ABT permavoid

ABT Permavoid is a unique stormwater management / water conservation system that locally mimics natural water cycles and can save up to 30% on overall site drainage costs.

Storage	Modular units with 95% void ratio interlock with patented lateral connectors to create a monolithic stormwater management system eliminating the need for end of line ponds and tanks.
Infiltration	The ultra-shallow profile promotes stormwater infiltration over the largest area possible, including under traditional pavements like asphalt and concrete removing the added costs of permeable paving.
Subbase Replacement	The ultra-high strength (104 psi yield) safely and reliably transfers traffic loads to subgrade soils replacing subbase stone.
Conveyance	Stormwater is efficiently transported to discharge locations or landscaped areas for natural reuse eliminating drainage and irrigation pipes.
Passive Irrigation	Patented wicking cones employ capillary action to bring stormwater directly to the root zone of landscaped areas while keeping it away from evaporative heat and sunlight for up to 60% savings vs traditional sprinkler irrigation.

Since its inception ABT Permavoid has revolutionized the way about which stormwater is thought. Its unique capabilities allow even the most challenging developed sites to behave like their natural pre-development counterparts. Whether returned to the community water cycle through infiltration or utilized locally through passive irrigation, ABT Permavoid promotes the most natural, environmentally friendly methods of managing stormwater. It is the clear choice on sites both big and small when designing resilient landscapes; beautiful landscapes that enhance neighborhood aesthetics, mitigate flood risks and during periods of drought, conserve our most precious resource.

SR SUBBASE REPLACEMENT

Minimize excavation costs while reducing runoff and meeting stormwater BMP objectives.

Ultra shallow envelope avoids surface bedrock, contaminated subgrades and high water tables.

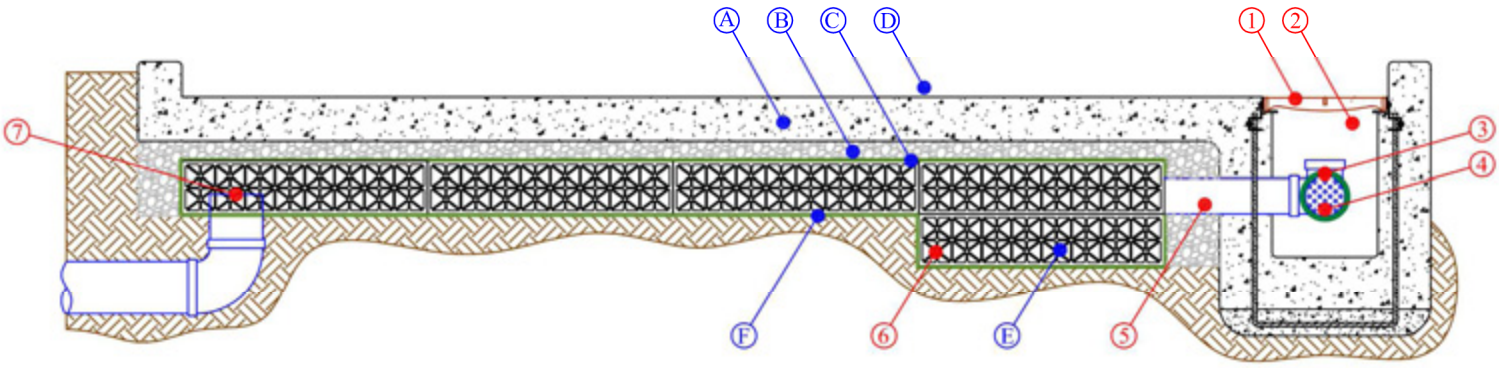
Maximize stormwater attenuation through increased surface area for infiltration

Eliminate large diameter, deep pipes by routing stormwater into Permavoid at it's source.

Reduce flood risks by storing water to reduce runoff and control discharge rates.

Maximize the performance of permeable surfaces by storing and conveying water within Peramvoid.

Minimize subgrade improvement by dissipating heavy traffic loads through the Permavoid interlocking structural raft.



Treatment Train

1. Ductile Iron Grate Inlet
2. TrenchFormer Catch Basin
3. FirstFlush Filter Fabric
4. FirstFlush Pipe w/ Orifice Bypass
5. Permavoid Inlet Connection
6. Permavoid Water Attenuation / Storage Units
7. Off-Site Controlled Discharge Pipe

Notes & Features

- A—Concrete Pavement (5 in. for H-20)
- B—Compacted Subbase (2 in. for H-20)
- C—Geotextile (Mirafi 1100N)
- D—Emergency Surface Water Storage
- E—Scour Prevention Chamber
- F—Geotextile or Geomembrane

Permavoid is exceptionally capable of withstanding heavy traffic loads. As a result it is often used to replace traditional stone subbase in order to add safety and functionality. When poor subgrade soils are present Permavoid can be utilized to help spread traffic loads without complicating the problem by adding dead loads. With ideal subgrades Permavoid is used under traditional impervious pavement to allow them to behave like permeable surfaces while maximizing infiltration area. With nearly any subgrade Permavoid can be used to convert traditional subbase into an extensive stormwater management tool capable of both conveyance and storage.

ABT® permavoid

PR PIPE REPLACEMENT

Minimize excavation costs while reducing runoff and meeting stormwater BMP objectives.

Avoid subgrade conflicts such as bedrock, contaminated ground, buried utilities and high water tables.

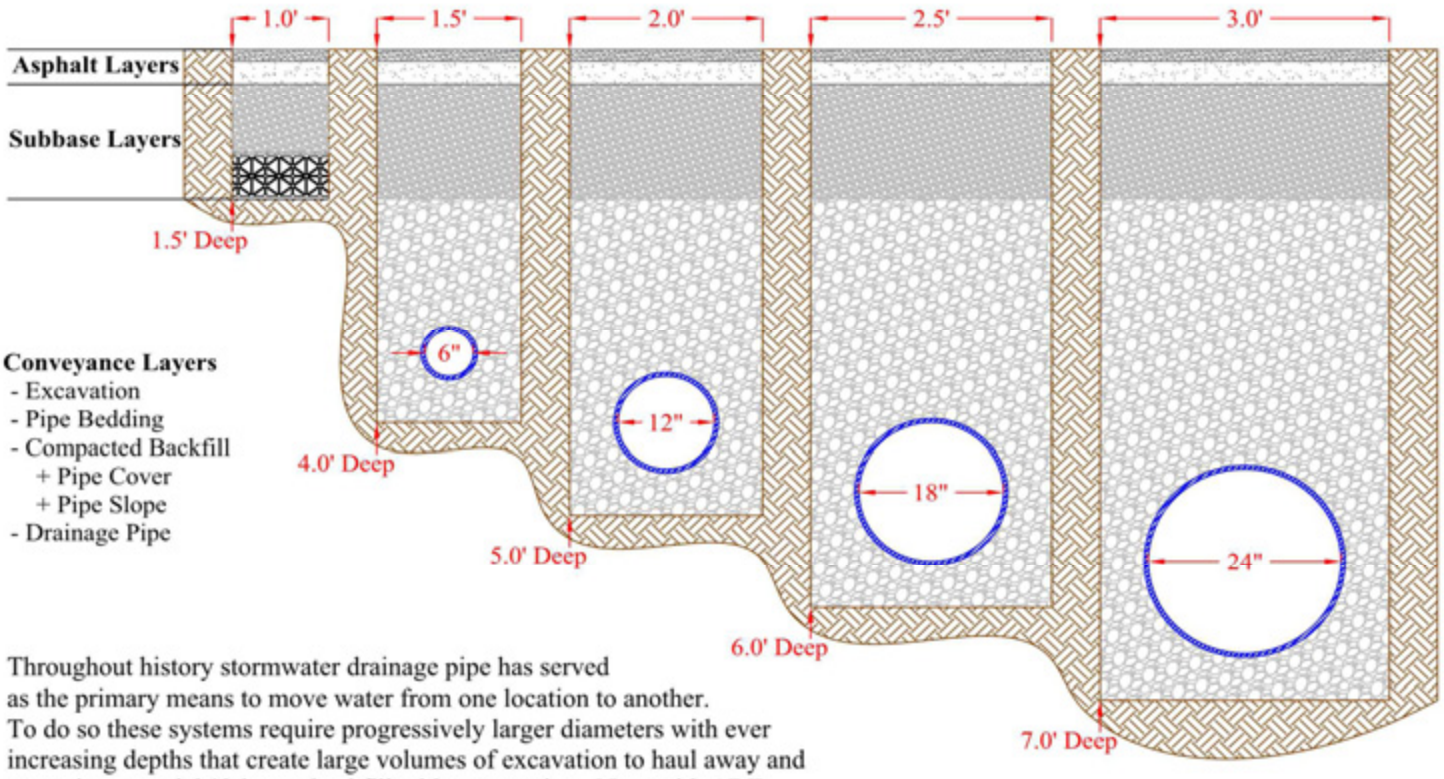
Maximize stormwater attenuation through increased surface area for infiltration

Eliminate large diameter, deep pipes by routing stormwater into Permavoid at it's source.

Reduce flood risks by storing water to reduce runoff and control discharge rates.

Maximize the performance of permeable surfaces by storing and conveying water within Permavoid.

Minimize subgrade improvement by dissipating heavy traffic loads through the Permavoid interlocking structural raft.



Throughout history stormwater drainage pipe has served as the primary means to move water from one location to another. To do so these systems require progressively larger diameters with ever increasing depths that create large volumes of excavation to haul away and extensive material / labor to backfill with compaction. Now with ABT, Permavoid these costs can be eliminated. ABT, Permavoid's ultra high strength and unique highly voided internal structure allows these traditionally deep conveyance layers to fit within the subbase layer.

ABT® permavoid

DR DETENTION REPLACEMENT

Minimize excavation costs while reducing runoff and meeting stormwater LID and BMP objectives.

Create offsetting costs by accomplishing multiple drainage functions simultaneously.

Design stormwater detention that remains accessible for easy and natural reuse on site.

Reduce construction time and cost by simplifying detention within a continuous, uniform layer of ABT, Permavoid.

Prevent subgrade conflicts such as bedrock, contaminated ground, buried utilities and high water tables.

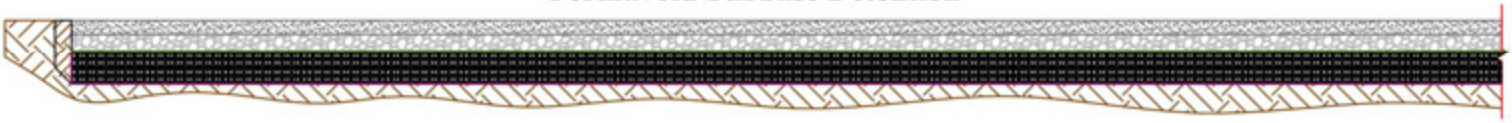
Mitigate roadway damage by eliminating massive volumes of hauled materials.

Avoid the hazards and liability of deep exposed surface water from open ponds through subbase detention with ABT, Permavoid.

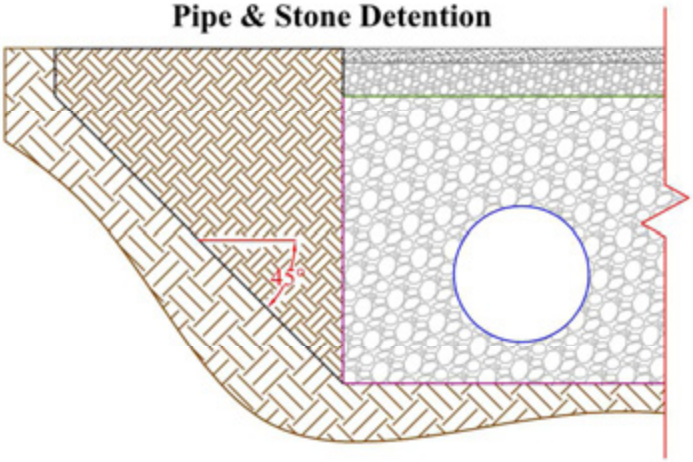
Eliminate unsightly trash and debris build-up that reduces property values.

Maximize land use by preventing the wasted area dedicated to open ponds.

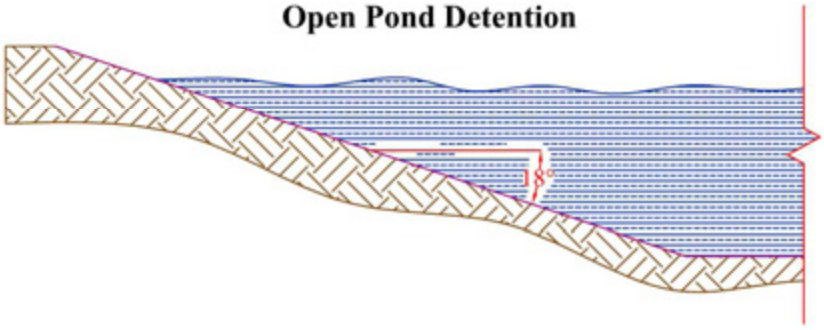
Permavoid Subbase Detention



Pipe & Stone Detention



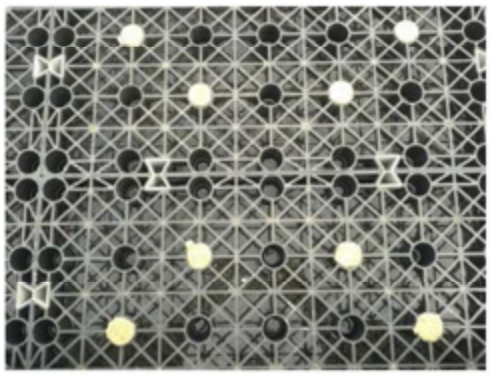
Open Pond Detention



Detention is a critical step for effective stormwater management systems. While traditional methods have been effective thus far, they have always come with trade-offs. With open ponds there are serious concerns of safety, aesthetics, maintenance and land use. With pipe / stone systems; construction time, materials handling and potential conflicts become driving factors. With ABT, Permavoid these pitfalls of historical approaches can be averted while promoting the most responsible and natural pre-development behavior of our stormwater.

ABT® permavoid

PI PASSIVE IRRIGATION



Achieve the classic look and feel of natural turf without costly irrigation.

Provides the ideal base for precision graded lawns, landscaping and playing surfaces.

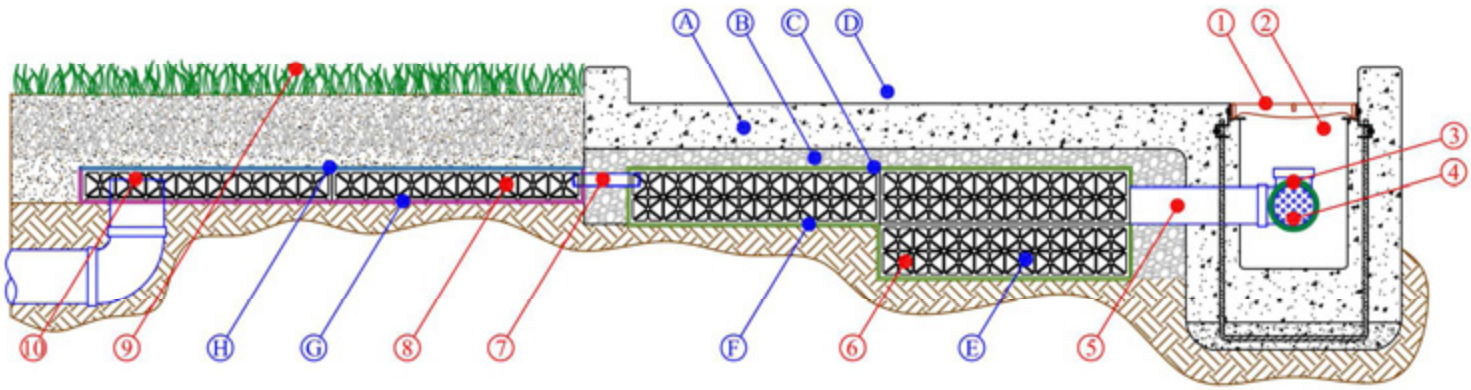
Maximizes LID performance by reducing storm- water discharge through evapo-transpiration.

Mimics pre-development stormwater behavior by maximizing green space functionality.

Reduces heat-island effect through natural and biological evaporation processes.

Eliminates costly irrigation systems by wicking stored water to turf and landscaped areas.

Reduces runoff by converting stormwater from a waste product to a valuable resource.



Treatment Train

1. Ductile Iron Grate Inlet
2. TrenchFormer Catch Basin
3. FirstFlush Filter Fabric
4. FirstFlush Pipe w/ Orifice Bypass
5. Permavoid Inlet Connection
6. Permavoid-150 Water Attenuation / Storage
7. Controlled Discharge Pipe
8. Permavoid-85 Passive Irrigation / Storage
9. Passive Irrigated Grass - Evapo-Transpiration
10. Off-site Controlled Discharge Pipe

Notes & Features

- A Concrete Pavement (5 in. for H-20)
- B Compacted Subbase (2 in. for H-20)
- C Geotextile (Mirafi 1100N)
- D Emergency Surface Water Storage
- E Scour Prevention Chamber
- F Infiltration Geotextile
- G Irrigation Geomembrane
- H Wicking Geotextile

Healthy green lawns and landscaping beds add to the property values and aesthetics of any neighborhood or commercial area. With Permavoid's unequaled strength, water can be held very near the surface and in turn allow for passive irrigation. This assures plants remain at their best even during periods of drought. With heavy rainfall stormwater is retained for later use. During dry months the spigot or well water can be used to partially fill the tank. In both cases Permavoid keeps this precious resource away from evaporative sunlight and heat insuring the water is used precisely where it is intended.

ABT® permavoid

BIOSWALE OPTIMIZATION

Maximizes shallow storage and conveyance assuring the best bio-swale efficiency.

Adds aesthetically pleasing green space promoting increased property value.

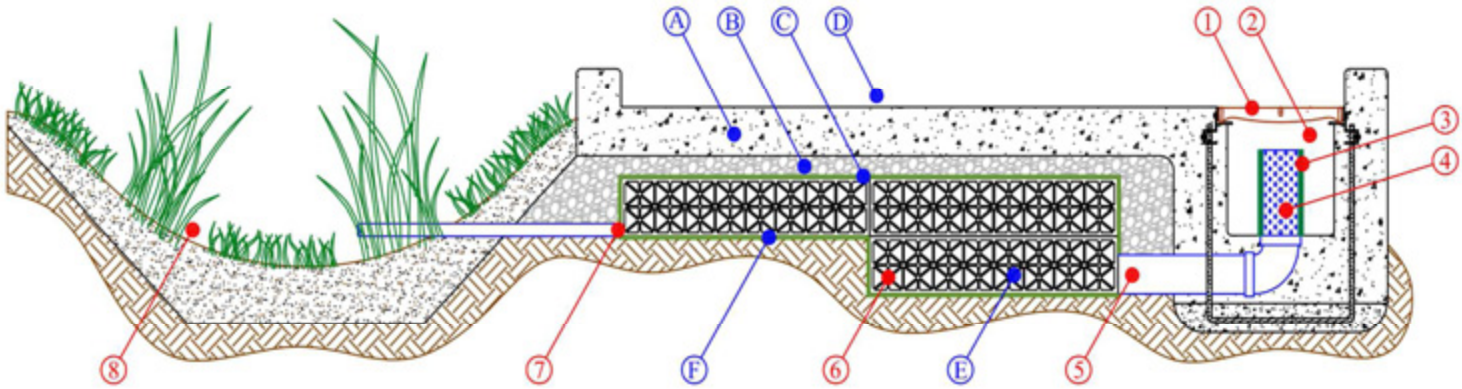
Maximizes LID performance by reducing storm- water discharge through evapo-transpiration.

Mimics pre-development stormwater behavior by maximizing green space functionality.

Reduces heat-island effect through natural and biological evaporation processes.

Minimizes liability by controlling exposed surface water elevations.

Maximizes bio-remediation by storing excess runoff until further capacity is available.



Treatment Train

1. Ductile Iron Grate Inlet
2. TrenchFormer Catch Basin
3. FirstFlush Filter Fabric
4. FirstFlush Pipe w/ Orifice Bypass
5. Permavoid Inlet Connection
6. Permavoid Water Attenuation / Storage Units
7. Controlled Discharge Pipe
8. Vegitative Bioswale

Notes & Features

- A. Concrete Pavement (5 in. for H-20)
- B. Compacted Subbase (2 in. for H-20)
- C. Geotextile (Mirafi 1100N)
- D. Emergency Surface Water Storage
- E. Scour Prevention Chamber
- F. Geotextile or Geomembrane

Bioswales provide a great opportunity to naturally treat and manage stormwater while adding bio-diversity and aesthetic appeal to any urban or rural landscape. Permavoid complements and enhances this by optimizing their footprint and maximizing their functionality. Excess water is stored in an ultra shallow profile allowing extended contact time for bio-remediation, evapo-transpiration and/or infiltration. Permavoid combined with bioswales create resilient landscapes that harness stormwater as an indispensable resource and utilize it to the fullest extent.

ABT® permavoid

TP TREE PROTECTION

Protect mature trees to enhance urban aesthetics, quality of life and property value.

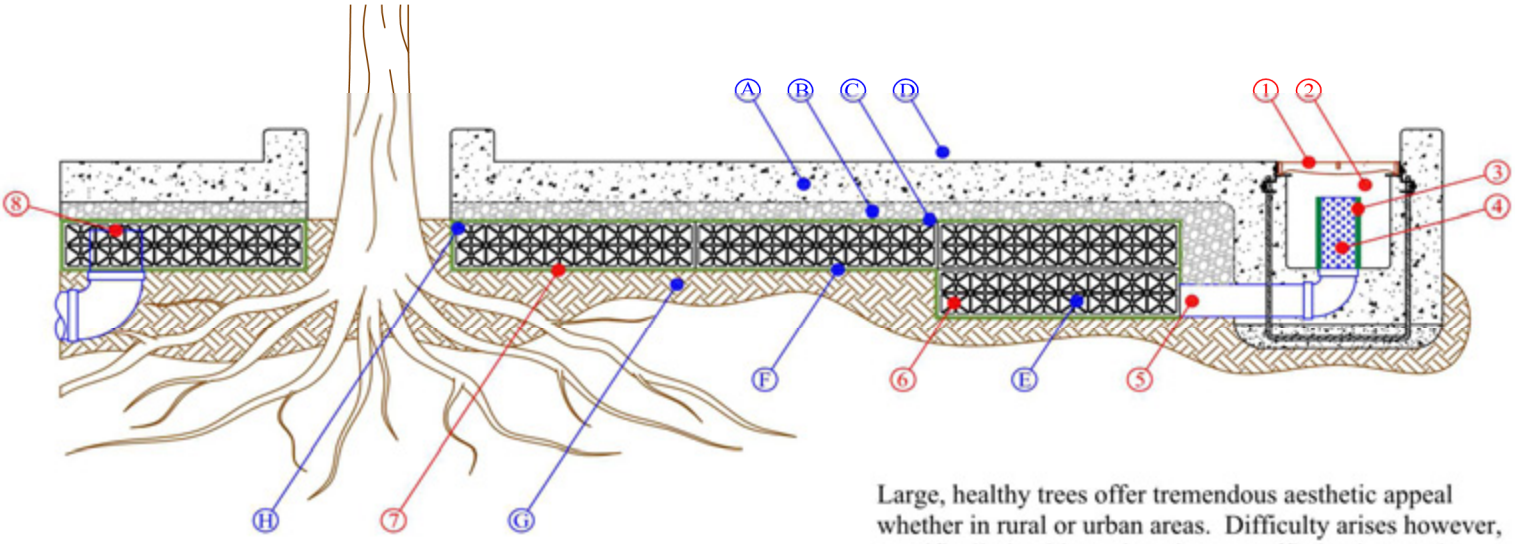
Increase LID effectiveness through local stormwater storage, attenuation and infiltration.

Minimize subgrade compaction by dissipating heavy urban loads throughout the structural ArborRaft.

Natural air gap prevents upward migration of roots, protecting pedestrian walkways and providing positive air circulation.

Maximize the performance of permeable surfaces by storing and conveying water within Peramvoid.

Minimize subgrade improvement by dissipating heavy traffic loads through the Permavoid interlocking structural raft.



Treatment Train

1. Ductile Iron Grate Inlet
2. TrenchFormer Catch Basin
3. FirstFlush Filter Fabric
4. FirstFlush Pipe w/ Orifice Bypass
5. Permavoid Inlet Connection
6. Permavoid Water Attenuation / Storage Units
7. Root Zone Infiltration
8. Off-site Controlled Discharge Pipe

Notes & Features

- A Concrete Pavement (5 in. for H-20)
- B Compacted Subbase (2 in. for H-20)
- C Geotextile (Mirafi 1100N)
- D Emergency Surface Water Storage
- E Scour Prevention Chamber
- F Geotextile or Geomembrane
- G Uncompacted Root Zone Sub-Grade
- H Positive Root Zone Air Circulation

Large, healthy trees offer tremendous aesthetic appeal whether in rural or urban areas. Difficulty arises however, specifically in cities, where heavy traffic loads must be transferred to sub-grade soils. Permavoid offers the ideal balance of load transference and surface protection. First, the void space created offers a guided path for stormwater to infiltrate through the root zone providing vital irrigation directly where it is needed most. Second, during periods without rainfall an air gap is present preventing roots from migrating upward and damaging valuable infrastructure while maintaining air circulation directly to the root zone. These features mean stormwater behaves more naturally while trees are provided an ideal growing environment.

ABT® permavoid

RESILIENT LANDSCAPES

Maximizes shallow storage and conveyance assuring the best bio-swale efficiency.

Adds aesthetically pleasing green space promoting increased property value.

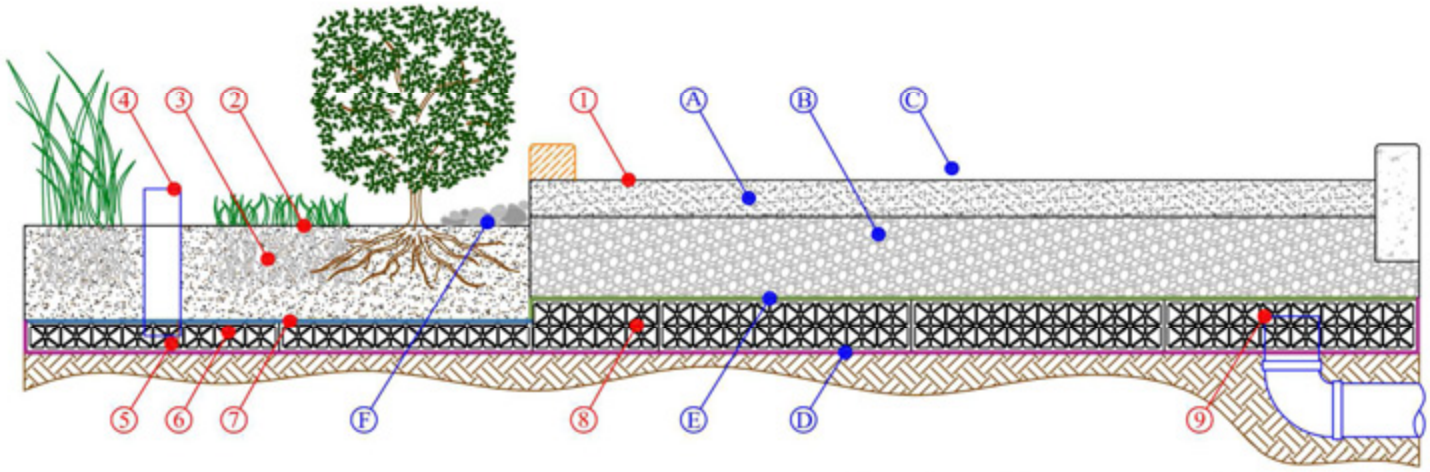
Maximizes LID performance by reducing storm- water discharge through evapo-transpiration.

Mimics pre-development stormwater behavior by maximizing green space functionality.

Reduces heat-island effect through natural and biological evaporation processes.

Minimizes liability by controlling exposed surface water elevations.

Maximizes bio-remediation by storing excess runoff until further capacity is available.



Treatment Train

1. Surface Runoff
2. Natural Infiltration
3. Bio-Remediation / Evapotranspiration
4. Vertical Bypass Pipe
5. Permavoid 85 Water Attenuation / Storage Units
6. Permavoid Wicking Cones for Passive Irrigation
7. Wicking Geotextile for Passive Irrigation
8. Permavoid 150 Water Attenuation / Storage Units
9. Controlled Discharge Outlet Pipe

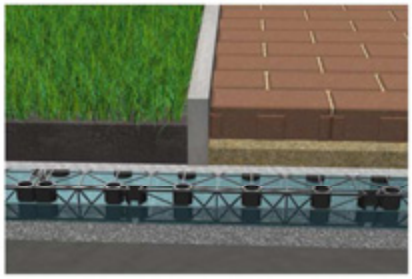
Notes & Features

- A – Asphalt Pavement
- B – Compacted Subbase
- C – Emergency Surface Water Storage
- D – Geotextile or Geomembrane
- E – Geotextile (Mirafi 1100N)
- F – Runoff Scour Prevention

Bioswales provide a great opportunity to naturally treat and manage stormwater while adding bio-diversity and aesthetic appeal to any urban or rural landscape. Permavoid complements and enhances this by optimizing their footprint and maximizing their functionality. Excess water is stored in an ultra shallow profile allowing extended contact time for bio-remediation, evapo-transpiration and/or infiltration. Permavoid combined with bioswales create resilient landscapes that harness stormwater as an indispensable resource and utilize it to the fullest extent.

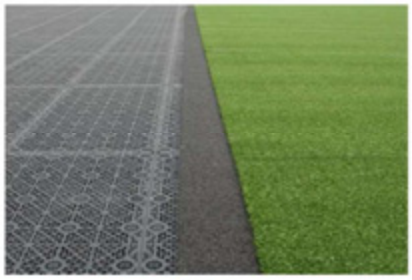
ABT® permavoid

Other Applications



Hybrid Solutions

Provides multi-surface interconnectedness assuring optimal drainage functionality and safety.
Converts traditional concrete and asphalt pavement into pervious surfaces for infiltration.
Easily transition between multiple surfaces without complicated terminations or connections.
Expedites site work by replacing complex excavations with simple grading.



Athletic Fields

Eliminates collector pipe excavation and materials while increasing stormwater source control.
Protects expensive synthetic infill turf fields by maximizing permeability and water storage.
Eliminates settlement concerns through high strength interconnected units and load distribution.
Provides the ideal base for precision graded athletic fields for all levels of play.

Green / Blue Roofs

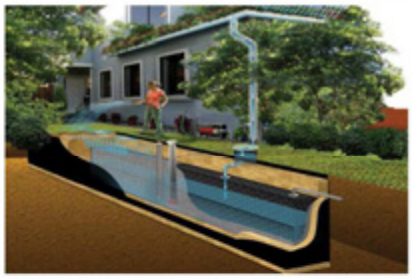
Rainfall storage on the roof allows larger building footprints while meeting LID criteria.
High strength and light weight Permavoid minimizes dead loads allowing structures to carry larger volumes of water and maximize plant diversity.
Passive irrigation offers precious water directly to plant roots preventing wasteful evaporation.

Permeable Pavers

Minimize excavation by replacing up to 18 inches of subbase drainage aggregate.
Reduce construction costs by supplementing permeable pavers with Permavoid under traditional surfacing allowing it to behave equally while maximizing infiltration capabilities.

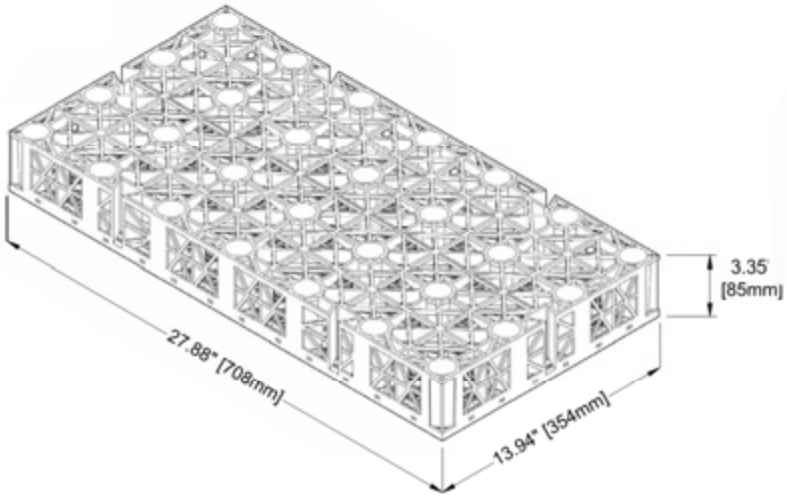
Equestrian

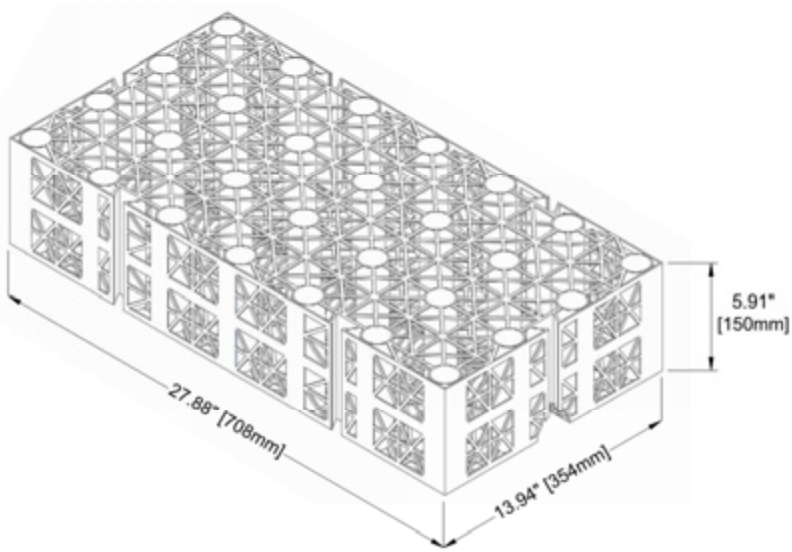
Provides the ideal base for precision graded surfacing for all types of equestrian events.
Create the ideal moisture content within sand surfacing through the capillary action of Permavoid's passive irrigation.
Minimize downtime after heavy rainfall events through Permavoid's superior storage volume.



Water Harvesting

Reduce operating budgets by replacing costly irrigation with water captured on site.
Capture rainwater to flush toilets, wash cars, wash clothes or purify for drinking water.
Reduce demands on local ground water by saving rainwater within Permavoid.
Reduce runoff by diverting excess water to Permavoid for use during periods of drought.





Part Number: PV85-EIS

Material:	Polypropylene (CoPo)
Weight:	4.96 lbs (2.25 kg)
Void Space:	0.6922 ft³ (0.01956 m³)

Compressive Yield Strength

Vertical:	103.7 psi (715 kPa)
Lateral:	22.6 psi (156 kPa)

Deflection Strength [⅛ in (3.175 mm)]

Vertical:	58.0 psi (400 kPa)
Lateral:	6.9 psi (48 kPa)

Hydraulic Performance [GPM / ft² (LPS / m²)]

0.0% Slope	74.0 GPM / ft² (50.2 LPS / m²)
1.0% Slope	119.3 GPM / ft² (81.6 LPS / m²)
2.0% Slope	138.8 GPM / ft² (94.2 LPS / m²)
3.0% Slope	157.2 GPM / ft² (106.7 LPS / m²)

Part Number: PV150-EIS

Material:	Polypropylene (CoPo)
Weight:	6.61 lbs (3.00 kg)
Void Space:	1.2613 ft³ (0.03672 m³)

Compressive Yield Strength

Vertical:	103.7 psi (715 kPa)
Lateral:	22.6 psi (156 kPa)

Deflection Strength [⅛ in (3.175 mm)]

Vertical:	58.0 psi (400 kPa)
Lateral:	6.9 psi (48 kPa)

Hydraulic Performance [GPM / ft² (LPS / m²)]

0.0% Slope	74.0 GPM / ft² (50.2 LPS / m²)
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ABT Permavoid is a unique stormwater management / water conservation system that locally mimics natural water cycles and can save up to 30% on overall site drainage costs.

Permavoid was originally developed in the Netherlands as a deep buried, low strength tank much like those popular in North America today. While the product enjoyed a history of success, it was clear to the inventor the inherent flaws of such systems. Primarily long term creep failure resulting from sustained dead loads of thick required cover. Culminating in 1997, Permavoid was refined through numerous iterations to become an ultra-high strength system that could be placed very near the surface. The resulting benefits and off-setting costs were overwhelming. Not only could the new version of Permavoid eliminate concerns of long term failure but because of its unique structure and ultra-shallow envelope it could serve multiple sustainable drainage functions simultaneously.

Storage **Infiltration** **Subbase Replacement** **Conveyance** **Passive Irrigation**