SOLMAX

PRODUCTS ENGINEERED WITH EARTH IN MIND

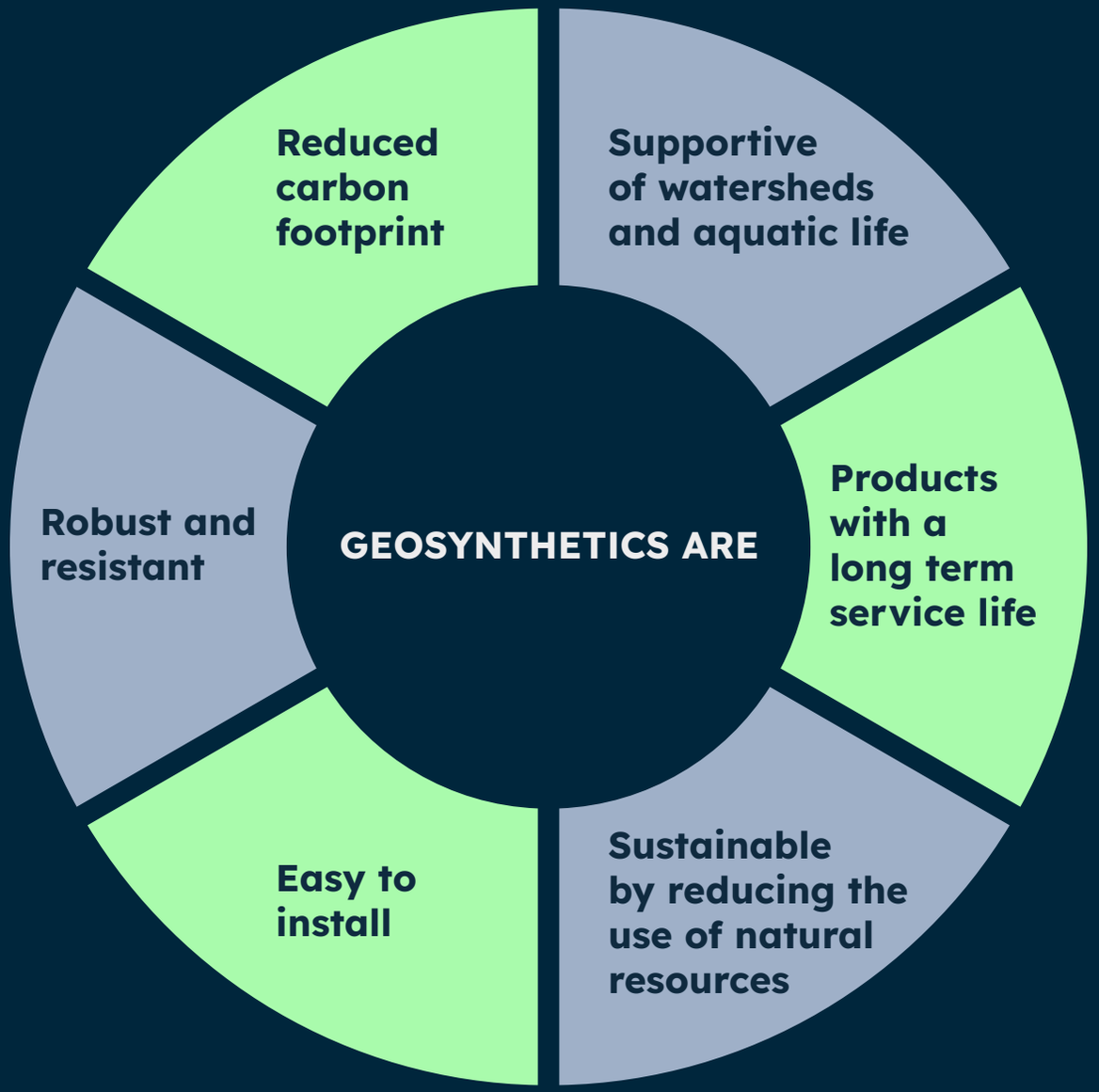
Sustainability and Resilience

SUSTAINABILITY AND RESILIENCE

Environmentally responsible infrastructure empowers communities, and innovative and sustainable solutions can help to building that infrastructure. We draw on our decades of engineering expertise to pioneer geosynthetic products that provide long-term solutions and protect the environments in which they are installed. Sustainability is a priority at Solmax, coupled with high-performance, cost-effective solutions.

In this challenging time for our planet, it’s imperative that we continue to rethink conventions. We look to the future with a commitment to creating inventive geosynthetic solutions that make our world a better place, and that means building infrastructure better.

GEOSYNTHETICS ARE THE ENVIRONMENTALLY FRIENDLY CHOICE OF CONSTRUCTION MATERIALS



MIRAFI In Roadways

Use of MIRAFI® H₂R*i* and RS*i*-Series in roadway stabilization can reduce CO_2 emissions by up to 70%.

GEOTUBE Containment

Dewatering systems can reduce waste by up to 80% and have been shows to successfully contain microplastics.

PROPEX Nature-Based Solutions

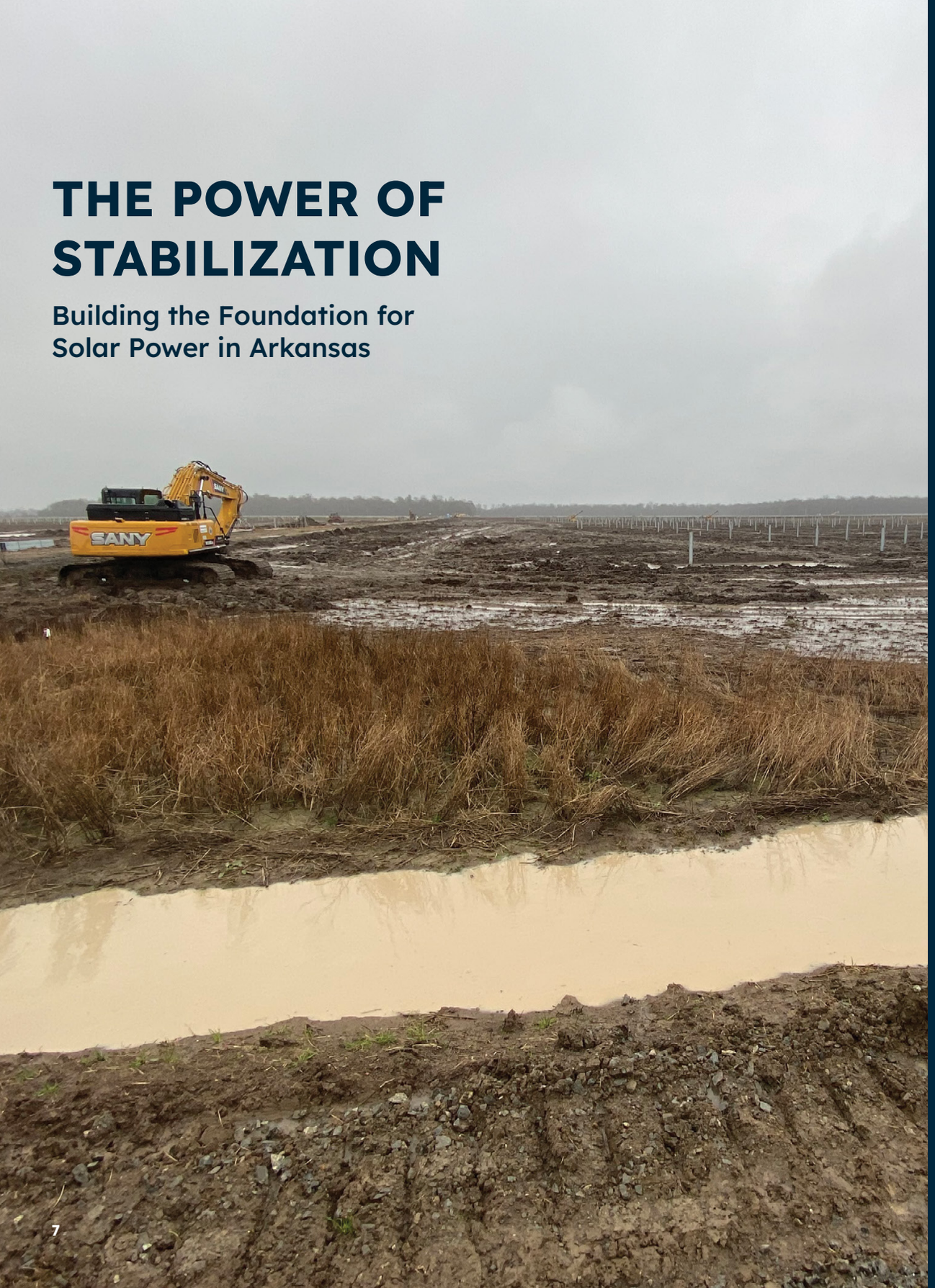
Replacing rock riprap with **PROPEX**® Armormax® can reduce transportation emissions by up to 90%.

GSE Environmental Protection

Replacing a conventional drainage layer in landfills with **GSE**® Geomembranes and **FABRINET**® geocomposites reduces overall climate change impact by up to 69%.

THE POWER OF STABILIZATION

Building the Foundation for Solar Power in Arkansas



Project: Chicot Solar Farm
Product: MIRAFI RS380*i*
Application: Stabilization and Roadway Reinforcement
Location: Pocahontas, Arkansas USA

CHALLENGE

In 2019 NextEra Energy planned to build the largest solar site in Arkansas. The 825-acre (334 ha) site would feature 350,000 solar panels capable of producing enough power for 18,000 homes. The area's soil conditions posed substantial challenges. The highly saturated soils exhibited an in-situ California Bearing Ratio (CBR) of only 1.5%, indicating their poor load-bearing capacity.

The project team needed an immediate solution because the poor soil strength was causing equipment to get stuck in the mud. The project manager/engineer initially considered rock, but felt that the cost to import enough rock to stabilize the weak soil would be too time consuming and costly

MIRAFI RS*i* reduced CO_2 emissions by more than 56%

SOLUTION

The loading and subgrade strength of the soil fell within the limits outlined by the Giroud-Han (2004) methodology. This methodology enabled the determination of a reduced aggregate thickness that would be sufficient to stabilize the haul roads during the construction process. The access roads were constructed by installing **MIRAFI** RS380*i* perpendicular to the direction of traffic loading. The materials were overlapped by 2.5 feet (0.7 m) to ensure proper coverage. The aggregate was then placed on top of the **MIRAFI** RS380*i* and compacted.

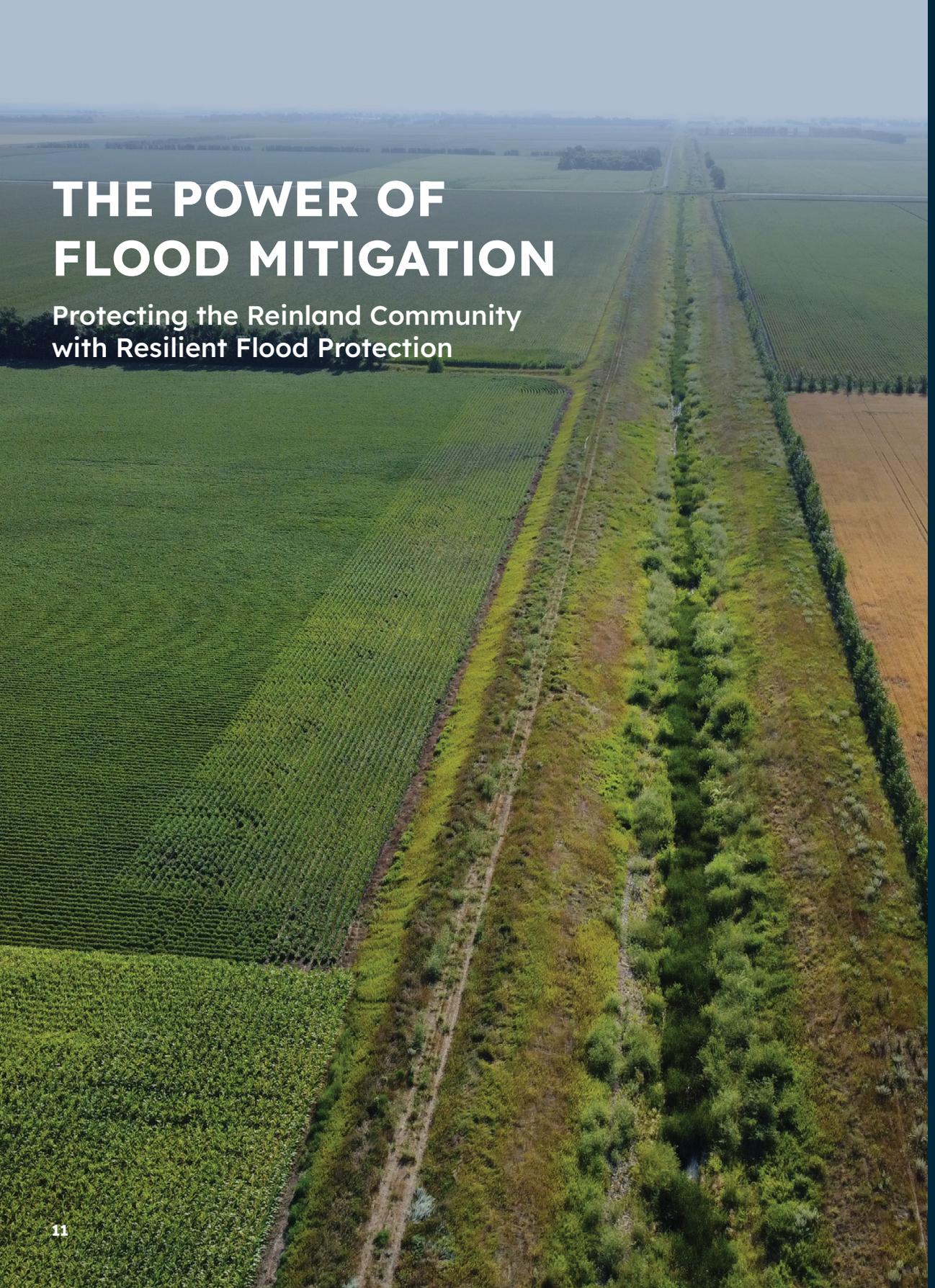
After stabilization of the access roads, pile driving equipment was operated in areas not originally intended to be trafficked. As the pile driving equipment moved through the unreinforced areas, soil was dragged onto the stabilized roads. This action disrupted the compacted aggregate, leading to the contamination of the access road in certain sections.

To preserve the integrity of the access roads and prevent further contamination, it became apparent that reinforcement was necessary in areas where the roads were not initially designed to accommodate heavy machinery like pile drivers. This occurrence highlighted the importance of reinforcing not only the designated access areas, but also parts of the site that might be subject to unintended traffic.

PERFORMANCE

Using **MIRAFI** RS380*i* reduced the amount of stabilization gravel from 16 inches to 7 inches (406 mm to 178mm) resulting in a 40% cost savings. The contractor was able to regain control of site development that previously experienced frequent shutdowns due to access delays during weather events.

It's estimated this solution reduced the number of trucks from 382 trucks to 167, resulting in a reduction in CO_2 emissions from 44,100 pounds (about 20,000 kg) to 19,400 pounds (about 8000 kg). Not only did **MIRAFI** RS380*i* address constructability issues, but it provides long-term defense against loss of roadway aggregate leading to reduced bearing capacity.



THE POWER OF FLOOD MITIGATION

Protecting the Reinland Community with Resilient Flood Protection

PROPEX Nature-Based Solutions

Project: Reinland Municipal Drainage Channel
Product: PROPEX Armormax
Application: Erosion Control Systems
Location: Winkler, Manitoba, Canada

CHALLENGE

The Reinland Drain, a municipal drainage channel in Manitoba, receives flows from the entire Pembina Valley. The channel's sandy, silty clay soil couldn't handle the flow, following a 100-year storm event. Years of erosion and damage from significant flooding, had caused major failures to approximately one mile (1.6 km) of the channel. The town needed to stabilize the eroded channel banks to prevent flooding and serious shoreline loss.

Because of wet weather, the construction schedule had been delayed until the winter months. This caused two major challenges. The first, damp soil had frozen creating a 3-foot-thick (1.8 m) section of solid frozen ground. Secondly, the project needed to be completed before the spring run-off, which began in March. This drastically shortened the designated construction schedule.

Rock riprap had previously been used in the channel but failed during rain events. Another challenge of using rock was transporting it to the project site. The closest quarry was 90 minutes away, and shipping the amount of needed rock would add considerable time and cost.

PROPEX ARMORMAX VS. ROCK

1/2
Container Van
of PROPEX **Armormax**

=

250
Dump Trucks
of Rock Riprap

Assumption based on 6” (150 mm) stone size at 18” (450 mm) depth and 15 tons (13.6 metric ton) per dump truck

SOLUTION

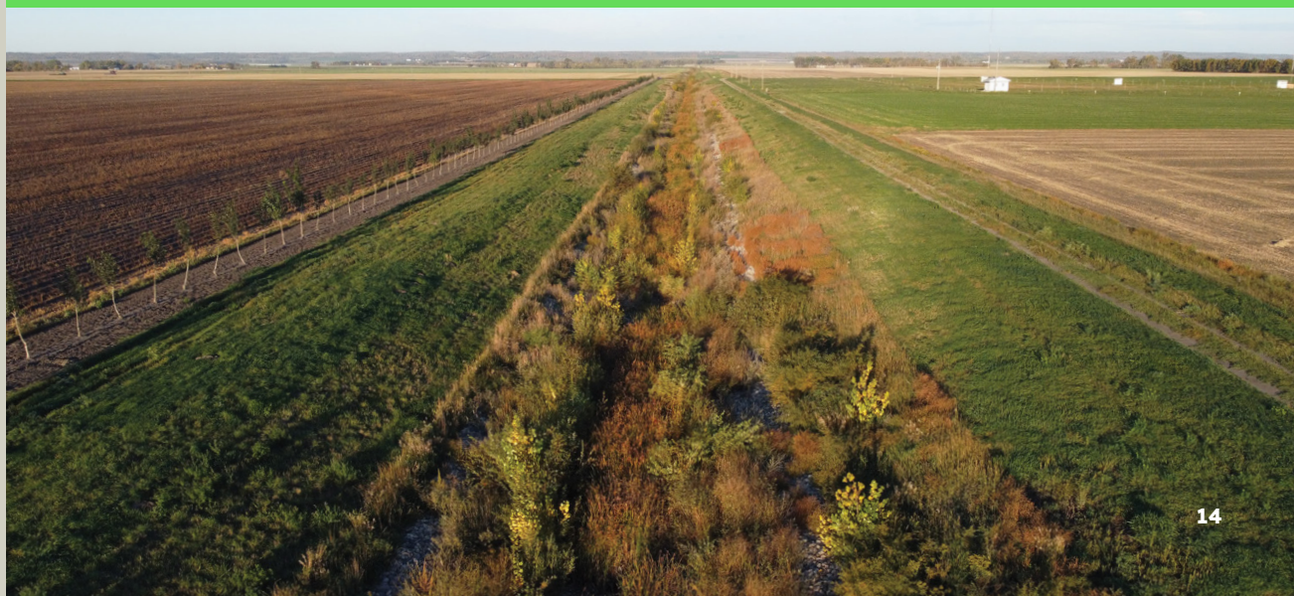
PROPEX Armormax was selected because its cost was significantly less to ship, and it outperformed hard armoring solutions.

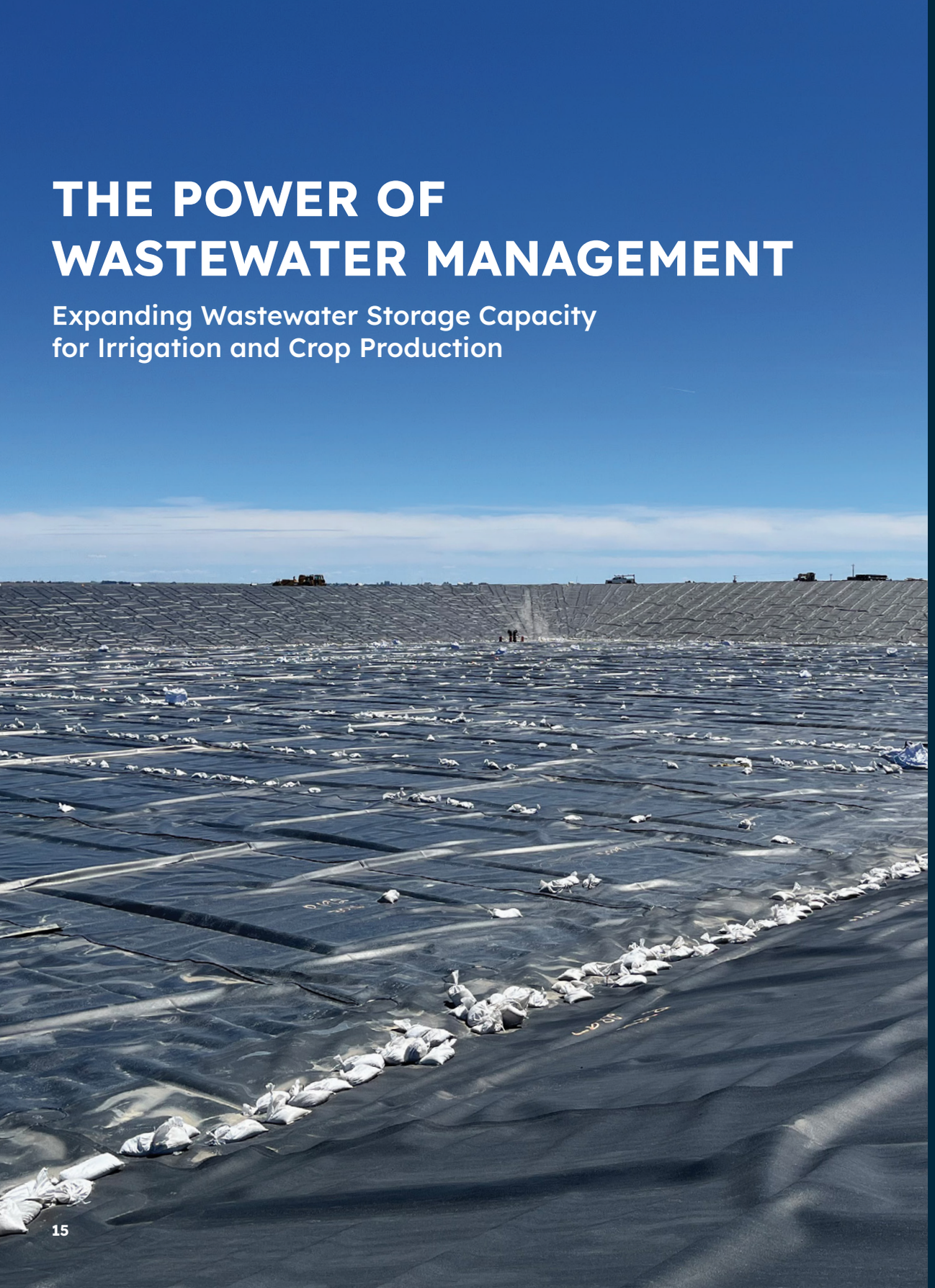
To circumvent the frozen ground, the engineer used a larger pin which was still within the acceptable specification range. In addition, **PROPEX** Armormax was chosen because it met hydraulic performance requirements. It’s also proven to provide up to 75 years of design life and is engineered to support natural vegetation growth.

Approximately 409,000 ft² (38,000 m²) of **PROPEX** Armormax was installed, providing the Reinland community with resilient flood protection infrastructure for generations to come. And within six months, the channel was fully vegetated.

PERFORMANCE

One shipment of 5,000 yd² (4,180 m²) of HPTRMs is equivalent to about 250 truckloads of rock. For the Reinland project, this meant significantly reducing the number of trucks sent to the site. The project team calculated that use of **PROPEX** Armormax instead of rock riprap reduced Reinland’s overall project cost by nearly 30 percent and lowered the carbon emissions by 90 percent. Armormax’s carbon footprint has been independently verified and is up to 30 times lower than rock riprap and concrete based solutions.





THE POWER OF WASTEWATER MANAGEMENT

Expanding Wastewater Storage Capacity for Irrigation and Crop Production

GSE for Environmental Applications

Project: Port of Moses Lake Wastewater Lagoon
Product: GSE Leak Location Conductive HD 100 mil geomembrane
Application: Barrier and Containment
Location: Grant County, Washington, USA

CHALLENGE

The Port of Moses Lake in eastern Washington, manages wastewater from six permitted facilities that discharged into the Port's wastewater collection system. The storage is used for seasonal irrigation for crop production and land treatment.

Nearly 60 million gallons of industrial wastewater is discharged into two lagoons for storage. Then it's withdrawn seasonally to irrigate 248 acres (100 ha) of crop land. With future industrial growth and the connection with the City of Moses Lake's municipal wastewater system, expansion of the Port's wastewater system was needed. This included a new 71.5 million gallons (270M liters) storage lagoon.

Geosynthetics can reduce the amount of aggregate used in landfill applications by more than three feet, significantly reducing transportation emissions.

Municipal Waste Landfill without Geosynthetics

Municipal Waste Landfill with Geosynthetics

SOLUTION

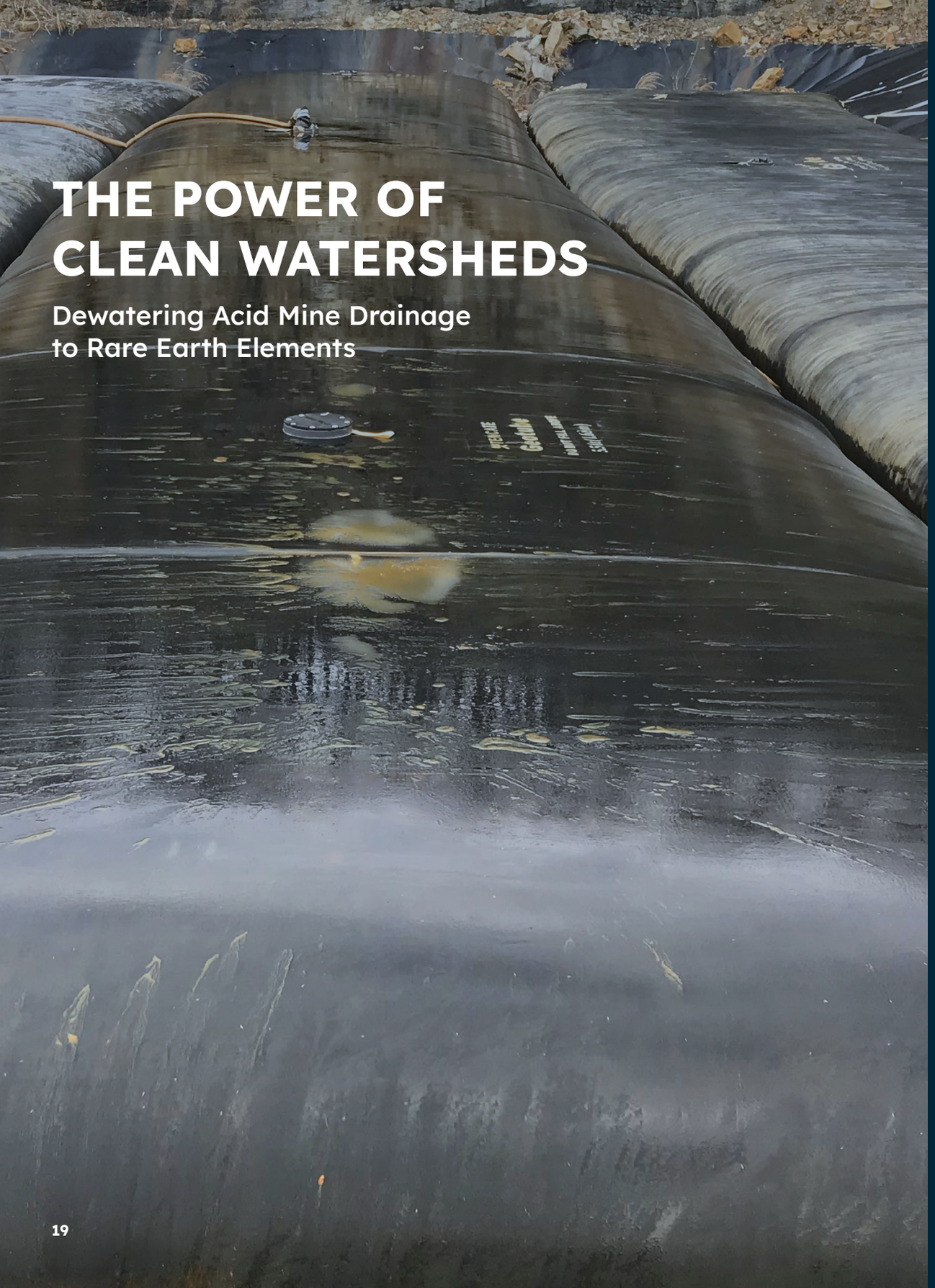
The project engineer determined that the lagoon would be lined with an exposed HDPE geomembrane. **GSE** Leak Location Conductive HD 100 mil (2.5 mm) geomembrane was selected. GSE Leak Location conductive liner is a co-extruded geomembrane that features a bottom conductive layer.

The conductive layer allows for a wide variety of electrical leak surveys to be performed on exposed applications, with greater reliability than surveys using non-conductive geomembranes.

The geomembrane also featured a textured finish on both sides of the liner. The double-sided texture was selected because it provides increased frictional resistance for improved stability, which enhances safety when walking on the embankment. The HD liner also features UV stabilizer additive in accordance with Geosynthetic Institute GRI-GM13 Standard Specification for HDPE.

PERFORMANCE

The **GSE** conductive geomembrane provided a durable solution for lining the wastewater storage lagoon. With the expansion of the wastewater system, the Port's capacity to store industrial wastewater grew, along with its ability to provide irrigation to miles of agricultural land. In additional to a significant cost savings over concrete alternatives, the conductive geomembrane will support environmental sustainability and regulatory compliance.



THE POWER OF CLEAN WATERSHEDS

Dewatering Acid Mine Drainage to Rare Earth Elements

GEOTUBE Dewatering Solutions

Project: Omega Mine Project
Product: GEOTUBE GT500
Application: Dewatering Systems
Location: Morgantown, West Virginia, USA

CHALLENGE

Acid mine drainage (AMD) was discharging from the Omega Mine site and impacting surrounding watersheds. AMD occurs when groundwater mixes with subsurface water containing sulfur-bearing minerals, resulting in sulfuric acid. This contaminated water is characterized by red, orange or yellow sediments. The result can be highly toxic to humans, animals and plants.

GEOTUBE Dewatering Solutions

Helps clean harmful discharge and rehabilitate surrounding watersheds.

SOLUTION

The West Virginia Department of Environmental Protection (WVDEP) utilized **GEOTUBE** GT500 cells to contain and dewater the AMD at the Omega Mine. **GEOTUBE** GT500 is engineered woven dewatering textile that is inert to biological degradation and resistant to naturally encountered chemicals, alkalis and acids. The site consisted of three abandoned mines generating 35 to 71 cubic feet per minute (1.0 to 2.0 m^3/min) of AMD, with a pH as low as 2.8. The flow was collected at the three different sources and pumped to a central point.

A system was designed to collect and treat the AMD at a central point. The liquid was then pumped into the **GEOTUBE** dewatering cells to contain the slurry as the solids separated, allowing the clear effluent to weep through the geotextile pores. The clear effluent is then returned to surrounding waterways.

PERFORMANCE

The AMD retained and dewatered within the geotextile tubes increased to 45% solids by weight within seven days and eventually reached 65% solids within 30 days. The current dewatering cell site has a capacity to receive and dewater the current rate of AMD flow for 20 years, operating 24 hours per day, 7 days per week. The Omega Mine AMD Treatment Plant has been operating since 2016 with no discharge violations. The system has been so successful that the WVDEP added multiple **GEOTUBE** AMD management sites. One of the new sites has flow rates up to ten times that of the Omega project.

In 2017, the U.S. Department of Defense and U.S. Department of Energy initiated a program to develop domestic sources of Rare Earth Elements (REE). The REE is a family of 17 elements that are critical to manufacturing communication, energy, defense, and aerospace products and systems. The University of West Virginia Water Research Institute identified AMD as a source of REE. Studies found that the dewatered solids in the **GEOTUBE** units at the Omega Mine retained more than 90% of available REE from the AMD. The recovery of REE from the AMD has had a significant economic and environmental benefit to the Appalachian region.

Let’s build infrastructure better.

Solmax is committed to being a responsible industry leader, driving positive change, and contributing to a more sustainable future.

Our civil and environmental infrastructure solutions protect the earth and have proven to be more resilient than the alternatives. These innovative solutions will extend the life of levees, dams, roadways, and communities well into the future.

To find out more, visit **SOLMAX.COM**

Sources available upon request.

About us

Solmax is a world leader in sustainable construction solutions, for civil and environmental infrastructure. Its pioneering products separate, contain, filter, drain and reinforce essential applications in a more sustainable way – making the world a better place. The company was founded in 1981, and has grown through the acquisition of GSE, TenCate and Propex. It is now the largest geosynthetics company in the world, empowered by more than 2,000 talented people. Solmax is headquartered in the province of Quebec, Canada, with subsidiaries and operations across the globe.

Setting standards

Solmax works with governments to draw up industry regulations, collaborates with stakeholders worldwide to raise environmental requirements, and enhances technical designs for projects. Groundbreaking products brought to market by Solmax and its wholly owned companies include the first HDPE geomembranes, textured liners, geosynthetic clay liners (GCLs), white reflective geomembranes, conductive geomembranes, and high-flow and pressure-resistant drainage solutions.

Uncompromised quality

Our products are manufactured to strict international quality standards. All our products are tested and verified at our dedicated and comprehensive laboratories which maintain numerous accreditations. We offer our partners a wide scope of testing according to published standards to ensure products delivered to sites meet specified quality requirements.

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