



Stormwater Treatment Control BMP Monitoring and Maintenance Plan

Avalon Inn

Fort Bragg, California

 **Consulting Engineers & Geologists, Inc.**

335 S. Main Street

Willits, CA 95490-3977

707-459-4518

January 2019

414054

Bio-retention Facilities

1.0 Introduction

Maintenance of the bioretention areas for the Avalon Inn are the responsibility of the property owner/manager. This maintenance plan was developed to assure proper maintenance procedures are followed and documented. After the first year of operation, the plan should be reviewed and, if necessary, revised to reflect the actual results of that first period of service. If ownership/management of the property is transferred, this maintenance plan must be transferred as well.

In general, maintenance of permeable pavement consists of monitoring the surface for sediment buildup and removing that buildup, as needed, to maintain the pavement's permeability. Regular and proper maintenance, including basic good housekeeping practices, ensures that each bioretention area will serve as an effective storm water management system for the entirety of its useful life.

2.0 Routine Maintenance Activities

The principal maintenance objective is to prevent sediment buildup and clogging, which reduces pollutant removal efficiency and may lead to bioretention area failure. Routine maintenance activities, and the frequency at which they will be conducted, are shown in Table 1.

No.	Maintenance Task	Frequency of Task
1	Remove obstructions, weeds, debris and trash from bioretention area and its inlets and outlets; and dispose of properly.	Monthly, or as needed after storm events
2	Inspect bioretention area for standing water. If standing water does not drain within 5 days, check if drains are clogged and consider replacement of surface biotreatment soil with the approved soil mix and replant.	Monthly, or as needed after storm events
3	Inspect inlets for channels, soil exposure, or other evidence of erosion. Clear obstructions and remove sediment.	Monthly, or as needed after storm events
4	Prune and weed the bioretention area as needed. Remove and replace all dead and diseased plants.	Twice a year

Table 1 Routine Maintenance Activities for Bioretention Areas, Cont'd.		
No.	Maintenance Task	Frequency of Task
5	Check that mulch is at appropriate depth (2 - 3 inches per soil specifications) and replenish as necessary before wet season begins. It is recommended that 2" – 3" of arbor mulch be reapplied every year.	Annually, before the wet season begins
6	Inspect bioretention area using the attached inspection checklist.	Monthly, or after large storm events

3.0 Prohibitions

Within the bioretention basin, the use of rodenticides containing any anti-coagulant compounds is prohibited.

Only native plants shall be planted within the bioretention basin. All proposed plantings shall be obtained from local genetic stocks within Mendocino County unless documentation is provided to the Executive Director of the Coastal Commission demonstrating that such vegetation is unavailable. In such cases, native vegetation obtained from genetic stock outside of the local area may be used.

No plant species listed as problematic and/or invasive by the California Native Plant Society, the California Invasive Plant Council, or as may be identified from time to time by the State of California shall be employed or allowed to naturalize or persist on the site.

No plant species listed as a "noxious weed" by the State of California or the U.S. Federal Government shall be planted or allowed to naturalize or persist on the site.

4.0 Documentation

A maintenance log shall be maintained by the property owners to document all inspection observations and maintenance activities related to the bioretention area (see Appendix A for a sample maintenance checklist). The maintenance log shall be available for inspection upon request by either the County of Mendocino or the Executive Director of the Coastal Commission.

Porous Asphalt

1.0 Introduction

Maintenance of the porous asphalt at the Avalon Inn is the responsibility of the property owner/manager. This maintenance plan was developed to assure proper maintenance procedures are followed and documented. After the first year of operation, the plan should be reviewed and, if necessary, revised to reflect the actual results of that first period of service. If ownership/management of the property is transferred, this maintenance plan must be transferred as well.

In general, maintenance of permeable pavement consists of monitoring the surface for sediment buildup and removing that buildup, as needed, to maintain the pavement's permeability. Regular and proper maintenance, including basic good housekeeping practices, ensures that the porous asphalt surface will serve as an effective storm water management system for the entirety of its useful life.

2.0 Infiltration Testing

Infiltration testing shall be performed to determine initial functionality of the permeable pavement, as well as ongoing performance. Immediately following the completion of construction, an infiltration test shall be conducted to establish a baseline infiltrative capacity. Testing shall be conducted annually, thereafter, to determine the necessary frequency of preventative or restorative maintenance during the life of the pavement. Typically, an average infiltration rate decrease of 25% from the initial value indicates the need for deep cleaning/unclogging.

ASTM has established a testing method for determining the infiltration rate in areas of permeable concrete, ASTM Standard C1701, which may be used to evaluate the performance of the porous asphalt at the boat launch facility. However, a simpler and less resource-intensive testing method outlined below may also be used.

Materials Needed

- 6 inch segment of 12-inch diameter PVC pipe on end with 1 inch depth marked inside
- 5 gallon bucket filled to 10 inch depth with clean water (~3.4 gallons)
- Plumber's putty (as needed)
- Stopwatch

Setup

Sweep the pavement in the area to be tested, removing any large debris. Place a 1-inch wide bead of plumber's putty around one end of the 12 inch PVC pipe. Then place the PVC ring, putty-side down, in the area to be tested to prevent lateral leakage from the device. Apply weight to the ring and press the putty into the pavement joints adding additional putty as necessary along the inside or outside edge of the frame to create a watertight seal. Weight, in the form of water buckets, cinder blocks, or body weight, can also be applied to the frame during the testing to help maintain a positive seal.

Test Method

With a stopwatch or timepiece ready, gradually pour the water into the sealed ring and record the time from when water hits the pavement until all ponded water has fully infiltrated the surface. Pour the water in order to maintain approximately a one-inch depth in the ring at all times (constant head) until the bucket is empty.

3.0 Maintenance

Regular maintenance must be performed to prevent the porous asphalt surface and/or underlying infiltration bed from being clogged by fine sediments. To keep the system clean throughout the year and prolong its lifespan, visual inspections should be conducted monthly and regular cleanings should take place at least twice a year. During rainy months, visual inspections should be performed immediately following a storm, allowing the inspector to identify areas of ponding that may require attention.

Planted areas adjacent to porous pavement should be well maintained to prevent soil washout onto the pavement. If any washout does occur, it should be cleaned off the pavement immediately to prevent further clogging of the pores. Furthermore, if any bare spots or eroded areas are observed within the planted areas, they should be replanted and/or stabilized at once. Planted areas should be inspected on a semi-annual basis. All trash and other litter that is observed during these inspections should be removed.

Superficial dirt does not necessarily clog the pavement voids. However, dirt that is ground in repeatedly by tires can lead to clogging. Therefore, trucks or other heavy vehicles should be prevented from tracking or spilling dirt onto the pavement. Furthermore, all construction or hazardous material carriers should be prohibited from entering a permeable pavement lot.

Biannual cleanings shall consist of thorough pressure washing, vacuum sweeping, or some combination of the two over the entirety of the surface. If the surface is to be power washed, the use of excessive pressure should be avoided in order to prevent degradation of the pavement. The use of all chemicals to clean the permeable pavement shall be avoided in order to prevent biological harm as well as pollution of nearby surface and groundwater.

4.0 Repairs

If proper precautions are taken, potholes in permeable pavement are unlikely, though settling may occur if a soft spot in the subgrade is not removed during construction (a specification for the porous asphalt concrete can be found in Appendix A). For damaged areas of less than 10 square feet, a declivity could be patched by any means suitable with standard pavement, with the loss of porosity of that area being insignificant. The declivity can also be filled with porous mix. If an area greater than 10 sf is in need of repair, approval of patch type must be sought from either the engineer or owner to ensure that the surface does not experience a significant loss in infiltration capacity.

Under no circumstance is an area of the pavement surface larger than 10 sf to ever be sealed, coated, or repaved with impervious materials including top coat sealers, asphalt sealers, or crack sealers. Any required repair of drainage structures should be done promptly to ensure continued proper functioning of the system.

The surface shall be inspected for pavement rutting/raveling on an annual basis. Such damage may occur as a result of stationary wheel rotation. Appropriate repairs, consistent with the guidelines stated above, should be made as needed.

5.0 Documentation

A maintenance log shall be created and maintained by the property owner to document all testing dates, inspection observations, and maintenance activities related to the porous asphalt (see Appendix B for a sample maintenance log). The maintenance log shall be available for inspection upon request by either the County of Mendocino or the Executive Director of the Coastal Commission.

A

Sample Bio-retention Maintenance Checklist

**Bioretention Area
Inspection and Maintenance Checklist**

Date of Inspection: _____

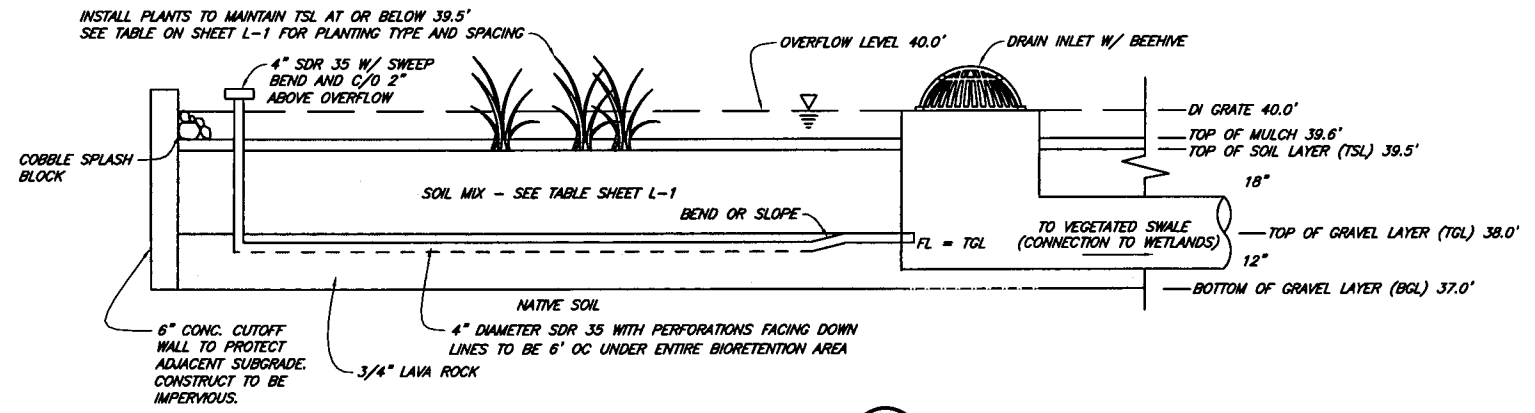
Type of Inspection: Quarterly PreWet Season
 After heavy runoff End of Wet Season
 Other: _____

Inspector(s): _____

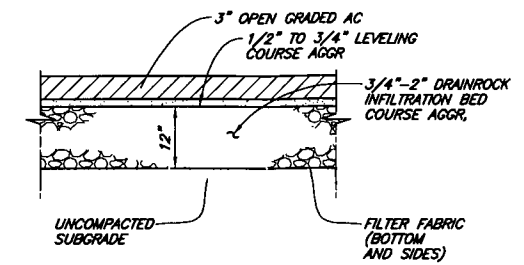
Defect	Conditions When Maintenance Is Needed	Maintenance Needed? (Y/N)	Comments (Describe maintenance completed and if needed maintenance was not conducted, note when it will be done)	Results Expected When Maintenance Is Performed
1. Standing Water	Water stands in the bioretention area between storms and does not drain within 5 days after rainfall.			There should be no areas of standing water once storm event has ceased. Any of the following may apply: sediment or trash blockages removed, improved grade from head to foot of bioretention area, or added underdrains.
2. Trash and Debris Accumulation	Trash and debris accumulated in the bioretention area, inlet, or outlet.			Trash and debris removed from bioretention area and disposed of properly.
3. Sediment	Evidence of sedimentation in bioretention area.			Material removed so that there is no clogging or blockage. Material is disposed of properly.
4. Erosion	Channels have formed around inlets, there are areas of bare soil, and/or other evidence of erosion.			Obstructions and sediment removed so that water flows freely and disperses over a wide area. Obstructions and sediment are disposed of properly.
5. Vegetation	Vegetation is dead, diseased and/or overgrown.			Vegetation is healthy and attractive in appearance.
6. Mulch	Mulch is missing or patchy in appearance. Areas of bare earth are exposed, or mulch layer is less than 2 inches in depth.			All bare earth is covered, except mulch is kept 6 inches away from trunks of trees and shrubs. Mulch is even in appearance, at a depth of 2 – 3 inches.
7. Miscellaneous	Any condition not covered above that needs attention in order for the bioretention area to function as designed.			Meets the design specifications.



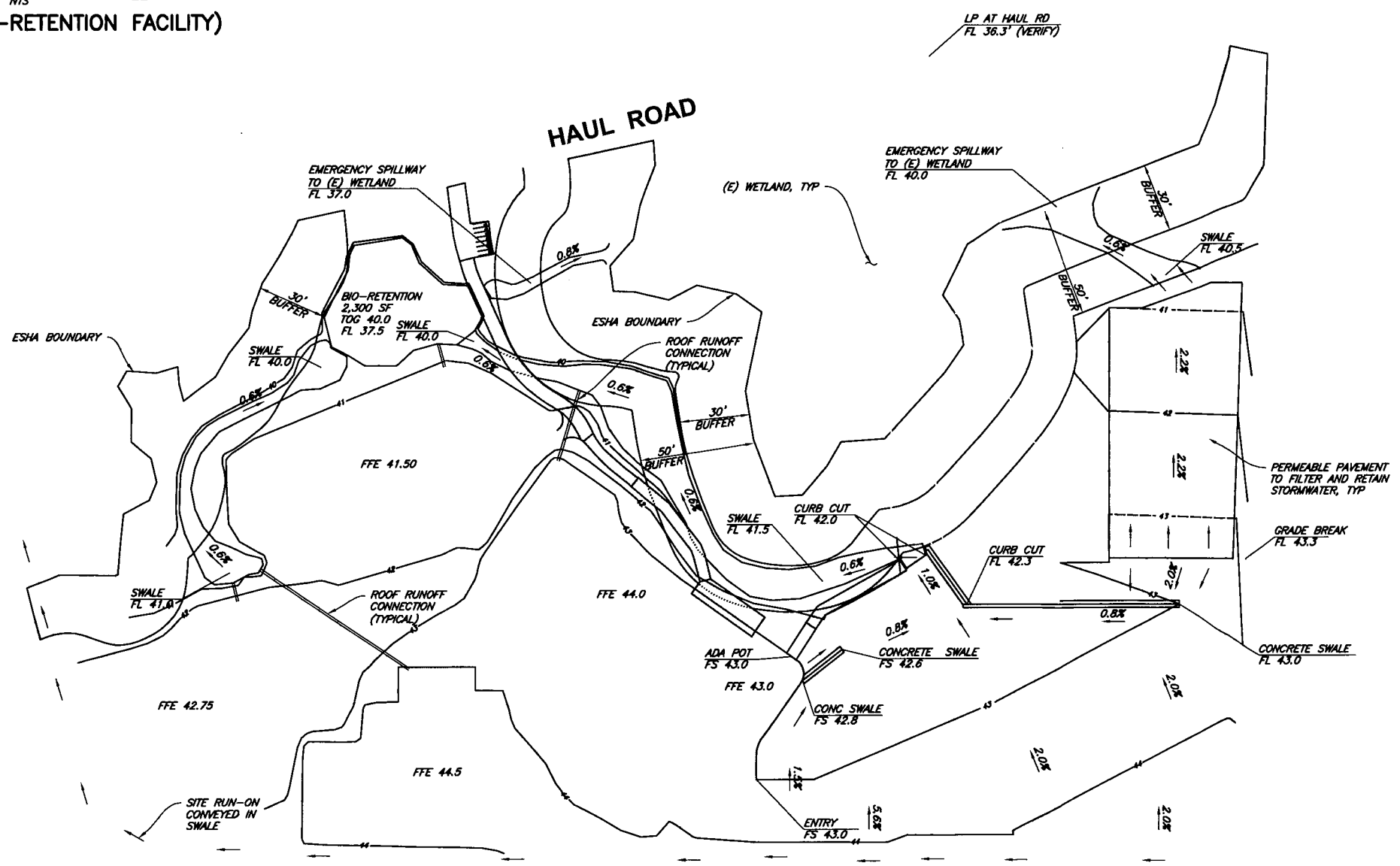
Sample Porous Asphalt Maintenance Checklist



DETAIL 1
NTS
(BIO-RETENTION FACILITY)



DETAIL 2
NTS
(PERMEABLE PAVEMENT)



HIGHWAY 1 NORTH

PLAN
1"=30'



SAVED: 1/18/2019 11:35 AM JISLAND, PLOTTED: 1/21/2019 9:38 AM JASON ISLAND
C:\My Documents\Projects\414054-Avalon\Drawings\414054-CIVIL.dwg

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
0 1" = 10'-0" INCH ON PLANS
1" = 1'-0" INCH ON SECTIONS, ACCORDINGLY

CONSULTING ENGINEERS & GEOLOGISTS, INC.
WWW.SHN-ENGR.COM
335 S. MAIN ST.
WILMITS, CA. 95490
707-459-4518

SHN

DESIGN	JGI	BY	
DR	SRH	REVISION	
CHK		DATE	
APP'D		NO.	

HUNT INVESTMENTS
AVALON INN
1201 N. MAIN STREET, FORT BRAGG, CA
STORMWATER MANAGEMENT PLAN
JANUARY 2019 REVISION

SHEET **C-1**
SEQ 1
DATE 01/2019
PROJ. NO. 414054



Stormwater LID

Calculations

Avalon Inn

Fort Bragg, California

Avalon Inn

4/4/2018

Bio-Retention Facility Sizing Calculations

1 DMA Name (Drainage Management Area)	2 DMA (sq. ft.)	3 Runoff Factor	4 DMA Area (Col. 2 x Col. 3)	6 Standard Sizing Factor	6 Minimum Facility Size (Col. 5 x Col. 6)
Buildings	27930	1	27930	0.04	1117
Paths	7460	0.5	3730	0.04	149
Parking Lot	22330	1	22330	0.04	893

**Total Area
Required** **2160** Sq. Ft.

