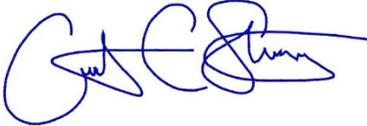


# ILLINOIS GULCH SITE

## Time-Critical Removal Action (TCRA)

### ENGINEERING CHANGE ORDER (ECO)

ECO # 3	DATE: 07/30/21
TITLE: FOUNDATION IMPROVEMENTS FOR NORTH AND WEST EMBANKMENTS OF THE WILLARD REPOSITORY	
<p>DESCRIPTION OF MODIFICATION: Test pit excavation during the geotechnical investigation revealed the presence of soft and compressible peat deposits in the areas of the to-be-constructed north and west embankments of the proposed settling pond. Preliminary slope stability analyses indicate that the presence of this material could result in instability of the embankments and/or differential settlement that could damage the pond liner. The potentially affected area is depicted in red on the attached drawing.</p> <p>To improve the foundation conditions in this area, existing waste rock that is currently within the embankment areas will be removed to expose the underlying peat material. The peat will be removed from the area shown on the attached figure to an approximate depth of two feet (depth determination based on field observations from the geotechnical investigation) to expose the underlying clay deposits. After peat removal, a woven geotextile (Mirafi HP370 or equivalent; spec sheet attached) will be placed on the exposed clay surface and then a geogrid material (Tensar Biaxial Geogrid BX1100; spec sheet attached) will be placed on top of the geotextile. 4" to 8" cobble will then be placed on top of the geogrid. The settling pond embankments will be constructed over this stabilized foundation in compacted lifts per the approved design.</p> <p>This modification will not materially affect the function of the TCRA.</p>	
JUSTIFICATION/BENEFIT: The geotextile, geogrid, and cobble layer will distribute the weight of the embankments and is expected to provide acceptable slope stability and to limit differential settlement to acceptable levels.	
<p>PREPARED BY: Formation Environmental, LLC and/or The Sanitas Group on behalf of TABR Realty Services Inc.</p> <p> Brian G. Hansen, PE – Formation Environmental, LLC</p> <p> Curtis C. Stevens, PE – The Sanitas Group</p>	<p>APPROVED BY:</p>          <p>U.S. EPA ON-SCENE COORDINATOR</p>

## Product Specification - Biaxial Geogrid BX1100

*Tensar International Corporation reserves the right to change its product specifications at any time. It is the responsibility of the specifier and purchaser to ensure that product specifications used for design and procurement purposes are current and consistent with the products used in each instance.*

**Product Type:** Integrally Formed Biaxial Geogrid  
**Polymer:** Polypropylene  
**Load Transfer Mechanism:** Positive Mechanical Interlock  
**Primary Applications:** Spectra System (Base Stabilization, Subgrade Improvement)

### Product Properties

Index Properties	Units	MD Values <sup>1</sup>	XMD Values <sup>1</sup>
▪ Aperture Dimensions <sup>2</sup>	mm (in)	25 (1.0)	33 (1.3)
▪ Rib Thickness <sup>2</sup>	mm (in)	0.76 (0.03)	0.76 (0.03)
▪ Tensile Strength @ 2% Strain <sup>3</sup>	kN/m (lb/ft)	4.1 (280)	6.6 (450)
▪ Tensile Strength @ 5% Strain <sup>3</sup>	kN/m (lb/ft)	8.5 (580)	13.4 (920)
▪ Ultimate Tensile Strength <sup>3</sup>	kN/m (lb/ft)	12.4 (850)	19.0 (1,300)
<b>Structural Integrity</b>			
▪ Junction Efficiency <sup>4</sup>	%	93	
▪ Overall Flexural Rigidity <sup>5</sup>	mg-cm	250,000	
▪ Aperture Stability <sup>6</sup>	m-N/deg	0.32	
<b>Durability</b>			
▪ Resistance to Installation Damage <sup>7</sup>	%SC / %SW / %GP	95 / 93 / 90	
▪ Resistance to Long Term Degradation <sup>8</sup>	%	100	
▪ Resistance to UV Degradation <sup>9</sup>	%	100	

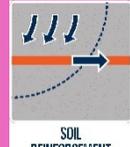
### Dimensions and Delivery

The biaxial geogrid shall be delivered to the jobsite in roll form with each roll individually identified and nominally measuring 4.0 meters (13.1 feet) in width and 75.0 meters (246 feet) in length and 3.93 meters (12.9 feet) in width and 75.0 meters (246 feet) in length.

### Notes

1. Unless indicated otherwise, values shown are minimum average roll values determined in accordance with ASTM D4759-02. Brief descriptions of test procedures are given in the following notes.
2. Nominal dimensions.
3. Determined in accordance with ASTM D6637-10 Method A.
4. Load transfer capability determined in accordance with ASTM D7737-11.
5. Resistance to bending force determined in accordance with ASTM D7748/D7748M-14.
6. Resistance to in-plane rotational movement measured in accordance with ASTM D7864/D7864M-15.
7. Resistance to loss of load capacity or structural integrity when subjected to mechanical installation stress in clayey sand (SC), well graded sand (SW), and crushed stone classified as poorly graded gravel (GP). The geogrid shall be sampled in accordance with ASTM D5818 and load capacity shall be determined in accordance with ASTM D6637.
8. Resistance to loss of load capacity or structural integrity when subjected to chemically aggressive environments in accordance with EPA 9090 immersion testing.
9. Resistance to loss of load capacity or structural integrity when subjected to 500 hours of ultraviolet light and aggressive weathering in accordance with ASTM D4355-05.

# Mirafi® HP370



Mirafi® HP370 geotextile is composed of high-tenacity monofilament polypropylene yarns, which are woven into a network such that the yarns retain their relative position. Mirafi® HP370 geotextile is inert to biological degradation and resistant to naturally encountered chemicals, alkalis, and acids.

TenCate Geosynthetics Americas is accredited by Geosynthetic Accreditation Institute – Laboratory Accreditation Program (GAI-LAP).

Mechanical Properties	Test Method	Unit	Minimum Average Roll Value	
			MD	CD
Tensile Strength (at ultimate)	ASTM D4595	lbs/ft (kN/m)	3600 (52.5)	3240 (47.3)
Tensile Strength (at 5% strain)	ASTM D4595	lbs/ft (kN/m)	1500 (21.9)	1560 (22.8)
			Minimum Roll Value	
Flow Rate	ASTM D4491	gal/min/ft <sup>2</sup> (l/min/m <sup>2</sup> )	60 (2444)	
Permittivity	ASTM D4491	sec <sup>-1</sup>	0.8	
			Maximum Opening Size	
Apparent Opening Size (AOS)	ASTM D4751	U.S. Sieve (mm)	30 (0.600)	
			Minimum Test Value	
UV Resistance (at 500 hours)	ASTM D4355	% strength retained	80	

Physical Properties	Unit	Roll Size
Roll Dimensions (width x length)	ft (m)	15 x 300 (4.5 x 91)
Roll Area	yd <sup>2</sup> (m <sup>2</sup> )	500 (418)

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