

# Building in a New Era

How civil construction solutions  
make infrastructure more sustainable



**TITAN**

BUILD YOUR LEGEND

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## Introduction

Unprecedented environmental challenges (such as climate change, resource depletion, and rapid urban expansion) are placing immense pressure on our infrastructure and natural systems, making sustainable solutions more critical than ever. Geosynthetics, which have been reliably used in construction for over 50 years, have proven to be an excellent solution for addressing these challenges. While adoption in the civil construction industry was initially gradual, consistent use over time has demonstrated their effectiveness in delivering innovative and sustainable outcomes.

### Why Geosynthetics and Civil Construction Solutions

In addition to geosynthetics, new, innovative civil construction solutions play a pivotal role in driving environmental protection and sustainability in construction. Together, these approaches offer versatile and effective ways to address the unique challenges posed by modern infrastructure demands. Whether through stabilizing soil, reducing material waste, or enhancing the durability of projects, both geosynthetics and civil construction solutions are essential tools for building resilient and sustainable infrastructure that protects our natural systems while meeting the needs of a growing world.

Geosynthetics and civil construction solutions can be useful for a wide range of sectors, namely:



**CIVIL CONSTRUCTION**



**MINING**



**WATER & WASTEWATER  
MANAGEMENT**



**OIL & GAS**



# Water Conservation

There's no underestimating the essential role that water conservation plays in building a sustainable future. Today, engineers need new approaches that better manage this crucial resource.

## Underground Stormwater Management

Underground stormwater management systems are at the forefront of low-impact development (LID). By capturing and controlling rainfall runoff near its source, they improve water conservation, minimize evaporation, and safeguard the health of the water cycle.

These systems offer a suite of benefits that go beyond basic water storage, including:

- **Enhanced Water Quality:** By filtering pollutants and managing runoff, these systems improve the quality of urban water bodies, fostering healthier ecosystems.
- **Flood Mitigation and Erosion Control:** Controlling stormwater flow during heavy rains reduces flooding risks, protects property, and enhances community safety.
- **Groundwater Recharge:** Certain systems allow water to percolate into the ground, replenishing groundwater reserves and supporting the natural water cycle.

Specific designs vary to suit project needs, but most systems fall into three categories, each supporting sustainable water management.

**Infiltration Systems** allow water to seep into the ground. They're aided by filter fabric and granular layers that stabilize the structure while preventing contamination. Many applications, such as sports fields, benefit from broad infiltration beds as they support natural water absorption.

**Retention Systems** utilize impermeable liners, known as geomembranes, to prevent infiltration. They can be used for rainwater harvesting, protection from contaminated subsoils or act as a barrier from groundwater.

**Detention Systems** prevent peak runoff by holding water within the tank and controlling the release of water downstream.



## Protect Water Resources with Concrete Canvas®

*Concrete Canvas® offers specialized products, CC, CCX® and CC Hydro™, designed to enhance water conservation and management.*

### CC

CC is used across a range of sectors including mining, oil & gas, agriculture, and civil construction for a variety of applications. It provides a thin, durable, waterproof and lower carbon alternative to traditional concrete. CC is available in 3 variants: CCT1™, CCT2™ and CCT3™.

### CCX®

CCX® is engineered for lining large-scale infrastructure such as canals, aiming to prevent erosion and reduce water seepage losses. Its rapid installation and durable concrete layer make it an effective solution for water management projects.

### CC Hydro™

This solution combines the impermeability of a containment liner with the durability of concrete, providing an all-in-one solution for containment applications. It eliminates the need for a protective top cover, simplifying installation and reducing costs. By preventing water loss and ensuring containment integrity, CC Hydro™ contributes to efficient water management.

*Being highly sustainable and efficient to install, Concrete Canvas® products have proven useful across many sectors and applications.*

### Agricultural Water Management

In agriculture, Concrete Canvas® products are utilized for water conveyance, management and erosion control. They can line existing infrastructure in ponds, drainage channels, canals, or irrigation ditches, facilitating quick and efficient construction and/or remediation, even in areas with limited access.

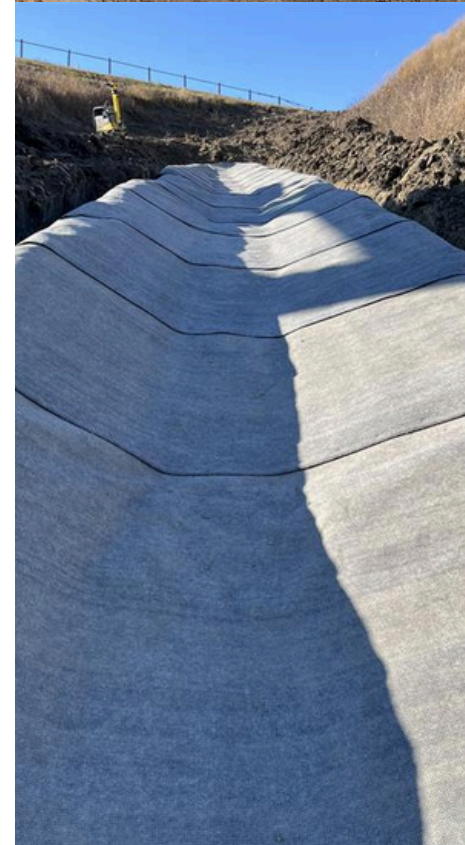
### Channel Lining

Concrete Canvas® products are employed to line channels and ditches, providing a durable, low-permeability concrete layer that reduces water loss and prevents erosion. This application is particularly beneficial for irrigation canals and drainage systems, enhancing water conservation and management, particularly in arid climates.

### Slope Protection

Concrete Canvas® products serve as an erosion control measure on slopes, preventing soil erosion caused by water runoff. By protecting slopes, it helps maintain the integrity of water management systems and reduces sedimentation in water bodies.

By integrating Concrete Canvas® products like these, we can improve the lifespans of infrastructure, reduce maintenance needs, and provide meaningful strides in water conservation.



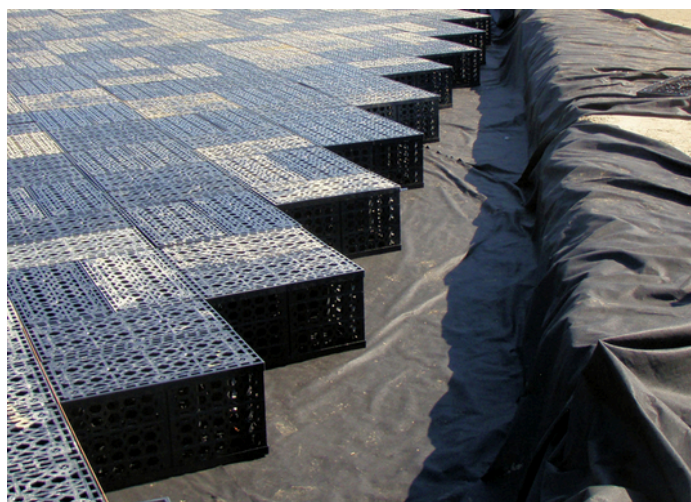
# Better Urban Planning

As cities expand and evolve, new design decisions can help keep that growth sustainable. Here's how geosynthetics can help pave the way to a livable future.

## Stormwater Management

Underground stormwater systems are essential for sustainable urban planning, addressing challenges both above and below ground. By integrating these systems with green infrastructure, cities can create more resilient environments.

- **Low-impact Development & Flood Mitigation:** These systems mimic natural water cycles by capturing, storing, and slowly releasing runoff, reducing strain on drainage systems. Better storage and controlled release of rainwater also mitigates flood risks.
- **Maximized Urban Space & Efficient Land Use:** Their underground placement eliminates the need for surface retention ponds – freeing land for parks, green spaces, or recreation. They are installed under parking lots, commercial developments and even residential buildings, enabling better stormwater management and flood mitigation in developed areas with limited land available.
- **Heat Island Reduction:** Replacing above-ground stormwater ponds with vegetation cools and enhances biodiversity.



## MSE Walls and Slopes

Mechanically Stabilized Earth (MSE) walls and slopes help cities grow upward and outward by making the most of available space.

- **Efficient Land Use:** Reinforces steep slopes, enabling development on otherwise unusable land.
- **Integrated Greenery:** MSE systems can feature vegetated facades, improving aesthetics, and urban cooling.
- **Erosion Control:** Stabilizing soil reduces sediment runoff into waterways, improving water quality and protecting aquatic ecosystems.
- **Quick Installation:** Modular facing elements minimize disruption in busy urban settings due to quick and simple installation.



## CPL

Concrete Protection Liners (CPL) offer an innovative approach to extending the lifespan of urban wastewater and utility infrastructure in concrete pipes, manholes, structures, and tanks.

- **Environmental Protection from Exfiltration:** CPL protects the environment by providing secondary containment in concrete infrastructure, eliminating the opportunity for wastewater to leak into the environment.
- **Extends the Life of Wastewater Infrastructure:** CPL eliminates the need for frequent rehabilitation or replacement by providing a long-lasting, corrosion-resistant barrier against microbial-induced corrosion and hydrogen sulfide attack.
- **Resource Conservation:** By extending infrastructure life, CPL eliminates the need for frequent digging and replacing of wastewater systems. This reduces the environmental impact of underground construction and reduces capital infrastructure costs.



## Geogrids

Soil conditions and properties are important considerations in civil construction projects. Poor soil properties can either make construction impossible or lead to performance failures that can be costly. Geogrids ensure proper soil reinforcement and/or stabilization.

### Geogrids work to do 2 critical things:

- Improve mechanical properties of soil by reducing stress-strain behaviour.
- Improve the mechanical behaviour of granular material by minimizing movement and allowing for effective load distribution.

Geogrids can be used across a wide range of applications, including gravel road construction, general site base development work, railway ballasts and sub-ballast construction, bridge abutments, and more.

Titan carries a range of geogrids each designed for specific project challenges:

- **Swamp Grid™**
- **Titan Earth Grid™**
- **Pyramid Grid™**
- **Titan Rail Grid™**
- **StrataGrid™**
- **Mine-Shield Grid™**
- **Spartan Road Grid™**



# Geogrids in Action

## Spartan Road Grid™ & Asphalt Reinforcement

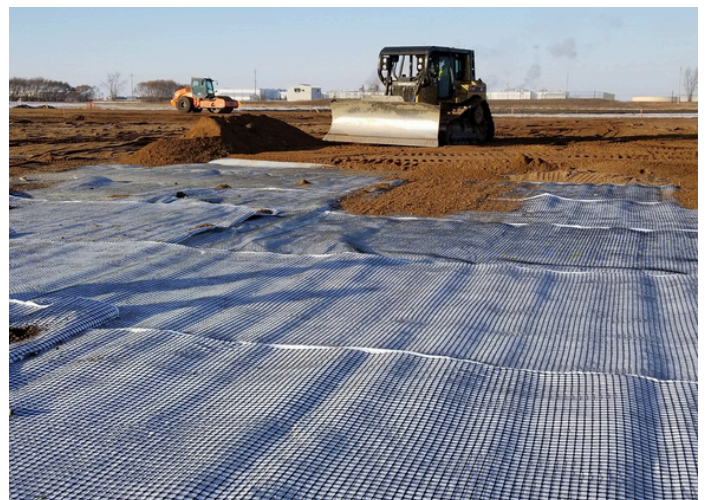
Geogrids are game changers for road construction and rehabilitation, offering true durability and environmental benefits. At Titan, we stand behind Spartan Road Grid™ as a top choice for asphalt reinforcement.

- **Durable and Efficient:** Spartan systems resist heat up to 900°F, ensuring stability during extreme conditions while reducing the need for frequent repairs.
- **Eco-friendly Construction:** These geogrids reduce earthworks and resource use, lowering their environmental impact.
- **Long-term Performance:** Resistant to UV degradation and soil chemicals, Spartan Road Grid™ supports resilient, low-maintenance urban infrastructure.

## Swamp Grid™ & Saturated Soils

Swamp Grid™ is a cutting-edge composite geogrid that combines Titan Earth Grid™ with a long-fiber PET nonwoven geotextile. Designed specifically for soft, saturated sub-base, it enables construction on land previously deemed unusable, whether in dense urban environments or remote rural areas. Its robust design performs reliably in any climate, from the frozen conditions of northern Canada to the humid landscapes of Florida.

- **Sustainable Soil Stability:** Swamp Grid™ reduces the need for aggregate, minimizes soil excavation and backfilling, and speeds up compaction, all lowering the environmental impact of construction.
- **Environmental Protection:** With advanced features like sub-base drainage and prevention of subgrade movement, Swamp Grid™ enhances soil health and mitigates environmental degradation, ensuring long-term ecosystem stability.
- **Long-term Performance:** Resistant to UV degradation and soil chemicals, Swamp Grid™ supports resilient, low-maintenance urban infrastructure.



# Geogrids in Action

## Warming Arctic Climates: Thawing Permafrost

Permafrost, the ground that traditionally remains frozen year-round in northern regions, has long provided stable foundations for arctic road construction. Now, rising ground temperatures from climate change are dramatically altering this landscape. As permafrost thaws, arctic roads could become increasingly unsafe and, eventually, obsolete

### Leading The Way to Expanded Transportation Corridors

**Geogrid and geocell technologies** now offer promising solutions, allowing the creation of floating granular embankments that distribute weight across unstable terrain.

These solutions enable road construction in challenging muskeg environments and provide a potential pathway to future all-season roads. Strategic routing now prioritizes high ground and river-adjacent terrain, minimizing dependence on traditional Arctic road routes (that rely on permafrost to operate) and preparing infrastructure for long-term climate adaptation.

**Geogrids and geocells are more than a temporary fix**—they represent a strategic approach to climate resilience for sustainable northern development. By preserving infrastructure in regions most affected by warming, they support economic stability, environmental sustainability, and community well-being. Leveraging these materials can help build a stronger, more adaptable global north.

## Aggregate Reduction

When it comes to stabilizing and reinforcing soil, geogrids such as Titan Earth Grid™ (for dry low load bearing soils) or Swamp Grid™ (for soft, saturated soils) provide support **without excessively depending on aggregate**.

In fact, geosynthetics have been shown to reduce the amount of aggregate needed by 30 to 40%. This gives them an edge over conventional solutions, which typically consist of thick aggregate layers and **risk sacrificing environmental preservation** for construction needs.



Filtration



Drainage



Reinforcement



Separation

# When Less Is More: The Advantages of Reduced Aggregate

## Reduced Transport

One of the primary benefits of reduced aggregate use is the decrease in transportation-related environmental impact. When less aggregate is needed, engineers require less material to be hauled to the construction site. This can lead to less fuel consumption and other environmental impacts of reduced transport.

## Conservation of Natural Resources

The reduction in aggregate demand also helps conserve natural resources. Aggregate materials, such as gravel and crushed stone, are mined from quarries and riverbeds. This can lead to:

- Land degradation
- Waterway disruptions
- Air pollution
- Noise pollution
- Reduced biodiversity
- And other ecological impacts

**By minimizing the need for large-scale aggregate mining**, geogrids help preserve these resources for future generations and reduce the environmental strain caused by extraction activities.

## Local Environment Preservation

Geogrid installation requires minimal earthworks, which translates into less soil excavation, backfilling, and disruption to the natural landscape. Reducing the physical disturbance to the site helps preserve local ecosystems and biodiversity. Less earthmoving also means fewer opportunities for erosion, and the reduced use of equipment minimizes the risk of habitat destruction.



# Project Longevity & Resilient Infrastructure

## Enhanced Durability with Geogrids

Whereas conventional solutions can be susceptible to UV degradation, constriction damage, higher differential settlement, freeze-thaw heaving and more, geogrids can better prevent or overcome these risks. Because geogrids typically support vital infrastructure such as roads and railways, this stability is hugely important, leading to:

- Reduced maintenance frequency
- Decreased project lifecycle costs
- Extended infrastructure life
- Minimized operational disruptions

## Geomembranes for Long-Term Protection

Geomembrane liners are vital to minimizing the environmental impact of human development. Acting as impermeable barriers, they prevent the migration of harmful substances, safeguarding soil, water, and air from contamination for several decades.

Whether used in waste containment, industrial applications, or water management systems, geomembranes create robust lining systems that provide critical protection for ecosystems and surrounding communities.

- Superior chemical resistance
- Extended service life
- Reliable containment performance

## Supporting You at Every Step

Need help finding the right product solution? We're happy to provide comprehensive design consultation to help you get it right and maximize the longevity of your civil construction project. To us, protecting your investment and the environment go hand in hand.

Visit [TitanEnviro.com](https://TitanEnviro.com).





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