

## **Appendix E: Hydrology and Water Quality Supporting Information**

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**PRELIMINARY  
SWLID REPORT  
EMERALD ISLE**

**GULLANE DRIVE  
SANTA ROSA, CA. 95403**

**APN's: 173-670-016 &  
173-670-004**

**OAKMONT SENIOR LIVING  
LLC**

**B&R JOB # 4081.04  
JANUARY 15, 2019**



**Prepared By:**

Brelje & Race Consulting Engineers  
475 Aviation Blvd. Suite 120, Santa Rosa, CA 95403  
v. 707.576.1322 f. 707.576.0469  
[www.brce.com](http://www.brce.com)

## TABLE OF CONTENTS

1. Project Description .....	1
2. Pollution Prevention Measures .....	2
3. Types of BMP's Selected .....	3
4. Level of Treatment, Design Goal & Conclusions .....	4
5. Maintenance Funding .....	5
6. BMP Selection Tables .....	6
7. LID Determination Worksheet .....	7
8. Storm Water Calculations.....	14
9. Soils Map .....	41

### Appendices

**Appendix A: Preliminary Post Construction Details of BMPs (drawings)**

**Appendix B: Maintenance - Checklists**

**Appendix C: Maintenance - Operations & Maintenance Manuals**

**Appendix D: Maintenance - Maintenance Declaration**

### Attachments

**Proposed Conditions SWLID Exhibit (map)**

## 1. PROJECT DESCRIPTION

The proposed project is located on Gullane Drive, a private road east of Thomas Lake Harris Drive, in the City of Santa Rosa. The project site totals 12.57± acres. The proposed Oakmont Senior Living Emerald Isle development project is a multi-family residential condominium complex of seven buildings totaling 82 units, with separate common garage structures, and a central recreational building and pool facility. Outdoor amenities will include fountains, arbors, dining patios, walking paths, raised garden beds, sports courts, and a pet park. The project will include construction of new buildings with surrounding courtyards, landscaping, garages and parking lots, access driveways with sidewalks extending Gullane Drive into the site, and an Emergency Vehicle Access driveway extending south from Thomas Lake Harris Drive into the site. The project is classified as a residential development and triggers NPDES Phase 1 Term 4 MS4 Storm Water LID mitigation requirements as it will create over 10,000 square feet of new or replacement impervious surface. In this particular project, all development will occur on what is currently the undeveloped knoll or pervious landscape within easements over the adjacent Fountaingrove Country Club golf course, therefore the Proposed Conditions Exhibit map exhibit submitted with this report shows only post-construction conditions, existing conditions being 100% pervious.

The project site is currently a legal flag parcel (APN's 173-670-016 & 173-670-004) located mostly on an undeveloped knoll, overlooking and almost entirely encircled by the 11<sup>th</sup>, 12<sup>th</sup>, 13<sup>th</sup>, 16<sup>th</sup> and 17<sup>th</sup> fairways of the Fountaingrove Golf & Country Club. The site's slopes range primarily from 10% to 25%. The site currently drains overland in all directions downhill from the knoll, with the first 300 feet of the entry road previously paved and developed as a part of The Oaks Subdivision constructed in 1993-94. Runoff travels across undeveloped hillside and down into the surrounding golf course before entering existing golf course surface swales and underground storm drain systems. The site drains to four separate storm drain tributaries, labeled on the Hydrology Map as the KILARNY (Kilarny Circle), TLH (Thomas Lake Harris Drive), FG&CC (16<sup>th</sup> fairway of the Fountaingrove Golf Course) and (Fountaingrove) LAKE. In general, separate site storm drain systems have been designed and routed to maintain the existing distribution of runoff from the site to these four tributaries. Where surface sheet flow of runoff is not feasible, drainage will be captured in the proposed underground pipe systems and conveyed to locations of downstream concentrated flow, in a few cases utilizing existing storm drain easements through the off-site golf course property to do so. Runoff captured from new developed areas of the site resulting from the theoretical 1 inch-24 hour storm event will be routed through proposed treatment and hydromodification BMP's and natural vegetation before being allowed to continue downstream to discharge into these tributaries and off of the site.

The Hydrologic Soil Group Map in Section 9 was generated from the USDA Natural Resource Conservation Service Web Soil Survey web site. The soil classifications for the project area are majority Gouling cobbly clay loam (GIE), some Raynor clay (RaD), with insignificant amounts of Spreckles Loam (SkD) and Felta very gravelly loam (FaE). Almost the entire proposed coverage of proposed buildings and adjacent paving are located over group D soils, with a small portion of the proposed entry driveway, a part of Building 1, and the on-site portion of the EVA road located over group C soils. (The existing pavement to be retained for the first 300 feet of Gullane Drive happens to be located over group B soils, however, no changes to the amount of impervious area is proposed.)

## 2. POLLUTION PREVENTION MEASURES

The project design has incorporated pollution source controls intended to prevent pollutants from entering downstream drainage systems. These source controls include:

- The site landscape and hardscape will be professionally maintained financed by a homeowner's association that will be created by the development, swept clean and with landscape leaves and debris removed on a regular schedule over the course of the year.
- Drainage inlets and structural BMP's will be fitted with gross pollutant (trash) racks and interceptor trays. Racks and trays will be regularly inspected and any captured debris removed and properly disposed of.
- Trash will be stored in covered exterior trash enclosures. Local drainage will be routed away from the trash enclosure location. Drainage within trash enclosures will be routed into the sanitary sewer, per City requirements.
- Vehicles will not be allowed to be washed or mechanically maintained on the site. All such activities will be required to occur off-site with encouragement of the use of commercial carwashes and car maintenance and repair shops.
- Landscape irrigation heads will be sized and tuned to avoid overspray and overwatering along with the selected use of drip irrigation.
- 100% capture and treatment, and retention of at least the increase in runoff from the 1-inch 24-hour storm event, of the entire developed portion of the site to the maximum extent practicable (MEP).
- Routing excess intercepted runoff to sheet drain where possible downslope through adjacent existing vegetation or, in the case of unavoidable concentrated flow, conveyed on site and through existing storm drain easements to a suitable outfall location with provisions for energy dissipation and erosion control.

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- Trash will be stored in covered exterior trash enclosures. Local drainage will be routed away from the trash enclosure location. Drainage within trash enclosures will be routed into the sanitary sewer, per City requirements.
- Vehicles will not be allowed to be washed or mechanically maintained on the site. All such activities will be required to occur off-site with encouragement of the use of commercial carwashes and car maintenance and repair shops.
- Landscape irrigation heads will be sized and tuned to avoid overspray and overwatering along with the selected use of drip irrigation.
- 100% capture and treatment, and retention of at least the increase in runoff from the 1-inch 24-hour storm event, of the entire developed portion of the site to the maximum extent practicable (MEP).
- Routing excess intercepted runoff to sheet drain where possible downslope through adjacent existing vegetation or, in the case of unavoidable concentrated flow, conveyed on site and through existing storm drain easements to a suitable outfall location with provisions for energy dissipation and erosion control.



### 3. TYPES OF BMP'S SELECTED

The Low Impact Development Technical Design Manual (Manual) encourages the use of Low Impact Development (LID) techniques to both retain and treat runoff water from impervious surfaces. The Manual prioritizes both universal techniques that are independent of soil type, groundwater level, and groundwater contamination and small scale, landscape-based LID techniques located close to the source of pollution. However, the higher priority BMP's are not always feasible on all sites.

The first 300 feet of Gullane Drive existing entry road improvements off of Thomas Lake Harris Drive will not be re-developed or altered, but shall remain as an existing paved driveway with sidewalks draining directly to an existing underground storm drain system constructed in 1994 as a part of The Oaks at Fountaingrove residential development, which was destroyed in the October 2017 fire and is currently being rebuilt. No new storm water mitigation BMP's are proposed for this area.

Drainage Management Areas (DMAs) 1 and 16, as indicated on the attached Proposed Condition Map, will drain through a pervious concrete gutter and into a bioretention area beneath the sidewalk. All runoff from the 1-inch 24-hour storm will be captured and retained. Excess runoff from larger storms will be bypassed via perforated pipe to the private site storm drain system. Retained stormwater will be allowed to infiltrate into the soil.

Drainage Management Areas (DMAs) 2 and 14, as indicated on the attached Proposed Condition Map, will drain into a vegetated swale with bioretention area beneath the swale. All runoff from the 1-inch 24-hour storm will be captured and retained. Excess runoff from larger storms will bypass the vegetated swale with bioretention once they are full and eventually spill over and sheet flow down the existing hillside.

Drainage Management Areas (DMAs) 3, 4, 5, 8, 15, and 18, as indicated on the attached Proposed Condition Map, will drain into infiltration trenches, installed on contour on the existing hillside. All runoff from the 1-inch 24-hour storm will be captured. Runoff from larger storms will bypass the trenches once they are full and eventually spill over and sheet flow down the existing hillside.

Drainage Management Areas (DMAs) 6, 9, 10, 12, and 19, as indicated on the attached Proposed Condition Map, will drain into a structural (StormCapture System) infiltration system. The system will be sized such that all runoff from the 1-inch 24-hour storm routed through these BMP's will be captured and retained. Runoff from larger storms will bypass the structural infiltration system once they are full and eventually spill over and sheet flow down the existing hillside.

Drainage Management Areas (DMAs) 7, 11, 13, and 17, as indicated on the attached Proposed Condition Map, will drain through a pervious concrete valley gutter and into a bioretention area beneath the pervious valley gutter. All runoff from the 1-inch 24-hour storm will be captured and retained. Excess runoff from larger storms will be bypassed via perforated pipe to the private site storm drain system. Retained stormwater will be allowed to infiltrate into the soil.

## 4. LEVEL OF TREATMENT, DESIGN GOAL & CONCLUSIONS

The design goal of 100% capture and treatment for the impervious developed portions of the site will be achieved by routing 100% of event runoff (or as near to 100% as possible) through the various BMPs associated with each of the DMA's around the project. In addition, BMP's will be designed to retain at minimum the increase in volume of runoff from the newly developed portion of the site resulting from the 1-inch 24-hour storm event before bypassing any excess runoff. Excess runoff will be dispersed to multiple outlets around the project where it will continue on downhill through the existing trees and vegetation before exiting the property. Outlets will be designed to de-energize and distribute flow to mitigate the erosive effect of concentrated flow. The proposed locations and sizing of BMP's are summarized in the SWLID Calculator worksheet, showing that the proposed BMP's will satisfy SWLID criteria.

## 5. MAINTENANCE FUNDING

BMPs shall be inspected and maintained as described in “Bioretention Inspection and Maintenance Requirements”, “Porous Pavement Inspection and Maintenance Requirements”, and “Infiltration Trench Inspection and Maintenance Requirements” provided in the 2017 Storm Water LID Technical Design Manual Reference Documents Section. Structural BMP’s such as the “StormCapture System” shall be inspected and maintained in accordance with the operations and maintenance (O&M) manual published by the manufacturer. All associated costs for inspection or maintenance of the onsite best management practices (BMPs) shall be financed, budgeted for this purpose and carried out by The Emerald Isle Homeowner’s Association, or its assigned successor(s).

## 6. BMP SELECTION TABLES

Project Name: \_\_\_\_\_

Best Management Practice (BMP)			Detail Sheet	Detail Title	Can be used with:				Achieves:				BMP in priority selected?				Explanation of selection				Other notes:
					High Ground Water	Contamination	Slope Constraints	Treatment	Volume Capture	Runoff Reduction Measure	Yes	No	Unique Identifier of BMP per	Explanation of selection							
Universal BMP- to be considered on all projects.	Living Roof	N/A	N/A	N/A	X	X	X	X	X	X											
	Rainwater Harvesting	N/A	N/A	N/A	X	X	X	X	X	X											

Runoff Reduction Measures	Interceptor Trees	N/A	N/A	X	X	X	X	X	X	X									
	Bovine Terrace	RRM-01																	
	Vegetated Buffer Strip	RRM-02																	
	Impervious Area Disconnection	N/A	X	X	X	X	X	X	X	X									

Priority 1- to be installed with no underdrains or liners. Must drain all standing water within 72 hours.	Bioretention	P1-02	Roadside Bioretention - no C & G				X	X	X	X									
	Vegetated Swale- with Bioretention	P1-06	Swale with Bioretention				X	X	X	X									
	Constructed Wetlands	N/A	N/A				X	X	X	X									

Priority 2 BMPs- with subsurface drains installed above the capture volume.	Bioretention	P2-02	Roadside Bioretention - Flush Design Roadside				X	X	X	X									
		P2-03	Roadside Bioretention- Contiguous SW				X	X	X	X									
		P2-04	Roadside Bioretention- Curb Opening				X	X	X	X									
		P2-05	Roadside Bioretention- No C & G				X	X	X	X									
	Constructed Wetlands	N/A	N/A				X	X	X	X									

Priority 3 BMPs- installed with subdrains and/or impermeable liner. Does not achieve volume capture and must be used as part of a treatment train.	Best Management Practice (BMP)	Detail Sheet	Detail Title	Can be used with...				Achieves...				BMP in priority selected?		Explanation of selection	Other notes:	
				High Ground Water Contamination				Slope Constraints				Runoff Reduction Measure				
				Treatments				Volume Capture				Yes				
							No	Unique Identifier of BMP per Planes			Explanation of selection					
	Bioretention	P3-02	Roadside Bioretention - Flush Design Roadside	X	X	X	X	X	X	X	X					
			Roadside Bioretention- Contiguous SW	X	X	X	X	X	X	X	X					
			Roadside Bioretention- Curb Opening	X	X	X	X	X	X	X	X					
	Flow Through Planters	P3-05	Flow Through Planters	X	X	X	X	X	X	X	X					
			With Planters	X	X	X	X	X	X	X	X	X				
	Vegetated Swale	P3-07	Bioretention	X	X	X	X	X	X	X	X	X				
			Vegetated Swale	X	X	X	X	X	X	X	X	X				

Priority 4 BMPs- does not achieve volume capture and must be used as part of a	Tree Filter Unit	X	X	X	X	X	X	X	X		X			
	Modular Bioretention	X	X	X	X	X	X	X	X		X			

Priority 5 BMPs- does not achieve volume capture and must be used as part of a treatment train.	Chambered Separator Units	X	X	X	X	X	X	X	X		X			
	Centrifugal Separator Units	X	X	X	X	X	X	X	X		X			
	Trash Excluders	X	X	X	X	X	X	X	X		X			
	Filter Inserts	X	X	X	X	X	X	X	X		X			

Priority 6 BMPs- see the "Offset Program" chapter for details.	Offset Program										X			
--	----------------	--	--	--	--	--	--	--	--	--	---	--	--	--

Other	Detention	X									X			
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## 7. LID DETERMINATION WORKSHEET

**FOR OFFICE USE ONLY:**

Does this project require permanent storm water BMP's?

Y N

Date Submitted: \_\_\_\_\_



File No:	Quadrant
Related Files:	
Set:	
Department Use Only	

## 2017 Storm Water LID Determination Worksheet

**PURPOSE AND APPLICABILITY:** This determination worksheet is intended to satisfy the specific requirements of "ORDER NO. R1-2015-0030, NPDES NO. CA0025054 NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT AND WASTE DISCHARGE REQUIREMENTS FOR DISCHARGES FROM THE MUNICIPAL SEPARATE STORM SEWER SYSTEMS." Additional design requirements imposed by Governing Agencies, such as local grading ordinances, CAL Green, CEQA, 401 permitting, and hydraulic design for flood control still apply as appropriate. Additionally, coverage under another regulation may trigger the requirement to design in accordance with the Storm Water LID Technical Design Manual.

### Part 1: Project Information

Project Name Applicant (owner or developer) Name

Project Site Address Applicant Mailing Address

Project City/State/Zip Applicant City/State/Zip

Permit Number(s) - (if applicable) Applicant Phone/Email/Fax

Designer Name Designer Mailing Address

Designer City/State/Zip Designer Phone/Email

### **Type of Application/Project:**

Subdivision      Grading Permit      Building Permit      Hillside Development  
 Design Review      Use Permit      Encroachment      Time Extensions      Other : \_\_\_\_\_

### PART 2: Project Exemptions

1. Is this a project that creates or replaces *less than* 10,000 square feet of impervious surface<sup>1</sup>, including all project phases and off-site improvements?

Yes No

<sup>1</sup> Impervious surface replacement, such as the reconstruction of parking lots or excavation to roadway subgrades, is not a routine maintenance activity. Reconstruction is defined as work that replaces surfaces down to the subgrade. Overlays, resurfacing, trenching and patching are defined as maintenance activities per section VI.D.2.b.



## 2017 Storm Water LID Determination Worksheet

2. Is this project a routine maintenance activity<sup>2</sup> that is being conducted to maintain original line and grade, hydraulic capacity, and original purpose of facility such as resurfacing existing roads and parking lots?

Yes                  No

3. Is this project a stand alone pedestrian pathway, trail or off-street bike lane?

Yes                  No

4. **Did you answer "YES" to any of the questions in Part 2?**

**YES:** This project will *not* need to incorporate permanent Storm Water BMP's as required by the NPDES MS4 Permit. **Please complete the "Exemption Signature Section" on Page 4.**

**NO:** Please complete the remainder of this worksheet.

### **Part 3: Project Triggers**

#### **Projects that Trigger Requirements:**

Please answer the following questions to determine whether this project requires permanent Storm Water BMP's and the submittal of a SW LIDs as required by the NPDES MS4 Permit order No. R1-2015-0030.

1. Does this project create or replace a combined total of 10,000 square feet or more of impervious surface<sup>1</sup> including all project phases and off-site improvements?

Yes                  No

2. Does this project create or replace a combined total or 10,000 square feet or more of impervious streets, roads, highways, or freeway construction or reconstruction<sup>3</sup>?                  Yes                  No

3. Does this project create or replace a combined total of 1.0 acre or more of impervious surface<sup>1</sup> including all project phases and off-site improvements?                  Yes                  No

4. **Did you answer "YES" to any of the above questions in Part 3?**

**YES:** This project will need to incorporate permanent Storm Water BMP's as required by the NPDES MS4 Permit. **Please complete remainder of worksheet and sign the "Acknowledgement Signature Section" on Page 4.**

**NO:** This project will *not* need to incorporate permanent Storm Water BMP's as required by the NPDES MS4 permit. **Please complete the "Exemption Signature Section" on Page 4.**

<sup>1</sup> Impervious surface replacement, such as the reconstruction of parking lots or excavation to roadway subgrades, is not a routine maintenance activity. Reconstruction is defined as work that replaces surfaces down to the subgrade. Overlays, resurfacing, trenching and patching are defined as maintenance activities per section VI.D.2.b.

<sup>2</sup> "Routine Maintenance Activity" includes activities such as overlays and/or resurfacing of existing roads or parking lots as well as trenching and patching activities and reroofing activities per section VI.D.2.b.

<sup>3</sup> "Reconstruction" is defined as work that extends into the subgrade of a pavement per section VI.D.2.b.

1. Total Project area: \_\_\_\_\_ square feet  
\_\_\_\_\_ acres

Commercial      Industrial      Residential      Public      Other

3. Existing impervious surface area: \_\_\_\_\_ square feet  
\_\_\_\_\_ acres

Commercial      Industrial      Residential      Public      Other

5. Proposed impervious surface area: \_\_\_\_\_ square feet  
\_\_\_\_\_ acres

## 2017 Storm Water LID Determination Worksheet

**Acknowledgment Signature Section:**

As the property owner or developer, I understand that this project is required to implement permanent Storm Water Best Management Practices and provide a Storm Water Low Impact Development Submittal (SW LIDS) as required by the City's National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer Systems (MS4) Permit Order No. R1-2015-0030. \*Any unknown responses must be resolved to determine if the project is subject to these requirements.

\_\_\_\_\_  
Applicant Signature

\_\_\_\_\_  
Date

**Exemption Signature Section:**

As the property owner or developer, I understand that this project as currently designed does not require permanent Storm Water BMP's nor the submittal of a Storm Water Low Impact Development Submittal (SW LIDS) as required by the City's National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer Systems (MS4) Permit\*. I understand that redesign may require submittal of a new Determination Worksheet and may require permanent Storm Water BMP's.

\_\_\_\_\_  
Applicant Signature

\_\_\_\_\_  
Date

\* This determination worksheet is intended to satisfy the specific requirements of "ORDER NO. R1-2015-0030, NPDES NO. CA0025054 NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT AND WASTE DISCHARGE REQUIREMENTS FOR DISCHARGES FROM THE MUNICIPAL SEPARATE STORM SEWER SYSTEMS." Additional design requirements imposed by Governing Agencies, such as local grading ordinances, CAL Green, CEQA, 401 permitting, and hydraulic design for flood control still apply as appropriate. Additionally, coverage under another regulation may trigger the requirement to design in accordance with the Storm Water LID Technical Design Manual.

**Implementation Requirements:** All calculations shall be completed using the "Storm Water Calculator" available at: [www.srcity.org/stormwaterLID](http://www.srcity.org/stormwaterLID)

**Hydromodification Control/100% Volume Capture:** Capture (infiltration and/or reuse) of 100% of the volume of runoff generated by a 1.0" 24-hour storm event, as calculated using the "Urban Hydrology for Small Watersheds" TR-55 Manual method. This is a retention requirement.

**Treatment Requirement:** Treatment of 100% of the flow calculated using the modified Rational Method and a known intensity of 0.20 inches per hour.

**Delta Volume Capture Requirement:** Capture (infiltration and/or reuse) of the increase in volume of storm water due to development generated by a 1.0" 24-hour storm event, as calculated using the "Urban Hydrology for Small Watersheds" TR-55 Manual method. This is a retention requirement.

## 8. STORM WATER CALCULATIONS

## C & CN Factor Calculations

### DMA

1

<u>Surface</u>	<u>C Value</u>	<u>Area</u>	<u>C*A</u>	<u>CN Value</u>	<u>Area</u>	<u>CN*A</u>
Roof	0.90	0	0.00	98	0	0
Concrete	0.80	1492	1193.60	98	1492	146216
Asphalt	0.70	5189	3632.30	98	5189	508522
Landscaping	0.10	334	33.40	84	334	28056
Impervious Area		6681			6681	
Pervious Area		334			334	
Total Area		7015	4859.30		7015	682794
<b>Composite C</b>			<b>0.69</b>	<b>Composite CN</b>		<b>97</b>

### DMA

2

<u>Surface</u>	<u>C Value</u>	<u>Area</u>	<u>C*A</u>	<u>CN Value</u>	<u>Area</u>	<u>CN*A</u>
Roof	0.90	0	0.00	98	0	0
Concrete	0.80	1904	1523.20	98	1904	186592
Asphalt	0.70	8572	6000.40	98	8572	840056
Landscaping	0.10	1562	156.20	84	1562	131208
Impervious Area		10476			10476	
Pervious Area		1562			1562	
Total Area		12038	7679.80		12038	1157856
<b>Composite C</b>			<b>0.64</b>	<b>Composite CN</b>		<b>96</b>

### DMA

3

<u>Surface</u>	<u>C Value</u>	<u>Area</u>	<u>C*A</u>	<u>CN Value</u>	<u>Area</u>	<u>CN*A</u>
Roof	0.90	9702	8731.80	98	9702	950796
Concrete	0.80	1509	1207.20	98	1509	147882
Asphalt	0.70	7326	5128.20	98	7326	717948
Landscaping	0.10	961	96.10	84	961	80724
Impervious Area		18537			18537	
Pervious Area		961			961	
Total Area		19498	15163.30		19498	1897350
<b>Composite C</b>			<b>0.78</b>	<b>Composite CN</b>		<b>97</b>

### DMA

4

<u>Surface</u>	<u>C Value</u>	<u>Area</u>	<u>C*A</u>	<u>CN Value</u>	<u>Area</u>	<u>CN*A</u>
----------------	----------------	-------------	------------	-----------------	-------------	-------------

Roof	0.90	3327	2994.30	98	3327	326046
Concrete	0.80	4462	3569.60	98	4462	437276
Asphalt	0.70	7225	5057.50	98	7225	708050
Landscaping	0.10	9116	911.60	84	9116	765744
Impervious Area		15014			15014	
Pervious Area		9116			9116	
Total Area		24130	12533.00	Total	24130	2237116
<b>Composite C</b>			<b>0.52</b>	<b>Composite CN</b>		<b>93</b>

#### DMA

5

<u>Surface</u>	<u>C Value</u>	<u>Area</u>	<u>C*A</u>	<u>CN Value</u>	<u>Area</u>	<u>CN*A</u>
Roof	0.90	1359	1223.10	98	1359	133182
Concrete	0.80	3654	2923.20	98	3654	358092
Asphalt	0.70	8452	5916.40	98	8452	828296
Landscaping	0.10	5306	530.60	84	5306	445704
Impervious Area		13465			13465	
Pervious Area		5306			5306	
Total Area		18771	10593.30	Total	18771	1765274
<b>Composite C</b>			<b>0.56</b>	<b>Composite CN</b>		<b>94</b>

#### DMA

6

<u>Surface</u>	<u>C Value</u>	<u>Area</u>	<u>C*A</u>	<u>CN Value</u>	<u>Area</u>	<u>CN*A</u>
Roof	0.90	11262	10135.80	98	11262	1103676
Concrete	0.80	1815	1452.00	98	1815	177870
Asphalt	0.70	7939	5557.30	98	7939	778022
Landscaping	0.10	3363	336.30	84	3363	282492
Impervious Area		21016			21016	
Pervious Area		3363			3363	
Total Area		24379	17481.40	Total	24379	2342060
<b>Composite C</b>			<b>0.72</b>	<b>Composite CN</b>		<b>96</b>

#### DMA

7

<u>Surface</u>	<u>C Value</u>	<u>Area</u>	<u>C*A</u>	<u>CN Value</u>	<u>Area</u>	<u>CN*A</u>
Roof	0.90	2184	1965.60	98	2184	214032
Concrete	0.80	357	285.60	98	357	34986
Asphalt	0.70	2841	1988.70	98	2841	278418
Landscaping	0.10	663	66.30	84	663	55692

Impervious Area	5382	Impervious Area	5382
Pervious Area	663	Pervious Area	663
Total Area	6045	Total	6045
<b>Composite C</b>	<b>0.71</b>	<b>Composite CN</b>	<b>96</b>

#### DMA

8

<u>Surface</u>	<u>C Value</u>	<u>Area</u>	<u>C*A</u>	<u>CN Value</u>	<u>Area</u>	<u>CN*A</u>
Roof	0.90	9864	8877.60	98	9864	966672
Concrete	0.80	1277	1021.60	98	1277	125146
Asphalt	0.70	4886	3420.20	98	4886	478828
Landscaping	0.10	2018	201.80	84	2018	169512
Impervious Area		16027			16027	
Pervious Area		2018			2018	
Total Area		18045	13521.20	Total	18045	1740158
<b>Composite C</b>			<b>0.75</b>	<b>Composite CN</b>		<b>96</b>

#### DMA

9

<u>Surface</u>	<u>C Value</u>	<u>Area</u>	<u>C*A</u>	<u>CN Value</u>	<u>Area</u>	<u>CN*A</u>
Roof	0.90	6982	6283.80	98	6982	684236
Concrete	0.80	427	341.60	98	427	41846
Asphalt	0.70	2519	1763.30	98	2519	246862
Landscaping	0.10	1022	102.20	84	1022	85848
Impervious Area		9928			9928	
Pervious Area		1022			1022	
Total Area		10950	8490.90	Total	10950	1058792
<b>Composite C</b>			<b>0.78</b>	<b>Composite CN</b>		<b>97</b>

#### DMA

10

<u>Surface</u>	<u>C Value</u>	<u>Area</u>	<u>C*A</u>	<u>CN Value</u>	<u>Area</u>	<u>CN*A</u>
Roof	0.90	6959	6263.10	98	6959	681982
Concrete	0.80	437	349.60	98	437	42826
Asphalt	0.70	2864	2004.80	98	2864	280672
Landscaping	0.10	954	95.40	84	954	80136
Impervious Area		10260			10260	
Pervious Area		954			954	
Total Area		11214	8712.90	Total	11214	1085616
<b>Composite C</b>			<b>0.78</b>	<b>Composite CN</b>		<b>97</b>

**DMA**

11

<u>Surface</u>	<u>C Value</u>	<u>Area</u>	<u>C*A</u>	<u>CN Value</u>	<u>Area</u>	<u>CN*A</u>
Roof	0.90	3276	2948.40	98	3276	321048
Concrete	0.80	491	392.80	98	491	48118
Asphalt	0.70	4344	3040.80	98	4344	425712
Landscaping	0.10	757	75.70	84	757	63588
Impervious Area		8111			8111	
Pervious Area		757			757	
Total Area		8868	6457.70	Total	8868	858466
<b>Composite C</b>			<b>0.73</b>	<b>Composite CN</b>		<b>97</b>

**DMA**

12

<u>Surface</u>	<u>C Value</u>	<u>Area</u>	<u>C*A</u>	<u>CN Value</u>	<u>Area</u>	<u>CN*A</u>
Roof	0.90	8460	7614.00	98	8460	829080
Concrete	0.80	1331	1064.80	98	1331	130438
Asphalt	0.70	6450	4515.00	98	6450	632100
Landscaping	0.10	3688	368.80	84	3688	309792
Impervious Area		16241			16241	
Pervious Area		3688			3688	
Total Area		19929	13562.60	Total	19929	1901410
<b>Composite C</b>			<b>0.68</b>	<b>Composite CN</b>		<b>95</b>

**DMA**

13

<u>Surface</u>	<u>C Value</u>	<u>Area</u>	<u>C*A</u>	<u>CN Value</u>	<u>Area</u>	<u>CN*A</u>
Roof	0.90	2687	2418.30	98	2687	263326
Concrete	0.80	262	209.60	98	262	25676
Asphalt	0.70	2594	1815.80	98	2594	254212
Landscaping	0.10	399	39.90	84	399	33516
Impervious Area		5543			5543	
Pervious Area		399			399	
Total Area		5942	4483.60	Total	5942	576730
<b>Composite C</b>			<b>0.75</b>	<b>Composite CN</b>		<b>97</b>

**DMA**

14

<u>Surface</u>	<u>C Value</u>	<u>Area</u>	<u>C*A</u>	<u>CN Value</u>	<u>Area</u>	<u>CN*A</u>
Roof	0.90	9178	8260.20	98	9178	899444



Concrete	0.80	805	644.00	98	805	78890
Asphalt	0.70	6436	4505.20	98	6436	630728
Landscaping	0.10	1197	119.70	84	1197	100548
Impervious Area		16419			16419	
Pervious Area		1197			1197	
Total Area		17616	13529.10	Total	17616	1709610
<b>Composite C</b>			<b>0.77</b>	<b>Composite CN</b>		<b>97</b>

#### DMA

15

<u>Surface</u>	<u>C Value</u>	<u>Area</u>	<u>C*A</u>	<u>CN Value</u>	<u>Area</u>	<u>CN*A</u>
Roof	0.90	0	0.00	98	0	0
Concrete	0.80	5172	4137.60	98	5172	506856
Asphalt	0.70	0	0.00	98	0	0
Landscaping	0.10	2099	209.90	84	2099	176316
Impervious Area		5172			5172	
Pervious Area		2099			2099	
Total Area		7271	4347.50	Total	7271	683172
<b>Composite C</b>			<b>0.60</b>	<b>Composite CN</b>		<b>94</b>

#### DMA

16

<u>Surface</u>	<u>C Value</u>	<u>Area</u>	<u>C*A</u>	<u>CN Value</u>	<u>Area</u>	<u>CN*A</u>
Roof	0.90	3575	3217.50	98	3575	350350
Concrete	0.80	1306	1044.80	98	1306	127988
Asphalt	0.70	6032	4222.40	98	6032	591136
Landscaping	0.10	4654	465.40	84	4654	390936
Impervious Area		10913			10913	
Pervious Area		4654			4654	
Total Area		15567	8950.10	Total	15567	1460410
<b>Composite C</b>			<b>0.57</b>	<b>Composite CN</b>		<b>94</b>

#### DMA

17

<u>Surface</u>	<u>C Value</u>	<u>Area</u>	<u>C*A</u>	<u>CN Value</u>	<u>Area</u>	<u>CN*A</u>
Roof	0.90	4528	4075.20	98	4528	443744
Concrete	0.80	154	123.20	98	154	15092
Asphalt	0.70	6685	4679.50	98	6685	655130
Landscaping	0.10	4047	404.70	84	4047	339948
Impervious Area		11367			11367	

	Pervious Area	4047	Pervious Area	4047			
	Total Area	15414	Total	15414			
	Composite C	0.60	Composite CN	94			
DMA	18						
	Surface	C Value	Area	C*A	CN Value	Area	CN*A
	Roof	0.90	6804	6123.60	98	6804	666792
	Concrete	0.80	930	744.00	98	930	91140
	Asphalt	0.70	3461	2422.70	98	3461	339178
	Landscaping	0.10	3253	325.30	84	3253	273252
	Impervious Area		11195		Impervious Area		11195
	Pervious Area		3253		Pervious Area		3253
	Total Area		14448	9615.60	Total		14448
	Composite C		0.67	Composite CN			95
DMA	19						
	Surface	C Value	Area	C*A	CN Value	Area	CN*A
	Roof	0.90	0	0.00	98	0	0
	Concrete	0.80	356	284.80	98	356	34888
	Asphalt	0.70	7129	4990.30	98	7129	698642
	Landscaping	0.10	466	46.60	84	466	39144
	Impervious Area		7485		Impervious Area		7485
	Pervious Area		466		Pervious Area		466
	Total Area		7951	5321.70	Total		7951
	Composite C		0.67	Composite CN			97



## STORM WATER CALCULATOR

### LID BMP Summary Page & Site Global Values

Project Information:				Site Information:				Based upon the pre and post development impervious area, the post construction BMP requirement is:			
Project Name: <b>Emerald Isle</b>				Mean Seasonal Precipitation (MSP) of Project Site: <b>35.00</b> (inches)				<b>100% Capture &amp; Treatment</b>			
Address/Location: <b>Gullane Drive</b>				K=MSP/3( K= <b>1.17</b>							
Designer: <b>Andrew Ferrol</b>				Impervious area - pre development: <b>17,273.0</b> ft <sup>2</sup>							
Date: <b>1/28/2019</b>				Impervious area - post development: <b>219,232.0</b> ft <sup>2</sup>							
Summary of Saved BMP Results:											
BMP ID:	Tributary Area		Requirements		BMP Design Results						
	Tributary Area (ft <sup>2</sup> )	Runoff Reduction Measures (Y/N)	Type of Requirement Met	Type of BMP Design	Percent Achieved	Required V <sub>Hydromod</sub> (ft <sup>3</sup> )	Achieved (ft <sup>3</sup> )	Required Q Treatment (cfs)	Achieved (ft <sup>3</sup> )	Required Vdelta (ft <sup>3</sup> )	Achieved (ft <sup>3</sup> )
1	1	7,015	Yes	Hydromod Volume Capture	Priority 2: P2-03 Roadside Bioretention - Contiguous Sidewalk	108.7	397.3799	432.0000			
2	2	12,038	Yes	Hydromod Volume Capture	Priority 3: P3-06 Swale with Bioretention	101.7	660.5341	672.0000			
3	3	19,498	Yes	Hydromod Volume Capture	Priority 1: P1-07 Infiltration Trench	102.8	945.2791	972.0000			
4	4	24,130	Yes	Hydromod Volume Capture	Priority 1: P1-07 Infiltration Trench	101.2	586.7209	594.0000			
5	5	18,771	Yes	Hydromod Volume Capture	Priority 1: P1-07 Infiltration Trench	100.8	503.5589	507.6000			
6	6	24,379	Yes	Hydromod Volume Capture	Priority 4: Modular Bioretention	100.1	#####	#####			
7	7	6,045	Yes	Hydromod Volume Capture	Priority 2: P2-06 Permeable Pavement	103.3	309.8005	320.0000			
8	8	18,045	Yes	Hydromod Volume Capture	Priority 1: P1-07 Infiltration Trench	102.0	588.1191	600.0000			
9	9	10,950	Yes	Hydromod Volume Capture	Priority 4: Modular Bioretention	105.6	393.9262	415.8000			
10	10	11,214	Yes	Hydromod Volume Capture	Priority 4: Modular Bioretention	103.1	403.4236	415.8000			
11	11	8,868	Yes	Hydromod Volume Capture	Priority 2: P2-06 Permeable Pavement	101.3	498.6135	505.1200			
12	12	19,929	Yes	Hydromod Volume Capture	Priority 4: Modular Bioretention	105.2	740.8538	779.6250			
13	13	5,942	Yes	Hydromod Volume Capture	Priority 2: P2-06 Permeable Pavement	107.6	317.8751	342.0000			
14	14	17,616	Yes	Hydromod Volume Capture	Priority 3: P3-06 Swale with Bioretention	103.5	678.1287	702.0000			
15	15	7,271	No	Hydromod Volume Capture	Priority 1: P1-07 Infiltration Trench	102.5	390.0891	400.0000			
16	16	15,567	Yes	Hydromod Volume Capture	Priority 2: P2-03 Roadside Bioretention - Contiguous Sidewalk	103.3	679.4236	702.0000			
17	17	15,414	Yes	Hydromod Volume Capture	Priority 2: P2-06 Permeable Pavement	102.5	674.5951	691.2000			
18	18	14,448	Yes	Hydromod Volume Capture	Priority 1: P1-07 Infiltration Trench	101.9	452.1426	460.8000			
19	19	7,951	Yes	Hydromod Volume Capture	Priority 4: Modular Bioretention	100.8	546.4603	550.9350			
20											
21											
22											
23											
24											
25											
26											
27											
28											
29											
30											



## STORM WATER CALCULATOR

<b>BMP Tributary Parameters</b>	Project Name: <b>Emerald Isle</b>
BMP ID: <b>19</b>	
BMP Design Criteria: <b>100% Capture &amp; Treatment</b>	
Type of BMP Design: <b>Priority 4: Modular Bioretention</b>	
BMP's Physical Tributary Area: <b>7,951.0</b> ft <sup>2</sup>	
Description/Notes:	

<b>Runoff Reduction Measures</b>	Resulting reduced Tributary Area used for BMP sizing = <b>7,595.0</b> ft <sup>2</sup>
	Total Runoff Reduction Measures = <b>356.0</b> ft <sup>2</sup>

<b>Interceptor Trees</b>	
Number of <b>new</b> interceptor <b>Evergreen Trees</b> : <b>0</b>	Total Number of <b>New</b> trees in BMP Tributary Area: <b>0</b>
Number of <b>new</b> interceptor <b>Deciduous Trees</b> : <b>0</b>	
Square footage of qualifying <b>existing tree canopy</b> : <b>0.0</b> ft <sup>2</sup>	

<b>Disconnected Roof Drains</b>	
Select disconnection condition: <b>Select disconnection condition</b>	
<b>Disconnected Roof Drains Method 1</b>	<b>Disconnected Roof Drains Method 2</b>
Roof area of disconnected downspouts: <b>0</b> ft <sup>2</sup>	Percent of rooftop area: <b>0</b> %
	Select Density: <b>1</b> Units per Acre

<b>Paved Area Disconnection</b>	
Paved Area Type: <b>Not Directly-connected Paved Area</b>	
Alternatively designed paved area: <b>356.0</b> ft <sup>2</sup>	

<b>Buffer Strips &amp; Bovine Terraces</b>	
Area draining to a Buffer Strip or Bovine Terrace: <b>0.0</b> ft <sup>2</sup>	

<b>Hydromodification Requirement: 100% Volume Capture; V<sub>HYDROMOD</sub></b>	V <sub>HYDROMOD</sub> = <b>546.46</b> ft <sup>3</sup>
Post development hydrologic soil type within tributary area: <b>D: 0 - 0.05 in/hr infiltration (transmission) rate</b>	
Post development ground cover description: <b>Impervious - Paved Parking, Rooftop, Driveways</b>	
CN <sub>POST</sub> : <b>97.0</b>	
User Composite post development CN: <b>97.0</b>	

<b>BMP Sizing Tool: Hydromodification Requirement</b>	Percent of Goal Achieved = <b>100.82</b> %
<b>BMP Volume Below Ground</b>	<b>Ponded Water Above Ground</b>
Porosity: <b>0.99</b>	Depth: <b>0.00</b> ft
Depth below perforated pipe if present: <b>5.30</b> ft	Width: <b>0.00</b> ft
Width: <b>7.00</b> ft	Length: <b>0.00</b> ft
Length: <b>15.00</b> ft	Area: <b>0.00</b> ft <sup>2</sup>
Area: <b>0.00</b> ft <sup>2</sup>	

# STORM WATER CALCULATOR

## BMP Tributary Parameters

Project Name: **Emerald Isle**

BMP ID: **18**

BMP Design Criteria: **100% Capture & Treatment**

Type of BMP Design: **Priority 1: P1-07 Infiltration Trench**

BMP's Physical Tributary Area: **14,448.0** ft<sup>2</sup>

Description/Notes:

## Runoff Reduction Measures

Resulting reduced Tributary Area used for BMP sizing = **7,644.0** ft<sup>2</sup>

Total Runoff Reduction Measures = **6,804.0** ft<sup>2</sup>

## Interceptor Trees

Number of **new** interceptor **Evergreen Trees**: **0**

Number of **new** interceptor **Deciduous Trees**: **0**

Square footage of qualifying **existing tree canopy**: **0.0** ft<sup>2</sup>

Total Number of **New** trees in BMP Tributary Area: **0**

## Disconnected Roof Drains

Select disconnection condition: **Runoff is directed across landscape; Width of area: 25' and larger**

## Disconnected Roof Drains Method 1

Roof area of disconnected downspouts: **6,804** ft<sup>2</sup>

## Disconnected Roof Drains Method 2

Percent of rooftop area: **0** %

Select Density: **1** Units per Acre

## Paved Area Disconnection

Paved Area Type: **Select paved area type**

Alternatively designed paved area: **0.0** ft<sup>2</sup>

## Buffer Strips & Bovine Terraces

Area draining to a Buffer Strip or Bovine Terrace: **0.0** ft<sup>2</sup>

## Hydromodification Requirement: 100% Volume Capture; V<sub>HYDROMOD</sub>

V<sub>HYDROMOD</sub> = **452.14** ft<sup>3</sup>

Post development hydrologic soil type within tributary area: **D: 0 - 0.05 in/hr infiltration (transmission) rate**

Post development ground cover description: **Impervious - Paved Parking, Rooftop, Driveways**

CN<sub>POST</sub>:

User Composite post development CN: **95.0**

## BMP Sizing Tool: Hydromodification Requirement

Percent of Goal Achieved = **101.91** %

### BMP Volume Below Ground

Porosity: **0.40**

Depth below perforated pipe if present: **4.00** ft

Width: **6.00** ft

Length: **48.00** ft

Area: **0.00** ft<sup>2</sup>

### Ponded Water Above Ground

Depth: **0.00** ft

Width: **0.00** ft

Length: **0.00** ft

Area: **0.00** ft<sup>2</sup>



## STORM WATER CALCULATOR

### BMP Tributary Parameters

Project Name: **Emerald Isle**BMP ID: **17**BMP Design Criteria: **100% Capture & Treatment**Type of BMP Design: **Priority 2: P2-06 Permeable Pavement**BMP's Physical Tributary Area: **15,414.0** ft<sup>2</sup>

Description/Notes:

### Runoff Reduction Measures

Resulting reduced Tributary Area used for BMP sizing = **12,574.0** ft<sup>2</sup>Total Runoff Reduction Measures = **2,840.0** ft<sup>2</sup>

#### Interceptor Trees

Number of **new** interceptor **Evergreen Trees**: **0**Number of **new** interceptor **Deciduous Trees**: **0**Square footage of qualifying **existing tree canopy**: **0.0** ft<sup>2</sup>Total Number of **New** trees in BMP Tributary Area: **0**

#### Disconnected Roof Drains

Select disconnection condition: **Runoff is directed across landscape; Width of area: 25' and larger**

##### Disconnected Roof Drains Method 1

Roof area of disconnected downspouts: **2,264** ft<sup>2</sup>

##### Disconnected Roof Drains Method 2

Percent of rooftop area: **0** %Select Density: **1** Units per Acre

#### Paved Area Disconnection

Paved Area Type: **Porous Pavement**Alternatively designed paved area: **576.0** ft<sup>2</sup>

#### Buffer Strips & Bovine Terraces

Area draining to a Buffer Strip or Bovine Terrace: **0.0** ft<sup>2</sup>

### Hydromodification Requirement: 100% Volume Capture; $V_{HYDROMOD}$

 $V_{HYDROMOD}$  = **674.60** ft<sup>3</sup>Post development hydrologic soil type within tributary area: **D: 0 - 0.05 in/hr infiltration (transmission) rate**Post development ground cover description: **Impervious - Paved Parking, Rooftop, Driveways**CN<sub>POST</sub>:User Composite post development CN: **94.0**

### BMP Sizing Tool: Hydromodification Requirement

Percent of Goal Achieved = **102.46** %

#### BMP Volume Below Ground

Porosity: **0.40**

Depth below perforated pipe if present: **3.00** ft

Width: **4.00** ft

Length: **144.00** ft

Area: **0.00** ft<sup>2</sup>

#### Ponded Water Above Ground

Depth: **0.00** ft

Width: **0.00** ft

Length: **0.00** ft

Area: **0.00** ft<sup>2</sup>



## STORM WATER CALCULATOR

<b>BMP Tributary Parameters</b>		Project Name: <b>Emerald Isle</b>
BMP ID:	<b>16</b>	
BMP Design Criteria:	<b>100% Capture &amp; Treatment</b>	
Type of BMP Design:	<b>Priority 2: P2-03 Roadside Bioretention - Contiguous Sidewalk</b>	
BMP's Physical Tributary Area:	<b>15,567.0</b>	ft <sup>2</sup>
Description/Notes:		

<b>Runoff Reduction Measures</b>	Resulting reduced Tributary Area used for BMP sizing =	<b>12,664.0</b>	ft <sup>2</sup>
	Total Runoff Reduction Measures =	<b>2,903.0</b>	ft <sup>2</sup>

<b>Interceptor Trees</b>	
Number of <i>new</i> interceptor <b>Evergreen Trees</b> :	<b>0</b>
Number of <i>new</i> interceptor <b>Deciduous Trees</b> :	<b>0</b>
Square footage of qualifying <b>existing tree canopy</b> :	<b>0.0</b> ft <sup>2</sup>
Total Number of <i>New</i> trees in BMP Tributary Area: <b>0</b>	

<b>Disconnected Roof Drains</b>	
Select disconnection condition:	<b>Runoff is directed across landscape; Width of area: 25' and larger</b>
<b>Disconnected Roof Drains Method 1</b>	<b>Disconnected Roof Drains Method 2</b>
Roof area of disconnected downspouts:	Percent of rooftop area:
<b>2,903</b> ft <sup>2</sup>	<b>0</b> %
	Select Density: <b>1</b> Units per Acre

<b>Paved Area Disconnection</b>	
Paved Area Type:	<b>Select paved area type</b>
Alternatively designed paved area:	<b>0.0</b> ft <sup>2</sup>

<b>Buffer Strips &amp; Bovine Terraces</b>	
Area draining to a Buffer Strip or Bovine Terrace:	<b>0.0</b> ft <sup>2</sup>

<b>Hydromodification Requirement: 100% Volume Capture; V<sub>HYDROMOD</sub></b>		V <sub>HYDROMOD</sub> =	<b>679.42</b>	ft <sup>3</sup>
Post development hydrologic soil type within tributary area:	<b>D: 0 - 0.05 in/hr infiltration (transmission) rate</b>			
Post development ground cover description:	<b>Impervious - Paved Parking, Rooftop, Driveways</b>			
CN <sub>POST</sub> :				
User Composite post development CN:	<b>94.0</b>			

<b>BMP Sizing Tool: Hydromodification Requirement</b>		Percent of Goal Achieved =	<b>103.32</b>	%
<b>BMP Volume Below Ground</b>		<b>Ponded Water Above Ground</b>		
Porosity:	<b>0.40</b>	Depth:	<b>0.00</b>	ft
Depth below perforated pipe if present:	<b>4.50</b> ft	Width:	<b>0.00</b>	ft
Width:	<b>6.00</b> ft	Length:	<b>0.00</b>	ft
Length:	<b>65.00</b> ft	Area:	<b>0.00</b>	ft <sup>2</sup>
Area:	<b>0.00</b> ft <sup>2</sup>			



# STORM WATER CALCULATOR

<b>BMP Tributary Parameters</b>		Project Name: <b>Emerald Isle</b>
BMP ID:	<b>15</b>	
BMP Design Criteria:	<b>100% Capture &amp; Treatment</b>	
Type of BMP Design:	<b>Priority 1: P1-07 Infiltration Trench</b>	
BMP's Physical Tributary Area:	<b>7,271.0 ft<sup>2</sup></b>	
Description/Notes:		

<b>Hydromodification Requirement: 100% Volume Capture; <math>V_{HYDROMOD}</math></b>		$V_{HYDROMOD} =$ <b>390.09</b> ft <sup>3</sup>
Post development hydrologic soil type within tributary area:	<b>D: 0 - 0.05 in/hr infiltration (transmission) rate</b>	
Post development ground cover description:	<b>Impervious - Paved Parking, Rooftop, Driveways</b>	
CN <sub>POST</sub> :		
User Composite post development CN:	<b>94.0</b>	

<b>BMP Sizing Tool: Hydromodification Requirement</b>		Percent of Goal Achieved = <b>102.54</b> %
	<b>BMP Volume Below Ground</b>	<b>Ponded Water Above Ground</b>
Porosity:	<b>0.40</b>	
Depth below perforated pipe if present:	<b>4.00</b> ft	Depth: <b>0.00</b> ft
Width:	<b>5.00</b> ft	Width: <b>0.00</b> ft
Length:	<b>50.00</b> ft	Length: <b>0.00</b> ft
Area:	<b>0.00</b> ft <sup>2</sup>	Area: <b>0.00</b> ft <sup>2</sup>





## STORM WATER CALCULATOR

<b>BMP Tributary Parameters</b>		Project Name: <b>Emerald Isle</b>
BMP ID:	<b>14</b>	
BMP Design Criteria:	<b>100% Capture &amp; Treatment</b>	
Type of BMP Design:	<b>Priority 3: P3-06 Swale with Bioretention</b>	
BMP's Physical Tributary Area:	<b>17,616.0</b>	<b>ft<sup>2</sup></b>
Description/Notes:		

<b>Runoff Reduction Measures</b>	Resulting reduced Tributary Area used for BMP sizing =	<b>9,425.0</b>	<b>ft<sup>2</sup></b>
	Total Runoff Reduction Measures =	<b>8,191.0</b>	<b>ft<sup>2</sup></b>

<b>Interceptor Trees</b>	
Number of <b>new</b> interceptor <b>Evergreen Trees</b> :	<b>0</b>
Number of <b>new</b> interceptor <b>Deciduous Trees</b> :	<b>0</b>
Square footage of qualifying <b>existing tree canopy</b> :	<b>0.0</b> <b>ft<sup>2</sup></b>
Total Number of <b>New</b> trees in BMP Tributary Area:	<b>0</b>

<b>Disconnected Roof Drains</b>	
Select disconnection condition:	<b>Runoff is directed across landscape; Width of area: 25' and larger</b>
<b>Disconnected Roof Drains Method 1</b>	<b>Disconnected Roof Drains Method 2</b>
Roof area of disconnected downspouts:	Percent of rooftop area:
<b>8,191</b> <b>ft<sup>2</sup></b>	<b>0</b> %
	Select Density:
	<b>1</b> Units per Acre

<b>Paved Area Disconnection</b>	
Paved Area Type:	<b>Select paved area type</b>
Alternatively designed paved area:	<b>0.0</b> <b>ft<sup>2</sup></b>

<b>Buffer Strips &amp; Bovine Terraces</b>	
Area draining to a Buffer Strip or Bovine Terrace:	<b>0.0</b> <b>ft<sup>2</sup></b>

<b>Hydromodification Requirement: 100% Volume Capture; <math>V_{HYDROMOD}</math></b>		$V_{HYDROMOD}$ =	<b>678.13</b>	<b>ft<sup>3</sup></b>
Post development hydrologic soil type within tributary area:	<b>D: 0 - 0.05 in/hr infiltration (transmission) rate</b>			
Post development ground cover description:	<b>Impervious - Paved Parking, Rooftop, Driveways</b>			
CN <sub>POST</sub> :				
User Composite post development CN:	<b>97.0</b>			

<b>BMP Sizing Tool: Hydromodification Requirement</b>		Percent of Goal Achieved =	<b>103.52</b>	<b>%</b>
<b>BMP Volume Below Ground</b>		<b>Ponded Water Above Ground</b>		
Porosity:	<b>0.40</b>	Depth:	<b>0.00</b>	<b>ft</b>
Depth below perforated pipe if present:	<b>4.50</b> <b>ft</b>	Width:	<b>0.00</b>	<b>ft</b>
Width:	<b>6.00</b> <b>ft</b>	Length:	<b>0.00</b>	<b>ft</b>
Length:	<b>65.00</b> <b>ft</b>	Area:	<b>0.00</b>	<b>ft<sup>2</sup></b>
Area:	<b>0.00</b> <b>ft<sup>2</sup></b>			



## STORM WATER CALCULATOR

### BMP Tributary Parameters

Project Name: **Emerald Isle**

BMP ID: **13**

BMP Design Criteria: **100% Capture & Treatment**

Type of BMP Design: **Priority 2: P2-06 Permeable Pavement**

BMP's Physical Tributary Area: **5,942.0** ft<sup>2</sup>

Description/Notes:

### Runoff Reduction Measures

Resulting reduced Tributary Area used for BMP sizing = **4,418.0** ft<sup>2</sup>

Total Runoff Reduction Measures = **1,524.0** ft<sup>2</sup>

### Interceptor Trees

Number of **new** interceptor **Evergreen Trees**: **0**

Number of **new** interceptor **Deciduous Trees**: **0**

Square footage of qualifying **existing tree canopy**: **0.0** ft<sup>2</sup>

Total Number of **New** trees in BMP Tributary Area: **0**

### Disconnected Roof Drains

Select disconnection condition: **Runoff is directed across landscape; Width of area: 25' and larger**

### Disconnected Roof Drains Method 1

Roof area of disconnected downspouts: **1,344** ft<sup>2</sup>

### Disconnected Roof Drains Method 2

Percent of rooftop area: **0** %

Select Density: **1** Units per Acre

### Paved Area Disconnection

Paved Area Type: **Porous Pavement**

Alternatively designed paved area: **180.0** ft<sup>2</sup>

### Buffer Strips & Bovine Terraces

Area draining to a Buffer Strip or Bovine Terrace: **0.0** ft<sup>2</sup>

### Hydromodification Requirement: 100% Volume Capture; $V_{HYDROMOD}$

$V_{HYDROMOD}$  = **317.88** ft<sup>3</sup>

Post development hydrologic soil type within tributary area: **D: 0 - 0.05 in/hr infiltration (transmission) rate**

Post development ground cover description: **Impervious - Paved Parking, Rooftop, Driveways**

CN<sub>POST</sub>:

User Composite post development CN: **97.0**

### BMP Sizing Tool: Hydromodification Requirement

Percent of Goal Achieved = **107.59** %

#### BMP Volume Below Ground

Porosity: **0.40**

Depth below perforated pipe if present: **4.75** ft

Width: **4.00** ft

Length: **45.00** ft

Area: **0.00** ft<sup>2</sup>

#### Ponded Water Above Ground

Depth: **0.00** ft

Width: **0.00** ft

Length: **0.00** ft

Area: **0.00** ft<sup>2</sup>



## STORM WATER CALCULATOR

<b>BMP Tributary Parameters</b>		Project Name: <b>Emerald Isle</b>
BMP ID:	<b>12</b>	
BMP Design Criteria:	<b>100% Capture &amp; Treatment</b>	
Type of BMP Design:	<b>Priority 4: Modular Bioretention</b>	
BMP's Physical Tributary Area:	<b>19,929.0</b>	ft <sup>2</sup>
Description/Notes:		

<b>Runoff Reduction Measures</b>	Resulting reduced Tributary Area used for BMP sizing =	<b>12,525.0</b>	ft <sup>2</sup>
	Total Runoff Reduction Measures =	<b>7,404.0</b>	ft <sup>2</sup>

<b>Interceptor Trees</b>	
Number of <b>new</b> interceptor <b>Evergreen Trees</b> :	<b>0</b>
Number of <b>new</b> interceptor <b>Deciduous Trees</b> :	<b>0</b>
Square footage of qualifying <b>existing tree canopy</b> :	<b>0.0</b> ft <sup>2</sup>
Total Number of <b>New</b> trees in BMP Tributary Area: <b>0</b>	

<b>Disconnected Roof Drains</b>	
Select disconnection condition:	<b>Runoff is directed across landscape; Width of area: 25' and larger</b>
<b>Disconnected Roof Drains Method 1</b>	<b>Disconnected Roof Drains Method 2</b>
Roof area of disconnected downspouts:	Percent of rooftop area:
<b>7,404</b> ft <sup>2</sup>	<b>0</b> %
	Select Density: <b>1</b> Units per Acre

<b>Paved Area Disconnection</b>	
Paved Area Type:	<b>Select paved area type</b>
Alternatively designed paved area:	<b>0.0</b> ft <sup>2</sup>

<b>Buffer Strips &amp; Bovine Terraces</b>	
Area draining to a Buffer Strip or Bovine Terrace:	<b>0.0</b> ft <sup>2</sup>

<b>Hydromodification Requirement: 100% Volume Capture; V<sub>HYDROMOD</sub></b>		V <sub>HYDROMOD</sub> =	<b>740.85</b>	ft <sup>3</sup>
Post development hydrologic soil type within tributary area:	<b>D: 0 - 0.05 in/hr infiltration (transmission) rate</b>			
Post development ground cover description:	<b>Impervious - Paved Parking, Rooftop, Driveways</b>			
CN <sub>POST</sub> :				
User Composite post development CN:	<b>95.0</b>			

<b>BMP Sizing Tool: Hydromodification Requirement</b>		Percent of Goal Achieved =	<b>105.23</b>	%
<b>BMP Volume Below Ground</b>		<b>Ponded Water Above Ground</b>		
Porosity:	<b>0.99</b>	Depth:	<b>0.00</b>	ft
Depth below perforated pipe if present:	<b>3.75</b> ft	Width:	<b>0.00</b>	ft
Width:	<b>14.00</b> ft	Length:	<b>0.00</b>	ft
Length:	<b>15.00</b> ft	Area:	<b>0.00</b>	ft <sup>2</sup>
Area:	<b>0.00</b> ft <sup>2</sup>			



## STORM WATER CALCULATOR

### BMP Tributary Parameters

Project Name: **Emerald Isle**BMP ID: **11**BMP Design Criteria: **100% Capture & Treatment**Type of BMP Design: **Priority 2: P2-06 Permeable Pavement**BMP's Physical Tributary Area: **8,868.0** ft<sup>2</sup>

Description/Notes:

### Runoff Reduction Measures

Resulting reduced Tributary Area used for BMP sizing = **6,930.0** ft<sup>2</sup>Total Runoff Reduction Measures = **1,938.0** ft<sup>2</sup>

#### Interceptor Trees

Number of **new** interceptor **Evergreen Trees**: **0**Number of **new** interceptor **Deciduous Trees**: **0**Square footage of qualifying **existing tree canopy**: **0.0** ft<sup>2</sup>Total Number of **New** trees in BMP Tributary Area: **0**

#### Disconnected Roof Drains

Select disconnection condition: **Runoff is directed across landscape; Width of area: 25' and larger**

##### Disconnected Roof Drains Method 1

Roof area of disconnected downspouts: **1,638** ft<sup>2</sup>

##### Disconnected Roof Drains Method 2

Percent of rooftop area: **0** %Select Density: **1** Units per Acre

#### Paved Area Disconnection

Paved Area Type: **Porous Pavement**Alternatively designed paved area: **300.0** ft<sup>2</sup>

#### Buffer Strips & Bovine Terraces

Area draining to a Buffer Strip or Bovine Terrace: **0.0** ft<sup>2</sup>

### Hydromodification Requirement: 100% Volume Capture; V<sub>HYDROMOD</sub>

V<sub>HYDROMOD</sub> = **498.61** ft<sup>3</sup>Post development hydrologic soil type within tributary area: **D: 0 - 0.05 in/hr infiltration (transmission) rate**Post development ground cover description: **Impervious - Paved Parking, Rooftop, Driveways**CN<sub>POST</sub>:User Composite post development CN: **97.0**

### BMP Sizing Tool: Hydromodification Requirement

Percent of Goal Achieved = **101.30** %

#### BMP Volume Below Ground

Porosity: **0.40**

Depth below perforated pipe if present: **4.10** ft

Width: **4.00** ft

Length: **77.00** ft

Area: **0.00** ft<sup>2</sup>

#### Ponded Water Above Ground

Depth: **0.00** ft

Width: **0.00** ft

Length: **0.00** ft

Area: **0.00** ft<sup>2</sup>



# STORM WATER CALCULATOR

## BMP Tributary Parameters

Project Name: **Emerald Isle**

BMP ID: **10**

BMP Design Criteria: **100% Capture & Treatment**

Type of BMP Design: **Priority 4: Modular Bioretention**

BMP's Physical Tributary Area: **11,214.0** ft<sup>2</sup>

Description/Notes:

## Runoff Reduction Measures

Resulting reduced Tributary Area used for BMP sizing = **5,607.0** ft<sup>2</sup>

Total Runoff Reduction Measures = **5,607.0** ft<sup>2</sup>

## Interceptor Trees

Number of **new** interceptor **Evergreen Trees**: **0**

Number of **new** interceptor **Deciduous Trees**: **0**

Square footage of qualifying **existing tree canopy**: **0.0** ft<sup>2</sup>

Total Number of **New** trees in BMP Tributary Area: **0**

## Disconnected Roof Drains

Select disconnection condition: **Runoff is directed across landscape; Width of area: 25' and larger**

## Disconnected Roof Drains Method 1

Roof area of disconnected downspouts: **6,959** ft<sup>2</sup>

## Disconnected Roof Drains Method 2

Percent of rooftop area: **0** %

Select Density: **1** Units per Acre

## Paved Area Disconnection

Paved Area Type: **Select paved area type**

Alternatively designed paved area: **0.0** ft<sup>2</sup>

## Buffer Strips & Bovine Terraces

Area draining to a Buffer Strip or Bovine Terrace: **0.0** ft<sup>2</sup>

## Hydromodification Requirement: 100% Volume Capture; $V_{HYDROMOD}$

$V_{HYDROMOD}$  = **403.42** ft<sup>3</sup>

Post development hydrologic soil type within tributary area: **D: 0 - 0.05 in/hr infiltration (transmission) rate**

Post development ground cover description: **Impervious - Paved Parking, Rooftop, Driveways**

CN<sub>POST</sub>:

User Composite post development CN: **97.0**

## BMP Sizing Tool: Hydromodification Requirement

Percent of Goal Achieved = **103.07** %

### BMP Volume Below Ground

Porosity: **0.99**

Depth below perforated pipe if present: **4.00** ft

Width: **7.00** ft

Length: **15.00** ft

Area: **0.00** ft<sup>2</sup>

### Ponded Water Above Ground

Depth: **0.00** ft

Width: **0.00** ft

Length: **0.00** ft

Area: **0.00** ft<sup>2</sup>



## STORM WATER CALCULATOR

### BMP Tributary Parameters

Project Name: **Emerald Isle**BMP ID: **9**BMP Design Criteria: **100% Capture & Treatment**Type of BMP Design: **Priority 4: Modular Bioretention**BMP's Physical Tributary Area: **10,950.0** ft<sup>2</sup>

Description/Notes:

### Runoff Reduction Measures

Resulting reduced Tributary Area used for BMP sizing = **5,475.0** ft<sup>2</sup>Total Runoff Reduction Measures = **5,475.0** ft<sup>2</sup>

### Interceptor Trees

Number of **new** interceptor **Evergreen Trees**: **0**Number of **new** interceptor **Deciduous Trees**: **0**Square footage of qualifying **existing tree canopy**: **0.0** ft<sup>2</sup>Total Number of **New** trees in BMP Tributary Area: **0**

### Disconnected Roof Drains

Select disconnection condition: **Runoff is directed across landscape; Width of area: 25' and larger**

### Disconnected Roof Drains Method 1

Roof area of disconnected downspouts: **6,982** ft<sup>2</sup>

### Disconnected Roof Drains Method 2

Percent of rooftop area: **0** %Select Density: **1** Units per Acre

### Paved Area Disconnection

Paved Area Type: **Select paved area type**Alternatively designed paved area: **0.0** ft<sup>2</sup>

### Buffer Strips & Bovine Terraces

Area draining to a Buffer Strip or Bovine Terrace: **0.0** ft<sup>2</sup>

### Hydromodification Requirement: 100% Volume Capture; $V_{HYDROMOD}$

 $V_{HYDROMOD}$  = **393.93** ft<sup>3</sup>Post development hydrologic soil type within tributary area: **D: 0 - 0.05 in/hr infiltration (transmission) rate**Post development ground cover description: **Impervious - Paved Parking, Rooftop, Driveways**CN<sub>POST</sub>:User Composite post development CN: **97.0**

### BMP Sizing Tool: Hydromodification Requirement

Percent of Goal Achieved = **105.55** %

#### BMP Volume Below Ground

Porosity: **0.99**

Depth below perforated pipe if present: **4.00** ft

Width: **7.00** ft

Length: **15.00** ft

Area: **0.00** ft<sup>2</sup>

#### Ponded Water Above Ground

Depth: **0.00** ft

Width: **0.00** ft

Length: **0.00** ft

Area: **0.00** ft<sup>2</sup>



# STORM WATER CALCULATOR

## BMP Tributary Parameters

Project Name: **Emerald Isle**

BMP ID: **8**

BMP Design Criteria: **100% Capture & Treatment**

Type of BMP Design: **Priority 1: P1-07 Infiltration Trench**

BMP's Physical Tributary Area: **18,045.0** ft<sup>2</sup>

Description/Notes:

## Runoff Reduction Measures

Resulting reduced Tributary Area used for BMP sizing = **9,022.5** ft<sup>2</sup>

Total Runoff Reduction Measures = **9,022.5** ft<sup>2</sup>

### Interceptor Trees

Number of **new** interceptor **Evergreen Trees**: **0**

Number of **new** interceptor **Deciduous Trees**: **0**

Square footage of qualifying **existing tree canopy**: **0.0** ft<sup>2</sup>

Total Number of **New** trees in BMP Tributary Area: **0**

### Disconnected Roof Drains

Select disconnection condition: **Runoff is directed across landscape; Width of area: 25' and larger**

#### Disconnected Roof Drains Method 1

Roof area of disconnected downspouts: **9,864** ft<sup>2</sup>

#### Disconnected Roof Drains Method 2

Percent of rooftop area: **0** %

Select Density: **1** Units per Acre

### Paved Area Disconnection

Paved Area Type: **Select paved area type**

Alternatively designed paved area: **0.0** ft<sup>2</sup>

### Buffer Strips & Bovine Terraces

Area draining to a Buffer Strip or Bovine Terrace: **0.0** ft<sup>2</sup>

## Hydromodification Requirement: 100% Volume Capture; V<sub>HYDROMOD</sub>

V<sub>HYDROMOD</sub> = **588.12** ft<sup>3</sup>

Post development hydrologic soil type within tributary area: **D: 0 - 0.05 in/hr infiltration (transmission) rate**

Post development ground cover description: **Impervious - Paved Parking, Rooftop, Driveways**

CN<sub>POST</sub>: **96.0**

User Composite post development CN: **96.0**

## BMP Sizing Tool: Hydromodification Requirement

Percent of Goal Achieved = **102.02** %

### BMP Volume Below Ground

Porosity: **0.40**

Depth below perforated pipe if present: **5.00** ft

Width: **6.00** ft

Length: **50.00** ft

Area: **0.00** ft<sup>2</sup>

### Ponded Water Above Ground

Depth: **0.00** ft

Width: **0.00** ft

Length: **0.00** ft

Area: **0.00** ft<sup>2</sup>



## STORM WATER CALCULATOR

<b>BMP Tributary Parameters</b>		Project Name: <b>Emerald Isle</b>
BMP ID:	<b>7</b>	
BMP Design Criteria:	<b>100% Capture &amp; Treatment</b>	
Type of BMP Design:	<b>Priority 2: P2-06 Permeable Pavement</b>	
BMP's Physical Tributary Area:	<b>6,045.0</b> ft <sup>2</sup>	
Description/Notes:		

<b>Runoff Reduction Measures</b>	Resulting reduced Tributary Area used for BMP sizing =	<b>4,753.0</b> ft <sup>2</sup>
	Total Runoff Reduction Measures =	<b>1,292.0</b> ft <sup>2</sup>

<b>Interceptor Trees</b>	
Number of <i>new</i> interceptor <b>Evergreen Trees</b> :	<b>0</b>
Number of <i>new</i> interceptor <b>Deciduous Trees</b> :	<b>0</b>
Square footage of qualifying <b>existing tree canopy</b> :	<b>0.0</b> ft <sup>2</sup>
Total Number of <i>New</i> trees in BMP Tributary Area: <b>0</b>	

<b>Disconnected Roof Drains</b>	
Select disconnection condition:	<b>Runoff is directed across landscape; Width of area: 25' and larger</b>
<b>Disconnected Roof Drains Method 1</b>	<b>Disconnected Roof Drains Method 2</b>
Roof area of disconnected downspouts:	<b>1,092</b> ft <sup>2</sup>
	Percent of rooftop area: <b>0</b> %
	Select Density: <b>1</b> Units per Acre

<b>Paved Area Disconnection</b>	
Paved Area Type:	<b>Porous Pavement</b>
Alternatively designed paved area:	<b>200.0</b> ft <sup>2</sup>

<b>Buffer Strips &amp; Bovine Terraces</b>	
Area draining to a Buffer Strip or Bovine Terrace:	<b>0.0</b> ft <sup>2</sup>

<b>Hydromodification Requirement: 100% Volume Capture; <math>V_{HYDROMOD}</math></b>		$V_{HYDROMOD}$ = <b>309.80</b> ft <sup>3</sup>
Post development hydrologic soil type within tributary area:	<b>D: 0 - 0.05 in/hr infiltration (transmission) rate</b>	
Post development ground cover description:	<b>Impervious - Paved Parking, Rooftop, Driveways</b>	
CN <sub>POST</sub> :		
User Composite post development CN:	<b>96.0</b>	

<b>BMP Sizing Tool: Hydromodification Requirement</b>		Percent of Goal Achieved = <b>103.29</b> %	
<b>BMP Volume Below Ground</b>		<b>Ponded Water Above Ground</b>	
Porosity:	<b>0.40</b>	Depth:	<b>0.00</b> ft
Depth below perforated pipe if present:	<b>4.00</b> ft	Width:	<b>0.00</b> ft
Width:	<b>4.00</b> ft	Length:	<b>0.00</b> ft
Length:	<b>50.00</b> ft	Area:	<b>0.00</b> ft <sup>2</sup>
Area:	<b>0.00</b> ft <sup>2</sup>		





## STORM WATER CALCULATOR

### BMP Tributary Parameters

Project Name: **Emerald Isle**BMP ID: **6**BMP Design Criteria: **100% Capture & Treatment**Type of BMP Design: **Priority 4: Modular Bioretention**BMP's Physical Tributary Area: **24,379.0** ft<sup>2</sup>

Description/Notes:

### Runoff Reduction Measures

Resulting reduced Tributary Area used for BMP sizing = **16,895.0** ft<sup>2</sup>Total Runoff Reduction Measures = **7,484.0** ft<sup>2</sup>

### Interceptor Trees

Number of **new** interceptor **Evergreen Trees**: **0**Number of **new** interceptor **Deciduous Trees**: **0**Square footage of qualifying **existing tree canopy**: **0.0** ft<sup>2</sup>Total Number of **New** trees in BMP Tributary Area: **0**

### Disconnected Roof Drains

Select disconnection condition: **Runoff is directed across landscape; Width of area: 25' and larger**

### Disconnected Roof Drains Method 1

Roof area of disconnected downspouts: **7,484** ft<sup>2</sup>

### Disconnected Roof Drains Method 2

Percent of rooftop area: **0** %Select Density: **1** Units per Acre

### Paved Area Disconnection

Paved Area Type: **Select paved area type**Alternatively designed paved area: **0.0** ft<sup>2</sup>

### Buffer Strips & Bovine Terraces

Area draining to a Buffer Strip or Bovine Terrace: **0.0** ft<sup>2</sup>

### Hydromodification Requirement: 100% Volume Capture; $V_{HYDROMOD}$

 $V_{HYDROMOD}$  = **1,101.22** ft<sup>3</sup>Post development hydrologic soil type within tributary area: **D: 0 - 0.05 in/hr infiltration (transmission) rate**Post development ground cover description: **Impervious - Paved Parking, Rooftop, Driveways**CN<sub>POST</sub>:User Composite post development CN: **96.0**

### BMP Sizing Tool: Hydromodification Requirement

Percent of Goal Achieved = **100.06** %

#### BMP Volume Below Ground

Porosity: **0.99**

Depth below perforated pipe if present: **5.30** ft

Width: **14.00** ft

Length: **15.00** ft

Area: **0.00** ft<sup>2</sup>

#### Ponded Water Above Ground

Depth: **0.00** ft

Width: **0.00** ft

Length: **0.00** ft

Area: **0.00** ft<sup>2</sup>



# STORM WATER CALCULATOR

## BMP Tributary Parameters

Project Name: **Emerald Isle**

BMP ID: **5**

BMP Design Criteria: **100% Capture & Treatment**

Type of BMP Design: **Priority 1: P1-07 Infiltration Trench**

BMP's Physical Tributary Area: **18,771.0** ft<sup>2</sup>

Description/Notes:

## Runoff Reduction Measures

Resulting reduced Tributary Area used for BMP sizing = **9,385.5** ft<sup>2</sup>

Total Runoff Reduction Measures = **9,385.5** ft<sup>2</sup>

## Interceptor Trees

Number of **new** interceptor **Evergreen Trees**: **0**

Number of **new** interceptor **Deciduous Trees**: **0**

Square footage of qualifying **existing tree canopy**: **0.0** ft<sup>2</sup>

Total Number of **New** trees in BMP Tributary Area: **0**

## Disconnected Roof Drains

Select disconnection condition: **Runoff is directed across landscape; Width of area: 25' and larger**

## Disconnected Roof Drains Method 1

Roof area of disconnected downspouts: **1,359** ft<sup>2</sup>

## Disconnected Roof Drains Method 2

Percent of rooftop area: **0** %

Select Density: **1** Units per Acre

## Paved Area Disconnection

Paved Area Type: **Not Directly-connected Paved Area**

Alternatively designed paved area: **12,106.0** ft<sup>2</sup>

## Buffer Strips & Bovine Terraces

Area draining to a Buffer Strip or Bovine Terrace: **0.0** ft<sup>2</sup>

## Hydromodification Requirement: 100% Volume Capture; V<sub>HYDROMOD</sub>

V<sub>HYDROMOD</sub> = **503.56** ft<sup>3</sup>

Post development hydrologic soil type within tributary area: **D: 0 - 0.05 in/hr infiltration (transmission) rate**

Post development ground cover description: **Impervious - Paved Parking, Rooftop, Driveways**

CN<sub>POST</sub>:

User Composite post development CN: **94.0**

## BMP Sizing Tool: Hydromodification Requirement

Percent of Goal Achieved = **100.80** %

### BMP Volume Below Ground

Porosity: **0.40**

Depth below perforated pipe if present: **4.50** ft

Width: **6.00** ft

Length: **47.00** ft

Area: **0.00** ft<sup>2</sup>

### Ponded Water Above Ground

Depth: **0.00** ft

Width: **0.00** ft

Length: **0.00** ft

Area: **0.00** ft<sup>2</sup>



# STORM WATER CALCULATOR

## BMP Tributary Parameters

Project Name: **Emerald Isle**

BMP ID: **4**

BMP Design Criteria: **100% Capture & Treatment**

Type of BMP Design: **Priority 1: P1-07 Infiltration Trench**

BMP's Physical Tributary Area: **24,130.0** ft<sup>2</sup>

Description/Notes:

## Runoff Reduction Measures

Resulting reduced Tributary Area used for BMP sizing = **12,065.0** ft<sup>2</sup>

Total Runoff Reduction Measures = **12,065.0** ft<sup>2</sup>

### Interceptor Trees

Number of **new** interceptor **Evergreen Trees**: **0**

Number of **new** interceptor **Deciduous Trees**: **0**

Square footage of qualifying **existing tree canopy**: **0.0** ft<sup>2</sup>

Total Number of **New** trees in BMP Tributary Area: **0**

### Disconnected Roof Drains

Select disconnection condition: **Runoff is directed across landscape; Width of area: 10' to 14'**

#### Disconnected Roof Drains Method 1

Roof area of disconnected downspouts: **3,327** ft<sup>2</sup>

#### Disconnected Roof Drains Method 2

Percent of rooftop area: **0** %

Select Density: **1** Units per Acre

### Paved Area Disconnection

Paved Area Type: **Not Directly-connected Paved Area**

Alternatively designed paved area: **11,687.0** ft<sup>2</sup>

### Buffer Strips & Bovine Terraces

Area draining to a Buffer Strip or Bovine Terrace: **0.0** ft<sup>2</sup>

## Hydromodification Requirement: 100% Volume Capture; V<sub>HYDROMOD</sub>

V<sub>HYDROMOD</sub> = **586.72** ft<sup>3</sup>

Post development hydrologic soil type within tributary area: **D: 0 - 0.05 in/hr infiltration (transmission) rate**

Post development ground cover description: **Impervious - Paved Parking, Rooftop, Driveways**

CN<sub>POST</sub>: **93.0**

User Composite post development CN: **93.0**

## BMP Sizing Tool: Hydromodification Requirement

Percent of Goal Achieved = **101.24** %

### BMP Volume Below Ground

Porosity: **0.40**

Depth below perforated pipe if present: **4.50** ft

Width: **6.00** ft

Length: **55.00** ft

Area: **0.00** ft<sup>2</sup>

### Ponded Water Above Ground

Depth: **0.00** ft

Width: **0.00** ft

Length: **0.00** ft

Area: **0.00** ft<sup>2</sup>



## STORM WATER CALCULATOR

<b>BMP Tributary Parameters</b>		Project Name: <b>Emerald Isle</b>
BMP ID:	<b>3</b>	
BMP Design Criteria:	<b>100% Capture &amp; Treatment</b>	
Type of BMP Design:	<b>Priority 1: P1-07 Infiltration Trench</b>	
BMP's Physical Tributary Area:	<b>19,498.0</b>	<b>ft<sup>2</sup></b>
Description/Notes:		

<b>Runoff Reduction Measures</b>	Resulting reduced Tributary Area used for BMP sizing =	<b>13,138.0</b>	<b>ft<sup>2</sup></b>
	Total Runoff Reduction Measures =	<b>6,360.0</b>	<b>ft<sup>2</sup></b>

<b>Interceptor Trees</b>		
Number of <b>new</b> interceptor <b>Evergreen Trees</b> :	<b>0</b>	Total Number of <b>new</b> trees in BMP Tributary Area: <b>0</b>
Number of <b>new</b> interceptor <b>Deciduous Trees</b> :	<b>0</b>	
Square footage of qualifying <b>existing tree canopy</b> :	<b>0.0</b>	<b>ft<sup>2</sup></b>

<b>Disconnected Roof Drains</b>		
Select disconnection condition:	<b>Select disconnection condition</b>	
<b>Disconnected Roof Drains Method 1</b>		<b>Disconnected Roof Drains Method 2</b>
Roof area of disconnected downspouts:	<b>4,851</b>	Percent of rooftop area: <b>0</b> %
	<b>ft<sup>2</sup></b>	Select Density: <b>1</b> Units per Acre

<b>Paved Area Disconnection</b>		
Paved Area Type:	<b>Not Directly-connected Paved Area</b>	
Alternatively designed paved area:	<b>1,509.0</b>	<b>ft<sup>2</sup></b>

<b>Buffer Strips &amp; Bovine Terraces</b>		
Area draining to a Buffer Strip or Bovine Terrace:	<b>0.0</b>	<b>ft<sup>2</sup></b>

<b>Hydromodification Requirement: 100% Volume Capture; <math>V_{HYDROMOD}</math></b>		$V_{HYDROMOD}$ = <b>945.28</b> <b>ft<sup>3</sup></b>
Post development hydrologic soil type within tributary area:	<b>D: 0 - 0.05 in/hr infiltration (transmission) rate</b>	
Post development ground cover description:	<b>Impervious - Paved Parking, Rooftop, Driveways</b>	
CN <sub>POST</sub> :		
User Composite post development CN:	<b>97.0</b>	

<b>BMP Sizing Tool: Hydromodification Requirement</b>		Percent of Goal Achieved = <b>102.83</b> %
<b>BMP Volume Below Ground</b>		<b>Ponded Water Above Ground</b>
Porosity:	<b>0.40</b>	Depth: <b>0.00</b> ft
Depth below perforated pipe if present:	<b>4.50</b> ft	Width: <b>0.00</b> ft
Width:	<b>6.00</b> ft	Length: <b>0.00</b> ft
Length:	<b>90.00</b> ft	Area: <b>0.00</b> ft <sup>2</sup>
Area:	<b>0.00</b> ft <sup>2</sup>	



## STORM WATER CALCULATOR

### BMP Tributary Parameters

Project Name: **Emerald Isle**BMP ID: **2**BMP Design Criteria: **100% Capture & Treatment**Type of BMP Design: **Priority 3: P3-06 Swale with Bioretention**BMP's Physical Tributary Area: **12,038.0** ft<sup>2</sup>

Description/Notes:

### Runoff Reduction Measures

Resulting reduced Tributary Area used for BMP sizing = **10,134.0** ft<sup>2</sup>Total Runoff Reduction Measures = **1,904.0** ft<sup>2</sup>

#### Interceptor Trees

Number of **new** interceptor **Evergreen Trees**: **0**Number of **new** interceptor **Deciduous Trees**: **0**Square footage of qualifying **existing tree canopy**: **0.0** ft<sup>2</sup>Total Number of **New** trees in BMP Tributary Area: **0**

#### Disconnected Roof Drains

Select disconnection condition: **Select disconnection condition**

##### Disconnected Roof Drains Method 1

Roof area of disconnected downspouts: **0** ft<sup>2</sup>

##### Disconnected Roof Drains Method 2

Percent of rooftop area: **0** %Select Density: **1** Units per Acre

#### Paved Area Disconnection

Paved Area Type: **Not Directly-connected Paved Area**Alternatively designed paved area: **1,904.0** ft<sup>2</sup>

#### Buffer Strips & Bovine Terraces

Area draining to a Buffer Strip or Bovine Terrace: **0.0** ft<sup>2</sup>

### Hydromodification Requirement: 100% Volume Capture; $V_{HYDROMOD}$

 $V_{HYDROMOD}$  = **660.53** ft<sup>3</sup>Post development hydrologic soil type within tributary area: **D: 0 - 0.05 in/hr infiltration (transmission) rate**Post development ground cover description: **Impervious - Paved Parking, Rooftop, Driveways**CN<sub>POST</sub>:User Composite post development CN: **96.0**

### BMP Sizing Tool: Hydromodification Requirement

Percent of Goal Achieved = **101.74** %

#### BMP Volume Below Ground

Porosity: **0.40**

Depth below perforated pipe if present: **4.00** ft

Width: **6.00** ft

Length: **70.00** ft

Area: **0.00** ft<sup>2</sup>

#### Ponded Water Above Ground

Depth: **0.00** ft

Width: **0.00** ft

Length: **0.00** ft

Area: **0.00** ft<sup>2</sup>



## STORM WATER CALCULATOR

### BMP Tributary Parameters

Project Name: **Emerald Isle**BMP ID: **1**BMP Design Criteria: **100% Capture & Treatment**Type of BMP Design: **Priority 2: P2-03 Roadside Bioretention - Contiguous Sidewalk**BMP's Physical Tributary Area: **7,015.0** ft<sup>2</sup>

Description/Notes:

### Runoff Reduction Measures

Resulting reduced Tributary Area used for BMP sizing = **5,523.0** ft<sup>2</sup>Total Runoff Reduction Measures = **1,492.0** ft<sup>2</sup>

#### Interceptor Trees

Number of **new** interceptor **Evergreen Trees**: **0**Number of **new** interceptor **Deciduous Trees**: **0**Square footage of qualifying **existing tree canopy**: **0.0** ft<sup>2</sup>Total Number of **New** trees in BMP Tributary Area: **0**

#### Disconnected Roof Drains

Select disconnection condition: **Select disconnection condition**

##### Disconnected Roof Drains Method 1

Roof area of disconnected downspouts: **0** ft<sup>2</sup>

##### Disconnected Roof Drains Method 2

Percent of rooftop area: **0** %Select Density: **1** Units per Acre

#### Paved Area Disconnection

Paved Area Type: **Not Directly-connected Paved Area**Alternatively designed paved area: **1,492.0** ft<sup>2</sup>

#### Buffer Strips & Bovine Terraces

Area draining to a Buffer Strip or Bovine Terrace: **0.0** ft<sup>2</sup>

### Hydromodification Requirement: 100% Volume Capture; $V_{HYDROMOD}$

 $V_{HYDROMOD}$  = **397.38** ft<sup>3</sup>Post development hydrologic soil type within tributary area: **C: 0.05 - 0.15 in/hr infiltration (transmission) rate**Post development ground cover description: **Impervious - Paved Parking, Rooftop, Driveways**CN<sub>POST</sub>: **97.0**User Composite post development CN: **97.0**

### BMP Sizing Tool: Hydromodification Requirement

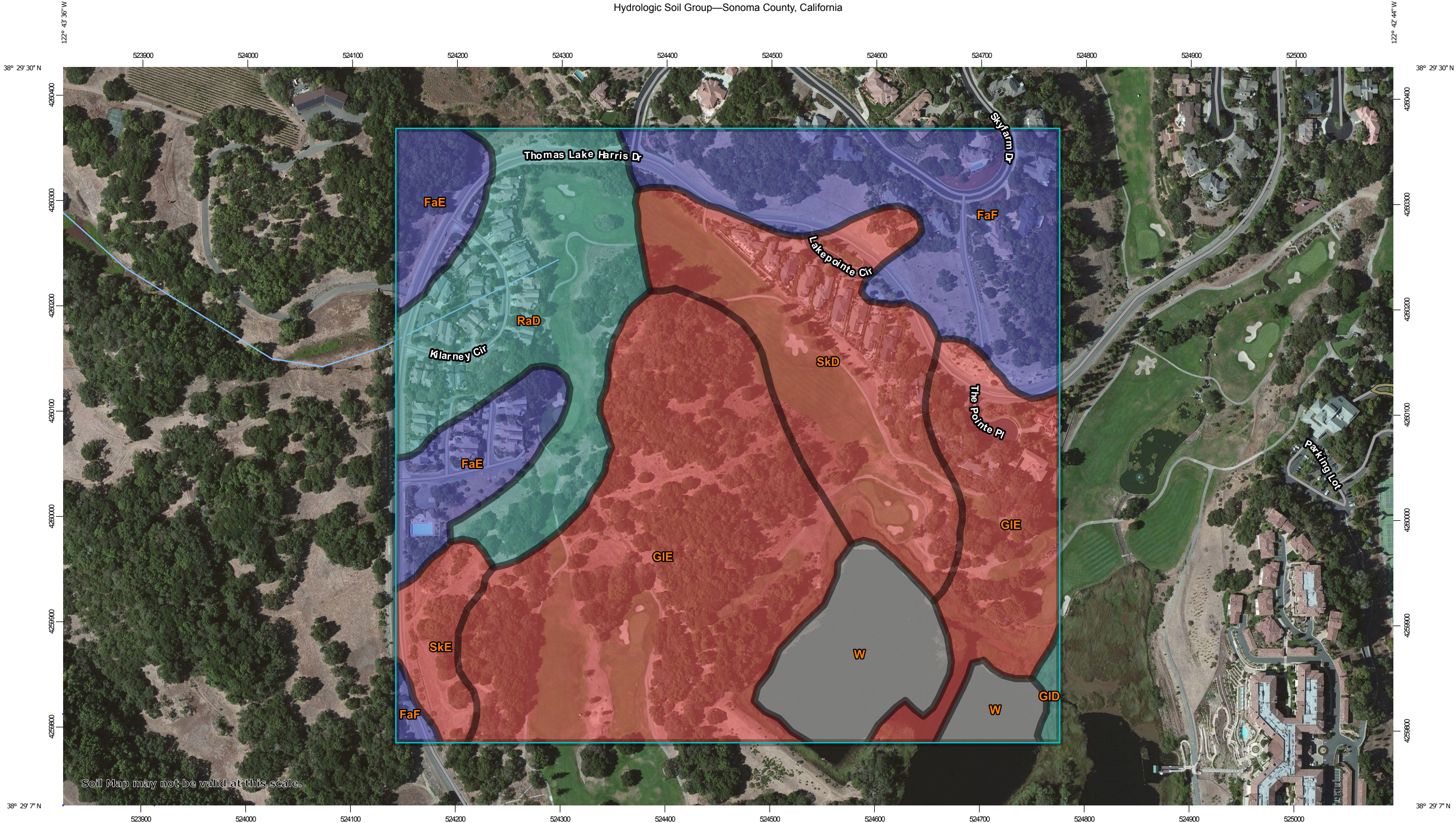
Percent of Goal Achieved = **108.71** %

	BMP Volume Below Ground
Porosity:	<b>0.40</b>
Depth below perforated pipe if present:	<b>4.00</b> ft
Width:	<b>6.00</b> ft
Length:	<b>45.00</b> ft
Area:	<b>0.00</b> ft <sup>2</sup>

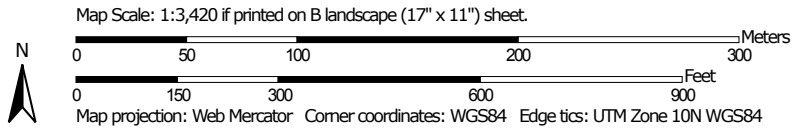
	Ponded Water Above Ground
Depth:	<b>0.00</b> ft
Width:	<b>0.00</b> ft
Length:	<b>0.00</b> ft
Area:	<b>0.00</b> ft <sup>2</sup>

## 9. SOILS MAP





Soil Map may not be valid at this scale.



Natural Resources  
Conservation Service

Web Soil Survey  
National Cooperative Soil Survey



MAP LEGEND

**Area of Interest (AOI)**

Area of Interest (AOI)

**Soils**

**Soil Rating Polygons**

A

A/D

B

B/D

C

C/D

D

Not rated or not available

**Soil Rating Lines**

A

A/D

B

B/D

C

C/D

D

Not rated or not available

**Soil Rating Points**

A

A/D

B

B/D

**Water Features**

Streams and Canals

**Transportation**

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

**Background**

Aerial Photography

C

C/D

D

Not rated or not available

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL: [Web Soil Survey](#)

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Sonoma County, California

Survey Area Data: Version 10, Sep 27, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 14, 2011—Aug 15, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

## Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Sonoma County, California (CA097)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
FaE	Felta very gravelly loam, 15 to 30 percent slopes	B	6.7	7.4%
FaF	Felta very gravelly loam, 30 to 50 percent slopes	B	13.9	15.2%
GID	Goulding cobbly clay loam, 5 to 15 percent slopes	C	0.4	0.4%
GIE	Goulding cobbly clay loam, 15 to 30 percent slopes	D	33.0	36.0%
RaD	Raynor clay, 9 to 15 percent slopes	C	14.3	15.6%
SkD	Spreckels loam, 9 to 15 percent slopes	D	13.6	14.9%
SkE	Spreckels loam, 15 to 30 percent slopes	D	2.7	3.0%
W	Water		6.9	7.6%
<b>Totals for Area of Interest</b>			<b>91.6</b>	<b>100.0%</b>

## Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

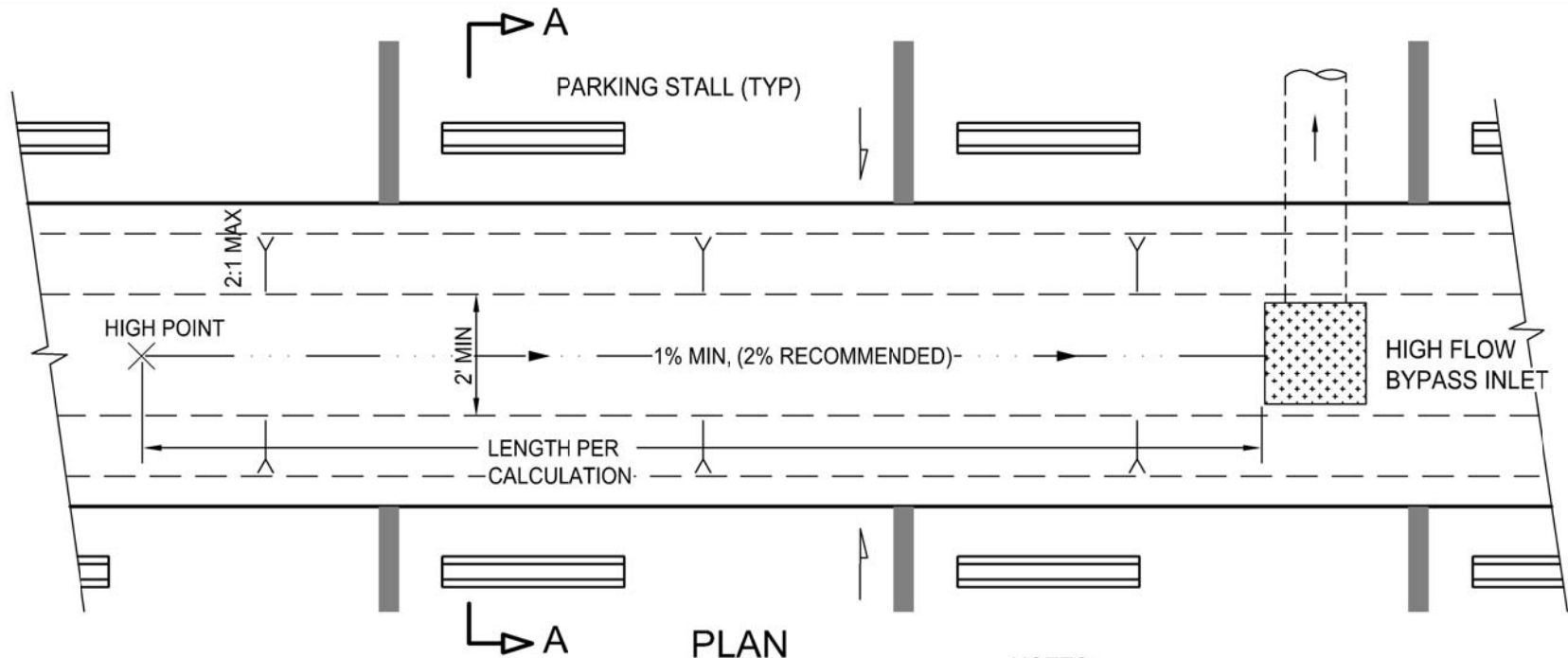
## Rating Options

*Aggregation Method:* Dominant Condition

*Component Percent Cutoff:* None Specified

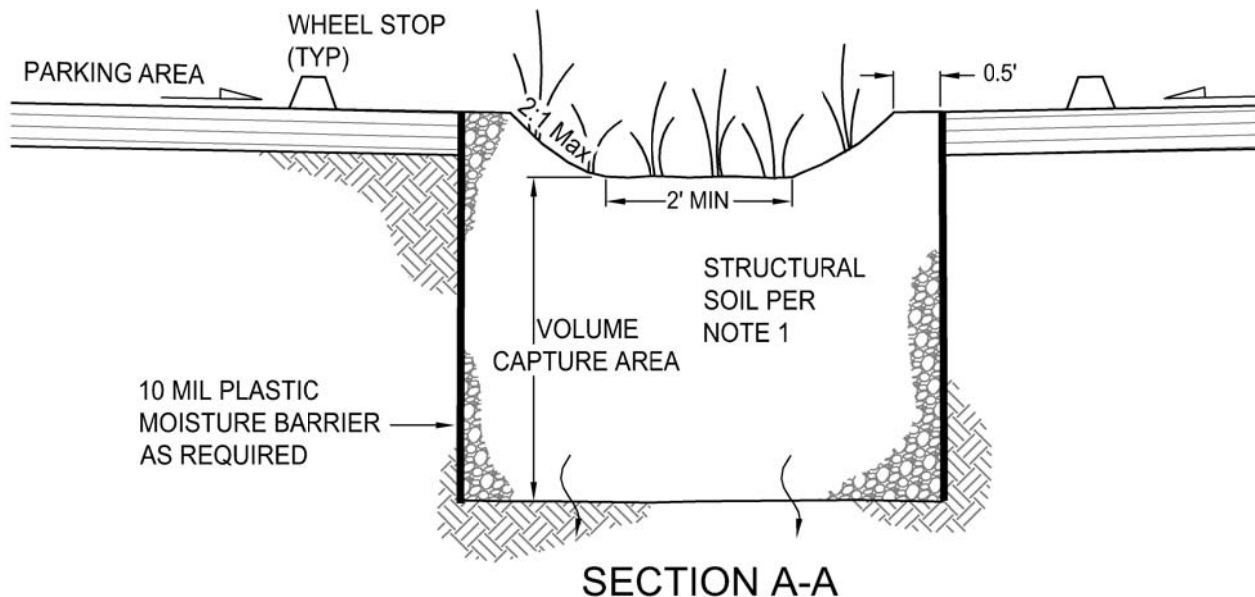
*Tie-break Rule:* Higher

**APPENDIX A:**  
**Preliminary Post Construction Details of BMPs (drawings)**



NOTES:

1. STRUCTURAL SOIL UNLESS OTHERWISE APPROVED BY GEOTECHNICAL ENGINEER AND ACCEPTED BY GOVERNING AGENCY.
2. SWALE MUST CONVEY FLOOD DESIGN FLOWS PER GOVERNING AGENCY DESIGN STANDARDS.
3. PARKING ISLAND WIDTH PER APPLICABLE GOVERNING AGENCY STANDARDS.

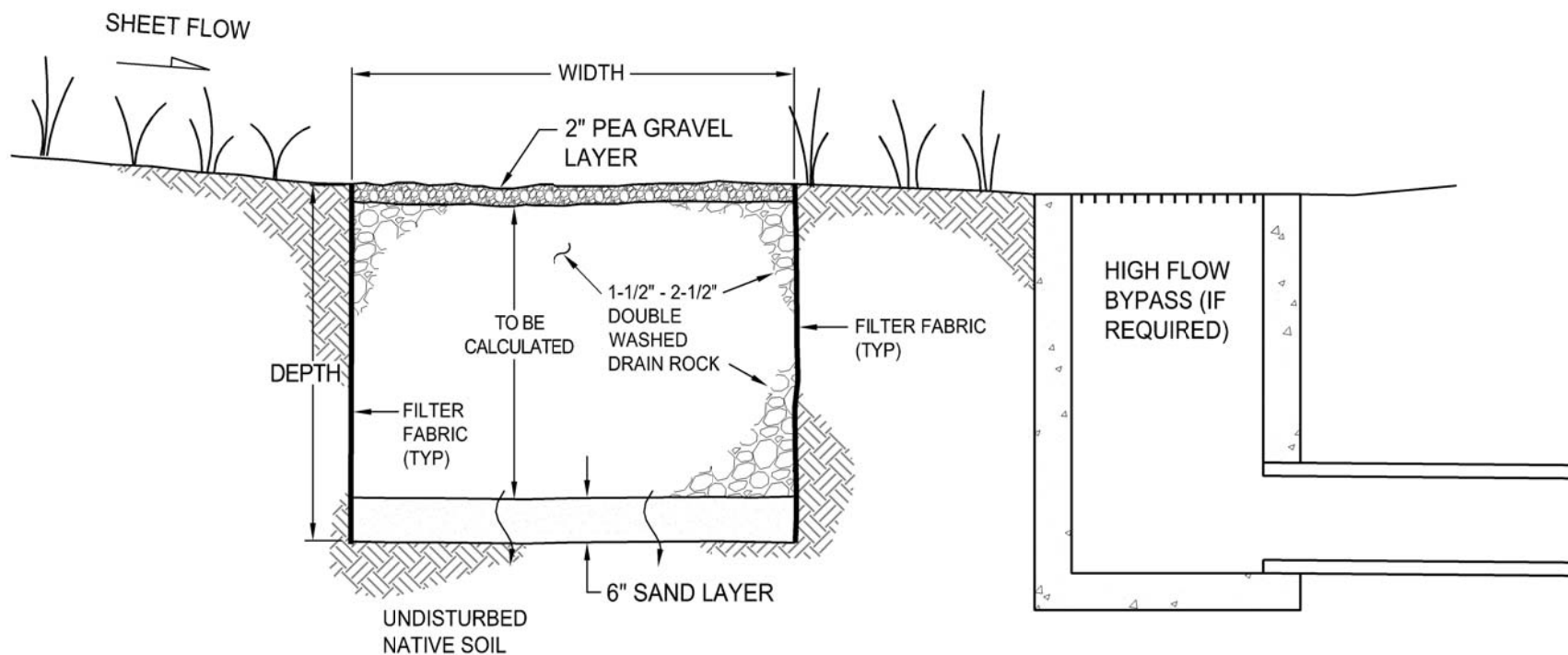


PRIORITY 1  
SWALE WITH BIORETENTION

SCALE: NONE DATE: 04/06/17

DWN. DIT  
CHK. HM SHEET 1 of 1 P1-06

Not to Scale



NOTES:

1. DEPTH SHALL NOT EXCEED WIDTH OR LENGTH.
2. TO BE USED AS PART OF A TREATMENT TRAIN.
3. ALL SURFACE WATER MUST DRAIN WITHIN 72 HOURS.

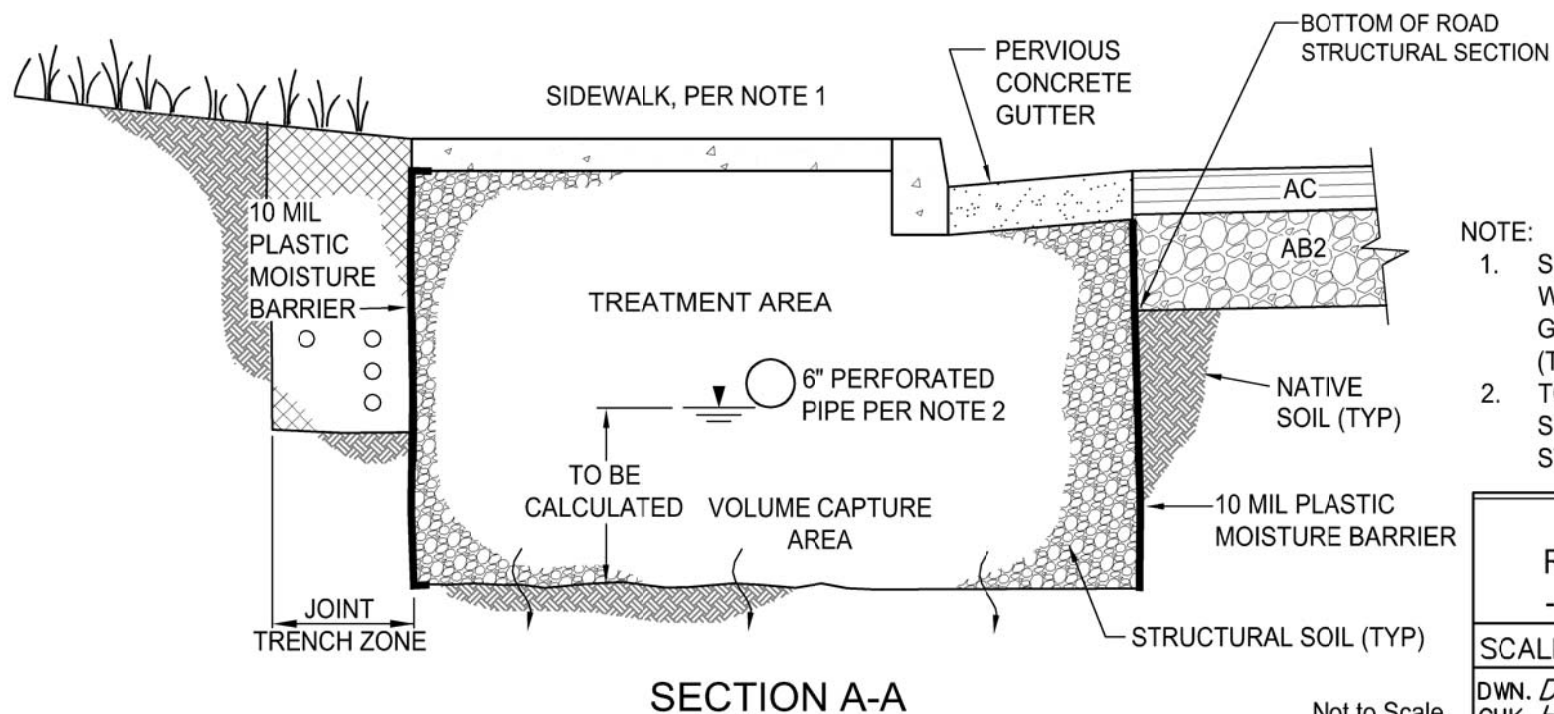
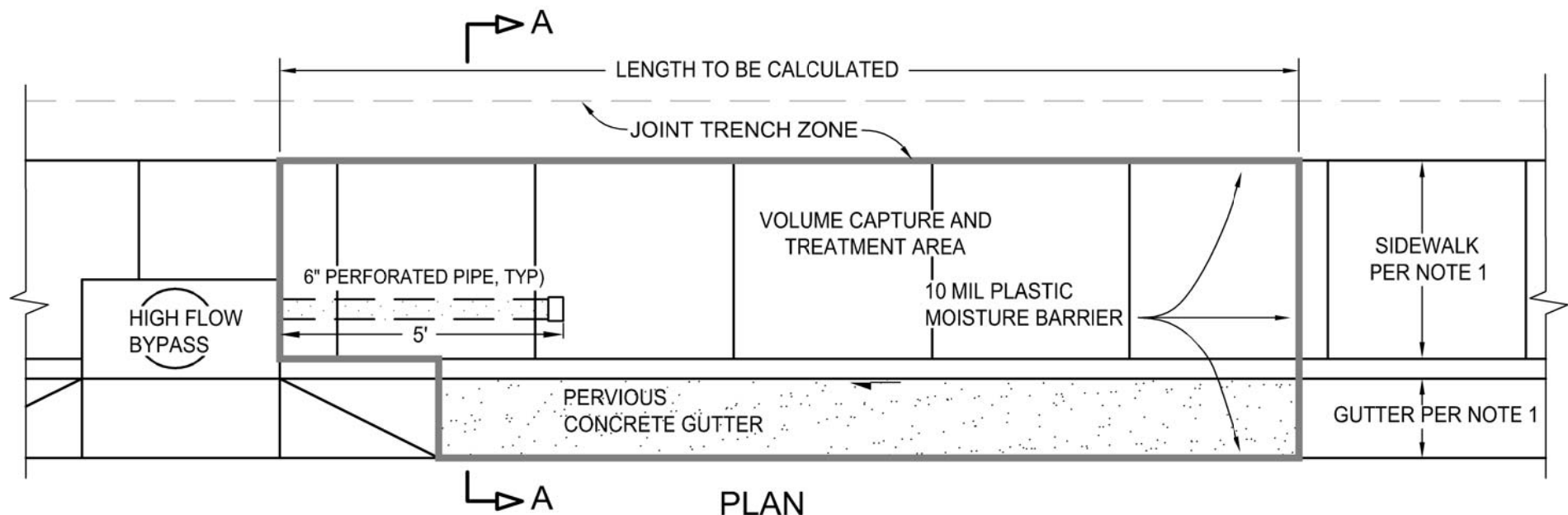
PRIORITY 3  
INFILTRATION TRENCH

SCALE: *NONE* DATE: *04/06/17*

DWN. *DIT*  
CHK. *HM*

P1-07

Not to Scale



NOTE:

1. SIDEWALK AND CURB AND GUTTER WIDTHS PER APPLICABLE GOVERNING AGENCY STANDARDS (TYP).
2. TOP OF 6" PERFORATED PIPE TO BE SET 6" BELOW BOTTOM OF ROAD STRUCTURAL SECTION, MIN.

**PRIORITY 2  
ROADSIDE BIORETENTION  
- CONTIGUOUS SIDEWALK**

SCALE: *NONE*

DATE: *04/06/17*

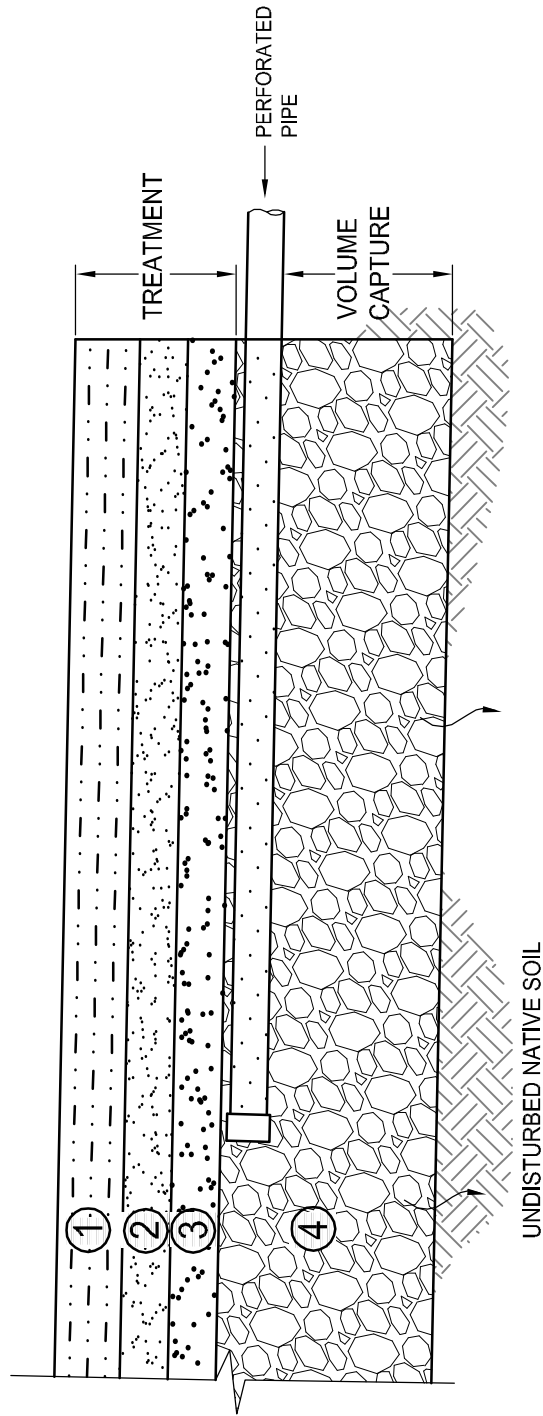
DWN. *DIT*  
CHK. *HM*

SHEET 1 of 1

P2-03

Not to Scale

- ① PERMEABLE PAVEMENT OR SURFACE  
PER GOVERNING AGENCY STANDARDS
- ② SAND LAYER (FINE SAND)
- ③ TRANSITION LAYER (COARSE SAND)  
AS NEEDED FOR CONVEYANCE AND  
TREATMENT
- ④ STRUCTURAL SOIL OR DRAIN ROCK



## PRIORITY 2 PERMEABLE PAVEMENT

SCALE: *NONE* DATE: *05/10/11*

DWN. *DIT*  
CHK. *HH*

P2-06

Not to Scale



## **APPENDIX B:**

### **Maintenance – Checklists**

Stop Time: \_\_\_\_\_ Address: \_\_\_\_\_

\* = Refer to Form B (Specials)  
and/or Form C (Notes).

and/or Form C (Notes).

**If Yes, attach Form B for Project.**

[illegible]

Office Use:		
Complete:	Issues Corrective Action:	Re-Inspection Required:

Page of

Date: \_\_\_\_\_

Start Time: \_\_\_\_\_

Stop Time: \_\_\_\_\_

Inspector: \_\_\_\_\_

Project: \_\_\_\_\_

Address: \_\_\_\_\_

Inspection Status Codes:

**S = Satisfactory**      \* - See Notes on Form C

**D = Deficient**

Special Feature or Conditions											
Reference code	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11
Additional Special Maintenance Inspection Criteria	Add special inspection requirements in addition to Form A here.	Add special inspection requirements in addition to Form A here.	Add special inspection requirements in addition to Form A here.	Add special inspection requirements in addition to Form A here.	Add special inspection requirements in addition to Form A here.	Add special inspection requirements in addition to Form A here.	Add special inspection requirements in addition to Form A here.	Add special inspection requirements in addition to Form A here.	Add special inspection requirements in addition to Form A here.	Add special inspection requirements in addition to Form A here.	Add special inspection requirements in addition to Form A here.
BMP ID:											

Office Use:

Complete: \_\_\_\_\_

Issues Corrective Action: \_\_\_\_\_

Re-Inspection Required: \_\_\_\_\_

Date: \_\_\_\_\_

Inspector: \_\_\_\_\_

Project: \_\_\_\_\_

Address: \_\_\_\_\_

[illegible]

# PLANTER STRIP BIORETENTION- CHECKLIST

## Planter Strip Bioretention

### Inspection and Maintenance Checklist

(aka: Street Rain Garden, Roadside Bioretention, Bioretention Cell)

Date of Inspection: \_\_\_\_\_  
 Inspector(s): \_\_\_\_\_  
 BMP ID #: \_\_\_\_\_  
 Property Owner: \_\_\_\_\_

Location Description: \_\_\_\_\_

Type of Inspection: ☐ Pre-rainy Season (PRS) ☐ Rainy Season (RS) ☐ After-rainy Season (ARS)

*This Inspection and Maintenance Checklist is to be used in conjunction with its corresponding LID Factsheet and Maintenance Plan. Please review these documents before performing the field inspection.*

Inspection Category	When to Inspect	Maintenance Issue	Is the Issue Present?	Require Maintenance	Comments (Describe maintenance completed and if needed maintenance was not conducted, note when it will be done)
Drainage	RS	Is there standing or pooling of water in the Bioretention area after 3 days of dry weather?		<ul style="list-style-type: none"> <li>Check perforated pipe outlet for obstruction or damage. *</li> <li>Flush perforated pipe to remove obstructions/sediment. *</li> <li>Remove and replace the first few inches of topsoil.</li> <li>Remove soil and inspect perforated pipe. Repair or replace perforated pipe, replace with new soil and regrade.</li> </ul>	
		Is water not draining into catch basin from the overflow pipe during a high intensity storm? *			
	PRS RS ARS	Is there sediment visible in the gutter?		<ul style="list-style-type: none"> <li>In dry weather, use a mechanical sweeper or a Vactor truck to clean gutter pan.</li> </ul>	
	RS	Is there water flowing in the pervious concrete gutter section during a low intensity storm? *		<ul style="list-style-type: none"> <li>In wet weather, use a Vactor truck to clean gutter pan.</li> </ul>	

\* If perforated pipe is present.

# PLANTER STRIP BIORETENTION- CHECKLIST

Inspection Category	When to Inspect	Maintenance Issue	Is the Issue Present?	Require Maintenance	Comments (Describe maintenance completed and if needed maintenance was not conducted, note when it will be done)
Erosion	RS ARS	Is there under cutting or washouts along the sidewalks and/or curbs abutting the planter strip?		<ul style="list-style-type: none"> <li>Fill in eroded areas and regrade.</li> </ul>	
	RS ARS	Is there channelization (gully) forming along the length of the planter area?		<ul style="list-style-type: none"> <li>Fill in eroded areas and regrade.</li> </ul>	
	RS ARS	Is there accumulation of sediment (sand, dirt, mud) in the planter?		<ul style="list-style-type: none"> <li>Remove sediment and check the grading. Add replacement soil and/or mulch.</li> </ul>	
	PRS RS ARS	Is the mulch unevenly distributed in the planter area?		<ul style="list-style-type: none"> <li>Redistribute and add additional mulch if needed.</li> <li>Regrade planter area.</li> </ul>	
	PRS RS ARS	Are there voids or deep holes present? Is there sediment present in the catch basin and in the overflow pipe?		<ul style="list-style-type: none"> <li>Check the perforated pipe for damage.*</li> </ul>	
	PRS RS ARS	Is there evidence of animal activity such as holes or dirt mounds from digging or borrowing?		<ul style="list-style-type: none"> <li>Repair and fill in damage areas.</li> <li>Rodent control activities must be in accordance with applicable laws and do not affect any protected species.</li> </ul>	

\* If perforated pipe is present.

# PLANTER STRIP BIORETENTION- CHECKLIST

Inspection Category	When to Inspect	Maintenance Issue	Is the Issue Present?	Require Maintenance	Comments (Describe maintenance completed and if needed maintenance was not conducted, note when it will be done)
Vegetation	PRS RS ARS	Is the vegetation clogging the inlet flow areas?		<ul style="list-style-type: none"> <li>Trim and/or remove the excess vegetation.</li> </ul>	
	PRS RS ARS	Is the mulch distributed evenly throughout the planter area?		<ul style="list-style-type: none"> <li>Redistribute and add additional mulch if needed.</li> <li>Regrade planter area.</li> </ul>	
	PRS RS ARS	Are there dead or dry plants/weeds? Is the vegetation over grown?		<ul style="list-style-type: none"> <li>Remove dead and/or dry vegetation. Replace as needed.</li> <li>Remove or trim any vegetation that is causing a visual barrier, trip, and or obstruction hazard.</li> </ul>	

# PLANTER STRIP BIORETENTION- CHECKLIST

Inspection Category	When to Inspect	Maintenance Issue	Is the Issue Present?	Require Maintenance	Comments (Describe maintenance completed and if needed maintenance was not conducted, note when it will be done)
BMP General	PRS RS ARS	Is there debris/trash in the planter area?		<ul style="list-style-type: none"> <li>Remove all trash and debris.</li> </ul>	
	PRS RS ARS	Is graffiti present?		<ul style="list-style-type: none"> <li>Remove all graffiti from the area.</li> </ul>	
	PRS RS ARS	Are there missing or disturbed aesthetics features?		<ul style="list-style-type: none"> <li>Replace and/or reposition aesthetics features to original placement.</li> <li>Placement should not disrupt flow characteristics/design.</li> </ul>	
	PRS RS ARS	Is the vegetation irrigation functional?		<ul style="list-style-type: none"> <li>Repaired broken missing spray/drip emitters.</li> <li>Reposition and/or adjust to eliminate over spray and/or over watering.</li> </ul>	
	PRS RS ARS	Are the aesthetic features firmly secured in placed?		<ul style="list-style-type: none"> <li>Repair and/or replace loose or damage features.</li> </ul>	
	PRS RS ARS	Check for damage sidewalk, curb, gutter, and catch basin including uplift and settling.		<ul style="list-style-type: none"> <li>Remove and replace damaged areas.</li> </ul>	



# POROUS PAVEMENT- CHECKLIST

## Porous Pavement

Inspection and Maintenance Checklist  
(aka: Unit Pavers, Porous Concrete)

Date of Inspection: \_\_\_\_\_  
Inspector(s): \_\_\_\_\_  
BMP ID #: \_\_\_\_\_  
Property Owner: \_\_\_\_\_

Location Description: \_\_\_\_\_

Type of Inspection: ☐ Pre-rainy Season (PRS) ☐ Rainy Season (RS) ☐ After-rainy Season (ARS)

*This Inspection and Maintenance Checklist is to be used in conjunction with its corresponding LID Factsheet and Maintenance Plan. Please review these documents before performing the field inspection.*

Inspection Category	When to Inspect	Maintenance Issue	Is the Issue Present?	Require Maintenance	Comments (Describe maintenance completed and if needed maintenance was not conducted, note when it will be done)
Drainage	RS	Is there standing or pooling of water?		<ul style="list-style-type: none"> <li>Check perforated pipe outlet for obstruction or damage. *</li> <li>Flush perforated pipe to remove obstructions/sediment. *</li> <li>Repair or replace perforated pipe, replace with new soil and regrade.</li> <li>Subsurface layers may need cleaning and/or replacing.</li> <li>In dry weather, use a mechanical sweeper or a vactor truck to vacuum clean surface area.</li> <li>In wet weather, use a vactor truck to vacuum clean surface area.</li> </ul>	
		Is there visible water flowing over the surface of the pervious concrete/pavers during a low intensity storm?			
	PRS RS ARS	Is there sediment visible on the surface of the pervious concrete/pavers?		<ul style="list-style-type: none"> <li>In dry weather, use a mechanical sweeper or a vactor truck to vacuum clean surface area.</li> </ul>	

\* If perforated pipe is present.

## POROUS PAVEMENT- CHECKLIST

Inspection Category	When to Inspect	Maintenance Issue	Is the Issue Present?	Require Maintenance	Comments (Describe maintenance completed and if needed maintenance was not conducted, note when it will be done)
Erosion	RS ARS	Is there under cutting or washouts along the sidewalks and/or curbs abutting a planter strip?		<ul style="list-style-type: none"> <li>• Fill in eroded areas and regrade.</li> </ul>	
	PRS RS ARS	Are there cracks, uplifts, slumps, missing pavers, and/or pot holes present?  Is there sediment present in the catch basin and in the overflow pipe?		<ul style="list-style-type: none"> <li>• Check perforated pipe outlet for damage. *</li> <li>• Repair or replace perforated pipe, replace with new soil and regrade. *</li> <li>• Subsurface layers may need cleaning and/or replacing.</li> <li>• Replace or repair damaged areas.</li> </ul>	

\* If perforated pipe is present.

## POROUS PAVEMENT- CHECKLIST

Inspection Category	When to Inspect	Maintenance Issue	Is the Issue Present?	Require Maintenance	Comments (Describe maintenance completed and if needed maintenance was not conducted, note when it will be done)
Vegetation	PRS RS ARS	Is the vegetation clogging the inlet flow areas?		<ul style="list-style-type: none"> <li>Trim and/or remove the excess vegetation.</li> </ul>	
	PRS RS ARS	Is there vegetation growing in the cracks, stress lines, and/or abutment areas?		<ul style="list-style-type: none"> <li>Remove vegetation.</li> <li>In dry weather, use a mechanical sweeper or a vactor truck to vacuum clean surface area.</li> <li>In wet weather, use a vactor truck to vacuum clean surface area.</li> </ul>	
	PRS RS ARS	Is algae present?		<ul style="list-style-type: none"> <li>In dry weather, use a mechanical sweeper or a vactor truck to vacuum clean surface area.</li> <li>In wet weather, use a vactor truck to vacuum clean surface area.</li> </ul>	

# POROUS PAVEMENT- CHECKLIST

Inspection Category	When to Inspect	Maintenance Issue	Is the Issue Present?	Require Maintenance	Comments (Describe maintenance completed and if needed maintenance was not conducted, note when it will be done)
BMP General	PRS RS ARS	Is there debris/trash area?		<ul style="list-style-type: none"> <li>Remove all trash and debris.</li> </ul>	
	PRS RS ARS	Is there gum or other material stuck to the pervious surface?		<ul style="list-style-type: none"> <li>In dry weather, use a mechanical sweeper or a vactor truck to vacuum clean surface area.</li> <li>In wet weather, use a vactor truck to vacuum clean surface area.</li> </ul>	
	PRS RS ARS	Is graffiti present?		<ul style="list-style-type: none"> <li>Remove all graffiti from the area.</li> </ul>	
	PRS RS ARS	Are there missing or disturbed aesthetics features?		<ul style="list-style-type: none"> <li>Replace and/or reposition aesthetics features to original placement.</li> <li>Placement should not disrupt flow characteristics/design.</li> </ul>	
	PRS RS ARS	Are the aesthetic features firmly secured in placed?		<ul style="list-style-type: none"> <li>Repair and/or replace loose or damaged features.</li> </ul>	
	PRS RS ARS	Check for damage sidewalk, curb, gutter, and catch basin including uplift and settling.		<ul style="list-style-type: none"> <li>Remove and replace damaged areas.</li> </ul>	

## INFILTRATION TRENCH

Also known as: Infiltration Gallery, Soakage Trench



### DESCRIPTION

Infiltration Trenches are typically long narrow trenches that are filled with gravel that receive storm water and allow it to infiltrate into the soil. Infiltration trenches can be used to intercept storm water from landscape or open space before it crosses onto paved area or can be used as part of a treatment train with other BMP (such as Vegetated Buffer Strips or Vegetated Swales) to achieve the Volume Capture requirement.

### ADVANTAGES

- Provides volume capture.
- Can be used as part of a treatment train with other BMPs.
- Can be used on sloped sites.
- Simple to install.

### LIMITATIONS

- Impacts to adjacent buildings and overflow requirements need to be considered in design.
- Requires adequate space.

## KEY DESIGN FEATURES

- Install a designated high flow bypass inlet or route.
- Design to prevent standing water. All surface water must drain within 72 hours to prevent mosquito breeding.

## SIZING DESIGN- GOAL AND REQUIREMENTS

- **For all projects:** The treatment component requires that all of the runoff generated by this water quality design storm from impermeable surfaces must be treated on site for the pollutants of concern.
- ***For projects that increase the amount of impervious surface, but create or replace less than a total of one acre:*** The **Delta Volume Capture** component requires that any increase in volume due to development for the water quality design storm must be infiltrated and/or reused on site. Further discussion of the Treatment and Delta Volume Capture requirements and the accompanying formulas can be found in Chapter 6.
- ***For projects that create or replace one acre or more of impervious surface:*** These larger projects must mitigate their impacts by meeting the **Hydromodification Requirement** by capturing 100% of the post development volume generated by the water quality rain event.
- All calculations shall be completed using the “Storm Water Calculator” available at [www.srcity.org/stormwaterLID](http://www.srcity.org/stormwaterLID).

## INSPECTION AND MAINTENANCE REQUIREMENTS

A maintenance plan shall be provided with the Final SWLID Submittal. The maintenance plan shall include recommended maintenance practices, identify the parties responsible for maintenance and upkeep, specify the funding source for ongoing maintenance with provisions for full replacement when necessary and provide site specific inspection checklist.

At a minimum inspection and maintenance shall include the following:

- Inspect twice annually for ponded water. If ponded water is observed, the top layer of pea gravel will need to be replaced.
- If ponded water remains, further grading and replacement may be necessary to prevent mosquito breeding.
- The high flow inlet should be inspected and cleaned as necessary to remove any obstructions.
- Pesticides and fertilizers shall not be used in vegetated areas draining to the infiltration trench.
- Remove any accumulated sediment and/or trash.

## **APPENDIX C:**

### **Operations & Maintenance Manuals**

## **STORMCAPTURE INSPECTION & MAINTENANCE MANUAL**

### **General**

Inspection and maintenance of the StormCapture system is vital for the satisfactory performance and life cycle of the stormwater management system. Permit requirements, local, state and federal regulations, along with Oldcastle and any incorporated device manufacturer recommendations must be followed for system compliance. The StormCapture design provides manway access for ease of inspection and debris removal if required. Flushing, which can cause particle displacement, undermining and internal disturbance, is not recommended for gravel foundation, open bottom systems. Flushing is acceptable in systems with concrete bases. Inlet controls, internal or external, are recommended for controlling, monitoring and maintaining the StormCapture system.

**External Inlets** are typically devices that are separate from the StormCapture modules. These external devices receive site stormwater and are designed with manway access for maintenance and typically include an internal sump for sediment capture. External Inlets may receive single or multiple pipes and incorporate an open grated top with an outfall pipe to the StormCapture system. Grated inlets may incorporate protection devices or baffles to capture floatables or the “first flush.” Scheduled inspections and maintenance shall include the removal of any sedimentation build up in the external inlets. Debris or sedimentation build up shall not exceed 3” below an outfall elevation. Internal components may be incorporated for pretreatment. Manufacturer recommendations must be followed. Scheduled maintenance and inspection will include removal of debris and sediments by manual or mechanical means.

**Maintenance Modules (MM's)** are optional internal control modules based on design preference. MM's are modules with roof manway access openings and provide the primary means of access to the StormCapture system for scheduled inspection and maintenance. In addition, MM's may incorporate weirs or baffles to enhance reduction or removal of Total Suspended Solids (TSS) from the stormwater. Placement of internal components must be part of the system engineering and design. Grated inlets can be incorporated to accommodate surface stormwater flows into the StormCapture and may include an inlet protection device. Scheduled inspection and manufacturer recommendations for maintenance must be followed.

For open bottom systems (no concrete floor), concrete splash pads may be installed below inlet grate openings and pipe inlets to prevent base erosion. During scheduled inspection and maintenance activities, the concrete splash pads must be inspected for proper function and any sediment shall be removed. Standard StormCapture module design incorporates lateral and longitudinal passageways between modules to accommodate internal stormwater conveyance between modules. These passageways may be of a window configuration with standard 12” tall sediment baffles below the windows extending from the internal module invert, or doorway configurations extending from the floor slab. Any sediment and debris build up over 6” deep



inside a module shall be removed by manual or mechanical means. Removal by vacuum is recommended. Internal module flushing, which can cause particle displacement, undermining, or internal disturbance, is prohibited.

### **Inspection Frequency**

Oldcastle recommends that the StormCapture system be inspected quarterly, and following any significant rain events within the first year of operation. Standard Operating Procedures shall specify an annual inspection and maintenance plan as required thereafter or as stated in the permit, or as required by other governing regulations. **Only authorized and trained personnel shall inspect and enter a StormCapture system.** Personnel must be properly trained and equipped before entering any underground or confined space structure. Training includes being familiar with and following any local, state and federal regulations governing the operation, inspection and maintenance of underground structures, as well as specific StormCapture system requirements.

### **Inspection Activities**

During inspection, a minimum of the following shall be inspected:

- Contributing drainage area inlets are clear of debris.
- If the StormCapture system is an exfiltration system (open bottom with stormwater percolating into the ground), monitor and confirm that the system drains completely within a reasonable time or the required permit time.
- Sediment depths within modules (anything over 6" deep shall be removed as outlined above).
- Inlet and outlet pipe penetrations to check for movement and/or leakage.
- Movement of modules.
- General interior condition of modules to look for concrete cracking or deterioration.
- Condition of pretreatment devices, baffles, and polishing devices if part of the system.

### **Recordkeeping**

A log must be kept of all inspection and maintenance activities.

## **APPENDIX D: Maintenance Declaration**

RECORDING REQUESTED BY  
AND WHEN RECORDED MAIL TO: \_\_\_\_\_

City of Santa Rosa- Utilities Department  
Storm Water & Creeks Section- Supervising Engineer  
69 Stony Circle  
Santa Rosa CA 95401

Project/Property: \_\_\_\_\_

APN(s): \_\_\_\_\_

Santa Rosa, California

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**DECLARATION OF COVENANTS REGARDING MAINTENANCE OF  
STORM WATER BMP FACILITIES**

This Declaration of Covenants Regarding Maintenance of Storm Water BMP Facilities ("Declaration") is made on this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, by \_\_\_\_\_ ("Landowner") IF BUSINESS ENTITY, ADD TYPE.

**RECITALS**

- A. Landowner is the fee simple owner of certain real property located in the City of Santa Rosa ("City"), Sonoma County, California, INSERT LOT #s & DEVELOPMENT DESCRIPTION; APN #s and more fully described in Exhibit A to this Declaration ("Property").
- B. The City's National Pollutant Discharge Elimination System ("NPDES") Municipal Separate Storm Sewer System ("MS4") Permit, Order number R1-2009-0050, issued by the North Coast Regional Water Quality Control Board, requires the City to implement and enforce specific requirements for the construction and maintenance of onsite storm water management facilities/best management practices (collectively, "BMP") for development, redevelopment, and other applicable projects with the goal of mitigating impacts to storm water quality and runoff volume discharges into the MS4.
- C. Provisions of Chapter 17-12 and other applicable sections of the Santa Rosa City Code shall apply to the construction, inspection and maintenance of BMP facilities and the enforcement of MS4 Permit requirements.
- D. On INSERT DATE, WHO (City Engineer OR Chief Building Official) approved Landowner's IMPROVEMENT PLANS or BUILDING PERMIT SITE PLAN ("Plan") and a Final Standard Urban Stormwater Mitigation Plan (SUSMP) for the Property which require the construction and maintenance of BMP facilities on the Property (the "BMP Facilities") by Landowner. The BMP Facilities required under the SUSMP may include both built and

landscaping features. The PLAN, SUSMP may be inspected at the City of Santa Rosa, Department of Utilities, Storm Water & Creeks Section, 69 Stony Circle upon appointment.

- E. The PLAN, SUSMP requires that Landowner make and execute this Declaration.

#### DECLARATION OF COVENANTS

NOW, THEREFORE, in consideration of the foregoing recitals, Landowner hereby covenants, agrees and declares as follows:

1. Landowner shall, at Landowner's sole cost and expense, construct, inspect, and maintain the BMP Facilities in accordance with the Plan and the SUSMP. Landowner shall assure that all BMPs remain fully functional and that all areas identified in the Plan and SUSMP for treatment and/or volume capture discharge to the specified BMP as designed.
2. Landowner shall keep all records related to annual inspections of BMP's by City and all records related to BMP maintenance for a period of at least five years. The records shall include records of any BMP Facilities corrections, repairs, and replacements. Landowner shall make these records available to the City upon request.
3. In the event Landowner fails to maintain the BMP Facilities in good working condition as solely determined by the City, the City may enter upon the Property and take whatever steps it deems reasonably necessary to maintain and/or make in good working condition, such BMP Facilities. It is expressly understood that the City is under no obligation to maintain or repair the BMP Facilities, and in no event shall this Declaration be construed to impose such an obligation on the City.
4. In the event that the City performs work of any nature, or expends any funds in the performance of such work for labor, use of equipment, supplies, materials, or the like, due to failure of the Landowner to perform its maintenance obligations under this Declaration, as solely determined by City, Landowner shall reimburse the City within 60 days of receipt of notice for all costs incurred by the City to undertake such work. Costs shall include, but are not limited to, the actual cost of construction, maintenance and/or repair, and administrative costs directly related to such work.
5. Any violation of the Plan or SUSMP by Landowner shall be deemed a public nuisance under Chapter 1-30 of the Santa Rosa City Code and City shall be entitled to the remedies available to it under Chapter 1-30 in addition to those available to it under Chapter 17-12. The remedies identified herein shall be in addition to and cumulative of all other remedies, criminal or civil, which may be pursued by the City.

6. Landowner shall indemnify, defend and hold harmless the City and its employees, officials, and agents, from and against any liability, (including liability for claims, suits, actions, arbitration proceedings, administrative proceedings, regulatory proceedings, losses, expenses or costs of any kind, whether actual, alleged or threatened, interest, defense costs, and expert witness fees), where the same relates to, or arises out of, the construction, presence, existence, inspection, or maintenance of BMP Facilities on the Property or the performance of the covenants underlying this Declaration by Landowner, its officers, employees, agents, contractors or sub-contractors, excepting only that resulting from the sole, active negligence or intentional misconduct of the City, its employees, officials, or agents. This indemnification obligation is not limited in any way by any limitation on the amount or type of damages or compensation payable to or for the Landowner or its agents under workers' compensation acts, disability benefits acts or other employees' benefits acts. If any judgment or claim against the City, its officials, agents, or employees, shall be entered, Landowner shall pay all cost and expenses in connection therewith.
7. If any provisions of this Declaration shall be held to be invalid, illegal or unenforceable, the validity, legality and enforceability of the remaining provisions shall not in any way be affected or impaired thereby.
8. This Declaration shall be governed according to the laws of the State of California. The parties hereto agree that the forum for the adjudication of any dispute related to this Declaration shall be brought exclusively and solely in Sonoma County, California.
9. Landowner shall not assign this Declaration to a third party without the express prior written consent of the City, provided that such consent will not be unreasonably withheld and that such consent shall not be required for Landowner to sell or lease the property to a third party.
10. Landowner binds itself, its partners, successors, legal representatives and assigns to the City, and to the partners, successors, legal representatives and assigns of the City with respect to all promises and agreements contained herein.
11. This Declaration shall be recorded by Landowner, and shall: a) constitute a "covenant running with the land;" b) be binding upon Landowner and Landowner's successors, heirs, and assigns in perpetuity; and, 3) benefit the City of Santa Rosa, its successors, and assigns. Any breach of this Declaration shall render Landowner

or Landowner's heirs, successors or assigns liable pursuant to the provisions of the Santa Rosa City Code.

12. Any notice, submittal or communication required or permitted to be served on Landowner or City may be served by personal delivery to the person or the office of the person identified below. Service may also be made by mail, by placing first-class postage, and addressed as indicated below, and depositing in the United States mail to:

City Representative:

City of Santa Rosa  
Utilities Department  
Storm Water & Creeks Section  
Supervising Engineer  
69 Stony Circle  
Santa Rosa CA 95401

Landowner or Landowner Representative:

Name: \_\_\_\_\_  
Address: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Executed as of the day and year first above stated.

**LANDOWNER:**

Name: \_\_\_\_\_

*Signatures of Authorized Persons:*

By: \_\_\_\_\_

Print Name: \_\_\_\_\_

Title: \_\_\_\_\_

By: \_\_\_\_\_

Print Name: \_\_\_\_\_

Title: \_\_\_\_\_

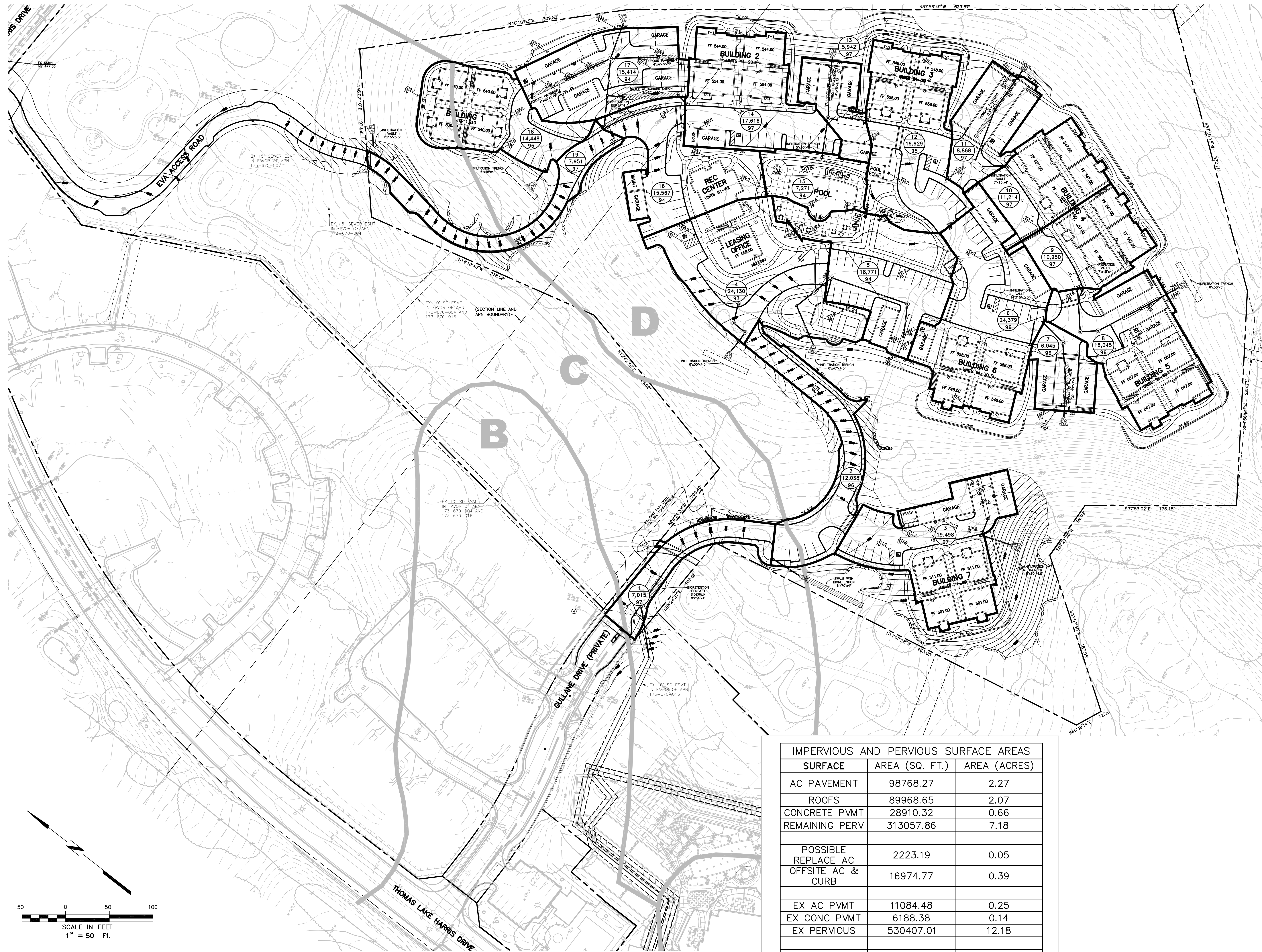
**ATTACHMENTS:**

Exhibit A- Property Description  
Notary Acknowledgment

**Attachment:**  
**SWLID Proposed Conditions Exhibit**

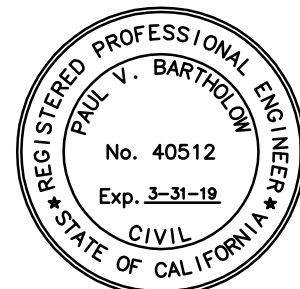


02-13-19 ferrel \\081.dwg 4081.04 EXHIBIT-SWLD-Proposed Conditions.dwg TAB: SWLD MAP



IMPERVIOUS AND PERVIOUS SURFACE AREAS		
SURFACE	AREA (SQ. FT.)	AREA (ACRES)
AC PAVEMENT	98768.27	2.27
ROOFS	89968.65	2.07
CONCRETE PVMT	28910.32	0.66
REMAINING PERV	313057.86	7.18
POSSIBLE REPLACE AC	2223.19	0.05
OFFSITE AC & CURB	16974.77	0.39
EX AC PVMT	11084.48	0.25
EX CONC PVMT	6188.38	0.14
EX PERVIOUS	530407.01	12.18
TOTAL PARCEL	547679.87	12.57

**Brelje & Race**  
CONSULTING ENGINEERS  
475 Aviation Boulevard, Suite 120  
Santa Rosa, CA 95403  
v: 707-576-1322  
f: 707-576-0469  
www.brce.com



## EMERALD ISLE

GULLANE DRIVE  
SANTA ROSA, CALIFORNIA

### LEGEND

- DMA BOUNDARY
- APPROXIMATE SOIL TYPE BOUNDARY
- SOIL TYPE REFERENCE
- DMA AREA LABEL

**PRELIMINARY**  
FOR STUDY PURPOSES ONLY  
DATE 11-27-18

REVISIONS		
NO.	DATE	DESCRIPTION

ON A FULL-SCALE DRAWING, LENGTH OF BAR BELOW IS 1-INCH. IF BAR MEASURES LESS THAN 1-INCH, THIS SHEET WAS PLOTTED AT A REDUCED SCALE, WHICH MAY REQUIRE ADJUSTMENT OF SCALE(S) SHOWN ON DRAWING.

PROJECT 4081.04	DATE FEBRUARY 2019
DRAWN BY AWR	CHECKED BY AJF

### SWLD PROPOSED CONDITIONS EXHIBIT

SHEET NO.

1 OF 1