

Example  
Stormwater Control Plan  
For a Residential Subdivision Project

Whispering Pines Lane  
Anytown, USA

December 2, 2015

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This example prepared by Dan Cloak Environmental Consulting  
to assist users of the BASMAA Post-Construction Manual



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## Attachments

Stormwater Control Plan Exhibit  
Provision E.12 Sizing Calculator Spreadsheet

This Stormwater Control Plan was prepared using the template dated July 11, 2014.

## I. Project Data

Table 1. Project Data Form

Project Name/Number	Example Small Residential Subdivision Project
Application Submittal Date	24 November 2015 [to be verified by municipal staff]
Project Location	Whispering Pines Lane, Anytown, USA
Project Phase No.	Not Applicable
Project Type and Description	Nine single family homes with public street and associated infrastructure
Total Project Site Area (acres)	3.0 acres
Total New and Replaced Impervious Surface Area	60,054 SF
Total Pre-Project Impervious Surface Area	0 SF
Total Post-Project Impervious Surface Area	60,054 SF

## II. Setting

### II.A. Project Location and Description

The project consists of nine single family homes, a new street with a cul-de-sac, and sidewalks. In addition, sidewalks will be constructed along the frontage of Arterial Road.

### II.B. Existing Site Features and Conditions

This 3-acre undeveloped infill site is nearly flat, sloping only 0.15% toward Arterial Road. The site was formerly agricultural, and there are no significant trees. See Figure 2. Soils are silty clays typical of the area (Hydrologic Soil Group “D”). There are no swales or other natural drainage features, and there are no storm drains on site. A municipal storm drain exists in Arterial Road bordering the site.



Figure 1. Location of Whispering Pines Lane, Anytown.

### II.C. Opportunities and Constraints for Stormwater Control

Disposal of runoff to deep infiltration is not feasible on this site due to the low permeability of the clay soils.

The planned development includes large front yards and rear yards, allowing runoff from some impervious areas to be managed by dispersal to landscaping.

There is a storm drain in Arterial Road; however, it is at a shallow depth, limiting the potential for connecting underdrains from bioretention facilities located more than a short distance from Arterial Road.

### III. Low Impact Development Design Strategies

#### III.A. Optimization of Site Layout

The site is infill within the existing urbanized area. Density reflects that of surrounding developments and is consistent with zoning.

To minimize street length and pavement area, the street is double loaded (driveways on each side). Street widths, sidewalk widths, and the radius of the cul-de-sac (with mountable curbs) are the minimum allowable consistent with City public works standards and fire district requirements.

The planned location of bioretention facilities along Arterial Road provides a buffer between the residences and the street.

#### III.B. Use of Permeable Pavements

Conventional concrete and conventional asphalt are to be used to construct the street, sidewalks, and driveways. Permeable pavements are not cost-effective for this site, in part because the pavements overlie expansive clay soils. This condition would necessitate a very deep gravel base course, which would, in turn, require large quantities of excavation and off-haul.

#### III.C. Dispersal of Runoff to Pervious Areas

Runoff from the rear portion of each house (about 50% of roof area) will be dispersed to rear yards, which will be graded concave to detain a volume equal to one inch times the roof + yard areas. In addition, the landscaped front yards will be graded to retain runoff. The mild concave grading will not interfere with flood flow paths directing runoff around building pads and out to the street.

#### III.D. Stormwater Treatment and Baseline Hydromodification Management Facilities

Runoff from the front portion of each house roof and from driveways will be routed to the street gutters. The combined runoff from lots and streets will be routed to two bioretention facilities located in separate parcels along Arterial Road. See Exhibit. The facilities will be designed to the criteria in the BASMAA *Post-Construction Manual* (July 2014), and will include the following features:

- Surrounded by a concrete curb.



Figure 2. Existing Site Conditions.

- Each layer built flat, level, and to the elevations specified in the plans:
  - Bottom of Gravel Layer (BGL)
  - Top of Gravel Layer (TGL)
  - Top of Soil Layer (TSL)
  - Overflow Grate
  - Facility Rim

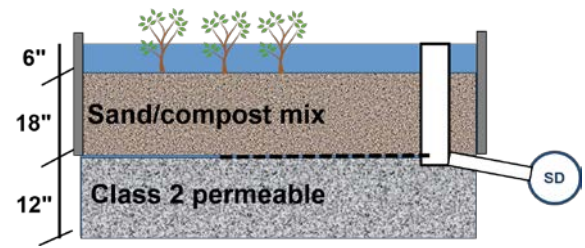


Figure 3. Bioretention Cross-Section (schematic)

- 12 inches of Class 2 permeable, Caltrans specification 68-2.02F(3)
- 18 inches sand/compost mix meeting the recommended BASMAA specifications
- 4 in. dia. PVC SDR 35 perforated pipe underdrain, installed with the invert at the top of the Class 2 permeable layer with holes facing down, and connected to the overflow structure at that same elevation
- 6-inch-deep reservoir between top of soil elevation and overflow grate elevation
- Concrete drop inlet with frame overflow structure, with grate set to specified elevation, connected to storm drain in Arterial Road
- Plantings selected for water conservation, and consistent with the plant matrix in Appendix F of the BASMAA Post-Construction Manual
- Irrigation system on a separate zone, with drip emitters and “smart” irrigation controllers
- Sign identifying the facility as a stormwater treatment facility.

The construction checklist in Appendix B of the BASMAA Post-Construction Manual will be adapted and used to guide inspections during construction of the facilities.

## IV. Documentation of Drainage Design

### IV.A. Descriptions of Each Drainage Management Area

#### IV.A.1. Drainage Management Areas

Table 2. Drainage Management Areas (DMAs) as shown on the Exhibit.

	<b>DMA ID</b>	<b>Description</b>	<b>Surface Type</b>	<b>SF</b>
<b>Lot 1</b>	1-RF	Roof, front	Roof	1846
	1-RR	Roof, rear	Roof	1388
	1-DW	Driveway	Paved	805
	1-FY-1	Front Yard	Landscaped	780
	1-FY-2	Front Yard	Landscaped	1725
	1-RY	Rear Yard	Landscaped	5210
<b>Lot 2</b>	2-RF	Roof, front	Roof	2204
	2-RR	Roof, rear	Roof	2550
	2-DW	Driveway	Paved	400
	2-FY-1	Front Yard	Landscaped	1620
	2-FY-2	Front Yard	Landscaped	370
	2-RY	Rear Yard	Landscaped	3580
<b>Lot 3</b>	3-RF	Roof, front	Roof	1846
	3-RR	Roof, rear	Roof	1388
	3-DW	Driveway	Paved	1000
	3-FY-1	Front Yard	Landscaped	1145
	3-FY-2	Front Yard	Landscaped	1665
	3-RY	Rear Yard	Landscaped	3775
<b>Lot 4</b>	4-RF	Roof, front	Roof	1792
	4-RR	Roof, rear	Roof	1753
	4-DW	Driveway	Paved	520
	4-FY-1	Front Yard	Landscaped	730
	4-FY-2	Front Yard	Landscaped	1575
	4-RY	Rear Yard	Landscaped	8045
<b>Lot 5</b>	5-RF	Roof, front	Roof	1846
	5-RR	Roof, rear	Roof	1388
	5-DW	Driveway	Paved	955
	5-FY-1	Front Yard	Landscaped	1045
	5-FY-2	Front Yard	Landscaped	1790
	5-RY	Rear Yard	Landscaped	5390
<b>Lot 6</b>	6-RF	Roof, front	Roof	1792
	6-RR	Roof, rear	Roof	1753
	6-DW	Driveway	Paved	555
	6-FY-1	Front Yard	Landscaped	1615
	6-FY-2	Front Yard	Landscaped	615
	6-RY	Rear Yard	Landscaped	8235
<b>Lot 7</b>	7-RF	Roof, front	Roof	2204
	7-RR	Roof, rear	Roof	2550
	7-DW	Driveway	Paved	670



	7-FY-1	Front Yard	Landscaped	1845
	7-FY-2	Front Yard	Landscaped	920
	7-RY	Rear Yard	Landscaped	2760
<b>Lot 8</b>	8-RF	Roof, front	Roof	1792
	8-RR	Roof, rear	Roof	1753
	8-DW	Driveway	Paved	480
	8-FY-1	Front Yard	Landscaped	870
	8-FY-2	Front Yard	Landscaped	1715
	8-RY	Rear Yard	Landscaped	4190
<b>Lot 9</b>	9-RF	Roof, front	Roof	2204
	9-RR	Roof, rear	Roof	2550
	9-DW	Driveway	Paved	370
	9-FY-1	Front Yard	Landscaped	460
	9-FY-2	Front Yard	Landscaped	1820
	9-RY	Rear Yard	Landscaped	4350
<b>Street</b>	S-1	Street	Paved	9330
	S-2	Street	Paved	10370

#### IV.A.2. Drainage Management Area Descriptions

**Front Roofs** (DMAs 1-RF, 2-RF, 3-RF, 4-RF, 5-RF, 6-RF, 7-RF, 8-RF, and 9-RF, totaling 17,526 square feet), drain via gutters to driveways or swales adjacent to the driveways and from there to the street gutters.

**Driveways** (DMAs 1-DW, 2-DW, 3-DW, 4-DW, 5-DW, 6-DW, 7-DW, 8-DW, and 9-DW, totaling 5,755 square feet, drain to the street gutters.

**Sidewalks and Whispering Pines Lane**, (DMAs S-1 and S-2, totaling 19,700 square feet) drain to Bioretention Facilities 1 and 2, respectively.

**Rear Roofs** (DMAs 1-RR, 2-RR, 3-RR, 4-RR, 5-RR, 6-RR, 7-RR, 8-RR, and 9-RR totaling 17,073 square feet), each drain to the associated rear yards.

**Rear Yards** (DMAs 1-RY, 2-RY, 3-RY, 4-RY, 5-RY, 6-RY, 7-RY, 8-RY, and 9-RY totaling 45,535 square feet) will be graded slightly concave to promote runoff retention. Each will receive runoff from rear roofs on the same lot.

**Front Yards** (DMAs 1-FY-1, 1-FY-2, 2-FY-1, 2-FY-2, 3-FY-1, 3-FY-2, 4-FY-1, 4-FY-2, 5-FY-1, 5-FY-2, 6-FY-1, 6-FY-2, 7-FY-1, 7-FY-2, 8-FY-1, 8-FY-2, and 9-FY-1 and 9-FY-2, totaling 22,305 square feet will be graded slightly concave to promote runoff retention.

#### IV.B. Tabulation and Sizing Calculations

See the attached spreadsheet. The Exhibit shows revisions to the sizes of DMAs 1-RY, 1-FY-2, 9-RY, and 9-FY-2 to accommodate the two bioretention facilities.

## V. Source Control Measures

### V.A. Site Activities and Potential Sources of Pollutants

On-site activities that could potentially produce stormwater pollutants include:

- Indoor and structural pest control
- Landscape maintenance

### V.B. Potential Pollutant Sources and Source Control Measures

Table 3. Pollutant Sources and Source Control Measures

Potential source of runoff pollutants	Permanent source control BMPs	Operational source control BMPs
Indoor and structural pest control	New construction minimizes potential for pest entry.	IPM information will be provided to new homeowners.
Landscape maintenance	Developer-installed landscaping will minimize irrigation and runoff and be selected for pest resistance, and will minimize the need for fertilizers and pesticides. Plants will be selected appropriate to site soils, slopes, climate, sun, wind rain, land use, air movement, ecological consistency, and plant interactions.	IPM information will be provided to new homeowners.  Landscaping will be maintainable using minimum or no pesticides.

## VI. Stormwater Facility Maintenance

### VI.A. Ownership and Responsibility for Maintenance in Perpetuity

The two bioretention facilities will each be located on a jointly owned parcel, with easy access to the public street. Owners of parcels 1, 2, 3, and 4 will jointly own the parcel on which Bioretention Facility 1 is located, and will be jointly responsible for the maintenance of that facility, subject to provisions in the subdivision map and Conditions, Covenants, and Restrictions (CC&Rs) recorded against the subdivision. Similarly, owners of parcels 5, 6, 7, 8, and 9 will jointly own the parcel on which Bioretention Facility 2 is located, and will be jointly responsible for the maintenance of that facility. The applicant has reviewed the map provisions and CC&Rs provided by Anytown, USA, for applicant's review, and commits to execute any additional agreements necessary to ensure

uninterrupted maintenance of the facilities. Applicant accepts responsibility for interim operation and maintenance of stormwater treatment and flow-control facilities until such time as this responsibility is formally transferred to subsequent owners.

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

The two bioretention facilities will be maintained on the following schedule at a minimum. Details of maintenance responsibilities and procedures will be included in a Stormwater Facility Operation and Maintenance Plan to be submitted for approval prior to the completion of construction.

At no time will synthetic pesticides or fertilizers be applied, nor will any soil amendments, other than aged compost mulch or sand/compost mix, be introduced.

**Weekly:** The facilities will be examined for visible trash during regular policing of the site, and trash will be removed. The facility, and the facility sign, will be inspected for graffiti or vandalism and any problems corrected.

**After Significant Rain Events:** A significant rain event is one that produces approximately a half-inch or more rainfall in a 24-hour period. Within 24 hours after each such event, the following will be conducted:

The surface of the facility will be observed to confirm there is no ponding. If ponding occurs, the cause (potential causes include matting of vegetation or mulch on the surface, accumulation of fine sediment, or failure of the soil mix) will be investigated and remediated.

- Inlets will be inspected, and any accumulations of trash or debris will be removed.
- The surface of the mulch layer will be inspected for movement of material. Mulch will be replaced and raked smooth if needed.

**Prior to the Start of the Rainy Season:** In September of each year, the facility will be inspected to confirm there is no accumulation of debris that would block flow, and that growth and spread of plantings does not block inlets or the movement of runoff across the surface of the facility.

**Annual Landscape Maintenance:** In December - February of each year, vegetation will be cut back as needed, debris removed, and plants and mulch replaced as needed. The concrete work will be inspected for damage. The elevation of the top of soil and mulch layer will be confirmed to be consistent with the 6-inch reservoir depth.

**VII. Construction Plan E.12 Checklist**

Table 4. Construction Checklist Table to be incorporated in Construction Drawings

Stormwater Control Plan		
Page #	Source Control or Treatment Control Measure	See Plan Sheet #s
p.2 and Exhibit	Drainage from rear roofs is directed and dispersed to rear yards	
p.2 and Exhibit	Rear yards are graded concave	
p.2 and Exhibit	Front yards are graded concave	
p.2 and Exhibit	Front roofs and driveways drain to street	
p. 2 and Exhibit	Street drains to bioretention facilities. High point/grade break as shown on Exhibit	
pp. 2-3 and Exhibit	Bioretention facilities are detailed per specifications in the BASMAA Post-Construction Manual	

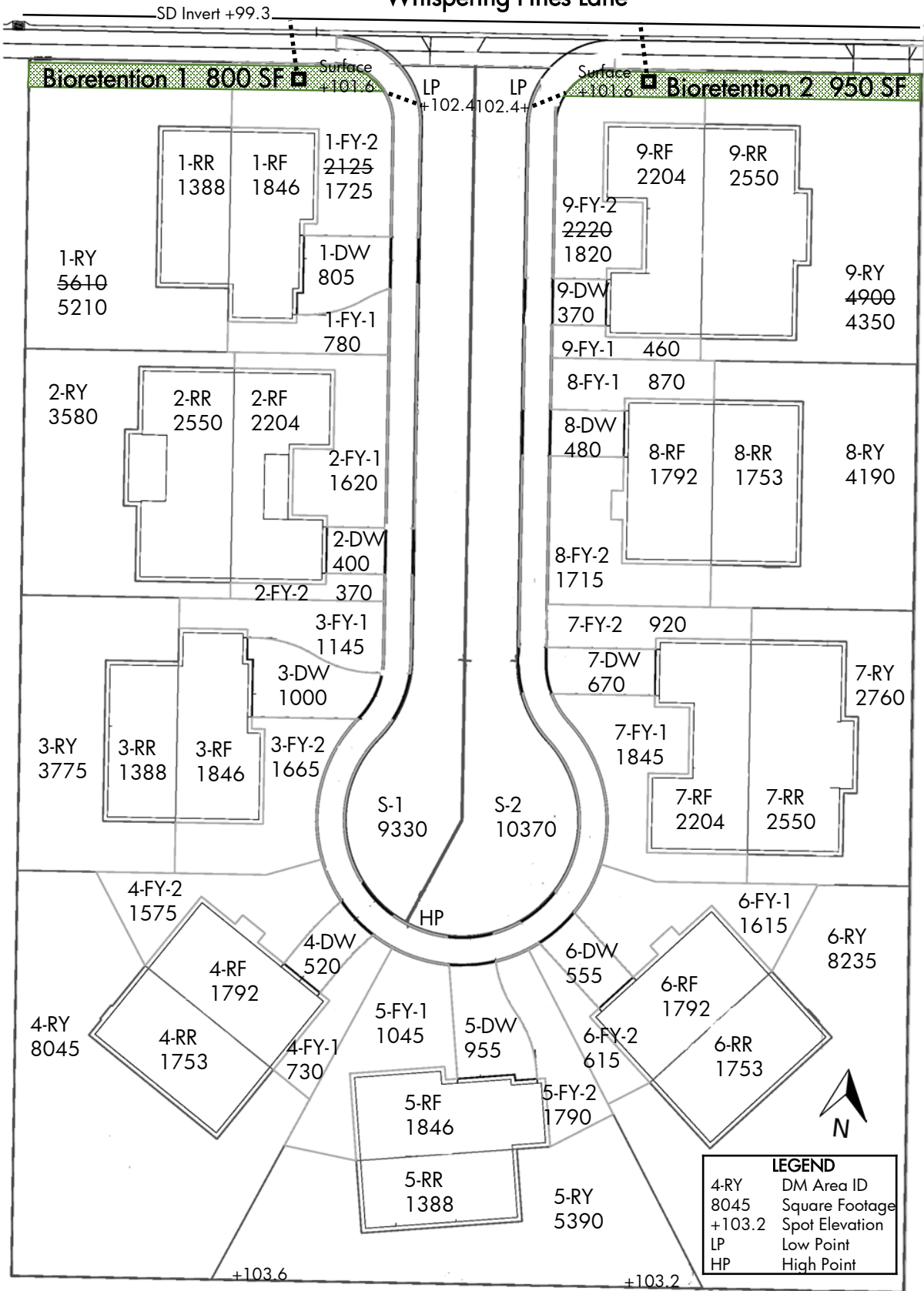
## **VIII. Certifications**

The preliminary design of stormwater treatment facilities and other stormwater pollution control measures in this plan are in accordance with the current edition of the BASMAA *Post-Construction Manual*.

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Preparer

# Stormwater Control Plan Exhibit Whispering Pines Lane





6-RF	1792			1.0			1792								
6-RR	1753			1.0	1753	6-RY									
6-DW	555			1.0			555								
6-FY-1	1615	1615													
6-FY-2	615	615													
6-RY	8235	8235													
7-RF	2204			1.0			2204								
7-RR	2550			1.0	2550	7-RY									
7-DW	670			1.0			670								
7-FY-1	1845	1845													
7-FY-2	920	920													
7-RY	2760	2760													
8-RF	1792			1.0			1792								
8-RR	1753			1.0	1753	8-RY									
8-DW	480			1.0			480								
8-FY-1	870	870													
8-FY-2	1715	1715													
8-RY	4190	4190													
9-RF	2204			1.0			2204								
9-RR	2550			1.0	2550	9-RY									
9-DW	370			1.0			370								
9-FY-1	460	460													
9-FY-2	1820	1820													
9-RY	4350	4350													
S-1	9330			1.0			9330								
S-2	10370			1.0			10370								
<b>Total DMAs</b>	<b>127894</b>	<b>0</b>	<b>67840</b>		<b>17073</b>		<b>19743</b>	<b>23238</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
						<b>Sizing Factor</b>	<b>0.04</b>	<b>0.04</b>	<b>0.04</b>	<b>0.04</b>	<b>0.04</b>	<b>0.04</b>	<b>0.04</b>	<b>0.04</b>	<b>0.04</b>
						<b>Minimum Size</b>	<b>789.72</b>	<b>929.52</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Total Facilities</b>	<b>1750</b>	<b>Step 7: Enter Facility Footprints</b>				<b>Footprint on Exhibit</b>	800	950							
<b>DMAs + Facilities</b>	<b>129644</b>	<b>OK</b>	<b>Step 8: Iterate sizes of facility footprints and DMAs until all footprints are at least the minimum AND DMAs + Facilities equals Total Site Area</b>											<b>OK</b>	<b>OK</b>
			<b>Step 9: Check to make sure Areas Draining to each Receiving Self-Retaining Area do not exceed maximum 2:1 ratio.</b>												
			<b>Step 10: Check results on this spreadsheet are consistent with what is shown on the SCP Exhibit.</b>												