Appendix H

DRAINAGE STUDY

PRELIMINARY DRAINAGE STUDY

FOR

MAIN STREET AT CARMEL VALLEY

PTS# 193036, IO# 24000155

Prepared For:

Kilroy Realty Inc.
3611 Valley Centre Drive, Suite 550
San Diego, CA 92130
(858) 523-0300

Prepared By:

Leppert Engineering Corporation
5190 Governor Drive, Suite 205
San Diego, CA 92122
(858) 597-2001
L.E.C. Job No. NCW 14.01-09.08

June 1, 2011

By: John D. Leppert
RCE 26283
Exp. 3/31/12

Leppert Engineering
CORPORATION

TABLE OF CONTENTS

FIGURES:

Appendices:

Map Pockets:

1.0 INTRODUCTION

1.1 Project Description

This drainage report presents the preliminary hydrologic analysis for the proposed San Diego Corporate Center Lots 1 & 2 (hereafter referred to as "the project"). The project is located southwest of the intersection of Del Mar Heights Road and El Camino Real, in the City of San Diego and specifically on Parcels 1 & 2 of Map 15061 and Parcel 2 of Map 19130. (See Figure 1, Vicinity Map, located at the end of Section 1.0) The planned 24 acre development will include a mixed-use center directly across from Del Mar Highlands. The proposed center will include office and retail space, 608 residential units, a 150-room hotel, a cinema, a 10-story corporate building on the lowest elevation of the site and a 25,000- to 30,000-square-foot full service market, such as Whole Foods or Gelson's. The plan would also include public improvements to Del Mar Heights Road which include median and widening work in addition to adding two new signal lights on Del Mar Heights Road to provide safe ingress and egress to the center.

1.1.1 Land Use and Drainage Characteristics

Pre-Project Drainage Characteristics

The pre-project condition for the project consists of an undeveloped, mass graded site per grading plan DWG No. 23217-D. There are two major drainage basins (i.e. western basin and eastern basin) that outlet into the public storm drain along El Camino Real via separate points of connection.

The western basin drains in a southerly direction toward El Camino Real. This basin is further subdivided approximately in half and designed to drain into two temporary sediment basins which outlet the site into the public storm drain along El Camino Real via a temporary private

storm drain system.

The eastern basin also drains in a southerly direction toward El Camino Real. This basin is further subdivided approximately in half and designed to drain into two temporary sediment basins which outlet the site into the public storm drain along El Camino Real via a temporary private storm drain system.

Both temporary on-site private storm drains discharge into the existing 66-inch public storm drain in El Camino Real which flows southwesterly into a regional detention basin as described in "Drainage Study, North City West Employment Center, Entire Precise Plan Area, dated February, 1984 by Rick Engineering Company."

Post-Project Drainage Characteristics

The proposed development will be a mixed-use center consisting of office, retail, commercial, and residential buildings, underground/aboveground parking structures, private roadways, "hardscape" and "softscape" landscaping, and public improvements to Del Mar Heights Road and El Camino Real.

Post-project outlet points and contributing drainage areas were designed to approximately match pre-project conditions. Based on this, there are two major drainage basins (i.e. western basin and eastern basin) that outlet into the public storm drain along El Camino Real via separate points of connection.

The western basin consists of approximately 10.8 acres and drains in a southerly direction toward El Camino Real. The upper portion of this basin consists of off-site public roadway drainage which will enter the private on-site storm drain system at Third Avenue. The on-site private storm drain system will be designed to convey the off-site roadway drainage and private

on-site runoff from throughout the drainage basin.

The eastern basin consists of approximately 12.3 acres and drains in a southerly direction toward El Camino Real. This drainage basin consists of a drainage system similar to that described above except that the off-site roadway drainage will enter the private system at First Avenue.

1.2 Hydrology and Hydraulics

Hydrology is discussed in detail in Section 2.0 of this report. Note that the hydrology results have been used to provide preliminary pipe sizes for the proposed on-site storm drain systems. Detailed hydraulic calculations will take place during final engineering of this project to determine inlet sizes and establish hydraulic grade lines (HGL's) throughout the proposed storm drains, and are not included in this report.

1.3 Detention

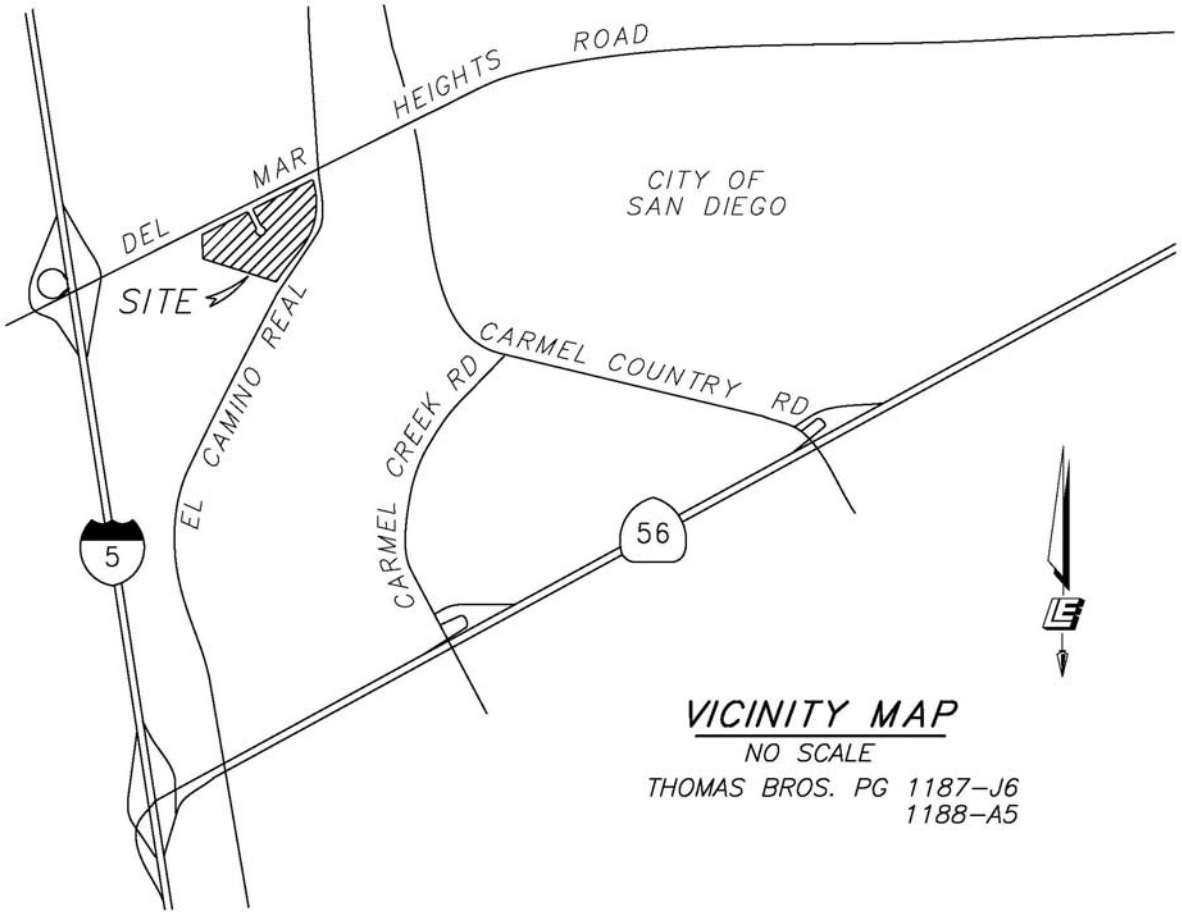
The City of San Diego Land Development Manual - Storm Water Standards Manual (herein referred to as Storm Water Standards Manual), dated March 24, 2008, requires that all priority projects shall compute the 2-year and 10-year peak runoff, time of concentration, and volume (if appropriate) in order to identify any downstream conditions of concern. The project will increase the amount of impervious surface in the proposed condition and will result in increased discharge rates. However, the area was master planned for ultimate build-out, including the existing 66-inch storm drain system in El Camino Real and a regional detention basin located downstream (as described in "Drainage Study, North City West Employment Center, Entire Precise Plan Area, dated February, 1984 by Rick Engineering Company"). The downstream system is engineered until it outfalls into the Los Peñasquitos Lagoon; therefore, there are no conditions of concern for downstream erosion (i.e. the 2-year and 10-year storm events) or for

the capacity of the downstream system (i.e. the 100-year storm event).

1.4 Water Quality

Post-project storm water runoff will be treated per the Storm Water Standards Manual and will be discussed in the report titled, "Water Quality Technical Report for Main Street at Carmel Valley" dated September 23, 2010, prepared by Leppert Engineering Corporation.

Figure 1: Vicinity Map



2.0 Hydrology

2.1 Methodology

The *City of San Diego Drainage Design Manual April 1984* requires that the Rational Method be used for hydrologic analysis of a watershed up to but not exceeding 1.0 square-mile (640 acres). The total drainage area is approximately 24.0 acres as described in Section 1.1. As stated in the introduction of this report, there are no conditions of concern for downstream erosion (i.e. the 2-year and 10-year storm events). Therefore, only the post-project 100-year storm event peak flow rates have been computed in this report to meet the City of San Diego's criteria and support sizing for the storm drain system. Autodesk Storm and Sanitary Analysis 2011 software (formerly Hydraflow) was used for this study because it satisfies the City of San Diego's design criteria.

2.1.1 Autodesk Storm and Sanitary Analysis 2011 Rational Method Computer Model

Autodesk Storm and Sanitary Analysis is a link-node based model that performs hydrology, hydraulic, and water quality analysis of storm water and wastewater drainage systems, including sewage treatment plants and water quality control devices. A link represents a hydraulic element (i.e., a pipe, channel, pump, standpipe, culvert, or weir) that transports flow and constituents. A node can represent the junction of two or more links, a storm drain catch basin inlet, the location of a flow or pollutant input into the system, or a storage element (such as a detention pond, retention pond, settling pond, or lake).

Drainage basin boundaries, flow patterns, and topographic elevations are shown on the drainage exhibits located in the map pockets.

2.2 Criteria

The hydrologic conditions were analyzed in accordance with the City of San Diego's design criteria as follows:

Design Storm: 100-year

Runoff Coefficients:

Industrial (Paved)	C = 0.95
Natural/Landscaped	C = 0.65

Soil Type: D

Rainfall Intensity: Based on Intensity – Duration – Frequency Curves per City of San Diego Drainage Manual Appendix I-B

Time of Concentration: Based on Urban Areas Overland Time of Flow Curves per City of San Diego Drainage Manual Appendix I-E

2.3 Hydrologic Results

Rational Method Results

The 100-year peak flow rates for the post-project conditions can be found below. Watershed boundaries, Rational Method node numbers, flow patterns, and areas can be found on the exhibits titled, "Drainage Basin Map for Main Street at Carmel Valley Proposed Condition." Rational Method computer output for the proposed condition can be found in Appendix A.

Pre-Project Conditions

As stated in the introduction of this report, there are no conditions of concern for downstream erosion and the existing public storm drain system within El Camino Real was designed for the ultimate build-out of this site. Based on this, pre-project hydrology calculations have not been provided, however a pre-project basin map has been included to identify existing watershed boundaries.

Post-Project Conditions

The western drainage basin is comprised of 10.8 acres and the eastern drainage basin is comprised of 12.3 acres. The project area that includes on-site and off-site improvements is conveyed into the existing 66-inch storm drain system in both pre- and post- project conditions. As compared to the pre-project condition, two major drainage basins show similarity in drainage characteristics (i.e. drainage area and flow pattern). Please see the exhibit, titled "Drainage Basin Map for Main Street at Carmel Valley Proposed Condition" located in Map Pocket 2 of this report.

The proposed drainage facilities within the project site will be private and shall be maintained by the owner of the project. A summary table of the 100-year post-project condition hydrological analyses for the project as been included below:

POST-PROJECT-100-YR PEAK RUNOFF RATES

	Area (Ac)	Runoff Coefficient (C)	Peak Runoff (CFS)
Link - 02	10.8	0.95	68.6
Link - 42	12.3	0.95	24.2

3.0 CONCLUSION

This drainage report presents the 100-year post-project hydrologic analysis for the Main Street at Carmel Valley project. The post-project condition peak discharge rates were determined using the Rational Method based on the hydrologic methodology and criteria described in the City of San Diego Drainage Manual April 1984.

Since the public storm drain within El Camino Real was designed for ultimate build-out, the results above are provided to size the on-site system and points of connection into the existing 66-inch system in El Camino Real.

Pertaining to the Del Mar Heights roadway improvements, additional impervious areas are proposed as a result of the roadway widening. This will create increased run-off within the roadway for both off-site drainage areas. However, these off-site drainage areas will be collected through proposed curb inlets and conveyed through the private on-site storm drain system, discharging into the same public system downstream of the original location. Subsequently, this will reduce the flows within the existing system upstream of the proposed points of connection, while the existing downstream has been designed for ultimate build-out.

Post-project storm water runoff will be treated per the Storm Water Standards Manual. Please refer to the report titled, Water Quality Technical Report for Main Street at Carmel Valley" dated September 23, 2010, prepared by Leppert Engineering Corporation. for more information with regards to water quality.

APPENDIX A

Rational Method Analysis (100-year)

[Post-Project]

Project Description

File Name	PROPOSED NETWORK.SPF
Description	Main Street at Carmel Valley

Project Options

Flow Units	CFS
Elevation Type	Elevation
Hydrology Method	Rational
Time of Concentration (TOC) Method	User-Defined
Link Routing Method	Steady Flow
Enable Overflow Ponding at Nodes	YES
Skip Steady State Analysis Time Periods	NO

Analysis Options

Start Analysis On	Sep 15, 2010	00:00:00
End Analysis On	Sep 16, 2010	00:00:00
Start Reporting On	Sep 15, 2010	00:00:00
Antecedent Dry Days	0	days
Runoff (Dry Weather) Time Step	0 01:00:00	days hh:mm:ss
Runoff (Wet Weather) Time Step	0 00:05:00	days hh:mm:ss
Reporting Time Step	0 00:05:00	days hh:mm:ss
Routing Time Step	30	seconds

Number of Elements

	Qty
Rain Gages	0
Subbasins	39
Nodes	69
Junctions	31
Outfalls	1
Flow Diversions	0
Inlets	37
Storage Nodes	0
Links	81
Channels	12
Pipes	69
Pumps	0
Orifices	0
Weirs	0
Outlets	0
Pollutants	0
Land Uses	0

Rainfall Details

Return Period	100 year(s)

Subbasin Summary

SN	Subbasin ID	Area (ac)	Weighted Runoff Coefficient	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	Sub-05	0.63	0.9500	0.38	0.36	0.22	3.36	0 00:03:57
2	Sub-07	0.41	0.9500	0.39	0.37	0.15	2.12	0 00:04:16
3	Sub-08	0.62	0.9500	0.39	0.37	0.23	3.14	0 00:04:24
4	Sub-09	1.35	0.9500	0.39	0.37	0.50	5.42	0 00:05:33
5	Sub-10	0.41	0.8500	0.31	0.27	0.11	2.30	0 00:02:52
6	Sub-11	0.84	0.9500	0.40	0.38	0.32	4.12	0 00:04:40
7	Sub-14	0.79	0.9000	0.40	0.36	0.28	2.97	0 00:05:41
8	Sub-15	0.90	0.9500	0.32	0.30	0.27	5.44	0 00:03:04
9	Sub-16	0.79	0.9500	0.38	0.36	0.29	4.13	0 00:04:10
10	Sub-17	0.24	0.9500	0.42	0.40	0.09	1.13	0 00:04:55
11	Sub-18	0.05	0.6500	0.45	0.29	0.02	0.13	0 00:07:02
12	Sub-19	0.03	0.6500	0.39	0.26	0.01	0.09	0 00:04:33
13	Sub-20	0.03	0.6500	0.42	0.27	0.01	0.10	0 00:04:58
14	Sub-21	0.12	0.9000	0.34	0.30	0.04	0.69	0 00:03:07
15	Sub-22	0.23	0.9500	0.35	0.33	0.08	1.29	0 00:03:31
16	Sub-23	3.13	0.9500	0.39	0.37	1.15	15.95	0 00:04:20
17	Sub-24	1.63	0.9500	0.39	0.37	0.60	8.27	0 00:04:23
18	Sub-25	0.12	0.9500	0.28	0.26	0.03	0.84	0 00:02:08
19	Sub-26	0.38	0.9500	0.34	0.32	0.12	2.27	0 00:03:06
20	Sub-27	1.80	0.9500	0.39	0.37	0.66	9.13	0 00:04:23
21	Sub-28	0.84	0.9500	0.39	0.37	0.31	4.35	0 00:04:15
22	Sub-29	1.47	0.9500	0.35	0.34	0.49	8.11	0 00:03:44
23	Sub-30	0.77	0.9500	0.38	0.37	0.28	4.06	0 00:04:05
24	Sub-31	0.23	0.9500	0.34	0.32	0.08	1.37	0 00:03:21
25	Sub-32	0.99	0.9500	0.33	0.31	0.31	5.84	0 00:03:14
26	Sub-33	0.51	0.9500	0.37	0.36	0.18	2.74	0 00:04:00
27	Sub-34	0.87	0.9500	0.39	0.37	0.32	3.48	0 00:05:31
28	Sub-35	0.59	0.9500	0.34	0.33	0.19	3.45	0 00:03:18
29	Sub-36	0.22	0.9500	0.31	0.29	0.07	1.47	0 00:02:39
30	Sub-37	0.45	0.9900	0.32	0.32	0.14	2.83	0 00:03:04
31	Sub-38	0.65	0.9500	0.38	0.37	0.24	3.40	0 00:04:05
32	Sub-39	0.53	0.9500	0.30	0.29	0.15	3.44	0 00:02:43
33	Sub-40	0.45	0.9500	0.32	0.31	0.14	2.77	0 00:03:01
34	Sub-41	0.21	0.9500	0.33	0.31	0.06	1.29	0 00:02:57
35	Sub-42	0.12	0.9500	0.28	0.27	0.03	0.81	0 00:02:24
36	Sub-43	0.47	0.9500	0.34	0.33	0.15	2.73	0 00:03:18
37	Sub-44	0.64	0.9500	0.37	0.35	0.22	3.48	0 00:03:49
38	Sub-45	0.33	0.9500	0.33	0.32	0.10	1.98	0 00:03:11
39	Sub-46	0.70	0.9500	0.41	0.39	0.27	3.37	0 00:04:54

Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft²)	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	Diversion-01	Junction	165.30	174.00	165.30	174.00	0.00	56.09	167.15	0.00	6.85	0 00:00	0.00	0.00
2	Jun-01	Junction	172.84	180.00	172.84	180.00	0.00	31.21	174.63	0.00	5.37	0 00:00	0.00	0.00
3	Jun-02	Junction	206.64	214.14	206.64	214.14	0.00	0.00	206.74	0.00	7.40	0 00:00	0.00	0.00
4	Jun-03	Junction	204.81	212.23	204.81	212.23	0.00	13.28	205.95	0.00	6.28	0 00:00	0.00	0.00
5	Jun-04	Junction	198.80	206.20	198.80	206.20	0.00	16.88	200.04	0.00	6.16	0 00:00	0.00	0.00
6	Jun-05	Junction	187.14	199.70	187.14	199.70	0.00	26.84	199.70	0.00	0.00	0 00:03	0.70	5.00
7	Jun-06	Junction	189.34	199.70	189.34	199.70	0.00	9.30	190.94	0.00	8.76	0 00:00	0.00	0.00
8	Jun-07	Junction	184.94	199.18	184.94	199.18	0.00	13.90	199.18	0.00	0.00	0 00:03	0.22	6.00
9	Jun-08	Junction	177.14	185.00	177.14	185.00	0.00	24.21	178.21	0.00	6.79	0 00:00	0.00	0.00
10	Jun-09	Junction	174.14	185.00	174.14	185.00	0.00	24.21	175.37	0.00	9.63	0 00:00	0.00	0.00
11	Jun-10	Junction	173.50	185.00	173.50	185.00	0.00	24.21	175.13	0.00	9.87	0 00:00	0.00	0.00
12	Jun-11	Junction	170.03	185.50	170.03	185.50	0.00	384.79	185.50	0.00	0.00	0 00:03	0.24	6.00
13	Jun-18	Junction	181.00	198.00	181.00	198.00	0.00	359.11	185.39	0.00	12.61	0 00:00	0.00	0.00
14	Jun-19	Junction	174.97	196.10	174.97	196.10	0.00	359.11	179.37	0.00	16.73	0 00:00	0.00	0.00
15	Jun-20	Junction	174.50	195.50	174.50	195.50	0.00	361.62	178.92	0.00	16.58	0 00:00	0.00	0.00
16	Jun-21	Junction	168.53	181.90	168.53	181.90	0.00	478.61	174.03	0.00	7.87	0 00:00	0.00	0.00
17	Jun-23	Junction	187.90	205.00	187.90	205.00	0.00	12.74	205.00	0.00	0.00	0 00:03	0.03	2.00
18	Jun-24	Junction	185.80	203.50	185.80	203.50	0.00	15.05	203.50	0.00	0.00	0 00:04	0.21	5.00
19	Jun-27	Junction	162.24	175.00	162.24	175.00	0.00	56.09	164.11	0.00	10.89	0 00:00	0.00	0.00
20	Jun-29	Junction	165.35	180.00	165.35	180.00	0.00	31.93	167.20	0.00	12.80	0 00:00	0.00	0.00
21	Jun-30	Junction	174.02	180.00	174.02	180.00	0.00	31.21	175.71	0.00	4.29	0 00:00	0.00	0.00
22	Jun-31	Junction	177.00	217.96	177.00	217.96	0.00	16.99	178.13	0.00	39.83	0 00:00	0.00	0.00
23	Jun-32	Junction	207.35	217.80	207.35	217.80	0.00	10.03	208.95	0.00	8.85	0 00:00	0.00	0.00
24	Jun-33	Junction	208.91	216.94	208.91	216.94	0.00	14.23	216.94	0.00	0.00	0 00:04	0.19	5.00
25	Jun-36	Junction	209.79	217.29	209.79	217.29	0.00	17.13	217.29	0.00	0.00	0 00:04	0.12	4.00
26	Jun-37	Junction	212.02	219.26	212.02	219.26	0.00	13.77	212.94	0.00	6.32	0 00:00	0.00	0.00
27	Jun-38	Junction	217.17	223.67	217.17	223.67	0.00	12.81	218.09	0.00	5.58	0 00:00	0.00	0.00
28	Jun-39	Junction	221.49	228.17	221.49	228.17	0.00	12.81	222.31	0.00	5.86	0 00:00	0.00	0.00
29	Jun-41	Junction	203.56	218.70	203.56	218.70	0.00	6.95	204.56	0.00	14.14	0 00:00	0.00	0.00
30	Jun-43	Junction	206.27	211.64	206.27	211.64	0.00	6.95	207.46	0.00	4.18	0 00:00	0.00	0.00
31	Out-01	Junction	160.80	173.00	158.30	173.00	0.00	547.18	164.76	0.00	8.24	0 00:00	0.00	0.00
32	Jun-22	Outfall	154.39					547.18	158.35					

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope	Diameter or Height	Manning's Roughness	Peak Flow	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged	Reported Condition
					(ft)	(ft)	(ft)	(%)	(in)		(cfs)	(cfs)		(ft/sec)	(ft)		(min)	
1	{Network - (4)}.Pipe - (12)	Pipe	Jun-37	Jun-36	48.76	211.92	209.89	4.1600	18.000	0.0130	13.77	21.95	0.63	13.11	0.86	0.57	0.00	Calculated
2	{Network - (4)}.Pipe - (13)	Pipe	Jun-38	Jun-37	112.67	217.07	212.12	4.3900	18.000	0.0130	12.81	22.24	0.58	13.02	0.82	0.54	0.00	Calculated
3	{Network - (4)}.Pipe - (14)	Pipe	Jun-39	Jun-38	94.45	221.39	217.27	4.3600	18.000	0.0130	12.81	22.20	0.58	13.00	0.82	0.55	0.00	Calculated
4	{Network - (4)}.Pipe - (15)	Pipe	Inlet - 40	Jun-39	54.22	226.97	221.59	9.9200	18.000	0.0130	3.18	33.09	0.10	11.84	0.31	0.21	0.00	Calculated
5	{Network - (4)}.Pipe - (16)	Pipe	Jun-41	Jun-31	28.91	203.46	177.10	91.1800	18.000	0.0130	6.95	100.49	0.07	32.65	0.27	0.18	0.00	Calculated
6	{Network - (4)}.Pipe - (17)	Pipe	Inlet - 42	Jun-43	22.64	206.50	206.37	0.5700	18.000	0.0130	6.95	7.96	0.87	5.07	1.09	0.72	0.00	Calculated
7	{Network - (4)}.Pipe - (18)	Pipe	Jun-43	Jun-41	271.14	206.17	203.66	0.9300	18.000	0.0130	6.95	10.31	0.67	6.26	0.90	0.60	0.00	Calculated
8	{Network - (4)}.Pipe - (2)	Pipe	Jun-27	Inlet - 39	10.63	162.24	162.00	2.2600	30.000	0.0130	56.09	61.63	0.91	14.22	1.87	0.75	0.00	Calculated
9	{Network - (4)}.Pipe - (20)	Pipe	Inlet - 45	Jun-33	11.75	209.15	208.91	2.0400	8.004	0.0130	1.73	1.73	1.00	5.63	0.67	1.00	3.00	SURCHARGED
10	{Network - (4)}.Pipe - (21)	Pipe	Inlet - 46	Jun-33	25.42	215.01	209.01	23.6000	8.004	0.0130	2.60	5.88	0.44	16.31	0.31	0.47	0.00	Calculated
11	{Network - (4)}.Pipe - (22)	Pipe	Inlet - 47	Jun-36	24.25	210.27	209.79	1.9800	18.000	0.0130	3.56	14.78	0.24	6.87	0.50	0.33	0.00	Calculated
12	{Network - (4)}.Pipe - (23)	Pipe	Inlet - 48	Jun-37	4.25	212.10	212.02	1.8800	18.000	0.0130	1.40	14.41	0.10	5.18	0.32	0.21	0.00	Calculated
13	{Network - (4)}.Pipe - (24)	Pipe	Inlet - 49	Inlet - 50	98.04	209.00	187.07	22.3700	12.000	0.0130	0.11	16.85	0.01	6.10	0.06	0.06	0.00	Calculated
14	{Network - (4)}.Pipe - (25)	Pipe	Inlet - 50	Inlet - 51	97.93	186.87	182.32	4.6500	12.000	0.0130	0.17	7.76	0.02	3.80	0.10	0.10	0.00	Calculated
15	{Network - (4)}.Pipe - (26)	Pipe	Inlet - 51	Inlet - 52	98.02	182.12	180.56	1.5900	12.000	0.0130	0.26	4.64	0.06	3.18	0.16	0.16	0.00	Calculated
16	{Network - (4)}.Pipe - (27)	Pipe	Inlet - 52	Jun-29	111.34	180.36	165.38	13.4500	12.000	0.0130	0.86	13.11	0.07	9.33	0.17	0.17	0.00	Calculated
17	{Network - (4)}.Pipe - (5)	Pipe	Jun-30	Jun-01	118.48	173.92	172.94	0.8300	30.000	0.0130	31.21	39.16	0.80	8.86	1.69	0.67	0.00	Calculated
18	{Network - (4)}.Pipe - (6)	Pipe	Jun-31	Jun-30	298.00	176.90	174.12	0.9300	30.000	0.0130	16.99	40.32	0.42	7.86	1.13	0.45	0.00	Calculated
19	{Network - (4)}.Pipe - (7)	Pipe	Jun-32	Jun-31	26.08	207.25	177.10	115.6100	18.000	0.0130	10.03	113.13	0.09	39.56	0.30	0.20	0.00	Calculated
20	Link-01	Pipe	Jun-36	Jun-33	87.85	209.69	209.01	0.7700	18.000	0.0130	9.90	9.90	1.00	6.38	1.50	1.00	3.00	SURCHARGED
21	Link-02	Pipe	Inlet - 39	Out-01	20.92	161.51	161.23	1.3400	36.000	0.0130	68.57	77.16	0.89	12.33	2.20	0.73	0.00	Calculated
22	Link-03	Pipe	Jun-01	Jun-29	125.61	172.74	165.38	5.8600	30.000	0.0130	31.21	99.96	0.31	17.98	0.96	0.38	0.00	Calculated
23	Link-16	Pipe	Inlet-18	Jun-02	22.77	209.00	206.74	9.9300	18.000	0.0130	0.00	33.09	0.00	0.00	0.00	0.00	0.00	Calculated
24	Link-17	Pipe	Jun-02	Jun-03	101.10	206.54	204.91	1.6100	18.000	0.0130	0.00	13.74	0.00	0.00	0.00	0.00	0.00	Calculated
25	Link-18	Pipe	Inlet-01	Jun-03	25.65	205.24	204.91	1.2900	18.000	0.0130	8.36	11.91	0.70	7.30	0.93	0.62	0.00	Calculated
26	Link-19	Pipe	Jun-03	Jun-04	318.94	204.71	198.90	1.8200	18.000	0.0130	13.28	14.30	0.93	9.19	1.14	0.76	0.00	Calculated
27	Link-20	Pipe	Inlet-02	Jun-04	26.04	199.23	198.90	1.2700	18.000	0.0130	4.01	11.83	0.34	6.04	0.60	0.40	0.00	Calculated
28	Link-21	Pipe	Jun-04	Jun-05	75.05	198.70	187.24	15.2700	18.000	0.0130	16.88	41.23	0.41	22.17	0.67	0.45	0.00	Calculated
29	Link-22	Pipe	Inlet-03	Inlet-04	49.71	190.77	190.05	1.4500	18.000	0.0130	4.95	13.49	0.37	7.04	0.63	0.42	0.00	Calculated
30	Link-23	Pipe	Inlet-05	Inlet-04	32.31	190.84	190.05	2.4500	18.000	0.0130	4.47	17.43	0.26	8.26	0.52	0.35	0.00	Calculated
31	Link-24	Pipe	Inlet-04	Jun-06	65.08	189.85	189.44	0.6300	18.000	0.0130	9.30	9.30	1.00	5.95	1.50	1.00	1.00	SURCHARGED
32	Link-25	Pipe	Jun-06	Jun-23	151.21	189.24	188.00	0.8200	18.000	0.0130	9.30	9.89	0.94	6.36	1.16	0.77	0.00	Calculated
33	Link-26	Pipe	Jun-05	Jun-24	100.91	187.04	185.90	1.1300	18.000	0.0130	11.64	11.64	1.00	7.50	1.50	1.00	5.00	SURCHARGED
34	Link-27	Pipe	Inlet-06	Jun-07	64.94	186.16	185.04	1.7200	18.000	0.0130	2.44	13.79	0.18	5.87	0.43	0.28	0.00	Calculated
35	Link-28	Pipe	Jun-07	Inlet-14	147.39	184.84	183.51	0.9000	18.000	0.0130	10.35	10.35	1.00	6.67	1.50	1.00	5.00	SURCHARGED
36	Link-29	Pipe	Inlet-07	Inlet-08	94.10	193.44	192.52	0.9800	18.000	0.0130	3.34	10.39	0.32	5.23	0.59	0.39	0.00	Calculated
37	Link-30	Pipe	Inlet-08	Inlet-09	200.73	192.52	190.53	0.9900	18.000	0.0130	4.31	10.46	0.41	5.63	0.67	0.45	0.00	Calculated
38	Link-31	Pipe	Inlet-09	Inlet-10	69.20	190.53	189.86	0.9700	18.000	0.0130	7.64	10.34	0.74	6.40	0.96	0.64	0.00	Calculated
39	Link-32	Pipe	Inlet-10	Inlet-11	94.23	189.86	188.94	0.9800	18.000	0.0130	10.06	10.38	0.97	6.69	1.19	0.79	0.00	Calculated
40	Link-33	Pipe	Inlet-11	Inlet-12	128.82	188.94	187.67	0.9900	18.000	0.0130	10.43	10.43	1.00	6.73	1.50	1.00	0.00	SURCHARGED
41	Link-34	Pipe	Inlet-12	Inlet-13	64.47	187.67	187.05	0.9600	18.000	0.0130	10.30	10.30	1.00	6.64	1.50	1.00	2.00	SURCHARGED
42	Link-35	Pipe	Inlet-13	Inlet-14	39.72	187.05	183.51	8.9100	18.000	0.0130	10.30	31.36	0.33	15.89	0.59	0.39	0.00	Calculated
43	Link-36	Pipe	Inlet-14	Inlet-15	32.72	183.01	182.83	0.5500	24.000	0.0130	16.78	16.78	1.00	6.08	2.00	1.00	4.00	SURCHARGED
44	Link-37	Pipe	Inlet-15	Inlet-16	130.05	182.63	181.56	0.8200	24.000	0.0130	21.46	21.46	1.00	7.78	2.00	1.00	3.00	SURCHARGED
45	Link-38	Pipe	Inlet-16	Inlet-17	83.31	181.36	177.81	4.2600	24.000	0.0130	23.69	47.35	0.50	15.07	1.00	0.50	0.00	Calculated
46	Link-39	Pipe	Inlet-17	Jun-08	15.76	177.61	177.14	2.9800	24.000	0.0130	24.21	43.02	0.56	14.09	1.07	0.54	0.00	Calculated
47	Link-40	Pipe	Jun-08	Jun-09	29.69	177.14	174.14	10.1000	24.000	0.0130	24.21	71.91	0.34	20.64	0.80	0.40	0.00	Calculated
48	Link-41	Pipe	Jun-09	Jun-10	27.08	174.14	173.50	2.3600	24.000	0.0130	24.21	34.78	0.70	11.96	1.23	0.61	0.00	Calculated
49	Link-42	Pipe	Jun-10	Jun-11	43.03	173.50	173.00	1.1600	24.000	0.0130	24.21	24.39	0.99	8.85	1.63	0.81	0.00	Calculated
50	Link-48	Pipe	Jun-33	Jun-32	159.99	208.81	207.45	0.8500	18.000	0.0130	10.03	10.03	1.00	6.47	1.50	1.00	4.00	SURCHARGED
51	Link-58	Pipe	Jun-18	Jun-19	501.00	181.00	174.97	1.2000	66.000	0.0130	359.11	368.41	0.97	17.66	4.39	0.80	0.00	Calculated
52	Link-59	Pipe	Jun-19	Jun-20	39.20	174.97	174.50	1.2000	66.000	0.0130	359.11	367.70	0.98	17.63	4.40	0.80	0.00	Calculated
53	Link-60	Pipe	Inlet-23	Jun-20	26.10	175.00	174.50	1.9200	18.000	0.0150	2.52	12.60	0.20	5.57	0.46	0.30	0.00	Calculated
54	Link-61	Pipe	Jun-20	Jun-11	371.00	174.50	170.03	1.2000	66.000	0.0130	361.62	368.60	0.98	17.68	4.42	0.80	0.00	Calculated
55	Link-62	Pipe	Jun-11	Jun-21	118.00	170.03	168.53	1.2700	66.000	0.0130	378.61	378.61	1.00	18.17	5.50	1.00	5.00	SURCHARGED
56	Link-63	Pipe	Jun-21	Out-01	220.00	168.53	160.80	3.5100	66.000	0.0130	478.61	629.46	0.76	29.16	3.59	0.65	0.00	Calculated
57	Link-64	Pipe	Out-01	Jun-22	182.00	160.80	154.39	3.5200	66.000	0.0130	547.18	630.21	0.87	29.85	3.96	0.72	0.00	Calculated
58	Link-68	Pipe	Inlet-22	Jun-18	18.19	182.00	181.00	5.5000	18.000	0.0130	2.11	24.63	0.09	8.51	0.30	0.20	0.00	Calculated

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope	Diameter or Height	Manning's Roughness	Peak Flow	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged	Reported Condition
					(ft)	(ft)	(ft)	(%)	(in)		(cfs)	(cfs)		(ft/sec)	(ft)		(min)	
59	Link-70	Pipe	Inlet-23	Inlet-14	71.83	0.00	183.01	-254.7800	18.000	0.0150	0.61	35.61	0.02	7.48	0.14	0.09	0.00	Calculated
60	Link-71	Pipe	Inlet-24	Inlet-25	207.08	238.00	224.60	6.4700	18.000	0.0130	2.26	26.72	0.08	9.21	0.30	0.20	0.00	Calculated
61	Link-72	Pipe	Inlet-25	Jun-39	49.00	224.60	221.49	6.3500	18.000	0.0130	9.94	26.46	0.38	13.90	0.64	0.42	0.00	Calculated
62	Link-73	Pipe	Inlet-26	Inlet - 42	125.94	232.00	206.50	20.2500	18.000	0.0150	2.94	40.96	0.07	13.47	0.27	0.18	0.00	Calculated
63	Link-74	Pipe	Inlet-27	Inlet-03	332.11	210.00	190.87	5.7600	12.000	0.0130	2.70	8.55	0.32	9.64	0.39	0.39	0.00	Calculated
64	Link-75	Pipe	Jun-23	Jun-05	73.44	187.80	187.24	0.7600	18.000	0.0130	9.96	9.96	1.00	6.42	1.50	1.00	1.00	SURCHARGED
65	Link-76	Pipe	Jun-24	Jun-07	63.84	185.70	185.04	1.0300	18.000	0.0130	11.46	11.46	1.00	7.37	1.50	1.00	5.00	SURCHARGED
66	Link-77	Pipe	Jun-29	Diversion-01	4.97	165.35	165.30	1.0100	30.000	0.0150	31.93	35.66	0.90	8.21	1.85	0.74	0.00	Calculated
67	Link-78	Pipe	Inlet-28	Diversion-01	17.66	165.70	165.30	2.2700	24.000	0.0130	26.59	34.05	0.78	11.99	1.33	0.66	0.00	Calculated
68	Link-79	Pipe	Diversion-01	Jun-27	47.29	165.30	162.16	6.6400	30.000	0.0130	56.09	104.34	0.54	21.63	1.31	0.52	0.00	Calculated
69	Link-82	Pipe	Inlet-29	Inlet-28	257.59	170.95	165.70	2.0400	24.000	0.0130	25.68	32.30	0.80	11.41	1.35	0.67	0.00	Calculated
70	Link-08	Channel	Inlet - 40	Inlet - 48	285.62	231.97	219.64	4.3200	6.000	0.0160	0.19	57.04	0.00	1.20	0.02	0.03	0.00	
71	Link-09	Channel	Inlet - 48	Inlet - 47	56.44	219.64	216.84	4.9600	6.000	0.0160	0.02	61.15	0.00	0.00	0.00	0.01	0.00	
72	Link-11	Channel	Inlet - 46	Inlet - 45	52.75	218.01	217.09	1.7400	6.000	0.0160	1.52	36.26	0.04	2.11	0.07	0.14	0.00	
73	Link-13	Channel	Inlet - 49	Inlet - 50	101.60	212.00	189.97	21.6800	6.000	0.0160	0.02	127.83	0.00	0.00	0.00	0.00	0.00	
74	Link-14	Channel	Inlet - 50	Inlet - 51	102.82	189.97	185.22	4.6200	6.000	0.0160	0.01	59.01	0.00	0.00	0.00	0.01	0.00	
75	Link-15	Channel	Inlet - 51	Inlet - 52	102.21	185.22	183.46	1.7200	6.000	0.0320	0.01	18.01	0.00	0.00	0.01	0.01	0.00	
76	Link-44	Channel	Inlet-01	Inlet-02	319.10	212.26	206.17	1.9100	6.000	0.0160	0.08	37.93	0.00	0.65	0.01	0.02	0.00	
77	Link-45	Channel	Inlet-02	Inlet-15	370.98	206.17	192.87	3.5900	6.000	0.0160	0.34	51.98	0.01	1.45	0.02	0.05	0.00	
78	Link-46	Channel	Inlet-06	Inlet-14	200.70	201.65	193.50	4.0600	6.000	0.0160	0.33	55.32	0.01	1.48	0.02	0.04	0.00	
79	Link-47	Channel	Inlet-03	Inlet-04	57.92	200.20	198.06	3.6900	6.000	0.0320	0.81	26.38	0.03	1.35	0.06	0.12	0.00	
80	Link-83	Channel	Inlet - 47	Inlet-01	216.69	216.84	212.26	2.1100	6.000	0.0320	0.50	41.17	0.01	0.72	0.03	0.07	0.00	
81	Link-84	Channel	Inlet - 45	Inlet-01	258.21	217.09	212.26	1.8700	6.000	0.0320	0.04	18.77	0.00	0.33	0.01	0.02	0.00	

Inlet Summary

SN	Element ID	Inlet Manufacturer	Manufacturer Part Number	Inlet Location	Number of Inlets	Catchbasin Invert Elevation (ft)	Max (Rim) Elevation (ft)	Initial Water Elevation (ft)	Ponded Area (ft²)	Peak Flow (cfs)	Peak Flow Intercepted by Inlet (cfs)	Peak Flow Bypassing Inlet (cfs)	Inlet Efficiency during Peak Flow (%)	Allowable Spread (ft)	Max Gutter Spread during Peak Flow (ft)	Max Gutter Water Elev. during Peak Flow (ft)
1	Inlet - 39	FHWA HEC-22 GENERIC	N/A	On Sag	1	161.51	175.00	161.51	40.00	5.41	N/A	N/A	N/A	7.00	11.19	176.78
2	Inlet - 40	FHWA HEC-22 GENERIC	N/A	On Grade	1	226.97	231.97	226.97	N/A	3.36	3.18	0.19	94.47	7.00	10.80	232.28
3	Inlet - 42	FHWA HEC-22 GENERIC	N/A	On Sag	1	206.50	211.50	206.50	40.00	5.44	N/A	N/A	N/A	7.00	22.74	212.37
4	Inlet - 45	FHWA HEC-22 GENERIC	N/A	On Grade	1	209.15	217.09	209.15	N/A	1.13	1.09	0.04	96.47	7.00	7.78	217.34
5	Inlet - 46	CALTRANS	G1	On Grade	1	215.01	218.01	215.01	N/A	4.13	2.60	1.52	63.11	7.00	13.79	218.35
6	Inlet - 47	FHWA HEC-22 GENERIC	N/A	On Grade	1	210.27	216.84	210.27	N/A	4.06	3.56	0.50	87.60	7.00	8.74	217.11
7	Inlet - 48	FHWA HEC-22 GENERIC	N/A	On Grade	1	212.10	219.64	212.10	N/A	1.37	1.35	0.02	98.35	7.00	5.06	219.84
8	Inlet - 49	CALTRANS	G1	On Grade	1	209.00	212.00	209.00	N/A	0.13	0.11	0.02	85.30	7.00	0.91	212.03
9	Inlet - 50	CALTRANS	G1	On Grade	1	186.97	189.97	186.97	N/A	0.09	0.08	0.01	85.30	7.00	0.61	189.99
10	Inlet - 51	CALTRANS	G1	On Grade	1	182.22	185.22	182.22	N/A	0.10	0.09	0.01	85.30	7.00	0.68	185.24
11	Inlet - 52	CALTRANS	G1	On Sag	1	180.46	183.46	180.46	50.00	0.69	N/A	N/A	N/A	7.00	3.63	183.57
12	Inlet-01	FHWA HEC-22 GENERIC	N/A	On Grade	1	205.24	212.26	205.24	N/A	8.11	8.03	0.08	99.07	7.00	13.59	212.63
13	Inlet-02	FHWA HEC-22 GENERIC	N/A	On Grade	1	199.23	206.17	199.23	N/A	4.35	4.01	0.34	92.13	7.00	10.52	206.47
14	Inlet-03	FHWA HEC-22 GENERIC	N/A	On Grade	1	190.87	200.20	190.87	N/A	3.48	2.67	0.81	76.78	7.00	7.43	200.44
15	Inlet-04	FHWA HEC-22 GENERIC	N/A	On Sag	1	189.95	198.06	189.95	40.00	1.47	N/A	N/A	N/A	7.00	5.85	198.74
16	Inlet-05	FHWA HEC-22 GENERIC	N/A	On Sag	1	190.94	198.37	190.94	40.00	2.83	N/A	N/A	N/A	7.00	0.00	199.13
17	Inlet-06	FHWA HEC-22 GENERIC	N/A	On Grade	1	186.16	201.65	186.16	N/A	2.77	2.44	0.33	87.97	7.00	8.57	201.92
18	Inlet-07	CALTRANS	G1	On Sag	1	193.44	196.44	193.44	50.00	3.37	N/A	N/A	N/A	7.00	13.19	196.77
19	Inlet-08	CALTRANS	G1	On Sag	1	192.52	197.38	192.52	50.00	1.98	N/A	N/A	N/A	7.00	8.94	197.62
20	Inlet-09	CALTRANS	G1	On Sag	1	190.53	199.10	190.53	50.00	3.48	N/A	N/A	N/A	7.00	12.96	199.45
21	Inlet-10	FHWA HEC-22 GENERIC	N/A	On Sag	1	189.86	199.24	189.86	40.00	2.73	N/A	N/A	N/A	7.00	15.72	199.98
22	Inlet-11	CALTRANS	G1	On Sag	1	188.94	199.10	188.94	50.00	0.81	N/A	N/A	N/A	7.00	3.83	199.25
23	Inlet-12	CALTRANS	G1	On Sag	1	187.67	195.91	187.67	50.00	1.28	N/A	N/A	N/A	7.00	5.81	196.12
24	Inlet-13	CALTRANS	G1	On Sag	1	187.05	194.27	187.05	50.00	0.00	N/A	N/A	N/A	7.00	0.00	194.27
25	Inlet-14	FHWA HEC-22 GENERIC	N/A	On Sag	1	183.01	193.50	183.01	40.00	3.44	N/A	N/A	N/A	7.00	13.43	194.03
26	Inlet-15	FHWA HEC-22 GENERIC	N/A	On Sag	1	182.73	192.87	182.73	40.00	9.13	N/A	N/A	N/A	7.00	13.78	194.95
27	Inlet-16	CALTRANS	G1	On Sag	1	181.46	190.02	181.46	50.00	2.27	N/A	N/A	N/A	7.00	9.34	190.30
28	Inlet-17	CALTRANS	G1	On Sag	1	177.71	187.30	177.71	50.00	0.84	N/A	N/A	N/A	7.00	4.01	187.45
29	Inlet-18	CALTRANS	G1	On Sag	1	209.00	214.80	209.00	50.00	0.00	N/A	N/A	N/A	7.00	0.00	214.80
30	Inlet-22	FHWA HEC-22 GENERIC	N/A	On Sag	1	182.00	197.80	182.00	40.00	2.12	N/A	N/A	N/A	7.00	12.22	198.51
31	Inlet-23	FHWA HEC-22 GENERIC	N/A	On Grade	1	175.00	194.00	175.00	N/A	3.14	2.52	0.61	80.47	7.00	8.30	194.26
32	Inlet-24	CALTRANS	G1	On Sag	1	238.00	233.00	238.00	50.00	2.30	N/A	N/A	N/A	7.00	8.89	239.30
33	Inlet-25	FHWA HEC-22 GENERIC	N/A	On Sag	1	224.60	229.10	224.60	40.00	4.12	N/A	N/A	N/A	7.00	11.69	229.40
34	Inlet-26	FHWA HEC-22 GENERIC	N/A	On Sag	1	232.00	238.00	232.00	50.00	2.97	N/A	N/A	N/A	7.00	8.97	238.30
35	Inlet-27	FHWA HEC-22 GENERIC	N/A	On Sag	1	210.00	216.00	210.00	50.00	2.74	N/A	N/A	N/A	7.00	8.35	216.29
36	Inlet-28	FHWA HEC-22 GENERIC	N/A	On Sag	1	165.70	175.00	165.44	40.00	1.29	N/A	N/A	N/A	7.00	8.60	175.60
37	Inlet-29	FHWA HEC-22 GENERIC	N/A	On Sag	1	167.95	178.00	167.95	50.00	8.27	N/A	N/A	N/A	7.00	21.55	178.81

Junction Input

SN	Element ID	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Ground/Rim (Max) Offset (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Surcharge Elevation (ft)	Surcharge Depth (ft)	Ponded Area (ft^2)	Minimum Pipe Cover (in)
1	Diversion-01	165.30	174.00	8.70	165.30	0.00	174.00	0.00	0.00	74.40
2	Jun-01	172.84	180.00	7.16	172.84	0.00	180.00	0.00	0.00	54.72
3	Jun-02	206.64	214.14	7.50	206.64	0.00	214.14	0.00	0.00	70.80
4	Jun-03	204.81	212.23	7.42	204.81	0.00	212.23	0.00	0.00	69.84
5	Jun-04	198.80	206.20	7.40	198.80	0.00	206.20	0.00	0.00	69.60
6	Jun-05	187.14	199.70	12.56	187.14	0.00	199.70	0.00	0.00	131.52
7	Jun-06	189.34	199.70	10.36	189.34	0.00	199.70	0.00	0.00	105.12
8	Jun-07	184.94	199.18	14.24	184.94	0.00	199.18	0.00	0.00	151.68
9	Jun-08	177.14	185.00	7.86	177.14	0.00	185.00	0.00	0.00	70.32
10	Jun-09	174.14	185.00	10.86	174.14	0.00	185.00	0.00	0.00	106.32
11	Jun-10	173.50	185.00	11.50	173.50	0.00	185.00	0.00	0.00	114.00
12	Jun-11	170.03	185.50	15.47	170.03	0.00	185.50	0.00	0.00	119.64
13	Jun-18	181.00	198.00	17.00	181.00	0.00	198.00	0.00	0.00	138.00
14	Jun-19	174.97	196.10	21.13	174.97	0.00	196.10	0.00	0.00	187.56
15	Jun-20	174.50	195.50	21.00	174.50	0.00	195.50	0.00	0.00	186.00
16	Jun-21	168.53	181.90	13.37	168.53	0.00	181.90	0.00	0.00	94.44
17	Jun-23	187.90	205.00	17.10	187.90	0.00	205.00	0.00	0.00	186.00
18	Jun-24	185.80	203.50	17.70	185.80	0.00	203.50	0.00	0.00	193.20
19	Jun-27	162.24	175.00	12.76	162.24	0.00	175.00	0.00	0.00	123.12
20	Jun-29	165.35	180.00	14.65	165.35	0.00	180.00	0.00	0.00	145.44
21	Jun-30	174.02	180.00	5.98	174.02	0.00	180.00	0.00	0.00	40.56
22	Jun-31	177.00	217.96	40.96	177.00	0.00	217.96	0.00	0.00	462.72
23	Jun-32	207.35	217.80	10.45	207.35	0.00	217.80	0.00	0.00	106.20
24	Jun-33	208.91	216.94	8.03	208.91	0.00	216.94	0.00	0.00	77.16
25	Jun-36	209.79	217.29	7.50	209.79	0.00	217.29	0.00	0.00	70.80
26	Jun-37	212.02	219.26	7.24	212.02	0.00	219.26	0.00	0.00	67.68
27	Jun-38	217.17	223.67	6.50	217.17	0.00	223.67	0.00	0.00	58.80
28	Jun-39	221.49	228.17	6.68	221.49	0.00	228.17	0.00	0.00	60.96
29	Jun-41	203.56	218.70	15.14	203.56	0.00	218.70	0.00	0.00	162.48
30	Jun-43	206.27	211.64	5.37	206.27	0.00	211.64	0.00	0.00	45.24
31	Out-01	160.80	173.00	12.20	158.30	-2.50	173.00	0.00	0.00	80.40

Junction Results

SN	Element ID	Peak Inflow (cfs)	Peak Lateral Inflow (cfs)	Max HGL Elevation Attained (ft)	Max HGL Depth Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Average HGL Elevation Attained (ft)	Average HGL Depth Attained (ft)	Time of Max HGL Occurrence (days hh:mm)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	Diversion-01	56.09	0.00	167.15	1.85	0.00	6.85	165.31	0.01	0 00:04	0 00:00	0.00	0.00
2	Jun-01	31.21	0.00	174.63	1.79	0.00	5.37	172.95	0.11	0 00:04	0 00:00	0.00	0.00
3	Jun-02	0.00	0.00	206.74	0.10	0.00	7.40	206.74	0.10	0 00:00	0 00:00	0.00	0.00
4	Jun-03	13.28	5.84	205.95	1.14	0.00	6.28	204.91	0.10	0 00:03	0 00:00	0.00	0.00
5	Jun-04	16.88	0.00	200.04	1.24	0.00	6.16	198.90	0.10	0 00:03	0 00:00	0.00	0.00
6	Jun-05	26.84	0.00	199.70	12.56	0.00	0.00	187.28	0.14	0 00:01	0 00:03	0.70	5.00
7	Jun-06	9.30	0.00	190.94	1.60	0.00	8.76	189.44	0.10	0 00:03	0 00:00	0.00	0.00
8	Jun-07	13.90	0.00	199.18	14.24	0.00	0.00	185.10	0.16	0 00:01	0 00:03	0.22	6.00
9	Jun-08	24.21	0.00	178.21	1.07	0.00	6.79	177.15	0.01	0 00:03	0 00:00	0.00	0.00
10	Jun-09	24.21	0.00	175.37	1.23	0.00	9.63	174.15	0.01	0 00:03	0 00:00	0.00	0.00
11	Jun-10	24.21	0.00	175.13	1.63	0.00	9.87	173.51	0.01	0 00:03	0 00:00	0.00	0.00
12	Jun-11	384.79	0.00	185.50	15.47	0.00	0.00	174.44	4.41	0 00:01	0 00:03	0.24	6.00
13	Jun-18	359.11	357.00	185.39	4.39	0.00	12.61	185.37	4.37	0 00:04	0 00:00	0.00	0.00
14	Jun-19	359.11	0.00	179.37	4.40	0.00	16.73	179.34	4.37	0 00:04	0 00:00	0.00	0.00
15	Jun-20	361.62	0.00	178.92	4.42	0.00	16.58	178.87	4.37	0 00:04	0 00:00	0.00	0.00
16	Jun-21	478.61	100.00	174.03	5.50	0.00	7.87	172.79	4.26	0 00:01	0 00:00	0.00	0.00
17	Jun-23	12.74	3.45	205.00	17.10	0.00	0.00	188.03	0.13	0 00:02	0 00:03	0.03	2.00
18	Jun-24	15.05	3.40	203.50	17.70	0.00	0.00	185.97	0.17	0 00:01	0 00:04	0.21	5.00
19	Jun-27	56.09	0.00	164.11	1.87	0.00	10.89	162.25	0.01	0 00:05	0 00:00	0.00	0.00
20	Jun-29	31.93	0.00	167.20	1.85	0.00	12.80	165.39	0.04	0 00:04	0 00:00	0.00	0.00
21	Jun-30	31.21	15.95	175.71	1.69	0.00	4.29	174.13	0.11	0 00:04	0 00:00	0.00	0.00
22	Jun-31	16.99	0.00	178.13	1.13	0.00	39.83	177.10	0.10	0 00:03	0 00:00	0.00	0.00
23	Jun-32	10.03	0.00	208.95	1.60	0.00	8.85	207.46	0.11	0 00:02	0 00:00	0.00	0.00
24	Jun-33	14.23	0.00	216.94	8.03	0.00	0.00	209.04	0.13	0 00:02	0 00:04	0.19	5.00
25	Jun-36	17.13	0.00	217.29	7.50	0.00	0.00	209.91	0.12	0 00:02	0 00:04	0.12	4.00
26	Jun-37	13.77	0.00	212.94	0.92	0.00	6.32	212.12	0.10	0 00:04	0 00:00	0.00	0.00
27	Jun-38	12.81	0.00	218.09	0.92	0.00	5.58	217.27	0.10	0 00:04	0 00:00	0.00	0.00
28	Jun-39	12.81	0.00	222.31	0.82	0.00	5.86	221.59	0.10	0 00:04	0 00:00	0.00	0.00
29	Jun-41	6.95	0.00	204.56	1.00	0.00	14.14	203.66	0.10	0 00:03	0 00:00	0.00	0.00
30	Jun-43	6.95	0.00	207.46	1.19	0.00	4.18	206.37	0.10	0 00:03	0 00:00	0.00	0.00
31	Out-01	547.18	0.00	164.76	3.96	0.00	8.24	164.28	3.48	0 00:05	0 00:00	0.00	0.00

Pipe Input

SN	Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Pipe Shape	Pipe Diameter or Height (in)	Pipe Width (in)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses
1	{Network - (4)}.Pipe - (12)	48.76	211.92	-0.10	209.89	0.10	2.03	4.1600	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000
2	{Network - (4)}.Pipe - (13)	112.67	217.07	-0.10	212.12	0.10	4.95	4.3900	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000
3	{Network - (4)}.Pipe - (14)	94.45	221.39	-0.10	217.27	0.10	4.12	4.3600	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000
4	{Network - (4)}.Pipe - (15)	54.22	226.97	0.00	221.59	0.10	5.38	9.9200	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000
5	{Network - (4)}.Pipe - (16)	28.91	203.46	-0.10	177.10	0.10	26.36	91.1800	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000
6	{Network - (4)}.Pipe - (17)	22.64	206.50	0.00	206.37	0.10	0.13	0.5700	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000
7	{Network - (4)}.Pipe - (18)	271.14	206.17	-0.10	203.66	0.10	2.51	0.9300	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000
8	{Network - (4)}.Pipe - (2)	10.63	162.24	0.00	162.00	0.49	0.24	2.2600	CIRCULAR	30.000	30.000	0.0130	0.5000	0.5000	0.0000
9	{Network - (4)}.Pipe - (20)	11.75	209.15	0.00	208.91	0.00	0.24	2.0400	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000
10	{Network - (4)}.Pipe - (21)	25.42	215.01	0.00	209.01	0.10	6.00	23.6000	CIRCULAR	8.040	8.040	0.0130	0.5000	0.5000	0.0000
11	{Network - (4)}.Pipe - (22)	24.25	210.27	0.00	209.79	0.00	0.48	1.9800	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000
12	{Network - (4)}.Pipe - (23)	4.25	212.10	0.00	212.02	0.00	0.08	1.8800	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000
13	{Network - (4)}.Pipe - (24)	98.04	209.00	0.00	187.07	0.10	21.93	22.3700	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000
14	{Network - (4)}.Pipe - (25)	97.93	186.87	-0.10	182.32	0.10	4.55	4.6500	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000
15	{Network - (4)}.Pipe - (26)	98.02	182.12	-0.10	180.56	0.10	1.56	1.5900	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000
16	{Network - (4)}.Pipe - (27)	111.34	180.36	-0.10	165.38	0.03	14.98	13.4500	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000
17	{Network - (4)}.Pipe - (5)	118.48	173.92	-0.10	172.94	0.10	0.98	0.8300	CIRCULAR	30.000	30.000	0.0130	0.5000	0.5000	0.0000
18	{Network - (4)}.Pipe - (6)	298.00	176.90	-0.10	174.12	0.10	2.78	0.9300	CIRCULAR	30.000	30.000	0.0130	0.5000	0.5000	0.0000
19	{Network - (4)}.Pipe - (7)	26.08	207.25	-0.10	177.10	0.10	30.15	115.6100	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000
20	Link-01	87.85	209.69	-0.10	209.01	0.10	0.68	0.7700	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000
21	Link-02	20.92	161.51	0.00	161.23	0.43	0.28	1.3400	CIRCULAR	36.000	36.000	0.0130	0.5000	0.5000	0.0000
22	Link-03	125.61	172.74	-0.10	165.38	0.03	7.36	5.8600	CIRCULAR	30.000	30.000	0.0130	0.5000	0.5000	0.0000
23	Link-16	22.77	209.00	0.00	206.74	0.10	2.26	9.9300	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000
24	Link-17	101.10	206.54	-0.10	204.91	0.10	1.63	1.6100	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000
25	Link-18	25.65	205.24	0.00	204.91	0.10	0.33	1.2900	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000
26	Link-19	318.94	204.71	-0.10	198.90	0.10	5.81	1.8200	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000
27	Link-20	26.04	199.23	0.00	198.90	0.10	0.33	1.2700	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000
28	Link-21	75.05	198.70	-0.10	187.24	0.10	11.46	15.2700	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000
29	Link-22	49.71	190.77	-0.10	190.05	0.10	0.72	1.4500	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000
30	Link-23	32.31	190.84	-0.10	190.05	0.10	0.79	2.4500	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000
31	Link-24	65.08	189.85	-0.10	189.44	0.10	0.41	0.6300	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000
32	Link-25	151.21	189.24	-0.10	188.00	0.10	1.24	0.8200	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000
33	Link-26	100.91	187.04	-0.10	185.90	0.10	1.14	1.1300	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000
34	Link-27	64.94	186.16	0.00	185.04	0.10	1.12	1.7200	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000
35	Link-28	147.39	184.84	-0.10	183.51	0.50	1.33	0.9000	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000
36	Link-29	94.10	193.44	0.00	192.52	0.00	0.92	0.9800	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000
37	Link-30	200.73	192.52	0.00	190.53	0.00	1.99	0.9900	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000
38	Link-31	69.20	190.53	0.00	189.86	0.00	0.67	0.9700	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000
39	Link-32	94.23	189.86	0.00	188.94	0.00	0.92	0.9800	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000
40	Link-33	128.82	188.94	0.00	187.67	0.00	1.27	0.9900	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000
41	Link-34	64.47	187.67	0.00	187.05	0.00	0.62	0.9600	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000
42	Link-35	39.72	187.05	0.00	183.51	0.50	3.54	8.9100	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000
43	Link-36	32.72	183.01	0.00	182.83	0.10	0.18	0.5500	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000
44	Link-37	130.05	182.63	-0.10	181.56	0.10	1.07	0.8200	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000
45	Link-38	83.31	181.36	-0.10	177.81	0.10	3.55	4.2600	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000
46	Link-39	15.76	177.61	-0.10	177.14	0.00	0.47	2.9800	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000
47	Link-40	29.69	177.14	0.00	174.14	0.00	3.00	10.1000	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000
48	Link-41	27.08	174.14	0.00	173.50	0.00	0.64	2.3600	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000
49	Link-42	43.03	173.50	0.00	173.00	2.97	0.50	1.1600	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000
50	Link-48	159.99	208.81	-0.10	207.45	0.10	1.36	0.8500	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000
51	Link-58	501.00	181.00	0.00	174.97	0.00	6.03	1.2000	CIRCULAR	66.000	66.000	0.0130	0.5000	0.5000	0.0000
52	Link-59	39.20	174.97	0.00	174.50	0.00	0.47	1.2000	CIRCULAR	66.000	66.000	0.0130	0.5000	0.5000	0.0000
53	Link-60	26.10	175.00	0.00	174.50	0.00	0.50	1.9200	CIRCULAR	18.000	18.000	0.0150	0.5000	0.5000	0.0000
54	Link-61	371.00	174.50	0.00	170.03	0.00	4.47	1.2000	CIRCULAR	66.000	66.000	0.0130	0.5000	0.5000	0.0000
55	Link-62	118.00	170.03	0.00	168.53	0.00	1.50	1.2700	CIRCULAR	66.000	66.000	0.0130	0.5000	0.5000	0.0000
56	Link-63	220.00	168.53	0.00	160.80	0.00	7.73	3.5100	CIRCULAR	66.000	66.000	0.0130	0.5000	0.5000	0.0000
57	Link-64	182.00	160.80	0.00	154.39	0.00	6.41	3.5200	CIRCULAR	66.000	66.000	0.0130	0.5000	0.5000	0.0000
58	Link-68	18.19	182.00	0.00	181.00	0.00	1.00	5.5000	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000
59	Link-70	71.83	0.00	-175.00	183.01	0.00	-183.01	-254.7800	CIRCULAR	18.000	18.000	0.0150	0.5000	0.5000	0.0000
60	Link-71	207.08	238.00	0.00	224.60	0.00	13.40	6.4700	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000
61	Link-72	49.00	224.60	0.00	221.49	0.00	3.11	6.3500	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000
62	Link-73	125.94	232.00	0.00	206.50	0.00	25.50	20.2500	CIRCULAR	18.000	18.000	0.0150	0.5000	0.5000	0.0000
63	Link-74	332.11	210.00	0.00	190.87	0.00	19.13	5.7600	CIRCULAR	12.000	12.000	0.0130	0.5000	0.5000	0.0000
64	Link-75	73.44	187.80	-0.10	187.24	0.10	0.56	0.7600	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000
65	Link-76	63.84	185.70	-0.10	185.04	0.10	0.66	1.0300	CIRCULAR	18.000	18.000	0.0130	0.5000	0.5000	0.0000
66	Link-77	4.97	165.35	0.00	165.30	0.00	0.05	1.0100	CIRCULAR	30.000	30.000	0.0150	0.5000	0.5000	0.0000
67	Link-78	17.66	165.70	0.00	165.30	0.00	0.40	2.2700	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000
68	Link-79	47.29	165.30	0.00	162.16	-0.08	3.14	6.6400	CIRCULAR	30.000	30.000	0.0130	0.5000	0.5000	0.0000
69	Link-82	257.59	170.95	3.00	165.70	0.00	5.25	2.0400	CIRCULAR	24.000	24.000	0.0130	0.5000	0.5000	0.0000

Pipe Results

SN	Element ID	Peak Flow	Time of Peak Flow Occurrence	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Travel Time	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged	Froude Number	Reported Condition
		(cfs)	(days hh:mm)	(cfs)		(ft/sec)	(min)	(ft)		(min)		
1	{Network - (4)}.Pipe - (12)	13.77	0 00:04	21.95	0.63	13.11	0.06	0.86	0.57	0.00		Calculated
2	{Network - (4)}.Pipe - (13)	12.81	0 00:04	22.24	0.58	13.02	0.14	0.82	0.54	0.00		Calculated
3	{Network - (4)}.Pipe - (14)	12.81	0 00:04	22.20	0.58	13.00	0.12	0.82	0.55	0.00		Calculated
4	{Network - (4)}.Pipe - (15)	3.18	0 00:04	33.09	0.10	11.84	0.08	0.31	0.21	0.00		Calculated
5	{Network - (4)}.Pipe - (16)	6.95	0 00:03	100.49	0.07	32.65	0.01	0.27	0.18	0.00		Calculated
6	{Network - (4)}.Pipe - (17)	6.95	0 00:03	7.96	0.87	5.07	0.07	1.09	0.72	0.00		Calculated
7	{Network - (4)}.Pipe - (18)	6.95	0 00:03	10.31	0.67	6.26	0.72	0.90	0.60	0.00		Calculated
8	{Network - (4)}.Pipe - (2)	56.09	0 00:05	61.63	0.91	14.22	0.01	1.87	0.75	0.00		Calculated
9	{Network - (4)}.Pipe - (20)	1.73	0 00:03	1.73	1.00	5.63	0.03	0.67	1.00	3.00		SURCHARGED
10	{Network - (4)}.Pipe - (21)	2.60	0 00:04	5.88	0.44	16.31	0.03	0.31	0.47	0.00		Calculated
11	{Network - (4)}.Pipe - (22)	3.56	0 00:04	14.78	0.24	6.87	0.06	0.50	0.33	0.00		Calculated
12	{Network - (4)}.Pipe - (23)	1.40	0 00:03	14.41	0.10	5.18	0.01	0.32	0.21	0.00		Calculated
13	{Network - (4)}.Pipe - (24)	0.11	0 00:07	16.85	0.01	6.10	0.27	0.06	0.06	0.00		Calculated
14	{Network - (4)}.Pipe - (25)	0.17	0 00:07	7.76	0.02	3.80	0.43	0.10	0.10	0.00		Calculated
15	{Network - (4)}.Pipe - (26)	0.26	0 00:05	4.64	0.06	3.18	0.51	0.16	0.16	0.00		Calculated
16	{Network - (4)}.Pipe - (27)	0.86	0 00:03	13.11	0.07	9.33	0.20	0.17	0.17	0.00		Calculated
17	{Network - (4)}.Pipe - (5)	31.21	0 00:04	39.16	0.80	8.86	0.22	1.69	0.67	0.00		Calculated
18	{Network - (4)}.Pipe - (6)	16.99	0 00:03	40.32	0.42	7.86	0.63	1.13	0.45	0.00		Calculated
19	{Network - (4)}.Pipe - (7)	10.03	0 00:02	113.13	0.09	39.56	0.01	0.30	0.20	0.00		Calculated
20	Link-01	9.90	0 00:02	9.90	1.00	6.38	0.23	1.50	1.00	3.00		SURCHARGED
21	Link-02	68.57	0 00:05	77.16	0.89	12.33	0.03	2.20	0.73	0.00		Calculated
22	Link-03	31.21	0 00:04	99.96	0.31	17.98	0.12	0.96	0.38	0.00		Calculated
23	Link-16	0.00	0 00:00	33.09	0.00	0.00		0.00	0.00	0.00		Calculated
24	Link-17	0.00	0 00:00	13.74	0.00	0.00		0.00	0.00	0.00		Calculated
25	Link-18	8.36	0 00:03	11.91	0.70	7.30	0.06	0.93	0.62	0.00		Calculated
26	Link-19	13.28	0 00:03	14.30	0.93	9.19	0.58	1.14	0.76	0.00		Calculated
27	Link-20	4.01	0 00:04	11.83	0.34	6.04	0.07	0.60	0.40	0.00		Calculated
28	Link-21	16.88	0 00:03	41.23	0.41	22.17	0.06	0.67	0.45	0.00		Calculated
29	Link-22	4.95	0 00:04	13.49	0.37	7.04	0.12	0.63	0.42	0.00		Calculated
30	Link-23	4.47	0 00:03	17.43	0.26	8.26	0.07	0.52	0.35	0.00		Calculated
31	Link-24	9.30	0 00:03	9.30	1.00	5.95	0.18	1.50	1.00	1.00		SURCHARGED
32	Link-25	9.30	0 00:03	9.89	0.94	6.36	0.40	1.16	0.77	0.00		Calculated
33	Link-26	11.64	0 00:01	11.64	1.00	7.50	0.22	1.50	1.00	5.00		SURCHARGED
34	Link-27	2.44	0 00:03	13.79	0.18	5.87	0.18	0.43	0.28	0.00		Calculated
35	Link-28	10.35	0 00:01	10.35	1.00	6.67	0.37	1.50	1.00	5.00		SURCHARGED
36	Link-29	3.34	0 00:05	10.39	0.32	5.23	0.30	0.59	0.39	0.00		Calculated
37	Link-30	4.31	0 00:05	10.46	0.41	5.63	0.59	0.67	0.45	0.00		Calculated
38	Link-31	7.64	0 00:04	10.34	0.74	6.40	0.18	0.96	0.64	0.00		Calculated
39	Link-32	10.06	0 00:03	10.38	0.97	6.69	0.23	1.19	0.79	0.00		Calculated
40	Link-33	10.43	0 00:03	10.43	1.00	6.73	0.32	1.50	1.00	0.00		SURCHARGED
41	Link-34	10.30	0 00:03	10.30	1.00	6.64	0.16	1.50	1.00	2.00		SURCHARGED
42	Link-35	10.30	0 00:03	31.36	0.33	15.89	0.04	0.59	0.39	0.00		Calculated
43	Link-36	16.78	0 00:01	16.78	1.00	6.08	0.09	2.00	1.00	4.00		SURCHARGED
44	Link-37	21.46	0 00:01	21.46	1.00	7.78	0.28	2.00	1.00	3.00		SURCHARGED
45	Link-38	23.69	0 00:03	47.35	0.50	15.07	0.09	1.00	0.50	0.00		Calculated
46	Link-39	24.21	0 00:03	43.02	0.56	14.09	0.02	1.07	0.54	0.00		Calculated
47	Link-40	24.21	0 00:03	71.91	0.34	20.64	0.02	0.80	0.40	0.00		Calculated
48	Link-41	24.21	0 00:03	34.78	0.70	11.96	0.04	1.23	0.61	0.00		Calculated
49	Link-42	24.21	0 00:03	24.39	0.99	8.85	0.08	1.63	0.81	0.00		Calculated
50	Link-48	10.03	0 00:02	10.03	1.00	6.47	0.41	1.50	1.00	4.00		SURCHARGED
51	Link-58	359.11	0 00:04	368.41	0.97	17.66	0.47	4.39	0.80	0.00		Calculated
52	Link-59	359.11	0 00:04	367.70	0.98	17.63	0.04	4.40	0.80	0.00		Calculated
53	Link-60	2.52	0 00:04	12.60	0.20	5.57	0.08	0.46	0.30	0.00		Calculated
54	Link-61	361.62	0 00:04	368.60	0.98	17.68	0.35	4.42	0.80	0.00		Calculated
55	Link-62	378.61	0 00:01	378.61	1.00	18.17	0.11	5.50	1.00	5.00		SURCHARGED
56	Link-63	478.61	0 00:01	629.46	0.76	29.16	0.13	3.59	0.65	0.00		Calculated
57	Link-64	547.18	0 00:05	630.21	0.87	29.85	0.10	3.96	0.72	0.00		Calculated
58	Link-68	2.11	0 00:04	24.63	0.09	8.51	0.04	0.30	0.20	0.00		Calculated
59	Link-70	0.61	0 00:04	35.61	0.02	7.48	0.16	0.14	0.09	0.00		Calculated
60	Link-71	2.26	0 00:03	26.72	0.08	9.21	0.37	0.30	0.20	0.00		Calculated
61	Link-72	9.94	0 00:04	26.46	0.38	13.90	0.06	0.64	0.42	0.00		Calculated
62	Link-73	2.94	0 00:05	40.96	0.07	13.47	0.16	0.27	0.18	0.00		Calculated
63	Link-74	2.70	0 00:04	8.55	0.32	9.64	0.57	0.39	0.39	0.00		Calculated
64	Link-75	9.96	0 00:02	9.96	1.00	6.42	0.19	1.50	1.00	1.00		SURCHARGED
65	Link-76	11.46	0 00:01	11.46	1.00	7.37	0.14	1.50	1.00	5.00		SURCHARGED
66	Link-77	31.93	0 00:04	35.66	0.90	8.21	0.01	1.85	0.74	0.00		Calculated
67	Link-78	26.59	0 00:05	34.05	0.78	11.99	0.02	1.33	0.66	0.00		Calculated
68	Link-79	56.09	0 00:05	104.34	0.54	21.63	0.04	1.31	0.52	0.00		Calculated
69	Link-82	25.68	0 00:05	32.30	0.80	11.41	0.38	1.35	0.67	0.00		Calculated

Inlet Input

SN	Element ID	Inlet Manufacturer	Manufacturer Part Number	Inlet Location	Number of Inlets	Catchbasin Invert Elevation (ft)	Max (Rim) Elevation (ft)	Inlet Depth (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Ponded Area (ft^2)	Grate Clogging Factor (%)
1	Inlet - 39	FHWA HEC-22 GENERIC	N/A	On Sag	1	161.51	175.00	13.49	161.51	0.00	40.00	0.00
2	Inlet - 40	FHWA HEC-22 GENERIC	N/A	On Grade	1	226.97	231.97	5.00	226.97	0.00	N/A	0.00
3	Inlet - 42	FHWA HEC-22 GENERIC	N/A	On Sag	1	206.50	211.50	5.00	206.50	0.00	40.00	0.00
4	Inlet - 45	FHWA HEC-22 GENERIC	N/A	On Grade	1	209.15	217.09	7.94	209.15	0.00	N/A	0.00
5	Inlet - 46	CALTRANS	G1	On Grade	1	215.01	218.01	3.00	215.01	0.00	N/A	0.00
6	Inlet - 47	FHWA HEC-22 GENERIC	N/A	On Grade	1	210.27	216.84	6.57	210.27	0.00	N/A	0.00
7	Inlet - 48	FHWA HEC-22 GENERIC	N/A	On Grade	1	212.10	219.64	7.54	212.10	0.00	N/A	0.00
8	Inlet - 49	CALTRANS	G1	On Grade	1	209.00	212.00	3.00	209.00	0.00	N/A	0.00
9	Inlet - 50	CALTRANS	G1	On Grade	1	186.97	189.97	3.00	186.97	0.00	N/A	0.00
10	Inlet - 51	CALTRANS	G1	On Grade	1	182.22	185.22	3.00	182.22	0.00	N/A	0.00
11	Inlet - 52	CALTRANS	G1	On Sag	1	180.46	183.46	3.00	180.46	0.00	50.00	0.00
12	Inlet-01	FHWA HEC-22 GENERIC	N/A	On Grade	1	205.24	212.26	7.02	205.24	0.00	N/A	0.00
13	Inlet-02	FHWA HEC-22 GENERIC	N/A	On Grade	1	199.23	206.17	6.94	199.23	0.00	N/A	0.00
14	Inlet-03	FHWA HEC-22 GENERIC	N/A	On Grade	1	190.87	200.20	9.33	190.87	0.00	N/A	0.00
15	Inlet-04	FHWA HEC-22 GENERIC	N/A	On Sag	1	189.95	198.06	8.11	189.95	0.00	40.00	0.00
16	Inlet-05	FHWA HEC-22 GENERIC	N/A	On Sag	1	190.94	198.37	7.43	190.94	0.00	40.00	0.00
17	Inlet-06	FHWA HEC-22 GENERIC	N/A	On Grade	1	186.16	201.65	15.49	186.16	0.00	N/A	0.00
18	Inlet-07	CALTRANS	G1	On Sag	1	193.44	196.44	3.00	193.44	0.00	50.00	0.00
19	Inlet-08	CALTRANS	G1	On Sag	1	192.52	197.38	4.86	192.52	0.00	50.00	0.00
20	Inlet-09	CALTRANS	G1	On Sag	1	190.53	199.10	8.57	190.53	0.00	50.00	0.00
21	Inlet-10	FHWA HEC-22 GENERIC	N/A	On Sag	1	189.86	199.24	9.38	189.86	0.00	40.00	0.00
22	Inlet-11	CALTRANS	G1	On Sag	1	188.94	199.10	10.16	188.94	0.00	50.00	0.00
23	Inlet-12	CALTRANS	G1	On Sag	1	187.67	195.91	8.24	187.67	0.00	50.00	0.00
24	Inlet-13	CALTRANS	G1	On Sag	1	187.05	194.27	7.22	187.05	0.00	50.00	0.00
25	Inlet-14	FHWA HEC-22 GENERIC	N/A	On Sag	1	183.01	193.50	10.49	183.01	0.00	40.00	0.00
26	Inlet-15	FHWA HEC-22 GENERIC	N/A	On Sag	1	182.73	192.87	10.14	182.73	0.00	40.00	0.00
27	Inlet-16	CALTRANS	G1	On Sag	1	181.46	190.02	8.56	181.46	0.00	50.00	0.00
28	Inlet-17	CALTRANS	G1	On Sag	1	177.71	187.30	9.59	177.71	0.00	50.00	0.00
29	Inlet-18	CALTRANS	G1	On Sag	1	209.00	214.80	5.80	209.00	0.00	50.00	0.00
30	Inlet-22	FHWA HEC-22 GENERIC	N/A	On Sag	1	182.00	197.80	15.80	182.00	0.00	40.00	0.00
31	Inlet-23	FHWA HEC-22 GENERIC	N/A	On Grade	1	175.00	194.00	19.00	175.00	0.00	N/A	0.00
32	Inlet-24	CALTRANS	G1	On Sag	1	238.00	233.00	-5.00	238.00	0.00	50.00	0.00
33	Inlet-25	FHWA HEC-22 GENERIC	N/A	On Sag	1	224.60	229.10	4.50	224.60	0.00	40.00	0.00
34	Inlet-26	FHWA HEC-22 GENERIC	N/A	On Sag	1	232.00	238.00	6.00	232.00	0.00	50.00	0.00
35	Inlet-27	FHWA HEC-22 GENERIC	N/A	On Sag	1	210.00	216.00	6.00	210.00	0.00	50.00	0.00
36	Inlet-28	FHWA HEC-22 GENERIC	N/A	On Sag	1	165.70	175.00	9.30	165.44	-0.26	40.00	0.00
37	Inlet-29	FHWA HEC-22 GENERIC	N/A	On Sag	1	167.95	178.00	10.05	167.95	0.00	50.00	0.00

Roadway & Gutter Input

SN	Element ID	Roadway Longitudinal Slope (ft/ft)	Roadway Cross Slope (ft/ft)	Roadway Manning's Roughness	Gutter Cross Slope (ft/ft)	Gutter Width (ft)	Gutter Depression (in)	Allowable Spread (ft)
1	Inlet - 39	N/A	0.0200	0.0160	0.0830	1.50	0.1312	7.00
2	Inlet - 40	0.0100	0.0200	0.0160	0.0830	1.50	0.1312	7.00
3	Inlet - 42	N/A	0.0200	0.0160	0.0830	1.50	0.1312	7.00
4	Inlet - 45	0.0050	0.0200	0.0160	0.0830	1.50	0.1312	7.00
5	Inlet - 46	0.0050	0.0200	0.0160	0.0830	1.00	0.0000	7.00
6	Inlet - 47	0.0400	0.0200	0.0160	0.0830	1.50	0.1312	7.00
7	Inlet - 48	0.0400	0.0200	0.0160	0.0830	1.50	0.1312	7.00
8	Inlet - 49	0.0100	0.0200	0.0160	0.0830	1.00	0.0000	7.00
9	Inlet - 50	0.0100	0.0200	0.0160	0.0830	1.00	0.0000	7.00
10	Inlet - 51	0.0100	0.0200	0.0160	0.0830	1.00	0.0000	7.00
11	Inlet - 52	N/A	0.0200	0.0160	0.0830	1.00	0.0000	7.00
12	Inlet-01	0.0190	0.0200	0.0160	0.0830	1.50	0.1312	7.00
13	Inlet-02	0.0190	0.0200	0.0160	0.0830	1.50	0.1312	7.00
14	Inlet-03	0.0600	0.0200	0.0160	0.0830	1.50	0.1312	7.00
15	Inlet-04	N/A	0.0200	0.0160	0.0830	1.50	0.1312	7.00
16	Inlet-05	N/A	0.0200	0.0160	0.0830	1.50	0.1312	7.00
17	Inlet-06	0.0200	0.0200	0.0160	0.0830	1.50	0.1312	7.00
18	Inlet-07	N/A	0.0200	0.0160	0.0830	1.00	0.0000	7.00
19	Inlet-08	N/A	0.0200	0.0160	0.0830	1.00	0.0000	7.00
20	Inlet-09	N/A	0.0200	0.0160	0.0830	1.50	0.0000	7.00
21	Inlet-10	N/A	0.0200	0.0160	0.0830	1.50	0.1312	7.00
22	Inlet-11	N/A	0.0200	0.0160	0.0830	1.50	0.0000	7.00
23	Inlet-12	N/A	0.0200	0.0160	0.0830	1.50	0.0000	7.00
24	Inlet-13	N/A	0.0200	0.0160	0.0830	1.50	0.0000	7.00
25	Inlet-14	N/A	0.0200	0.0160	0.0830	1.50	0.0656	7.00
26	Inlet-15	N/A	0.0200	0.0160	0.0830	1.50	0.1312	7.00
27	Inlet-16	N/A	0.0200	0.0160	0.0830	1.50	0.0000	7.00
28	Inlet-17	N/A	0.0200	0.0160	0.0830	1.50	0.0000	7.00
29	Inlet-18	N/A	0.0200	0.0160	0.0830	1.00	0.0000	7.00
30	Inlet-22	N/A	0.0200	0.0160	0.0830	2.00	0.1312	7.00
31	Inlet-23	0.0300	0.0200	0.0160	0.0830	1.50	0.1312	7.00
32	Inlet-24	N/A	0.0200	0.0160	0.0830	2.00	0.0000	7.00
33	Inlet-25	N/A	0.0200	0.0160	0.0830	2.00	0.0000	7.00
34	Inlet-26	N/A	0.0200	0.0160	0.0830	2.00	0.0000	7.00
35	Inlet-27	N/A	0.0200	0.0160	0.0830	2.00	0.0000	7.00
36	Inlet-28	N/A	0.0200	0.0160	0.0830	1.50	0.1312	7.00
37	Inlet-29	N/A	0.0200	0.0160	0.0830	1.50	0.1312	7.00

Inlet Results

SN	Element ID	Peak Flow (cfs)	Peak Lateral Inflow (cfs)	Peak Flow Intercepted by Inlet (cfs)	Peak Flow Bypassing Inlet (cfs)	Inlet Efficiency during Peak Flow (%)	Max Gutter Spread during Peak Flow (ft)	Max Gutter Water Elev. during Peak Flow (ft)	Max Gutter Water Depth during Peak Flow (ft)	Time of Max Depth Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	Inlet - 39	5.41	5.41	N/A	N/A	N/A	11.19	176.78	1.78	0 00:05	0.00	0.00
2	Inlet - 40	3.36	3.36	3.18	0.19	94.47	10.80	232.28	0.31	0 00:04	0.00	0.00
3	Inlet - 42	5.44	5.44	N/A	N/A	N/A	22.74	212.37	0.87	0 00:03	0.00	0.00
4	Inlet - 45	1.13	1.13	1.09	0.04	96.47	7.78	217.34	0.25	0 00:03	0.02	3.00
5	Inlet - 46	4.13	4.13	2.60	1.52	63.11	13.79	218.35	0.34	0 00:04	0.00	0.00
6	Inlet - 47	4.06	4.06	3.56	0.50	87.60	8.74	217.11	0.27	0 00:03	0.00	0.00
7	Inlet - 48	1.37	1.37	1.35	0.02	98.35	5.06	219.84	0.20	0 00:04	0.00	0.00
8	Inlet - 49	0.13	0.13	0.11	0.02	85.30	0.91	212.03	0.03	0 00:07	0.00	0.00
9	Inlet - 50	0.09	0.09	0.08	0.01	85.30	0.61	189.99	0.02	0 00:07	0.00	0.00
10	Inlet - 51	0.10	0.10	0.09	0.01	85.30	0.68	185.24	0.02	0 00:04	0.00	0.00
11	Inlet - 52	0.69	0.69	N/A	N/A	N/A	3.63	183.57	0.11	0 00:00	0.00	1440.00
12	Inlet-01	8.11	8.11	8.03	0.08	99.07	13.59	212.63	0.37	0 00:04	0.00	0.00
13	Inlet-02	4.35	4.35	4.01	0.34	92.13	10.52	206.47	0.30	0 00:03	0.00	0.00
14	Inlet-03	3.48	3.48	2.67	0.81	76.78	7.43	200.44	0.24	0 00:04	0.00	0.00
15	Inlet-04	1.47	1.47	N/A	N/A	N/A	5.85	198.74	0.68	0 00:01	0.01	8.00
16	Inlet-05	2.83	2.83	N/A	N/A	N/A	0.00	199.13	0.76	0 00:03	0.00	0.00
17	Inlet-06	2.77	2.77	2.44	0.33	87.97	8.57	201.92	0.27	0 00:03	0.00	0.00
18	Inlet-07	3.37	3.37	N/A	N/A	N/A	13.19	196.77	0.33	0 00:05	0.00	0.00
19	Inlet-08	1.98	1.98	N/A	N/A	N/A	8.94	197.62	0.24	0 00:05	0.00	0.00
20	Inlet-09	3.48	3.48	N/A	N/A	N/A	12.96	199.45	0.35	0 00:04	0.00	0.00
21	Inlet-10	2.73	2.73	N/A	N/A	N/A	15.72	199.98	0.74	0 00:03	0.00	0.00
22	Inlet-11	0.81	0.81	N/A	N/A	N/A	3.83	199.25	0.15	0 00:03	0.00	0.00
23	Inlet-12	1.28	1.28	N/A	N/A	N/A	5.81	196.12	0.21	0 00:03	0.02	2.00
24	Inlet-13	0.00	0.00	N/A	N/A	N/A	0.00	194.27	0.00	0 00:03	0.00	0.00
25	Inlet-14	3.44	3.44	N/A	N/A	N/A	13.43	194.03	0.53	0 00:01	0.33	5.00
26	Inlet-15	9.13	9.13	N/A	N/A	N/A	13.78	194.95	2.08	0 00:01	1.35	6.00
27	Inlet-16	2.27	2.27	N/A	N/A	N/A	9.34	190.30	0.28	0 00:01	0.00	0.00
28	Inlet-17	0.84	0.84	N/A	N/A	N/A	4.01	187.45	0.15	0 00:03	0.00	0.00
29	Inlet-18	0.00	0.00	N/A	N/A	N/A	0.00	214.80	0.00	0 00:00	0.00	0.00
30	Inlet-22	2.12	2.12	N/A	N/A	N/A	12.22	198.51	0.71	0 00:04	0.00	0.00
31	Inlet-23	3.14	3.14	2.52	0.61	80.47	8.30	194.26	0.26	0 00:04	0.00	0.00
32	Inlet-24	2.30	2.30	N/A	N/A	N/A	8.89	239.30	0.30	0 00:03	0.00	0.00
33	Inlet-25	4.12	4.12	N/A	N/A	N/A	11.69	229.40	0.30	0 00:04	0.00	0.00
34	Inlet-26	2.97	2.97	N/A	N/A	N/A	8.97	238.30	0.30	0 00:05	0.00	0.00
35	Inlet-27	2.74	2.74	N/A	N/A	N/A	8.35	216.29	0.29	0 00:04	0.00	0.00
36	Inlet-28	1.29	1.29	N/A	N/A	N/A	8.60	175.60	0.60	0 00:05	0.00	0.00
37	Inlet-29	8.27	8.27	N/A	N/A	N/A	21.55	178.81	0.81	0 00:05	0.00	0.00

MAIN STREET AT CARMEL VALLEY
BASIN TIME OF CONCENTRATION CALCULATION

BASIN	AREA (AC.)	OUTLET NODE	MAX OVERLAND FLOW PATH	AVERAGE SLOPE	C	Tc
SUB-05	0.63	STRUCTURE 40	520	3.75%	0.95	3.96
SUB-07	0.41	INBLET-22	250	1.00%	0.95	4.27
SUB-08	0.62	INLET-23	350	1.50%	0.95	4.41
SUB-09	1.35	INLET STRUCTURE-26	880	3.00%	0.95	5.55
SUB-10	0.41	INLET-24	190	10.00%	0.85	2.88
SUB-11	0.84	INLET-25	300	1.00%	0.95	4.68
SUB-14	0.79	INLET-26	250	1.00%	0.9	5.69
SUB-15	0.9	INLET STRUCTURE-42	300	3.50%	0.95	3.08
SUB-16	0.79	INLET STRUCTURE-46	240	1.00%	0.95	4.18
SUB-17	0.24	INLET STRUCTURE-45	220	0.54%	0.95	4.92
SUB-18	0.05	INLET STRUCTURE 49	120	2.00%	0.65	7.04
SUB-19	0.03	INLET STRUCTURE 50	50	2.00%	0.65	4.55
SUB-20	0.03	INLET STRUCTURE 51	60	2.00%	0.65	4.98
SUB-21	0.12	INLET STRUCTURE 52	120	2.00%	0.9	3.13
SUB-22	0.23	INLET-28	170	1.00%	0.95	3.52
SUB-23	3.13	STRUCTURE 30	410	2.00%	0.95	4.34
SUB-24	0.36	INLET29	100	2.00%	0.95	2.14
SUB-25	0.39	INLET-17	100	2.00%	0.95	2.14
SUB-26	0.37	INLET-16	210	2.00%	0.95	3.11
SUB-27	1.8	INLET-15	420	2.00%	0.95	4.39
SUB-28	0.84	INLET-02	380	1.89%	0.95	4.26
SUB-29	1.48	INLET-01	400	3.00%	0.95	3.74
SUB-30	0.77	INLET STRUCTURE 47	480	3.00%	0.95	4.10
SUB-31	0.24	INLET STRUCTURE 48	320	3.00%	0.95	3.35
SUB-32	0.98	JUN-03	300	3.00%	0.95	3.24
SUB-33	0.51	INLET-27	220	1.00%	0.95	4.00
SUB-34	0.87	INLET-03	420	1.00%	0.95	5.53
SUB-35	0.59	JUN-23	150	1.00%	0.95	3.31
SUB-36	0.22	INLET-04	210	3.20%	0.95	2.66
SUB-37	0.45	INLET-05	280	3.20%	0.95	3.07
SUB-38	0.65	JUN-24	230	1.00%	0.95	4.09
SUB-39	0.53	INLET-14	290	4.84%	0.95	2.72
SUB-40	0.45	INLET-06	200	2.00%	0.95	3.03
SUB-41	0.21	INLET-12	120	1.00%	0.95	2.96
SUB-42	0.12	INLET-11	80	1.00%	0.95	2.41
SUB-43	0.47	INLET-10	250	2.15%	0.95	3.31
SUB-44	0.64	INLET-09	200	1.00%	0.95	3.82
SUB-45	0.33	INLET-08	140	1.00%	0.95	3.19
SUB-46	0.7	INLET-07	330	1.00%	0.95	4.90

MAP POCKET 1

Drainage Study Map
for
Main Street at Carmel Valley
[Pre-project]

DEL MAR HEIGHTS ROAD

HIGH BLUFF DRIVE

EL CAMINO REAL

EX. 24" RCP SD

EX. 12" RCP SD

EX. 36" RCP SD

EX. 18" RCP SD

EX. 48" RCP SD

EX. 18"

EX. 66" RCP

EXISTING 30" C.M.P. RISER

EX. 24" RCP

EX. 18" RCP

EX. 42" RCP

EX. 66" RCP

EX. 18" VCP

SCALE: 1" = 50'

50 0 50 100

1" = 50'

NO.	DATE	BY	DESCRIPTION
6			
5			
4			
3			
2			
1	09-23-10	MO	ORIGINAL

NO.	DATE	BY	DESCRIPTION
12			
11			
10			
9			
8			
7			

Leppert Engineering CORPORATION
5190 Governor Drive, Suite 205, San Diego, Ca. 92122-2848
Phone: (858) 597-2001 Fax: (858) 597-2009

APPROVED BY ENGINEER OF WORK: JOHN D. LEPPERT — REGISTRATION R C E: 26283

FILE CODE: — DATE:

PREPARATION AND REVISION LOG

DRAINAGE BASIN MAP FOR: MAIN STREET AT CARMEL VALLEY EXISTING CONDITIONS

MAP POCKET 2

Drainage Study Map
for
Main Street at Carmel Valley
[Post-project]

DEL MAR HEIGHTS ROAD

HIGH BLUFF DRIVE

EL CAMINO REAL

EXIST. 48" R.C.P.

EXIST. 42" R.C.P.

EXIST. 66" R.C.P.
Q(m) = 357.0 CFS

EXIST. 66" R.C.P.

EXISTING 66" R.C.P.

EXIST. 42" R.C.P.
Q(m) = 100.0 CFS

125+40
C/L 26' COMM. DWY

117+30
C/L 26' COMM. DWY

114+30
C/L

BLDG 10
ROOF
+XXX

BLDG 8
ROOF
+XXX

BLDG 11
ROOF
+XXX

BLDG 12
ROOF
+XXX

BLDG 9
ROOF
+XXX

GARAGE 4

Sub-05
Total Area 0.6290 ac
Weighted Runoff Coeff. 0.95

Sub-10
Total Area 0.4085 ac
Weighted Runoff Coeff. 0.85

Sub-14
Total Area 0.7892 ac
Weighted Runoff Coeff. 0.90

Sub-11
Total Area 0.8400 ac
Weighted Runoff Coeff. 0.95

Sub-16
Total Area 0.7936 ac
Weighted Runoff Coeff. 0.95

Sub-15
Total Area 0.8953 ac
Weighted Runoff Coeff. 0.95

Sub-17
Total Area 0.2320 ac
Weighted Runoff Coeff. 0.95

Sub-33
Total Area 0.5149 ac
Weighted Runoff Coeff. 0.95

Sub-34
Total Area 0.6664 ac
Weighted Runoff Coeff. 0.95

Sub-30
Total Area 0.7732 ac
Weighted Runoff Coeff. 0.95

Sub-32
Total Area 0.9857 ac
Weighted Runoff Coeff. 0.95

Sub-35
Total Area 0.5880 ac
Weighted Runoff Coeff. 0.95

Sub-36
Total Area 0.2249 ac
Weighted Runoff Coeff. 0.95

Sub-37
Total Area 0.4535 ac
Weighted Runoff Coeff. 0.99

Sub-46
Total Area 0.7024 ac
Weighted Runoff Coeff. 0.95

Sub-45
Total Area 0.3309 ac
Weighted Runoff Coeff. 0.95

Sub-44
Total Area 0.6383 ac
Weighted Runoff Coeff. 0.95

Sub-38
Total Area 0.6469 ac
Weighted Runoff Coeff. 0.95

Sub-43
Total Area 0.4661 ac
Weighted Runoff Coeff. 0.95

Sub-40
Total Area 0.4517 ac
Weighted Runoff Coeff. 0.95

Sub-42
Total Area 0.1171 ac
Weighted Runoff Coeff. 0.95

Sub-41
Total Area 0.2071 ac
Weighted Runoff Coeff. 0.95

Sub-39
Total Area 0.5439 ac
Weighted Runoff Coeff. 0.95

Sub-48
Total Area 0.2000 ac
Weighted Runoff Coeff. 0.95

Sub-29
Total Area 1.4731 ac
Weighted Runoff Coeff. 0.95

Sub-28
Total Area 0.8439 ac
Weighted Runoff Coeff. 0.95

Sub-27
Total Area 1.8000 ac
Weighted Runoff Coeff. 0.95

Sub-24
Total Area 1.6312 ac
Weighted Runoff Coeff. 0.95

Sub-26
Total Area 0.3753 ac
Weighted Runoff Coeff. 0.95

Sub-25
Total Area 0.1153 ac
Weighted Runoff Coeff. 0.95

Sub-18
Total Area 0.0533 ac
Weighted Runoff Coeff. 0.65

Sub-23
Total Area 3.1287 ac
Weighted Runoff Coeff. 0.95

Sub-19
Total Area 0.0260 ac
Weighted Runoff Coeff. 0.65

Sub-20
Total Area 0.0307 ac
Weighted Runoff Coeff. 0.65

Sub-22
Total Area 1.2171 ac
Weighted Runoff Coeff. 0.65

Sub-21
Total Area 0.1202 ac
Weighted Runoff Coeff. 0.90

Sub-09
Total Area 1.3500 ac
Weighted Runoff Coeff. 0.95

Inlet - 40
Invert Elev. 226.97 ft
Rim Elev. 231.97 ft

Inlet-24
Invert Elev. 238 ft
Rim Elev. 233 ft

Inlet-25
Invert Elev. 224.6 ft
Rim Elev. 229.1 ft

Inlet-26
Invert Elev. 232 ft
Rim Elev. 238 ft

Inlet - 42
Invert Elev. 206.5 ft
Rim Elev. 211.5 ft

Jun-43
Invert Elev. 206.27 ft
Rim Elev. 211.64 ft

Inlet - 46
Invert Elev. 215.01 ft
Rim Elev. 218.01 ft

Jun-41
Invert Elev. 203.56 ft
Rim Elev. 218.7 ft

Jun-42
Invert Elev. 207.35 ft
Rim Elev. 217.8 ft

Jun-31
Invert Elev. 177 ft
Rim Elev. 217.96 ft

Inlet - 49
Invert Elev. 209 ft
Rim Elev. 212 ft

Inlet - 50
Invert Elev. 186.97 ft
Rim Elev. 189.97 ft

Jun-30
Invert Elev. 174.02 ft
Rim Elev. 180 ft

Jun-01
Invert Elev. 172.84 ft
Rim Elev. 180 ft

Inlet - 51
Invert Elev. 182.22 ft
Rim Elev. 185.22 ft

Inlet - 52
Invert Elev. 180.46 ft
Rim Elev. 183.46 ft

Jun-39
Invert Elev. 221.49 ft
Rim Elev. 228.17 ft

Jun-38
Invert Elev. 217.17 ft
Rim Elev. 223.67 ft

Jun-37
Invert Elev. 212.02 ft
Rim Elev. 219.26 ft

Inlet - 48
Invert Elev. 212.1 ft
Rim Elev. 218.64 ft

Inlet - 47
Invert Elev. 210.23 ft
Rim Elev. 216.94 ft

Jun-36
Invert Elev. 209.79 ft
Rim Elev. 217.29 ft

Jun-33
Invert Elev. 208.91 ft
Rim Elev. 216.94 ft

Inlet - 45
Invert Elev. 209.15 ft
Rim Elev. 217.09 ft

Inlet-18
Invert Elev. 209 ft
Rim Elev. 214.8 ft

Jun-02
Invert Elev. 206.84 ft
Rim Elev. 214.14 ft

Jun-03
Invert Elev. 204.81 ft
Rim Elev. 212.23 ft

Inlet-01
Invert Elev. 205.24 ft
Rim Elev. 212.26 ft

Inlet-27
Invert Elev. 210 ft
Rim Elev. 216 ft

Inlet-03
Invert Elev. 190.87 ft
Rim Elev. 200.2 ft

Inlet-04
Invert Elev. 189.95 ft
Rim Elev. 198.06 ft

Inlet-05
Invert Elev. 190.94 ft
Rim Elev. 198.37 ft

Jun-06
Invert Elev. 189.34 ft
Rim Elev. 199.7 ft

Jun-23
Invert Elev. 187.9 ft
Rim Elev. 205 ft

Jun-04
Invert Elev. 198.8 ft
Rim Elev. 206.2 ft

Inlet-02
Invert Elev. 199.23 ft
Rim Elev. 206.17 ft

Jun-05
Invert Elev. 187.14 ft
Rim Elev. 199.7 ft

Jun-24
Invert Elev. 185.8 ft
Rim Elev. 203.5 ft

Inlet-06
Invert Elev. 186.16 ft
Rim Elev. 201.65 ft

Jun-07
Invert Elev. 184.94 ft
Rim Elev. 199.18 ft

Inlet-13
Invert Elev. 187.05 ft
Rim Elev. 194.27 ft

Inlet-14
Invert Elev. 183.01 ft
Rim Elev. 193.5 ft

Inlet-15
Invert Elev. 182.73 ft
Rim Elev. 192.87 ft

Inlet-17
Invert Elev. 177.71 ft
Rim Elev. 187.3 ft

Jun-08
Invert Elev. 177.14 ft
Rim Elev. 185 ft

Jun-09
Invert Elev. 174.14 ft
Rim Elev. 185 ft

Jun-10
Invert Elev. 173.89 ft
Rim Elev. 185 ft

Inlet-29
Invert Elev. 167.95 ft
Rim Elev. 178 ft

Jun-11
Invert Elev. 170.03 ft
Rim Elev. 185.5 ft

Jun-21
Invert Elev. 168.53 ft
Rim Elev. 181.9 ft

Inlet-07
Invert Elev. 193.44 ft
Rim Elev. 196.44 ft

Inlet-08
Invert Elev. 192.52 ft
Rim Elev. 197.38 ft

Inlet-22
Invert Elev. 182 ft
Rim Elev. 197.8 ft

Jun-18
Invert Elev. 181 ft
Rim Elev. 198 ft

Inlet-09
Invert Elev. 190.53 ft
Rim Elev. 199.1 ft

Inlet-10
Invert Elev. 189.86 ft
Rim Elev. 199.24 ft

Inlet-11
Invert Elev. 188.94 ft
Rim Elev. 199.1 ft

Inlet-12
Invert Elev. 187.67 ft
Rim Elev. 195.91 ft

Inlet-23
Invert Elev. 175 ft
Rim Elev. 194 ft

Jun-19
Invert Elev. 174.97 ft
Rim Elev. 196.1 ft

Jun-20
Invert Elev. 174.5 ft
Rim Elev. 195.5 ft

Inlet-16
Invert Elev. 181.96 ft
Rim Elev. 190.62 ft

Jun-27
Invert Elev. 162.19 ft
Rim Elev. 175 ft

Inlet-28
Invert Elev. 165.44 ft
Rim Elev. 175 ft

Inlet - 39
Invert Elev. 162.01 ft
Rim Elev. 175 ft

Diversion-01
Invert Elev. 165.3 ft
Rim Elev. 174 ft

Out-01
Invert Elev. 160.8 ft
Rim Elev. 173 ft

Jun-22
Invert Elev. 154.39 ft

Network - (4).Pipe - (15)
Network - (4).Pipe - (14)
Network - (4).Pipe - (13)
Network - (4).Pipe - (23)
Network - (4).Pipe - (12)
Network - (4).Pipe - (22)
Network - (4).Pipe - (17)
Network - (4).Pipe - (11)
Network - (4).Pipe - (20)
Network - (4).Pipe - (16)
Network - (4).Pipe - (7)
Network - (4).Pipe - (6)
Network - (4).Pipe - (24)
Network - (4).Pipe - (5)
Network - (4).Pipe - (25)
Network - (4).Pipe - (26)
Network - (4).Pipe - (27)
Network - (4).Pipe - (2)

Link-71
Link-72
Link-73
Link-74
Link-22
Link-23
Link-24
Link-25
Link-75
Link-29
Link-30
Link-31
Link-58
Link-32
Link-33
Link-34
Link-35
Link-59
Link-60
Link-36
Link-37
Link-61
Link-38
Link-39
Link-40
Link-41
Link-42
Link-62
Link-82
Link-63
Link-01
Link-16
Link-17
Link-19
Link-18
Link-20
Link-21
Link-28
Link-76
Link-27
Link-26
Link-77
Link-78
Link-02
Link-79
Link-03
Link-64
Link-48
Link-65
Link-66

1.00%
1.33%
2%
1.71%
1.59%
2.15%

SCALE: 1" = 50'

50 0 50 100

1" = 50'

6				12			
5				11			
4				10			
3				9			
2				8			
1	09-23-10	MO	ORIGINAL	7			
NO.	DATE	BY	DESCRIPTION	NO.	DATE	BY	DESCRIPTION

Leppert Engineering CORPORATION
5190 Governor Drive, Suite 205, San Diego, Ca. 92122-2948
Phone: (858) 597-2001 Fax: (858) 597-2009

APPROVED BY ENGINEER OF WORK: JOHN D. LEPPERT
REGISTRATION R C E: 26283
FILE CODE:
DATE:

PREPARATION AND REVISION LOG

DRAINAGE BASIN MAP FOR: MAIN STREET AT CARMEL VALLEY PROPOSED CONDITIONS

Appendix I

WATER QUALITY TECHNICAL REPORT

WATER QUALITY TECHNICAL REPORT
FOR
MAIN STREET AT CARMEL VALLEY
(Preliminary Engineering)

Prepared for:

Kilroy Realty Inc.
3611 Valley Centre Drive, Suite 550
San Diego, CA 92130
(858) 523-0300

Prepared by:

Leppert Engineering Corporation
5190 Governor Drive, Suite 205
San Diego, CA 92122-2848
(858) 597-2001
LEC Job No.: NCW 14.01-09.08

PTS. No. 193036

June 1, 2011

By: Anthony Dieli
RCE 31615
Exp. 12/31/12

TABLE OF CONTENTS

FIGURES

TABLES

APPENDICES

MAP POCKETS

1.0 INTRODUCTION

This water quality technical report (WQTR) summarizes storm water protection requirements for the Main Street at Carmel Valley project (herein referred to as "the project") in support of the plans titled, "Main Street at Carmel Valley." The project is located southwest of the intersection at Del Mar Heights Road and El Camino Real, in the City of San Diego. See Figure 1, Vicinity Map, located at the end of Section 1.0. The planned development will include a mixed-use center directly across from Del Mar Highlands. The proposed center will include office and retail space, 608 residential units, a 150-room hotel, a cinema, two 10-story office buildings on the eastern edge of the site and a 25,000 to 30,000 square foot full service market, such as Whole Foods or Gelson's. The plan would also include public improvements to Del Mar Heights Road and El Camino Real which include median and widening work in addition to adding two new signal lights on Del Mar Heights Road to provide safe ingress and egress to the center.

This WQTR describes the permanent storm water Best Management Practices (BMPs) that will be incorporated into the project in order to mitigate the impacts of pollutants in storm water runoff from the proposed project. For the purposes of post-construction storm water quality management, such as incorporating Low Impact Development (LID) concepts and treating anticipated pollutants at "medium" to "high" removal efficiencies, the project will follow the guidelines and requirements set forth in the City of San Diego's "San Diego Municipal Code Land Development Manual-Storm Water Standards: A Manual for Construction & Permanent Storm Water Best Management Practices Requirements," dated March 24, 2008 (herein "Storm Water Standards Manual") adopted by the City of San Diego.

Priority Development Project

The project is a "Priority Development Project," based on the Storm Water Standards Manual. The project applies to the following priority development project categories based on the City of San Diego's Storm Water Requirements Applicability Checklist: detached or attached residential development of 10 or more units, commercial development greater than 1 acre, restaurant, parking lots greater than or equal to 5,000 square feet or with at least 15 parking spaces, and potentially exposed to urban runoff, and streets, roads, highways, and freeways which would create a new paved surface that is 5,000 square feet or greater. A copy of the Storm Water

Requirements Applicability Checklist for the Main Street at Carmel Valley project is located in Appendix A of this WQTR.

Land Use and Drainage Characteristics

Pre-project Condition

The pre-project condition for the project consists of an undeveloped, mass graded site per grading plan DWG No. 23217-D. There are two major drainage basins (i.e. western basin and eastern basin) that outlet into the public storm drain along El Camino Real via separate points of connection.

The western basin drains in a southerly direction toward El Camino Real. This basin is further subdivided approximately in half and designed to drain into two temporary sediment basins which outlet the site into the public storm drain along El Camino Real via a temporary private storm drain system.

The eastern basin drains in a southerly direction toward El Camino Real. This basin is further subdivided approximately in half and designed to drain into two temporary sediment basins which outlet the site into the public storm drain along El Camino Real via a temporary private storm drain system.

Both temporary on-site private storm drains discharge into the existing 66-inch public storm drain in El Camino Real which flows southwesterly into a regional detention basin as described in "Drainage Study, North City West Employment Center, Entire Precise Plan Area, dated February, 1984 by Rick Engineering Company."

Post-Project Condition

The post-project development will be a mixed-use center consisting of office, retail, commercial, and residential buildings, underground/aboveground parking structures, private roadways, "hardscape" and "softscape" landscaping, and public improvements to Del Mar Heights Road and El Camino Real.

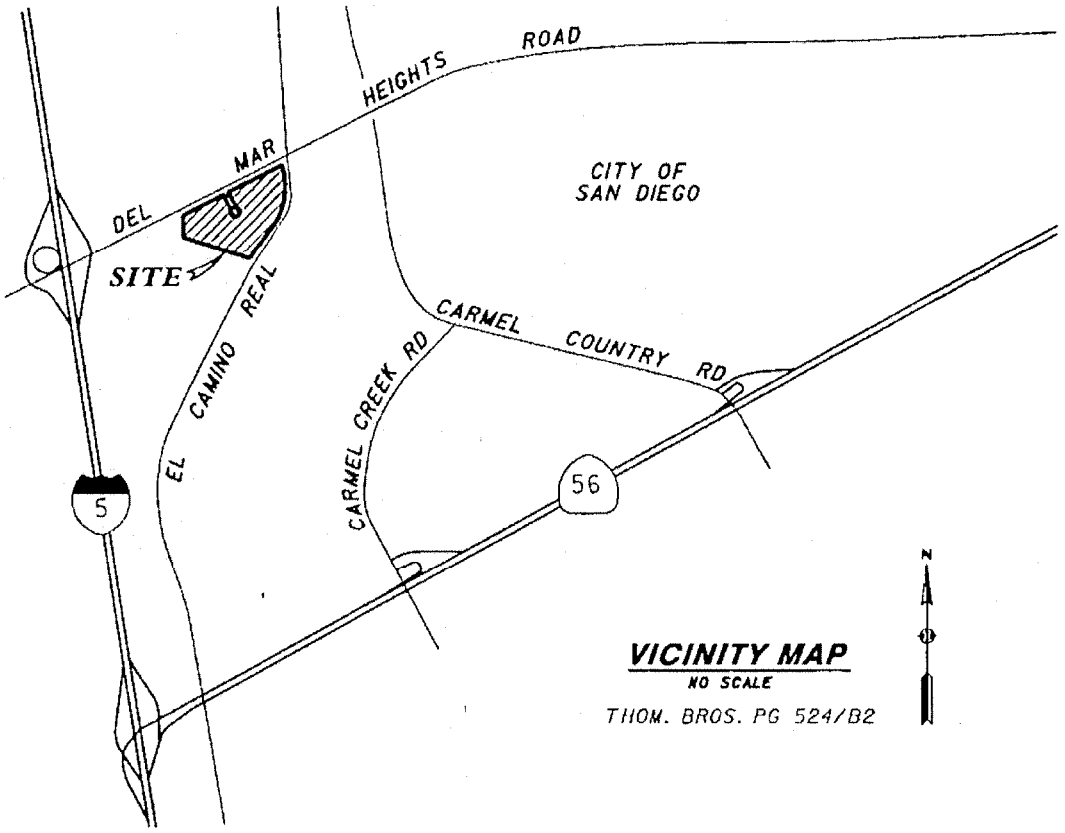
Post-project outlet points and contributing drainage areas were designed to approximately match pre-project conditions. Based on this, there are two major drainage basins (i.e. western basin and

eastern basin) that outlet into the public storm drain along El Camino Real via separate points of connection.

The western basin consists of approximately 14 acres and drains in a southerly direction toward El Camino Real. The upper portion of this basin consists of off-site public roadway drainage, which will enter the private on-site storm drain system at Third Avenue. The on-site private storm drain system will be designed to convey the off-site roadway drainage and private on-site runoff from throughout the drainage basin.

The eastern basin consists of approximately 10 acres and drains in a southerly direction toward El Camino Real. This drainage basin consists of a drainage system similar to that described above except that the off-site roadway drainage will enter the private system at First Ave.

Figure 1 Vicinity Map



2.0 IDENTIFICATION OF POLLUTANTS AND CONDITIONS OF CONCERN

Section III of the City of San Diego's Storm Water Standards Manual outlines the procedure for the selection of permanent storm water BMPs. The procedure begins with identification of pollutants and conditions of concern, a three-step process described in Section III.A of the Storm Water Standards Manual. This Section of WQTR addresses each step from Section III.A to identify pollutants and conditions of concern.

A.1 Identify Pollutants from the Project Area

Table 2 of the Storm Water Standards Manual, "Anticipated and Potential Pollutants Generated by Land Use Type," identifies general pollutant categories that are either anticipated or potential pollutants for general project categories. The following general project categories listed in Table 2 apply to the project: "Attached Residential Development," "Commercial Development," "Restaurants," "Parking Lots," and "Streets, Highways & Freeways." Table 2 of the Storm Water Standards Manual is renamed as Table 2.1 and reproduced on the following page, with the Priority Development Project categories applicable to the project highlighted.

Based on the highlighted rows, the anticipated pollutants generated from the project include sediments, nutrients, heavy metals, organic compounds, trash and debris, oxygen demanding substances, oil and grease, bacteria and viruses, and pesticides.

Table 2.1 Anticipated and Potential Pollutants Generated by Land Use Type

General Pollutant Categories									
General Project Categories	Sediments	Nutrients	Heavy Metals	Organic Compounds	Trash & Debris	Oxygen Demanding Substances	Oil & Grease	Bacteria & Viruses	Pesticides
Housing Development	X	X			X	X	X	X	X
Attached Residential Development	X	X			X	P(1)	P(2)	P(1)	X
Commercial Development	P(1)	P(1)		P(2)	X	P(5)	X	P(3)	P(5)
Industrial Development	X	P(1)	X(4)(5)	X	X	X	X		
Automotive Repair Shops			X	X(4)(5)	X		X		
Restaurants					X	X	X	X	
Steep Hillside Developments	X	X			X	X	X		X
Parking Lots	P(1)	P(1)	X		X	P(1)	X		P(1)
Streets, Highways & Freeways	X	P(1)	X	X(4)	X	P(5)	X		
Retail Gasoline Outlets (RGO)			X	X	X	X	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.

Source: City of San Diego "San Diego Municipal Code Land Development Manual - Storm Water Standards: A Manual for Construction & Permanent Storm Water Best Management Practices Requirements," dated March 24, 2008.

A.2 Identify Pollutants of Concern in Receiving Waters

Based on Section III.A.2 of the Storm Water Standards Manual, to identify pollutants of concern in receiving waters, the following analysis shall be conducted and reported in the project's WQTR: (1) for each of the proposed project discharge points, identify the receiving water(s), including hydrologic unit basin number(s), as identified in the most recent version of the "Water Quality Control Plan for the San Diego Basin," prepared by the SDRWQCB; and (2) identify any receiving waters, into which the developed area would discharge to, included in the "2006 CWA Section 303(d) List of Water Quality Limited Segments" approved by the SWRCB on October 25, 2006. List any and all pollutants for which the receiving waters are impaired.

Identification of Receiving Waters

According to the "Water Quality Control Plan for the San Diego Basin (9), "adopted by the California Regional Water Quality Control Board San Diego Region on September 8, 1994 approved by the SWRCB on December 13, 1994 (Basin Plan); the proposed project is located within the Miramar Reservoir Hydrologic Area within the Peñasquitos Hydrologic Unit. The corresponding number designation is 906.10 (Region '9' , Hydrologic Unit '06', Hydrologic Area '10'). An exhibit has been provided in Appendix B of this report titled "Hydrologic Unit for Main Street at Carmel Valley," which shows the project location in reference to the Hydrologic Subarea 906.10.

The storm water runoff from the site will be conveyed via existing storm drain system along El Camino Real, and ultimately outfalls into the Los Peñasquitos Lagoon. Los Peñasquitos Lagoon eventually discharges into the Pacific Ocean.

Identification of Receiving Water Impairments

On October 25, 2006, the SWRCB approved the 2006 CWA Section 303(d) List of Water Quality Limited Segments (303(d) List). Subsequently on November 30, 2006, the United States Environmental Protection Agency (USEPA) approved the SWRCB's inclusion of all waters and pollutants identified for the San Diego region in its 2006 List of Water Quality Limited Segments. The receiving water for the project that is currently listed as impaired based on the

2006 303(d) List is the Los Peñasquitos Lagoon. The pollutants/stressors causing impairment of the Los Peñasquitos Lagoon are sedimentation/siltation.

Pollutants of Concern for the Project

Based on Table 2.1and the 2006 CWA Section 303(d) List of Water Quality Limited Segments, the following are the project's pollutants of concern: sediments, nutrients, heavy metals, organic compounds, trash and debris, oxygen demanding substances, oil and grease, bacteria and viruses, and pesticides. The Low Impact Development (LID) site design, source control, and treatment control BMPs will be designed to treat these pollutants to the maximum extent practicable (MEP).

A.3 Identify Conditions of Concern

A.3.a Standard Element

Conditions of concern for the project are related to any relevant hydrologic and environmental factors that are to be protected specific to the project area's watershed. A change to a Priority Development Project site's hydrologic regime would be considered a considered a condition of concern if the change would impact downstream channels and habitat integrity. Potential impacts to downstream channels and habitat are evaluated and addressed in this Section of the WQTR. The following discussion summarizes the factors that were evaluated and addressed in this Section of the WQTR. The following discussion summarizes the factors that were evaluated and design measures that were incorporated to mitigate impacts to downstream channels and habitat.

The Storm Water Standards Manual requires that all projects shall compute the rainfall runoff characteristics for the 2-year and 10-year frequency storm including peak runoff, time of concentration and detention volume (if appropriate), and report the project's conditions of concern. The project will create more impervious surfaces than what already exists on-site, hence the project will increase storm water runoff in the post-project condition as compared to the pre-project condition. However, the area was master planned for ultimate build-out of the subject property as industrial development and the downstream system is engineered until it outfalls into the Los Peñasquitos Lagoon. Therefore, there are no conditions of concern.

A drainage study titled, "Main Street at Carmel Valley," dated December 9, 2009 or any revisions thereafter (prepared by Rick Engineering Company, Job No. 15701), presents hydrologic analyses for the project. Post-project Rational Method hydrologic analyses for the site were prepared to compute storm water runoff from the project area including peak runoff and time of concentration.

A.3.b Priority Development Project Element

Priority Development Projects are to include Low Impact Development (LID), which will include features that attempt to mimic the natural hydrologic conditions for the water quality design storm. To evaluate the feasibility of implementing such features, it will be necessary to estimate the capacity of a site to safely infiltrate water or the amount of water that could potentially be stored and re-used or evapo-transpirated at a site. To estimate these parameters, some site investigation will be required. A separate Geological Investigation Report will be prepared by a Geotechnical Engineer. Please see Section 3.1 for a discussion on LID features that are feasible for the project.

A.3.c Hydromodification Element

The Hydromodification Element section does not apply because the site is approximately 25.2 acres, which is less than the 50-acre threshold area for the Interim Hydromodification Criteria in the March 24, 2008 Storm Water Standards Manual. Besides the 50-acre threshold area criteria, the project site was master planned for ultimate build-out and the downstream system is engineered until it outfalls into the Los Peñasquitos Lagoon, including a regional detention basin located between the project site and the lagoon. Therefore, the project is exempt from the Hydromodification requirement.

3.0 PERMANENT STORM WATER BEST MANAGEMENT PRACTICES (BMPS)

The following discussion addresses requirements of Section III.B of the Storm Water Standards Manual, to establish permanent BMPs. Projects subject to standard or Priority Development Project requirements shall implement all applicable low impact development and source control BMPs listed in Sections III.B.1.a and III.B.2 of the Storm Water Standards Manual. Projects subject to Priority Development Project requirements must also implement the Priority Development Project LID Requirements, BMPs applicable to individual Priority Development Project categories and structural treatment control BMPs (listed in Sections III.B.1.b, III.B.3, and III.B.4 of the Storm Water Standards Manual, respectively).

Sections 3.1 through 3.4 of this WQTR will discuss the permanent storm water BMPs proposed for the project.

3.1. Low Impact Development (LID) BMPs

The term low impact development (LID) means a storm water management and land development strategy that emphasizes conservation and the use of on-site natural features integrated with engineered, small-scale hydrologic controls to more closely reflect pre-development hydrologic functions. The following text discusses the low impact development BMPs from Section III.B.1 of the Storm Water Standards Manual with respect to the project. Italicized text is taken directly from the Storm Water Standards Manual, and reproduced for this report. Portions of the italicized text are condensed from the Storm Water Standards Manual. Immediately following and written in regular text, will be the response as it applies to the project.

3.1.a. Standard LID BMPs Requirements

1. *Conserve natural areas, provide buffer zones between natural water bodies and the project footprint, preserve existing native trees and shrubs, and concentrate or cluster development on the least environmentally sensitive portions of a site.*

The project is proposed on previously graded lots and will not encroach on any natural areas and/or water body.

2. Minimize impervious footprint.

The project will incorporate landscaping areas to minimize impervious footprint. It has also included parking structures to further reduce the impervious footprint.

3. Minimize directly connect impervious areas.

The project proposes landscaped vegetation to be incorporated throughout the project site, which will reduce directly connected impervious areas. Rooftop runoff will also be discharged through vegetated areas wherever feasible prior to entering the storm drain system.

Storm water runoff from impervious areas will be conveyed to LID vegetated swales where possible (i.e. located northern, northeastern, and southwestern perimeters) prior to entering treatment control BMPs (i.e. underground filtration system). LID vegetated swales are not numerically sized since they will not be utilized as treatment control BMPs.

4. Minimize soil compaction in landscape areas.

The project will be designed to provide an "urban" neighborhood look to the project incorporating outdoor eating areas and café's. A central plaza area with landscape treatment will be provided in the eastern end of the project, and a passive recreational area will be provided in the western portion of the site. Per standard landscape practice, areas to receive planting will only be compacted to 85%.

5. Soil amendments.

The landscape areas for the project will be treated with soil amendment prior to planting to help promote plant growth.

6. Convey runoff safely from the tops of slopes.

The project will direct runoff away from the tops of slopes via swales, and will safely collect runoff through a network of swales and area drains.

7. *Vegetate slopes with native or drought tolerant vegetation.*

Landscaping areas within the project will be planted with drought tolerant plants, where possible. Project will conform to the City of San Diego water usage limits for projects.

8. *Stabilize permanent channel crossings.*

There are no permanent channel crossings proposed for the project.

9. *Install energy dissipaters, such as riprap, at the outlets of the new storm drains, culverts, conduits, or channels that enter unlined channels in accordance with applicable specifications to minimize erosion.*

Splash pads and/or landscape rocks will be provided at each roof drain outlet located on-site to help minimize potential erosion in the proposed landscaped areas.

3.1.b. Priority Development Project LID Requirements

For Priority Development Projects, the feasible portion of the post-project runoff volumes and peak flows from the water quality design storm shall be infiltrated on site. However, there are several reasons why the use of infiltration facilities is not as feasible for the project, including that the project was previously mass-graded resulting in a high level of compaction, and it will have large structures and foundations across the project area, including subterranean parking structures. These restrictions on infiltration-based LID and treatment control BMP solutions have been confirmed during preliminary discussions with the Geotechnical Engineer.

A separate Geological Investigation Report will be prepared by a Geotechnical Engineer. As a result of the anticipated constraints, the project has elected not to rely on infiltration-based treatment control facilities; however, it has included standard LID site design BMP techniques to the maximum extent practicable. For instance, impervious areas throughout the project have been directed to several landscaped areas that are proposed along the perimeter of the property. These areas will allow a small amount of runoff to naturally infiltrate prior to leaving the project

site. The design of the standard LID site design BMPs was discussed in Section 3.1.a, and the design of the treatment control BMPs are discussed later in Section 3.4.

3.2. Source Control BMPs

The term "source control BMP" refers to land use or site planning practices, or structures that aim to prevent urban runoff pollution by reducing the potential for contamination at the source of pollution. Source control BMPs minimize the contact between pollutants and urban runoff. The following text discusses the source control BMPs from Section III.B.2 of the Storm Water Standards Manual with respect to the project. Italicized text is taken directly from the Storm Water Standards Manual, and reproduced for this report. Portions of the italicized text are condensed from the Storm Water Standards Manual. Immediately following and written in regular text, will be the response as it applies to the project.

a. *Design Outdoor Materials Storage Areas to Reduce Pollution Introduction*

- *Materials with the potential to contaminate urban runoff shall be: (1) placed in an enclosure such as, but not limited to, a cabinet, shed, or similar structure that prevents contact with rain, runoff or spillage to the storm water conveyance system; and (2) hazardous materials shall be protected by secondary containment structures such as berms, dikes, or curbs. The storage area shall be paved and sufficiently impervious to contain leaks and spills, and have a roof or awning to minimize direct precipitation within the secondary containment area.*

The project does not propose any outdoor hazardous material storage areas. If these conditions change it is the responsibility of the project site owner/operator to ensure that outdoor materials storage will be designed pursuant to the guidelines shown above.

b. *Design Trash Storage Areas to Reduce Pollution Introduction*

- *Trash storage areas shall be:(I) paved with an impervious surface, designed not to allow run-on from adjoining areas, and screened or walled to prevent off-site transport of trash; and (2) contain attached lids on all trash containers that*

exclude rain; or (3) contain a roof or awning to minimize direct precipitation Limited exclusion: detached residential homes.

Trash storage areas for the project will be designed pursuant to the guidelines shown above.

c. Employ Integrated Pest Management Principles

Integrated pest management (IPM) is an ecosystem-based pollution prevention strategy that focuses on long-term prevention of pests or their damage through a combination of techniques such as a biological control, habitat manipulation, modification of cultural practices, and use of resistant plant varieties. Pesticides are used only after monitoring indicates they are needed according to established guidelines. Pest control materials are selected and applied in a manner that minimizes risks to human health, beneficial and non-target organisms, and the environment. More information can be obtained at the UC Davis website (http://www.ipm.ucdavis.edu/WATER/U/index.html)

- *Eliminate and/or reduce the need for pesticide use in the project design by: (1) plant pest-resistant or well-adapted plant varieties such as native plants; and (2) Discourage pests by modifying the site and landscaping design. Pollution prevention is the primary "first line of defense" because pollutants that are never used do not have to be controlled or treated (methods which are inherently less efficient).*

- *Distribute IPM educational materials to future site residents/tenants. Minimally, educational materials must address the following topics: (1) Keeping pests out of buildings and landscaping using barriers, screens, and caulking; (2) Physical pest elimination techniques, such as, weeding squashing, trapping, washing, or pruning out pests; (3) Relying on natural enemies to eat pests; (4) Proper use of pesticides as a last line of defense. More information can be obtained at the UC Davis website (http://www.ipm.ucdavis.edu/WATER/U/index.html) .*

The project will include Integrated Pest Management in the accordance with the above guidelines. The party responsible to ensure implementation and funding of maintenance

of permanent BMPs will be responsible to require IPM to be implemented in the landscape design and maintenance.

d. Use Efficient Irrigation Systems & Landscape Design

Limited exclusion: detached residential homes.

- *Employ rain shutoff devises to prevent irrigation during and after precipitation in accordance with City of San Diego landscape requirements. Design irrigation systems to each landscape area's specific water requirements.*
- *Use flow reducers or shutoff valves triggered by a pressure drop to control water loss in the event of broken sprinkler heads or lines.*

Irrigation systems for the project will be designed pursuant to the guidelines shown above.

e. Provide Storm Water Conveyance System Stamping and Signage

- *Provide concrete stamping, or equivalent, of all storm water conveyance system inlets and catch basins within the project area with prohibitive language (e.g., "No Dumping-I Live in <<name receiving water>>"), satisfactory to the City Engineer. Stamping may also be required in Spanish.*
- *Post signs and prohibitive language and/or graphical ions, which prohibit illegal dumping at public access points along channels and creeks within the project area, trailheads, parks and building entrances.*

Concrete stamping, or the equivalent, with prohibitive language will be provided for curb inlets, catch basins, and any Brooks Box inlets located within the project site. The owner will confirm stenciling language and design with the City of San Diego before implementation. There are no channels and/or creeks within the project area; therefore signage does not apply to this project.

f. Design New Buildings Fire Sprinklers Systems to enable Discharge to Sanitary Sewer

- *For new buildings with fire sprinkler systems, design fire sprinklers to enable operational maintenance and testing to be contained and discharged to the sanitary sewer system.*

The fire sprinkler systems will be designed pursuant to the guidelines shown above.

3.3. BMPs Applicable to Individual Priority Development Project Categories

Table 1 of the Storm Water Standards Manual identifies additional BMPs that are required for individual Priority Development Project categories. The following Priority Development Project categories listed in Table 1 apply to the project: "Housing Development greater than 10 dwelling units," "Commercial Development greater than 1 acre," "Restaurants," "Parking Lots," and "Streets, Highways & Freeways." Based on Table 1, all of the BMPs applicable to individual Priority Development Project categories apply to one or more of the Priority Development Project categories for the project.

The following text discusses the BMPs applicable to individual Priority Development Project categories from Section III.B.3 of the Storm Water Standards Manual with respect to the project. Italicized text is taken directly from the Storm Water Standards Manual, and reproduced for this report. Portions of the italicized text are condenses from the Storm Water Standards Manual. Immediately following and written in regular text, will be the response as it applies to the project.

a. <u>Roads</u>

- *Roads shall utilize the Best Management Practices detailed in Appendix VI of the City of San Diego Street Design Standards to the extent feasible. Feasibility shall be determined according to the Section III.B.1.b. The effect of infiltration on the reliability of road surfaces, underground utilities and other nearby structures shall be a part of the feasibility analysis.*

Road will be designed pursuant to the guidelines described in City of San Diego Street Design Standards.

b. <u>Residential Driveways & Guest Parking</u>

- *Driveways shall have one of the following: (1) shared access; (2) flared entrance (single-lane at street); (3) wheel strips (paving only under tires); (4) porous paving; or (5) designed to drain into landscaping prior to discharging to the storm water conveyance system.*

- *Uncovered temporary or guest parking on private residential lots shall be: (1) paved with a permeable surface; or (2) designed to drain into landscaping prior to discharging to the storm water conveyance system.*

There are no residential driveways or exterior guest parking proposed on site for this project. All spaces are contained with parking structure.

c. Dock Areas

There are no exterior dock areas proposed for this project.

d. Maintenance Bays

Maintenance bays are not proposed for this project.

e. (& f). Vehicle & Equipment Wash Areas

Vehicle and equipment wash areas are not proposed for the project.

g. Outdoor Processing Areas

Outdoor processing areas are not proposed for the project.

h. Surface Parking Areas

- *Where landscaping is proposed in surface parking areas (both covered and uncovered), incorporate landscape areas into the drainage design.*

- *Overflow parking (parking in excess of the project's minimum parking requirements) may be constructed with permeable paving.*

Runoff from the surface parking areas will be directed, where feasible, to adjacent landscaping areas prior to conveyance by the storm drain system.

i. Non-Retail Fueling Areas

Fueling areas are not proposed for the project.

j. Steep Hillside Landscaping

- *Steep hillside areas disturbed by project development shall be landscaped with deep-rooted, drought tolerant and/or native plant species selected for erosion control, in accordance with the Landscape Technical Manual.*

Steep hillside areas are not proposed for the project.

3.4. Treatment Control BMPs

Structural treatment facilities (treatment control BMPs) are designed to remove pollutants contained in storm water runoff. Methods of pollutant removal include sedimentation settling, filtration, plant uptake, ion exchange, absorption, and bacterial decomposition. Floatable pollutants such as oil, debris, and scum can be removed with separator structures. Treatment control facilities may need to be used in series as a "Treatment Train" to achieve the desired level of pollutant removal for different pollutants.

Pursuant to Section III.B.4 of Storm Water Standards Manual, after LID and source control BMPs have been incorporated into the project, applicants of Priority Development Projects shall design a single or combination of treatment control BMPs designed to infiltrate, filter, and/or treat runoff from the project footprint to one of the "Numeric Sizing Treatment Standards" listed in Table 4 of the Storm Water Standards Manual. The required LID BMPs may be applied towards the numeric sizing treatment standards satisfactory to the City Engineer.

Pursuant to Section III.B.5 of the Storm Water Standards Manual, Priority Development Projects shall select a single or combination of treatment BMPs from the categories in Table 5 of the Storm Water Standards Manual that maximize pollutant removal for the particular pollutants of concern. This means that the selected treatment control BMPs must collectively provide minimum pollutant removal efficiencies of "medium" or "high" for all pollutants of concern.

Table 5 of the Storm Water Standards Manual, "Structural Treatment Control BMP Selection Matrix," provides a guide for treatment control BMP selection. Table 5 is renamed as Table 3.1and reproduced below. The anticipated pollutants applicable to the project are highlighted.

Table 3.1 Structural Treatment Control BMP Selection Matrix

Category →→	Public Domain											Manufactured (Proprietary)	
BMP →→	Infiltration Trench	Infiltration Basin	Retention/Irrigation	Wet Ponds	Constructed Wetlands	Extended Detention Basin	Vegetated Swale	Vegetated Buffer Strip	Bio-filtration	Media Filter	Water Quality Inlet	Vortex Separator (1)	Drain Inserts (1)
↓ Targeted ↓ Pollutant	TC-10	TC-11	TC-12	TC-20	TC-21	TC-22	TC-30	TC-31	TC-32	TC-40	TC-50	MP-51	MP-52
Sediment	H	H	H	H	H	M	M	H	H	H	L	M	L
Nutrients	H	H	H	M	M	L	L	L	M	L	L	L	L
Trash	H	H	H	H	H	H	L	M	H	H	M	M	M
Metals	H	H	H	H	H	M	M	H	H	H	L	L	L
Bacteria	H	H	H	H	H	M	L	L	H	M	L	L	L
Oil and Grease	H	H	H	H	H	M	M	H	H	H	M	L	L
Organics	H	H	H	H	H	M	M	M	H	H	L	L	L
Pesticides (1)	U	U	U	U	U	U	U	U	U	U	U	L	L
Oxygen Demanding Substances (1)	M	M	U	M	M	M	U	U	L	M	U	L	L

L: Low removal efficiency
M: Medium removal efficiency
H: High removal efficiency
U: Unknown removal efficiency

(1): Efficiency Rating based on Model Standard Urban Storm Water Mitigation Plan for San Diego County, Port of San Diego and Cities in San Diego County (2002)
Source: Stormwater Best Management Practice Handbook (2003), developed by the California Stormwater Quality Association

Source: City of San Diego "San Diego Municipal Code Land Development Manual - Storm Water Standards: A Manual for Construction & Permanent Storm Water Best Management Practices Requirements," dated March 24, 2008 (Table 5).

The following discussion identifies the treatment control BMPs proposed for the project, pursuant to the structural treatment BMP selection procedure described in Section III.B.5 of the Storm Water Standards Manual. The procedure requires that pollutant removal be maximized for any anticipated pollutant from the project site for which the project's receiving waters are listed as impaired based on the Clean Water Act Section 303(d) List.

As discussed in Section 2, the following are the project's pollutant of concern: sediments, nutrients, heavy metals, organic compounds, trash and debris, oxygen demanding substances, oil and grease, bacteria and viruses, and pesticides. The Low Impact Development (LID) site design, source control, and treatment control BMPs will be designed to treat these pollutants at "medium" to "high" removal efficiencies.

Phosphate and total dissolved solids (nutrients) will be managed using source control BMPs which can be more effective than treatment. The landscaped areas will be managed with source controls to prevent off-site transport of nutrients by runoff. Source controls will include designing the landscape and irrigation system in accordance with current standard of care for landscape areas, and ensuring on-going maintenance of the landscape and irrigation system. These source controls will also be effective for reducing transport of sediment from the project site.

In addition to the LID site design and source control BMPs concepts, for the purposes of Treatment Control BMPs, all of the BMPs listed in the Storm Water Standards Manual Table 5 were evaluated. It was determined that the most practicable treatment BMP would be underground vaults with media filtration units, including a pretreatment system located immediately upstream and bypass capability for higher flows.

The following treatment control BMPs were selected:

- Two (2) BaySaver BayFilter systems (including pretreatment BaySeparators)

The BayFilter was selected for the project based on the following considerations:

- The BayFilter will treat for sediment, trash, heavy metals, oil and grease, and organics at a high level of removal efficiency, and bacteria and oxygen demanding substances at a medium level of removal efficiency.
- All runoff from the project site, including the off-site improvement areas in Del Mar Heights Road, are collected and conveyed to two discharge locations. Therefore, use of an underground treatment system at each of the two locations allows all collection points throughout the project to receive the same high level of treatment provided by these units.
- It has been located at the two discharge locations to facilitate easy access for ongoing inspection and maintenance activities, ensuring continued functionality of the units.
- Several of the large-footprint surface-based BMP types were found to be infeasible due to the limited amount of space available on the project site, including infiltration basins, wet ponds, wetlands, and extended detention basins.
- The footprint of the building and underground structures cover the majority of the site and restrict use of infiltration-based BMPs as well. However, as described earlier, LID vegetated swales for flow-through filtering and pre-treatment have been provided throughout the landscape design, where feasible.

The BayFilter is a flow-based BMP. Therefore, the BayFilter has been sized using a flow-based numeric sizing criteria to meet the requirements of the Storm Water Standards Manual. The treatment flow rate is determined pursuant to numeric sizing criteria 2.I shown in Table 4, "Numeric Sizing Treatment Standards," of the Storm Water Standards Manual, the maximum flow rate of runoff produced from a rainfall intensity of 0.2 inch rainfall per hour for each hour of a storm event.

The rational method equation was used to determine the treatment flow rate.

- Rational method equation: Q = CIA
- 'Q' is the treatment flow rate in the cubic feet per second (cfs),
- 'C' is the weighted runoff coefficient for the drainage area,

- 'I' is the rainfall intensity in inches per hour (in/hr) [0.2 in/hr per flow-based numeric sizing criteria], and
- 'A' is the drainage area is acres (ac).

The calculations for water quality treatment flow rates are included in Appendix C of this report. A detail of the BayFilter and manufacturer's information are included in Appendix D. Locations of the BayFilter are shown on the exhibit titled "Water Quality Technical Report Exhibit for Main Street at Carmel Valley" located in Map Pocket 1.

4.0 OPERATION & MAINTENANCE PLAN

The owner of the project will enter into a Storm Water Management and Discharge Control Maintenance Agreement (SWMDCMA) with the City of San Diego to ensure maintenance of permanent BMPs for the project. The SWMDCMA will be prepared upon final design of the project.

4.1. Maintenance Responsibility

The owner of the project is the site operator and will be party responsible to ensure implementation and funding of maintenance of permanent BMPs.

It is anticipated that the owner of the project will manage multiple separate maintenance contracts for different types of maintenance (e.g., landscape maintenance vs. maintenance of the BMPs). Throughout this section, the owner of the project is the "party responsible to ensure implementation and funding of maintenance of permanent BMPs." The party who actually performs the activities is the "inspector," "maintenance contractor," or "maintenance operator."

4.2. Inspection and Maintenance Activities

4.2.a. Inspection and Maintenance Activities for LID and Source Control BMPs

The following LID and source control BMPs for the project requires permanent maintenance: concrete stamping, landscaped areas (including vegetated swales), irrigation systems within the landscaped areas. The discussions below provide inspection criteria, maintenance indicators, and maintenance activities for the above-listed LID and source control BMPs that require permanent maintenance.

Concrete Stamping

Inspection/maintenance of the concrete stamping may be performed by the building/facilities maintenance contractor as applicable. In addition, there may be storm drain maintenance contractors who will perform this service for a fee.

During inspection, the inspector(s) shall check for the maintenance indicators given below:

- *Faded, vandalized, or otherwise unreadable concrete stamping.*

There are no routine maintenance activities for the concrete stamping. If inspection indicates the concrete stamping is intact, no action is required.

If inspection indicates the concrete stamping is not legible, the concrete stamping shall be repaired or replaced as applicable.

Landscaped Areas

Inspection and maintenance of the vegetated areas may be performed by the landscape maintenance contractor.

During inspection, the inspector shall check for the maintenance indicators given below:

- Erosion in the form of rills or gullies
- Ponding water
- Bare areas or less than 70% vegetation cover
- Animal burrows, holes, or mounds
- Trash

Routine maintenance of vegetated areas shall include mowing and trimming vegetation, and removal and proper disposal of trash.

If erosion, ponding water, bare areas, poor vegetation establishment, or disturbance by animals are identified during the inspection, additional (non-routine) maintenance will be required to correct the problem. For ponding water or erosion, see also inspection and maintenance measures for irrigation systems. In the event that any non-routine maintenance issues are persistently encountered such as poor vegetation establishment, erosion in the form of rills or gullies, or ponding water, the party responsible to ensure that maintenance is performed in perpetuity shall consult a licensed landscape architect or engineer as applicable.

As applicable, IPM procedures must be incorporated in any corrective measures that are implemented in response to damage by pests. This may include using physical barriers to keep

pests out of landscaping; physical pest elimination techniques, such as, weeding, squashing, trapping, washing, or pruning out pests; relying on natural enemies to eat pests; or proper use of pesticides as a last line of defense. More information can be obtained at the UC Davis website *(http://www.ipm.ucdavis.edu/WATER/U/index.html)*

Irrigation Systems

Inspection and maintenance of the irrigation system may be performed by the landscape maintenance contractor.

During inspection, the inspector shall check for the maintenance indicators given below:

- Eroded areas due to concentrated flow
- Ponding water
- Broken sprinkler heads or pipes

Refer to proprietary product information for the irrigation system for routine maintenance activities for the irrigation system, as applicable. If none of the maintenance indicators listed above are identified during inspection of the irrigation system, no other action is required.

If any of the maintenance indicators listed above are identified during the inspection, additional (non-routine) maintenance will be required to restore the irrigation system to an operable condition. If inspection indicates breaks of leaks in the irrigation lines or individual sprinkler heads, the affected portion of the irrigation system shall be repaired. If inspection indicates eroded areas due to concentrated flow from the irrigation system, the eroded areas shall be repaired and the irrigation system shall be adjusted or repaired as applicable to prevent further erosion. If inspection indicates ponding water resulting from the irrigation system, the irrigation system operator shall identify the cause of the ponded water and adjust or repair the irrigation system as applicable to prevent ponding water. Refer to proprietary product information for the irrigation system for other non-routine maintenance activities as applicable.

4.2.b. Inspection and Maintenance Activities for Treatment Control BMPs

The treatment control BMPs proposed for the project consist of two (2) BayFilter systems. The BayFilter systems are located at the southern corner of the project (i.e. one for the western drainage basin and another one for the eastern drainage basin). The discussions below provide inspection criteria, maintenance indicators, and maintenance activities for the BayFilter.

BayFilter (Media Filter, TC-40)

Inspection/maintenance of the BayFilter must be performed by properly trained personnel. Maintenance of the BayFilter involves handling of potentially hazardous material. Therefore the BayFilter maintenance operator must be trained in handling and disposal of hazardous waste. The party responsible to ensure implementation and funding of maintenance of permanent BMPs will be responsible to select a maintenance contractor for maintenance of the BayFilter who meets this requirement, and to contract for additional cleaning and disposal services as necessary if non-routine cleaning and disposal is required. There are several storm drain cleaning service providers who are able to inspect and/or maintain this product.

During inspection, the inspector shall check for the maintenance indicators given below:

- Accumulation of liquids and solids in the Pre-treatment BaySeparator and BayFilter filtration vault.
- Level of sediment build-up on the floor of the vault, and on top of the cartridges.
- Spent filter media cartridges. When the media is spent it is typically indicated by a change in color of the material.
- Damage to internal components within the Pre-treatment BaySeparator and BayFilter filtration vault.

Routine maintenance of the system shall include removal and proper disposal of accumulated materials (e.g., sediment, litter) from the Pre-treatment BaySeparator and BayFilter filtration vault, and replacement of the cartridges in the BayFilter.

If inspection indicates that internal components within the system are damaged, additional non-routine maintenance will be required to repair or replace the damaged parts as applicable. The party responsible to ensure implementation and funding of maintenance of permanent BMPs shall contract for additional cleaning and disposal services as necessary if non-routine cleaning and disposal is required.

4.3. Inspection and Maintenance Frequency

Table 4.1 below lists the BMPs to be inspected and maintained and the minimum frequency of inspection and maintenance activities.

Table 4.1 Summary Table of Inspection and Maintenance Frequency

BMP	Inspection Frequency	Maintenance Frequency
Concrete Stamping	Annual	As-needed based on maintenance indicators in Section 4.2.1
Landscaped Areas	Monthly	Routine mowing and trimming and trash removal: monthly Non-routine maintenance as-needed based on maintenance indicators in Section 4.2.1
Irrigation Systems	Monthly	As-needed based on maintenance indicators in Section 4.2.1
BayFilter (treatment control BMP, including Pretreatment BaySeparator)	Annual, and after major storm events	Routine maintenance to remove accumulated materials and replace media cartridges: annually, on or before September 30th As-needed maintenance based on maintenance indicators in Section 4.2.2

The frequencies given in the Summary Table of Inspection and Maintenance Frequency are minimum recommended frequencies for inspection and maintenance activities for the project. Typically, the frequency of maintenance required for permanent BMPs is site and drainage area specific. If it is determined during the regularly scheduled inspection and/or routine maintenance that a BMP requires more frequent maintenance (e.g., to remove accumulated trash) it may be necessary to increase the frequency of inspection and/or routine maintenance. If it is determined during the regularly scheduled inspection that the maintenance thresholds are consistently met or exceeded, it may be necessary to increase the frequency of inspection and routine maintenance.

4.4. Estimated Maintenance Cost

The estimate maintenance cost for the Bay Filter Treatment BMP is included in Appendix F.

4.5. Recordkeeping Requirements

The party responsible to ensure implementation and funding of maintenance of permanent BMPs shall maintain records documenting the inspection and maintenance activities. The records must be kept a minimum of 5 years and shall be made available to the City of San Diego for inspection upon request at any time.

5.0 SUMMARY

This water quality technical report (WQTR) summarizes storm water protection requirements for the Main Street at Carmel Valley project. The planned development will be a mixed-use center consisting of office, retail, commercial, and residential buildings, underground/aboveground parking structures, private roadways, "hardscape" and "softscape" landscaping, and public improvements to Del Mar Heights Road and El Camino Real.

The following priority development project categories apply to the project based on the City of San Diego's Storm Water Requirements Applicability Checklist: detached or attached residential development of 10 or more units, commercial development greater than 1 acre, restaurant, parking lots greater than or equal to 5,000 square feet or with at least 15 parking spaces, and potentially exposed to urban runoff, and streets, roads, highways, and freeways which would create a new paved surface that is 5,000 square feet or greater.

The proposed project is located in the Miramar Reservoir Hydrologic Area within the Peñasquitos Hydrologic Unit. The corresponding number designation is 906.10. The storm water runoff from the site will be conveyed via an existing storm drain system along El Camino Real until it outfalls into the Los Peñasquitos Lagoon. Los Peñasquitos Lagoon eventually discharges into the Pacific Ocean. The receiving waters for the project that are currently listed as impaired based on the 2006 303(d) List is the Los Peñasquitos Lagoon. The pollutants/stressors causing impairment of the Los Peñasquitos Lagoon are sedimentation/siltation.

The project can be expected to generate the following pollutants: sediments, nutrients, heavy metals, organic compounds, trash and debris, oxygen demanding substances, oil and grease, bacteria and viruses, and pesticides. Based on the selection procedure outlined in Section III.B.5 of the Storm Water Standards Manual, the treatment control BMP(s) for the project should maximize pollutant removal for these anticipated pollutants of concern. The project will incorporate standard LID site design, source control, priority project category, and treatment control BMPs, which are described in Section 3 of this report. LID and source control BMPs

include landscaped areas including vegetated swales, concrete stamping, and efficient irrigation systems within the landscaped areas.

The treatment control BMPs selected for the site, two (2) BayFilters from BaySaver Technologies, Inc., were selected based on elevation of all treatment control BMPs listed in the Storm Water Standards Manual. The BayFilter will treat for sediment, trash, heavy metals, oil and grease, and organics at a high level of removal efficiency, and bacteria and oxygen demanding substances at a medium level of removal efficiency. BayFilters will be provided as flow-based BMPs. The treatment flow rates are based on numeric sizing criteria from the Storm Water Standards Manual, the maximum flow rate of runoff produced from a rainfall intensity of 0.2 inches per hour for each hour of a storm event.

The owner of the project will enter into a Storm Water Management and Discharge Control Maintenance Agreement (SWMDCMA) with the City of San Diego to ensure maintenance of permanent BMPs for the project. The following BMPs for the project require permanent maintenance: landscaped areas, concrete stamping, irrigation system, and BayFilter with Pretreatment BaySeparator. The operation and maintenance information provided in Section 4 of this WQTR provides inspection criteria, maintenance indicators, and maintenance activities for the above-listed BMPs that require permanent maintenance.

APPENDIX A - Storm Water Requirements Applicability Checklist

for

Main Street at Carmel Valley

THE CITY OF SAN DIEGO
City of San Diego
Development Services
1222 First Ave., MS-302
San Diego, CA 92101
(619) 446-5000

Storm Water Requirements Applicability Checklist

FORM
DS-560
February 2010

Project Address:	Assessor Parcel Number(s):	Project Number *(for City Use Only):*
San Diego Corporate Center Lots 1 & 2	304-070-43, 49, 52 % 57	

This form must be completed and submitted with your permit application.

Section 1 - Permanent Storm Water BMP Requirements:

If any answers to Part A are answered "Yes," your project is subject to the "Priority Project Permanent Storm Water BMP Requirements," and "Standard Permanent Storm Water BMP Requirements" of the Storm Water Standards Manual, Section III. If all answers to Part A are "No," and any answers to Part B are "Yes," your project is only subject to the Standard Permanent Storm Water BMP Requirements. If every question in Part A and B is answered "No," your project is exempt from permanent storm water requirements.

Part A: Determine Priority Project Permanent Storm Water BMP Requirements.

Does the project meet the definition of one or more of the following priority project categories? (Refer to the definitions section in the Storm Water Standards for expanded definitions of the priority project categories.)

1.	(Effective as of 1/24/2010) Does the project disturbs one acre or more and not meet one of the exclusions listed below?	☑ Yes ☐ No

Exclusions: Projects creating less than 5,000 sf of impervious surface; projects that add landscaping that does not require regular use of pesticides and fertilizers such as a slope stabilization project using native plants; linear pathway projects that are for infrequent vehicle use, such as for emergency or maintenance access or for bicycle or pedestrian use, if they are built with impervious surfaces or if they sheet flow to surrounding pervious surfaces; and, projects that do not meet the definition of New Development or Significant Redevelopment in the Storm Water Standards.

2.	New detached or attached residential development of 10 or more units	☐ Yes ☑ No
3.	New developments of heavy industry greater than 1 acre	☐ Yes ☑ No
4.	New commercial development greater than 1 acre	☑ Yes ☐ No
5.	New automotive repair shop	☐ Yes ☑ No
6.	New restaurant	☑ Yes ☐ No
7.	New hillside development greater than 5,000 square feet	☐ Yes ☑ No
8.	New project within, directly adjacent to or discharging to receiving waters within Water Quality Sensitive Areas	☐ Yes ☑ No
9.	New parking lots greater than or equal to 5,000 square feet or with at least 15 parking spaces	☑ Yes ☐ No
10.	New streets, roads, highways, and freeways which would create a new paved surface that is 5,000 square feet or greater	☑ Yes ☐ No
11.	New retail gasoline outlets	☐ Yes ☑ No
12.	Redevelopment that installs and/or replaces 5,000 square feet or more of impervious surface and the existing site meets at least one of the categories 2-11 above?	☐ Yes ☑ No

Limited Exclusion: Trenching and resurfacing work associated with utility projects are not considered priority projects.

Part B: Determine Standard Permanent Storm Water Requirements.

Does the project propose:

1.	New impervious areas, such as rooftops, roads, parking lots, driveways, paths and sidewalks?	☑ Yes ☐ No
2.	New pervious landscape areas and irrigation systems?	☑ Yes ☐ No
3.	Permanent structures within 100 feet of any natural water body?	☐ Yes ☑ No

4.	Trash storage areas?	☑ Yes	☐ No
5.	Liquid or solid material loading and unloading areas?	☐ Yes	☑ No
6.	Vehicle or equipment fueling, washing, or maintenance areas?	☐ Yes	☑ No
7.	Require a General NPDES Permit for Storm Water Discharges Associated with Industrial Activities (visit the State Water Resources Control Board website)	☐ Yes	☑ No
8.	Commercial or industrial waste handling or storage, excluding typical office or household waste?	☐ Yes	☑ No
9.	Any grading or ground disturbance during construction?	☑ Yes	☐ No
10.	Any new storm drains, or alteration to existing storm drains?	☑ Yes	☐ No

Section 2. Construction Storm Water BMP Requirements:

If any of the answers to the questions in Part C are "Yes," complete the construction site prioritization in Part D below.

Part C: Determine Construction Phase Storm Water Requirements.

If any of Part C is answered "Yes", then the project is subject to Section IV of the Storm Water Standards Manual. If question 1 is answered "Yes" then a Storm Water Pollution Prevention Plan (SWPP) is required; otherwise a Water Pollution Control Plan (WPCP is required).

Would the project meet any of these criteria during construction?

1.	Is the project subject to California's statewide General NPDES Permit for Storm Water Discharges Associated with Construction Activities?	☑ Yes	☐ No
2.	Does the project propose grading or soil disturbance?	☑ Yes	☐ No
3.	Would storm water or urban runoff have the potential to contact any portion of the construction area, including washing and staging areas?	☑ Yes	☐ No
4.	Would the project use any construction materials that could negatively affect water quality if discharged from the site (such as, paints, solvents, concrete, and stucco)?	☑ Yes	☐ No

Part D: Determine Construction Site Priority

This prioritization must be completed with this form, noted on the plans, and included in the SWPPP or WPCP. The City reserves the right to adjust the priority of the projects both before and during construction. [Note: The construction priority does NOT change construction BMP requirements that apply to projects; rather, it determines the frequency of inspections that will be conducted by City staff.]

☑ 1) High Priority

a) Projects where the site is 50 acres or more and grading will occur during the wet season

b) Projects 1 acre or more and tributary to an impaired water body for sediment (e.g., Peñasquitos watershed)

c) Projects 1 acre or more within or directly adjacent to or discharging directly to a coastal lagoon or other receiving water within a Water Quality Sensitive Area.

d) Projects subject to phased grading or advanced treatment requirements.

☐ 2) Medium Priority

Projects 1 acre or more but not subject to a high priority designation.

☐ 3) Low Priority

Projects requiring a Water Pollution Control Plan but not subject to a medium or high priority designation.

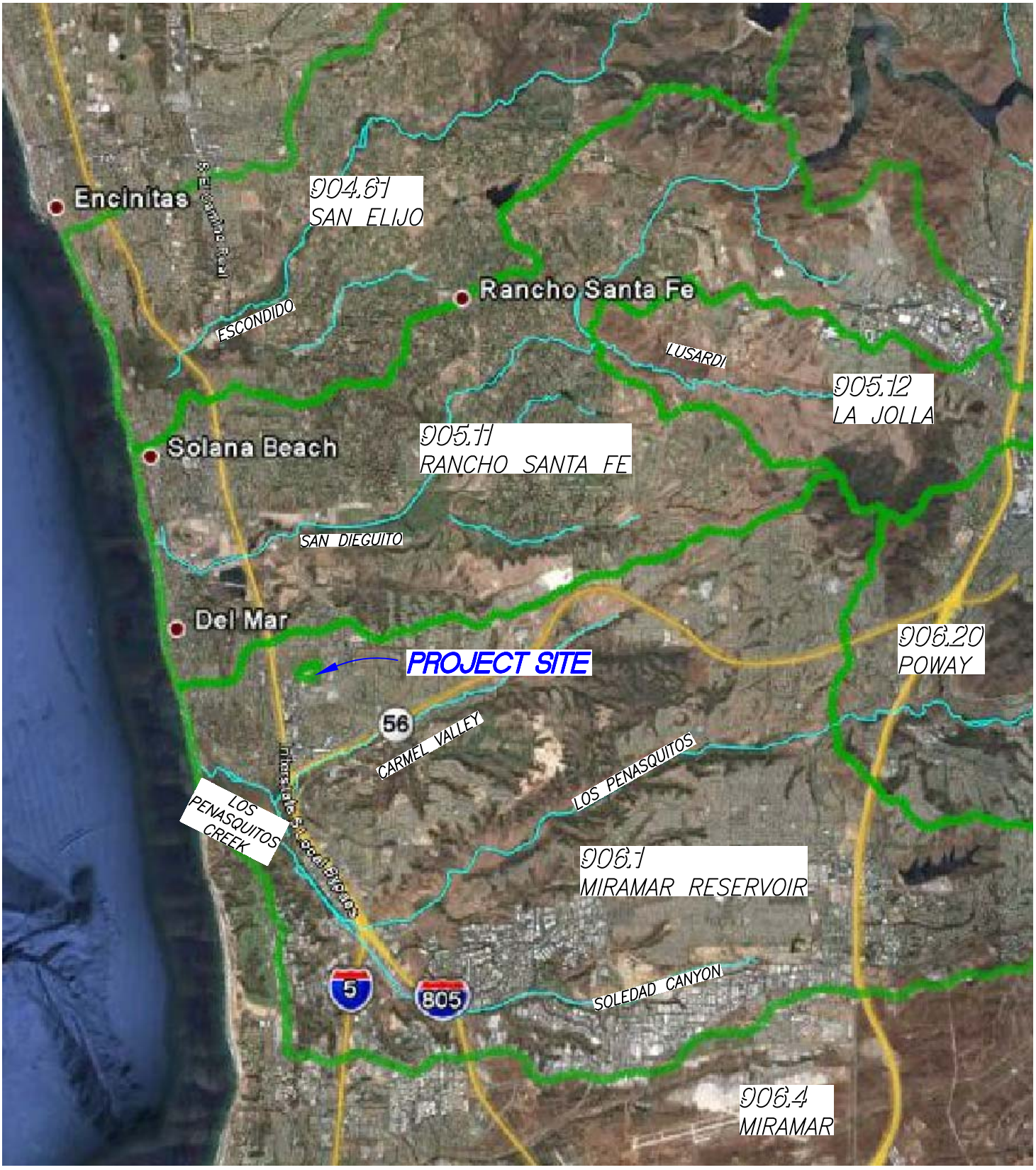
Name of Owner or Agent *(Please Print):*	Title:
Signature:	Date:

Reset Button

APPENDIX B - Hydrologic Unit Map

for

Main Street at Carmel Valley



HYDROLOGIC UNIT FOR:

MAIN STREET AT CARMEL VALLEY

SCALE: N.T.S. | LEC JOB NO. NCW 14.01-09.08 | DATE: 9.24.10

APPENDIX C - Water Quality Treatment Calculations

for

Main Street at Carmel Valley

APPENDIX D - Literature and Details

for

Treatment Control Best Management Practices (BMPs)

(i.e. BayFilter)

BAYFILTER™ SPECIFICATIONS

PART 1.00 GENERAL

1.1 DESCRIPTION

A. The BayFilter™ system's internal components manufacturer selected by the Contractor and approved by the Engineer, shall furnish all labor, materials, equipment and incidentals required to manufacture the BayFilter system components(s) specified herein in accordance with the attached drawing(s) and these specifications.

B. Concrete structures and any appurtenances that form an integral part of the BayFilter™ system shall be described in Part 2.00 of these specifications.

1.2 QUALITY CONTROL INSPECTION

A. The quality of materials, the process of manufacture, and the finished sections shall be subject to inspection by the Engineer. Such inspection may be made at the place of manufacture, or on the worksite after delivery, or at both places, and shall be subject to rejection at any time if material conditions fail to meet any of the specification requirements. If a BayFilter system component(s) is rejected after delivery to the site, it shall be marked for identification and removed from the site. Any BayFilter system component(s) which have been damaged beyond repair during delivery will be rejected.

1.3 SUBMITTALS

A. Plan, elevation, and profile dimensional drawings shall be submitted to the Engineer for review and approval. The Contractor shall be provided with the approved plan, elevation, and profile dimensional drawings.

PART 2.00 PRODUCTS

2.1 INTERNAL COMPONENTS

All components including concrete structure(s), PVC manifold piping and filter cartridges, shall be provided by BaySaver Technologies Inc., 1302 Rising Ridge Road, Unit 1, Mount Airy, MD (800.229.7283).

A. PVC Manifold Piping: All internal PVC pipe and fittings shall meet ASTM D1785. Manifold piping shall be provided to the contractor partially pre-cut and pre assembled.

B. Filter Cartridges: External shell of the filter cartridges shall be substantially constructed of polyethylene or equivalent material acceptable to the manufacturer. Filtration media shall be arranged in a layered fashion to maximize available filtration area. An orifice plate shall be supplied with each cartridge to restrict flow rate to a maximum of 30 gpm.

C. Filter Media: Filter media shall be by BaySaver Technologies Inc. or approved alternate. Filter media shall consist of the following mix. Sand media shall have an effective particle size of not more than 0.49mm, it shall have an angular grain shape, a hardness of 7, be 99% silica, and not leach nutrients. The media shall also include a blend of Perlite and Activated Alumina.

2.2 PERFORMANCE

A. The stormwater filter system shall be capable of treating 100% of the required treatment flow at full sediment load conditions.

B. The stormwater filter system's cartridges shall have no moving parts.

C. The stormwater treatment unit shall be designed to remove at least 80% of the suspended solids load. Said removal shall be based on full-scale testing using SIL-CO-SIL 106 media gradation with a d_{50} of 23 microns (manufactured by US Silica) or equivalent. Said full scale testing shall have included sediment capture based on actual total mass collected by the stormwater filtration system.

D. The stormwater filtration system shall reduce incoming turbidity (measured as NTUs) by 50% or more and shall not have any components that leach nitrates or phosphates.

E. The stormwater filtration cartridge shall be equipped with a hydrodynamic backwash mechanism to extend the filter's life and optimize its performance. Inlet flow shall be upflow.

F. The stormwater filtration system shall be designed to remove a minimum of 50% of the incoming Total Phosphorus (TP) load.

G. The stormwater filtration system's cartridges shall have the following minimum flow and sediment load capacities:

Design Flow per BFC- (gpm) Nominal	Treated Sediment Load (lbs)
30	150
23	200
20	250
15	300

2.3 PRECAST CONCRETE VAULT COMPONENTS

A. Concrete structures shall be designed for H-20 traffic loading and applicable soil loads or as otherwise determined by a Licensed Professional Engineer. The materials and structural design of the devices shall be per ASTM C857 and ASTM C858.

B. The minimum compressive strength of the concrete shall be 4000 psi.

C. Cement shall conform to the requirements for Portland cement of Specification C150.

D. Aggregates shall conform to Specification C33, except that the requirement for gradation shall not apply.

E. Reinforcement shall consist of wire conforming to Specification A82 or Specification A496, of wire fabric conforming to Specification A185 or Specification A497, or of bars of Grade 40 steel conforming to Specification A615/A615M.

F. The access cover shall be designed for HS20-44 traffic loading and shall provide a minimum 30 inch clear opening.

G. All joints shall be waterproof with wrapped gaskets or sealed with a mastic treatment.

H. Any grout used within the system shall meet the ASTM C 1107 “Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-Shrink)”. Grades A, B and C at a pourable and plastic consistency at 70ºF. CRD C 621 “Corps of Engineers Specification For Non-Shrink Grout.”

2.4 CONTRACTOR PROVIDED COMPONENTS

Specifications for all contractor-provided components are minimum requirements. If a higher standard is shown on the plans or described in another section of the technical specifications, then the higher standard shall govern.

A. Sub-Base: Sub-base shall be six-inch minimum of ¾-inch minus rock, 95% compaction. Compact undisturbed sub-grade materials to 95% of maximum density at +/-2% of optimum moisture content. Unsuitable material below sub-grade shall be replaced to engineer's approval.

B. The minimum compressive strength of the concrete for cast in place structures shall be 4000 psi.

C. Silicone Sealant: Shall be pure RTV silicone conforming to Federal Specification Number TT S001543A or TT S00230C or Engineer approved.

D. Grout: Shall be non-shrink grout meeting the requirements of Corps of Engineers CRD-C588. Specimens molded, cured and tested in accordance with ASTM C-109 shall have minimum compressive strength of 6,200 psi. Grout shall not exhibit visible bleeding.

E. Backfill: Backfill shall be ¾-inch minus rock at 95% compaction.

PART 3.00 EXECUTION

3.1 PRECAST CONCRETE VAULT

A. Vault top finish grade shall be even with surrounding finish grade surface unless otherwise noted on plans.

B. Contractor shall grout all inlet and outlet pipes flush with vault interior wall.

C. Sanded PVC fittings shall be used on all PVC inlet and outlet pipes.

3.2 ANTI-FLOTATION BALLAST (Where Required)

A. Ballast shall be to the dimensions specified by the engineer and noted on the data block. Ballast shall run the entire length of the long side of the vault on both sides. Ballast shall not encase the inlet and/or outlet piping. Provide 12" clearance from outside diameter of pipe.

3.3 CLEAN UP

A. Remove all excess materials, rocks, roots, or foreign debris, leaving the site in a clean, complete condition approved by the engineer. All filter components shall be free of any foreign materials including concrete.

3.4 FILTER CARTRIDGES

A. Filter cartridges shall not be installed until the project site is clean and stabilized or if the inlet and outlet pipes are temporarily blocked off. The project site includes any surface that contributes stormwater runoff to the BayFilter system. All impermeable surfaces shall be clean and free of dirt and debris. All catch basins, manholes and pipes shall be free of dirt and sediments.

3.5 INSTALLATION NOTES

A. Contractor to strictly follow the approved design and construction specifications. Any substitutions are to be pre-approved by the inspector and design engineer in writing prior to placement of materials.

B. The stormwater filtration system(s) may not be activated until all contributing drainage areas to each facility are stabilized. Construction of the facility shall not proceed without prior authorization of the inspector.

C. No "rock dust" can be used for sand.

D. Contact "Miss Utility" at 1-800-257-7777 at least 48 hours prior to the start of construction.

PART 4.00 EXECUTION

4.1 INSTALLATION

A. Installation of the BayFilter System(s) shall be performed per manufacturer's Installation Instructions. Such instructions can be obtained by calling BaySaver Technologies, Inc. at 1.800.229.7283 or by login to www.BaySaver.com.

Installation of a BayFilter™ System

1. Contact utility locator to mark any nearby underground utilities and make sure it is safe to excavate.

2. Reference the site plan and stake out the location of the BayFilter™ manhole/vault.

3. Excavate the hole, providing any sheeting and shoring necessary to comply with all federal, state and local safety regulations.

4. Level the subgrade to the proper elevation. Verify the elevation against the manhole/vault dimensions, the invert elevations, and the site plans. Adjust the base aggregate, if necessary.

5. Have the soil bearing capacity verified by a licensed engineer for the required load bearing capacity. On solid subgrade, set the first section of the BayFilter™ manhole/vault.

6. Check the level and elevation of the first section to ensure it is correct before adding any riser sections.

7. If additional section(s) are required, add a watertight seal to the first section of the BayFilter™ manhole/vault. Set additional section(s) of the manhole/vault, adding a watertight seal to each joint.

8. Install the trolley system (if applicable). See separate instruction sheet.

9. Install the PVC outlet manifold. Glue all PVC joints with the exception of the BayFilter cartridge coupling.

10. Install the PVC outlet pipe in BayFilter™ manhole/vault.

11. Install the inlet pipe to the BayFilter™ manhole/vault.

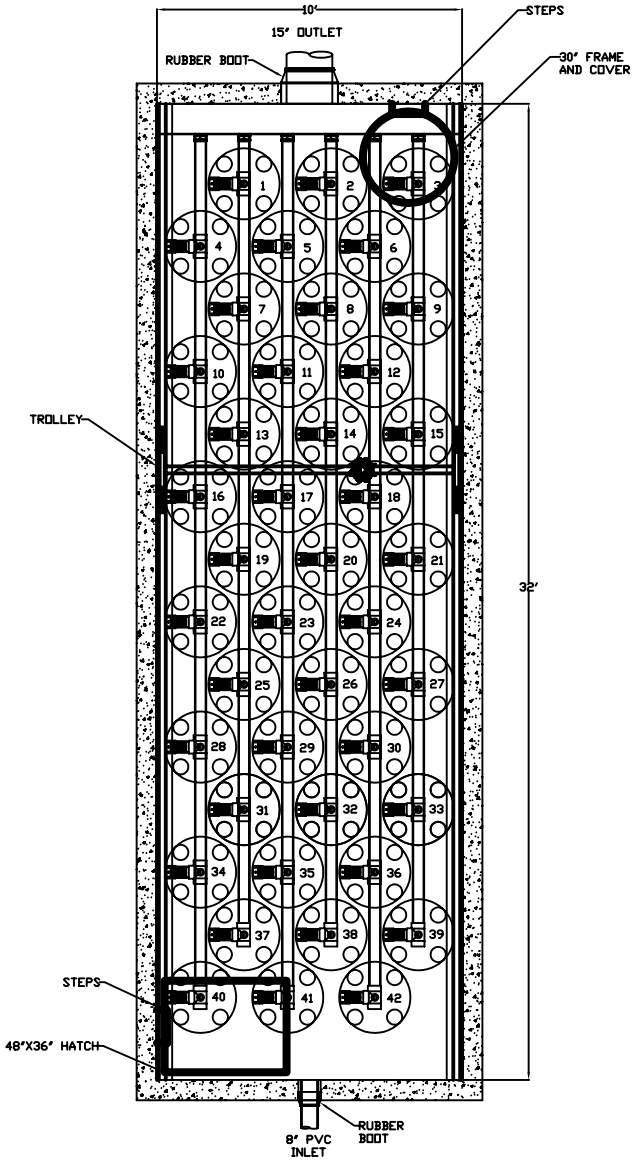
12. Install Bayfilter Drain Down Modules (DDM) with red mark aligned to the top of the manifold system.

13. After the site is stabilized, remove any accumulated sediment or debris from the vault and install the flow disks and the BayFilter™ cartridges.

TOOL LIST:

- PVC GLUE AND PRIMER
- CRANE / LIFTING MECHANISM TO LOWER THE CARTRIDGES IN THE VAULT (EACH CARTRIDGE WEIGHS 350 LB)
- SCREWDRIVER OR NUT DRIVER FOR FERNCO COUPLERS
- SOFT BLOW HAMMER
- SAW (IN CASE PVC SCH 40 PIPING LENGTH NEEDS TO BE ADJUSTED).

BAYFILTER STORMWATER FILTRATION SYSTEM PROTECTED BY U.S. PATENT # 6,869,528



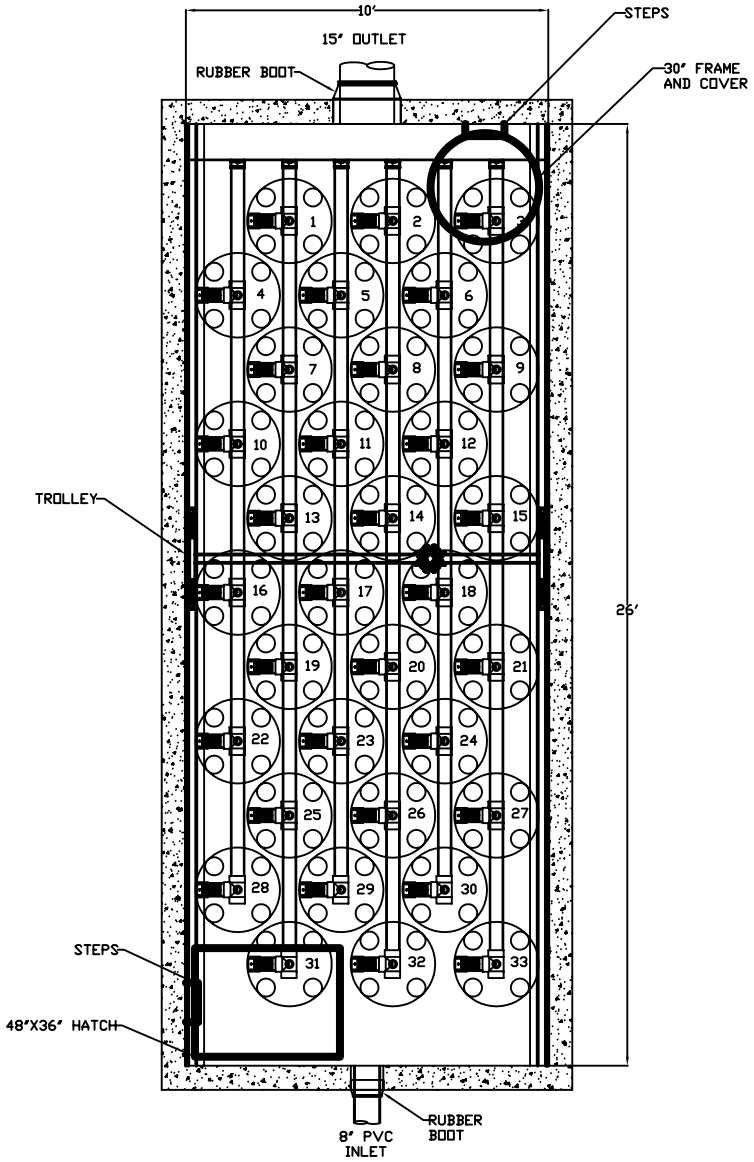
REV	DESCRIPTION	DATE	APPR	NOTES:

BAYSAVER
TECHNOLOGIES, INC.
ENGINEERING STORMWATER SOLUTIONS
WWW.BAYSAVER.COM

DESIGNED:	TEP	DATE:	9/30/08
DRAWN:	EKH	SCALE:	N.T.S.
CHECKED:	EKH	DWG NO:	BF-204

VAULT BAYFILTER
PRELIMINARY
MODEL PVF-10-32-42

BAYFILTER STORMWATER FILTRATION SYSTEM PROTECTED BY U.S. PATENT # 6,869,528



REV	DESCRIPTION	DATE	APPR	NOTES:

BAYSAVER
TECHNOLOGIES, INC.
ENGINEERING STORMWATER SOLUTIONS
WWW.BAYSAVER.COM

DESIGNED:	TEP	DATE:	11/14/07
DRAWN:	EKH	SCALE:	N.T.S.
CHECKED:	AJW	DWG NO:	BF-203

VAULT BAYFILTER
MODEL PVF-10-26-33
PRELIMINARY

APPENDIX E - Storm Water Management and Discharge Control Maintenance Agreement

for

Main Street at Carmel Valley

SWMDCMA will be prepared during final engineering

(Intentionally Left Blank)

APPENDIX F - Estimated Maintenance Cost

for

Treatment Control Best Management Practices (BMPs)

ATTACHMENT F Estimated O & M Costs for BMP Project

Estimated vlaues derived from Caltrans Pilot BMP Study. This spreadsheet will change as additional data becomes available.						Labor			Equipment				Materials		Total	Comments
						Per. Hrs	Rate	Cost	Type	Days	rate	Cost	Item	Cost	Cost	
BIOFILTER – STRIPS and SWALES																
Preventive Maintenance and Routine Inspections																
ROUTINE ACTIONS	MAINTENANCE INDICATOR	FIELD MEASUREMENT	MEASUREMENT FREQUENCY	MAINTENANCE ACTIVITY	SITE-SPECIFIC REQUIREMENTS											
Height of vegetation	Average vegetation height exceeds 12 inches, emergence of trees, or woody vegetation	Visual inspection of vegetation throughout strip/swale	Once during wet season, once during dry season.(depending on growth)	Cut vegetation to an average height of 6 inches	Remove any trees, or woody vegetation.	10	43.63	436.3	one-ton truck	2	26.84	53.68	string trimmer, rake, fork, bags, safety equipment	50	539.98	
Assess adequate vegetative cover	Less than 90 percent coverage in strip invert/swale or less than 70 percent on swale side slope	Visual inspection of strip/swale. Prepare a site schematic to record location and distribution of barren or browning spots to be restored. File the schematic for assessment of persistent problems.	Assess quantity needed in May each year late wet season and late dry season.	Reseed/revegetate barren spots by Nov.		8	43.63	349.04	one-ton truck & hydroseeder	1	48.15	48.15	seed	150	547.19	
				Scarify area to be restored, to a depth of 2-inches. Restore side slope coverage with hydroseed mixture.		0	43.63	0	one-ton truck	0	26.84	0			0	
				If after 2 applications (2 seasons) of reseeding/revegetating and growth is unsuccessful both times, an erosion blanket or equivalent protection will be installed over eroding areas		0	43.63	0	one-ton truck	0	26.84	0	blanket	0	0	
Inspect for debris accumulation	Debris or litter present	Visual observation	During routine trashing, per Districts schedule.	Remove litter, and debris.	None	0	0	0	one-ton truck	0	0	0			0	
Inspect for accumulated sediment	Sediment at or near vegetation height, channeling of flow, inhibited flow due to change in slope.	Visual observation	Annually	Remove sediment. If flow is channeled, determine cause and take corrective action. If sediment becomes deep enough to change the flow gradient, remove sediment during dry season, characterize and properly dispose of sediment, and revegetate.		16	43.63	698.08	one-ton truck & hydroseeder	1	48.15	48.15	seed, testing and disposal of sediment	300	1046.23	once every three years
				Notify engineer to determine if regrading is necessary. If necessary, regrade to design specification and revegetate swale/strip. If regrading is necessary, the process should start in May. Revegetate strip/swale in Nov. Target completion prior to wet season.	None	2	43.63	87.26				0			87.26	

ATTACHMENT F Estimated O & M Costs for BMP Project

Estimated vlaues derived from Caltrans Pilot BMP Study. This spreadsheet will change as additional data becomes available.						Labor			Equipment				Materials		Total	Comments
						Per. Hrs	Rate	Cost	Type	Days	rate	Cost	Item	Cost	Cost	
Inspect for burrows	Burrows, holes, mounds	Visual observation	Annually and after vegetation trimming.	Where burrows cause seepage, erosion and leakage, backfill firmly.		0	0	0	one-ton truck	0	26.84	0			0	
General Maintenance Inspection	Inlet structures, outlet structures, side slopes or other features damaged, significant erosion,emergence of trees, woody vegetation , fence damage, etc.	Visual observation	Semi-Annually, late wet season and late dry season.	Corrective action prior to wet season. Consult engineer if an immediate solution is not evident.	Remove any trees, or woody vegetation.	16	43.63	698.08	one-ton truck	2	26.84	53.68			751.76	
TOTAL BIO FILTER AND SWALES						52		2268.76				203.66		500	2972.42	
BIO STRIP WITH SPREADER DITCH					Includes all the above plus the following.			0				0			0	
Inspect for standing water	Water accumulation in spreader ditch	Standing water in spreader ditch	Within 72 hours after a storm event 0.75 inches or greater.	De-water the spreader ditch to a depth of less than 0.25 inches. If sediment impedes the de-watering activity, then move or remove that portion of the sediment. Characterize and properly dispose.		3	43.63	130.89	0	0	0	0			130.89	
				De-water the spreader ditch to a depth of less than 0.25” by removing the bypass plug and allowing the water to drain into the infiltration trench. Use care to prevent sediment from discharging into the infiltration trench. Replace the bypass plug once the de-watering has been completed.		6	43.63	261.78	0	0	0	0			261.78	
				At the end of the wet season, remove the bypass plug and allow the spreader ditch to drain. Use care to prevent sediment from discharging into the infiltration trench. Remove, characterize, and dispose of sediment from the spreader ditch. Replace the bypass plug before the beginning of the wet season.		2	43.63	87.26	sedan	1	21.28	21.28	testing & disposal costs	200	308.54	
TOTAL BIO STRIP WITH SPREADER DITCH						55		2399.65				203.66		500	3103.31	
CONTINUOUS DEFLECTIVE SEPARATION (CDS) UNITS																
Preventive Maintenance and Routine Inspections																
DESIGN CRITERIA,																
ROUTINE ACTIONS	MAINTENANCE INDICATOR	FIELD MEASUREMENT	MEASUREMENT FREQUENCY	MAINTENANCE ACTIVITY	SITE-SPECIFIC REQUIREMENTS											
Inspect sump for accumulation of material.																
	or							0				0			0	

ATTACHMENT F Estimated O & M Costs for BMP Project

Estimated vlaues derived from Caltrans Pilot BMP Study. This spreadsheet will change as additional data becomes available.						Labor			Equipment				Materials		Total	Comments
						Per. Hrs	Rate	Cost	Type	Days	rate	Cost	Item	Cost	Cost	
	When the sump is 50% full during two consecutive monthly inspections.							0				0			0	
	or															
	Annually in May, effect cleaning within 15 days			Empty unit		72	43.63	3141.36	one-ton truck & vactor	3	198.75	596.25	testing & disposal costs	1800	5537.61	
								0				0			0	
Inspect weir box for accumulation of material.	Presence of trash and debris	Visual observation	Monthly during the wet season	Remove trash and debris while onsite conducting inspection.		0	0	0		0	0	0		0	0	Hours accounted for during inspections
Inspect for standing water. (Include with all of inspection)	Standing water in sump	Visual observation	Annually, 72 hours after target2 storm (0.75 in)	If standing water cannot be removed or remains through the wet season notify VCD.	None											
Inspect the screen for damage and to ensure that it is properly fastened.	Screen becomes clogged, damaged or loose	Visual observation	Annually before wet season.	Clean screen.	None	0	0	0	0	0	0	0	0	0	0	Hours accounted for during inspections
Inspection for structural integrity	Holes in screen, large debris, damage to housing or weir box	Visual observation	Annually or after a cleanout.	Immediately consult with engineer and manufacturer's representative to develop a course of action, effect repairs prior to the wet season.	None			0				0			0	Hours accounted for during inspections
TOTAL CDS UNITS						72		3141.36				596.25		1800	5537.61	
DRAIN INLET INSERTS – FOSSIL FILTER																
Preventive Maintenance and Routine Inspections																
DESIGN CRITERIA,																
ROUTINE ACTIONS	MAINTENANCE INDICATOR	FIELD MEASUREMENT	MEASUREMENT FREQUENCY	MAINTENANCE ACTIVITY	SITE-SPECIFIC REQUIREMENTS											
Inspect for debris/trash	Sufficient debris/trash that could interfere with proper functioning of insert	Visual observation	During the wet season:				43.63	0				0			0	
Before and once during each target2 storm (0.25 in) event				Remove and properly dispose of debris/trash. Target completion period while onsite conducting inspection.		18	43.63	785.34				0			785.34	
Oil and grease removal	Absorbent granules dark gray, or darker, or unit clogged with sediment.	Visual observation	At the end of each target2 storm (0.25 in) event	Replace Fossil FilterTM adsorbent within 10 working days. Characterize and properly dispose spent media prior to wet season.		2	43.63	87.26				0			87.26	
Inspection for structural integrity	Broken or otherwise damaged insert	Visual observation	Twice per year in October and May.	Replace insert or immediately consult vendor to develop course of action, effect repairs within 10 working days	None	2	43.63	87.26				0			87.26	
Annual renewal of medium	End of wet season, April 30	None	Annually, in May	Remove, characterize, and properly dispose of media a Replace media before Oct 1	None	2	43.63	87.26	sedan	1	21.28	21.28	new adsorbent and testing & disposal costs	115	223.54	
TOTAL DRAIN INLET INSERTS-FOSSIL FILTERS						24		1047.12				21.28		115	1183.4	

ATTACHMENT F Estimated O & M Costs for BMP Project

Estimated vlaues derived from Caltrans Pilot BMP Study. This spreadsheet will change as additional data becomes available.						Labor			Equipment				Materials		Total	Comments
						Per. Hrs	Rate	Cost	Type	Days	rate	Cost	Item	Cost	Cost	
DRAIN INLET INSERTS – STREAM GUARD																
Preventive Maintenance and Routine Inspections																
DESIGN CRITERIA,																
ROUTINE ACTIONS	MAINTENANCE INDICATOR	FIELD MEASUREMENT	MEASUREMENT FREQUENCY	MAINTENANCE ACTIVITY	SITE-SPECIFIC REQUIREMENTS											
Sediment removal	Sediment more than 6-inches	Visual inspection of sediment collected within insert	During the wet season:	Replace insert. Target completion while onsite conducting inspection.				0				0			0	
Inspect for debris/trash	Sufficient debris/trash that could interfere with proper functioning of insert	Visual observation	During the wet season	Remove and dispose of debris/trash. Target completion period while onsite conducting inspection.				0				0			0	
Oil and grease removal	When oil absorbent polymer becomes saturated with oil	Visual observation (absorbent polymer expansion indicates oil saturation)	Monthly	Within 10 working days, replace oil absorbent polymer		2	43.63	87.26				0			87.26	
Inspection for structural integrity	Signs of rips, gashes, and/or fallen media	Visual observation	Twice per year in October and May.	Replace insert or immediately consult vendor to develop a course of action, effect repairs within 10 working days	None	2	43.63	87.26				0			87.26	
Annual renewal of medium	End of wet season, April 30	None	Annually, in May	Remove characterize, and properly dispose of media.. Replace media before Oct 1	None	2	43.63	87.26	sedan	1	21.28	21.28	new adsorbent and testing & disposal costs	195	303.54	
TOTAL DRAIN INLET INSERTS-STREAM GUARDS						6		261.78				21.28		195	478.06	
EXTENDED DETENTION BASINS																
Preventive Maintenance and Routine Inspections																
DESIGN CRITERIA,																
ROUTINE ACTIONS	MAINTENANCE INDICATOR	FIELD MEASUREMENT	MEASUREMENT FREQUENCY	MAINTENANCE ACTIVITY	SITE-SPECIFIC REQUIREMENTS											
Basin side slope planted for erosion protection and planted invert	Average vegetation height greater than 12-inches, emergence of trees or woody vegetation,	Visual observation and random measurements through out the side slope area	Once during wet season, once during dry season.	Cut vegetation to an average height of 6-inches and remove trimmings. Remove any trees, or woody vegetation.		48	43.63	2094.24	one-ton truck	2	26.84	53.68	string trimmer, rake, fork, bags, safety equipment	50	2197.92	
Slope stability	Evidence of erosion	Visual observation	October each year	Reseed/revegetate barren spots prior to wet season.		0	43.63	0	one-ton truck & hydroseeder	0	48.15	0	seed	150	150	
				Contact environmental or landscape architect for appropriate seed mix.												
				Scarify surface if needed.												
				If after two applications (2 seasons) of reseeding/revegetating and growth is unsuccessful both times, an erosion blanket or equivalent protection will be installed over eroding areas. No erosion blanket will be installed in the basin invert.	NOT AN ANNUAL COST	0	43.63	0	one-ton truck	0	26.84	0	blanket	0	0	

ATTACHMENT F Estimated O & M Costs for BMP Project

Estimated vlaues derived from Caltrans Pilot BMP Study. This spreadsheet will change as additional data becomes available.						Labor			Equipment				Materials		Total	Comments
						Per. Hrs	Rate	Cost	Type	Days	rate	Cost	Item	Cost	Cost	
Inspect for standing water.	Standing water for more than 72 hours	Visual observation	Annually, 72 hours after a target2 storm (0.75 in) event	Drain facility	None											
				Check and unclog clogged orifice.	Should be Annual Mtce.											
				Notify engineer, if immediate solution is not evident.												
Inspection for trash and debris	Debris/trash present	Visual observation	During routine trashing, per Districts schedule.	Remove and dispose of trash and debris	None											
Inspection for sediment management and characterization of sediment for removal	Sediment depth exceeds marker on staff gage	Measure depth at apparent maximum and minimum accumulation of sediment. Calculate average depth	Annually	Remove and properly dispose of sediment. Regrade if necessary.		16	43.63	698.08	4-yd dump truck, backhoe & trailer, one-ton truck & hydroseeders edan	0.4	176.5	70.6	testing and disposal	460	1228.68	once every 5 years
Inspect for burrows	Burrows, holes, mounds	Visual observation	Annually and after vegetation trimming.	Where burrows cause seepage, erosion and leakage, backfill firmly.												
General Maintenance Inspection	Inlet structures, outlet structures, side slopes or other features damaged, significant erosion, emergence of trees or woody vegetation, graffiti or vandalism, fence damage, etc.	Visual observation	Semi-Annually, late wet season and late dry season Monthly	Corrective action prior to wet season. Consult engineers if immediate solution is not evident.	None	16	43.63	698.08	one-ton truck	2	26.84	53.68			751.76	
TOTAL EXTENDED BASIN						80		3490.4				177.96		660	4328.36	
INFILTRATION BASINS																
Preventive Maintenance and Routine Inspections																
DESIGN CRITERIA,																
ROUTINE ACTIONS	MAINTENANCE INDICATOR	FIELD MEASUREMENT	MEASUREMENT FREQUENCY	MAINTENANCE ACTIVITY	SITE-SPECIFIC REQUIREMENTS											
Vegetation of basin invert and side slopes	Vegetation height exceeds 12 inches, emergence of trees or woody vegetation,	Visual observation and random measurements through out the side slope and invert area	Once during wet season, once during dry season.	Cut vegetation to an average height of 6-inches. Remove any trees, or woody vegetation.	None	48	43.63	2094.24	two-ton truck	2	50	100	string trimmer, rake, fork, bags, safety equipment	50	2244.24	
Inspect for standing water.	Standing water for more than 72 hours	Visual observation	Annually, 72 hours after a target2 storm (0.75 in) event.	Drain facility, if possible.		16	43.63	698.08	one-ton truck	4	26.84	107.36			805.44	
				Notify engineer to consider:												
				Remove sediment, scarify invert, and regrade if necessary.				0				0			0	covered under sediment removal
				If unable to achieve acceptable infiltration rate or implement alternative solution then move to decommission				0				0			0	

ATTACHMENT F Estimated O & M Costs for BMP Project

Estimated vlaues derived from Caltrans Pilot BMP Study. This spreadsheet will change as additional data becomes available.						Labor			Equipment				Materials		Total	Comments
						Per. Hrs	Rate	Cost	Type	Days	rate	Cost	Item	Cost	Cost	
				If standing water can not be removed then notify VCD.	None											
Inspection for trash and debris at inlet structures	Debris/trash present	Visual observation	During routine trashing, per Districts schedule.	Remove and dispose of trash and debris	None											
Inspection for sediment accumulation	Sediment depth exceeds marker on staff gage.	Measure depth at apparent maximum and minimum accumulation of sediment. Calculate average depth	Annually	Remove, characterize and properly dispose of sediment. Regrade and revegetate bare areas.	None	4	43.63	174.52	4-yd dump truck, loader & trailer, grader, sedan, one-ton truck & hydroseeder	0.5	256.94	128.47	seed, testing & disposal	150	452.99	once every 10 years
Slope stability	Evidence of erosion.	Visual observation	October each year.	Reseed/revegetate barren spots by Nov. Scarify surface if needed.		20	43.63	872.6	one-ton truck & hydroseeder	1	48.15	48.15	seed	275	1195.75	
				If after two applications (2 seasons) of reseeding/revegetating and growth is unsuccessful both times, an erosion blanket or equivalent protection will be installed over eroding areas. No erosion blanket will be installed in the basin invert.		0	43.63	0	one-ton truck	0	26.84	0	blanket	60	60	
				Contacet environmental or landscape architect for appropriate seed mix.	None	0	43.63	0				0			0	
Inspect for burrows	Burrows, holes, mounds.	Visual observation	Annually and after vegetation trimming.	Where burrows cause seepage, erosion and leakage, backfill firmly.	None	0	43.63	0	one-ton truck	0	26.84	0			0	
General Maintenance Inspection	Inlet structures, outlet structures, side slopes or other features damaged, significant erosion, emergence of trees or woody vegetation, graffiti or vandalism, fence damage, etc.	Visual observation	Semi-Annually, late wet season and late dry season	Take corrective action prior to wet season. Consult engineer if immediate solution is not evident.	None	20	43.63	872.6	two-ton truck	1	50	50			922.6	
TOTAL INFILTRATION BASIN						108		4712.04				433.98		535	5681.02	
INFILTRATION TRENCHES																
Preventive Maintenance and Routine Inspections																
DESIGN CRITERIA,																
ROUTINE ACTIONS	MAINTENANCE INDICATOR	FIELD MEASUREMENT	MEASUREMENT FREQUENCY	MAINTENANCE ACTIVITY	SITE-SPECIFIC REQUIREMENTS											
Inspect for standing water	Standing surface water for more than 72 hours	Visual observation	Annually, 72 hours after a target2 storm (0.75 in) event	Drain facility		16	43.63	698.08	one-ton truck	2	26.84	53.68			751.76	
				Notify engineer to consider:		0	43.63	0				0			0	

ATTACHMENT F Estimated O & M Costs for BMP Project

Estimated vlaues derived from Caltrans Pilot BMP Study. This spreadsheet will change as additional data becomes available.						Labor			Equipment				Materials		Total	Comments
						Per. Hrs	Rate	Cost	Type	Days	rate	Cost	Item	Cost	Cost	
				Undertake investigation for course of action to achieve acceptable infiltration rate. If unable to achieve acceptable infiltration then BMP operations cease.				0				0			0	
				If standing water can not be removed, notify VCD.	None			0				0			0	Does not include Vector Control Agency costs
Inspection for trash and debris at inlet and outlet structures	Trash/debris present	Visual observation	During routine trashing per Districts schedule.	Remove and dispose of trash and debris.	None	0	43.63	0				0		0	0	
Inspect for sediment accumulation	Visible sediment	Visual inspection of the stone aggregate, no sediment should be visible at the top of the trench due to sediment buildup from filter fabric.	Annually.	Remove top layer of trench, silt, filter fabric and stone, wash stone and reinstall fabric and stone into trench prior to wet season.	None	8	43.63	349.04	gradeall shovel, 10-yd dump trucks	0.066	6000	396	replacement stone and filter fabric	1200	1945.04	once every 15 years
General Maintenance Inspection	Inlet structures, outlet structures, filter fabric or other features damaged, emergence of trees or woody vegetation, graffiti or vandalism, fence damage, etc.	Visual observation	Semi-Annually, late wet season and late dry seasonMonthly	Take corrective action, prior to wet season. Consult engineer if immediate solution is not evident.	None Remove any trees, or woody vegetation.	8	43.63	349.04	one-ton truck	2	26.84	53.68			402.72	
TOTAL INFILTRATION TRENCHES						32		1396.16				503.36		1200	3099.52	
MEDIA FILTERS – PERLITE/ZEOLITE																
Preventive Maintenance and Routine Inspections																
DESIGN CRITERIA,																
ROUTINE ACTIONS	MAINTENANCE INDICATOR	FIELD MEASUREMENT	MEASUREMENT FREQUENCY	MAINTENANCE ACTIVITY	SITE-SPECIFIC REQUIREMENTS											
						0	43.63	0	one-ton truck	0	26.84	0			0	
Inspect for sediment accumulation in pre-treatment sedimentation chamber	Sediment occupies 10% of the filter chamber volume.	Measure with appropriate device	Annually in May.			4	43.63	174.52	one-ton truck	1	26.84	26.84			201.36	
				Remove sediment prior to wet season. Characterize sediment and properly dispose	None	8	43.63	349.04	sedan	1	21.28	21.28	testing & disposal costs	600	970.32	
								0				0			0	
Inspect for minor maintenance	Per manufacture's guidelines	None	Annually	Clean per manufacturer's guidelines. Prior to wet season.	None.	4	43.63	174.52	one-ton truck	1	26.84	26.84			201.36	

ATTACHMENT F Estimated O & M Costs for BMP Project

Estimated vlaues derived from Caltrans Pilot BMP Study. This spreadsheet will change as additional data becomes available.						Labor			Equipment				Materials		Total	Comments
						Per. Hrs	Rate	Cost	Type	Days	rate	Cost	Item	Cost	Cost	
Manufacturer's recommended major maintenance	Per manufacture's guidelines	Per manufacture's guidelines	Annually	Consult with manufacturer regarding need for replacement of canisters. If manufacturer confirms need, replace canisters. Prior to wet season. When canisters are changed send canisters to manufacturer to determine remaining life of the media	None	8	43.63	349.04	one-ton truck	1	26.84	26.84	major maintenance	5000	5375.88	By Contract and oversite
Inspection for trash and debris at inlet and outlet structures and within vaults	Trash/debris present	Visual observation	During routine trashing, per Districts schedule.	Remove and dispose of trash and debris when on site conducting inspections.	None	0	43.63	0				0			0	
Inspect for standing water	Water accumulation in any structure or other location within the filter	Standing water in any structure or other location within the filter	Annually, at end of wet season.	Gravity drain where possible.		0	43.63	0	one-ton truck	1	0	0			0	
				If standing water can not be removed or remains through wet season notify VCD.	None			0				0			0	Does not include Vector Control Agency costs
General Maintenance Inspection	Inlet structures, outlet structures, vault, piping, or other features damaged and for graffiti or vandalism	Visual observation	Semi-Annually, late wet season and late dry season Monthly	Take corrective action prior to wet season. Consult engineer if immediate solution is not evident.	None	8	43.63	349.04	one-ton truck	2	26.84	53.68			402.72	
TOTALMEDIA FILTERS – PERLITE/ZEOLITE						32		1396.16				155.48		5600	7151.64	
MEDIA FILTERS – SAND W/PUMP																
Preventive Maintenance and Routine Inspections																
DESIGN CRITERIA,																
ROUTINE ACTIONS	MAINTENANCE INDICATOR	FIELD MEASUREMENT	MEASUREMENT FREQUENCY	MAINTENANCE ACTIVITY	SITE-SPECIFIC REQUIREMENTS											
Drain time of 48 hours	Drain time exceeds 72 hours	Determine drain time by visual observation	Annually, after one target2 storm (0.75 in) event during wet season	Remove sediment, trash and debris.		4	43.63	174.52	one-ton truck	1	26.84	26.84			201.36	
				Check orifice				0				0			0	
				Notify engineer to consider removing top 2 inches of media and dispose of sediment. Restore media depth to 18 inches when overall media depth drops to 12 inches. Complete prior to wet season.	Escondido MS Delaware SF – Remove and restore media depth to 12 inches.	12	43.63	523.56	boom truck	0.5	74.94	37.47	drums, shovel, rake, drum grappler, confined space equipment characterization and disposal	1250	1811.03	every 2 years

ATTACHMENT F Estimated O & M Costs for BMP Project

Estimated vlaues derived from Caltrans Pilot BMP Study. This spreadsheet will change as additional data becomes available.						Labor			Equipment				Materials		Total	Comments
						Per. Hrs	Rate	Cost	Type	Days	rate	Cost	Item	Cost	Cost	
Inspect for sediment accumulation in sedimentation chamber	Sediment depth exceeds marker on staff gage.	Measure with appropriate device	Measure sediment depth annually.	Remove sediment prior to wet season. Characterize sediment and properly dispose.		12	43.63	523.56	boom truck	0.5	74.94	37.47	drums, shovel, rake, drum grappler, confined space equipment characterization and disposal	1250	1811.03	every 2 years
Inspection for trash / debris	Trash and debris present	Visual observation	During routine trashing, per Districts schedule.	Remove and dispose of trash and debris during routine trashing.	None	0	43.63	0	one-ton truck	0	26.84	0	confined space equipment	0	0	
Inspect pumps for proper functioning	Pump does not operate	Energize pump to see if water is discharged	After every storm.	Make assessment to determine if problem is electrical or mechanical. Take appropriate action. Replace pump if needed.	District 7 filters only	0	43.63	0	one-ton truck	0	26.84	0	confined space equipment	0	0	
Inspect pumps for serviceability and periodic maintenance	Per manufacture's guidelines	Per manufacture's guidelines	Per manufacture's guidelines	Per manufacture's guidelines	District 7 filters only	0	55.7	0	one-ton truck	0	26.84	0	pump or parts, confined space equipment	0	0	
Inspect for burrows	Burrows, holes, mounds.	Visual observation	Annual inspections after vegetation trimming.	Where burrows cause seepage, erosion and leakage, backfill firmly.	None			0				0			0	
Inspect for standing water	Water accumulation in any structure or other location within the filter	Standing water in any structure or other location within the filter	Annually, 72 hours after a target2 storm (0.75 in)	Gravity drain where possible.		4	43.63	174.52	one-ton truck	1	26.84	26.84			201.36	
				Notify engineer, if immediate solution is not evident.		2	43.63	87.26				0			87.26	
				If standing water can not be removed or remains through wet season notify VCD.	None	2	43.63	87.26				0			87.26	Does not include Vector Control Agency costs
General Maintenance Inspection	Inlet structures, outlet structures, filter fabric or other features damaged, emergence of vegetation, graffiti or vandalism, fence damage, etc.	Visual observation	Semi-Annually, late wet season and late dry season Monthly	Within 30 working days, take corrective action. Consult engineer if immediate solution is not evident.	None	8	43.63	349.04	one-ton truck	2	26.84	53.68			402.72	
TOTAL MRDIA FILTER-SAND W/PUMP						44		1919.72				182.3		2500	4602.02	
MEDIA FILTERS – SAND WO/PUMP																
Preventive Maintenance and Routine Inspections																
DESIGN CRITERIA,																
ROUTINE ACTIONS	MAINTENANCE INDICATOR	FIELD MEASUREMENT	MEASUREMENT FREQUENCY	MAINTENANCE ACTIVITY	SITE-SPECIFIC REQUIREMENTS											

ATTACHMENT F Estimated O & M Costs for BMP Project

Estimated vlaues derived from Caltrans Pilot BMP Study. This spreadsheet will change as additional data becomes available.						Labor			Equipment				Materials		Total	Comments
						Per. Hrs	Rate	Cost	Type	Days	rate	Cost	Item	Cost	Cost	
Drain time of 48 hours	Drain time exceeds 72 hours	Determine drain time by visual observation	Annually, after one target2 storm (0.75 in) event during wet season	Remove sediment, trash and debris.		4	43.63	174.52	one-ton truck	1	26.84	26.84			201.36	
				Check orifice				0				0			0	
				Notify engineer to consider removing top 2 inches of media and dispose of sediment. Restore media depth to 18 inches when overall media depth drops to 12 inches. Complete prior to wet season.	Escondido MS Delaware SF – Remove and restore media depth to 12 inches.	8	43.63	349.04	boom truck	0.33	74.94	24.7302	drums, shovel, rake, drum grappler, confined space equipment characterization and disposal	833	1206.77	every 3 years
Inspect for sediment accumulation in sedimentation chamber	Sediment depth exceeds marker on staff gage.	Measure with appropriate device	Measure sediment depth annually.	Remove sediment prior to wet season. Characterize sediment and properly dispose.		8	43.63	349.04	boom truck	0.33	74.94	24.7302	drums, shovel, rake, drum grappler, confined space equipment characterization and disposal	833	1206.77	every 3 years
Inspection for trash / debris	Trash and debris present	Visual observation	During routine trashing, per Districts schedule.	Remove and dispose of trash and debris during routine trashing.	None	24	43.63	1047.12	one-ton truck	2	26.84	53.68	confined space equipment	50	1150.8	
Inspect for burrows	Burrows, holes, mounds.	Visual observation	Annual inspections after vegetation trimming.	Where burrows cause seepage, erosion and leakage, backfill firmly.	None			0				0			0	
Inspect for standing water	Water accumulation in any structure or other location within the filter	Standing water in any structure or other location within the filter	Annually, 72 hours after a target2 storm (0.75 in)	Gravity drain where possible.		4	43.63	174.52	one-ton truck	1	26.84	26.84			201.36	
				Notify engineer, if immediate solution is not evident.		2	43.63	87.26				0			87.26	
				If standing water can not be removed or remains through wet season notify VCD.	None	2	43.63	87.26				0			87.26	Does not include Vector Control Agency costs
General Maintenance Inspection	Inlet structures, outlet structures, filter fabric or other features damaged, emergence of vegetation, graffiti or vandalism, fence damage, etc.	Visual observation	Semi-Annually, late wet season and late dry season Monthly	Within 30 working days, take corrective action. Consult engineer if immediate solution is not evident.	None	8	43.63	349.04	one-ton truck	2	26.84	53.68			402.72	
TOTAL MRDIA FILTER-SAND WO/PUMP						60		2617.8				210.5004		1716	4544.3	
MULTI-CHAMBER TREATMENT TRAINS																
Preventive Maintenance and Routine Inspections																
DESIGN CRITERIA,																
ROUTINE ACTIONS	MAINTENANCE INDICATOR	FIELD MEASUREMENT	MEASUREMENT FREQUENCY	MAINTENANCE ACTIVITY	SITE-SPECIFIC REQUIREMENTS											

ATTACHMENT F Estimated O & M Costs for BMP Project

Estimated vlaues derived from Caltrans Pilot BMP Study. This spreadsheet will change as additional data becomes available.

						Labor			Equipment				Materials		Total	Comments
						Per. Hrs	Rate	Cost	Type	Days	rate	Cost	Item	Cost	Cost	
Maximum filter drain time of 72 hrs for design and smaller storms	Drain time greater than 72 hours or sediment accumulation is greater than 0.1 inch over more than 50 percent of the fabric surface area.	Visual observation	After one target2 storm (0.75 in) event during wet season.	Remove and replace filter fabric blanket.		4	43.63	174.52	one-ton truck	1	26.84	26.84			201.36	
				If problem persists, consult with engineer, the media may need to be replaced. Complete prior to wet season.	None	2	43.63	87.26		0	0	0		0	87.26	
Inspection for trash/ debris at inlet and outlet structures and the MCTT	Trash and debris present	Visual observation	.During routine trashing per District schedule	Remove and dispose of trash and debris During routine trashings.	None	0	43.63	0	one-ton truck	0	26.84	0	confined space equipment	50	50	
Inspection for sediment accumulation	Sediment accumulates 50% of the volume underneath the tube settlers. Maximum of 2-feet grit chamber	Measure with appropriate device	Remove tube settler, measure sediment depth annually	Remove sediment prior to wet season. Characterize sediment and properly dispose.	None	36	43.63	1570.68	one-ton truck	1	26.84	26.84	drums, shovel, rake, drum grappler, confined space equipment, characterization and disposal	600	2197.52	
				If standing water can not be removed or remains through the wet season notify VCD.	None	2	43.63	87.26				0			87.26	Does not include Vector Control Agency costs
Replace filter media every 3 years per designer's specification	Operation greater than 3 years	Not applicable	Every 3 years	Remove and replace filter media. Characterize and properly dispose.	None	8	43.63	349.04	vactor and one-ton truck	0.33	198.75	65.5875	confined space equipment, characterization and disposal	1200	1614.628	every three years
Inspect sorbent pillows in main settling chamber	Darkened by oily material	Visual Observation	Annually, in May.	Annually, renew sorbent pillows, or immediately if pillows are darkened by oily material, characterize and properly dispose.	None	4	43.63	174.52	one-ton truck	1	26.84	26.84	sorbent pillows	100	301.36	
Inspect pumps for proper functioning	Pump does not operate	Energize pump to see if water is discharged	After every storm.	Make assessment to determine if problem is electrical or mechanical. Take appropriate action. Replace pump if needed.	None	0	43.63	0	one-ton truck	0	26.84	0	confined space equipment	0	0	
Inspect pumps for serviceability and periodic maintenance	Per manufacture's guidelines	Per manufacture's guidelines	Per manufacture's guidelines	Per manufacture's guidelines	None	0	55.7	0	one-ton truck	0	26.84	0	confined space equipment, pump or parts	0	0	
General Maintenance Inspection	Inlet structures, outlet structures, filter fabric, settling tubes or other features damaged, emergence of vegetation, graffiti or vandalism, fence damage, etc.	Visual observation	Semi-Annually, late wet season and late dry season	Within 30 working days, take corrective action. Consult engineer if immediate solution is not evident.	None	8	43.63	349.04	one-ton truck	2	26.84	53.68			402.72	
TOTAL MULTI-CHAMBER TREATMENT TRAINS						64		2792.32				199.7875		1950	4942.108	
OIL-WATER SEPARATOR																
Preventive Maintenance and Routine Inspections																
DESIGN CRITERIA,																

ATTACHMENT F Estimated O & M Costs for BMP Project

Estimated vlaues derived from Caltrans Pilot BMP Study. This spreadsheet will change as additional data becomes available.						Labor			Equipment				Materials		Total	Comments
						Per. Hrs	Rate	Cost	Type	Days	rate	Cost	Item	Cost	Cost	
ROUTINE ACTIONS	MAINTENANCE INDICATOR	FIELD MEASUREMENT	MEASUREMENT FREQUENCY	MAINTENANCE ACTIVITY	SITE-SPECIFIC REQUIREMENTS											
Inspect for sediment accumulation in the pre-separator and separator chamber	Greater than 12-inches	Measure with appropriate device	Annually	Prior to wet season, remove the accumulated material. Characterize and properly dispose.	None	4	43.63	174.52				0	testing and disposal	120	294.52	every 5 years
Inspect for oil accumulation in oil chamber	Oil depth is not more than 50 percent of chamber volume	Gauge the level of oil/water with a wooden gauge stick	Annually	Prior to wet season remove and properly dispose of oil and grease.	None	1	43.63	43.63				0	testing and disposal	60	103.63	every 5 years
Inspect coalescer for debris and gummy deposits	Debris or gummy deposits present	Visual observation	Annually	Wash the coalescer in an appropriate area with high-pressure hot water when needed.	None	1	43.63	43.63				0			43.63	
Inspect water level in tank	Less than full	Visual observation	Annually	Fill with water prior to wet season.	None	1	43.63	43.63				0			43.63	
Inspect for general mechanical integrity	Per manufacture's guidelines	Per manufacture's guidelines	Annually	Operate each mechanical component to ensure proper operation. Repair as needed	None	4	43.63	174.52				0			174.52	
TOTAL OIL-WATER SEPARATOR						11		479.93				0		180	659.93	
WET BASIN																
Preventive Maintenance and Routine Inspections																
DESIGN CRITERIA,																
ROUTINE ACTIONS	MAINTENANCE INDICATOR	FIELD MEASUREMENT	MEASUREMENT FREQUENCY	MAINTENANCE ACTIVITY	SITE-SPECIFIC REQUIREMENTS											
24-hour draw down measured between the rim of the outlet structure and invert of the WQ orifice in the outlet structure.	Drawdown greater than 25 hours or water is flowing over weir.	Evaluate drain time from inlet and outlet flow data loggers or observe 25 hours after target2 storm (0.75 in) Observation of water flowing over spillway	Once during wet season and after completion or modification of the facility,	If >25-hours:		4	43.63	174.52	one-ton truck	1	26.84	26.84			201.36	
				Open gate to discharge water to permanent pool elevation,		2	43.63	87.26	one-ton truck	1	26.84	26.84			114.1	
				Clear outlet of debris.		2	43.63	87.26	one-ton truck	1	26.84	26.84			114.1	
				Consult engineer if needed.		2	43.63	87.26	one-ton truck	1	26.84	26.84			114.1	
								0				0			0	
				If water is spilling over weir, open canal gate until water level is at permanent pool elevation. Check/clear outlet of debris.	None	4	43.63	174.52	one-ton truck	1	26.84	26.84			201.36	
Inspect for burrows	Burrows, holes, mounds	Visual observation	Annually and after vegetation trimming.	Where burrows cause seepage, erosion and leakage, backfill firmly.	None	4	43.63	174.52	one-ton truck	1	26.84	26.84			201.36	
General Maintenance Inspection	Inlet structures, outlet structures, side slopes or other features damaged, significant erosion, graffiti or vandalism, fence damage, etc.	Visual observation	Semi-Annually, late wet season and late dry season	Take corrective action, or restore to as-constructed condition prior to wet season. Consult engineers if immediate solution is not evident.	None	8	43.63	349.04	one-ton truck	2	26.84	53.68			402.72	

ATTACHMENT F Estimated O & M Costs for BMP Project

Estimated vlaues derived from Caltrans Pilot BMP Study. This spreadsheet will change as additional data becomes available.						Labor			Equipment				Materials		Total	Comments
						Per. Hrs	Rate	Cost	Type	Days	rate	Cost	Item	Cost	Cost	
Inspect Zone 1 4 for vegetation coverage and density to sustain vector abatement efficacy								0				0			0	
(See attachments for zone locations.)	Observable vegetation coverage/density	Visual, visible vegetation growth or emergent vegetation growth	Quarterly	1. Have a biologist survey the Wet Basin to determine if any birds are nesting or other sensitive animals are present. If birds are nesting, with advice from the biologist, proceed with the maintenance.		8	70	560	sedan	1	21.28	21.28			581.28	
				2. Lower and maintain the water level to expose the area to be maintained, do not completely drain basin		4	43.63	174.52	one-ton truck	1	26.84	26.84			201.36	
				3. Mechanically remove allCut plantsvegetation		56	43.63	2443.28	one-ton truck	3	26.84	80.52	string trimmer, hand tools, bags, safety equipment	100	2623.8	
				4. Dispose of the vegetation material in a landfill or other appropriate disposal area.		24	43.63	1047.12	packer	3	53.44	160.32	hand tools, safety equipment	50	1257.44	
				4.5. Restock mosquito fish as recommended by vector control agency.	None	8	70	560	sedan	1	21.28	21.28			581.28	
Inspect Zone 2 4 for vegetation coverage and density to sustain vector abatement efficacy	Vegetation density is such that mosquito fish cannot swim freely in the planted area.	Mosquito fish cannot be seen in the planted area, vegetation density approximately 80 to 100 percent	Quarterly	Annually, or at a special request of the local vector control agency				0				0			0	
								0				0			0	
				1. Have a biologist survey the Wet Basin to determine if any birds are nesting or other sensitive animals are present. If birds are nesting, with advice from the biologist, proceed with the maintenance.		8	70	560	sedan	1	21.28	21.28			581.28	
				2. Lower and maintain the water level to expose the area to be maintained, do not completely drain basin		4	43.63	174.52	one-ton truck	1	26.84	26.84			201.36	
				3. Mechanically removeCut Typha sp. (cattail), Scirpus sp. (bulrush) to produce random vegetation clusters (2-5 plants) with clusters at approximately 0.5 meters on center4. An effort should be made to maintain a ratio of Scirpus to Typha of 2:1. If the vegetation is cut, cut the vegetation to below the permanent pool water surface.		56	43.63	2443.28	one-ton	3	26.84	80.52	string trimmer, hand tools, bags, safety equipment	100	2623.8	
				4. Dispose of the vegetation material in a landfill or other appropriate disposal area.		24		0	packer	3	53.44	160.32	hand tools, safety equipment	50	210.32	

ATTACHMENT F Estimated O & M Costs for BMP Project

Estimated vlaues derived from Caltrans Pilot BMP Study. This spreadsheet will change as additional data becomes available.						Labor			Equipment				Materials		Total	Comments
						Per. Hrs	Rate	Cost	Type	Days	rate	Cost	Item	Cost	Cost	
				5. Monitor vegetation density quarterly to determine grow back rate.	None	4	43.63	174.52	one-ton	1	26.84	26.84			201.36	
Maintain Vegetated Access Road to reduce fire hazard from contact with vehicle catalytic converters.								0				0			0	
								0				0			0	
Inspect for sediment accumulation in forebay and main pond	More than 2 inches in the forebay and 4 inches in the main pond, or	Sediment depth exceeds marker on staff gage.						0				0			0	life cycle
		Measure in forebay by estimating depth using stationing along concrete maintenance ramp. In main pond by measuring down from water quality orifice and comparing to as-constructed grade.	When pond is drained for Zone 1 vegetation removal, or every 3 years.	Remove and properly dispose of sediment. By November, restore vegetation to the plan shown on the as-built drawings.	La Costa site only			0				0			0	life cycle
.								0				0			0	
								0				0			0	
								0				0			0	
TOTAL WET BASIN						222		9271.62				840.76		300	10412.38	

NOTES:

1. The design storm event is a storm that has a one year, 24 hour recurrence frequency.
2. A target storm event is a storm greater than 0.7525 inches of rainfall. For drain inlet inserts, a target storm event is a storm with a prediction of greater than 0.25 inches of rainfall.
3. Woody wetland vegetation consists of: willows (Salix spp), mule fat (baccharis salicifolia), cottonwood (populus fremontii), and western sycamore (plantanus racemosa). Note, this criterion is not applicable to the wet basin.
4. Zone 1, open water area of the basin, average depth is about 3 feet. Zone 2, shallow water bench, depth of water 0 –12 inches. Zone 3, periodic inundation is the temporary water storage volume impounded between the permanent pool and the overflow weir, i.e. the water quality storage. (See attachments for zone locations.) Zone A is the remaining upland slope between Zone 3 and the maintenance road.

This Maintenance Indicator Document has been developed using site-specific information gathered by specialists trained in the identification of threatened and endangered species and their habitat. Information contained in this document includes guidance for inspection for possible threatened and endangered species harborage. Further, some of the maintenance recommendations are based on the requirements of specific plant species used in this Pilot Program. The recommendations provided in this document must be reassessed with respect to species and plant materials if the guidance contained herein is to be

Map Pocket 1 - Water Quality Technical Report Exhibit

for

Main Street at Carmel Valley

Appendix J

WATER SUPPLY ASSESSMENT AND WATER SUPPLY VERIFICATION

WATER SUPPLY ASSESSMENT AND VERIFICATION REPORT

San Diego Corporate Center
(Project # 193036)

Prepared by:

City of San Diego Public Utilities Department

Approved by:

9/6/11 MTS 9/6/11 09:06:11

Roger Bailey, Director of Public Utilities **Date**

Prepared: August 2011

City of San Diego Public Utilities Department
Water Supply Assessment Report

San Diego Corporate Center

Table of Contents

Section 1 - Purpose

On January 1, 2002, Senate Bill 610 (SB 610) and Senate Bill 221 (SB 221) took effect. The intent of SB 610 and SB 221 was to improve the link between information on water supply availability and certain land-use decisions made by cities and counties. Under SB 610 (codified in the Water Code beginning at Section 10910), a water supply assessment (WSA) must be furnished to cities and counties for inclusion in any environmental documentation of projects (defined in the Water Code) that propose to construct 500 or more residential units, or that will use an amount of water equivalent to what would be used by 500 residential units, and are subject to the California Environmental Quality Act (CEQA). Under SB 221, approval by a city or county of certain residential subdivisions requires an affirmative written verification of sufficient water supply or water supply verification (WSV).

Not every project that is subject to the requirements of SB 610 is also subject to the mandatory water verification of SB 221 (e.g., if there is no subdivision map approval). Conversely, not every project that is subject to the requirements of SB 221 must also obtain a SB 610 water supply assessment.

A foundational document for compliance for both SB 610 and SB 221 is the Urban Water Management Plan (UWMP) of the relevant water agency. Both of these statutes repeatedly identify the UWMP as a planning document that can be used by a water supplier to meet the standards set forth in both statutes. Thorough and complete UWMPs will allow water suppliers to use UWMPs as a foundation to fulfill the specific requirements of these two statutes. Cities, counties, water districts, property owners and developers will all be able to utilize this document when planning for and proposing new projects. It is crucial that cities, counties and water suppliers work closely when developing and updating these planning documents. The City of San Diego's 2010 UWMP, which is used as the basis for this Report (WSA & WSV), was adopted by the San Diego City Council in June 2011.

The City's Development Services Department (DSD) requested that the City of San Diego Public Utilities Department (Public Utilities Department) prepare this Report as part of the environmental review for the San Diego Corporate Center (Project). A more detailed description of the Project is provided in Section 2 of this Report. This Report evaluates water supplies that are or will be available during normal, single-dry year, and multiple-dry water years during a 20-year projection to meet the projected demands of the Project, in addition to existing and planned future water demands of the Public Utilities Department. This Report provides an assessment of the availability of sufficient water supplies for the Project only and does not constitute approval of the Project.

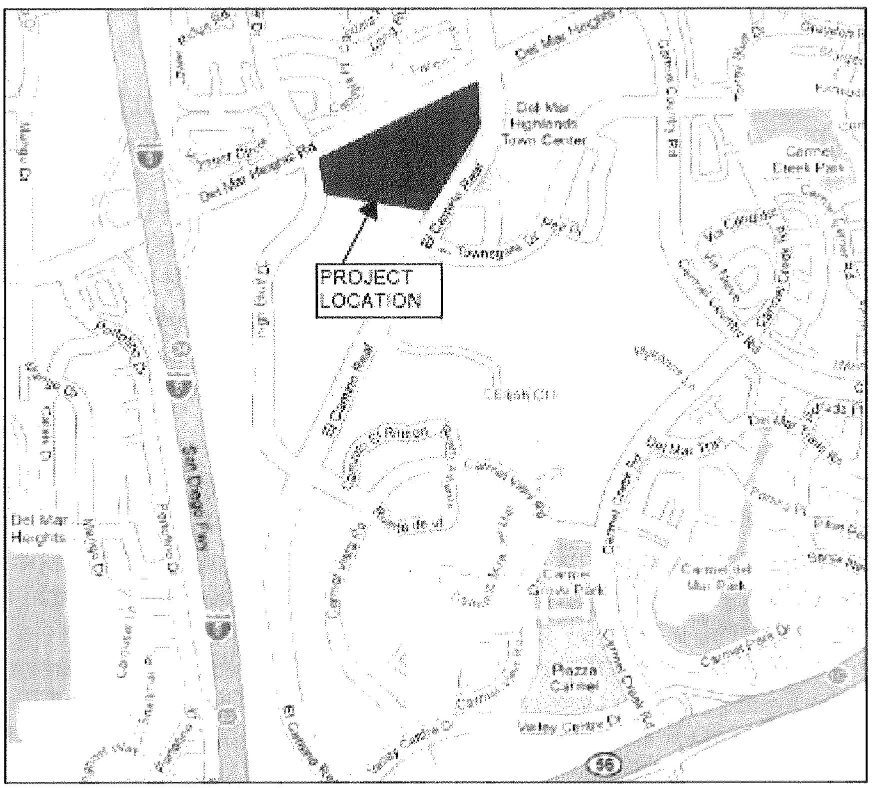
This Report includes, among other information, identification of existing water supply entitlements, water rights, water service contracts, or agreements relevant to the identified water supply for the Project and quantities of water received in prior years pursuant to those entitlements, rights, contracts and agreements.

This Report has been prepared in compliance with the requirements under SB 610 by the Public Utilities Department in consultation with DSD, the San Diego County Water Authority (Water Authority) and the Metropolitan Water District of Southern California (MWD).

Section 2 - Project Description

The project site is located at 12910 Del Mar Heights Place in the City of San Diego within the Carmel Valley Community Plan Area. The 23.6 acre project site is located at the southwestern corner of the Del Mar Heights Road and El Camino Real intersection. High Bluff Drive is located directly west of the project site and interstate 5 (I-5) is a quarter mile to the west of the project site. The site is located in the North City West Community Plan, the North City West Development Unit Number Two Precise Plan, and Council District 1. The site was previously graded as a part of the North City West Development Unit 2 (i.e., Carmel Valley Employment Center) mass grading under Tentative Parcel Map (TPM) 86-0276, and was planned to be developed with employment center uses.

FIGURE 2-1
VICINITY MAP OF SAN DIEGO CORPORATE CENTER



The project would entail the phased construction of up to 836,000 square feet (sq ft) of mixed-use development on the 23.6 acre graded and vacant site. The mixed-use development would include approximately 300,000 sq ft of commercial/retail, 536,000 sq ft of office, a 150 room hotel and 608 multi-family residential units. The project also would include public spaces, internal roadways, parking facilities, landscaping, hardscape treatments, and utility improvements to support these uses.

The required discretionary approvals include a Community Plan & Precise Plan Amendment, Rezone from CVPD-EC to MC, a Planned Development Permit, a Site Development Permit, an Easement Abandonment, a Vesting Tentative Map, and Right of Way Vacation to vacate a portion of Del Mar Heights Place.

Section 3 - Findings

Water Assessment

This Report identifies that the water demand projections for the Project, as proposed, are included in the regional water resource planning documents of the Water Authority, and MWD. Current and future water supplies, as well as actions necessary to develop the future water supplies, have been identified. This Report demonstrates that there will be sufficient water supplies available during normal, single-dry year, and multiple-dry water years during a 20-year projection to meet the projected demands of the Project, in addition to existing and planned future water demands of the Public Utilities Department.

Based on a normal water supply year, the estimated water supply projected in five-year increments for a 20-year projection will meet the City's projected water demand of 240,472 acre-feet[1] (AF) in 2015 to 298,860 AF in 2035 (**Table 6-5**). Based on a single-dry year forecast (**Table 6-7**), the estimated water supply will meet the projected water demand of 318,586 AF (2035). Based on a multiple-dry year, third year supply (**Table 6-8**), the estimated water supply will meet the projected demands of 281,466 AF (2015); 303,004 AF (2020); 322,166 AF (2025); 334,720 AF (2030); and 346,823 AF (2035).

The Water Authority's 2010 UWMP provides for a comprehensive planning analysis at a regional level and includes water use associated with accelerated forecasted residential development as part of its municipal and industrial sector demand projections. These housing units were identified by the San Diego Association of Government (SANDAG) in the course of its regional housing needs assessment, but are not yet included in existing general land use plans of local jurisdictions. The demand associated with accelerated forecasted growth is intended to account for SANDAG's land-use development currently projected to occur between 2035 and 2050, but has the likely potential to occur on an accelerated schedule. SANDAG estimates that this accelerated residential development could occur within the planning horizon of the 2010 UWMP update. These units are not yet included in local jurisdictions' general plans, so their projected demands are incorporated at a regional level. When necessary, this additional demand increment, termed Accelerated Forecasted Growth, can be used by member agencies to meet the demands of development projects not identified in the general land use plans.

The SANDAG Series 12 2050 Regional Growth Forecast (SANDAG Series 12 Forecast) did not include the level of development of the proposed Project for the 20-year planning horizon required by SB 610 and SB 221. The difference between the planned and proposed water demands of the Project can be accounted for in the Water Authority's 2010 UWMP accelerated forecasted growth demand increment. As documented in the Water Authority's 2010 UWMP, the Water Authority is planning to meet future and existing demands which include the demand increment associated with the accelerated forecasted growth. The Water Authority will also assist its member agencies in tracking the certified EIRs provided by the agencies that include water supply assessments that

[1] An acre-foot of water equals 325,851 gallons, which is enough water for two average families of four for one year.

utilize the accelerated forecasted growth demand increment, to demonstrate adequate supplies for the development. In addition, the next update of the demand forecast for the Water Authority's 2015 UWMP will be based on SANDAG's most recently updated forecast, which will include the Project.

As demonstrated in **Table 3-1** of this Report, which has been prepared by the Public Utilities Department in compliance with the requirements of SB 610 and using the City's and Water Authority's 2010 UWMP, which are based on SANDAG Series 12 Forecast, there is sufficient water planned to supply the Project's estimated annual average usage. The proposed water demands of the Project are 208,138 gallons per day or 233 acre feet per year (AFY). Per the City of San Diego 2010 UWMP, the planned water demands of the project's site are 76,800 gallons per day or 86 AFY. The remaining portion of the estimated 131,388 gallons per day or 147 AFY is accounted for through the Accelerated Forecasted Growth demand increment of the Water Authority's 2010 UWMP. Therefore, based on the findings from the City's 2010 UWMP and the Water Authority's 2010 UWMP, this project will result in no unanticipated demands.

TABLE 3-1
WATER DEMAND ANALYSIS

Planned Water Demands for the Project Site per the 2010 UWMP		
Category	**Quantity**	**Estimated Potable Water Use in Gallons per Day**
Employees[1]	*1280*	*76,800*
Total		***76,800 (or 86 AFY)***
Proposed Water Demands for San Diego Corporate Center		
Multi-Family Units[2]	*608*	*120,129*
Commercial-Office[3]	*536,000 sq ft*	*46,337*
Commercial-Retail	*270,000 sq ft*	*23,342*
Hotel[4]	*150 Rooms*	*14,250*
Landscaping[5]	*2.30 Acres*	*4,080*
Total[6]		***208,138 (or 233 AFY)***
Summary		
Proposed		***233 AFY***
City of San Diego 2010 UWMP - Planned		***86 AFY***
Planned from Water Authority's Accelerated Forecasted Growth		***147 AFY***
Net Unanticipated Demands		***0***

Table 3-1 Notes:

1. The utilization of 60 gallons per person per day is the City's acceptable standard for employment water use.
2. 80 gallons per person per day is the City's acceptable standard for multi-family water consumption. The person per household (residential) is estimated at 2.78 and the vacancy rate is 3.9 %.
3. Commercial (Retail and Office) water use is estimated at 91 gallons per day per 1000 sq ft.
4. Hotel water use is estimated at 100 gallons per room per day.
5. Landscaping water demands are calculated using City of San Diego online landscaping calculator.
6. The applicant is proposing advanced conservation measures which include waterless urinals, dual-flush toilets, high efficiency cooling towers, high-efficiency washing machines and dishwashers, dual-flush toilets, individually metered multi-family units, and smart meter with leak detection. Based on this information Public Utilities Department has accepted a water demand reduction of 5% for commercial uses and 7.5% for residential uses.

Water Verification

Verification, per SB 221, involves provision of substantial evidence that adequate water supplies will be available to meet projected demands based on the following: a) written contracts or agreements containing specifications and conditions under which future supply becomes available; b) capital outlay programs for financing delivery systems if needed; c) securing applicable agency permits for construction of infrastructure: and, d) necessary regulatory approvals to convey or deliver water to the subdivision.

Substantial evidence verifying local, regional, and state water supplies available for the proposed Project plus existing and projected demands within the Public Utilities Department service area is provided in Section 5 of this Report. The WSV findings presented in Section 5 substantiate that there will be sufficient water supply available to serve existing demands, demands of the Project, and projected future demands within the Public Utilities Department service area under normal and dry year forecasts.

Conclusion

In summary, these findings substantiate that there is sufficient water supply planned to serve this Project's future water demands within the Public Utilities Department service area in normal, single-dry year, and multiple-dry water year forecasts.

Therefore, this Report concludes that the proposed level of water use for this Project is within the regional water resource planning documents of the Water Authority and MWD. Current and future water supplies, as well as the actions necessary to develop these supplies, have been identified in the water resources planning documents of the Public Utilities Department, the Water Authority, and MWD to serve the projected demands of the Project, in addition to existing and planned future water demands of the Public Utilities Department.

Section 4 - City of San Diego Public Utilities Department

The City of San Diego (City) purchased its initial water system in 1901 from the privately owned San Diego Water & Telephone Company. Since then, continual expansion of the water system has been required to meet the demands of the growing population of the City. To meet the demand, the Public Utilities Department purchased a number of reservoirs between 1913 and 1935 to supplement local water supplies. Despite low annual precipitation for the area (approximately 10 inches per year), these reservoirs supplied the City's growing demands until 1940.

The need to import water emerged with the increased demand generated by the presence of the United States Navy before and up to World War II, and the ensuing population boom. As a result, the Public Utilities Department and other local retail water distributors formed the Water Authority in 1944 for the purpose of purchasing Colorado River water from MWD. The Public Utilities Department and other local retail water distributors began receiving imported water from the Colorado River in 1947.

Today, the Public Utilities Department treats and delivers more than 200,000 AFY of water to more than 1.3 million residents. The water system extends over 404 square miles, including 342 square miles in the City. The Public Utilities Department potable water system serves the City of San Diego and certain surrounding areas, including both retail and wholesale customers. The Project is located within the Public Utilities Department service area.

In addition to delivering potable water the City has a recycled water program. Its objectives are to optimize the use of local water supplies, lessen the reliance on imported water and free up capacity in the potable system. Recycled water provides the City a dependable, year-round, locally produced and controlled water resource.

4.1 Overview of Potable System Facilities

The water system consists primarily of nine raw water storage facilities with over 408,000 AF of storage capacity, three water treatment plants, 31 treated water storage facilities, and more than 3,213 miles of transmission and distribution lines.

The Public Utilities Department maintains and operates nine local surface raw water storage facilities, which are connected directly or indirectly to the City's water treatment operations. The Lower Otay, Barrett, and Morena Reservoirs (135,349 AF total capacity) service the Otay Water Treatment Plant in south San Diego; the El Capitan, San Vicente, Sutherland, and Lake Murray Reservoirs (236,311 AF total capacity) service the Alvarado Water Treatment Plant in central San Diego; and the Miramar Reservoir (6,682 AF total capacity) services the Miramar Water Treatment Plant in north San Diego. Lake Hodges Reservoir has a total capacity of 30,251 AF and is connected to Olivenhain Reservoir, which is owned by Water Authority and Olivenhain Municipal Water District. The connection provides the City the ability to access 20,000 AF of water in Hodges Reservoir via the Water Authority's delivery system.

The Public Utilities Department maintains and operates three water treatment plants with a combined total rated capacity of 294.4 million gallons per day (MGD). The Miramar Water

Treatment Plant (Miramar WTP), originally constructed in 1962, has a rated capacity of 140 MGD with the ability to increase to 215 MGD in the future with further approval from the State of California Department of Public Health (CDHP) based upon a future treatment process study (High Filtration Rate Study) that is yet to be performed. Current and short term (5 years) forecasted demands indicate no current need to increase the plants rated capacity from 140 MGD to 215 MGD. The required study to increase the rated capacity to 215 MGD will be performed in anticipation and as required to ensure future demands are met. The Miramar WTP generally serves the City's geographical area north of the San Diego River (north San Diego). The Alvarado Water Treatment Plant (Alvarado WTP), operational since 1951, had an initial capacity rating of 66 MGD. Several hydraulic improvements to the Alvarado WTP were constructed in the mid-1970s to increase the plant's capacity to 120 MGD. Upon completion of ongoing upgrades and improvements and approval of the operations plan by the CDHP, the rated capacity of the Alvarado WTP is anticipated to increase to 200 MGD. The Alvarado WTP generally serves the geographical area from National City to the San Diego River (central San Diego). The Otay Water Treatment Plant (Otay WTP) was originally constructed in 1940, and has a current rated capacity of 34.4 MGD, which meets current and short term forecasted demands. The Otay WTP has hydraulic capacity to increase to 40 MGD in the future. In order to do so, approval is required, similar to the process mentioned above for the Miramar WTP. The Otay WTP generally serves the geographical area bordering Mexico (south San Diego) and parts of the southeastern portion of central San Diego. Currently, the Otay WTP is in the process of being upgraded to include a third set of flocculation and sedimentation basins, filter piping and media improvements.

The Public Utilities Department maintains and operates 31 treated water storage facilities including steel tanks, standpipes, concrete tanks and rectangular concrete reservoirs, with capacities varying from less than one to 35 million gallons.

The water system consists of more than 3,213 miles of pipelines, including transmission lines up to 84 inches in diameter and distribution lines as small as four inches in diameter. Transmission lines are pipelines with larger diameters that convey raw water to the water treatment plants and convey treated water from the water treatment plants to the treated water storage facilities. Distribution lines are pipelines with smaller diameters that directly service the retail users connected to a meter. In addition, the Public Utilities Department maintains and operates 49 water pump stations that deliver treated water from the water treatment plants to approximately 274,000 metered service connections in over 127 different pressure zones. The Public Utilities Department also maintains several emergency connections to and from neighboring water agencies, including the Santa Fe Irrigation District (Miramar WTP), the City of Poway, Olivenhain Municipal Water District (Miramar WTP), the Cal-American Water Company (Alvarado and Otay WTP's), the Sweetwater Authority (Otay WTP) and the Otay Water District (Otay WTP).

4.2 Overview of Recycled System Facilities

The City of San Diego built the North City Water Reclamation Plant (NCWRP) and the South Bay Water Reclamation Plant (SBWRP) to treat wastewater to a level approved for irrigation, manufacturing, and other non-potable purposes.

The NCWRP provides recycled water to businesses, golf courses, homeowner associations, and other users in the northern service area of the City; as well as the City of Poway and the

Olivenhain Municipal Water District. The NCWRP currently treats 22.5 MGD of wastewater, although the Plant has an ultimate treatment capability of 30 MGD. In CY 2010, an average of 6.2 MGD of the wastewater flows were treated to a tertiary level and beneficially reused. During dry months, the beneficial reuse of recycled water has peaked at 11.6 MGD. The Public Utilities Department maintains and operates the North City recycled water distribution system which consists of 83 miles of recycled water pipeline, two reservoirs, and two pump stations.

In July 2006 SBWRP began production of recycled water with service to the International Boundary and Water Commission (IBWC). Recycled water production at South Bay expanded in May 2007 when the Otay Water District began taking deliveries. The SBWRP currently treats approximately 10 MGD of wastewater, although the Plant has an ultimate treatment capability of 15 MGD. In CY 2010, an average of 3.9 MGD of the wastewater flows were treated to a tertiary level and beneficially reused. During dry months, the beneficial reuse of recycled water has peaked at 7.92 MGD. Winter beneficial reuse from SBWRP is approximately 3 MGD. The Public Utilities Department maintains and operates the South Bay recycled water distribution system which consists of 3000 feet of recycled water pipeline, one storage tank, and one pump station.

Section 5 - Existing and Projected Supplies

The Public Utilities Department relies on imported water as its major water supply source, and is a member public agency of the Water Authority. The Water Authority is a member agency of MWD. The statutory relationships between the Water Authority and its member agencies, and MWD and its member agencies, respectively, establish the scope of the Public Utilities Department's entitlements to water from these two agencies. Due to the Public Utilities Department's reliance on these two agencies, this Report relies and includes information on the existing and projected supplies, supply programs, and related projects of the Water Authority and MWD.

The City of San Diego relies on the long-term water resources planning documents of the Water Authority and MWD to support the work on this Report. These documents are available at the following websites and contacts:

San Diego County Water Authority

http://www.sdcwa.org/2010-urban-water-management-plan

Dana Friehauf, Principal Water Resources Specialist (858) 522-6749

Metropolitan Water District of Southern California

http://www.mwdh2o.com/mwdh2o/pages/yourwater/ywater01.html#RUWMP

MWD staff, (213) 217-6000

The Water Authority and MWD are actively pursuing programs and projects to diversify their water supply resources. A description of these efforts as well as the challenges facing the Water Authority and MWD can be found in the San Diego County Water Authority Official Statement, dated January 21, 2010, relating to Water Revenue Bonds 2010B, and MWD's Official Statement, dated June 8, 2011, relating to Water Revenue Refunding Bonds, 2011 Series B. These Official Statements are available at the following websites[1]:

http://www.sdcwa.org/sites/default/files/files/finance-investor/2010Bond.pdf

http://www.mwdh2o.com/mwdh2o/pages/finance/statement.html

A brief overview of MWD and the Water Authority, including the Public Utilities Department relationship to these agencies, is included below.

A description of local surface and local recycled water supplies available to the Public Utilities Department can be found is Section 5.4 of this Report.

[1] This information is current at the time this document was prepared.

5.1 Metropolitan Water District of Southern California

MWD was created in 1928, under authority of the Metropolitan Water District Act (California Statutes 1927, Chapter 429, as reenacted in 1969 as Chapter 209, as amended) (the "MWD Act"). MWD's primary purpose is to provide a supplemental supply of wholesale water for domestic and municipal uses to its constituent agencies. The MWD service area comprises approximately 5,200 square miles and includes portions of the six counties of Los Angeles, Orange, Riverside, San Bernardino, San Diego and Ventura. There are 26 member agencies of MWD, consisting of 14 cities, 11 municipal water districts and the Water Authority. A Board of Directors, currently numbering 37 members, governs MWD. Each constituent agency has at least one representative on the MWD Board. Representation and voting rights are based upon the assessed valuation of property within each constituent agency. The Water Authority has four members on the MWD Board. The total population of the MWD service area is currently estimated at approximately 19 million.

MWD's existing water supplies have been historically sufficient to meet demands within the service area of MWD during years of normal precipitation. Although MWD plans and manages reserve supplies to account for normal occurrences of drought conditions, regulatory restrictions, including but not limited to restrictions under the Federal and California Endangered Species Acts, have placed limitations on MWD's ability to provide water to its member agencies. In the future, population growth, regulatory restrictions, increased competition for low-cost water supplies, and other factors such as climate change could impact MWD's ability to supply its member agencies even in normal years.

MWD Water Supply

MWD's two major sources of water are from the Colorado River and the State Water Project (SWP).

Colorado River Water: The Colorado River was MWD's original source of water after MWD's establishment in 1928. The Colorado River Aqueduct, which is owned and operated by MWD, is 242 miles long, starting at Lake Havasu and terminating at Lake Mathews in Riverside County.

Under applicable laws, agreements and treaties governing the use of water from the Colorado River, California is entitled to use 4.4 million acre-feet of Colorado River water annually, plus one-half of any surplus that may be available for use collectively in Arizona, California and Nevada as declared on an annual basis by the United States Secretary of the Interior. Under the priority system that governs the distribution of Colorado River water made available to California, MWD holds the fourth priority right of 550,000 acre-feet per year and a fifth priority right of 662,000 acre-feet per year. MWD's fourth priority right is within California's basic annual apportionment of 4.4 million acre-feet; however, the fifth priority right is outside of this entitlement and therefore is not considered a firm supply of water.

Several fish species and other wildlife species either directly or indirectly have the potential to affect Colorado River operations, thus changing the amount of water deliveries to the Colorado River Aqueduct. A number of species that are on either "endangered" or "threatened" lists under

the federal and/or California endangered species acts ("ESAs") are present in the area of the Lower Colorado River. MWD and other stakeholder agencies have developed a multi-species conservation program that allows MWD to obtain federal and state permits for any incidental take of protected species resulting from current and future water and power operations of its Colorado River facilities and to minimize any uncertainty from additional listings of endangered species.

State Water Project: The SWP is owned by the State of California and operated by the State Department of Water Resources ("DWR"). The SWP transports Feather River water stored in and released from Oroville Dam and unregulated flows diverted directly from the San Francisco Bay/Sacramento-San Joaquin Delta Estuary ("Bay-Delta") south via the California Aqueduct to four delivery points near the northern and eastern boundaries of MWD. The total length of the California Aqueduct is 444 miles. MWD is one of 29 agencies that have long-term contracts for water service from DWR, but is the largest agency in terms of the number of people it serves, the share of SWP water to which it is entitled, and the total amount of annual payments made to DWR. MWD's contract with DWR provides for the ultimate delivery of 1,911,400 acre-feet per year (46 percent of the total SWP entitlement). MWD also retains a "call" on 100,000 acre-feet per year on water transferred to the Coachella Valley Water District and the Desert Water Agency, if needed, so long as it pays for the financial obligations associated with the water during the call period. The SWP was originally intended to meet demands of 4.2 million acre-feet per year. Initial SWP facilities were completed in the early 1970s, and it was envisioned that additional facilities would be constructed as contractor demands increased. Several factors, including public opposition, increased costs, and increased non-SWP demands for limited water supplies, combined to delay the construction of additional facilities.

The quantity of SWP water available for delivery each year is controlled by hydrology, environmental and operational considerations. In addition to its importance to urban and agricultural water users, the Bay-Delta is of critical ecological importance. The Bay-Delta is the largest estuary on the West Coast of the United States and provides habitat for more than 750 plant and animal species. One hundred fifty years of human activity have contributed to the destruction of habitat, the decline of several estuarine and anadromous fish species, and the deterioration of water quality. These activities include increasing water demands from urban and agricultural uses, the dredging and filling of tidal marshes, the construction of levees, urban runoff, agricultural drainage, runoff from abandoned mines, and the introduction of non-native species, thus affecting the supply and reliability of this source. Since 2008, layers of new pumping restrictions have been put in place to address the migration pattern of various fish species. Delta pumping restrictions now exist in nine out of twelve months of the year. The result is a loss of supply of approximately 30 percent in an average year.

5.2 San Diego County Water Authority

The Water Authority's service area lies within the foothill and coastal areas of the westerly third of San Diego County, encompassing 952,208 acres (1,488 square miles). When the Water Authority was established in 1944, its service area consisted of 94,707 acres. Growth has primarily resulted from the addition and annexation of additional service areas by member agencies. The City of San Diego, with 210,726 acres, is the largest service area within the Water Authority's total service area. Of the total population of San Diego County, 97 percent live within the Water Authority's

service area. The City of San Diego represents approximately 43 percent of the total population of the Water Authority's service area.

The Water Authority's service area is a semi-arid region where historically the natural occurrence of water from rainfall and groundwater provides a firm water supply for only a small portion of the water needs of the current population. Since 1990, the Water Authority has provided an average of 85 percent of the water supply within its service area. As a wholesaling entity, the Water Authority has no retail customers, but serves only its member agencies.

The Water Authority's mission is to provide its service area a safe and reliable water supply. Historically, the principal source of supply for the Water Authority's service area has been water purchased by the Water Authority from MWD for sale to the Water Authority's member agencies. However, drought conditions and population growth in the Water Authority's service area have highlighted the need for diversification of the Water Authority's water supply. Therefore, consistent with its mission statement, the Water Authority has actively pursued a strategy of supply diversification that includes the acquisition and importation of additional water supplies, the development of additional local water supply projects and augmentation of its water supply via local and regional water storage capacity. Water supplies utilized within the Water Authority service area originate from two sources: (1) water imported by the Water Authority and (2) local supplies (such as local runoff, groundwater, recycled water and, prospectively seawater desalination). Since 1990, local supplies have grown to constitute 15 percent of the Water Authority's water supply, and the Water Authority has implemented programs and supported new technologies in order to assist its member agencies in increasing this percentage. Although MWD remains the Water Authority's largest source of imported water, recent years have also seen the diversification of the Water Authority's sources of imported water through core and spot water transfers with other agencies.

The Quantification Settlement Agreement (QSA) for the Colorado River was completed in October 2003. This historic agreement was enacted to provide California the means to implement water transfers and supply programs that will allow California to live within the state's 4.4 million acre-foot basic annual apportionment of Colorado River water. The QSA also commits the state to a restoration path for the environmentally sensitive Salton Sea and provides full mitigation for these water supply programs.

Specific programs under the QSA that directly benefits the Water Authority include the San Diego County Water Authority-Imperial Irrigation District water transfer agreement, which will provide up to 200,000 acre-feet of water a year through water conservation measures in Imperial Valley. The QSA also allows for the transfer of water conserved from the concrete lining of portions of the previously earthen All-American and Coachella Canals from the Imperial Irrigation District. The canal lining projects reduce the loss of water that occurs through seepage. The Water Authority will annually receive 77,700 acre-feet of this conserved water.

The QSA intended to assure California up to 75 years of stability in its Colorado River water supplies. In February 2010, Sacramento County Superior Court Judge Roland Candee invalidated the QSA on grounds that a provision in the contract failed to cap the State of California's Salton Sea environmental mitigation fees. The MWD, IID, Water Authority, the State and others have

appealed various aspects of the court's ruling, which has been stayed pending outcome of the appeal. If the ruling stands, it could delay the implementation of programs authorized under the QSA or result in increased costs or other adverse impacts. The impact, if any, which the ruling might have on water supplies, cannot be adequately determined at this time.

The Water Authority has encouraged development of additional local water supply projects such as water recycling and groundwater projects through the award of Local Water Supply Development ("LWSD") incentives of up to $200 per acre-foot for recycled water and groundwater produced and beneficially reused within the Water Authority's service area. The purpose of the Water Authority's LWSD program is to promote the development of cost-effective water recycling and groundwater projects that prevent or reduce a demand for imported water and improve regional water supply reliability. The LWSD Program reimburses member agencies for all, or a portion of the difference between the actual per acre-foot cost of producing recycled water, and the revenue generated by the LWSD participant through the sale of that acre-foot of recycled water (not to exceed $200 per acre-foot). In February 2008, the program was expanded to include funding for local brackish and seawater desalination projects.

5.3 2009 Comprehensive Water Package

On November 4, 2009, the California State Legislature passed a comprehensive package of water legislation (the "2009 State Water Legislation") that included five bills (four of which were subsequently signed by Governor Schwarzenegger) addressing California's statewide water situation, with particular emphasis on the Bay-Delta. The 2009 State Water Legislation includes, among other things, a 20 percent water conservation mandate for most localities in the State by 2020, new regulations regarding voluntary monitoring of groundwater levels by localities, and an $11.1 billion State general obligation bond measure. The 2009 State Water Legislation also created two new governmental agencies – the Delta Stewardship Council and the Sacramento-San Joaquin Delta Conservancy. The Delta Stewardship Council is charged with developing and implementing a Delta Plan, which would include the Bay Delta Conservation Plan, upon meeting certain conditions. The Sacramento-San Joaquin Delta Conservancy will implement ecosystem restoration activities in the Bay-Delta. In addition, the 2009 State Water Legislation includes legislation addressing unauthorized Bay-Delta water diversions. At this time, it is not known what effect the 2009 State Water Legislation will have on future water supplies.

The $11.1 billion State general obligation bond measure originally set to be presented to the voters for their approval in 2010 would provide funding for projects and programs throughout the State and in the Bay-Delta. Major categories of bond funding would include statewide water system operational improvements, Bay-Delta sustainability, water supply reliability, conservation and watershed protection, groundwater protection, water quality improvements, and water recycling and water conservation.
On August 9, 2010, the California Legislature voted to postpone the water bond to the 2012 general elections. The decision was made since the state was facing a massive budget deficit and the chances of the bond passing by a general vote were slim. Postponing the bond required amendment of the water bond legislation. Governor Schwarzenegger affirmed that delaying the bond will not impact other parts of the 2009 water legislation. Supporters of the bond say that the delay will help lawmakers eliminate any imperfections in the bond.

Additional information regarding the 2009 Comprehensive Water Package can be found at the following website: http://www.sdcwa.org/

5.4 Public Utilities Department

The Public Utilities Department currently purchases approximately 85 to 90 % of its water from the Water Authority, which supplies the water (raw and treated) through two aqueducts consisting of five pipelines. While the Public Utilities Department imports a majority of its water, it uses three local supply sources to meet or offset potable demands: local surface water, conservation, and recycled water.

The availability of sufficient imported and regional water supplies to serve existing and planned uses within the Public Utilities Department service area is demonstrated in the prior discussion on the water supply reliability of MWD and the Water Authority. The City has been receiving water from the Water Authority since 1947 and during the last 20 years the City has purchased between 100,000 and 228,000 AFY. For Calendar Year 2010, water purchases totaled approximately 180,488 AF. Depending upon demands, growth and the success of local water supply initiatives, this could remain somewhat constant or increase up to a projected maximum of 298,860 AFY in 2035 during normal years. For the purpose of this analysis the maximum is used.

5.4.1 Demonstrating the Availability of Sufficient Supplies

Imported Supplies

Section 5, subdivision 11 of the County Water Authority Act states that the Water Authority "as far as practicable, shall provide each of its member agencies with adequate supplies of water to meet their expanding and increasing needs." Depending on local weather and supply conditions, the Water Authority provides between 75 to 95 percent of the total supplies used by its 24 member agencies. As mentioned in Section 4, the Public Utilities Department and other local retail water distributors formed the Water Authority in 1944 for the purpose of purchasing Colorado River water from the MWD.

Local Surface Water Supplies

The Public Utilities Department maintains and operates nine local surface raw water storage facilities which are connected directly or indirectly to water treatment operations. In the San Diego region approximately 13 percent of the local precipitation produces surface runoff to streams that supply Public Utilities Department reservoirs. Approximately half of this run-off is used for the municipal water supply, while the remainder evaporates during reservoir storage. In very wet years, the run-off remainder may spill over the reservoir dams and return to the Pacific Ocean. Average rainfall produces less than half of the average runoff in San Diego. The local climate requires about average rainfall to saturate the soils sufficiently for significant surface run-off to occur. Therefore, most of the run-off to reservoirs is produced in years with much greater than average rainfall. Some flooding may occur even during average or below average rainfall years if the annual rainfall is concentrated in a few intense storms.

The use of local water is affected by availability and water resource management policies. The Public Utilities Department's policy is to use local water first to reduce imported water purchases and costs. The Public Utilities Department also operates emergency and seasonal storage programs in conjunction with its policy.

The purpose of emergency storage is to increase the reliability of the imported water aqueduct system. This is accomplished by maintaining an accessible amount of stored water that could provide an uninterrupted supply of water to the City's water treatment facilities should an interruption to the supply of imported water occur. The management of reservoirs is guided by Council Policy 400-04, which outlines the City's Emergency Water Storage Program. The policy mandates that the Public Utilities Department store sufficient water in active, available storage to meet six-tenths of the normal annual (7.2 months) City water demand requirements (conservation is not included). Active, available storage is that portion of the water that is above the lowest usable outlet of each reservoir.

The monthly emergency storage requirement changes from month to month and is based on the upcoming seven months water demand. This results in a seasonally fluctuating emergency storage requirement, generally peaking in May and reaching its minimum in October. This seasonally fluctuating requirement makes a portion of the required emergency storage capacity available for impounding or seasonal storage.

The purpose of seasonal storage is to increase imported water supply. This is done by storing surplus imported water in the wet winter season for use during the dry summer season. This may also be accomplished by increased use of imported water in lieu of local water in the winter when local water may be saved in reservoirs or groundwater basins for summer use. In addition to increased water yield, this type of seasonal operation also reduces summer peaking on the imported water delivery system.

Conservation

The Public Utilities Department's Water Conservation Program is effective in promoting permanent water savings. Established by the City Council in 1985, the Water Conservation Program now accounts for over 34,000 AF of potable water savings per year. This savings has been achieved by creating a water conservation ethic, adopting programs, policies and ordinances designed to promote water conservation practices, and implementing comprehensive public information and education campaigns.

The City offers a broad range of conservation methods to help meet the needs of our residential and commercial water customers. These include:

- Rebate programs for high efficiency toilets, washing machines and commercial water saving devices
- Survey programs
- Regulations
- Landscape and irrigation efficiency
- Public Education and Outreach

Research conducted by the City, the Water Authority, and the Water Research Foundation has shown that more than half of residential water-use is outdoors. Therefore, the City has added outdoor conservation programs to focus on water efficient landscaping and irrigation management which provide the best opportunity to achieve significant water savings.

Tools and services available and being developed for customers include:

- Commercial and Residential Water-Use Survey Programs — account for all water-use, determine leaks, and check irrigation systems for proper function and uniform coverage. Residential surveys average 15% water savings, while commercial surveys, depending on type of facility, can achieve 15% to 25% water savings. The current focus is on multi-family surveys.

- Nationally recognized Landscape Watering Calculator — an on-line tool that creates watering schedules based on landscaping features, soil type, and weather data. The Calculator is very popular and those who have used it are impressed with its ease of use. MWD has adapted this tool and it is available throughout Southern California.

- Water Resources Landscape Database — another tool used to create water budgets and manage irrigation using aerial photographs, GIS maps, weather data, etc. This service has generated significant water savings in City parks, freeway landscapes, schools, and homeowner associations.

- New programs in place include incentives to install water efficient irrigation equipment and evapo-transpiration controllers (smart irrigation clocks that use weather data to set watering schedules); as well as incentives to replace turf with sustainable landscapes.

In addition to offering landscape water conservation programs to existing customers, the Public Utilities Department is also working closely with the City's Planning and Development Services Departments to incorporate water conservation requirements in the City's General Plan and permitting process. This will ensure that new communities and properties will also have water efficient landscapes.

Planning to increase water conservation is an ongoing process. The aforementioned water conservation programs undergo periodic reevaluation to ensure the realization of forecasted savings. Additionally, changes in water conservation technologies may require reassessment of long-range plans. The Public Utilities Department continues to work with proven water conservation programs, while including irrigation management programs to maximize water savings. The Public Utilities Department regularly examines new technologies and annually checks progress towards conservation goals. The Public Utilities Department continues to work collaboratively with MWD and the Water Authority to formulate new conservation initiatives.

Drought Management

In response to the Governor's Executive Order in 2008, the Mayor declared a water shortage emergency for the City of San Diego under Municipal Code and implemented a "Level 1 – Voluntary Compliance – Water Watch" and called for redoubling of efforts aimed to achieve

voluntary water reduction. Also in 2008, the Mayor directed the Public Utilities Department to review the City's existing Emergency Water Regulations and propose amendments with the goal of improving the City's response to water shortage conditions. The review resulted in a series of amendments to the existing Municipal Code which established year-round water waste prohibitions, provided clear water shortage "triggers" for moving from one drought response level to another, provided clear targets for achieving water use reductions, and provided an updated penalty and hardship variance process which governs the application and enforcement of the emergency water restrictions. These amendments became effective January 14, 2009. On April 27, 2009 the City Council adopted a "Level 2 – Drought Alert". Level 2 consists of additional mandatory water use restrictions. These restrictions became effective on June 1, 2009. In FY 2011, an unusually heavy snow and rainfall season brought California's water storage levels way up after three drought years. Following the footsteps of DWR, MWD and the Water Authority, the San Diego City Council decided to end mandatory water-use restrictions in May 2011. The move did not affect several water-waste restrictions that remain permanent year-round.

Recycled Water Supplies

Recycled water is produced from wastewater processed at two water reclamation plants owned and operated by the City of San Diego: North City and South Bay. In CY 2010, financial incentives from the sale of recycled water resulted in nearly $2.3 million in savings towards imported water purchases. The financial incentives are a result of local water resources development agreements with MWD and Water Authority.

In 2010, the beneficial reuse of the recycled water was 11,317 AF: 6,948 AF from the North City Water Reclamation Plant and 4,369 AF from the South Bay Plant. Proactive marketing activities targeting existing irrigation customers, to encourage them to convert their cooling systems to recycled water, coupled with outreach efforts to connect new customers have been successful, as recycled water meter connections have increased over 25% (2007 figures compared to 2010). On December 31, 2007, 406 retail meters were connected to the distribution system and as of December 31, 2010, 511 retail meters are connected. Major retail customers include the City of San Diego Park & Recreation Department, CalTrans, University of California at San Diego, Black Mountain Ranch HOA, Santa Luz Golf Course, the City of San Diego Metro Biosolids Center, Miramar Marine Corps Air Station Golf Course, and the IBWC. The City also provides recycled water to 4 wholesale connections. The majority of customers use the recycled water for irrigation purposes.

By the end of CY 2011, the Public Utilities Department, in cooperation with the Park & Recreation Department, will have completed thirteen parkland/street median irrigation system conversions to recycled water. The retrofits are funded in part by reimbursement grants from the Bureau of Reclamation, MWD and San Diego Gas & Electric.

Public Utilities Department's Capital Improvement Program

The Public Utilities Department reevaluates the projects contained in the Capital Improvements Program (CIP) and the timing thereof periodically. Changes to the CIP are made to reflect changing priorities within the water system and occur as a result of project scope changes, date

revisions, project sequencing, and operational considerations. The Public Utilities Department expended approximately $1.1 billion from July 1, 1998 through June 30, 2010 on CIP projects. Improvements included projects to upgrade and expand water treatment plants, rehabilitate raw and treated water storage facilities, construct major transmission pipelines, replace and/or upgrade existing pump stations, replace cast iron water mains citywide, expand the recycled water system, and other new supply initiatives. In February 2007, the City Council adopted increases for the next four fiscal years of 6% per year. These rate increases will provide needed revenue to continue funding the upgrade and expansion of the water system through the CIP in order to ensure a reliable water supply for all City residents. For the Fiscal Years ending June 30, 2008 through June 30, 2011, the Public Utilities Department plans to expend approximately $585 million on such improvements.

With the above program coming to a close, the Public Utilities Department initiated a facilities master plan in 2009 to identify long-term facility needs. Over 80 projects were identified through this master planning effort and will comprise the 2012-2032 CIP. Project scopes were based on findings primarily from facility condition assessments and system evaluations that identified areas in which hydraulic performance criteria cannot all be met. Council Policy 800-14 (CP 800-14) establishes a framework for prioritizing CIP projects, and it has been refined to reflect water-specific needs. The refined framework has provided a mechanism for objectively and consistently prioritizing over 80 recently-identified projects. CP 800-14 refinements were made with significant input from staff throughout the department as well as IROC (Independent Rates Oversight Committee). The list of prioritized projects, along with cost estimates and durations, will be the basis for 2012-2032 CIP.

Summary of Supplies

Historic imported water deliveries from the Water Authority to the Public Utilities Department and local surface water, conservation savings and recycled water deliveries are shown in **Table 5-1.**

Table 5-1
Historic Imported, Local and Recycled Water Demands*
Public Utilities Department

Fiscal Year	Imported Water (acre-feet)	Local Surface Water (acre-feet)	Conservation[1] (acre-feet)	Recycled Water (acre-feet)	Total[2] (acre-feet)
1990	233,158	22,500	-	-	255,658
1995	162,404	59,024	8,914	-	230,342
2000	207,874	39,098	17,410	3,250	267,632
2005	204,144	26,584	29,410	4,294	264,432
2010	188,337	13,117	34,317	12,173	247,944

[1]Conserved water results in savings and is not a direct supply.
[2]Total includes water supplied and conserved.
*Includes retail and wholesale demands

5.4.2 Plans for Acquiring Additional Supplies

Future Supplies

In 2002, the City of San Diego City Council adopted the Long-Range Water Resources Plan 2002-2030 (Long-Range Plan). This plan provides a decision-making framework for evaluating water supply options. The Long-Range Plan identifies water conservation, water recycling, groundwater desalination, groundwater storage, ocean desalination, marine transport, water transfers, and imported supply from the Water Authority and MWD as potential near-term and long-term supplies. The Long-Range Plan concluded that no single supply source would be sufficient to meet the City's future water demands, but a portfolio of supply options would reduce the dependence upon imported water over time.

The Public Utilities Department has begun work on updating the Long-Range Plan and will have the update complete in 2012. The 2012 Long-Range Plan will evaluate supply options such as water conservation, recycled water, groundwater storage, brackish groundwater desalination and indirect potable reuse. Conservation and water recycling have been implemented and will be increased. The Public Utilities Department is currently investigating the development of groundwater. Once these supplies are developed, and contracts, permits, and approvals obtained, these new supplies will be included in the UWMP.

Conservation

Future conservation supply development programs and technologies that may be pursued include:

1) Hot water circulating pump: This emerging water-savings technology reduces "warm-up" time for showers and other fixtures throughout the home. This system can save the average family approximately 2 gallons per use at the fixture.
2) "ShowerStart™": ShowerStart™ is an innovative device designed to be installed at the shower. This device has an internal temperature sensor and valve that works to stop the flow of water to a trickle once hot water has arrived at the fixture.
3) Flow restrictors: Flow restrictions for hospital sinks can reduce water waste during medical "scrubbing".

"Other" potential programs

- Special programs for dedicated landscape meters
- Landscape requirements and water budgets
- Tiered water rates to encourage water savings
- Retrofit multi-family meters with sub meters
- Retrofit mixed use commercial meters with separate irrigation meters

For the purposes of this Report, these enhanced conservation programs are not included as a resource to meet demands.

Recycled Water Study

The City of San Diego is currently conducting a Recycled Water Study. The purpose of this study is to identify opportunities to increase the usage of recycled water for potable and non-potable uses, the potential costs of implementing such opportunities, and to what extent such recycling could feasibly offload wastewater flows to the Point Loma Wastewater Treatment Plant (PLWTP).

The United States Environmental Protection Agency (USEPA) recently made a decision to grant the City San Diego a waiver to its National Pollutant Discharge Elimination System Permit. The waiver allows the City to continue to operate the PLWTP as an Advanced-Primary Treatment facility rather than requiring an upgrade to secondary treatment. Members of the environmental community (San Diego Coastkeeper and Surfrider Foundation) have traditionally opposed past permit waiver issuance in favor of urging higher level of water recycling. However, during the 2009 permit waiver process and in lieu of such opposition, San Diego Coastkeeper and the San Diego Chapter of Surfrider Foundation entered into a Cooperative Agreement with the City to conduct a Recycled Water Study. In accordance with the Agreement, both of these organizations will provide their support of the USEPA's decision to grant the waiver. The City's responsibility per the Agreement is to execute this study.

Additional goals of the study include identification and evaluation of recycling alternatives that would result in:

- The upgrade of the existing PLWTP to secondary treatment at the lowest possible cost.
- Maximizing water reclamation and to use recycled water to the fullest extent possible, including indirect potable reuse, non potable reuse and direct potable reuse.
- Evaluating opportunities to increase recycled water reuse via satellite facilities or via existing water reclamation plants. Evaluation will include detailed economic analysis that will consider potential capital and operation and maintenance savings on both the water and wastewater systems.

Groundwater

The City has several groundwater basins within its jurisdiction, including San Pasqual in the north; San Diego River System in the center of the City comprising the Mission Valley Basin and the El Monte/Santee Basin; the Tijuana River Valley Basin in the south; and the San Diego Formation, a large geological water bearing formation, underlying the southwestern portion of San Diego County along the coast, roughly from the Mexican border to Mission Valley.

The groundwater from these basins is predominantly brackish. Improved technologies provide consideration of affordable water supply sources, such as brackish groundwater, that were not available a few decades ago. This supply source is a viable alternative and is part of the City's planning efforts. Local water supply projects, particularly groundwater exploration, benefit city rate payers, offer drought protection, and are locally controlled. The City is presently pursuing groundwater feasibility projects in San Pasqual, Mission Valley Basin, El Monte/Santee Basin, Tijuana River Valley Basin, and the San Diego Formation.

In the San Pasqual Basin, the San Pasqual Brackish Groundwater Desalination Project, which included a small scale demonstration project and looked at the feasibility of building a full-scale desalination facility in the lower western end of the San Pasqual basin, is complete. In addition, a planning study for San Pasqual Conjunctive Use that investigates the feasibility of storing and recovering raw water in the upper eastern portion of the San Pasqual basin has been completed. Identified in the report are percolation basins alternatives and project costs. The project team is focused on investigating the synergies between the potential full scale desalination facility and conjunctive use studies completed. Finally, efforts are in progress to implement basin recommendations and actions from the Council adopted 2007 San Pasqual Groundwater Management Plan (GMP).

The City is executing a feasibility study in the Mission Valley Basin, El Monte/Santee Basin, and the San Diego Formation known as the Pilot Production Wells Investigation. The goal of this investigation is to install a single production well in each of the basins to test the performance of the basin, evaluate potential environmental impacts, and assess appropriate treatment technologies for approximate two year duration while delivering the groundwater for beneficial use. At the end of the testing period, the City will decide whether to keep the wells in operation, expand the facilities, or shut down operations depending on the outcome of the investigation in each basin.

Separately, the City is examining the feasibility of using the Tijuana River Valley alluvial basin for aquifer storage and recovery (ASR) to seasonally store recycled water during the wet season, and extraction during the dry season to meet the service area peak demands for recycled water. A number of concerns will be addressed including: useable storage capacity of the alluvial aquifer, the injection or spreading of tertiary treated wastewater into a groundwater basin, potential lowering or mounding of the groundwater table near environmentally sensitive lands, potential of contributing to sea water intrusion, the mixing of native groundwater with recycled water when extracted for distribution, compliance with Basin Plan objectives, and potential impacts to neighboring Tijuana municipal supply wells.

Water Purification Demonstration Project

The City has implemented a Water Purification Demonstration Project to evaluate the feasibility of using advanced water purification (AWP) on recycled wastewater for eventual augmentation of supplies in a local reservoir. Reservoir water would undergo further treatment before being distributed as drinking water. The AWP Demonstration Facility will operate for 18 months. During the first 12 months of operation the advanced purified water will be frequently tested to determine the effectiveness of the treatment equipment in removing contaminants; the equipment will be monitored for flow-and overall performance; operating data will be gathered and analyzed to refine operation and maintenance estimates for a full-scale system; tours are being conducted as part of the public outreach effort; a study of the San Vicente Reservoir will be conducted to establish residence time and short circuiting conditions of the AWP water in the reservoir and all necessary steps will be taken to ensure that the treatment process meets the requirements set by the CDHP. A Final Project Report for the Demonstration Project will be prepared and serve as a single document describing the results of the Demonstration Project for elected officials, regulators, and the public. The Demonstration Project is an essential step towards full implementation of the Indirect Potable Reuse/Reservoir Augmentation program. On November

18, 2008, the City Council approved a rate increase to fund the $11.8 million Demonstration Project. The rate increase went into effect on January 1, 2009.

Water Transfers

Water transfers are agreements in which water supplies are transferred from the original point of origin or control to a new place of use. Transfers can offer flexibility and help ensure that the state's water resources are used effectively. While a myriad of rules surround transfers in California, water transfers are not currently considered as a supply resource as defined in SB 610 to meet projected demands. The Public Utilities Department is relying upon the Water Authority and MWD to pursue water transfers.

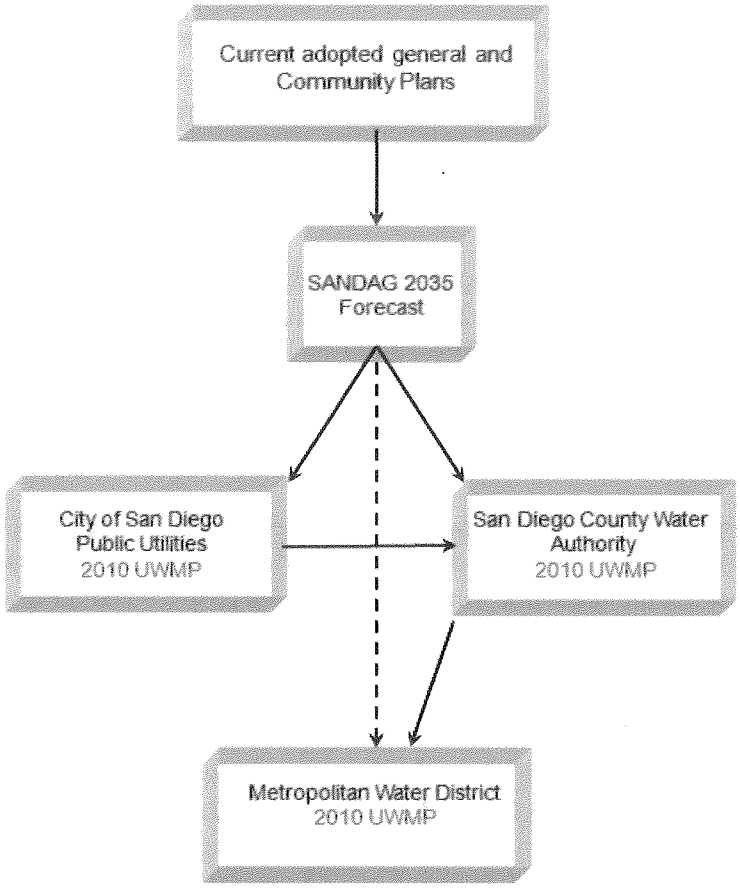
Section 6 - Projected Demands

Approximately every three years the Public Utilities Department calculates projected water demands within its service area for planning purposes. A computer model is used (IWR-MAIN) to break down water-use by major water-use sectors: Commercial, Industrial, Residential and Public uses. Using past water-use data from the Public Utilities Department and demographic data provided by SANDAG, the model is able to correlate the data to determine sector water demands. Using this correlated data, future demographic data is used to project water demands. The model also accounts for water conservation, weather and water rate changes. The most recent computer model is utilized consistent with the timing for the upcoming UWMP and forms the basis for the water demand numbers contained in the next UWMP.

The Public Utilities Department updates its UWMP every five years. The 2010 UWMP, originally scheduled for completion in December 2010, was completed and adopted in June 2011. The time extension granted for the completion of the 2010 UWMP was due to the new SBX7-7 reporting requirement that needed to be incorporated into the 2010 UWMP. SBX7-7, which is part of the 2009 Water Legislation, requires urban water agencies to reduce statewide per capita water consumption 20 percent by 2020.

In addition to the Public Utilities Department, the Water Authority and MWD use regional growth forecasts to calculate projected water demands within their respective service areas. This provides for consistency between the retail and wholesale agencies projected water demands, thereby ensuring that adequate supplies are being planned for the Public Utilities Department's existing and future water users. The SANDAG forecasts are based on adopted community plan land use, but not citywide zoning. SANDAG forecasts the number of residents, dwelling units, and employees in an area, but not square footage, hotel rooms, or visitors (non-residents or non-employees). For urban areas the smallest forecast geography is typically at the block level, but for suburban and less developed area the forecast geography can be larger. SANDAG typically updates the regional growth forecast every three to four years. The Public Utilities Department water demand projections which based on the SANDAG Series 12 Forecast are incorporated in the City's 2010 UWMP. These projections are then forwarded to the Water Authority for use in the preparation of their UWMP, which is further incorporated into MWD's UWMP to calculate the ultimate water demands of the region (see **Figure 6-1**).

FIGURE 6-1
WATER DEMAND PROJECTIONS



The demands from the 2010 UWMP are used throughout this Report. The historical and projected water demands for a normal year are shown in **Table 6-1**.

As part of the requirements for complying with SB 610, **Table 6-7** and **Table 6-8** show the single dry year and consecutive multiple dry year demands. All tables in this section are based on data from the 2010 UWMP.

TABLE 6-1
PAST, CURRENT, AND PROJECTED WATER DELIVERIES
(AFY)

Water Use Sector	2005				
	Metered		Unmetered		Total Volume (AFY)
	# Accounts	Volume (AFY)	# Accounts	Volume (AFY)	
Single family	217,983	77,864	0	0	77,864
Multi-family	28,443	39,220	0	0	39,220
Commercial	14,468	33,099	0	0	33,099
Industrial	253	4,276	0	0	4,276
Institutional/Governmental	2,341	16,842	0	0	16,842
Landscape Irrigation	7,245	27,877	0	0	27,877
Total	270,733	199,178	0	0	199,178

Source: City of San Diego Public Utilities Report U02-P10715.

Water Use Sector	2010				
	Metered		Unmetered		Total Volume (AFY)
	# Accounts	Volume (AFY)	# Accounts	Volume (AFY)	
Single family	220,862	62,367	0	0	62,367
Multi-family	28,361	36,324	0	0	36,324
Commercial	14,542	27,244	0	0	27,244
Industrial	186	2,325	0	0	2,325
Institutional/Governmental	2,321	13,774	0	0	13,774
Landscape Irrigation	7,327	20,257	0	0	20,257
Total	273,599	162,291	0	0	162,291

Source: City of San Diego Public Utilities Report U02-P100715.

Table 6-1, Continued

Water Use Sector	2015				
	Metered		Unmetered		Total Volume (AFY)
	# Accounts	Volume (AFY)	# Accounts	Volume (AFY)	
Single family	231,346	75,922	0	0	75,922
Multi-family	32,082	47,266	0	0	47,266
Commercial	14,376	31,617	0	0	31,617
Industrial	186	2,071	0	0	2,071
Institutional/Governmental	2,302	13,359	0	0	13,359
Landscape Irrigation	7,583	25,452	0	0	25,452
Total	287,587	195,688	0	0	195,688

Water Use Sector	2020				
	Metered		Unmetered		Total Volume (AFY)
	# Accounts	Volume (AFY)	# Accounts	Volume (AFY)	
Single family	236,639	79,992	0	0	79,992
Multi-family	37,330	56,700	0	0	56,700
Commercial	14,783	33,541	0	0	33,541
Industrial	186	2157	0	0	2157
Institutional/Governmental	2,302	13,772	0	0	13,772
Landscape Irrigation	7,869	27,247	0	0	27,247
Total	298,582	213,409	0	0	213,409

Water Use Sector	2025		2030		2035	
	Metered		Metered		Metered	
	# Accounts	Volume (AFY)	# Accounts	Volume (AFY)	# Accounts	Volume (AFY)
Single family	241,491	83,370	244,138	85,633	245,682	86,471
Multi-family	42,662	66,070	47,910	75,328	52,420	82,781
Commercial	14,681	34,012	14,100	33,116	13,853	32,740
Industrial	176	2,077	166	1,995	166	1,967
Institutional/Governmental	2,247	13,639	2,172	13,399	2,154	13,329
Landscape irrigation	8,192	28,893	8,162	29,301	8,543	30,698
Total	308,505	228,061	315,534	238,772	321,337	247,986

Table 6-2 summarizes the current and planned water sources the City is relying on to meet future demands.

TABLE 6-2
PLANNED WATER SUPPLY SOURCES
(AFY)

Water Supply Sources	Wholesaler Supplied Volume (yes/no)	2015	2020	2025	2030	2035
San Diego County Water Authority	Yes	201,719	221,458	237,622	249,728	260,107
Supplier produced surface water [a]		29,000	29,000	29,000	29,000	29,000
Supplier produced groundwater		500	500	500	500	500
Transfers In		0	0	0	0	0
Exchanges In		0	0	0	0	0
Recycled Water [b]		9,253	9,253	9,253	9,253	9,253
Desalinated Water		0	0	0	0	0
Other		0	0	0	0	0
Total		240,472	260,211	276,375	288,481	298,860

Notes:

[a] Local surface water estimates provided by City, 2011.

[b] Recycled water excludes recycled water sold to other agencies and is from table entitled, "NCWRP and SBWRP Summary of Baseline Demands", provided by the City on April 22, 2011.

6.1 Sales to other Agencies

Potable

The City, through past agreements, sells treated water to the Cal-Am which provides water service to the cities of Coronado and Imperial Beach, City of Del Mar, and Naval Air Station North Island. The population of Naval Station North Island is located within the City of Coronado, whereas the other military bases that the City serves are within the City. The City also sells untreated water to Santa Fe Irrigation District and San Dieguito Water District. **Table 6-3** presents the water sales to other agencies.

Per the agreement between the City and Cal-Am, only local surface water is sold to Cal-Am to provide water to supply Cal-Am customers. A portion of City residents in the South Bay area are also served by Cal-Am and can be served by imported water as well. Per the agreement between the City and the City of Del Mar, the City takes deliveries of water, which the City of Del Mar purchases from the Water Authority, through the Second Aqueduct Connection at Miramar. This water is then treated at the City's Miramar WTP and transported to the City of Del Mar through several interconnections.

The City has agreements to provide surplus treated water to Otay Water District and untreated exchange water to Ramona Municipal Water District. These water deliveries occur infrequently and for short periods of time, and are therefore not shown in **Table 6-3**.

TABLE 6-3
SALES TO OTHER AGENCIES-POTABLE
(AFY)

Water Distributed	2005	2010	2015	2020	2025	2030	2035
California American Water Company	13,311	11,462	13,153	13,395	13,452	13,757	13,988
Santa Fe Irrigation District and San Dieguito Water District [a]	2,012	7,227	7,596	7,983	8,391	8,819	9,268
City of Del Mar [b]	1,324	1,058	1,112	1,168	1,228	1,290	1,356
Naval Air Station North Island	1,204	1,568	1,568	1,568	1,568	1,568	1,568
Total	14,515	13,030	14,721	14,963	15,020	15,325	15,556

Notes:

[a] Through a joint agreement, the City supplies raw water from local surface water supplies to Santa Fe Irrigation District/San Dieguito Water District, and treated water to the other agencies. This water supply is not included in total since the supply is not included in the local surface water supply.

[b] City of Del Mar not included in total as the City is treating water for Del Mar that is provided by Water Authority.

Recycled and Non-Revenue Water

The City has three separate agreements to sell recycled water. Olivenhain Municipal Water District and the City of Poway are provided recycled water from the City's North City Water Reclamation Plant while Otay Water District receives recycled water from the City's South Bay Water Reclamation Plant.

Non-Revenue Water (NRW) is water that is unaccounted for or unbilled water consumption. Unaccounted for water can be attributed to unauthorized consumption, meter inaccuracies, data errors, leakage on mains, leakage and overflow at storage and leakage at service connections. Using metered demand and total City delivered values, NRW was computed as 9.0 percent in 2008. Water use for firefighting, line flushing and other authorized, but unbilled use is classified in the computation of NRW as unbilled consumption.

City staff deemed it reasonable to assume this percent system loss could be maintained in future years given the City's aggressive program of leak detection and repair. The City is going forward with an automated meter reading system that could improve billing accuracy, better quantify real versus apparent losses and identify customer leaks. Thus, NRW is held constant in the projections at 9.0 percent for forecast years. **Table 6-4** presents the City's additional water uses (recycled water) and NRW.

TABLE 6-4
ADDITIONAL WATER USES AND LOSSES
(AFY)

Water Use	2005	2010	2015	2020	2025	2030	2035
Recycled water	4,294	7,656	9,253	9,253	9,253	9,253	9,253
Non-revenue water	10,404	21,909	20,810	22,586	24,041	25,131	26,065
Total	14,698	29,565	30,063	31,839	33,294	34,384	35,318

Notes:

1. *Source for recycled water: 2005 from Table 2-8 of the City's 2005 Urban Water Management Plan. 2010 from NCWRP and SBWRP beneficial reuse summary tables with wholesale deliveries excluded provided by the City on March 2, 2011. 2015 and later from table entitled, "NCWRP and SBWRP Summary of Baseline Demands", provided by the City on April 22, 2011.*
2. *Recycled water is City use only and excludes recycled water sold to other agencies.*
3. *Source for non-revenue water: For 2005, Table 2-8 of the City's 2005 Urban Water Management Plan with 4.3% assumption. For 2010 to 2035, City of San Diego Public Utilities, Update of Long-Term Water Demand Forecast, Table 6-5, Water Demand Forecast with Normal Weather, June 2010.*

Table 6-5 is a summary of and displays City's past water use from 2005 and 2010 with projected water use shown for 2015 thru 2035.

TABLE 6-5
TOTAL WATER-USE
(AFY)

Water Distributed	Total Water Use (AFY)						
	2005	2010	2015	2020	2025	2030	2035
Total Water Deliveries (Table 6-1)	199,178	162,291	195,688	213,409	228,061	238,772	247,986
Sales to Other Water Agencies (Table 6-3)	14,515	13,030	14,721	14,963	15,020	15,325	15,556
Additional Water Uses and Losses (Table 6-4)	14,698	29,565	30,063	31,839	33,294	34,384	35,318
Total	228,391	204,886	240,472	260,211	276,375	288,481	298,860

The analysis in **Table 6-6** below compares the projected normal water supply and customer demands from 2010 to 2035, in five-year increments.

TABLE 6-6
PROJECTED NORMAL SUPPLY AND DEMAND COMPARISON
(AFY)

	2015	2020	2025	2030	2035
Supply totals	240,472	260,211	276,375	288,481	298,860
Demand totals	240,472	260,211	276,375	288,481	298,860
Difference (supply minus demand)	0	0	0	0	0

6.2 Projected Single-Dry-Year Water Supply and Demand

Table 6-7 provides a comparison of a single dry year water supply with projected total water use over the next 25 years, in five-year increments. The City's demands in single dry years are projected to be higher similar in proportion to the increase in regional water demands projected in the Water Authority's 2010 UWMP. An increase in use for landscape irrigation accounts for most of the increase in demands. It is assumed that recycled water demands would not increase in single dry years. The wholesale water supplies from the Water Authority are assumed to increase to meet the difference between the City's increased water demands and reduced local water supplies.

TABLE 6-7
PROJECTED SINGLE DRY YEAR SUPPLY AND DEMAND COMPARISON
(AFY)

	2015	2020	2025	2030	2035
Supply totals	255,040	276,526	293,895	307,230	318,586
Demand totals	255,040	276,526	293,895	307,230	318,586
Difference (supply minus demand)	0	0	0	0	0

6.3 Projected Multiple-Dry-Year Water Supply and Demand

Table 6-8 compares the total water supply available in multiple dry water years with projected total water use over the next 25 years. The City's demands in multiple dry years are projected to be higher similar in proportion to the increase in regional water demands projected in Water Authority's 2010 UWMP. It is assumed that recycled water demands would not increase in multiple dry years. The wholesale water supplies from Water Authority are assumed to increase to meet the difference between the City's increased water demands and reduced local water supplies. Multiple dry year scenarios represent hot, dry weather periods which may generate urban water demands that are greater than normal. No extraordinary conservation measures are reflected in the demand projections. The recycled water supplies are assumed to experience no reduction in a dry year.

TABLE 6-8
PROJECTED SUPPLY AND DEMAND COMPARISON DURING MULTIPLE DRY YEAR PERIOD ENDING IN 2035
(AFY)

		Supply and Demand Comparison – Multiple Dry Year Events				
		2015	2020	2025	2030	2035
Multiple-dry year First year supply	Supply totals	257,587	278,451	296,319	309,230	320,382
	Demand totals	257,587	278,451	296,319	309,230	320,382
	Difference	0	0	0	0	0
Multiple-dry year Second year supply	Supply totals	267,323	288,723	306,726	320,467	332,038
	Demand totals	267,323	288,723	306,726	320,467	332,038
	Difference	0	0	0	0	0
Multiple-dry year Third year supply	Supply totals	281,466	303,004	322,166	334,720	346,823
	Demand totals	281,466	303,004	322,166	334,720	346,823
	Difference	0	0	0	0	0

Section 7 - Conclusion - Availability of Sufficient Supplies

The Project is consistent with water demand assumptions in the regional water resource planning documents of MWD, and the Water Authority. The Public Utilities Department receives the majority of its water supply from MWD through the Water Authority. In addition, MWD and the Water Authority have developed water supply plans to improve reliability and reduce dependence upon existing imported supplies. MWD's Regional Urban Water Management Plan and Integrated Resources Plan, the Water Authority's 2010 UWMP and annual water supply report include projects that meet long-term supply needs through securing water from the State Water Project, Colorado River, local water supply development and recycled water.

The forecasted normal year water demands compared with projected supplies for the Public Utilities Department are shown in **Table 7-1**. This demonstrates that with existing supplies and implementation of the projects discussed in the three agencies's planning documents there will be adequate water supplies to serve all anticipated growth (existing and future planned uses) and development.

TABLE 7-1
PROJECTED SUPPLY AND DEMAND COMPARISON – NORMAL YEAR
(AFY)

	2015	2020	2025	2030	2035
Supply totals	240,472	260,211	276,375	288,481	298,860
Demand totals	240,472	260,211	276,375	288,481	298,860
Difference (supply minus demand)	0	0	0	0	0

Table 7-2 provides a comparison of a single dry year water supply with projected total water use over the next 25 years, in five-year increments.

TABLE 7-2
PROJECTED SINGLE DRY YEAR SUPPLY AND DEMAND COMPARISON
(AFY)

	2015	2020	2025	2030	2035
Supply totals	255,040	276,526	293,895	307,230	318,586
Demand totals	255,040	276,526	293,895	307,230	318,586
Difference (supply minus demand)	0	0	0	0	0

The multiple-dry year scenarios, within a 20-year projection, are shown in **Table 7-3**. This demonstrates that supplies will be adequate to meet all anticipated growth (existing and future planned uses) and development in multiple dry year periods.

TABLE 7-3
PROJECTED SUPPLY AND DEMAND COMPARISON DURING MULTIPLE DRY YEAR PERIOD ENDING IN 2035
(AFY)

		Supply and Demand Comparison – Multiple Dry Year Events				
		2015	2020	2025	2030	2035
Multiple-dry year First year supply	Supply totals	257,587	278,451	296,319	309,230	320,382
	Demand totals	257,587	278,451	296,319	309,230	320,382
	Difference	0	0	0	0	0
Multiple-dry year Second year supply	Supply totals	267,323	288,723	306,726	320,467	332,038
	Demand totals	267,323	288,723	306,726	320,467	332,038
	Difference	0	0	0	0	0
Multiple-dry year Third year supply	Supply totals	281,466	303,004	322,166	334,720	346,823
	Demand totals	281,466	303,004	322,166	334,720	346,823
	Difference	0	0	0	0	0

This Report demonstrates that there are sufficient water supplies over a 20-year planning horizon to meet the projected demands of the Project as well as the existing and other planned development projects within the Public Utilities Department service area in normal, dry year, and multiple dry year forecasts. This Project is proposing water demands which are included in the regional water resource planning documents of the Water Authority, and MWD.

Source Documents

California Department of Water Resources (DWR), Progress on Incorporating Climate Change into Management of California's Water Resources, July 2006 Report
California Climate Change Center, 2006 Biennial Report: Our Changing Climate: Assessing the Risks to California, 2006
California Department of Water Resources Guidebook for Implementation of Senate Bill 610 and Senate Bill 221 of 2001, March 2011
DSD Memorandum - Request for assessment and project description, March 2010
MWD 2010 Regional Urban Water Management Plan
MWD Report on Metropolitan's Water Supplies, A Blueprint for Water Reliability, March 2003
MWD Integrated Resources Plan Update, Oct 2010
Water Authority 2010 Urban Water Management Plan
Water Authority Regional Water Facilities Master Plan, 2003
Water Department Long-Range Water Resources Plan (2002-2030), December 2002
Public Utilities Department 2010 Urban Water Management Plan
Water Department The City of San Diego Subordinated Water Revenue Bonds, Series 2002, October 2002

Appendix K

WATER STUDY

Atkins North America, Inc.
9275 Sky Park Court, Suite 200
San Diego, California 92123

Telephone: +1.858.874.1810
Fax: +1.858.514.1001

www.atkinsglobal.com/northamerica

June 1, 2011

Ms. Bobbi Salvini
Senior Civil Engineer
Water & Sewer Development of the Public Utilities Department
City of San Diego
600 "B" Street, Suite 800, MS908A
San Diego, CA 92101-4502

SUBJECT: SAN DIEGO CORPORATE CENTER ON-SITE WATER STUDY

Dear Ms. Salvini:

This letter constitutes an On-Site Water Study (study) for the San Diego Corporate Center project (Project), which is a proposed mixed use town center development in Carmel Valley by Kilroy Realty Corporation. The study is for your review and approval.

The purpose of the study is to identify the on-site facilities required to provide domestic water and fire service to the project. The study determines potable water demands and recommends facility sizes for the proposed on-site domestic water and fire service system required to serve the project. The study is based on City of San Diego (City) planning and design criteria.

BACKGROUND

The Project is a 23-acre mixed use town center project within the Carmel Valley Community Planning Area in the City of San Diego. The project consists of 608 multi-family residential units, 806,000 square feet of retail and office space, and a 150-room hotel. **Figure 1** shows the proposed Project site.

WATER SERVICE

The Project site is located in the City's 470 Pressure Zone (PZ), which primarily serves the Carmel Valley area through pressure reducing facilities from the City's 610 North City Pressure Zone. The 470 PZ provides water service to the Project site from multiple sources. The primary sources are the 610/470 pressure reducing station (PRS) at Del Mar Heights Road and El Camino Real which supplies the 470 PZ pipelines in both Del Mar Heights Road and El Camino Real, thereby providing redundant sources. In addition, the 610/470 PRS at Carmel Country Road and Townsgate Drive provides another source of 470 PZ water supply via Townsgate Drive to El Camino Real.

The Project site is served via connections to the existing 16-inch water main in El Camino Real and the existing 12-inch main in Del Mar Heights Road. Together, these two connections will provide the City the required two sources of water supply to the proposed project.

Based on a graded pad elevation range of 180 to 220 feet, we expect the static hydraulic pressures within the proposed on-site system to be 108 to 125 psi. An on-site fire hydrant layout was provided by Leppert Engineering and is shown on **Exhibit 1**. Final fire hydrant placement and locations will be set in accordance with City criteria. Existing fire hydrants along the project site will be utilized and relocated as necessary.

ATKINS

WATER DEMANDS

Projected water demands for the site are shown in **Table 1**. The total average day demand (ADD) for the Project is 283,450 gpd (197 gpm). Based on City Design Criteria, the peaking factors are 2.1 for max day and 5.2 for peak hour. These equate to a maximum day demand (MDD) of 595,250 gpd (413 gpm) and a peak hour (PH) demand of 1,023 gpm.

Table 1. Projected Site Water Demands

Component	Area/Units	Population Density	Equivalent Population	Unit Rate	Average Demand (gpd)
Retail/Commercial	6.20 ac			5,000 gpd/n-acre	30,990
Hotel	2.30 ac			6,555 gpd/n-acre	15,050
Office	12.30 ac			5,730 gpd/n-acre	70,510
Residential	608 DU	1.83 / DU	1,113	150 gpd/person	166,900
Total					**283,450 gpd**

Notes:
1. Non-residential areas are based on component floor space and are considered a net area.
2. Residential unit demands based on SANDAG multi-family residential density for Carmel Valley (1.83 pph).
3. Retail/Commercial demands based on City of San Diego Design Guidelines.

WATER SYSTEM DESIGN CRITERIA

The City's planning and design criteria for potable water system sizing and service conditions were used to analyze and layout the proposed facilities. A summary of criteria used is provided in **Table 2**.

Table 2. City Planning and Design Criteria

Parameter	Criteria
Hazen-Williams Coefficient, C	120
Maximum Velocity, Max Day Demand	10 fps
Maximum Velocity, Max Day plus Fire	15 fps
Maximum Static Pressure	125 psi
Minimum Static Pressure	65 psi
Minimum Pressure, Peak Hour Demand	40 psi
Minimum Pressure, Max Day plus Fire	20 psi
Multi-Family Residential Fire Flow	3,000 gpm
Commercial Fire Flow	4,000 gpm

City criteria used in this analysis include the fire flow requirement of 4,000 gpm for commercial/mixed use developments. City criteria include a reliability requirement that no more than 30 homes or two fire hydrants be out-of-service at any time. The City allows the distribution of 4,000 gpm over multiple hydrants within 300 feet of each other along a street. Maximum day plus fire flow demand scenarios were run at selected key locations within the Project area.

ATKINS

HYDRAULIC ANALYSIS

Exhibit 1 shows the existing and proposed on-site City water distribution system for the Project. Our hydraulic analysis utilized a hydraulic model (H_2ONET version 7.0) representing the Project site as a pipe and node network. Simulated model boundary conditions include a fixed-head reservoir at El Camino Real and Del Mar Heights Road and a fixed-head reservoir in El Camino Real, both using an assumed HGL of 450 feet. Our hydraulic analysis focused primarily on fire flow availability as the most critical demand scenario. We used a Hazen-Williams C-value of 120 for all pipes to calculate headloss.

Analyses consisted of subjecting the proposed system to specified demand conditions, and comparing to the City's design criteria. The hydraulic model simulated projected maximum day, peak hour, and maximum day plus fire flow demand conditions, at critical nodes throughout the proposed Project site. **Table 3** presents those selected model results that resulted in minimum pressures and maximum velocities and which therefore reflect the critical hydraulic conditions for site evaluation. The hydraulic analysis is based on Phase 1 potable water facilities as the most critical scenario, with the understanding that the Project may defer Phase 2 facilities as the development progresses.

Table 3. Hydraulic Model Simulations

Run No.	Description	Results
1	Maximum Day Demands	Tables B-1a & B-1b
2	Peak Hour Demands	Tables B-2a & B-2b
3	Maximum Day Demands with 4,000 gpm fire (Nodes J16 and J18) with El Camino Real supply (pipe P29) out-of-service	Tables B-3a & B-3b

In all cases, minimum pressures and maximum pipeline velocities remained within City design criteria requirements. Based on the assumed boundary HGL of 450 feet, onsite minimum peak hour pressures were well above the City minimum criteria of 40 psi and minimum fire flow residuals were above 20 psi. H_2ONet simulation results and a pipe and node map are provided in **Appendix B**.

RECOMMENDED SYSTEM

The recommended potable water system for providing service to the Project is illustrated in **Exhibit 1**. This system will provide water service to the Project site in conformance with applicable City of San Diego requirements.

We look forward to working with you and your staff toward the successful completion of this project. Please contact me at (715) 347-4635 with any questions or comments you may have.

Sincerely yours,

Atkins

Mark B. Elliott, P.E.
Project Manager
MBE:lma

c: Bob Little, Kilroy Realty Corporation
Tony Dieli, Rick Engineering
Leanne Abe, Atkins
H:\Waterres\Kilroy Realty\100008492_SDCC\Report\Water Study\June 2011\SDCC Water Study 053111.docx

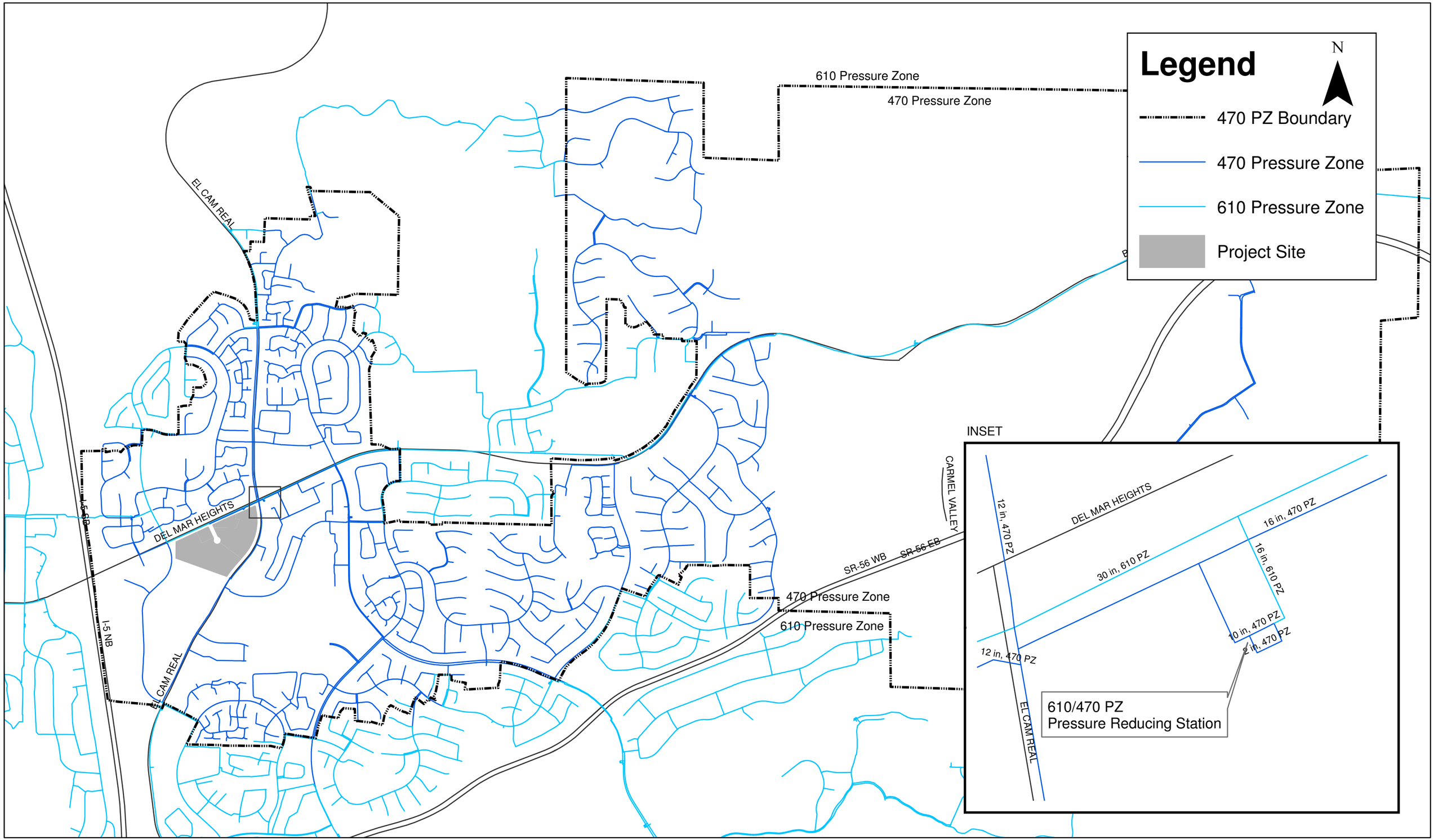
Enclosures: Figure 1 – Project Site
Figure 2 – Hydraulic Control Map
Exhibit 1 – Proposed Utilities
Appendix A – Correspondence
Appendix B – Hydraulic Model Data
Exhibit B-1 – Pipe and Node Map

FIGURE 1
SITE LOCATION

9/24/10 SDO LA Z:\IS\Projects\Kilroy\KilroySite.mxd

ATKINS

San Diego Corporate Center
Water Study
June 2011



Z:\Projects\IS\Kilroy\mxd\Hydraulic Control.mxd

HYDRAULIC CONTROL MAP
FIGURE 2

ATKINS

SDCC Water Study
June 2011

MAIN STREET AT CARMEL VALLEY

PROPOSED UTILITIES

DEL MAR HEIGHTS ROAD

HIGH BLUFF DRIVE

EL CAMINO REAL

THIRD AVE PRIV. DWY.

FIRST AVE PRIV. DWY.

ONE PASEO PRIV. DWY.

MARKET PLAZA PRIV. DWY.

ENTERPRISE PRIV. DWY.

TOWNSGATE DRIVE

BLOCK "A" LOWEST LEVEL: 168.0'

BLOCK "B" LOWEST LEVEL: 189.0'

BLOCK "C" LOWEST LEVEL: 190.0'

BLOCK "D" LOWEST LEVEL: 182.0'

BLOCK "E" LOWEST LEVEL: 182.0'

PHASE 1

PHASE 2

PHASE 3

29+70 NEW 2" IRR. SERVICE TO BE INSTALLED WITH 12" NEW WATER. METER TO BE MOVED FROM OLD SERVICE AT 32+20

32+20 EX. 2" IRR. SERVICE TO BE REMOVED WITH 12" ACP REMOVAL. METER TO BE MOVED TO NEW SERVICE AT 29+70

BEGIN 30" W.M. RELOCATION

END 30" W.M. RELOCATION

BEGIN 12" W.M. REMOVAL

END 12" W.M. REMOVAL

EX. 30" WATER PER 23427-D

EX. 12" WATER PER 20857-D

EX. 16" ACP WATER PER 20857-D

EX. 16" ACP WATER PER 20920-D

EX. 6" ACP WATER PER 20857-D

EX. FIRE HYDRANT ASSEMBLY(TYP)

6"COLD WATER (BLDG 6 – RESIDENTIAL) (400 GPM) (139 DU'S)

6"COLD WATER (BLDG 5 – RESIDENTIAL) (500 GPM) (181 DU'S)

6"COLD WATER (BLDG 3 – RESIDENTIAL) (480 GPM) (194 DU'S)

6" COLD WATER (BLDG 7 – RESIDENTIAL) (320 GPM) (94 DU'S)

2" COLD WATER (BLDG 3 – MARKET) (100 GPM)

2" COLD WATER (BLDG 5 – RETAIL) (80 GPM)

2"COLD WATER (BLDG 2 – RETAIL) (80 GPM)

4" COLD WATER (BLDG 4 – HOTEL) (250 GPM) (150 ROOMS)

1-1/2" COLD WATER (BLDG 4 – RETAIL) (40 GPM)

1-1/2"COLD WATER (BLDG 1 – RETAIL) (40 GPM)

2" COLD WATER (BLDG 8 – RETAIL) (XX GPM)

2" COLD WATER (BLDG 10 – RETAIL) (XX GPM)

2" COLD WATER (BLDG 11 – RETAIL) (XX GPM)

2"COLD WATER (BLDG 12 – OFFICE) (XX GPM)

2"COLD WATER (BLDG 9 – OFFICE) (80 GPM)

6" FIRE SERVICE (1000 GPM)

2" COLD WATER (RETAIL) (80 GPM)

FIRE HYDRANT ASSEMBLY(TYP)

FIRE SERVICE TO INCLUDE P.I.V. AND DCDA. LOCATION PENDING BLDG. DESIGN.(TYP)

32+60 EX. 2" IRR. SERVICE TO BE RE-CONNECTED TO NEW 12" PVC WATER. METER TO BE MOVED BEHIND NEW CURB LOCATION

EXTEND HYDRANT

RELOCATE FIRE HYDRANT ASSEMBLY

151 STALLS +251

HV-5 184.36

WATER P.O.C.

125+15 EX. 4" DOM WATER SERVICE TO BE ABANDONDED

125+10 EX. 8" FIRE SERVICE TO BE ABANDONDED

125+00 EX. 6" SEWER LATERAL TO BE ABANDONDED

118+15 EX. 4" DOM WATER SERVICE TO BE ABANDONDED

118+10 EX. 8" FIRE SERVICE TO BE ABANDONDED

118+00 EX. 6" SEWER LATERAL TO CONNECT TO BUILDING 12

MAP 10688 LOT 113

WEST LINE SECTION 18

304-230-43 MAP 11470 PAR A

304-230-08 MAP 11402 PAR C

304-072-12 PAR 12

PM 16370

304-072-26 PAR 19

PM 18004

304-072-47 PAR 2

304-072-38 PAR 23

PM 18379 PAR 21

304-072-38 PAR 25

304-072-20 PORTION SW 1/4, SEC 18, T14S, R3W, SBM

304-070-60 PM 10394 PAR 2

SE 1/4 OF SW 1/4, SEC 18, T14S, R3W, SBM

ROS 13062

WATER NOTES:

1. EXISTING 30" WATER IN DEL MAR HEIGHTS ROAD TO BE REALIGNED FROM STA.24+75 TO STA. 33+40 WITH PHASE 1.

2. EXISTING 12" WATER IN DEL MAR HEIGHTS ROAD TO BE REALIGNED FROM STA. 27+60 TO STA. 33+40 WITH PHASE 1, AND WILL BE EXTENDED TO THIRD AVENUE.

3. 12" WATERLINE THROUGH MIDDLE OF PROJECT FROM STA. 12+60 IN DEL MAR HEIGHTS ROAD TO STA. 114+30 IN EL CAMINO REAL WAS NOT CONSTRUCTED AND WILL BE DELETED FROM 23217-D UPON PROJECT APPROVAL.

LEGEND:

EXISTING 30" WATER -----	30" WATER
PROPOSED 30" WATER ----	30" WATER
EXISTING 16" WATER -----	16" WATER
EXISTING 12" WATER -----	12" WATER
PROPOSED 12" WATER ----	12" WATER
EXISTING FIRE HYDRANT ---	
PROPOSED FIRE HYDRANT --	
12" WATER NOT BUILT ----	

SCALE: 1" = 50'

50 0 50 100 150

GRAPHIC SCALE 1" = 50'

Prepared By:

Name: Leppert Engineering Corporation

Address: 5190 Governor Drive, Suite 205
San Diego, CA 92122

Phone #: (858) 597-2001

Fax #: (858) 597-2009

Project Address:

Southwest Corner Of Intersection At
Del Mar Heights Road & El Camino Real.

Project Name:

ONE PASEO

Sheet Title:

Proposed Water

Revision 14:
Revision 13:
Revision 12:
Revision 11:
Revision 10:
Revision 9:
Revision 8:
Revision 7:
Revision 6:
Revision 5:
Revision 4:
Revision 3:
Revision 2: 08/07/2011
Revision 1: 10/08/2010

Original:: 12/21/2009

SHEET W-1 OF 1

DEP#

Leppert Engineering CORPORATION
5190 Governor Drive, Suite 205, San Diego, Ca. 92122-2944
Phone: (858) 597-2001 Fax: (858) 597-2009

APPENDIX A
CORRESPONDENCE

an **Atkins** company

October 8, 2010

Mr. Mahmood Keshavarzi
City of San Diego Public Utilities Department
600 B Street, Suite 2210, MS 922
San Diego, CA 92101

SUBJECT: San Diego Corporate Center Water Study – Response to Comments

Dear Mr. Keshavarzi:

We have received and reviewed the City of San Diego Public Utilities (City) comments dated March 26, 2010 on the *San Diego Corporate Center Water Study*, January 2010. The following summarizes our response to your comments:

1. Please provide vicinity map.

   A vicinity map has been added as Figure 1 of the revised study.

2. Please provide Hydraulic Control map showing pressure zones boundary, PRS and transmission water mains.

   A hydraulic control map has been added as Figure 2 of the revised study.

3. Please provide a bigger map instead of Figure 1, showing pad elevations or contour lines, Legend, existing and proposed water mains and fire hydrants. Use heavier lines for water facilities.

   A utility exhibit has been added as Exhibit 1 of the revised study to show existing and proposed utilities in more detail.

4. Please show alignment of the existing and proposed 30" water mains. Specify during which phase it will be built.

   The re-alignment of the existing 30-inch water main is shown in the new Exhibit 1.

We feel the attached September 2010 study, along with these responses and clarifications, adequately address sewer system issues for this development and we request that the City approve the revised study. Please feel free to contact me with any questions or comments you may have.

Respectfully submitted,

PBS&J

Mark B. Elliott, P.E.
Project Manager

MBE:lma

REGISTERED PROFESSIONAL ENGINEER
MARK B. ELLIOTT
No. 42064
Exp. 03/31/12
CIVIL
STATE OF CALIFORNIA

9275 Sky Park Court, Suite 200 • San Diego, California 92123 • Telephone: 858.874.1810 • Fax: 858.514.1001 • www.pbsj.com

c: Bobbi Salvini, City of San Diego
Bob Little, Kilroy Realty Corporation
Tony Dieli, Rick Engineering
Leanne Abe, PBS&J
H:\Waterres\Kilroy Realty\100008492_SDCC\Report\Water Study\September 2010\Water RTC letter 092410.doc

THE CITY OF SAN DIEGO
Development Services
1222 First Avenue, San Diego, CA 92101-4154

L64A-003A

Review Information

Cycle Type:	15 Submitted (Multi-Discipline)	**Submitted:**	01/04/2010	Deemed Complete on 01/15/2010
Reviewing Discipline:	PUD-Water & Sewer Dev	**Cycle Distributed:**	01/15/2010	
Reviewer:	**Keshavarzi, Mahmood**	**Assigned:**	01/20/2010	
	(619) 533-4692	**Started:**	02/22/2010	
Hours of Review:	12.00	**Review Due:**	02/23/2010	
Next Review Method:	Submitted (Multi-Discipline)	**Completed:**	02/24/2010	**COMPLETED LATE**
		Closed:	03/26/2010	

. The reviewer has indicated they want to review this project again. Reason chosen by the reviewer: First Review Issues.
. We request a 2nd complete submittal for PUD-Water & Sewer Dev on this project as: Submitted (Multi-Discipline).
. The reviewer has requested more documents be submitted.
. Your project still has 11 outstanding review issues with PUD-Water & Sewer Dev (all of which are new).
. The reviewer has not signed off 2 jobs.
. Last month PUD-Water & Sewer Dev performed 25 reviews, 88.0% were on-time, and 100.0% were on projects at less than < 3 complete submittals.

Informational items

Cleared?	Issue Num	Issue Text
☒	1	All water services to the site, including domestic, irrigation and fire, will require private, above ground back flow prevention devices (BFPDs). BFPDs are typically located on private property, in line with the service and immediately adjacent to the right-of-way. The Water Department will not permit the required BFPDs to be located below grade or within the structure. (New Issue) [Recommended]
☒	2	Water and sewer capacity charges will be due at the time of building permit issuance. Capacity charges, as well as service and meter size, are determined by the Water Meter Data Card which is completed during the building plan review process. Any questions regarding water and sewer capacity fees should be addressed to Information and Application Services (619-446-5000). (New Issue) [Recommended]
☒	3	If it is determined that the existing water services are not of adequate size to serve the proposed project, the applicant will be required to abandon (kill) any existing unused water services and install new water service(s) and meter which must be located outside of any driveway or vehicular use area. (New Issue) [Recommended]
☒	4	All proposed public water and sewer facilities, including services and meters, must be designed and constructed in accordance with established criteria in the most current edition of the City of San Diego Water and Sewer Facility Design Guidelines and City regulations, standards and practices pertaining thereto. (New Issue) [Recommended]
☒	5	No trees or shrubs exceeding three feet in height at maturity shall be installed within ten feet of any water and sewer facilities. (New Issue) [Recommended]
☒	6	Upon review of the revised plans addressing the comments, the Water and Sewer Review Section will provide additional comments, if any, and draft permit conditions. If you have any questions regarding the Water and Sewer Review Section comments, please contact Moe Keshavarzi at (619) 533-4692. (New Issue) [Recommended]

1st Review Comments

Cleared?	Issue Num	Issue Text
☐	7	Sheet C-2: Show and call out the proposed water easement on private drive sections. (New Issue)
☐	8	Revise Sheet C-13 of 15 (proposed Utilities) per items below: 1- Call out the existing water and sewer main drawing numbers. 2- Show and call out the existing water (domestic, fire, irrigation) and sewer services and identify to remain or abandon. If remain call out future use. 3- The existing 12" water main and 10" sewer main at the intersection of Del Mar Heights Road and Del Mar Heights Place and the existing 12" water main and 10" sewer main at the southwest corner of project on El Camino Real must be abandoned. Continued below: (New Issue)
☐	9	4- Show and call out the proposed water easement. Show easement for all public appurtenances. 5- Is the proposed water line shown on First Avenue public or private? If private; please call out private and move it out of the driveway and show private BF. Water service and meter cannot be connected to the private water line. The proposed water service for Block "A" must be connected to the existing water main on Del Mar Heights Road and El Camino Real. Continued below: (New Issue)
☐	10	6- Please show dimension between the existing 30" water main and the proposed median's face of curb on Del Mar Heights Road. A minimum 5' separation (edge to edge) is required between the existing 30" water main and face of curb. 7- Please add the following note: No approved improvements or landscaping, including private water facilities, grading and enhanced paving, shall be installed in or over a water easement prior to the applicant obtaining an Encroachment Maintenance and Removal Agreement. 8- Location of the proposed fire hydrant east of Block "C" is not acceptable. Continued below: (New Issue)

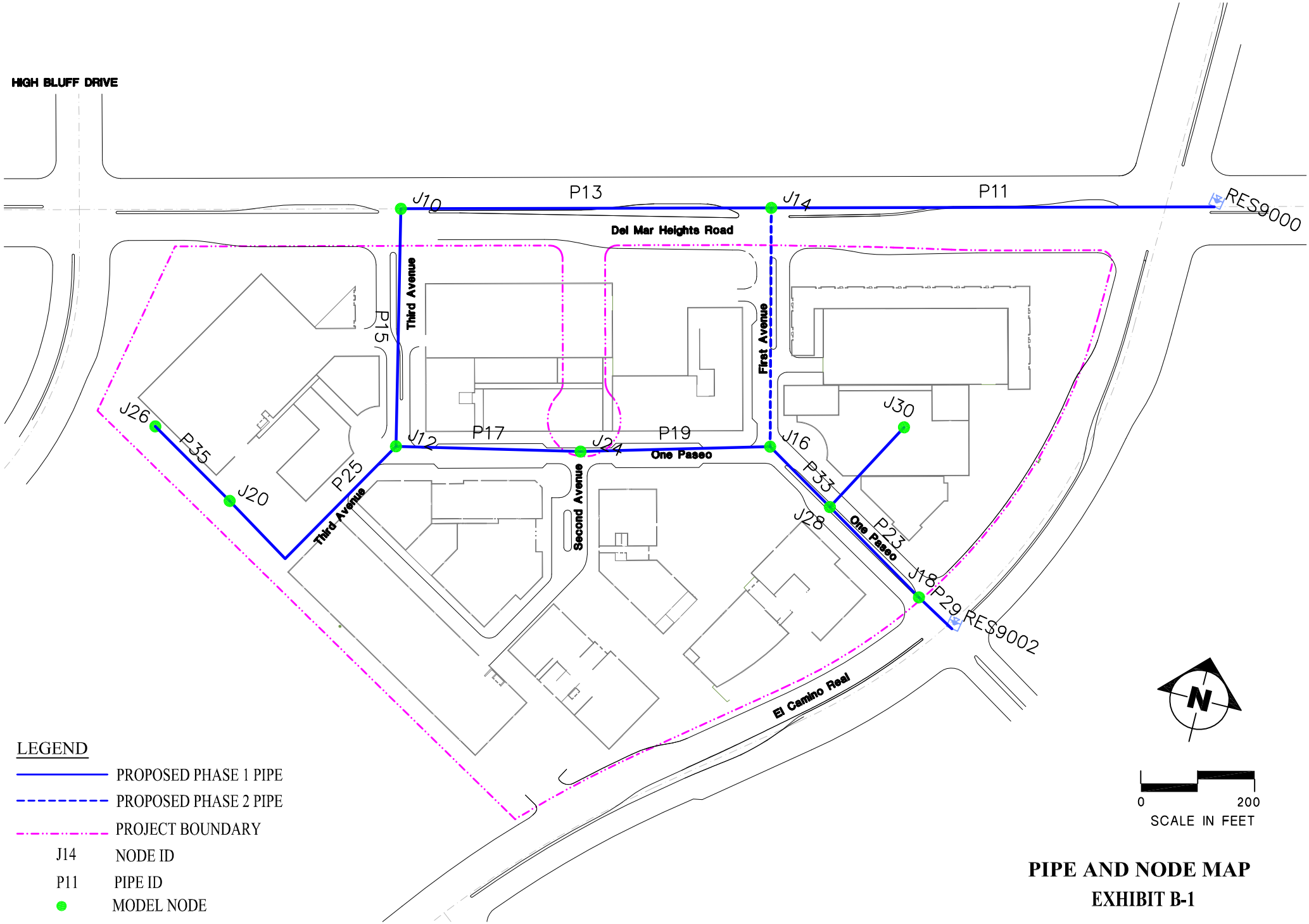
For questions regarding the 'PUD-Water & Sewer Dev' review, please call Mahmood Keshavarzi at (619) 533-4692. Project Nbr: 193036 / Cycle: 15

Cleared?	Issue Num	Issue Text
☐	11	9- Please show the rim and invert elevation of the existing and proposed sewer manholes. 10- Please add the following note: All proposed Sewer facilities are private. 11- The proposed sewer laterals must be connected to the existing 18" trunk sewer main by a manhole. Please revise plans. 12- The proposed sewer laterals require odorless connection per figure 2-1 of the Sewer Design Guide. 13- Please add the following note: Private sewer lateral connection into the existing public sewer main requires an Encroachment Maintenance and Removal Agreement. Continued below: (New Issue)
☐	12	Please add the following note on all landscape sheets: No approved improvements or landscaping, including private water facilities, grading and enhanced paving, shall be installed in or over a water easement prior to the applicant obtaining an Encroachment Maintenance and Removal Agreement. (New Issue)

Water Study Comments

Cleared?	Issue Num	Issue Text
☐	13	Please provide vicinity map. (New Issue)
☐	14	Please provide Hydraulic Control map showing pressure zones boundary, PRS and transmission water mains. (New Issue)
☐	15	Please provide a bigger map instead of Figure 1, showing pad elevations or contour lines, Legend, existing and proposed water mains and fire hydrants. Use heavier lines for water facilities. (New Issue)
☐	16	Please show alignment of the existing and proposed 30" water mains. Specify during which phase it will be built. (New Issue)
☐	17	Please submit 2 copies of the revised water study. (New Issue)

APPENDIX B
HYDRAULIC MODEL DATA



PIPE AND NODE MAP
EXHIBIT B-1

H:\Waterres\Kilroy Realty\100008492_SDCC\Model\water model CAD.dwg May 31, 2011

TABLE B-1A
MAXIMUM DAY DEMANDS

NODE ID	DEMAND (gpm)	ELEVATION (ft)	HEAD (ft)	PRESSURE (psi)
J10	84.46	217	449.89	100.91
J12	8.76	215	449.88	101.77
J14	50.04	210	449.92	103.96
J16	21.95	214	449.92	102.22
J18	0.00	198	449.98	109.18
J20	0.00	216	449.86	101.33
J24	74.42	215	449.89	101.78
J26	108.89	214	449.86	102.2
J28	53.61	201	449.94	107.86
J30	11.21	202	449.94	107.43

TABLE B-1B
MAXIMUM DAY DEMANDS

PIPE ID	FROM NODE	TO NODE	DIAMETER (in)	FLOW (gpm)	VELOCITY (fps)	HEADLOSS (ft)
P11	RES9000	J14	12	168.21	0.48	0.08
P13	J14	J10	12	120.49	0.34	0.04
P15	J10	J12	12	36.02	0.1	0
P17	J12	J24	12	-81.62	0.23	0.01
P19	J24	J16	12	-156.04	0.44	0.03
P21	J14	J16	12	-2.32	0.01	0.00
P23	J18	J28	12	245.13	0.7	0.05
P25	J12	J20	12	108.89	0.31	0.02
P29	RES9002	J18	12	245.13	0.7	0.02
P31	J28	J30	12	11.21	0.03	0
P33	J28	J16	12	180.30	0.51	0.02
P35	J20	J26	12	108.89	0.31	0.01

TABLE B-2A
PEAK HOUR DEMANDS

NODE ID	DEMAND (gpm)	ELEVATION (ft)	HEAD (ft)	PRESSURE (psi)
J10	209.14	217	449.39	100.69
J12	21.68	215	449.37	101.55
J14	123.92	210	449.58	103.81
J16	54.34	214	449.58	102.08
J18	0.00	198	449.91	109.15
J20	0.00	216	449.27	101.08
J24	184.29	215	449.42	101.57
J26	269.62	214	449.23	101.92
J28	132.76	201	449.67	107.75
J30	27.77	202	449.67	107.31

TABLE B-2B
PEAK HOUR DEMANDS

PIPE ID	FROM NODE	TO NODE	DIAMETER (in)	FLOW (gpm)	VELOCITY (fps)	HEADLOSS (ft)
P11	RES9000	J14	12	416.53	1.18	0.42
P13	J14	J10	12	298.35	0.85	0.19
P15	J10	J12	12	89.2	0.25	0.01
P17	J12	J24	12	-202.1	0.57	0.05
P19	J24	J16	12	-386.39	1.1	0.16
P21	J14	J16	12	-5.74	0.02	0
P23	J18	J28	12	606.99	1.72	0.24
P25	J12	J20	12	269.62	0.76	0.1
P29	RES9002	J18	12	606.99	1.72	0.09
P31	J28	J30	12	27.77	0.08	0
P33	J28	J16	12	446.47	1.27	0.09
P35	J20	J26	12	269.62	0.76	0.04

TABLE B-3A
MAXIMUM DAY DEMANDS PLUS 4,000 GPM FIRE FLOW
WITH EL CAMINO REAL SUPPLY OUT OF SERVICE

NODE ID	DEMAND (gpm)	ELEVATION (ft)	HEAD (ft)	PRESSURE (psi)
J10	84.46	217	412.90	84.88
J12	8.76	215	410.83	84.85
J14	50.04	210	416.51	89.48
J16	2021.94	214	408.20	84.15
J18	2000.00	198	404.42	89.44
J20	0	216	410.81	84.41
J24	74.42	215	409.46	84.26
J26	108.89	214	410.80	85.27
J28	53.61	201	406.63	89.10
J30	11.21	202	406.63	88.67

TABLE B-3B
MAXIMUM DAY DEMANDS PLUS 4,000 GPM FIRE FLOW
WITH EL CAMINO REAL SUPPLY OUT OF SERVICE

PIPE ID	FROM NODE	TO NODE	DIAMETER (in)	FLOW (gpm)	VELOCITY (fps)	HEADLOSS (ft)
P11	RES9000	J14	12	4,413.34	12.52	33.49
P13	J14	J10	12	1,460.67	4.14	3.61
P15	J10	J12	12	1,376.20	3.9	2.08
P17	J12	J24	12	1,258.56	3.57	1.37
P19	J24	J16	12	1,184.14	3.36	1.25
P21	J14	J16	12	2,902.63	8.23	8.31
P23	J18	J28	12	-2,000.00	5.67	2.21
P25	J12	J20	12	108.89	0.31	0.02
P29	RES9002	J18	12	0.00	0	0
P31	J28	J30	12	11.21	0.03	0.00
P33	J28	J16	12	-2,064.83	5.86	1.57
P35	J20	J26	12	108.89	0.31	0.01