

<b>Bid Opportunity 839-2012</b>	<b>BRRMF L&amp;YW AND PILOT BIOSOLIDS COMPOSTING</b>	<b>Page 1 of 3</b>
<b>REVISION 0</b>	<b>SECTION 02201 BIOFILTER MEDIA</b>	

**PART 1. GENERAL**

1.01 GENERAL

- A. This specification includes requirements for selection and placement of new biofilter media for organic bark/wood chip based biofilters designed for odor and VOC control.
- B. Biofilter media for organic bark/wood chip biofilters can generally be supplied from locally available materials such as shredded wood, shredded brush, chipped wood, or some combination of similar materials to meet the requirements herein.
- C. Contractor is to supply, deliver, blend and install new media into the biofilter cells.
- D. City/Contract Administrator may inspect the media mixing process and stockpiled media at the Contractor's Site before shipping to verify quality of new material.

1.02 SUBMITTALS

- A. Media Samples:
  - 1. Provide 12 Litre sample of each media component for Contract Administrator approval prior to mixing or use. Sample to be provided at least 10 days prior to date when contractor requires approval.
- B. Quality Control Submittals:
  - 1. Moisture content, sieve, porosity and bulk density analyses for each media component to be used.
  - 2. Laboratory test data verifying constituents identified herein.
  - 3. Media placement plan – a written description of means and methods of mixing (if required) and loading media into biofilter cells.

**PART 2. PRODUCTS**

2.01 BIOFILTER MEDIA

- A. New Media
  - 1. Media shall be made up of properly sized chipped/shredded/screened wood chips. Wood shall be non-composted hardwood in origin. Soft wood (pine, fir, etc.), cedar bark, or composted wood materials are not acceptable. The following media characteristic requirements are:
    - a. Particle size gradation on a weight basis of placed biofilter media shall be as follows:

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<b>Particle Size</b>	<b>Percent Acceptable</b>
Less than 3/8"	0 - 10 percent
3/8" - 1.0"	20 - 50 percent
1.0" - 3.0"	30 - 50 percent
Greater than 3.0"	0 - 10 percent

- b. No visible green vegetation, leaves, etc.
  - c. Minimum organic matter content of 90 percent.
  - d. Maximum total TKN nitrogen of 0.35 percent.
  - e. Sum of nitrate and ammonium concentration < 100 ppm.
  - f. Minimum porosity of 60 percent.
  - g. Media shall be free of rock, gravel, soil, nails, paint, wood preservatives, trash or other contaminants.
  - h. Moisture of placed media between 45 and 55 percent.
2. Mixtures/Blend Requirements
- a. If a blend of wood based media components are proposed to be used, samples and analyses for each component must be submitted to the Contract Administrator for review and approval PRIOR to mixing/blending.
  - b. The proposed percentage of each media type to be used in a blend shall be submitted to the Contract Administrator for review and approval prior to mixing/blending of media.

### **PART 3. EXECUTION**

#### **3.01 MEDIA MIXING, DELIVERY, AND INSTALLATION**

##### **A. Mixing**

- 1. Notify Contract Administrator at least 5 days before mixing new media to allow observation of mixing process. The Contract Administrator shall be present to observe mixing and placement of biofilter media.
- 2. Before placing media into the biofilter cell, mix/ media on a paved surface and prevent rocks, vegetation, soil, trash, and any other foreign material from being incorporated into the mix.
- 3. Mix entire volume of new media as one lot to have one homogeneous media for the biofilter cell.
- 4. The media or media components shall be thoroughly blended and clean water shall be added to thoroughly wet the media/mixture. The media shall be turned and moved by front-end loader a minimum of three times to provide complete mixing. Complete mixing is accomplished when no visible variations in the media materials are observed.

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5. Water is to be added to the media during mixing by high volume system to increase the moisture content to approximately 45-55 percent. The media shall be tested for moisture content to verify proper moisture content. No free water should drain from piled media that has been properly moistened.

**B. Delivery**

1. Load and deliver the media to the project Site and at the specific location as shown on the Drawings or directly into biofilter from truck. Do not stockpile more than what will fit in the available stockpile footprint onsite.
2. If stockpiling media, prevent contamination of media until it is installed in the biofilter. Storage of the media for longer than 2 weeks after mixing/blending prior to placement in biofilter cells is not permitted.

**C. Installation**

1. Place media in biofilter as loosely as possible and in a consistent manner to ensure minimal compaction.
2. The finished surface of media must be raked level and smooth to within +/- 50 mm of the elevation for the top of the biofilter prescribed in the drawings.
3. No equipment or load shoring is permitted on top of placed media at any time and foot traffic should be kept to a minimum.
4. Media shall be installed such that the moisture content and finished media elevation is maintained until the biofilter system is started up.
5. After six weeks, media shrinkage may occur. If this happens and the media depth decreases by 100 mm or more, Contractor shall add additional media to within +/- 50 mm of the elevation prescribed in the drawings and level uniformly.

**END OF SECTION**

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<b>REVISION 0</b>	<b>SECTION 02240 DEWATERING</b>	

**PART 1. GENERAL**

1.01 SUMMARY

A. Section Includes:

1. Control of groundwater and surface run-off.

1.02 SUBMITTALS

A. Informational Submittals:

1. Submit Water Control Plan.

**PART 2. PRODUCTS (NOT USED)**

**PART 3. EXECUTION**

3.01 GENERAL

- A. Remove and control water during periods when necessary to accomplish Work.
- B. Maintain existing runoff channels and ditches during construction.

3.02 SURFACE WATER CONTROL

- A. See Section 01500, Construction Facilities and Temporary Controls, Article Temporary Controls.
- B. Remove surface runoff controls when no longer needed.

3.03 DEWATERING SYSTEMS

- A. Take corrective measures as required to maintain groundwater at a sufficiently low level to meet performance requirements.
- B. Flotation of Structures
  1. Maintain groundwater at a sufficiently low level to prevent damage or displacement of structures by groundwater pressures.
  2. Protect completed structures or part of completed structures which would suffer displacement or other damage as a result of dewatering equipment failure by providing a positive means by which the structures may be flooded with water to neutralize exterior hydraulic pressures.
- C. Design and Operate Dewatering Systems:
  1. To prevent loss of ground as water is removed.
  2. To avoid inducing settlement or damage to existing facilities, completed Work, or adjacent property.
  3. To relieve artesian pressures and resultant uplift of excavation bottom.

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3.04 DISPOSAL OF WATER

- A. Obtain discharge permit for water disposal from authorities having jurisdiction.
- B. Treat water collected by dewatering operations, as required by regulatory agencies, prior to discharge.
- C. Discharge water as required by discharge permit and in manner that will not cause erosion or flooding, or otherwise damage existing facilities, completed Work, or adjacent property.
- D. Remove solids from treatment facilities and perform other maintenance of treatment facilities as necessary to maintain their efficiency.

3.05 PROTECTION OF PROPERTY

- A. Make assessment of potential for dewatering induced settlement. Provide and operate devices or systems, including but not limited to reinjection wells, infiltration trenches and cutoff walls, necessary to prevent damage to existing facilities, completed Work, and adjacent property.
- B. Securely support existing facilities, completed Work, and adjacent property vulnerable to settlement due to dewatering operations. Support shall include, but not be limited to, bracing, underpinning, or compaction grouting.

**END OF SECTION**

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<b>REVISION 0</b>	<b>SECTION 02260 COMPACTED CLAY LINER</b>	

**PART 1. GENERAL**

1.01 WORK INCLUDES

- A. Obtain, place, compact, and grade low permeable soil (clay) from an on-Site source approved by the Contract Administrator to a minimum 500 mm thick Compacted Clay Liner (CCL) over the base subgrade of Biosolids Composting Pad, to the lines and grades shown on the Contract Drawings or as determined in the field by the Contract Administrator and provide a qualified assistant(s) to assist Contract Administrator in the taking of field measurements of this item.
- B. Obtain, place, compact, and grade low permeable soil (clay) from an on-Site source approved by the Contract Administrator to a minimum 1000 mm thick CCL over the base and sidewall subgrade of the Biosolids Pond, to the lines and grades shown on the Contract Drawings or as determined in the field by the Contract Administrator and provide a qualified assistant(s) to assist Contract Administrator in the taking of field measurements of this item.

1.02 RELATED SECTIONS

- A. Section 01400 – Quality Control
- B. CW 2030 – Excavation, Bedding and Backfilling
- C. CW 3110 – Subgrade, Sub-base and Base Course Construction
- D. CW 3130 – Supply and Installation of Geotextile Fabrics

1.03 APPROVAL OF CLAY MATERIAL SUPPLY

- A. Low permeable soil having a permeability of  $10^{-7}$  cm/sec or less for construction of the CCL is to be obtained from an on-Site source approved by the Contract Administrator.

1.04 ENVIRONMENTAL REQUIREMENTS

- A. Suspend operations whenever climatic conditions, as determined by Contract Administrator, are unsatisfactory for placing clay material to the requirements of this Section.
- B. After occurrence of heavy rains, do not operate equipment on previously placed material or on approved graded areas until the material has dried sufficiently to prevent the occurrence of excessive rutting.
- C. Do not place clay material in a frozen state or against frozen ground or previously placed material.
- D. Do not place clay material on snow, ice, water or other objectionable material or on improperly graded areas or previously placed material.
- E. Remove, fill and compact softened, eroded or otherwise objectionable or damaged areas

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of the slopes or previously placed material at no additional cost to City.

1.05 PROTECTION

- A. Immediately prior to temporary suspension of clay placement operations, fine grade surfaces of clay material under construction to a uniform slope so as to leave the area free of ruts, depressions, or areas that would pond or collect water. Provide suitable equipment on Site at all times for this purpose.

1.06 SEQUENCING AND SCHEDULING

- A. Perform construction of CCL subsequent to excavation, filling, grading and proof rolling of the subgrade and sidewall subgrade, in such a manner as to minimize the extent of open excavation and fill areas. The requirements for management of surface water under this Contract and other construction activities may dictate which areas may be lined at any one time.
- B. Perform construction of the CCL to the lines and grades shown on the Drawings.
- C. Constructed CCL is to be covered with geotextile and overlying granular base as soon as possible after the completion of the Quality Control Testing or as directed by the Contract Administrator.
- D. Do not allow or cause any of the Work performed or installed to be covered up or enclosed prior to the required inspections, tests or approvals.

**PART 2. MATERIAL**

2.01 UNSUITABLE MATERIALS

- A. Clay liner material shall be free of unsuitable materials and consists of suitable mixtures of clay, silt, sand and gravel provided such materials are sufficiently impermeable and stable when compacted as specified. Unsuitable materials means materials, which are not approved for use as, determined by the Contract Administrator and include the following:
  1. Material containing loam, roots or organic matter.
  2. Frozen material or material containing snow or ice.
  3. Clays which are classified as inorganic clays of high plasticity in accordance with ASTM D2487.
  4. Soft and/or organic clays and silts of low strength.
  5. Frost susceptible silts or clays.
  6. Excessively Swelling clays.
  7. Rock and lumps of material with dimensions greater than 100 mm or the specified layer thickness before compaction, whichever is least.

2.02 MATERIAL SPECIFICATIONS

- A. Clay liner material shall have a permeability of  $10^{-7}$  cm/sec or less and a minimum of

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70 percent fines (silt and clay) by weight passing the No. 200 sieve (0.074 mm) of which a minimum of 20 percent is clay (0.002 mm).

- B. The grain size distribution curve provided in Supplement 1 – Typical Acceptable Gradation for Compacted Clay Liner (CCL) Material represents the minimum acceptable gradation for the clay material to be supplied. Gradation curves above the line are acceptable.

### **PART 3. EXECUTION**

#### **3.01 PREPARATION**

- A. Grade, compact and proof-roll top of subgrade to a relatively smooth uniform surface following excavation within the limits of the Works and prior to placing the CCL. Ensure a minimum of two passes are conducted over the subgrade with suitable compaction equipment approved by the Contract Administrator to achieve a minimum 95% Standard Proctor maximum dry density in the subgrade.

#### **3.02 INSTALLATION – BONDING**

- A. Place the clay material in 150 mm lifts in areas under concrete foundations and in 200 mm lifts in all other pad areas to obtain an impervious bond between layers of clay material and the graded subgrade surface or previously placed material.
- B. During the Work, whenever the surface of the clay material already in place becomes too dry or too smooth to bond properly with the succeeding layer, as determined by the Contract Administrator, and whenever clay material placement resumes after suspension, disc or scarify the clay material surface in place to a depth between 100 mm and 150 mm and compact at the specified moisture content.
- C. Obtain approval from the Contract Administrator of prepared surfaces prior to resumption of clay material placement after suspension and prior to covering surfaces with permanent material.

#### **3.03 INSTALLATION – PLACING**

- A. Place the CCL in continuous uniform lifts:
  1. Not exceeding 150 mm in thickness in areas under the concrete foundations and to a minimum thickness of 500 mm over the surface as shown on the Contract Drawings.
  2. Not exceeding 200 mm in thickness in all other pad areas to a minimum thickness of 500 mm over the surface as shown on the Contract Drawings.
- B. Connect (transition) the new CCL along the entire perimeter of the existing ground surface or fill area as shown on the Contract Drawings.
- C. Ensure all clay material is free from lenses, pockets, streaks and layers of pervious material.



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D. Grade the final clay cover layer material in a top of slope to bottom of slope direction.

#### 3.04 INSTALLATION - MOISTURE CONTENT

- A. Maintain the moisture content throughout each layer of clay material as uniformly as practical and control the moisture content to within zero and plus 4 of optimum moisture content as determined by ASTM D698.
- B. In case of clay material that is too dry or too wet, including un-compacted clay material, adjust the moisture content by methods approved by Contract Administrator.
- C. The clay material is to be watered at the completion and/or start of each working day and on hot sunny days, as directed by the Contract Administrator. Additionally, the clay material is to be watered as required to maintain the specified moisture content and to prevent shrinkage cracks greater than 50 mm in depth.

#### 3.05 INSTALLATION – COMPACTION

- A. Compact each layer to a density of:
  - 1. At least 98% of Standard Proctor maximum dry density as determined by ASTM D698 under the concrete foundations.
  - 2. At least 95% of Standard Proctor maximum dry density as determined by ASTM D698 in all other pad areas.
- B. Obtain approval by Contract Administrator for the type, size and efficiency of compaction equipment. As a minimum, equipment shall be a wedge-shape sheep's foot roller with depth of wedge equal to one-half the un-compacted lift thickness.

#### 3.06 INSTALLATION - FINISH TOLERANCE

- A. Construct the CCL of the Leaf & Yard Waste Composting Facility and the Pilot Biosolids Composting Facility such that the finished depth is not less than 500 mm in thickness with the top of liner elevation as shown on the drawings (tolerance of -0/+50 mm).
- B. Construct the CCL of the Contact Water Detention Pond(s) such that the finished depth is not less than 1,000 mm in thickness with the top of liner elevation as shown on the drawings (tolerance of -0/+50 mm).
- C. Correct surface irregularities by loosening and adding or removing material until the surface is within the specified tolerance. Payment will not be made for material placed outside the tolerance limits unless directed by the Contract Administrator.

#### 3.07 OVERLYING PROTECTIVE LAYER

- A. The overlying cover material shall be as specified in other Sections and placed in a manner appropriate to the particular material. The finished (completed) depth of the overlying cover material shall not be less than 450 mm in thickness. Ensure protection of the underlying CCL at all times during placement of the cover material.

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1. Overlying cover material shall be placed with low ground pressure equipment, unless otherwise approved by the Contract Administrator. Avoid damaging the CCL by making sharp turns or pivots with equipment as well as sudden starts or stops.
2. Overlying cover material may be placed on the CCL by pushing with a track dozer or by carefully placing it with a loader or a back-hoe. The use of scrapers or pans directly over the CCL is strictly prohibited.
3. When covering the CCL on sloped areas steeper than 4 Horizontal: 1 Vertical, the overlying cover material should be pushed upslope to minimize tension on the CCL.
4. To prevent damage to the CCL, a minimum thickness of 300 mm of overlying cover material shall be maintained between the equipment tires/tracks and the CCL at all times. In frequently travelled areas or haul roads, a minimum thickness of 600 mm is required except when final grading.
5. Compaction of the overlying cover material shall be as specified in other Sections. Equipment used for compaction will be subject to approval by the Contract Administrator. Maintain optimum moisture content of the protective layer to attain required compaction density.

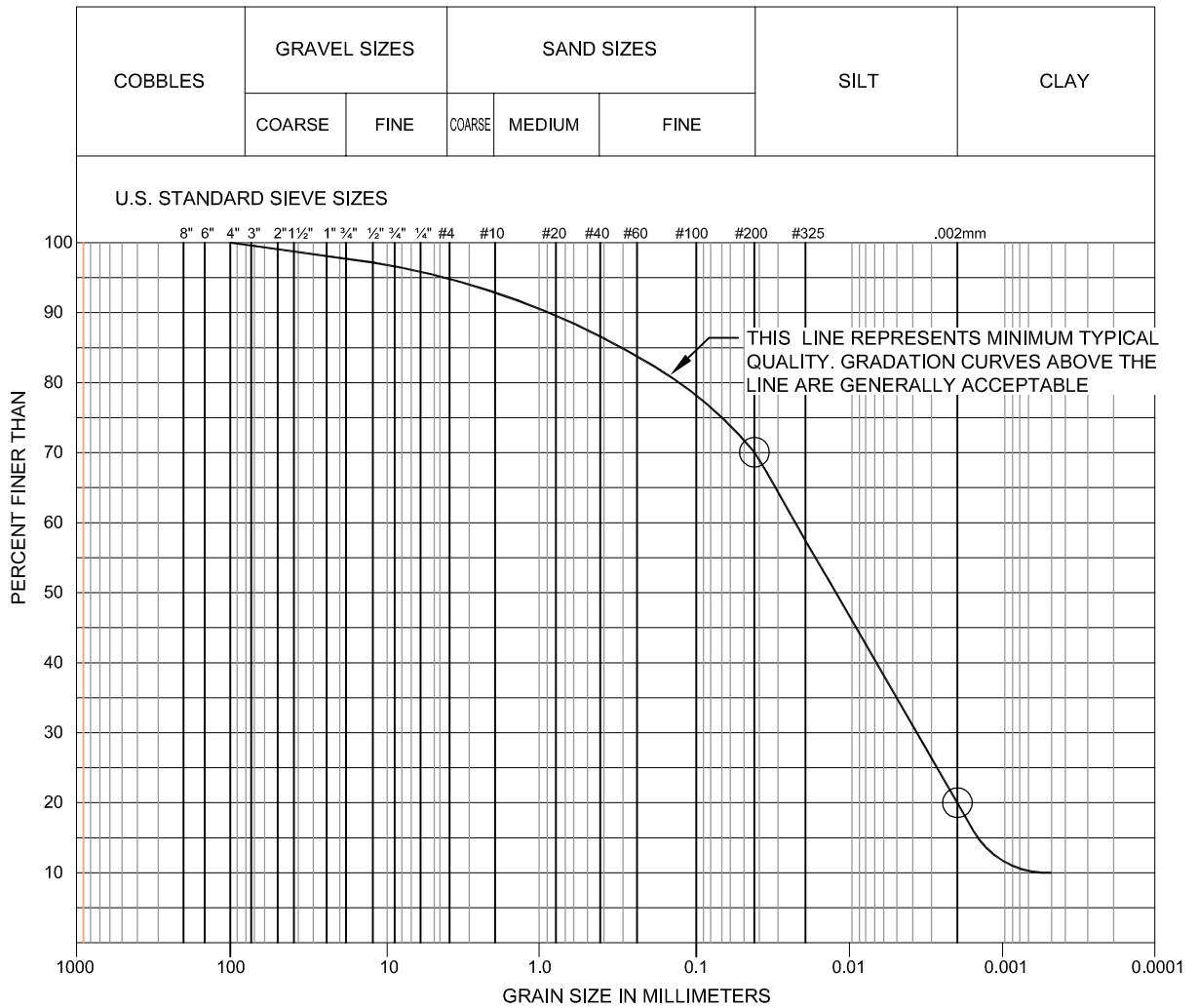
### 3.08 INSTALLATION - QUALITY CONTROL BY CONTRACT ADMINISTRATOR

- A. Contract Administrator will from time to time select samples of un-compacted clay material intended for the Works and samples of compacted clay liner in the Works.
- B. Contract Administrator will perform tests in the field and in the laboratory on samples of un-compacted and compacted clay to determine if the material meets the Specifications and except as otherwise specified, tests will be at the expense of the City. Copies of test reports will be supplied on request. Furnish labour, equipment and material to assist the Contract Administrator in accessing compacted fill in the Works.
- C. Rework and compact areas which do not meet the specified moisture content and/or compaction density as directed by the Contract Administrator at no additional cost to the Contract.

### 3.01 SUPPLEMENTS

- A. The supplements listed below, following “End of Section”, are part of this Specification.
  1. Typical Acceptable Gradation for Compacted Clay Liner (CCL) Material.

**END OF SECTION**



HAZEN PERMEABILITY ESTIMATE $(D_{10})^2 = \underline{\hspace{2cm}}$ cm/sec NOTE: $D_{10}$ = GRAIN SIZE IN mm AT 10% FINER THAN	SOIL CLASSIFICATION DESCRIPTIVE MODIFIERS		SUMMARY
	AND	36-50%	GRAVEL _____%
REMARKS: <u>CLAY LINER MATERIAL SHALL HAVE A MINIMUM OF 70 PERCENT FINES (SILT AND CLAY) BY WEIGHT PASSING THE No. 200 SIEVE (0.074mm) OF WHICH A MINIMUM OF 20 PERCENT IS CLAY (0.002mm)</u>	SOME	20-35%	SAND _____%
	LITTLE	11-20%	SILT _____%
	TRACE	1-10%	CLAY _____%

Typical Acceptable Gradation for  
 Compacted Clay Liner (CCL) Material  
 Leaf and Yard Waste and Pilot Biosolids Composting  
 Brady Road Resource Management Facility