STORMWATER CALCULATIONS

Canyon Power Plant Project
WQV/WQF Calculations

Prepared By:	M. Grodzki	Date:	10/9/2007
Checked By:	K. Chang	Date:	10/10/2007
Revised By:		Date:	

Purpose: To calculate Water Quality Volumes (WQV) for this project

Assumptions/ Methods:
-Basin Sizer version 1.4 was used for these calculations.
-WQV is Calculated as:
WQV = (Water Quality Event Depth x Runoff Coefficient) x Tributary Area
(Water Quality Event Depth x Runoff Coefficient) is taken from the Basin Sizer output data
-Runofff Coefficient for this project is **C=0.90**

References: -Caltrans Storm Water Quality Handbooks - Project Planning and Design Guide May 2007

Output Data from Basin Sizer:

Project: Anaheim

Latitude 33.858
Longitude -117.8396

Caltrans Stations

Name	Distance	Elevation	Years of Data
ANAHEIM	1.07	102	17

Water Quality Volumes

Maximized Volume Method (in)
Drawdown Time (Hours) 48
Runoff Coefficient 0.95
Unit Basin Storage Volume (in) 0.91

Predetermined Numbers
A water quality event depth of 0.75 inches has been set by the Los Angles RWQCB for the Los Angeles Area

Water Quality Flows

Caltrans Water Quality Flows
Region 8, all counties: 0.2 in/hour.

CSUS, Office of Water Programs

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Prepared By:	M. Grodzki	Date:	10/9/2007
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Entire Property

WQV Calculation

			Line
area =	9.02	Ac.	1
area conversion (Ac to ft^2) =	392,911	ft^2	2
runoff coefficient =	0.9		3
Water Quality Event Depth =	0.75	in	4
WQE depth conversion (in to ft) =	0.0625	ft	5

WQV = Line 2 x Line 3 x Line 5

WQV = 22,101 ft^3

Entire Site within Soundwall

WQV Calculation

			Line
area =	8.56	Ac.	1
area conversion (Ac to ft^2) =	372,874	ft^2	2
runoff coefficient =	0.9		3
Water Quality Event Depth =	0.75	in	4
WQE depth conversion (in to ft) =	0.0625	ft	5

WQV = Line 2 x Line 3 x Line 5

WQV = 20,974 ft^3

Disturbed Area (approximate area of development - eastern and southern portion of site)

WQV Calculation

			Line
area =	4.25	Ac.	1
area conversion (Ac to ft^2) =	185,130	ft^2	2
runoff coefficient =	0.9		3
Water Quality Event Depth =	0.75	in	4
WQE depth conversion (in to ft) =	0.0625	ft	5

WQV = Line 2 x Line 3 x Line 5

WQV = 10,414 ft^3

Canyon Power Plant Project
Water Quality BMP Size Calculations

Prepared By: M. GRODZKI
Checked By: K. CHANG
Revised By:

Purpose: To estimate the size of the proposed multi-chamber treatment train BMP unit for the referenced site.

Assumptions: WQV treated is presumed to be that generated by the *approximate area of construction disturbance only,* 4.25 Ac. (185,130 ft^2)

Entire Site Area
Total Area of Construction Disturbance = 185,130 ft^2
WQV= 10,414 ft^3

Multi-Chamber Treatment Train:
- Total head 5 ft

First Chamber
- Sized to hold 25% WQV
- Depth Below Weir 1 ft

Second Chamber
- Depth below ground surface 9 ft

Third Chamber
- Equation 1:

$A_f = (C * VOL * d) / (k * T * (h + d))$

A_f =	Surface area of third chamber (m^2)	
C =	Conversion Factor for units of permeability 12 for inches to ft	12
VOL =	100% Water Quality Volume	
d =	Depth of filter bed	2 ft
k =	Coefficient of permeability	4 in/hr
T =	Drain design time	48 hr
h =	Average water height above media surface	0.5*max head of second chamber ft

- Equation 2:

$L_{3rd\ chamber} = A_f / W$

$L_{3rd\ chamber}$=	Third chamber length (ft)
A_f =	Surface area of third chamber (ft^2)
W =	Filter bed width (ft)

References: -Caltrans Storm Water Quality Handbooks - Project Planning and Design Guide May 2007

-Equations:
Equation 1: Caltrans Storm Water Quality Handbooks, B-68
Equation 2: Caltrans Storm Water Quality Handbooks, B-68

Multi-Chamber Treatment Train (MCTT)

BMP Unit	Area Treated (ft^2)	Percent WQV Treated (%)	WQV (ft^3)	First Chamber Size 25% WQV (ft^3)	First Chamber Surface Area (ft^2)	First Chamber Width (ft)	First Chamber Length (ft)	Second Chamber Size 75% WQV (ft^3)	Second Chamber Surface Area (ft^2)	Second Chamber Length (ft)	Third Chamber Size 100% WQV (ft^3)	Third Chamber A_f (ft^2)	Third Chamber Length (ft)	Total Length (ft)	Total Width (ft)	Total Depth (ft)
Anaheim	185,130	100%	10,414	2,603.5	433.9	25.0	17.4	7,810.50	976.31	39.05	10,414.00	289.28	11.57	67.98	25.00	9.00

PB Americas, Inc.

STORM SEWER COMPUTATIONS

Project: COA Canyon Power Plant
Project No: 13642A
Desc: CPP pipe capacity calcs

Designed: M. Grodzki Date: 10/10/07
Checked: K. Chang Date: 10/10/07
Checked: _____
Checked: _____

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Rainfall Data: Anaheim, CA
Units: English

Manning's "n" values:	
RC	0.013
DI	0.010
CM	0.024
HDPE	0.011

Intensity, $i = at^b$		
Fr	a	b
2	5.702	-0.574
5	7.870	-0.562
10	10.209	-0.573
25	11.995	-0.566
50	13.521	-0.566
100	15.560	-0.573

LOCATION		SUBAREA DATA									PIPE DATA														DESIGN FLOW				
FROM	TO	Area	"C"	CxA	CxA	Tc*	T_c	Fr	"I"	Q_A	Mat	# of	Type	Span	Hgt	L	Slope	n	Q_{cap}	Inverts		Upper	Cover		% of	Q_A	d	V_A	t
		Ac			Sum	min	Sum	Yr	in/hr	cfs		Pipes	C,E,B	in	in	ft	%		cfs	Upper	Lower	Grate	Upper	Lower	Cap	cfs	ft	fps	min
1-1	1-2	0.244	0.90	0.22	0.22	10.0	10.0	25	3.26	0.7	RC	1	C	15	15	48	0.20	0.013	2.9	215.50	215.40	218.50	3.00	3.20	25	0.7	0.44	1.85	0.5
1-2	1-3	0.223	0.90	0.20	0.42	10.0	10.5	25	3.17	1.3	RC	1	C	15	15	76	0.20	0.013	2.9	215.40	215.25	218.60	3.20	3.42	46	1.3	0.62	2.19	0.6
1-3	1-4	0.387	0.90	0.35	0.77	10.0	11.1	25	3.07	2.4	RC	1	C	15	15	76	0.20	0.013	2.9	215.25	215.10	218.67	3.42	3.60	82	2.4	0.92	2.47	0.5
1-4	1-5	0.327	0.90	0.29	1.06	10.0	11.6	25	3.00	3.2	RC	1	C	15	15	68	0.30	0.013	3.5	215.10	214.90	218.70	3.60	4.05	91	3.2	1.00	3.04	0.4
2-1	2-2	0.149	0.90	0.13	0.13	10.0	10.0	25	3.26	0.4	RC	1	C	15	15	77	0.20	0.013	2.9	215.50	215.35	218.50	3.00	3.15	15	0.4	0.34	1.64	0.5
2-2	2-3	0.128	0.90	0.12	0.25	10.0	10.5	25	3.17	0.8	RC	1	C	15	15	55	0.20	0.013	2.9	215.35	215.24	218.50	3.15	3.31	28	0.8	0.47	1.89	0.5
2-3	1-5	0.137	0.90	0.12	0.37	10.0	11.0	25	3.09	1.2	RC	1	C	15	15	64	0.53	0.013	4.7	215.24	214.90	218.55	3.31	4.05	25	1.2	0.44	2.98	0.4
2-4	1-5	0.483	0.90	0.43	0.43	15.0	15.0	25	2.59	1.1	RC	1	C	15	15	44	1.14	0.013	6.9	215.40	214.90	218.55	3.15	4.05	16	1.1	0.36	3.89	0.5
1-5	1-6	0.330	0.90	0.30	2.17	12.0	15.5	25	2.54	5.6	RC	1	C	18	18	101	0.30	0.013	5.8	214.65	214.35	218.70	4.05	4.15	97	5.6	1.29	3.43	0.5
3-1	3-2	0.149	0.90	0.13	0.13	10.0	10.0	25	3.26	0.4	RC	1	C	15	15	77	0.20	0.013	2.9	215.50	215.35	218.50	3.00	3.15	15	0.4	0.34	1.64	0.5
3-2	3-3	0.135	0.90	0.12	0.26	10.0	10.5	25	3.17	0.8	RC	1	C	15	15	70	0.20	0.013	2.9	215.35	215.21	218.50	3.15	3.34	28	0.8	0.47	1.94	0.6
3-3	1-6	0.137	0.90	0.12	0.38	10.0	11.1	25	3.07	1.2	RC	1	C	15	15	73	0.83	0.013	5.9	215.21	214.60	218.55	3.34	4.15	20	1.2	0.39	3.60	0.3
3-4	1-6	0.168	0.90	0.15	0.15	12.0	12.0	25	2.94	0.4	RC	1	C	15	15	51	2.16	0.013	9.5	215.70	214.60	218.70	3.00	4.15	5	0.4	0.19	3.81	0.2
1-6	1-7	0.319	0.90	0.29	2.98	10.0	16.0	25	2.50	7.5	RC	1	C	18	18	90	0.60	0.013	8.1	214.35	213.81	218.50	4.15	4.69	92	7.5	1.22	4.90	0.3
4-1	4-2	0.149	0.90	0.13	0.13	10.0	10.0	25	3.26	0.4	RC	1	C	15	15	77	0.20	0.013	2.9	215.50	215.35	218.50	3.00	3.15	15	0.4	0.34	1.64	0.5
4-2	4-3	0.135	0.90	0.12	0.26	10.0	10.5	25	3.17	0.8	RC	1	C	15	15	70	0.20	0.013	2.9	215.35	215.21	218.50	3.15	3.34	28	0.8	0.47	1.94	0.6
4-3	1-7	0.137	0.90	0.12	0.38	10.0	11.1	25	3.07	1.2	RC	1	C	15	15	73	0.20	0.013	2.9	215.21	215.06	218.55	3.34	4.69	41	1.2	0.58	2.10	0.6
1-7	1-8	0.366	0.90	0.33	3.69	10.0	16.3	25	2.47	9.2	RC	1	C	18	18	65	0.80	0.013	9.4	213.81	213.29	218.50	4.69	5.21	98	9.2	1.31	5.62	0.2
1-8	1-9	0.153	0.90	0.14	3.83	10.0	16.5	25	2.46	9.5	RC	1	C	18	18	54	0.85	0.013	9.7	213.29	212.83	218.50	5.21	6.10	98	9.5	1.31	5.79	0.2
5-1	5-2	0.454	0.90	0.41	0.41	12.0	12.0	25	2.94	1.2	RC	1	C	15	15	114	0.20	0.013	2.9	215.20	214.97	218.20	3.00	3.35	42	1.2	0.59	2.13	0.5
5-2	1-9	0.302	0.90	0.27	0.68	10.0	12.5	25	2.87	2.0	RC	1	C	15	15	111	0.20	0.013	2.9	214.97	214.75	218.32	3.35	6.10	68	2.0	0.79	2.40	0.8
1-9	1-10	0.178	0.90	0.16	4.67	10.0	16.6	25	2.44	11.5	RC	1	C	24	24	172	0.30	0.013	12.4	212.33	211.81	218.43	6.10	5.42	93	11.5	1.64	4.17	0.7
1-10	1-11	0.691	0.90	0.62	5.29	15.0	17.3	25	2.39	12.7	RC	1	C	24	24	61	0.35	0.013	13.4	211.81	211.60	217.23	5.42	5.15	95	12.7	1.68	4.53	0.2
1-11	MCTT																												
MCTT	Infiltration Basin																												
Infiltration Overflow	Exist. SD Manhole	2.670	0.90	2.40	7.70	30.0	30.0	25	1.75	13.6	RC	1	C	24	24	76	1.00	0.013	22.6	211.60	210.84	216.75	5.15	0.00	60	13.6	1.17	7.08	0.2