GreenArmor™ System
A Revolutionary Green Alternative to Hard Armor
UNMATCHED FACTORS OF SAFETY
Providing immediate and lasting protection, the GreenArmor System exceeds safety factors of other TRMs at 1/3 to 1/2 the cost of hard armor.

TWICE AS FAST!
Holding 17 times its weight in water, the GreenArmor System doubles turf establishment rates of other TRMs.

HYDRAULICALLY INFILLED
Flexterra HP-FGM is sprayed into the Futerra TRM matrix to provide immediate erosion control.

STRUCTURAL INTEGRITY
Designed with durable, UV-stabilized, thermally fused nylon filaments, Futerra TRM will not unravel, crush or tear.

ENVIRONMENTALLY SUPERIOR
More aesthetically pleasing — vegetation filters pollutants and cools runoff, promotes groundwater recharge and provides wildlife habitat.

HIGHER-DENSITY TURF
With 95% open space, Futerra TRM assures thicker turf establishment and enhanced root reinforcement.

99% EFFECTIVE
Upon installation, the GreenArmor System delivers superior erosion control on slopes and in channels.

HARD ARMOR
Prior to the introduction of turf reinforcement systems, hard armor was used exclusively to accommodate sites where velocities of 6-8 ft/sec (1.8-2.4 m/sec) and shear stresses over 2.5 lb/ft² (95-145 N/m²) exceeded the limits of natural vegetation.

NATURAL VEGETATION
CocoFlex™ ET-FGM
Flextex™ HP-FGM
Fiber Reinforced Matrix (FRM)
ProMatrix™ EFM™

Banded Fiber Matrix (BFM)
Erosion Control Blanket (ECB)
Wood/Straw Mix with Rock Fill
Straw/Paper Mix

REINFORCED VEGETATION
Futerra™ HP-TRM
GreenArmor™ System
Futerra TRM
Turf Reinforcement Mat (TRM)

CocoFlex™ ET-FGM
Flextex™ HP-FGM
Fiber Reinforced Matrix (FRM)
ProMatrix™ EFM™

Banded Fiber Matrix (BFM)
Erosion Control Blanket (ECB)
Wood/Straw Mix with Rock Fill
Straw/Paper Mix

Today, the fully vegetated GreenArmor R45 can protect against velocities as high as 30 ft/sec (9.1 m/sec) and shear stresses up to 20 lb/ft² (958 N/m²).

www.greenarmorsystem.com
REVOLUTIONARY SYSTEM—UNPRECEDENTED RESULTS

Designers need to know TRM performance limits in vegetated and unvegetated conditions. The GreenArmor® System has been comprehensively evaluated at the world renowned Colorado State University (CSU) Hydraulics Laboratory. All testing was conducted according to ASTM D6460-12 protocol—"Determination of Rolled Erosion Control Product (RECP) Performance in Protecting Earthen Channels from Stormwater-Induced Erosion."

VEGETATED RESULTS:
The GreenArmor 7020 System has been scrutinized for its performance with both cool season (Kentucky Bluegrass) and warm season (Bermuda Grass) species. Both species were seeded and established in portable planter boxes that were placed into a hydraulic flume at a fixed slope of 20 percent (2.1 H:V). The reinforced vegetation was then subjected to a series of increasing water discharge rates.

Close monitoring of the severe conditions proved the reinforced warm and cool season grasses resisted extreme flow velocities and shear stresses—a testament to the strength, dimensional stability and true root reinforcement provided by the GreenArmor System. Further, High Performance GreenArmor R45 was evaluated with Bluegrass under the same conditions and demonstrated even higher levels of performance.

UNVEGETATED RESULTS:
The objective of unvegetated testing is to measure the ability of an RECP to resist soil erosion prior to vegetative establishment. The unvegetated GreenArmor System was installed within an indoor flume above a one-foot thick soil layer and subjected to increasing flow discharges.

This research demonstrated the unique properties of Flexterra® HP-FGM™ to physically bond to the soil surface and create a barrier to overland flow; resisting soil erosion and holding seeds in place. The GreenArmor 7020 System produced the highest unvegetated critical shear stress and velocity ratings reported in the industry—easily outperforming other TRM products.

<table>
<thead>
<tr>
<th>Vegetated Product</th>
<th>Critical Shear Stress</th>
<th>Critical Velocity</th>
</tr>
</thead>
<tbody>
<tr>
<td>GreenArmor™ System 7020</td>
<td>17.0 lb/ft² (814 N/m²)</td>
<td>20 ft/sec (6.1 m/sec)</td>
</tr>
<tr>
<td>GreenArmor™ System R45</td>
<td>20.0 lb/ft² (958 N/m²)</td>
<td>30 ft/sec (9.1 m/sec)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Unvegetated Product</th>
<th>Critical Shear Stress</th>
<th>Critical Velocity</th>
</tr>
</thead>
<tbody>
<tr>
<td>GreenArmor™ System 7010</td>
<td>3.3 lb/ft² (158 N/m²)</td>
<td>12 ft/sec (3.7 m/sec)</td>
</tr>
<tr>
<td>GreenArmor™ System 7020</td>
<td>5.8 lb/ft² (276 N/m²)</td>
<td>16 ft/sec (4.9 m/sec)</td>
</tr>
</tbody>
</table>
REPLACES HARD ARMOR
ON A WIDE RANGE OF SITES

The GreenArmor™ System brings together the rapid growth establishment capabilities found in Flexterra® HP-FGM® with the dimensional stability of Futerra TRM®, the most widely used type of turf reinforcement mat on the planet. This unique solution has been proven to provide immediate erosion control, speed growth establishment and deliver superior performance—in a range of applications worldwide, including:

- STEEP SLOPES & EMBANKMENTS
- LANDFILL SLOPES & DIVERSION CHANNELS
- DITCHES & STORMWATER CONVEYANCE CHANNELS
- STREAMBANKS & SHORELINES
- EARTHEN DAMS & SPILLWAYS
- LEVEES & CANAL SIDE SLOPES

Case Study: Collierville, TN: Residential Development

Challenge: Developers of a retirement community sought an aesthetically pleasing and environmentally superior means of protecting a storm water conveyance channel located adjacent to a sensitive wetland.

Solution: Profile’s GreenArmor™ System was recommended for its ability to withstand high-discharge water flow with triple the erosion resistance of non-reinforced vegetation, while also addressing environmental and aesthetic considerations.

Results: Even under the exceptional drought conditions of 2007, the conveyance channel exhibited dense vegetative growth in less than two months, requiring minimal maintenance and enhancing the area’s visual appeal to nearby residents.

Case Study: San Antonio, TX: Residential Project

Challenge: Poor soil conditions on near-vertical geogrid reinforced slopes of up to 40 feet (12.2 m) in height required a cost-effective erosion control solution for the Toll Brother’s Sonoma Verde residential project in San Antonio, TX.

Solution: Profile’s GreenArmor System was chosen for the unrivaled structural integrity of Futerra TRM and the immediate protection and rapid turf establishment provided by Flexterra HP-FGM.

Results: More than 10 walls were implemented with the GreenArmor System. Within three months, the first 30-foot (9.1 m) wall was fully vegetated, and each of the walls held up despite record rainfall events and torrential downpours during the spring and summer of 2007.

For specifications, CAD drawings and installation guidelines, visit www.greenarmor-system.com.
EXTEND THE BOUNDARIES OF NATURAL VEGETATION

The GreenArmor² System combines engineering and agronomic excellence to create the world's most effective Green Design Engineering² alternative. The system begins with Futerra® TRM (Turf Reinforcement Mat) which provides a permanent, lofty and open matrix. It is then hydraulically infilled with Flexterra® HP-FGM³ (High Performance-Flexible Growth Medium³) to intimately bond soil and seeds while accelerating growth. This unique system protects against elevated levels of hydraulic lift and shear force while encouraging turf establishment and long-term root reinforcement—growing denser vegetation, faster, in areas where other TRMs have fallen short. This synergistic combination of cost effective technologies enables the GreenArmor System to provide unprecedented levels of design safety.

QUICK, THICK AND LONG-TERM KEYS TO THE GREENARMOR SYSTEM

1) FUTERRA TRM
PERMANENT PROTECTION

The resilient three-dimensional matrix of thermally fused nylon filaments creates the ideal anchor for root reinforcement. Because the lofty matrix consists of 95% open space, it readily accepts a hydraulic infill, captures soil and encourages vegetative growth. And unlike stitch-bonded TRM products combining loose fibers, threads and nets, Futerra TRMs resist crushing, unraveling and tearing during and long after installation. The durable, UV-stabilized Futerra TRM matrix offers unrivaled structural integrity.

2) FLEXterra HP-FGM
IMMEDIATE PROTECTION/RAPID GROWTH

This hydraulically applied blanket provides immediate erosion control with no cure time required. Flexterra HP-FGM is designed with Thermally Refined® wood fibers, biodegradable crimped interlocking fibers and additives engineered to perform under extreme conditions, delivering > 99% erosion control effectiveness. When applied into a Futerra TRM, Flexterra HP forms an intimate bond with the matrix, seeds and soil. Holding 17 times its weight in water, the GreenArmor System doubles turf establishment rates of other TRMs.

3) SYNERGISTIC SOLUTION
UNMATCHED ROOT REINFORCEMENT

Combining today's most technologically advanced erosion control and revegetation products, the GreenArmor System is a superior way to reinforce turf. Futerra TRM is designed to maximize root reinforcement and stand up to high water velocity and shear conditions. Flexterra HP-FGM offers immediate protection while speeding growth establishment and root entanglement. Together these components provide up to ten times the erosion resistance of natural vegetation.
Green Design Engineering™ is a holistic approach that combines agronomic and engineering expertise with advanced technologies to provide cost-effective and earth-friendly solutions. Profile strives to deliver Green Design Engineering across our team of consulting professionals, innovative products and educational resources.

PS³ is a free, comprehensive 24/7 online resource you can use to design a project and select the right products that address both the physical and agronomic needs of your site. It will help you develop holistic, sustainable solutions for cost-effective erosion control, vegetation establishment and subsequent reductions in sediment and other pollutants from leaving disturbed sites. Because good plans start with the soil, PS³ offers free soil testing to ensure this critical step is considered. To access the site, design your project and take advantage of a free soil analysis, visit www.profileps3.com.
Profile's 5 Fundamentals are the Foundation to Sustainable Vegetation

Establishing sustainable vegetation and receiving the earliest possible Notice of Termination (NOT) are the goals of every project. Profile's 5 Fundamentals are the surest way to get you there. Picking the right erosion control material like Flexterra® HP-FGM™ is just one of the 5 steps.

1. Assess and Create Optimal Soil Conditions

Soil testing provides essential information to determine what soil amendments, if any, are required to assure a more favorable growing environment for faster, more complete vegetative growth and sustainable establishment.

2. Pick the Right Plant Species

It is essential to select plant species that are adapted to the site conditions.

3. Select the Correct Erosion Control Material

The right cover protects both seed and soil, and facilitates growth. Flexterra HP-FGM is unsurpassed in delivering outstanding performance.

4. Ensure Proper Installation

Products must be installed in accordance with manufacturer recommendations to maximize their performance.

5. Follow-up Inspections and Maintenance Practices

Continual monitoring ensures all site compliance issues are being addressed. Maintenance may be required to mitigate unexpected challenges.

Profile provides valuable assistance for each of these Fundamentals 24/7—beginning with FREE soil testing.

FLEXTERRA® HP-FGM™
Absolutely the Most Effective Erosion Control Medium Available

Flexterra® HP-FGM™ stands alone as the ultimate erosion control and revegetation product. Fine grading and extensive soil preparation are unnecessary, allowing you to apply the product for immediate protection and superior performance at reduced overall costs.

Flexterra HP-FGM Delivers:
• The highest germination and growth establishment of any rolled or other hydraulically applied erosion control product available
• Greater than 99% erosion control effectiveness immediately upon application
• 100% biodegradable
• Non-toxic and safe for even the most sensitive environments

Superior erosion control across Profile's spectrum of products ensures reliable, sustainable solutions for slopes, channels, shorelines, water management projects, pipeline restorations, waste and fly ash containment sites, fine turf areas and other environmentally sensitive sites.

Patented Technologies and Greener Components Deliver Unmatched Performance

Flexterra HP-FGM combines both chemical and mechanical bonding techniques to lock the engineered medium in place and promote accelerated germination with minimal soil loss. Greener from the inside out, here's what makes it work so well:

Revolutionary patented Micro-Pore particles optimize water and nutrient retention

100% recycled, virgin Thermally Refined® wood fibers produce the highest yield and coverage per unit weight, and are phyto-sanitized, eliminating weed seeds and pathogens

100% non-toxic biopolymers and water absorbents enhance erosion control resistance and growth establishment

100% biodegradable interlocking fibers increase mechanical bonding of the matrix to provide immediate performance upon installation
A Closer Look at Micro-Pore Particles and Thermally Refined® Wood Fibers

- Micro-Pore particles capture and hold moisture and nutrients, reduce soil surface evaporation and improve oxygen exchange, which all contribute to faster, more uniform vegetation establishment.
- Micro-Pore particles also increase bond strength of the flexible growth medium, resulting in greater resistance to raindrop impact and sheet flow.
- 100% recycled, Thermally Refined® virgin wood chips create fine, long and highly absorbent fibers that deliver superior yield, coverage and water-holding capacity.
- Competitive refining technologies develop inferior fibers that require more bales to achieve the coverage of Profile’s Thermally Refined wood fiber matrices. Additionally, claims that competitive mulches save or use less water during application just don’t hold water.

Fibers magnified 45 times by independent lab specializing in fiber analysis.

Inferior wood fibers magnified 45 times.

Nothing Keeps More Soil On Site

Flexterra® HP-FGM™ has demonstrated nearly perfect erosion control performance — even on slopes as severe as 0.25H:1V. In addition to minimizing soil loss, the turbidity of runoff is greatly reduced. In large scale testing, Flexterra HP-FGM reduced effluent turbidity of sandy loam soils to less than 250 Nephelometric Turbidity Units (NTUs).

Establishes Vegetation More Reliably

Quicker and complete establishment is the key to long-term erosion control. Flexterra HP-FGM has recorded the highest growth establishment rating of any erosion control product in independent laboratory testing using standard test method ASTM D7322.

The First Erosion Control Product to Offer Documented Functional Longevity

ASTM D5338 testing protocol confirms Flexterra HP-FGM’s observed functional longevity of up to 18 months. Flexterra HP-FGM is proven to last longer than other hydraulically applied erosion control products.

Long-lasting Flexterra HP-FGM is designed to:
- Provide protection on bare soil over periods of dormancy; assures that when more optimal growing conditions arrive, the seed and nutrients are still in place and in an environment conducive to rapid germination and emergence.
- Increase survivability of plants; exceptional water retention nurtures vegetation to better withstand environmental stress.
- Accommodate a broad range of vegetative species; safeguards and helps to cultivate even the slowest establishing species.

![Erosion Control Performance Chart](chart1)

![Growth Improvement Factors Chart](chart2)

![Typical Functional Longevity Chart](chart3)
### Flexterra® HP-FGM™ Technical Data:

<table>
<thead>
<tr>
<th>PHYSICAL PROPERTIES*</th>
<th>TEST METHOD</th>
<th>UNITS</th>
<th>TESTED VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mass Unit Area</td>
<td>ASTM D6566*</td>
<td>g/m² (oz/yd²)</td>
<td>≈ 390 (11.6)</td>
</tr>
<tr>
<td>Thickness</td>
<td>ASTM D6525†</td>
<td>mm (in)</td>
<td>&gt; 5.6 (0.22)</td>
</tr>
<tr>
<td>Ground Cover</td>
<td>ASTM D6567*</td>
<td>%</td>
<td>&gt; 99</td>
</tr>
<tr>
<td>Water-Holding Capacity</td>
<td>ASTM D7367</td>
<td>%</td>
<td>≈ 1,700</td>
</tr>
<tr>
<td>Material Color</td>
<td>Observed</td>
<td></td>
<td>Green</td>
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<table>
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<tr>
<th>ENVIRONMENTAL PROPERTIES*</th>
<th>TEST METHOD</th>
<th>UNITS</th>
<th>TESTED VALUE</th>
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<tbody>
<tr>
<td>Biodegradability</td>
<td>ASTM D5338</td>
<td>n/a</td>
<td>Yes</td>
</tr>
<tr>
<td>Ecotoxicity</td>
<td>EPA 2021.0</td>
<td>%</td>
<td>48-hr LC₅₀ &gt; 100%</td>
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<tr>
<td>Effluent Turbidity</td>
<td>Large Scale⁶</td>
<td>NTU</td>
<td>&lt; 250</td>
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</table>

<table>
<thead>
<tr>
<th>PERFORMANCE PROPERTIES*</th>
<th>TEST METHOD</th>
<th>UNITS</th>
<th>TESTED VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cover Factor</td>
<td>Large Scale⁶</td>
<td>n/a</td>
<td>≈ 0.01</td>
</tr>
<tr>
<td>Percent Effectiveness</td>
<td>Large Scale⁶</td>
<td>%</td>
<td>&gt; 99</td>
</tr>
<tr>
<td>Functional Longevity</td>
<td>ASTM D5338</td>
<td>months</td>
<td>≈ 18</td>
</tr>
<tr>
<td>Core Time</td>
<td>Observed</td>
<td>hours</td>
<td>0-2</td>
</tr>
<tr>
<td>Vegetation Establishment</td>
<td>ASTM D7322⁷</td>
<td>%</td>
<td>&gt; 800</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PRODUCT COMPOSITION</th>
<th>TYPICAL VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermally Processed* (within a pressurized vesicle) 100% Recycled Virgin Wood Fibers</td>
<td>80%</td>
</tr>
<tr>
<td>Wetting agents (including high-viscosity colloidal polysaccharides, cross-linked biopolymers, and water absorbents)</td>
<td>10%</td>
</tr>
<tr>
<td>Creped Biodegradable Interlocking Fibers</td>
<td>5%</td>
</tr>
<tr>
<td>Micro-Pore Granules</td>
<td>5%</td>
</tr>
</tbody>
</table>

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* When uniformly applied at a rate of 3,500 lb/ac (3,940 kg/ha) under laboratory conditions,

1. ASTM test methods developed for Rolled Erosion Control Products that have been modified to accommodate Hydraulic Erosion Control Products,

2. Cover Factor is calculated as soil loss ratio of treated surface versus an untreated control surface,

3. Percent Effectiveness = One minus Cover Factor multiplied by 100%,

4. Functional Longevity is the estimated time period, based upon field observations, that a material can be anticipated to provide erosion control and agronomic benefits as influenced by composition, as well as site-specific conditions, including, but not limited to—temperature, moisture and light conditions, soils, biological activity, vegetative establishment and other environmental factors,

5. Large Scale testing conducted at Utah Water Research Laboratory. For specific testing information, please contact a Profile technical service representative at 800-508-8681 (US and Canada) or International - +1-847-215-1144.

6. Heated to a temperature greater than 380 degrees Fahrenheit (193 degrees Celsius) for 5 minutes at a pressure greater than 50 psi (345 kPa),

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**Profile**

## Solutions for your Environment

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Buffalo Grove, IL 60089 • 800-508-8681 • profileproducts.com
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Solutions for your Environment, HP-FGM, The 5 Fundamentals, GreenArmor System, ET-FGM, Flexible Growth Medium, ProMatrix, Engineered Fiber Matrix, Green Design Engineering and Earth-Friendly Solutions for Sustainable Results are trademarks of PROFILE Products LLC.

PS³, Profile's unique online project design and management software, is the best place to start applying The 5 Fundamentals™ to your next project. The process begins with a FREE soil test, and walks you through every Fundamental. It's the only program of its kind that integrates and compares a variety of technologies to your specific project parameters, and provides complete documentation including product specifications, installation guidelines, CAD details and other pertinent technical information. Get started by visiting ProfilePS3.com.
Engineered Fiber Matrix is mixed at a rate of 60 pounds per 100 gallons of water

Engineered Fiber Matrix (EFM) has been specially designed to be mixed in a low ratio of water to product. Follow the EFM Loading Chart and Application Guide closely. Not mixing enough EFM will water-down the slurry and compromise coverage during application and the performance of the formulation.

Application / Loading Procedures

A. **Strictly comply with equipment Manufacturer’s installation instructions and recommendations.** Use approved hydro-spraying machines with fan-type nozzle (50-degree tip) whenever possible to achieve best soil coverage. Apply from opposing directions to assure 100% soil surface coverage. Slope interruption devices or water diversion techniques are recommended when slope lengths exceed the maximum recommendations as shown in the Slope Application and Slope Interruption Limits tables on the back page of these guidelines.

B. To ensure proper application rates, measure and stake area. For maximum performance, apply EFM as follows:

1. Apply fertilizer with specified prescriptive agronomic formulations, seed and **EFM at a rate of 60 pounds per 100 gallons (27 kg/379 liters) of water** over properly prepared surfaces.

2. See loading chart on the back and confirm loading rates with equipment manufacturer. Do not leave seeded surfaces unprotected, especially if precipitation is imminent.

C. Fill 1/3 of mechanically agitated hydroteeder with water. Turn pump on for 15 seconds and purge and pre-wet lines. Turn pump off.

D. Turn agitator on, open recirculation valve and load low density materials first (i.e. seed).

E. Continue slowly filling tank with water while loading fiber matrix into tank.

F. Consult loading chart on the back to determine the number of bags to be added for desired area and application rate.

G. EFM should be completely loaded before water level reaches 75% of the top of tank.

H. Add fertilizer as water level approaches the top of the tank.

I. Top off with water and mix until all fiber is fully broken apart and hydrated (minimum of 10 minutes — increase mixing time when applying in cold conditions). This is very important to fully activate the bonding additives and to obtain proper viscosity.

J. Shut off recirculation valve to minimize potential for air entrainment within the slurry.

K. Slow down agitator and start applying with a 50-degree fan tip nozzle.

L. Spray in opposing directions for maximum soil coverage.

---

1 Best results and more rapid curing are achieved at temperatures exceeding 60°F (15°C). Curing times may be accelerated in high temperature, low humidity, and windy conditions with product applied on dry soils.

2 Do not add additional tackifiers or polymers to this pre-mixed formulation.
Loading Chart for Profile’s Engineered Fiber Matrix

<table>
<thead>
<tr>
<th>Tank Size (gal)</th>
<th># of 50-lb bales</th>
<th>Displacement (gal)</th>
<th>2,500 lb/ac</th>
<th>3,000 lb/ac</th>
<th>3,500 lb/ac</th>
<th>4,000 lb/ac</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sq ft</td>
<td>Acres</td>
<td>Sq ft</td>
<td>Acres</td>
</tr>
<tr>
<td>250</td>
<td>3</td>
<td>280</td>
<td>2,614</td>
<td>0.060</td>
<td>2,178</td>
<td>0.050</td>
</tr>
<tr>
<td>500</td>
<td>6</td>
<td>560</td>
<td>5,227</td>
<td>0.120</td>
<td>4,356</td>
<td>0.100</td>
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<tr>
<td>750</td>
<td>9</td>
<td>840</td>
<td>7,841</td>
<td>0.180</td>
<td>6,534</td>
<td>0.150</td>
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<tr>
<td>1,000</td>
<td>12</td>
<td>1,120</td>
<td>10,454</td>
<td>0.240</td>
<td>8,712</td>
<td>0.200</td>
</tr>
<tr>
<td>1,500</td>
<td>18</td>
<td>1,680</td>
<td>15,682</td>
<td>0.360</td>
<td>13,068</td>
<td>0.300</td>
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<tr>
<td>2,000</td>
<td>24</td>
<td>2,240</td>
<td>20,909</td>
<td>0.480</td>
<td>17,424</td>
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<tr>
<td>2,500</td>
<td>30</td>
<td>2,800</td>
<td>26,136</td>
<td>0.600</td>
<td>21,790</td>
<td>0.500</td>
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<td>3,000</td>
<td>36</td>
<td>3,360</td>
<td>31,363</td>
<td>0.720</td>
<td>26,136</td>
<td>0.600</td>
</tr>
<tr>
<td>3,500</td>
<td>42</td>
<td>3,920</td>
<td>36,590</td>
<td>0.840</td>
<td>30,492</td>
<td>0.700</td>
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<tr>
<td>4,000</td>
<td>48</td>
<td>4,480</td>
<td>41,818</td>
<td>0.960</td>
<td>34,848</td>
<td>0.800</td>
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</tbody>
</table>

Additional Notes:
- Rough surfaces (rocky terrain, cat tracks, ripped soils, etc.) may require additional product to achieve 100% coverage.
- Be sure to allow for residual material in tank on subsequent applications.

Application Rates

<table>
<thead>
<tr>
<th>Slope Condition</th>
<th>English</th>
<th>SI</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 4H:1V</td>
<td>2500 lb/ac</td>
<td>2800 kg/ha</td>
</tr>
<tr>
<td>≥ 4H:1V and ≤ 8H:1V</td>
<td>3000 lb/ac</td>
<td>3300 kg/ha</td>
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<tr>
<td>≥ 8H:1V and ≤ 12H:1V</td>
<td>3500 lb/ac</td>
<td>3620 kg/ha</td>
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<tr>
<td>≥ 12H:1V and ≤ 16H:1V</td>
<td>4000 lb/ac</td>
<td>4480 kg/ha</td>
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</tbody>
</table>

*Listed slope interruption limits are for product applications on a 3H:1V slope. For application on steeper slopes, slope interruption lengths may need to be decreased.

Visual Key for Proper Application

Proper Application
![Proper Application Image]

Improper Application
![Improper Application Image]

3,000 lb/ac
![3,000 lb/ac Image]

3,500 lb/ac
![3,500 lb/ac Image]

4,000 lb/ac
![4,000 lb/ac Image]
GLEN OAKS - BANK STABILIZATION DESIGN
DENNISON TWP., LUZERNE CO., PA
DRAWN BY: John Lautitsky
LUZERNE CONSERVATION DISTRICT

PERCUTIVE DRIVEN ANCHORS
OR #3 REBAR ANCHORS MAY BE
USED AS OPTIONAL ANCHORS
FOR SUBMERGED APPLICATIONS

FLEXTERRA HP FGM
WITH SPECIFIED SEED MIXTURE
SEE ATTACHED SPECIFIED SEED MIX

FUTERRA GREEN ARMOR 7020

RG RIPRAPP PLACED

10-12" 8 GAUGE MIN. STAPLES/ANCHOR PINS, INSTALL ANCHORS @ 2.5/402 TYPICAL

6" LIMESTONE GRAVEL

SEE DETAIL
# Glen Oakes Bank Stabilization Costs

Dennison Township, Luzerne County, PA

## Sheffield Shrub Seed Request:

<table>
<thead>
<tr>
<th>Lbs.</th>
<th>Genus species</th>
<th>Common Name</th>
<th>germination</th>
<th>seed #/Lb</th>
<th>estimated germination #</th>
<th>10% to Maturity</th>
<th>Price/Lb</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.2</td>
<td><em>Viburnum lentago</em></td>
<td>Nannyberry</td>
<td>0.98</td>
<td>5903</td>
<td>1157</td>
<td>116</td>
<td>$</td>
<td>-</td>
</tr>
<tr>
<td>0.5</td>
<td><em>Cornus amomum</em></td>
<td>Silky dogwood</td>
<td>0.91</td>
<td>11305</td>
<td>5144</td>
<td>514</td>
<td>$</td>
<td>-</td>
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<tr>
<td>0.07</td>
<td><em>Comptonia peregrina</em></td>
<td>Sweetfern</td>
<td>0.98</td>
<td>25424</td>
<td>1744</td>
<td>174</td>
<td>$</td>
<td>-</td>
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<tr>
<td>0.5</td>
<td><em>Viburnum lantanaoides</em></td>
<td>Hobble Bush</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$</td>
<td>-</td>
</tr>
</tbody>
</table>

Total Cost
**Ernst 243 Seed Mix with Adjustments**

<table>
<thead>
<tr>
<th>Mix Composition</th>
<th>Species</th>
<th>Common Name &amp; Ecotype</th>
</tr>
</thead>
<tbody>
<tr>
<td>30.00%</td>
<td>Panicum clandestinum,</td>
<td>'Tioga' (Deertongue, 'Tioga')</td>
</tr>
<tr>
<td>15.0%</td>
<td>Sorghastrum nutans,</td>
<td>PA Ecotype (Indiangrass, PA Ecotype)</td>
</tr>
<tr>
<td>10.0%</td>
<td>Carex vulpinoidea,</td>
<td>PA Ecotype (Fox Sedge, PA Ecotype)</td>
</tr>
<tr>
<td>10.0%</td>
<td>Elymus riparius,</td>
<td>PA Ecotype (Riverbank Wildrye, PA Ecotype)</td>
</tr>
<tr>
<td>10.0%</td>
<td>Elymus virginicus,</td>
<td>PA Ecotype (Virginia Wildrye, PA Ecotype)</td>
</tr>
<tr>
<td>4.00%</td>
<td>Agrostis perennans,</td>
<td>Albany Pine Bush-NY Ecotype (Autumn Bentgrass, Albany Pine Bush-NY Ecotype)</td>
</tr>
<tr>
<td>2.0%</td>
<td>Asclepias incarnata,</td>
<td>PA Ecotype (Swamp Milkweed, PA Ecotype)</td>
</tr>
<tr>
<td>2.0%</td>
<td>Heliopsis helianthoides,</td>
<td>PA Ecotype (Oxeye Sunflower, PA Ecotype)</td>
</tr>
<tr>
<td>2.0%</td>
<td>Juncus effusus</td>
<td>(Soft Rush)</td>
</tr>
<tr>
<td>2.0%</td>
<td>Verbena hastata,</td>
<td>PA Ecotype (Blue Vervain, PA Ecotype)</td>
</tr>
<tr>
<td>1.0%</td>
<td>Aster novae-angliae (Symphyotrichum n.),</td>
<td>PA Ecotype (New England Aster, PA Ecotype)</td>
</tr>
<tr>
<td>1.0%</td>
<td>Aster prenanthoides,</td>
<td>PA Ecotype (Zigzag Aster, PA Ecotype)</td>
</tr>
<tr>
<td>1.0%</td>
<td>Aster punicus,</td>
<td>PA Ecotype (Purplestem Aster, PA Ecotype)</td>
</tr>
<tr>
<td>1.00%</td>
<td>Aster umbellatus,</td>
<td>PA Ecotype (Flat Topped White Aster, PA Ecotype)</td>
</tr>
<tr>
<td>1.00%</td>
<td>Aster divaricatus,</td>
<td>White Wood Aster PA Ecotype</td>
</tr>
<tr>
<td>1.0%</td>
<td>Carex stricta</td>
<td>(Tussock Sedge)</td>
</tr>
<tr>
<td>5.00%</td>
<td>Lotus corniculatus</td>
<td>Birds-foot trefoil</td>
</tr>
<tr>
<td>1.0%</td>
<td>Lilium superbum,</td>
<td>PA Ecotype (Turk's Cap Lily, PA Ecotype)</td>
</tr>
<tr>
<td>1.0%</td>
<td>Panicum rigidulum,</td>
<td>PA Ecotype (Redtop Panicgrass, PA Ecotype)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lbs/Acre</th>
<th>Area</th>
<th>Cost/Lb</th>
<th>5%</th>
<th>Shipping</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>0.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Include separately in the estimate Annual Ryegrass for temporary stabilization:

10 Lbs

Total Cost

* Seed mix to be applied to all exposed areas.

GENERAL

1.01 SUMMARY
A. This section specifies the hydraulically-applied erosion control product Flexterra® High Performance-Flexible Growth Medium™ (HP-FGM™). Flexterra HP-FGM is 100% biodegradable, made in the United States and composed of 100% recycled, thermally refined (within a pressurized vessel) virgin wood fibers, crimped interlocking biodegradable fibers, mineral activators, and wetting agents (including high-viscosity colloidal polysaccharides, cross-linked biopolymers and water absorbents). The HP-FGM is phytosanitized, free from plastic netting, requires no curing period and upon application forms an intimate bond with the soil surface to create a continuous, porous, absorbent and flexible erosion resistant blanket that allows for rapid germination and accelerated plant growth.

B. Related Sections: Other Specification Sections, which directly relate to the work of this Section include, but are not limited to the following:
   1. Section 01 57 00 – Temporary Erosion and Sediment Control
   2. Section 02 24 23 – Chemical Sampling and Analysis of Soils
   3. Section 31 00 00 – Earthwork
   4. Section 31 91 00 – Planting Preparation
   5. Section 32 01 90.16 – Amending Soils
   6. Section 32 92 00 – Turf and Grasses

1.02 SUBMITTALS
A. Product Data: Submit manufacturer’s product data and installation instructions. Include required substrate preparation, list of materials and application rate.

B. Certifications: Manufacturer shall submit a letter of certification that the product meets or exceeds all technical and packaging requirements and is made in the U.S.A.

1.03 DELIVERY, STORAGE AND HANDLING
A. Deliver materials and products in UV and weather-resistant factory labeled packages. Store and handle in strict compliance with manufacturer’s instructions and recommendations. Protect from damage, weather, excessive temperatures and construction operations.

PRODUCTS

2.01 ACCEPTABLE MANUFACTURER
A. PROFILE Products LLC
   750 Lake Cook Road – Suite 440
   Buffalo Grove, IL 60089
   International - +1-847-215-1144
   United States and Canada – 800-366-1180 (Fax 847-215-0577)
   www.profileproducts.com
2.02 MATERIALS

A. The HP-FGM shall be Flexterra HP-FGM and conform to the following typical property values when uniformly applied at a rate of 3,500 pounds per acre (3,900 kilograms/hectare) under laboratory conditions.

<table>
<thead>
<tr>
<th>Property</th>
<th>Test Method</th>
<th>Tested Value (English)</th>
<th>Tested Value (SI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mass Per Unit Area</td>
<td>ASTM D6566¹</td>
<td>≥ 11.6 oz/yd²</td>
<td>≥ 390 g/m²</td>
</tr>
<tr>
<td>Thickness</td>
<td>ASTM D6525¹</td>
<td>≥ 0.22 inch</td>
<td>≥ 5.6 mm</td>
</tr>
<tr>
<td>Ground Cover</td>
<td>ASTM D6567¹</td>
<td>≥ 99%</td>
<td>≥ 99%</td>
</tr>
<tr>
<td>Water Holding Capacity</td>
<td>ASTM D7367</td>
<td>≥ 1,700%</td>
<td>≥ 1,700%</td>
</tr>
<tr>
<td>Material Color</td>
<td>Observed</td>
<td>Green</td>
<td>Green</td>
</tr>
<tr>
<td>Performance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cover Factor²</td>
<td>Large Scale Testing⁴</td>
<td>≤ 0.01</td>
<td>≤ 0.01</td>
</tr>
<tr>
<td>% Effectiveness³</td>
<td>Large Scale Testing⁴</td>
<td>≥ 99%</td>
<td>≥ 99%</td>
</tr>
<tr>
<td>Cure time</td>
<td>Observed</td>
<td>0 - 2 hours</td>
<td>0 - 2 hours</td>
</tr>
<tr>
<td>Vegetation Establishment</td>
<td>ASTM D7322¹</td>
<td>≥ 800%</td>
<td>≥ 800%</td>
</tr>
<tr>
<td>Functional Longevity⁵</td>
<td>ASTM D5338</td>
<td>≤ 18 months</td>
<td>≤ 18 months</td>
</tr>
<tr>
<td>Environmental</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ecotoxicity</td>
<td>EPA 2021.0</td>
<td>48-hr LC₅₀ &gt; 100%</td>
<td>48-hr LC₅₀ &gt; 100%</td>
</tr>
<tr>
<td>Effluent Turbidity</td>
<td>Large Scale Testing⁴</td>
<td>≤ 250 NTU</td>
<td>≤ 250 NTU</td>
</tr>
<tr>
<td>Biodegradability</td>
<td>ASTM D5338</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

1. ASTM test methods developed for Rolled Erosion Control Products and have been modified to accommodate Hydraulically-Applied Erosion Control Products.
2. Cover Factor is calculated as soil loss ratio of treated surface versus an untreated control surface.
3. % Effectiveness = One minus Cover Factor multiplied by 100%.
4. Large scale testing conducted at Utah Water Research Laboratory. For specific testing information please contact a Profile technical service representative at 800-508-8681 (US and Canada) or +1-847-215-1144 (International).
5. Functional Longevity is the estimated time period, based upon ASTM D5338 testing and field observations, that a material can be anticipated to provide erosion control and agronomic benefits as influenced by composition, as well as site-specific conditions, including, but not limited to – temperature, moisture, light conditions, soils, biological activity, vegetative establishment and other environmental factors.

2.03 COMPOSITION

A. All components of the HP-FGM shall be pre-packaged by the Manufacturer to assure both material performance and compliance with the following values. Under no circumstances shall field mixing of components be permitted. No chemical additives with the exception of fertilizer, soil neutralizers and biostimulant materials should be added to this product.

1. Thermally Processed* (within a pressurized vessel) Virgin Wood Fibers – 80%
   *Heated to a temperature greater than 380 degrees Fahrenheit (193 degrees Celsius) for 5 minutes at a pressure greater than 50 psi (345 kPa)
2. Wetting agents (including high-viscosity colloidial polysaccharides, cross-linked biopolymers, and water absorbents) – 10%
3. Crimped Biodegradable Interlocking Fibers – 5%
4. Micro-Pore Granules – 5%

2.04 PACKAGING

A. Bags: Net Weight – 50 lb (22.7 kg), UV and weather-resistant plastic film
   Pallets: Weather-proof, stretch-wrapped with UV resistant pallet cover
   Pallet Quantity: 40 bags/pallet or 1 ton (909 kg)/pallet
EXECUTION

3.01 SOIL TESTING

A. Soil Samples shall be taken and sent to a third-party, independent lab for analysis and in compliance with Section 02 24 23 – Chemical Sampling and Analysis of Soils, if applicable.

B. The tests shall include analysis and interpretation of results.

C. The soil testing methods used shall be compliant with recognized agronomic testing standards, as outlined in Section 02 24 23, for revegetation of disturbed sites.

D. Soil Analysis shall include results for:

1. Soil pH
2. Soluble Salts
3. Excess Carbonate
4. Organic Matter
5. Nutrient readings for:
   i. Nitrogen, Phosphorus, Potassium
   ii. Magnesium, Calcium, Sodium, Manganese, Sulfur, Zinc, Copper, Iron, Boron
6. Cation Exchange Capacity
7. Percent Base Saturation Sodium

E. ProGanics® BSM, BioPrime™, JumpStart™, Aqua-pHix™ and NeutraLime™ Dry or other amendments shall be specified according to Section 32 01 90.16 – Amending Soils and applied with the hydroseeding slurry at Manufacturer recommended rates based on soil test results.

3.02 VEGETATION SPECIES SELECTION

A. Once soils have been analyzed for agronomic potential and amendment recommendations, selection of suitable plant species for achieving sustainable growth and effective erosion control shall be determined by a qualified seed supplier, consulting professional and/or regulatory agency. Species selection and establishment shall be compliant with Section 32 92 00 – Turf and Grasses, if applicable.

B. Site and project specific information considered for species selection shall include:

1. Project Location and Planning
   i. Climate
   ii. Elevation
   iii. Aspect
   iv. Slope/Gradient
   v. Permanent or Temporary Planting
   vi. Installation Date(s)
2. Soil Conditions
   i. Soil Texture
   ii. Soil pH
   iii. Toxicities/Deficiencies noted in the previous section.
3. Site Maintenance Requirements
   i. Mowing
   ii. Irrigation
   iii. Animal grazing preference
4. Preferred Vegetation
   i. Drought Tolerant
   ii. Native Vegetation
   iii. Shrub Species
   iv. Turf Grasses
3.03 SUBSTRATE AND SEEDBED PREPARATION

A. Examine substrates and conditions where materials will be applied. Apply products to geotechnically stable slopes that have been designed and constructed to divert runoff away from the face of the slope. Do not proceed with installation until satisfactory conditions are established.

B. Depending upon project sequencing and intended application, prepare seedbed in compliance with other specifications under Section 1.01 B

3.04 INSTALLATION

A. Strictly comply with equipment manufacturer’s installation instructions and recommendations. Use approved hydroseeding machines with fan-type nozzle (50-degree tip). To achieve optimum soil surface coverage, apply HP-FGM from opposing directions to soil surface. Rough surfaces (rocky terrain, cat tracked and ripped soils) may require higher application rates to achieve 100% cover. Slope interruption devices or water diversion techniques are recommended when slope lengths (3H:1V) exceed 100 feet (30 m). Slope interruption intervals may need to be decreased based on steeper slopes or other site conditions. HP-FGM is not recommended for channels or areas with concentrated water flow unless used in conjunction with a rolled erosion control product designed to accommodate the anticipated hydraulic conditions. Unless approved by the Manufacturer, no chemical additives with the exception of fertilizer, soil neutralizers and biostimulant materials should be added to this product.

B. For Erosion Control and Revegetation: To ensure proper application rates, measure and stake area. For maximum performance, apply HP-FGM in a two-step process*:

1. **Step One:** Apply fertilizer with specified prescriptive agronomic formulations and typically 50% of specified seed mix with a small amount of HP-FGM for visual metering. Do not leave seeded surfaces unprotected, especially if precipitation is imminent.
2. **Step Two:** Mix balance of seed and apply HP-FGM at a rate of 50 lb per 125 gallons (22.7 kg/475 liters) of water over freshly seeded surfaces. Confirm loading rates with equipment manufacturer.

*Depending upon site conditions HP-FGM may be applied in a one-step process where all components may be mixed together in single tank loads. Consult with Manufacturer for further details.

Best results and more rapid curing are achieved at temperatures exceeding 60°F (15°C). Curing times may be accelerated in high temperature, low humidity conditions with product applied on dry soils.

C. Mixing: A mechanically agitated hydroseeding machine is strongly recommended:

1. Fill 1/3 of mechanically agitated hydroseeder with water. Turn pump on for 15 seconds and purge and pre-wet lines. Turn pump off.
2. Turn agitator on and load low density materials first (i.e. seed).
3. Continue slowly filling tank with water while loading fiber matrix into tank.
4. Consult application and loading charts to determine number of bags to be added for desired area and application rate. Mix at a rate of 50 lb of HP-FGM per 125 gallons (22.7 kg/475 liters).
5. All HP-FGM should be completely loaded before water level reaches 75% of the top of tank.
6. Top off with water and mix until all fiber is fully broken apart and hydrated (minimum of 10 minutes — increase mixing time when applying in cold conditions). This is very important to fully activate the bonding additives and to obtain proper viscosity.
7. Add fertilizer and any other remaining amendments.
8. Shut off recirculation valve to minimize potential for air entrainment within the slurry.
9. Slow down agitator and start applying with a 50-degree fan tip nozzle.
10. Spray in opposing directions for maximum soil coverage.
D. Application Rates: These application rates are for standard conditions. Application rates may need to be increased to accommodate very rough surfaces.

<table>
<thead>
<tr>
<th>Slope Gradient / Condition</th>
<th>English</th>
<th>SI</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 4H to 1V</td>
<td>2,500 lb/ac</td>
<td>2,800 kg/ha</td>
</tr>
<tr>
<td>&gt; 4H to 1V and ≤ 3H to 1V</td>
<td>3,000 lb/ac</td>
<td>3,400 kg/ha</td>
</tr>
<tr>
<td>&gt; 3H to 1V and ≤ 2H to 1V</td>
<td>3,500 lb/ac</td>
<td>3,900 kg/ha</td>
</tr>
<tr>
<td>&gt; 2H to 1V and ≤ 1H to 1V</td>
<td>4,000 lb/ac</td>
<td>4,500 kg/ha</td>
</tr>
<tr>
<td>&gt; 1H to 1V</td>
<td>4,500 lb/ac</td>
<td>5,100 kg/ha</td>
</tr>
<tr>
<td>Below ECB or TRM</td>
<td>1,500 lb/ac</td>
<td>1,700 kg/ha</td>
</tr>
<tr>
<td>As infill for TRM*</td>
<td>3,500 lb/ac</td>
<td>3,900 kg/ha</td>
</tr>
</tbody>
</table>

*Use only approved and tested Futerra® Turf Reinforcement Mats (TRMs) to create the GreenArmor™ System

For additional details including mixing ratios/loading rates for specific machine sizes and visual keys for proper application, please consult Profile® Application Guide for HP-FGM™ and ET-FGM™.

3.05 CLEANING AND PROTECTION

A. After application, thoroughly flush the tank, pumps and hoses to remove all material. Wash all material from the exterior of the machine and remove any slurry spills. Once dry, material will be more difficult to remove.

B. Clean spills promptly. Advise owner of methods for protection of treated areas. Do not allow treated areas to be trafficked or subjected to grazing.

3.06 INSPECTION AND MAINTENANCE

A. All inspections and maintenance recommendations shall be conducted by qualified professionals consistent with the owner, engineer/specifier and regulatory entity(ies) expectations.

B. Initial inspections shall insure installations are in accordance with the project plans and specifications with material quantities and activities fully documented. Refer to Section 32 92 00 – Turf and Grasses for any additional details.

C. Subsequent inspections shall be conducted at pre-determined time intervals and corrective maintenance activities directed after each significant precipitation or other potentially damaging weather or site event.

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Revision Date: 03/2017
Project Information

Project 2161-0098

* Project Name Glen Oaks Property

Location 51 East Nescopeck Creek Lane
Luzerne, Pennsylvania
United States

Contact Matt Welch

Phone 8472153464

Email mwelch@profileproducts.com

* Project Type Stormwater

Estimated Start Date 01/31/2019

* Estimated Project Size (Acres) 1

* Project Stage In Planning

Channel Details

Channel Name 100 Year - Section AA

Channel Shape Trapezoidal

Functional Longevity >36 months

Existing Soil Description Loam

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discharge (Q)</td>
<td>1620 ft^3/s</td>
</tr>
<tr>
<td>Bottom Width (B)</td>
<td>22 ft</td>
</tr>
<tr>
<td>Right Side Slope (SR)</td>
<td>1.5 H:1V</td>
</tr>
<tr>
<td>Left Side Slope (SL)</td>
<td>4 H:1V</td>
</tr>
<tr>
<td>Longitudinal Channel Slope (SO)</td>
<td>0.01 ft/ft</td>
</tr>
<tr>
<td>Retardance Class</td>
<td>C</td>
</tr>
<tr>
<td>Grass Growth Form</td>
<td>Mixed</td>
</tr>
<tr>
<td>Cover Density</td>
<td>Good (65-79%)</td>
</tr>
<tr>
<td>Channel Length (CL)</td>
<td>100 ft</td>
</tr>
<tr>
<td>Required Freeboard (FB)</td>
<td>1 ft</td>
</tr>
<tr>
<td>Channel Bend</td>
<td>No</td>
</tr>
<tr>
<td>Tank Size</td>
<td>1000 gal</td>
</tr>
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</table>

**Selected Product Information**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td><strong>GreenArmor 7020</strong></td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unveg. Solved Depth, du</td>
<td>4.06 ft</td>
</tr>
<tr>
<td>Unveg. Product Roughness, nu</td>
<td>0.025</td>
</tr>
<tr>
<td>Unveg. Flowrate, Q</td>
<td>1618.94 ft^3/s</td>
</tr>
<tr>
<td>Unveg. Velocity, V</td>
<td>12.03 ft/s</td>
</tr>
<tr>
<td>Maximum Unveg. Shear, TMU</td>
<td>2.53 lb/ft^2</td>
</tr>
<tr>
<td>Unveg. Factor of Safety, FSU</td>
<td>2.1</td>
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</table>

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Veg. Solved Depth, dv</td>
<td>4.81 ft</td>
</tr>
</tbody>
</table>
Veg. Product Roughness, \( n_v \) 0.035

Veg. Flowrate, \( Q \) 1618.95 ft\(^3\)/s

Veg. Velocity, \( V \) 9.56 ft/s

Maximum Veg. Shear, TMV 3 lb/ft\(^2\)

Veg. Factor of Safety, FSV 2.7

Functional Longevity >36 Months

TRM Coverage Area +12% 653 yd\(^2\)

Required Infill Product Flexterra HP-FGM

Suggested Application Rate 3500 lb/acre

Job Size 0.121 acres

# of Tanks per Acre 9.33

Estimated # of Bags 9

# of Bags per Tank 8

Total # of Tanks 1.125

---

**Soil Sample Locations and Descriptions**

No Soil Test Data Found
Project Information

Project 2161-0098

* Project Name Glen Oaks Property
Location 51 East Nescopeck Creek Lane
Luzerne, Pennsylvania
United States
Contact Matt Welch
Phone 8472153464
Email mwelch@profileproducts.com

* Project Type Stormwater
Estimated Start Date 01/31/2019

* Estimated Project Size (Acres) 1
* Project Stage In Planning

Channel Details

Channel Name 100 Year - Section BB
Channel Shape Trapezoidal
Functional Longevity >36 months
Existing Soil Description Loam

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discharge (Q)</td>
<td>1620 ft$^3$/s</td>
</tr>
<tr>
<td>Bottom Width (B)</td>
<td>14 ft</td>
</tr>
<tr>
<td>Right Side Slope (SR)</td>
<td>1.5 H:1V</td>
</tr>
<tr>
<td>Left Side Slope (SL)</td>
<td>4 H:1V</td>
</tr>
<tr>
<td>Longitudinal Channel Slope (SO)</td>
<td>0.01 ft/ft</td>
</tr>
<tr>
<td>Retardance Class</td>
<td>C</td>
</tr>
<tr>
<td>Grass Growth Form</td>
<td>Mixed</td>
</tr>
<tr>
<td>Cover Density</td>
<td>Very Good (80-90%)</td>
</tr>
<tr>
<td>Channel Length (CL)</td>
<td>100 ft</td>
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<tr>
<td>Required Freeboard (FB)</td>
<td>1 ft</td>
</tr>
<tr>
<td>Channel Bend</td>
<td>No</td>
</tr>
<tr>
<td>Tank Size</td>
<td>1000 gal</td>
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### Selected Product Information

**Name**  
GreenArmor 7020

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unveg. Solved Depth, du</td>
<td>4.81 ft</td>
</tr>
<tr>
<td>Unveg. Product Roughness, nu</td>
<td>0.025</td>
</tr>
<tr>
<td>Unveg. Flowrate, Q</td>
<td>1618.67 ft$^3$/s</td>
</tr>
<tr>
<td>Unveg. Velocity, V</td>
<td>12.37 ft/s</td>
</tr>
<tr>
<td>Maximum Unveg. Shear, TMU</td>
<td>3 lb/ft$^2$</td>
</tr>
<tr>
<td>Unveg. Factor of Safety, FSU</td>
<td>1.7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Veg. Solved Depth, dv</td>
<td>5.57 ft</td>
</tr>
</tbody>
</table>
Veg. Product Roughness, \( r_v \) & 0.034 \\
Veg. Flowrate, \( Q \) & 1619.93 \( \text{ft}^2/\text{s} \) \\
Veg. Velocity, \( V \) & 9.92 \( \text{ft/s} \) \\
Maximum Veg. Shear, \( TMV \) & 3.48 \( \text{lb/ft}^2 \) \\
Veg. Factor of Safety, \( FSV \) & 2.7 \\

<table>
<thead>
<tr>
<th>Functional Longevity</th>
<th>&gt;36 Months</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRM Coverage Area +12%</td>
<td>610 ( \text{yd}^2 )</td>
</tr>
</tbody>
</table>

Required Infill Product & Flexterra HP-FGM \\
Suggested Application Rate & 3500 \( \text{lb/acre} \) \\
Job Size & 0.113 acres \\
# of Tanks per Acre & 10 \\
Estimated # of Bags & 9 \\
# of Bags per Tank & 8 \\
Total # of Tanks & 1.125 \\

**Soil Sample Locations and Descriptions**

No Soil Test Data Found
SOIL TEST RESULTS
* All soil tests were conducted by an independent, third-party laboratory.

Project: 0117-0045-1
* Project Name: Glen Oaks
Project Number: 5678
File #: 
Location: 43 Nescopeck Creek Trail
Luzerne, Pennsylvania
United States
Notes: Been working with Luzerne Co.
Watershed specialist on this project

SOIL SAMPLE LOCATIONS AND DESCRIPTIONS

<table>
<thead>
<tr>
<th>Sample (#)</th>
<th>Location</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

RECOMMENDED PRESCRIPTIVE AGRONOMIC FORMULATIONS BASED ON SOIL ANALYSIS

<table>
<thead>
<tr>
<th>Sample</th>
<th>Aqua-pHix™</th>
<th>NeutraLime™</th>
<th>Agricultural Lime³</th>
<th>JumpStart™</th>
<th>BioPrime™</th>
<th>ProGanics™</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>gal/ac</td>
<td>L/ha</td>
<td>lb/ac</td>
<td>kg/ha</td>
<td>gal/ac</td>
<td>L/ha</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
<td>160</td>
<td>179</td>
<td>6970</td>
<td>7811</td>
</tr>
</tbody>
</table>

Notes: 1. Aqua-pHix is also available in a granular form, please contact Tech@profileproducts.com with questions. 2. NeutraLime is also available in a liquid form, please contact Tech@profileproducts.com with questions. 3. Based on 100% Calcium Carbonate Equivalent tilled in to a depth of 6in.

FERTILIZER RECOMMENDATIONS

<table>
<thead>
<tr>
<th>Sample</th>
<th>Crop Yield or Turf / Ornamental Code</th>
<th>Gypsum</th>
<th>Sulfur</th>
<th>N</th>
<th>P₂O₅</th>
<th>K₂O</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>lb/ac</td>
<td>kg/ha</td>
<td>lb/ac</td>
<td>kg/ha</td>
<td>lb/ac</td>
<td>kg/ha</td>
</tr>
<tr>
<td>1</td>
<td>TURF</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>122</td>
<td>136.7</td>
</tr>
</tbody>
</table>
## SOIL ANALYSIS RESULTS

### Sample

<table>
<thead>
<tr>
<th></th>
<th>Nitrate N ppm</th>
<th>Phosphorus ppm</th>
<th>Potassium ppm</th>
<th>Magnesium ppm</th>
<th>Calcium ppm</th>
<th>Sulfur ppm</th>
<th>Zinc ppm</th>
<th>Manganese ppm</th>
<th>Copper ppm</th>
<th>Iron ppm</th>
<th>Boron ppm</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>7</td>
<td>75</td>
<td>35</td>
<td>150</td>
<td>15</td>
<td>1.3</td>
<td>19.1</td>
<td>0.7</td>
<td>39.8</td>
<td>0.2</td>
</tr>
</tbody>
</table>

(10 - 30) IF pH ≤ 7.1 (20-40)
(150 - 250) IF pH > 7.1 (10-25)
(x 400) (5 - 20)
(1.3 - 3.0)
(4.1 - 12.0)
(1.0 - 2.0)
(7.1 - 20.0)
(< 2.0)

### Sample

<table>
<thead>
<tr>
<th></th>
<th>% Organic Matter</th>
<th>Soil Respiration mg CO2/kg soil/week</th>
<th>Sand %</th>
<th>Silt %</th>
<th>Clay %</th>
<th>Texture USDA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.4</td>
<td>236.6</td>
<td>58.4</td>
<td>28</td>
<td>13.6</td>
<td>Sandy Loam</td>
</tr>
</tbody>
</table>

(> 5%)
(> 1,000)
(20 - 60%)
Silt & Clay (40 - 80%)

Notes: 4. Soil Respiration ppm = mg/kg

### Sample

<table>
<thead>
<tr>
<th></th>
<th>Soil pH</th>
<th>Buffer Index</th>
<th>TDS</th>
<th>Soluble Salts mmhos/cm</th>
<th>Sodium ppm</th>
<th>SAR</th>
<th>Bulk Density g/cm³</th>
<th>oz/in³</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5.1</td>
<td>6.4</td>
<td>89.6</td>
<td>0.18</td>
<td>13</td>
<td>0.44</td>
<td>1.4</td>
<td>0.81</td>
</tr>
</tbody>
</table>

(6.3 - 7.3)
(< 256)
(< 0.75)
(< 2)

Notes: 5. Contact Tech@profisegproducts.com if pH is < 4.2 or > 9.2 for specific recommendation. 6. Total Dissolved Salts. 7. Sodium Adsorption Ratio.

### Sample

<table>
<thead>
<tr>
<th></th>
<th>% K</th>
<th>% Mg</th>
<th>% Ca</th>
<th>% Na</th>
<th>% H</th>
<th>Total CEC</th>
<th>Bicarbonate ppm</th>
<th>Chloride ppm</th>
<th>Silicon ppm</th>
<th>SO₄ ppm</th>
<th>Zinc ppm</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2.3</td>
<td>3.5</td>
<td>9</td>
<td>0.7</td>
<td>84.6</td>
<td>8.4</td>
<td>39.7</td>
<td>16.7</td>
<td>40</td>
<td>11.1</td>
<td>0</td>
</tr>
</tbody>
</table>

(3 - 7%)
(15 - 20%)
(65 - 75%)
(0 - 4%)
(0 - 5%)
(10 - 30)

### General Fertilization Guidance

- Fertilizer recommendations are based on annual requirements for turfgrass species. Application rates should be adjusted to account for annual application time, seasonality and vegetation that is being planted.
- Contact your seed supplier for specific recommendations that are applicable to your seed blend, area, and climate.
- Values shown above for Macro and Micro Nutrients should be reviewed by a local agronomist prior to making any general fertilization recommendations.