

# DESIGN THINKING



Focused on User  
Outcomes



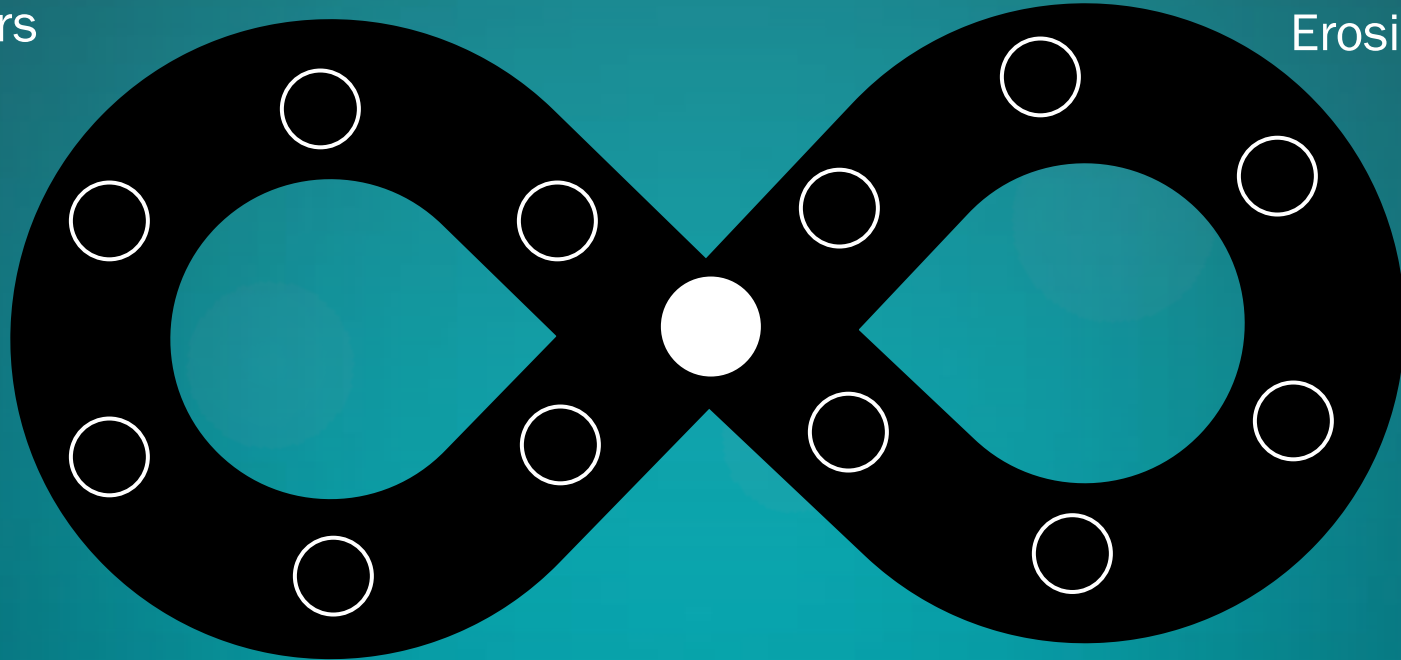
Multidiscipline  
Teams



Restless  
Reinvention

Public Works  
MS4  
Regulators

Stormwater Pollution  
Stormwater Quality  
Erosion Control



Architect  
Civil  
Landscape Architect

General Contractor  
Earthwork/Landscape Contractor  
Maintenance Contractor

# The Loop >

UNDERSTAND USER NEEDS AND DELIVER OUTCOMES CONTINUOUSLY

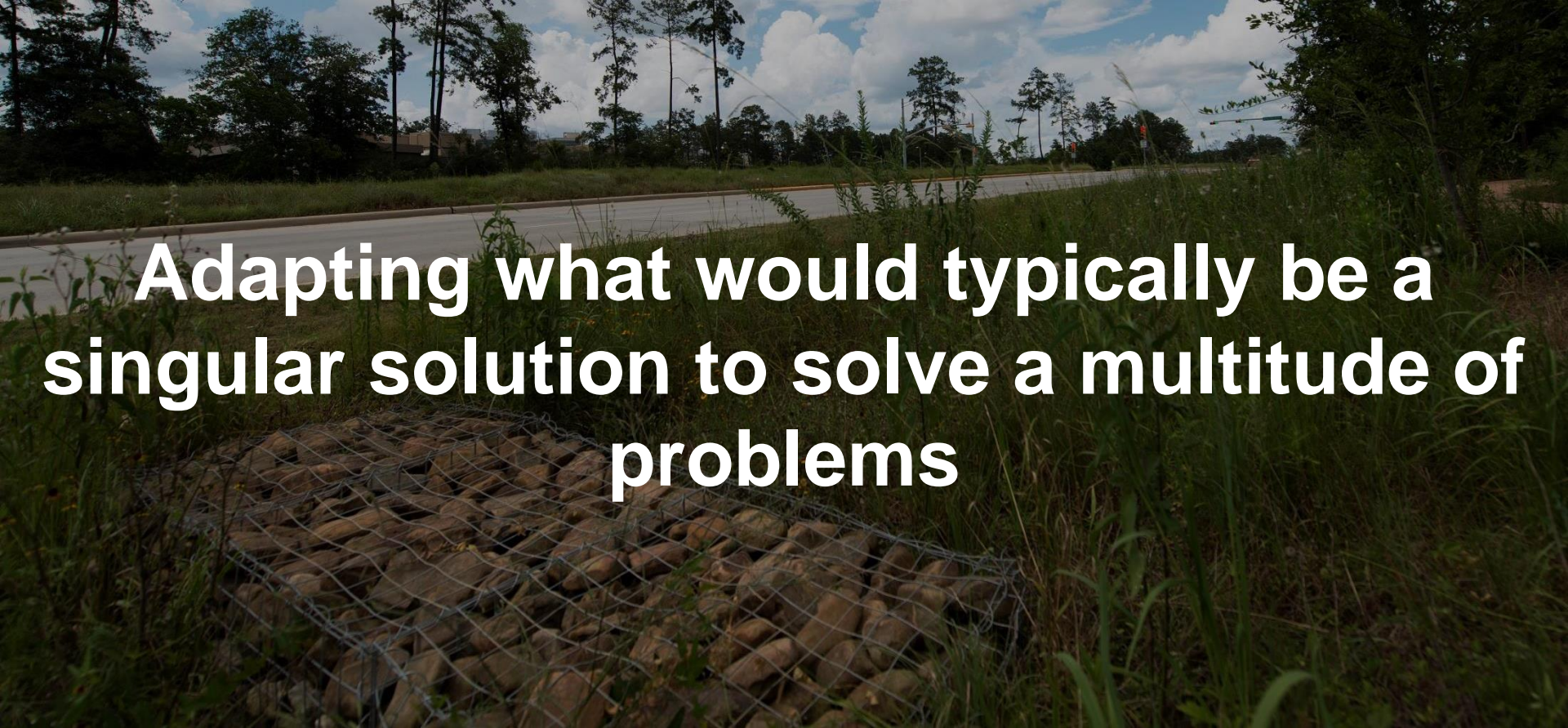


# Multifunctional Design Thinking



# What is Multifunctional Design?

**Adapting what would typically be a singular solution to solve a multitude of problems**

The background image shows a roadside landscape. In the foreground, there is a wire mesh structure filled with rocks, which is a common engineering solution for erosion control or water management. This structure is situated next to a road. The background features a line of trees and a cloudy sky, suggesting a natural or semi-natural environment. The text is overlaid on the image, emphasizing the concept of multifunctional design.





PARKING  
←  
KISS AND  
RIDE ONLY  
8:00 - 9:00 AM  
8:00 - 9:00 PM  
→

# Why Multifunctional Design?

- INCREASES LOT YIELD
- IMPROVES AESTHETICS
- LOWERS UPFRONT COSTS
- IMPROVE WATER QUALITY
- REDUCES FLASH FLOODING
- ALLOWS FOR CREATIVITY / THOUGHT / ENGINEERING

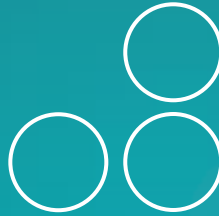




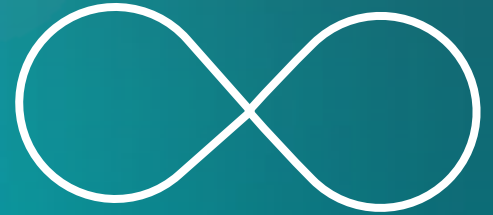
# BIORETENTION DESIGN THINKING



Focused on User  
Outcomes

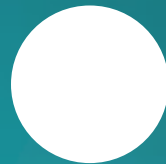


Multidiscipline  
Teams



Restless  
Reinvention

# Focus on User Outcomes





# Begin with the End in Mind ➤ Maintenance



Remove sediment  
& clogged mulch



Expose engineered  
soil

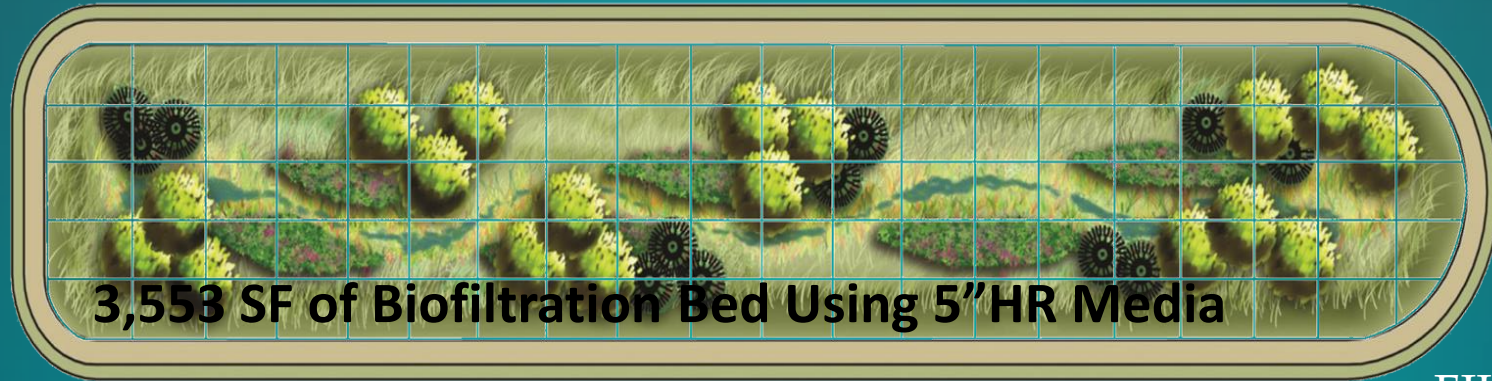


Replace with new  
mulch

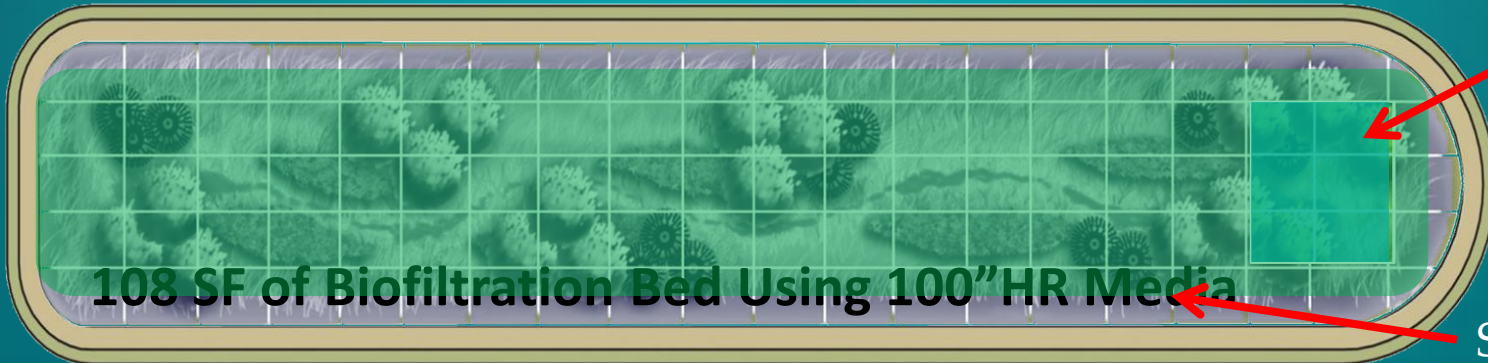


Finished!

# Maintenance ➤ Engineered Soil Selection



FILTRATION



STORAGE



# Maintenance ➤ Planting Plan



# Maintenance ➤ Identifying Engineered Soil



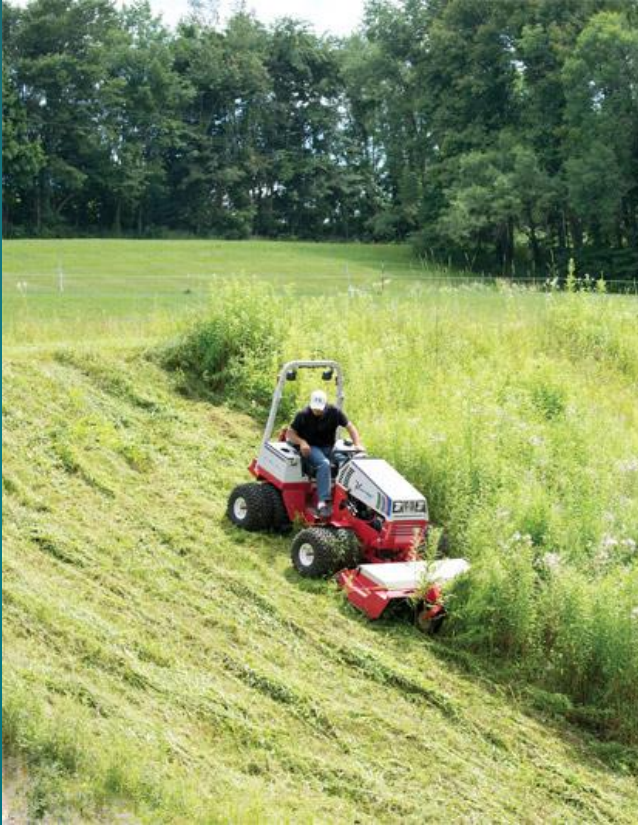


# Maintenance ➤ What's a Weed?





# Maintenance ➤ Who Do You Hire?



# Maintenance ➤ Controlling the Outcome

City of Austin

Thinking

1. f

2. Le

4

## SWQMP INSPECTION REPORT

## MONTHLY CYCLE

Project Name: Maple Court Subdivision Date of Inspection: Date of Inspection:  
Project Address: Owner & Address: PALT, Inc.  
401 Studewood #312, Houston, 77007

Observations & Comments Maintenance/Repairs Required?

### NON-STRUCTURAL CONTROLS

ARE LITTER CONTROL PRACTICES PRODUCING DESIRED RESULTS?	Y	N
ARE STREET SWEEPING PRACTICES PRODUCING DESIRED RESULTS?	Y	N
ARE LANDSCAPING PRACTICES EFFECTIVE?	Y	N
OTHER PRACTICES UTILIZED? IF SO DESCRIBE:	Y	N

### STRUCTURAL CONTROLS

<b>DRY DETENTION POND:</b>		
IS STANDING WATER EVIDENT?	Y	N
IF YES, HOW MUCH?		
EXCESSIVE SEDIMENT ACCUMULATION EVIDENT?	Y	N
IF YES, HOW MUCH?		
EXCESSIVE TRASH ACCUMULATION EVIDENT?	Y	N
ARE SLOPES STABLE AND VEGETATED?	Y	N
ARE THERE ANY OTHER STRUCTURAL ISSUES EVIDENT?	Y	N

<b>BIORETENTION SYSTEMS:</b>		
IS STANDING WATER EVIDENT?	Y	N
IF YES, HOW MUCH WHEN WAS LAST RAIN?		
EXCESSIVE SEDIMENT EVIDENT IN SLUMP OR ENGINEERED MEDIA?	Y	N
IF YES, HOW MUCH?		
EXCESSIVE TRASH ACCUMULATION EVIDENT?	Y	N
ARE SLOPES STABLE AND VEGETATED?	Y	N
ARE THERE ANY OTHER STRUCTURAL ISSUES EVIDENT?	Y	N
DO THE PLANTS LOOK HEALTHY? IF NOT, EXPLAIN:	Y	N

<b>MAINTENANCE:</b>		
REPAIRS/MAINTENANCE BEEN PERFORMED SINCE LAST INSPECTION?	Y	N
IF "YES" THEN WHAT AND WHEN? (MM-DD-YYYY)	Y	N

### NOTES

### INSPECTOR QUALIFICATIONS

CONSTRUCTION CONTROLS: INTERNAL TRAINING COURSE, ASSOCIATION OF GENERAL CONTRACTORS COURSE, "COMPLYING WITH STORM WATER REGULATIONS", INTERNATIONAL EROSION CONTROL ASSOCIATION "HOW TO SELECT, INSTALL AND INSPECT CONSTRUCTION SITE SEDIMENT CONTROL BMP'S", FOUR-WEEK STORMWATER SITE INSPECTOR TRAINING APPRENTICESHIP PROGRAM.

DESCRIPTION: I CERTIFY UNDER PENALTY OF LAW THAT THE DOCUMENT AND DATA SUBMITTED WERE PREPARED UNDER MY SUPERVISION OR ASSISTANCE, WITH A SYSTEM DESIGNED TO ASSURE THAT QUALIFIED PERSONNEL PROPERLY GATHERED AND EVALUATED THE INFORMATION SUBMITTED. BASED ON MY JUDGMENT OF THE PERSON OR PERSONS WHO MANAGE THE SYSTEM, OR THOSE PERSONS DIRECTLY RESPONSIBLE FOR GATHERING THE INFORMATION IS TO THE BEST OF MY KNOWLEDGE AND BELIEF, TRUE, ACCURATE, AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITIES OF FINES AND IMPRISONMENT FOR KNOWING VIOLATIONS.

SIGNATURE: ORIGINAL ☐ COPY ☐ INITIAL INSPECTION ☐ DATE: ☐

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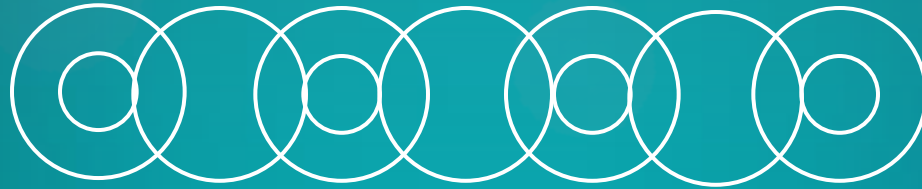
# Rehab ➤ What Happens When It Fails?



# Multidiscipline Teams



Collaborate as a Unit

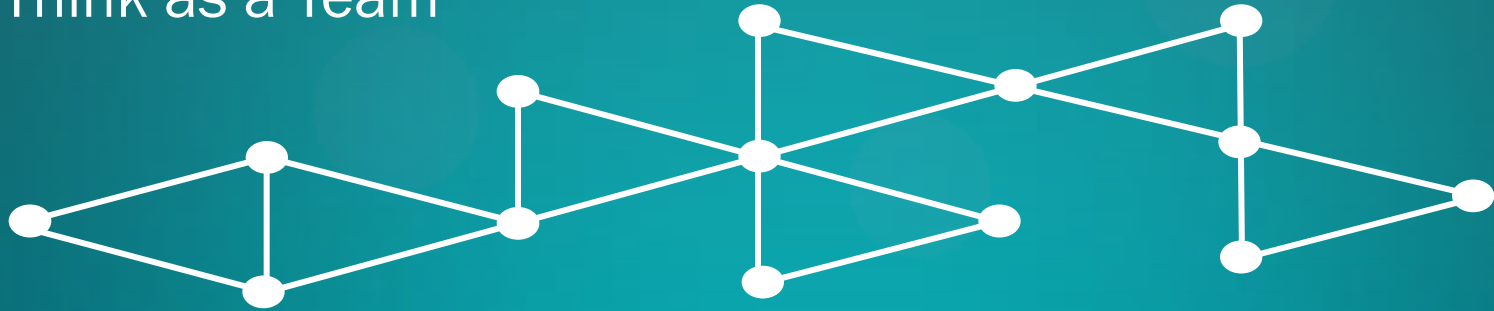






# Multidiscipline Teams >

Think as a Team





# Restless Reinvention ➤ ∞

Solve Old Problems in a New Way



Everything's a Prototype ➤



2001: 28.5" in 12-hr  
288 North Bound



1913: 20" – 25"



In The Swim  
Houston & Main St





2016: 16.5" in 12-Hr

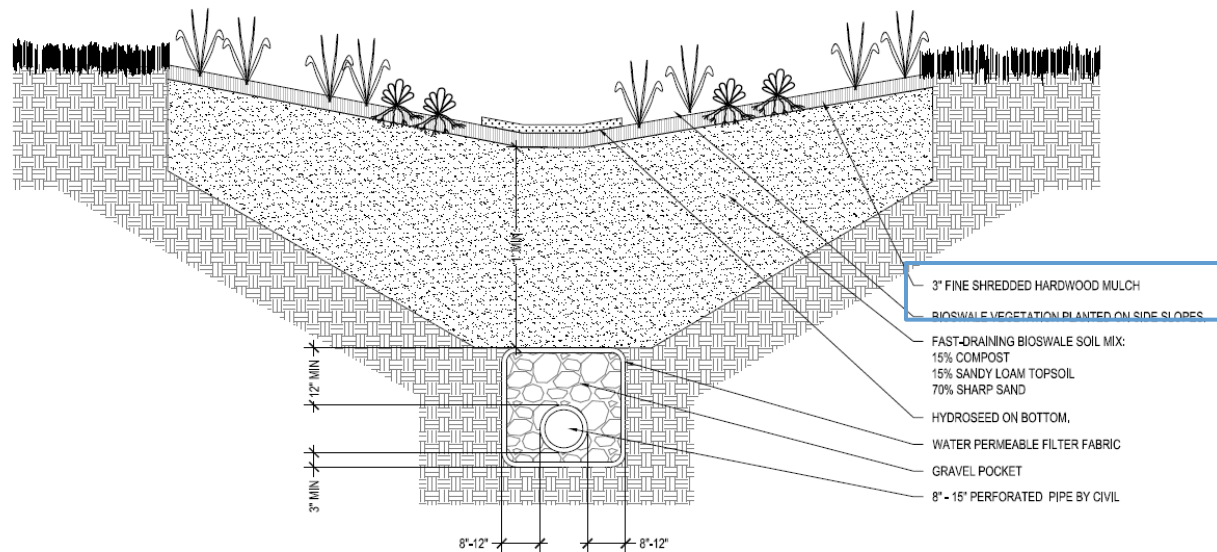
Allen Parkway Eastbound





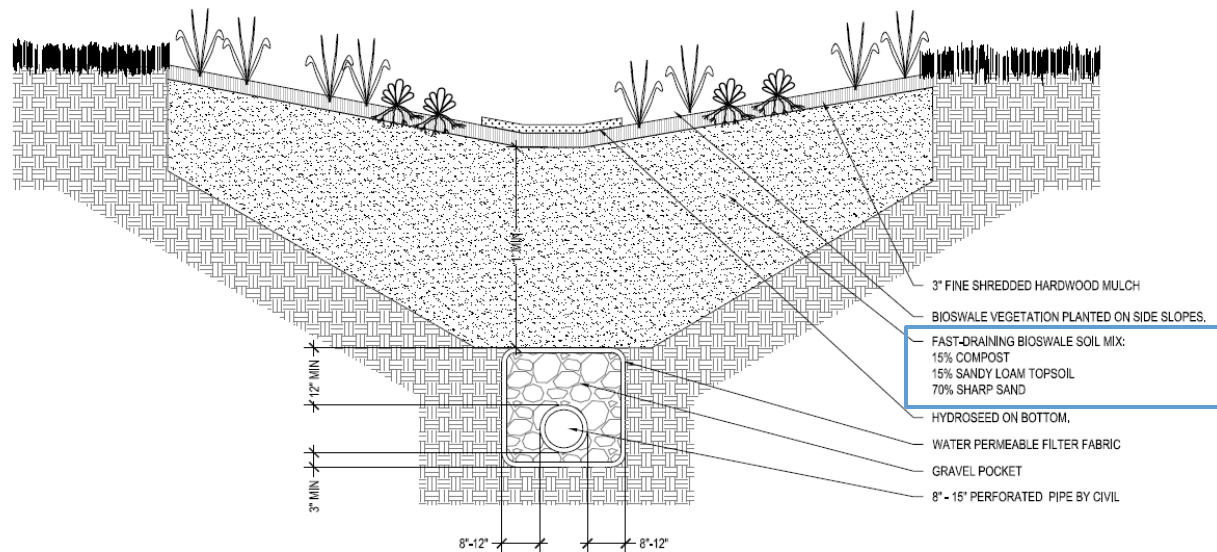






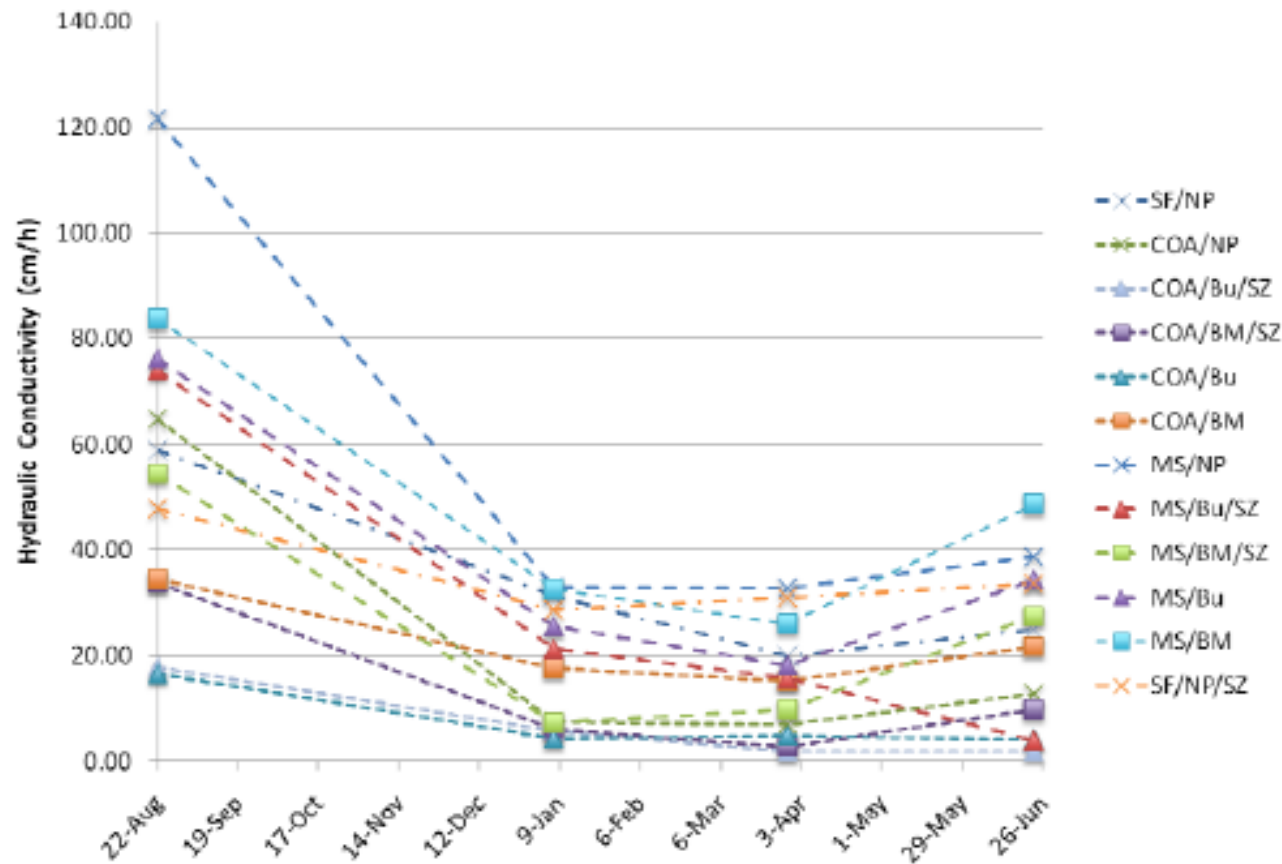




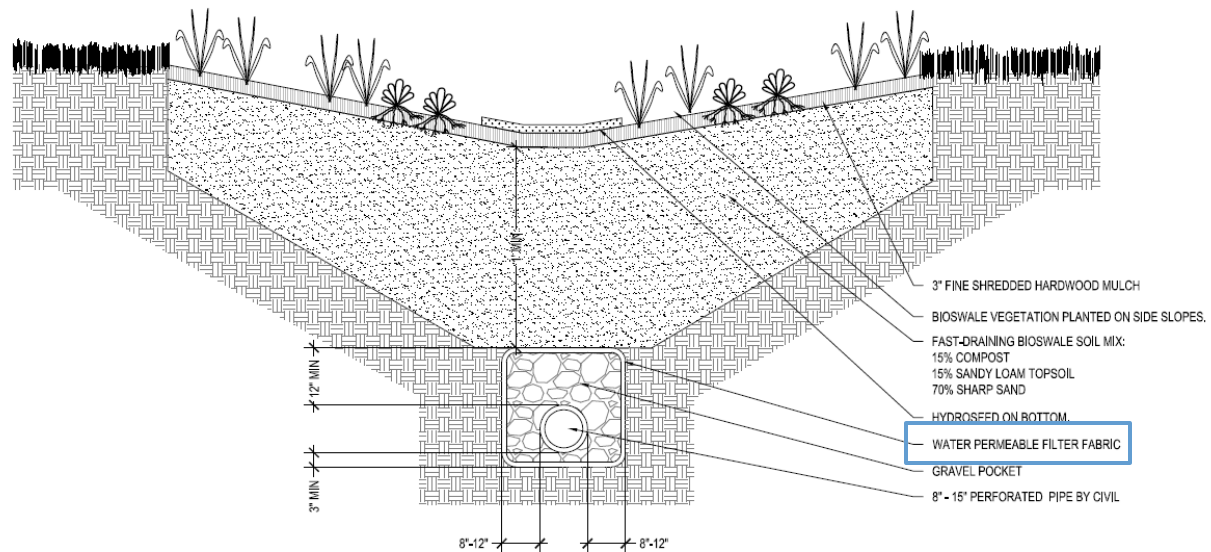




# Hydraulic Conductivity



-QA/QC  
-Safety Factor  
-Plants Matter!





Fabric ~~Can~~ Will

**Clog Over Time**



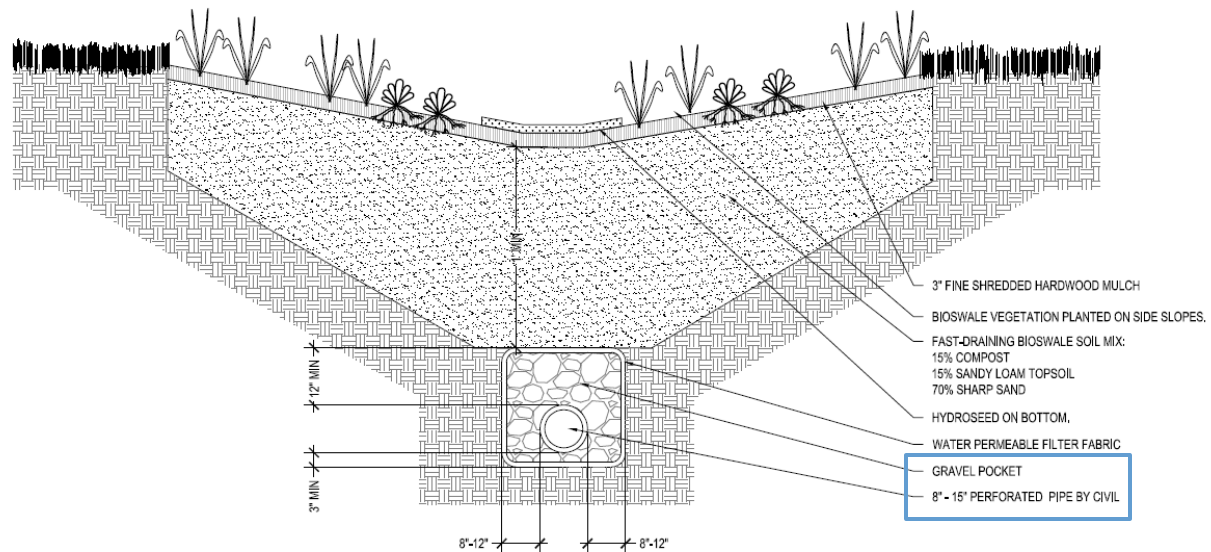


Bridging

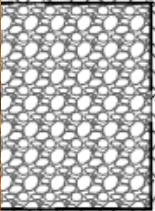
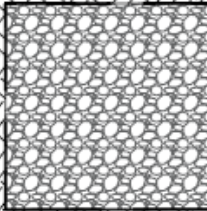
**Prevents Clogging**







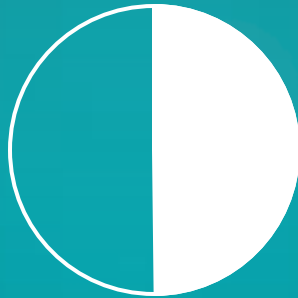




GRID TO BE PLAC  
OP OF R-TANK AN  
ND THE BRIDGING

# Restless Reinvention ➤ ∞

Bias Toward Action



THERE IS A WAY TO DO IT BETTER – FIND IT  
~ THOMAS EDISON





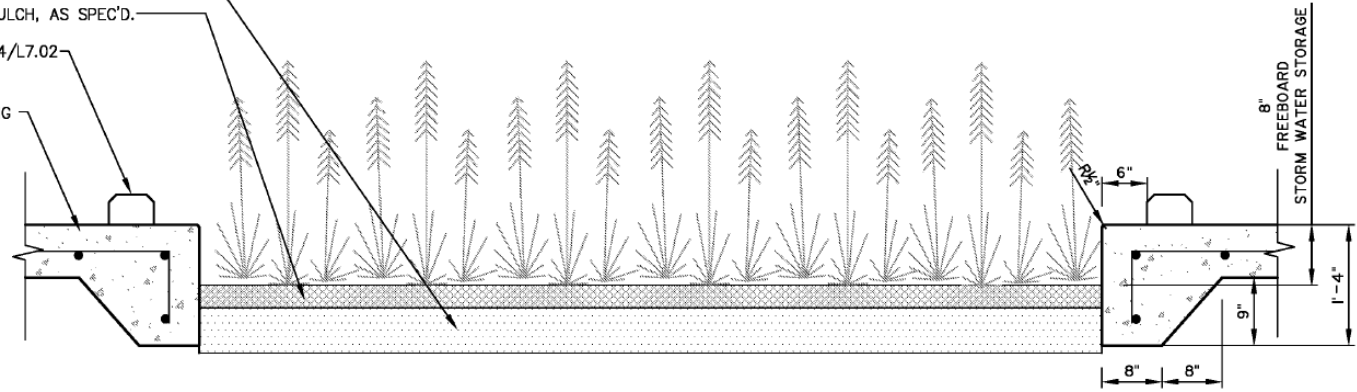


6" DEEP PREPARED SOIL MIX, AS SPEC'D.

3" LAYER OF HARDWOOD MULCH, AS SPEC'D.

WHEELSTOP PER DET. 4/L7.02

5" OR 7" PARKING LOT PAVING  
SIMILAR TO THICKENED EDGE  
PER DET. 5/L7.06



1

## PARKING LOT BIO-FILTER

SCALE: 1"=1'-0"















# SIDE NOTE





## CAUTION: BIOFILTRATION SYSTEM

### DO NOT REMOVE GEOTEXTILE COVER

*No quite la cubierta geotextil*

### DO NOT PLACE SOIL ON TOP OF ENGINEERED MEDIA OR COVER

*No coloque tierra en la parte superior de la cubierta protectora*

### DO NOT STOCKPILE DIRT OR HAZARDOUS MATERIAL UPSTREAM

*No acumular tierra o materiales peligrosos en el canal de drenaje*

**CAUTION:** This FocalPoint Biofiltration System is an engineered stormwater treatment system. It must not be compromised prior to activation by Construction EcoServices. Do not remove the protective geotextile.

**PRECAUCIÓN:** FocalPoint Biofiltration System es un sistema de tratamiento de agua de lluvias. La cubierta protectora no debe ser removida o abierta, antes de ser activada solamente por Construction EcoServices.

#### ACTIVATION PREREQUISITES

*Requisitos de activación*

#### **70% OF THE DRAINAGE AREA MUST BE STABILIZED**

*El 70% del área que rodea el drenaje debe ser estabilizada*

#### **STREET/PARKING MUST BE SWEEPED**

*La calle / estacionamiento debe ser barrido*

#### **90% OF THE SWALE MUST BE VEGETATED OR MULCHED**

*El 90% del canal de drenaje debe tener por cobijación vegetación o mulch*



#### **CONTACT CONSTRUCTION ECOSERVICES FOR ACTIVATION**

*Comuníquese con Construction EcoServices para la activación*











# SIDE NOTE

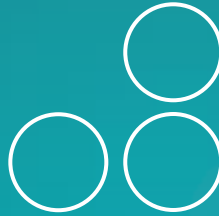




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Multidiscipline  
Teams



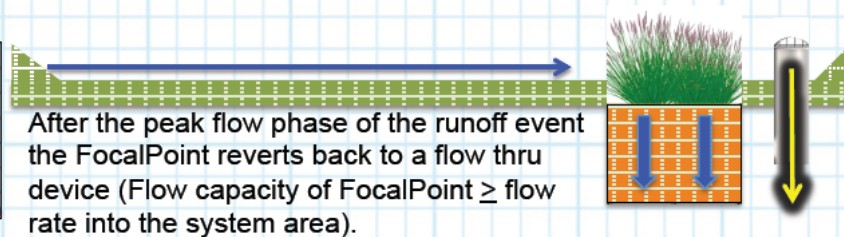
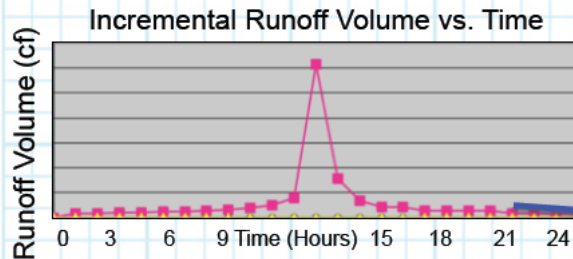
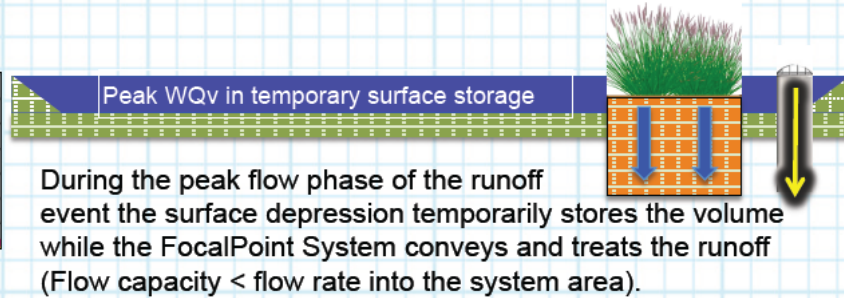
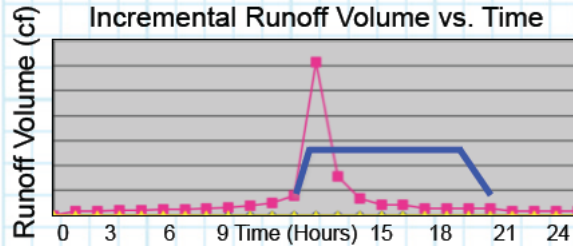
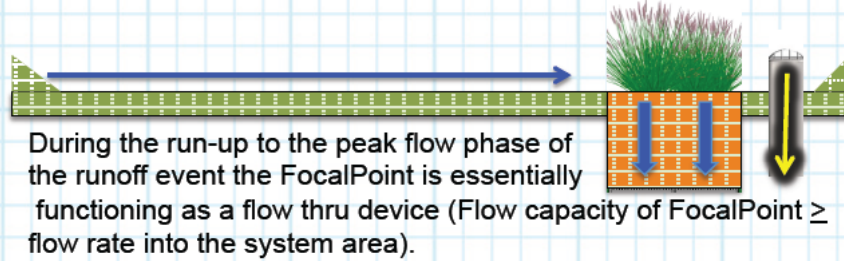
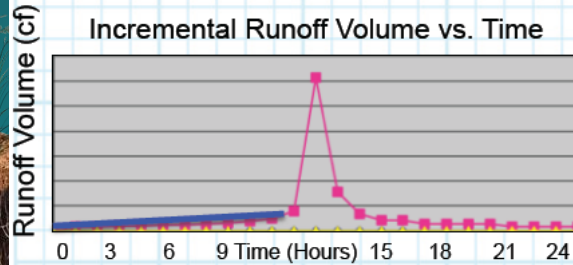
Restless  
Reinvention

High Performance  
System (HPS)

# FocalPoint: TR-55 Volume Distribution Implications

When designed to treat the increase from pre to post conditions, the WQv shall be treated by the FocalPoint System per the TR-55 24 hour Type III event distribution, as illustrated below:

— = Water Quality Volume    — = FocalPoint Treatment    — = Volume > WQv to bypass



- 3" Aged Hardwood Mulch
- High Flow Media
- Bridging Stone
- Open Cell Underdrain
- 3" Aged Hardwood Mulch
- High Flow Media
- Bridging Stone
- Open Cell Underdrain

-20X Smaller  
-Scalable  
-Easily Maintained  
-Inexpensive  
-Performance



## Cameillia - RainGarden H

Drainage Area – 143,715 SF (3.29 Acres)

Water Stored – 85,813 CF (642,000 Gallons)

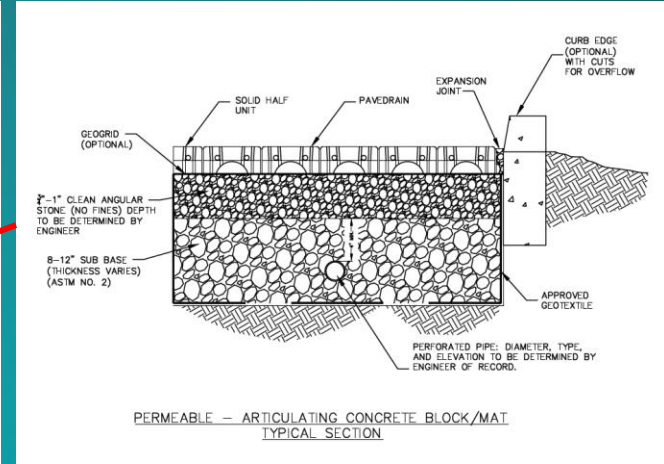
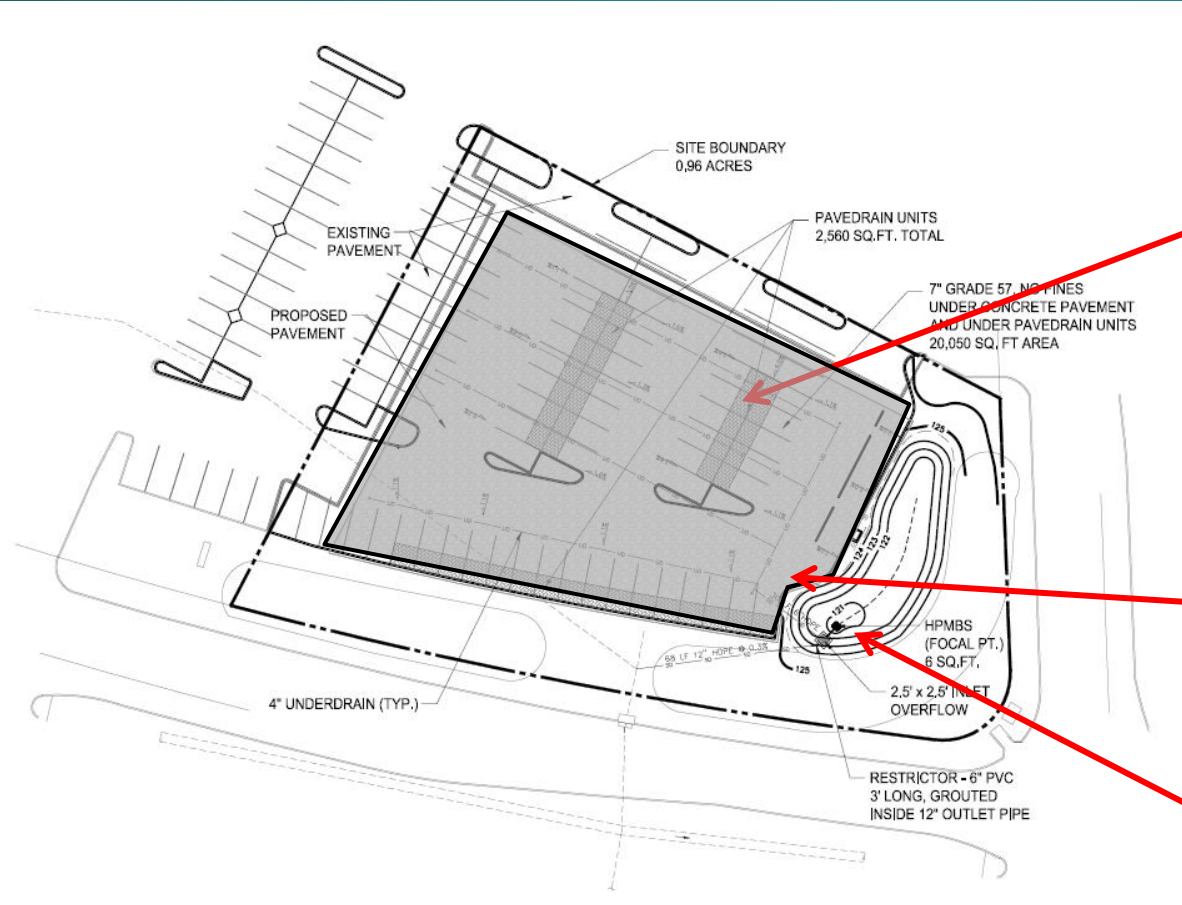
Water Treated – 78,400 CF (586,432 CF)

FocalPoint Size – 196 SF → \$29,400

Traditional Rain Garden Equivalent – 7,840 SF → \$156,800



# Eastern Commons



7" Stone Subgrade

Overflow = Bioretention













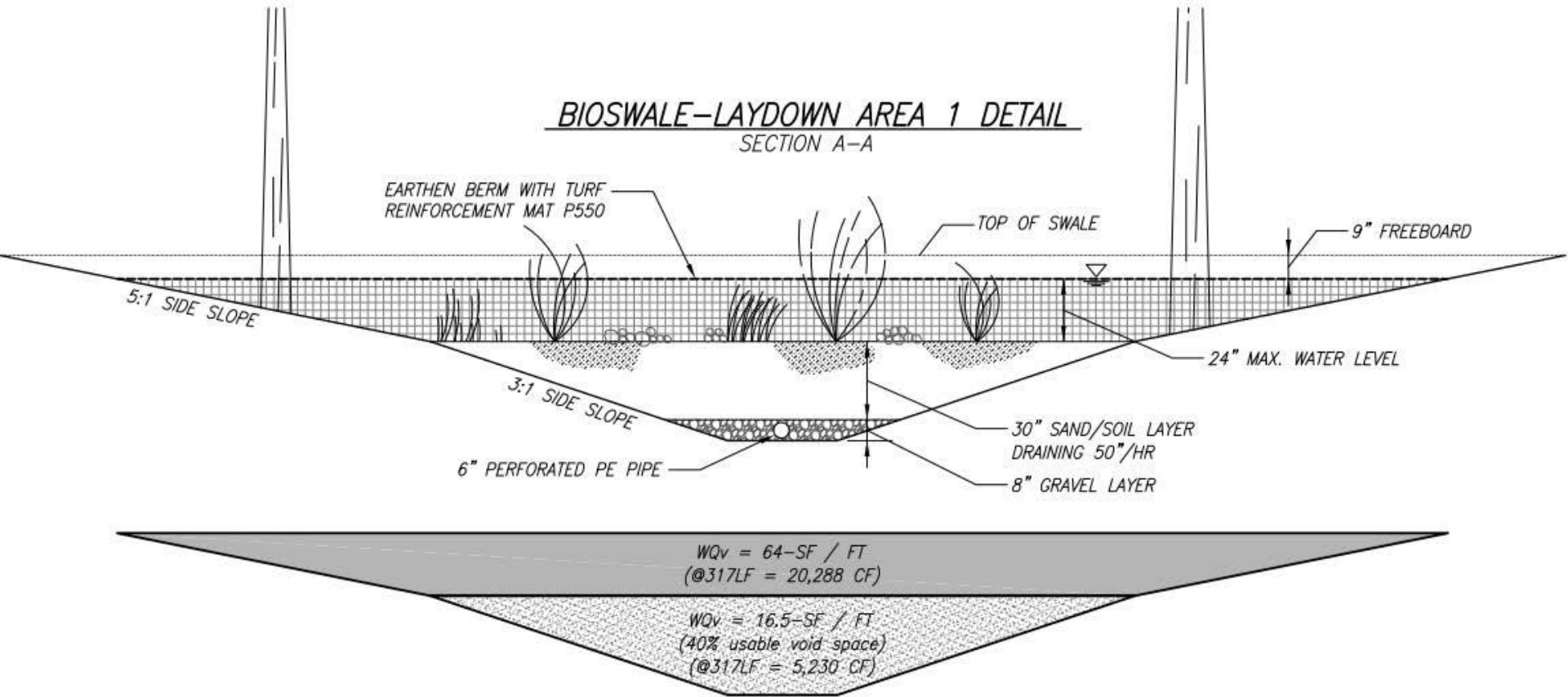
Overflow into bioretention basin



20 SF of High Flow  
Biofiltration System







# Traditional Bioretention



## 6,072 SF of Biofiltration Bed using 50" HR Media

Excavation:	\$8,720.00 (872 CY @ \$10 CY)
Geotextile:	\$1,500.00 (3Rolls @ \$500 Roll)
Perforated Pipe:	\$4,500.00 (300 LF @ \$15 LF)
Aggregate:	\$15,000.00 (8" On All Sides of Perforated Pipe)
Engineered Media:	\$30,000.00 (500 CY at \$60 CY)
Bark Mulch:	\$500.00 (3" Deep at \$8 CY)
Labor:	\$6,000.00 (240 hours @ \$25 Hour)
Total:	\$66,260.00/8.88 AC (\$7,461 per acre)



N

6" SUBDRAIN  
INSTALL:  
1-45° BEND  
N: 7024173.62'  
E: 2319321.61'

6" SUBDRAIN  
INSTALL:  
1-1-WAY CLEANOUT  
N: 7024181.71'  
E: 2319421.53'

6" SUBDRAIN  
INSTALL:  
1-6" PLUG  
N: 7024181.72'  
E: 2319422.53'

6" SUBDRAIN  
INSTALL:  
1-45° BEND  
N: 7024174.78'  
E: 2319435.60'

6" SUBDRAIN  
INSTALL:  
1-1-WAY CLEANOUT  
N: 7024182.86'  
E: 2319534.42'

6" SUBDRAIN  
INSTALL:  
1-45° BEND  
N: 7024175.93'  
E: 2319547.93'

6" SUBDRAIN  
INSTALL:  
1-1-WAY CLEANOUT  
N: 7024184.10'  
E: 2319655.17'

6" SUBDRAIN  
INSTALL:  
1-45° BEND  
1-2-WAY CLEANOUT  
N: 7024180.76'  
E: 2319328.61'

6" SUBDRAIN  
INSTALL:  
1-45° BEND  
1-2-WAY CLEANOUT  
N: 7024181.72'  
E: 2319442.60'

6" SUBDRAIN  
INSTALL:  
1-6" PLUG  
N: 7024182.87'  
E: 2319535.42'

6" SUBDRAIN  
INSTALL:  
1-45° BEND  
1-2-WAY CLEANOUT  
N: 7024183.07'  
E: 2319554.93'

6" SUBDRAIN  
INSTALL:  
1-6" PLUG  
N: 7024184.10'  
E: 2319656.17'

Remove Berm

FocalPoint = 27' L x 8' W

CONSTRUCT COMPACTED EARTHEN  
BERM WITH 483 SF OF 12" THICK  
GROUTED 6"-12" ROCK RIP-RAP.

42 LF 6" SDR-35 FROM TEE TO VERTICAL BEND

CONSTRUCT COMPACTED EARTHEN  
BERM WITH 483 SF OF 12" THICK  
GROUTED 6"-12" ROCK RIP-RAP.

42 LF 6" SDR-35 FROM TEE TO VERTICAL BEND

CONSTRUCT COMPACTED EARTHEN  
BERM WITH 483 SF OF 12" THICK  
GROUTED 6"-12" ROCK RIP-RAP.

41 LF 6" SDR-35 FROM TEE TO VERTICAL BEND

6" PVC SDR 35  
INSTALL:  
1-2-WAY CLEANOUT  
N: 7024158.69'  
E: 2319321.76'

6" PVC SDR 35  
INSTALL:  
1-6" TEE  
N: 7024147.49'  
E: 2319435.88'

6" PVC SDR 35  
INSTALL:  
1-2-WAY CLEANOUT  
N: 7024159.86'  
E: 2319435.76'

6" PVC SDR 35  
INSTALL:  
1-1-WAY CLEANOUT  
N: 7024148.61'  
E: 2319546.21'

6" PVC SDR 35  
INSTALL:  
1-2-WAY CLEANOUT  
N: 7024161.00'  
E: 2319548.08'

6" PVC SDR 35  
INSTALL:  
1-2-WAY CLEANOUT  
N: 7024147.51'  
E: 2319437.88'

6" PVC SDR 35  
INSTALL:  
1-6" TEE  
N: 7024148.63'  
E: 2319548.21'

6" PVC SDR 35  
INSTALL:  
1-6" END CAP  
N: 7024148.64'  
E: 2319549.21'

REFER TO LG PLAN TOP  
FOR RETENTION DETAILS

LINE F  
24" RCP  
SEE C&E

ed  
uch

ance  
Media

ng Stone

abric

Underdrain

Liner

216 SF

Excav  
Focal  
Total:

# Keys to Success

- **Verify Maintainability**
- **Design with Emergency Overflow**
- **Protect System During Construction**
- **Push for Turn-Key Installation**
- **Require Performance Verification in Specification**
- **Require Maintenance in Specification**





OBSERVE>

MAKE>

REFLECT>

# Not the Typical Contractor

- We Manage Green Infrastructure Project Risks
- We Provide Turn-Key Installation
- Provide Erosion and Sediment Control Consultation
- Conduct Post Construction Verification
- Provide First Years Maintenance
- Provide Extended Maintenance



# Questions?

## THANK YOU!

ANTHONY KENDRICK, ENV SP  
Green Infrastructure Specialist  
Construction EcoServices  
214.701.2117  
Kendrick@ecosvs.com

www.ecosvs.com  
832.456.1000

