

# Attachment K

## BIOCHAR ENHANCED FILTER MEDIA MATERIAL (BEFM)

### PART 1 GENERAL

#### 1.1 DESCRIPTION

THE BIOCHAR ENHANCED FILTER MEDIA (BEFM) SHALL CONTAIN, BY VOLUME:

- 80-85% BIORETENTION MEDIA MIX (PER ARLINGTON COUNTY DESIGN SPECIFICATIONS)
- 15-20% BIOCHAR AS PER MATERIAL SPECIFICATION BELOW

BEFM CONSISTS OF A MODIFIED FILTER MEDIA USING "BIOCHAR." BIOCHAR CONSISTS OF A SOLID CARBON-BASED MATERIAL OBTAINED FROM THERMO-CHEMICAL CONVERSION OF BIOMASS IN AN OXYGEN-LIMITED ENVIRONMENT. THE BIOMASS FEED-STOCKS SHOULD BE LIMITED TO CLEAN CELLULOSIC MATERIAL FROM THE 1) WOODY BY-PRODUCTS FROM FORESTRY OPERATIONS (INCLUDING CUT RESIDUES LEFT AFTER A TIMBER HARVEST, CUT TREES THAT ARE NOT MARKETABLE AS LUMBER), 2) CHIPPED TREES AND BRUSH FROM BIOMASS REDUCTION OPERATIONS (I.E. COMMERCIAL TREE TRIMMING), 3) CLEAN CLASS A CHIPPED WOOD FROM PERMITTED C&D FACILITIES AND 4) AGRICULTURAL RESIDUES SUCH AS NUT SHELLS, ORCHARD PRUNING, SEEDS, HULLS, AND PITS. THE BIOMASS FEEDSTOCKS SHOULD NOT INCLUDE ANY POST-CONSUMER OR POST-INDUSTRIAL SOURCED WOODY BIOMASS CONTAMINATED WITH PAINTS OR SEALERS, METAL, PLASTIC, OR OTHER DELETERIOUS MATERIALS.

BIOCHAR MUST HAVE AN INTERNATIONAL BIOCHAR INITIATIVE (IBI) CERTIFICATION AND/OR HAVE BEEN TESTED USING THE IBI BIOCHAR STANDARDS (23 NOVEMBER 2015) FOR TESTING CATEGORY A.

#### 1.2 SUBMITTALS

THE BEFM MUST BE PROVIDED BY A SUPPLIER IDENTIFIED ON THE LIST OF APPROVED FILTER MEDIA VENDORS FOR VDEQ BIORETENTION SOIL MEDIA (VERSION 2.0) IN ARLINGTON COUNTY. A SUBMITTAL IDENTIFYING THE SELECTED FILTER MEDIA VENDOR AND DESIGNATED VENDOR CONTACT MUST BE PROVIDED WITHIN 10 BUSINESS DAYS OF THE NOTICE TO PROCEED.

RESULTS OF PHYSICAL AND CHEMICAL TESTING CONFIRMING ADHERENCE TO THE MATERIAL SPECIFICATIONS FOR BIOCHAR IN PART 2 BELOW AND IBI CERTIFICATION OR CERTIFICATION OF IBI BIOCHAR CATEGORY A CONFORMANCE TESTING SHALL BE PROVIDED TO AND APPROVED BY THE COUNTY PRIOR TO MIXING THE BIOCHAR WITH THE BIORETENTION FILTER MEDIA. .

THE SUPPLIER MUST CERTIFY THAT THE BIOCHAR PARTICLE SIZE IN THE MIX HAS NOT BEEN IMPACTED OR REDUCED IN SIZE BELOW THE SPECIFICATION LIMITS.

### PART 2 MATERIALS:

BIOCHAR SHALL CONFORM TO THE FOLLOWING REQUIREMENTS:

PARTICLE SIZE DISTRIBUTION (ASTM D2862) WOOD\_BASED CARBON MATERIAL LESS THAN 6 MM IN SIZE WITH A MINIMUM OF 80% LESS THAN 4 MM, WITH 30 - 50% 2 TO 4 MM, 20-40% 1 TO 2 MM, AND NO MORE THAN 15% OF THE MATERIAL LESS THAN 1 MM IN SIZE. THE BIOCHAR SHALL HAVE NO MORE THAN 5% (<0.5mm) DUST AND SHALL MEET THE FOLLOWING CRITERIA AS REPORTED BY THE LABORATORY TEST:

1. BULK DENSITY OF 6-12 POUNDS/CUBIC FOOT (DRY WT.)
2. MOISTURE LESS THAN 30%
3. TOTAL ASH LESS THAN 8%
4. FIXED CARBON EQUAL TO OR GREATER THAN 80%
5. HYDROGEN/CARBON (H:C) MOLAR RATIO OF 0.7 (MAX.)
6. SURFACE AREA CORRELATION EQUIVALENT TEST SHOWING GREATER THAN 325 M<sup>2</sup>/G DRY.
7. CARBON PH LESS THAN 11 UNITS
8. LIMING EFFECT LESS THAN 15%
9. CHEMICAL ANALYSIS SHALL BE UNDERTAKEN FOR NITRATE NITROGEN, AMMONIUM NITROGEN, PHOSPHOROUS, ARSENIC, CADMIUM, CHROMIUM, COBALT, COPPER, LEAD, MERCURY, MOLYBDENUM, NICKEL, SELENIUM, ZINC, BORON, CHLORINE, AND SODIUM. ALL TESTS SHALL BE CONDUCTED USING EPA TEST 6020 METHOD AND SHALL BE UNDER THE LIMITS ACCORDING TO THE ABOVE REFERENCE GUIDELINE REQUIREMENTS.
10. VOLATILE MATTER LESS THAN 20% (MAX.) PROXIMATE ANALYSIS (ASTM D1762)
11. POLYCYCLIC AROMATIC HYDROCARBONS (PAHS) OF 300 PPM (MAX.). METHOD EPA TEST 8270 (2007) USING SOXHLET EXTRACTION (EPA 3549) AND 100% TOLUENE AS THE EXTRACTING SOLVENT.
12. DIOXINS/FURANS WHO-TEQ OF 17 PPB MAX. METHOD EPA 8290 (2007)

A TOXIC EQUIVALENCY (TEQ) IS CALCULATED BY MULTIPLYING THE CONCENTRATION OF EACH POLYCHLORINATED DIBENZO PARA DIOXIN (PCDD) AND POLYCHLORINATED DIBENZOFURAN (PCDF) BY ITS WORLD HEALTH ORGANIZATION (WHO) TOXIC EQUIVALENCY FACTOR (TEF) AND SUMMING THE PRODUCTS.

### PART 3 EXECUTION

THE BEFM SUPPLIER WILL IDENTIFY AND PROVIDE A CLEAN, DRY LOCATION FREE OF CONTAMINANTS FOR THE STORING OF THE BIOCHAR.

THE BEFM SUPPLIER WILL MIX THE BIOCHAR INTO THE ARLINGTON COUNTY APPROVED BIORETENTION SOIL MEDIA IN THE PROPORTIONS, BY VOLUME, IDENTIFIED IN THIS SPECIFICATION. BIOCHAR SHALL BE

THE LAST AMENDMENT TO BE MIXED INTO THE MEDIA TO AVOID SIGNIFICANT DAMAGE TO THE BIOCHAR.

FOLLOWING MIXING, THE BEFM SUPPLIER AND PROJECT CONTRACTOR MUST TAKE ALL REASONABLE PRECAUTIONS DURING STORAGE AND DELIVERY TO ENSURE THAT THE BEHM IS NOT CONTAMINATED BY OTHER MATERIALS PRIOR TO INSTALLATION AT THE PROJECT SITE.

THE CONTRACTOR SHALL TAKE CARE NOT TO OVER HANDLE THE MATERIAL AND AVOID RUNNING EQUIPMENT OVER THE MIXTURE. MATERIAL IS TO BE LEVELED VIA HAND TOOLS OR WITH A SMOOTH-EDGED BUCKET FROM THE EDGE OF THE FACILITY AND WHAT CANNOT BE REACHED SHOULD BE DONE BY HAND.

#### PART 4 MEASUREMENT AND PAYMENT

1. PAYMENT FOR BEFM SHALL BE PER CUBIC YARD OF MIXED MEDIA INSTALLED IN ACCORDANCE WITH THE APPROVED PLANS AND SPECIFICATIONS.
2. PAYMENT INCLUDES ALL LABOR, MATERIALS AND EQUIPMENT NECESSARY TO OBTAIN, MIX, TRANSPORT AND INSTALL THE BEFM.