**MNGWPD STORMWATER TECHNOLOGY ASSISTANCE PROTOCOL EVALUATION FORM**

**Company:** Americast/KriStar Enterprises  
**Device/Model:** Filterra Bioretention System  
**Reviewer:** Technical Review Team / District Staff  
**Date:** 2013

### A. TECHNOLOGY / PRODUCT SPECIFICATIONS

<table>
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<tr>
<th>Submittal Includes:</th>
<th>Yes</th>
<th>No</th>
<th>Reference</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. General description of the technology, including all components and processes</td>
<td>✓</td>
<td></td>
<td>Main Submittal, pp 4-8</td>
<td></td>
</tr>
<tr>
<td>2. Underlying scientific and engineering principles for the technology / description of how the technology functions in treating stormwater runoff</td>
<td>✓</td>
<td></td>
<td>Main Submittal, pp 9-10; Appendix D</td>
<td></td>
</tr>
<tr>
<td>3. Minimum siting and design specifications</td>
<td>✓</td>
<td></td>
<td>Main Submittal, pp 11-12</td>
<td>Additional info provided in 5/14/13 Response</td>
</tr>
<tr>
<td>4. Discussion of the advantages of the technology when compared to conventional stormwater systems</td>
<td>✓</td>
<td></td>
<td>Main Submittal, p 12</td>
<td></td>
</tr>
<tr>
<td>5. Standard drawings, including a schematic of the technology and a process flow diagram</td>
<td>✓</td>
<td></td>
<td>Appendix K</td>
<td></td>
</tr>
<tr>
<td>6. Discussion of technology hydraulics and system sizing to meet performance standards and goals</td>
<td>✓</td>
<td></td>
<td>Main Submittal, pp 13-14; Appendix C</td>
<td></td>
</tr>
</tbody>
</table>
## MNGWPD Stormwater Technology Assistance Protocol Evaluation Form

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<tbody>
<tr>
<td>7. Clear specification of the sizing process, including appropriate flow rates if applicable</td>
<td>✓</td>
<td></td>
<td>Appendices C, D, I and K</td>
<td></td>
</tr>
<tr>
<td>8. Description of the full range of operating conditions for the technology, including minimal, maximal, and optimal conditions to achieve performance goals and standards, and for the reliability of the technology</td>
<td>✓</td>
<td></td>
<td>Appendix K</td>
<td>Additional info provided in 5/14/13 Response</td>
</tr>
<tr>
<td>9. Maintenance requirements to sustain performance and safe operation</td>
<td>✓</td>
<td></td>
<td>Main Submittal, p 15; Appendix M</td>
<td></td>
</tr>
<tr>
<td>10. Description of technology limitations</td>
<td>✓</td>
<td></td>
<td>Main Submittal, p 15</td>
<td></td>
</tr>
<tr>
<td>11. Identified secondary impacts</td>
<td>✓</td>
<td></td>
<td>Main Submittal, pp 16-17</td>
<td></td>
</tr>
<tr>
<td>12. Discussion of the generation, handling, removal, and disposal of discharges, emissions, and waste byproducts</td>
<td>✓</td>
<td></td>
<td>Main Submittal, p 17</td>
<td></td>
</tr>
</tbody>
</table>
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<tbody>
<tr>
<td>13. Discussion of pretreatment and preconditioning of stormwater to achieve stated performance</td>
<td>✓</td>
<td></td>
<td>Main Submittal, p 17</td>
<td></td>
</tr>
<tr>
<td>14. Identification of any special licensing or hauling requirements, safety issues, and access requirements associated with the operation or maintenance of the technology</td>
<td>✓</td>
<td></td>
<td>Main Submittal, pp 17-18</td>
<td></td>
</tr>
<tr>
<td>15. Capital and projected annual costs, including O&amp;M costs</td>
<td>✓</td>
<td></td>
<td>Main Submittal, p 17; Appendix M</td>
<td></td>
</tr>
<tr>
<td>16. Executive summary</td>
<td>✓</td>
<td></td>
<td>Exec Summary</td>
<td></td>
</tr>
</tbody>
</table>

**Additional Comments on Technology Engineering Report(s):**

Summary and descriptions of product design variations provided in the product sheets found in Appendices A and B. The Engineering Design Assistance Kit for the Southeast U.S. Region is provided in Appendix K. The product Installation Manual is provided in Appendix L. The product Operations and Maintenance Manual is provided in Appendix M. A list of appropriate plant species for the product bioretention systems is provided in Appendix N.
B. PERFORMANCE CLAIMS

<table>
<thead>
<tr>
<th>Submittal Includes:</th>
<th>Yes</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Performance claim that identifies the technology's intended use and predicts the</td>
<td>✓</td>
<td></td>
<td>Main Submittal, p 18</td>
<td></td>
</tr>
<tr>
<td>technology's capabilities to remove contaminants and/or control the quantity of</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>stormwater runoff</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Additional Comments on Specific Performance Claims:

Performance claim provided:

“The Filterra® Bioretention System can capture and treat the water quality volume for up to a 0.353 acre runoff area that is up to 100% impervious. Under these conditions, a total suspended solid (TSS) removal rate of 85% can be achieved with inflow TSS concentrations greater than 20 mg/l. for flow rates of 140 inches per hour.”
### C. PERFORMANCE TESTING REPORTING

<table>
<thead>
<tr>
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<th>Yes</th>
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<tbody>
<tr>
<td>1. Statement of performance testing objectives</td>
<td>✓</td>
<td></td>
<td>Appendices D, E, F, G</td>
<td></td>
</tr>
<tr>
<td>2. Performance testing project plan providing adequate information on the site, technology sizing and design, and use of appropriate monitoring equipment.</td>
<td>✓</td>
<td></td>
<td>Appendices D, E, F</td>
<td></td>
</tr>
<tr>
<td>3. Standardized test methods and procedures used</td>
<td>✓</td>
<td></td>
<td>Appendices D, E, F, G</td>
<td></td>
</tr>
<tr>
<td>4. QA/QC objectives and procedures</td>
<td>✓</td>
<td></td>
<td>Appendix E</td>
<td></td>
</tr>
<tr>
<td>5. Date and time when samples were collected</td>
<td>✓</td>
<td></td>
<td>Appendices D, E, F, G</td>
<td></td>
</tr>
<tr>
<td>6. Rainfall data (including the antecedent dry periods, total rainfall and rainfall duration/intensity)</td>
<td>✓</td>
<td></td>
<td>Appendices E and F</td>
<td></td>
</tr>
<tr>
<td>7. Comparison of rainfall data to rainfall criteria</td>
<td>✓</td>
<td></td>
<td>Appendix E</td>
<td>Additional info provided in 5/14/13 Response</td>
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<tr>
<td>8. Comparison of collected aliquots to sampling criteria</td>
<td>✓</td>
<td></td>
<td>5/14/13 Response</td>
<td></td>
</tr>
<tr>
<td>9. Comparison of influent to effluent pollutant concentrations</td>
<td>✓</td>
<td></td>
<td>Appendices D, E, F, and G</td>
<td></td>
</tr>
<tr>
<td>10. Particle size distribution (PSD) analysis</td>
<td>✓</td>
<td></td>
<td>Appendices D and H</td>
<td></td>
</tr>
<tr>
<td>11. Demonstration of scour prevention (if applicable)</td>
<td>✓</td>
<td></td>
<td>5/14/13 Response</td>
<td></td>
</tr>
<tr>
<td>12. An estimation of annual average total suspended solids (TSS) removal</td>
<td>✓</td>
<td></td>
<td>Appendix E</td>
<td></td>
</tr>
<tr>
<td>13. Statistical data evaluation</td>
<td>✓</td>
<td></td>
<td>Appendices D, E, F, and G</td>
<td></td>
</tr>
<tr>
<td>14. Discussion of whether QA/QC objectives were met</td>
<td>✓</td>
<td></td>
<td>Appendix E</td>
<td></td>
</tr>
<tr>
<td>15. Discussion on deviations from any sampling procedures (if any)</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
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<tbody>
<tr>
<td>16. Data quality assurance summary (field and laboratory QA/QC results)</td>
<td>✓</td>
<td></td>
<td>5/14/13 Response</td>
<td></td>
</tr>
<tr>
<td>17. Maintenance performed during the study period, including activities and frequency</td>
<td>✓</td>
<td></td>
<td>Appendix G</td>
<td></td>
</tr>
<tr>
<td>18. Total amount (estimated dry weight) of sediment and floatables removed and sediment depth prior to each cleaning</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. Media replacement and/or cleaning, if applicable</td>
<td>✓</td>
<td></td>
<td>Appendix G</td>
<td></td>
</tr>
<tr>
<td>20. Evaluation of results</td>
<td>✓</td>
<td></td>
<td>Appendices D, E, F, and G</td>
<td></td>
</tr>
<tr>
<td>21. Executive summary</td>
<td>✓</td>
<td></td>
<td>Main Submittal; Exec Summary</td>
<td></td>
</tr>
</tbody>
</table>

**Additional Comments on Performance Testing Report(s):**

Vendor provided multiple performance testing reports and analyses (Appendices D, E, F, G, H and I).
D. Use of Other Testing Data

Field testing and the resulting data and verifiable technology claims which will and/or have occurred outside the state of Georgia may be accepted for performance claim verification by the TRC with the following conditions:

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<tbody>
<tr>
<td>1. Adherence to the protocol's performance testing reporting requirements under 6.1</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(above)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Hydrological differences between the actual field test location(s) versus a</td>
<td>✓</td>
<td></td>
<td>5/14/13 Response</td>
<td></td>
</tr>
<tr>
<td>representative location within Georgia must be accounted for with proper</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>engineering design using rainfall data analyses and appropriate water quality</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>volume treatment criteria. Only field test data from other regions within North</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>America which have a Type II rainfall pattern will be considered.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Appropriate particle size distribution that is applicable to the soil conditions</td>
<td>✓</td>
<td></td>
<td></td>
<td>Appendix H</td>
</tr>
<tr>
<td>for a representative location within Georgia (for consideration of potential</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>applications where the site conditions are less than 90% impervious cover)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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**Additional Comments on Use of Other Testing Data:**

Vendor provided approval and protocol compliance documentation from several other states including Virginia, Maryland, Washington and Texas (Appendices J1, J2, J3 and J4).
## E. Storm Event Criteria

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>1. Minimum of 15 storm or discrete flow rate sampling events per site</td>
<td>✓</td>
<td></td>
<td>Appendix E</td>
<td>Precipitation represented by monitored storms is 29% of the annual rainfall during the study period.</td>
</tr>
<tr>
<td>2. Storms should represent the entire annual hydrologic range of storm events and constiute at least 20% of the annual rainfall</td>
<td>✓</td>
<td></td>
<td>Appendix E</td>
<td>Study conducted over 13 months from October 2004-November 2005.</td>
</tr>
<tr>
<td>3. Recommended that sampling events be evenly distributed over the testing period to capture seasonal influences on storm conditions and system performance</td>
<td>✓</td>
<td></td>
<td>Appendix E</td>
<td>Study conducted over 13 months from October 2004-November 2005.</td>
</tr>
<tr>
<td>4. Storm events meet criteria outline in Section 7.2</td>
<td>✓</td>
<td></td>
<td>5/14/13 Response</td>
<td></td>
</tr>
</tbody>
</table>

**Additional Comments on Storm Event Criteria:**

See 5/14/13 Response for additional information.