HYDROTURF® CS AND Z MONITORING & MAINTENANCE GUIDELINES

January 2018, Revision 2.0

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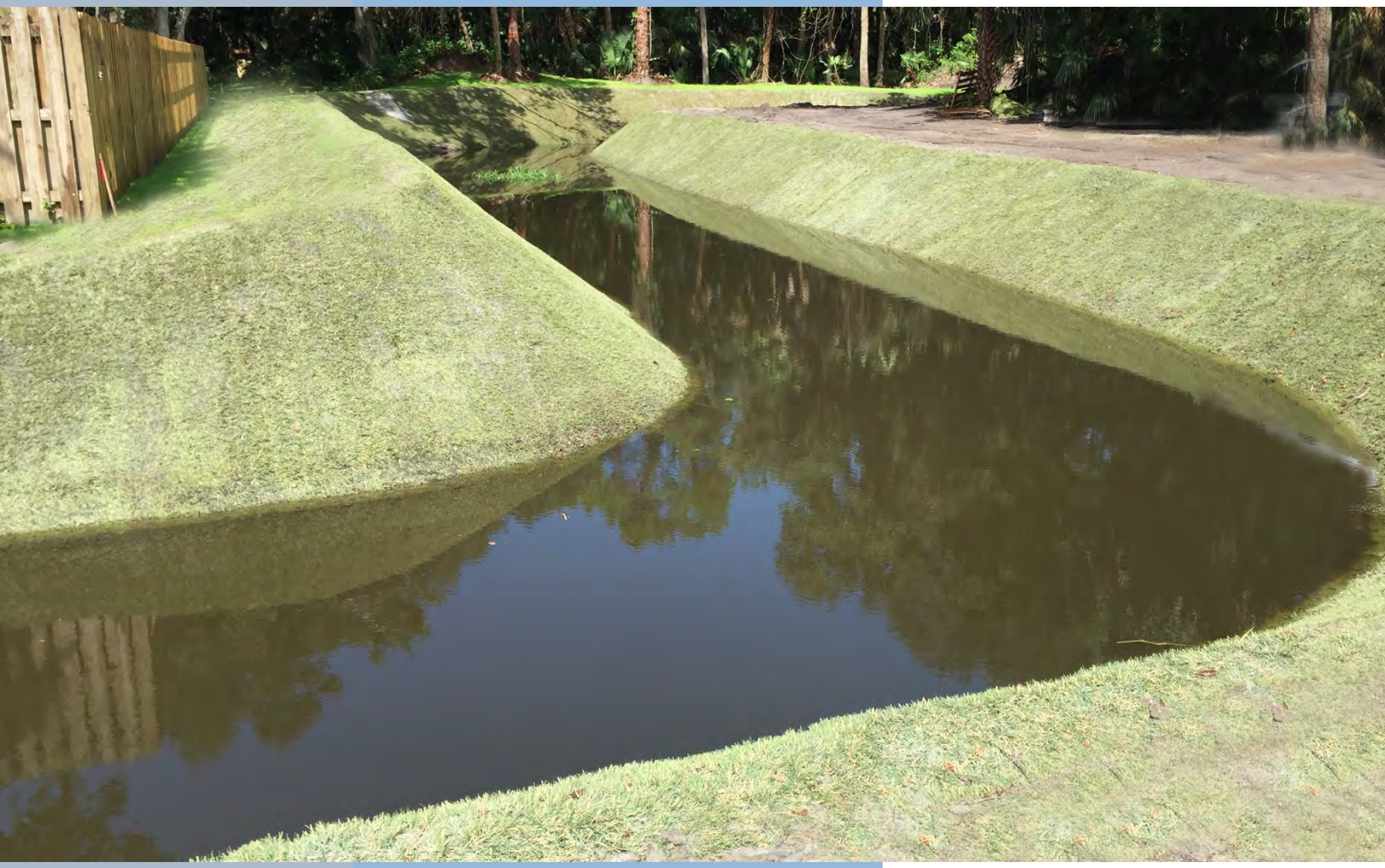

HydroTurf®

Advanced Revetment Technology

HydroTurf® CS and Z Monitoring & Maintenance Guidelines

1.0 Introduction

This document is intended to be a general guide of suggested procedures for Monitoring and Maintenance related to installed HydroTurf® CS and Z Systems. These guidelines do not supersede any site specific regulatory maintenance and reporting requirements; project specific plans, specifications and/or conditions; or Watershed Geosynthetics, LLC (WG) Agreements.

Inspection and repair activities shall be performed by Watershed Geosynthetics (WG) trained individuals. While some corrective procedures can be performed by trained site personnel, a list of trained contractors / installers is available upon request.

2.0 Inspections

2.1 Owner's Internal Inspections

The owner's designated representative shall establish the site's specific inspection intervals as required by permits and/or internal procedures. A minimum annual inspection interval is to be performed by the owner or owner's representative. Also, inspections should be performed after major storm events. A sample Monitoring & Maintenance Report is included at the end of this document. Please forward a copy of the monitoring and repair reports to WG representative Mr. Curt Boling by email at cboling@watershedgeo.com.

2.2 WG Inspections

WG may make periodic site visits related to managing site-specific warranties. WG will coordinate with the owners designated representative.

3.0 Visual Monitoring & Documentation

3.1 Visually Inspect HydroTurf® CS and Z Noting the Following:

3.1.1 Damaged HydroBinder® Infill such as Large Cracks, Excessive Cracking, Crushed Infill, and/or Voids;
3.1.2 Damaged Engineered Synthetic Turf;
3.1.3 Damaged Geomembrane; and
3.1.4 Localized Differential Settlement / Undermining.

3.2 Documentation

Documentation should include a written report (see attached sample Monitoring & Maintenance Report). The report should note locations of areas of damage and have supporting photographs. Documentation and reporting of the repairs (i.e., size, location, area, etc.) with before and after photos shall also be prepared.

4.0 Corrective Maintenance and Repair Procedures

4.1 Damaged HydroBinder® Infill

Visually inspect, document and take photos of areas where there is damage to or concern with the HydroBinder® infill. These areas may include large cracks, excessive cracking, crushed infill, and/or voids. If possible, define the cause(s) of damage so that it may be proactively addressed. Repairing these areas includes the following:

4.1.1 Clean the affected area by removing any loose infill and/or other materials. This may require the use of a hammer to break out some of the loose infill areas.

4.1.2 Confirm that the synthetic turf and underlying geomembrane are not damaged. If they are damaged, please refer to Sections 4.2 and 4.3 for repair guidelines.

4.1.3 Cracks in the HydroBinder® can be sealed by applying concrete crack sealants such as Quikrete Product 8640, Sakrete Product 60205006, or equal. Note that these products can typically be purchased at big box home improvement stores (i.e., Lowes, Home Depot, etc.).

4.1.4 For areas of concern that are larger than cracks, new HydroBinder® infill shall be applied to the affected area. If HydroBinder® is not readily available, a dry mortar / concrete mix which meets ASTM C387 with a 5,000 psi 28 day compressive strength may be used as a substitute. These products can typically be purchased at big box home improvement stores (i.e., Lowes, Home Depot, etc.).

4.1.4.1 The dry infill mix shall be applied to a minimum thickness of ¾-in and shall match the thickness of the intact HydroBinder®.

4.1.4.2 The area shall then be raked or broomed to pull the turf fibers up through the dry infill mix.

4.1.4.3 The hydration process must occur the day of the infill placement. The infill is hydrated thoroughly with a light spray of water to avoid displacement of the non-hydrated infill. Do not overhydrate the infill so that water begins to runoff and

causes the loss of cement particles in the infill. The general objective is to soak the area to start the hydration process but not to inundate with water beyond saturation.

4.1.4.4 It should be verified that the infill has been fully hydrated, and not over hydrated. This verification includes a visual observation that the top of the HydroBinder® has a wet sheen (denoting saturation) but that water is not ponding on top. Also, verification can be performed by using a finger or small tool to probe the infill to confirm full hydration of the section was achieved.

4.1.5 Document and report (i.e., size, location, area, etc.) the repairs including before and after photos.

4.2 Damaged Engineered Synthetic Turf

Visually inspect, document and take photos of areas where there is damage to or concern with the engineered synthetic turf layer. If possible, define the cause(s) of damage so that it may be proactively addressed. Repairing these areas includes the following:

4.2.1 Clean the affected area by removing any loose infill and/or other materials. This may require the use of a hammer to break out some of the loose infill areas.

4.2.2 Cut and remove the damaged synthetic turf 4-in (min) beyond the damaged area.

4.2.3 Observe the condition of the subgrade under the engineered synthetic turf (HydroTurf® Z). If it is smooth and firm, move forward with patching the engineered synthetic turf. If it is damaged, the subgrade shall be fixed prior to patching the engineered synthetic turf.

4.2.4 Confirm that the underlying geomembrane is not damaged (HydroTurf® CS). If it is damaged, please refer to Section 4.3 of these guidelines for repair procedures.

4.2.5 Cut a patch of new synthetic turf that will extend a minimum of 3-in beyond the damaged area in all directions.

4.2.6 Tuck the new synthetic turf patch under the existing synthetic turf such that 3-in (min) of the new turf is covered by the existing turf on all sides.

4.2.7 Use the hand-held heat bonding method (hot-air gun with hand pressure) for seaming the 3-in tucked edge to the bottom of the existing synthetic turf.

4.2.8 Replace the HydroBinder® Infill as described in Section 4.1 of these guidelines.

4.2.9 Document and report (i.e., size, location, area, etc.) the repairs including before and after photos.

4.3 Damaged Geomembrane (HydroTurf® CS)

Visually inspect, document and take photos of areas where there is damage to or concern with the geomembrane. If possible, define the cause(s) of damage so that it may be proactively addressed. Repairing these areas includes the following:

4.3.1 Clean the affected area by removing any loose infill and/or other materials. This may require the use of a hammer to break out some of the loose infill areas.

4.3.2 Cut back and remove the overlying engineered synthetic turf in order to access the damaged area of the geomembrane.

4.3.3 Observe the condition of the subgrade under the geomembrane. If it is smooth and firm, move forward with patching the geomembrane. If it is damaged, the subgrade shall be fixed prior to patching the geomembrane.

4.3.4 Cut a patch of new geomembrane material. This material shall be the same thickness and resin (e.g., 50 mil LLDPE) as the geomembrane of the existing installation. Patch shall extend a minimum of 4-in beyond the damaged area in all directions. Extrudate rod shall be the same resin type as the resin of the existing geomembrane.

4.3.5 Clean the geomembrane and properly grind the location of the extrusion weld.

4.3.6 Extrusion weld the patch to the existing geomembrane. The welding technician shall be certified by the International Association of Geosynthetics Installers (IAGI) as a Certified Welding Technician (CWT) for Polyethylene Geomembranes, and have a minimum experience of seaming 1,000,000 sf of polyethylene geomembrane using the same type of seaming apparatus to be used in this repair.

4.3.7 The extrusion weld shall be vacuum box tested for leaks in accordance with ASTM D5641.

4.3.8 Replace the synthetic turf and HydroBinder® infill as described in Sections 4.2 and 4.1, respectively.

4.3.9 Document and report (i.e., size, location, area, etc.) the repairs including before and after photos.

4.4 Localized Differential Settlement / Undermining

If localized differential settlement or undermining occurs under the HydroTurf® system, first determine and address the underlying cause of the settlement / undermining. Then the original grades may be re-established as follows:

4.4.1 Cut and remove the HydroBinder® infill, synthetic turf and geomembrane.

4.4.2 Place and compact earthen materials in the settled / undermined area to the designated grades. Flowable fill may also be used to re-establish the grades.

4.4.3 Replace the HydroTurf® CS system in this area with a patch of new geomembrane, synthetic turf, and infill materials. Each component (geomembrane and synthetic turf) patch shall be seamed into its respective component of the existing HydroTurf® CS system. After the patches are seamed, infill the synthetic turf with the HydroBinder®. The replacement patches shall be installed in accordance with Sections 4.1, 4.2, and 4.3 of these guidelines.

4.4.4 Document and report (i.e., size, location, area, etc.) the repairs including before and after photos.

5.0 Reporting

The owner's designated site representative(s) shall be responsible for the monitoring and maintenance procedures and reporting of field documentation. Please forward a copy of the monitoring and repair reports to WG representative Mr. Curt Boling by email at cboling@watershedgeo.com.

6.0 Sample - Field Inspection & Documentation Report (Attachment)

7.0 Limitations

This manual is meant as a guideline only. Watershed Geosynthetics LLC cannot anticipate the many ways this product may be applied either in design or installation. Varying site conditions will require close coordination between the engineer and the installer to account for site conditions and adjust accordingly. When required by state and/or local regulations, a licensed professional engineer or architect will be required.

HydroTurf® is a U.S. registered trademark which designates a product from Watershed Geosynthetics LLC. This product is the subject of issued U.S. and foreign patents and/or pending U.S. and foreign patent applications. All information, recommendations and suggestions appearing in this literature concerning the use of our products are based upon tests and data believed to be reliable; however, this information should not be used or relied upon for any specific application without independent professional examination and verification of its accuracy, suitability and applicability. Since the actual use by others is beyond our control, no guarantee or warranty of any kind, expressed or implied, is made

by Watershed Geosynthetics LLC as to the effects of such use or the results to be obtained, nor does Watershed Geosynthetics LLC assume any liability in connection herewith. Any statement made herein may not be absolutely complete since additional information may be necessary or desirable when particular or exceptional conditions or circumstances exist or because of applicable laws or government regulations. Nothing herein is to be construed as permission or as a recommendation to infringe any patent.

HydroTurf® Monitoring & Maintenance
Sample - Field Inspection & Documentation Report

A. Site Information	B. Contact Information
Facility Name:	Site Operator:
Address:	Phone #:
Installation Date:	Inspected By:
Date of Last Monitoring Event:	Date of Monitoring Event:

C. HydroTurf® Inspection

If damage is present, indicate if damage is Minor or Major then use Section D to provide additional information, if necessary. The location and extent of damage shall be noted on site plans which shall be attached to this M&M Report. Photographs of all damage and repairs shall also be included in the report.

[Minor Damage=no immediate repair needed, but should be repaired or watched during the year.]
[Major Damage= requires immediate repair and submittal of a work scope to conduct repair.]

		Yes	No	NA	Minor	Major
1	Is the HydroTurf System in good working condition?					
2	Does the HydroBinder have large cracks, excessive cracking, crushed infill, and/or voids?					
3	Is the synthetic turf damaged?					
4	Is the geomembrane exposed and/or damaged?					
5	Is the subgrade smooth and firm?					
6	Evidence of damage due to unauthorized access?					
7	Evidence of settlement and/or ponding water?					
8	Does the HydroTurf have positive drainage?					
9	Any build-up of debris on the HydroTurf?					
10	Evidence of damage due to Burrowing Animals?					
11	Are other hydraulic structures present and in good working condition?					
11a	Culverts					
11b	Drainage Channels and Swales					
11c	Headwalls					
11d	Storm Water Basins					
11e	Slopes					
11f	Sea Walls					
11g	Other					

		Yes	No	NA	Minor	Major
12	Do the other hydraulic structures have excessive debris or blockage?					
13	Do the other hydraulic structures have positive drainage?					
D. Comments and Recommendations						

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