WATER QUALITY

2. Calculate the stormwater quality design flow for the site (or each sub-drainage area that will discharge to a separate BMP) produced by 0.2-inch/hour rainfall by using the rational method equation:

$$Q_{P,SQDF} = C * I * A$$

Where:

C = runoff coefficient obtained from **Table A-1**.

I = rainfall intensity (0.2 in/hr)

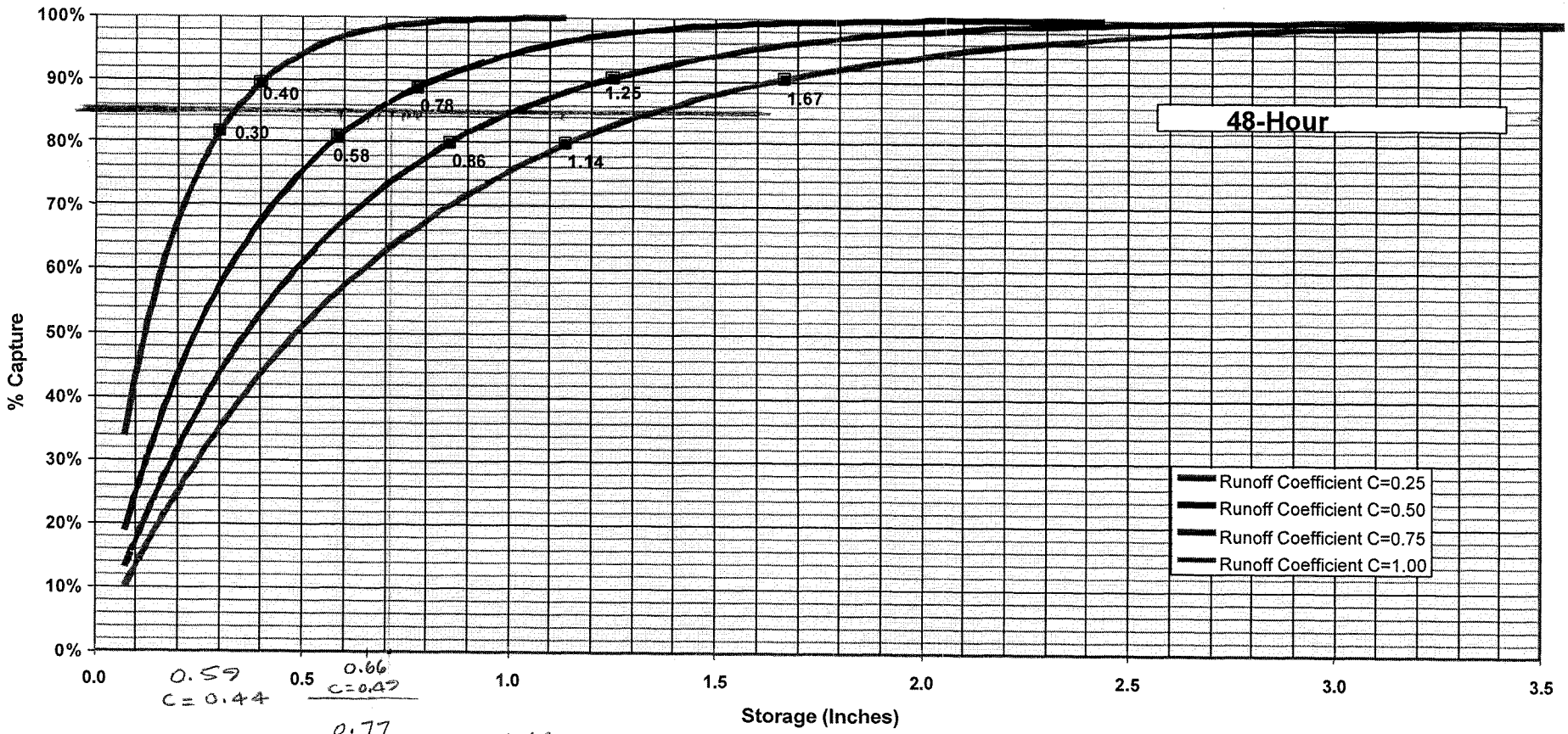
A = area of the site or sub-drainage area in acres

Table A-1

C Values Based on Impervious/Pervious Area Ratios

% Impervious	% Pervious	C
0	100	0.15
5	95	0.19
10	90	0.23
15	85	0.26
20	80	0.30
25	75	0.34
30	70	0.38
35	65	0.41
40	60	0.45
45	55	0.49
50	50	0.53
55	45	0.56
60	40	0.60
65	35	0.64
70	30	0.68
75	25	0.71
80	20	0.75
85	15	0.79
90	10	0.83
95	5	0.86
100	0	0.90

Figure A-3
Volumetric BMP Sizing Curves for
Orange County Stormwater Quality Management Program
Silverado Ranger Station (ABOVE 1,000 FEET)



0.59
C=0.44

0.66
C=0.49

0.77
C=0.57

0.72
C=0.53

0.68
C=0.51

0.79
C=0.58

0.74
C=0.55

6.3 Treatment Control BMPs

Table 6.2 Treatment Control BMPs		
Number	**BMP and Objective**	**Included**
	Infiltration	
TC-10	**Infiltration Trench:** A long narrow rock filled trench with no outlet receives water and stores it until it infiltrates into the underlying soil. Its effective are removing most pollutants but can get clogged with sediment. *Explanation/Description:* Soils do not allow for infiltration BMPs	N
TC-11	**Infiltration Basin:** A shallow impoundment designed to capture and hold stormwater until it infiltrates into underlying soil. Effective at removing most pollutants but requires large areas and may be constrained by soil types. *Explanation/Description:* Soils do not allow for infiltration BMPs	N
TC-12	**Retention/Irrigation:** Stormwater is captured in cistern, basin, trench, or other storage area and is subsequently used for irrigation of site landscaping. *Explanation/Description:* Reuse was found to be infeasible for a project of this size	N
	Detention and Settling	
TC-20	**Wet Pond:** A constructed basin with a permanent pool of water throughout the year. Differ from wetlands because it is of greater depth. Treats stormwater runoff by settling and biological uptake. *Explanation/Description:* Wet ponds were found to be infeasible for this project considering space constraints and associated vector issues	N
TC-21	**Constructed Wetland:** A constructed basin with permanent pool of shallow water throughout most of year with substantial vegetative coverage. *Explanation/Description:* Constructed wetlands were found to be infeasible for this project considering space constraints and associated vector issues	N
TC-22	**Extended Detention Basin:** A constructed basin with an outlet designed to detain stormwater for at least 48 hours to allow particles and pollutants to settle. *Explanation/Description:* An extended detention basin is being utilized for one portion of this project. Other portions will utilize underground detention basins housed in a modular concrete structure manufactured by Old Castle precast.	N
MP-20	**Wetland:** Similar to a constructed wetland but a self-contained, manufactured module with vegetation that mimics natural wetland processes. *Explanation/Description:* A series of Modular Wetlands are being utilized downstream of the underground WQV/hydromod detention vaults	Y
	Biofiltration	
TC-30	**Vegetated Swale:** Open, shallow, vegetated channels that collect and slowly convey runoff through the property. Filters runoff through vegetation, subsoil matrix, and/or underlying soils; traps pollutants, promotes infiltration and reduce flow velocity.	N

	Explanation/Description: Infeasible due to project topography	
TC-31	**Vegetated Buffer Strip:** Vegetated surfaces that are designed to treat sheet flow from adjacent surfaces. Removes pollutants by deceleration, settling, and infiltration. *Explanation/Description:* Infeasible due to project topography	N
TC-32	**Bioretention:** A soil and plant based filtration strategy that involved capturing stormwater in depressed landscaped areas. Bioretention practices are flexible strategies for using landscaping as treatment. *Explanation/Description:* The Modular Wetlands operate on the same scientific principles as bioretention system	Y
	Filtration	
TC-40	**Media Filter:** Usually two-chambered with a pretreatment settling basin and a filter bed filled with sand or other absorptive filter media. *Explanation/Description:* . .feasible due to project layout	Y
MP-40	Media Filter: Similar to constructed media filter but manufactured as self-contained filtering vaults, units, or cartridges. *Explanation/Description:* Modular Wetland is a two-stage system with wetland chambers containing biofiltration/sorptive media. Prior to the wetland chamber are pre-treatment chambers that contain a series of cartridge filters that utilize a coarse granular media to remove fine sediments and hydrocarbons from entering the wetland chambers. This system has been independently tested in the field in both California and Oregon under the TAPE protocol. It has been proven to remove TSS, hydrocarbons, dissolved and particulate nutrients and metals and bacteria at medium to high levels.	Y
	Flow Through Separation	
TC-50	**Water Quality Inlet:** Vaults with chambers including screens, settling areas, and/or filter media to promote settling and/or separation of pollutants from stormwater. *Explanation/Description:* Pretreatment provided by vortex separators with built in trash screens	N
MP-50	**Wet Vault:** A vault with a permanent water pool and internal features to promote settling and/or separation of pollutants from stormwater. *Explanation/Description:* Pretreatment provided by vortex separators with built in trash screens	N
MP-51	**Vortex Separator:** Similar to wet vaults but round and use centrifugal action as primary separation mechanism. *Explanation/Description:* Pre-treatment of runoff entering the underground WQV/hydromod vaults are pre-treated by Dual Stage Hydrodynamic separators containing elevated screening systems to remove trash and debris and store in a dry state. The screening system is certified for full capture. Below is a series of three hydrodynamic separation chambers to captures greater than 80% removal of TSS down to 75 microns. The system, known as the Nutrient Separating Baffle Box has been locally tested in the field by the City of Santa Monica and found capable of removing 87% of TSS and 99% of Oils & Grease.	Y

MP-52	**Drain Inserts:** Boxes, trays, or socks with screens or filter fabric and may also include filter media. They are installed in inlets or catch basins and removal effectiveness for pollutants is generally low except for large sediment. *Note: Drain inserts cannot be the sole Treatment Control BMP selection for Priority Projects.* *Explanation/Description:* Pretreatment provided by vortex separators with built in trash screens	N
	Other	
TC-60	**Multiple Systems:** A system that uses two or more BMPs in series to increase treatment. Useful when one BMP does not provide sufficient treatment alone. *Explanation/Description:* A treatment train has been utilized to treat stormwater runoff from this project. Influent water is first treated by a vortex separator with built-in screening systems to remove trash and debris. Once runoff is pre-treated it enters underground storage vaults to hold and release the water quality and hydromodification volumes in less than 48 hours. 100% of the water quality volume is treated downstream of the underground storage vaults by a dual-stage biofiltration BMP. This BMP is composed of two chambers. The first chamber contains a series of cartridges utilizing a coarse media to remove fine TSS and hydrocarbons. The second chamber utilizes to biological and sorptive filtration media that utilizes ion exchange and various biological processes to capture, break down and cycle harmful pollutants.	Y

6.3.1 SELECTION

Selection of BMPs was based upon the best available technology at the time. Due to the large scale of this project, the dynamics of off-site flow, limited open space and the hydromodification requirements it was found to be the most practicable to utilize volume based design for the main treatment BMP. Due to limited space the hydromodification volumes for each drainage area had to be efficient stored underground in all but one basin. The calculated hydromodification volume and limited footprint required the underground detention tanks to be 14' deep. It was found that only concrete structures could handle the loading of this depth of install while maximizing storage space. The Storm Capture modular pre-cast concrete storage system has a void capacity of 95% making a much more viable option than pipe or other storage methods rated for such depths.

To minimize maintenance on the underground detention tanks and downstream treatment BMPs a vortex separator with elevated screen system was chosen to effective remove TSS, trash & debris, oils & grease and other particulate pollutants. The Bio Clean Dual Stage Separator (also known as the Nutrient Separating Baffle Box - NSBB) was one of only a few NJ CAT approved devices that was:

- Approved for online use and verified not to scour during larger storm events.
- Full capture certified.
- Captures and stores trash, debris, and oxygen demanding substances in a try state to prevent nutrient leaching.
- Had been independently tested in the field by a local agency and found capable

of removing 87% of TSS, and 99% of oil & grease.

Following is a performance summary of the independent testing done by the City of Santa Monica:

Pollutant	NSBB Removal Efficiency
TSS Removal	87%
Turbidity	72%
Oils & Grease	**99%**
Copper	40%

Both Water Quality Design Flows (WQDF) and Water Quality Design Volumes (WQDV) were calculated for each basin. In order to maximize the pre-treatment to the main treatment BMP and better control the flows to that BMP it was chosen to be put downstream of the detention tanks which are sized to hold both the WQDV and hydromodification volume. Only, one biofiltration system (wetland, bioretention, rain garden), manufactured by Modular Wetland Systems, Inc. was designed and has been utilized downstream of detention tanks. The Modular Wetland System utilizes horizontal flow. This allows for greater surface area and more retention time within the media. This system has been thoroughly tested in a volume based setup where is receives continuous flows over extended period of time.

The verified loading rate and superior performance proved that this was a better choice than traditional downward flow sand filters which are notorious for clogging and have very high associated maintenance costs. The Modular Wetland System is approved by the Washington Department of Ecology TAPE protocol. Following is a list of performance numbers from independent field testing done is Oceanside, CA:

- **TSS - 82%** (46 mg/L influent & 8 mg/L effluent) (mean particle size of < 8 microns)
- **Nutrients - 75%** (as nitrate-N) (0.85 mg/L influent & 0.21 mg/L effluent)
- **Copper - > 53%** (influent 0.04 mg/L & effluent non/detectable)
- **Zinc - > 79%** (influent 0.24 mg/L & effluent non/detectable)
- **TPH – Diesel - 99.99%** (influent 0.29 mg/L & effluent 0.00 mg/L)
- **TPH – Motor Oil - 99.99%** (0.83 mg/L & 0.00 mg/L)
- **Fecal Coliform - 72%** (31,666 MPN/100mL influent & 8,666 MPN/100mL effluent)
- **E. Coli - 83%** (6,280 MPN/100mL influent & 1,058 MPN/100mL effluent)
- **Enterococci - 89%** (558 MPN/100mL influent & 63 MPN/100mL effluent)

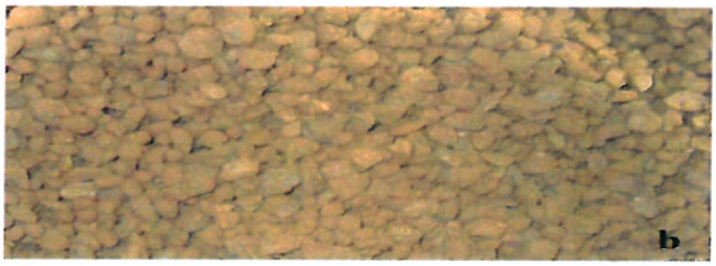
Following is a summary of TAPE testing:

Row Labels	Average of InletResult	Count of InletResult	Average of OutletResult	Count of OutletResult	Percent Removal
Coliform, Fecal Total	719	5	351	5	51%
Copper Total	0.0073	9	0.0038	9	47%
Escherichia coli Total	722	5	260	5	64%
Lead Total	0.007	9	0.002	9	71%
orthophosphate Total	0.023	9	0.012	9	48%
Phosphorus Total	0.119	8	0.038	8	68%
Total Suspended Solids Total	59.8	8	7.7	8	87%
Zinc Total	0.056	9	0.022	9	39%

Wetland Media

The Modular Wetland System utilizes a proprietary blend of bioretention media that provides greater plant growth, moisture retention, evapotranspiration, pollutant removal than standard sand filters and bioretention systems. The media is composed of the following:

- 80% expanded shale (tested by CalTrans and CSUS)
- 20% sand clay loam soil



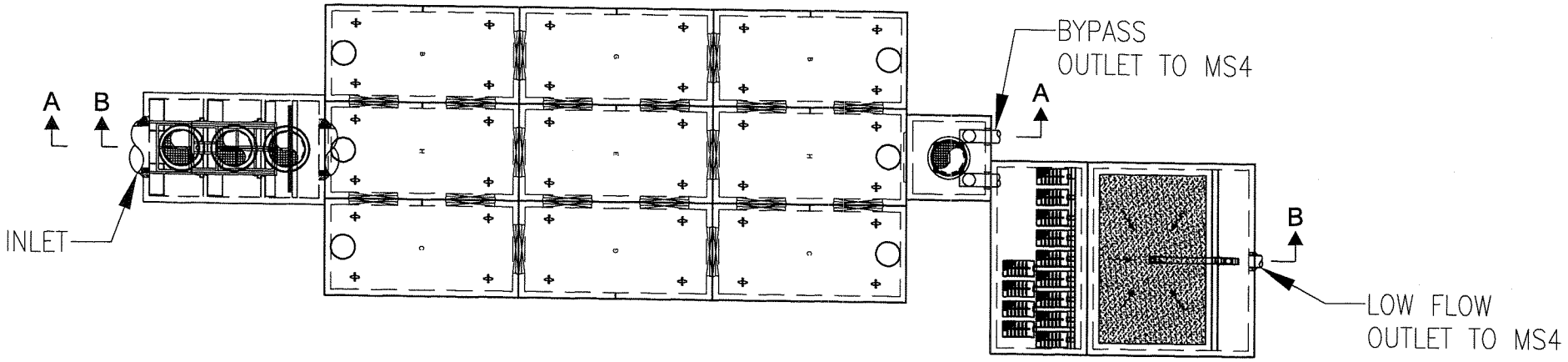
This media mix has been independently tested by the University of California, Davis.

- TKN – 48% Reduction
- NH4-N – 76% Reduction
- NO3-N – 85% Reduction
- P_S – 65% Reduction
- K_S – 53% Reduction
- Zn – 74% Reduction

The testing done on the wetland media proves that it can be highly effective in underground installation where vegetation is prohibitive.

Treatment Control BMP Operational Exhibits

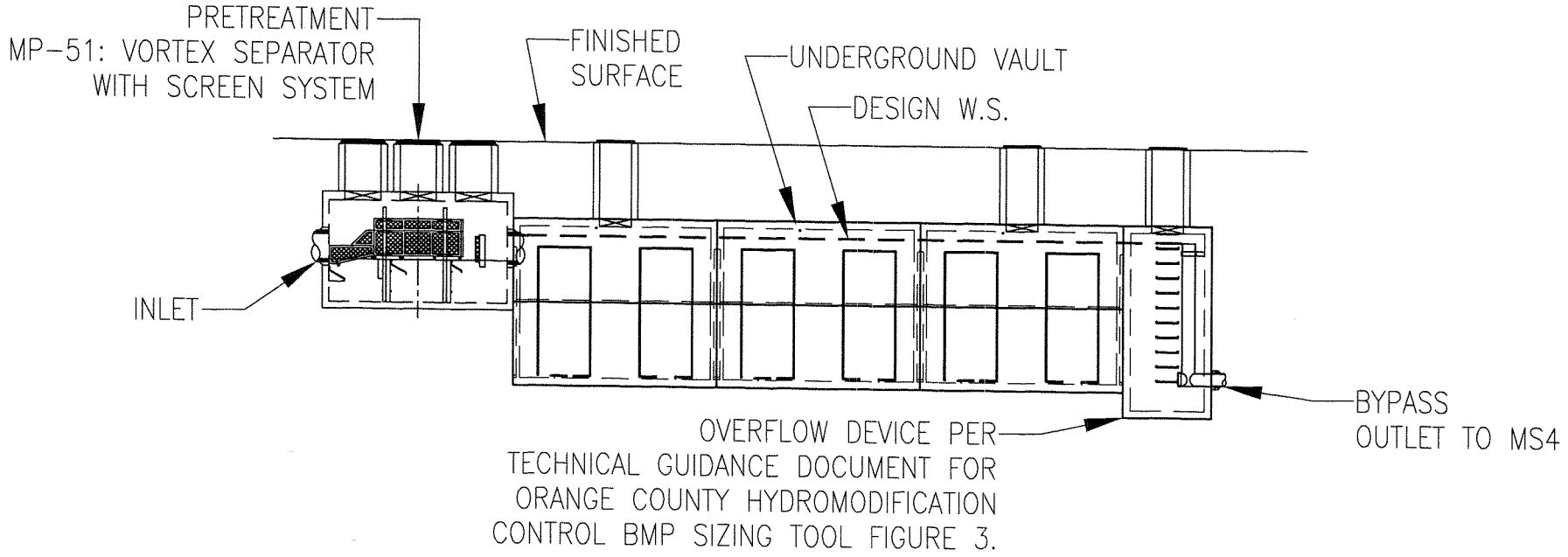
PORTOLA CENTER WATER QUALITY - TREATMENT CONTROL BMP EXHIBIT



PLAN VIEW

BIO CLEAN ENVIRONMENTAL SERVICES, INC. 2975 SAN LUIS REY ROAD, OCEANSIDE, CA 92058 P 760.433.7640 F 760.433.3179		PROJECT: PORTOLA CENTER WATER QUALITY DRAWING #:
PORTOLA CENTER WATER QUALITY TREATMENT CONTROL BMP EXHIBIT		FILE NAME:
DATE:8/6/12	SCALE: NTS	REVISIONS: DATE:
DRAFTER: JOHN	UNITS: FEET	REVISIONS: DATE:

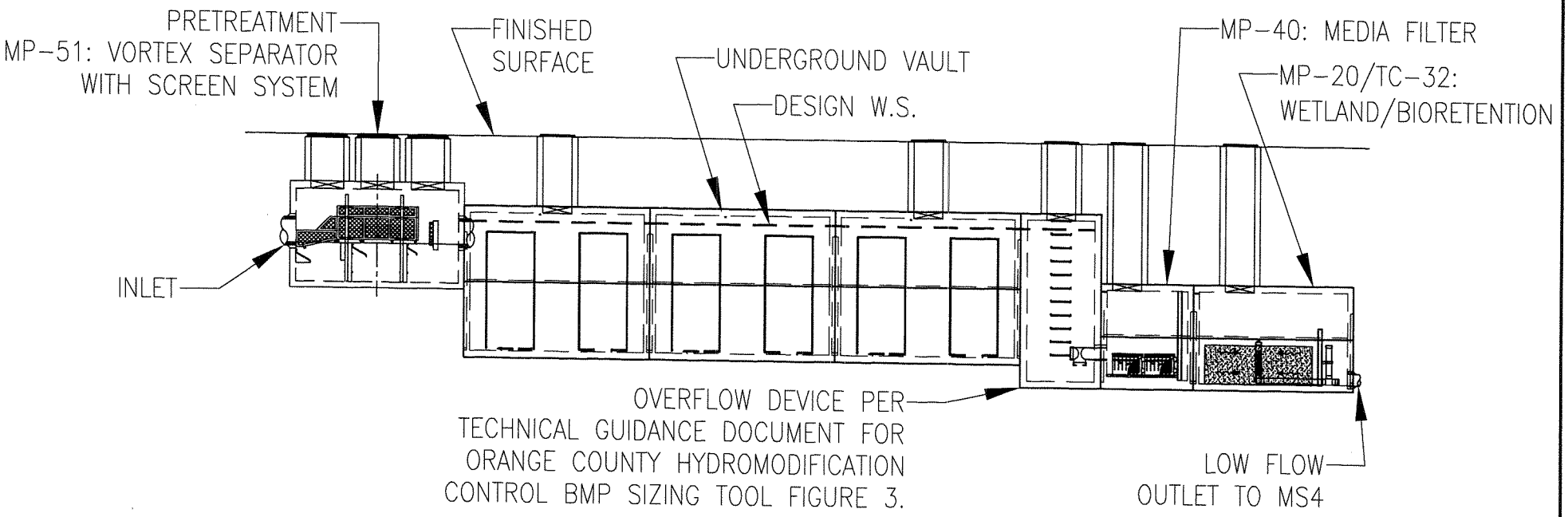
PORTOLA CENTER WATER QUALITY - TREATMENT CONTROL BMP EXHIBIT



SECTION A-A

BIO CLEAN ENVIRONMENTAL SERVICES, INC. 2975 SAN LUIS REY ROAD, OCEANSIDE, CA 92058 P 760.433.7640 F 760.433.3179	PROJECT: PORTOLA CENTER WATER QUALITY DRAWING #:
PORTOLA CENTER WATER QUALITY TREATMENT CONTROL BMP EXHIBIT	FILE NAME:
DATE:8/6/12 SCALE: NTS	REVISIONS: DATE:
DRAFTER: JOHN UNITS: FEET	REVISIONS: DATE:

PORTOLA CENTER WATER QUALITY - TREATMENT CONTROL BMP EXHIBIT



SECTION B-B

BIO CLEAN ENVIRONMENTAL SERVICES, INC. 2975 SAN LUIS REY ROAD, OCEANSIDE, CA 92058 P 760.433.7640 F 760.433.3179		PROJECT: PORTOLA CENTER WATER QUALITY DRAWING #:
PORTOLA CENTER WATER QUALITY TREATMENT CONTROL BMP EXHIBIT		FILE NAME:
DATE:8/6/12	SCALE: NTS	REVISIONS: DATE:
DRAFTER: JOHN	UNITS: FEET	REVISIONS: DATE:

Bio Clean Dual Stage Hydrodynamic Separator Sizing
(Vortex Separator with Elevated Screen System)

Nutrient Separting Baffle Box Sizing - Portola Water Quality - Lake Forest, CA

Basin	Basin Information		Pipe Information	Nutrient Separating Baffle Box Information				
	Treatment Flow (cfs)	Peak Flow (cfs)	Inlet/Outlet (in)	Model	Capacity (cfs)	Head Loss (ft)	HGL at Outlet (ft)	Unit Price
1	0.18	3.60	18.00	3-6-72	1.48	0.30	0.73	$9,800.00
3	3.89	90.80	36.00	6-12-84	5.92	4.10	2.85	$28,300.00
4	1.55	31.60	24.00	4-6.5-72	2.14	2.60	1.88	$13,400.00
5	7.23	178.20	48.00	8-12-96	7.89	5.10	3.77	$36,704.00
7A & 7B	1.05	21.20	24.00	4-6.5-72	2.14	3.60	1.65	$13,400.00
8A	0.43	12.40	18.00	3-6-72	1.48	1.30	1.33	$9,800.00
8B	0.64	16.90	24.00	4-6.5-72	2.14	0.90	1.49	$13,400.00
9	1.38	29.00	30.00	5-10.5-84	4.32	2.20	1.84	$23,900.00

Prepared
3-1-2013

Base Price - Does not include risers or access hatches

SITE SPECIFIC DATA*	
PROJECT NAME	PORTOLA WATER QUALITY
PROJECT LOCATION	LAKE FOREST, CA
STRUCTURE ID	BASIN 1
WATER QUALITY FLOW RATE (CFS)	0.18
PEAK FLOW RATE (CFS)	3.60
PEAK STORM DURATION (YEARS)	100

PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	*	RCP	18"
OUTLET PIPE 1	*	RCP	18"
RIM ELEVATION	*		

SURFACE LOADING REQUIREMENT	*
CORROSIVE SOIL CONDITIONS	*
KNOWN GROUNDWATER ELEVATION	*

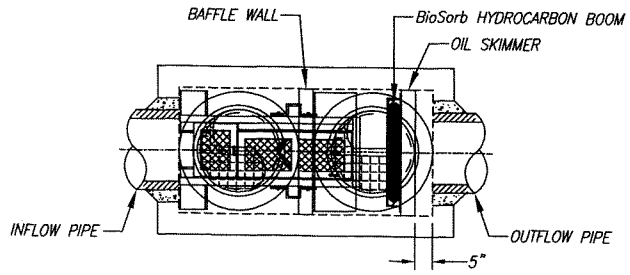
NOTES:

*PER ENGINEER OF RECORD

NSBB PERFORMANCE DATA	
TREATMENT FLOW RATE (CFS)	1.48
SETTLING AREA (SF)	18
LOADING RATE (GPM/SF)	37
SCREEN SYSTEM STORAGE CAPACITY (CF)	11.85
SEDIMENT STORAGE CAPACITY (CF)	50.94
80% TSS REMOVAL @ 125 MICRONS	

NSBB STORAGE CAPACITIES

FILTRATION SCREEN CAPACITY				
	LENGTH (FT)	WIDTH (FT)	HEIGHT (FT)	TOTAL (CF)
	4.25	1.67	1.67	11.85
SEDIMENT CHAMBER CAPACITY				
CHAMBER 1	2.83	3.00	3.00	25.47
CHAMBER 2	2.83	3.00	3.00	25.47



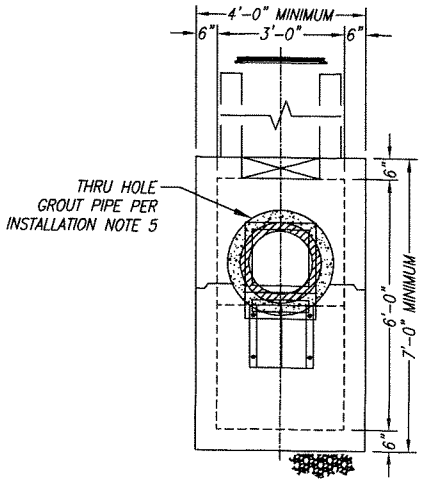
PLAN VIEW
NTS

GENERAL NOTES

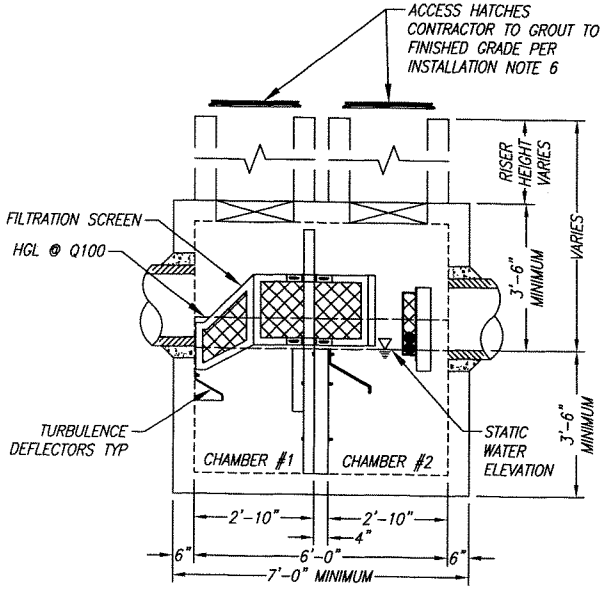
1. BIO CLEAN TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS, AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS, AND ACCESSORIES PLEASE CONTACT BIO CLEAN.
3. SLIDING LIDS FOR THE SCREEN SYSTEM ARE AVAILABLE UPON REQUEST.
4. FULL CAPTURE SCREEN AVAILABLE UPON REQUEST.

INSTALLATION NOTES

1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS, AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE NSBB UNIT AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURERS SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURERS CONTRACT.
2. MANUFACTURER RECOMMENDS A MINIMUM 6"-12" LEVEL ROCK BASE UNLESS SPECIFIED BY THE PROJECT ENGINEER. CONTRACTOR IS RESPONSIBLE TO VERIFY PROJECT ENGINEERS RECOMMENDED BASE SPECIFICATIONS.
3. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE. (PIPES CANNOT INTRUDE BEYOND FLUSH).
4. INVERT OF OUTFLOW PIPE MUST BE 3" ABOVE BOTTOM OF SKIMMER WALL.
5. ALL GAPS AROUND PIPES SHALL BE SEALED WATER TIGHT WITH A NON-SHRINK GROUT PER MANUFACTURERS STANDARD CONNECTION DETAIL AND SHALL MEET OR EXCEED REGIONAL PIPE CONNECTION STANDARDS.
6. CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL RISERS, MANHOLES, AND HATCHES. ALL COVERS SHALL BE SHIPPED LOOSE. CONTRACTOR TO GROUT ALL MANHOLES AND HATCHES TO MATCH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.



END VIEW
NTS



ELEVATION VIEW
NTS

BIO CLEAN ENVIRONMENTAL SERVICES, INC.
biocleanenvironmental.com
P 760.433.7640 F 760.433.3176

NSBB-3-6-72
DUAL STAGE HYDRODYNAMIC SEPARATOR
STANDARD DETAIL

SITE SPECIFIC DATA*	
PROJECT NAME	PORTOLA WATER QUALITY
PROJECT LOCATION	LAKE FOREST, CA
STRUCTURE ID	BASIN 3
WATER QUALITY FLOW RATE (CFS)	3.89
PEAK FLOW RATE (CFS)	90.80
PEAK STORM DURATION (YEARS)	100

PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	*	RCP	36"
OUTLET PIPE 1	*	RCP	36"
RIM ELEVATION	*		

SURFACE LOADING REQUIREMENT	*
CORROSIVE SOIL CONDITIONS	*
KNOWN GROUNDWATER ELEVATION	*

NOTES:

*PER ENGINEER OF RECORD

NSBB PERFORMANCE DATA	
TREATMENT FLOW RATE (CFS)	5.92
SETTLING AREA (SF)	72
LOADING RATE (GPM/SF)	37
SCREEN SYSTEM STORAGE CAPACITY (CF)	78.75
SEDIMENT STORAGE CAPACITY (CF)	136.44
80% TSS REMOVAL @ 125 MICRONS	

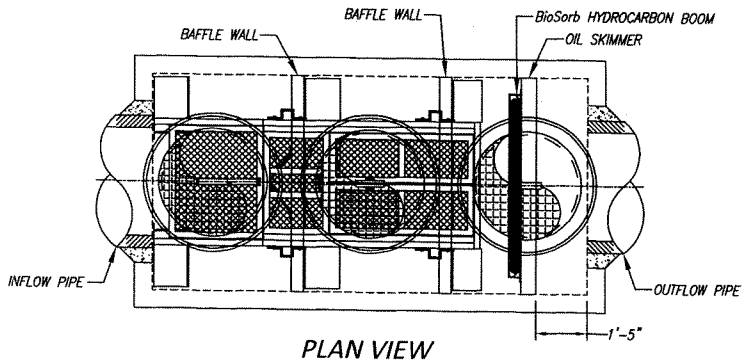
NSBB STORAGE CAPACITIES

FILTRATION SCREEN CAPACITY

	LENGTH (FT)	WIDTH (FT)	HEIGHT (FT)	TOTAL (CF)
	9.00	3.50	2.50	78.75

SEDIMENT CHAMBER CAPACITY

CHAMBER 1	3.83	6.00	3.00	68.94
CHAMBER 2	3.75	6.00	3.00	67.50
CHAMBER 3	3.75	6.00	3.00	67.50



PLAN VIEW
NTS

GENERAL NOTES

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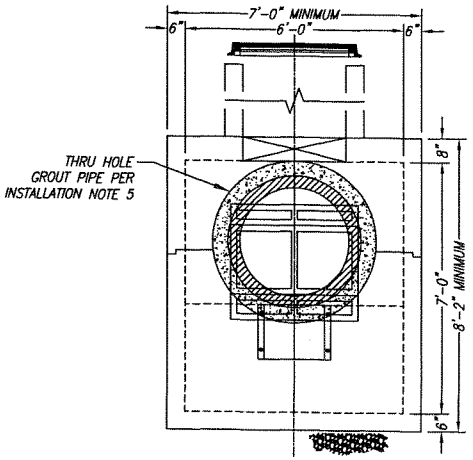
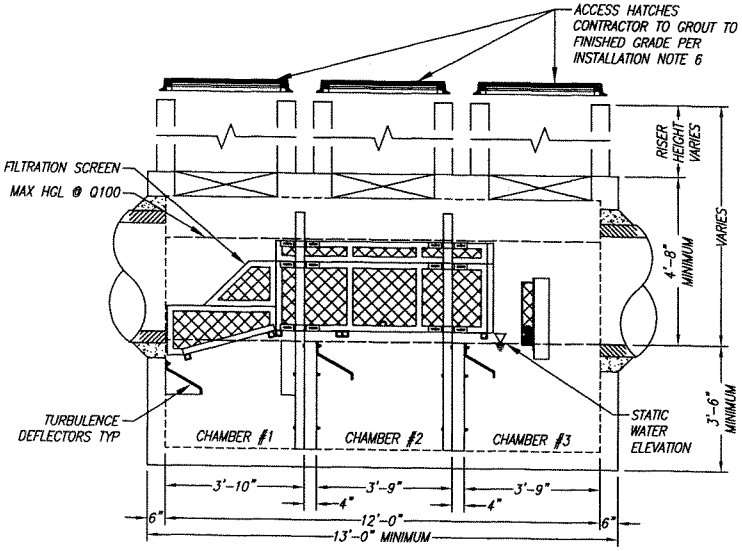
2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS, AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS, AND ACCESSORIES PLEASE CONTACT BIO CLEAN.
3. SLIDING LIDS FOR THE SCREEN SYSTEM ARE AVAILABLE UPON REQUEST.
4. FULL CAPTURE SCREEN AVAILABLE UPON REQUEST.

INSTALLATION NOTES

1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS, AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE NSBB UNIT AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURERS SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURERS CONTRACT.
2. MANUFACTURER RECOMMENDS A MINIMUM 6"-12" LEVEL ROCK BASE UNLESS SPECIFIED BY THE PROJECT ENGINEER. CONTRACTOR IS RESPONSIBLE TO VERIFY PROJECT ENGINEERS RECOMMENDED BASE SPECIFICATIONS.
3. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE. (PIPES CANNOT INTRUDE BEYOND FLUSH).
4. INVERT OF OUTFLOW PIPE MUST BE 3" ABOVE BOTTOM OF SKIMMER WALL.
5. ALL GAPS AROUND PIPES SHALL BE SEALED WATER TIGHT WITH A NON-SHRINK GROUT PER MANUFACTURERS STANDARD CONNECTION DETAIL AND SHALL MEET OR EXCEED REGIONAL PIPE CONNECTION STANDARDS.
6. CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL RISERS, MANHOLES, AND HATCHES. ALL COVERS SHALL BE SHIPPED LOOSE. CONTRACTOR TO GROUT ALL MANHOLES AND HATCHES TO MATCH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.



END VIEW
NTS



ELEVATION VIEW
NTS

BIO CLEAN ENVIRONMENTAL SERVICES, INC.
biocleanenvironmental.com
P 760.433.7640 F 760.433.3176

NSBB-6-12-84
DUAL STAGE HYDRODYNAMIC SEPARATOR
STANDARD DETAIL

SITE SPECIFIC DATA*	
PROJECT NAME	PORTOLA WATER QUALITY
PROJECT LOCATION	LAKE FOREST, CA
STRUCTURE ID	BASIN 7A & 7B
WATER QUALITY FLOW RATE (CFS)	1.05
PEAK FLOW RATE (CFS)	21.20
PEAK STORM DURATION (YEARS)	100

PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	*	RCP	24"
OUTLET PIPE 1	*	RCP	24"
RIM ELEVATION	*		

SURFACE LOADING REQUIREMENT	*
CORROSIVE SOIL CONDITIONS	*
KNOWN GROUNDWATER ELEVATION	*

NOTES:

*PER ENGINEER OF RECORD

NSBB PERFORMANCE DATA	
TREATMENT FLOW RATE (CFS)	2.14
SETTLING AREA (SF)	26
LOADING RATE (GPM/SF)	37
SCREEN SYSTEM STORAGE CAPACITY (CF)	20.40
SEDIMENT STORAGE CAPACITY (CF)	76.08
80% TSS REMOVAL @ 125 MICRONS	

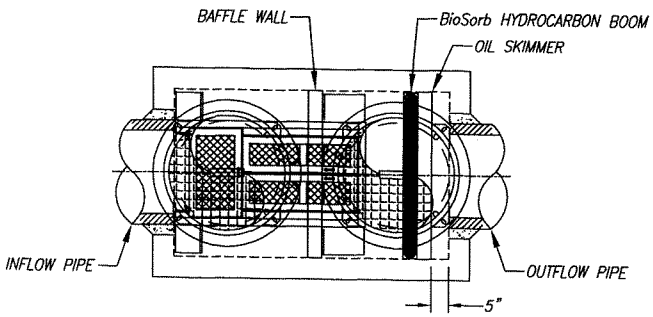
NSBB STORAGE CAPACITIES

FILTRATION SCREEN CAPACITY

	LENGTH (FT)	WIDTH (FT)	HEIGHT (FT)	TOTAL (CF)
	4.25	2.50	1.92	20.40

SEDIMENT CHAMBER CAPACITY

CHAMBER 1	3.17	4.00	3.00	38.04
CHAMBER 2	3.17	4.00	3.00	38.04



PLAN VIEW
NTS

GENERAL NOTES

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2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS, AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS, AND ACCESSORIES PLEASE CONTACT BIO CLEAN.
3. SLIDING LIDS FOR THE SCREEN SYSTEM ARE AVAILABLE UPON REQUEST.
4. FULL CAPTURE SCREEN AVAILABLE UPON REQUEST.

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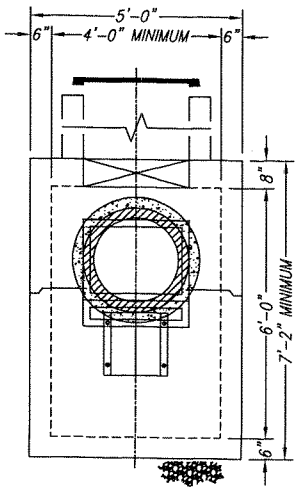
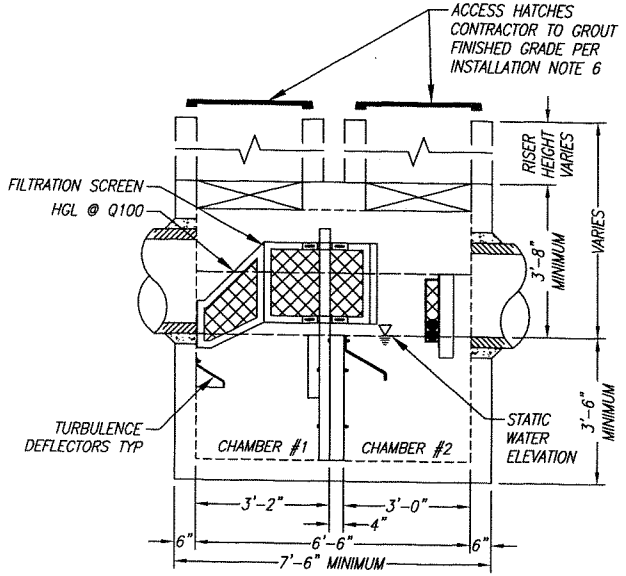


END VIEW
NTS



ELEVATION VIEW
NTS

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NSBB-4-6.5-72
DUAL STAGE HYDRODYNAMIC SEPARATOR STANDARD DETAIL

SITE SPECIFIC DATA*	
PROJECT NAME	PORTOLA WATER QUALITY
PROJECT LOCATION	LAKE FOREST, CA
STRUCTURE ID	BASIN 5
WATER QUALITY FLOW RATE (CFS)	7.23
PEAK FLOW RATE (CFS)	178.20
PEAK STORM DURATION (YEARS)	100

PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	*	RCP	48"
OUTLET PIPE 1	*	RCP	48"
RIM ELEVATION	*		

SURFACE LOADING REQUIREMENT	*
CORROSIVE SOIL CONDITIONS	*
KNOWN GROUNDWATER ELEVATION	*

NOTES:

*PER ENGINEER OF RECORD

NSBB PERFORMANCE DATA	
TREATMENT FLOW RATE (CFS)	7.89
SETTLING AREA (SF)	96
LOADING RATE (GPM/SF)	37
SCREEN SYSTEM STORAGE CAPACITY (CF)	113.79
SEDIMENT STORAGE CAPACITY (CF)	181.92
80% TSS REMOVAL @ 125 MICRONS	

NSBB STORAGE CAPACITIES

FILTRATION SCREEN CAPACITY

	LENGTH (FT)	WIDTH (FT)	HEIGHT (FT)	TOTAL (CF)
	9.00	4.33	2.92	113.79

SEDIMENT CHAMBER CAPACITY

CHAMBER 1	3.83	8.00	3.00	91.92
CHAMBER 2	3.75	8.00	3.00	90.00
CHAMBER 3	3.75	8.00	3.00	90.00

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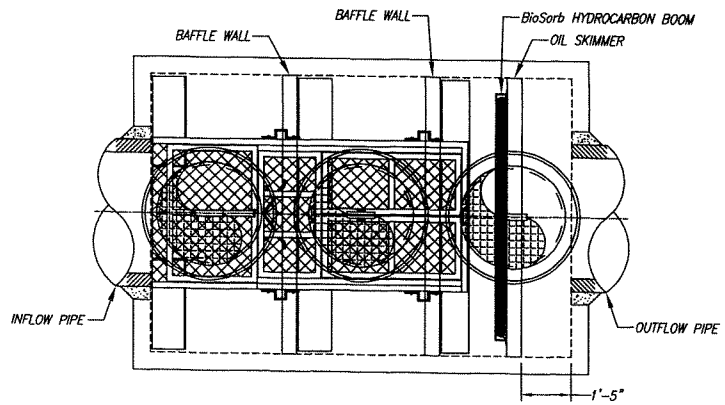
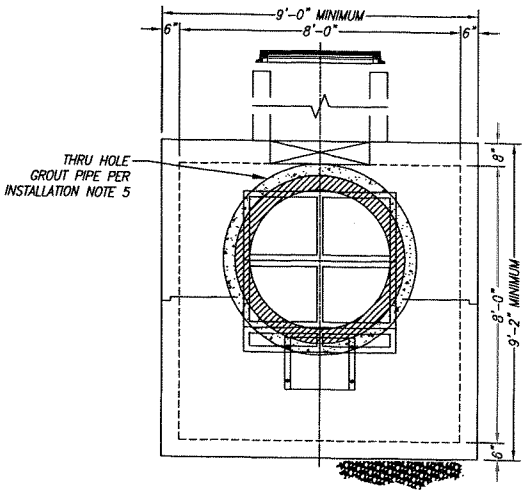


PLAN VIEW
NTS



END VIEW
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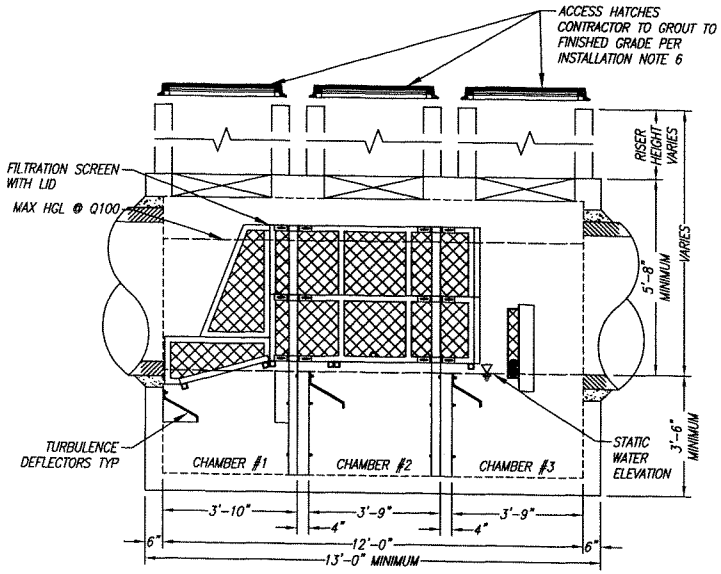

ELEVATION VIEW
NTS

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NSBB-8-12-96
DUAL STAGE HYDRODYNAMIC SEPARATOR
STANDARD DETAIL

SITE SPECIFIC DATA*	
PROJECT NAME	PORTOLA WATER QUALITY
PROJECT LOCATION	LAKE FOREST, CA
STRUCTURE ID	BASIN 4
WATER QUALITY FLOW RATE (CFS)	1.55
PEAK FLOW RATE (CFS)	31.60
PEAK STORM DURATION (YEARS)	100

PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	*	RCP	24"
OUTLET PIPE 1	*	RCP	24"
RIM ELEVATION	*		

SURFACE LOADING REQUIREMENT	*
CORROSIVE SOIL CONDITIONS	*
KNOWN GROUNDWATER ELEVATION	*

NOTES:

*PER ENGINEER OF RECORD

NSBB PERFORMANCE DATA	
TREATMENT FLOW RATE (CFS)	2.14
SETTLING AREA (SF)	26
LOADING RATE (GPM/SF)	37
SCREEN SYSTEM STORAGE CAPACITY (CF)	20.40
SEDIMENT STORAGE CAPACITY (CF)	76.08
80% TSS REMOVAL @ 125 MICRONS	

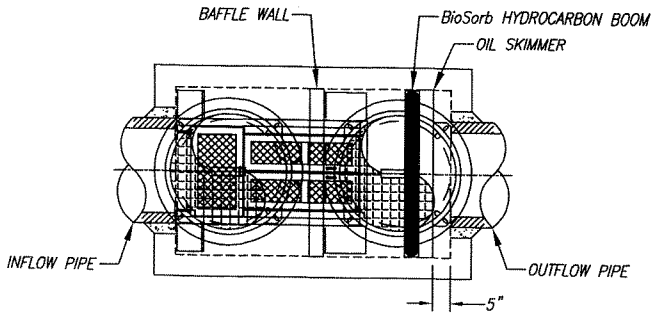
NSBB STORAGE CAPACITIES

FILTRATION SCREEN CAPACITY

	LENGTH (FT)	WIDTH (FT)	HEIGHT (FT)	TOTAL (CF)
	4.25	2.50	1.92	20.40

SEDIMENT CHAMBER CAPACITY

CHAMBER 1	3.17	4.00	3.00	38.04
CHAMBER 2	3.17	4.00	3.00	38.04



PLAN VIEW
NTS

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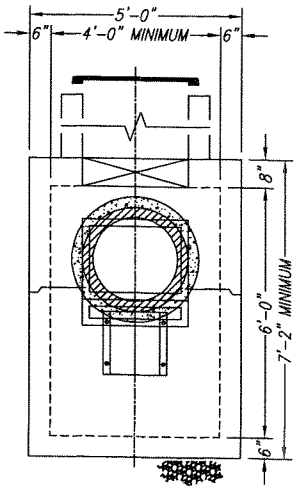
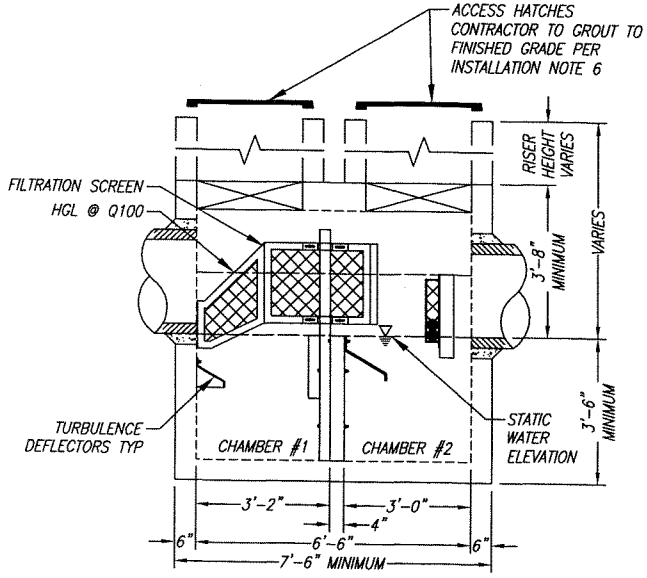


END VIEW
NTS



ELEVATION VIEW
NTS

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NSBB-4-6.5-72
DUAL STAGE HYDRODYNAMIC SEPARATOR
STANDARD DETAIL

SITE SPECIFIC DATA*	
PROJECT NAME	PORTOLA WATER QUALITY
PROJECT LOCATION	LAKE FOREST, CA
STRUCTURE ID	BASIN 8A
WATER QUALITY FLOW RATE (CFS)	0.43
PEAK FLOW RATE (CFS)	12.40
PEAK STORM DURATION (YEARS)	100

PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	*	RCP	18"
OUTLET PIPE 1	*	RCP	18"
RIM ELEVATION	*		

SURFACE LOADING REQUIREMENT	*
CORROSIVE SOIL CONDITIONS	*
KNOWN GROUNDWATER ELEVATION	*

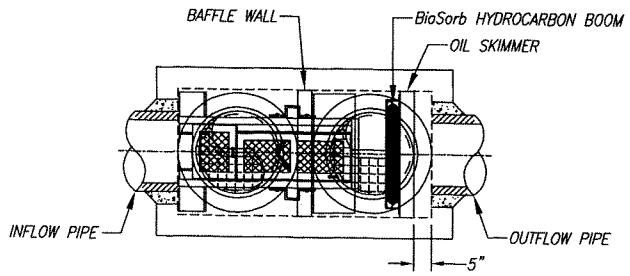
NOTES:

*PER ENGINEER OF RECORD

NSBB PERFORMANCE DATA	
TREATMENT FLOW RATE (CFS)	1.48
SETTLING AREA (SF)	18
LOADING RATE (GPM/SF)	37
SCREEN SYSTEM STORAGE CAPACITY (CF)	11.85
SEDIMENT STORAGE CAPACITY (CF)	50.94
80% TSS REMOVAL @ 125 MICRONS	

NSBB STORAGE CAPACITIES

FILTRATION SCREEN CAPACITY				
	LENGTH (FT)	WIDTH (FT)	HEIGHT (FT)	TOTAL (CF)
	4.25	1.67	1.67	11.85
SEDIMENT CHAMBER CAPACITY				
CHAMBER 1	2.83	3.00	3.00	25.47
CHAMBER 2	2.83	3.00	3.00	25.47



PLAN VIEW
NTS

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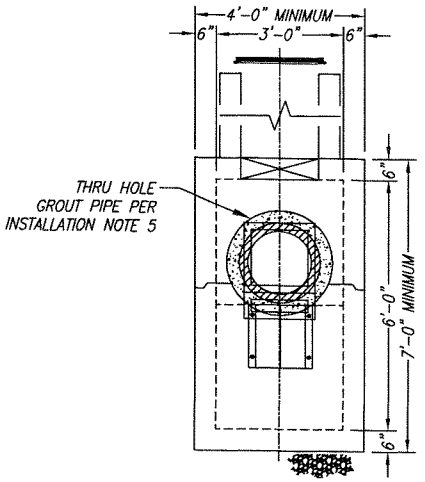
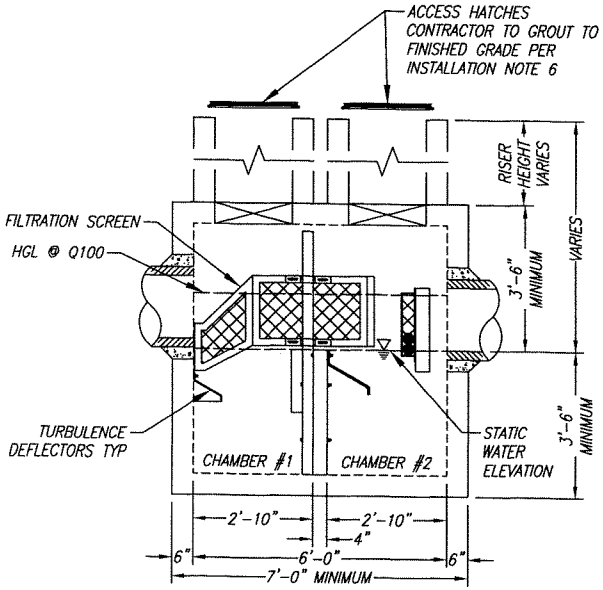


END VIEW
NTS



ELEVATION VIEW
NTS

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NSBB-3-6-72
DUAL STAGE HYDRODYNAMIC SEPARATOR
STANDARD DETAIL

SITE SPECIFIC DATA*	
PROJECT NAME	PORTOLA WATER QUALITY
PROJECT LOCATION	LAKE FOREST, CA
STRUCTURE ID	BASIN 8B
WATER QUALITY FLOW RATE (CFS)	0.64
PEAK FLOW RATE (CFS)	16.90
PEAK STORM DURATION (YEARS)	100

PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	*	RCP	24"
OUTLET PIPE 1	*	RCP	24"
RIM ELEVATION	*		

SURFACE LOADING REQUIREMENT	*
CORROSIVE SOIL CONDITIONS	*
KNOWN GROUNDWATER ELEVATION	*

NOTES:

*PER ENGINEER OF RECORD

NSBB PERFORMANCE DATA	
TREATMENT FLOW RATE (CFS)	2.14
SETTLING AREA (SF)	26
LOADING RATE (GPM/SF)	37
SCREEN SYSTEM STORAGE CAPACITY (CF)	20.40
SEDIMENT STORAGE CAPACITY (CF)	76.08
80% TSS REMOVAL @ 125 MICRONS	

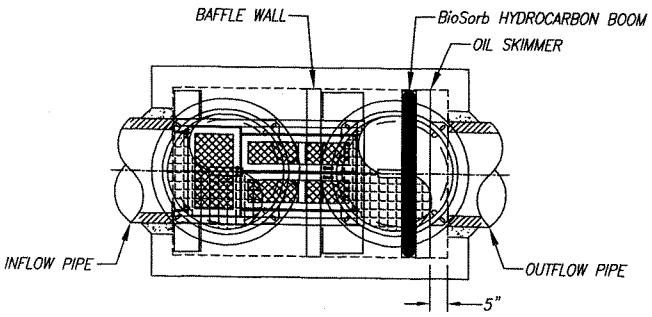
NSBB STORAGE CAPACITIES

FILTRATION SCREEN CAPACITY

	LENGTH (FT)	WIDTH (FT)	HEIGHT (FT)	TOTAL (CF)
	4.25	2.50	1.92	20.40

SEDIMENT CHAMBER CAPACITY

CHAMBER 1	3.17	4.00	3.00	38.04
CHAMBER 2	3.17	4.00	3.00	38.04



PLAN VIEW
NTS

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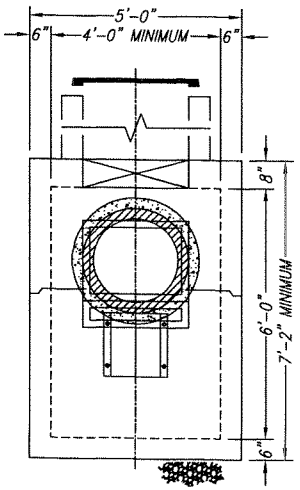
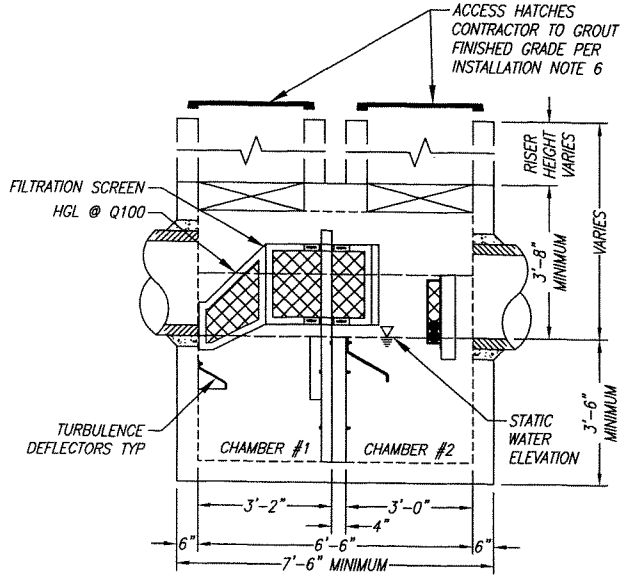


END VIEW
NTS



ELEVATION VIEW
NTS

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NSBB-4-6.5-72
DUAL STAGE HYDRODYNAMIC SEPARATOR
STANDARD DETAIL

SITE SPECIFIC DATA*	
PROJECT NAME	PORTOLA WATER QUALITY
PROJECT LOCATION	FOREST LAKE, CA
STRUCTURE ID	BASIN 9
WATER QUALITY FLOW RATE (CFS)	1.38
PEAK FLOW RATE (CFS)	29
PEAK STORM DURATION (YEARS)	100

PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	*	RCP	30"
OUTLET PIPE 1	*	RCP	30"
RIM ELEVATION	*		

SURFACE LOADING REQUIREMENT	*
CORROSIVE SOIL CONDITIONS	*
KNOWN GROUNDWATER ELEVATION	*

NOTES:

*PER ENGINEER OF RECORD

NSBB PERFORMANCE DATA	
TREATMENT FLOW RATE (CFS)	4.32
SETTLING AREA (SF)	52.50
LOADING RATE (GPM/SF)	37
SCREEN SYSTEM STORAGE CAPACITY (CF)	45.62
SEDIMENT STORAGE CAPACITY (CF)	147.45
80% TSS REMOVAL @ 125 MICRONS	

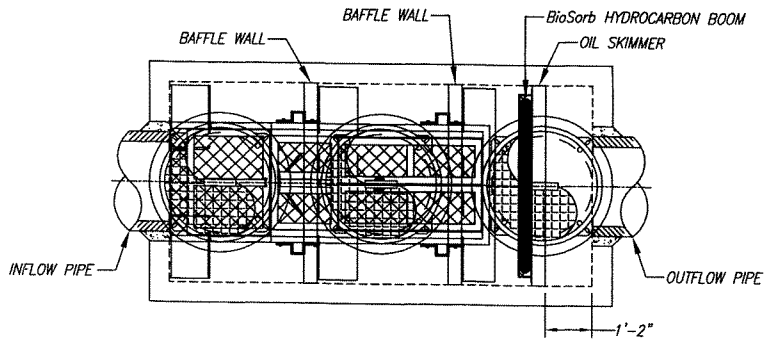
NSBB STORAGE CAPACITIES

FILTRATION SCREEN CAPACITY

	LENGTH (FT)	WIDTH (FT)	HEIGHT (FT)	TOTAL (CF)
	7.92	3.00	1.92	45.62

SEDIMENT CHAMBER CAPACITY

CHAMBER 1	3.33	5.00	3.00	49.95
CHAMBER 2	3.25	5.00	3.00	48.75
CHAMBER 3	3.25	5.00	3.00	48.75



PLAN VIEW
NTS

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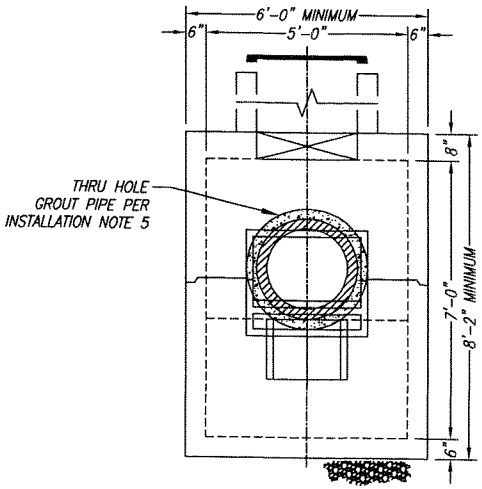
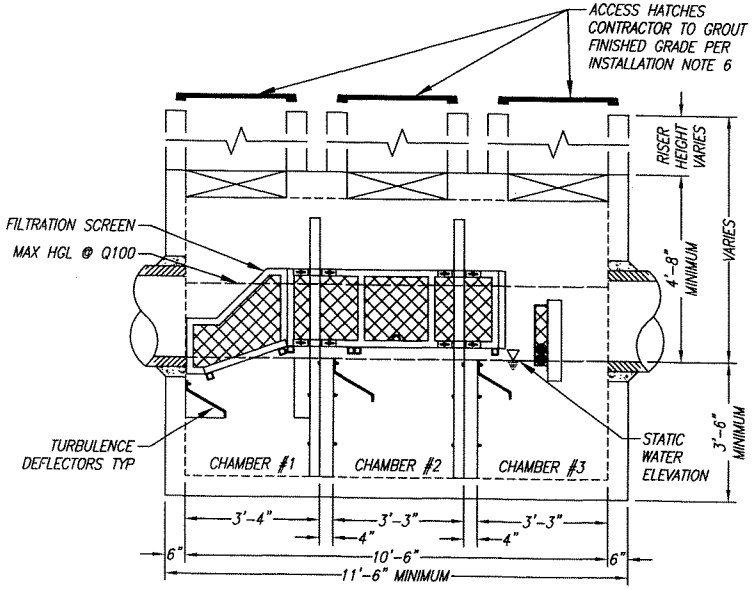


END VIEW
NTS



ELEVATION VIEW
NTS

BIO CLEAN ENVIRONMENTAL SERVICES, INC.
biocleanenvironmental.com
P 760.433.7640 F 760.433.3176

NSBB-5-10.5-84
DUAL STAGE HYDRODYNAMIC SEPARATOR
STANDARD DETAIL

Modular Wetland System Sizing
(Media Filter & Wetland/Bioretention)

Model # MWS-L-UGV-2-1-S

Horizontal Flow Biotreatment Calculator

Project Name:	**Portola**

Basin #	**1**

BMP Type	**Closed Vault with Horizontal Bioretention**

Design Capture Volume (cu-ft):	**4356**
Associated Tank Discharge Flow @ Volume Accumilate = WQV (cfs):	**0.079**
Associated Tank Discharge Flow @ Volume Accumilate = WQV (gpm):	**35**

Total Pre-Treatment Cartridge Surface Area (sq ft):	**50**	25 sq ft per cartridge
Total Cartridges Needed:	**2**	
Pre-Treatment Cartridge Infiltration Rate (in/hr):	**200**	
Pre-Treatment Cartridge Flow Rate (gpm/sq ft):	**2**	
Pre-Treatment Cartridges Peak Treatment Flow Rate (cfs)	**0.111**	

Pre-Treatment Cartridge Sized Appropriately:	yes

Bioretention Media Infiltration Rate (in/hr):	**100**	
Bioretention Media Flow Rate (gpm/sq ft):	**1**	TAPE approved loading rate
Total Bioretention Media Surface Area Needed (sq ft)	**35**	
Total Bioretention Media Surface Area Provided (sq ft)	**50.32**	
Bioretention Media Peak Treatment Flow Rate (cfs)	**0.112**	

BMP Sized Appropriately:	yes

Model # MWS-L-UGV-20-8

Horizontal Flow Biotreatment Calculator

Project Name:	**Portola**

Basin #	**3**

BMP Type	**Closed Vault with Horizontal Bioretention**

Design Capture Volume (cu-ft):	**101059**
Associated Tank Discharge Flow @ Volume Accumilate = WQV (cfs):	**2.14**
Associated Tank Discharge Flow @ Volume Accumilate = WQV (gpm):	**961**

Total Pre-Treatment Cartridge Surface Area (sq ft):	**500**	25 sq ft per cartridge
Total Cartridges Needed:	**20**	
Pre-Treatment Cartridge Infiltration Rate (in/hr):	**200**	
Pre-Treatment Cartridge Flow Rate (gpm/sq ft):	**2**	
Pre-Treatment Cartridges Peak Treatment Flow Rate (cfs)	**2.228**	

Pre-Treatment Cartridge Sized Appropriately:	**yes**

Bioretention Media Infiltration Rate (in/hr):	**100**	
Bioretention Media Flow Rate (gpm/sq ft):	**1**	TAPE approved loading rate
Total Bioretention Media Surface Area Needed (sq ft)	**961**	
Total Bioretention Media Surface Area Provided (sq ft)	**987.28**	
Bioretention Media Peak Treatment Flow Rate (cfs)	**2.199**	

BMP Sized Appropriately:	**yes**

Model # MWS-L-UGV-5-4

Horizontal Flow Biotreatment Calculator

Project Name:	**Portola**
Basin #	**4**
BMP Type	**Closed Vault with Horizontal Bioretention**
Design Capture Volume (cu-ft):	**38333**
Associated Tank Discharge Flow @ Volume Accumilate = WQV (cfs):	**0.54**
Associated Tank Discharge Flow @ Volume Accumilate = WQV (gpm):	**242**

Total Pre-Treatment Cartridge Surface Area (sq ft):	**125**	25 sq ft per cartridge
Total Cartridges Needed:	**5**	
Pre-Treatment Cartridge Infiltration Rate (in/hr):	**200**	
Pre-Treatment Cartridge Flow Rate (gpm/sq ft):	**2**	
Pre-Treatment Cartridges Peak Treatment Flow Rate (cfs)	**0.557**	
Pre-Treatment Cartridge Sized Appropriately:	yes	

Bioretention Media Infiltration Rate (in/hr):	**100**	
Bioretention Media Flow Rate (gpm/sq ft):	**1**	TAPE approved loading rate
Total Bioretention Media Surface Area Needed (sq ft)	**242**	
Total Bioretention Media Surface Area Provided (sq ft)	**282.08**	
Bioretention Media Peak Treatment Flow Rate (cfs)	**0.628**	
BMP Sized Appropriately:	yes	

Model # MWS-L-UGV-39-28

Horizontal Flow Biotreatment Calculator

Project Name:	**Portola**

Basin #	**5**

BMP Type	**Closed Vault with Horizontal Bioretention**

Design Capture Volume (cu-ft):	**169448**
Associated Tank Discharge Flow @ Volume Accumilate = WQV (cfs):	**4.32**
Associated Tank Discharge Flow @ Volume Accumilate = WQV (gpm):	**1939**

Total Pre-Treatment Cartridge Surface Area (sq ft):	**975**	25 sq ft per cartridge
Total Cartridges Needed:	**39**	
Pre-Treatment Cartridge Infiltration Rate (in/hr):	**200**	
Pre-Treatment Cartridge Flow Rate (gpm/sq ft):	**2**	
Pre-Treatment Cartridges Peak Treatment Flow Rate (cfs)	**4.344**	

Pre-Treatment Cartridge Sized Appropriately:	yes

Bioretention Media Infiltration Rate (in/hr):	**100**	
Bioretention Media Flow Rate (gpm/sq ft):	**1**	TAPE approved loading rate
Total Bioretention Media Surface Area Needed (sq ft)	**1939**	
Total Bioretention Media Surface Area Provided (sq ft)	**1974.56**	
Bioretention Media Peak Treatment Flow Rate (cfs)	**4.399**	

BMP Sized Appropriately:	yes

Model # MWS-L-UGV-5-4

Horizontal Flow Biotreatment Calculator

Project Name:	**Portola**
Basin #	**7 A & B**
BMP Type	**Closed Vault with Horizontal Bioretention**
Design Capture Volume (cu-ft):	**25625**
Associated Tank Discharge Flow @ Volume Accumilate = WQV (cfs):	**0.51**
Associated Tank Discharge Flow @ Volume Accumilate = WQV (gpm):	**229**

Total Pre-Treatment Cartridge Surface Area (sq ft):	**125**	25 sq ft per cartridge
Total Cartridges Needed:	**5**	
Pre-Treatment Cartridge Infiltration Rate (in/hr):	**200**	
Pre-Treatment Cartridge Flow Rate (gpm/sq ft):	**2**	
Pre-Treatment Cartridges Peak Treatment Flow Rate (cfs)	**0.557**	
Pre-Treatment Cartridge Sized Appropriately:	yes	

Bioretention Media Infiltration Rate (in/hr):	**100**	
Bioretention Media Flow Rate (gpm/sq ft):	**1**	TAPE approved loading rate
Total Bioretention Media Surface Area Needed (sq ft)	**229**	
Total Bioretention Media Surface Area Provided (sq ft)	**282.08**	
Bioretention Media Peak Treatment Flow Rate (cfs)	**0.628**	
BMP Sized Appropriately:	yes	

Model # MWS-L-UGV-2-1

Horizontal Flow Biotreatment Calculator

Project Name:	**Portola**

Basin #	**8 A**

BMP Type	**Closed Vault with Horizontal Bioretention**

Design Capture Volume (cu-ft):	**10454**
Associated Tank Discharge Flow @ Volume Accumilate = WQV (cfs):	**0.166**
Associated Tank Discharge Flow @ Volume Accumilate = WQV (gpm):	**75**

Total Pre-Treatment Cartridge Surface Area (sq ft):	**50**	25 sq ft per cartridge
Total Cartridges Needed:	**2**	
Pre-Treatment Cartridge Infiltration Rate (in/hr):	**200**	
Pre-Treatment Cartridge Flow Rate (gpm/sq ft):	**2**	
Pre-Treatment Cartridges Peak Treatment Flow Rate (cfs)	**0.223**	

Pre-Treatment Cartridge Sized Appropriately:	yes

Bioretention Media Infiltration Rate (in/hr):	**100**	
Bioretention Media Flow Rate (gpm/sq ft):	**1**	TAPE approved loading rate
Total Bioretention Media Surface Area Needed (sq ft)	**75**	
Total Bioretention Media Surface Area Provided (sq ft)	**78.48**	
Bioretention Media Peak Treatment Flow Rate (cfs)	**0.175**	

BMP Sized Appropriately:	yes

Model # MWS-L-UGV-3-2

Horizontal Flow Biotreatment Calculator

Project Name:	**Portola**
Basin #	**8 B**
BMP Type	**Closed Vault with Horizontal Bioretention**

Design Capture Volume (cu-ft):	**15682**
Associated Tank Discharge Flow @ Volume Accumilate = WQV (cfs):	**0.226**
Associated Tank Discharge Flow @ Volume Accumilate = WQV (gpm):	**101**

Total Pre-Treatment Cartridge Surface Area (sq ft):	**75**	25 sq ft per cartridge
Total Cartridges Needed:	**3**	
Pre-Treatment Cartridge Infiltration Rate (in/hr):	**200**	
Pre-Treatment Cartridge Flow Rate (gpm/sq ft):	**2**	
Pre-Treatment Cartridges Peak Treatment Flow Rate (cfs)	**0.334**	

Pre-Treatment Cartridge Sized Appropriately:	**yes**

Bioretention Media Infiltration Rate (in/hr):	**100**	
Bioretention Media Flow Rate (gpm/sq ft):	**1**	TAPE approved loading rate
Total Bioretention Media Surface Area Needed (sq ft)	**101**	
Total Bioretention Media Surface Area Provided (sq ft)	**141.04**	
Bioretention Media Peak Treatment Flow Rate (cfs)	**0.314**	

BMP Sized Appropriately:	**yes**

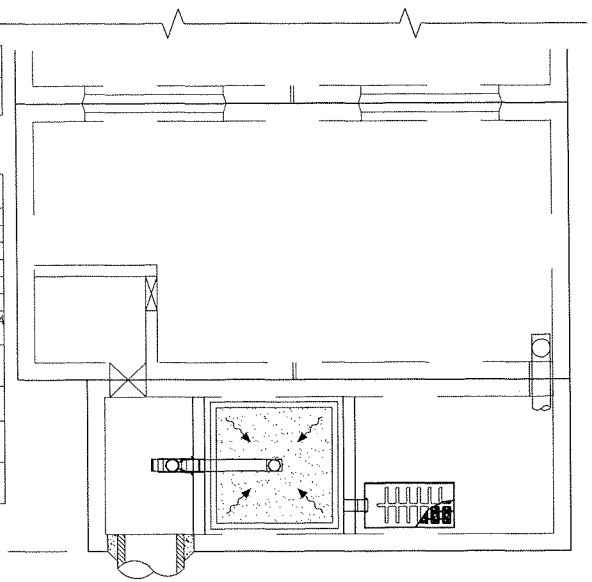
PORTOLA CENTER WATER QUALITY
BASIN #1

MODULAR WETLANDS™

BIO CLEAN® ENVIRONMENTAL SERVICES, INC.

FLOW RATES
PEAK TREATMENT FLOW RATE = 0.111 CFS OR 50 GPM

BIOFILTRATION CHAMBER SURFACE AREA CALCS
SIDES = 2
3.7' L x 3.4' H = 12.58 SF
SIDES = 4
12.58 x 4 SIDES = 50.32 SF
CELLS = 1
50.32 x 1 CELLS = 50 SF
TOTAL WETLANDS MEDIA SURFACE AREA = 50 SF
WETLANDS MEDIA LOADING RATE 50 GPM / 50 SF = 1.00 GPM/SF
PRETREATMENT FILTER SURFACE AREA CALCS
TOTAL PRETREATMENT SURFACE AREA 25 SF x 1 FILTERS = 25 SF
PRETREATMENT FILTER LOADING RATE 50 GPM / 25 SF = 2.00 GPM/SF



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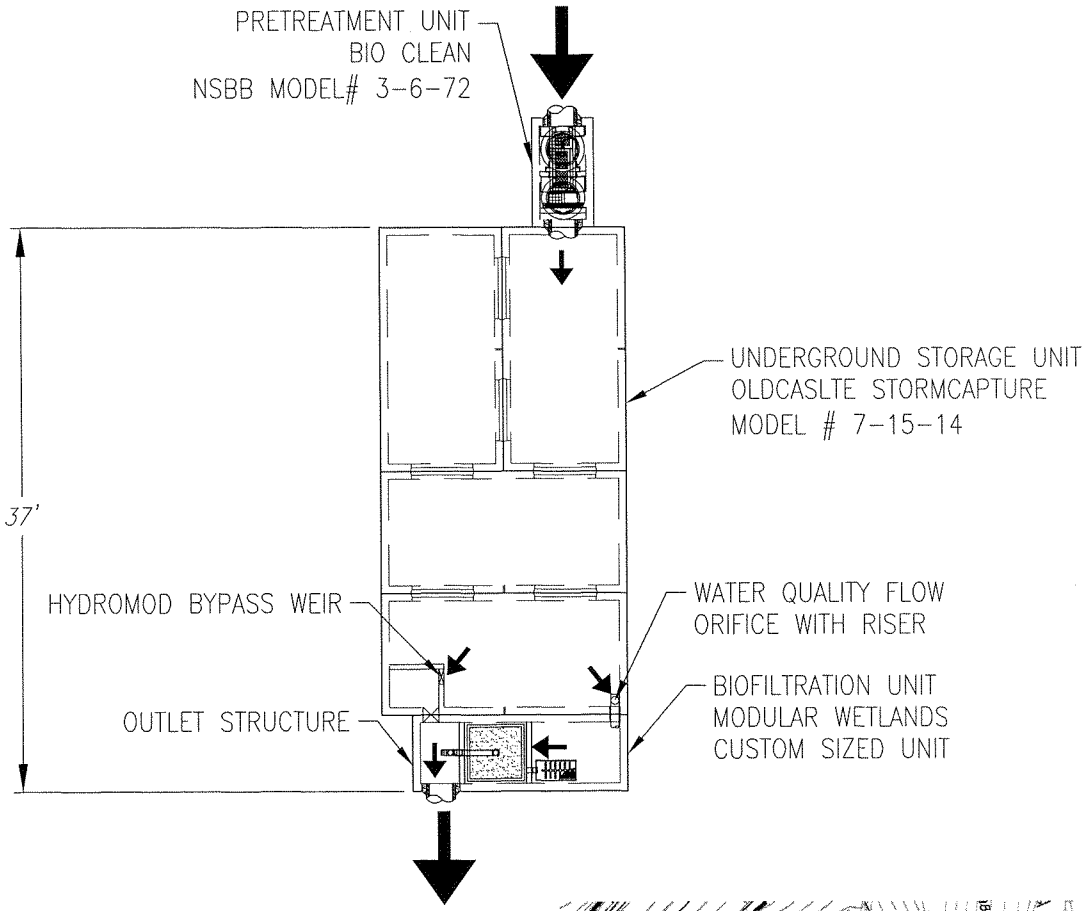
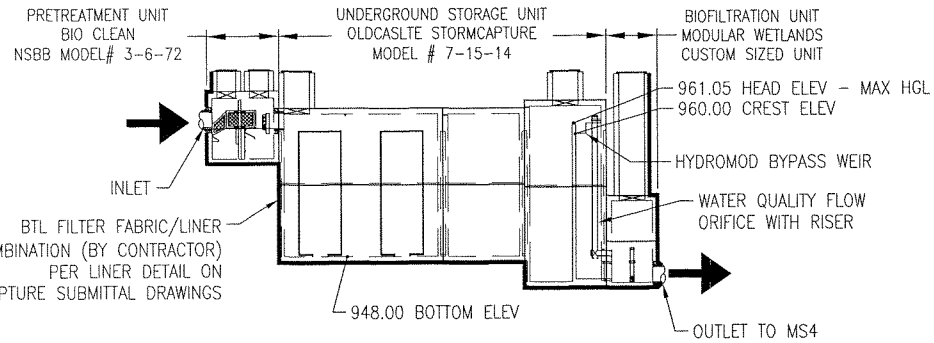
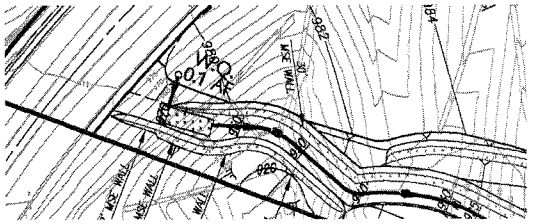


PLAN VIEW
NTS



ELEVATION VIEW
NTS



SITE MAP - BASIN #1
NTS

		NAME	DATE
MODULAR WETLANDS SYSTEMS INC. P.O. BOX 869 OCEANSIDE, CA 92049 www.ModularWetlands.com	DRAWN		
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TITLE: BASIN #1 PORTOLA WATER QUALITY

SIZE	DWG. NO.	REV

SHEET 1 OF 1

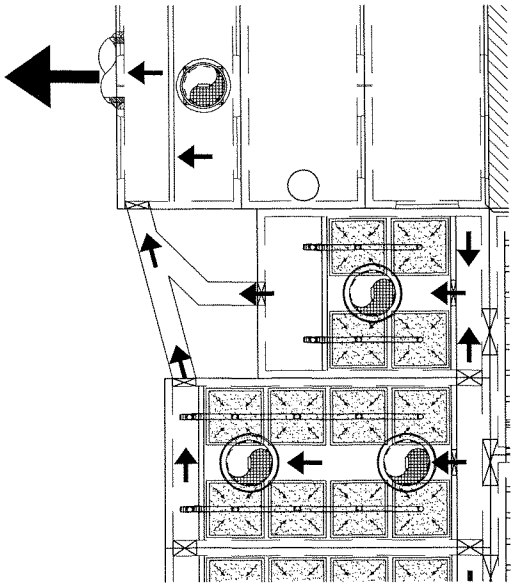
PORTOLA CENTER WATER QUALITY
BASIN #3

MODULAR WETLANDS™

BIO CLEAN® ENVIRONMENTAL SERVICES, INC.

FLOW RATES
PEAK TREATMENT FLOW RATE = 2.24 CFS OR 1,006.40 GPM

BIOFILTRATION CHAMBER SURFACE AREA CALCS
SIDES = 2
3.7' L x 3.4' H = 12.58 SF
SIDES = 4
12.58 x 4 SIDES = 50.32 SF
CELLS = 20
50.32 x 20 CELLS = 1006.40 SF
TOTAL WETLANDS MEDIA SURFACE AREA = 1006.40 SF
WETLANDS MEDIA LOADING RATE 1006.40 GPM / 1006.40 SF = 1.00 GPM/SF
PRETREATMENT FILTER SURFACE AREA CALCS
TOTAL PRETREATMENT SURFACE AREA 25 SF x 20 FILTERS = 500 SF
PRETREATMENT FILTER LOADING RATE 1006.40 GPM / 500 SF = 2.01 GPM/SF



MODULAR WETLANDS DETAIL

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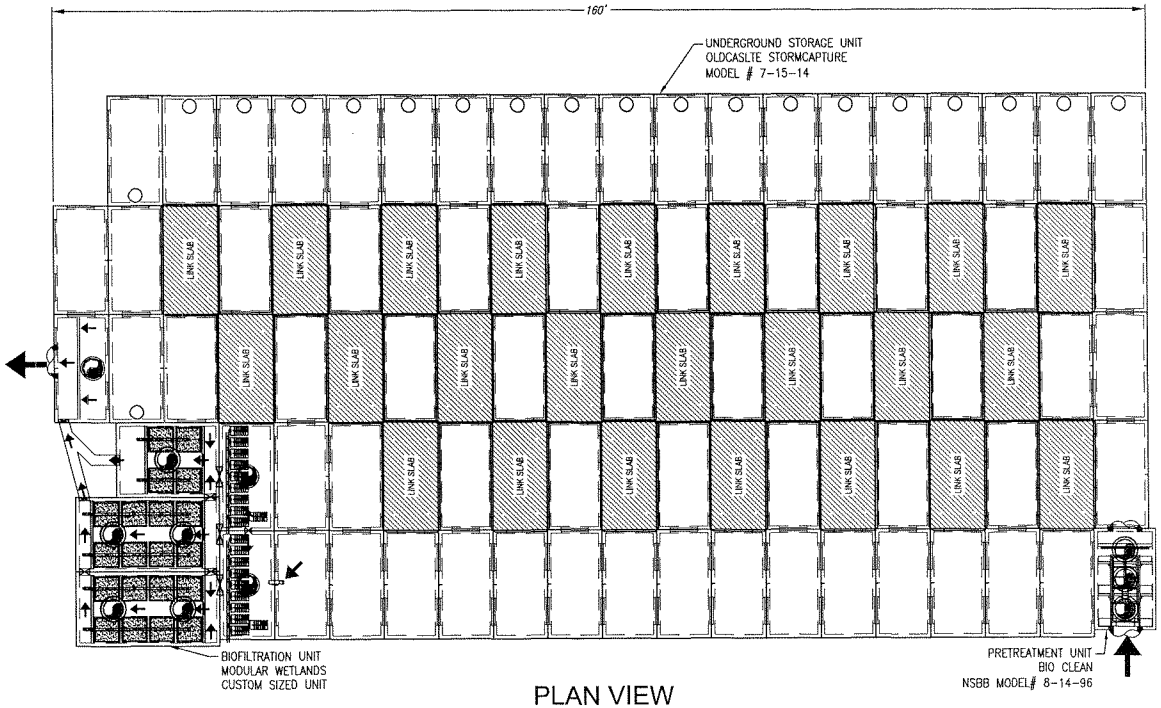
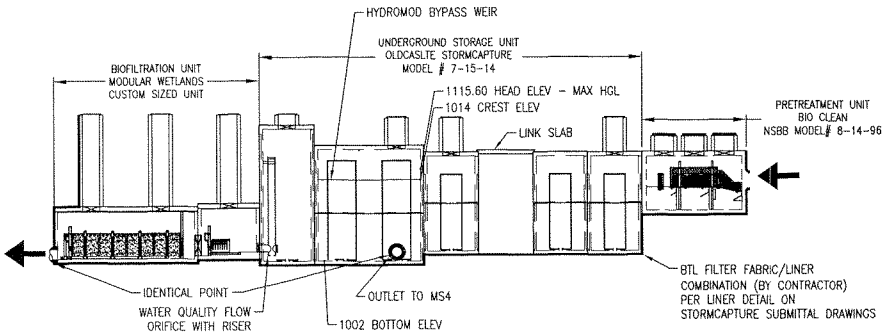


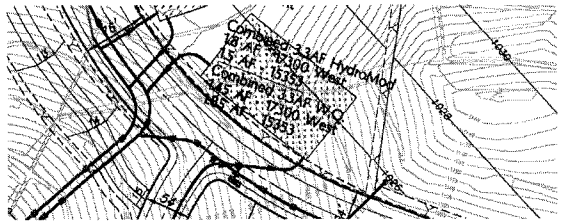
PLAN VIEW

NTS



ELEVATION VIEW/ FLOW PATH DIAGRAM

NTS



SITE MAP - BASIN #3

NTS

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TITLE: BASIN #3
PORTOLA WATER QUALITY

SIZE | DWG. NO. | REV

SHEET 1 OF 1

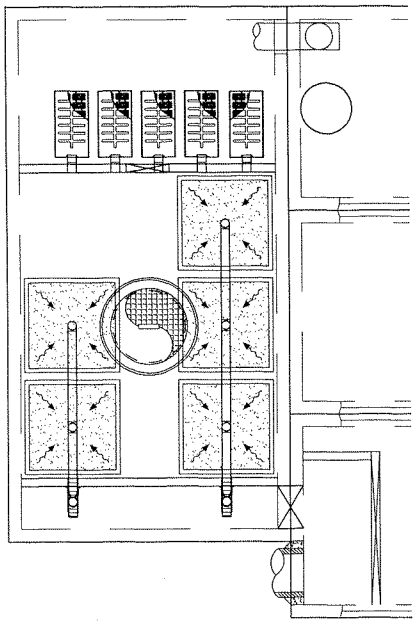
PORTOLA CENTER WATER QUALITY
BASIN #4

MODULAR WETLANDS™

BIO CLEAN® ENVIRONMENTAL SERVICES, INC.

FLOW RATES
PEAK TREATMENT FLOW RATE = 0.56 CFS OR 251.60 GPM

BIOFILTRATION CHAMBER SURFACE AREA CALCS
SIDES = 2
3.7' L x 3.4' H = 12.58 SF
SIDES = 4
12.58 x 4 SIDES = 50.32 SF
CELLS = 5
50.32 x 5 CELLS = 251.60 SF
TOTAL WETLANDS MEDIA SURFACE AREA **= 251.60 SF**
WETLANDS MEDIA LOADING RATE 251.60 GPM / 251.60 SF **= 1.00 GPM/SF**
PRETREATMENT FILTER SURFACE AREA CALCS
TOTAL PRETREATMENT SURFACE AREA 25 SF x 5 FILTERS **= 125 SF**
PRETREATMENT FILTER LOADING RATE 251.60 GPM / 125 SF **= 2.01 GPM/SF**



MODULAR WETLANDS DETAIL

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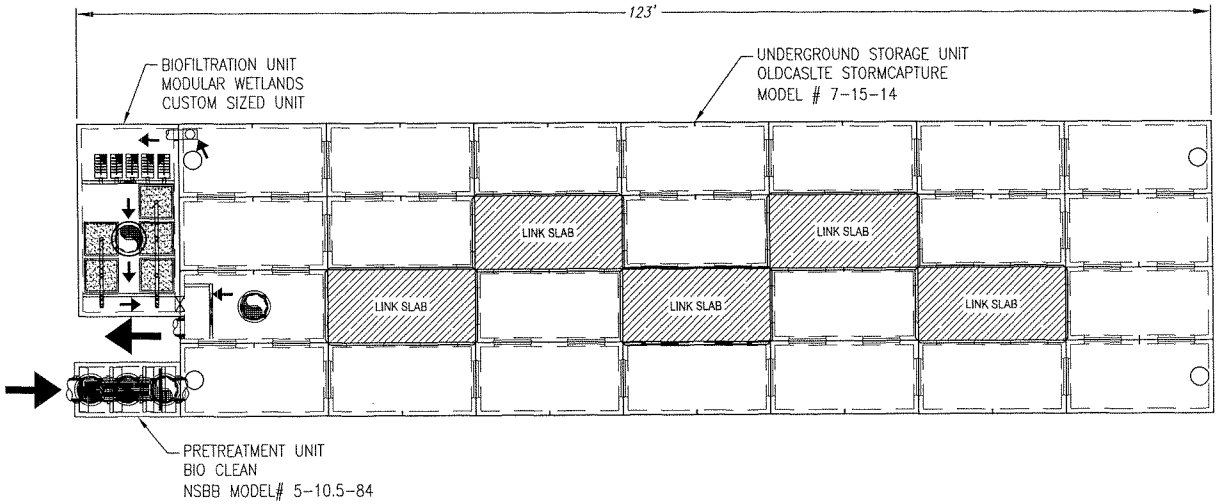
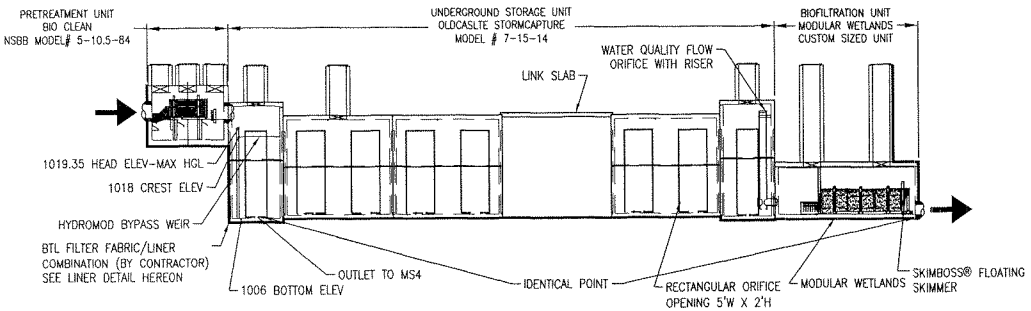


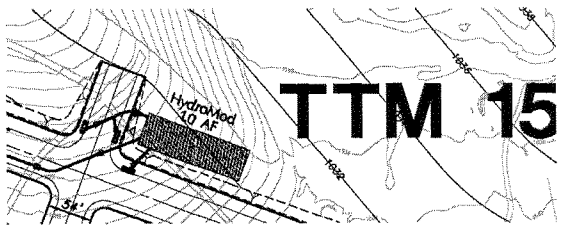
PLAN VIEW

NTS



ELEVATION VIEW/ FLOW PATH DIAGRAM

NTS



SITE MAP - BASIN #4

NTS

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COMMENTS:

TITLE: BASIN #4 PORTOLA WATER QUALITY

SIZE	DWG. NO.	REV

SHEET 1 OF 1

PORTOLA CENTER WATER QUALITY

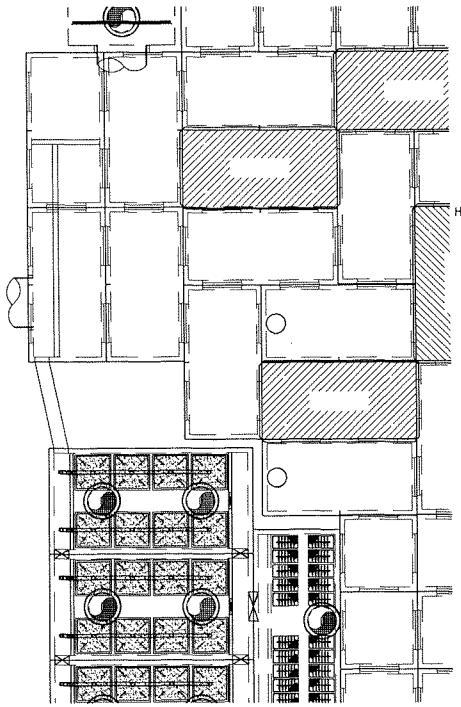
BASIN #5

MODULAR WETLANDS™

BIO CLEAN® ENVIRONMENTAL SERVICES, INC.

FLOW RATES
PEAK TREATMENT FLOW RATE = 4.49 CFS OR 2,012.80 GPM

BIOFILTRATION CHAMBER SURFACE AREA CALCS
SIDES = 2
3.7' L x 3.4' H = 12.58 SF
SIDES = 4
12.58 x 4 SIDES = 50.32 SF
CELLS = 40
50.32 x 40 CELLS = 2,012.80 SF
TOTAL WETLANDS MEDIA SURFACE AREA = 2,012.80 SF
WETLANDS MEDIA LOADING RATE 2012.80 GPM / 2,012.80 SF = 1.00 GPM/SF
PRETREATMENT FILTER SURFACE AREA CALCS
TOTAL PRETREATMENT SURFACE AREA 25 SF x 40 FILTERS = 1,000 SF
PRETREATMENT FILTER LOADING RATE 2,012.80 GPM / 1,000 SF = 2.01 GPM/SF



MODULAR WETLANDS DETAIL

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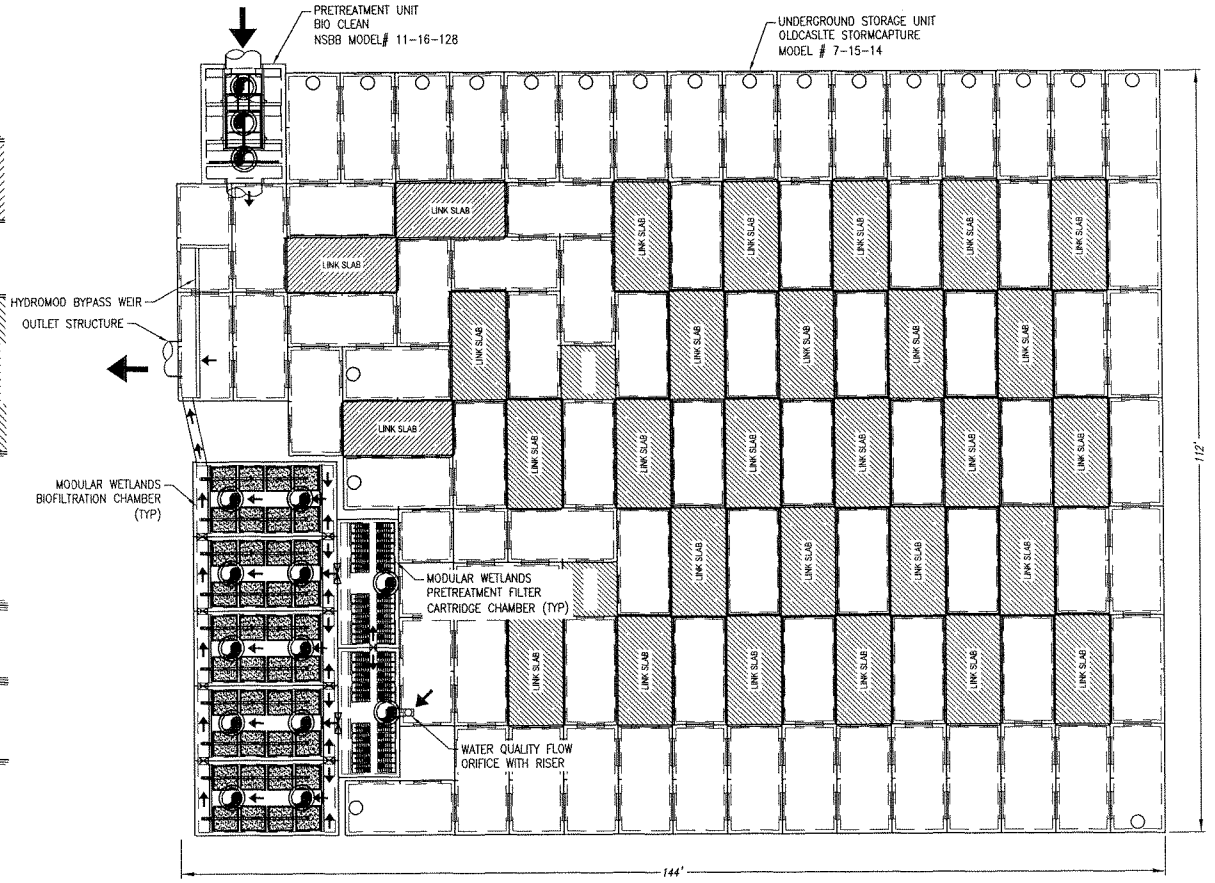

PLAN VIEW

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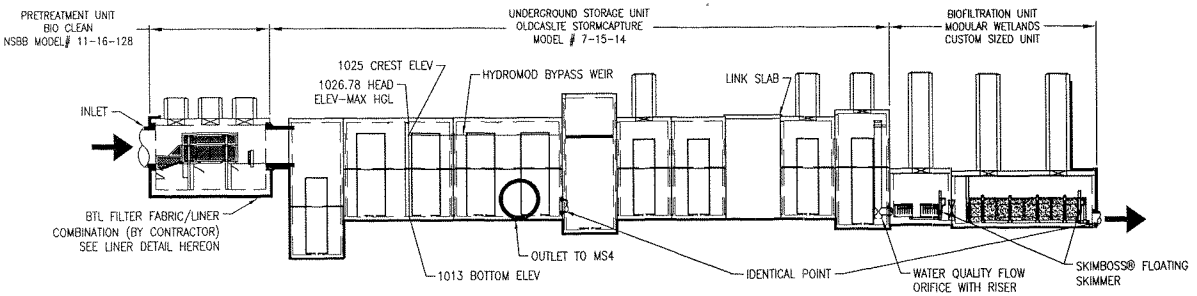

ELEVATION VIEW

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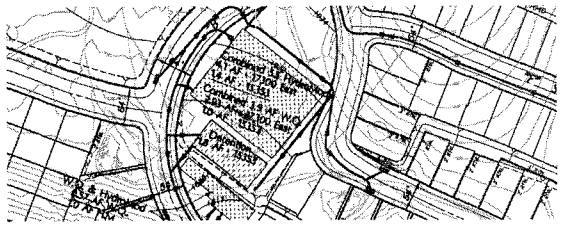

SITE MAP - BASIN #5

NTS

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OCEANSIDE, CA 92049
www.ModularWETLANDS.com

	NAME	DATE
DRAWN		
EDITED		

COMMENTS:

TITLE: BASIN #5 PORTOLA WATER QUALITY

SIZE | DWG. NO. | REV

SHEET 1 OF 1

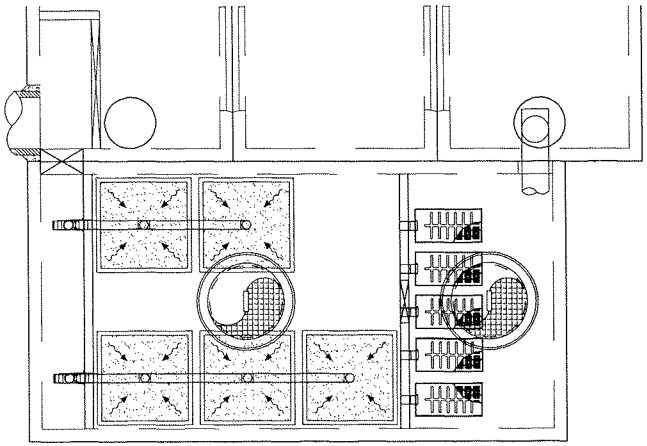
PORTOLA CENTER WATER QUALITY
BASIN # 7B

MODULAR WETLANDS™

BIO CLEAN ENVIRONMENTAL SERVICES, INC.

FLOW RATES
PEAK TREATMENT FLOW RATE = 0.56 CFS OR 251.60 GPM

BIOFILTRATION CHAMBER SURFACE AREA CALCS
SIDES = 2
3.7' L x 3.4' H = 12.58 SF
SIDES = 4
12.58 x 4 SIDES = 50.32 SF
CELLS = 5
50.32 x 5 CELLS = 251.60 SF
TOTAL WETLANDS MEDIA SURFACE AREA = 251.60 SF
WETLANDS MEDIA LOADING RATE 251.60 GPM / 251.60 SF = 1.00 GPM/SF
PRETREATMENT FILTER SURFACE AREA CALCS
TOTAL PRETREATMENT SURFACE AREA 25 SF x 5 FILTERS = 125 SF
PRETREATMENT FILTER LOADING RATE 251.60 GPM / 125 SF = 2.01 GPM/SF



MODULAR WETLANDS DETAIL
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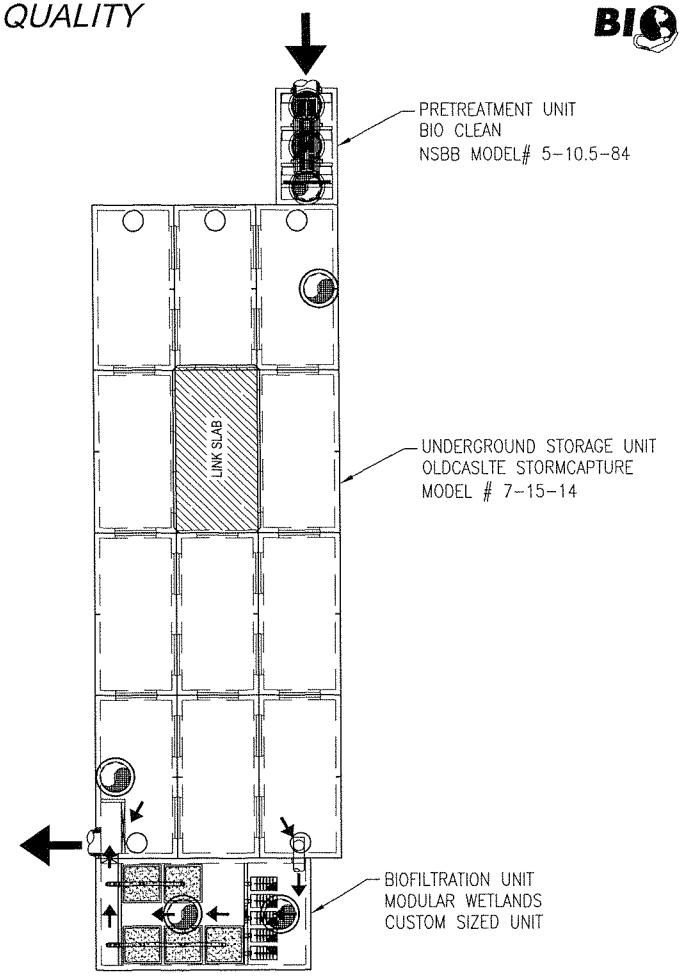
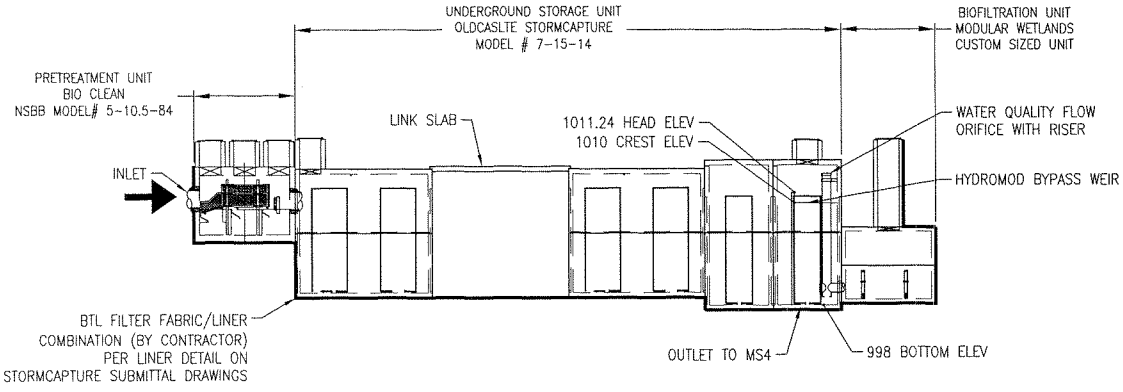


PLAN VIEW
NTS



ELEVATION VIEW
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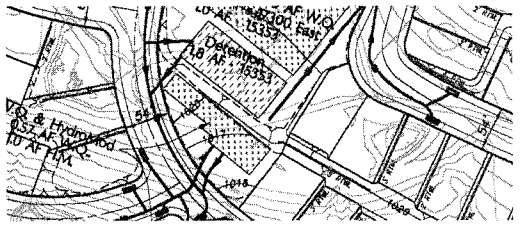

SITE MAP - BASIN #7B
NTS

		NAME	DATE
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COMMENTS:

TITLE: BASIN #7B PORTOLA WATER QUALITY

SIZE	DWG. NO.	REV

SHEET 1 OF 1

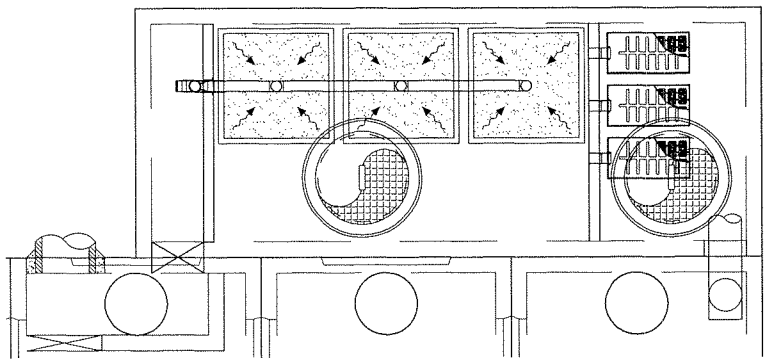
PORTOLA CENTER WATER QUALITY
BASIN #8B

MODULAR WETLANDS™

BIO CLEAN® ENVIRONMENTAL SERVICES, INC.

FLOW RATES
PEAK TREATMENT FLOW RATE = 0.34 CFS OR 150.96 GPM

BIOFILTRATION CHAMBER SURFACE AREA CALCS
3.7' L x 3.4' H = 12.58 SF
12.58 x 4 SIDES = 50.32 SF
50.32 x 3 CELLS = 150.96 SF
TOTAL WETLANDS MEDIA SURFACE AREA = 150.96 SF
WETLANDS MEDIA LOADING RATE 150.96 GPM / 150.96 SF = 1.00 GPM/SF
PRETREATMENT FILTER SURFACE AREA CALCS
TOTAL PRETREATMENT SURFACE AREA 25 SF x 3 FILTERS = 75 SF
PRETREATMENT FILTER LOADING RATE 150.96 GPM / 75 SF = 2.01 GPM/SF



MODULAR WETLANDS DETAIL

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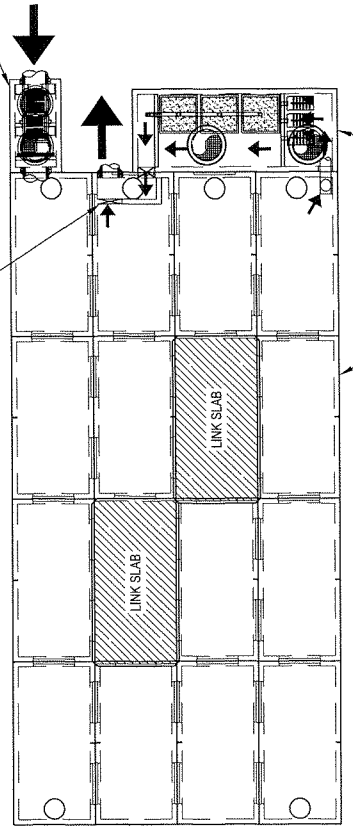

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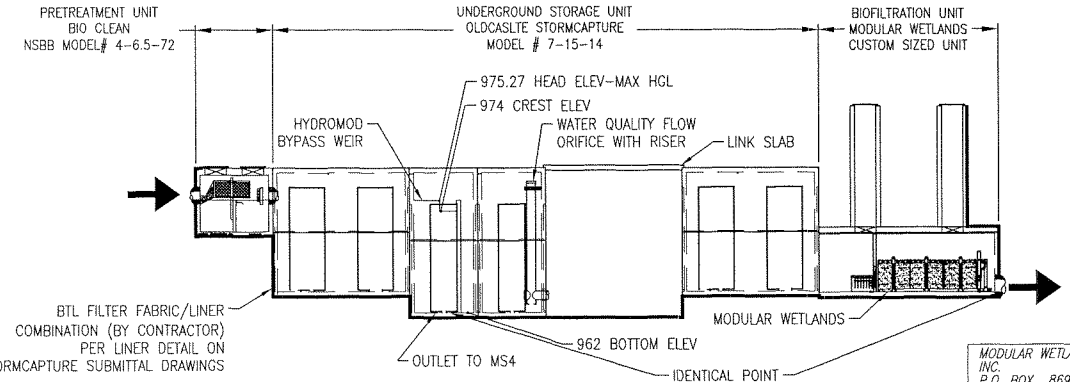
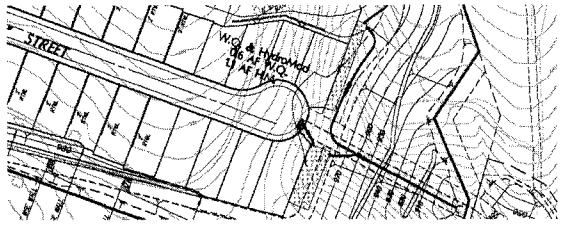


ELEVATION VIEW

NTS



SITE MAP - BASIN #8B

NTS

MODULAR WETLANDS SYSTEMS INC.
P.O. BOX 869
OCEANSIDE, CA 92049
WWW.MODULARWETLANDS.com

	NAME	DATE
DRAWN		
EDITED		

COMMENTS:

TITLE: BASIN #8B PORTOLA WATER QUALITY

SIZE | DWG. NO. | REV

SHEET 1 OF 1