STORMWATER SOLUTIONS LLC

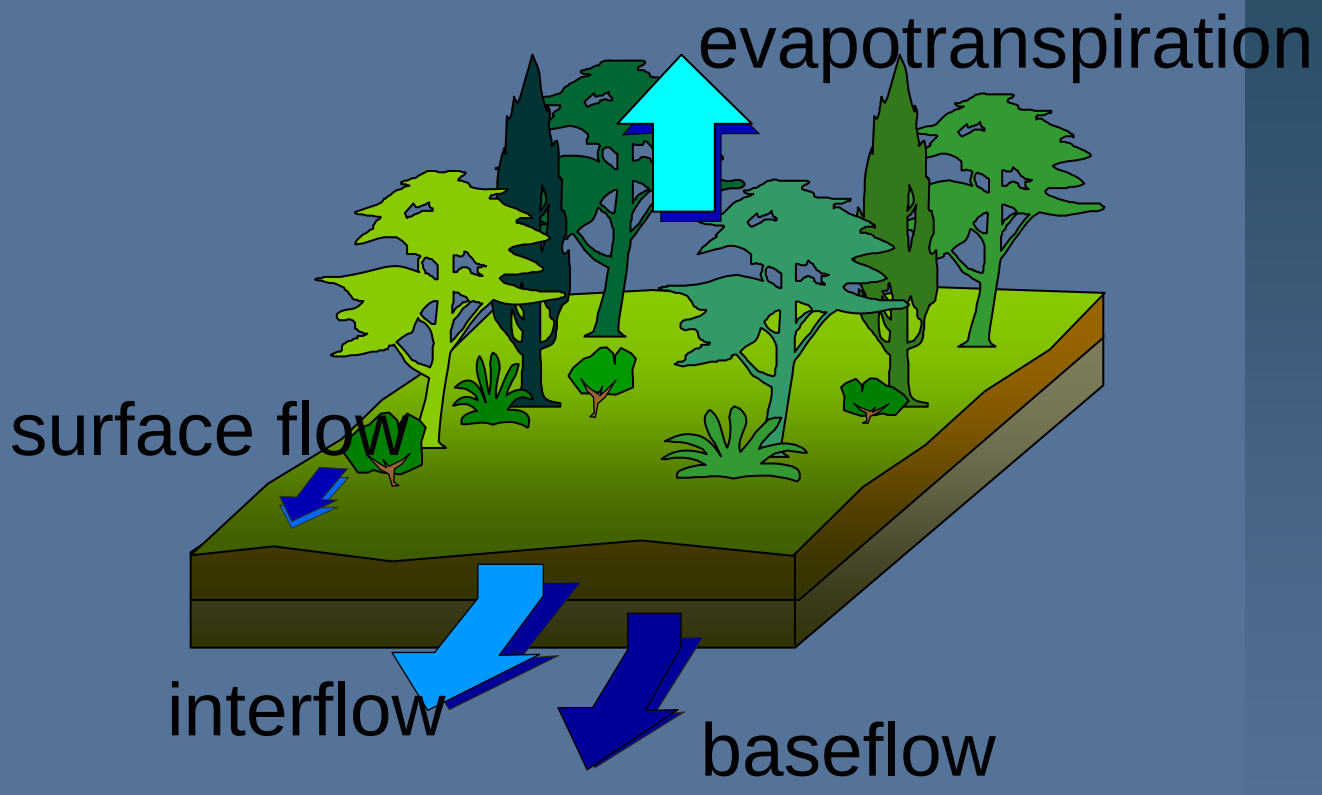
Simple water management solutions, that work!

www.stormh2osolutions.com

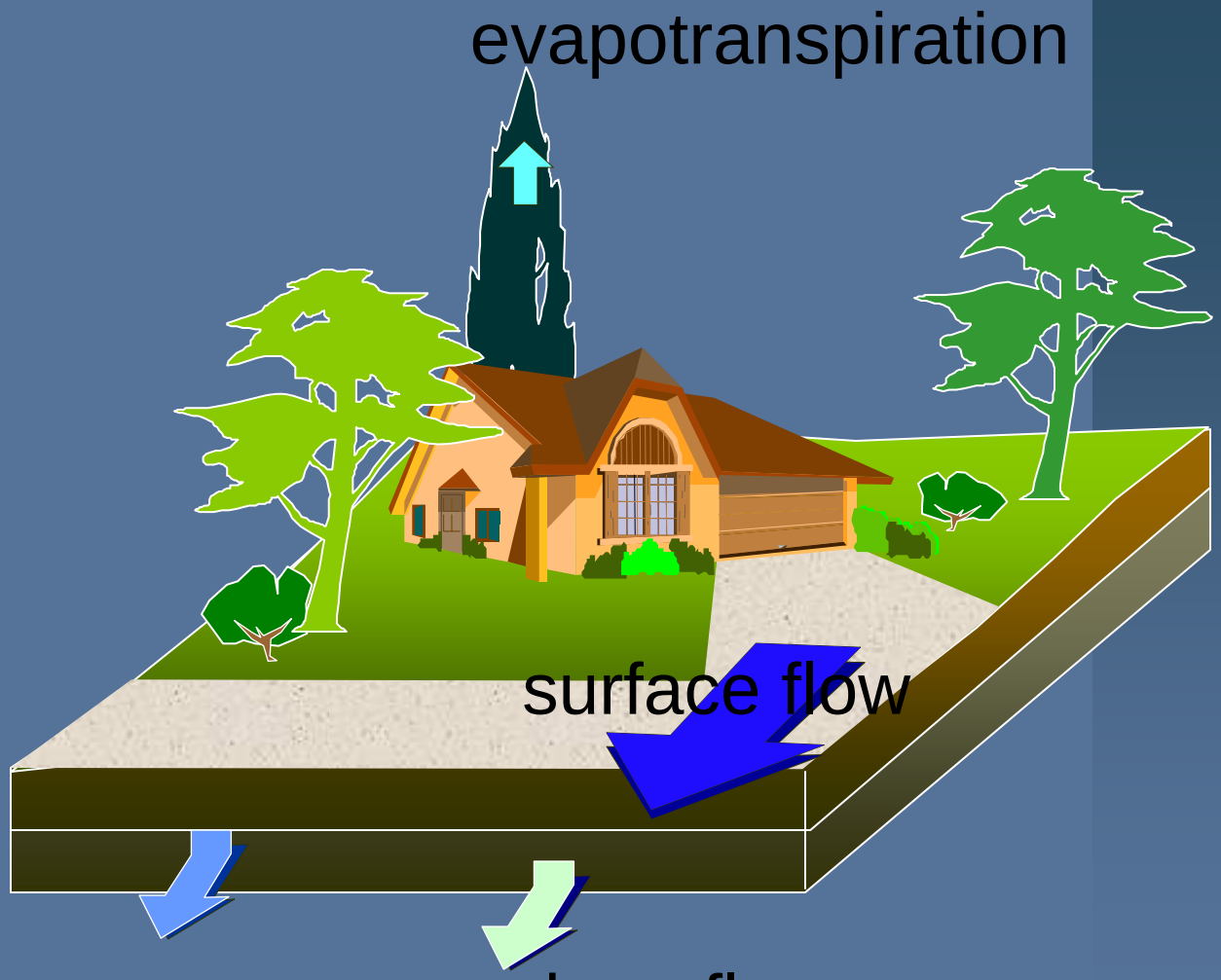
Presentation Overview

- Problems of traditional systems
- Sustainability
- General methods used in SUDS
- Barriers to wider use

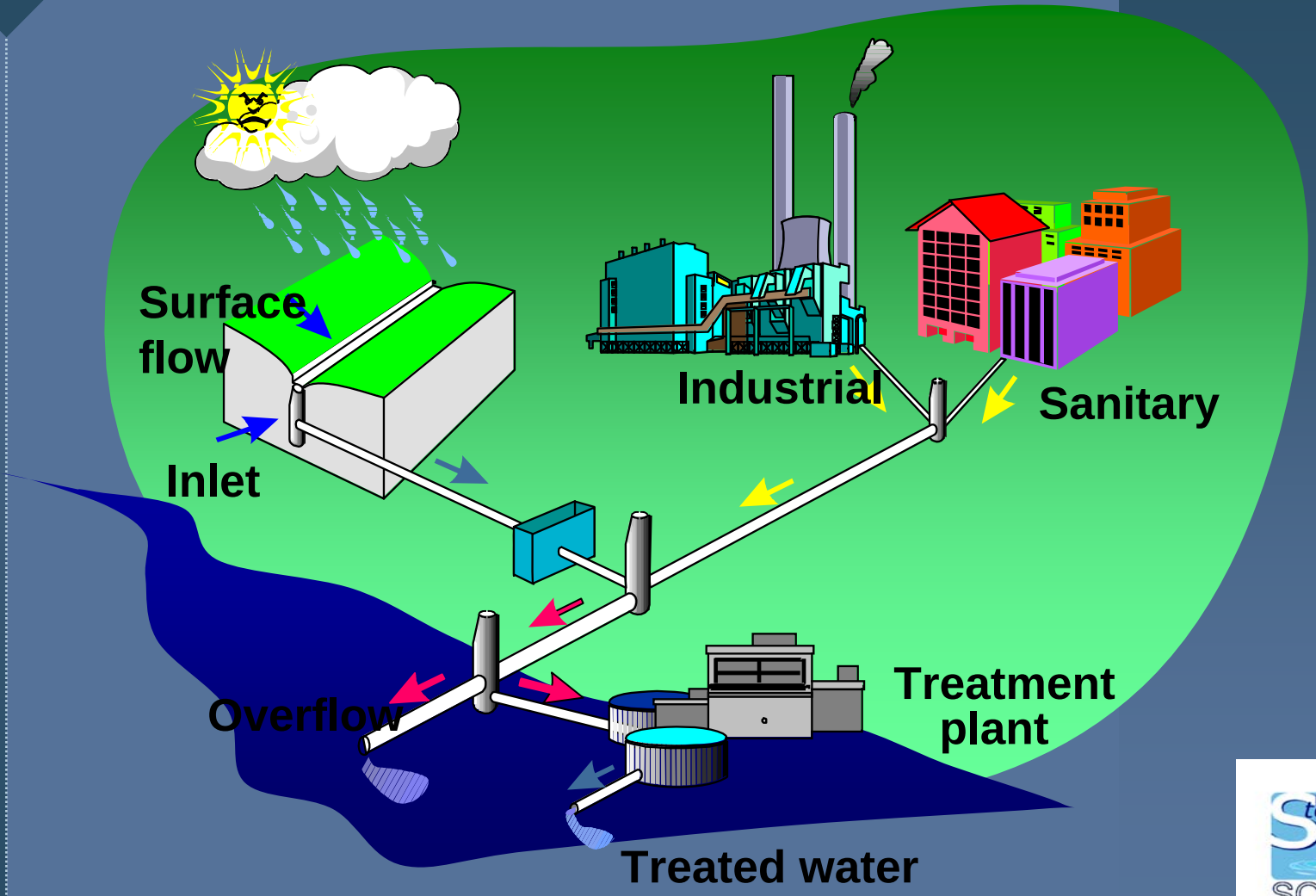
Natural Catchments



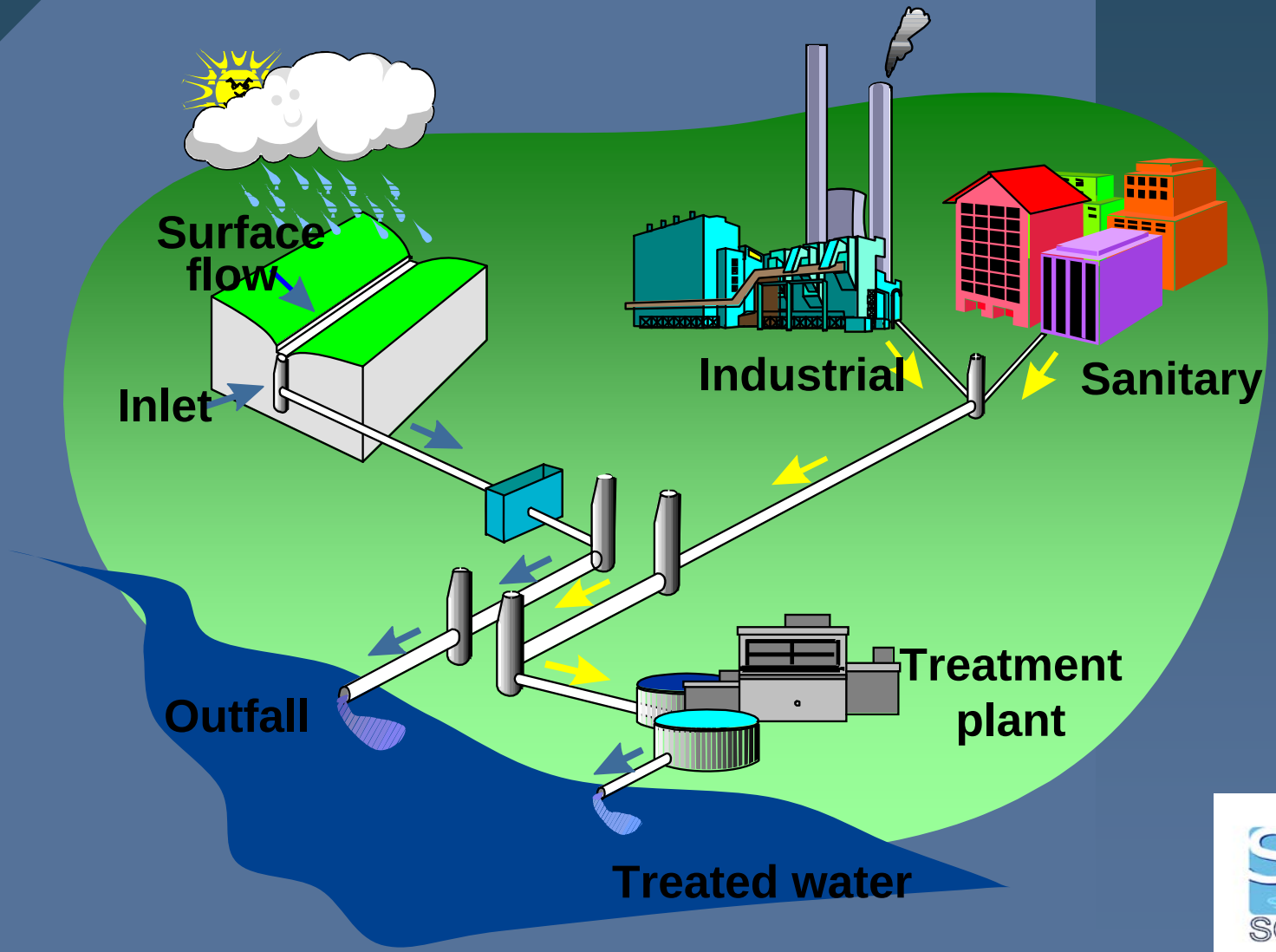
Developed Catchments



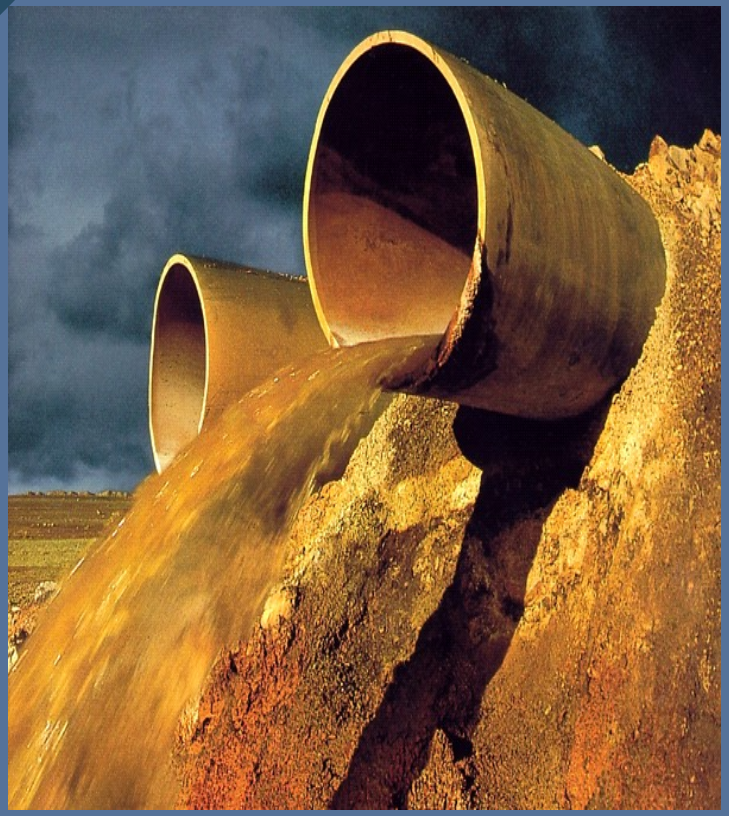
Traditional Approach to Drainage and Treatment



Separate Foul and Surface Water Drainage



Current Situation

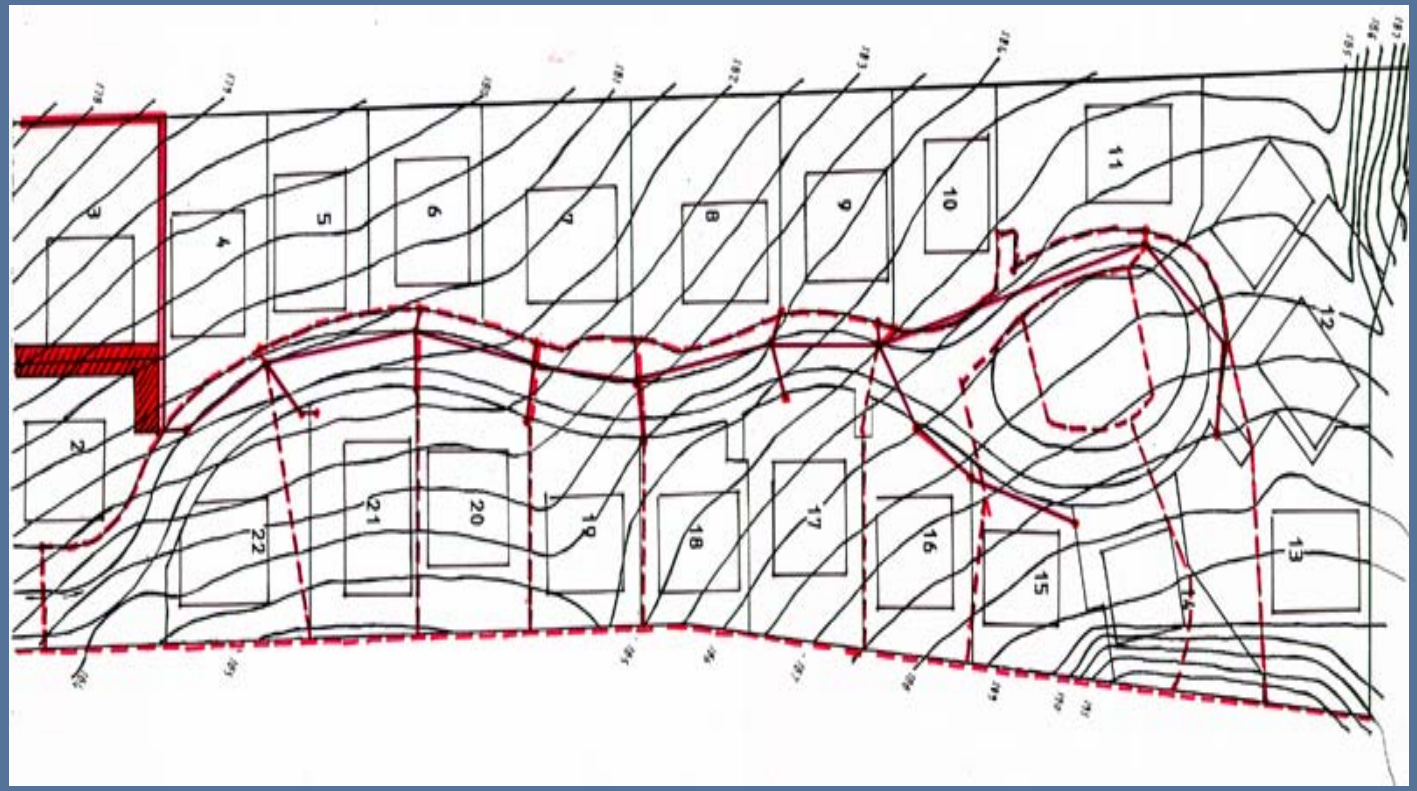


Outfalls

Urban Flooding

Domestic Drainage

Traditional Systems



Contaminated Water Discharge

Stormwater-Atlantis Solution

Stormwater-Atlantis Sub Division System

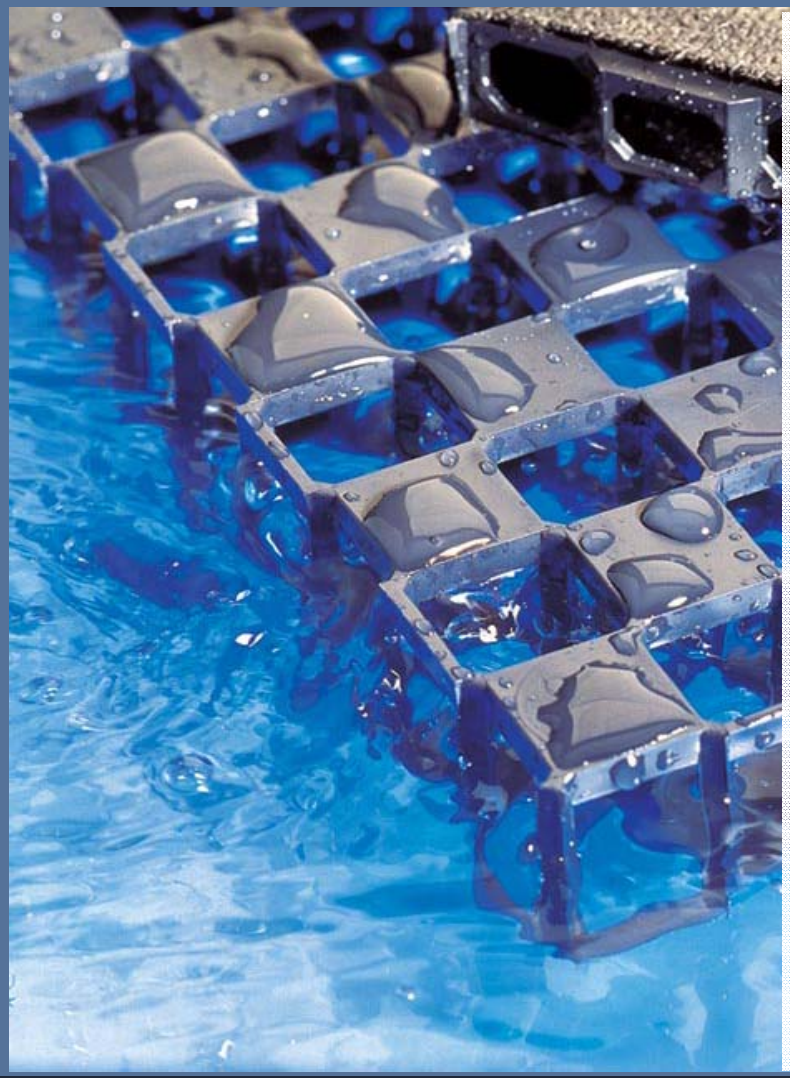
Zero Contamination Discharge

BMP Solution systems

STORMWATER - ATLANTIS SYSTEM

DRAINAGE CELLS

Drainage Cell



Atlantis® 30mm Drainage Cell

Size : (H) 30mm (1.19”)

(W) 405mm (15.94”)

(L) 607mm (23.9”)

Strength: 116.7 **psi**

Atlantis® 52mm Drainage Cell

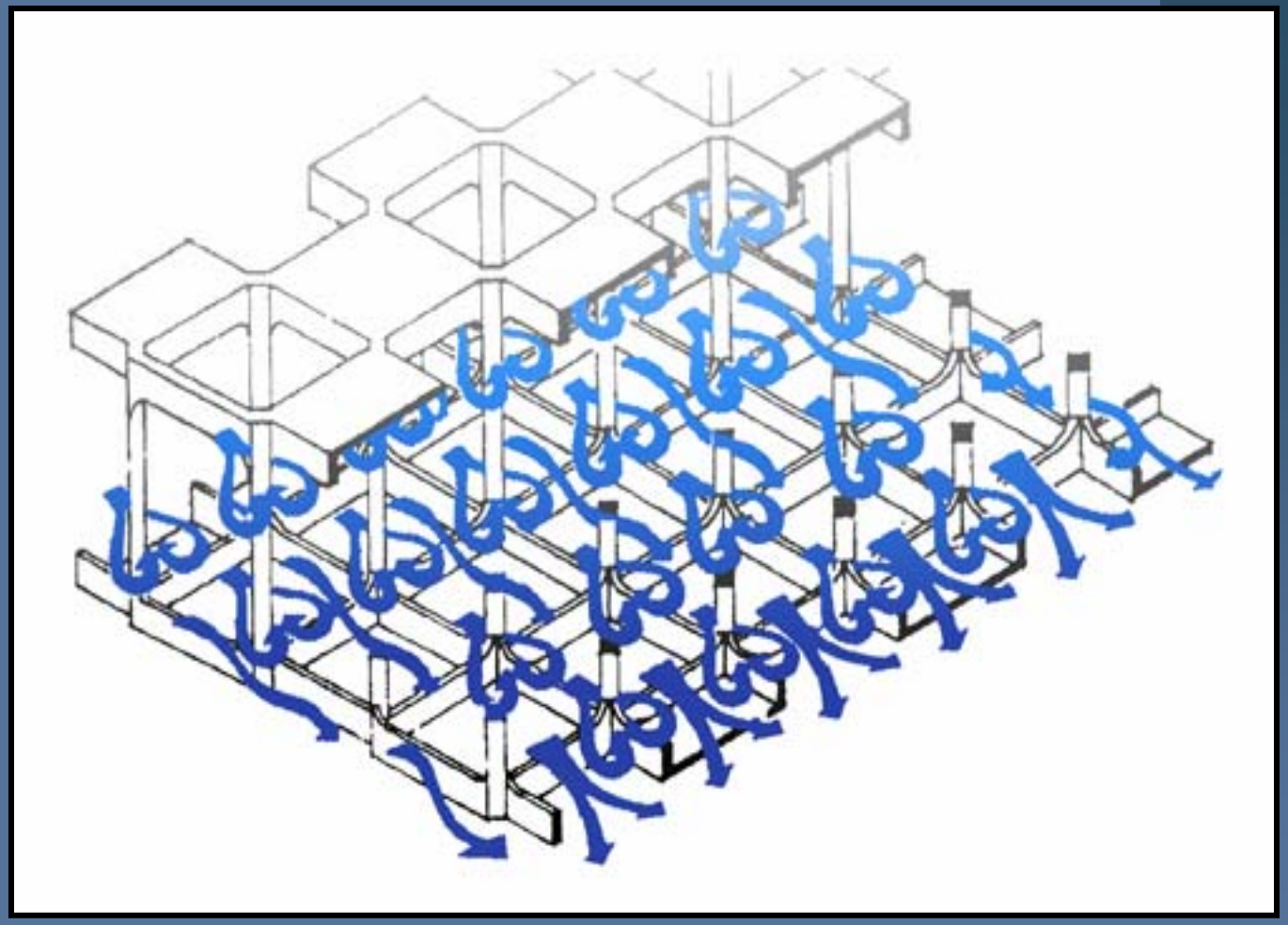
Size : (H) 52mm (2.04”)

(W) 260mm (10.24”)

(L) 480mm (18.89”)

Strength: 1660 **psi**

Drainage Cell



Water Oxygenation & Self Cleaning

Atlantis® Drainage Cell Video

www.stormh2osolutions.com

Roof Garden - Australia

INSTALLATION YEAR 2000

Roof Garden - Australia

AFTER 1 YEAR

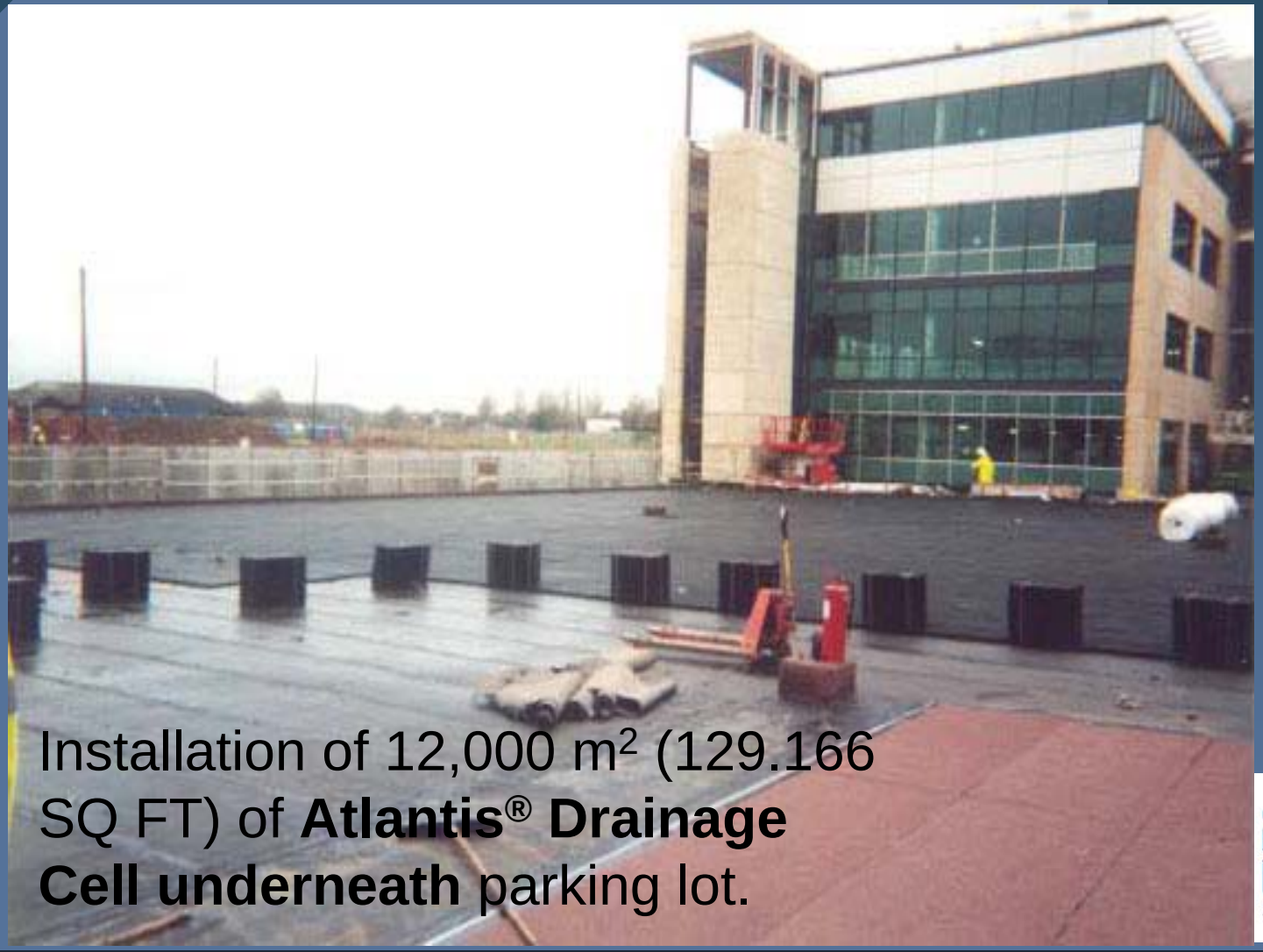
Horizontal Drainage Singapore

Installation of 43,000 m^2 (462.848 SQ FT) of **Atlantis® Drainage Cell.**

Horizontal Drainage Singapore

Completed installation.

Parking Lot Drainage-UK

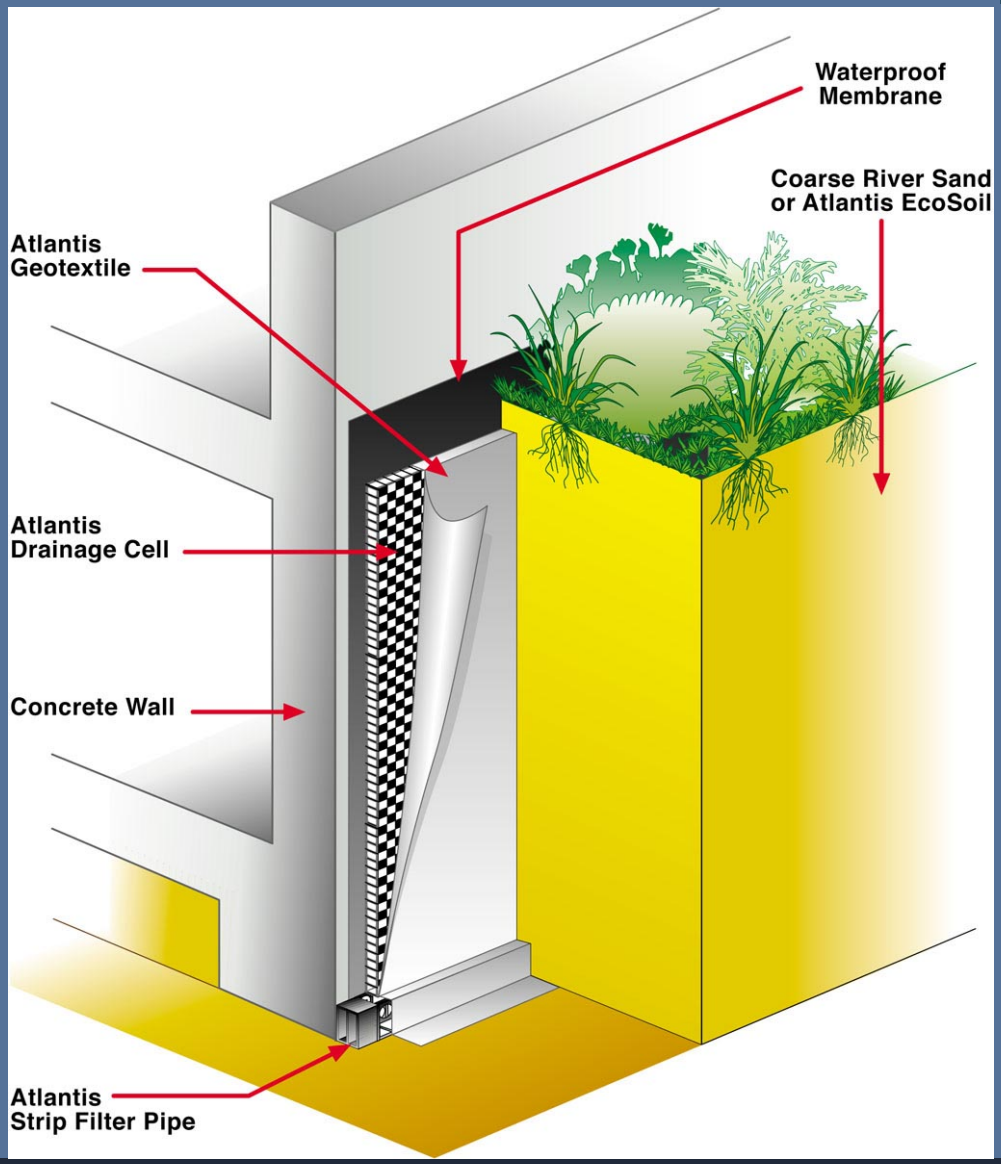


Installation of 12,000 m^2 (129.166 SQ FT) of **Atlantis® Drainage Cell underneath** parking lot.

Parking lot Drainage – UK

Completed Parking Lot

Vertical Drainage



TRUE VOID SPACE BETWEEN WALL AND BACKFILL

Wall Drainage-Singapore

Atlantis® Drainage Cell glued onto wall surface.

Wall Drainage-Singapore

Installation of geotextile over
Atlantis® Drainage Cell

Stormwater Solutions
Atlantis® Matrix
D-Raintank™

D-Raintank™ (tank module)

Ultimate Load: 34.0 **psi (H20 Loading Tested)**

Color: Black

Single Module

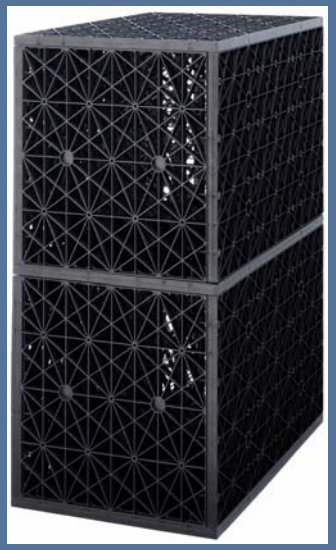
Size:

(W) 16.06”

(L) 26.97”

(H) 17.72”

Volume: 33.031 gallons



Double Module

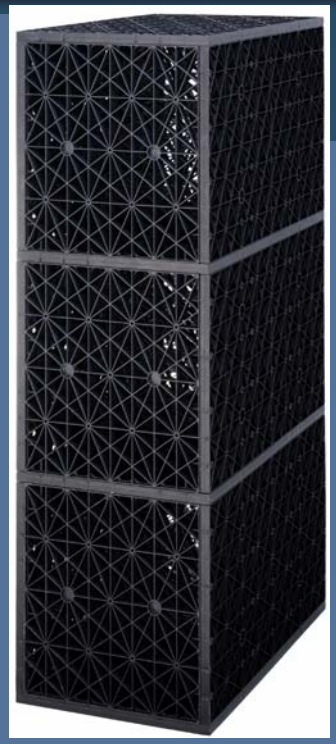
Size:

(W) 16.06”

(L) 26.97”

(H) 34.65”

Volume: 65.085 gallons



Triple Module

Size:

(W) 16.06”

(L) 26.97”

(H) 51.57”

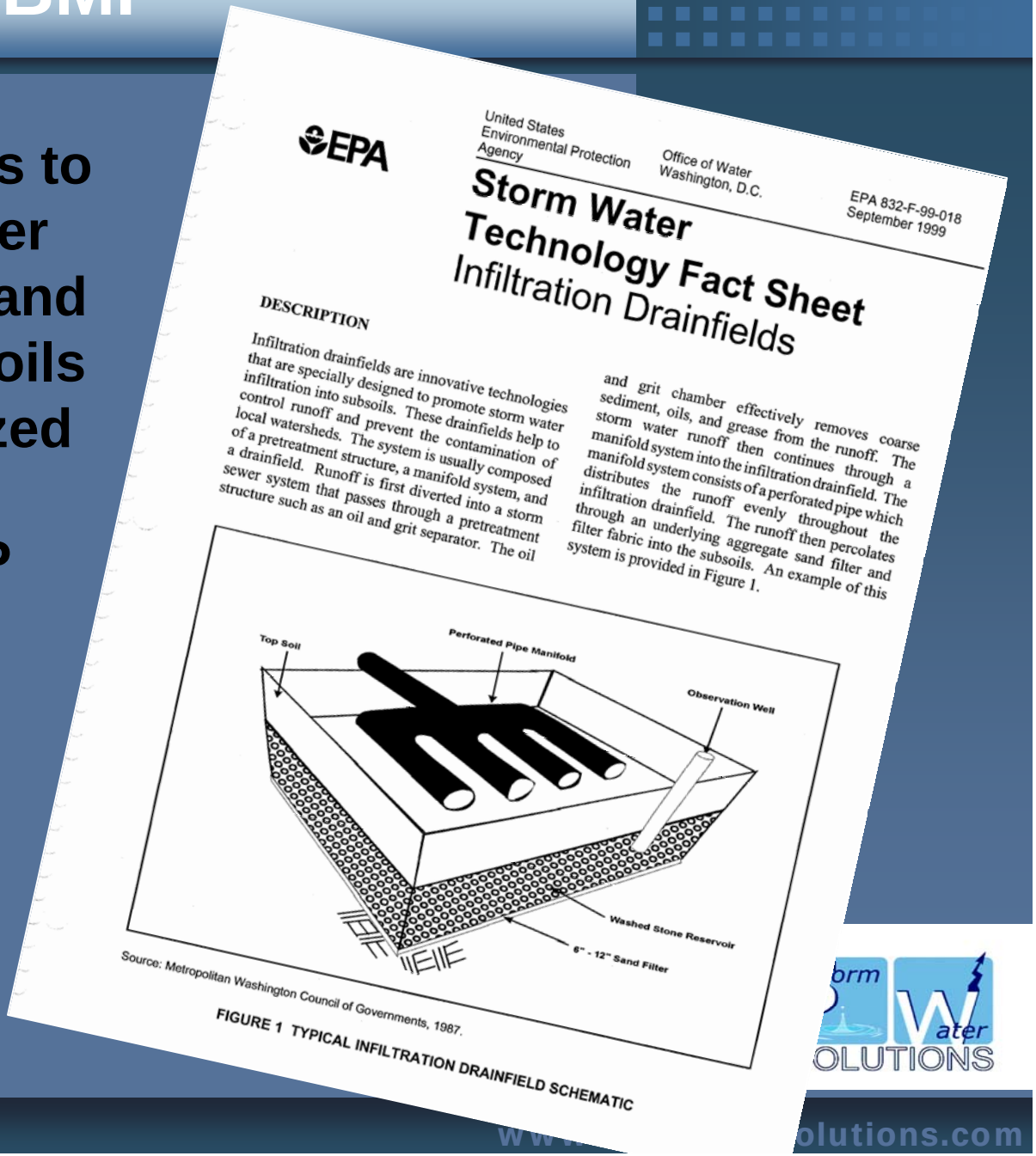
Volume: 88.135 gallons

Applications:

- **Tank Applications**
  - Retention
    - Infiltration
    - Harvesting / Recycling
  - Detention
  - Dry Wells
- **Linear Applications**
  - Infiltration Trench
  - Bioretention

EPA Recognized BMP

Infiltration Drainfields to promote storm water retention, detention and infiltration into subsoils are an EPA recognized Storm Water Management BMP



EPA

United States Environmental Protection Agency

Office of Water
Washington, D.C.

EPA 832-F-99-018
September 1999

Storm Water Technology Fact Sheet
Infiltration Drainfields

DESCRIPTION

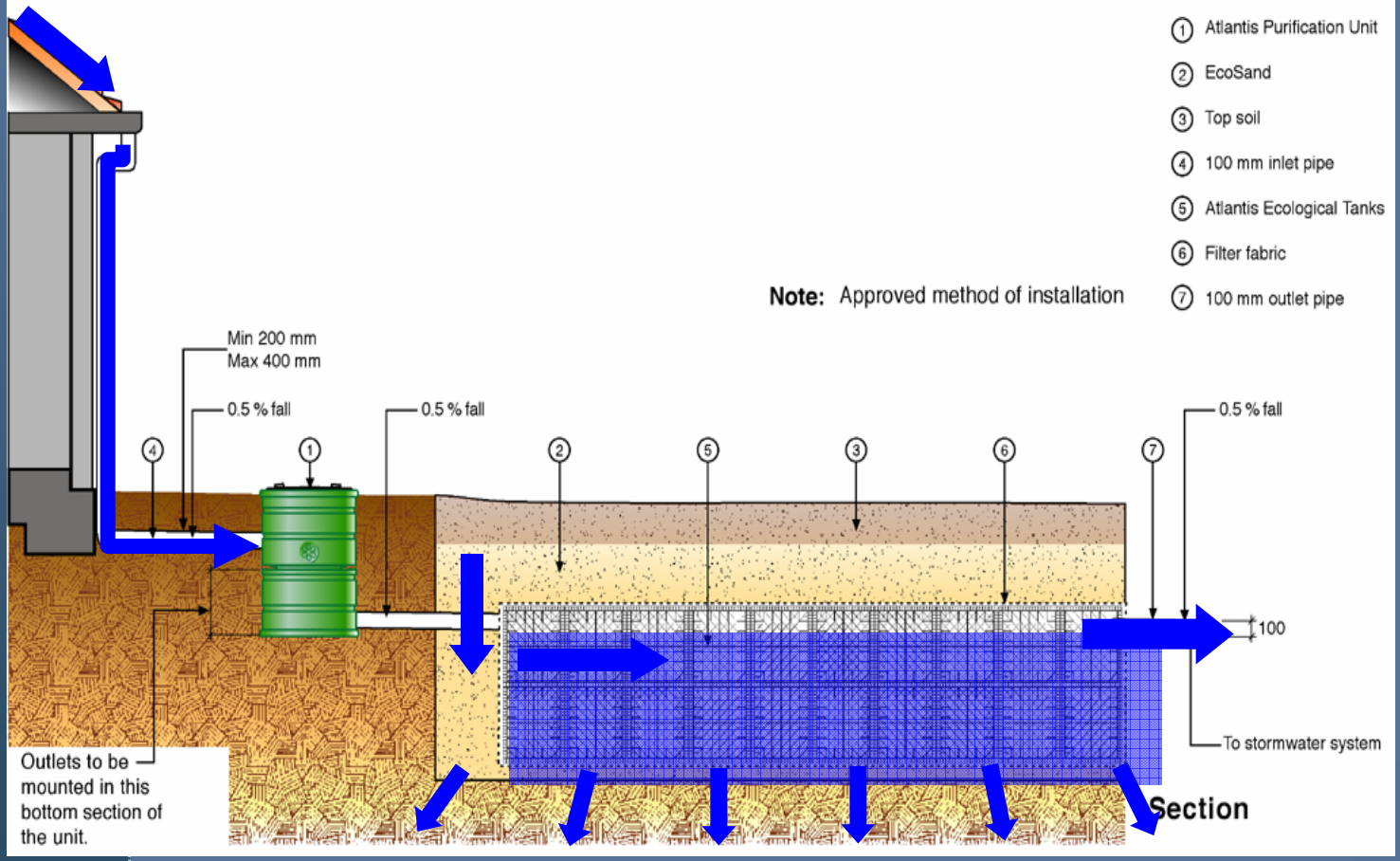
Infiltration drainfields are innovative technologies that are specially designed to promote storm water infiltration into subsoils. These drainfields help to control runoff and prevent the contamination of local watersheds. The system is usually composed of a pretreatment structure, a manifold system, and a drainfield. Runoff is first diverted into a storm sewer system that passes through a pretreatment structure such as an oil and grit separator. The oil and grit chamber effectively removes coarse sediment, oils, and grease from the runoff. The storm water runoff then continues through a manifold system into the infiltration drainfield. The manifold system consists of a perforated pipe which distributes the runoff evenly throughout the infiltration drainfield. The runoff then percolates through an underlying aggregate sand filter and filter fabric into the subsoils. An example of this system is provided in Figure 1.

Source: Metropolitan Washington Council of Governments, 1987.

FIGURE 1 TYPICAL INFILTRATION DRAINFIELD SCHEMATIC

Typical Tank Design

"Valley



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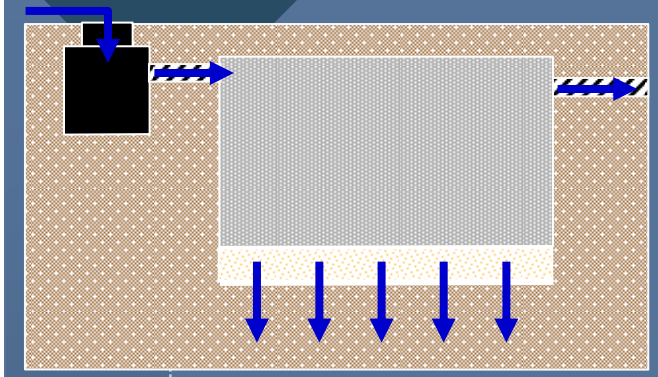
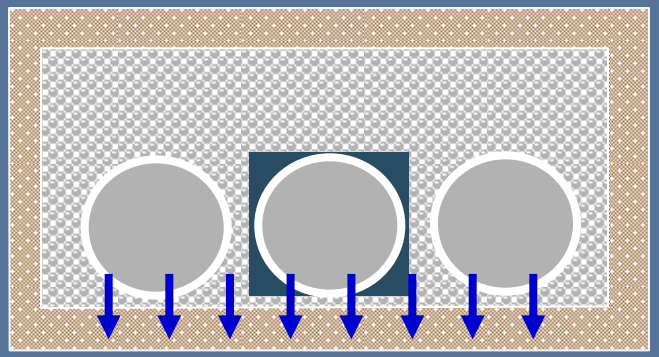
Evolution of Drainfield Designs



Drainage Stone Bed

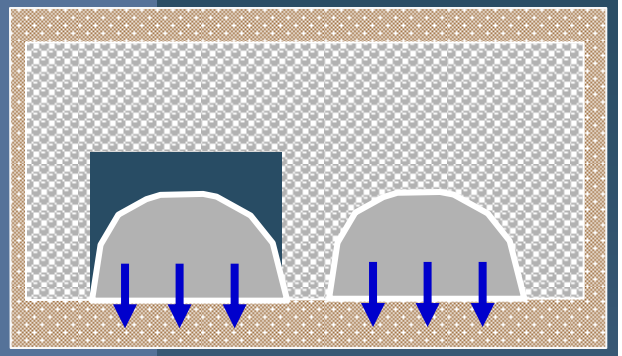
- Excavation filled with Drainage Stone
- 40% Void Space for Water Storage
- Inefficient – But It Worked



Pipe & Stone Filled Bed

- Pipe Creates Additional Void Area

Heavy use of stone (60-70%) to fill corners



Plastic Arch & Stone Filled Bed

Squares off bottom corners to increase efficiency

- Stone still required (59%) to fill corners and provide structural support

…allows for reduced excavation needs

Atlantis
Water Management for Life

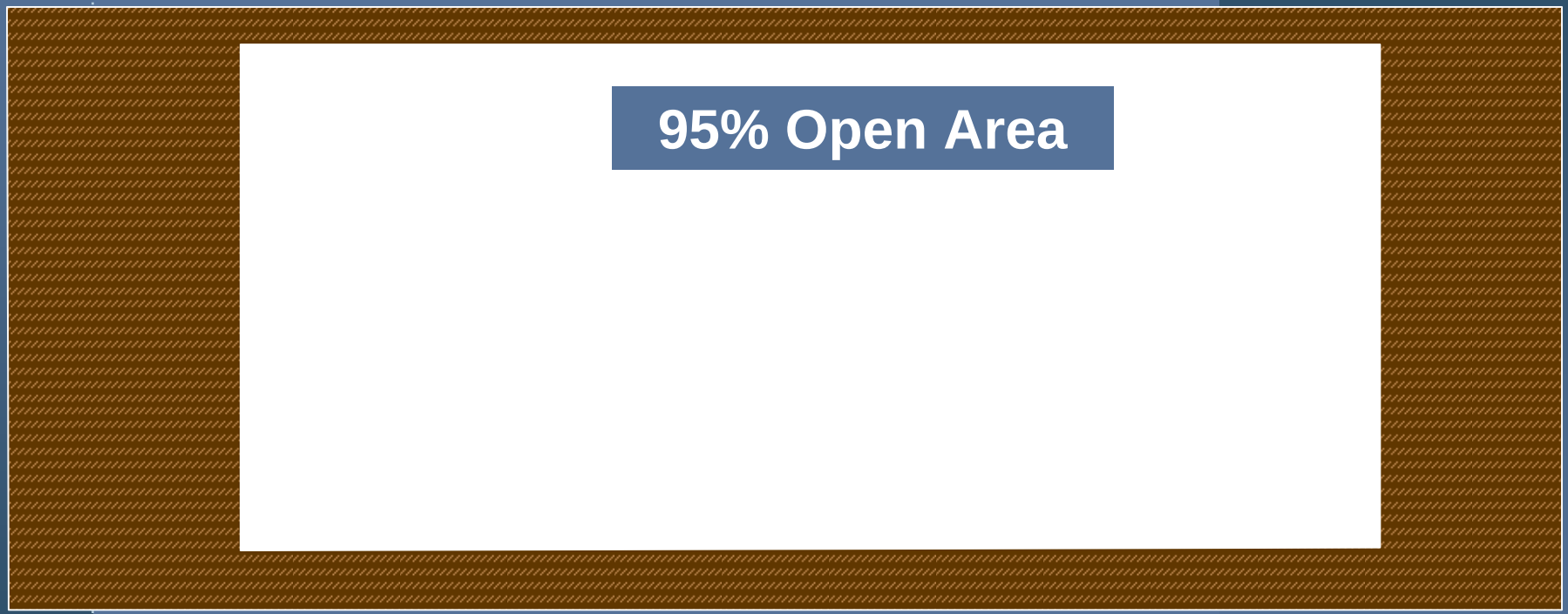
Instead of filling the excavation with stone…

Storm Water SOLUTIONS

...allows for reduced excavation needs

Atlantis
Water Management for Life

Fill it with storm water!



Minimize environmental impacts and make better use of land by excavating smaller storage areas or store more water in any given excavated area.

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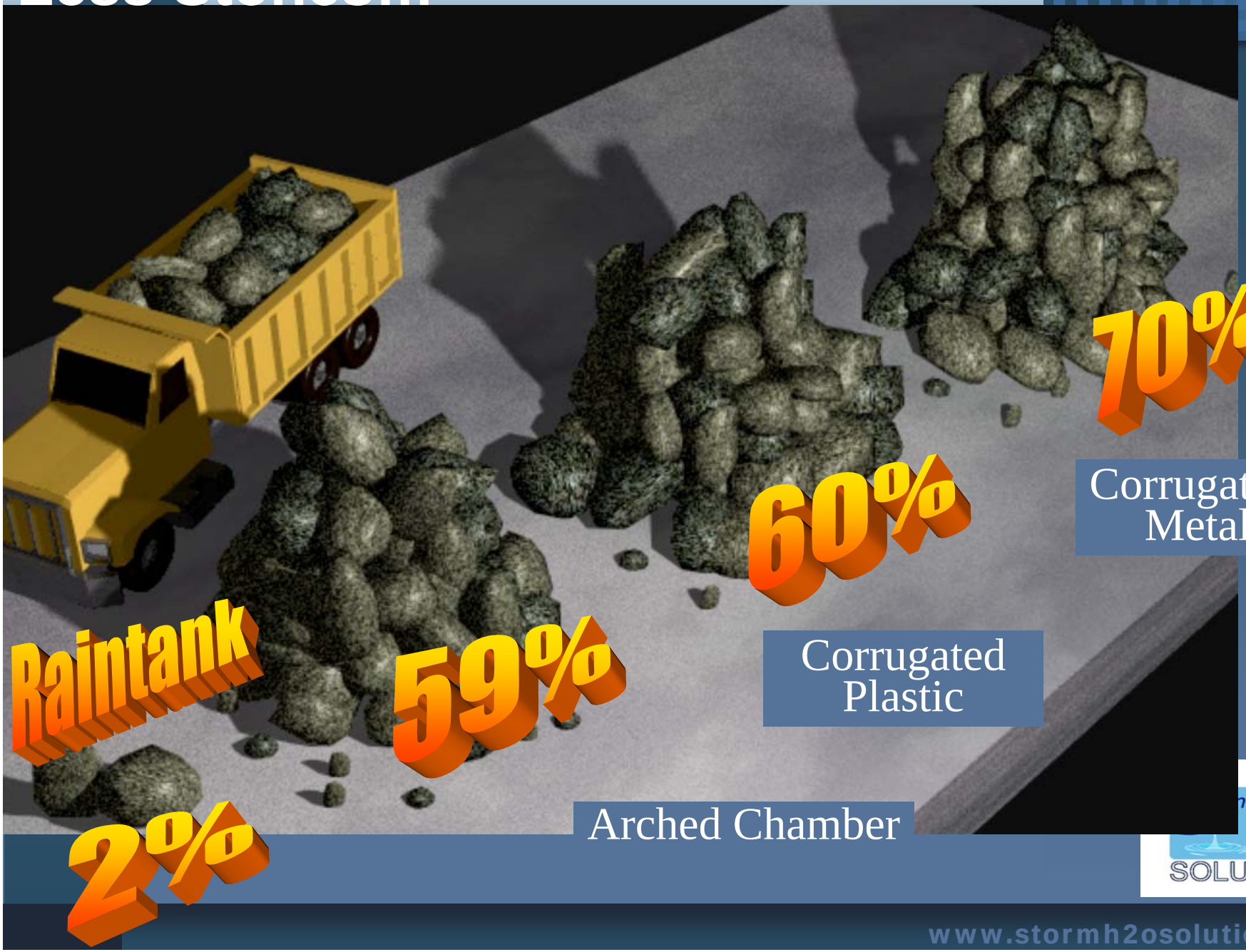
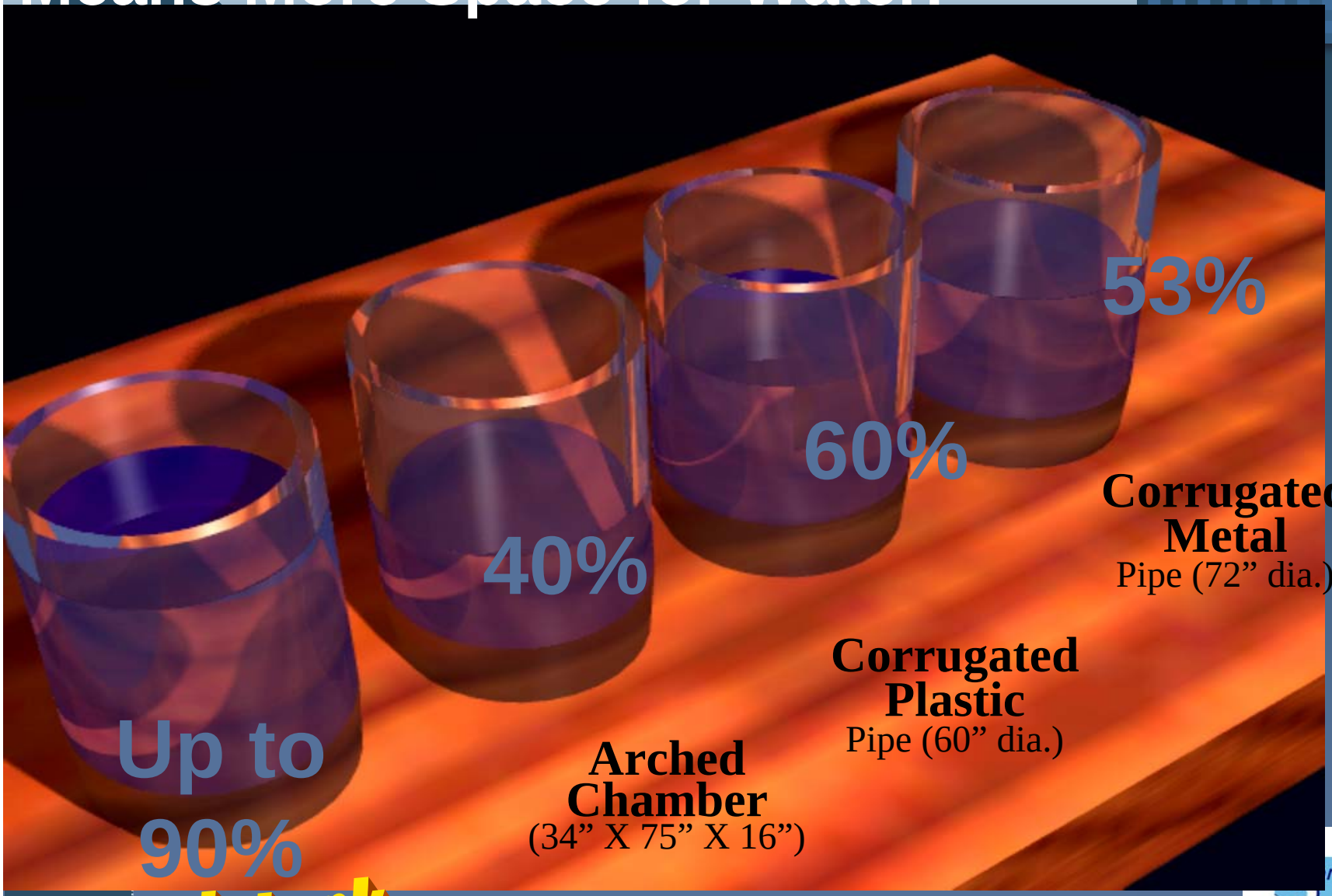
Less Stones…


70%
Corrugated Metal
60%
Corrugated Plastic
59%
Arched Chamber
Raintank
2%

Means More Space for Water!



Raintank

SOLUTIONS

Benefits:

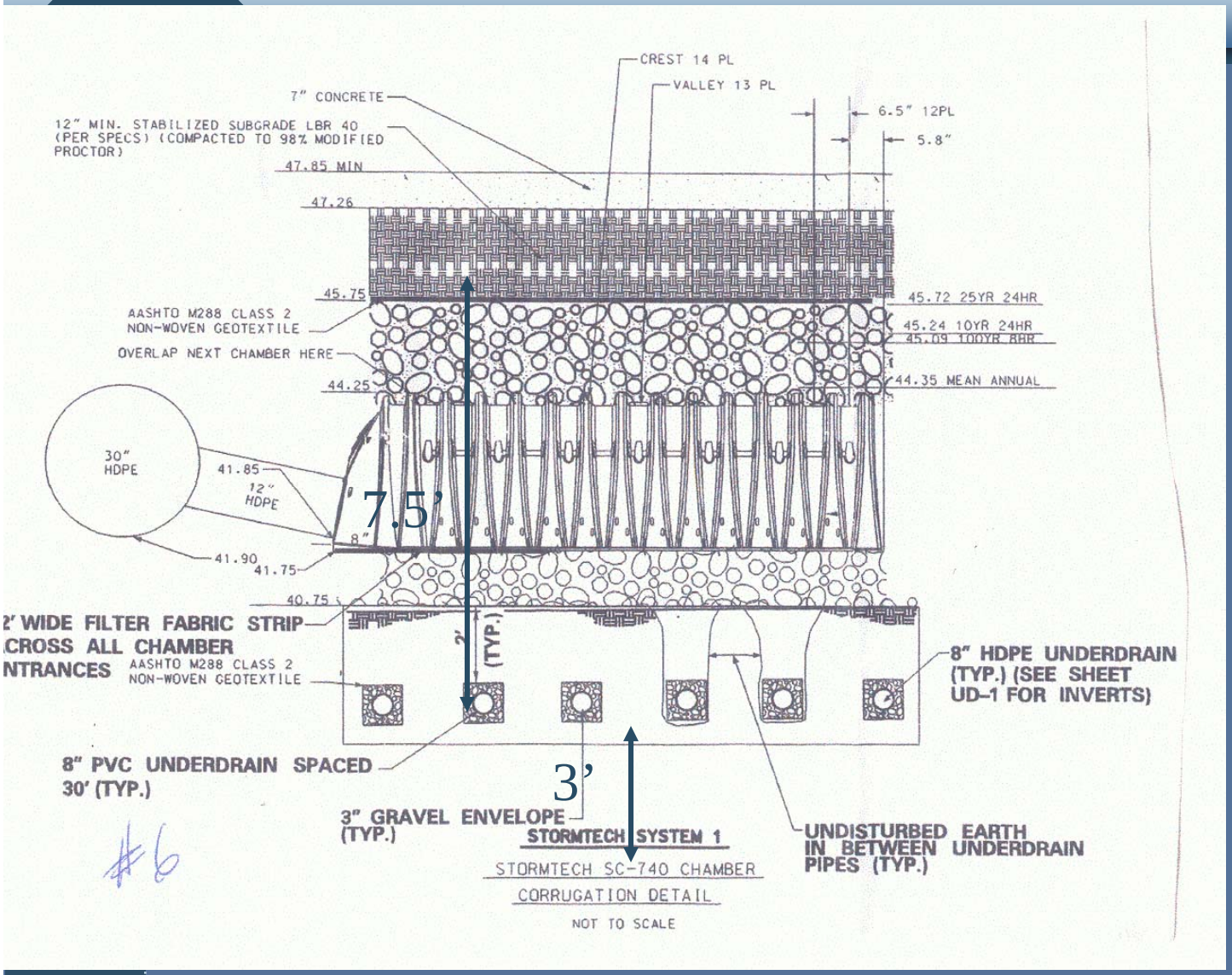
- 95% Void Space = Smaller Footprint for Water Storage
  - Less disturbance of site
  - Smaller excavations
  - Avoid underground utilities
- Infiltration & Reduced Runoff Improves Water Quality
- Retrofit / Reclaim Valuable Real Estate by Eliminating Ponds and Ditches
- Installation is Extremely Simple and Fast, Preventing Construction Delays
- Eliminates Environmental Concerns
  - West Nile
  - Trash
- Eliminates Liability Concerns

Case Study:

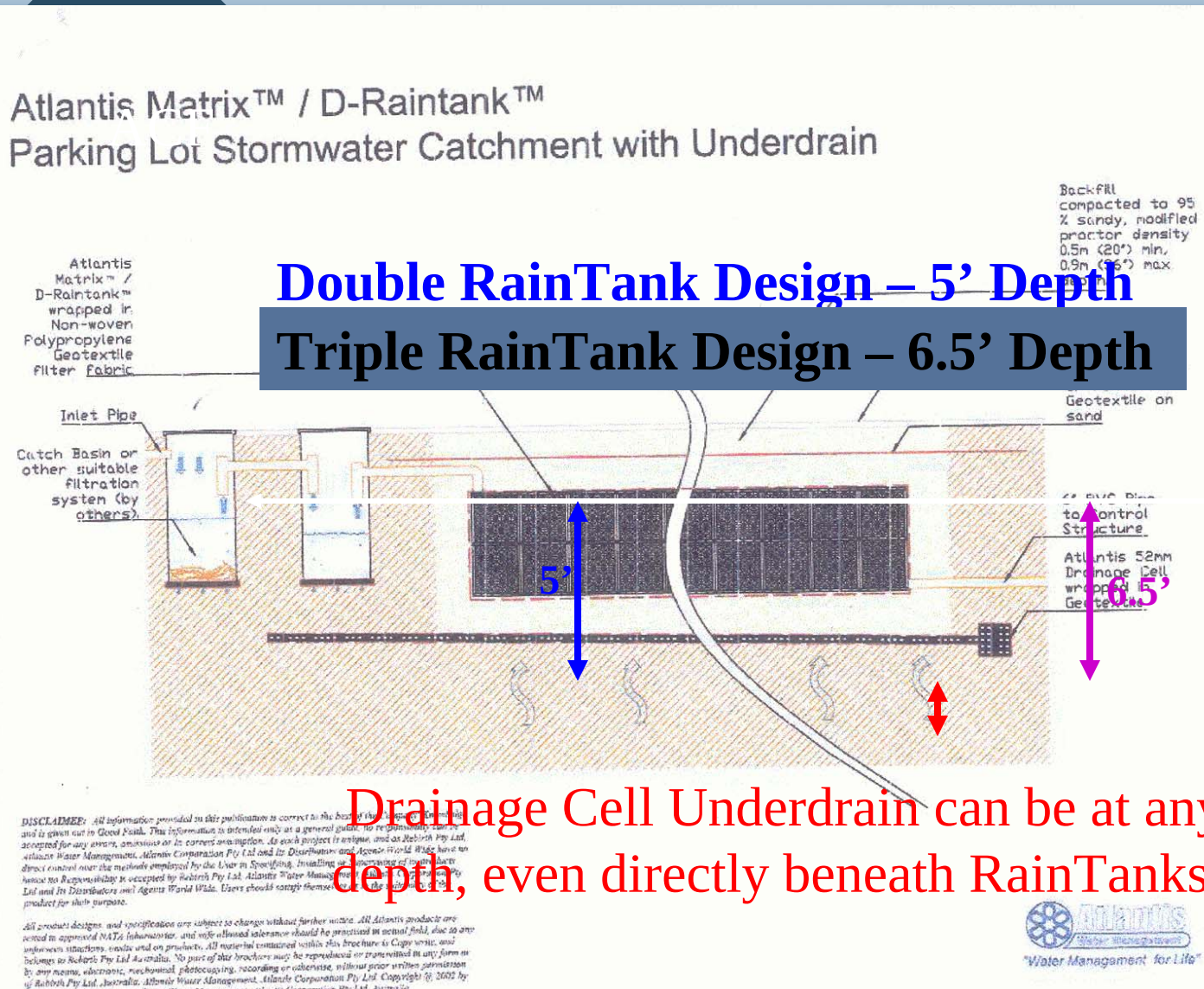
Arched Chamber System
vs.
Raintank®

Lowe's Home Improvement Warehouse
Orange Park, FL

Lowe's Home Improvement Warehouse *Original Design*



Lowe's Home Improvement Warehouse *Two Suggested Design Options*



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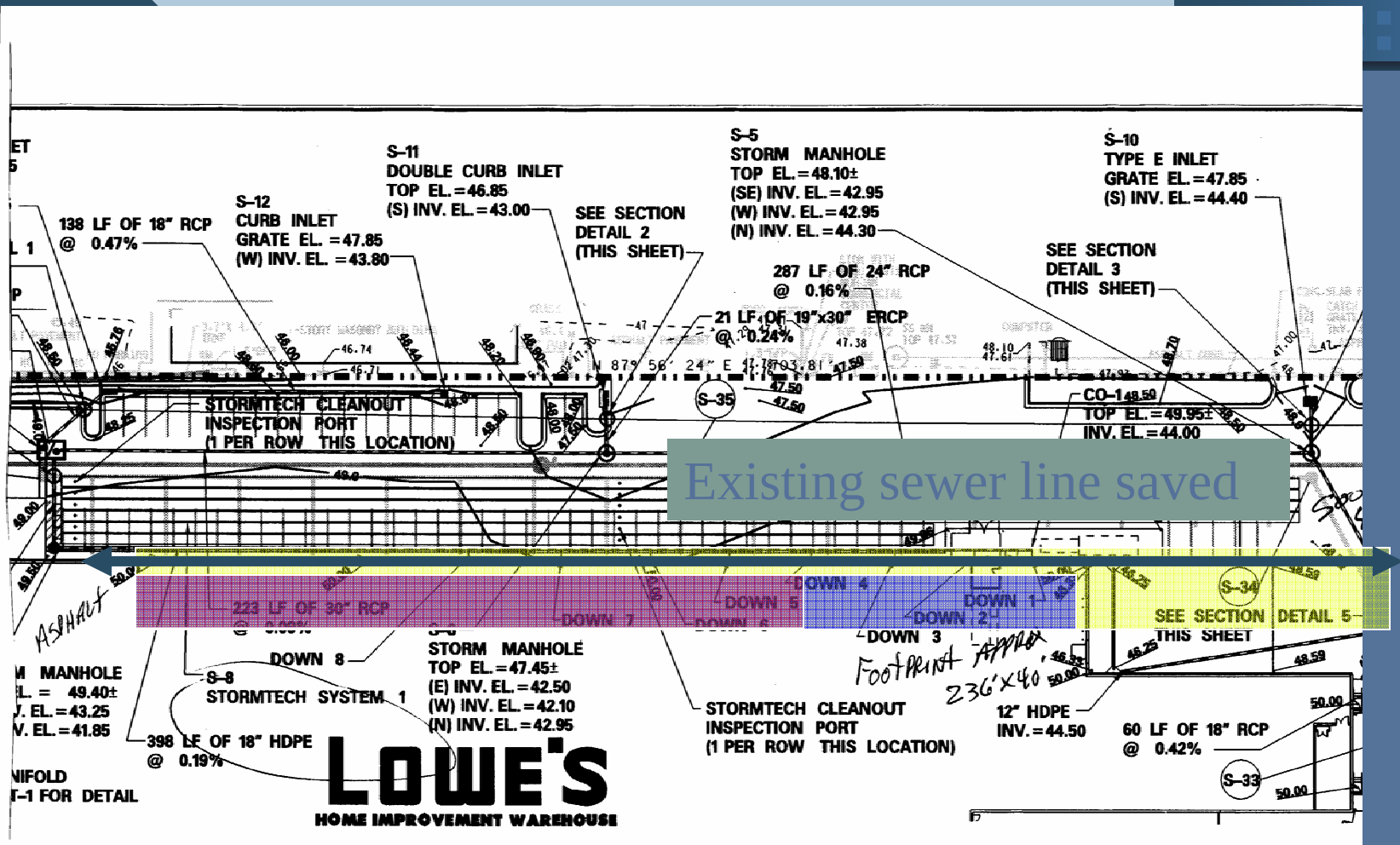
Lowe's Home Improvement Warehouse *Footprint Comparison*



Arched Chamber footprint - 40' x 500' x 10.5' (7,778 cy)

Double RainTank footprint - 30' x 401' x 5' (2,228 cy)

Triple RainTank footprint - 30' X 291' x 6.5' (2,102 cy)

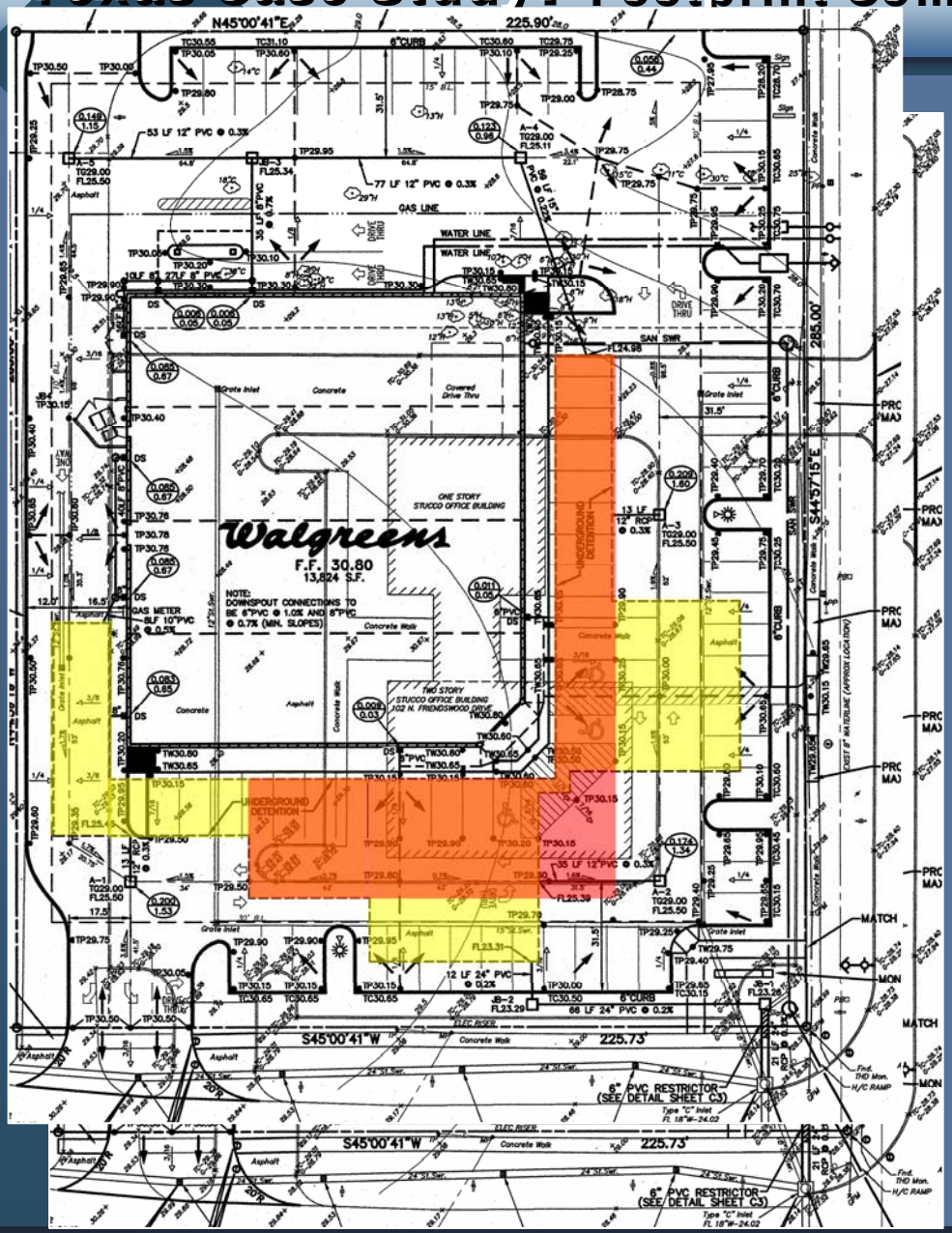
Case Study vs. Plastic Pipe System

ADS N-12 Pipe System
vs.
Raintank®

Walgreen's Drugstore
Friendswood, TX

www.stormh2osolutions.com

Texas Case Study: Footprint Comparison



Smaller footprint means less excavation, less time, less project disruption.

Filling the hole with Raintank rather than rock, means less backfill material required.

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Texas Case Study: Cost Comparison

ADS N-12 Pipe System		Raintank
$ 118,947	MATERIALS COST	$ 124,014
$ 10,427	EXCAVATION COST	$ 6,048
$ 20,986	BACKFILL COST	$ 3,710
$150,370	TOTAL SYSTEM COSTS	$ 135,772
Installation Labor	OTHER COSTS	< $2,000
Additional Installation Time		NA
Installation Equipment		NA
Freight Cost		NA

New Sub-Division

CANADA

New Sub-Division

St Katherine
Canada

Infiltration Tank - UK

Ground is excavated awaiting a 350 m3 (12.360 CU FT) tank installation

Infiltration Tank - UK

Geotextile is laid in excavated area

Infiltration Tank - UK

Atlantis® D-Raintank™ tank modules are placed into position.

Infiltration Tank - UK

The assembled tank is wrapped in geotextile.

Infiltration Tank - UK

Completed installation, ready for landscaping

Detention / Infiltration Tank - USA

Assembly of **Atlantis®** D-Raintank™ tank modules

Detention / Infiltration Tank - USA

Compacting surface.

Detention / Infiltration Tank - USA

Installing Atlantis® D-Raintank™ tank modules.

Detention / Infiltration Tank - USA

Tank is backfilled ready for driveway construction on top.

Florida-USA Detention Basin

Detention Basin

www.stormh2osolutions.com

Detention Basin

www.stormh2osolutions.com

Detention Basin

www.stormh2osolutions.com

Infiltration Tank Installation Video

Atlantis
Water Management for Life

Stormwater Solutions – Atlantis

D-Raintank™ Channels and swales

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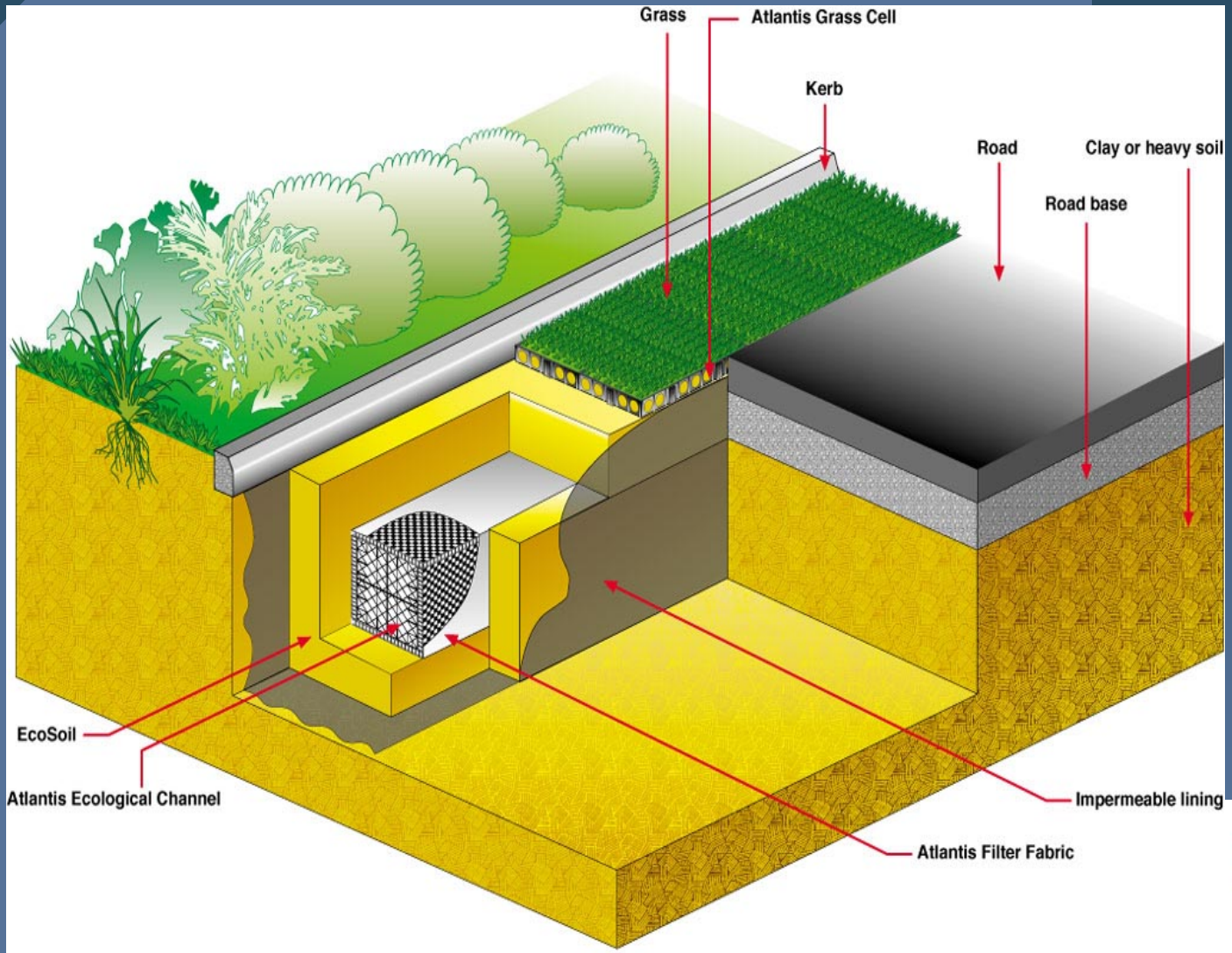
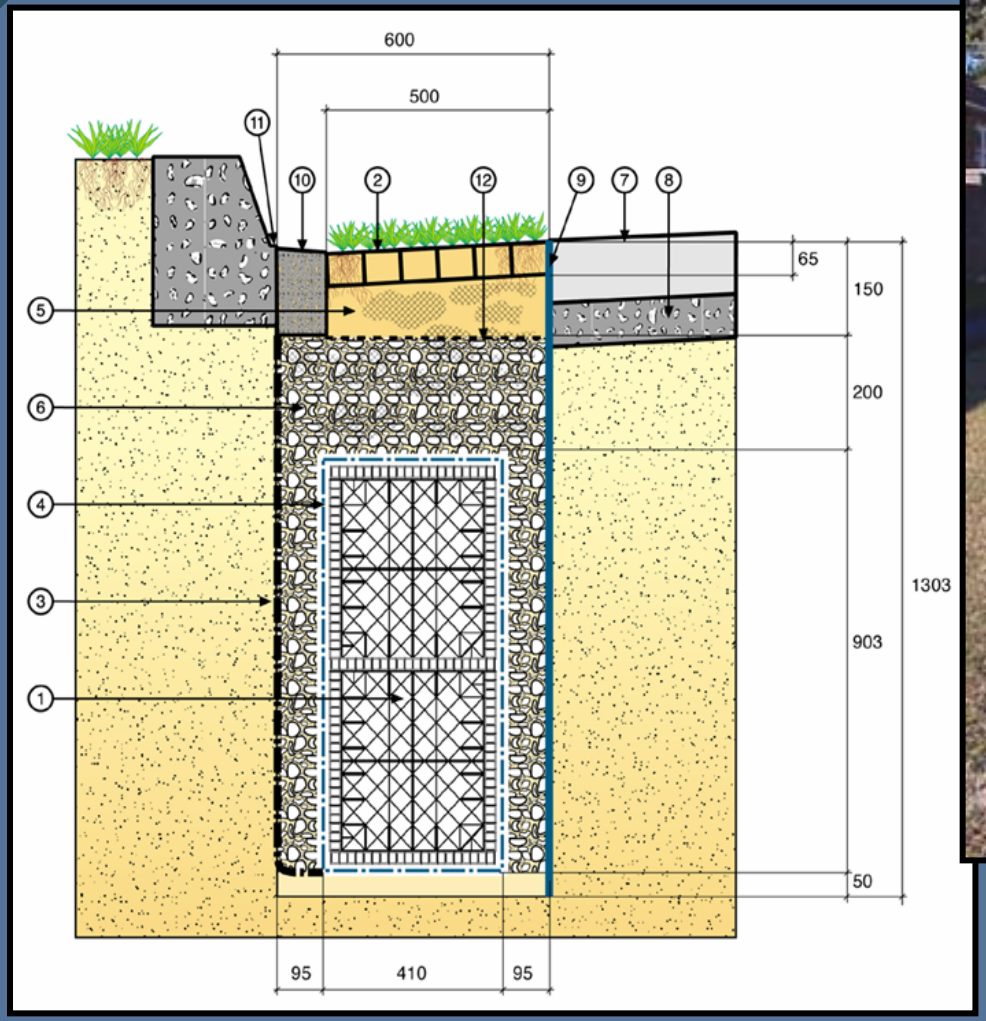
Concord Council-EPA Project, pervious road shoulders



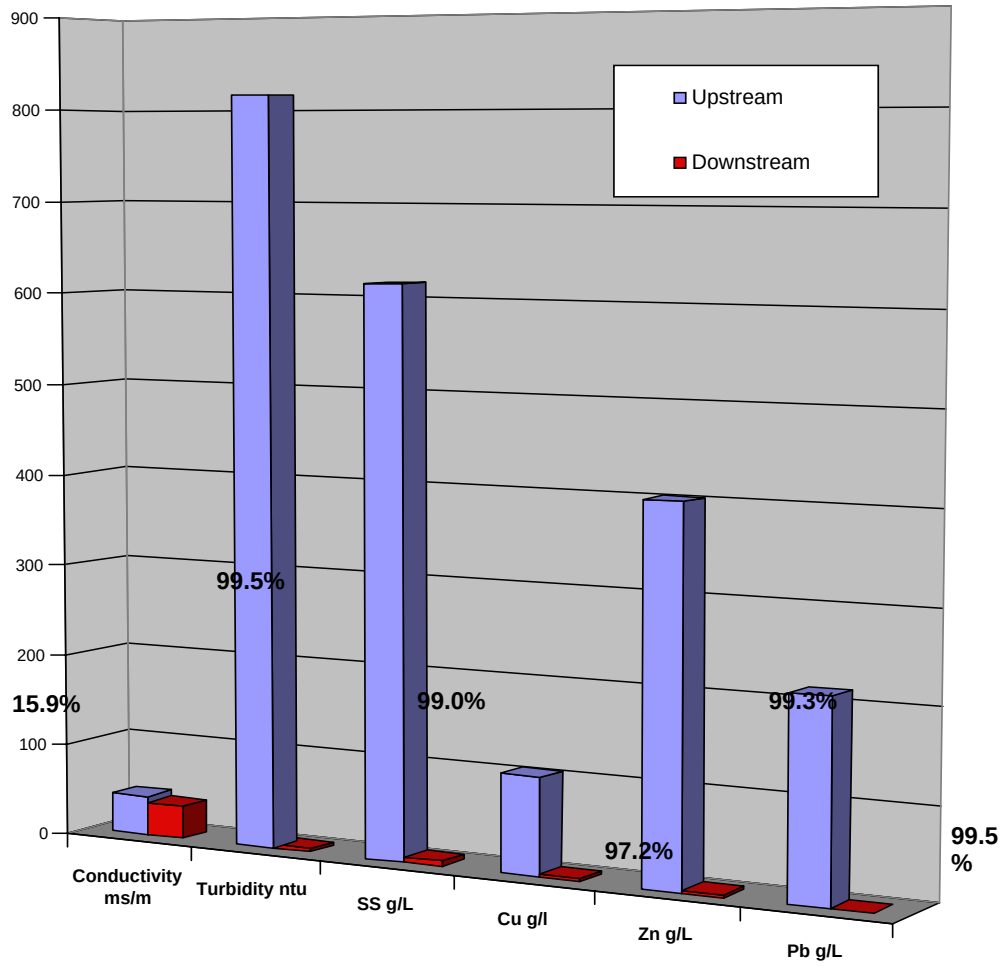
Concord Council-EPA Project

Curb Gully Channel



Concord Project-EPA Results

Graph 1b: Concord Water Quality



Channel 3d Video

Road Infiltration Channel Spain

Installation of road infiltration channel system using the **Atlantis® D-Raintank™** tank module.

Ecological Channels Holland

Installation of 600 l/m (1,968 l/FT) of **Atlantis®** **D-Raintank™** infiltration channel.

Road Channel - Spain

Installation of 1.5 kilometer (4,921 l/FT) of **Atlantis® D-Raintank™** infiltration road channel.

Channel Retrofitting - Malaysia

Channel Retrofitting-Malaysia

Channel Retrofitting-Malaysia

CONSTRUCTION OF AN ECOLOGICAL SWALE-Malaysia

Malaysia University Engineering Campus

CONSTRUCTION OF AN ECOLOGICAL SWALE-Malaysia

Malaysia University Engineering Campus

Water quality research by University

Stations	Temperature (°C)	pH	DO (mg/L)	BOD_5 (mg/L)	COD (mg/L)	TSS (mg/L)	Turbidity (NTU)	Pb (mg/L)	Cu (mg/L)	Zn (mg/L)
GS1	26.1-30.1	5.7-7.9	2-3	3-9	0-99	0-19	8-13	0-1.4	0-1.8	0.0
GS2	25.6-30.5	5.4-7.8	1-6	0-12	5-129	0-3	6-21	1-1.4	0-1.9	0.0
GS3	24.0-31.9	5.5-8.2	2-4	2-8	16-72	0-27	7-33	1-1.4	0-1.6	0.0
GS4	24.6-30.1	5.3-7.9	1-6	1-7	11-144	0-10	15-28	0-1.4	0-1.8	0.0
GS5	25.0-32.1	5.4-8.1	1-5	0-11	0-80	0-13	9-19	0-1.1	0-1.7	0.0
GS6	25.0-32.1	5.4-8.7	1-5	1-5	0-110	0-28	10-128	0-1.1	0-1.6	0.0
GS7	25.6-31.5	5.5-7.4	1-5	1-5	2-190	0-19	10-22	0-1.1	0-1.9	0.0
GS10	24.0-28.7	5.4-8.2	1-5	1-5	16-87	5-48	22-66	0-1.4	0-1.7	0.0
GS9	24.9-26.7	5.6-7.8	2-5	2-5	13-110	0-60	13-23	0-1.2	0-1.6	0-0.5
GS8	6.0-29.6	5.4-7.4	1-5	1-5	2-83	0-9	9-18	0-1.4	0-1.6	0.0

Parameters Range

(July - October 2003)

Roads and Highways-USA

Water running down and across road lead to major damage

Roads and Highways-USA

Fabric Wrapped around D-RainTanks and Trench Backfilled with Sand

Roads and Highways-USA

Seeded and Erosion Blanket Installed.

Completed Project

Underdrain using 52mm (2,05”)Cell - Scotland

Concrete slab for building, build on top of CELL to release water pressure

UNDER-DRAIN USING 52mm(2,05”) CELL - Scotland

Construction of building starts

UNDERDRAIN USING 52mm(2,05”) CELL - USA

Drainage Cell replacing pipes and gravel as underdrain

UNDERDRAIN USING 52mm(2,05”) CELL - USA

Site ready for installation of D-RainTanks as a detention BMP

Infiltration BMP Basin-USA

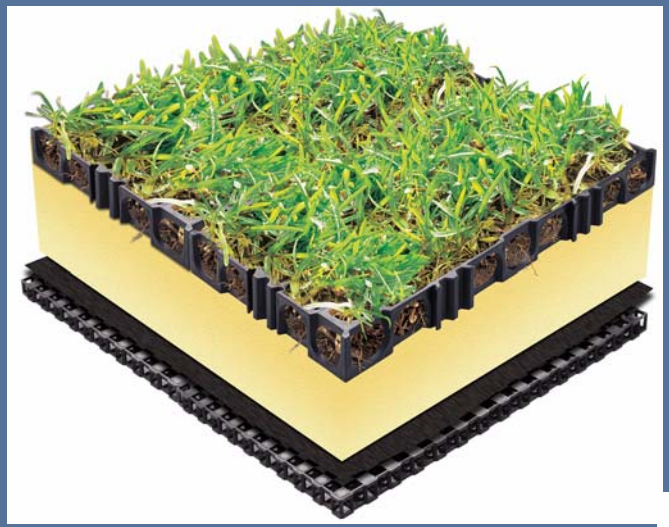
Santa Monica –CA

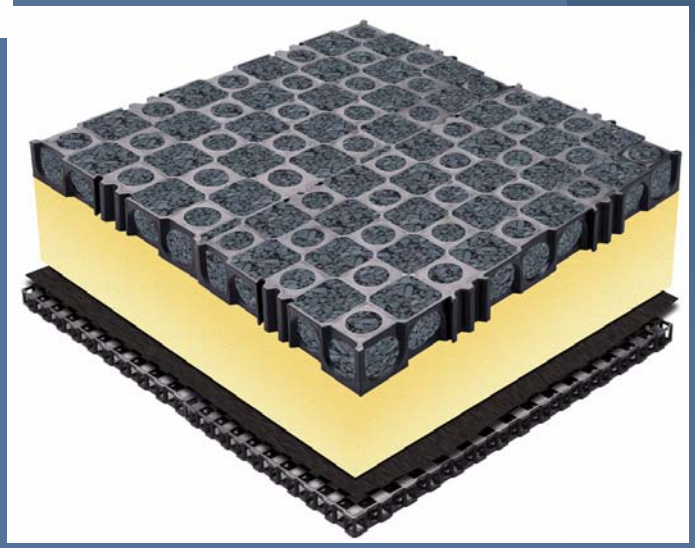
BMP at work using Stormwater Solutions-Atlantis D-RainTanks

Infiltration BMP Basin-USA

easy installation about to be finish

Turf & GravelCell





Parking Lot with GravelCell

Parking Lot with GravelCell

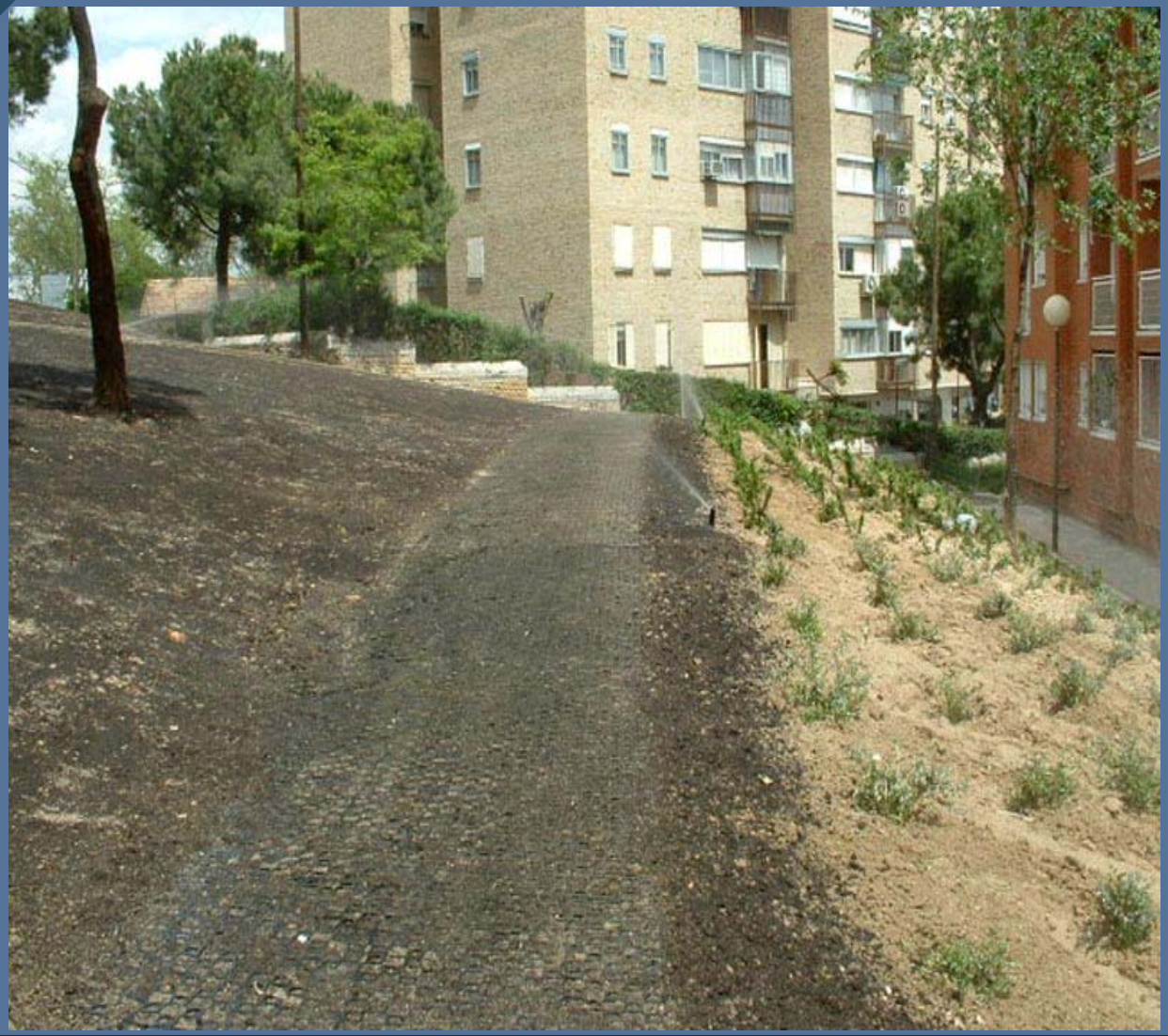
Creation of pervious road gutters using GravelCell

Parking Lot with TurfCell

TurfCell™ Access Road-Spain

Installation of Atlantis® Turf Cell® grass reinforcement structure for internal road upgrade for existing unit development.

TurfCell™ Access Road - Spain



Atlantis® Turf Cell® grass reinforcement structure filled with soil mix and turf seedlings.

TurfCell™ Road - Spain

Established luscious grass growth reinforced within the Atlantis® TurfCell®.

SPORT FIELDS

Sydney Olympic Stadium

SPORTFIELDS-USA

Baseball field,
Jacksonville-FL

SPORTFIELDS-USA

Cricket Field -CA

LANDFILLS

UK

OTHER APPLICATIONS & CONTACTS

- Bio Filters
- Leach Drain
- Environmental Applications

CONTACTS:

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Mary: 310 560-7734

Manuel: 323 440-0448

Email:info@stormh2osolutions.com

Web: www.stormh2osolutions.com