plastics are used.
- Plastics are treated for UV resistance.
- These plastics are inert from damage from normal chemicals used in horticulture.

ST² Units & System-
The ST² system includes the unit, and duckbill anchors - 3 ft (1 meter) lengths of 1/2" (1.25 cm) rebar not included. Soil preparation, product placement, anchors, soil or gravel fill, and irrigation (if required), are provided by the contractor, and considered an essential part of the installation of the system.

ST² Installation Guidelines-
If undisturbed slope continues above the area designated for ST², cut-off drains should be installed at the top of

the new slope to intercept surface water generated from above. The new slope will need only to contend with water actually falling on the ST² surfaced area, minimizing storm water volume build-up.

At the toe of long slopes, or at terrace levels, additional cut-off drains may be installed for the similar purposes downstream.

The units should extend from the top to toe of a slope in one continuous piece. 1 - 2.5 meter wide rolls are sold in standard lengths but can be preassembled in custom lengths.

Generally spunbonded non-woven fabrics made of either polyester or polypropylene are used, to enhance root system strength.

Units are anchored securely from the top of the slope, and periodically along the face of the slope. Types of anchors used may vary with substrata conditions.

ST² units are then filled with small gravel, or a lightweight soil mix, preferably, which includes Hydrogrow soil conditioner to retain adequate moisture in the primary root zone.

Gravel Fill -
For slopes that do not require vegetation cover, the ST² units can be filled with small gravel - which should be 3/8's inch minus in size, and sharp (crushed) rather than rounded to best lock into place.

Vegetation -
ST² system can be very effective in assisting new vegetative cover to establish and remain in place for years by protecting the root zone from soil removal due to water runoff.
Compatible forms of vegetation include:

- Grasses
- Groundcovers
- Vines
- Shrubs
- Trees

The selected form(s) should be matched with slope, soil types, moisture, maintenance and aesthetic requirements of the site.

Shrubs and trees, with their larger roots, will most likely be restricted to slopes with permeable soils below the units and openings cut into the unit (remove rings with pruning shears) to allow proper root development.

Groundcovers other than grasses will usually be planted from pots ranging in size from 2" to 1 gallon. Small plants may have the root system split to grow over and between rings, while larger plants may require ring removal.

Grasses and most wildflowers will be best installed by seeding, or hydroseeding techniques.

As the root systems develop, roots will penetrate and integrate with the fabric layer to establish a very strong surface.

Normal Installation Steps-
Installation of the system begins with soil preparation.

1. The soil should be tilled to a depth of 10 cm to 15 cm.
2. Pre-assemble on flat ground 1, 1.5, 2, or 2.5 meter widths, for the continuous length of the slope, deforming the top of connection pins with heat (propane torch and screwdriver) to prevent separation.

3. Start at the highest elevation and place the ST² mat with rings up, fabric down, and the double hole corner at the upper right position, and unroll down the slope. Make connections to adjacent units and deform pins to keep interlocked.

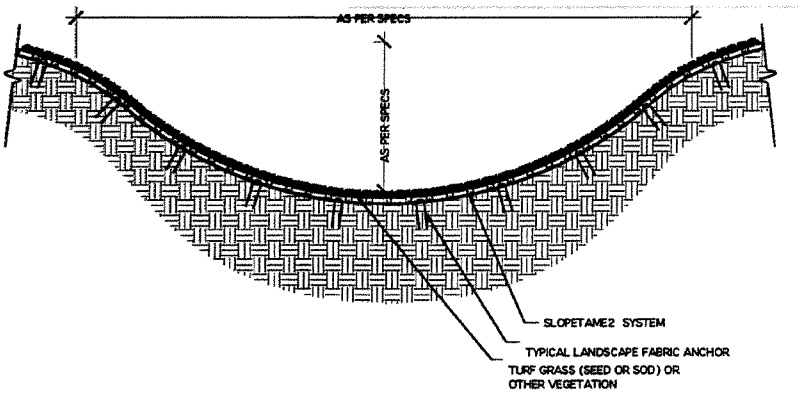
4. Anchor the mat with 1 pin (15 cm long x 25 mm wide x 2 mm ga. wire) placed just inside the double hole corner, every 40" on center, or closer as may be needed by local conditions.

5. Shrubs and trees may be placed by cutting away rings/grid/fabric to accommodate root ball. Place crown of plant just below the top of rings.

6. Fill the Slopetame² units with proper topsoil type materials in preparation for seeding.

7. Hydroseed and mulch the area for grasses and groundcovers. Mulch materials (paper, cellulose, or light fabric) will protect delicate seedlings until germination, and roots have reached the ST² fabric layer.

8. Provide supplemental irrigation as needed to assure germination and plant root establishment.



NOTE: GRASS/VEGETATION AND SAND/SOIL TYPES SHALL BE SPECIFIED BY A LANDSCAPE ARCHITECT OR ENGINEER

SLOPETAME2 SWALE REINFORCEMENT

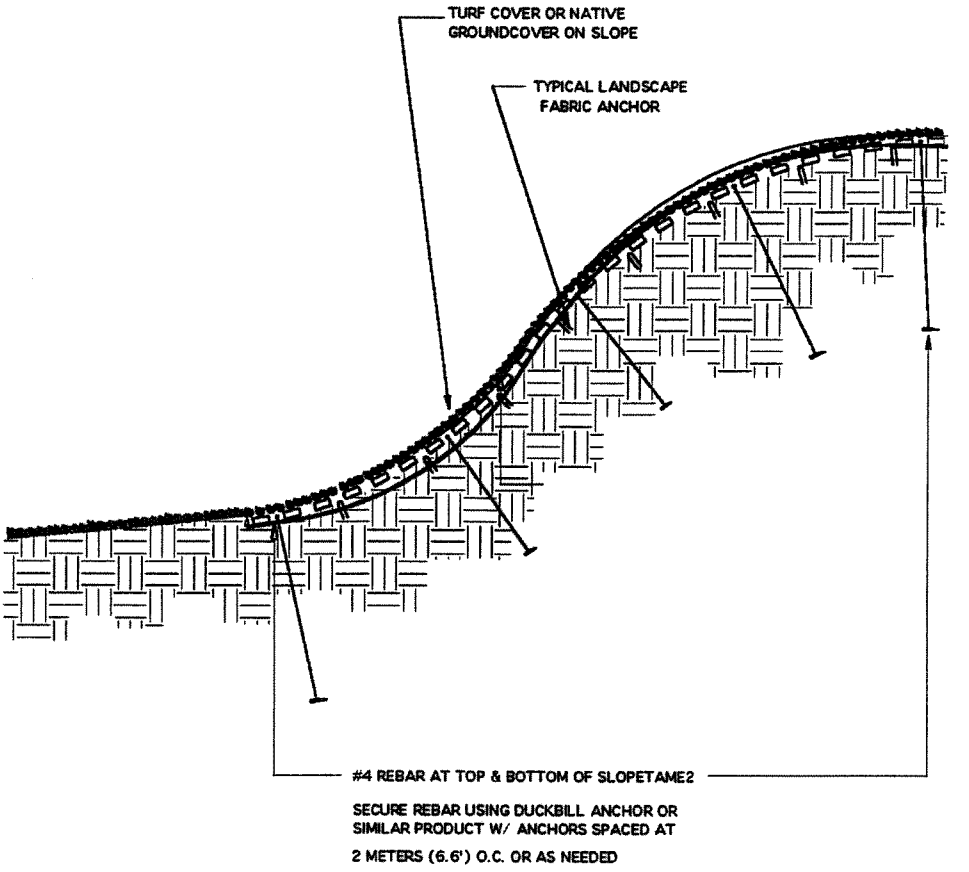
1
1OF1

NOT TO SCALE

CHOOSE THIS PRODUCT FOR EROSION AND SEDIMENT CONTROL

Invisible
Structures, Inc.
ST2Swale.dwg

1600 Jackson St., SUITE 310
GOLDEN, COLORADO 80401
800-233-1510 or 303-233-8383
Fax 303-233-6262
www.invisiblestructures.com
Rev. 08/04



SLOPETAME2 CHANNEL REINFORCEMENT

1
1 OF 1

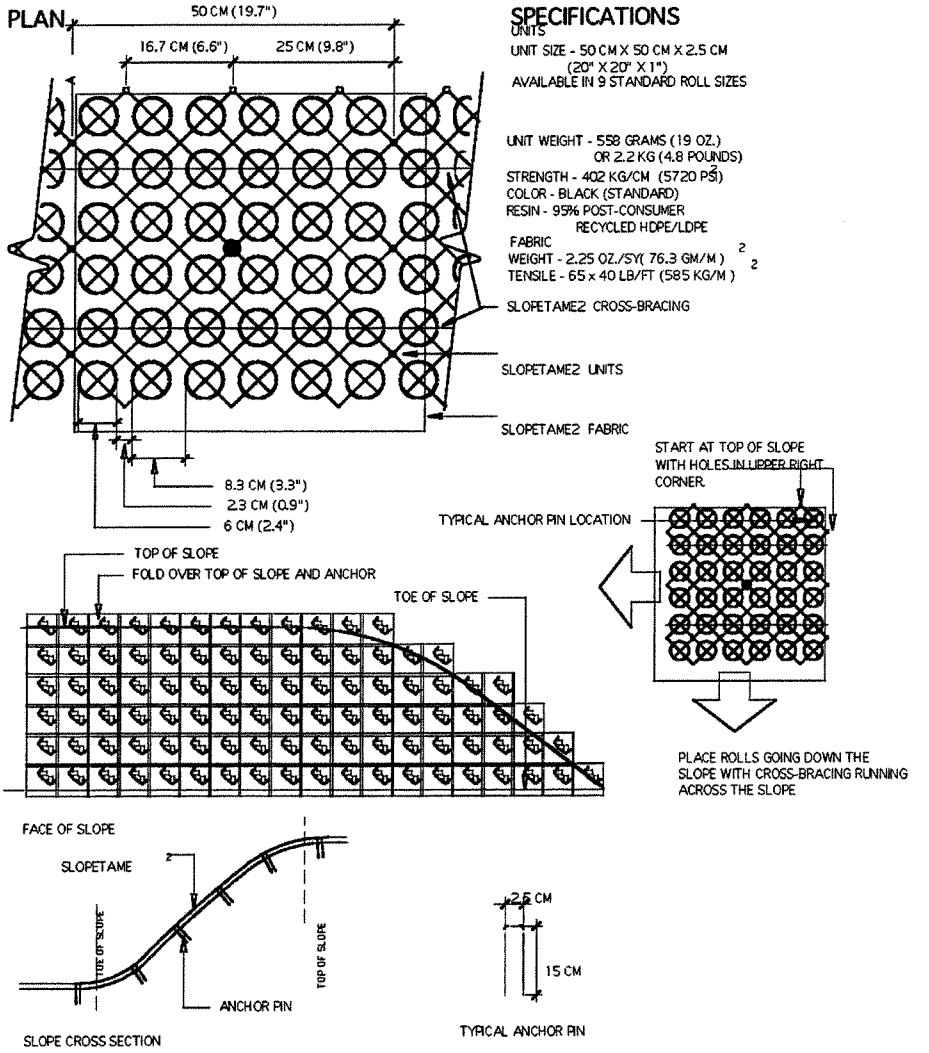
NOT TO SCALE

CHOOSE THIS PRODUCT FOR CHANNEL EROSION AND SEDIMENT CONTROL

Invisible Structures, Inc.

St2-channel.dwg

1600 Jackson St., Suite 310
Golden, CO 80401
800-233-1510 OR 303-233-8383
FAX: 303-233-8282
www.invisiblestructures.com
Rev. 08/04



TYPICAL SLOPETAME2 ASSEMBLY AND ANCHORAGE

1
1 OF 1

CHOOSE THIS PRODUCT FOR STABALIZING SLOPE CONDITIONS

NOT TO SCALE

Invisible
Structures, Inc.

1600 Jackson St., Suite 310
Golden, Colorado 80401
800-233-1510 OR 303-233-8383
FAX: 303-233-8282
rev. 08/04

St2.dwg

ATTACHMENT F
OPERATION AND MAINTENANCE PROGRAM FOR TREATMENT BMPs

BMP CATEGORY (FIRST)	**MAINTENANCE ACTIVITIES**	**ANNUAL COST**
BIO-FILTERATION SWALES (along the roadways only) (12,850 sf total)	- CUT VEGETATION IN CHANNEL TO 8" or 6" HEIGHT - RESEED/VEGETATE BARE SPOTS AS NECESSARY - REMOVE SEDIMENT FROM CHANNEL AS NECESSARY - BACKFILL BURROW HOLES AS NECESSARY	$38,500
	TOTAL	**$ 38,500**
MAINTENANCE RESPONSIBILITY	The County should have only minimal concern for ongoing maintenance. The property owners and HOA can naturally be expected to do so as a requirement of taking care of their property.	
BMP CATEGORY (SECOND)	**MAINTENANCE ACTIVITIES**	**ANNUAL COST**
SEDIMENT TRAPS (9 total)	- INSPECT STRUCTURAL INTEGRITY - REMOVE SEDIMENT FROM BASIN AS NECESSARY	$18,000
CURB INLET W/ WATER QUALITY INTERCEPTOR/DROP OUTLET BOX (11 total)	- INSPECT STRUCTURAL INTEGRITY - REMOVE TRASH AND DEBRIS FROM GRATE	$11,000
	- **TOTAL**	**$29,000**
MAINTENANCE RESPONSIBILITY	The County needs to assure ongoing maintenance. It is appropriate for the HOA to be given primary responsibility for maintenance. The County needs to be able to step in and perform the maintenance if HOA fails, and needs to have security to provide funding for such maintenance.	
BMP CATEGORY (THIRD)	**MAINTENANCE ACTIVITIES**	**ANNUAL COST**
DETENTION BASIN (1 total)	- CUT VEGETATION IN BASIN TO 8" HEIGHT - RESEED/VEGETATE BARE SPOTS AS NECESSARY - REMOVE SEDIMENT FROM BASIN AS NECESSARY - INSPECT STRUCTURAL INTEGRITY - BACKFILL BURROW HOLES AS NECESSARY	$10,000
MAINTENANCE RESPONSIBILITY	The County needs to assure ongoing maintenance is heightened, to the point that the County is willing to take on this responsibility. The master HOA will be primarily responsible for maintenance. A permanent funding mechanism needs to be established. A special assessment district will be established for this project, the assessment will be collected with property tax.	
	TOTAL	**$10,000**
	GRAND TOTAL	**$ 77,500**

Note: There are no storm drain inserts with this project. However, see Section II of this report for the number of storm drain inserts proposed with the "B" Designator site plans.

ATTACHMENT G

FISCAL RESOURCES

The individual home owners will be responsible for the BMP devices on their individual residential lots. The master Home Owners' Associations (HOA) will be responsible for the BMP devices in the public right of way and adjoining slopes, the Sports Complex, the Pool Site, the detention basin and the Staging Area/Pump Station lot. The developer will be responsible for the maintenance of interim BMP devices (i.e. sediment traps) on the mass-graded multi-family and commercial lots before they are developed into their ultimate use. Ultimately, after the "B" Designator site plan areas are developed, the individual site HOAs will be responsible for the permanent BMP devices in the multi-family neighborhoods and neighbor recreation facilities and the Tenants' Association will be responsible for the maintenance of permanent BMP devices on the commercial lots.

ATTACHMENT H

CERTIFICATION SHEET

This Stormwater Management Plan has been prepared under the direction of the following Registered Civil Engineer. The Registered Civil Engineer attests to the technical information contained herein and the engineering data upon which recommendations, conclusions, and decisions are based.

The combination of proposed construction and post-construction BMPs will reduce, to the maximum extent practicable, the expected pollutants and will not adversely impact the beneficial uses or water quality of the receiving waters.



Date:

ATTACHMENT I

ADDENDUM

Section II

Storm Water Management Plan
For Priority Projects
(Major SWMP)

The Major Stormwater Management Plan (Major SWMP) must be completed in its entirety and accompany applications to the County for a permit or approval associated with certain types of development projects. To determine whether your project is required to submit a Major or Minor SWMP, please reference the County's Stormwater Intake Form for Development Projects.

Project Name:	Campus Park, "B" Designator Site Plans
Permit Number (Land Development Projects):	TM 5338 RPL6
Work Authorization Number (CIP):	
Applicant:	Passerelle, LLC
Applicant's Address:	402 W. Broadway, Suite 1320 San Diego, Ca 92101
Plan Prepare By (*Leave blank if same as applicant*):	Landmark Consulting
Date:	6-27-07
Revision Date (If applicable):	~~9-1-08~~ 3-3-09

The County of San Diego Watershed Protection, Storm Water Management, and Discharge Control Ordinance (WPO) (Ordinance No. 9424) requires all applications for a permit or approval associated with a Land Disturbance Activity must be accompanied by a Storm Water Management Plan (SWMP) (section 67.804.f). The purpose of the SWMP is to describe how the project will minimize the short and long-term impacts on receiving water quality. Projects that meet the criteria for a priority project are required to prepare a Major SWMP.

Since the SWMP is a living document, revisions may be necessary during various stages of approval by the County. Please provide the approval information requested below.

Project Stages	Does the SWMP need revisions?		If YES, Provide Revision Date
	YES	NO	
1		X	
2	X		9-1-08
3	X		3-3-09

Instructions for a Major SWMP can be downloaded at http://www.co.sandiego.ca.us/dpw/stormwater/susmp.html.

Completion of the following checklists and attachments will fulfill the requirements of a Major SWMP for the project listed above.

PROJECT DESCRIPTION

The project is located on the northerly side of Pala Road, east of Interstate 15, west of Rice Canyon Road and south of Stewart Canyon Road, in the County of San Diego, State of California. The surrounding land uses around the project are as follows: westerly is Interstate 15, southerly is Pala Road (SR-76)/agricultural, easterly is agricultural/vacant/large parcel SFR, northerly is agricultural/large parcel SFR. The main entrance to the project is from SR-76 (Pala Road) to the south of the project site.

Attachment A is a vicinity map showing the general property location. In its pre-development condition, the site is located on a north to south sloping topography. The terrain along the northerly and easterly boundaries are steep sloping, the mid-portion of the project is moderately sloping and the southerly end of the project is very gently sloping. The project site is located at the downstream end of an approximately 7,500 acre upstream drainage basin. An existing Caltrans channel conveys runoff from this upstream basin southerly along a portion of the westerly boundary of this project. The runoff from this upstream basin creates the Horse Ranch Creek and floodplain which eventually confluence with the San Luis Rey River to the south.

~~The project consists of approximately 415.8 areas of mixed development including 73.6 acres of single family dwelling units, 44.8 acres of multi-family dwelling units, 7.8 acres of town center development, 10.9 acres of professional office development, 0.7 acres of trail staging area, 0.1 acres of pump station area, 10.4 acres of park area, 49.8 acres of streets and 217.7 acres of open space area.~~

The project consists of approximately 416.1 acres of mixed-use development including 113.8 acres of single family dwelling units, 45.4 acres of multi-family dwelling units, 11.5 acres of professional office development, 8.1 acres of town center, 215.4 acres of parks and open space, 0.2 acres of pump station area as well as 21.7 acres of major circulation roads.

This SWMP will address the water quality issues of the recreational areas, the multi-family sites, professional office sites and commercial sites of this planned development. These sites will be built upon mass-graded pads. Section I of this report addresses the water quality issues of the tentative map and mass grading of the site. Runoff coefficents used throughout this report were taken from the hydrology report titled "A CEQA Level Preliminary Hydrology & Hydraulics Study for Campus Park".

The following pages will describe in detail each of the "B" Designator Site Plans proposed with this project.

Multi-Family 1, MF-1, is located on ~~the southwesterly corner of the intersection of Pala Mesa Drive and~~ Horse Ranch Creek Road just south of the proposed Palomar College site.. The site is located on a super pad at a 1% north to south sloping terrain. Nine multi-family building clusters will be built along a north-south main driveway through the middle of the site. The runoff from clusters 1 -4 flows into the landscaped areas surrounding each building and then onto the main driveway via a series of concrete ribbon gutters. The runoff flows southerly along a concrete ribbon gutter on the easterly side of the main driveway and into a proposed curb inlet equipped with fossil filter insert. The discharge then is carried to a fossil filter insert equipped grated drain inlet at the southerly end of the concrete ribbon gutter in cluster 9. Clusters 5-9 also drain into the landscaped areas surrounding the buildings and then into this inlet via a series of concrete ribbon gutters, the confluence flow from this inlet is discharged onto the southerly natural terrain via a down drain.

The runoff from the buildings is treated when it is discharged into the landscaped areas surrounding each building. The buildings will contribute very limited amount of pollutants, such as sediments, to the overall discharge from the site. Even though the runoff from the building intermingles with the untreated runoff from the street, it is anticipated that the buildings will not contribute additional pollutants to the runoff.

The grated inlet will be equipped with a water quality drop outlet that will divert the low flow, first flush runoff from the main outlet pipe to a low-flow water quality pipe that will discharge the first flush flow into a grass-lined bio-swale cut into the southerly fill slope and discharge onto the existing natural terrain. The low flow outlet pipe will have a flow line elevation 8 inches below the main storm drain flow line elevation such that pollutant laden first flush flow will flow into the outlet trap and out the low flow 8" outlet pipe without reaching the downstream main storm drain pipe. The 8" water quality low flow outlet pipe will convey the first flush runoff into a turf reinforced grass-lined water quality low flow bio-filtration swales cut into the manufactured slopes.

The bio-swales will have a 0.2% slope where the first flush runoff will slow and filter through the vegetation before reaching the down stream terrain. Since the bio-swales are cut into the slopes, the slope at the downstream end is relatively steep, thus, turf reinforcement such as Slope Tame 2 by Invisible Structures will be installed at the downstream end of the swale to prevent erosion. During normal peak runoff events following the first flush flow, the peak runoff will simply fill the outlet trap to reach the normal flow lines of the 100-year storm drain pipe and continue on downstream.

The tributary area of the site is 10.8 acres, the water quality flow based on 0.2 in/hr is 1.5 cfs (Qwq = C x I x A = 0.71 x 0.2in/hr x 10.8 Ac = 1.5 cfs).

Multi-Family 2, MF-2, is located on the southeasterly corner of the intersection of Harvest Glen Lane and Horse Ranch Creek Road. This site consists of 4 building clusters of town home type development. The site will be mass graded to a gentle northeast to southwest sloping terrain (at approximately 1% grade). A driveway cuts across the northwesterly corner of the site to provide access from both Harvest Glen Lane and Horse Ranch Creek Road. ~~The runoff from clusters 7 and 8 sheet flows onto the driveway and flow to a low point just south of cluster 3 that will confluence with the flows from clusters 1-3. The combined runoff will flow southerly along a concrete ribbon gutter through clusters 4-6 and into a curb inlet, and from there the runoff will be discharged into a storm trunk system located in Horse Ranch Creek Road via an under ground pipe along the westerly property line. During first flush rain event, the low flow runoff will be diverted from the curb inlet by a baffle such that it will enter a grass-lined swale long the westerly property line and into a grated inlet. The low flow runoff will then be conveyed into the main outlet pipe via an 8" pvc pipe.~~

The runoff from each of the building clusters will drain into the surrounding landscaped areas then onto the street and ribbon gutters. The discharge from the building clusters and streets will flow along the ribbon gutters and to a proposed curb inlet equipped with fossil filter insert at the southerly end of the driveway. Prior to entering the curb inlet, an low flow interceptor channel drain, installed in front of the curb inlet opening, will divert the low flow water quality runoff into bio-filtration swale located in the landscaped area at the southerly tip of the site. The 100-year storm runoff volumes will simply bypass the low flow interceptor channel drain in front of the curb inlet and will flow directly into the storm drain lateral from the Horse Ranch Creek Road storm drain system.

The tributary area of the site is 5.4 acres, the 85th percentile storm is 0.8 in. The water quality first flush runoff volume is:

The tributary area of the site is 5.4 acres, the water quality flow based on 0.2 in/hr is 0.8 cfs (Qwq = C x I x A = 0.71 x 0.2in/hr x 5.4 Ac = 0.8 cfs).

Multi-Family 3, MF-3, is located between Longspur Road and Harvest Glen Lane, easterly of the proposed Town Center sites. The site is on a gentle northeast to southwest sloping mass-graded pad (at approximately 1% grade). The runoff form the northeasterly corner of the site – building cluster 1, flows onto the circle drive's northerly gutter and into a curb inlet located at the northeaster end of the driveway approach form Longspur Road. This curb inlet will be connected to another curb inlet located on the northwesterly corner of the driveway. The northwesterly curb inlet outlets to the storm drain main located in Longspur Road. A water quality low flow drop structure will be built into this northwesterly curb inlet such that the first flush flow will not reach the main outlet pipe but instead into low flow outlet pipe. The low flow outlet pipe will discharge the first flush flow onto a grass-lined bio-filtration swale located along Longspur Road. A grated drain inlet will collect the first flush flow from the swale at the westerly end of the swale and discharge the runoff into the same storm drain main pipe in Longspur Road. The runoff form the easterly and southerly portions of the site, building clusters 2-5, as well as the driveway approach off Harvest Glen Lane, flows onto the circle drive and into two curb inlets located at the southerly end of the driveway approach. The westerly curb inlet is equipped with a water quality low flow drop outlet such that the first flush will by pass the main outlet pipe and into a low flow outlet pipe. The low flow outlet pipe will discharge the first flush runoff into a grass-line bio-filtration swale along Harvest Glen Lane and into storm drain main pipe in Harvest Glen Lane. The main outlet pipe is connected to an underground system located at the southwesterly corner of the site. This underground system will convey the runoff from rest of the site to the storm drain main pipe in Harvest Glen Lane. This system is also equipped with a water quality low flow outlet structure that will discharge the first flush flow into the same bio-filtration swale along Harvest Glen Lane.

The tributary area to the northeasterly system is 1.7 acres, the water quality flow based on 0.2in/hr is 0.2 cfs (Qwq = C x I x A = 0.71 x 0.2in/hr x 1.7 Ac = 0.2 cfs).

The tributary area to the southerly system is 16.8 acres, the water quality flow is 2.4 cfs (Qwq = C x I x A = 0.71 x 0.2in/hr x 16.8 Ac = 2.4 cfs).

Multi-Family 4, MF-4, is located on the on the northeasterly corner of Pala Mesa Drive and Pala Road. The northeasterly corner of the site drains into Street "A" where the street gutter will convey the runoff northerly (towards Pankey Place) into a curb inlet located at the easterly intersection into the site from Pankey Place. A water quality low flow drop structure will be built into this curb inlet such that the first flush flow will not reach the main outlet pipe but instead into a low flow outlet pipe. The low flow outlet pipe will discharge the first flush flow into a grass-lined bio-filtration swale located along Pankey Place, south of this intersection. The 100-year runoff will bypass the water quality low flow drop structure and continue flowing into a proposed storm drain main located south of and parallel to Pankey Place. The water quality low flow runoff in the bio-swale will get picked up in a grated inlet located at the southeasterly corner of the westerly intersection into the site from Pankey Place.

The middle section of the site drains to two grated inlets looked in the middle of the site, just south of Pankey Place. The grated inlets will have water quality low flow interceptor channel drains in front of the grated inlets so that the first flush flow will be diverted into a low flow outlet pipe. The low flow outlet pipe will discharge into the same grass-lined bio-filtration swale located south of and parallel to Pankey Place. This low flow runoff will be picked up in the same grated inlet located at the southeasterly corner of the westerly intersection into the site from Pankey Place.

The rest of the site drains onto Street "A" and into a water quality low flow drop structure built into a curb inlet located at the westerly intersection into the site such that the first flush flow will not reach the main outlet pipe but instead into a low flow outlet pipe . The low flow outlet pipe will discharge the first flush flow into a grass-lined bio-filtration swale located along Pankey Place, south of this intersection. The 100-year runoff will bypass the water quality low flow drop structure and continue flowing into a proposed storm drain main located south of and parallel to Pankey Place. The water quality low flow runoff in the bio-swale will get picked up in a grated inlet located at the southeasterly corner of the intersection of Pankey Place and Pala Mesa Drive.

The tributary area of the northeasterly corner is 2.2 acres, the water quality flow is:

$Qwq = C \times I \times A = 0.71 \times 0.2 \times 2.2 = 0.3$ cfs

The tributary area for the middle section of the site is 1.1 acres, the water quality flow is:

$Qwq = C \times I \times A = 0.71 \times 0.2 \times 1.1 = 0.2$ cfs

The tributary area of the rest of the site is 6.1 acres, the water quality flow is:

$Qwq = C \times I \times A = 0.71 \times 0.2 \times 6.1 = 0.9$ cfs

Professional Office 1, PO1, is located across the Baltimore Oriole Road from the above site, between Jaeger Street and Horse Ranch Creek Road. This site consists of one professional office building that is surrounded by a driveway isle and parking spaces. The runoff from the site sheet flows southerly and westerly and into a curb and gutter system along the northwesterly, westerly and southerly sides of the site. The curb will have small opening at regular intervals to allow the first flush runoff to enter a grass-lined bio swale located just behind the northwesterly, westerly and southerly curbs. The bio swale will convey the first flush runoff to a filtration basin located at the southwesterly corner of the site and discharge the runoff into the storm drain system in Baltimore Oriole Road. The 100-year runoff gets picked up in a curb inlet located at the southwesterly corner of the site and then discharges into the same storm drain system in Baltimore Oriole Road.

The westerly site (PO2) has a tributary area of 2.7 acres, the water quality runoff is:

$Qwq = C \times I \times A = 0.85 \times 0.2 \times 2.7 = 0.5$ cfs.

Professional Office 2, PO2, is located on the southeasterly corner of Baltimore Oriole Road and Horse Ranch Creek Road. The site consists of three office building and a parking lot. The northwesterly portion (around Building D) of the site drains into an underground system via grated inlet at concentration points in the parking areas. Under normal rainfall, the runoff will be conveyed through this system and discharged into the storm drain main pipe in Horse Ranch Creek Road. For first flush rain fall events, the first flush flow will bypass the main outlet pipe located at the last grated inlet of this system and into a built-in water quality low flow drop outlet which discharges the first flush flow into a grass-lined bio swale located along Horse Ranch Creek Road and into a grated inlet located northerly of the Horse Ranch Creek Road site entry driveway which is then discharged into the Horse Ranch Creek Road storm drain system. The easterly portion of the site (east of Buildings B & C) also drains to concentration points in the parking areas which carries the 100-year runoff to the storm drain system in Horse Ranch Creek Road. The first flush flows will bypass the main outlet pipe located in the grated inlet just southeasterly of Building C and into a built-in water quality low flow drop outlet which discharges the first flush flow into a grass-lined bio swale located along southerly property line and into a grated inlet located at the southwesterly corner of the site which is then discharged into the Horse Ranch Creek Road storm drain system The rest of site (around Buildings B & C) drains into another underground system that outlets into the same Horse Ranch Creek Road storm drain system. During first flush storm events, the flow will bypass the main outlet pipe located at the last grated inlet of this system, near the southwesterly corner of the site and into a water quality low flow drop structure in the last grated inlet and into a low flow pipe. The low flow pipe will discharge the first flush runoff into the another grass-lined bio swale located along Horse Ranch Creek Road and into a grated inlet located at the southwesterly corner of the site and into the Horse Ranch Creek Road storm drain system. Lastly, there are two curb inlets located at the site entry off of Horse Ranch Creek Road. These two inlets pick up the 100-year runoff and flow to the Horse Ranch Creek Road storm drain system. Prior to entering these curb inlets, an low flow interceptor channel drain, installed in front of the curb inlet openings, will divert the low flow water quality runoff into the same grass-lined bio swale that runs along Horse Ranch Creek Road at the southwesterly corner of the site.

The northwesterly side of PO1 (around Building D) has a tributary area of 1.9 acres, the water quality runoff is:

$Qwq = C \times I \times A = 0.85 \times 0.2 \times 1.9 = 0.3$ cfs.

The easterly side of PO1 (north of Buildings B & C) has a tributary area of 1.9 acres, the water quality runoff is:

$Qwq = C \times I \times A = 0.85 \times 0.2 \times 1.9 = 0.3$ cfs.

The middle area of PO1 (west of Buildings B & C) has a tributary area of 4.5 acres, the water quality runoff is:

$Qwq = C \times I \times A = 0.85 \times 0.2 \times 4.5 = 0.8$ cfs.

Sports Complex. The Sports Complex (Lot 574) is located on the northeasterly corner of Longspur Road and Horse Ranch Creek Road. The Sports Complex consists of two large ball fields locate on the northerly 90% of the site and a parking lot on the southerly end. The runoff from the northerly ball field sheet flows southwesterly into a grated drain inlet that discharges the runoff into the storm drain main pipe in Horse Ranch Creek Road. The runoff from the ball field does not require treatment control BMPs since the vegetation of the field will function as bio filtration BMPs to treat the runoff before it reaches downstream storm drains.

The southerly ball field sheet flows southwesterly into a grated inlet and storm drain system. The storm drain will also convey the runoff into the storm drain main pipe in Horse Ranch Creek Road. Likewise, the runoff from this ball field does not require treatment control BMPs since the vegetation of the field will function as bio filtration BMPs to treat the runoff before it reaches downstream storm drains.

The parking lot sheet flows southwesterly into a drain inlet located at the southwesterly corner of the parking lot. The main flow will be conveyed into the storm drain main pipe in Horse Ranch Creek Road. The first flush flow will be diverted by the water quality low flow drop outlet in the drain inlet, into a grass-lined bio swale along the westerly site boundary and into a bio swale cut into the fill slope along Horse Ranch Creek Road. The low flow will flow southerly in the bio swale and into a grated inlet at the southerly end of the swale. The inlet will discharge the low flow into the storm drain main pipe in Horse Ranch Creek Road.

The tributary area of the ball field parking lot is 0.7 acres, the water quality flow is:

$Qwq = C \times I \times A = 0.85 \times 0.2 \times 0.7 = 0.1$ cfs

HOA Parks. The pool site (Lot 569 – P3) is located on the southwesterly corner of Frigatebird Road and Jaeger Street. The site consists of a pool and pool house on the northerly half of the site and a parking lot on the southerly half. The pool deck will drain into a series of deck drains that discharge into the sanitary sewer system due to the potential of chlorine and other chemicals used in pool waters. The runoff from the pool house and the parking lot sheet flow southerly and to a curb inlet at the southwesterly corner of the parking lot. Prior to entering the curb inlet, an low flow interceptor channel drain, installed in front of the curb inlet openings, will divert the low flow water quality runoff into a grass-lined bio-swale along the westerly side of the parking lot. The bio swale discharges into a grated inlet and outlets the runoff onto the riprap pad westerly of the fill slope and onto the natural terrain.

The tributary area of the pool parking lot is 0.35 acres, the water quality flow is:

$Qwq = C \times I \times A = 0.85 \times 0.2 \times 0.35 = 0.1$ cfs

The park sites on Lot 568 (P-1), Lot 572 (P-2), Lot 570 (P-5), Lot 571 (P-6), Lot 575 (P-7), Lot 573 (P-8) are scattered throughout the single-family residential neighborhoods. All of these park sites will be landscaped and the vegetation cover will function as treatment BMP for the runoff. Therefore, no BMP is necessary for these park sites.

Staging Area (Lot 576) and Sewer Pump Station (Lot 577), are located on the on the northeasterly corner of Pala Mesa Drive and Pala Road.

The runoff from this site sheet flows northerly into a water quality low flow pipe equipped curb inlet. The low flow pipe will convey the first flush runoff into a grass-lined bio swale located on the northerly fill slope that discharges the runoff onto the existing terrain. The 100-year runoff will bypass the low flow pipe and discharge directly into riprap to dissipate the runoff before flowing into the existing terrain.

The tributary area of the site is 0.8 acres, the water quality flow is:

$Qwq = C \times I \times A = 0.79 \times 0.2 \times 0.8 = 0.1$ cfs.

Town Center, TC, is located on the easterly side of Horse Ranch Creek Road, between Longspur Road and Harvest Glen Lane. It consists of 7 commercial and retail buildings and a surrounding parking lot on a gentle northeast to southwesterly sloping terrain.

The Town Center is divided into northerly, central and southerly portions by the two driveway approaches from Horse Ranch Creek Road. The northerly portion consists of two buildings, Buildings A and B and driveways and parking lots. The runoff from this portion of the site sheet flows southwesterly and into a fossil filter equipped curb inlet located at the southwesterly corner of the drive-thru lane around Building B and two fossil filter equipped curb inlets located on each side of the center driveway entrance into the site. These curb inlets will discharge the runoff into an underground oil-water separator before it is discharged into the storm drain main pipe in Horse Ranch Creek Road.

The central portion of the site consists of three buildings, Buildings C, D & E and a parking lot. This portion of the site sheet flows southwesterly and into a fossil filter equipped curb inlets located: 1. at the southwesterly corner of this portion of the site (northerly of Building F); 2. on each side of the southerly driveway entrance from Horse Ranch Creek Road; and 3. on the westerly side of the entry driveway on Harvest Glen Lane. The runoff from these curb inlets flows into an underground storm drain system that conveys the runoff to an oil/water separator located at the northeasterly corner of Harvest Glen Lane and Horse Ranch Creek Road. The oil/water separator discharges the runoff into the storm drain main pipe in Harvest Glen Lane.

The northerly tributary area of the site is 3.4 acres. The water quality flow is:

$Qwq = C \times I \times A = 0.79 \times 0.2 \times 3.4 = 0.5$ cfs.

The central and southerly tributary area of the site is 4.4 acres, the water quality flow is:

$Qwq = C \times I \times A = 0.79 \times 0.2 \times 4.4 = 0.7$ cfs

PRIORITY DEVELOPMENT PROJECT DETERMINATION

Please check the box that best describes the project. Does the project meet one of the following criteria? Please note that a Priority Development Project Determination Table was completed for each land use type proposed with the "B" Designator Site Plans due to the unique water quality issues associated with each of the proposed uses.

Table 1

PRIORITY DEVELOPMENT PROJECT (MF1 through MF4)	YES	NO
Redevelopment that creates or adds at least 5,000 net square feet of additional impervious surface area		X
Residential development of more than 10 units	X	
Commercial developments with a land area for development of greater than 1 acre		X
Heavy industrial development with a land area for development of greater than 1 acre		X
Automotive repair shop(s)		X
Restaurants, where the land area for development is greater than 5,000 square feet		X
Hillside development, in an area with known erosive soil conditions, where there will be grading on any natural slope that is twenty-five percent or greater, if the development creates 5,000 square feet or more of impervious surface	X	
Environmentally Sensitive Areas (ESA): All development located within or directly adjacent to or discharging directly to an ESA (where discharges from the development or redevelopment will enter receiving waters within the ESA), which either creates 2,500 square feet of impervious surface on a proposed project site or increases the area of imperviousness of a proposed project site to 10% or more of its naturally occurring condition. "Directly adjacent" means situated within 200 feet of the ESA. "Discharging directly to" means outflow from a drainage conveyance system that is composed entirely of flows from the subject development or redevelopment site, and not commingled with flows from adjacent lands.	X	
Parking Lots 5,000 square feet or more or with 15 parking spaces or more and potentially exposed to urban runoff	X	
Streets, roads, highways, and freeways which would create a new paved surface that is 5,000 square feet or greater	X	
Retail Gasoline Outlets (RGO) that meet the following criteria: (a) 5,000 square feet or more or (b) a projected Average Daily Traffic (ADT) of 100 or more vehicles per day.	X	

Limited Exclusion: Trenching and resurfacing work associated with utility projects are not considered Priority Development Projects. Parking lots, buildings and other structures associated with utility projects are subject to the WPO requirements if one or more of the criteria above are met.

If you answered **NO** to all the questions, then **STOP**. Please complete a Minor SWMP for your project. If you answered **YES** to any of the questions, please continue.

Table 1 (continued)

PRIORITY DEVELOPMENT PROJECT (PROFESSIONAL OFFICE)	YES	NO
Redevelopment that creates or adds at least 5,000 net square feet of additional impervious surface area	X	
Residential development of more than 10 units		X
Commercial developments with a land area for development of greater than 1 acre	X	
Heavy industrial development with a land area for development of greater than 1 acre		X
Automotive repair shop(s)		X
Restaurants, where the land area for development is greater than 5,000 square feet		X
Hillside development, in an area with known erosive soil conditions, where there will be grading on any natural slope that is twenty-five percent or greater, if the development creates 5,000 square feet or more of impervious surface		X
Environmentally Sensitive Areas (ESA): All development located within or directly adjacent to or discharging directly to an ESA (where discharges from the development or redevelopment will enter receiving waters within the ESA), which either creates 2,500 square feet of impervious surface on a proposed project site or increases the area of imperviousness of a proposed project site to 10% or more of its naturally occurring condition. "Directly adjacent" means situated within 200 feet of the ESA. "Discharging directly to" means outflow from a drainage conveyance system that is composed entirely of flows from the subject development or redevelopment site, and not commingled with flows from adjacent lands.	X	
Parking Lots 5,000 square feet or more or with 15 parking spaces or more and potentially exposed to urban runoff	X	
Streets, roads, highways, and freeways which would create a new paved surface that is 5,000 square feet or greater	X	
Retail Gasoline Outlets (RGO) that meet the following criteria: (a) 5,000 square feet or more or (b) a projected Average Daily Traffic (ADT) of 100 or more vehicles per day.		X

Limited Exclusion: Trenching and resurfacing work associated with utility projects are not considered Priority Development Projects. Parking lots, buildings and other structures associated with utility projects are subject to the WPO requirements if one or more of the criteria above are met.

If you answered **NO** to all the questions, then **STOP**. Please complete a Minor SWMP for your project. If you answered **YES** to any of the questions, please continue.

Table 1 (continued)

PRIORITY DEVELOPMENT PROJECT (SPORTS COMPLEX AND PARKS)	YES	NO
Redevelopment that creates or adds at least 5,000 net square feet of additional impervious surface area	X	
Residential development of more than 10 units		X
Commercial developments with a land area for development of greater than 1 acre	X	
Heavy industrial development with a land area for development of greater than 1 acre		X
Automotive repair shop(s)		X
Restaurants, where the land area for development is greater than 5,000 square feet		X
Hillside development, in an area with known erosive soil conditions, where there will be grading on any natural slope that is twenty-five percent or greater, if the development creates 5,000 square feet or more of impervious surface		X
Environmentally Sensitive Areas (ESA): All development located within or directly adjacent to or discharging directly to an ESA (where discharges from the development or redevelopment will enter receiving waters within the ESA), which either creates 2,500 square feet of impervious surface on a proposed project site or increases the area of imperviousness of a proposed project site to 10% or more of its naturally occurring condition. "Directly adjacent" means situated within 200 feet of the ESA. "Discharging directly to" means outflow from a drainage conveyance system that is composed entirely of flows from the subject development or redevelopment site, and not commingled with flows from adjacent lands.	X	
Parking Lots 5,000 square feet or more or with 15 parking spaces or more and potentially exposed to urban runoff	X	
Streets, roads, highways, and freeways which would create a new paved surface that is 5,000 square feet or greater	X	
Retail Gasoline Outlets (RGO) that meet the following criteria: (a) 5,000 square feet or more or (b) a projected Average Daily Traffic (ADT) of 100 or more vehicles per day.		X

Limited Exclusion: Trenching and resurfacing work associated with utility projects are not considered Priority Development Projects. Parking lots, buildings and other structures associated with utility projects are subject to the WPO requirements if one or more of the criteria above are met.

If you answered **NO** to all the questions, then **STOP**. Please complete a Minor SWMP for your project. If you answered **YES** to any of the questions, please continue.

Table 1 (continued)

PRIORITY DEVELOPMENT PROJECT (TOWN CENTER)	YES	NO
Redevelopment that creates or adds at least 5,000 net square feet of additional impervious surface area	X	
Residential development of more than 10 units		X
Commercial developments with a land area for development of greater than 1 acre	X	
Heavy industrial development with a land area for development of greater than 1 acre		X
Automotive repair shop(s)		X
Restaurants, where the land area for development is greater than 5,000 square feet	X	
Hillside development, in an area with known erosive soil conditions, where there will be grading on any natural slope that is twenty-five percent or greater, if the development creates 5,000 square feet or more of impervious surface		X
Environmentally Sensitive Areas (ESA): All development located within or directly adjacent to or discharging directly to an ESA (where discharges from the development or redevelopment will enter receiving waters within the ESA), which either creates 2,500 square feet of impervious surface on a proposed project site or increases the area of imperviousness of a proposed project site to 10% or more of its naturally occurring condition. "Directly adjacent" means situated within 200 feet of the ESA. "Discharging directly to" means outflow from a drainage conveyance system that is composed entirely of flows from the subject development or redevelopment site, and not commingled with flows from adjacent lands.	X	
Parking Lots 5,000 square feet or more or with 15 parking spaces or more and potentially exposed to urban runoff	X	
Streets, roads, highways, and freeways which would create a new paved surface that is 5,000 square feet or greater	X	
Retail Gasoline Outlets (RGO) that meet the following criteria: (a) 5,000 square feet or more or (b) a projected Average Daily Traffic (ADT) of 100 or more vehicles per day.		X

Limited Exclusion: Trenching and resurfacing work associated with utility projects are not considered Priority Development Projects. Parking lots, buildings and other structures associated with utility projects are subject to the WPO requirements if one or more of the criteria above are met.

If you answered **NO** to all the questions, then **STOP**. Please complete a Minor SWMP for your project. If you answered **YES** to any of the questions, please continue.

Table 1 (continued)

PRIORITY DEVELOPMENT PROJECT (PUMP STATION AND STAGING AREA)	YES	NO
Redevelopment that creates or adds at least 5,000 net square feet of additional impervious surface area	X	
Residential development of more than 10 units		X
Commercial developments with a land area for development of greater than 1 acre	X	
Heavy industrial development with a land area for development of greater than 1 acre		X
Automotive repair shop(s)		X
Restaurants, where the land area for development is greater than 5,000 square feet		X
Hillside development, in an area with known erosive soil conditions, where there will be grading on any natural slope that is twenty-five percent or greater, if the development creates 5,000 square feet or more of impervious surface		X
Environmentally Sensitive Areas (ESA): All development located within or directly adjacent to or discharging directly to an ESA (where discharges from the development or redevelopment will enter receiving waters within the ESA), which either creates 2,500 square feet of impervious surface on a proposed project site or increases the area of imperviousness of a proposed project site to 10% or more of its naturally occurring condition. "Directly adjacent" means situated within 200 feet of the ESA. "Discharging directly to" means outflow from a drainage conveyance system that is composed entirely of flows from the subject development or redevelopment site, and not commingled with flows from adjacent lands.	X	
Parking Lots 5,000 square feet or more or with 15 parking spaces or more and potentially exposed to urban runoff	X	
Streets, roads, highways, and freeways which would create a new paved surface that is 5,000 square feet or greater		X
Retail Gasoline Outlets (RGO) that meet the following criteria: (a) 5,000 square feet or more or (b) a projected Average Daily Traffic (ADT) of 100 or more vehicles per day.		X

Limited Exclusion: Trenching and resurfacing work associated with utility projects are not considered Priority Development Projects. Parking lots, buildings and other structures associated with utility projects are subject to the WPO requirements if one or more of the criteria above are met.

If you answered **NO** to all the questions, then **STOP**. Please complete a Minor SWMP for your project. If you answered **YES** to any of the questions, please continue.

HYDROMODIFICATION DETERMINATION

The following questions provide a guide to collecting information relevant to hydromodification management issues.

Table 2: This table applies to each site plan individually.

	QUESTIONS	YES	NO	Information
1.	Will the proposed project disturb 50 or more acres of land? (Including all phases of development)		X	If YES, continue to 2. If NO, go to 6.
2.	Would the project site discharge directly into channels that are concrete-lined or significantly hardened such as with rip-rap, sackcrete, etc, downstream to their outfall into bays or the ocean?		X	If NO, continue to 3. If YES, go to 6.
3.	Would the project site discharge directly into underground storm drains discharging directly to bays or the ocean?		X	If NO, continue to 4. If YES, go to 6.
4.	Would the project site discharge directly to a channel (lined or un-lined) and the combined impervious surfaces downstream from the project site to discharge at the ocean or bay are 70% or greater?		X	If NO, continue to 5. If YES, go to 6.
5.	Project is required to manage hydromodification impacts.		X	Hydromodification Management Required as described in Section 67.812 b(4) of the WPO.
6.	Project is not required to manage hydromodification impacts.	X		Hydromodification Exempt. Keep on file.

An exemption is potentially available for projects that are required (No. 5. in Table 2 above) to manage hydromodification impacts: The project proponent may conduct an independent geomorphic study to determine the project's full hydromodification impact. The study must incorporate sediment transport modeling across the range of geomorphically-significant flows and demonstrate to the County's satisfaction that the project flows and sediment reductions will not detrimentally affect the receiving water to qualify for the exemption.

STORMWATER QUALITY DETERMINATION

The following questions provide a guide to collecting information relevant to project stormwater quality issues. Please provide the following information in a printed report accompanying this form.

Table 3

	QUESTIONS	COMPLETED	NA
1.	Describe the topography of the project area.	**MF-1**is located on the southwesterly corner of the intersection of Pala Mesa Drive and Horse Ranch Creek Road. The site is located on a super pad at a 1% north to south sloping terrain. **MF-2** is located on the southeasterly corner of the intersection of Harvest Glen Lane and Horse Ranch Creek Road. The site is located on a super pad at a 1% gentle northeast to southwest sloping terrain. **MF-3** is located between Longspur Road and Harvest Glen Lane, easterly of the proposed Town Center sites. The site is located on a super pad at a 1% gentle northeast to southwest sloping pad. **MF-4** is located is at the northeasterly intersection of Pala Mesa Drive and Pala Road. The site is located on a super pad at a 1% northwest sloping terrain. **Professional Office** is located on the southeasterly corner of Baltimore Oriole Road and Horse Ranch Creek Road. The northerly site is on a gentle north to south sloping terrain. The southerly site is on a gentle northeast to southwest sloping terrain. **Sports Complex** is located on the northeasterly corner of Longspur Road and Horse Ranch Creek Road. The site is located on a gentle northeast to southwest sloping terrain. **The pool site (Lot 569)** is located on the southwesterly corner of Frigatebird Road and Jaeger Street. The site is located on a gentle north to south sloping terrain. **The park sites on Lot 568 (P-1), Lot 572 (P-2), Lot 570 (P-5), Lot 571 (P-6), Lot 575 (P-7) and Lot 573 (P-8)** are located on Birdwatcher Court in the R-4 neighborhood, and on the easterly end of Caracara Court in the R-1 neighborhood, respectively. Both sites are on gently sloping terrain. **Town Center** is located on the easterly side of Horse Ranch Creek Road, between Longspur Road and Harvest Glen Lane. It consists of 7 commercial and retail buildings and parking lots on a gentle northeast to southwesterly sloping terrain. **Staging Area/Pump Station** are located at the northeasterly intersection of Pala Mesa Drive and Pala Road. The site is on a gentle westerly sloping terrain.	
2.	Describe the local land use within the project area and adjacent areas.	**MF-1:** N-College site S-Open space E-Prop. Meadowood TM 5354 W-Open Space **MF-2:** N-MF-1 & Town Center S-College Site E-Prop. Meadowood TM 5354 W- College Site	

		MF-3: N-Single Family Residences S- Prop. Meadowood TM 5354 E- Single Family Residences W- Town Center **MF-4:** N- Open space S-Pala Road Highway 76 E-Prop. Meadowood TM 5354 W-Pala Mesa Drive **PO:** N-HOA Lot 535 and Open Space S-Sports Complex E- Single Family Residences W- College site **Sports complex:** N-Professional Office S-Town Center E- Single Family Residences W-College Site **Pool Site (Lot 569):** N- Single Family Residences S- Professional Office E- Single Family Residences W- Open Space **The park sites on Lot 568 (P-1), Lot 572 (P-2), Lot 570 (P-5), Lot 571 (P-6), Lot 575 (P-7) and Lot 573 (P-8):** N- Single Family Residences S- Single Family Residences E- Single Family Residences W- Single Family Residences **Town Center:** N-Sports Complex S-Multi-family residential E- Multi-family residential W-College Site **Staging Area/Pump Station:** N- Open Space S- Pala Road Highway 76 E- Multi-family residential W- Open Space	
3.	Evaluate the presence of dry weather flow.	No dry weather flow is evident.	
4.	Determine the receiving waters that may be affected by the project throughout the project life cycle (i.e., construction, maintenance and operation).	Horse Ranch Creek and San Luis Rey River and Pacific Ocean	
5.	For the project limits, list the 303(d) impaired receiving water bodies and their constituents of concern.	Pacific Ocean shoreline by **Bacteria Indicators** San Luis Rey River by **Chloride and TDS.**	
6.	Determine if there are any High Risk Areas (municipal or domestic water supply reservoirs or groundwater	Not Applicable	X

	percolation facilities) within the project limits.		
7.	Determine the Regional Board special requirements, including TMDLs, effluent limits, etc.	Not Applicable	X
8.	Determine the general climate of the project area. Identify annual rainfall and rainfall intensity curves.	The project area is located in climate Zone 10. The annual rainfall is 24".	
9.	If considering Treatment BMPs, determine the soil classification, permeability, erodibility, and depth to groundwater.	Type 'D' soil, low permeability when soil is thoroughly wetted. Moderate to low erodibility. No groundwater was encountered.	
10.	Determine contaminated or hazardous soils within the project area.	There are no evidence of contaminated or hazardous soils within the project area.	
11.	Determine if this project is within environmentally sensitive areas as defined on the maps in Appendix A of the *County of San Diego Standard Urban Storm Water Mitigation Plan for Land Development and Public Improvement Projects.*	Not Applicable	X
12.	Determine if this is an emergence project.	Not Applicable	X

WATERSHED

Please check the watershed(s) for the project.

San Juan 901	Santa Margarita 902	**San Luis Rey 903**	Carlsbad 904
San Dieguito 905	Penasquitos 906	San Diego 907	Sweetwater 909
Otay 910	Tijuana 911	Whitewater 719	Clark 720
West Salton 721	Anza Borrego 722	Imperial 723	

Please provide the hydrologic sub-area and number(s)

Number	Name
903.12	Bonsall

Please provide the beneficial uses for Inland Surface Waters and Ground Waters. Beneficial Uses can be obtained from the Water Quality Control Plan for the San Diego Basin, which is available at the Regional Board office or at http://www.waterboards.ca.gov/sandiego/water_issues/programs/basin_plan/index.shtml

SURFACE WATERS	Hydrologic Unit Basin Number	MUN	AGR	IND	PROC	GWR	FRESH	POW	REC1	REC2	BIOL	WARM	COLD	WILD	RARE	SPWN
Inland Surface Waters	903.12	X	X	X			X	X	X	X		X	X	X	X	
Ground Waters																

*** Excepted from Municipal**

X = Existing Beneficial Use
0 = Potential Beneficial Use

POLLUTANTS OF CONCERN

Using Table 4, identify pollutants that are anticipated to be generated from the proposed priority project categories. Pollutants associated with any hazardous material sites that have been remediated or are not threatened by the proposed project are not considered a pollutant of concern.

Table 4. Anticipated and Potential Pollutants Generated by Land Use Type

	General Pollutant Categories								
PDP Categories	Sediments	Nutrients	Heavy Metals	Organic Compounds	Trash & Debris	Oxygen Demanding Substances	Oil & Grease	Bacteria & Viruses	Pesticides
Detached Residential Development	**X**	**X**			**X**	**X**	**X**	**X**	**X**
Attached Residential Development	**X**	**X**			**X**	**P(1)**	**P(2)**	**P**	**X**
Commercial Development 1 acre or greater	**P(1)**	**P(1)**		**P(2)**	**X**	**P(5)**	**X**	**P(3)**	**P(5)**
Heavy industry /industrial development	X		X	X	X	X	X		
Automotive Repair Shops			X	X(4)(5)	X		X		
Restaurants					**X**	**X**	**X**	**X**	
Hillside Development >5,000 ft2	X	X			X	X	X		X
Parking Lots	**P(1)**	**P(1)**	**X**		**X**	**P(1)**	**X**		**P(1)**
Retail Gasoline Outlets			X	X	X	X	X		
Streets, Highways & Freeways	**X**	**P(1)**	**X**	**X(4)**	**X**	**P(5)**	**X**		

X = anticipated
P = potential

(1) A potential pollutant if landscaping exists on-site.
(2) A potential pollutant if the project includes uncovered parking areas.
(3) A potential pollutant if land use involves food or animal waste products.
(4) Including petroleum hydrocarbons.
(5) Including solvents.

Note: If other monitoring data that is relevant to the project is available, please include as Attachment C.

CONSTRUCTION BMPs

Please check the construction BMPs that may be implemented during construction of the project. The applicant will be responsible for the placement and maintenance of the BMPs incorporated into the final project design.

X	Silt Fence	X	Desilting Basin
X	Fiber Rolls	X	Gravel Bag Berm
X	Street Sweeping and Vacuuming	X	Sandbag Barrier
X	Storm Drain Inlet Protection	X	Material Delivery and Storage
X	Stockpile Management	X	Spill Prevention and Control
X	Solid Waste Management	X	Concrete Waste Management
X	Stabilized Construction Entrance/Exit	X	Water Conservation Practices
X	Dewatering Operations	X	Paving and Grinding Operations
X	Vehicle and Equipment Maintenance	X	Any minor slopes created incidental to construction and not subject to a major or minor grading permit shall be protected by covering with plastic or tarp prior to a rain event, and shall have vegetative cover reestablished within 180 days of completion of the slope and prior to final building approval.

EXCEPTIONAL THREAT TO WATER QUALITY DETERMINATION

Complete the checklist below to determine if a proposed project will pose an "exceptional threat to water quality," and therefore require Advanced Treatment Best Management Practices.

Table 5

No.	CRITERIA	YES	NO	INFORMATION
1.	Is all or part of the proposed project site within 200 feet of waters named on the Clean Water Act (CWA) Section 303(d) list of Water Quality Limited Segments as impaired for sedimentation and/or turbidity? Current 303d list may be obtained from the following site: http://www.swrcb.ca.gov/tmdl/docs/303dlists2006/approved/r9_06_303d_reqt mdls.pdf		X	If YES, continue to 2. If NO, go to 5.
2.	Will the project disturb more than 5 acres, including all phases of the development?	X		If YES, continue to 3. If NO, go to 5.
3.	Will the project disturb slopes that are steeper than 4:1 (horizontal: vertical) with at least 10 feet of relief, and that drain toward the 303(d) listed receiving water for sedimentation and/or turbidity?	X		If YES, continue to 4. If NO, go to 5.
4.	Will the project disturb soils with a predominance of USDA-NRCS Erosion factors k_f greater than or equal to 0.4?		X	If YES, continue to 6. If NO, go to 5.
5.	Project is not required to use Advanced Treatment BMPs.	X		Document for Project Files by referencing this checklist.
6.	Project poses an "exceptional threat to water quality" and is required to use Advanced Treatment BMPs.		X	Advanced Treatment BMPs must be consistent with WPO section 67.811(b)(20)(D) performance criteria

Exemption potentially available for projects that require advanced treatment:
Project proponent may perform a Revised Universal Soil Loss Equation, Version 2 (RUSLE 2), Modified Universal Soil Loss Equation (MUSLE), or similar analysis that shows to the County official's satisfaction that advanced treatment is not required

Now that the need for treatment BMPs has been determined, other information is needed to complete the SWMP.

SITE DESIGN

To minimize stormwater impacts, site design measures must be addressed. The following checklist provides options for avoiding or reducing potential impacts during project planning. If YES is checked, it is assumed that the measure was used for this project.

Table 6: This table applies to each site plan individually.

	OPTIONS		YES	NO	N/A
1.	Has the project been located and road improvements aligned to avoid or minimize impacts to receiving waters or to increase the preservation of critical (or problematic) areas such as floodplains, steep slopes, wetlands, and areas with erosive or unstable soil conditions?		X		
2.	Is the project designed to minimize impervious footprint?		X		
3.	Is the project conserving natural areas where feasible?		X		
4.	Where landscape is proposed, are rooftops, impervious sidewalks, walkways, trails and patios be drained into adjacent landscaping?		X		
5.	For roadway projects, are structures and bridges be designed or located to reduce work in live streams and minimize construction impacts?		X		
6.	Can any of the following methods be utilized to minimize erosion from slopes:				
	6.a.	Disturbing existing slopes only when necessary?	X		
	6.b.	Minimize cut and fill areas to reduce slope lengths?	X		
	6.c.	Incorporating retaining walls to reduce steepness of slopes or to shorten slopes?	X		
	6.d.	Providing benches or terraces on high cut and fill slopes to reduce concentration of flows?			X
	6.e.	Rounding and shaping slopes to reduce concentrated flow?	X		
	6.f.	Collecting concentrated flows in stabilized drains and channels?	X		

LOW IMPACT DEVELOPMENT (LID)

Each numbered item below is a LID requirement of the WPO. Please check the box(s) under each number that best describes the Low Impact Development BMP(s) selected for this project.

Table 7

1.	Conserve natural Areas, Soils, and Vegetation-County LID Handbook 2.2.1
X	Preserve well draining soils (Type A or B)
X	Preserve Significant Trees
	Other. Description:
	1. Not feasible. State Reason:
2.	Minimize Disturbance to Natural Drainages-County LID Handbook 2.2.2
X	Set-back development envelope from drainages
	Restrict heavy construction equipment access to planned green/open space areas
	Other. Description:
	2. Not feasible. State Reason:
3.	Minimize and Disconnect Impervious Surfaces (see 5) -County LID Handbook 2.2.3
X	Clustered Lot Design
	Items checked in 5?
	Other. Description:
	3. Not feasible. State Reason:
4.	Minimize Soil Compaction-County LID Handbook 2.2.4
X	Restrict heavy construction equipment access to planned green/open space areas
X	Re-till soils compacted by construction vehicles/equipment
X	Collect & re-use upper soil layers of development site containing organic materials
	Other. Description:
	4. Not feasible. State Reason:
5.	Drain Runoff from Impervious Surfaces to Pervious Areas-County LID Handbook 2.2.5
	LID Street & Road Design
	Curb-cuts to landscaping
	Rural Swales
	Concave Median
	Cul-de-sac Landscaping Design
	Other. Description:
	LID Parking Lot Design
	Permeable Pavements
X	Curb-cuts to landscaping
	Other. Description:
	LID Driveway, Sidewalk, Bike-path Design

	Permeable Pavements
X	Pitch pavements toward landscaping
	Other. Description:
	LID Building Design
	Cisterns & Rain Barrels
X	Downspout to swale
	Vegetated Roofs
	Other. Description:
	LID Landscaping Design
X	Soil Amendments
X	Reuse of Native Soils
X	Smart Irrigation Systems
X	Street Trees
	Other. Description:
	5. Not feasible. State Reason:

CHANNELS & DRAINAGES

Complete the following checklist to determine if the project includes work in channels.

Table 8

No.	CRITERIA	YES	NO	N/A	COMMENTS
1.	Will the project include work in channels?		X		If YES go to 2 If NO go to 13.
2.	Will the project increase velocity or volume of downstream flow?		X		If YES go to 6.
3.	Will the project discharge to unlined channels?	X			If YES go to. 6.
4.	Will the project increase potential sediment load of downstream flow?		X		If YES go to 6.
5.	Will the project encroach, cross, realign, or cause other hydraulic changes to a stream that may affect downstream channel stability?		X		If YES go to 8.
6.	Review channel lining materials and design for stream bank erosion.	X			Continue to 7.
7.	Consider channel erosion control measures within the project limits as well as downstream. Consider scour velocity.	X			Continue to 8.
8.	Include, where appropriate, energy dissipation devices at culverts.	X			Continue to 9.
9.	Ensure all transitions between culvert outlets/headwalls/wingwalls and channels are smooth to reduce turbulence and scour.	X			Continue to 10.
10.	Include, if appropriate, detention facilities to reduce peak discharges.	X			Continue to 11.
11.	"Hardening" natural downstream areas to prevent erosion is not an acceptable technique for protecting channel slopes, unless pre-development conditions are determined to be so erosive that hardening would be required even in the absence of the proposed development.		X		Continue to 12.
12.	Provide other design principles that are comparable and equally effective.	X			Continue to 13.
13.	End				

SOURCE CONTROL

Please complete the following checklist for Source Control BMPs. If the BMP is not applicable for this project, then check N/A only at the main category.

Table 9

	BMP		YES	NO	N/A
1.	**Provide Storm Drain System Stenciling and Signage**				
	1.a.	All storm drain inlets and catch basins within the project area shall have a stencil or tile placed with prohibitive language (such as: "NO DUMPING – DRAINS TO San Luis Rey River") and/or graphical icons to discourage illegal dumping.	X		
	1.b.	Signs and prohibitive language and/or graphical icons, which prohibit illegal dumping, must be posted at public access points along channels and creeks within the project area.	X		
2.	**Design Outdoors Material Storage Areas to Reduce Pollution Introduction**				
	2.a.	This is a detached single-family residential project. Therefore, personal storage areas are exempt from this requirement.			X
	2.b.	Hazardous materials with the potential to contaminate urban runoff shall either be: (1) placed in an enclosure such as, but not limited to, a cabinet, shed, or similar structure that prevents contact with runoff or spillage to the storm water conveyance system; or (2) protected by secondary containment structures such as berms, dikes, or curbs.	All hazardous material will be stored indoors or in enclosed storage.		
	2.c.	The storage area shall be paved and sufficiently impervious to contain leaks and spills.	X		
	2.d.	The storage area shall have a roof or awning to minimize direct precipitation within the secondary containment area.	X		
3.	**Design Trash Storage Areas to Reduce Pollution Introduction**				
	3.a.	Paved with an impervious surface, designed not to allow run-on from adjoining areas, screened or walled to prevent off-site transport of trash; or,	X		
	3.b.	Provide attached lids on all trash containers that exclude rain, or roof or awning to minimize direct precipitation.	X		
4.	**Use Efficient Irrigation Systems & Landscape Design**				
	The following methods to reduce excessive irrigation runoff shall be considered, and incorporated and implemented where determined applicable and feasible.				
	4.a.	Employing rain shutoff devices to prevent irrigation after precipitation.	X		
	4.b.	Designing irrigation systems to each landscape area's specific water requirements.	X		
	4.c.	Using flow reducers or shutoff valves triggered by a pressure drop to control water loss in the event of broken sprinkler heads or lines.	X		
	4.d.	Employing other comparable, equally effective, methods to reduce irrigation water runoff.	X		
5.	**Private Roads**				
	The design of private roadway drainage shall use at least one of the following				
	5.a.	Rural swale system: street sheet flows to vegetated swale or gravel shoulder, curbs at street corners, culverts under driveways and street crossings.			X

	5.b.	Urban curb/swale system: street slopes to curb, periodic swale inlets drain to vegetated swale/biofilter.			X
	5.c.	Dual drainage system: First flush captured in street catch basins and discharged to adjacent vegetated swale or gravel shoulder, high flows connect directly to storm water conveyance system.	X		
	5.d.	Other methods that are comparable and equally effective within the project.	X		
6.	**Residential Driveways & Guest Parking**				
	The design of driveways and private residential parking areas shall use one at least of the following features.				
	6.a.	Design driveways with shared access, flared (single lane at street) or wheelstrips (paving only under tires); or, drain into landscaping prior to discharging to the storm water conveyance system.			X
	6.b.	Uncovered temporary or guest parking on private residential lots may be: paved with a permeable surface; or, designed to drain into landscaping prior to discharging to the storm water conveyance system.	X		
	6.c.	Other features which are comparable and equally effective.	X		
7.	**Dock Areas**				
	Loading/unloading dock areas shall include the following.				
	7.a.	Cover loading dock areas, or design drainage to preclude urban run-on and runoff.	X		
	7.b.	Direct connections to storm drains from depressed loading docks (truck wells) are prohibited.	X		
	7.c.	Other features which are comparable and equally effective.	X		
8.	**Maintenance Bays**				
	Maintenance bays shall include the following.				
	8.a.	Repair/maintenance bays shall be indoors; or, designed to preclude urban run-on and runoff.	X		
	8.b.	Design a repair/maintenance bay drainage system to capture all wash water, leaks and spills. Connect drains to a sump for collection and disposal. Direct connection of the repair/maintenance bays to the storm drain system is prohibited. If required by local jurisdiction, obtain an Industrial Waste Discharge Permit.	X		
	8.c.	Other features which are comparable and equally effective.	X		
9.	**Vehicle Wash Areas**				
	Priority projects that include areas for washing/steam cleaning of vehicles shall use the following.				
	9.a.	Self-contained; or covered with a roof or overhang.	X		
	9.b.	Equipped with a clarifier or other pretreatment facility.	X		
	9.c.	Properly connected to a sanitary sewer.	X		
	9.d.	Other features which are comparable and equally effective.	X		
10.	**Outdoor Processing Areas**				
	Outdoor process equipment operations, such as rock grinding or crushing, painting or coating, grinding or sanding, degreasing or parts cleaning, waste piles, and wastewater and solid waste treatment and disposal, and other operations determined to be a potential threat to water quality by the County shall adhere to the following requirements.				

	10.a.	Cover or enclose areas that would be the most significant source of pollutants; or, slope the area toward a dead-end sump; or, discharge to the sanitary sewer system following appropriate treatment in accordance with conditions established by the applicable sewer agency.	X		
	10.b.	Grade or berm area to prevent run-on from surrounding areas.	X		
	10.c.	Installation of storm drains in areas of equipment repair is prohibited.	X		
	10.d.	Other features which are comparable or equally effective.	X		
11.	**Equipment Wash Areas**				
	Outdoor equipment/accessory washing and steam cleaning activities shall be.				
	11.a.	Be self-contained; or covered with a roof or overhang.	X		
	11.b.	Be equipped with a clarifier, grease trap or other pretreatment facility, as appropriate	X		
	11.c.	Be properly connected to a sanitary sewer.	X		
	11.d.	Other features which are comparable or equally effective.	X		
12.	**Parking Areas**				
	The following design concepts shall be considered, and incorporated and implemented where determined applicable and feasible by the County.				
	12.a.	Where landscaping is proposed in parking areas, incorporate landscape areas into the drainage design.	X		
	12.b.	Overflow parking (parking stalls provided in excess of the County's minimum parking requirements) may be constructed with permeable paving.	X		
	12.c.	Other design concepts that are comparable and equally effective.	X		
13.	**Fueling Area**				
	Non-retail fuel dispensing areas shall contain the following.				
	13.a.	Overhanging roof structure or canopy. The cover's minimum dimensions must be equal to or greater than the area within the grade break. The cover must not drain onto the fuel dispensing area and the downspouts must be routed to prevent drainage across the fueling area. The fueling area shall drain to the project's treatment control BMP(s) prior to discharging to the storm water conveyance system.	X		
	13.b.	Paved with Portland cement concrete (or equivalent smooth impervious surface). The use of asphalt concrete shall be prohibited.	X		
	13.c.	Have an appropriate slope to prevent ponding, and must be separated from the rest of the site by a grade break that prevents run-on of urban runoff.	X		
	13.d.	At a minimum, the concrete fuel dispensing area must extend 6.5 feet (2.0 meters) from the corner of each fuel dispenser, or the length at which the hose and nozzle assembly may be operated plus 1 foot (0.3 meter), whichever is less.	X		

Please list other project specific Source Control BMPs in the following box. Write **N/A** if there are none and briefly explain.

N/A

TREATMENT CONTROL

To select a structural treatment BMP using Treatment Control BMP Selection Matrix (Table 10), each priority project shall compare the list of pollutants for which the downstream receiving waters are impaired (if any), with the pollutants anticipated to be generated by the project (as identified in Table 4). Any pollutants identified by Table 4, which are also causing a Clean Water Act section 303(d) impairment of the receiving waters of the project, shall be considered primary pollutants of concern. Priority projects that are anticipated to generate a primary pollutant of concern shall select a single or combination of stormwater BMPs from Table 10, which **maximizes pollutant removal** for the particular primary pollutant(s) of concern.

Priority development projects that are **not** anticipated to generate a pollutant for which the receiving water is CWA 303(d) impaired shall select a single or combination of stormwater BMPs from Table 10, which are effective for pollutant removal of the identified secondary pollutants of concern, consistent with the "maximum extent practicable" standard.

Table 10. Treatment Control BMP Selection Matrix

Pollutants of Concern	**Bioretention Facilities (LID)***	**Settling Basins (Dry Ponds)**	Wet Ponds and Wetlands	**Infiltration Facilities or Practices (LID)***	**Media Filters**	High-rate biofilters	High-rate media filters	**Trash Racks & Hydro - dynamic Devices**
Coarse Sediment and Trash	**High**	**High**	High	**High**	**High**	High	High	**High**
Pollutants that tend to associate with fine particles during treatment	**High**	**High**	High	**High**	**High**	Medium	Medium	**Low**
Pollutants that tend to be dissolved following treatment	**Medium**	**Low**	Medium	**High**	**Low**	Low	Low	**Low**

*Additional information is available in the County of San Diego LID Handbook.

NOTES ON POLLUTANTS OF CONCERN:

In Table 11, Pollutants of Concern are grouped as gross pollutants, pollutants that tend to associate with fine particles, and pollutants that remain dissolved.

Table 11

Pollutant	Coarse Sediment and Trash	Pollutants that tend to associate with fine particles during treatment	Pollutants that tend to be dissolved following treatment
Sediment	X	X	
Nutrients		X	X
Heavy Metals		X	
Organic Compounds		X	
Trash & Debris	X		
Oxygen Demanding		X	
Bacteria		X	
Oil & Grease		X	
Pesticides		X	

A Treatment BMP must address runoff from developed areas. Please provide the post-construction water quality treatment volume or flow values for the selected project Treatment BMP(s). Guidelines for design calculations are located in Chapter 5, Section 4.3, Principle 8 of the County SUSMP. Label outfalls on the BMP map. The Water Quality peak rate of discharge flow (QWQ) and the Water Quality storage volume (VWQ) is dependent on the type of treatment BMP selected for the project.

Outfall	**Tributary Area (acres)**	**Q_{WQ} (cfs)**	**V_{WQ} (cf)**
MF-1 Southerly tip of site	10.8	1.5	N/A * no volume based permanent BMP proposed.
MF-2 Southerly tip of site	5.4	0.8	N/A * no volume based permanent BMP proposed.
MF-3 Northerly of site, adjacent to Longspur Rd. Southerly of site, adjacent to Harvest Glen Ln.	1.7 16.8	0.2 2.4	N/A * no volume based permanent BMP proposed.
MF-4 Westerly of easterly D/W entry along Pankey Place Middle area of site at about the midway point on Pankey Place Westerly of westerly D/W entry along Pankey Place	2.2 1.1 6.1	0.3 0.2 0.9	N/A * no volume based permanent BMP proposed.
Professional Office 1, PO1 At northwesterly side of site Along southerly property line At southwesterly corner of site	1.9 1.9 4.5	0.3 0.3 0.8	N/A * no volume based permanent BMP proposed.
Professional Office 2, PO2 At southwesterly corner of site	2.7	0.5	N/A * no volume based permanent BMP proposed.
Sports Complex (parking lot only) At southwesterly corner of site	0.7	0.1	N/A * no volume based permanent BMP proposed.
Pool site (Lot 569)(parking lot only) At southwesterly corner of site	0.35	0.1	N/A * no volume based permanent BMP proposed.
Pump Station & Staging Area At northerly tip of site	0.8	0.1	N/A * no volume based permanent BMP proposed.
Town Center Northerly of center D/W off Horse Ranch Creek Rd At northeasterly corner of intersection of Horse Ranch Creek Rd and Harvest Glen Ln	3.4 4.1	0.5 0.7	N/A * no volume based permanent BMP proposed.

Please check the box(s) that best describes the Treatment BMP(s) selected for this project.

	Biofilters
X	Bioretention swale
	Vegetated filter strip
	Stormwater Planter Box (open-bottomed)
	Stormwater Flow-Through Planter (sealed bottom)
	Bioretention Area
	Vegetated Roofs/Modules/Walls
	Detention Basins
X	Extended/dry detention basin with grass/vegetated lining
	Extended/dry detention basin with impervious lining
	Infiltration Basins
	Infiltration basin
X	Infiltration trench
	Dry well
	Permeable paving
	Gravel
	Permeable asphalt
	Pervious concrete
	Unit pavers, ungrouted, set on sand or gravel
	Subsurface reservoir bed
	Wet Ponds or Wetlands
	Wet pond/basin (permanent pool)
	Constructed wetland
	Filtration
	Media filtration
	Sand filtration
X	**Hydrodynamic Separator Systems**
	Swirl Concentrator
	Cyclone Separator
	Trash Racks and Screens

Include Treatment Datasheet as Attachment E. The datasheet should include the following:	**COMPLETED**	**NO**
1. Description of how treatment BMP was designed. Provide a description for each type of treatment BMP.	X	
2. Engineering calculations for the BMP(s)	X	

Please describe why the selected treatment BMP(s) was selected for this project. For projects utilizing a low performing BMP, please provide a detailed explanation:

In general, bio-filtration swales were chosen as the main treatment BMP in each of the site plan areas. They were chosen due to their effectiveness, ease in maintaining and inspecting. Bio-swales, at the most downstream ends of the underground storm drain pipes, will only function as a BMP device – see attached Post-Construction BMP Site Plan. Since the bio-swales are very long and flat, the runoff will settle and infiltrate into the ground, thus it will also function as a filtration trench.

An oil-water separator was chosen for the Town Center due to the high traffic volumes expected at this site and due to the difficulty of finding sufficient room to construct bio-swales.

Based on the land use of the tributary areas, the anticipated pollutants are: sediments, nutrients, heavy metals, organic compounds, trash & debris, oxygen demanding substances, oil & grease, bacteria & viruses and pesticides. The bio-swales/filtration trenches have combined adequacy efficiency to remove all the abovementioned pollutants.

Treatment BMP engineering calculations:

MF-1: (flow based BMP).
Qwq=1.5 cfs. The grass-lined swale located at the southerly tip of the site has a bottom width of 5.5' and a design depth of 6", with a 3:1 side slope the top width is 8.5 feet. The Qwq will require a 4" flow depth, and the flow velocity is 0.70 fps. The design length is 420 feet to provide a minimum10 minute resident time.

Project Description		
Worksheet	BIO SWALE MF1	
Flow Element	Trapezoidal Channel	
Method	Manning's Formula	
Solve For	Discharge	
Input Data		
Mannings Coefficient	0.045	
Channel Slope	0.24	%
Depth	4.0	in
Left Side Slope	3.00	H : V
Right Side Slope	3.00	H : V
Bottom Width	5.50	ft
Results		
Discharge	1.52	cfs
Flow Area	2.2	ft²
Wetted Perimeter	7.61	ft
Top Width	7.50	ft
Critical Depth	0.13	ft
Critical Slope	6.00	%
Velocity	0.70	ft/s
Velocity Head	0.01	ft
Specific Energy	4.1	in
Froude Number	0.23	
Flow Type	Subcritical	

MF-2: (flow based BMP).

Qwq=0.8 cfs. ~~Vwq = 9,148 cf.~~ The grass-lined swale located at the southerly tip of the site has a bottom width of 4.5 feet, a design depth of 6" with a 3:1 side slope the top width is 6.5 feet. The Qwq will require a 4" flow depth, and the flow velocity is 0.44 fps. The design length is 264 feet to provide a minimum10 minute resident time.

~~The proposed detention basin has a bottom area of 706sf and a top area of 3,421sf, the side slope is at 3:1 and the design depth is 6', the total volume of the basin is 12,380 cf, greater than the anticipated first flush runoff volume (of 11,130 cf).~~

Project Description	
Worksheet	BIO SWALE MF2
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.045	
Channel Slope	0.10	%
Left Side Slope	3.00	H : V
Right Side Slope	3.00	H : V
Bottom Width	4.50	ft
Discharge	0.80	cfs

Results		
Depth	4.0	in
Flow Area	1.8	ft^2
Wetted Perimeter	6.59	ft
Top Width	6.48	ft
Critical Depth	0.10	ft
Critical Slope	6.59	%
Velocity	0.44	ft/s
Velocity Head	0.00	ft
Specific Energy	4.0	in
Froude Number	0.15	
Flow Type	Subcritical	

MF-3: (all flow based BMPs):

NE'ly system: Qwq = 0.2 cfs, the grass-lined swale has a bottom width of 1' and a design depth of 6", with a 3:1 side slope the top width is 4.0 feet and 0.1% longitudinal slope. The Qwq will require a 4" flow depth, and the flow velocity is 0.37 fps. The design length is 222 feet which provides a minimum of 10-minute resident time.

Project Description	
Worksheet	BIO SWALE MF3 NE
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Mannings Coefficient	0.045	
Channel Slope	0.10	%
Depth	**4.0**	**in**
Left Side Slope	3.00	H : V
Right Side Slope	3.00	H : V
Bottom Width	1.00	ft

Results		
Discharge	**0.25**	**cfs**
Flow Area	0.7	ft²
Wetted Perimeter	3.11	ft
Top Width	3.00	ft
Critical Depth	0.11	ft
Critical Slope	6.80	%
Velocity	**0.37**	**ft/s**
Velocity Head	0.00	ft
Specific Energy	4.0	in
Froude Number	0.14	
Flow Type	Subcritical	

S'ly system: Qwq = 2.4 cfs, the grass-lined swale has a bottom width of 13' and a design depth of 6", with a 3:1 side slope the top width is 4.0 feet and 0.12% longitudinal slope. The Qwq will require a 4" flow depth, and the flow velocity is 0.52 fps. The design length is 312 feet which provides a minimum of 10-minute resident time.

Project Description	
Worksheet	BIO SWALE MF3 S
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Mannings Coefficient	0.045	
Channel Slope	**0.12**	**%**
Depth	**4.0**	**in**
Left Side Slope	3.00	H : V
Right Side Slope	3.00	H : V
Bottom Width	13.00	ft

Results		
Discharge	**2.44**	**cfs**
Flow Area	4.7	ft²
Wetted Perimeter	15.11	ft
Top Width	15.00	ft
Critical Depth	0.10	ft
Critical Slope	6.39	%
Velocity	**0.52**	**ft/s**
Velocity Head	0.00	ft
Specific Energy	4.1	in
Froude Number	0.17	
Flow Type	Subcritical	

MF-4: (all flow based BMPs).

NW'ly corner: Qwq = 0.3 cfs. The grass-lined bio-swale has a bottom width of 9' and a design depth of 6", with a 3:1 side slope and 0.1% longitudinal slope, the flow has a velocity of 0.25 fps, the design length of the bio-swale is 150 feet that will provide a minimum of 10-minutes resident time.

Project Description	
Worksheet	BIO SWALE MF4NW
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Mannings Coefficient	0.045	
Channel Slope	**0.10**	**%**
Depth	1.5	in
Left Side Slope	3.00	H : V
Right Side Slope	3.00	H : V
Bottom Width	9.00	ft

Results

Results		
Discharge	**0.30**	**cfs**
Flow Area	1.2	ft²
Wetted Perimeter	9.79	ft
Top Width	9.75	ft
Critical Depth	0.03	ft
Critical Slope	9.34	%
Velocity	**0.25**	**ft/s**
Velocity Head	0.00	ft
Specific Energy	1.5	in
Froude Number	0.13	
Flow Type	Subcritical	

Middle Section of the site: Qwq=0.2 cfs. And a combined flow of 0.5 cfs. The grass-lined bio-swale has a bottom width of 9' and a design depth of 6", with a 3:1 side slope and 0.1% longitudinal slope, the flow has a velocity of 0.31 fps, the design length of the bio-swale is 186 feet that will provide a minimum of 10-minutes resident time.

Project Description	
Worksheet	BIO SWALE MF4MID
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Mannings Coefficient	0.045	
Channel Slope	0.10	%
Depth	2.1	in
Left Side Slope	3.00	H : V
Right Side Slope	3.00	H : V
Bottom Width	**9.00**	**ft**

Results		
Discharge	**0.52**	**cfs**
Flow Area	1.7	ft²
Wetted Perimeter	10.11	ft
Top Width	10.05	ft
Critical Depth	0.05	ft
Critical Slope	8.25	%
Velocity	**0.31**	**ft/s**
Velocity Head	0.00	ft
Specific Energy	2.1	in
Froude Number	0.14	
Flow Type	Subcritical	

The south and west portions of site: Qwq=0.9 cfs. The grass-lined bio-swale has a bottom width of 3.5' and a design depth of 6", with a 3:1 side slope and 0.20% longitudinal slope, the flow has a velocity of 0.61 fps, the design length of the bio-swale is 366 feet that will provide a minimum of 10-minutes resident time.

Project Description		
Worksheet	BIO SWALE MF4 S	
Flow Element	Trapezoidal Channel	
Method	Manning's Formula	
Solve For	Discharge	
Input Data		
Mannings Coefficient	0.045	
Channel Slope	**0.20**	**%**
Depth	4.0	in
Left Side Slope	3.00	H : V
Right Side Slope	3.00	H : V
Bottom Width	3.50	ft
Results		
Discharge	**0.92**	**cfs**
Flow Area	1.5	ft²
Wetted Perimeter	5.61	ft
Top Width	5.50	ft
Critical Depth	0.12	ft
Critical Slope	6.17	%
Velocity	**0.61**	**ft/s**
Velocity Head	0.01	ft
Specific Energy	4.1	in
Froude Number	0.21	
Flow Type	Subcritical	

Professional Office 1: (flow based BMP).

Qwq=0.5 cfs. The grass-lined swale located along the north, west and south sides of the site has a bottom width of 3 feet, a design depth of 6" with a side slope of 3:1. The velocity of the water quality flow is 0.43 fps, the proposed 258 feet long bio swale will offer a minimum of 10 minutes of resident time. In addition to the bio-swale, a sediment trap is also proposed at the southerly corner of the site that also offers approximately 940 cubic feet of storage space and acts as an additional BMP treatment on this site.

Project Description	
Worksheet	BIO SWALE OP1
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Discharge

Input Data	
Mannings Coefficient	0.045
Channel Slope	0.10 %
Depth	**4.0 in**
Left Side Slope	3.00 H : V
Right Side Slope	3.00 H : V
Bottom Width	3.00 ft

Results	
Discharge	**0.51 cfs**
Flow Area	1.3 ft²
Wetted Perimeter	5.11 ft
Top Width	5.00 ft
Critical Depth	0.10 ft
Critical Slope	6.59 %
Velocity	**0.43 ft/s**
Velocity Head	0.00 ft
Specific Energy	4.0 in
Froude Number	0.15
Flow Type	Subcritical

Professional Office 2: (flow based BMP).

NW'ly system: Qwq=0.3 cfs. The grass-lined swale located at the northwesterly corner of the site has a bottom width of 1.5 feet, a design depth of 6" with a side slope of 3:1. The velocity of the water quality flow is 0.39 fps, the proposed 234 feet long bio swale will offer a minimum of 10 minutes of resident time.

Project Description	
Worksheet	BIO SWALE OP2 NW
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Discharge

Input Data	
Mannings Coefficient	0.045
Channel Slope	0.10 %
Depth	**4.0 in**

Input Data		
Left Side Slope	3.00	H : V
Right Side Slope	3.00	H : V
Bottom Width	1.50	ft

Results		
Discharge	**0.33**	**cfs**
Flow Area	0.8	ft²
Wetted Perimeter	3.61	ft
Top Width	3.50	ft
Critical Depth	0.11	ft
Critical Slope	6.73	%
Velocity	**0.39**	**ft/s**
Velocity Head	0.00	ft
Specific Energy	4.0	in
Froude Number	0.14	
Flow Type	Subcritical	

S'ly system: Qwq=0.3 cfs. The grass-lined swale located along the southerly property line of the site has a bottom width of 1.5 feet, a design depth of 6" with a side slope of 3:1. The velocity of the water quality flow is 0.39 fps, the proposed 234 feet long bio swale will offer a minimum of 10 minutes of resident time.

Project Description	
Worksheet	BIO SWALE OP2 S
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Mannings Coefficient	0.045	
Channel Slope	0.10	%
Depth	**4.0**	**in**
Left Side Slope	3.00	H : V
Right Side Slope	3.00	H : V
Bottom Width	1.50	ft

Results		
Discharge	**0.33**	**cfs**
Flow Area	0.8	ft²
Wetted Perimeter	3.61	ft
Top Width	3.50	ft
Critical Depth	0.11	ft
Critical Slope	6.73	%
Velocity	**0.39**	**ft/s**
Velocity Head	0.00	ft
Specific Energy	4.0	in
Froude Number	0.14	
Flow Type	Subcritical	

SW'ly system: Qwq=0.8 cfs. The grass-lined swale located at the southwesterly corner of the site adjacent to Horse Ranch Creek Road has a bottom width of 4.5 feet, a design depth of 6" with a side slope of 3:1. The velocity of the water quality flow is 0.44 fps, the proposed 264 feet long bio swale will offer a minimum of 10 minutes of resident time.

Project Description		
Worksheet	BIO SWALE OP2 SE	
Flow Element	Trapezoidal Channel	
Method	Manning's Formula	
Solve For	Discharge	
Input Data		
Mannings Coefficient	0.045	
Channel Slope	0.10	%
Depth	**4.0**	**in**
Left Side Slope	3.00	H : V
Right Side Slope	3.00	H : V
Bottom Width	4.50	ft
Results		
Discharge	**0.81**	**cfs**
Flow Area	1.8	ft²
Wetted Perimeter	6.61	ft
Top Width	6.50	ft
Critical Depth	0.10	ft
Critical Slope	6.56	%
Velocity	**0.44**	**ft/s**
Velocity Head	0.00	ft
Specific Energy	4.0	in
Froude Number	0.15	
Flow Type	Subcritical	

Sports Complex (parking lot only): (flow based BMP).

Qwq=0.1 cfs. The grass-lined swale located at the southwesterly corner of the site has a bottom width of 1 feet, a design depth of 6" with a side slope of 3:1. The water quality flow velocity is 0.3 fps, the proposed 180 feet long bio swale will provide a minimum of 10 minutes of resident time.

Project Description		
Worksheet	BIO SWALE SC	
Flow Element	Trapezoidal Channel	
Method	Manning's Formula	
Solve For	Discharge	
Input Data		
Mannings Coefficient	0.045	
Channel Slope	0.10	%
Depth	2.7	in
Left Side Slope	3.00	H : V
Right Side Slope	4.00	H : V

Input Data		
Bottom Width	1.00	ft

Results		
Discharge	0.12	cfs
Flow Area	0.4	ft²
Wetted Perimeter	2.64	ft
Top Width	2.58	ft
Critical Depth	0.07	ft
Critical Slope	7.74	%
Velocity	0.30	ft/s
Velocity Head	0.00	ft
Specific Energy	2.7	in
Froude Number	0.13	
Flow Type	Subcritical	

Pool Site (Lot 569): (flow based BMP).

Qwq= 0.1 cfs The grass-lined swale located along the west side of the site has a bottom width of 1 feet, a design depth of 4" with a side slope of 3:1. The water quality flow velocity is 0.29 fps, the proposed 174 feet long bio swale will provide a minimum of 10 minutes of resident time.

Project Description	
Worksheet	BIO SWALE POOL
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Mannings Coefficient	0.045	
Channel Slope	0.10	%
Depth	**2.5**	**in**
Left Side Slope	3.00	H : V
Right Side Slope	3.00	H : V
Bottom Width	1.00	ft

Results		
Discharge	**0.10**	**cfs**
Flow Area	0.3	ft²
Wetted Perimeter	2.32	ft
Top Width	2.25	ft
Critical Depth	0.06	ft
Critical Slope	7.93	%
Velocity	**0.29**	**ft/s**
Velocity Head	0.00	ft
Specific Energy	2.5	in
Froude Number	0.13	
Flow Type	Subcritical	

Pump Station & Staging Area: (flow based BMP).

Qwq=0.1 cfs. The grass-lined swale located at the northwesterly area of the site has a bottom width of 1 feet and a design depth of 6", with a 3:1 side slope the top width is 4 feet. The Qwq will require a 4" flow depth, and the flow velocity is 0.29 fps. The design length is 174 feet to provide a minimum10

minute resident time.

Project Description	
Worksheet	BIO SWALE PUMP STA/STAGING
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Mannings Coefficient	0.045	
Channel Slope	0.10	%
Depth	**2.5**	**in**
Left Side Slope	3.00	H : V
Right Side Slope	3.00	H : V
Bottom Width	1.00	ft

Results		
Discharge	**0.10**	**cfs**
Flow Area	0.3	ft²
Wetted Perimeter	2.32	ft
Top Width	2.25	ft
Critical Depth	0.06	ft
Critical Slope	7.93	%
Velocity	**0.29**	**ft/s**
Velocity Head	0.00	ft
Specific Energy	2.5	in
Froude Number	0.13	
Flow Type	Subcritical	

Town Center: (all flow based BMPs).

N'ly of center D/W off Horse Ranch Creek Road: Qwq=0.5 cfs. CDS Technologies model number PMIU20-15 has a treatment capacity of **0.7 cfs**, and the 100-year runoff will be diverted into the bypass chamber and continue on to the downstream storm drain system.

SW'ly system: Qwq=0.7 cfs. CDS Technologies model number PMIU20-15 has a treatment capacity of **0.7 cfs**, and the 100-year runoff will be diverted into the bypass chamber and continue on to the downstream storm drain system.

MAINTENANCE

Please check the box that best describes the maintenance mechanism(s) for this project. Guidelines for each category are located in Chapter 5, Section 5.2 of the County SUSMP.

CATEGORY	SELECTED		SELECTED		SELECTED		SELECTED		SELECTED		SELECTED		SELECTED		SELECTED	
	MF-1		MF-2		MF-3		MF-4		PROFES-SIONAL OFFICE		SPORT / PARK		TOWN CENTER		PUMP STA./ STAGING AREA	
	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO
First																
Second	X		X		X		X		X		X				X	
Third													X			
Fourth																

(Note: Projects in Category 2 or 3 may choose to establish or be included in a Stormwater Maintenance Assessment District for the long-term maintenance of treatment BMPs).

With the exception of the Town Center, the BMP facilities (i.e. bio-filtration swales, curb inlet low flow drop out boxes, the low flow channel drain inlets in front of some of the curb inlets, the low flow pipes leading to the bio-filtration swales and curb inlets equipped with fossil filter inserts) within the "B" designator sites fall under either the **first category** (for the bio-filtration swales) or the **second category** (for the remaining BMPs). Therefore, it is appropriate for the individual site HOAs and/or Tenant Associations to be given primary responsibility for on going maintenance of these BMPs. The County needs to be able to step in and perform the maintenance if the HOAs and Tenant Associations fail, and needs to have security to provide funding for such backup maintenance.

The Town Center falls under **third category** with its multiple storm drain inserts and oil/water separators. The Tenant Association would still be given the primary maintenance responsibility. The County needs to assure ongoing maintenance is heightened, to the point that the County is willing to take on this responsibility. A permanent funding mechanism needs to be established.

The developer will dedicate the streets as well as the effected storm drain system to the County, also the bio-filtration swales will be dedicated to the County. Since the project is still in TM stage, it is anticipated that an IOD will be used to assure permanent maintenance of these facilities.

With the exception of the Town Center, the developer will provide the County with security to substantiate the maintenance agreement, which will remain in place for 5 years. The amount of security would equal the estimated cost of 2 years of maintenance activities. The security can be a cash deposit, letter of credit or other form acceptable to the County.

The Town Center will have a special assessment under the authority of a proposed landscape maintenance district. The assessment will be collected with property tax. Because this primary funding mechanism will require substantial amount of time to establish and collect assessments, a developer fee will be needed to cover the initial maintenance period of 24 months.

ATTACHMENTS

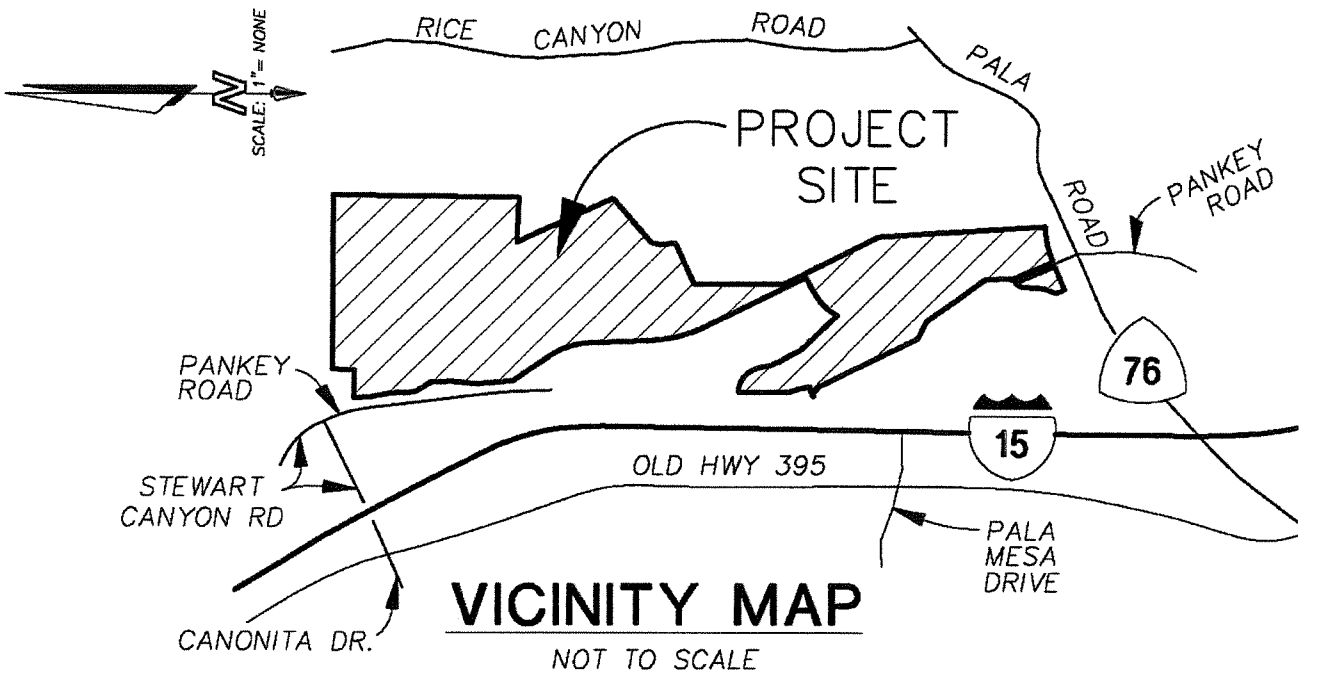
Please include the following attachments.

ATTACHMENT		COMPLETED	N/A
A	Project Location Map	X	
B	Site Map	X	
C	Relevant Monitoring Data		X
D	LID and Treatment BMP Location Map	X	
E	Treatment BMP Datasheets	X	
F	Operation and Maintenance Program for Treatment BMPs	X	
G	Fiscal Resources	X	
F	Engineer's Certification Sheet	X	
I	Addendum		X

Note: Attachments A and B may be combined.

ATTACHMENT A

LOCATION MAP



ATTACHMENT B

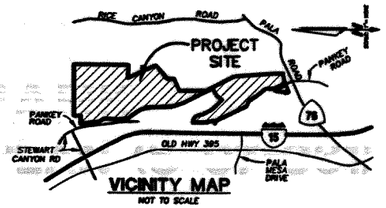
PROJECT SITE MAP

COUNTY OF SAN DIEGO TRACT 5338 RPL-5

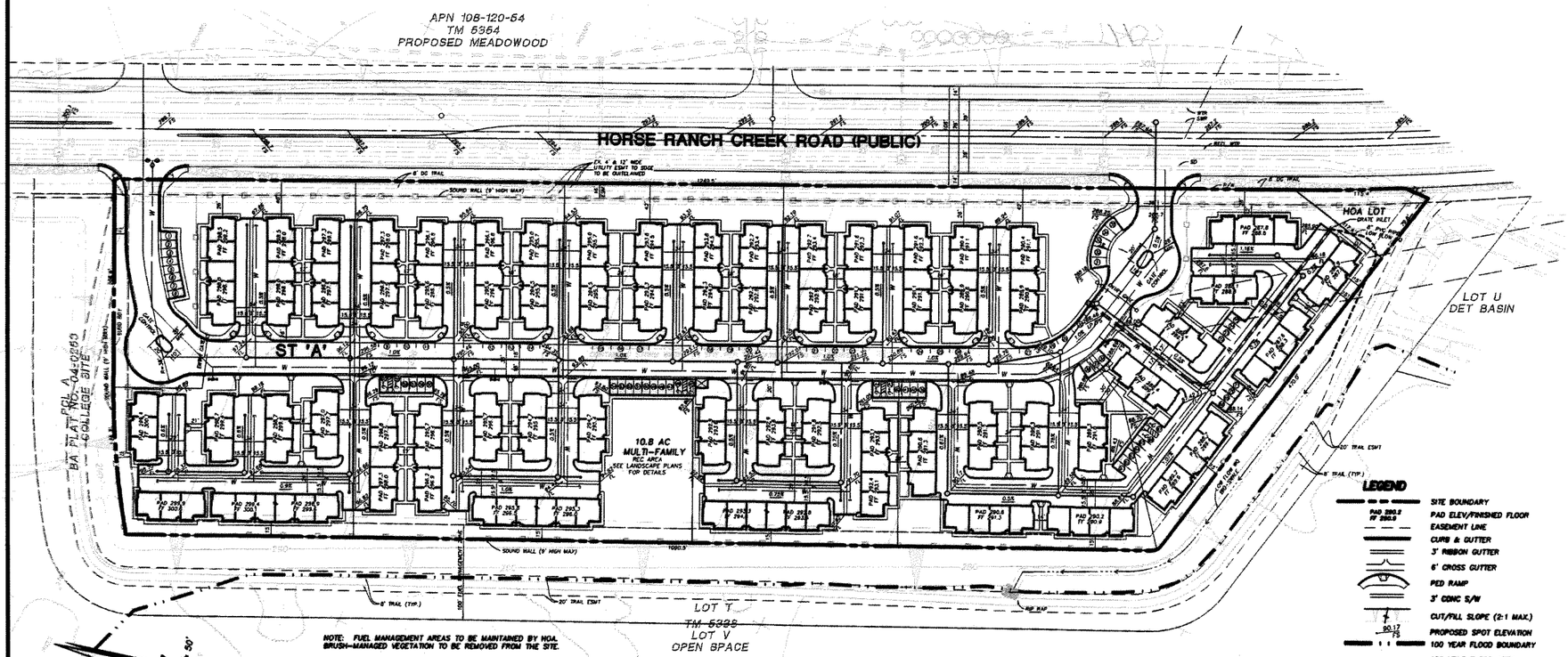
VESTING SITE PLAN

CAMPUS PARK

"B" DESIGNATOR SITE PLAN (S 07-031)



VICINITY MAP
NOT TO SCALE



NOTE: FUEL MANAGEMENT AREAS TO BE MAINTAINED BY HOA. BRUSH-MANAGED VEGETATION TO BE REMOVED FROM THE SITE.

SCALE: 1" = 50'

GRAPHIC SCALE

(IN FEET)
1 inch = 60 ft.

SHEET INDEX

SHEET	1	TITLE SHEET/SITE PLAN
SHEET	2	OPEN SPACE EXHIBIT
SHEET	3-4	LANDSCAPE PLANS
SHEET	5-10	ARCHITECTURAL PLANS
SHEET	11	REC BUILDING PLANS

SITE SUMMARY

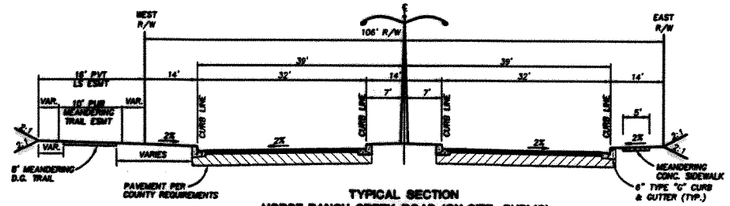
SITE AREA		
MULTI FAMILY-1	10.8 AC	472,035 SF
TOTAL SITE AREA		472,035 SF
RESIDENT PARKING SPACES REQUIRED		
92 3-BEDROOM UNITS X 2.0 SPACES*		184
100 2-BEDROOM UNITS X 1.5 SPACES*		150
SUBTOTAL		334
GUEST PARKING SPACES REQUIRED		
182 (UNITS) X 0.2 GUEST SPACES/UNIT*		36
RECREATION CENTER PARKING*		--
SUBTOTAL		36
TOTAL SPACES REQUIRED		370
RESIDENT PARKING SPACES PROVIDED		
18 BUILDINGS X 6 COVERED SPACES/BUILDING		108
5 BUILDINGS X 8 COVERED SPACES/BUILDING		40
20 BUILDINGS X 10 COVERED SPACES/BUILDING		200
3 BUILDINGS X 12 COVERED SPACES/BUILDING		36
SUB TOTAL		384
GUEST PARKING SPACES PROVIDED		
STANDARD (9'X18')		45
PARALLEL		22
HANDICAP (14'X18')		8
SUB TOTAL		75
TOTAL SPACES PROVIDED		459

* PER SECTION 6758 OF THE SAN DIEGO COUNTY ZONING ORDINANCE

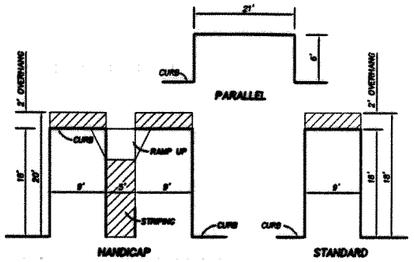
EXISTING AND PROPOSED ZONING

APN 108-121-17, 125-081-03

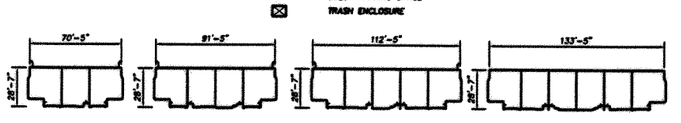
DESIGNATOR S-1 SPECIFIC PLAN AREA (SPA) PASSERELLE		EXISTING	PROPOSED
USE REGULATIONS		S-90	S-88/RM-15
ANIMAL REGS		K	S
DEVELOPMENT REGULATIONS	DENSITY	0.5	18.0
	LOT SIZE	20.0 AC.	--
	BUILDING TYPE	C	K
	MAXIMUM FLOOR AREA	--	--
	FLOOR AREA RATIO	--	--
	HEIGHT	G	L
	LOT COVERAGE	--	--
	SETBACK	A	V
	OPEN SPACE	--	F
SPECIAL AREA REGULATIONS		B, FOR F	B



TYPICAL SECTION
HORSE RANCH CREEK ROAD (ON-SITE PUBLIC)
NO SCALE



TYPICAL PARKING DIMENSIONS
NOT TO SCALE



TYPICAL BUILDING SIZES
NOT TO SCALE

GENERAL NOTES

1. TOTAL GROSS SITE AREA: 10.8 ACRES
   TOTAL NET SITE AREA: 10.8 ACRES
2. TOTAL NUMBER OF LOTS: 1
3. TOTAL NUMBER OF UNITS: 182 (182 MULTIFAMILY CONDOMINIUM UNITS)
4. ASSESSOR'S PARCEL NUMBER: 108-121-17, 125-081-03
5. EXISTING GENERAL PLAN LAND USE DESIGNATION: SPA 21
   PROPOSED GENERAL PLAN LAND USE DESIGNATION: SPA 21
6. EXISTING GENERAL PLAN REGIONAL CATEGORY: SSA
   PROPOSED GENERAL PLAN REGIONAL CATEGORY: CUDA
7. EXISTING ZONING: SEE ZONING BOX, THIS SHEET
   PROPOSED ZONING: SEE ZONING BOX, THIS SHEET
8. GROSS DENSITY: 17.8 DU/AC (192 DU'S/10.8 GROSS AC.)
9. EXISTING USE: VACANT
10. PROPOSED USE: RESIDENTIAL (MULTIFAMILY UNITS)
11. TAX RATE AREA: 57161
12. THOMAS BROTHERS COORDINATES: 1028, J7
    LAMBERT COORDINATES: 438-1723
13. COMMUNITY/SUBREGIONAL AREA: FALLBROOK/SPA 21(3.0)
14. SPA: CAMPUS PARK

GENERAL DESIGN NOTES

1. ALL GRADING FOR PROPOSED AND FUTURE STREETS SHALL CONFORM TO THE COUNTY DESIGN STANDARDS AND AS REQUIRED BY THE COUNTY ENGINEER.
2. ALL PROPOSED UTILITIES SHALL BE UNDERGROUND. EASEMENTS SHALL BE PROVIDED, REMOVED OR RELOCATED AS REQUIRED BY THE COUNTY ENGINEER, PUBLIC UTILITIES AND THEIR APPROPRIATE DISTRICTS.
3. SOURCE OF TOPOGRAPHY: MORENO AERIAL PHOTO SURVEY, DATED _____
4. THERE SHALL BE NO PARKING DELINEATED BY RED CURBS WITHIN THE FIRE LANES.
5. MANUFACTURED SLOPE RATIOS SHALL BE VARIABLE (2:1 MAX.)
6. FINISHED GRADES ARE APPROXIMATE ONLY AND SUBJECT TO CHANGE AT FINAL DESIGN, CONSISTENT WITH THE COUNTY'S SUBSTANTIAL CONFORMANCE GUIDELINES.
7. SOIL INFORMATION WAS OBTAINED FROM THE PRELIMINARY SOILS REPORT PREPARED BY: SHEPARDSON ENGINEERS, DATED _____
8. MODEL UNITS MAY BE BUILT PRIOR TO FINAL MAP RECORDATION WITH APPROVAL FROM THE COUNTY ENGINEER AND PLANNING DIRECTOR.
9. ALL STREET DESIGNS, LANDSCAPING AND FIRE HYDRANTS SHALL CONFORM TO THE COUNTY DESIGN STANDARDS AND AS REQUIRED BY THE COUNTY ENGINEER.
10. THE SUBDIVIDER/DEVELOPER SHALL PROVIDE AND INSTALL APPROVED STREET LIGHT STANDARDS AND FIXTURES IN THE TYPE AND MANNER APPROVED BY THE COUNTY OF SAN DIEGO AND THE PUBLIC WORKS DEPARTMENT.
11. THIS IS A MAP WHICH INCLUDES CONDOMINIUM PROJECTS AS DEFINED IN SECTION 1351 OF THE CIVIL CODE OF THE STATE OF CALIFORNIA AND FILED PURSUANT TO THE SUBDIVISION MAP ACT. THE TOTAL NUMBER OF CONDOMINIUM UNITS SHALL NOT EXCEED 182 UNITS.
12. TRASH RECEPTACLES WILL BE KEPT IN GARAGES WITH WEEKLY PICK-UP.
13. FOR SIGNAGE, SITE WALL, FLOOR PLANS, ELEVATION AND FENCING, SEE LANDSCAPE PLANS.
14. ACCESS DRIVE TO GARAGES WILL BE MARKED AS FIRE LANES AND CURBS PAINTED RED.
15. THIS PROJECT IS SUBJECT TO UTILIZING LOW IMPACT DESIGN TECHNIQUES IN CONTAINING STORM WATER ON SITE PER THE SATISFACTION OF COUNTY ENGINEER.

PARK LAND DEDICATION STATEMENT

THE SUBDIVIDER INTENDS TO COMPLY WITH THE PARK LAND DEDICATION ORDINANCE THROUGH THE DEDICATION OF PARK LAND WITHIN THE SUBDIVISION AUTHORIZED BY THE ORDINANCE AND/OR BY PAYMENT OF IN LIEU PARK IMPACT FEES.

SPECIAL ASSESSMENT ACT STATEMENT

A REQUEST TO THE BOARD OF SUPERVISORS FOR PERMISSION TO INITIATE PROCEEDINGS UNDER THE SPECIAL ASSESSMENT ACT FOR CONSTRUCTION OF ANY SUBDIVISION IMPROVEMENTS IS NOT BEING MADE AT THIS TIME.

EASEMENT LEGEND

NO EASEMENT EXIST ON THIS SITE UNLESS SHOWN OTHERWISE.

LEGAL DESCRIPTION

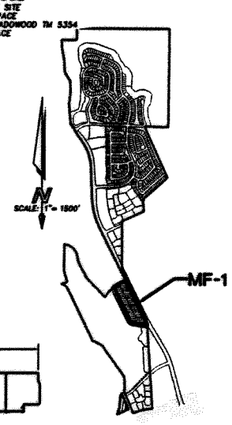
PORTION OF PARCEL B OF BOUNDARY ADJUSTMENT PLAT NO. 04-0253, IN THE COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, FILED IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY, UNDER CERTIFICATE OF COMPLIANCE RECORDED DECEMBER 11, 2006 AS DOC. NO. 2006-0876284.

ADJACENT LAND USE

NORTH – COLLEGE SITE
SOUTH – OPEN SPACE
EAST – PROP. MEADOWOOD TM 5354
WEST – OPEN SPACE

LEGEND

- SITE BOUNDARY
- PAD ELEV/FINISHED FLOOR (PAD 280.6 FF 280.9)
- EASEMENT LINE
- CURB & GUTTER
- 3' RIBBON GUTTER
- 6' CROSS GUTTER
- PED RAMP
- 3' CONC S/W
- CUT/FILL SLOPE (2:1 MAX.)
- PROPOSED SPOT ELEVATION (80.17 PS)
- 100 YEAR FLOOD BOUNDARY
- 100 YEAR FLOOD AREA
- FIRE MANAGEMENT ZONE
- EXISTING COUNTOURS
- PROPOSED COUNTOURS
- PROPOSED SEWER LINE & MANHOLE
- SEWER CLEANOUT
- PROPOSED WATER LINE
- PROPOSED RECLAIMED WATER LINE
- END CAP
- FIRE HYDRANT
- STORM DRAIN
- GRATED INLET
- CURB INLET
- SOUND/PERIMETER WALL (SEE LANDSCAPE PLANS FOR DETAILS)
- GUEST PARKING SPACE
- TRASH ENCLOSURE



KEY MAP

ENGINEER OF WORK:

LANDMARK CONSULTING
9555 GENESEE AVENUE, SUITE 200
SAN DIEGO, CA 92121
TELEPHONE (858) 587-8070
FAX (858) 587-8750

REGISTERED PROFESSIONAL ENGINEER
MARK A. BRENCICK
NO. 48153
EXP. 6/30/10
CIVIL
STATE OF CALIFORNIA

MARK A. BRENCICK
R.C.E. 48153

DATE

OWNER:

PASSERELLE, LLC
A CALIFORNIA LIMITED LIABILITY COMPANY
402 WEST BROADWAY, SUITE 1320
SAN DIEGO, CA 92101-3542
TELEPHONE (619) 696-7355

BY:
BRUCE TABB

DATE

LANDMARK CONSULTING
A LAND ENGINEERING SURVEYING CORPORATION
9555 GENESEE AVE., SUITE 200
SAN DIEGO, CA 92121 (858)587-8070

COUNTY OF SAN DIEGO TRACT 5338 RPL 5
VESTING SITE PLAN FOR
CAMPUS PARK
MULTI-FAMILY 1

SHEET NO. 1 OF 11 SHEETS

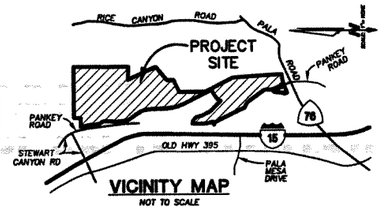
f:\08-1123a dwg\SP-1.dwg 3/7/2008 2:14:18 PM PST

COUNTY OF SAN DIEGO TRACT 5338 RPL-5

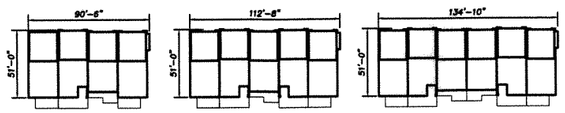
VESTING SITE PLAN

CAMPUS PARK

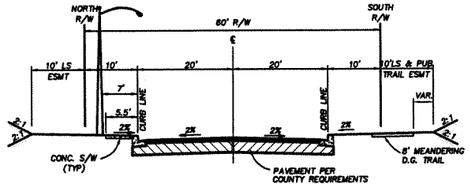
"B" DESIGNATOR SITE PLAN (S 07-031)



VICINITY MAP
NOT TO SCALE



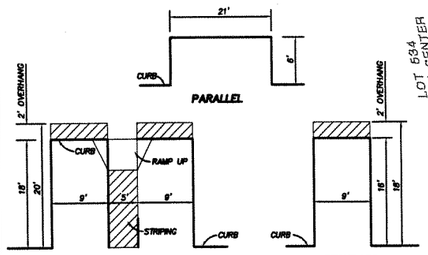
TYPICAL BUILDING SIZES
NOT TO SCALE



TYPICAL SECTION
NEIGHBORHOOD STREETS
HARVEST GLEN LANE (PUBLIC)
NO SCALE

SCALE: 1" = 50'

GRAPHIC SCALE
(IN FEET)
1 inch = 50 ft.



TYPICAL PARKING DIMENSIONS
NOT TO SCALE

SITE SUMMARY

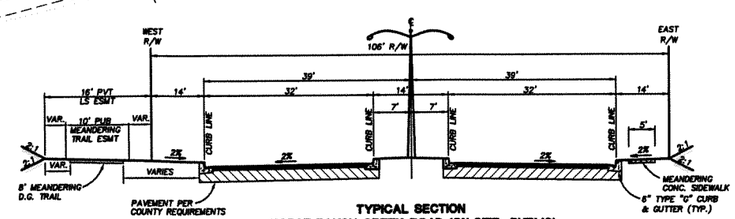
SITE AREA		
MULTI FAMILY-2	5.3 AC	229,192 SF
TOTAL SITE AREA		229,192 SF
RESIDENTS PARKING SPACES REQUIRED		
48 3-BEDROOM UNITS X 2.0 SPACES*		96
18 2-BEDROOM UNITS X 1.5 SPACES*		27
SUB TOTAL		123
GUEST PARKING SPACES REQUIRED		
66 (UNITS) X 0.2 GUEST SPACES/UNIT*		13
RECREATION CENTER PARKING*		–
SUB TOTAL		13
TOTAL SPACES REQUIRED		136
RESIDENT PARKING SPACES PROVIDED		
4 BUILDING X 8 COVERED SPACES/BUILDING		32
4 BUILDINGS X 10 COVERED SPACES/BUILDING		40
5 BUILDINGS X 12 COVERED SPACES/BUILDING		60
SUB TOTAL		132
GUEST PARKING SPACES PROVIDED		
16 STANDARD (9'X18')		14
5 HANDICAP (14'X19')		5
SUB TOTAL		19
TOTAL SPACES PROVIDED		151

* PER SECTION 6758 OF THE SAN DIEGO COUNTY ZONING ORDINANCE

EXISTING AND PROPOSED ZONING

APN 108-120-06

WOODLEY MF-2			
SPECIFIC PLAN AREA (SPA) PASSERELLE			
		EXISTING	PROPOSED
USE REGULATIONS		S-90	S-88/RM-15
ANIMAL REGS		K	S
DEVELOPMENT REGULATIONS	DENSITY	0.5	15
	LOT SIZE	20.0 AC.	–
	BUILDING TYPE	C	K
	MAXIMUM FLOOR AREA	–	–
	FLOOR AREA RATIO	–	–
	HEIGHT	G	G
	LOT COVERAGE	–	–
	SETBACK	A	V
	OPEN SPACE	–	F
SPECIAL AREA REGULATIONS		B, POR F	B



TYPICAL SECTION
HORSE RANCH CREEK ROAD (ON-SITE PUBLIC)
NO SCALE

ENGINEER OF WORK:

LANDMARK CONSULTING
9555 GENESEE AVENUE, SUITE 200
SAN DIEGO, CA 92121
TELEPHONE (858) 587-8070
FAX (858) 587-8750

REGISTERED PROFESSIONAL ENGINEER
MARK A. BRENCICK
NO. 48153
EXP. 6/30/10
CIVIL
STATE OF CALIFORNIA

MARK A. BRENCICK
R.C.E. 48153
DATE

OWNER:

PASSERELLE, LLC
A CALIFORNIA LIMITED LIABILITY COMPANY
402 WEST BROADWAY, SUITE 1320
SAN DIEGO, CA 92101-3542
TELEPHONE (619) 696-7355

BY:
BRUCE TABB
DATE

LEGEND

- SITE BOUNDARY
- PAD 290.2 FF 290.9 — PAD ELEV/FINISHED FLOOR
- EASEMENT LINE
- CURB & GUTTER
- 3" RIBBON GUTTER
- 6" CROSS GUTTER
- PED RAMP
- CUT/FILL SLOPE (2:1 MAX.)
- 8' HIGH SOUND/PERIMETER WALL (PER LS PLANS)
- 90.17 FS — PROPOSED SPOT ELEVATION
- FIRE MANAGEMENT ZONE
- EXISTING COUNTOURS
- PROPOSED COUNTOURS
- PROPOSED SEWER LINE & MANHOLE
- W — PROPOSED WATER LINE
- RW — EX. RECLAIMED WATER LINE
- END CAP
- FIRE HYDRANT
- STORM DRAIN
- GRATED INLET
- CURB INLET
- GUEST PARKING SPACE
- TRASH RECYCLING AREA
- 4' CONC WALKWAYS

GENERAL NOTES

1. TOTAL GROSS SITE AREA: 5.3 ACRES
   TOTAL NET SITE AREA: 5.3 ACRES
2. TOTAL NUMBER OF LOTS: 1
3. TOTAL NUMBER OF UNITS: 66 (66 MULTIFAMILY CONDOMINIUM UNITS)
4. ASSESSOR'S PARCEL NUMBER: 108-120-56
5. EXISTING GENERAL PLAN LAND USE DESIGNATION: SPA 21(2.8)
   PROPOSED GENERAL PLAN LAND USE DESIGNATION: SPA 21(3.0)
6. EXISTING GENERAL PLAN REGIONAL CATEGORY: SSA
   PROPOSED GENERAL PLAN REGIONAL CATEGORY: CUDA
7. EXISTING ZONING: SEE ZONING BOX, THIS SHEET
   PROPOSED ZONING: SEE ZONING BOX, THIS SHEET
8. GROSS DENSITY: 12.2 DU/AC (66 DU'S/5.4 GROSS AC.)
9. EXISTING USE: VACANT
10. PROPOSED USE: RESIDENTIAL (MULTIFAMILY UNITS)
11. TAX RATE AREA: 75168
12. THOMAS BROTHERS COORDINATES: 1028, J7
    LAMBERT COORDINATES: 426-1723
13. COMMUNITY/SUBREGIONAL AREA: FALLBROOK/SPA 21(3.0)
14. SPA: CAMPUS PARK

GENERAL DESIGN NOTES

1. ALL GRADING FOR PROPOSED AND FUTURE STREETS SHALL CONFORM TO THE COUNTY DESIGN STANDARDS AND AS REQUIRED BY THE COUNTY ENGINEER.
2. ALL PROPOSED UTILITIES SHALL BE UNDERGROUND. EASEMENTS SHALL BE PROVIDED, REMOVED OR RELOCATED AS REQUIRED BY THE COUNTY ENGINEER, PUBLIC UTILITIES AND THEIR APPROPRIATE DISTRICTS.
3. SOURCE OF TOPOGRAPHY: MORENO AERIAL PHOTO SURVEY, DATED _____
4. THERE SHALL BE NO PARKING DELINEATED BY RED CURBS WITHIN THE FIRE LANES.
5. MANUFACTURED SLOPE RATIOS SHALL BE VARIABLE (2:1 MAX.)
6. FINISHED GRADES ARE APPROXIMATE ONLY AND SUBJECT TO CHANGE AT FINAL DESIGN, CONSISTENT WITH THE COUNTY'S SUBSTANTIAL CONFORMANCE GUIDELINES.
7. SOIL INFORMATION WAS OBTAINED FROM THE PRELIMINARY SOILS REPORT PREPARED BY: SHEPARDSON ENGINEERS, DATED _____
8. MODEL UNITS MAY BE BUILT PRIOR TO FINAL MAP RECORDATION WITH APPROVAL FROM THE COUNTY ENGINEER AND PLANNING DIRECTOR.
9. ALL STREET DESIGNS, LANDSCAPING AND FIRE HYDRANTS SHALL CONFORM TO THE COUNTY DESIGN STANDARDS AND AS REQUIRED BY THE COUNTY ENGINEER.
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11. THIS IS A MAP WHICH INCLUDES CONDOMINIUM PROJECTS AS DEFINED IN SECTION 1351 OF THE CIVIL CODE OF THE STATE OF CALIFORNIA AND FILED PURSUANT TO THE SUBDIVISION MAP ACT. THE TOTAL NUMBER OF CONDOMINIUM UNITS SHALL NOT EXCEED 66 UNITS.
12. TRASH RECEPTACLES WILL BE KEPT IN GARAGES WITH WEEKLY PICK-UP.
13. FOR SIGNAGE, SITE WALL, FLOOR PLANS, ELEVATION AND FENCING, SEE LANDSCAPE PLANS.
14. ACCESS DRIVE TO GARAGES WILL BE MARKED AS FIRE LANES AND CURBS PAINTED RED.
15. THIS PROJECT IS SUBJECT TO UTILIZING LOW IMPACT DESIGN TECHNIQUES IN CONTAINING STORM WATER ON SITE PER THE SATISFACTION OF COUNTY ENGINEER.

PARK LAND DEDICATION STATEMENT

THE SUBDIVIDER INTENDS TO COMPLY WITH THE PARK LAND DEDICATION ORDINANCE THROUGH THE DEDICATION OF PARK LAND WITHIN THE SUBDIVISION AUTHORIZED BY THE ORDINANCE AND/OR BY PAYMENT OF IN LIEU PARK IMPACT FEES.

SPECIAL ASSESSMENT ACT STATEMENT

A REQUEST TO THE BOARD OF SUPERVISORS FOR PERMISSION TO INITIATE PROCEEDINGS UNDER THE SPECIAL ASSESSMENT ACT FOR CONSTRUCTION OF ANY SUBDIVISION IMPROVEMENTS IS NOT BEING MADE AT THIS TIME.

EASEMENT LEGEND

NO EASEMENT EXIST ON THIS SITE UNLESS SHOWN OTHERWISE.

LEGAL DESCRIPTION

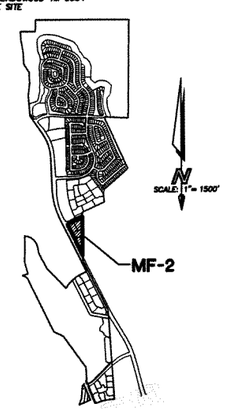
PORTION OF PARCEL B OF BOUNDARY ADJUSTMENT PLAT NO. 04-0253, IN THE COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, FILED IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY, UNDER CERTIFICATE OF COMPLIANCE RECORDED DECEMBER 11, 2006 AS DOC. NO. 2006-0876284.

ADJACENT LAND USE

NORTH – MULTIFAMILY RES & TOWN CENTER
SOUTH – COLLEGE SITE
EAST – PROP. MEADOWOOD TM 5354
WEST – COLLEGE SITE

SHEET INDEX

SHEET	1	TITLE SHEET/SITE PLAN
SHEET	2	OPEN SPACE EXHIBIT
SHEET	3-4	LANDSCAPE PLANS
SHEET	5	ARCHITECTURAL PLANS
SHEET	6	RECREATION BLDG PLANS



KEY MAP
SCALE: 1" = 1500'

LANDMARK CONSULTING
PLANNING ENGINEERING SURVEYING
9555 GENESEE AVE., SUITE 200
SAN DIEGO, CA 92121, (858)587-8070

COUNTY OF SAN DIEGO TRACT 5338 RPL 5
VESTING SITE PLAN FOR
CAMPUS PARK
MULTI-FAMILY 2
SHEET NO. 1 OF 6 SHEETS

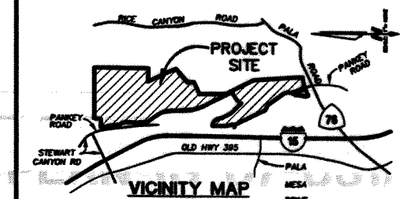
T:\108-11\SDP plan\VP-2.dwg 3/7/2008 8:15:12 PM PST

COUNTY OF SAN DIEGO TRACT 5338 RPL-5

VESTING SITE PLAN

CAMPUS PARK

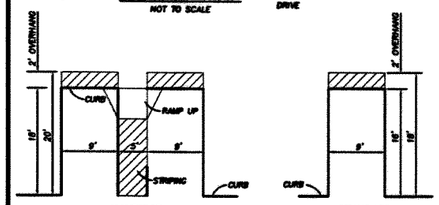
"B" DESIGNATOR SITE PLAN (S 07-031)



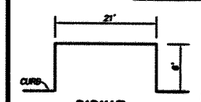
VICINITY MAP
NOT TO SCALE

SHEET INDEX

SHEET	1	TITLE SHEET/SITE PLAN
SHEET	2	OPEN SPACE EXHIBIT
SHEET	3-4	LANDSCAPE PLANS
SHEET	5-10	ARCHITECTURAL PLANS
SHEET	10	REC BUILDING PLANS



TYPICAL PARKING DIMENSIONS
NOT TO SCALE



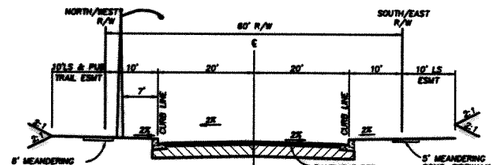
NOTE: FUEL MANAGEMENT AREAS TO BE MAINTAINED BY HOA. BRUSH-MANAGED VEGETATION TO BE REMOVED FROM THE SITE.

GRAPHIC SCALE
SCALE: 1" = 60'
(IN FEET)
1 inch = 60 ft.

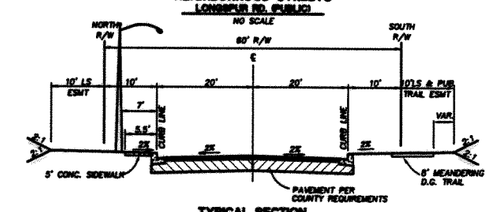
TYPICAL BUILDING SIZE
NOT TO SCALE

LEGEND

- SITE BOUNDARY
- PAD ELEV/FINISHED FLOOR
- EASEMENT LINE
- CURB & GUTTER
- 3' RIBBON GUTTER
- 10' CROSS GUTTER
- PED RAMP
- 4' CONC SIDEWALK
- CUT/FILL SLOPE (2:1 MAX.)
- PROPOSED SPOT ELEVATION
- FIRE MANAGEMENT ZONE
- EXISTING CONTOURS
- PROPOSED CONTOURS
- PROPOSED SEWER LINE & MANHOLE
- PROPOSED WATER LINE
- END CAP
- FIRE HYDRANT
- STORM DRAIN
- GRATED INLET
- CURB INLET
- SOUND/PERIMETER WALL (SEE LANDSCAPE PLANS FOR DETAILS)
- GUEST PARKING SPACE



TYPICAL SECTION
NEIGHBORHOOD STREETS
LONGSPUR RD. (PUBLIC)
NO SCALE



TYPICAL SECTION
NEIGHBORHOOD STREETS
HARVEST GLEN LANE
NO SCALE

SITE SUMMARY

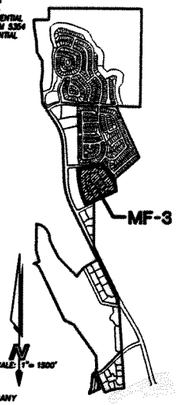
SITE AREA		
MULTI FAMILY-3	16.4 AC	802,348 SF
TOTAL SITE AREA		802,348 SF
RESIDENT PARKING SPACES REQUIRED		
189 3-BEDROOM UNITS X 2.0 SPACES*		378
SUB TOTAL		378
GUEST PARKING SPACES REQUIRED		
189 (UNITS) X 0.2 GUEST SPACES/UNIT*		38
RECREATION CENTER PARKING*		--
SUB TOTAL		38
TOTAL SPACES REQUIRED		416
RESIDENT PARKING SPACES PROVIDED		
189 BUILDINGS X 2 COVERED SPACES/BUILDING		378
SUB TOTAL		378
GUEST PARKING SPACES PROVIDED		
PARALLEL		117
HANDICAP (14'X18')		10
SUB TOTAL		127
TOTAL SPACES PROVIDED		505

* PER SECTION 6759 OF THE SAN DIEGO COUNTY ZONING ORDINANCE

EXISTING AND PROPOSED ZONING

APN 108-120-56

		CANTERBURY SPECIFIC PLAN AREA (SPA) PASSERELLE	
		EXISTING	PROPOSED
USE REGULATIONS		S-88	S-88/RM-10
ANIMAL REGS		K	K
DEVELOPMENT REGULATIONS	DENSITY	0.5	10
	LOT SIZE	20 AC.	--
	BUILDING TYPE	C	K
	MAXIMUM FLOOR AREA	--	--
	FLOOR AREA RATIO	--	--
	HEIGHT	G	H
	LOT COVERAGE	--	--
	SETBACK	A	V
	OPEN SPACE	--	F
SPECIAL AREA REGULATIONS		B, FOR F	B



KEY MAP
SCALE: 1" = 1500'

ENGINEER OF WORK:

LANDMARK CONSULTING
5955 GENESEE AVENUE, SUITE 200
SAN DIEGO, CA 92121
TELEPHONE (858) 587-8070
FAX (858) 587-8750

REGISTERED PROFESSIONAL ENGINEER
MARK A. BRENNOCK
NO. 48153
EXP. 6/30/10
CIVIL
STATE OF CALIFORNIA

MARK A. BRENNOCK
R.C.E. 48153
DATE

OWNER:

PASSERELLE, LLC
A CALIFORNIA LIMITED LIABILITY COMPANY
402 WEST BROADWAY, SUITE 1320
SAN DIEGO, CA 92101-3542
TELEPHONE (619) 696-7355

BY:
BRUCE TABB
DATE

GENERAL NOTES

1. TOTAL GROSS SITE AREA: 16.4 ACRES
   TOTAL NET SITE AREA: 16.4 ACRES
2. TOTAL NUMBER OF LOTS: 1
3. TOTAL NUMBER OF UNITS: 189 (189 MULTIFAMILY CONDOMINIUM UNITS)
4. ASSESSOR'S PARCEL NUMBER: 108-120-56
5. EXISTING GENERAL PLAN LAND USE DESIGNATION: SPA 21(2.9)
   PROPOSED GENERAL PLAN LAND USE DESIGNATION: SPA 21(3.0)
6. EXISTING GENERAL PLAN REGIONAL CATEGORY: SSA
   PROPOSED GENERAL PLAN REGIONAL CATEGORY: CUDA
7. EXISTING ZONING: SEE ZONING BOX, THIS SHEET
   PROPOSED ZONING: SEE ZONING BOX, THIS SHEET
8. GROSS DENSITY: 10.3 DU/AC (189 DU'S/16.4 GROSS AC.)
9. EXISTING USE: VACANT
10. PROPOSED USE: RESIDENTIAL (MULTIFAMILY UNITS)
11. TAX RATE AREA: 75169
12. THOMAS BROTHERS COORDINATES: 1028, J7
    LAMBERT COORDINATES: 426-1723
13. COMMUNITY/SUBREGIONAL AREA: FALLBROOK/SPA 21(3.0)
14. SPA: CAMPUS PARK

GENERAL DESIGN NOTES

1. ALL GRADING FOR PROPOSED AND FUTURE STREETS SHALL CONFORM TO THE COUNTY DESIGN STANDARDS AND AS REQUIRED BY THE COUNTY ENGINEER.
2. ALL PROPOSED UTILITIES SHALL BE UNDERGROUND. EASEMENTS SHALL BE PROVIDED, REMOVED OR RELOCATED AS REQUIRED BY THE COUNTY ENGINEER, PUBLIC UTILITIES AND THEIR APPROPRIATE DISTRICTS.
3. SOURCE OF TOPOGRAPHY: MORENO AERIAL PHOTO SURVEY, DATED _____
4. THERE SHALL BE NO PARKING DELINEATED BY RED CURBS WITHIN THE FIRE LANES.
5. MANUFACTURED SLOPE RATIOS SHALL BE VARIABLE (2:1 MAX.)
6. FINISHED GRADES ARE APPROXIMATE ONLY AND SUBJECT TO CHANGE AT FINAL DESIGN, CONSISTENT WITH THE COUNTY'S SUBSTANTIAL CONFORMANCE GUIDELINES.
7. SOIL INFORMATION WAS OBTAINED FROM THE PRELIMINARY SOILS REPORT PREPARED BY: SHEPARDSON ENGINEERS, DATED _____
8. MODEL UNITS MAY BE BUILT PRIOR TO FINAL MAP RECORDATION WITH APPROVAL FROM THE COUNTY ENGINEER AND PLANNING DIRECTOR.
9. ALL STREET DESIGNS, LANDSCAPING AND FIRE HYDRANTS SHALL CONFORM TO THE COUNTY DESIGN STANDARDS AND AS REQUIRED BY THE COUNTY ENGINEER.
10. THE SUBDIVIDER/DEVELOPER SHALL PROVIDE AND INSTALL APPROVED STREET LIGHT STANDARDS AND FIXTURES IN THE TYPE AND NUMBER APPROVED BY THE COUNTY OF SAN DIEGO AND THE PUBLIC WORKS DEPARTMENT.
11. THIS IS A MAP WHICH INCLUDES CONDOMINIUM PROJECTS AS DEFINED IN SECTION 1351 OF THE CIVIL CODE OF THE STATE OF CALIFORNIA AND FILED PURSUANT TO THE SUBDIVISION MAP ACT. THE TOTAL NUMBER OF CONDOMINIUM UNITS SHALL NOT EXCEED 189 UNITS.
12. TRASH RECEPTACLES WILL BE KEPT IN GARAGES WITH WEEKLY PICK-UP.
13. FOR STORAGE, SITE WALL, FLOOR PLANS, ELEVATION AND FENCING, SEE LANDSCAPE PLANS.
14. ACCESS DRIVE TO GARAGES WILL BE MARKED AS FIRE LANES.
15. THIS PROJECT IS SUBJECT TO UTILIZING LOW IMPACT DESIGN TECHNIQUES IN CONTAINING STORM WATER ON SITE PER THE SATISFACTION OF COUNTY ENGINEER.

PARK LAND DEDICATION STATEMENT

THE SUBDIVIDER INTENDS TO COMPLY WITH THE PARK LAND DEDICATION ORDINANCE THROUGH THE DEDICATION OF PARK LAND WITHIN THE SUBDIVISION AUTHORIZED BY THE ORDINANCE AND/OR BY PAYMENT OF IN LIEU PARK IMPACT FEES.

SPECIAL ASSESSMENT ACT STATEMENT

A REQUEST TO THE BOARD OF SUPERVISORS FOR PERMISSION TO INITIATE PROCEEDINGS UNDER THE SPECIAL ASSESSMENT ACT FOR CONSTRUCTION OF ANY SUBDIVISION IMPROVEMENTS IS NOT BEING MADE AT THIS TIME.

EASEMENT LEGEND

NO EASEMENT EXIST ON THIS SITE UNLESS SHOWN OTHERWISE.

LEGAL DESCRIPTION

PORTION OF PARCEL B OF BOUNDARY ADJUSTMENT PLAT NO. 04-0233, IN THE COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, FILED IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY, UNDER CERTIFICATE OF COMPLIANCE RECORDED DECEMBER 11, 2006 AS DOC. NO. 2006-0876284.

ADJACENT LAND USE

NORTH - SINGLE FAMILY RESIDENTIAL
SOUTH - PROP MEADOWOOD TM 5354
EAST - SINGLE FAMILY RESIDENTIAL
WEST - TOWN CENTER

LANDMARK CONSULTING
PLANNING SURVEYING
5955 GENESEE AVE., SUITE 200
SAN DIEGO, CA 92121 (858)587-8070

COUNTY OF SAN DIEGO TRACT 5338 RPL 5
VESTING SITE PLAN FOR
CAMPUS PARK
MULTI-FAMILY 3

SHEET NO. 1 OF 10 SHEETS

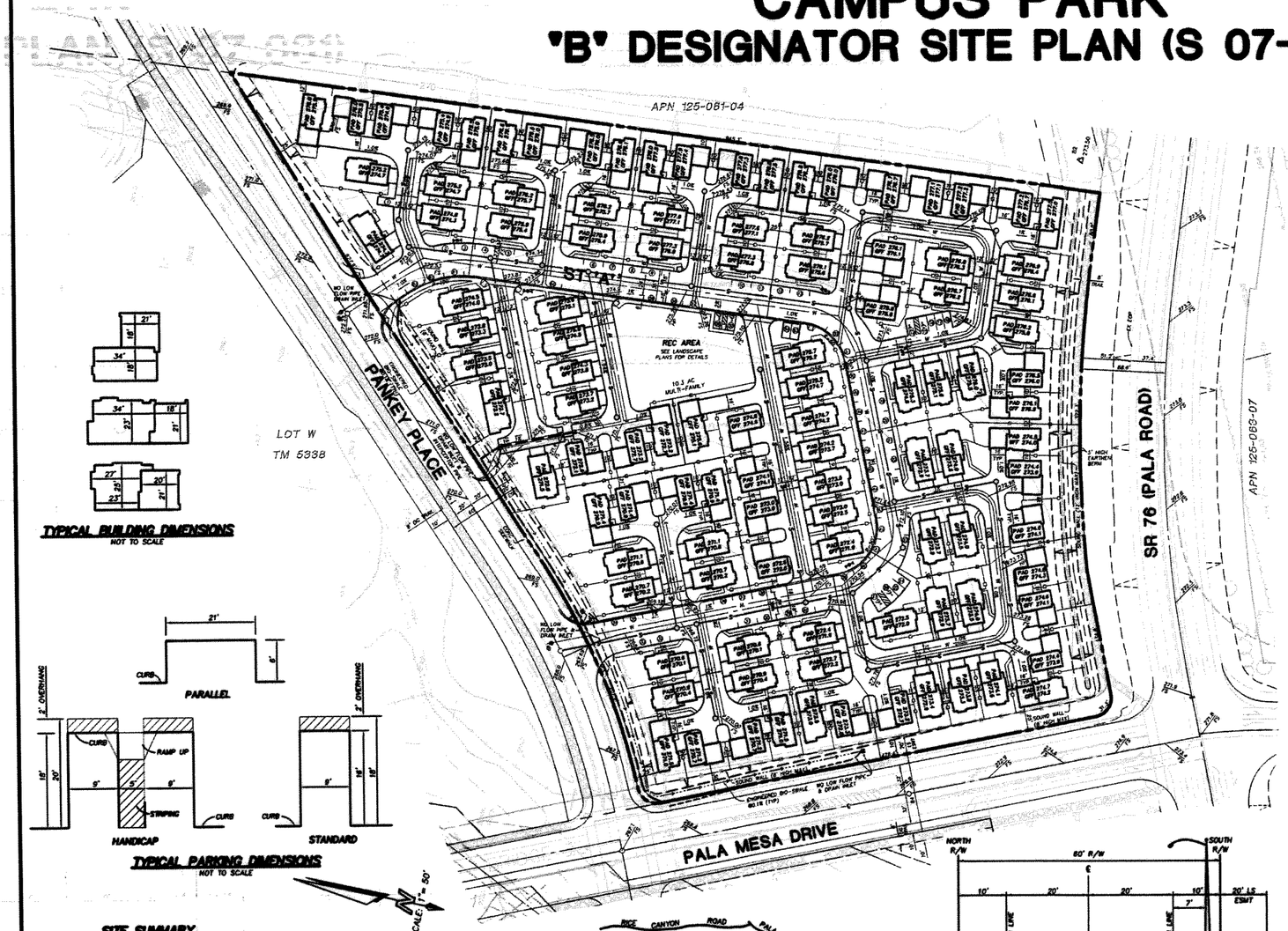
F:\08-191SM plan\SP1.dwg 3/5/2008 3:34:10 PM PST

COUNTY OF SAN DIEGO TRACT 5338 RPL-5

VESTING SITE PLAN

CAMPUS PARK

"B" DESIGNATOR SITE PLAN (S 07-031)



LEGEND

- SITE BOUNDARY
- PAD ELEV/FINISHED FLOOR
- EASEMENT LINE
- CURB & GUTTER
- 3' RIBBON GUTTER
- 10' CROSS GUTTER
- PED RAMP
- CUT/FILL SLOPE (2:1 MAX.)
- PROPOSED SPOT ELEVATION
- 100 YEAR FLOOD BOUNDARY
- 100 YEAR FLOOD AREA
- FIRE MANAGEMENT ZONE
- EXISTING CONTOURS
- PROPOSED CONTOURS
- PROPOSED SEWER LINE & MANHOLE
- PROPOSED WATER LINE
- END CAP
- FIRE HYDRANT
- STORM DRAIN
- GRATED INLET
- CURB INLET
- 4' CONC WALKWAYS
- SOUND/PERIMETER WALL (SEE LANDSCAPE PLANS FOR DETAILS)
- FENCE
- (G) GUEST PARKING SPACE

SHEET INDEX

SHEET	1	TITLE SHEET/SITE PLAN
SHEET	2	OPEN SPACE EXHIBIT
SHEET	3-4	LANDSCAPE PLANS
SHEET	5-6	ARCHITECTURAL PLANS
SHEET	7	POOL BUILDING PLANS

ADJACENT LAND USE

NORTH – OPEN SPACE
SOUTH – PALA ROAD HIGHWAY 76
EAST – PROP. MEADOWOOD TM 5354
WEST – SEWER PUMP STATION/OPEN SPACE

OWNER:

PASSERELLE, LLC
A CALIFORNIA LIMITED LIABILITY COMPANY
402 WEST BROADWAY, SUITE 1320
SAN DIEGO, CA 92101-3542
TELEPHONE (619) 696-7355

BY: _____ DATE _____
BRUCE TABB

ENGINEER OF WORK:

LANDMARK CONSULTING
9335 GENESEE AVENUE, SUITE 200
SAN DIEGO, CA 92121
TELEPHONE (858) 587-8070
FAX (858) 587-8750

MARK A. BRENOCK R.C.E. 48153 DATE _____

REGISTERED PROFESSIONAL ENGINEER – MARK A. BRENOCK – NO. 48153 – EXP. 6/30/10 – CIVIL – STATE OF CALIFORNIA

GENERAL NOTES

1. TOTAL GROSS SITE AREA: 10.3 ACRES TOTAL NET SITE AREA: 10.3 ACRES
2. TOTAL NUMBER OF LOTS: 1
3. TOTAL NUMBER OF UNITS: 108 (108 MULTI FAMILY CONDOMINIUM UNITS)
4. ASSESSOR'S PARCEL NUMBER: 125-081-03
5. EXISTING GENERAL PLAN LAND USE DESIGNATION: SPA 21(2.8)
   PROPOSED GENERAL PLAN LAND USE DESIGNATION: SPA 21(3.0)
6. EXISTING GENERAL PLAN REGIONAL CATEGORY: SSA
   PROPOSED GENERAL PLAN REGIONAL CATEGORY: CUDA
7. EXISTING ZONING: SEE ZONING BOX, THIS SHEET
   PROPOSED ZONING: SEE ZONING BOX, THIS SHEET
8. GROSS DENSITY: 10.5 DU'S/AC (108 DU'S/10.3 GROSS AC)
9. EXISTING USE: VACANT PROPOSED USE: RESIDENTIAL (MULTIFAMILY UNITS)
10. TAX RATE AREA: 57161
11. THOMAS BROTHERS COORDINATES: 1048, J1
    LAMBERT COORDINATES: 426-1719
12. COMMUNITY/SUBREGIONAL AREA: FALLBROOK/SPA 21(3.0)
13. SPA: CAMPUS PARK

GENERAL DESIGN NOTES

1. ALL GRADING FOR PROPOSED AND FUTURE STREETS SHALL CONFORM TO THE COUNTY DESIGN STANDARDS AND AS REQUIRED BY THE COUNTY ENGINEER.
2. ALL PROPOSED UTILITIES SHALL BE UNDERGROUND. EASEMENTS SHALL BE PROVIDED, REMOVED OR RELOCATED AS REQUIRED BY THE COUNTY ENGINEER, PUBLIC UTILITIES AND THEIR APPROPRIATE DISTRICTS.
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5. MANUFACTURED SLOPE RATIOS SHALL BE VARIABLE (2:1 MAX.)
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12. TRASH RECEPTACLES WILL BE KEPT IN GARAGES WITH WEEKLY PICK-UP.
13. FOR SIGNAGE, SITE WALL, FLOOR PLANS, ELEVATION AND FENCING, SEE LANDSCAPE PLANS.
14. ACCESS DRIVE TO GARAGES WILL BE MARKED AS FIRE LANES AND CURBS PAINTED RED.
15. THIS PROJECT IS SUBJECT TO UTILIZING LOW IMPACT DESIGN TECHNIQUES IN CONTAINING STORM WATER ON SITE PER THE SATISFACTION OF COUNTY ENGINEER.

PARK LAND DEDICATION STATEMENT

THE SUBDIVIDER INTENDS TO COMPLY WITH THE PARK LAND DEDICATION ORDINANCE THROUGH THE DEDICATION OF PARK LAND WITHIN THE SUBDIVISION AUTHORIZED BY THE ORDINANCE AND/OR BY PAYMENT OF IN LIEU PARK IMPACT FEES.

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EASEMENT LEGEND

NO EASEMENT EXIST ON THIS SITE UNLESS OTHERWISE SHOWN.

LEGAL DESCRIPTION

PORTION OF PARCEL B OF BOUNDARY ADJUSTMENT PLAT NO. 04-0253, IN THE COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, FILED IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY, UNDER CERTIFICATE OF COMPLIANCE RECORDED DECEMBER 11, 2008 AS DOC. NO. 2008-0676294.

TYPICAL BUILDING DIMENSIONS

NOT TO SCALE

TYPICAL PARKING DIMENSIONS

NOT TO SCALE

SCALE: 1" = 50'

GRAPHIC SCALE

0 50 100 200 400

(IN FEET)
1 inch = 50 ft.

SITE SUMMARY

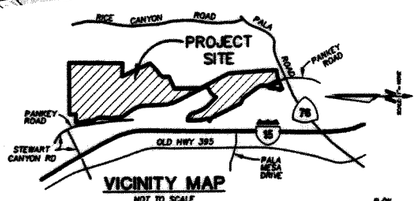
SITE AREA		
MULTI FAMILY-4	10.3 AC	448,419 SF
TOTAL SITE AREA		448,419 SF
RESIDENT PARKING SPACES REQUIRED		
108 3-BEDROOM UNITS X 2.0 SPACES*		216
SUBTOTAL		216
GUEST PARKING SPACES REQUIRED		
108 UNITS X 0.2 GUEST SPACES/UNIT*		22
RECREATION CENTER PARKING*		–
SUBTOTAL		22
TOTAL SPACES REQUIRED		238
RESIDENT PARKING SPACES PROVIDED		
108 BUILDINGS X 2 COVERED SPACES/BUILDING		216
SUB TOTAL		216
GUEST PARKING SPACES PROVIDED		
STANDARD (9'X18')		6
PARALLEL		72
HANDICAP (14'X19')		6
SUB TOTAL		84
TOTAL SPACES PROVIDED		300

* PER SECTION 6758 OF THE SAN DIEGO COUNTY ZONING ORDINANCE

EXISTING AND PROPOSED ZONING

APN 125-081-03

SPECIFIC PLAN AREA (SPA) PASSERELLE		EXISTING	PROPOSED
USE REGULATIONS		S-90	S-88/RM-12
ANIMAL SDDS		K	S
DEVELOPMENT REGULATIONS	DENSITY	0.5	12.0
	LOT SIZE	20 AC	–
	BUILDING TYPE	C	K
	MAXIMUM FLOOR AREA	–	–
	FLOOR AREA RATIO	–	–
	HEIGHT	G	G
	LOT COVERAGE	–	–
	SETBACK	A	V
	OPEN SPACE	–	F
SPECIAL AREA REGULATIONS		B, FOR F	B

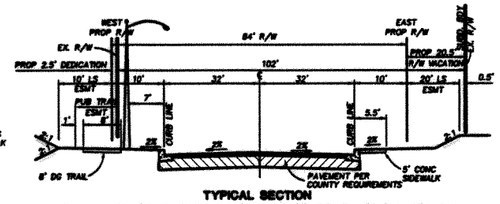


VICINITY MAP

NOT TO SCALE

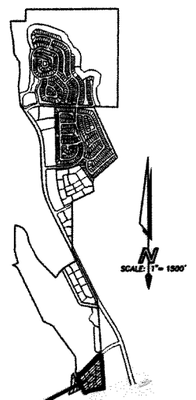
TYPICAL SECTION NEIGHBORHOOD STREETS PANKEY PLACE (PUBLIC)

NO SCALE



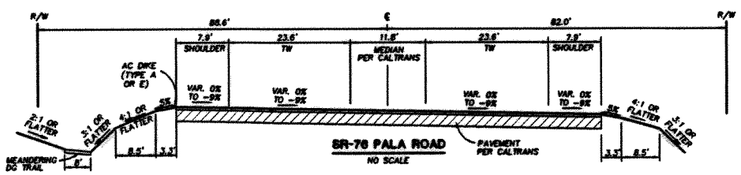
TYPICAL SECTION PALA MESA DR (PUBLIC) (EX PANKEY RD SOUTH OF PANKEY PL)

NO SCALE



KEY MAP

SCALE: 1" = 100'



LANDMARK CONSULTING – A CIVIL ENGINEERING COMPANY – 9335 GENESEE AVE., SUITE 200, SAN DIEGO, CA 92121, (858)587-8070

COUNTY OF SAN DIEGO TRACT 5338 RPL 5
VESTING SITE PLAN FOR
CAMPUS PARK
MULTI-FAMILY 4

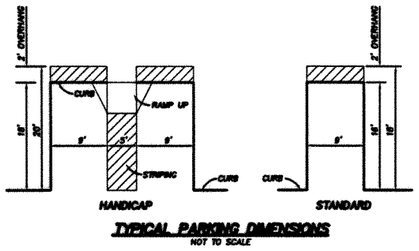
SHEET NO. 1 OF 7 SHEETS

COUNTY OF SAN DIEGO TRACT 5338 RPL-5

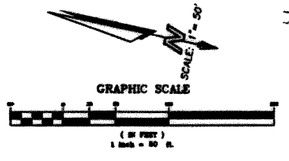
VESTING SITE PLAN

CAMPUS PARK

"B" DESIGNATOR SITE PLAN (S 07-031)

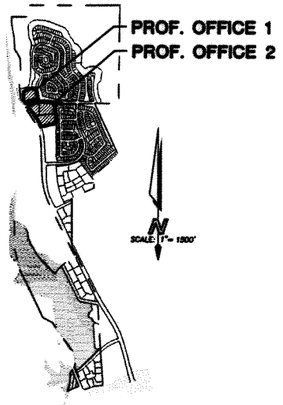


TYPICAL PARKING DIMENSIONS
NOT TO SCALE



LEGEND

- SITE BOUNDARY
- PAD ELEV/FINISHED FLOOR
- EASEMENT LINE
- CURB & GUTTER
- 3" RIBBON GUTTER
- 6" CROSS GUTTER
- PED RAMP
- CUT/FILL SLOPE (2:1 MAX.)
- PROPOSED SPOT ELEVATION
- FIRE MANAGEMENT ZONE
- EXISTING COUNTOURS
- PROPOSED COUNTOURS
- PROPOSED SEWER LINE & MANHOLE
- SEWER CLEANOUT
- PROPOSED SEWER LAT
- PROPOSED WATER SVC
- PROPOSED WATER LINE
- PROPOSED RECLAIMED WATER LINE
- END CAP
- FIRE HYDRANT
- STORM DRAIN
- GRATED INLET
- CURB INLET
- PROPOSED BUILDING
- TRASH/RECYCLING AREA
- NO. OF PARKING SPACES
- BICYCLE PARKING 1.5 PER 10 PS – 107 SPACES TOTAL
- 566 LOT NUMBER
- PHASE LINE
- RET WALL



KEY MAP
SCALE: 1" = 1500'

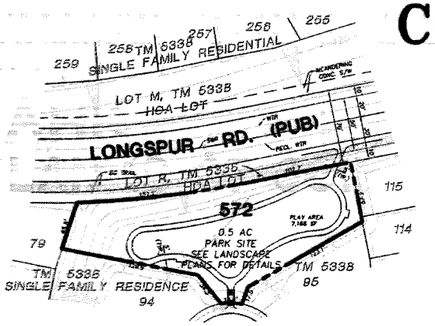
COUNTY OF SAN DIEGO TRACT 5338 RPL 5
VESTING SITE PLAN FOR
CAMPUS PARK
PROFESSIONAL OFFICE
SHEET NO. 2 OF 10 SHEETS

COUNTY OF SAN DIEGO TRACT 5338 RPL-5

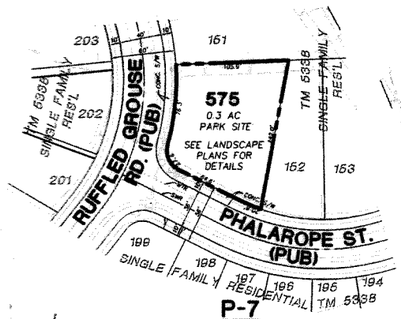
VESTING SITE PLAN

CAMPUS PARK

"B" DESIGNATOR SITE PLAN (S 07-031)



P-2



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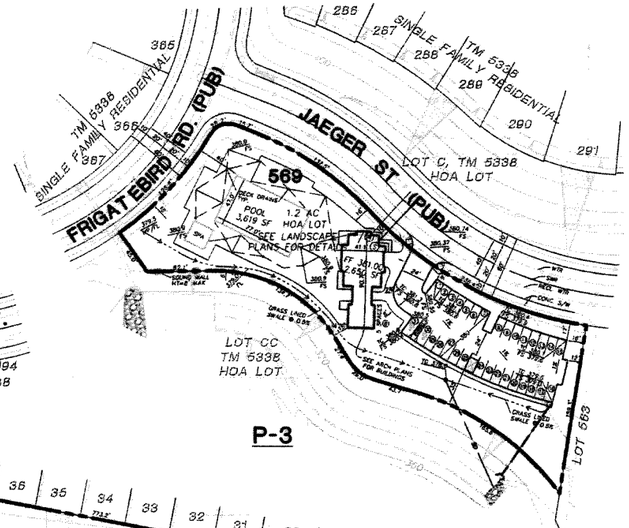

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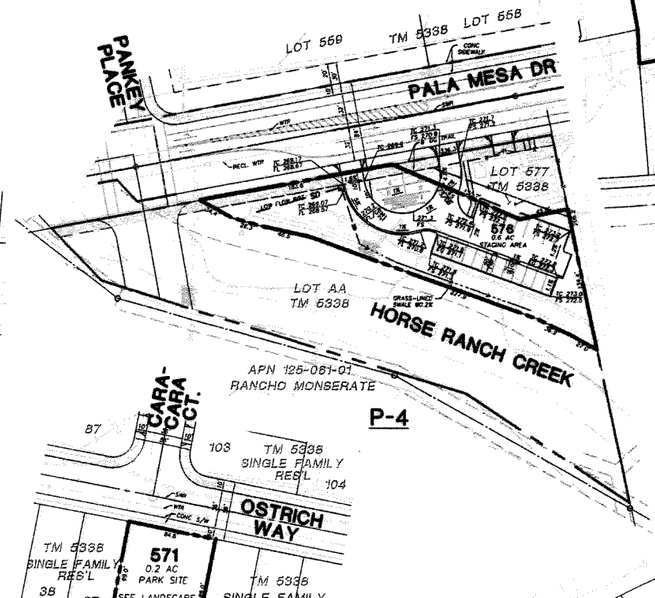

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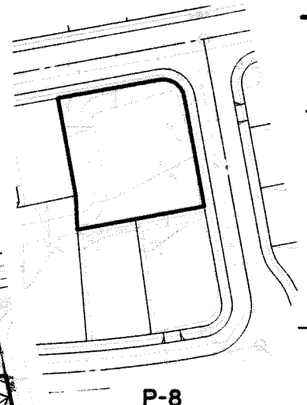

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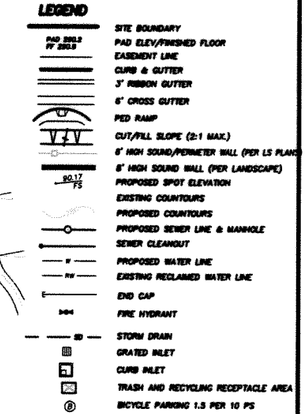

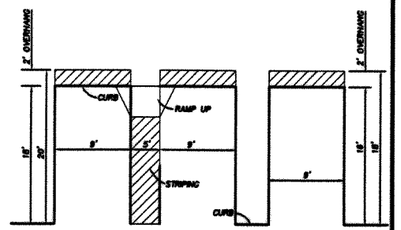

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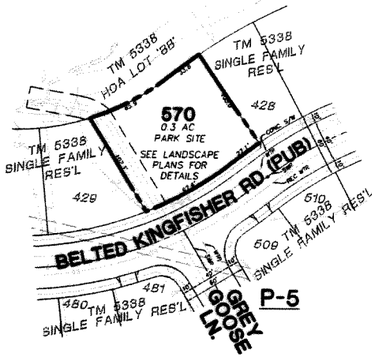

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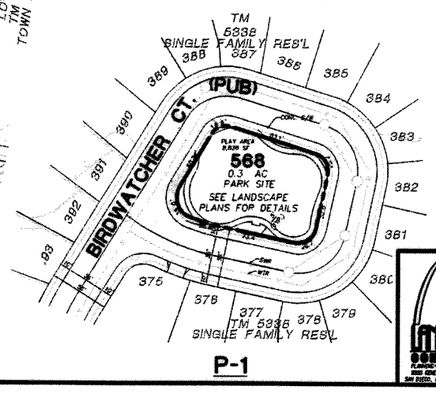
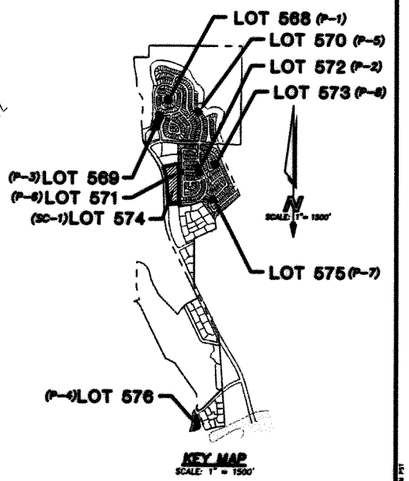
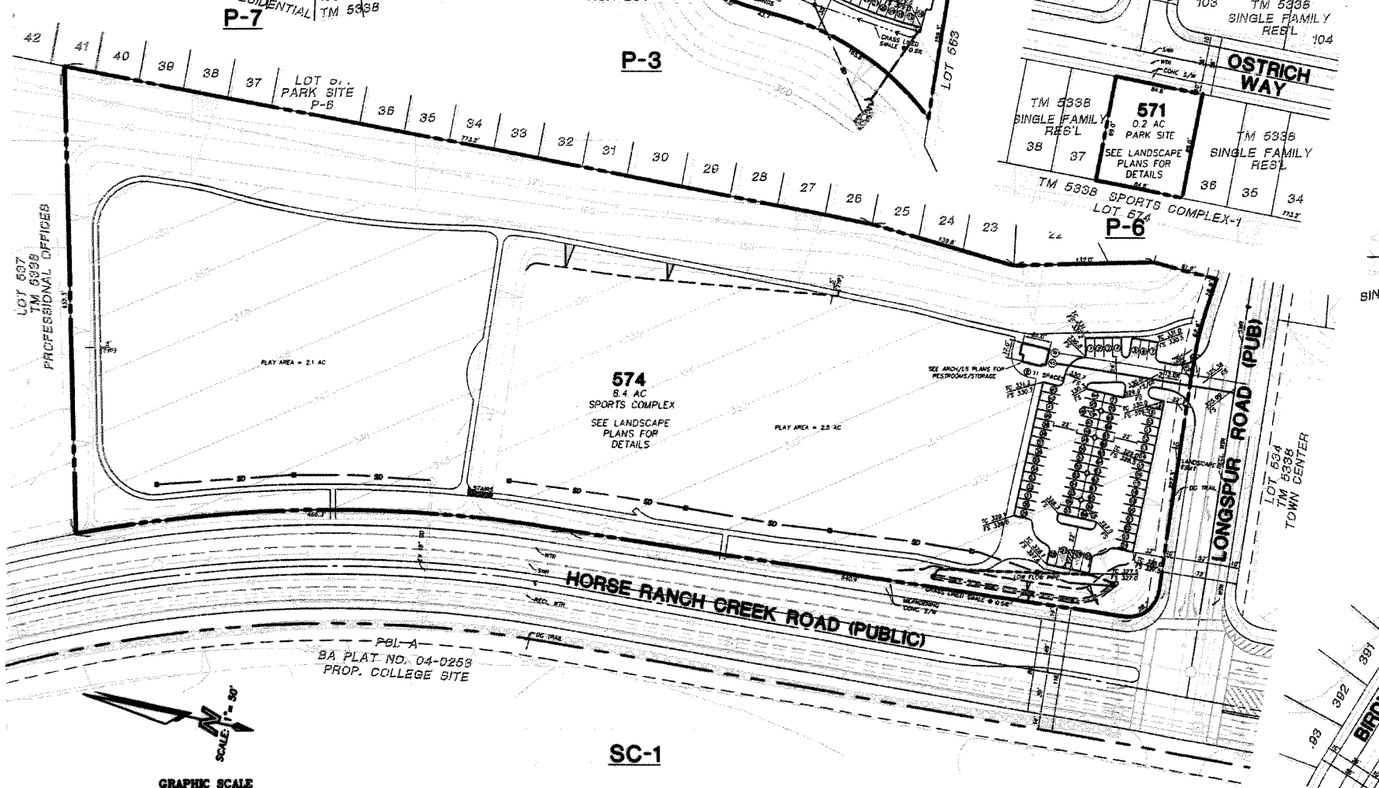


P-1

TYPICAL PARKING DIMENSIONS
NOT TO SCALE





SC-1

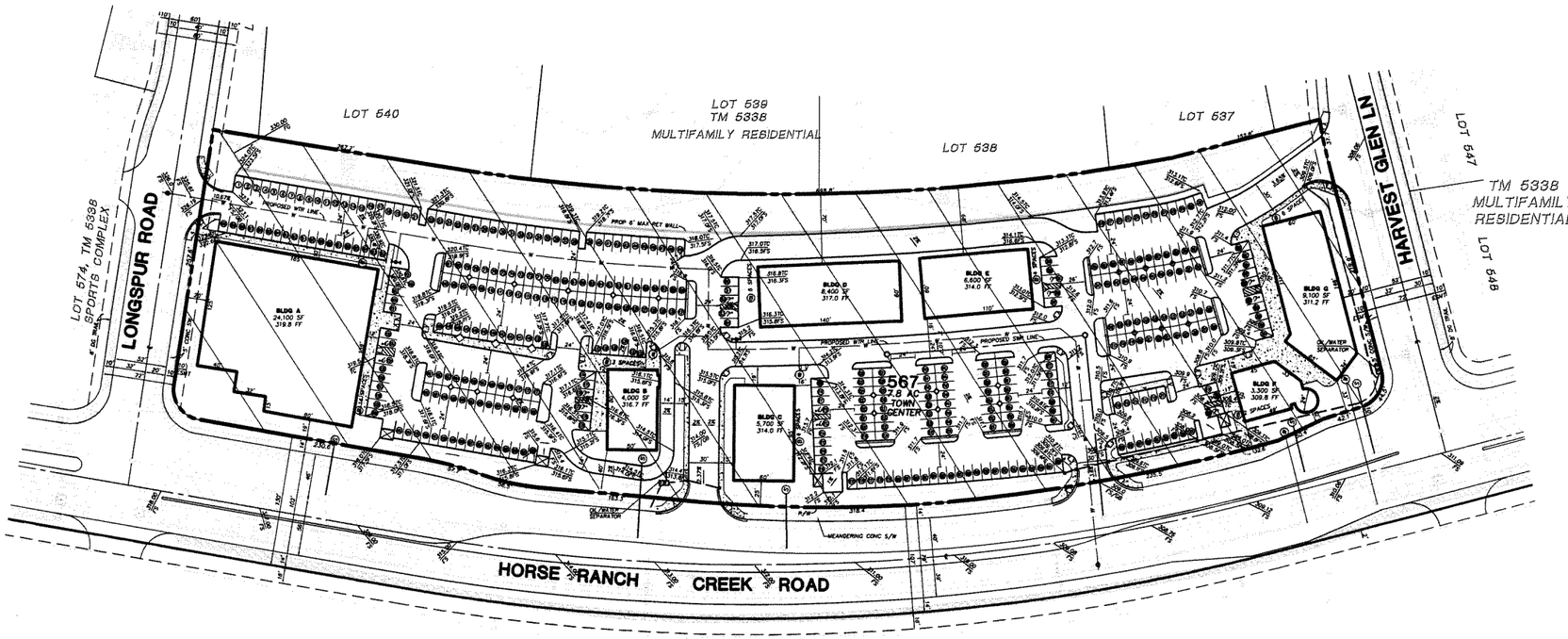
	COUNTY OF SAN DIEGO TRACT 5338 RPL 5
	VESTING SITE PLAN FOR
	CAMPUS PARK
	SPORTS COMPLEX/PARKS
	SHEET NO. 2 OF 10 SHEETS

COUNTY OF SAN DIEGO TRACT 5338 RPL-5

VESTING SITE PLAN

CAMPUS PARK

"B" DESIGNATOR SITE PLAN (S 07-031)



LEGEND

- SITE BOUNDARY
- PAD ELEV/FINISHED FLOOR
- EASEMENT LINE
- CURB & GUTTER
- 3' RIBBON GUTTER
- 6' CROSS GUTTER
- PED RAMP
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- PROPOSED SPOT ELEVATION
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- PROPOSED SEWER LINE & MANHOLE
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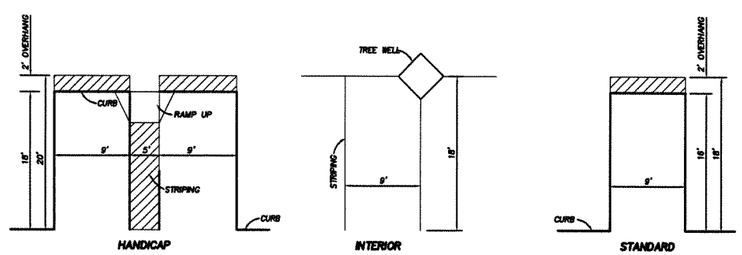
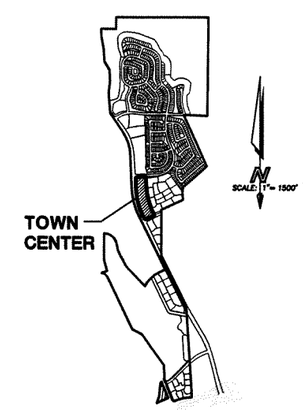
- PROPOSED WATER LINE
- PROPOSED RECLAIMED WATER LINE
- PROPOSED WATER SVC
- END CAP
- FIRE HYDRANT
- STORM DRAIN
- GRATED INLET
- CURB INLET
- PROPOSED BUILDING
- RETAINING WALL
- TRASH/RECYCLING AREA
- NO. OF PARKING SPACES
- BICYCLE PARKING 1 PER 10 PS - 41 SPACES TOTAL



TYPICAL PARKING DIMENSIONS
NOT TO SCALE



KEY MAP
SCALE: 1" = 1500'

LANDMARK CONSULTING
PLANNING-ENGINEERING-SURVEYING
5333 GENESEE AVE., SUITE 200
SAN DIEGO, CA 92121, (858)587.8070

COUNTY OF SAN DIEGO TRACT 5338 RPL 5
VESTING SITE PLAN FOR
CAMPUS PARK
TOWN CENTER
SHEET NO. 2 OF 10 SHEETS

ATTACHMENT C

RELEVANT MONITORING DATA

(NOTE: PROVIDE RELEVANT WATER QUALITY MONITORING DATA IF AVAILABLE.)

N/A

ATTACHMENT D

LID AND TREATMENT BMP LOCATION MAP

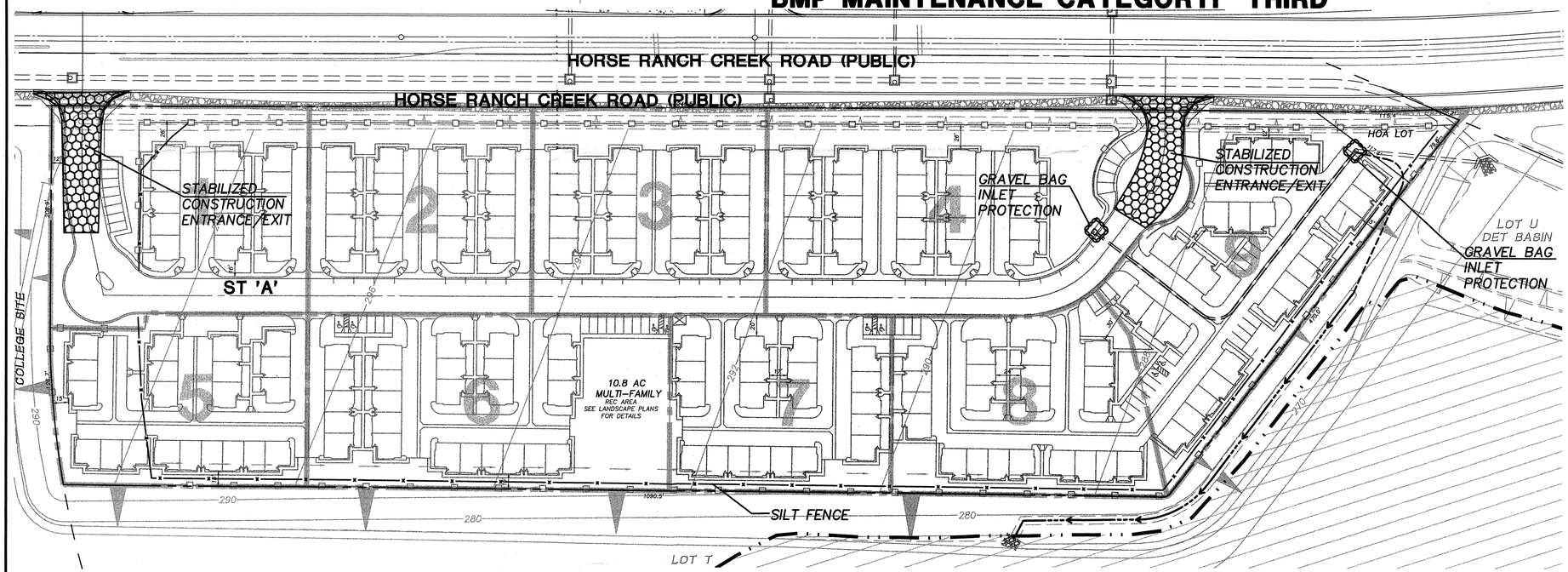
COUNTY OF SAN DIEGO TRACT 5338 RPL-6

BMP SITE PLAN

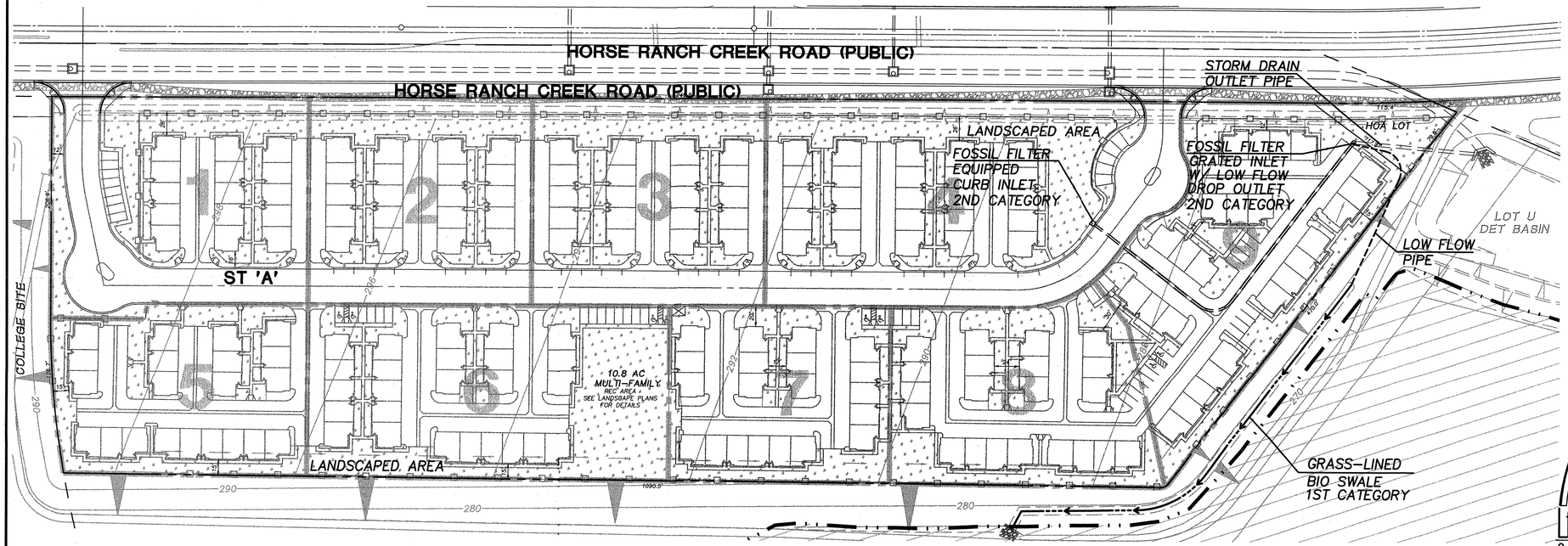
CAMPUS PARK

"B" DESIGNATOR SITE PLAN (STP 07-030)

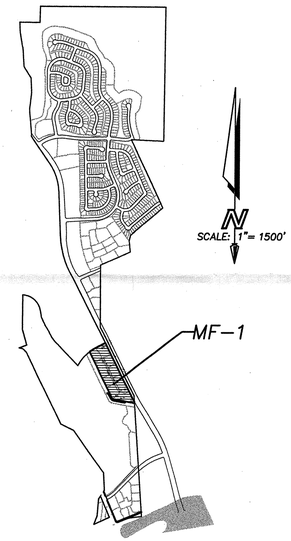
BMP MAINTENANCE CATEGORY: THIRD

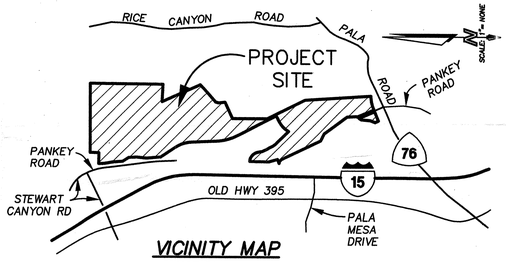


CONSTRUCTION BMP



POST-CONSTRUCTION (PERMANENT)





VICINITY MAP

NOT TO SCALE

LEGEND

- SITE BOUNDARY
- CURB & GUTTER
- 3' RIBBON GUTTER
- 6' CROSS GUTTER
- PED RAMP
- CUT/FILL SLOPE (2:1 MAX.)
- 100 YEAR FLOOD BOUNDARY
- 100 YEAR FLOOD AREA
- STORM DRAIN
- GRATED INLET
- CURB INLET

SCALE: 1" = 60'

0 15 30 45 60 120 180 240 300

SCALE: 1" = 60'

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COUNTY OF SAN DIEGO TRACT 5338 RPL 6

BMP SITE PLAN FOR

CAMPUS PARK

MULTI-FAMILY 1, MF1

SHEET NO. 1 OF 1 SHEET

J.N.: 6-14

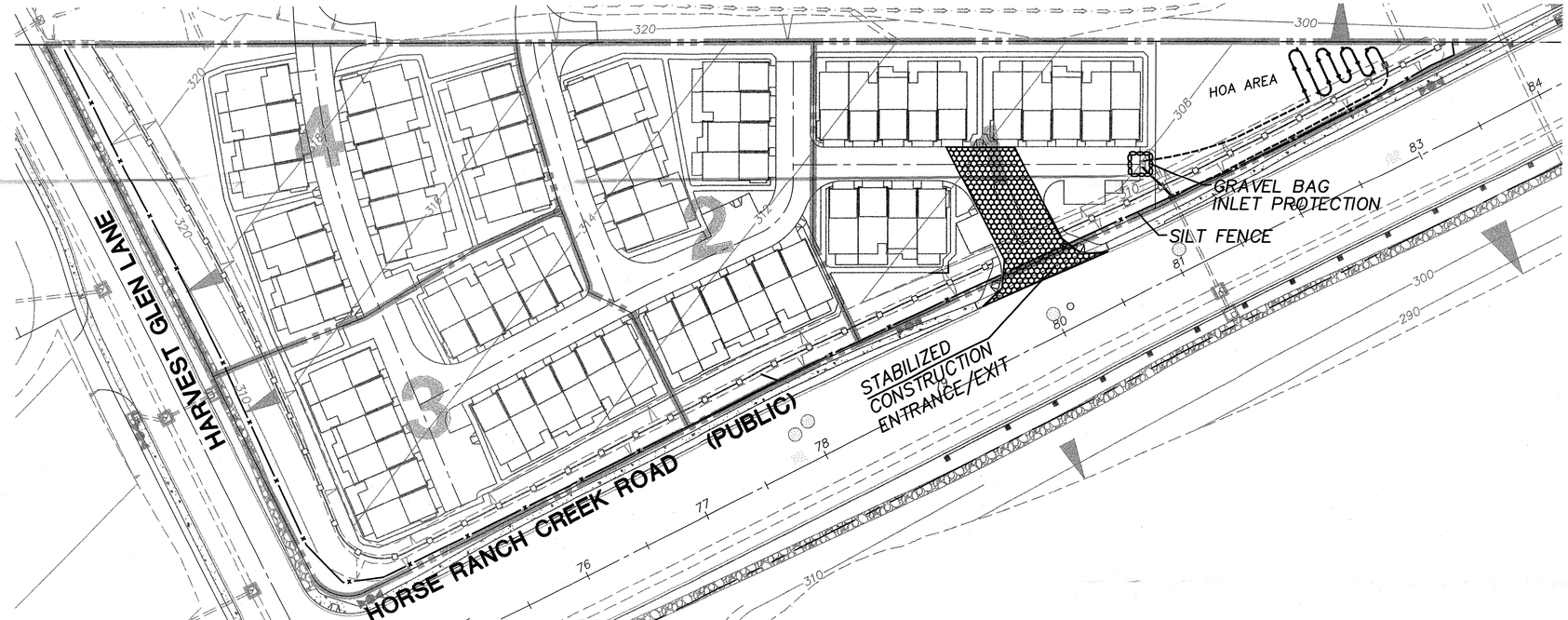
P:\06-14\swmp\MF-1bmp.dwg 3/4/2009 3:28:44 PM PST

COUNTY OF SAN DIEGO TRACT 5338 RPL-6

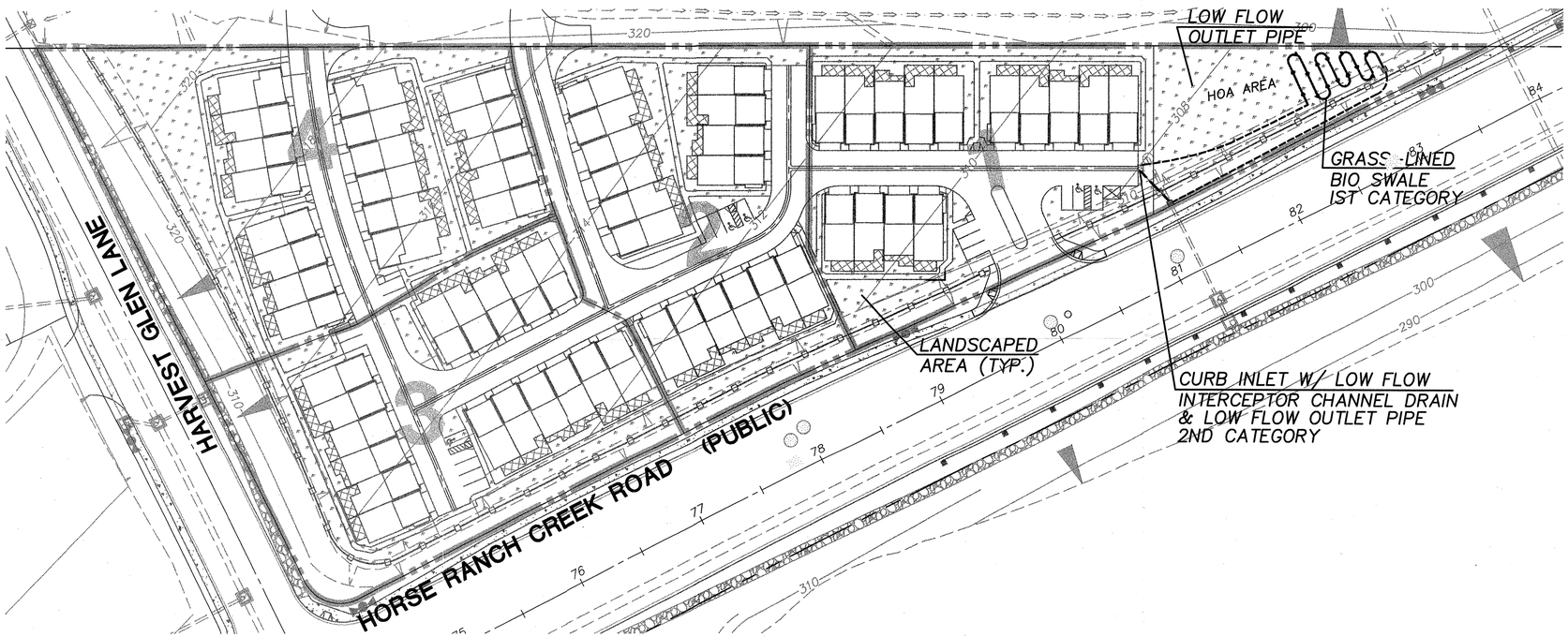
BMP SITE PLAN

CAMPUS PARK

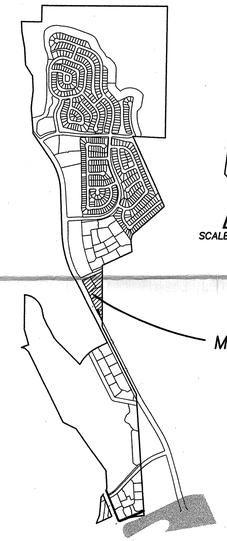
"B" DESIGNATOR SITE PLAN (STP 07-030)



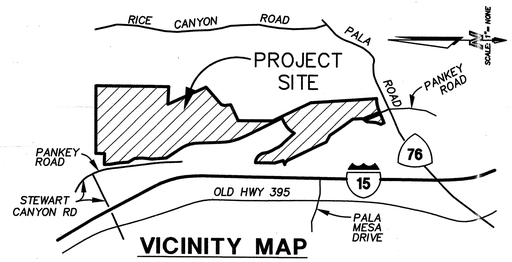
CONSTRUCTION BMP



POST CONSTRUCTION (PERMANENT) BMP



KEY MAP
SCALE: 1" = 1500'



VICINITY MAP
NOT TO SCALE

LEGEND

- SITE BOUNDARY
- CURB & GUTTER
- 3' RIBBON GUTTER
- 6' CROSS GUTTER
- PED RAMP
- CUT/FILL SLOPE (2:1 MAX.)
- 100 YEAR FLOOD BOUNDARY
- 100 YEAR FLOOD AREA
- PHASE LINE
- STORM DRAIN
- GRATED INLET
- CURB INLET
- STREET LIGHT

N
SCALE: 1" = 50'

0 50 100 150 200 250
SCALE: 1" = 50'

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COUNTY OF SAN DIEGO TRACT 5338 RPL 6
BMP SITE PLAN FOR
CAMPUS PARK

MULTI-FAMILY 2, MF2

SHEET NO. 1 OF 1 SHEET

J.N.: 6-14

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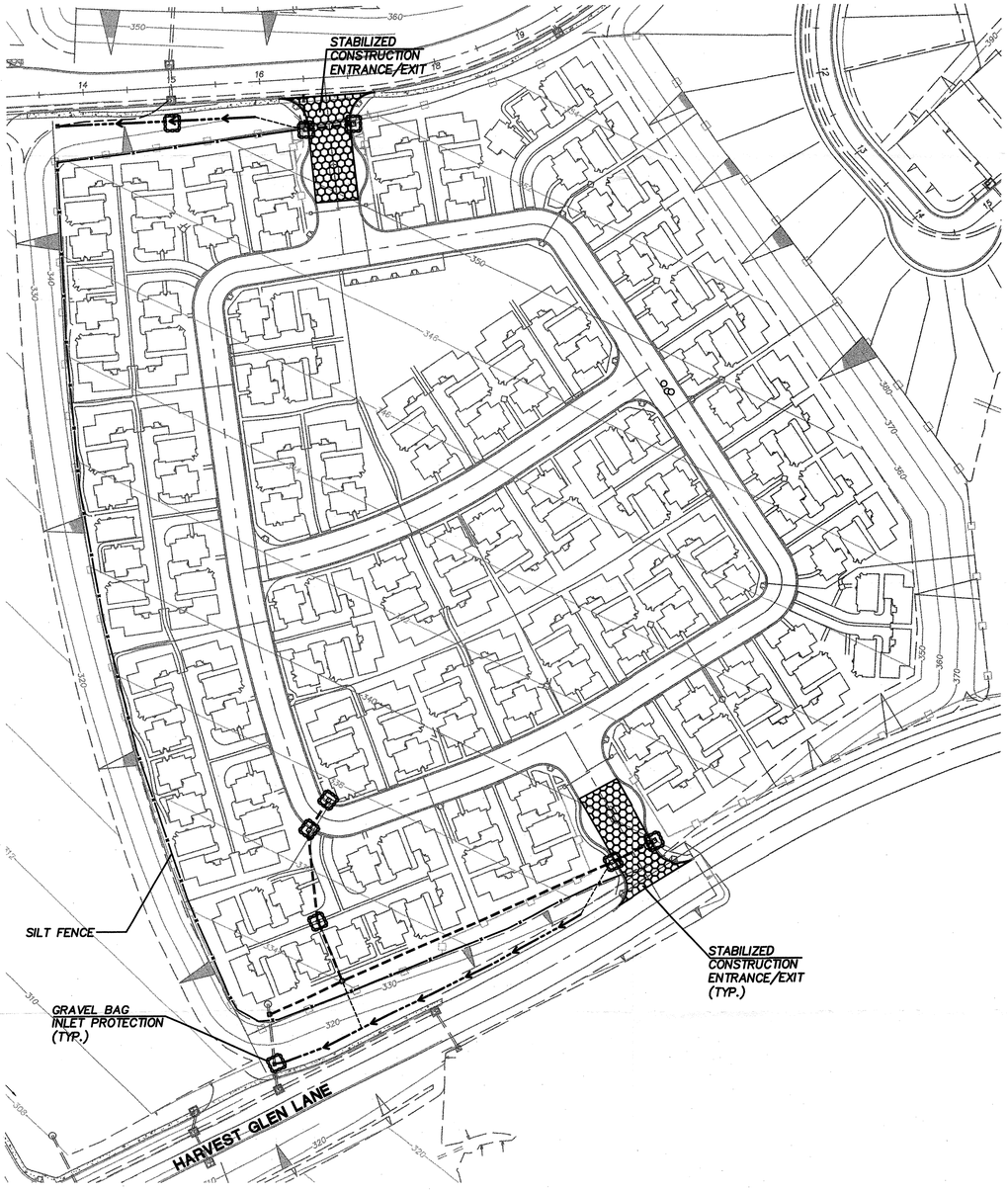
COUNTY OF SAN DIEGO TRACT 5338 RPL-6

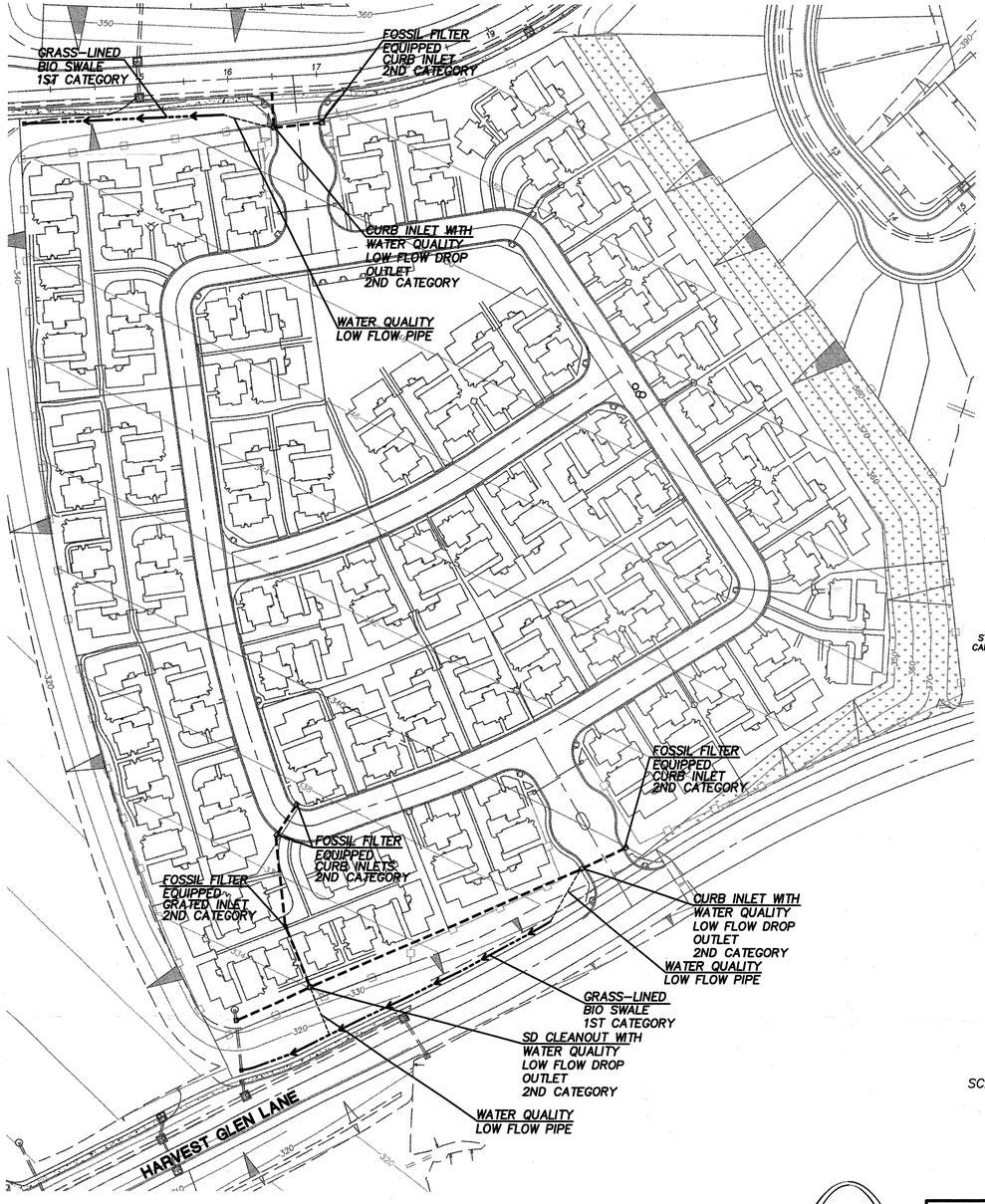
BMP SITE PLAN

CAMPUS PARK

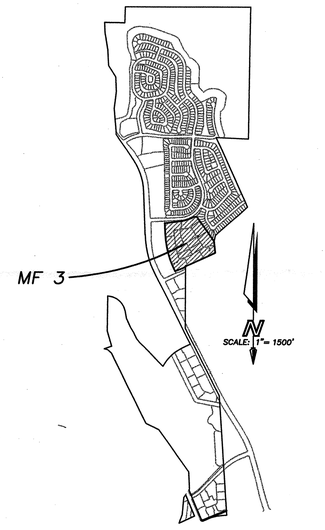
"B" DESIGNATOR SITE PLAN (STP 07-030)



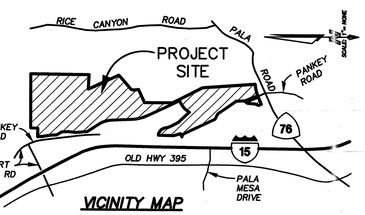
CONSTRUCTION BMP SITE PLAN



POST CONSTRUCTION (PERMANENT) BMP SITE PLAN



KEY MAP
SCALE: 1" = 500'



VICINITY MAP
NOT TO SCALE

LEGEND

- SITE BOUNDARY
- CURB & GUTTER
- 3' RIBBON GUTTER
- 6' CROSS GUTTER
- PED RAMP
- CUT/FILL SLOPE (2:1 MAX.)
- 100 YEAR FLOOD BOUNDARY
- 100 YEAR FLOOD AREA
- STORM DRAIN
- GRATED INLET
- CURB INLET

N
SCALE: 1"= 100'

0 100 200 300 400 500
SCALE: 1" = 100'

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COUNTY OF SAN DIEGO TRACT 5338 RPL 6
BMP SITE PLAN FOR
CAMPUS PARK

MULTI-FAMILY 3, MF3

SHEET NO. 1 OF 1 SHEET

J.N.: 6-14

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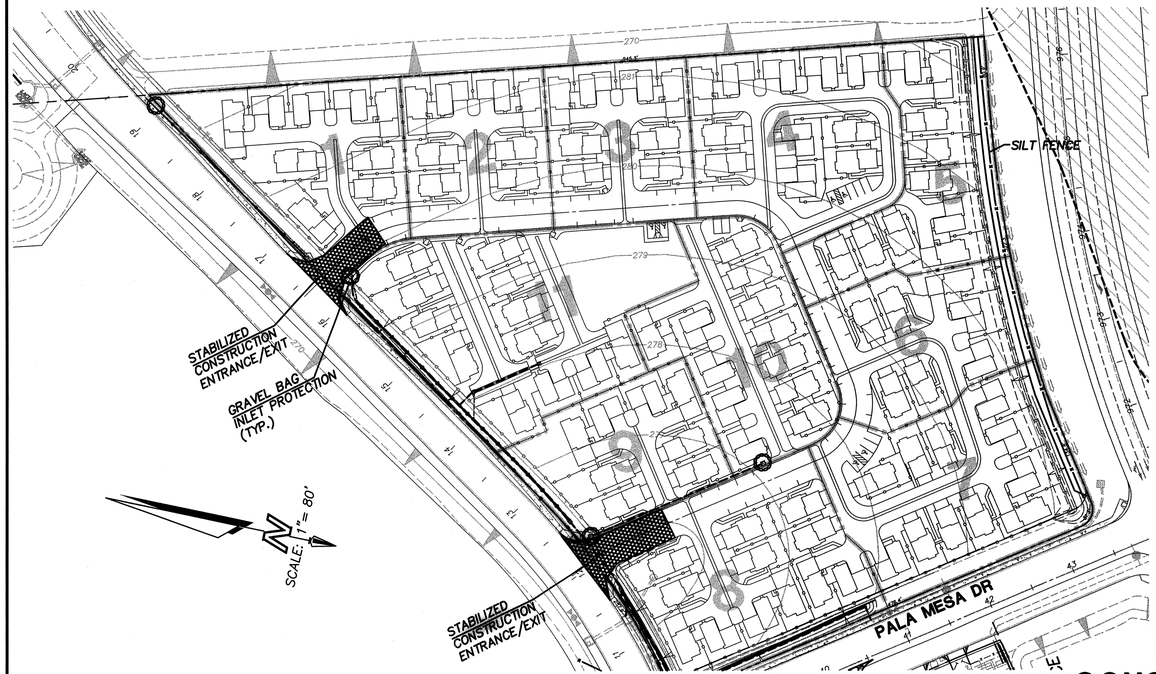
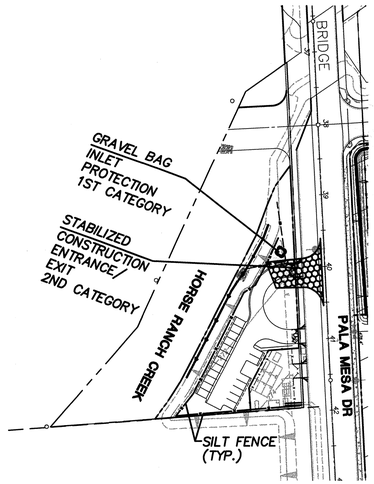
COUNTY OF SAN DIEGO TRACT 5338 RPL-6

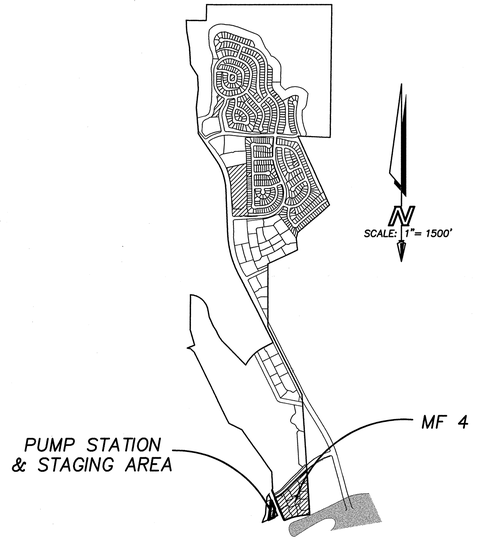
BMP SITE PLAN

CAMPUS PARK

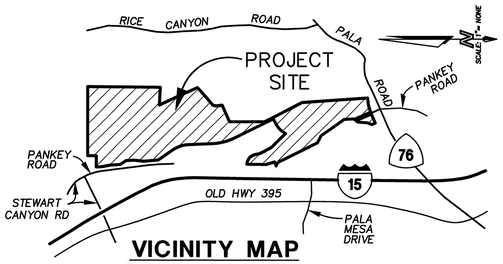
"B" DESIGNATOR SITE PLAN (STP 07-030)





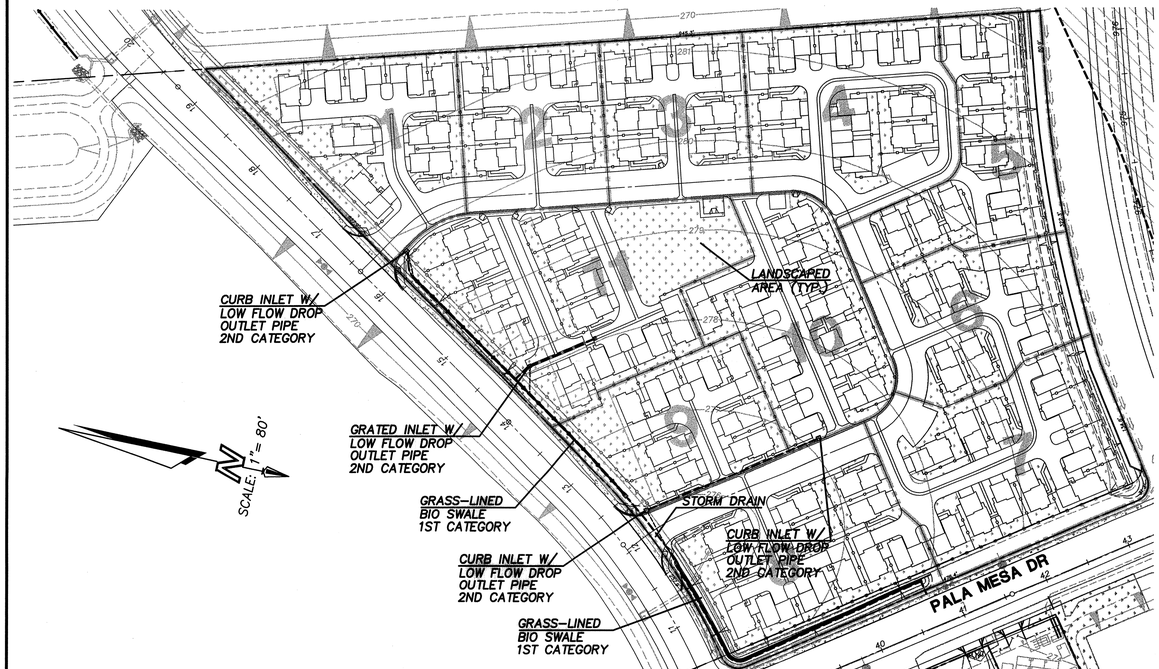


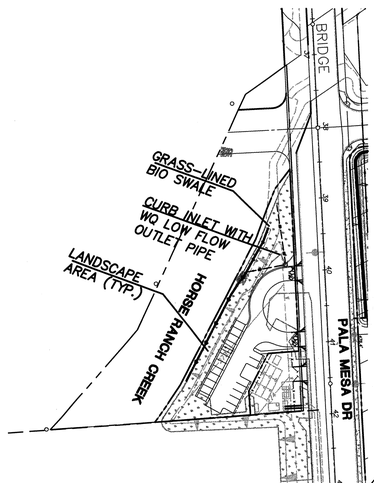
KEY MAP
SCALE: 1" = 1500'



VICINITY MAP
NOT TO SCALE

CONSTRUCTION BMP





LEGEND

- SITE BOUNDARY
- CURB & GUTTER
- 3' RIBBON GUTTER
- 6' CROSS GUTTER
- PED RAMP
- CUT/FILL SLOPE (2:1 MAX.)
- 100 YEAR FLOOD BOUNDARY
- 100 YEAR FLOOD AREA
- PHASE LINE
- STORM DRAIN
- GRATED INLET
- CURB INLET
- STREET LIGHT

SCALE: 1" = 80'

0 50 100 150 200 250

SCALE: 1" = 50'

POST CONSTRUCTION (PERMANENT) BMP

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COUNTY OF SAN DIEGO TRACT 5338 RPL 6
BMP SITE PLAN FOR
CAMPUS PARK
MULTI-FAMILY 4, MF4
PUMP STATION & STAGING AREA
SHEET NO. 1 OF 1 SHEET

J.N.: 6-14

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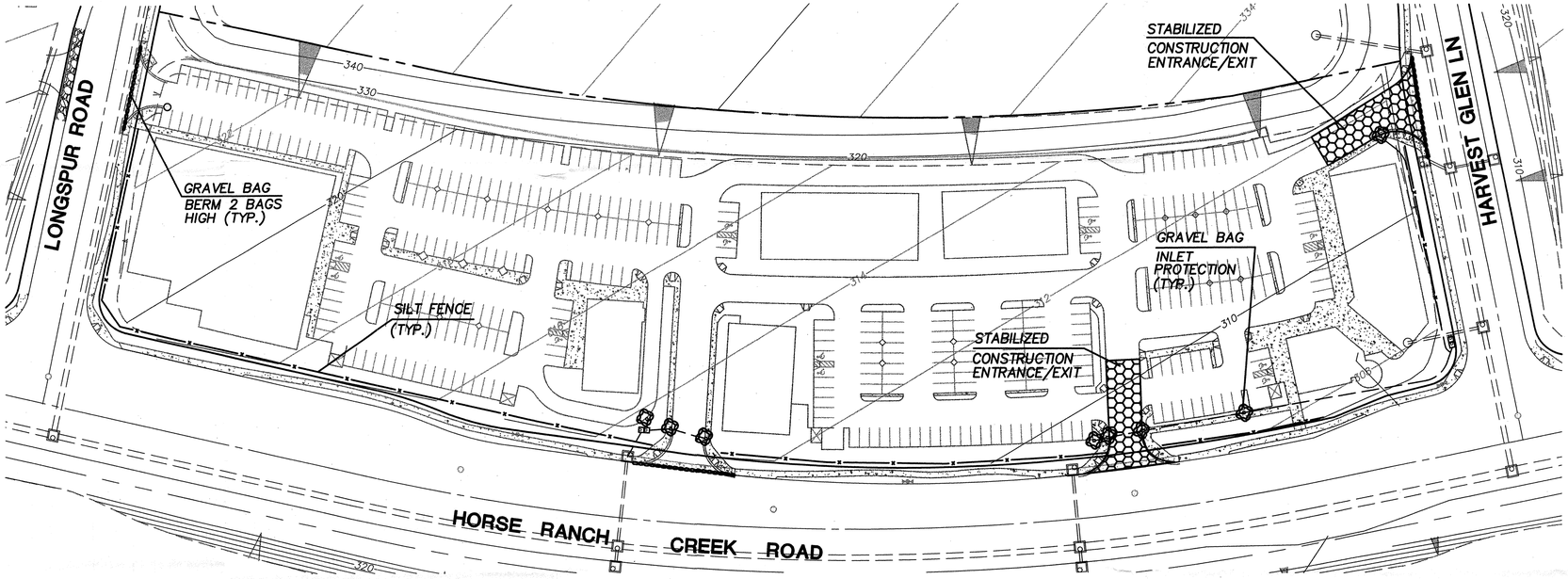
COUNTY OF SAN DIEGO TRACT 5338 RPL-6

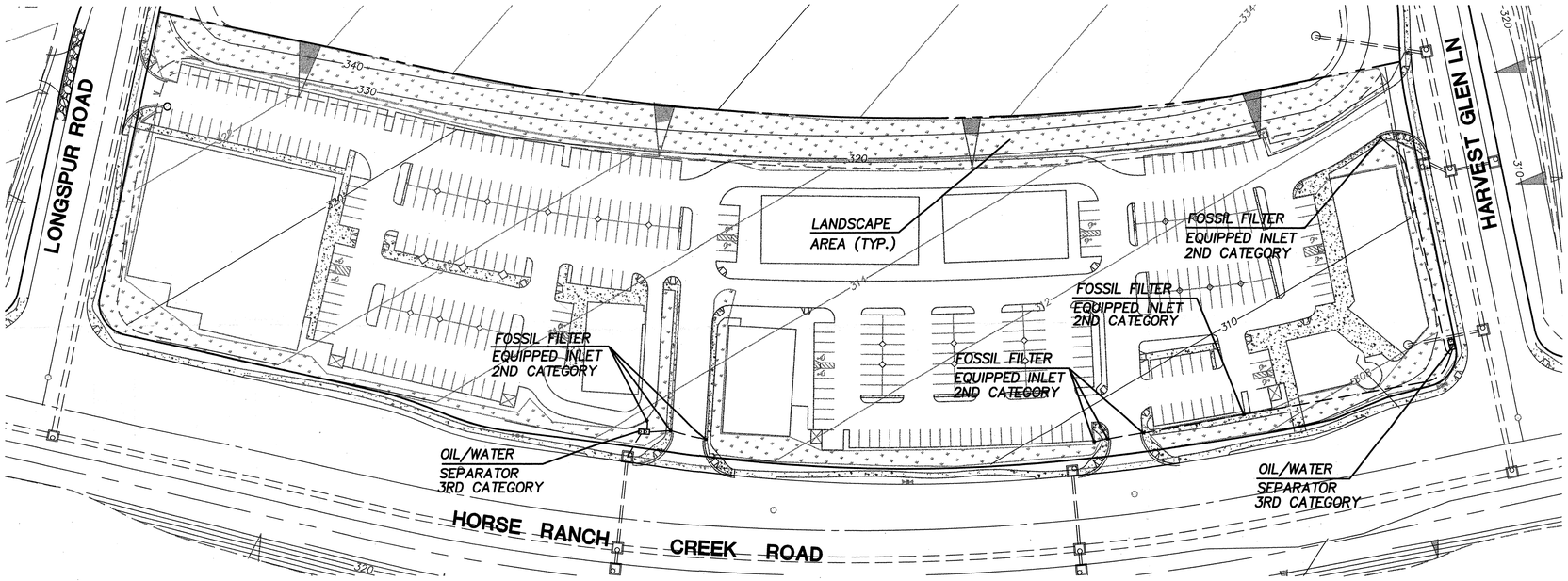
BMP SITE PLAN

CAMPUS PARK

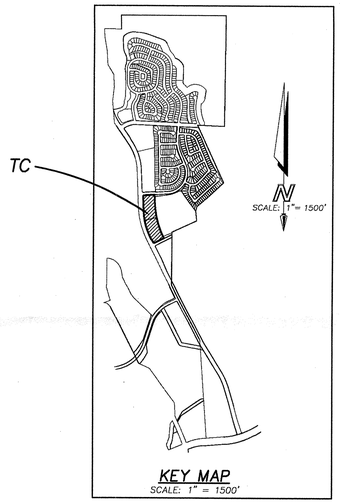
"B" DESIGNATOR SITE PLAN (STP 07-030)

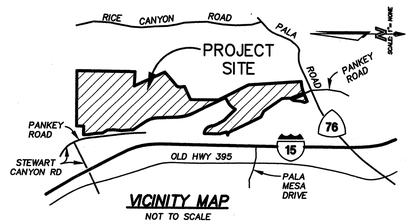


CONSTRUCTION BMP SITE PLAN



POST CONSTRUCTION (PERMANENT) BMP SITE PLAN





LEGEND

- SITE BOUNDARY
- CURB & GUTTER
- 3' RIBBON GUTTER
- 10' CROSS GUTTER
- PED RAMP
- CUT/FILL SLOPE (2:1 MAX.)
- STORM DRAIN
- GRATED INLET
- CURB INLET
- PROPOSED BUILDING
- TRASH ENCLOSURE

N SCALE: 1" = 100'

0 100 200 300 400 500

SCALE: 1" = 100'

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COUNTY OF SAN DIEGO TRACT 5338 RPL 6

BMP SITE PLAN FOR

CAMPUS PARK

TOWN CENTER, TC

SHEET NO. 1 OF 1 SHEET

J.N.: 6-14

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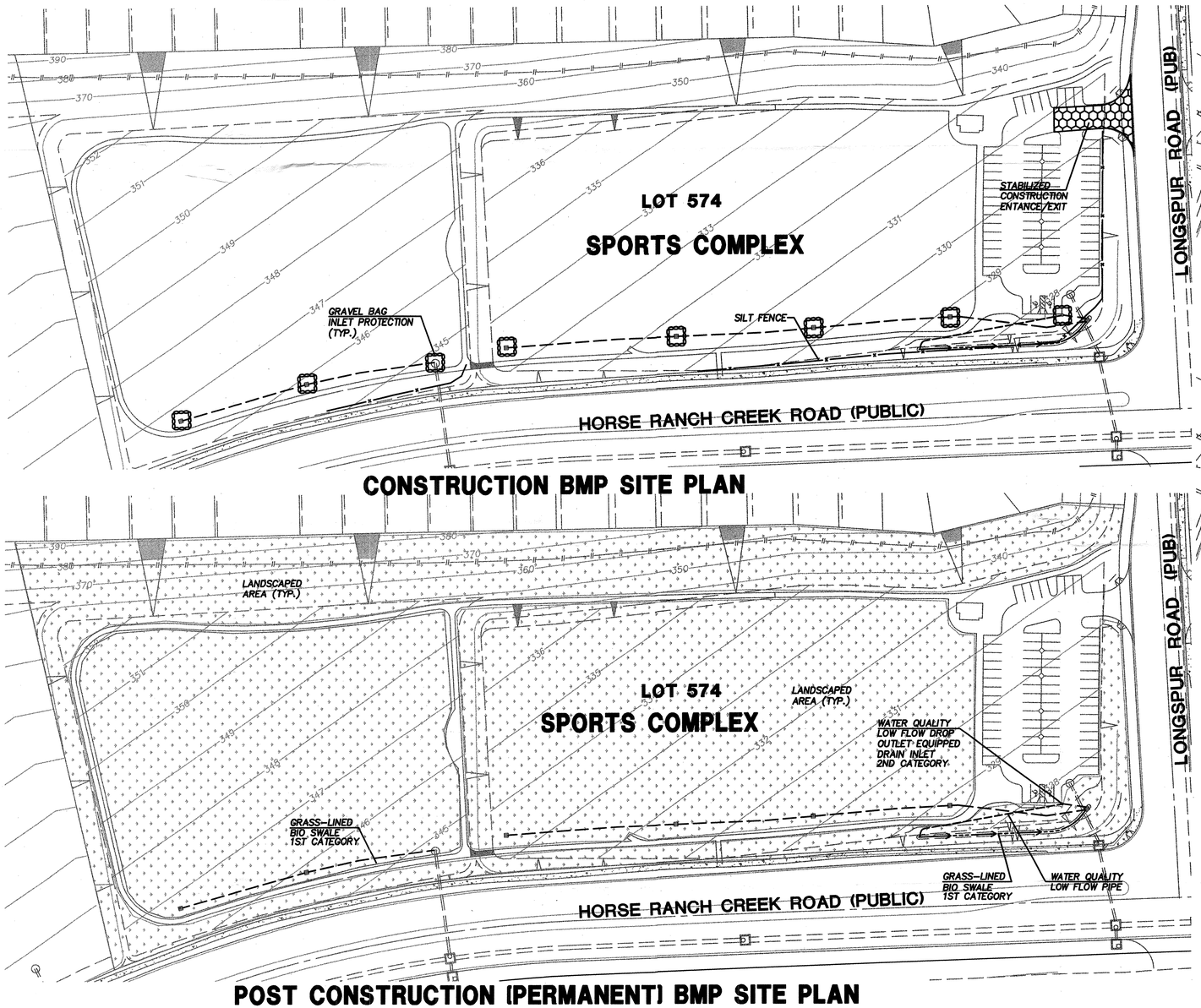
COUNTY OF SAN DIEGO TRACT 5338 RPL-6

BMP SITE PLAN

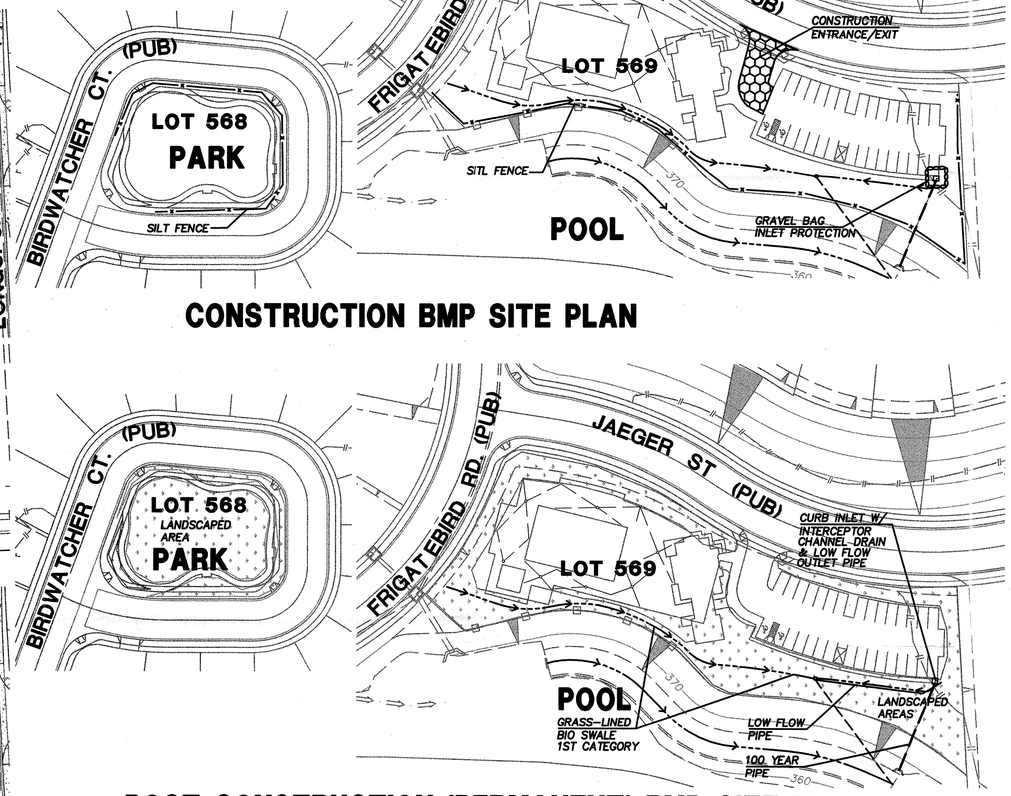
CAMPUS PARK

"B" DESIGNATOR SITE PLAN (STP 07-030)



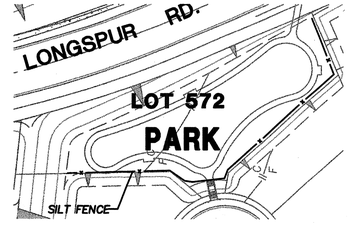
CONSTRUCTION BMP SITE PLAN

POST CONSTRUCTION (PERMANENT) BMP SITE PLAN

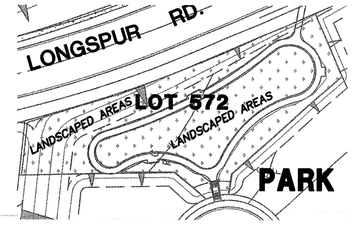


CONSTRUCTION BMP SITE PLAN

POST CONSTRUCTION (PERMANENT) BMP SITE PLAN



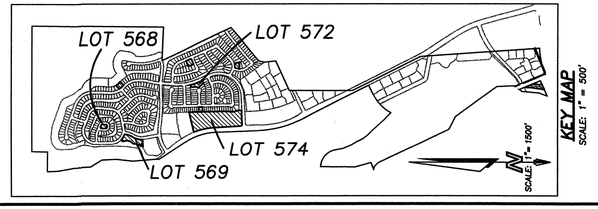
CONSTRUCTION BMP SITE PLAN

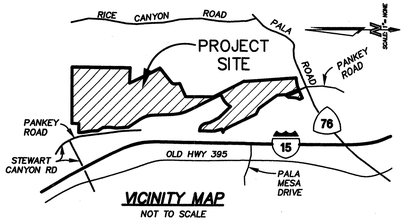


POST CONSTRUCTION (PERMANENT) BMP SITE PLAN

LEGEND

- SITE BOUNDARY
- CURB & GUTTER
- 3' RIBBON GUTTER
- 6' CROSS GUTTER
- PED RAMP
- CUT/FILL SLOPE (2:1 MAX.)
- STORM DRAIN
- GRATED INLET
- CURB INLET





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COUNTY OF SAN DIEGO TRACT 5338 RPL 6
BMP SITE PLAN FOR
CAMPUS PARK

SPORTS COMPLEX AND PARKS

SHEET NO. 1 OF 1 SHEET

J.N.: 6-14

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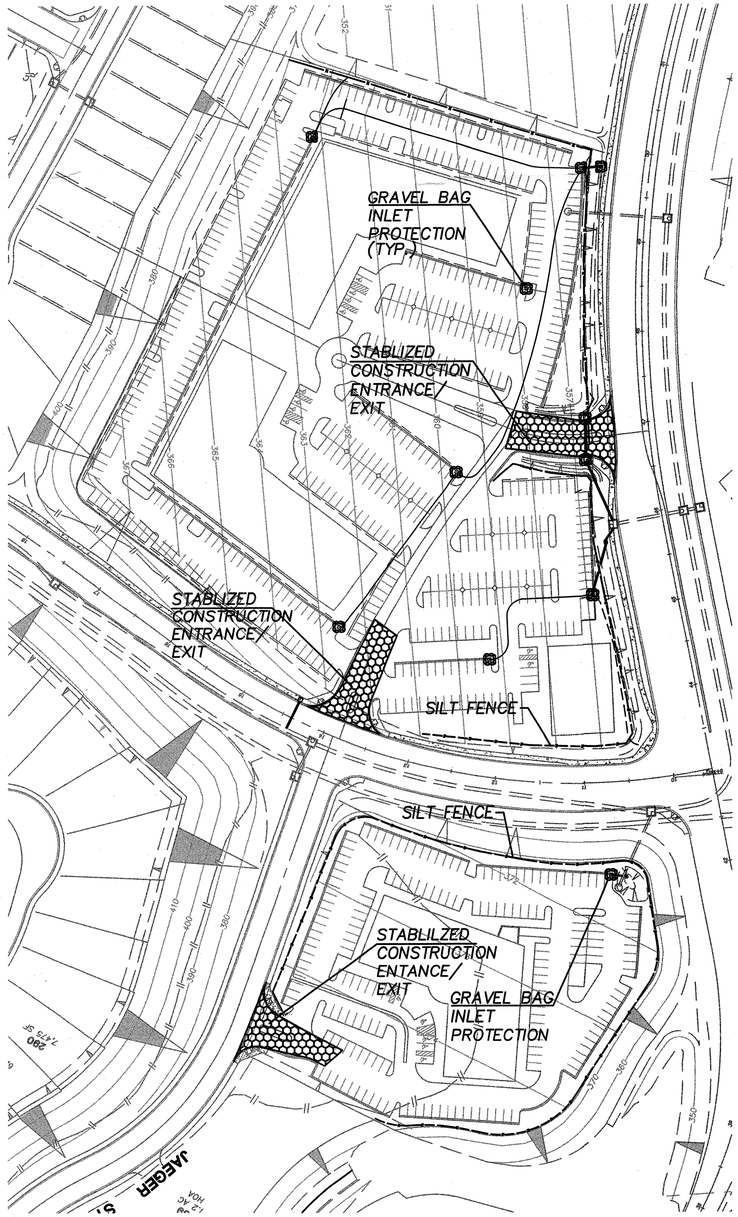
COUNTY OF SAN DIEGO TRACT 5338 RPL-6

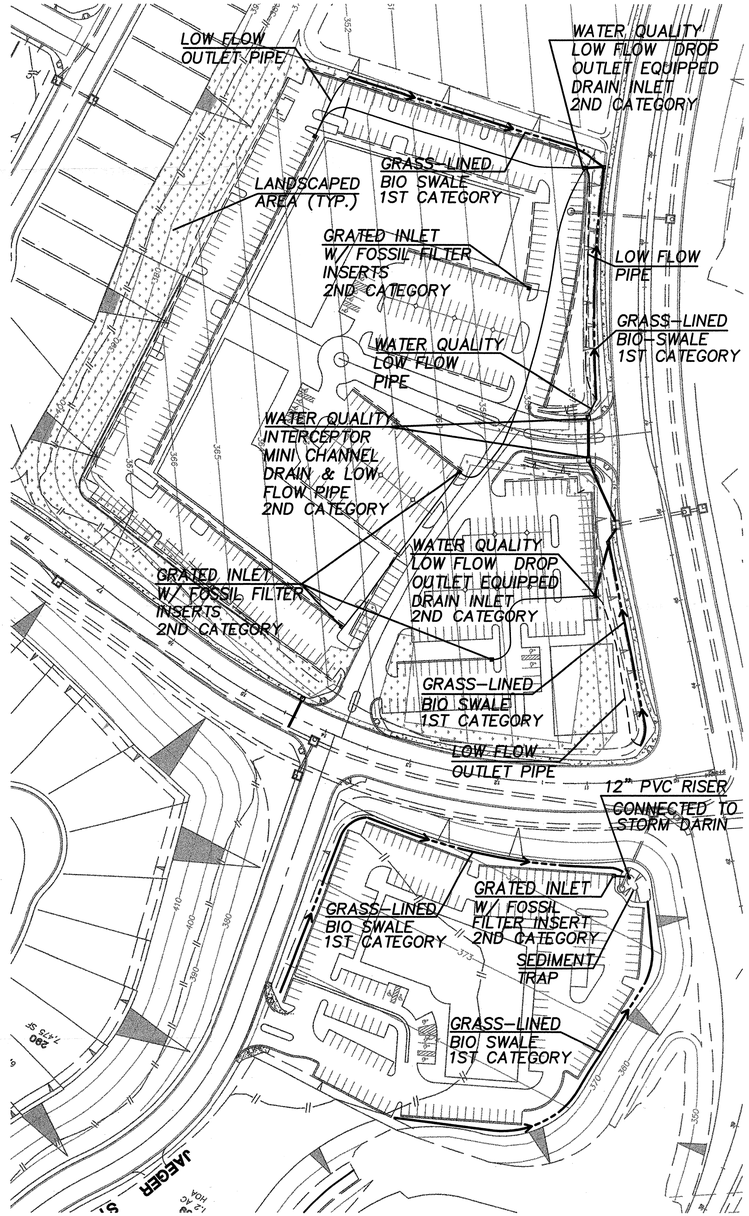
BMP SITE PLAN

CAMPUS PARK

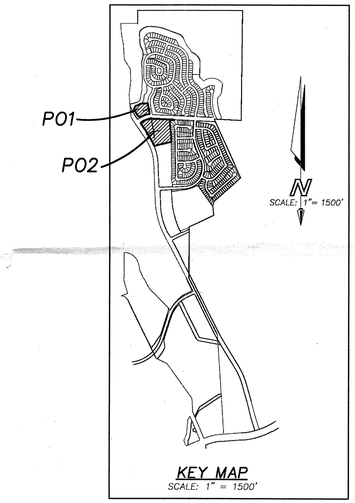
"B" DESIGNATOR SITE PLAN (STP 07-030)



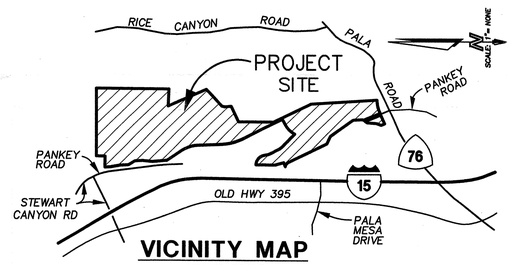
CONSTRUCTION BMP SITE PLAN



POST CONSTRUCTION (PERMANENT) BMP SITE PLAN



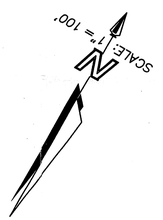
KEY MAP
SCALE: 1" = 1500'



VICINITY MAP
NOT TO SCALE

LEGEND

- SITE BOUNDARY
- CURB & GUTTER
- 3' RIBBON GUTTER
- 6' CROSS GUTTER
- PED RAMP
- CUT/FILL SLOPE (2:1 MAX.)
- STORM DRAIN
- GRATED INLET
- CURB INLET
- PROPOSED BUILDING
- TRASH ENCLOSURE



0 100 200 300 400 500

SCALE: 1" = 100'

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5555 GENESEE AVENUE, STE. 200
SAN DIEGO, CA 92121, 858.587.8070

COUNTY OF SAN DIEGO TRACT 5338 RPL 6
BMP SITE PLAN FOR
CAMPUS PARK
PROFESSIONAL OFFICE
PO1 & PO2

SHEET NO. 1 OF 1 SHEET

J.N.: 6-14

F:\06-14\swmp\PO-BMP.dwg 3/5/2009 11:04:54 AM PST

ATTACHMENT E

TREATMENT BMP DATASHEET

*(**NOTE:** POSSIBLE SOURCE FOR DATASHEETS CAN BE FOUND AT WWW.CABMPHANDBOOKS.COM. INCLUDE ENGINEERING CALCULATIONS FOR SIZING THE TREATMENT BMP.)*

FOSSIL FILTER INSERTS

E-Mail Suntree | Order Catalog | Home Page | Next Page

Features
Functional Description
Installation
Flow Rate
Drawings

Grate Inlet Skimmer Box

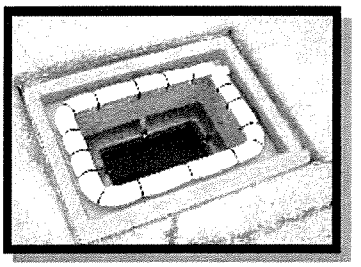
Grated Inlet Stormwater Treatment System

Since 1993

Built Strong To Last!

Engineered To Be Permanent Infrastructure





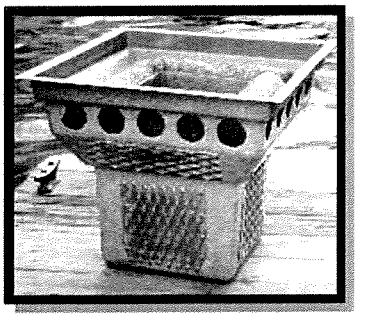
Installs Quickly

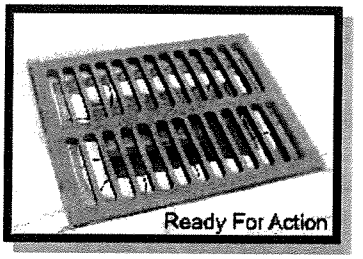
Step 1: **Remove the grate.**

Step 2: **Drop in the filter.**

Step 3: **Replace the grate.**

Custom Sizes... No Problem





Great For Retrofits...
Will Not Impede The Original Designed Flow Of The Inlet

E-Mail Suntree | Order Catalog | Home Page | Next Page

E-Mail Suntree | Order Catalog | Home Page | Previous Page | Next Page

Features
Functional Description
Installation
Flow Rate
Drawings

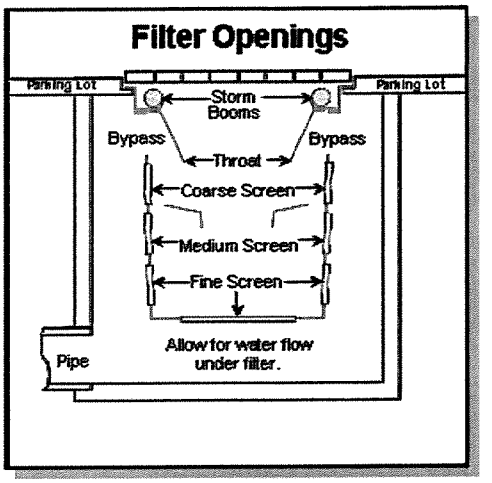
Grate Inlet Skimmer Box

Sizing and Flow Rates

Although certain sizes are recommended, The *Grate Inlet Skimmer Box* can be sized to fit any size inlet.

Custom Sizes No Problem

The **maximum flow rate** of a *Grate Inlet Skimmer Box* is determined by the amount of flow that can pass through the throat, the exception is found only in very large units



To determine the **minimum flow rate** of a *Grate Inlet Skimmer Box*, consider only the potential flow through the throat and bypass. If the potential flow through the throat is less than the potential flow through the bypass, then the then the throat determines the minimum flow. If the potential water flow through the bypass is less than that of the throat, then the bypass determines the minimum flow.

The table below represents the flow rates of 8 different sizes of Grate Inlet Skimmer Box.

Filtered Flow represents the potential flow rate through all screens, and does not include the potential flow through the bypass. Water flow through the bypass happens only when the flow rate through the grate exceeds the flow rate through all the screens.

Flow Rate Table						
	Dimensions of the flange around the top of the Grate Inlet Skimmer Box			Flow Rate (cubic feet per second)		
Model Number	Width (inches)	Length (inches)	Depth (inches)	Throat	Filtered Flow	Bypass Flow
GISB-I-24-24-25	24	24	25	4.4	14.9	6.7
GISB-A-24-37-25	24	37	25	10.2	21.1	8.7
GISB-C-28-37-25	28	37	25	12.2	19.4	7.4
GISB-J-24-41-25	24	41	25	12	24.6	10
GISB-NK-32-32-25	32	32	25	12.5	19.1	10.3
GISB-36-36-25	36	36	25	18.8	23.4	13.4
GISB-D-36-48-18	36	48	18	33.2	26.3	13.3
GISB-G-52-58-18	52	58	18	89.3	40.1	25
♦ The yellow blocks represent the minimum flow rates. ♦ Filtered flow is based on unobstructed screens.						

Drawings and flow specifications for any size Grate Inlet Skimmer Box is available upon request.

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Grate Inlet Skimmer Box

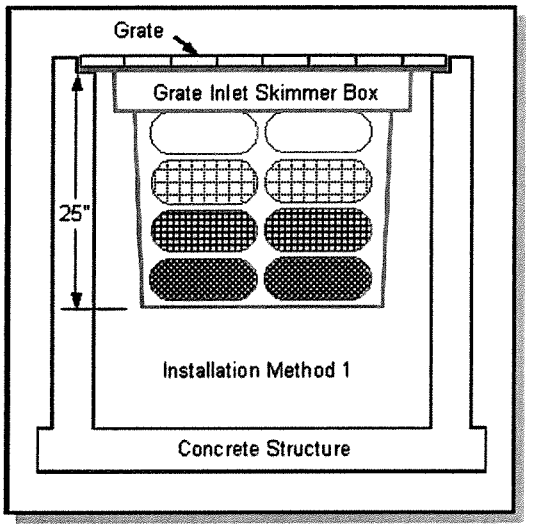
Installation

Although certain sizes are recommended, The *Grate Inlet Skimmer Box* can be sized to fit any size inlet.

Can Be Sized To Fit Any Inlet

Installation Method 1

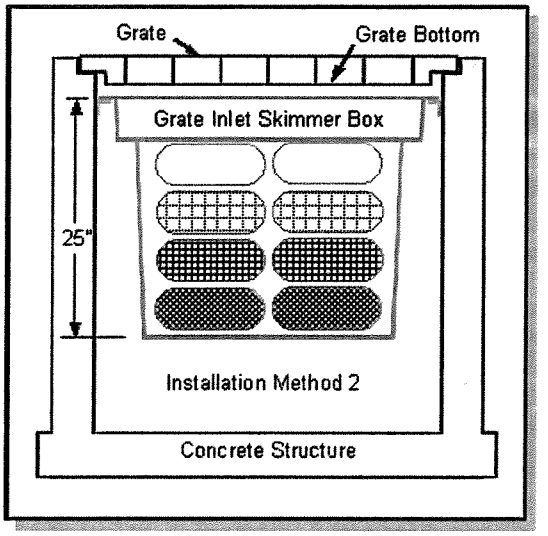
- Remove the grate.
- Place the *Grate Inlet Skimmer Box* into the catchbasin so that it rests on the same landing as the grate.
- Replace the grate so that the flange around the top of the *Grate Inlet Skimmer Box* is sandwiched between the grate and the landing.



A second method of installing a *Grate Inlet Skimmer Box* involves the use of an aluminum landing kit which is supplied separately. This method is used for installing larger units, and in catchbasins fitted with extra thick grates.

Installation Method 2

- Remove the grate.
- Attach the aluminum landing kit



to the catchbasin wall 2" below the grate bottom.

- Place the *Grate Inlet Skimmer Box* into the catchbasin so that it rests on the aluminum landing kit.
- Replace the grate.

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Grate Inlet Skimmer Box

Captured Debris

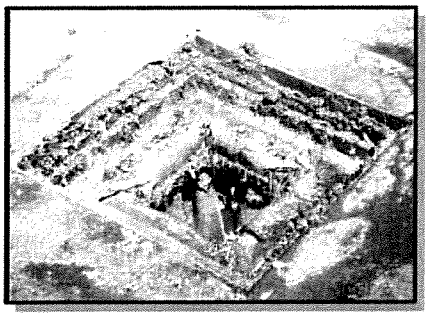
The Challenge...

Take On The Toughest Inlets...

Capture & Keep The Debris...

Keep The Inlet Flowing!

The picture to the right shows an inlet with a ***Grate Inlet Skimmer Box*** immediately after the grate was removed, just 45 days after it was installed. Because this inlet is adjacent to a wash down area, it experiences a simulated storm event everyday. The filter is full to capacity and has been operating in bypass mode for some time.

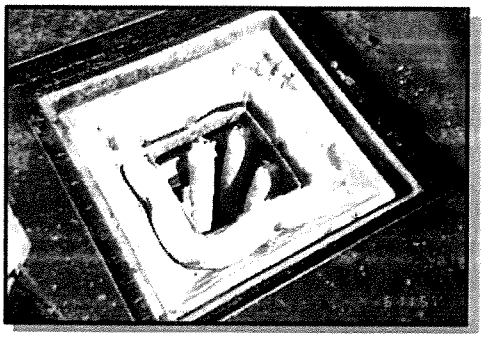




The picture to the left shows the ***Grate Inlet Skimmer Box*** immediately after the removal of booms and skimmer tray. Notice the bypass openings around the top are completely unobstructed. The filter is full to capacity and is operating bypass mode. Because this inlet experiences an extra heavy hydrocarbon pollutant load it is fitted with extra ***Storm Booms***.

Stainless Steel Screens are easily cleaned to restore the original unobstructed flow rates to the Grate Inlet Skimmer Box

Although the inlet is relatively small with a grate that measures 24" x 24", debris weighing 232 pounds with a volume of 78 quarts was removed during this servicing. To the right is a photo of the same ***Grate Inlet Skimmer Box*** after being serviced.



Ready For The Next Storm Event!

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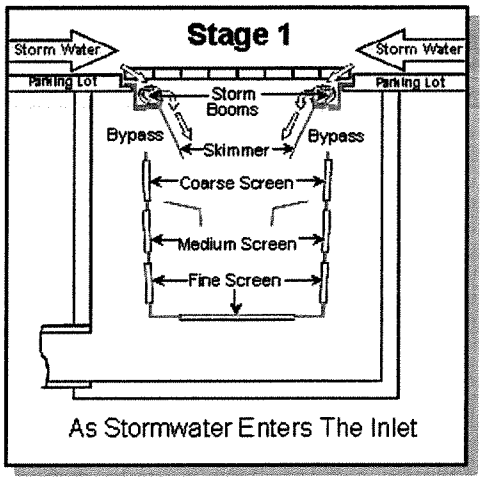
Grate Inlet Skimmer Box

Functional Description

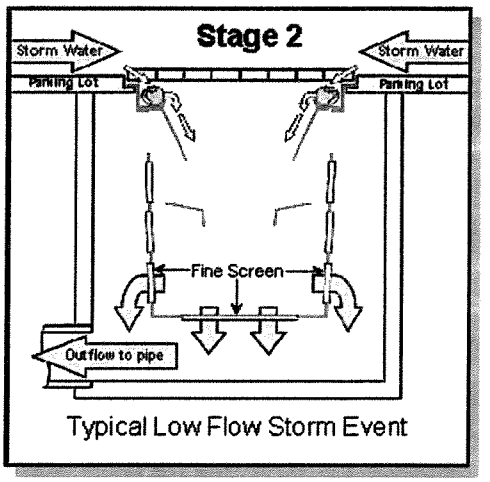
Multi-Stage Filtration Utilizes Screens Of Different Sieve Sizes Optimize Filtration And Water Flow

Stage 1: As stormwater enters the inlet through the grate it comes in contact with and passes through a ***Storm Boom*** located around the top perimeter of the ***Grate Inlet Skimmer Box***. After making contact with the ***Storm Boom***, the stormwater flows down into the lower filtration chamber which is equipped with 3 different sieve size filtration screens and bypass openings.

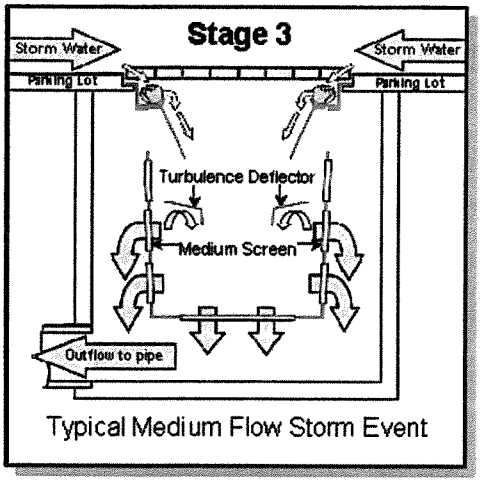


As Stormwater Enters The Inlet

Stage 2: Throughout the entire storm event, stormwater continues to come in contact with the ***Storm Boom*** and then flow into the lower filtration chamber, adjacent to the fine sieve size screens. The fines sieve size screens are sized to be able to capture sediment such as sand, clay, phosphates, etc. A sand filter quickly forms across the bottom which has the potential to capture the finest of particles.

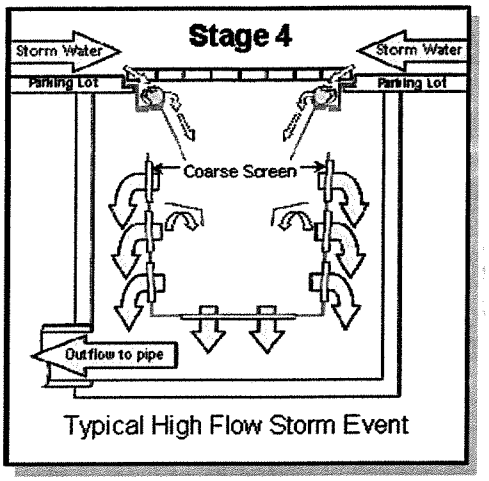


Stage 3: As the storm event increases in intensity the water level in the ***Grate Inlet Skimmer box*** rises to a level adjacent to the medium sieve size screens and the ***turbulence deflector***. The medium screen provides additional flow with less chance of obstruction than the fine screen. The ***turbulence deflector*** dramatically reduces the turbulence in the lower filtration chamber, which allows sediment to continue to settle, without re-suspending sediment that has previously been captured.



Stage 4: As the storm event increases in intensity to that of high flow storm event, the water level in the ***Grate Inlet Skimmer box*** rises to a level adjacent to the coarse sieve size screens above ***turbulence deflector***.

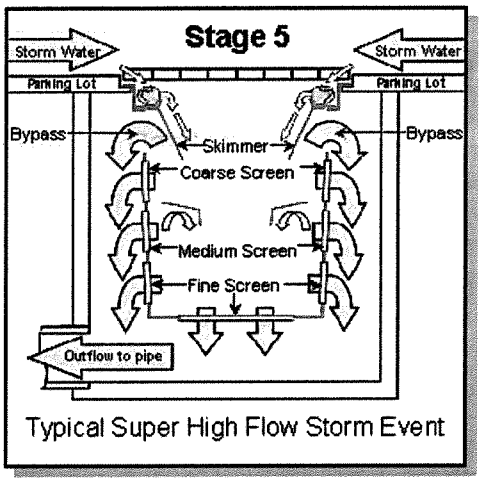
The coarse screen provides yet more additional filtered flow with less chance for obstruction than either the medium or fine screen. The coarse screen is sized to capture floatables like foliage and litter. At this stage water is flowing through all the different sieve size screens, the ***turbulence deflector***



Typical High Flow Storm Event

continues to dramatically reduce the turbulence in the lower filtration chamber, and sediment continues to settle and collect toward the bottom.

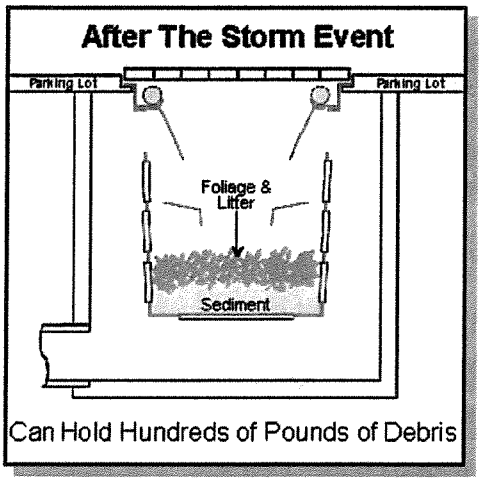
Stage 5: If the storm event creates an extremely high flow rate into the inlet which exceeds the flow through all the screens, the water flow can bypass the filtration screens through skimmer protected bypass openings near the top of the ***Grate Inlet Skimmer Box***. As water flows through the bypass openings, it also continues to flow through all the other screens. Storm events that produce such high flow rates are rare and typically don't last very long.



Typical Super High Flow Storm Event

Drains Dry After Storm

After The Storm Event: The stormwater drains completely out of the ***Grate Inlet Skimmer Box*** after the storm event. The debris collected in the unit is stored in a dry state which helps to contain the nutrient pollutant load, prevents the filter from going septic, and prevents mosquitoes from breeding in the unit. After each storm event more debris is collected, which can ultimately weigh many hundreds of



pounds.

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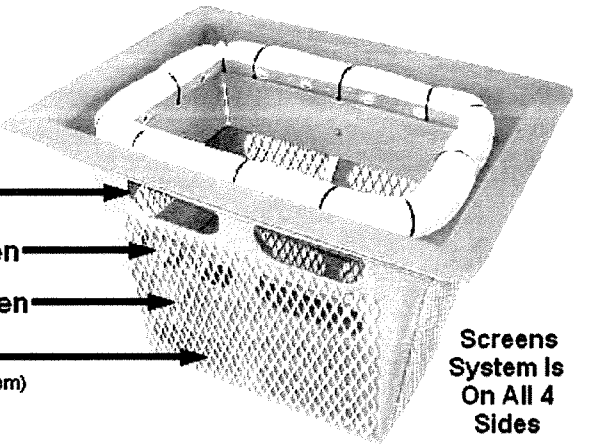
Grate Inlet Skimmer Box

Unique Features

Multi-Stage Filtration

Screens of Different Sieve Sizes Optimize Filtration And Water Flow

All Screens Are Stainless Steel



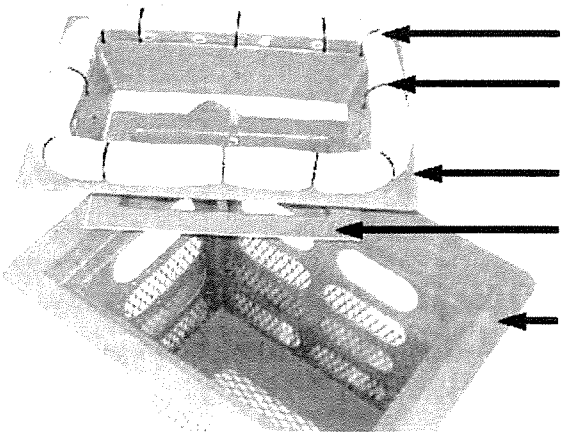
- Bypass Openings
- Coarse Sieve Size Screen
- Medium Sieve Size Screen
- Fine Sieve Size Screen
  (Fine Sieve Size Screen Also On Bottom)

Screens System Is On All 4 Sides

Interior components are easily removed to allow easy access to lower filtration chamber.

Fiberglass components have gelcoated finish with UV filter.

- Storm Boom *Absorbs Hydrocarbons*
- Zip Tie
- Skimmer Tray
- Deflection Shield



Flange is reinforced
With knitted 1808 ± 45°
Biaxial fiberglass

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For More Information

on our Grate Inlet Skimmer Box
Please contact us directly:

Suntree Technologies, Inc.
798 Clearlake RD
Cocoa, FL 32922

Ph: (321) 637-7552
FAX: (321) 637-7554

Since 1993

Infrastructure Stormwater Filtration Systems

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Suntree Technologies Inc.

Curb Inlet Basket

Patented

A stormwater filtration system for Curb Inlets where access to the catchbasin is through a manhole.



Captures Everything From Litter, Foliage, Sediment, To Hydrocarbons...Everything!

- ***Fits any catchbasin***
- ***No need to enter the catchbasin to service.***
- ***No need to enter or lay in the street to service.***
- ***Filtration screens of different sieve sizes can be utilized to optimize filtration and water flow.***

Will Not Impede The Water Flow Into The Inlet

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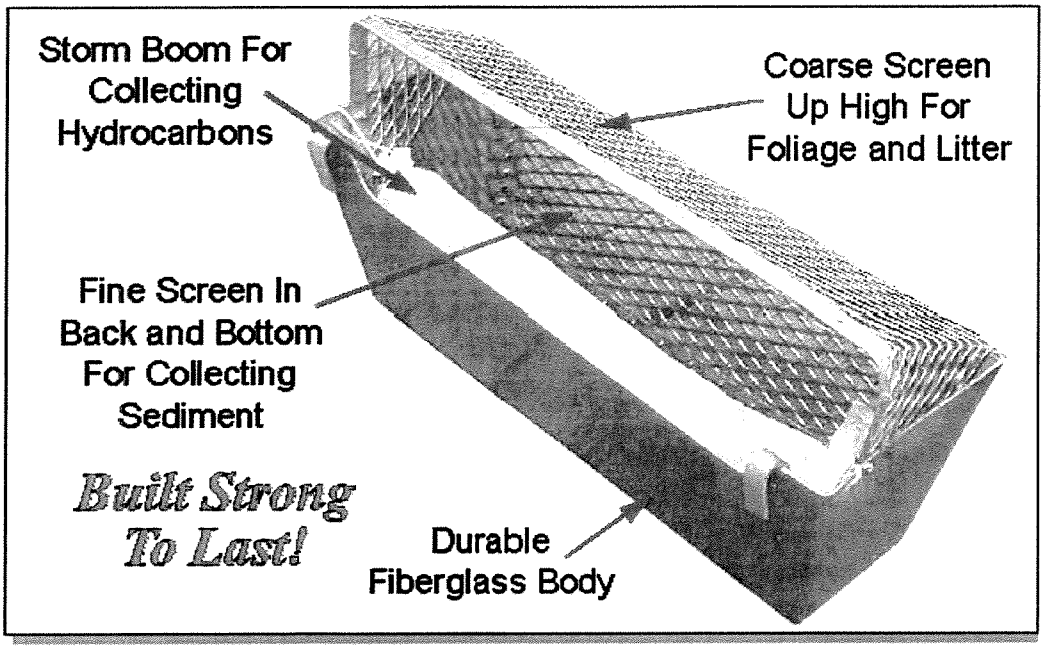
Curb Inlet Basket

Patented



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Suntree Technologies Inc.



Curb Inlet Basket

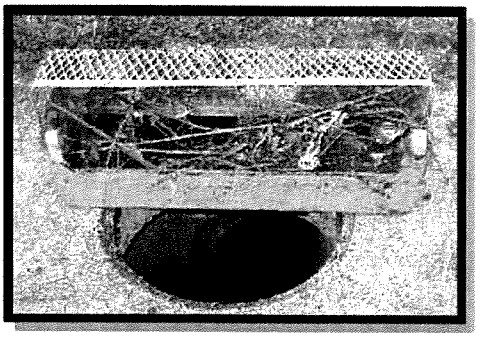
No Need To Enter The Confined Space Of The Catchbasin To Service

To Service:

- Remove the manhole lid
- Reach in with by hand or with a manhole hook and remove the basket
- Empty the contents of the basket and replace the Storm Boom
- Replace the basket and manhole lid

Heavy and Expensive Equipment Is Not Required To Do Service Work

Multi-stage Filtration Captures Everything From Hydrocarbons, To Sediment, To Grass Clippings, To Litter...Everything!



Once The Basket Is Removed From The Catchbasin It Can Be Easily Emptied.



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Curb Inlet Basket (CIB)

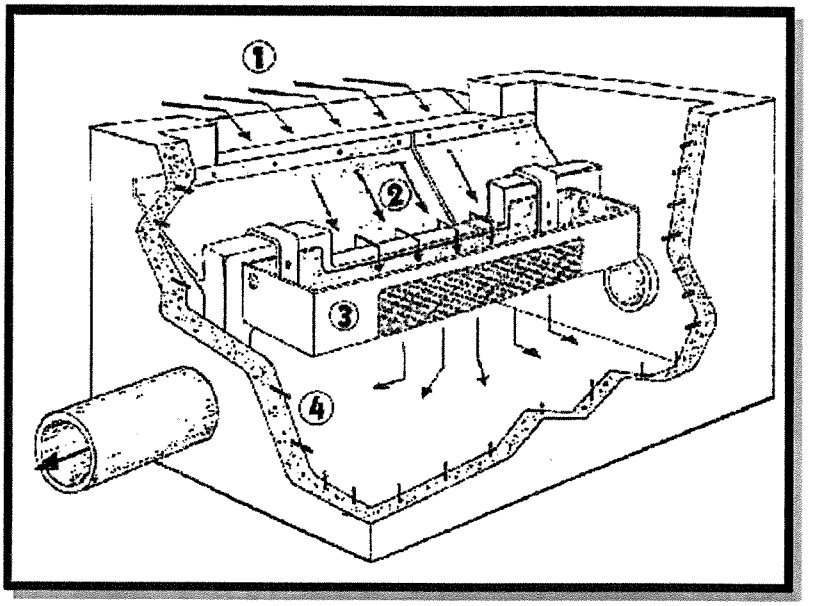
Functional Description

① Stormwater runoff carrying debris and pollutants enters curb inlet.

② Adjustable throat width funnels water to weir. The immediate drop in the throat elevation prevents head losses through the inlet. Sediment will collect along the incoming side of the weir.

③ Water flows over weir and into removable basket, filtering trash, leaves, yard clippings, sediment, etc.. If desired, a hydrocarbon absorption boom can be fitted along the incoming edge of the basket.

④ Cleaner water leaves basket and enters catchbasin, then flows down stream. The position of the CIB, high in the catch basin, avoids any restriction of up-stream pipes flowing through the catchbasin.



The CIB telescopes to change size so that it can fit almost any catchbasin. In addition, CIBs that fit a round catchbasin are also available.

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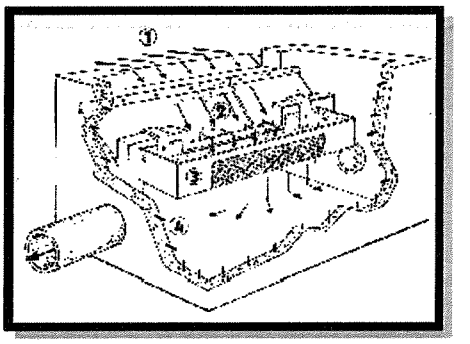
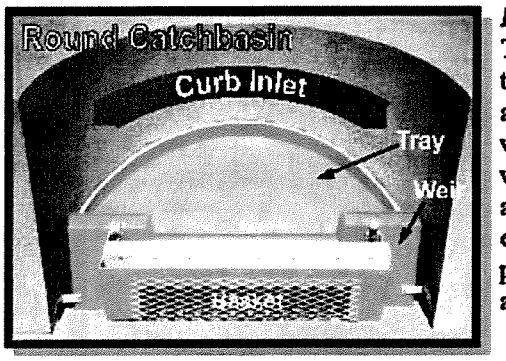
Curb Inlet Basket (CIB)

Installation

Square Catchbasin:

For installation into a square catchbasin, there is a left half and a right half that telescope together to adjust for size, which make up the main body of the CIB and mounts solid to the catchbasin wall with either drive pins or *Tap-Cons*. The non-removable portion consists of a tray area that directs the flow toward the weir, and a weir that channels the flow into the removable basket. The basket is placed on last, and is simply dropped in place and hangs from the top of the weir.





Round Catchbasin:

To install the CIB into a round catchbasin there are 3 main pieces; the weir, which attaches to the catch basin wall, the tray which attaches to the catchbasin wall and weir, and the removable basket. The weir and tray attach to the catchbasin wall with either *Tap-Cons* or drive pins. The basket is placed on last, and is just dropped in place and hangs from the top of the weir.

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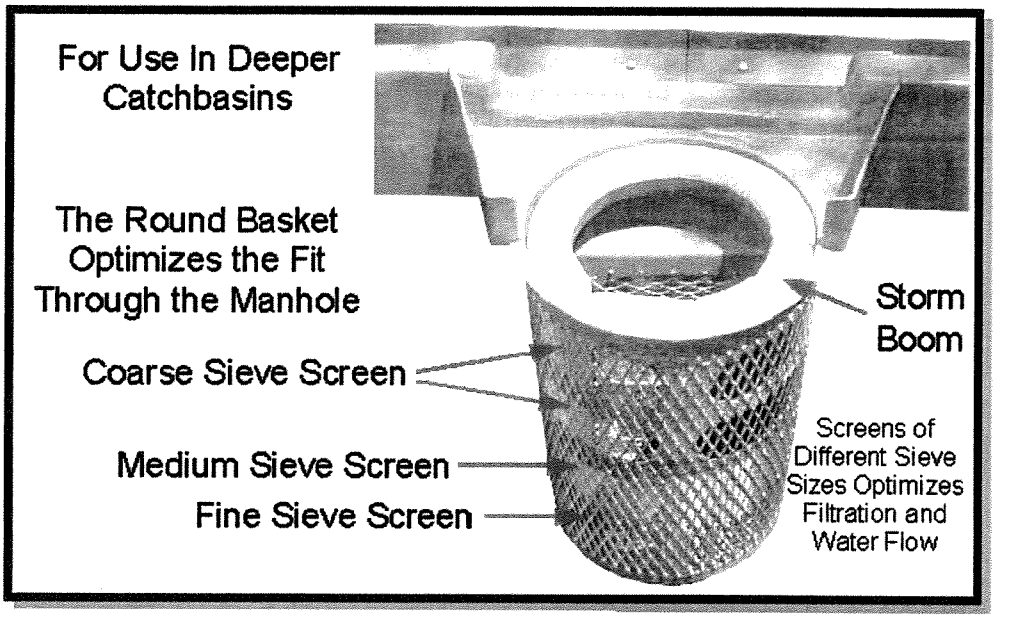
Suntree Technologies Inc.

High Capacity Curb Inlet Basket

Patented



Captures Everything From Litter, Foliage, Sediment, To Hydrocarbons...Everything!

Installation and servicing is similar to the standard Curb Inlet Basket

Built Strong To Last!



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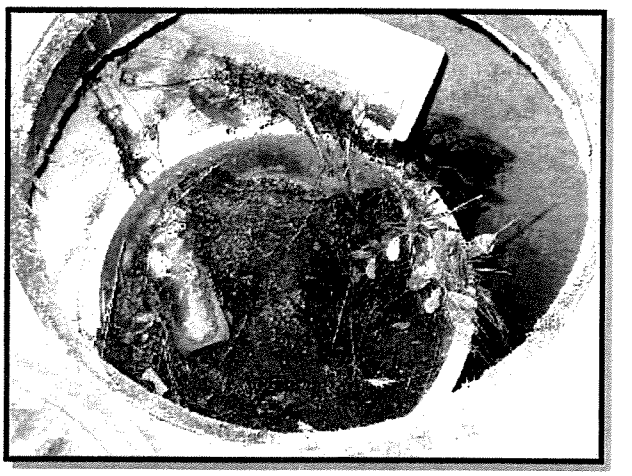
High Capacity Curb Inlet Basket
In The Field

View of Debris In High Capacity Curb Inlet Basket Before Removal From Catchbasin



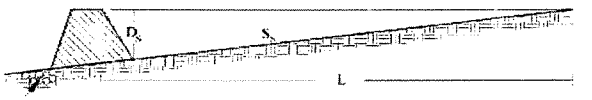
This unit did not utilize a Storm Boom.



Once Removed From The Catch Basin, The Collected Debris Was Emptied And The Basket Put Back.

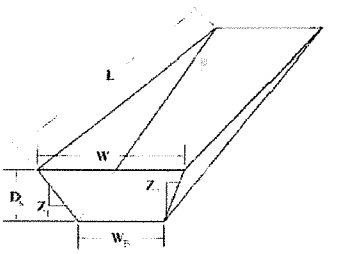
200 Pounds of Debris Was Emptied From This Curb Inlet Basket.

BIOFILTER/GRASS-LINED SWALE



Provide for scour protection.

(a) Cross section of swale with check dam.

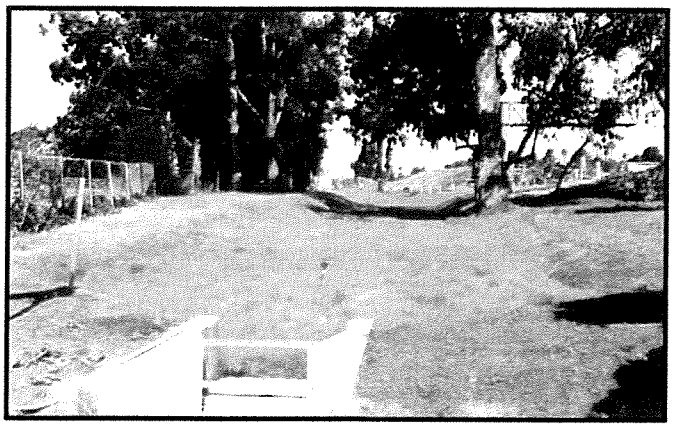


(b) Dimensional view of swale impoundment area.

Notation:

L = Length of swale impoundment area per check dam (ft)
D_s = Depth of check dam (ft)
S_s = Bottom slope of swale (ft/ft)
W = Top width of check dam (ft)
W_B = Bottom width of check dam (ft)
Z_{m2} = Ratio of horizontal to vertical change in swale side slope (ft/ft)

Vegetated Swale TC-30



Design Considerations

- Tributary Area
- Area Required
- Slope
- Water Availability

Description

Vegetated swales are open, shallow channels with vegetation covering the side slopes and bottom that collect and slowly convey runoff flow to downstream discharge points. They are designed to treat runoff through filtering by the vegetation in the channel, filtering through a subsoil matrix, and/or infiltration into the underlying soils. Swales can be natural or manmade. They trap particulate pollutants (suspended solids and trace metals), promote infiltration, and reduce the flow velocity of stormwater runoff. Vegetated swales can serve as part of a stormwater drainage system and can replace curbs, gutters and storm sewer systems.

Targeted Constituents

☑	Sediment	▲
☑	Nutrients	●
☑	Trash	●
☑	Metals	▲
☑	Bacteria	●
☑	Oil and Grease	▲
☑	Organics	▲

Legend *(Removal Effectiveness)*

● Low ■ High

▲ Medium

California Experience

Caltrans constructed and monitored six vegetated swales in southern California. These swales were generally effective in reducing the volume and mass of pollutants in runoff. Even in the areas where the annual rainfall was only about 10 inches/yr, the vegetation did not require additional irrigation. One factor that strongly affected performance was the presence of large numbers of gophers at most of the sites. The gophers created earthen mounds, destroyed vegetation, and generally reduced the effectiveness of the controls for TSS reduction.

Advantages

- If properly designed, vegetated, and operated, swales can serve as an aesthetic, potentially inexpensive urban development or roadway drainage conveyance measure with significant collateral water quality benefits.

- Roadside ditches should be regarded as significant potential swale/buffer strip sites and should be utilized for this purpose whenever possible.

Limitations

- Can be difficult to avoid channelization.
- May not be appropriate for industrial sites or locations where spills may occur
- Grassed swales cannot treat a very large drainage area. Large areas may be divided and treated using multiple swales.
- A thick vegetative cover is needed for these practices to function properly.
- They are impractical in areas with steep topography.
- They are not effective and may even erode when flow velocities are high, if the grass cover is not properly maintained.
- In some places, their use is restricted by law: many local municipalities require curb and gutter systems in residential areas.
- Swales are mores susceptible to failure if not properly maintained than other treatment BMPs.

Design and Sizing Guidelines

- Flow rate based design determined by local requirements or sized so that 85% of the annual runoff volume is discharged at less than the design rainfall intensity.
- Swale should be designed so that the water level does not exceed 2/3rds the height of the grass or 4 inches, which ever is less, at the design treatment rate.
- Longitudinal slopes should not exceed 2.5%
- Trapezoidal channels are normally recommended but other configurations, such as parabolic, can also provide substantial water quality improvement and may be easier to mow than designs with sharp breaks in slope.
- Swales constructed in cut are preferred, or in fill areas that are far enough from an adjacent slope to minimize the potential for gopher damage. Do not use side slopes constructed of fill, which are prone to structural damage by gophers and other burrowing animals.
- A diverse selection of low growing, plants that thrive under the specific site, climatic, and watering conditions should be specified. Vegetation whose growing season corresponds to the wet season are preferred. Drought tolerant vegetation should be considered especially for swales that are not part of a regularly irrigated landscaped area.
- The width of the swale should be determined using Manning's Equation using a value of 0.25 for Manning's n.

Construction/Inspection Considerations

- Include directions in the specifications for use of appropriate fertilizer and soil amendments based on soil properties determined through testing and compared to the needs of the vegetation requirements.
- Install swales at the time of the year when there is a reasonable chance of successful establishment without irrigation; however, it is recognized that rainfall in a given year may not be sufficient and temporary irrigation may be used.
- If sod tiles must be used, they should be placed so that there are no gaps between the tiles; stagger the ends of the tiles to prevent the formation of channels along the swale or strip.
- Use a roller on the sod to ensure that no air pockets form between the sod and the soil.
- Where seeds are used, erosion controls will be necessary to protect seeds for at least 75 days after the first rainfall of the season.

Performance

The literature suggests that vegetated swales represent a practical and potentially effective technique for controlling urban runoff quality. While limited quantitative performance data exists for vegetated swales, it is known that check dams, slight slopes, permeable soils, dense grass cover, increased contact time, and small storm events all contribute to successful pollutant removal by the swale system. Factors decreasing the effectiveness of swales include compacted soils, short runoff contact time, large storm events, frozen ground, short grass heights, steep slopes, and high runoff velocities and discharge rates.

Conventional vegetated swale designs have achieved mixed results in removing particulate pollutants. A study performed by the Nationwide Urban Runoff Program (NURP) monitored three grass swales in the Washington, D.C., area and found no significant improvement in urban runoff quality for the pollutants analyzed. However, the weak performance of these swales was attributed to the high flow velocities in the swales, soil compaction, steep slopes, and short grass height.

Another project in Durham, NC, monitored the performance of a carefully designed artificial swale that received runoff from a commercial parking lot. The project tracked 11 storms and concluded that particulate concentrations of heavy metals (Cu, Pb, Zn, and Cd) were reduced by approximately 50 percent. However, the swale proved largely ineffective for removing soluble nutrients.

The effectiveness of vegetated swales can be enhanced by adding check dams at approximately 17 meter (50 foot) increments along their length (See Figure 1). These dams maximize the retention time within the swale, decrease flow velocities, and promote particulate settling. Finally, the incorporation of vegetated filter strips parallel to the top of the channel banks can help to treat sheet flows entering the swale.

Only 9 studies have been conducted on all grassed channels designed for water quality (Table 1). The data suggest relatively high removal rates for some pollutants, but negative removals for some bacteria, and fair performance for phosphorus.

Table 1 Grassed swale pollutant removal efficiency data							
	Removal Efficiencies (% Removal)						
Study	TSS	TP	TN	NO_3	Metals	Bacteria	Type
Caltrans 2002	77	8	67	66	83-90	-33	dry swales
Goldberg 1993	67.8	4.5	-	31.4	42–62	-100	grassed channel
Seattle Metro and Washington Department of Ecology 1992	60	45	-	-25	2–16	-25	grassed channel
Seattle Metro and Washington Department of Ecology, 1992	83	29	-	-25	46–73	-25	grassed channel
Wang et al., 1981	80	-	-	-	70–80	-	dry swale
Dorman et al., 1989	98	18	-	45	37–81	-	dry swale
Harper, 1988	87	83	84	80	88–90	-	dry swale
Kercher et al., 1983	99	99	99	99	99	-	dry swale
Harper, 1988.	81	17	40	52	37–69	-	wet swale
Koon, 1995	67	39	-	9	-35 to 6	-	wet swale

While it is difficult to distinguish between different designs based on the small amount of available data, grassed channels generally have poorer removal rates than wet and dry swales, although some swales appear to export soluble phosphorus (Harper, 1988; Koon, 1995). It is not clear why swales export bacteria. One explanation is that bacteria thrive in the warm swale soils.

Siting Criteria

The suitability of a swale at a site will depend on land use, size of the area serviced, soil type, slope, imperviousness of the contributing watershed, and dimensions and slope of the swale system (Schueler et al., 1992). In general, swales can be used to serve areas of less than 10 acres, with slopes no greater than 5 %. Use of natural topographic lows is encouraged and natural drainage courses should be regarded as significant local resources to be kept in use (Young et al., 1996).

Selection Criteria (NCTCOG, 1993)

- Comparable performance to wet basins
- Limited to treating a few acres
- Availability of water during dry periods to maintain vegetation
- Sufficient available land area

Research in the Austin area indicates that vegetated controls are effective at removing pollutants even when dormant. Therefore, irrigation is not required to maintain growth during dry periods, but may be necessary only to prevent the vegetation from dying.

The topography of the site should permit the design of a channel with appropriate slope and cross-sectional area. Site topography may also dictate a need for additional structural controls. Recommendations for longitudinal slopes range between 2 and 6 percent. Flatter slopes can be used, if sufficient to provide adequate conveyance. Steep slopes increase flow velocity, decrease detention time, and may require energy dissipating and grade check. Steep slopes also can be managed using a series of check dams to terrace the swale and reduce the slope to within acceptable limits. The use of check dams with swales also promotes infiltration.

Additional Design Guidelines

Most of the design guidelines adopted for swale design specify a minimum hydraulic residence time of 9 minutes. This criterion is based on the results of a single study conducted in Seattle, Washington (Seattle Metro and Washington Department of Ecology, 1992), and is not well supported. Analysis of the data collected in that study indicates that pollutant removal at a residence time of 5 minutes was not significantly different, although there is more variability in that data. Therefore, additional research in the design criteria for swales is needed. Substantial pollutant removal has also been observed for vegetated controls designed solely for conveyance (Barrett et al, 1998); consequently, some flexibility in the design is warranted.

Many design guidelines recommend that grass be frequently mowed to maintain dense coverage near the ground surface. Recent research (Colwell et al., 2000) has shown mowing frequency or grass height has little or no effect on pollutant removal.

Summary of Design Recommendations

1) The swale should have a length that provides a minimum hydraulic residence time of at least 10 minutes. The maximum bottom width should not exceed 10 feet unless a dividing berm is provided. The depth of flow should not exceed 2/3rds the height of the grass at the peak of the water quality design storm intensity. The channel slope should not exceed 2.5%.

2) A design grass height of 6 inches is recommended.

3) Regardless of the recommended detention time, the swale should be not less than 100 feet in length.

4) The width of the swale should be determined using Manning's Equation, at the peak of the design storm, using a Manning's n of 0.25.

5) The swale can be sized as both a treatment facility for the design storm and as a conveyance system to pass the peak hydraulic flows of the 100-year storm if it is located "on-line." The side slopes should be no steeper than 3:1 (H:V).

6) Roadside ditches should be regarded as significant potential swale/buffer strip sites and should be utilized for this purpose whenever possible. If flow is to be introduced through curb cuts, place pavement slightly above the elevation of the vegetated areas. Curb cuts should be at least 12 inches wide to prevent clogging.

7) Swales must be vegetated in order to provide adequate treatment of runoff. It is important to maximize water contact with vegetation and the soil surface. For general purposes, select fine, close-growing, water-resistant grasses. If possible, divert runoff (other than necessary irrigation) during the period of vegetation

establishment. Where runoff diversion is not possible, cover graded and seeded areas with suitable erosion control materials.

Maintenance

The useful life of a vegetated swale system is directly proportional to its maintenance frequency. If properly designed and regularly maintained, vegetated swales can last indefinitely. The maintenance objectives for vegetated swale systems include keeping up the hydraulic and removal efficiency of the channel and maintaining a dense, healthy grass cover.

Maintenance activities should include periodic mowing (with grass never cut shorter than the design flow depth), weed control, watering during drought conditions, reseeding of bare areas, and clearing of debris and blockages. Cuttings should be removed from the channel and disposed in a local composting facility. Accumulated sediment should also be removed manually to avoid concentrated flows in the swale. The application of fertilizers and pesticides should be minimal.

Another aspect of a good maintenance plan is repairing damaged areas within a channel. For example, if the channel develops ruts or holes, it should be repaired utilizing a suitable soil that is properly tamped and seeded. The grass cover should be thick; if it is not, reseed as necessary. Any standing water removed during the maintenance operation must be disposed to a sanitary sewer at an approved discharge location. Residuals (e.g., silt, grass cuttings) must be disposed in accordance with local or State requirements. Maintenance of grassed swales mostly involves maintenance of the grass or wetland plant cover. Typical maintenance activities are summarized below:

- Inspect swales at least twice annually for erosion, damage to vegetation, and sediment and debris accumulation preferably at the end of the wet season to schedule summer maintenance and before major fall runoff to be sure the swale is ready for winter. However, additional inspection after periods of heavy runoff is desirable. The swale should be checked for debris and litter, and areas of sediment accumulation.
- Grass height and mowing frequency may not have a large impact on pollutant removal. Consequently, mowing may only be necessary once or twice a year for safety or aesthetics or to suppress weeds and woody vegetation.
- Trash tends to accumulate in swale areas, particularly along highways. The need for litter removal is determined through periodic inspection, but litter should always be removed prior to mowing.
- Sediment accumulating near culverts and in channels should be removed when it builds up to 75 mm (3 in.) at any spot, or covers vegetation.
- Regularly inspect swales for pools of standing water. Swales can become a nuisance due to mosquito breeding in standing water if obstructions develop (e.g. debris accumulation, invasive vegetation) and/or if proper drainage slopes are not implemented and maintained.

Cost

Construction Cost

Little data is available to estimate the difference in cost between various swale designs. One study (SWRPC, 1991) estimated the construction cost of grassed channels at approximately $0.25 per ft². This price does not include design costs or contingencies. Brown and Schueler (1997) estimate these costs at approximately 32 percent of construction costs for most stormwater management practices. For swales, however, these costs would probably be significantly higher since the construction costs are so low compared with other practices. A more realistic estimate would be a total cost of approximately $0.50 per ft², which compares favorably with other stormwater management practices.

Table 3 Estimated Maintenance Costs (SEWRPC, 1991)

Component	Unit Cost	Swale Size (Depth and Top Width)		Comment
		1.5 Foot Depth, One-Foot Bottom Width, 10-Foot Top Width	3-Foot Depth, 3-Foot Bottom Width, 21-Foot Top Width	
Lawn Mowing	$0.85 / 1,000 ft²/ mowing	$0.14 / linear foot	$0.21 / linear foot	Lawn maintenance area=(top width + 10 feet) x length. Mow eight times per year
General Lawn Care	$9.00 / 1,000 ft²/ year	$0.16 / linear foot	$0.26 / linear foot	Lawn maintenance area = (top width + 10 feet) x length
Swale Debris and Litter Removal	$0.10 / linear foot / year	$0.10 / linear foot	$0.10 / linear foot	--
Grass Reseeding with Mulch and Fertilizer	$0.30 / yd²	$0.01 / linear foot	$0.01 / linear foot	Area revegetated equals 1% of lawn maintenance area per year
Program Administration and Swale Inspection	$0.15 / linear foot / year, plus $25 / inspection	$0.15 / linear foot	$0.15 / linear foot	Inspect four times per year
Total	--	$0.58 / linear foot	$ 0.75 / linear foot	--

Maintenance Cost

Caltrans (2002) estimated the expected annual maintenance cost for a swale with a tributary area of approximately 2 ha at approximately $2,700. Since almost all maintenance consists of mowing, the cost is fundamentally a function of the mowing frequency. Unit costs developed by SEWRPC are shown in Table 3. In many cases vegetated channels would be used to convey runoff and would require periodic mowing as well, so there may be little additional cost for the water quality component. Since essentially all the activities are related to vegetation management, no special training is required for maintenance personnel.

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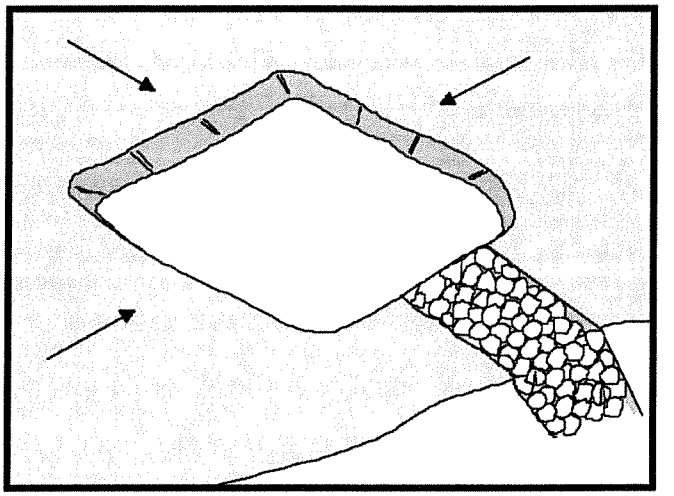
SEDIMENT TRAP

Sediment Trap SE-3



Description and Purpose

A sediment trap is a containment area where sediment-laden runoff is temporarily detained under quiescent conditions, allowing sediment to settle out or before the runoff is discharged. Sediment traps are formed by excavating or constructing an earthen embankment across a waterway or low drainage area.

Suitable Applications

Sediment traps should be considered for use:

- At the perimeter of the site at locations where sediment-laden runoff is discharged offsite.
- At multiple locations within the project site where sediment control is needed.
- Around or upslope from storm drain inlet protection measures.
- Sediment traps may be used on construction projects where the drainage area is less than 5 acres. Traps would be placed where sediment-laden stormwater may enter a storm drain or watercourse. SE-2, Sediment Basins, must be used for drainage areas greater than 5 acres.
- As a supplemental control, sediment traps provide additional protection for a water body or for reducing sediment before it enters a drainage system.

Objectives

EC	Erosion Control	
SE	Sediment Control	☑
TR	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:
☑ Primary Objective
☒ Secondary Objective

Targeted Constituents

Sediment	☑
Nutrients	
Trash	☑
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-2 Sediment Basin (for larger areas)

Limitations

- Requires large surface areas to permit infiltration and settling of sediment.
- Not appropriate for drainage areas greater than 5 acres.
- Only removes large and medium sized particles and requires upstream erosion control.
- Attractive and dangerous to children, requiring protective fencing.
- Conducive to vector production.
- Should not be located in live streams.

Implementation

Design

A sediment trap is a small temporary ponding area, usually with a gravel outlet, formed by excavation or by construction of an earthen embankment. Its purpose is to collect and store sediment from sites cleared or graded during construction. It is intended for use on small drainage areas with no unusual drainage features and projected for a quick build-out time. It should help in removing coarse sediment from runoff. The trap is a temporary measure with a design life of approximately six months to one year and is to be maintained until the site area is permanently protected against erosion by vegetation and/or structures.

Sediment traps should be used only for small drainage areas. If the contributing drainage area is greater than 5 acres, refer to SE-2, Sediment Basins, or subdivide the catchment area into smaller drainage basins.

Sediment usually must be removed from the trap after each rainfall event. The SWPPP should detail how this sediment is to be disposed of, such as in fill areas onsite, or removal to an approved offsite dump. Sediment traps used as perimeter controls should be installed before any land disturbance takes place in the drainage area.

Sediment traps are usually small enough that a failure of the structure would not result in a loss of life, damage to home or buildings, or interruption in the use of public roads or utilities. However, sediment traps are attractive to children and can be dangerous. The following recommendations should be implemented to reduce risks:

- Install continuous fencing around the sediment trap or pond. Consult local ordinances regarding requirements for maintaining health and safety.
- Restrict basin side slopes to 3:1 or flatter.

Sediment trap size depends on the type of soil, size of the drainage area, and desired sediment removal efficiency (see SE-2, Sediment Basin). As a rule of thumb, the larger the basin volume the greater the sediment removal efficiency. Sizing criteria are typically established under the local grading ordinance or equivalent. The runoff volume from a 2-year storm is a common design criteria for a sediment trap. The sizing criteria below assume that this runoff volume is 0.042 acre-ft/acre (0.5 in. of runoff). While the climatic, topographic, and soil type extremes make it difficult to establish a statewide standard, the following criteria should trap moderate to high amounts of sediment in most areas of California:

Sediment Trap SE-3

- Locate sediment traps as near as practical to areas producing the sediment.
- Trap should be situated according to the following criteria: (1) by excavating a suitable area or where a low embankment can be constructed across a swale, (2) where failure would not cause loss of life or property damage, and (3) to provide access for maintenance, including sediment removal and sediment stockpiling in a protected area.
- Trap should be sized to accommodate a settling zone and sediment storage zone with recommended minimum volumes of 67 yd^3/acre and 33 yd^3/acre of contributing drainage area, respectively, based on 0.5 in. of runoff volume over a 24-hour period. In many cases, the size of an individual trap is limited by available space. Multiple traps or additional volume may be required to accommodate specific rainfall, soil, and site conditions.
- Traps with an impounding levee greater than 4.5 ft tall, measured from the lowest point to the impounding area to the highest point of the levee, and traps capable of impounding more than 35,000 ft^3, should be designed by a Registered Civil Engineer. The design should include maintenance requirements, including sediment and vegetation removal, to ensure continuous function of the trap outlet and bypass structures.
- The outlet pipe or open spillway must be designed to convey anticipated peak flows.
- Use rock or vegetation to protect the trap outlets against erosion.
- Fencing should be provided to prevent unauthorized entry.

Installation

Sediment traps can be constructed by excavating a depression in the ground or creating an impoundment with a small embankment. Sediment traps should be installed outside the area being graded and should be built prior to the start of the grading activities or removal of vegetation. To minimize the area disturbed by them, sediment traps should be installed in natural depressions or in small swales or drainage ways. The following steps must be followed during installation:

- The area under the embankment must be cleared, grubbed, and stripped of any vegetation and root mat. The pool area should be cleared.
- The fill material for the embankment must be free of roots or other woody vegetation as well as oversized stones, rocks, organic material, or other objectionable material. The embankment may be compacted by traversing with equipment while it is being constructed.
- All cut-and-fill slopes should be 3:1 or flatter.
- When a riser is used, all pipe joints must be watertight.
- When a riser is used, at least the top two-thirds of the riser should be perforated with 0.5 in. diameter holes spaced 8 in. vertically and 10 to 12 in. horizontally. See SE-2, Sediment Basin.
- When an earth or stone outlet is used, the outlet crest elevation should be at least 1 ft below the top of the embankment.

- When crushed stone outlet is used, the crushed stone used in the outlet should meet AASHTO M43, size No. 2 or 24, or its equivalent such as MSHA No. 2. Gravel meeting the above gradation may be used if crushed stone is not available.

Costs

Average annual cost per installation and maintenance (18 month useful life) is $0.73 per ft^3 ($1,300 per drainage acre). Maintenance costs are approximately 20% of installation costs.

Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Inspect outlet area for erosion and stabilize if required.
- Inspect trap banks for seepage and structural soundness, repair as needed.
- Inspect outlet structure and spillway for any damage or obstructions. Repair damage and remove obstructions as needed.
- Inspect fencing for damage and repair as needed.
- Inspect the sediment trap for area of standing water during every visit. Corrective measures should be taken if the BMP does not dewater completely in 72 hours or less to prevent vector production.
- Sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the trap capacity. Sediment removed during maintenance may be incorporated into earthwork on the site or disposed of at an appropriate location.
- Remove vegetation from the sediment trap when first detected to prevent pools of standing water and subsequent vector production.
- BMPs that require dewatering shall be continuously attended while dewatering takes place. Dewatering BMPs shall be implemented at all times during dewatering activities.

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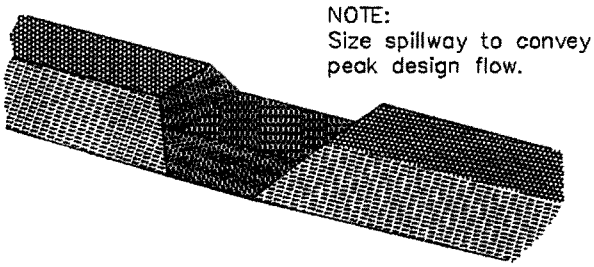
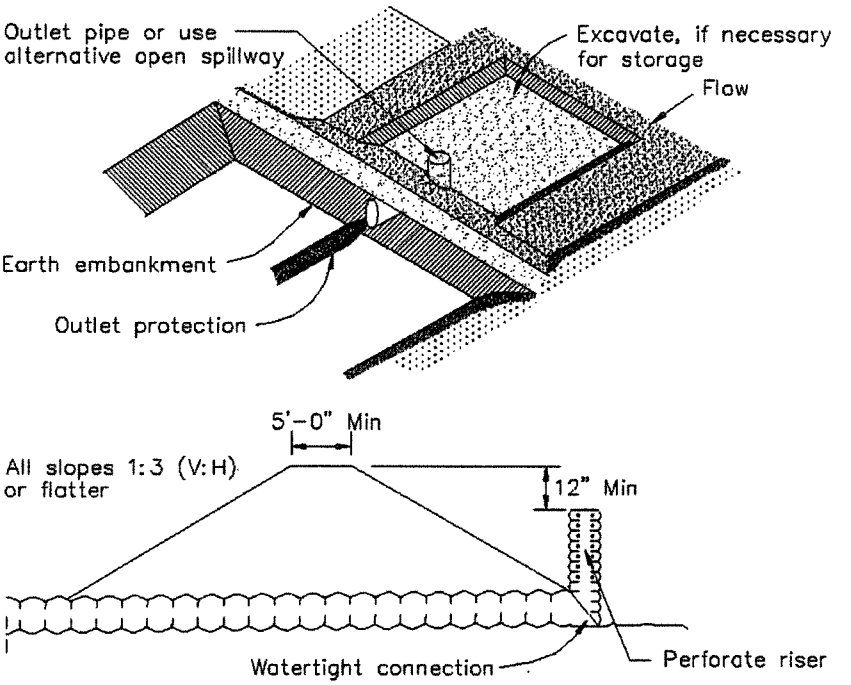


TYPICAL OPEN SPILLWAY



EMBANKMENT SECTION THRU RISER

TYPICAL SEDIMENT TRAP
NOT TO SCALE

SLOPETAME 2

Product Data Sheet - Slopetame^2

Slopetame^2 (ST^2) is a unique solution to age old problems - soil erosion and stabilization of soil on slopes and vegetated drainage channels.

The difficulty with most erosion control products are their lack of ability to keep soils in place until root systems are mature, and their potential to be undercut by rapid flow of storm water. These products are usually thin sheets of various materials, or open web-like matrices.

Other existing products act to "contain" various depths of fill materials by cellular constructions of fabrics or plastic sheets, but offer little resistance to water undercutting, or ability to interconnect cells of vegetation.

ST^2 System Description-
Each ST^2 unit is a 3-dimensional structure designed to isolate and contain small zones of soil over the entire slope surface, while at the same time preventing water from under cutting the unit and dislodging soil and roots.

ST^2 units consist of rigid upstanding rings connected with a flexible diagonal geogrid injection molded onto a geotextile fabric. The fabric acts to contain soil or gravel fill, while rows of bars and rings act to prevent erosion channels developing between rows of rings.

ST^2 Benefits-

- True 3-dimensional containment of fill.
- Rings and bars offer small scale confinement.
- Shallow depth of fill material needed.
- Strong diagonal grid to disperse loads across slopes.
- All units can be interlocked for continuous structure across slopes.
- Geotextile fabrics to strengthen root matrix.
- Fabrics act to slow speed of water infiltration and reduce chance of undercutting.
- Fabrics under gravel fill can prevent plant penetration from below and resist root penetration from above.
- Product is lightweight and easy to assemble.
- Recycled plastics are used.
- Plastics are treated for UV resistance.
- These plastics are inert from damage from normal chemicals used in horticulture.

ST^2 Units & System-
The ST^2 system includes the unit, and duckbill anchors - 3 ft (1 meter) lengths of 1/2" (1.25 cm) rebar not included. Soil preparation, product placement, anchors, soil or gravel fill, and irrigation (if required), are provided by the contractor, and considered an essential part of the installation of the system.

ST^2 Installation Guidelines-
If undisturbed slope continues above the area designated for ST^2, cut-off drains should be installed at the top of the new slope to intercept surface water generated from above. The new slope will need only to contend with water actually falling on the ST^2 surfaced area, minimizing storm water volume build-up.

At the toe of long slopes, or at terrace levels, additional cut-off drains may be installed for the similar purposes downstream.

The units should extend from the top to toe of a slope in one continuous piece. 1 - 2.5 meter wide rolls are sold in standard lengths but can be preassembled in custom lengths.

Generally spunbonded non-woven fabrics made of either polyester or polypropylene are used, to enhance root system strength.

Units are anchored securely from the top of the slope, and periodically along the face of the slope. Types of anchors used may vary with substrata conditions.

ST² units are then filled with small gravel, or a lightweight soil mix, preferably, which includes Hydrogrow soil conditioner to retain adequate moisture in the primary root zone.

Gravel Fill -
For slopes that do not require vegetation cover, the ST² units can be filled with small gravel - which should be 3/8's inch minus in size, and sharp (crushed) rather than rounded to best lock into place.

Vegetation -
ST² system can be very effective in assisting new vegetative cover to establish and remain in place for years by protecting the root zone from soil removal due to water runoff.
Compatible forms of vegetation include:

- Grasses
- Groundcovers
- Vines
- Shrubs
- Trees

The selected form(s) should be matched with slope, soil types, moisture, maintenance and aesthetic requirements of the site.

Shrubs and trees, with their larger roots, will most likely be restricted to slopes with permeable soils below the units and openings cut into the unit (remove rings with pruning shears) to allow proper root development.

Groundcovers other than grasses will usually be planted from pots ranging in size from 2" to 1 gallon. Small plants may have the root system split to grow over and between rings, while larger plants may require ring removal.

Grasses and most wildflowers will be best installed by seeding, or hydroseeding techniques.

As the root systems develop, roots will penetrate and integrate with the fabric layer to establish a very strong surface.

Normal Installation Steps-
Installation of the system begins with soil preparation.

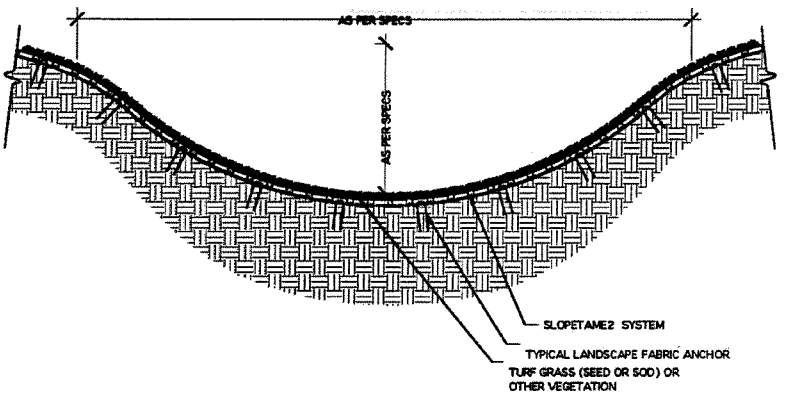
1. The soil should be tilled to a depth of 10 cm to 15 cm.
2. Pre-assemble on flat ground 1, 1.5, 2, or 2.5 meter widths, for the continuous length of the slope, deforming the top of connection pins with heat (propane torch and screwdriver) to prevent separation.
3. Start at the highest elevation and place the ST² mat with rings up, fabric down, and the double hole corner at the upper right position, and unroll down the slope. Make connections to adjacent units and deform pins to keep interlocked.
4. Anchor the mat with 1 pin (15 cm long x 25 mm wide x 2 mm ga. wire) placed just inside the double hole corner, every 40" on center, or closer as may be needed by local conditions.

5. Shrubs and trees may be placed by cutting away rings/grid/fabric to accommodate root ball. Place crown of plant just below the top of rings.

6. Fill the Slopetame^2 units with proper topsoil type materials in preparation for seeding.

7. Hydroseed and mulch the area for grasses and groundcovers. Mulch materials (paper, cellulose, or light fabric) will protect delicate seedlings until germination, and roots have reached the ST^2 fabric layer.

8. Provide supplemental irrigation as needed to assure germination and plant root establishment.



NOTE: GRASS/VEGETATION AND SAND/SOIL TYPES SHALL BE SPECIFIED BY A LANDSCAPE ARCHITECT OR ENGINEER

SLOPETAME2 SWALE REINFORCEMENT

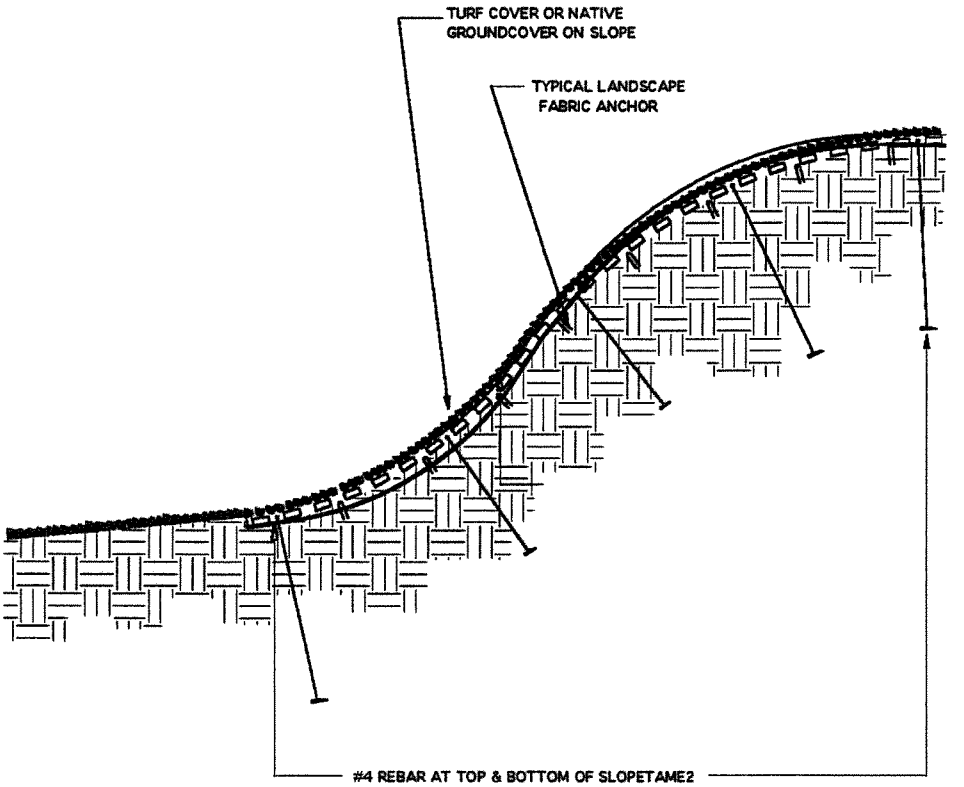
1
1OF1

NOT TO SCALE

CHOOSE THIS PRODUCT FOR EROSION AND SEDIMENT CONTROL

Invisible Structures, Inc.
ST2Swale.dwg

1600 Jackson St., SUITE 310
GOLDEN, COLORADO 80401
800-233-1510 or 303-233-8383
Fax 303-233-8202
www.invisiblestructures.com
Rev. 06/04



SLOPETAME2 CHANNEL REINFORCEMENT

1
1 OF 1

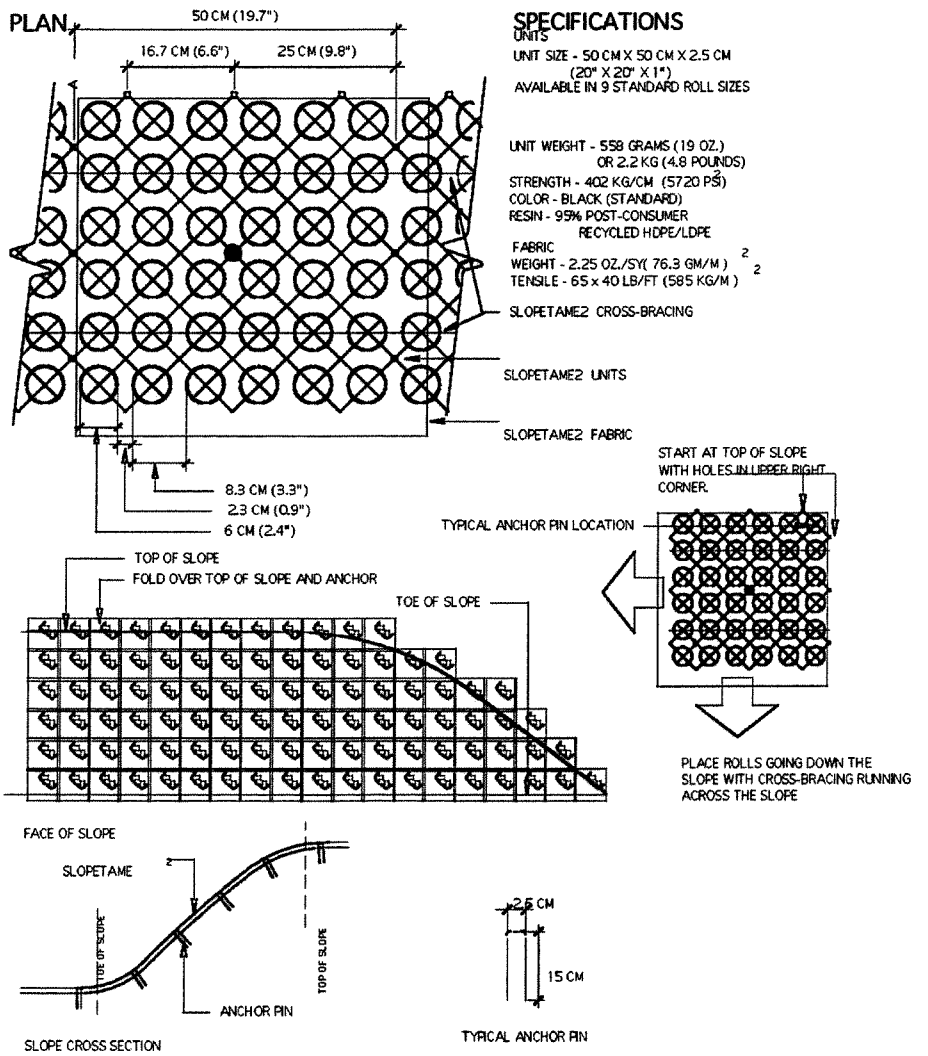
NOT TO SCALE

CHOOSE THIS PRODUCT FOR CHANNEL EROSION AND SEDIMENT CONTROL

Invisible Structures, Inc.

St2-channel.dwg

1600 Jackson St., Suite 310
Golden, CO 80401
800-233-1510 OR 303-233-8383
FAX: 303-233-8282
www.invisiblestructures.com
Rev. 08/04



TYPICAL SLOPETAME2 ASSEMBLY AND ANCHORAGE

1
1 OF 1

CHOOSE THIS PRODUCT FOR STABALIZING SLOPE CONDITIONS

NOT TO SCALE

Invisible
Structures, Inc.

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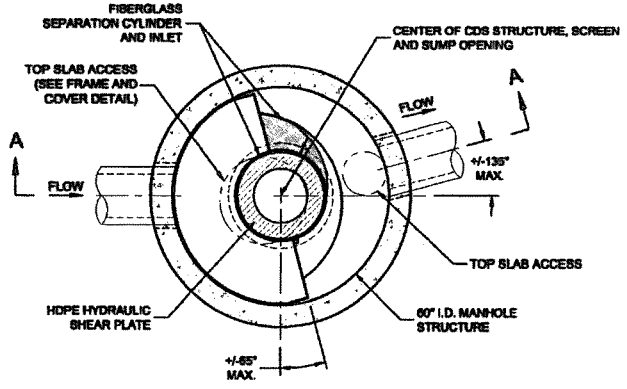
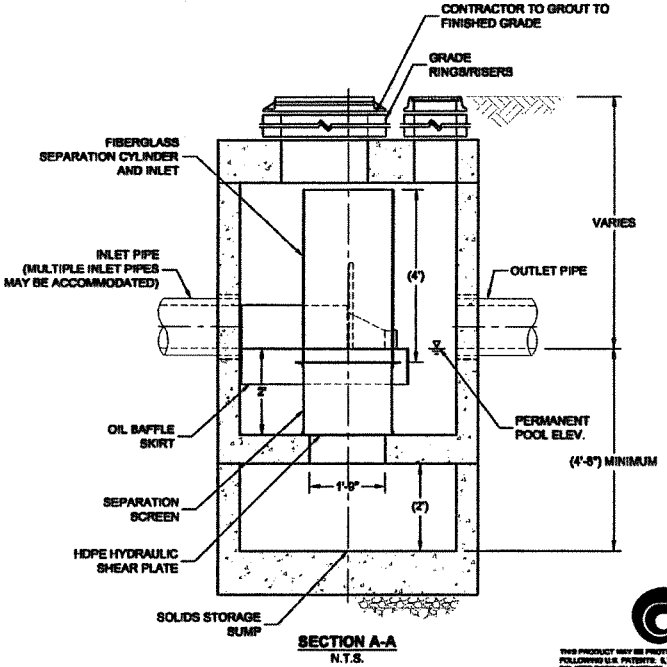
St2.dwg



PLAN VIEW
N.T.S.



SECTION A-A
N.T.S.

CDS2015 DESIGN NOTES

CDS2015 RATED TREATMENT CAPACITY IS 0.7 CFS, OR PER LOCAL REGULATIONS. MAXIMUM HYDRAULIC INTERNAL BYPASS CAPACITY IS 14.0 CFS. IF THE SITE CONDITIONS EXCEED 14.0 CFS, AN UPSTREAM BYPASS STRUCTURE IS REQUIRED.

THE STANDARD CDS2015 CONFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW. SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS.

DESIGNATION (MODEL SUFFIX)	CONFIGURATION DESCRIPTION
G	GRATED INLET ONLY (NO INLET PIPE)
GP	GRATED INLET WITH INLET PIPE OR PIPES
K	CURB INLET ONLY (NO INLET PIPE)
KP	CURB INLET WITH INLET PIPE OR PIPES
B	SEPARATE OIL BAFFLE (SINGLE INLET PIPE REQUIRED FOR THIS CONFIGURATION)
W	SEDIMENT WEIR FOR NJDEP / NJCAT CONFORMING UNITS



FRAME AND COVER
(DIAMETER VARIES)
N.T.S.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID			*
WATER QUALITY FLOW RATE (CFS)			*
PEAK FLOW RATE (CFS)			*
RETURN PERIOD OF PEAK FLOW (YRS)			*
SCREEN APERTURE (2400 OR 4700)			*
PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	*	*	*
INLET PIPE 2	*	*	*
OUTLET PIPE	*	*	*
RIM ELEVATION			*
ANTI-FLOTATION BALLAST		WIDTH	HEIGHT
		*	*

NOTES/SPECIAL REQUIREMENTS:

* PER ENGINEER OF RECORD

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. DIMENSIONS MARKED WITH ( ) ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
3. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH STORMWATER SOLUTIONS REPRESENTATIVE. www.contechstormwater.com
4. CDS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
5. STRUCTURE AND CASTINGS SHALL MEET AASHTO HS20 LOAD RATING.
6. HDPE HYDRAULIC SHEAR PLATE IS PLACED ON SHELF AT BOTTOM OF SCREEN CYLINDER. REMOVE AND REPLACE AS NECESSARY DURING MAINTENANCE CLEANING.

INSTALLATION NOTES
1. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
2. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CDS MANHOLE STRUCTURE (LIFTING CLUTCHES PROVIDED).
3. CONTRACTOR TO ADD JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS, AND ASSEMBLE STRUCTURE.
4. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES. MATCH PIPE INVERTS WITH ELEVATIONS SHOWN.
5. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING U.S. PATENTS: 5,788,848; 6,641,720; 6,511,605; 6,361,700; RELATED FOREIGN PATENTS, OR OTHER PATENTS PENDING.

CONTECH STORMWATER SOLUTIONS
contechstormwater.com

CDS2015
PRECAST CONCRETE WATER QUALITY SYSTEM
STANDARD DETAIL

I:\STORMWATER\DRAFTING\TEMPLATES\CAD STANDARDS\SUBMITTAL WORK IN PROGRESS\CDS\CDS STD DETAIL DWG\PTCDS2015H-STD.DWG 6/27/2008 2:19 PM

ATTACHMENT F

OPERATION AND MAINTENANCE PROGRAM FOR TREATMENT BMPs

MF-1

BMP CATEGORY HOA primarily responsible for maintenance. The County needs to assure ongoing maintenance.	**MAINTENANCE ACTIVITIES**	**ANNUAL COST**
BIO-FILTER (2,310 sf) First Category	- CUT VEGETATION IN NATURAL CHANNEL TO 6" HEIGHT - RESEED/VEGETATE BARE SPOTS AS NECESSARY - REMOVE SEDIMENT FROM CHANNEL AS NECESSARY - BACKFILL BURROW HOLES AS NECESSARY	**$1,500**
CURB INLET INSERTS W/ STREAM GUARD (1 total) Second Category	- SEDIMENT REMOVAL - INSPECT FOR DEBRIS/TRASH - OIL/GREASE REMOVAL - INSPECT FOR STRUCTURAL INTEGRITY - ANNUAL RENEWAL OF MEDIUM	**$1,000**
CURB INLET W/ WATER QUALITY INTERCEPTOR/DROP OUTLET BOX (1 total) Second Category	- INSPECT STRUCTURAL INTEGRITY - REMOVE TRASH AND DEBRIS FROM GRATE	**$1,000**
	TOTAL	**$3,500**

MF-2

BMP CATEGORY HOA primarily responsible for maintenance. The County needs to assure ongoing maintenance.	**MAINTENANCE ACTIVITIES**	**ANNUAL COST**
BIO-FILTER (1,188 sf) First Category	- CUT VEGETATION IN NATURAL CHANNEL TO 6" HEIGHT - RESEED/VEGETATE BARE SPOTS AS NECESSARY - REMOVE SEDIMENT FROM CHANNEL AS NECESSARY - BACKFILL BURROW HOLES AS NECESSARY	**$1,500**
CURB INLET W/ WATER QUALITY INTERCEPTOR/DROP OUTLET BOX (1 total) Second Category	- INSPECT STRUCTURAL INTEGRITY - REMOVE TRASH AND DEBRIS FROM GRATE	**$1,000**
~~LOW FLOW DETENTION BASIN~~	~~- CUT VEGETATION IN NATURAL CHANNEL TO MAX. 12" HEIGHT~~ ~~- RESEED/VEGETATE BARE SPOTS AS NECESSARY~~ ~~- REMOVE SEDIMENT FROM TRAPS AS NECESSARY~~ ~~- BACKFILL BURROW HOLES AS NECESSARY~~	~~**$5000**~~
	TOTAL	**$ 2,500**

MF-3

BMP CATEGORY HOA primarily responsible for maintenance. The County needs to assure ongoing maintenance.	**MAINTENANCE ACTIVITIES**	**ANNUAL COST**
BIO-FILTER (4,278 sf) First Category	- CUT VEGETATION IN NATURAL CHANNEL TO 6" HEIGHT - RESEED/VEGETATE BARE SPOTS AS NECESSARY - REMOVE SEDIMENT FROM CHANNEL AS NECESSARY - BACKFILL BURROW HOLES AS NECESSARY	**$3,000**
CURB INLET INSERTS W/ STREAM GUARD (4 total) Second Category	- SEDIMENT REMOVAL - INSPECT FOR DEBRIS/TRASH - OIL/GREASE REMOVAL - INSPECT FOR STRUCTURAL INTEGRITY - ANNUAL RENEWAL OF MEDIUM	**$4,000**
CURB INLET/CLEANOUT W/ WATER QUALITY INTERCEPTOR/DROP OUTLET BOX (3 total) Second Category	- INSPECT STRUCTURAL INTEGRITY - REMOVE TRASH AND DEBRIS FROM GRATE	**$3,000**
	TOTAL	**$ 10,000**

MF-4

BMP CATEGORY HOA primarily responsible for maintenance. The County needs to assure ongoing maintenance.	**MAINTENANCE ACTIVITIES**	**ANNUAL COST**
BIO-FILTER (3,036 sf) First Category	- CUT VEGETATION IN NATURAL CHANNEL TO 6" HEIGHT - RESEED/VEGETATE BARE SPOTS AS NECESSARY - REMOVE SEDIMENT FROM CHANNEL AS NECESSARY - BACKFILL BURROW HOLES AS NECESSARY	**$3,000**
CURB INLET INSERTS W/ STREAM GUARD (1 total) Second Category	- SEDIMENT REMOVAL - INSPECT FOR DEBRIS/TRASH - OIL/GREASE REMOVAL - INSPECT FOR STRUCTURAL INTEGRITY - ANNUAL RENEWAL OF MEDIUM	**$1,000**
CURB INLET W/ WATER QUALITY INTERCEPTOR/DROP OUTLET BOX (3 total) Second Category	- INSPECT STRUCTURAL INTEGRITY - REMOVE TRASH AND DEBRIS FROM GRATE	**$3,000**
	TOTAL	**$7,000**

PUMP STATION AND STAGING AREA

BMP CATEGORY Master HOA primarily responsible for maintenance. The County needs to assure ongoing maintenance.	**MAINTENANCE ACTIVITIES**	**ANNUAL COST**
BIO-FILTER (174 sf) First Category	- CUT VEGETATION IN NATURAL CHANNEL TO 6" OR 8" HEIGHT - RESEED/VEGETATE BARE SPOTS AS NECESSARY - REMOVE SEDIMENT FROM CHANNEL AS NECESSARY - BACKFILL BURROW HOLES AS NECESSARY	**$1,500**
CURB INLET W/ WATER QUALITY INTERCEPTOR/DROP OUTLET BOX (1 total) Second Category	- INSPECT STRUCTURAL INTEGRITY - REMOVE TRASH AND DEBRIS FROM GRATE	**$1,000**
	TOTAL	**$2,500**

Professional Office, PO1 & PO2

BMP CATEGORY Tenants Association primarily responsible for maintenance. The County needs to assure ongoing maintenance.	**MAINTENANCE ACTIVITIES**	**ANNUAL COST**
BIO-FILTER (2,664 sf) First Category	- CUT VEGETATION IN NATURAL CHANNEL TO 6" HEIGHT - RESEED/VEGETATE BARE SPOTS AS NECESSARY - REMOVE SEDIMENT FROM CHANNEL AS NECESSARY - BACKFILL BURROW HOLES AS NECESSARY	**$4,500**
CURB INLET INSERTS W/ STREAM GUARD (5 total) Second Category	- SEDIMENT REMOVAL - INSPECT FOR DEBRIS/TRASH - OIL/GREASE REMOVAL - INSPECT FOR STRUCTURAL INTEGRITY - ANNUAL RENEWAL OF MEDIUM	**$5,000**
CURB INLET W/ WATER QUALITY INTERCEPTOR/DROP OUTLET BOX (5 total) Second Category	- INSPECT STRUCTURAL INTEGRITY - REMOVE TRASH AND DEBRIS FROM GRATE	**$5,000**
	TOTAL	**$12,500**

SPORTS COMPLEX AND PARKS

BMP CATEGORY Master HOA primarily responsible for maintenance. The County needs to assure ongoing maintenance.	**MAINTENANCE ACTIVITIES**	**ANNUAL COST**
BIO-FILTER (354 sf) First Category	- CUT VEGETATION IN NATURAL CHANNEL TO MAX. 12" HEIGHT - RESEED/VEGETATE BARE SPOTS AS NECESSARY - REMOVE SEDIMENT FROM CHANNEL AS NECESSARY - BACKFILL BURROW HOLES AS NECESSARY	**$1,500**
CURB INLET W/ WATER QUALITY INTERCEPTOR/DROP OUTLET BOX (2 total) Second Category	- INSPECT STRUCTURAL INTEGRITY - REMOVE TRASH AND DEBRIS FROM GRATE	**$2,000**
	TOTAL	**$ 3,500**

TOWN CENTER

BMP CATEGORY Tenant Association primarily responsible for maintenance. The County needs to assure ongoing maintenance.	**MAINTENANCE ACTIVITIES**	**ANNUAL COST**
OIL/WATER SEPARATORS (2 total) Third Category	- REMOVE SEDIMENT IN PRE-SEPARATOR AND SEPARATOR CHAMBERS - REMOVED OIL IN OIL CHAMBER - REMOVE DEBRIS AND GUMMY DEPOSITS FROM COALESCER - INSPECT WATER LEVEL IN TANK - INSPECT GENERAL MECHANICAL INTEGRITY	**$6,000**
CURB INLET INSERTS W/ STREAM GUARD (8 total) Second Category	- SEDIMENT REMOVAL - INSPECT FOR DEBRIS/TRASH - OIL/GREASE REMOVAL - INSPECT FOR STRUCTURAL INTEGRITY - ANNUAL RENEWAL OF MEDIUM	**$8,000**
	TOTAL	**$14,000**

Note: There are a total of 19 storm drain curb inlet inserts proposed with the "B" Designator site plans.

TOTAL ANNUAL MAINTENANCE COST SUMMARY

CATEGORY	**FIRST**	**SECOND**	**THIRD**	**FOURTH**
TOTAL ANNUAL COST	$16,500	$35,000	$6,000	N/A

GRAND TOTAL FOR "B" DESIGNATOR SITE PLANS: **$57,500**

ATTACHMENT G

FISCAL RESOURCES

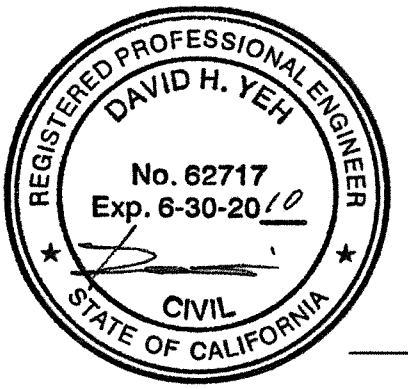
The individual homeowners will be responsible for the BMP devices on their individual residential lots. The master Home Owners' Associations (HOA) will be responsible for the BMP devices in the public right of way and adjoining slopes, the Sports Complex, the Pool Site, the detention basin and the Staging Area/Pump Station lot. The developer will be responsible for the maintenance of interim BMP devices (i.e. sediment traps) on the mass-graded multi-family and commercial lots before they are developed into their ultimate use. Ultimately, after the "B" Designator site plan areas are developed, the individual site HOAs will be responsible for the permanent BMP devices in the multi-family neighborhoods and neighbor recreation facilities and the Tenants' Association will be responsible for the maintenance of permanent BMP devices on the commercial lots.

ATTACHMENT H

CERTIFICATION SHEET

This Stormwater Management Plan has been prepared under the direction of the following Registered Civil Engineer. The Registered Civil Engineer attests to the technical information contained herein and the engineering data upon which recommendations, conclusions, and decisions are based.

The combination of proposed construction and post-construction BMPs will reduce, to the maximum extent practicable, the expected pollutants and will not adversely impact the beneficial uses or water quality of the receiving waters.



Date:

ATTACHMENT I

ADDENDUM

PRELIMINARY HYDROMODIFICATION MANAGEMENT PLAN

PRELIMINARY HYDROMODIFICATION MANAGEMENT PLAN (HMP) FOR:

CAMPUS PARK TM5338 RPL6

San Diego, California

Prepared for:

Passerelle, LLC
402 W. Broadway, Suite 1320
San Diego, Ca 92101

Prepared by:

Landmark Consulting
9555 Genesee Ave, Suite 200
San Diego, Ca 92121
Ph: 858-587-8070
Jn 6-14
Rev. Date: 8-17-09



David Yeh, RCE 62717, Exp. 6-30-10

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PERVIOUS/IMPERVIOUS LAND PARAMETERS SUMMARY 41

BASIN OUTLET STRUCTURE DETAIL 42

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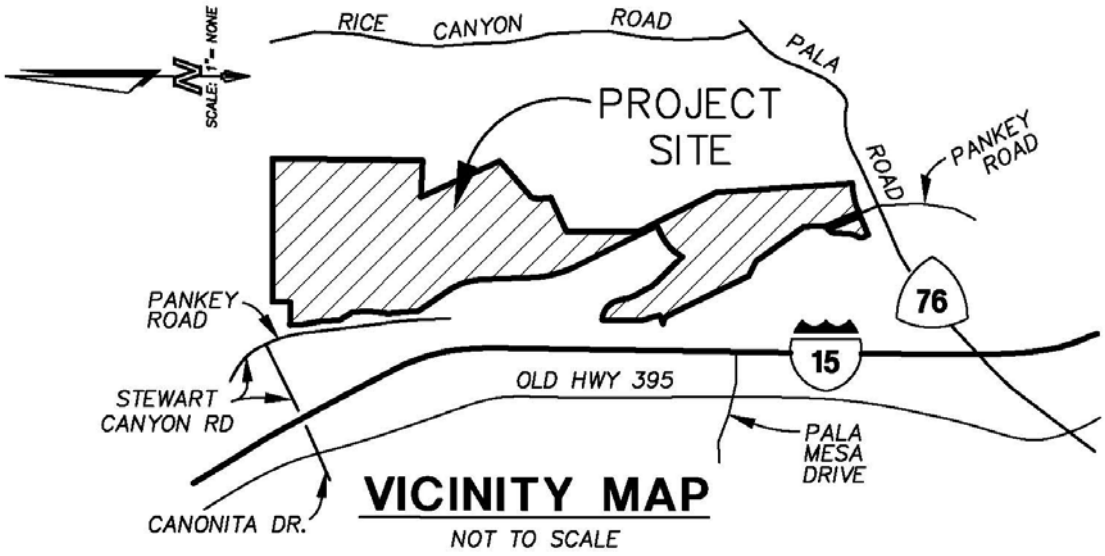
- **LAND USE EXHIBIT**
- **PRE & POST-DEVELOPMENT SLOPE ANALYSIS EXHIBITS**
- **RAINFALL ISOPLUVIAL MAPS**
- **POINTS OF COMPLIANCE LOCATION AND BASIN EXHIBITS**
- **RAIN GAUGE STATION SELECTION MAP**
- **SOIL GROUPS MAPS**
- **DRAINAGE MAP – SEE "A CEQA LEVEL PRELIMINARY HYDROLOGY & HYDRAULICS STUDY FOR CAMPUS PARK" (ATTACHED)**
- **GEOTECHNICAL INPUT**



VICINITY MAP

NOT TO SCALE

INTRODUCTION

Hydromodification is due to the changes in the natural flow pattern of surface and ground water as a result of development such as increases in impervious areas, decreases in natural vegetation, grading and compacting of soil and construction of drainage facilities.

Hydromodification impacts downstream facilities due to less infiltration as a result of increases in impervious areas such as roads, roof areas, driveways and hardscaped areas. This results in increases in peak flow and volume and the likelihood of newly constructed drainage system discharging runoff directly into downstream creeks and water bodies.

The impact to the receiving water can include stream bank erosion due to increased flow velocity and volume, sediment transport and deposition further downstream.

Hydromodification mitigation measures must be employed in this proposed development to reduce and eliminate additional impact to downstream facilities.

A discussion of the geotechnical conditions at the site is included in a soils report included in the Appendix of this report. A discussion of the pre and post-development drainage analysis is included in the preliminary drainage report prepared for this project in the Appendix of this report.

PROJECT DESCRIPTION

The project is located on the northerly side of Pala Road, east of Interstate 15, west of Rice Canyon Road and south of Stewart Canyon Road, in the County of San Diego, State of California.

A vicinity map, showing the general property location, is located on page 5. The site is located on a north to south sloping topography. The terrains along the northerly and easterly boundaries are steep sloping, the mid-portion of the project is moderately sloping and southerly end of the project is very gently sloping.

The project consists of approximately 416 acres of mixed-use development including 113.8 acres of single family dwelling units, 45.4 acres of multi-family dwelling units, 11.5 acres of professional office development, 8.1 acres of town center, 215.4 acres of parks and open space, 0.2 acres of pump station area as well as 21.7 acres of major circulation roads. The acreages indicated are of the lot size not the actual imperious area used in the calculations. The actual impervious areas were measured and calculated based on the most current TM and Site Plans. The 416-acre site area is within an approximately 964-acre sub-area basin that contributes to the overall 7,500-acre Horse Ranch Creek watershed at the lower end of the project site.

There are four Points of Compliance (POC) designated for this project where discharge from the project site leave the project boundary. They are identified as POC 1, POC 3, POC 4 & POC 5. There was previous discussion of a fifth POC (i.e. POC 2), however, that point of compliance was combined with POC 1. See the Pre and Post-development POC Exhibits in the Appendix of this report.

POC 1:

POC 1 is located at the existing Caltrans' rock-lined drainage channel along the westerly project boundary, just easterly of I-15, approximately 600 down stream of the existing 5'x8' box culvert. Under the predevelopment conditions, the runoff from the northerly portion of the project and the easterly upstream tributary area flows into a series of natural channels that convey the flow to an existing 5'x8' culvert located at the easterly side of I-15. The culvert discharges the runoff into the existing rock-lined drainage channel along the easterly side of I-15 and flows southerly to the point of compliance.

Under the proposed conditions, the tributary area has two components: one is routed through the on-site development via a proposed storm drain system that confluences with the on-site, post-development runoff and the other is a bypass system that convey the easterly upstream runoff from the undisturbed areas through the northerly neighborhood, without picking up any on-site post-development runoff, and discharges directly into the existing rock-lined drainage channel at POC 1 and confluences with the flow from the existing 5'x8' culvert.

POC 3:

POC 3 is located on the westerly side of the proposed Horse Ranch Creek Road, approximately 4,300 feet northerly of the intersection with the existing SR 76. The tributary area to POC 3 is the easterly off-site basin.

Under the pre-development conditions, the runoff from the easterly off-site basin drains into a natural drainage channel that crosses the project site and discharges the runoff onto the Horse Ranch Creek floodplain.

Under the post-development conditions, the runoff from the easterly off-site basin drains into the same natural channel and into a proposed culvert crossing the proposed Horse Ranch Creek Road and discharges onto the Horse Ranch Creek floodplain. No on-site, post-development runoff will enter this culvert.

POC 4:

Point of Compliance 4 (POC 4) is located at just upstream of the existing Pankey Road bridge. The tributary area is the drainage basin between the tributary areas of POCs 1 and 3 as well as the tributary area northerly and easterly of the bridge.

Under the existing conditions, the runoff from this tributary area sheet flows onto the Horse Ranch Creek floodplain and flows southerly to the bridge.

Under the proposed conditions, the tributary area has two components. One is northerly and upstream of the proposed detention basin located on the westerly side of the proposed Horse Rand Creek Road, approximately 2,100 feet northerly of the intersection with SR 76. The runoff from this area drains into a storm drain system that conveys the runoff into the detention basin. As the runoff exits the detention basin via an outlet structure, it is discharged onto the existing Horse Ranch Creek floodplain and concentrates at the upstream of the existing Pankey Road bridge. The discharge point of POC 4 is within the Horse Ranch Creek flow limits thus, no overland flows are anticipated.

POC 5:

Point of Compliance 5 (POC 5) is located at approximately 260 feet downstream of the existing Pankey Road bridge.

Under the existing conditions, the runoff from the tributary area to POC 5 sheet flows into Horse Ranch Creek and flows southerly to the existing SR 76 bridge.

Under the post-development conditions, the discharge from proposed multi-family site 4 (MF4), the pump station and portions of the proposed Pankey Place roadway enters the creek and confluences with the main flow in Horse Ranch Creek via an underground storm drain system. The detention/hydromodification mitigation basin will be maintained by the HOA. An outlet structure in the detention/hydromodification mitigation basin will regulate discharge from the basin such that both the duration and peak flow will not exceed those under the pre-development conditions as set forth in the San Diego Draft HMP.
The existing channel is capable of handling the anticipated 100-year peak discharge from the site, POC 4 and 5 specifically, the low intensity storm events analyzed in this report will not negatively affect down stream facilities, and the proposed rip rap energy dissipaters at the outlet points will reduce and eliminate the potential of erosion to down stream banks and streams.

METHOD OF ANALYSIS

Per County of San Diego requirements, hydrograph modification analysis is required for any project disturbing more than 50 acres. Hydrograph modification is caused by the increases in the frequency and duration of runoff as a result of watershed development. An increase in runoff is caused by additional imperious areas and more hydraulically efficient drainage facilities in developed watersheds. The increase can cause or accelerate erosion of existing downstream streambeds and/or banks.

San Diego Hydrology Model (SDHM) published by Clear Creek Solutions, Inc. was used in this hydro-modification analysis. The version of the software is V1.0, published 3-6-2009.

The purpose of the hydrograph modification analysis is to certify that the post-construction hydrologic characteristics of the project simulates the pre-development hydrologic characteristics at the identified points of compliance (POCs). For this project, the POCs were established at four confluence points where the runoff leaves the site.

Under the pre-development conditions, the entire project is vacant and covered with vegetation with a sole exception of a paved access road cut across the northerly portion of the site from existing Pankey Road to the easterly project boundary. The project site is at the lower end of the large Horse Ranch Creek watershed. The entire project site drains into existing Horse Ranch Creek that eventually discharges into San Luis Rey River south of the project via the existing Pankey Road bridge overpass and the SR 76 bridge overpass further south.

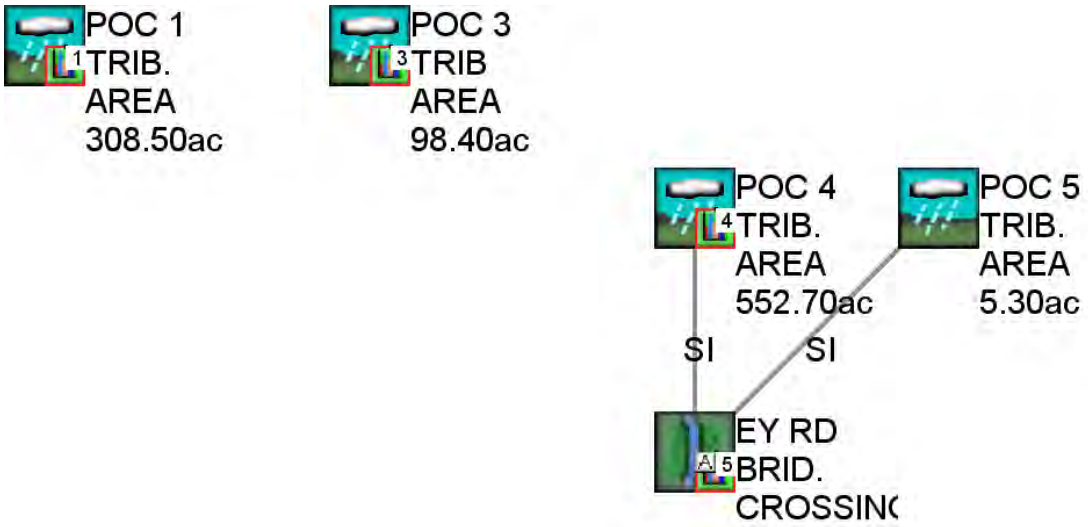
Under the post-development conditions, the disturbance area of the project site is approximately 257 acres, of which approximately 107 acres will be impervious areas such as roadways, roof areas, driveways and parking lots and sidewalks, the remaining will be landscaped pervious areas such as planted slopes, parkways, parks and ball fields. The impervious areas are calculated based on the proposed building and roadway footprint according to the most current Tentative Map and B-Designator Site Plans being processed with the DPLU as TM 5338.

The bulk of the project site and its immediate easterly upstream areas drain into a proposed detention basin located approximately 2,500 feet north of the intersection of Pala Drive (SR 76) and the proposed Horse Ranch Creek Road. The basin has a uniform 2 to 1 side slope and irregular bottom and top. The basin is simulated with a rectangular trapezoidal basin with equivalent depth and volume in the SDHM model. The total storage volume of the detention basin is approximately 15.8 ac-ft. The outlet structure is a riser with small orifices at various depths and a notched overflow inlet at the top – an exhibit of the proposed outlet structure is included on page 42 of this report.

The rainfall data used in the hydrograph modification analysis is based on the annual gauge data at the Lake Wohlford Station. The rainfall data was obtained from the www.projectcleanwater.org web site. The Lake Wohford Station data was used, based on the County of San Diego's average annual precipitation Isopluvial Maps in the San Diego County Hydrology Manual. The project site and the Lake Wohford Station are on the same rain curve - instead of the nearby Fallbrook Station, which is at a lower rain curve.

The infiltration rate of 0.05in/hr is obtained from the San Diego Draft HMP, Appendix C – Technical Memorandum. The soil type of the site ranges from Type “A” to Type “D” per the current Soil Hydrologic Groups map in the County of San Diego Hydrology Manual.

HYDROMODIFICATION CALCULATIONS
PRE-DEVELOPMENT WATERSHED SCHEMATICS:



and Use Report For 614-6-11-09 Predeveloped

Pervious Land Areas

	POC 1 TRIB	POC 3 TRIB	POC 4 TRIB	POC 5 TRIB
B-Shrub-Flat(0-5%)	1.9	3.6	139.9	
B-Shrub-Mod(5-10%)	13.6	5.3	87.2	
B-Shrub-Stee(10-20%)	35.4	4.7	54	
B-Shrub-Very S(>20%)	28.6	4.2	21.4	
C D-Shrub-Flat(0-5%)	2.7	2.2	23.7	3
C D-Shrub-Mod(5-10%)	13.2	2.8	9.4	.4
C D-Shrub-St(10-20%)	35.3	19.7	30.9	.1
C D-Shrub-Very(>20%)	176.6	55.9	186.2	.1

Impervious Land Areas

	POC 1 TRIB	POC 5 TRIB
Roads-Flat(0-5%)		1.7
Roads-Mod(5-10%)	1.2	

POST-DEVELOPMENT WATERSHED SCHEMATICS:



Land Use Report For 614-6-11-09 Developed Mitigated

Pervious Land Areas

	POC 1 TRIB	POC 3 TRIB	POC 4 TRIB	POC 4 TRIB	POC 5 TRIB
B-Shrub-Flat(0-5%)	.28	2.4	8.5	84.3	
B-Shrub-Mod(5-10%)	1	3.4	21.8	4	
B-Shrub-Stee(10-20%)	6.9	3.5	24.1	2.8	
B-Shrub-Very S(>20%)	16.7	4	13.4	3.6	
B-Grass-Flat(0-5%)	4.2		67.1		
B-Grass-Very S(>20%)	8.4		22.3	3	
C D-Shrub-Flat(0-5%)	1.74	2.4	3.7	2.8	14.2
C D-Shrub-Mod(5-10%)	2.55	2.8	2.9	2.6	3.4
C D-Shrub-St(10-20%)	20.1	19.8	22.5	2.9	3.7
C D-Shrub-Very(>20%)	160.9	55.9	153.6	24.5	15.2
C D-Grass-Flat(0-5%)	11.6		4		9.2
C D-Grass-Very(>20%)	1		5.5		

Impervious Land Areas

	POC 1 TRIB	POC 4 TRIB	POC 5 TRIB
Roads-Flat(0-5%)	1.5	25.3	5.2
Roads-Mod(5-10%)	3.6	12.8	1.9
Roads-Steep(10-20%)	1	.7	
Roof Area	5.8	21.3	2.7
Driveways-Flat(0-5%)	2.5	1.8	2.8
Driveways-Mod(5-10%)	1.5	1.8	
Sidewalks-Flat(0-5%)	3	4.6	
Sidewalks-Mod(5-10%)		2	

SAN DIEGO HYDROLOGY MODEL

San Diego Hydrology Model
PROJECT REPORT

Project Name: 614-6-11-09
Site Address:
City : BONSAL
Report Date : 7/2/2009
Gage : LAKE WOHLFORD
Data Start : 1959/10/01 00:00
Data End : 2004/10/31 23:00
Precip Scale: 1.00
SDHM Version:

Element Flows To:
Surface **Interflow** **Groundwater**
DETENTION BASIN, DETENTION BASIN,

Name : DETENTION BASIN
Bottom Length: 320ft.
Bottom Width: 205ft.
Depth : 10ft.
Volume at riser head : 15.8146ft.
Infiltration On
Infiltration rate : 0.05
Infiltration saftey factor : 0.25
Wetted surface area On
Side slope 1: 2 To 1
Side slope 2: 2 To 1
Side slope 3: 2 To 1
Side slope 4: 2 To 1
Discharge Structure
Riser Height: 9 ft.
Riser Diameter: 84 in.
NotchType : Rectangular
Notch Width : 4.000 ft.
Notch Height: 2.000 ft.
Orifice 1 Diameter: 18 in. **Elevation:** 0 ft.
Orifice 1 Diameter: 27 in. **Elevation:** 5 ft.

Element Flows To:
Outlet 1 **Outlet 2**
PANKEY RD BRID CROSSING,

Pond Hydraulic Table

Stage(ft)	Area(acr)	Volume(acr-ft)	Dschrg(cfs)	Infilt(cfs)
0.000	1.506	0.000	0.000	0.000
0.111	1.511	0.168	2.837	0.019
0.222	1.517	0.336	4.011	0.019
0.333	1.522	0.505	4.913	0.019

0.444	1.527	0.674	5.673	0.019
0.556	1.533	0.844	6.343	0.019
0.667	1.538	1.015	6.948	0.019
0.778	1.544	1.186	7.505	0.020
0.889	1.549	1.358	8.023	0.020
1.000	1.555	1.530	8.510	0.020
1.111	1.560	1.703	8.970	0.020
1.222	1.565	1.877	9.408	0.020
1.333	1.571	2.051	9.826	0.020
1.444	1.576	2.226	10.23	0.020
1.556	1.582	2.401	10.61	0.020
1.667	1.587	2.577	10.99	0.020
1.778	1.593	2.754	11.35	0.020
1.889	1.598	2.931	11.70	0.020
2.000	1.604	3.109	12.03	0.020
2.111	1.609	3.288	12.36	0.020
2.222	1.615	3.467	12.69	0.021
2.333	1.620	3.647	13.00	0.021
2.444	1.626	3.827	13.30	0.021
2.556	1.632	4.008	13.60	0.021
2.667	1.637	4.190	13.90	0.021
2.778	1.643	4.372	14.18	0.021
2.889	1.648	4.555	14.46	0.021
3.000	1.654	4.738	14.74	0.021
3.111	1.660	4.922	15.01	0.021
3.222	1.665	5.107	15.28	0.021
3.333	1.671	5.292	15.54	0.021
3.444	1.676	5.478	15.79	0.021
3.556	1.682	5.665	16.05	0.021
3.667	1.688	5.852	16.29	0.022
3.778	1.693	6.040	16.54	0.022
3.889	1.699	6.228	16.78	0.022
4.000	1.705	6.417	17.02	0.022
4.111	1.710	6.607	17.25	0.022
4.222	1.716	6.797	17.49	0.022
4.333	1.722	6.988	17.71	0.022
4.444	1.727	7.180	17.94	0.022
4.556	1.733	7.372	18.16	0.022
4.667	1.739	7.565	18.38	0.022
4.778	1.745	7.759	18.60	0.022
4.889	1.750	7.953	18.82	0.022
5.000	1.756	8.148	19.03	0.023
5.111	1.762	8.343	25.62	0.023
5.222	1.768	8.539	28.47	0.023
5.333	1.774	8.736	30.71	0.023
5.444	1.779	8.933	32.62	0.023
5.556	1.785	9.131	34.33	0.023
5.667	1.791	9.330	35.89	0.023
5.778	1.797	9.529	37.34	0.023
5.889	1.803	9.729	38.70	0.023
6.000	1.808	9.930	39.99	0.023
6.111	1.814	10.13	41.22	0.023
6.222	1.820	10.33	42.39	0.023
6.333	1.826	10.54	43.52	0.023
6.444	1.832	10.74	44.61	0.024
6.556	1.838	10.94	45.67	0.024
6.667	1.844	11.15	46.69	0.024

6.778	1.850	11.35	47.68	0.024
6.889	1.856	11.56	48.65	0.024
7.000	1.861	11.76	49.59	0.024
7.111	1.867	11.97	50.99	0.024
7.222	1.873	12.18	52.74	0.024
7.333	1.879	12.39	54.68	0.024
7.444	1.885	12.60	56.75	0.024
7.556	1.891	12.81	58.90	0.024
7.667	1.897	13.02	61.11	0.024
7.778	1.903	13.23	63.36	0.025
7.889	1.909	13.44	65.62	0.025
8.000	1.915	13.65	67.89	0.025
8.111	1.921	13.87	70.49	0.025
8.222	1.927	14.08	73.17	0.025
8.333	1.933	14.29	75.93	0.025
8.444	1.939	14.51	78.76	0.025
8.556	1.945	14.73	81.67	0.025
8.667	1.951	14.94	84.64	0.025
8.778	1.957	15.16	87.68	0.025
8.889	1.964	15.38	90.79	0.025
9.000	1.970	15.60	93.96	0.026
9.111	1.976	15.81	97.17	0.026
9.222	1.982	16.03	102.5	0.026
9.333	1.988	16.26	109.1	0.026
9.444	1.994	16.48	116.9	0.026
9.556	2.000	16.70	125.5	0.026
9.667	2.006	16.92	135.1	0.026
9.778	2.012	17.14	145.4	0.026
9.889	2.019	17.37	156.4	0.026
10.00	2.025	17.59	168.0	0.026
10.11	2.031	17.82	180.3	0.026

Name : PANKEY RD BRID. CROSSING
Bottom Length: 220ft.
Bottom Width : 20ft.
Manning's n : 0.06
Channel bottom slope 1: 1 To 1
Channel Left side slope 0: 2 To 1
Channel right side slope 2: 2 To 1
Infiltration On
Infiltration rate : 0.05
Infiltration saftey factor : 0.25
Discharge Structure
Riser Height: 0 ft.
Riser Diameter: 0 in.

Element Flows To:
Outlet 1 **Outlet 2**

Channel Hydraulic Table

Stage(ft)	Area(acr)	Volume(acr-ft)	Dschrg(cfs)	Infilt(cfs)
0.000	0.101	0.000	0.000	0.000
0.111	0.103	0.011	12.78	0.001
0.222	0.106	0.023	40.67	0.001
0.333	0.108	0.035	80.13	0.001
0.444	0.110	0.047	129.8	0.001
0.556	0.113	0.059	188.7	0.001
0.667	0.115	0.072	256.5	0.001
0.778	0.118	0.085	332.6	0.001
0.889	0.120	0.098	416.8	0.001
1.000	0.122	0.112	508.9	0.001
1.111	0.125	0.125	608.6	0.001
1.222	0.127	0.139	715.9	0.001
1.333	0.129	0.154	830.5	0.001
1.444	0.132	0.168	952.5	0.001
1.556	0.134	0.183	1081.	0.001
1.667	0.137	0.198	1218.	0.001
1.778	0.139	0.213	1361.	0.001
1.889	0.142	0.229	1512.	0.001
2.000	0.144	0.245	1670.	0.001
2.111	0.146	0.261	1834.	0.001
2.222	0.149	0.277	2006.	0.001
2.333	0.151	0.294	2185.	0.001
2.444	0.154	0.311	2371.	0.001
2.556	0.156	0.328	2564.	0.001
2.667	0.159	0.346	2765.	0.001
2.778	0.161	0.363	2972.	0.001
2.889	0.164	0.381	3186.	0.001
3.000	0.166	0.400	3408.	0.001
3.111	0.168	0.418	3637.	0.001
3.222	0.171	0.437	3873.	0.001
3.333	0.173	0.456	4116.	0.001
3.444	0.176	0.476	4366.	0.001
3.556	0.178	0.495	4624.	0.001
3.667	0.181	0.515	4889.	0.001
3.778	0.183	0.536	5161.	0.001
3.889	0.186	0.556	5441.	0.001
4.000	0.188	0.577	5728.	0.001
4.111	0.191	0.598	6023.	0.001
4.222	0.193	0.619	6325.	0.001
4.333	0.196	0.641	6635.	0.001
4.444	0.199	0.663	6952.	0.001
4.556	0.201	0.685	7277.	0.001
4.667	0.204	0.708	7609.	0.001
4.778	0.206	0.730	7950.	0.001
4.889	0.209	0.753	8298.	0.001
5.000	0.211	0.777	8653.	0.001
5.111	0.214	0.800	9017.	0.001
5.222	0.216	0.824	9388.	0.001
5.333	0.219	0.848	9768.	0.001
5.444	0.221	0.873	10155	0.001
5.556	0.224	0.898	10551	0.001
5.667	0.227	0.923	10954	0.001
5.778	0.229	0.948	11365	0.001
5.889	0.232	0.974	11785	0.001
6.000	0.234	0.999	12213	0.001
6.111	0.237	1.026	12649	0.001

6.222	0.240	1.052	13093	0.001
6.333	0.242	1.079	13546	0.001
6.444	0.245	1.106	14007	0.001
6.556	0.247	1.133	14476	0.001
6.667	0.250	1.161	14954	0.001
6.778	0.253	1.189	15441	0.001
6.889	0.255	1.217	15936	0.001
7.000	0.258	1.246	16439	0.001
7.111	0.260	1.274	16951	0.001
7.222	0.263	1.303	17472	0.001
7.333	0.266	1.333	18002	0.001
7.444	0.268	1.362	18540	0.001
7.556	0.271	1.392	19087	0.001
7.667	0.274	1.423	19643	0.001
7.778	0.276	1.453	20208	0.001
7.889	0.279	1.484	20782	0.001
8.000	0.282	1.515	21365	0.001
8.111	0.284	1.547	21957	0.001
8.222	0.287	1.578	22558	0.001
8.333	0.290	1.611	23169	0.001
8.444	0.292	1.643	23788	0.001
8.556	0.295	1.676	24417	0.001
8.667	0.298	1.708	25055	0.001
8.778	0.301	1.742	25702	0.001
8.889	0.303	1.775	26359	0.001
9.000	0.306	1.809	27025	0.001
9.111	0.309	1.843	27701	0.001
9.222	0.311	1.878	28386	0.001
9.333	0.314	1.912	29081	0.001
9.444	0.317	1.947	29785	0.001
9.556	0.320	1.983	30499	0.001
9.667	0.322	2.019	31223	0.001
9.778	0.325	2.054	31956	0.001
9.889	0.328	2.091	32700	0.001
10.00	0.331	2.127	33453	0.001
10.11	0.333	2.164	34216	0.001

ANALYSIS RESULTS

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	33.3243
5 year	112.871391
10 year	177.275217
25 year	210.86713

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	32.1021
5 year	97.767161
10 year	151.816696
25 year	178.414304

Yearly Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1961	53.134	50.532
1962	1.246	10.245
1963	55.530	55.062
1964	47.082	44.297
1965	0.914	8.998
1966	26.364	26.950
1967	92.908	81.239
1968	165.839	138.472
1969	17.041	18.279
1970	136.975	115.916
1971	39.834	40.036
1972	29.552	29.248
1973	32.648	30.986
1974	41.218	39.680
1975	36.304	34.014
1976	21.078	24.122
1977	33.324	31.345
1978	3.314	12.877
1979	210.879	178.187
1980	100.723	86.122
1981	196.666	164.988
1982	23.353	24.088
1983	128.508	111.800
1984	95.409	89.230
1985	1.187	7.944
1986	82.308	76.141
1987	114.799	99.451
1988	9.466	10.999
1989	1.506	22.240
1990	0.460	6.631
1991	0.101	1.517
1992	105.932	91.704
1993	75.861	67.999
1994	192.495	172.018
1995	48.715	48.991
1996	210.866	180.801
1997	15.343	20.966
1998	9.547	12.706

1999	169.158	144.792
2000	0.489	4.871
2001	0.403	5.894
2002	0.321	4.532
2003	0.466	7.107
2004	30.014	32.102
2005	7.056	11.510

Ranked Yearly Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	210.8790	180.8010
2	210.8660	178.1870
3	196.6660	172.0180
4	192.4950	164.9880
5	169.1580	144.7920
6	165.8390	138.4720
7	136.9750	115.9160
8	128.5080	111.8000
9	114.7990	99.4514
10	105.9320	91.7039
11	100.7230	89.2297
12	95.4092	86.1218
13	92.9075	81.2385
14	82.3084	76.1411
15	75.8611	67.9989
16	55.5296	55.0618
17	53.1340	50.5319
18	48.7154	48.9909
19	47.0819	44.2971
20	41.2179	40.0358
21	39.8342	39.6803
22	36.3043	34.0135
23	33.3243	32.1021
24	32.6482	31.3451
25	30.0141	30.9864
26	29.5523	29.2479
27	26.3644	26.9504
28	23.3532	24.1219
29	21.0782	24.0877
30	17.0408	22.2399
31	15.3430	20.9662
32	9.5467	18.2790
33	9.4662	12.8765
34	7.0558	12.7057
35	3.3142	11.5100
36	1.5060	10.9991
37	1.2456	10.2450
38	1.1870	8.9978
39	0.9138	7.9435
40	0.4888	7.1071
41	0.4664	6.6310
42	0.4599	5.8935
43	0.4031	4.8709
44	0.3206	4.5315
45	0.1009	1.5172

POC #1
The Facility PASSED

The Facility PASSED.

Flow(CFS)	Predev	Dev	Percentage	Pass/Fail
22.5743	485	453	93	Pass
24.1369	451	416	92	Pass
25.6995	415	389	93	Pass
27.2622	389	359	92	Pass
28.8248	362	335	92	Pass
30.3875	337	318	94	Pass
31.9501	318	288	90	Pass
33.5127	295	269	91	Pass
35.0754	281	253	90	Pass
36.6380	264	237	89	Pass
38.2006	252	226	89	Pass
39.7633	240	206	85	Pass
41.3259	228	187	82	Pass
42.8885	218	174	79	Pass
44.4512	209	163	77	Pass
46.0138	189	150	79	Pass
47.5765	174	144	82	Pass
49.1391	164	135	82	Pass
50.7017	158	128	81	Pass
52.2644	151	120	79	Pass
53.8270	140	116	82	Pass
55.3896	131	106	80	Pass
56.9523	126	97	76	Pass
58.5149	123	91	73	Pass
60.0775	118	86	72	Pass
61.6402	110	81	73	Pass
63.2028	101	75	74	Pass
64.7654	95	72	75	Pass
66.3281	90	67	74	Pass
67.8907	86	66	76	Pass
69.4534	81	63	77	Pass
71.0160	77	60	77	Pass
72.5786	73	55	75	Pass
74.1413	70	53	75	Pass
75.7039	67	47	70	Pass
77.2665	65	45	69	Pass
78.8292	61	45	73	Pass
80.3918	60	44	73	Pass
81.9544	57	41	71	Pass
83.5171	52	38	73	Pass
85.0797	50	37	74	Pass
86.6423	49	35	71	Pass
88.2050	46	33	71	Pass
89.7676	45	31	68	Pass
91.3303	45	29	64	Pass
92.8929	44	27	61	Pass
94.4555	41	25	60	Pass
96.0182	39	22	56	Pass
97.5808	37	22	59	Pass
99.1434	36	21	58	Pass

100.7061	35	19	54	Pass
102.2687	32	18	56	Pass
103.8313	30	18	60	Pass
105.3940	30	17	56	Pass
106.9566	26	17	65	Pass
108.5192	24	17	70	Pass
110.0819	23	15	65	Pass
111.6445	21	13	61	Pass
113.2072	20	12	60	Pass
114.7698	19	12	63	Pass
116.3324	18	11	61	Pass
117.8951	18	10	55	Pass
119.4577	18	10	55	Pass
121.0203	18	10	55	Pass
122.5830	18	9	50	Pass
124.1456	16	9	56	Pass
125.7082	16	9	56	Pass
127.2709	16	9	56	Pass
128.8335	14	9	64	Pass
130.3961	13	8	61	Pass
131.9588	12	7	58	Pass
133.5214	12	7	58	Pass
135.0841	11	6	54	Pass
136.6467	11	6	54	Pass
138.2093	10	6	60	Pass
139.7720	10	5	50	Pass
141.3346	10	5	50	Pass
142.8972	9	5	55	Pass
144.4599	9	5	55	Pass
146.0225	9	4	44	Pass
147.5851	9	4	44	Pass
149.1478	9	4	44	Pass
150.7104	9	4	44	Pass
152.2730	8	4	50	Pass
153.8357	8	4	50	Pass
155.3983	7	4	57	Pass
156.9610	7	4	57	Pass
158.5236	6	4	66	Pass
160.0862	6	4	66	Pass
161.6489	6	4	66	Pass
163.2115	6	4	66	Pass
164.7741	6	4	66	Pass
166.3368	5	3	60	Pass
167.8994	5	3	60	Pass
169.4620	4	3	75	Pass
171.0247	4	3	75	Pass
172.5873	4	2	50	Pass
174.1499	4	2	50	Pass
175.7126	4	2	50	Pass
177.2752	4	2	50	Pass

Drawdown Time Results
Pond: Trapezoidal Pond 1

Days	Stage(feet)	Percent of Total Run Time
1	10.00	0.0022

2	**10.00**	**0.0022**
3	**10.00**	**0.0022**
4	**10.00**	**0.0022**
5	**10.00**	**0.0022**

Maximum Stage: 10.87
Drawdown Time: 00 09:38:40

Flow Frequency Return Periods for Predeveloped. POC #3

Return Period	Flow(cfs)
2 year	10.444
5 year	34.950291
10 year	55.11723
25 year	65.632013

Flow Frequency Return Periods for Mitigated. POC #3

Return Period	Flow(cfs)
2 year	10.3653
5 year	34.257717
10 year	53.669291
25 year	63.7806

Yearly Peaks for Predeveloped and Mitigated. POC #3

Year	Predeveloped	Mitigated
1961	16.458	16.330
1962	0.174	0.171
1963	16.973	16.850
1964	14.615	14.492
1965	0.105	0.103
1966	7.956	7.919
1967	28.613	28.187
1968	51.737	50.212
1969	5.056	5.032
1970	42.850	41.795
1971	11.858	11.773
1972	9.093	9.047
1973	10.194	10.126
1974	12.817	12.706
1975	11.342	11.259
1976	6.501	6.460
1977	10.444	10.365
1978	0.725	0.717
1979	66.141	64.180
1980	31.427	30.681
1981	61.645	59.816
1982	7.022	6.988
1983	39.683	38.902
1984	28.813	28.511
1985	0.240	0.238
1986	25.197	24.937
1987	35.518	34.814
1988	2.787	2.775
1989	0.015	0.014
1990	0.053	0.052
1991	0.000	0.000
1992	32.907	32.257
1993	23.444	23.128
1994	59.769	58.167
1995	14.798	14.698
1996	65.584	63.743
1997	4.428	4.405
1998	2.770	2.757
1999	52.637	51.270
2000	0.065	0.065
2001	0.021	0.020
2002	0.014	0.014
2003	0.002	0.002
2004	9.118	9.078

2005 1.915 1.902

Ranked Yearly Peaks for Predeveloped and Mitigated. POC #3

Rank	Predeveloped	Mitigated
1	66.1414	64.1796
2	65.5835	63.7426
3	61.6453	59.8163
4	59.7686	58.1674
5	52.6365	51.2703
6	51.7365	50.2120
7	42.8503	41.7948
8	39.6832	38.9020
9	35.5179	34.8135
10	32.9069	32.2569
11	31.4267	30.6813
12	28.8127	28.5114
13	28.6130	28.1872
14	25.1973	24.9372
15	23.4443	23.1277
16	16.9729	16.8499
17	16.4582	16.3301
18	14.7980	14.6981
19	14.6154	14.4921
20	12.8171	12.7056
21	11.8576	11.7733
22	11.3422	11.2591
23	10.4440	10.3653
24	10.1936	10.1263
25	9.1184	9.0781
26	9.0935	9.0470
27	7.9564	7.9189
28	7.0221	6.9878
29	6.5005	6.4597
30	5.0558	5.0317
31	4.4277	4.4052
32	2.7870	2.7754
33	2.7704	2.7572
34	1.9147	1.9024
35	0.7252	0.7170
36	0.2398	0.2385
37	0.1740	0.1715
38	0.1049	0.1035
39	0.0653	0.0647
40	0.0532	0.0516
41	0.0208	0.0205
42	0.0152	0.0144
43	0.0139	0.0136
44	0.0017	0.0015
45	0.0000	0.0000

POC #3

The Facility PASSED

The Facility PASSED.

Flow(CFS)	Predev	Dev	Percentage	Pass/Fail
6.9901	492	486	98	Pass
7.4762	457	450	98	Pass
7.9623	420	412	98	Pass
8.4485	393	388	98	Pass
8.9346	366	355	96	Pass
9.4207	333	332	99	Pass
9.9069	319	314	98	Pass
10.3930	298	293	98	Pass
10.8791	283	276	97	Pass

11.3653	268	264	98	Pass
11.8514	252	245	97	Pass
12.3375	242	237	97	Pass
12.8237	228	226	99	Pass
13.3098	220	215	97	Pass
13.7959	208	205	98	Pass
14.2821	191	182	95	Pass
14.7682	176	171	97	Pass
15.2543	165	161	97	Pass
15.7405	160	156	97	Pass
16.2266	151	149	98	Pass
16.7127	142	137	96	Pass
17.1989	131	128	97	Pass
17.6850	126	125	99	Pass
18.1711	122	120	98	Pass
18.6573	119	115	96	Pass
19.1434	112	104	92	Pass
19.6295	101	96	95	Pass
20.1157	94	91	96	Pass
20.6018	91	87	95	Pass
21.0879	87	82	94	Pass
21.5740	82	79	96	Pass
22.0602	77	74	96	Pass
22.5463	73	70	95	Pass
23.0324	70	67	95	Pass
23.5186	66	65	98	Pass
24.0047	65	62	95	Pass
24.4908	62	60	96	Pass
24.9770	60	56	93	Pass
25.4631	55	52	94	Pass
25.9492	51	50	98	Pass
26.4354	50	48	96	Pass
26.9215	49	46	93	Pass
27.4076	46	45	97	Pass
27.8938	45	45	100	Pass
28.3799	45	43	95	Pass
28.8660	42	40	95	Pass
29.3522	39	37	94	Pass
29.8383	38	36	94	Pass
30.3244	37	35	94	Pass
30.8106	36	33	91	Pass
31.2967	35	31	88	Pass
31.7828	31	29	93	Pass
32.2690	29	26	89	Pass
32.7551	27	25	92	Pass
33.2412	26	23	88	Pass
33.7274	24	23	95	Pass
34.2135	23	20	86	Pass
34.6996	22	19	86	Pass
35.1858	20	18	90	Pass
35.6719	18	18	100	Pass
36.1580	18	18	100	Pass
36.6442	18	18	100	Pass
37.1303	18	18	100	Pass
37.6164	18	17	94	Pass
38.1026	18	16	88	Pass
38.5887	16	16	100	Pass

39.0748	16	15	93	Pass
39.5610	16	13	81	Pass
40.0471	14	12	85	Pass
40.5332	12	11	91	Pass
41.0194	12	11	91	Pass
41.5055	11	11	100	Pass
41.9916	11	10	90	Pass
42.4778	11	10	90	Pass
42.9639	10	9	90	Pass
43.4500	10	9	90	Pass
43.9362	10	9	90	Pass
44.4223	9	9	100	Pass
44.9084	9	9	100	Pass
45.3946	9	9	100	Pass
45.8807	9	8	88	Pass
46.3668	9	8	88	Pass
46.8530	8	8	100	Pass
47.3391	8	7	87	Pass
47.8252	8	7	87	Pass
48.3114	7	6	85	Pass
48.7975	7	6	85	Pass
49.2836	7	6	85	Pass
49.7698	6	6	100	Pass
50.2559	6	5	83	Pass
50.7420	6	5	83	Pass
51.2282	6	5	83	Pass
51.7143	6	4	66	Pass
52.2004	5	4	80	Pass
52.6866	4	4	100	Pass
53.1727	4	4	100	Pass
53.6588	4	4	100	Pass
54.1450	4	4	100	Pass
54.6311	4	4	100	Pass
55.1172	4	4	100	Pass

Drawdown Time Results
Pond: Trapezoidal Pond 1

Days	Stage(feet)	Percent of Total Run Time
1	10.00	0.0022
2	10.00	0.0022
3	10.00	0.0022
4	10.00	0.0022
5	10.00	0.0022

Maximum Stage: 10.87
Drawdown Time: 00 09:38:40

Flow Frequency Return Periods for Predeveloped. POC #4

Return Period	Flow(cfs)
2 year	34.2587
5 year	136.767348
10 year	245.496826
25 year	294.405783

Flow Frequency Return Periods for Mitigated. POC #4

Return Period	Flow(cfs)
2 year	22.0492

5 year	108.627717
10 year	178.761565
25 year	230.44213

Yearly Peaks for Predeveloped and Mitigated. POC #4

Year	Predeveloped	Mitigated
1961	54.478	42.673
1962	0.652	12.727
1963	56.802	22.049
1964	48.584	39.197
1965	0.388	11.847
1966	26.563	18.689
1967	100.712	98.939
1968	235.229	225.223
1969	17.141	15.782
1970	181.526	191.852
1971	40.390	36.903
1972	29.855	17.973
1973	33.314	24.806
1974	43.656	20.233
1975	37.187	35.927
1976	21.449	19.103
1977	34.259	36.157
1978	2.669	13.695
1979	306.573	207.137
1980	131.869	111.319
1981	283.593	285.243
1982	23.531	17.357
1983	152.751	90.346
1984	98.841	65.358
1985	0.847	10.144
1986	85.418	32.788
1987	138.128	144.463
1988	9.543	13.250
1989	0.082	16.071
1990	0.236	12.124
1991	0.000	3.121
1992	128.998	92.143
1993	83.554	60.795
1994	264.749	171.780
1995	49.598	22.078
1996	293.247	158.786
1997	15.145	13.510
1998	9.498	15.661
1999	228.086	143.704
2000	0.233	7.694
2001	0.079	10.722
2002	0.063	10.434
2003	0.012	8.696
2004	30.394	14.347
2005	6.764	14.456

Ranked Yearly Peaks for Predeveloped and Mitigated. POC #4

Rank	Predeveloped	Mitigated
1	306.5730	285.2430
2	293.2470	225.2230
3	283.5930	207.1370
4	264.7490	191.8520
5	235.2290	171.7800
6	228.0860	158.7860
7	181.5260	144.4630
8	152.7510	143.7040
9	138.1280	111.3190
10	131.8690	98.9391
11	128.9980	92.1432
12	100.7120	90.3459
13	98.8413	65.3582
14	85.4180	60.7951
15	83.5536	42.6730

16	56.8021	39.1966
17	54.4775	36.9031
18	49.5982	36.1568
19	48.5844	35.9271
20	43.6560	32.7882
21	40.3902	24.8063
22	37.1870	22.0784
23	34.2587	22.0492
24	33.3136	20.2333
25	30.3939	19.1032
26	29.8553	18.6892
27	26.5631	17.9728
28	23.5313	17.3574
29	21.4494	16.0705
30	17.1410	15.7822
31	15.1451	15.6606
32	9.5432	14.4558
33	9.4977	14.3469
34	6.7636	13.6950
35	2.6693	13.5102
36	0.8468	13.2495
37	0.6517	12.7269
38	0.3882	12.1239
39	0.2359	11.8466
40	0.2326	10.7221
41	0.0817	10.4337
42	0.0790	10.1442
43	0.0632	8.6960
44	0.0121	7.6940
45	0.0000	3.1208

POC #4

The Facility PASSED

The Facility PASSED.

Flow(CFS)	Predev	Dev	Percentage	Pass/Fail
27.3535	452	424	93	Pass
29.5569	407	389	95	Pass
31.7604	361	362	100	Pass
33.9639	335	334	99	Pass
36.1673	306	315	102	Pass
38.3708	286	292	102	Pass
40.5743	268	266	99	Pass
42.7777	262	240	91	Pass
44.9812	247	228	92	Pass
47.1847	230	215	93	Pass
49.3882	217	202	93	Pass
51.5916	204	186	91	Pass
53.7951	185	171	92	Pass
55.9986	170	159	93	Pass
58.2020	160	148	92	Pass
60.4055	153	132	86	Pass
62.6090	144	121	84	Pass
64.8124	136	117	86	Pass
67.0159	126	108	85	Pass
69.2194	120	102	85	Pass
71.4228	112	93	83	Pass
73.6263	106	89	83	Pass
75.8298	98	78	79	Pass
78.0332	94	74	78	Pass
80.2367	91	72	79	Pass

82.4402	84	69	82	Pass
84.6436	78	66	84	Pass
86.8471	73	63	86	Pass
89.0506	72	63	87	Pass
91.2540	68	57	83	Pass
93.4575	61	55	90	Pass
95.6610	59	52	88	Pass
97.8645	58	50	86	Pass
100.0679	54	46	85	Pass
102.2714	50	43	86	Pass
104.4749	46	40	86	Pass
106.6783	45	40	88	Pass
108.8818	44	39	88	Pass
111.0853	41	38	92	Pass
113.2887	41	37	90	Pass
115.4922	40	35	87	Pass
117.6957	38	34	89	Pass
119.8991	37	33	89	Pass
122.1026	36	31	86	Pass
124.3061	36	27	75	Pass
126.5095	36	25	69	Pass
128.7130	36	23	63	Pass
130.9165	33	23	69	Pass
133.1199	29	23	79	Pass
135.3234	28	23	82	Pass
137.5269	27	20	74	Pass
139.7304	26	20	76	Pass
141.9338	25	19	76	Pass
144.1373	23	17	73	Pass
146.3408	22	16	72	Pass
148.5442	21	16	76	Pass
150.7477	19	16	84	Pass
152.9512	16	15	93	Pass
155.1546	16	15	93	Pass
157.3581	15	14	93	Pass
159.5616	13	13	100	Pass
161.7650	13	13	100	Pass
163.9685	12	13	108	Pass
166.1720	11	12	109	Pass
168.3754	11	11	100	Pass
170.5789	11	10	90	Pass
172.7824	11	9	81	Pass
174.9858	11	8	72	Pass
177.1893	11	7	63	Pass
179.3928	11	7	63	Pass
181.5962	10	7	70	Pass
183.7997	9	7	77	Pass
186.0032	8	7	87	Pass
188.2067	8	7	87	Pass
190.4101	8	6	75	Pass
192.6136	8	5	62	Pass
194.8171	8	4	50	Pass
197.0205	8	4	50	Pass
199.2240	8	4	50	Pass
201.4275	8	4	50	Pass
203.6309	8	4	50	Pass
205.8344	7	4	57	Pass

208.0379	7	3	42	Pass
210.2413	7	2	28	Pass
212.4448	7	2	28	Pass
214.6483	7	2	28	Pass
216.8517	7	2	28	Pass
219.0552	7	2	28	Pass
221.2587	7	2	28	Pass
223.4621	7	2	28	Pass
225.6656	6	1	16	Pass
227.8691	6	1	16	Pass
230.0725	5	1	20	Pass
232.2760	5	1	20	Pass
234.4795	5	1	20	Pass
236.6830	4	1	25	Pass
238.8864	4	1	25	Pass
241.0899	4	1	25	Pass
243.2934	4	1	25	Pass
245.4968	4	1	25	Pass

Drawdown Time Results
Pond: Trapezoidal Pond 1

Days	Stage(feet)	Percent of Total Run Time
1	10.00	0.0022
2	10.00	0.0022
3	10.00	0.0022
4	10.00	0.0022
5	10.00	0.0022

Maximum Stage: 10.87
Drawdown Time: 00 09:38:40

Flow Frequency Return Periods for Predeveloped. POC #5

Return Period	Flow(cfs)
2 year	34.5535
5 year	138.159696
10 year	247.860087
25 year	296.148087

Flow Frequency Return Periods for Mitigated. POC #5

Return Period	Flow(cfs)
2 year	22.838
5 year	105.588957
10 year	166.838043
25 year	216.37987

Yearly Peaks for Predeveloped and Mitigated. POC #5

Year	Predeveloped	Mitigated
1961	55.095	42.784
1962	1.490	17.486
1963	57.036	22.838
1964	49.012	39.641
1965	1.151	15.996
1966	26.897	19.190
1967	101.631	98.097
1968	237.906	211.533
1969	17.199	17.473
1970	183.245	185.708
1971	40.850	38.007
1972	30.274	18.313
1973	33.475	24.825

1974	43.894	20.414
1975	37.443	36.286
1976	21.475	21.046
1977	34.554	36.737
1978	3.419	17.079
1979	309.085	183.130
1980	133.493	107.670
1981	286.916	267.272
1982	23.904	18.280
1983	153.823	91.351
1984	99.271	65.980
1985	1.338	11.981
1986	85.666	32.945
1987	139.456	142.501
1988	9.771	15.084
1989	2.014	21.806
1990	0.640	15.206
1991	0.130	3.464
1992	130.300	91.689
1993	84.183	60.627
1994	266.524	158.149
1995	50.101	23.318
1996	294.916	152.607
1997	15.541	14.873
1998	9.799	18.381
1999	229.739	131.677
2000	0.603	9.671
2001	0.552	13.187
2002	0.450	12.368
2003	0.632	9.713
2004	30.589	17.335
2005	7.161	16.781

Ranked Yearly Peaks for Predeveloped and Mitigated. POC #5

Rank	Predeveloped	Mitigated
1	309.0850	267.2720
2	294.9160	211.5330
3	286.9160	185.7080
4	266.5240	183.1300
5	237.9060	158.1490
6	229.7390	152.6070
7	183.2450	142.5010
8	153.8230	131.6770
9	139.4560	107.6700
10	133.4930	98.0972
11	130.3000	91.6891
12	101.6310	91.3505
13	99.2705	65.9796
14	85.6659	60.6268
15	84.1830	42.7841
16	57.0360	39.6411
17	55.0946	38.0070
18	50.1006	36.7372
19	49.0117	36.2855
20	43.8943	32.9448
21	40.8504	24.8248
22	37.4432	23.3180
23	34.5535	22.8380
24	33.4745	21.8058
25	30.5886	21.0461
26	30.2737	20.4140
27	26.8970	19.1900
28	23.9035	18.3807
29	21.4754	18.3125
30	17.1993	18.2795
31	15.5414	17.4863
32	9.7995	17.4729
33	9.7709	17.3352
34	7.1612	17.0788
35	3.4195	16.7811

36	2.0145	15.9961
37	1.4901	15.2062
38	1.3385	15.0836
39	1.1510	14.8725
40	0.6405	13.1868
41	0.6317	12.3679
42	0.6027	11.9814
43	0.5519	9.7128
44	0.4504	9.6711
45	0.1303	3.4643

POC #5

The Facility PASSED

The Facility PASSED.

Flow(CFS)	Predev	Dev	Percentage	Pass/Fail
27.6319	454	413	90	Pass
29.8565	408	379	92	Pass
32.0810	362	348	96	Pass
34.3055	334	328	98	Pass
36.5300	305	303	99	Pass
38.7546	287	281	97	Pass
40.9791	269	245	91	Pass
43.2036	261	231	88	Pass
45.4282	247	221	89	Pass
47.6527	230	208	90	Pass
49.8772	217	188	86	Pass
52.1017	205	176	85	Pass
54.3263	185	157	84	Pass
56.5508	170	149	87	Pass
58.7753	160	135	84	Pass
60.9998	154	125	81	Pass
63.2244	143	117	81	Pass
65.4489	137	110	80	Pass
67.6734	127	103	81	Pass
69.8979	122	94	77	Pass
72.1225	111	88	79	Pass
74.3470	107	81	75	Pass
76.5715	97	73	75	Pass
78.7961	94	72	76	Pass
81.0206	90	72	80	Pass
83.2451	85	67	78	Pass
85.4696	79	63	79	Pass
87.6942	74	61	82	Pass
89.9187	72	58	80	Pass
92.1432	68	54	79	Pass
94.3677	62	53	85	Pass
96.5923	60	51	85	Pass
98.8168	58	46	79	Pass
101.0413	54	41	75	Pass
103.2658	49	39	79	Pass
105.4904	46	38	82	Pass
107.7149	44	36	81	Pass
109.9394	43	35	81	Pass
112.1640	41	35	85	Pass
114.3885	41	31	75	Pass
116.6130	41	31	75	Pass

118.8375	38	28	73	Pass
121.0621	37	27	72	Pass
123.2866	36	25	69	Pass
125.5111	36	24	66	Pass
127.7356	36	24	66	Pass
129.9602	36	23	63	Pass
132.1847	33	21	63	Pass
134.4092	31	21	67	Pass
136.6337	28	20	71	Pass
138.8583	27	19	70	Pass
141.0828	26	17	65	Pass
143.3073	24	16	66	Pass
145.5319	23	16	69	Pass
147.7564	22	15	68	Pass
149.9809	21	15	71	Pass
152.2054	19	15	78	Pass
154.4300	16	13	81	Pass
156.6545	16	13	81	Pass
158.8790	15	12	80	Pass
161.1035	13	12	92	Pass
163.3281	13	11	84	Pass
165.5526	12	10	83	Pass
167.7771	11	9	81	Pass
170.0017	11	8	72	Pass
172.2262	11	8	72	Pass
174.4507	11	7	63	Pass
176.6752	11	7	63	Pass
178.8998	11	7	63	Pass
181.1243	11	7	63	Pass
183.3488	10	6	60	Pass
185.5733	9	6	66	Pass
187.7979	8	4	50	Pass
190.0224	8	4	50	Pass
192.2469	8	3	37	Pass
194.4714	8	3	37	Pass
196.6960	8	3	37	Pass
198.9205	8	3	37	Pass
201.1450	8	3	37	Pass
203.3696	8	3	37	Pass
205.5941	8	2	25	Pass
207.8186	7	2	28	Pass
210.0431	7	2	28	Pass
212.2677	7	1	14	Pass
214.4922	7	1	14	Pass
216.7167	7	1	14	Pass
218.9412	7	1	14	Pass
221.1658	7	1	14	Pass
223.3903	7	1	14	Pass
225.6148	7	1	14	Pass
227.8393	6	1	16	Pass
230.0639	5	1	20	Pass
232.2884	5	1	20	Pass
234.5129	5	1	20	Pass
236.7375	5	1	20	Pass
238.9620	4	1	25	Pass
241.1865	4	1	25	Pass
243.4110	4	1	25	Pass

```
245.6356    4       1       25      Pass
247.8601    4       1       25      Pass
```

Drawdown Time Results
Pond: Trapezoidal Pond 1

Days	Stage(feet)	Percent of Total Run Time
1	10.00	0.0022
2	10.00	0.0022
3	10.00	0.0022
4	10.00	0.0022
5	10.00	0.0022

Maximum Stage: 10.87
Drawdown Time: 00 09:38:40

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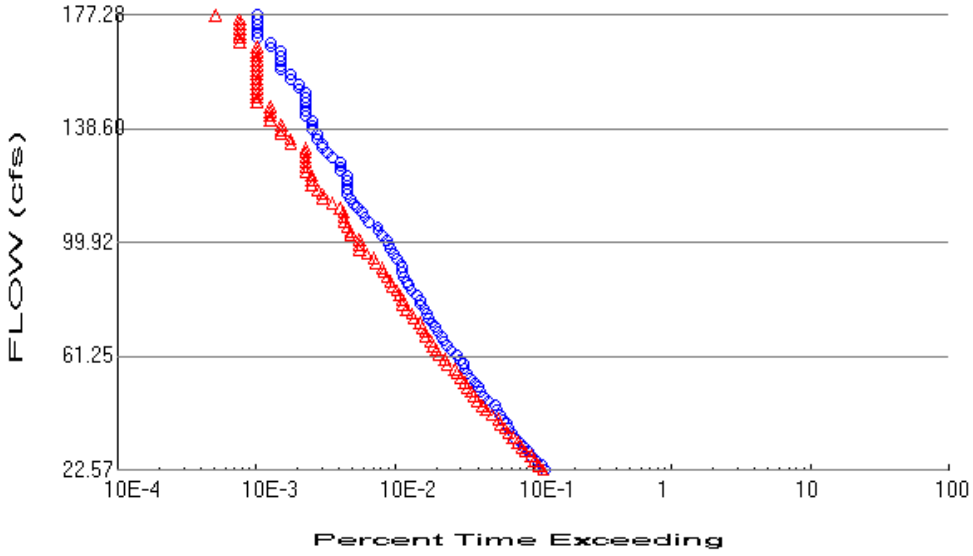
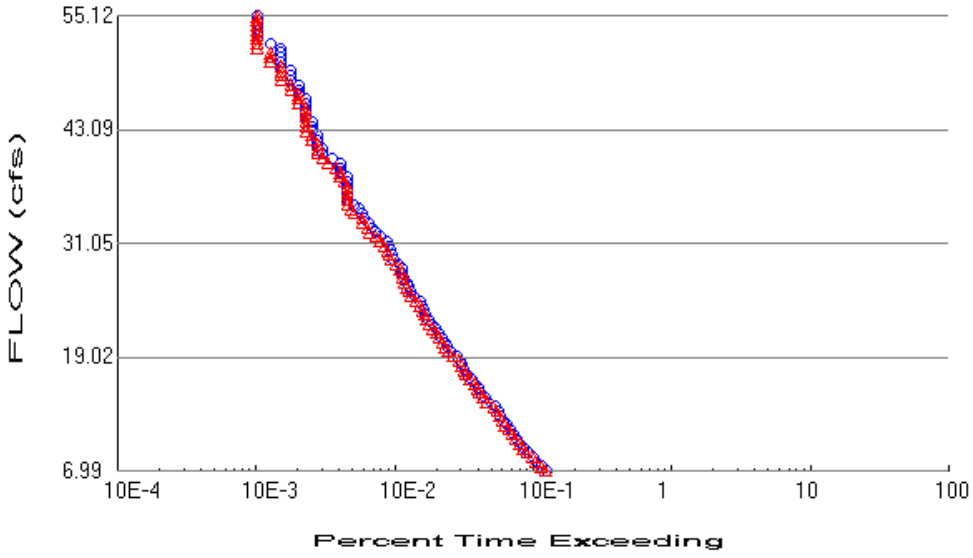
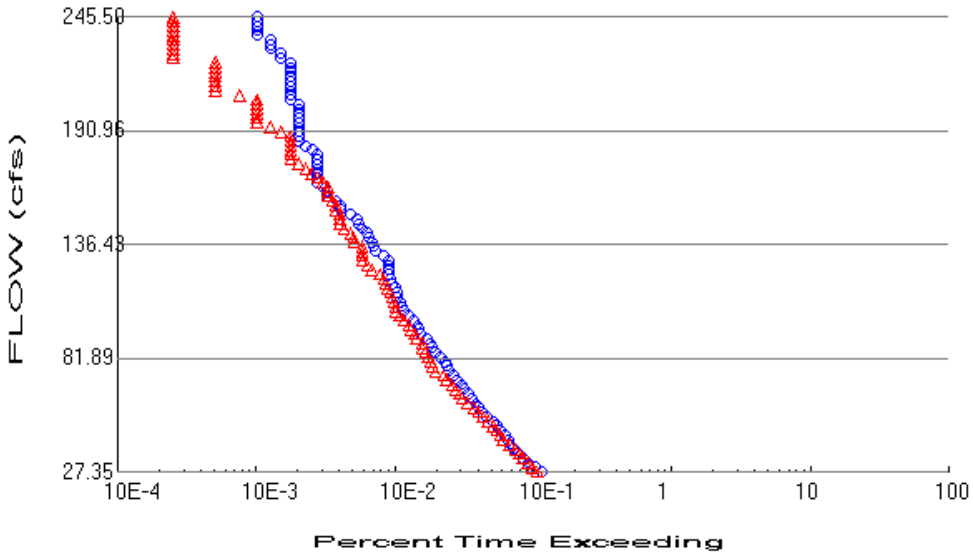
POC 1 DURATION



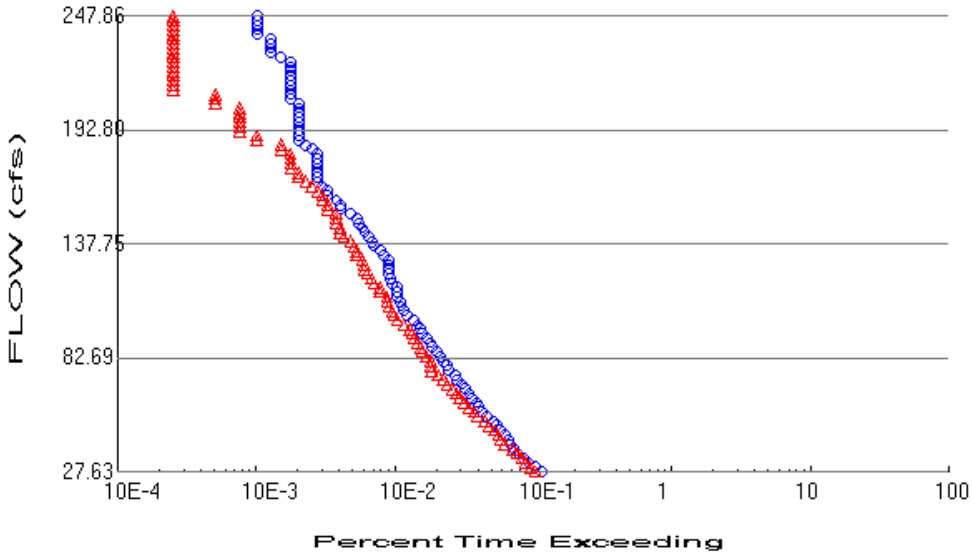
POC3 DURATION



POC4 DURATION



POC5 DURATION



Drawdown Time Results
Pond: Trapezoidal Pond 1

Days	Stage(feet)	Percent of Total Run Time
1	10.00	0.0022
2	10.00	0.0022
3	10.00	0.0022
4	10.00	0.0022
5	10.00	0.0022

Maximum Stage: 10.87
Drawdown Time: 00 09:38:40

SUMMARY

FLOW DATA AT POINTS OF COMPLIANCE (POC)

POC1

	PRE-DEVELOPMENT	POST-DEVELOPMENT
5-YEAR FLOW RATE Q5 (CFS)	112.9	98.6
10-YEAR FLOW RATE Q10 (CFS)	177.3	153.9
20% 5-YEAR FLOW RATE 0.2Q5 (CFS)	22.6	19.6

POC3

	PRE-DEVELOPMENT	POST-DEVELOPMENT
5-YEAR FLOW RATE Q5 (CFS)	34.9	34.2
10-YEAR FLOW RATE Q10 (CFS)	55.1	53.7
20% 5-YEAR FLOW RATE 0.2Q5 (CFS)	7.0	6.8

POC4

	PRE-DEVELOPMENT	POST-DEVELOPMENT
5-YEAR FLOW RATE Q5 (CFS)	136.8	108.6
10-YEAR FLOW RATE Q10 (CFS)	245.5	178.8
20% 5-YEAR FLOW RATE 0.2Q5 (CFS)	27.4	21.7

POC5

	PRE-DEVELOPMENT	POST-DEVELOPMENT
5-YEAR FLOW RATE Q5 (CFS)	112.9	99.6
10-YEAR FLOW RATE Q10 (CFS)	177.3	153.9
20% 5-YEAR FLOW RATE 0.2Q5 (CFS)	22.6	19.2

Based on the calculations presented in this report, The post-development discharge rates and durations do not exceed those of the pre-development conditions by more than 10% over more than 10% of the length of the flow duration curve. See pages 22 to 23 for POC1, pages 25-27 for POC 3, pages 29-31 for POC 4 and pages 33 – 35 for POC 5 for more detailed results.

In accordance with the San Diego Draft HMP Sections 5.0 and 7.0, and Minimum Criteria for Evaluation of Storm Water Controls to Meet Interim Hydromodification Criteria (IHC) prepared by Brown and Caldwell, dated 8-11-2008, the post-development flow rates from 20% of pre-development 5-year flow, 0.2Q5, to the pre-development 5-year flow, Q5, range do not exceed the pre-development conditions. And the post-development flow rates from the pre-development 5-year flow, Q5, to the pre-development 10-year flow, Q10, range do not exceed the pre-development conditions. See page 21 for POC1, page 25 for POC 3, pages 28-29 for POC 4 and pages 32-33 for POC 5 for more detailed results.

According to the drawdown analysis on page 38, the drawdown time is 9 hours and 39 minutes. The runoff will completely discharge from the basin in less than 3 days or 72 hours such that no vector control scenarios will occur.

PROPOSED MITIGATION MEASURE:

The proposed mitigation measure is the detention/hydromodification mitigation basin - it is a trapezoidal basin with a uniform 2 to 1 side slopes and irregular bottom and top. The maximum depth of the basin is 10 feet and the maximum volume is 15.8 ac-ft. The outlet structure is a 84-inch diameter riser pipe. An 18-inch diameter orifice will be installed in the riser at the bottom of the basin and a 27-inch diameter orifice will be installed 5' from the bottom of the basin. A rectangular notch will be cut into the riser, the bottom of the notch is 2' from the bottom of the basin and the width of the notch is 4'. See Basin Outlet Structure Detail on page 41 for more details.

Based on the post-development SDHM analysis from page 11 to 38, the proposed detention basin is adequate to mitigate the anticipated post-development runoff to satisfy the criteria set forth in Sections 5.0 and 7.0 of the San Diego Draft HMP. No damage to downstream facilities is anticipated due to hydromodification concerns.

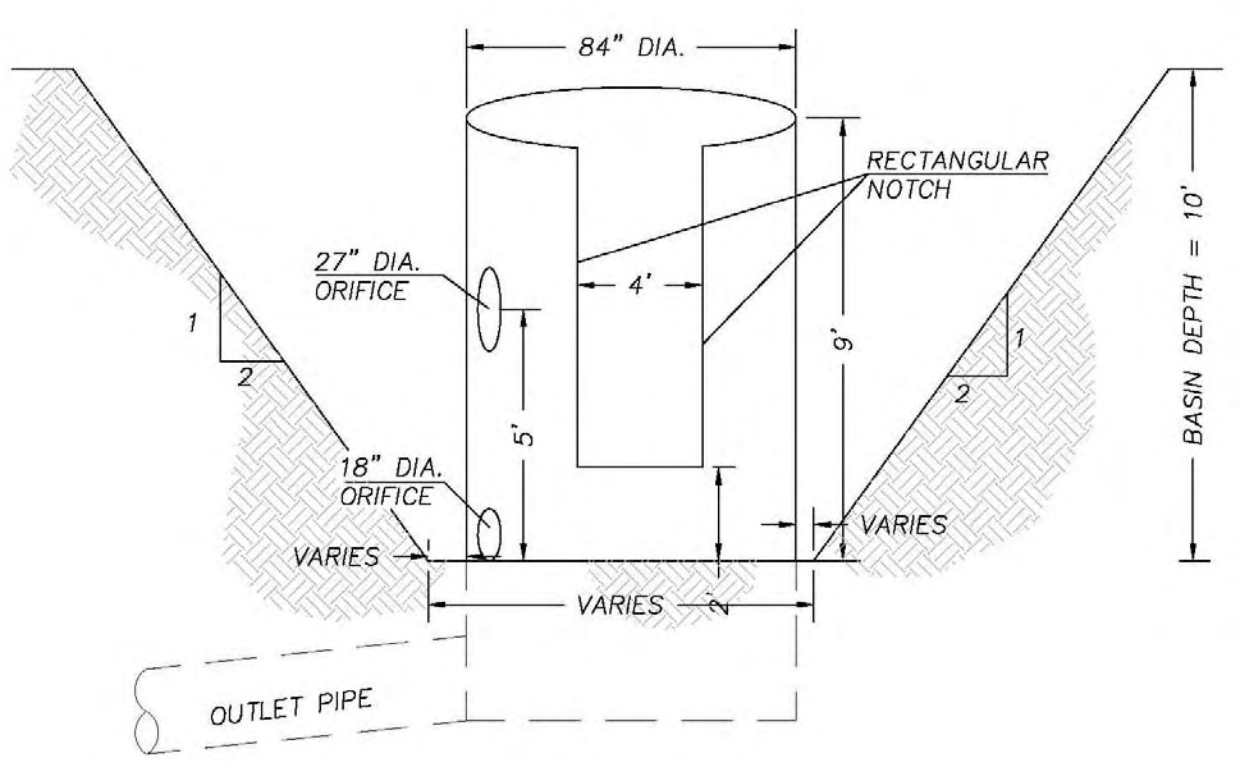
PERVIOUS/IMPERVIOUS LAND PARAMETERS SUMMARY

	TOTAL ROOF AREA[1]	DRIVEWAY/ HARDSCAPE AREA	STREET AREA	SIDEWALK AREA	2:1 SLOPE AREA	LANDSCAPE AREA	UNDISTURBED AREA	TOTAL AREA
	(AC)	(AC)	(AC)	(AC)	(AC)	(AC)	(AC)	(AC)
POC1:								
PRE-DEV	0	0	1.2	0	0	0	307.3	308.5
POST-DEV	5.8	4.0	6.1	3.0	8.4	4.2	222.8	254.3
POC3:								
PRE-DEV	0	0	0	0	0	0	98.4	98.4
POST-DEV	0	0	0	0	0	0	94.2	94.2
POC4:								
PRE-DEV	0	0	0	0	0	0	552.7	552.7
POST-DEV	21.3	6.6	38.8	6.6	25.3	67.1	384.5	550.2
POC5:								
PRE-DEV	0	0	1.7	0	0	0	3.6	5.3
POST-DEV	2.7	2.8	7.1	0	0	9.2	36.5	58.3

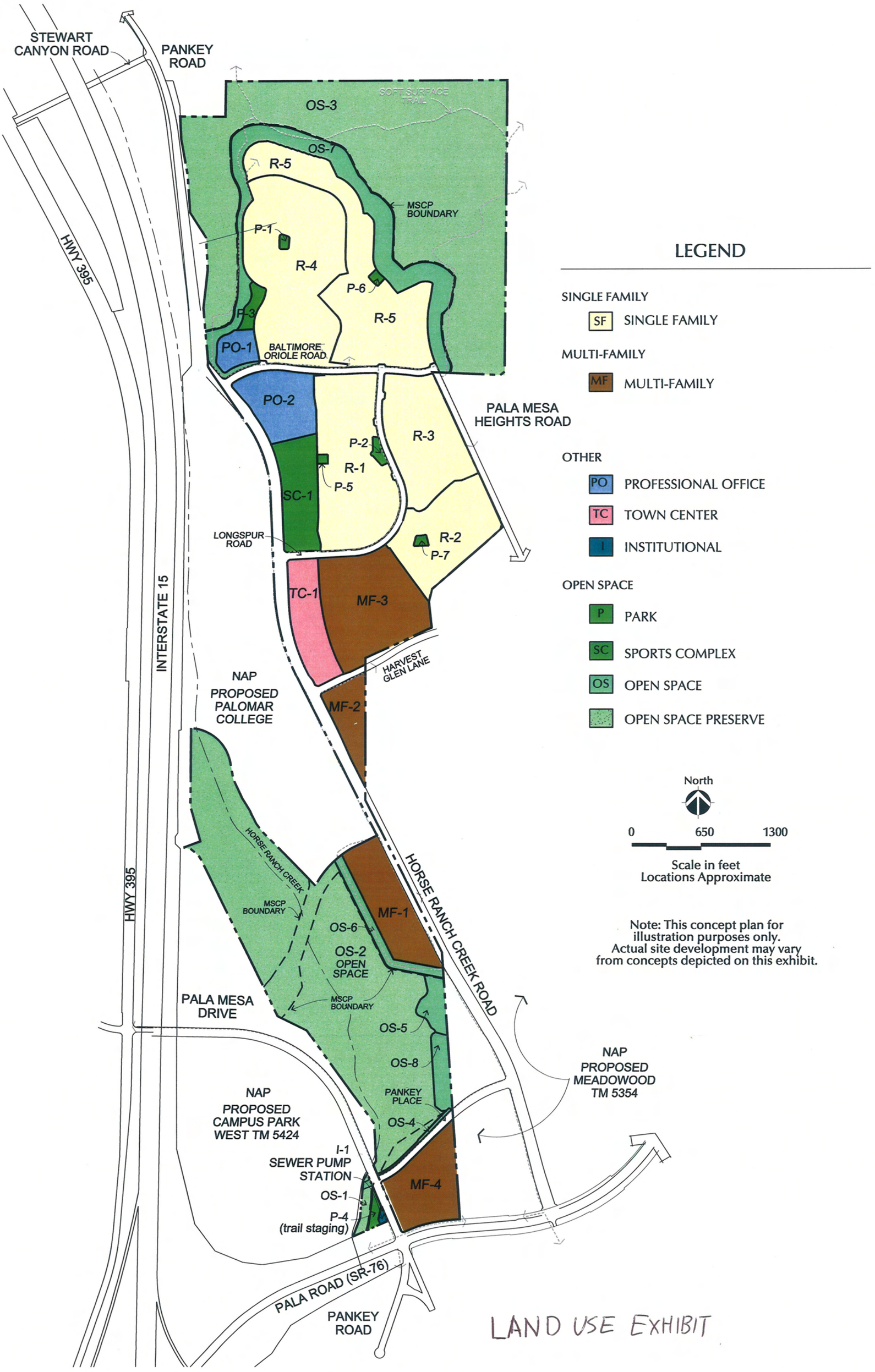
Footnotes:

[1] Roof Areas in POC1: SFR=5.8, MFR=0, Comm/Office=0; Roof Areas in POC3: SFR=0, MFR=0, Comm/Office=0; Roof Areas in POC4: SFR=8.3, MFR=9.7, Comm/Office=3.3; Roof Areas in POC5: SFR=0, MFR=2.7, Comm/Office=0

DETENTION/HYDROMODIFICATION MITIGATION BASIN OUTLET STRUCTURE DETAIL (NOT TO SCALE):

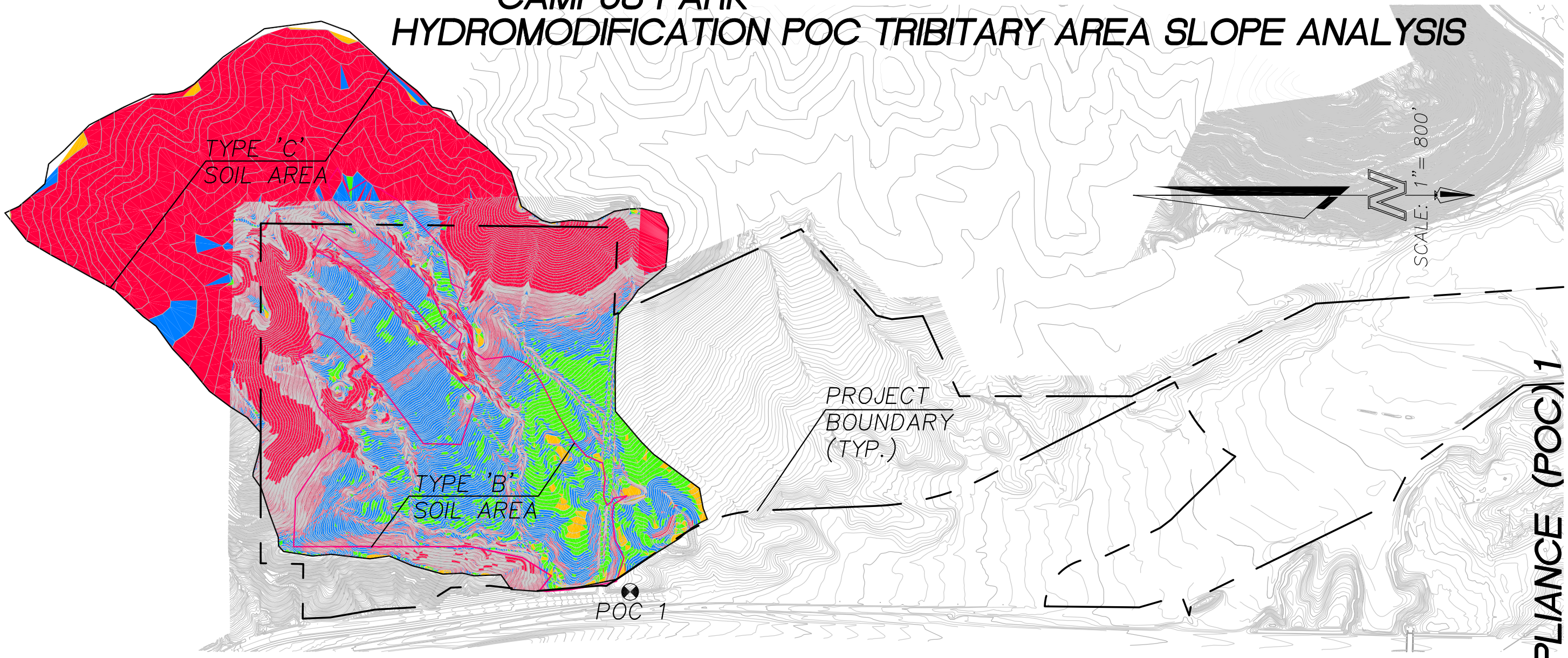


APPENDIX



LAND USE EXHIBIT

CAMPUS PARK
HYDROMODIFICATION POC TRIBITARY AREA SLOPE ANALYSIS



POC 1 OVERALL PRE DEV

Color	BEG. %	END %	SLOPE AREA
	0.00	5.00	4.6
	5.00	10.00	26.8
	10.00	20.00	70.7
	20.00	10000.00	205.2

POC 1 SOIL B

Color	BEG. %	END %	SLOPE AREA
	0.00	5.00	1.9
	5.00	10.00	13.6
	10.00	20.00	35.4
	20.00	10000.00	28.6

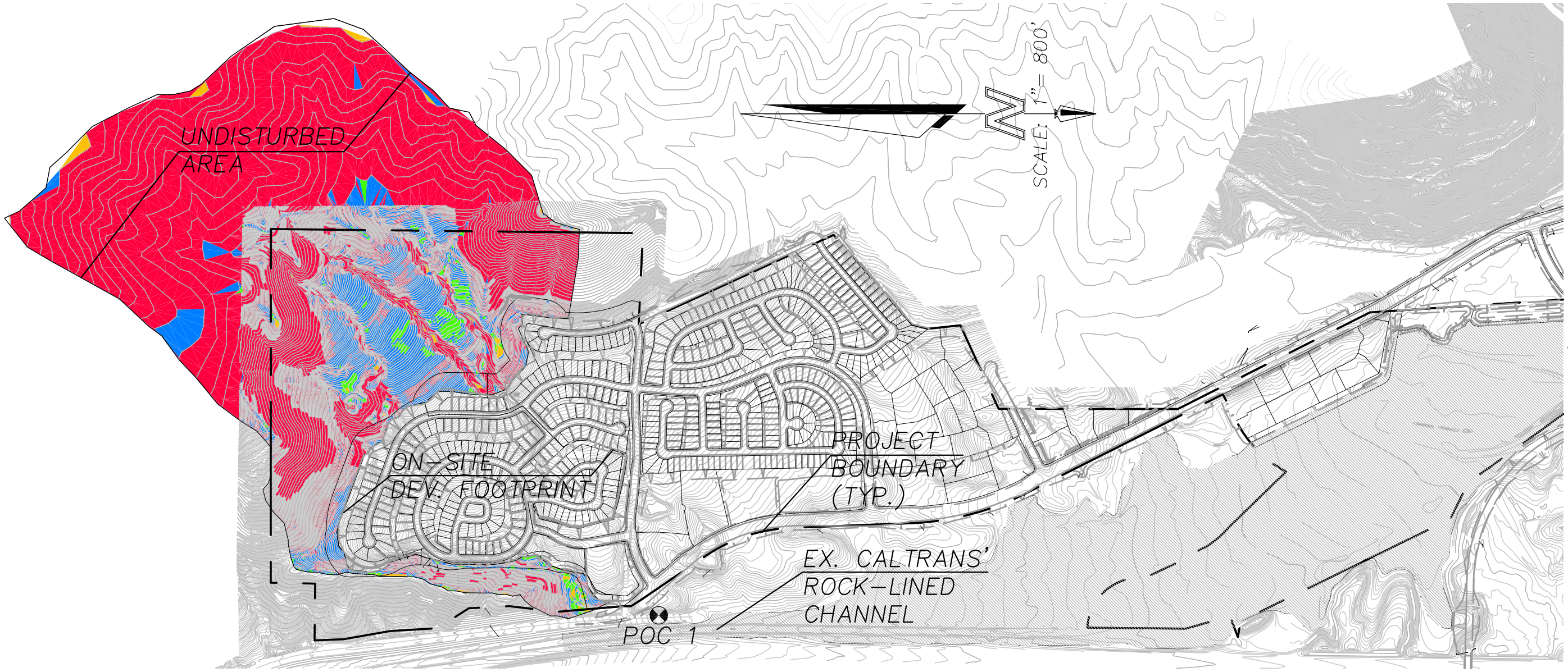
POC 1 SOIL C

Color	BEG. %	END %	SLOPE AREA
	0.00	5.00	2.7
	5.00	10.00	13.2
	10.00	20.00	35.3
	20.00	10000.00	176.6

POINT OF COMPLIANCE (POC) 1
PRE DEVELOPMENT

J.N.:

CAMPUS PARK
HYDROMODIFICATION POC TRIBITARY AREA SLOPE ANALYSIS



POINT OF COMPLIANCE (POC) 1
POST DEVELOPMENT

J.N.:

POC 1 POST UNDISTURBED

Color	BEG. %	END %	SLOPE AREA
	0.00	5.00	2.02
	5.00	10.00	3.57
	10.00	20.00	27.04
	20.00	10000.00	177.62

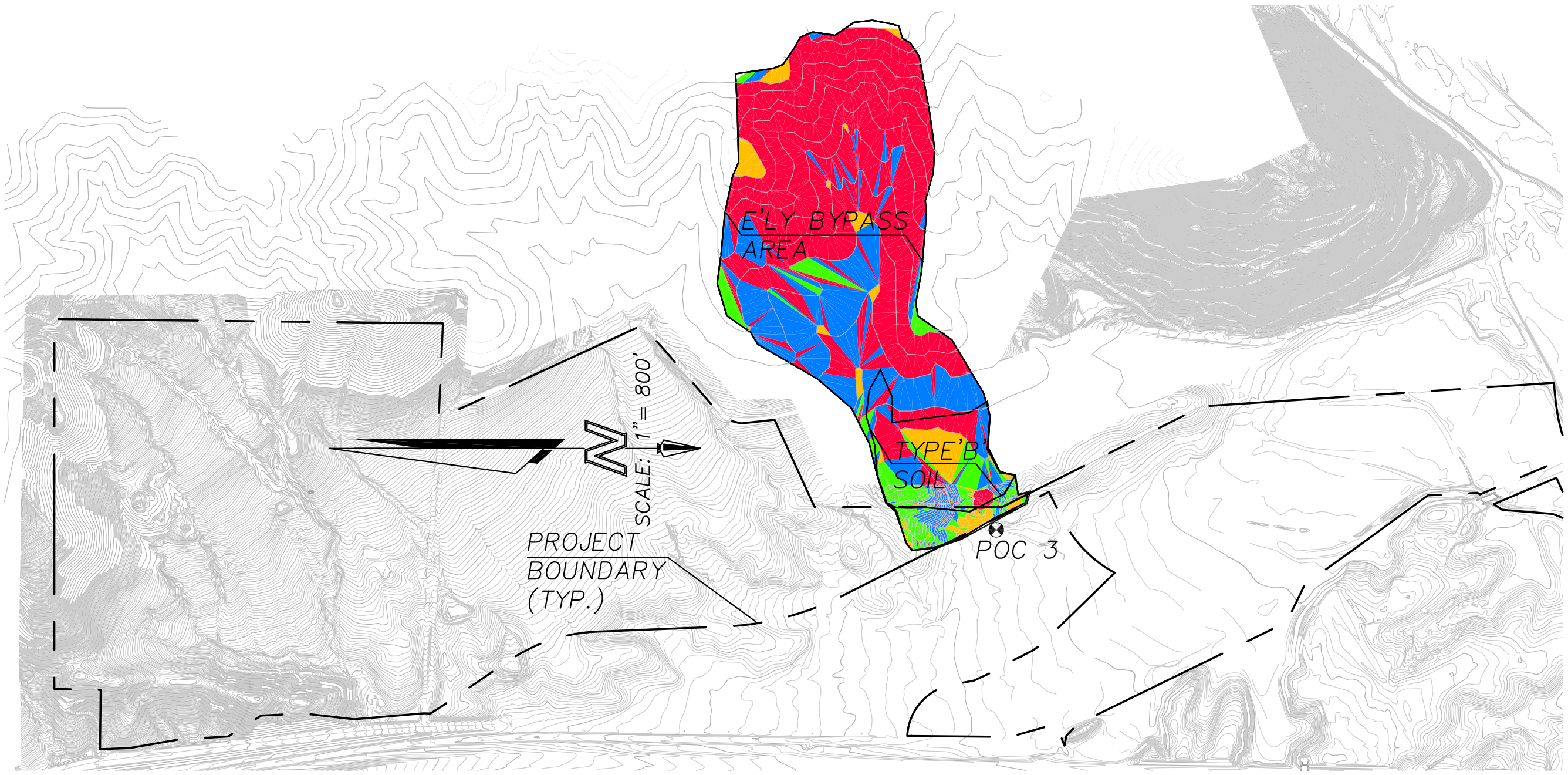
POC 1 POST UNDISTURBED SOIL B AREA

Color	BEG. %	END %	SLOPE AREA
	0.00	5.00	0.28
	5.00	10.00	1.02
	10.00	20.00	6.94
	20.00	10000.00	16.67

POC 1 POST UNDISTURBED SOIL C AREA

Color	BEG. %	END %	SLOPE AREA
	0.00	5.00	1.74
	5.00	10.00	2.55
	10.00	20.00	20.10
	20.00	10000.00	160.92

CAMPUS PARK
HYDROMODIFICATION POC TRIBITARY AREA SLOPE ANALYSIS



POC 3 OVERALL EX

Color	BEG. %	END %	SLOPE AREA
	0.00	5.00	5.80
	5.00	10.00	8.0
	10.00	20.00	24.4
	20.00	10000.00	60.1

POC 3 B SOIL

Color	BEG. %	END %	SLOPE AREA
	0.00	5.00	3.6
	5.00	10.00	5.3
	10.00	20.00	4.7
	20.00	10000.00	4.2

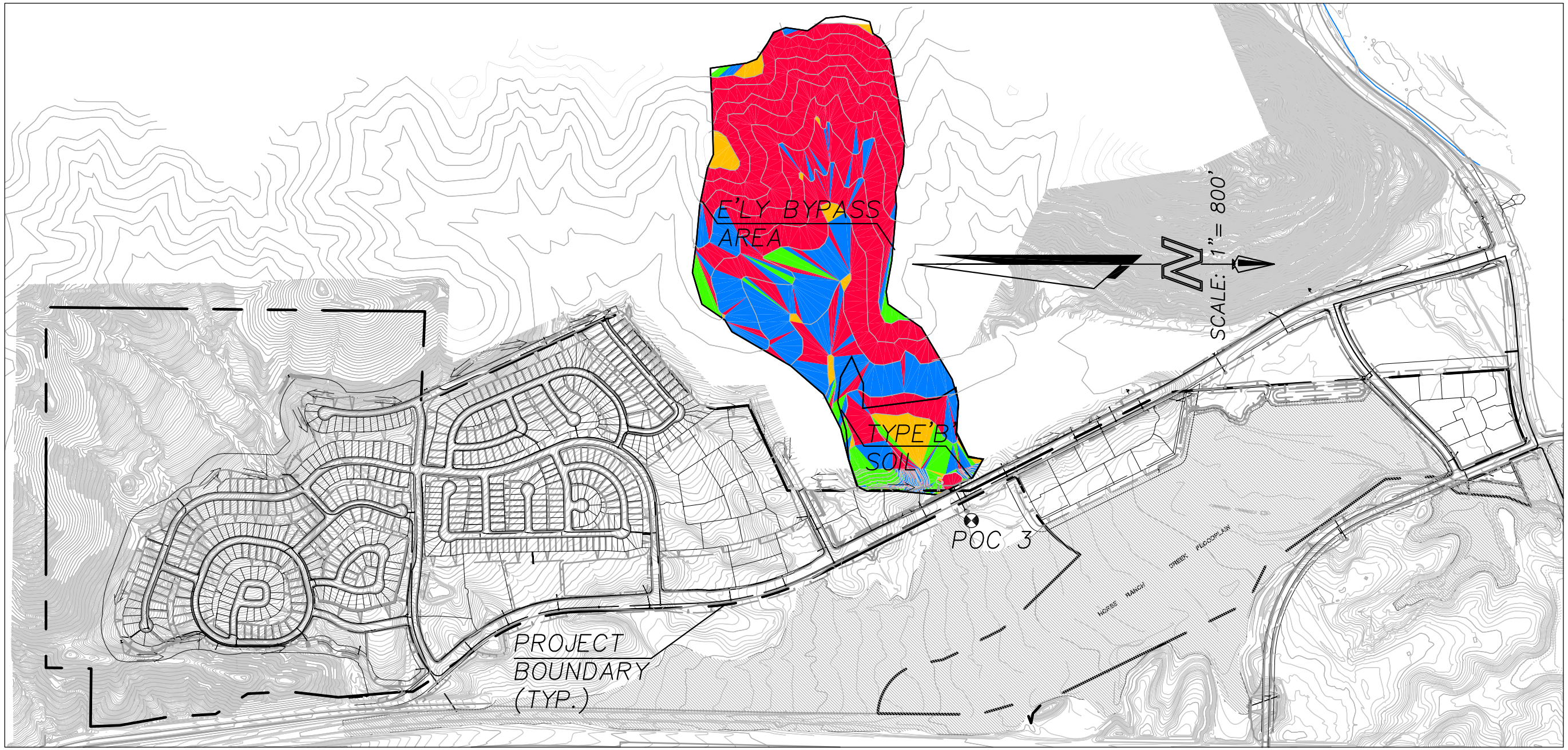
POC 3 C SOIL

Color	BEG. %	END %	SLOPE AREA
	0.00	5.00	2.2
	5.00	10.00	2.7
	10.00	20.00	19.7
	20.00	10000.00	55.9

POINT OF COMPLIANCE (POC) 3
PRE DEVELOPMENT

J.N.:

CAMPUS PARK
HYDROMODIFICATION POC TRIBITARY AREA SLOPE ANALYSIS



POC 3 POST OVERALL

Color	BEG. %	END %	SLOPE AREA
	0.00	5.00	4.8
	5.00	10.00	6.2
	10.00	20.00	23.3
	20.00	10000.00	59.9

POC 3 POST C SOIL

Color	BEG. %	END %	SLOPE AREA
	0.00	5.00	2.4
	5.00	10.00	2.8
	10.00	20.00	19.8
	20.00	10000.00	55.9

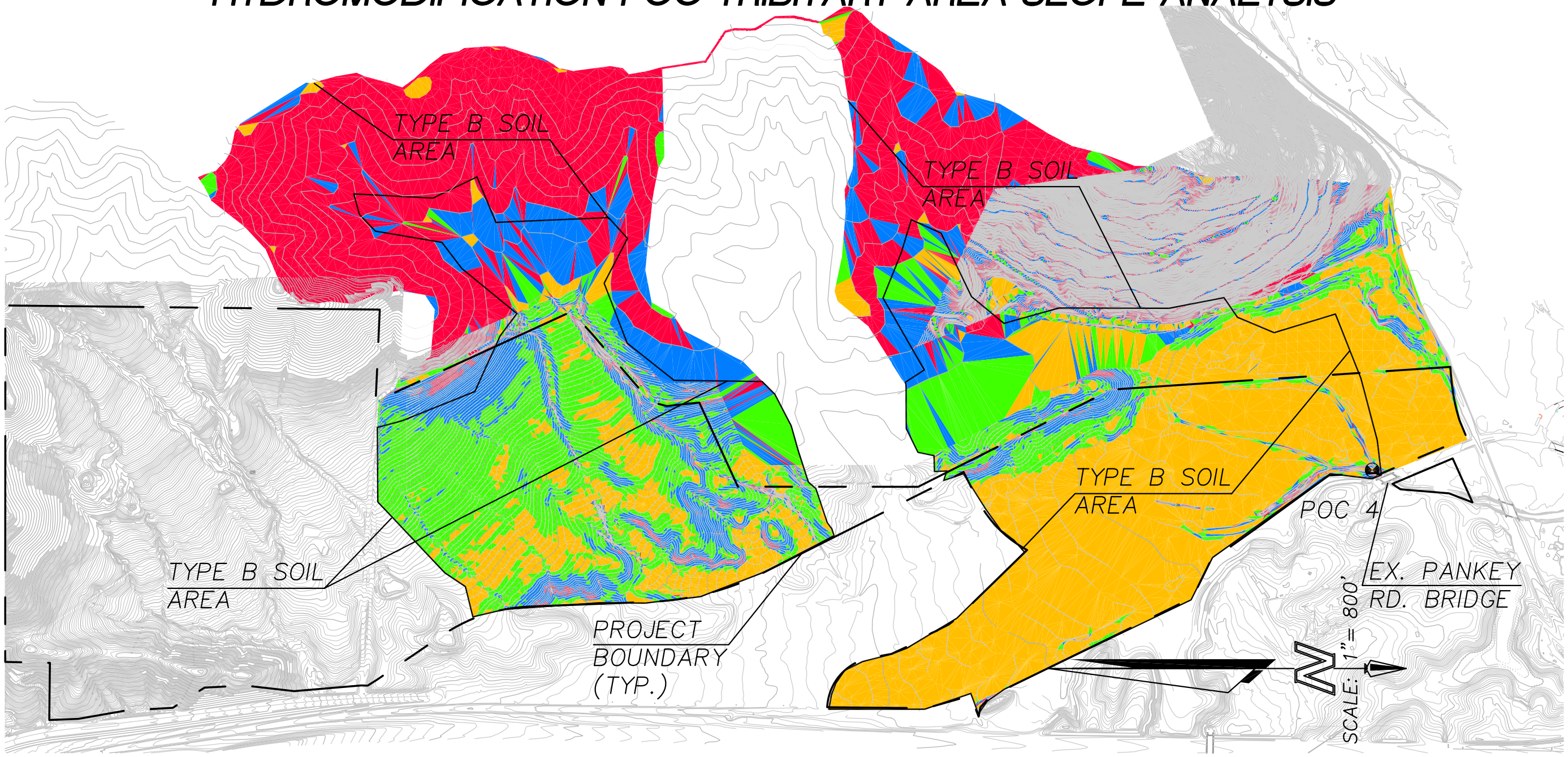
POC 3 POST B SOIL

Color	BEG. %	END %	SLOPE AREA
	0.00	5.00	2.4
	5.00	10.00	3.4
	10.00	20.00	3.5
	20.00	10000.00	4.0

POINT OF COMPLIANCE (POC) 3
POST DEVELOPMENT

J.N.:

CAMPUS PARK
HYDROMODIFICATION POC TRIBITARY AREA SLOPE ANALYSIS



POC 4 PRE DEV. OVERALL

Color	BEG. %	END %	SLOPE AREA
	0.00	5.00	163.6
	5.00	10.00	96.7
	10.00	20.00	85.0
	20.00	10000.00	207.4

POC 4 PRE DEV TYPE C SOIL

Color	BEG. %	END %	SLOPE AREA
	0.00	5.00	23.7
	5.00	10.00	9.5
	10.00	20.00	30.9
	20.00	10000.00	186.2

POC 4 PRE DEV TYPE B SOIL

Color	BEG. %	END %	SLOPE AREA
	0.00	5.00	139.9
	5.00	10.00	87.2
	10.00	20.00	54.1
	20.00	10000.00	21.1

POINT OF COMPLIANCE (POC) 4
PRE DEVELOPMENT

J.N.:

CAMPUS PARK
HYDROMODIFICATION POC TRIBITARY AREA SLOPE ANALYSIS



POINT OF COMPLIANCE (POC) 4
POST DEVELOPMENT

J.N.:

POC 4 POST UNDISTRUBED AREA OVERALL

Color	BEG. %	END %	SLOPE AREA
	0.00	5.00	87.5
	5.00	10.00	4.2
	10.00	20.00	4.1
	20.00	10000.00	25.7

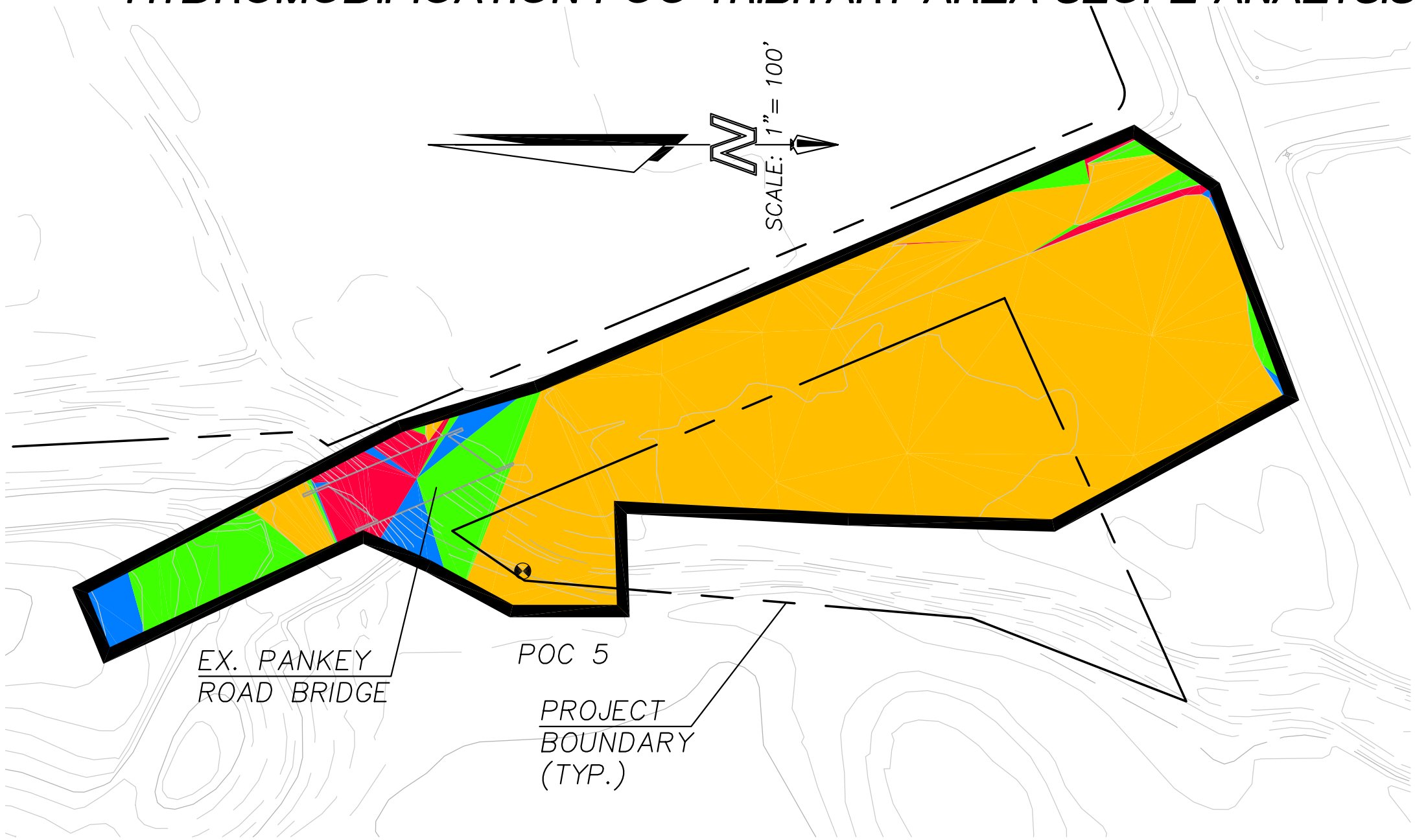
POC 4 POST TPYE C SOIL (IN UNDISTURBED AREA)

Color	BEG. %	END %	SLOPE AREA
	0.00	5.00	0.1
	5.00	10.00	0.1
	10.00	20.00	1.3
	20.00	10000.00	22.1

POC 4 POST TYPE B SOIL (N UNDISTURBED AREA)

Color	BEG. %	END %	SLOPE AREA
	0.00	5.00	87.4
	5.00	10.00	4.1
	10.00	20.00	2.8
	20.00	10000.00	3.7

CAMPUS PARK
HYDROMODIFICATION POC TRIBITARY AREA SLOPE ANALYSIS



POC 5 PRE DEVELOPMENT

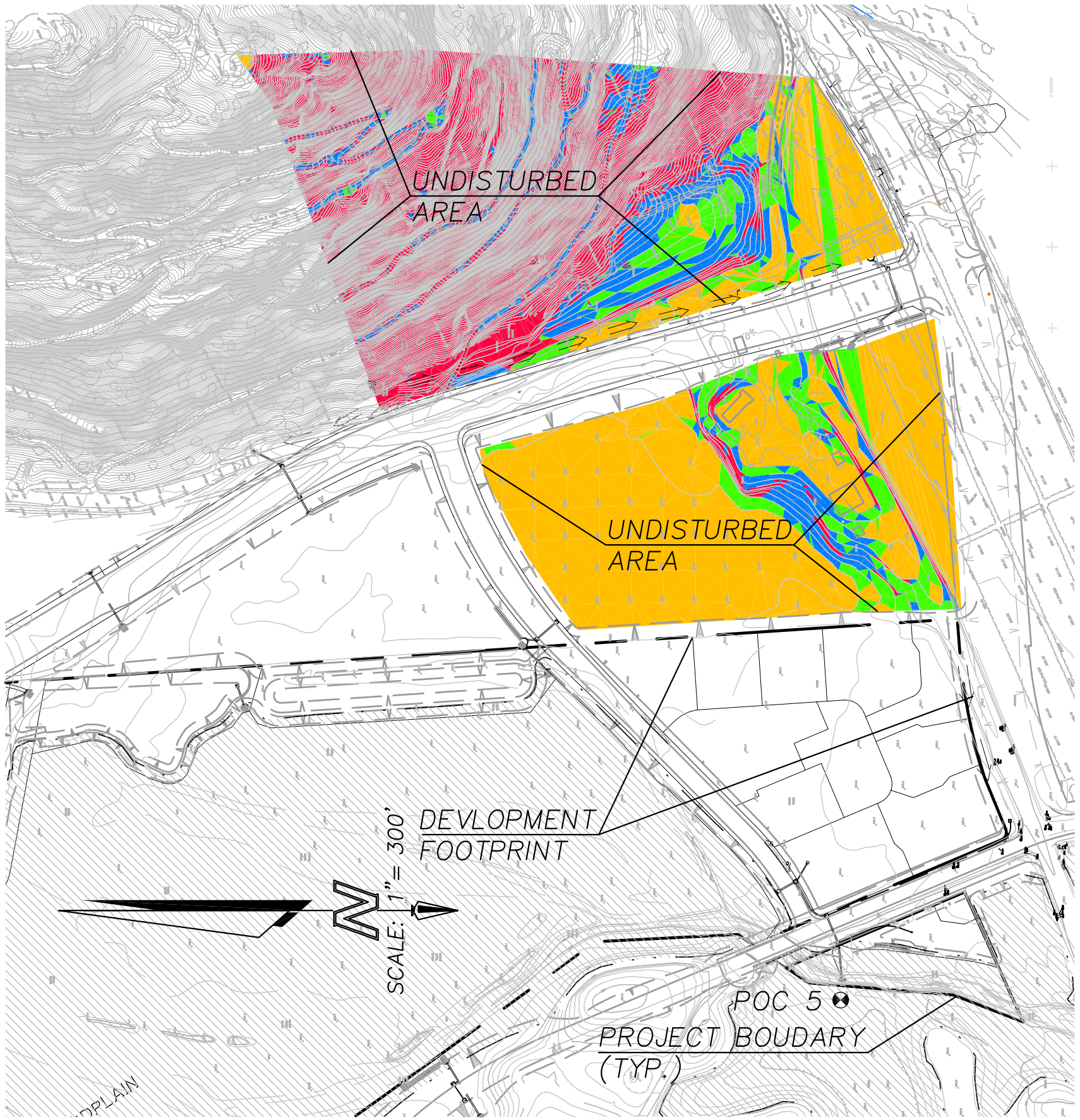
Color	BEG. %	END %	SLOPE AREA
	0.00	5.00	3.0
	5.00	10.00	0.4
	10.00	20.00	0.1
	20.00	10000.00	0.1

ALL IN TYPE 'C' SOIL

POINT OF COMPLIANCE (POC) 5
PRE DEVELOPMENT

J.N.:

CAMPUS PARK
HYDROMODIFICATION POC TRIBITARY AREA SLOPE ANALYSIS



POC 5 POST (IN UNDISTURBED AREAS)

Color	BEG. %	END %	SLOPE AREA
	0.00	5.00	14.2
	5.00	10.00	3.4
	10.00	20.00	3.7
	20.00	10000.00	15.2

POINT OF COMPLIANCE (POC) 5
POST DEVELOPMENT

J.N.:

County of San Diego Hydrology Manual

Rainfall Isopluvials

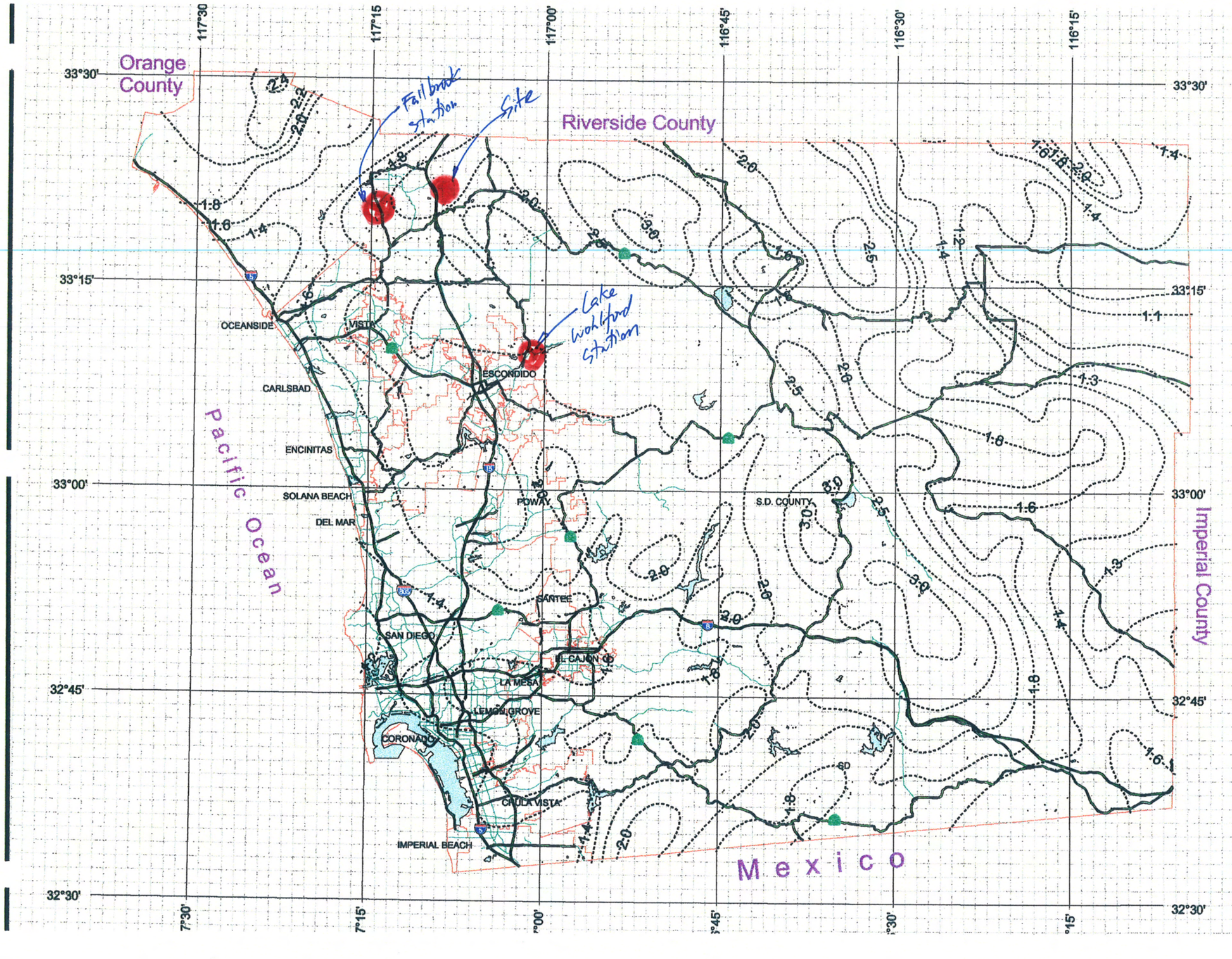
5 Year Rainfall Event - 6 Hours

Isopluvial (inches)

I_6 @ Fallbrook = 1.9 in

I_6 @ Site = 2.0 in

I_6 @ Lake Wohlford = 2.0 in



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N W E S

3 0 3 Miles

County of San Diego Hydrology Manual

Rainfall Isopluvials

10 Year Rainfall Event - 6 Hours

Isopluvial (inches)

I_6 @ Fallbrook = 2.2 in

I_6 @ Site = 2.4 in

I_6 @ Lake Wohlford = 2.4 in

Orange County

Riverside County

Imperial County

Mexico

Pacific Ocean

Fallbrook station

Site

Lake Wohlford station

OCEANSIDE
VISTA
CARLSBAD
ESCONDIDO
ENCINITAS
SOLANA BEACH
DEL MAR
POWAY
S.D. COUNTY
SANTEE
SAN DIEGO
EL CAJON
LA MESA
LEMON GROVE
CORONADO
CHULA VISTA
IMPERIAL BEACH
SD

117°30' 117°15' 117°00' 116°45' 116°30' 116°15'
33°30' 33°15' 33°00' 32°45' 32°30'

DPW GIS
Department of Public Works
Geographic Information Services

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N W E S

3 0 3 Miles

County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

Isopluvial (inches)

I_6 @ Fallbrook = 3.0 in

I_{site} = 3.5 in

$I_{Lake\ Wohlford}$ = 3.5 in ←

Orange County

Riverside County

Imperial County

Mexico

Pacific Ocean

Fallbrook Station

Site

Lake Wohlford station

OCEANSIDE

VISTA

CARLSBAD

ESCONDIDO

ENCINITAS

SOLANA BEACH

DEL MAR

POWAY

S.D. COUNTY

SANTEE

SAN DIEGO

EL CAJON

LA MESA

LEMON GROVE

CORONADO

CHULA VISTA

IMPERIAL BEACH

SD

117°30' 117°15' 117°00' 116°45' 116°30' 116°15'

33°30' 33°15' 33°00' 32°45' 32°30'

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Department of Public Works
Geographic Information Services

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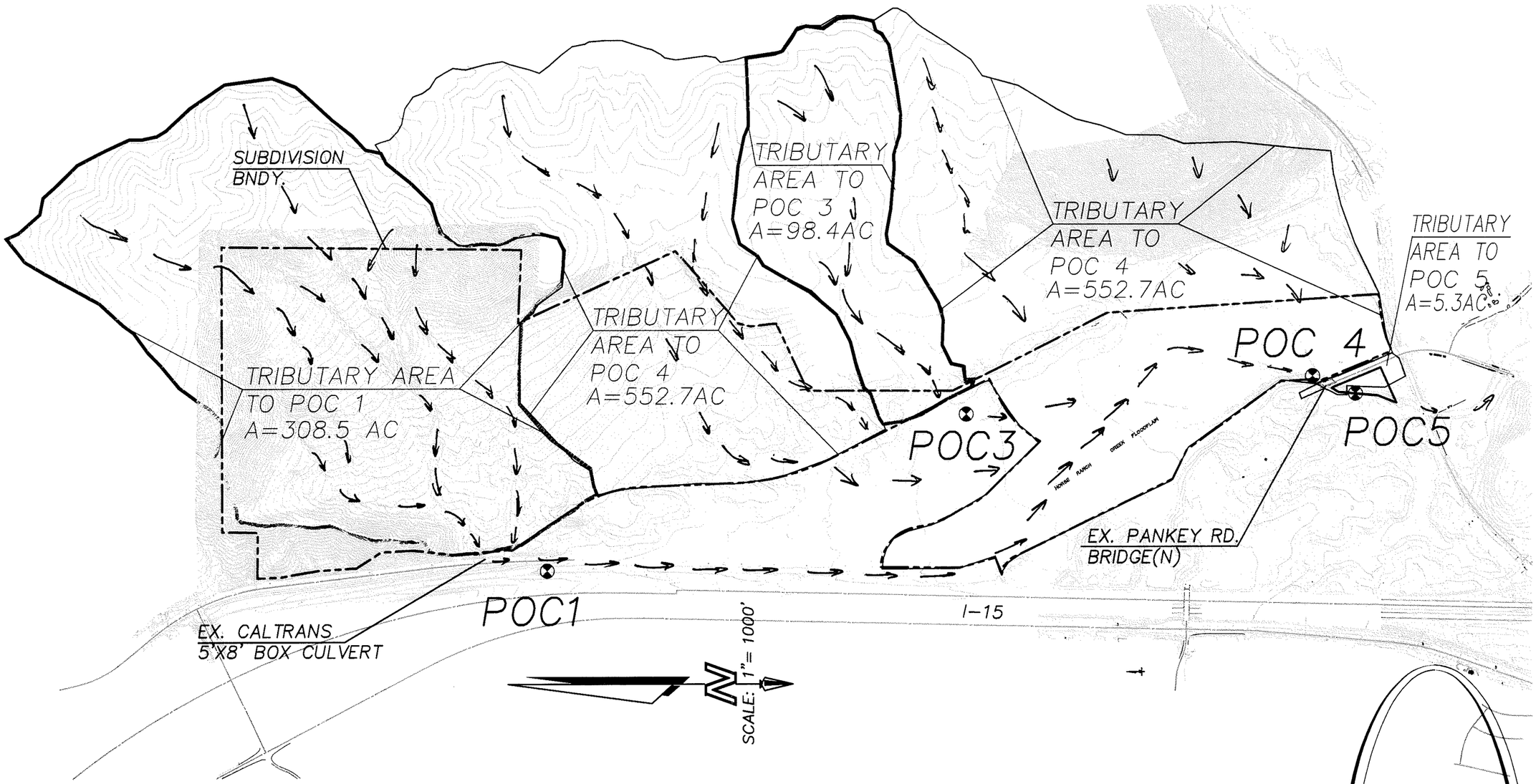
N W E S

3 0 3 Miles

POINTS OF COMPLIANCE LOCATION EXHIBIT

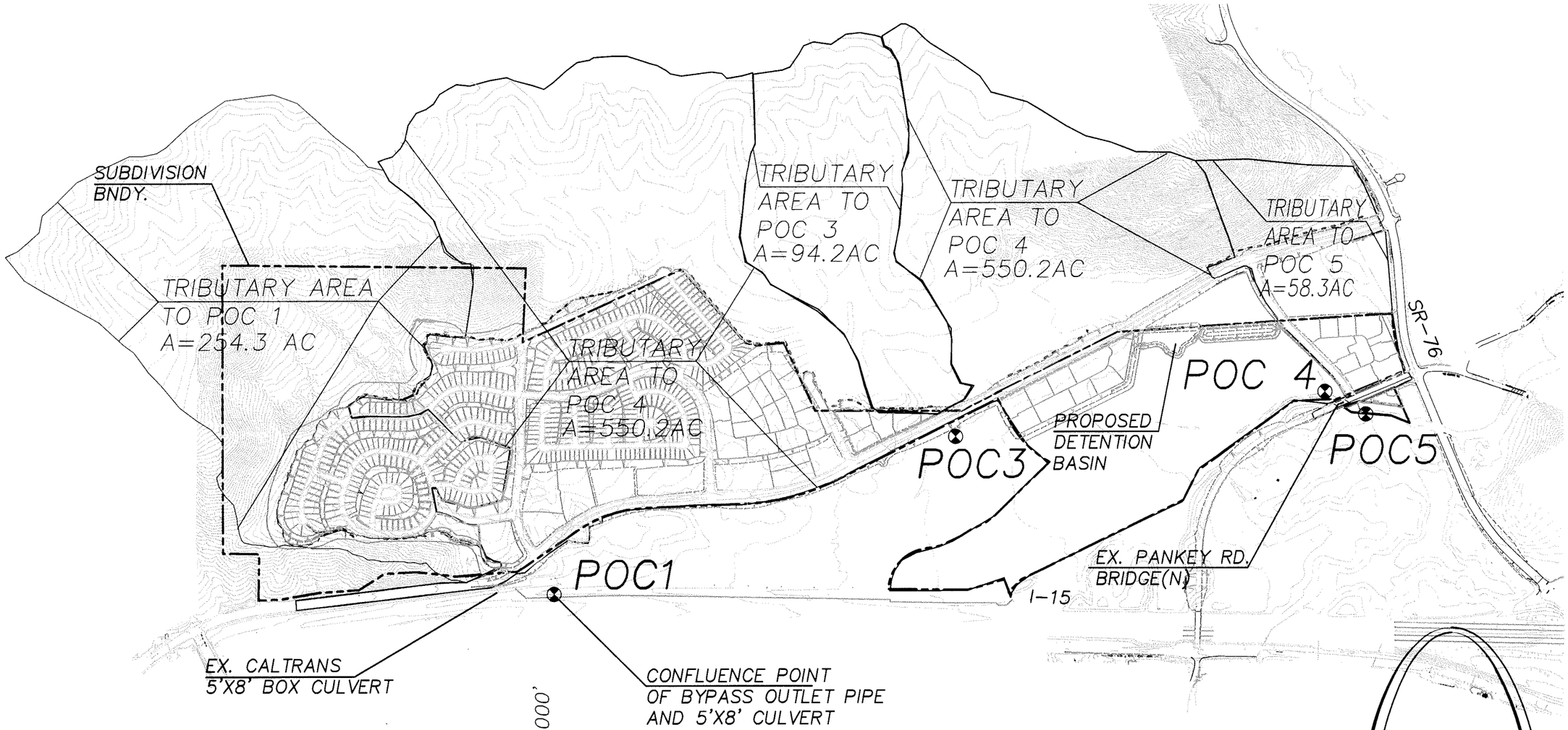


PRE-DEVELOPMENT CONDITIONS

LANDMARK CONSULTING
PLANNING•ENGINEERING•SURVEYING
9555 GENESEE AVENUE, STE. 200
SAN DIEGO, CA 92121, 858.587.8070

J.N.:

POINTS OF COMPLIANCE LOCATION EXHIBIT
CAMPUS PARK



POST-DEVELOPMENT CONDITIONS

LANDMARK
CONSULTING
PLANNING•ENGINEERING•SURVEYING
9555 GENESEE AVENUE, STE. 200
SAN DIEGO, CA 92121, 858.587.8070

J.N.:

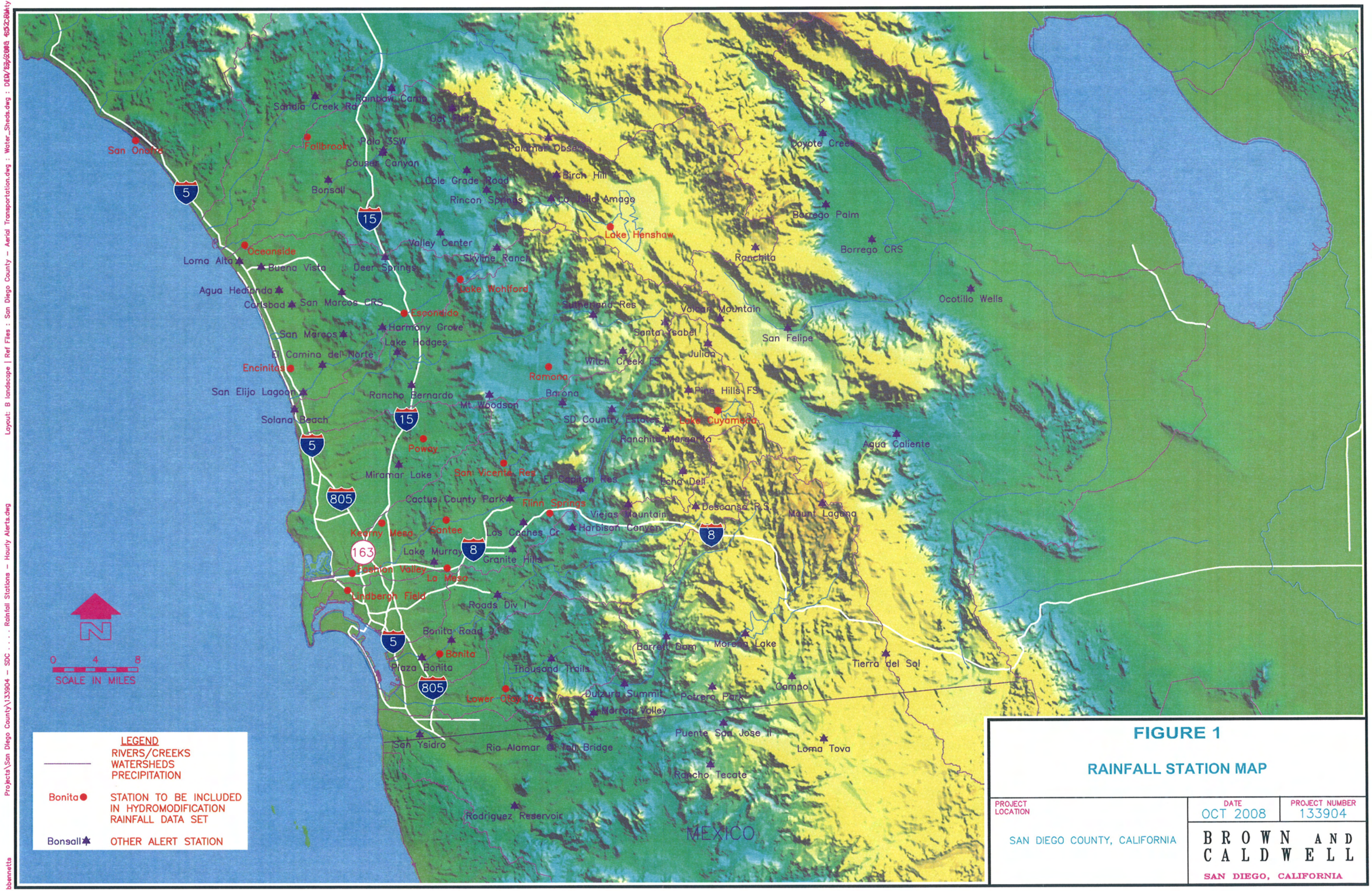


FIGURE 1

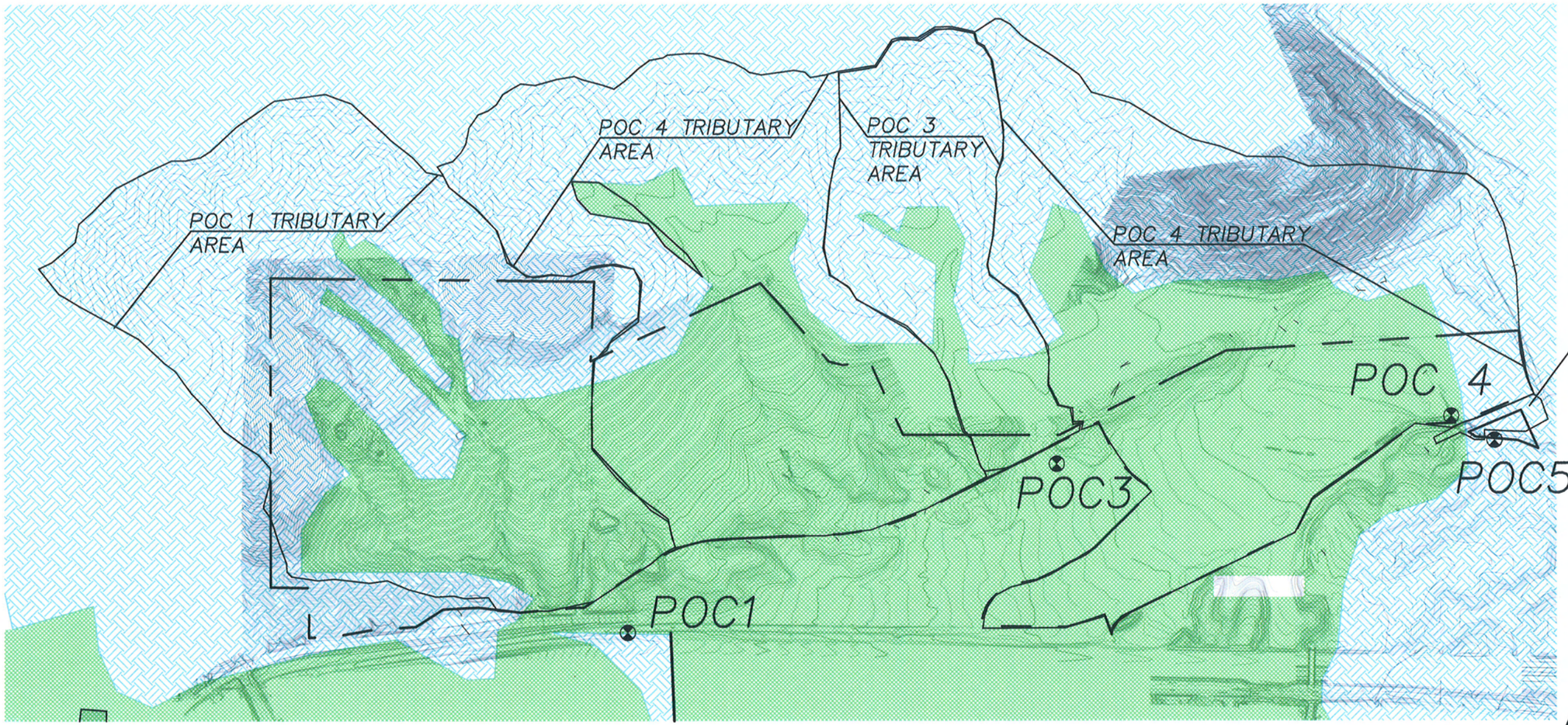
RAINFALL STATION MAP

PROJECT LOCATION	DATE	PROJECT NUMBER
SAN DIEGO COUNTY, CALIFORNIA	OCT 2008	133904

BROWN AND CALDWELL
SAN DIEGO, CALIFORNIA

Layout: B landscape | Ref Files : San Diego County – Aerial Transportation.dwg : Water_Sheds.dwg : DEM/Bay/2008 8:52:08 Hrly Aeri
Projects\San Diego County\133904 – SDC . . . Rainfall Stations – Hourly Alerts.dwg
bbennetts

SOIL GROUP EXHIBIT
CAMPUS PARK



LEGEND

TYPE B SOIL

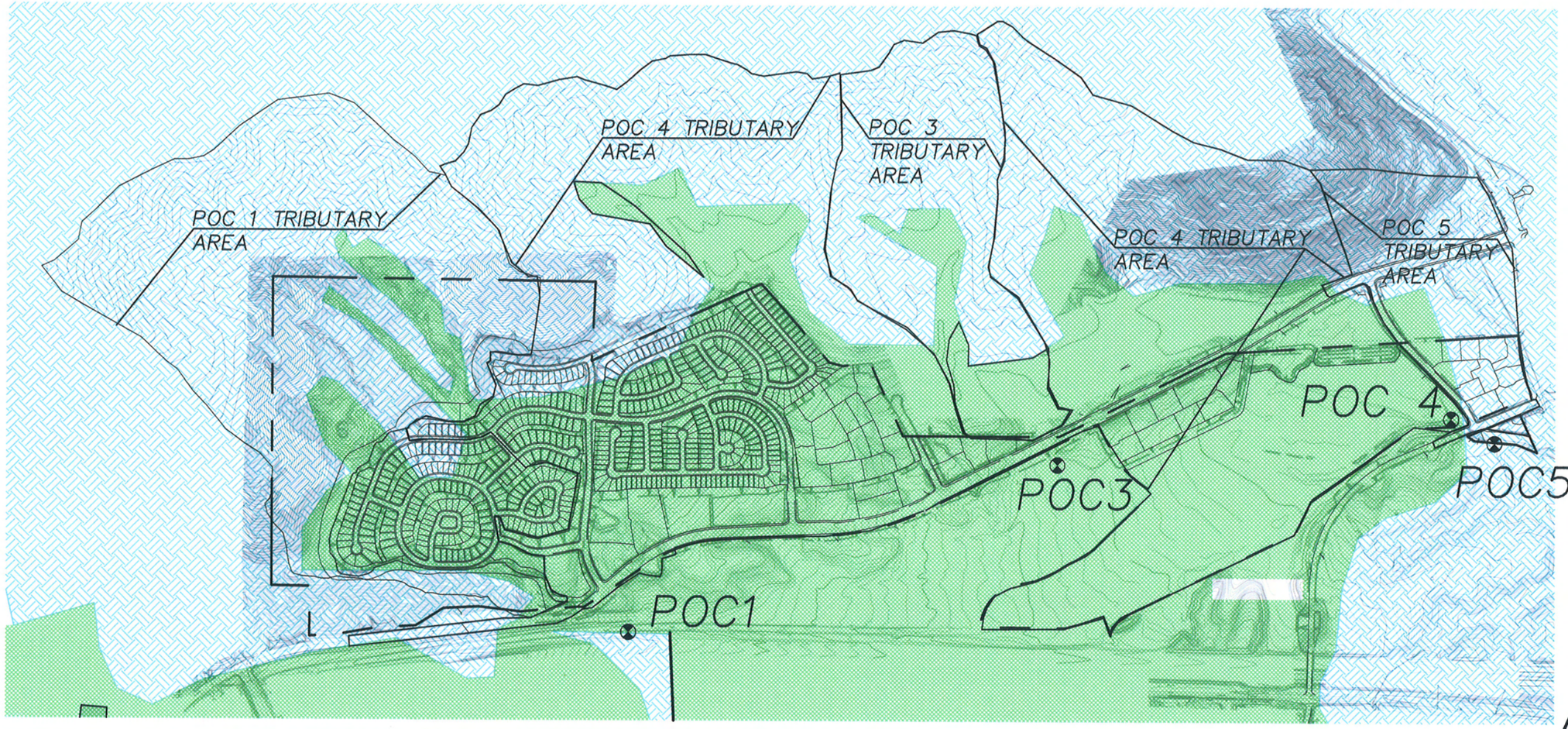
TYPE C SOIL

SCALE: 1" = 1000'

LANDMARK CONSULTING
PLANNING • ENGINEERING • SURVEYING
9555 GENESEE AVENUE, STE. 200
SAN DIEGO, CA 92121, 858.587.8070

PRE-DEVELOPMENT CONDITIONS

SOIL GROUP EXHIBIT
CAMPUS PARK



LEGEND

TYPE B SOIL

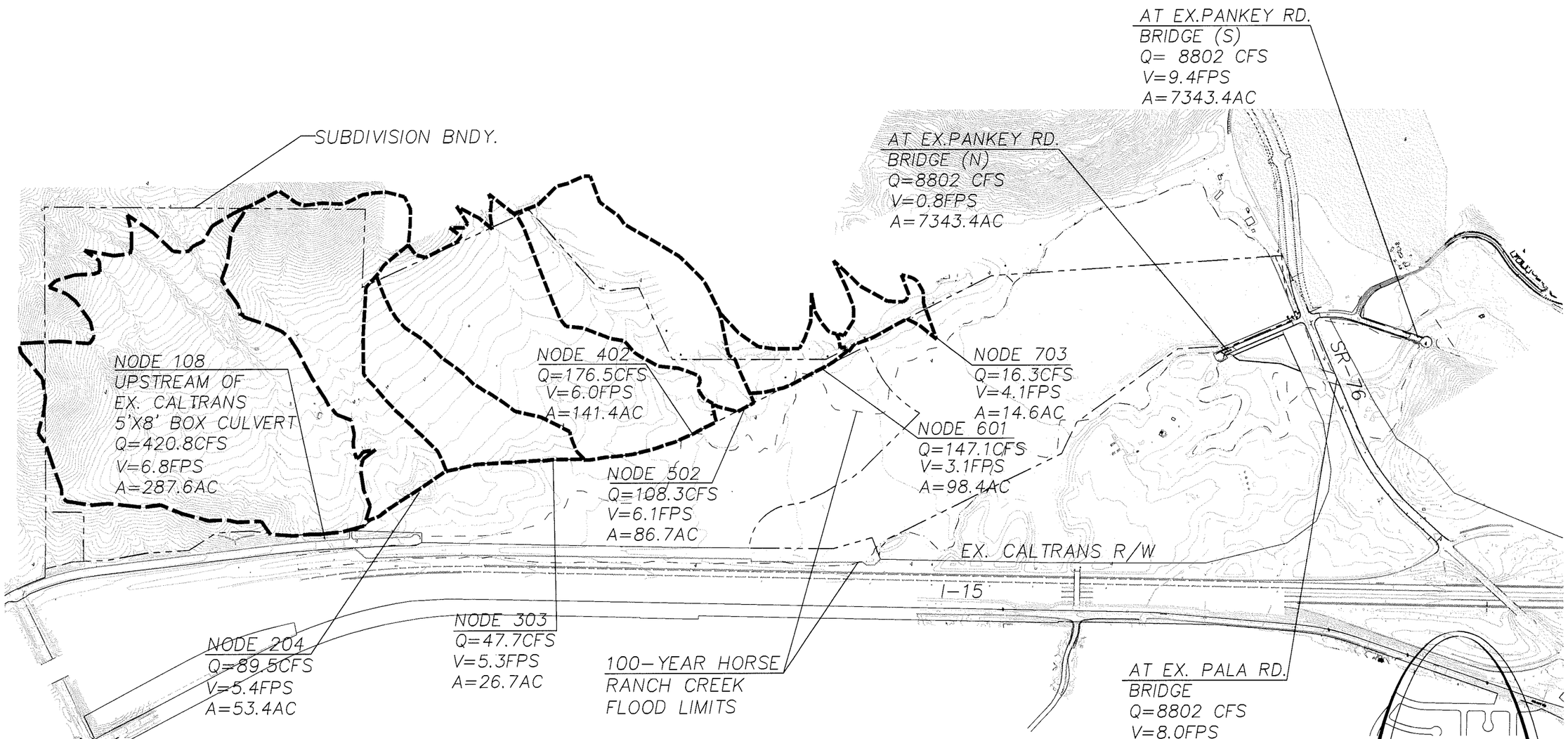
TYPE C SOIL

SCALE: 1" = 1000'

LANDMARK CONSULTING
PLANNING • ENGINEERING • SURVEYING
9555 GENESEE AVENUE, STE. 200
SAN DIEGO, CA 92121, 858.587.8070

POST-DEVELOPMENT CONDITIONS

PROJECT DISCHARGE POINT SUMMARY EXHIBIT
CAMPUS PARK

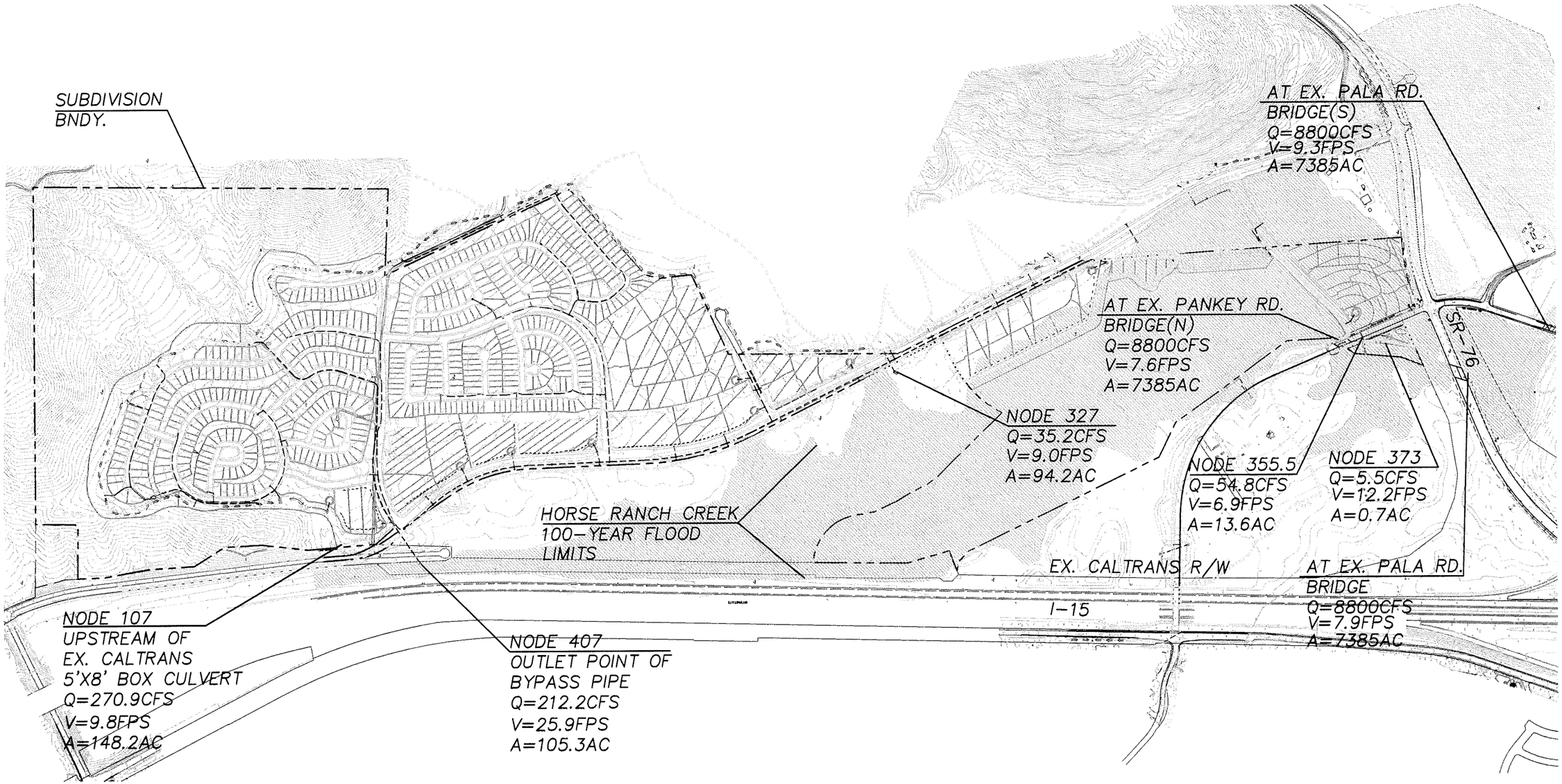


PRE-DEVELOPMENT CONDITIONS

LANDMARK
CONSULTING
PLANNING•ENGINEERING•SURVEYING
9555 GENESEE AVENUE, STE. 200
SAN DIEGO, CA 92121, 858.587.8070

J.N.:

PROJECT DISCHARGE POINT SUMMARY
CAMPUS PARK



POST-DEVELOPMENT CONDITIONS

J.N.:

SHEPARDSON
ENGINEERING ASSOCIATES INC.

Geotechnical Consultants:
Engineers-Geologists

10035 Prospect Ave., Suite 101
Santee, CA 92071-4398
619 / 449-9830 FAX 619 / 449-5824

July 9, 2009

S.E.A. 201171-04

Passerelle, LLC
402 W. Broadway, Suite 1320
San Diego, CA 92101-3542

ATTENTION: Mr. David Davis

Landmark Consulting
9555 Genessee Ave., Suite 200
San Diego, CA 92121

ATTENTION: Mr. David Yeh

SUBJECT: Geotechnical Input for Hydro-Modification Management Study

Dear Mr. Davis:

In accordance with the request of David Yeh of Landmark Consulting, we have prepared this letter to address the items required for the preliminary design of the hydro-modification management study.

We have reviewed the location of the preliminary detention basin, prepared by Landmark, as shown on their Points of Compliance location exhibit for Campus Park. We have also reviewed a detail of their preliminary detention basin design, which shows the bottom of the basin having elevations from approximately 268 to 264 msl, which appear to be very close to the elevations of the existing ground in this area, based on topographic maps for the project.

Information regarding the subsurface soils is available from a test boring placed by Woodward-Clyde & Associates very near, or within, the area of the proposed basin. We have attached a copy of this boring log for your review. Essentially, the upper approximately one foot of soil consists of a silty, fine sand which, in turn, is underlain by approximately 4 feet of clayey fine sand to sandy clay to a depth of approximately 5 feet, where sandy to clayey silt was encountered to a depth of 10 feet. These are all alluvial materials and, in our opinion, will be the controlling soils for the infiltration rate within the bottom of the detention basin. It is our understanding that Landmark Consulting has used an infiltration rate of .05 inches per hour for the bottom of the detention basin. This rate would seem to be appropriate for such low permeability soils. Based

on our experience and review of prior geotechnical investigations within the project area, we are of the opinion that generally, the low lying areas within the project will be underlain by similar soil conditions so, to our knowledge, there would not be other areas of similar elevation that would be more suitable for infiltration.

The test boring performed in this area by Woodward-Clyde, in 1982, encountered groundwater at a depth of approximately 7 ft. Based on our experience, we would estimate that the depth to groundwater in this area may be as shallow as 5 feet below the existing ground surface.

We do not know of any infiltration testing that has been performed within the project area, or near the proposed detention basin.

If you have any questions regarding the information in this letter, please do not hesitate to contact the undersigned.

Respectfully submitted,

SHEPARDSON ENGINEERING ASSOCIATES, INC.

Kendall L. Sherrod, CEG
Senior Engineering Geologist/Vice President

cc: (1) Addressees

Enclosure

Boring 1

Approximate El. 264'

DEPTH IN FEET	TEST DATA *MC	TEST DATA *DD	TEST DATA *BC	*OTHER TESTS	SAMPLE NUMBER	SOIL DESCRIPTION
			5		1-1	Loose, moist, gray brown, silty fine sand (SM) VALLEY ALLUVIUM
					1-2	Loose to soft, wet, dark gray brown to black, clayey fine sand (SC) to sandy clay (CL) VALLEY ALLUVIUM
5	43	80	3	GS,PI	1-3	Soft, wet, dark gray brown, sandy to clayey silt (ML) VALLEY ALLUVIUM
10			4		1-4	Loose to soft, wet, dark gray brown, silty to clayey medium to fine sand (SM) with some sandy clay (CL) VALLEY ALLUVIUM
15	26	101	5	GS,PI	1-5	
20			29		1-6	
25	14	117	10		1-7	Loose to medium dense, wet, brown, silty medium sand (SM) with some clay OLDER ALLUVIUM
30			17		1-8	
35			56		1-9	Medium dense to dense, saturated, brown, clayey coarse sand (SM) with scattered gravels OLDER ALLUVIUM
40	32	92	18		1-10	Stiff, wet, gray brown, fine sandy clay (CL) OLDER ALLUVIUM

Bottom of Hole

* description of symbols see Figure A-1

LOG OF TEST BORING 1
HEWLETT PACKARD PALA MESA SITE

DRAWN BY	CR	CHECKED BY: RSD	PROJECT NO: 52231W-SI01	DATE: 10-8-82	FIGURE NO: A-2

WOODWARD-CLYDE CONSULTANTS

NITRATE REPORT

NITRATE LABORATORY TEST RESULTS FOR WATER OUTLET FLOW FROM IRON PIPE CAMPUS PARK PROJECT FALLBROOK, SAN DIEGO COUNTY, CALIFORNIA 92028

FOR

PASSERELLE, LLC
402 WEST BROADWAY, SUITE 1320
SAN DIEGO, CALIFORNIA 92101-3542

W.O. E3176.2-SC FEBRUARY 18, 2009

GeoSoils, Inc.

Geotechnical • Geologic • Coastal • Environmental

5741 Palmer Way • Carlsbad, California 92010 • (760) 438-3155 • FAX (760) 931-0915

February 18, 2009

W.O. E3176.2-SC

Passerelle, LLC
402 West Broadway, Suite 1320
San Diego, California 92101-3542

Attention: Mr. David Davis

Subject: Nitrate Laboratory Test Results of Water Outlet Flow from Iron Pipe, Campus Park Project, Fallbrook, San Diego County, California 92028

Reference: "Phase I Environmental Site Assessment and Limited Chemical Residue Survey, Hewlett Packard Property, 500-Acre Property Northeast of Highway 76 and Interstate 15, Pala Mesa Area of San Diego County, California 92028," W.O. E3176-SC, dated January 7, 2002, by GeoSoils, Inc.

Dear Mr. Davis:

In accordance with your request, GeoSoils, Inc. (GSI), is providing this summary report of nitrate laboratory test results for sampling of water discharge from an offsite outlet pipe into an onsite creek. A water sample was previously collected and analyzed for nitrates from the iron pipe during our Phase 1 Environmental Site Assessment performed in 2002 (see Reference). The scope of services for this evaluation have included water sampling/testing, analyses of data, preparation of this summary report presenting the laboratory test results for the water seepage, and our conclusions.

LABORATORY TEST RESULTS

A water sample was collected from the iron outlet pipe located on the east side of the property during the middle of a heavy rainstorm. The outlet pipe discharges surface runoff water from offsite citrus orchards located east of the subject property into an onsite creek. The water sample was collected in a laboratory provided container on February 9, 2009, then delivered to the laboratory within eight (8) hours of collection in an ice cooled chest. Analysis for nitrate as (N), utilizing EPA Test Method 300.0, was performed. Laboratory results are presented in the following table and the laboratory report is provided in the Appendix. Laboratory results for the previous water sample collected from the pipe (see Reference) are also provided in the following table.

SAMPLE DATE	NITRATE as (N)
December 11, 2001	43.0 mg/L
February 9, 2009	9.5 mg/L

The nitrate as (N) concentration is just below the drinking water standards and just below the Basin Plan regulatory level for nitrate as (N), during this sampling event. The Maximum Contaminant Level (MCL) relative to drinking water standards for nitrate (as N) concentration is 10 milligrams per liter (mg/L). The Regional Water Quality Control Board-San Diego numerical objective for nitrate (as N) is also 10 mg/L.

CONCLUSIONS

The nitrate concentration is immediately below regulatory levels for this particular sampling event. Thus, our prior conclusions and recommendations remain pertinent and applicable in this regard. We point out that it is the responsibility of the property owner to disclose information of conditions that may represent a potential risk of harm to public health or the environment, to the appropriate governmental agency(s).

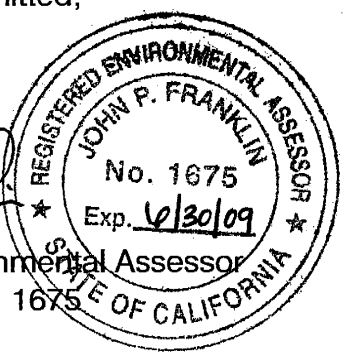
LIMITATIONS

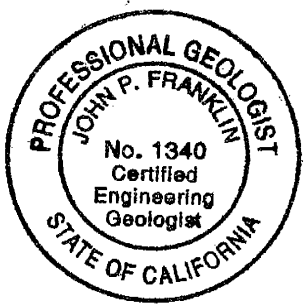
The conclusions and recommendations are professional opinions. These opinions have been derived in accordance with current standards of practice and no warranty is express or implied. Standards of practice are subject to change with time. GSI assumes no responsibility for work, testing or recommendations performed or provided by others.

The opportunity to be of service is greatly appreciated. If you have any questions, please do not hesitate to call our office.

Respectfully submitted,

GeoSoils, Inc.





John P. Franklin
President, Environmental Assessor
CEG 1340, REA-1 1675

DG/JPF/jh

Attachment: Appendix - Chemical Laboratory Test Results

Distribution: (4) Addressee

APPENDIX

CHEMICAL LABORATORY TEST RESULTS

Calscience
Environmental
Laboratories, Inc.

February 16, 2009

Donna Gooley
GeoSoils, Inc.
5741 Palmer Way
Carlsbad, CA 92010-7248

Subject: **Calscience Work Order No.: 09-02-0904**
Client Reference: Campus Park / E3176.2

Dear Client:

Enclosed is an analytical report for the above-referenced project. The samples included in this report were received 2/9/2009 and analyzed in accordance with the attached chain-of-custody.

Unless otherwise noted, all analytical testing was accomplished in accordance with the guidelines established in our Quality Systems Manual, applicable standard operating procedures, and other related documentation. The original report of subcontracted analysis, if any, is provided herein, and follows the standard Calscience data package. The results in this analytical report are limited to the samples tested and any reproduction thereof must be made in its entirety.

If you have any questions regarding this report, please do not hesitate to contact the undersigned.

Sincerely,

Richard Villafania

Calscience Environmental
Laboratories, Inc.
Richard Villafania
Project Manager

Calscience Environmental Laboratories, Inc.

Analytical Report

GeoSoils, Inc.	Date Received:	02/09/09
5741 Palmer Way	Work Order No:	09-02-0904
Carlsbad, CA 92010-7248	Preparation:	N/A
	Method:	EPA 300.0

Project: Campus Park / E3176.2

Client Sample Number	Lab Sample Number	Date/Time Collected	Matrix	Instrument	Date Prepared	Date/Time Analyzed	QC Batch ID
WS-1	**09-02-0904-1-A**	**02/09/09 00:00**	**Aqueous**	**IC 7**	**N/A**	**02/10/09 08:34**	**090209L02**

Parameter	Result	RL	DF	Qual	Units
Nitrate (as N)	9.5	0.50	5		mg/L

Method Blank	099-05-118-5,079	N/A	Aqueous	IC 7	N/A	02/10/09 04:13	090209L02

Parameter	Result	RL	DF	Qual	Units
Nitrate (as N)	ND	0.10	1		mg/L

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

Calscience Environmental Laboratories, Inc.

Quality Control - Spike/Spike Duplicate

GeoSoils, Inc.		Date Received:	02/09/09
5741 Palmer Way		Work Order No:	09-02-0904
Carlsbad, CA 92010-7248		Preparation:	N/A
		Method:	EPA 300.0

Project Campus Park / E3176.2

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
09-02-0845-17	**Aqueous**	**IC 7**	**N/A**	**02/10/09**	**090209S02**

Parameter	MS %REC	MSD %REC	%REC CL	RPD	RPD CL	Qualifiers
Nitrate (as N)	106	108	58-142	1	0-6	

RPD - Relative Percent Difference , CL - Control Limit

Calscience Environmental Laboratories, Inc.

Quality Control - LCS/LCS Duplicate

GeoSoils, Inc.
5741 Palmer Way
Carlsbad, CA 92010-7248

Date Received: N/A
Work Order No: 09-02-0904
Preparation: N/A
Method: EPA 300.0

Project: Campus Park / E3176.2

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	LCS/LCSD Batch Number
099-05-118-5,079	Aqueous	IC 7	N/A	02/10/09	090209L02

Parameter	LCS %REC	LCSD %REC	%REC CL	RPD	RPD CL	Qualifiers
Nitrate (as N)	102	102	87-111	0	0-12	

RPD - Relative Percent Difference , CL - Control Limit

Calscience Environmental Laboratories, Inc.

Glossary of Terms and Qualifiers

Work Order Number: 09-02-0904

Qualifier	Definition
*	See applicable analysis comment.
1	Surrogate compound recovery was out of control due to a required sample dilution, therefore, the sample data was reported without further clarification.
2	Surrogate compound recovery was out of control due to matrix interference. The associated method blank surrogate spike compound was in control and, therefore, the sample data was reported without further clarification.
3	Recovery of the Matrix Spike (MS) or Matrix Spike Duplicate (MSD) compound was out of control due to matrix interference. The associated LCS and/or LCSD was in control and, therefore, the sample data was reported without further clarification.
4	The MS/MSD RPD was out of control due to matrix interference. The LCS/LCSD RPD was in control and, therefore, the sample data was reported without further clarification.
5	The PDS/PDSD associated with this batch of samples was out of control due to a matrix interference effect. The associated batch LCS/LCSD was in control and, hence, the associated sample data was reported with no further corrective action required.
A	Result is the average of all dilutions, as defined by the method.
B	Analyte was present in the associated method blank.
C	Analyte presence was not confirmed on primary column.
E	Concentration exceeds the calibration range.
H	Sample received and/or analyzed past the recommended holding time.
J	Analyte was detected at a concentration below the reporting limit and above the laboratory method detection limit. Reported value is estimated.
ME	LCS Recovery Percentage is within LCS ME Control Limit range.
N	Nontarget Analyte.
ND	Parameter not detected at the indicated reporting limit.
Q	Spike recovery and RPD control limits do not apply resulting from the parameter concentration in the sample exceeding the spike concentration by a factor of four or greater.
U	Undetected at the laboratory method detection limit.
X	% Recovery and/or RPD out-of-range.
Z	Analyte presence was not confirmed by second column or GC/MS analysis.

Calscience Environmental Laboratories, Inc.

CHAIN OF CUSTODY RECORD

☐ SoCal Laboratory
7440 Lincoln Way
Garden Grove, CA 92841-1427
(714) 895-5494

☐ NorCal Service Center
5063 Commercial Circle, Suite H
Concord, CA 94520-8577
(925) 689-9022

Date 2-9-09

Page 1 of 1

LABORATORY CLIENT: GeoSoils Inc.

ADDRESS: 5741 Palmer Way

CITY: Carlsbad STATE: CA ZIP: 92010

TEL: 760 438 3155 E-MAIL: bvoss@geosoilsinc.com

CLIENT PROJECT NAME / NUMBER: Campus Park / E3176.2

PROJECT CONTACT: Donna Gooley

P.O. NO.:

LAB USE ONLY: 02-0904

SAMPLER(S): (PRINT) DonnaGooley

COELT LOG CODE: ☐☐☐☐

COOLER RECEIPT TEMP= °C

TURNAROUND TIME:
☐ SAME DAY ☐ 24 HR ☐ 48 HR ☐ 72 HR ☐ 5 DAYS ☐ 10 DAYS

SPECIAL REQUIREMENTS (ADDITIONAL COSTS MAY APPLY)
☐ RWQCB REPORTING FORMS ☐ COELT EDF ☐ _____

SPECIAL INSTRUCTIONS:

REQUESTED ANALYSES

LAB USE ONLY	SAMPLE ID	FIELD POINT NAME (FOR COELT EDF)	SAMPLING DATE	SAMPLING TIME	MATRIX	NO. OF CONT.	TPH (g)	TPH (d) or (C7-C36) or (C7-C44)	TPH ( )	BTEX / MTBE (8260B)	VOCs (8260B)	VOCs+Oxys (8260B)	Encore Prep (5035)	SVOCs (8270C)	Pesticides (8181A)	PCBs (8082)	PNAs (8310) or (8270C)	T22 Metals (6010B/747X)	Cr(VI)[7196A or 7199 or 218.6]	VOCs (TO-14A) or (TO-15)	TPH (g)[TO-3]+	Nitrate as N
	WS-1		2/9/09		water	1																✓

Relinquished by: (Signature)	Received by: (Signature/Affiliation)	Date:	Time:
Donna Gooley	CEL	2/9/9	1100
Relinquished by: (Signature)	Received by: (Signature/Affiliation) CEL	Date: 2/9/09	Time: 1600
Relinquished by: (Signature)	Received by: (Signature/Affiliation)	Date:	Time:

DISTRIBUTION: White with final report, Green and Yellow to Client.
Please note that pages 1 and 2 of 2 of our T/Cs are printed on the reverse side of the green and Yellow copies respectively.

05/01/07 Revision

Q&Q Graphic 760-898-9702 Page 1 of 2

Calscience Environmental Laboratories, Inc.

WORK ORDER #: 09-02-0904

SAMPLE RECEIPT FORM

Cooler 1 of 1

CLIENT: Geosoils

DATE: 2/9/09

TEMPERATURE: (Criteria: 0.0 °C – 6.0 °C, not frozen)

Temperature 2.8 °C - 0.2 °C (CF) = 2.6 °C ☑ Blank ☐ Sample

☐ Sample(s) outside temperature criteria (PM/APM contacted by:_____).

☐ Sample(s) outside temperature criteria but received on ice/chilled on same day of sampling.

☐ **Received at ambient temperature, placed on ice for transport by Courier.**

Ambient Temperature: ☐ Air ☐ Filter ☐ Metals Only ☐ PCBs Only Initial:

CUSTODY SEALS INTACT:

☐ Cooler ☐_____ ☐ No (Not Intact) ☑ Not Present ☐ N/A Initial:

☐ Sample ☐_____ ☐ No (Not Intact) ☑ Not Present Initial: DL

SAMPLE CONDITION:	Yes	No	N/A
Chain-Of-Custody (COC) document(s) received with samples.....	☑	☐	☐
COC document(s) received complete.....	☑	☐	☐
Sampler's name indicated on COC.....	☑	☐	☐
Sample container label(s) consistent with COC.....	☑	☐	☐
Sample container(s) intact and good condition.....	☑	☐	☐
Correct containers and volume for analyses requested.....	☑	☐	☐
Analyses received within holding time.....	☑	☐	☐
Proper preservation noted on COC or sample container.....	☑	☐	☐
Volatile analysis container(s) free of headspace.....	☐	☐	☑
Tedlar bag(s) free of condensation.....	☐	☐	☑

CONTAINER TYPE:

Solid: ☐4ozCGJ ☐8ozCGJ ☐16ozCGJ ☐Sleeve ☐EnCores® ☐TerraCores® ☐_____

Water: ☐VOA ☐VOAh ☐VOAna_2 ☐125AGB ☐125AGBh ☐125AGBpo_4 ☐1AGB ☐1AGBna_2 ☐1AGBs ☐500AGB ☐500AGBs ☐250CGB ☐250CGBs ☐1PB ☐500PB ☐500PBna ☐250PB ☐250PBn ☐125PB ☐125PBznna ☐100PBsterile ☐100PBna_2 ☑250PBJ ☐_____ ☐_____

Air: ☐Tedlar® ☐Summa® ☐_____

Checked/Labeled by: DL

Container: C:Clear A:Amber P:Poly/Plastic G:Glass J:Jar B:Bottle

Preservative: h:HCL n:HNO_3 na_2:$Na_2S_2O_3$ na:NaOH po_4:H_3PO_4 s:H_2SO_4 znna:$ZnAc_2$+NaOH

Reviewed by: YL

Scanned by: DL

Calscience Environmental Laboratories, Inc.

INVOICE

Date: 2/16/2009
Invoice Number: 1170570

Accounts Payable
GeoSoils, Inc.
5741 Palmer Way
Carlsbad, CA 92010-7248

Report Sent To: Donna Gooley
Calscience Work Order No 09-02-0904
Project Name/No : Campus Park / E3176.2
Terms: Net 30

Total Amount Due : $ 70.00

Matrix	Test	TAT	Qty	Unit Cost	Subtotal	Rush Surcharge	Total
Water	EPA 300.0 Anions	5	1	$70.00	$70.00	$0.00	$70.00

Total Amount Due : $70.00

Amounts not paid within terms are subject to a 1.5% per month service charge.
Please include invoice number with your remittance.

PLEASE REMIT TO: **19433 E. WALNUT DRIVE SOUTH**
CITY OF INDUSTRY, CA 91748-2316

7440 Lincoln Way, Garden Grove, CA 92841-1427 • TEL:(714) 895-5494 • FAX: (714) 894-7501

Calscience Environmental Laboratories, Inc.

☐ SoCal Laboratory
7440 Lincoln Way
Garden Grove, CA 92841-1427
(714) 895-5494

☐ NorCal Service Center
5063 Commercial Circle, Suite H
Concord, CA 94520-8577
(925) 689-9022

CHAIN OF CUSTODY RECORD

Date 2-9-09

Page 1 of 1

LABORATORY CLIENT: GeoSoils Inc.

ADDRESS: 5741 Palmer Way

CITY: Carlsbad STATE: CA ZIP: 92010

TEL: 760 438 3155 E-MAIL: bvoss@geosoilsinc.com

TURNAROUND TIME: ☐ SAME DAY ☐ 24 HR ☐ 48 HR ☐ 72 HR ☐ 5 DAYS ☐ 10 DAYS

SPECIAL REQUIREMENTS (ADDITIONAL COSTS MAY APPLY)
☐ RWQCB REPORTING FORMS ☐ COELT EDF ☐ _____

SPECIAL INSTRUCTIONS:

CLIENT PROJECT NAME / NUMBER: Campus Park / E3176.2

PROJECT CONTACT: Donna Gooley

SAMPLER(S): (PRINT) DonnaGooley

COELT LOG CODE: ☐☐☐☐

P.O. NO.:

LAB USE ONLY: 0 2 - 0 9 0 4

COOLER RECEIPT TEMP= _____ °C

REQUESTED ANALYSES

LAB USE ONLY	SAMPLE ID	FIELD POINT NAME (FOR COELT EDF)	SAMPLING DATE	SAMPLING TIME	MATRIX	NO. OF CONT.	TPH (g)	TPH (d) or (C7-C36) or (C7-C44)	TPH ( )	BTEX / MTBE (8260B)	VOCs (8260B)	VOCs+Oxys (8260B)	Encore Prep (5035)	SVOCs (8270C)	Pesticides (8181A)	PCBs (8082)	PNAs (8310) or (8270C)	T22 Metals (6010B/747X)	Cr(VI)[7196A or 7199 or 218.6]	VOCs (TO-14A) or (TO-15)	TPH (g)[TO-3]+	Nitrate as N
	WS-1		2/9/09		water	1																✓

Relinquished by: (Signature) Donna Gooley	Received by: (Signature/Affiliation) CEL	Date: 2/9/9	Time: 1100
Relinquished by: (Signature)	Received by: (Signature/Affiliation) CEL	Date: 2/9/09	Time: 1600
Relinquished by: (Signature)	Received by: (Signature/Affiliation)	Date:	Time:

DISTRIBUTION: White with final report, Green and Yellow to Client.
Please note that pages 1 and 2 of 2 of our T/Cs are printed on the reverse side of the green and Yellow copies respectively.

05/01/07 Revision

Q&Q Graphic 714-898-9702

CalScience Environmental Laboratories, Inc.

WORK ORDER #: 09-12-0904

SAMPLE RECEIPT FORM

Cooler 1 of 1

CLIENT: Geosoils

DATE: 2/9/09

TEMPERATURE: (Criteria: 0.0 °C – 6.0 °C, not frozen)

Temperature 2.8 °C - 0.2 °C (CF) = 2.6 °C ☑ Blank ☐ Sample

☐ Sample(s) outside temperature criteria (PM/APM contacted by:_____).

☐ Sample(s) outside temperature criteria but received on ice/chilled on same day of sampling.

☐ **Received at ambient temperature, placed on ice for transport by Courier.**

Ambient Temperature: ☐ Air ☐ Filter ☐ Metals Only ☐ PCBs Only Initial:

CUSTODY SEALS INTACT:

☐ Cooler ☐_____ ☐ No (Not Intact) ☑ Not Present ☐ N/A Initial:

☐ Sample ☐_____ ☐ No (Not Intact) ☑ Not Present Initial: DL

SAMPLE CONDITION:	Yes	No	N/A
Chain-Of-Custody (COC) document(s) received with samples.....	☑	☐	☐
COC document(s) received complete.....	☑	☐	☐
Sampler's name indicated on COC.....	☑	☐	☐
Sample container label(s) consistent with COC.....	☑	☐	☐
Sample container(s) intact and good condition.....	☑	☐	☐
Correct containers and volume for analyses requested.....	☑	☐	☐
Analyses received within holding time.....	☑	☐	☐
Proper preservation noted on COC or sample container.....	☑	☐	☐
Volatile analysis container(s) free of headspace.....	☐	☐	☑
Tedlar bag(s) free of condensation.....	☐	☐	☑

CONTAINER TYPE:

Solid: ☐4ozCGJ ☐8ozCGJ ☐16ozCGJ ☐Sleeve ☐EnCores® ☐TerraCores® ☐_____

Water: ☐VOA ☐VOAh ☐VOAna_2 ☐125AGB ☐125AGBh ☐125AGBpo_4 ☐1AGB ☐1AGBna_2 ☐1AGBs ☐500AGB ☐500AGBs ☐250CGB ☐250CGBs ☐1PB ☐500PB ☐500PBna ☐250PB ☐250PBn ☐125PB ☐125PBznna ☐100PBsterile ☐100PBna_2 ☑250PBJ ☐_____ ☐_____

Air: ☐Tedlar® ☐Summa® ☐_____

Checked/Labeled by: DL

Reviewed by: YL

Scanned by: DL

Container: C:Clear A:Amber P:Poly/Plastic G:Glass J:Jar B:Bottle

Preservative: h:HCL n:HNO_3 na_2:$Na_2S_2O_3$ na:NaOH po_4:H_3PO_4 s:H_2SO_4 znna:$ZnAc_2$+NaOH