Brian D. Williams, CPESC










2013. 9.20 9:41


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08/06/2013 12:13


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16

Good perimeter protection is your primary defense!!

EPA
United States Environmental Protection Agency New England

Incorporating Low Impact Development into Municipal Stormwater Programs

EPA 901-F-09-005

April 2009

Executive Summary

Managing stormwater with Low Impact Development (LID) techniques can help jurisdictions meet National Pollutant Discharge Elimination System (NPDES) requirements, reduce construction costs, and provide a variety of other benefits over traditional stormwater management approaches. The goal of LID is to reduce runoff and to mimic a site's predevelopment hydrology by infiltrating, filtering, storing, evaporating, and detaining stormwater runoff. LID employs principles such as preserving and recreating natural landscape features and minimizing imperviousness to create functional and appealing site drainage that treat stormwater as a resource, rather than a waste product. There are many practices that have been used to adhere to these principles such as bioretention facilities, rain gardens, vegetated rooftops, rain barrels, and permeable pavements. LID practices need to be sited and designed carefully and work in conjunction with other stormwater management efforts.

This fact sheet describes the benefits of LID, and various types of LID practices. It also discusses the importance of good land use planning and outlines steps that municipalities and/or developers could take to implement LID.

Stormwater and TMDLs

In New England, many streams are impaired by stormwater and, as a result, a total maximum daily load (TMDL) water quality study is required. Research has shown that there is a strong correlation between pollutant loads, stormwater flows, and runoff from impervious landcover in the watershed. Therefore, TMDLs have been developed using Impervious Cover (IC) as a surrogate parameter for a mix of pollutants conveyed by stormwater. Using LID techniques and other best management practices (BMPs) will help with the implementation of these TMDLs and result in restored water quality. Additional information on incorporating green infrastructure and/or LID concepts into TMDLs and implementing stormwater TMDLs can be found at:

http://www.epa.gov/owow/tmdl/stormwater/pdf/tmdl_lid_final.pdf

http://www.epa.gov/region1/eco/tmdl/assets/pdfs/Stormwater-TMDL-Implementation-Support-Manual.pdf

Green Infrastructure: Management approaches and technologies that infiltrate, evapotranspire, capture and reuse stormwater to maintain or restore natural hydrology. At the largest scale, green infrastructure approaches also work to preserve and restore natural landscape features (e.g., forests, floodplains, wetlands).

Introduction

As more undeveloped land is being converted to impervious surfaces, it becomes increasingly important to consider the effects of construction and land development on water resources. The effects of urbanization on water resources are well known and include degraded habitat, incised channels, impaired aquatic life, high pollutant loads, depleted and contaminated groundwater, and higher incidence of flooding, among others. The mid-20th century approach to stormwater management—to dispose of stormwater using engineered systems of curbs, gutters, pipes, and open channels—resulted in significant damage to water quality. Recently, new approaches have evolved to mitigate effects and reverse damage caused by existing development. These approaches, commonly referred to as LID, focus on emulating the functions of natural systems to reintegrate rainfall into the water cycle. LID is an approach to land development (or redevelopment) that works with nature to manage stormwater as close to its source as possible.

LID is an environmentally sensitive approach to stormwater management. By implementing LID principles and practices, water can be managed in a way that reduces the effects of built areas and promotes the natural movement of water in an ecosystem or watershed. Applied on a broad scale, LID can maintain or restore a watershed's hydrologic and ecological functions and provide numerous other environmental, economic, and social benefits.

Benefits of LID

- Reduce urban heat island effect
- Increase aquifer recharge
- Reduce stream temperatures
- Reduce treatment costs
- Improve water quality
- Reduce flooding and sewer overflows
- Reduce energy and water use
- Add green space
- Increase base flow to streams
- Reduce costs
- Manage stormwater

LID, in the broader view, includes land use strategies. To fully protect water resources, communities should consider incorporating a wide range of environmentally sound land use strategies—such as maintaining natural resource areas, preserving critical ecological and buffer areas, minimizing land disturbance, minimizing impervious cover, and following smart growth principles.

Smart growth is development that serves the economy, the community, and the environment. It changes the terms of the development debate away from the traditional growth/no-growth questions to "how and where should new

Where Are We Going With All Of This?

- Low Impact Development
- Green Infrastructure
- Stormwater Issues

Definitions

Bioretention = held indefinitely

Biodetention = held temporarily

Low impact development (LID) = mimicking pre-development runoff

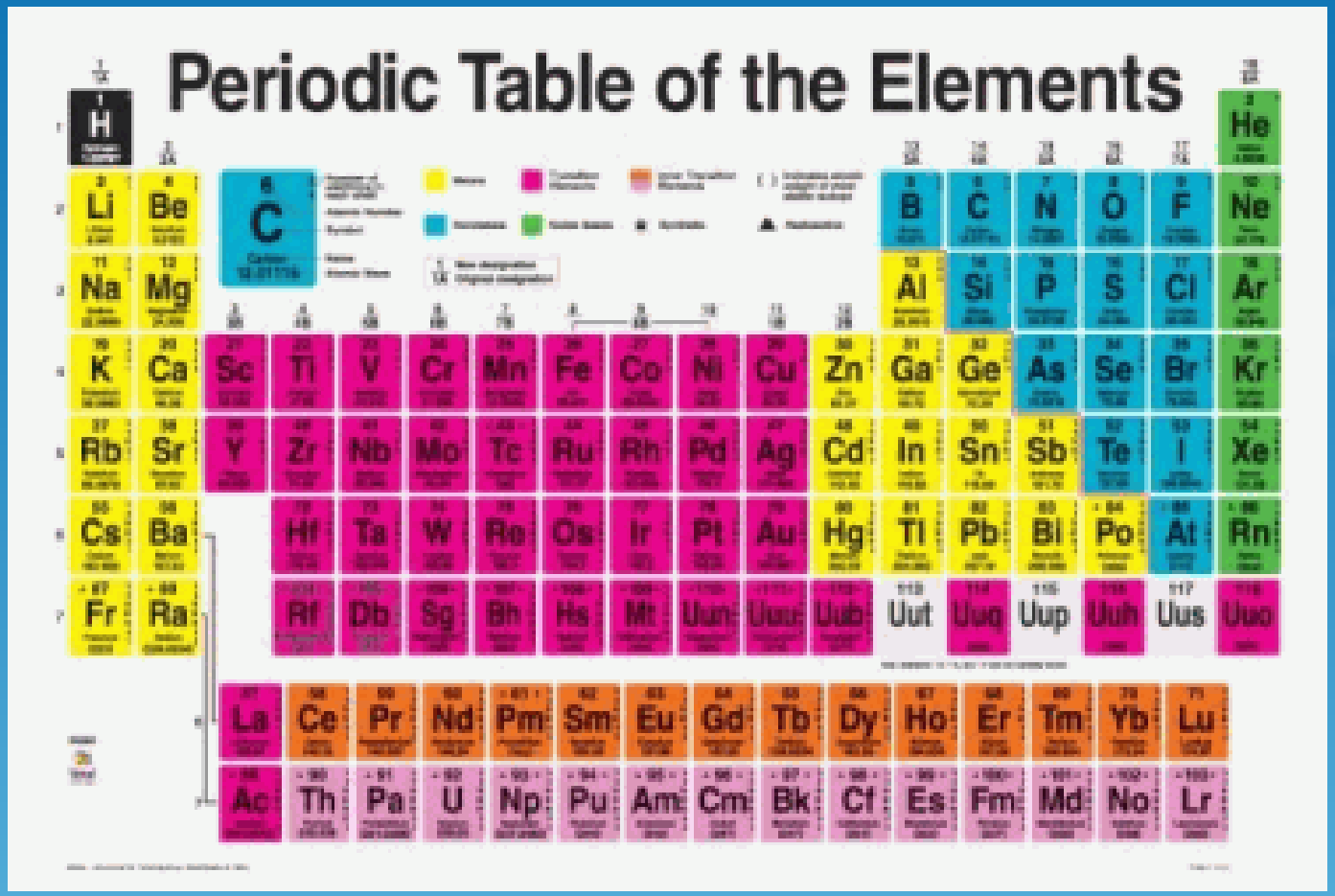
Volume reduction (No. 1 issue in many metro areas)

You Want This but...

…You May Get This!

BMP Options – The Future

- Underground Retention/Detention
- Bio-detention/Raingarden
- Surface Sand Filter/Pocket Sand Filter
- Organic Filter
- Pervious Asphalt/Concrete/Pavers
- Catch Basin Inserts
- Detention/Retention Basin
- Bio-Swale
- Filter Strip


Periodic Table of the Elements
H
He
Li
Be
B
C
N
O
F
Ne
Na
Mg
Al
Si
P
S
Cl
Ar
K
Ca
Sc
Ti
V
Cr
Mn
Fe
Co
Ni
Cu
Zn
Ga
Ge
As
Se
Br
Kr
Rb
Sr
Y
Zr
Nb
Mo
Tc
Ru
Rh
Pd
Ag
Cd
In
Sn
Sb
Te
I
Xe
Cs
Ba
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Ta
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Er
Tm
Yb
Lu
Ac
Th
Pa
U
Np
Pu
Am
Cm
Bk
Cf
Es
Fm
Md
No
Lr

	5 detention pond	8 retention pond	11 surface sand filter		15 infiltration trench	18 riparian buffer	21 constructed wetland	
2 flow control devices	4 underground detention	7 rainwater harvesting	10 underground sand filter	13 vegetated roof	14 pervious paving	17 rain garden	20 infiltration basin	
1 oversized pipes	3 dry swale	6 wet vault	9 filter strip	12 vegetated wall		16 tree box filter	19 bioswale	

increasing level of volume reduction

rom mechanical → to biological

LID facilities menu

Major Considerations

BMP types are keyed to the difference between:

- Linear projects (e.g. roads and highways)
- Multi-lot developments
- Single use sites

BMPs must be:

- Constructible within site dimensions and topography
- Maintainable within available access paths
- Aesthetically pleasing (or at least not objectionable!)

Design Considerations

Hydraulics and Sediment Transport:

- Hydraulics (plus Hydrology): How much water, how fast it's moving.
- Sediment Transport – how much is it carrying? That's the suspended solids that we want to remove!
- No sediment no BMP's!
- Know sediment know BMP's

Designing for Life Cycle Costs

- This consideration will lead right to maintenance. Mainly, remember it's not just the construction cost that counts!

Design Considerations

Enemies of BMPs:

- Erosion – if it erodes, it won't do its job and may make things worse (erosion *here* is sediment *there*).
- Chemicals – that's a two-way street, chemicals may harm BMP vegetation, but the right vegetation removes many chemicals. We also have little control except prevention and plant selection for resistance.
- Drought – problematic initially, less so after the vegetation is established.

Design Considerations

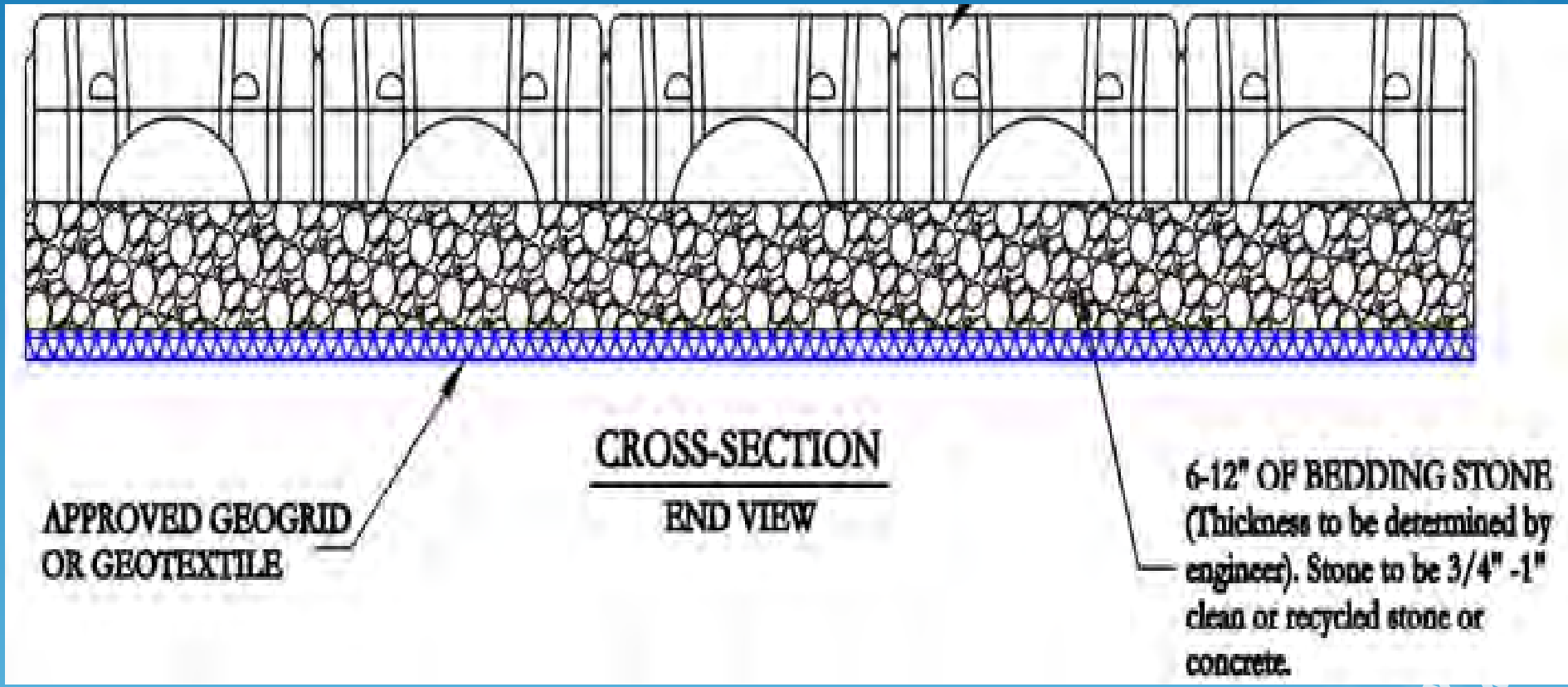
Proprietary Systems – Pros

- Very small footprint, needs less ROW
- Vendor-aided design including design aids, software and hand holding
- May be less expensive to install

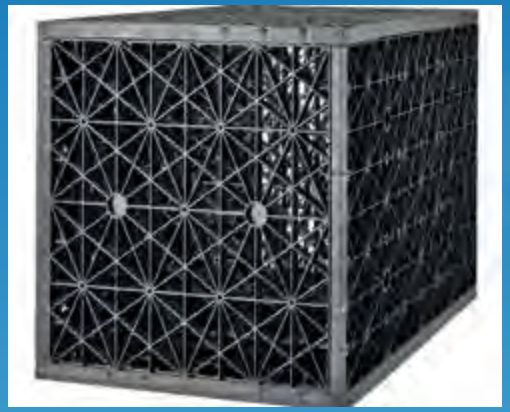
Proprietary Systems – Cons

- High acquisition cost
- Dependent on vendor/manufacturer for replacement parts and maintenance components (i.e. cartridges, filters etc.)
- No Reduction in Runoff Volume!! – missing one of the key objectives of BMPs

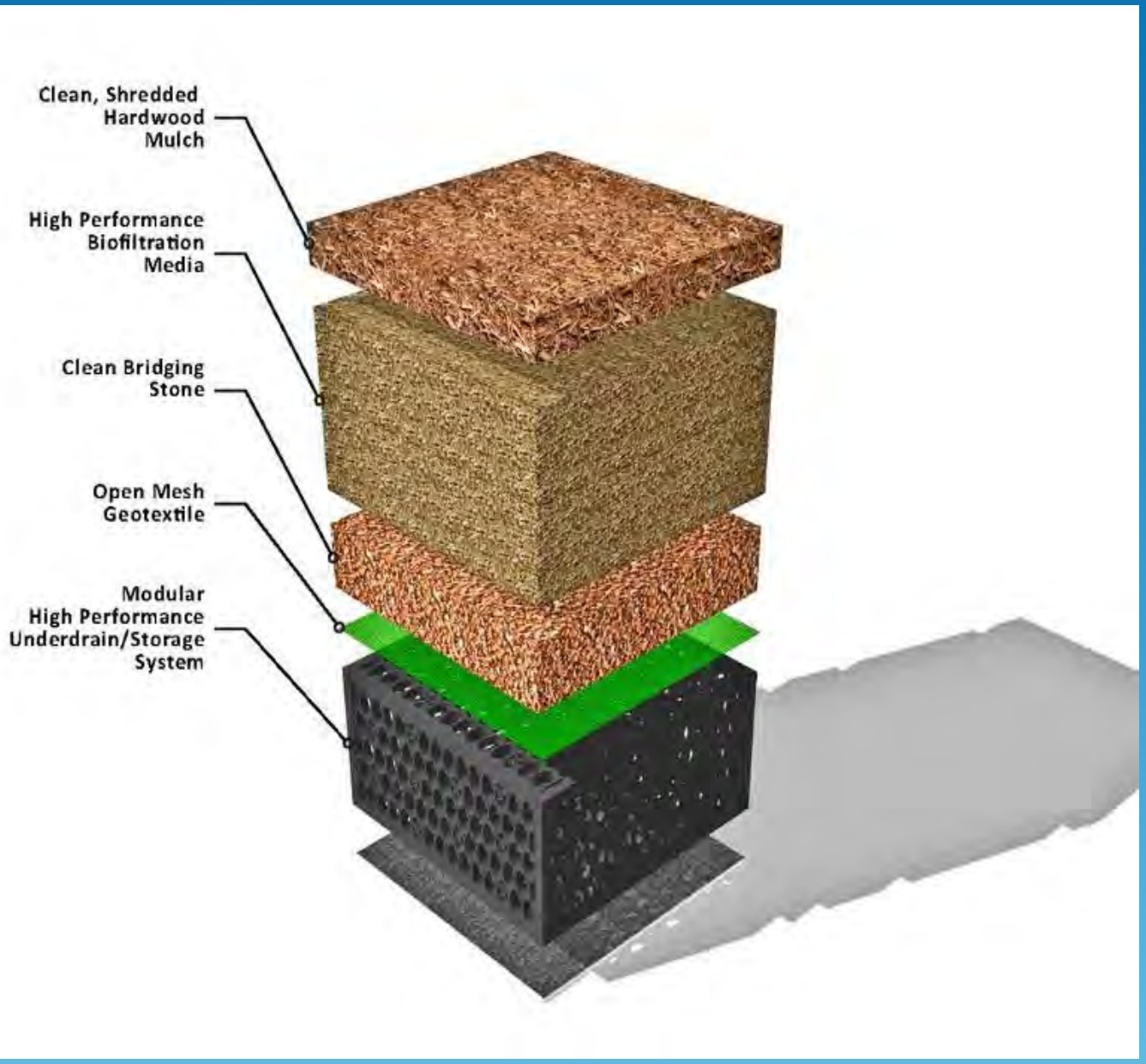
Typical PaveDrain Cross- Section



Atlantis Raintanks



Stormtech Chambers


Clean, Shredded Hardwood Mulch
High Performance Biofiltration Media
Clean Bridging Stone
Open Mesh Geotextile
Modular High Performance Underdrain/Storage System

FocalPoint

Stormceptor

Bay Separator

Temporary Inlet Protection

- **Curb Inlets**
- **Area Inlets**
- **Grated Inlets**

- **NOT Meant to be used alone!!**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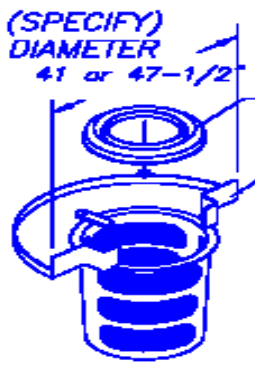
SEWER


CAUTION

HIGH CAPACITY CURB INLET BASKET FOR FDOT TYPES 3 AND 4 TOPS



DETAIL OF PARTS
FIGURE 1

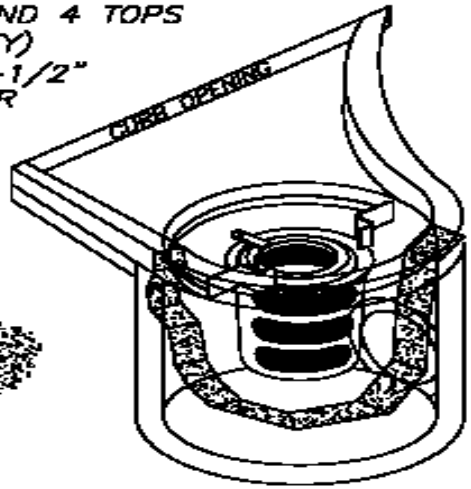
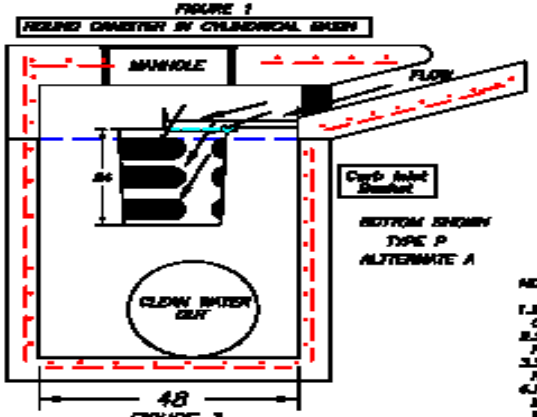


FIGURE 2
DETAIL OF INSTALLATION



BOTTOM SHOWN
TYPE P
ALTERNATE A

FIGURE 3
DETAIL OF PROCESS

REMOVABLE BASKET CATCHES EVERYTHING AND MAY BE REMOVED THROUGH MANHOLE WITHOUT ENTRY.

TOP SIDE	1	138.88	5.90	2.48
CENTER SIDE	.82	120.38	11.8	2.95
BOTTOM SIDE	.38	186.80	17.80	3.17
BOTTOM	.28	63.14	20.67	2.11
TOTAL				11.66

NOTES:

1. SHELF SYSTEM PROVIDES FOR ENTIRE COVERAGE OF INLET OPENING SO TO DIVERT ALL FLOW TO BASKET.
2. SHELF SYSTEM MANUFACTURED FROM MARINE GRADE FIBERGLASS, GEL COATED FOR UV PROTECTION.
3. SHELF SYSTEM ATTACHED TO THE CURB SIDE WITH NON-CORRODING HARDWARE.
4. FILTRATION BASKET STRUCTURE MANUFACTURED OF MARINE GRADE FIBERGLASS, GEL COATED FOR UV PROTECTION.
5. FILTRATION BASKET FINE SCREEN AND COARSE CONTAINMENT SCREEN MANUFACTURED FROM STAINLESS STEEL.
6. FILTRATION BASKET HOLDS BOOM OF ABSORBENT MEDIA TO CAPTURE HYDROCARBONS. BOOM IS EASILY REPLACED WITHOUT REMOVING HOUSING HARDWARE.
7. FILTRATION BASKET LOCATION IS DIRECTLY UNDER MANHOLE FOR EASY MAINTENANCE.

5 YEAR MANUFACTURERS WARRANTY

PATENTED

ALL FILTER SCREENS ARE STAINLESS STEEL

SUNTREE QUALITY PRODUCTS ARE BUILT FOR EASY CLEANING AND ARE DESIGNED TO BE PERMANENT INSTALLATIONS AND SHOULD LAST FOR DECADES

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TEL. 321-637-7554 FAX 321-637-7594

HIGH CAPACITY BASKET SYSTEM

DATE: 01/26/09 | SCALE: 3" = 1'

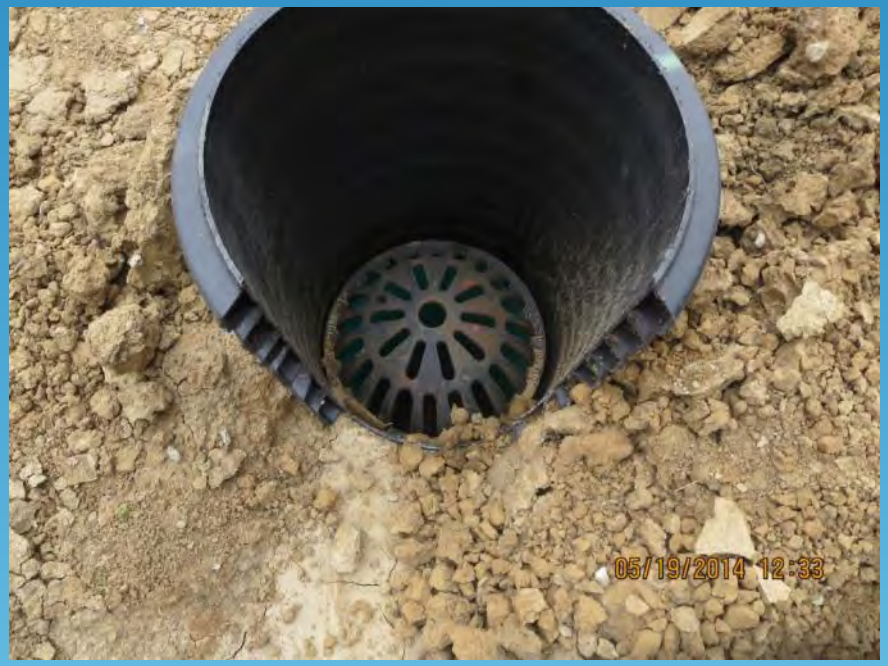
DRAFTER: N.R.S. | UNITS -INCHES


NO DUMPING

CITY OF OMAHA
SEWER


CAUTION
07/07/2008

Area Inlets



Grated Inlets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Blocksom Filters

Flexstorm


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Clean Solutions for Omaha
ITY OF OMAHA
"YOUR SEWER USE
FEES AT WORK"
ROJECT NUMBER / COST
OPW51497 / 1,844,888.24
CONTRACTOR / PHONE NO.
HEIMES CORP. / 402-894-1000
ENGINEER
PUBLIC WORKS DEPT.
24TH & OGDEN STREET
OMA20090319-961-2
CITY OF OMAHA/CITY OF OMAHA
This area operates under NPDES Permit NER 100000 and a Storm Water Pollution Prevention Plan (SWPPP). To view the SWPPP and Permit information contact:
Design Division
402-444-3390
All contractors/operators must adhere to the SWPPP Permit information and SWPPP can also be viewed at:

Bio-Degradable Wattles

CASE
05/19/2014 12:12


Tyvek
Tyvek
Tyvek
05/19/2014 12

GRANITE environmental

Wattle Installation

Erosion Control Wattle Installation Guide

Below you find the typical installation for straw and coconut coir wattles. Installation requirements and methods may vary depending on the specifications of your location.

STEP 1: Dig a small trench where the wattles need to be placed. Trenches are generally anywhere from 2" to 5" in size depending on the soil in your location (soft or hard) and the diameter of the wattle.

Vertical Spacing General Guideline:

1:1 Slopes– 10 ft. Apart

2:1 Slopes– 20 ft. Apart

3:1 Slopes– 30 ft. Apart

4:1 Slopes– 40 ft. Apart

STEP 2: Place the wattles in the trench and backfill with soil so that wattles are tightly packed within the slope. Wattles should be joined together tightly so that one end is tightly packed against the end of the adjacent wattle. Ends of the wattles can be tied together, but they should not be overlapping.

STEP 3: Stake the wattles along each end and every 4 ft. on center. Stakes should be driven through the center of the wattle until only 2-3" of the stake is visible. The first stake on the end of the second wattle should be angled towards the first wattle for a more secure joining.

Stake Placement:

Flat Areas– Stakes should be placed straight down into the ground

Slopes– Stakes should be placed perpendicular to the slope

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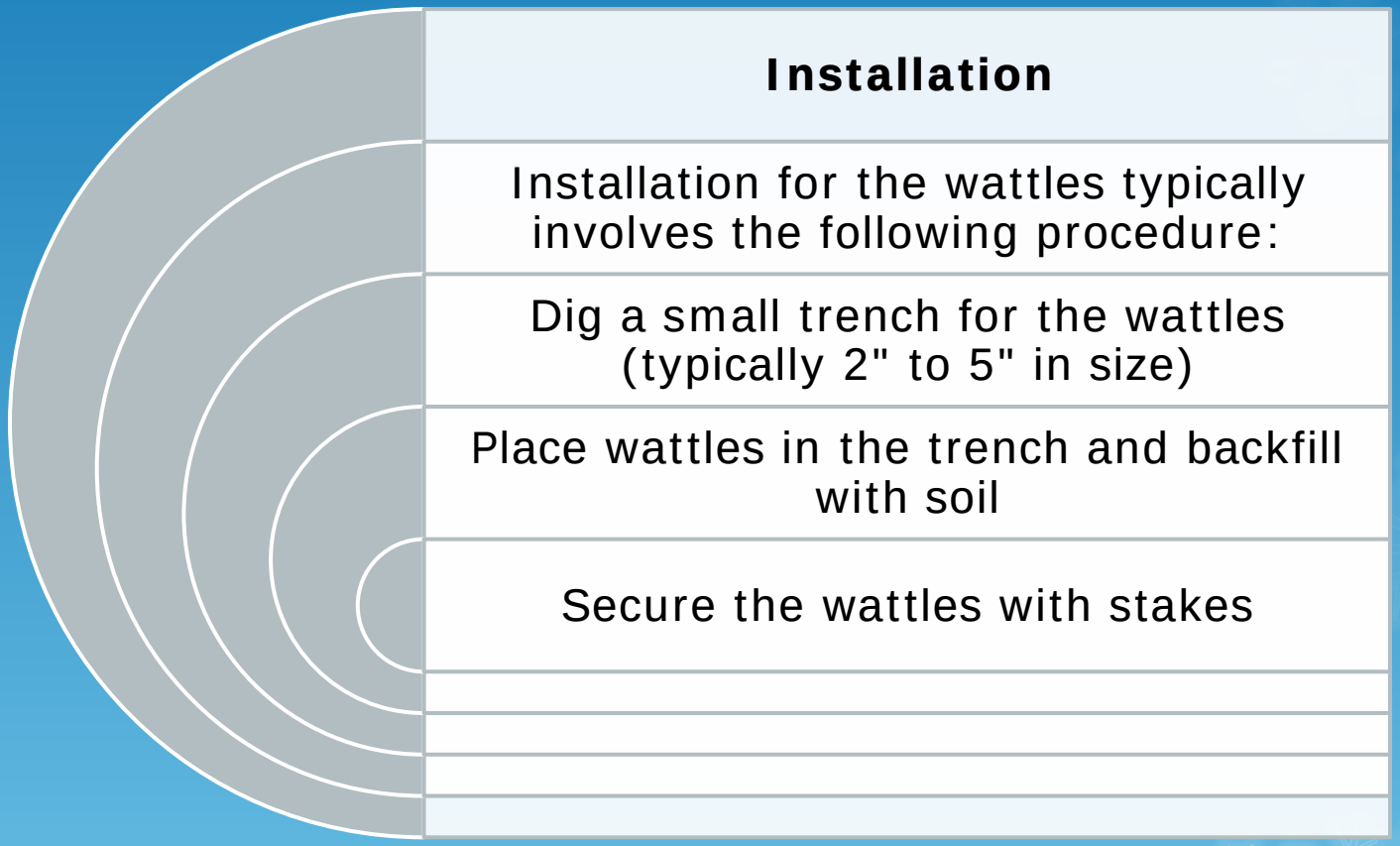


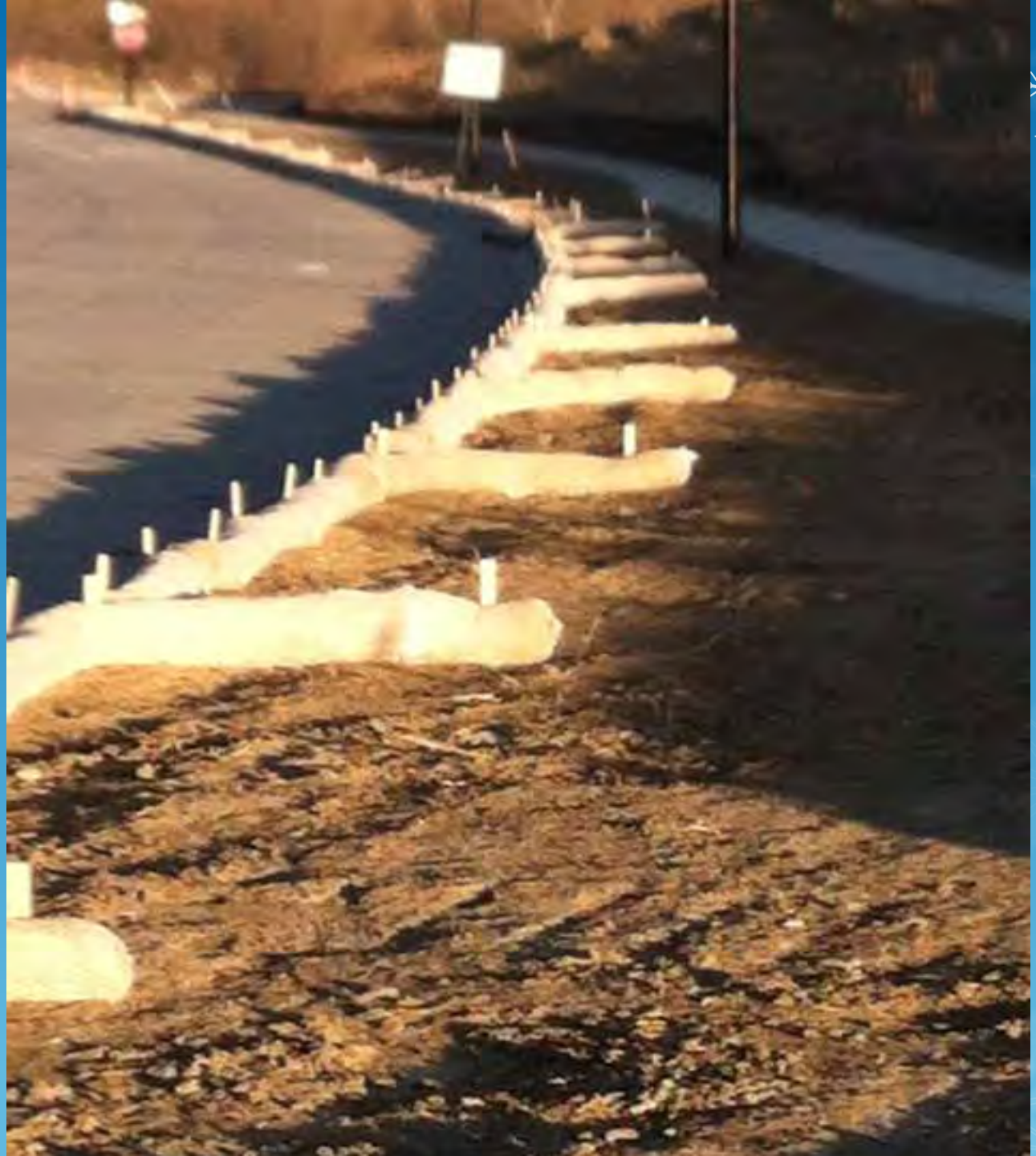
Installation

Installation for the wattles typically involves the following procedure:

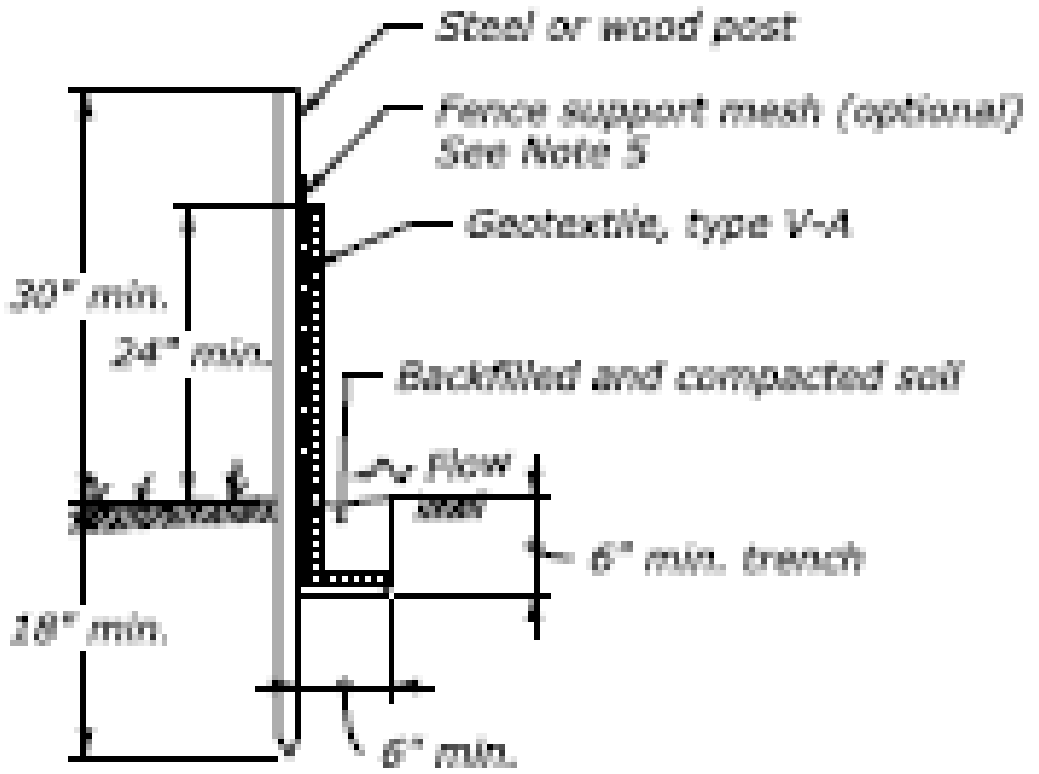
Dig a small trench for the wattles (typically 2" to 5" in size)

Place wattles in the trench and backfill with soil

Secure the wattles with stakes



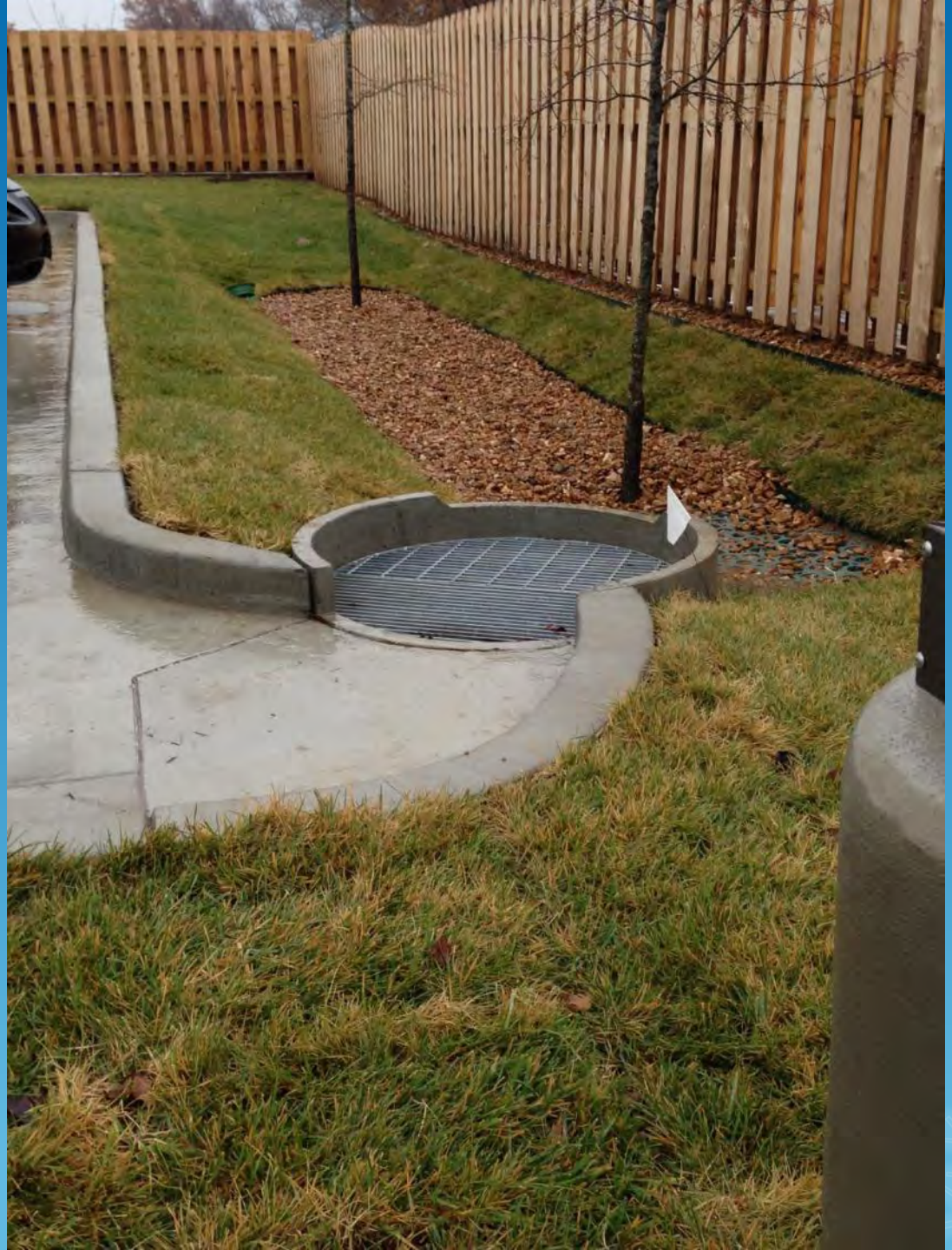
Silt fence

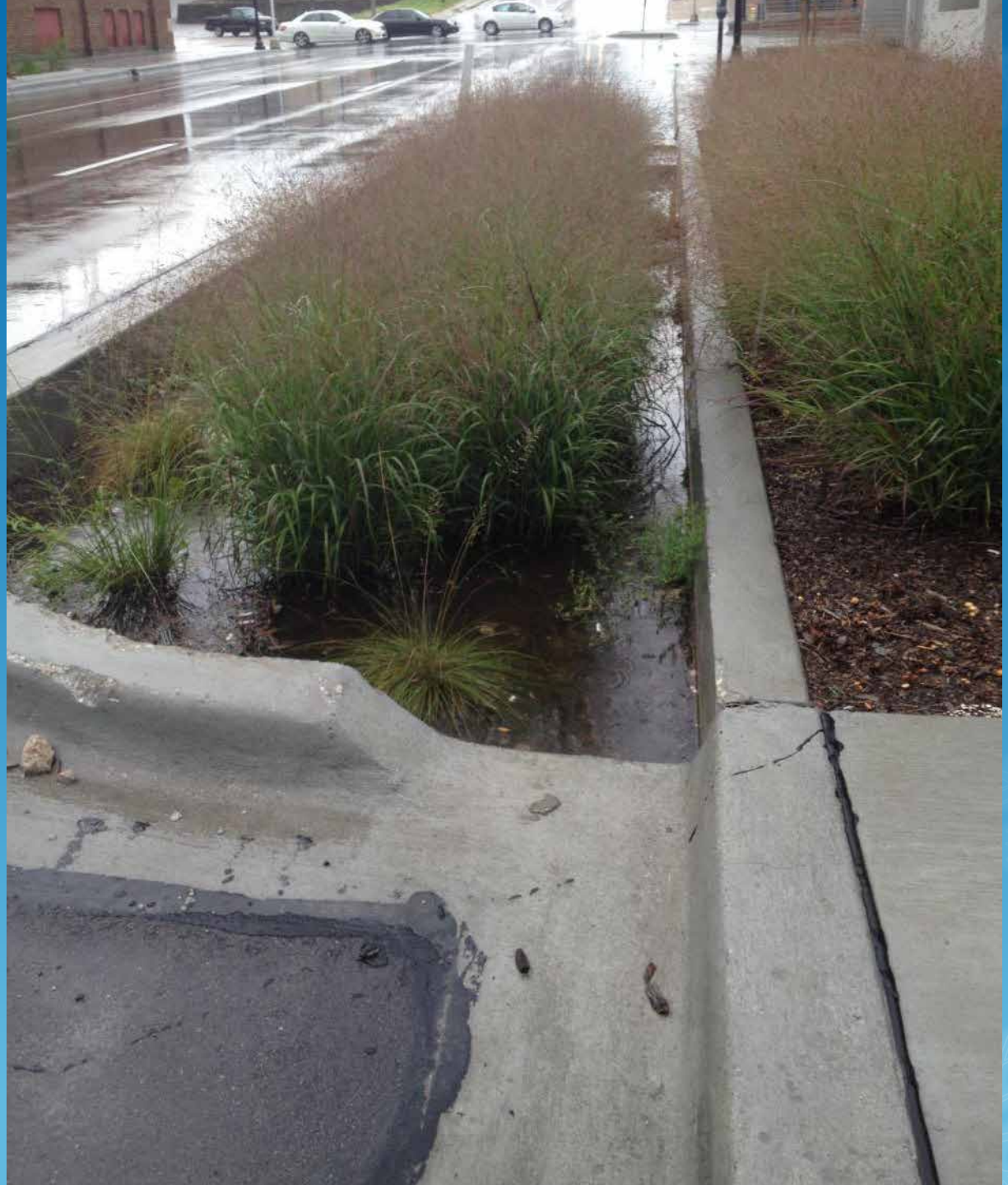


POST AND GEOTEXTILE INSTALLATION DETAIL


XTS


FARMLAND





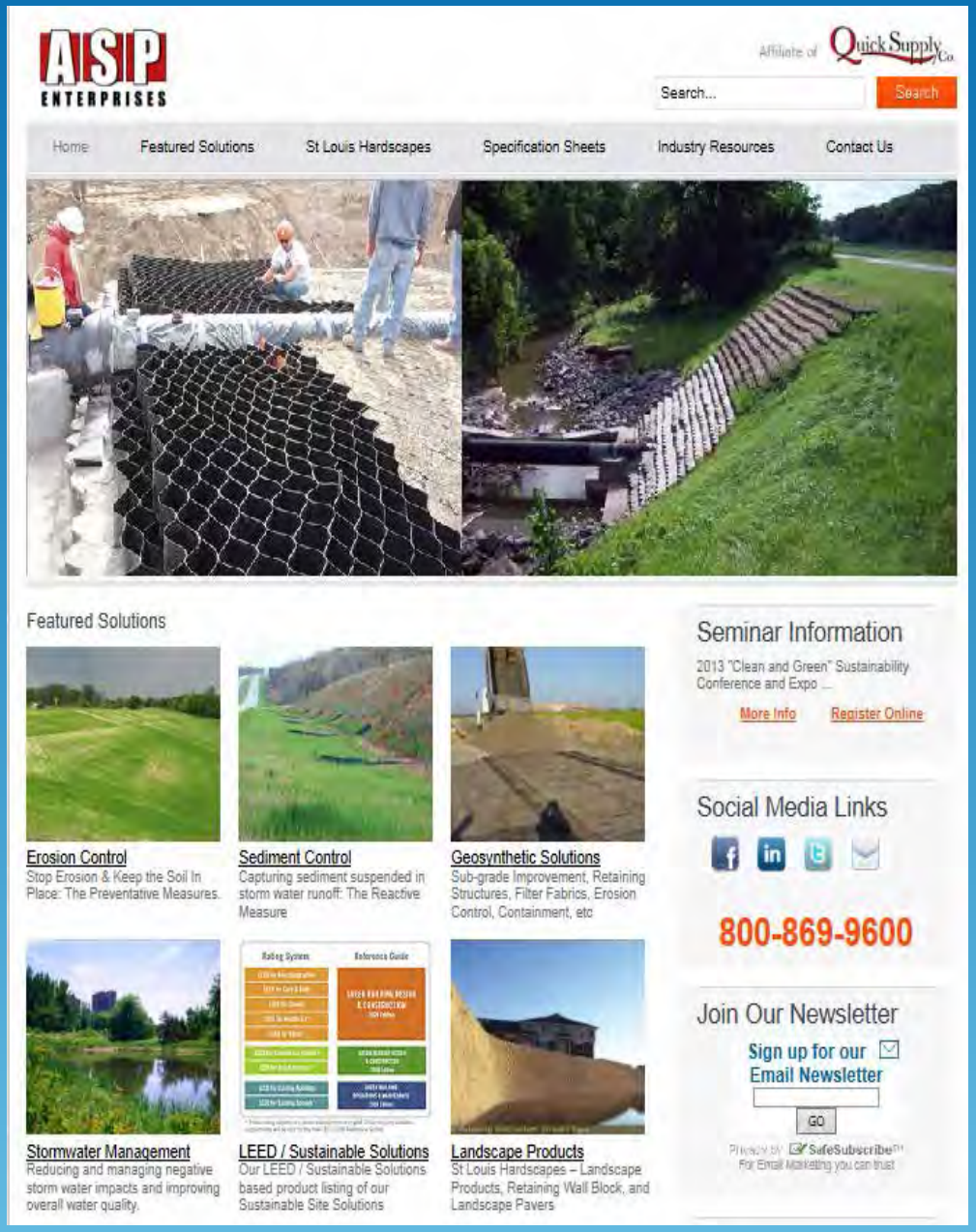
The **Greening** of Stormwater Mgmt.

- Slow-moving although it has gained traction
- Specialized
- Collaborative
- Forensic
- Sensitive to materials and construction methods
- **Expensive to build**
- Easy to screw up
- Expensive to fix

Maintenance

Final Thoughts

- Designers must understand maintenance
- Inspectors must understand design
- Suppliers must understand both
- Contractors must put up with all the above



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A Project Based Approach

We are focusing our 2015 Clean and Green Sustainability Conference and Expo on project based presentations. We will showcase multiple projects in each region and in the process understand the specific values individual solutions can bring, how to design with them; and other key aspects of creating a successful project. In some cases, we will be working with multiple solutions on the same project. As in past years, experts in their fields will participate in our exhibit hall and be available to answer questions, offer assistance, etc. We are excited about our content this year and our focus on successful projects and solutions. We hope you will attend!!

Locations and Dates:

- **Omaha, NE-March 10th, 2015,** Tiburon Golf Club; 10302 S 168th St, Omaha, NE
- **Des Moines, IA-March 11th, 2015,** Hilton Garden Inn, 8600 Northpark Drive, Johnston, IA
- **Kansas City, MO-March 12th, 2015,** Ritz Charles, 9000 West 137th St., Overland Park, KS
- **St. Louis, MO-March 13, 2015,** Alberici Corporate Campus, 8800 Page Avenue, St. Louis, MO 63114

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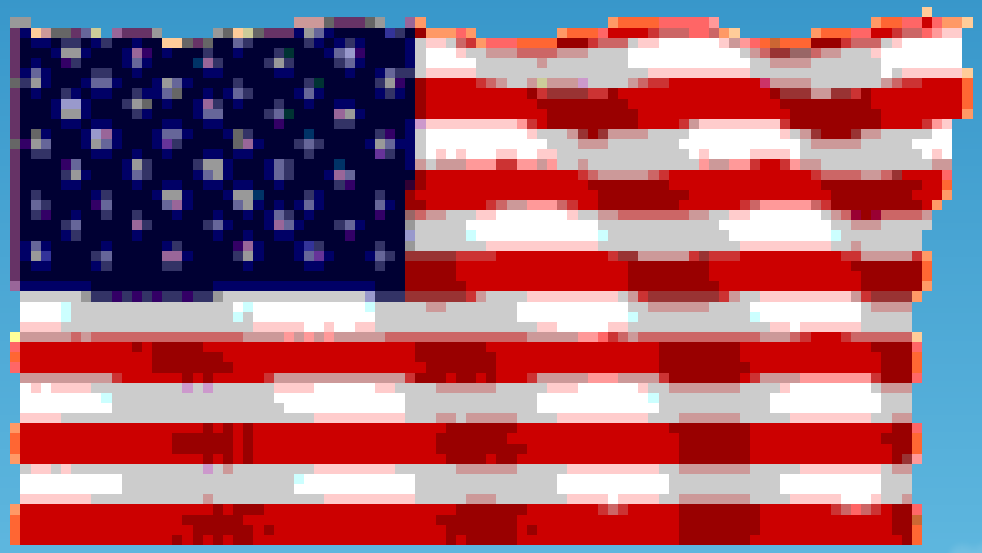
Thanks for your time!



Questions? or Comments!

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Brian D.Williams

(402) 861-8579 off.

(402) 669-1074 cel.

bwilliams@aspent.com