



August 29, 2013

Audrey O'Brien
Oregon Department of Environmental Quality
Solid Waste Program
2020 SW Fourth Ste. 400
Portland, Oregon 97201

Dear Mrs. O'Brien,

Clean Water Services (District) and other storm and sanitary sewer agencies across the nation are transitioning from a business model focused on handling, treating, and disposing of waste (treated wastewater, bio-solids, street sweeper fines and catch basin debris) to a business model focused on resource recovery.

In light of this "waste to resource recovery" paradigm shift, the District is pursuing beneficial use options for the material (street sweeper fines and catch basin debris) generated from operations and maintenance BMPs associated with the District's Municipal Separate Storm Sewer (MS4) permit.

The District is requesting your review and approval of the enclosed Beneficial Use Determination (BUD) application related to screened street sweeper fines collected throughout the District's service area.

The District is requesting the BUD to use screened street sweeper debris in a variety of applications, including use as non-residential construction fill, utility trench fill, and as a soil amendment in certain situations. Attachment B includes additional details on the proposed uses. Chemical, physical, and biological characterization of the material is included in Attachment C, D and E respectively.

I appreciate DEQ's efforts to work with us on this application and as we take the next steps in the evolution of our storm water program. I am looking forward to discussing our application with you and your staff. Please contact me at 503.547.8123 if you have any questions.

Sincerely,

A handwritten signature in blue ink that reads "Ryan J. Sandhu".

Ryan J. Sandhu, PE
Field Operations Manager

Attachments:

- A. DEQ Solid Waste Beneficial Use Determination Application
- B. Narrative response to Application Questions
- C. Street Sweeping Fines Chemical Characterization Data (submitted electronically)
- D. Street Sweeping Fines Physical Characterization Data
- E. Street Sweeping Fines Biological Analysis and Memo



State of Oregon
Department of
Environmental
Quality

Application for a Solid Waste Beneficial Use Determination

DEQ USE ONLY – BUSINESS OFFICE

Date Received: _____

Amount Received: _____

Check No.: _____

Deposit No.: _____

Forward confirmation of fee payment for:
Eastern Region to DEQ, The Dalles
Northwestern Region to DEQ-NWR, Portland
Western Region to DEQ, Salem .

A. REFERENCE INFORMATION (Please type or print clearly.)

Clean Water Services (Attn: Ryan Sandhu)			
Legal name of applicant		Business name of applicant if different	
2550 SW Hillsboro Highway		Hillsboro	Oregon 97123
Mailing address		City	State Zip
503-547-8123	503-367-4788	sandhur@cleanwaterservices.org	503-547-8101
Phone	Mobile	E-mail	Fax

Clean Water Services			
Generator of solid waste (may be same as applicant)			
2550 SW Hillsboro Highway		Hillsboro	Oregon 97123
Mailing address		City	State Zip
503-547-8123	503-367-4788	sandhur@cleanwaterservices.org	503-547-8101
Phone	Mobile	E-mail	Fax

B. TYPE OF BENEFICIAL USE DETERMINATION REQUESTED Beneficial Use Determination applications are categorized based on the type of information and potential amount of work required by DEQ staff to review application materials and render a decision. A tiered review and fee system has been established in rule. The tiers are:

- Tier 1 For a beneficial use of a solid waste that does not contain hazardous substances significantly exceeding the concentration in a comparable raw material or commercial product and that will be used in a manufactured product;
- Tier 2 For a beneficial use of a solid waste that contains hazardous substances significantly exceeding the concentration in a comparable raw material or commercial product, or involves application on the land;
- Tier 3 For a beneficial use of a solid waste that requires research, such as a literature review or risk assessment, or for a demonstration project to demonstrate compliance with this rule.

I am applying for a Tier 1 Tier 2 Tier 3 determination.

C. DOES THIS PROPOSED BENEFICIAL USE INVOLVE LAND APPLICATION OF ANY MATERIAL?

Yes No

D. SIGNATURE I hereby certify by my signature below that the information contained in this application, and the documents I have attached, are true and correct to the best of my knowledge and belief.

Ryan J Sandhu RYAN J SANDHU PIAD OPERATIONS MGR 8/29/2013
Signature of legally authorized representative Print name Title Date

Attachment (A)

E. REQUIRED ATTACHMENTS TO THIS APPLICATION *(For an application to be complete, it must provide the required information for each listed item of the tier which is being applied for.)*

Tier 1

- A description of the material, manner of generation, and estimated quantity to be used each year;
- A description of the proposed use;
- A comparison of the chemical and physical characteristics of the material proposed for use with the material it will replace;
- A demonstration of compliance with the performance criteria in OAR 340-093-0280 based on knowledge of the process that generated the material, properties of the finished product, or testing; and
- Any other information that DEQ may require to evaluate the proposal.

Tier 2

- The information required for a Tier 1 application;
- Sampling and analysis that provides chemical, physical, and biological characterization of the material and that identifies potential contaminants in the material or the end product, as applicable;
- A risk screening comparing the concentration of hazardous substances in the material to existing, DEQ approved, risk-based screening level values, and demonstrating compliance with acceptable risk levels;
- Location or type of land use where the material will be applied, consistent with the risk scenarios used to evaluate risk;
- Contact information of property owner(s) if this is a site-specific land application proposal, including name, address, phone number, e-mail, site address and site coordinates (latitude and longitude); and
- A description of how the material will be managed to minimize potential adverse impacts to public health, safety, welfare, or the environment.

Tier 3

- The information required for a Tier 1 & 2 application;
- A discussion of the justification for the proposal;
- An estimate of the expected length of time that would be required to complete the project, if it is a demonstration; and
- If it is a demonstration project, the methods proposed to ensure safe and proper management of the material.

F. PERFORMANCE CRITERIA *(For all tiers - An application for a beneficial use determination must demonstrate satisfactory compliance with the following performance criteria.)*

The use is productive, including:

- ◆ There is an identified or reasonably likely use for the material that is not speculative;
- ◆ The use is a valuable part of a manufacturing process, an effective substitute for a valuable raw material or commercial product, or otherwise authorized by DEQ, and does not constitute disposal; and
- ◆ The use is in accordance with applicable engineering standards, commercial standards, and agricultural or horticultural practices.

The use will not create an adverse impact to public health, safety, welfare, or the environment, including:

- ◆ The material is not a hazardous waste under ORS 466.005;
- ◆ Until the time the material is used in accordance with a beneficial use determination, the material will be managed, including any storage, transportation, or processing, to prevent releases to the environment or nuisance conditions;
- ◆ Hazardous substances in the material do not significantly exceed the concentration in a comparable raw material or commercial product, or do not exceed naturally occurring background concentrations, or do not exceed acceptable risk levels, including evaluation of persistence and potential bioaccumulation, when the material is managed according to a beneficial use determination.

The use will not result in the increase of a hazardous substance in a sensitive environment.

The use will not create objectionable odors, dust, unsightliness, fire, or other nuisance conditions.

The use will comply with all applicable federal, state, and local regulations.

Attachment (A)

G. FEES (Must accompany the application for it to be considered complete)

<input type="checkbox"/>	Tier 1 beneficial use determination	\$1,000
<input checked="" type="checkbox"/>	Tier 2 beneficial use determination	\$2,000
<input type="checkbox"/>	Tier 3 beneficial use determination	\$5,000

Make checks out to: **Oregon DEQ**

Total fees included: \$2,000

H. APPLICATION PROCEDURE

Step 1

Contact a DEQ staff person for assistance with the preparation of the application. DEQ staff will help with: 1) Determination of the eligibility for a beneficial use determination of a particular waste or process; and, 2) If eligible, establish the tier of beneficial use determination review required and associated fee to submit with the application.

Step 2

Mail the original signed application, all attachments, including the fee payment plus one extra copy to the appropriate regional office (see listing below.) Note that DEQ review work will not begin until a complete application packet is received. Incomplete applications may be returned. DEQ recommends the applicant keep a full copy of all application materials to guard against possible loss in transit.

Step 3

DEQ will contact the applicant, acknowledging receipt of the application, and will identify the staff person assigned to carryout the review. This staff person will contact the applicant if any additional information is needed.

Region	Counties Served	Address & Phone
Eastern Region	Baker, Crook, Deschutes, Gilliam, Grant, Harney, Hood River, Jefferson, Klamath, Lake, Malheur, Morrow, Sherman, Umatilla, Union, Wallowa, Wasco, and Wheeler	Eastern Region Department of Environmental Quality 400 E Scenic Drive, Ste 2.307 The Dalles, OR 97058 (541) 298-7255 ext. 221
Northwest Region	Clatsop, Clackamas, Columbia, Multnomah, Tillamook, and Washington	Northwest Region DEQ Solid Waste Programs 2020 SW Fourth Ave. Ste 400 Portland, OR 97201 (503) 229-5353
Western Region	Benton, Coos, Curry, Douglas, Jackson, Josephine, Lane, Lincoln, Linn, Marion, Polk, and Yamhill	Western Region DEQ Solid Waste Programs 750 Front St. NE Suite 120 Salem, OR 97301 (503) 378-5047

Attachment (A)

**REQUIRED ATTACHMENTS TO
APPLICATION FOR BENEFICIAL USE DETERMINATION**

Tier 1 information

1. A description of the material, manner of generation, and estimated quantity to be used each year.

The material proposed for beneficial use is collected from municipal street sweeping operations. The product use has a rich, dark, sandy soil texture and appearance.

The raw material is generated through sweeping urban streets in Clean Water Services' (District) service area. Street sweeping is carried out under the District's Storm Water Management Plan (SWMP) to reduce the discharge of pollutants from municipal streets. The District and the cities that are co-implementers of the SWMP comply with performance standards requiring them to sweep all curbed streets within their respective areas of responsibility at least twelve times per year. The material is collected using regenerative air street sweepers. The material recovered through this process is transferred to a processing site at the Forest Grove Wastewater Treatment Plant. After the material is dewatered, it is mechanically screened via a Vermeer Wildcat trommel screen with a one-inch screen to remove the "garbage" (which is landfilled), leaving the material referred to as "street sweeping fines."

Actual quantities available for beneficial use vary from year to year. Approximately 30% of the material collected is screened out by the trommel screen and sent to the Hillsboro landfill as garbage. The District expects to produce approximately 8000 to 9000 cubic yards of screened material that will be available for beneficial use on an annual basis.

2. A description of the proposed use.

District proposes to use street sweeping fines in the following two beneficial uses:

A. Non-residential construction and utility trench fill

The non-residential construction and utility trench fill beneficial use encompasses a wide range of possible uses. Examples include: use as landscaping fill along a street within a public right of way, common fill in a commercial or industrial construction site, landscaping features such as berms or vegetated areas along parking strips. Street sweeping fines could be used to backfill excavations or utilities trenches where native backfill is approved for use or if deemed appropriate by the engineer of record. The material would be used only in upland areas of commercial, industrial or agricultural settings. The material would be placed so that it does not contact or adversely impact waters of the state or other sensitive areas such as wetlands.

B. Soil amendment

Street sweeping fines are composed primarily of sand-sized material. The addition of street sweeping fines to non-food crop farmland or in a landscaped area contribute to improving soil texture and increasing drainage and aeration in heavy clay soils, which are predominate in our service area. In addition, a summary of the biological analysis (see Attachment E) conducted by Matthew Slaughter, President of Earth Fortification Supplies Company, states:

“...This material [street sweeping fines] contains agronomically beneficial microorganisms. The bacterial populations are very good; the fungal content is on the low side, but beneficial. Also, the protozoa populations overall are very good. Addition of this material to farmland or a landscape will help to enhance the natural conditions of the soil treated.”

3. A comparison of the chemical and physical characteristics of the material proposed for use with the material it will replace.

As non-residential construction and utility trench fill, the street sweeping fines will replace common fill “dirt” or costly aggregate. As a soil amendment, the street sweeping fines will provide coarse to medium sand and beneficial bacterial, fungi, and protozoa in place of other fertilizers, mulch, or top soil to provide a good growing medium for plants.

Physically, street sweeping fines are similar to typical soils, sediments and aggregates. Street sweeping fines consist of a mixture of gravel, sand, silt and clay-sized material, along with leaves, twigs and other organic material. Visually, the material resembles a rich, dark soil or mulch. A sieve analysis for particle size distribution, along with moisture content and organic matter content is included in Attachment D. The sieve analysis shows predominantly coarse to medium sand-size material, 10% gravel and 12% silt and clay, with 5.9% organic matter. The chemical characteristics of street sweeping fines debris are discussed below in section 4.(1).

4. A demonstration of compliance with the performance criteria in OAR 340-093-0280 based on knowledge of the process that generated the material, properties of the finished product, or testing.

340-093-0280

Case-Specific Beneficial Use Performance Criteria

The Department may approve a beneficial use of a solid waste that meets the criteria of this rule.

(1) The applicant has characterized the solid waste and use sufficiently to demonstrate compliance with this rule.

Characterization of street sweeping fines:

The physical characteristics of the street sweeping fines are described in section 3.

The chemical characterization is based on chemical analysis included as Attachment C (submitted electronically). The District's Water Quality Lab staff used a sampling grid to locate eight randomly selected sampling points from screened street sweeper fines at the Forest Grove material processing site. Samples of approximately one liter were collected below the surface of the pile at each sampling point using a shovel. These grab samples were then mixed thoroughly in a clean five-gallon bucket and split into subsamples for distribution to Columbia Analytical Services and the District's Water Quality Lab for analysis. To prevent loss of analyte, subsamples for volatile organics analysis were immediately placed into 4-ounce jars containing methanol, tightly capped, and mixed.

The analytical results are included in the Attachment C, consisting of: the complete report from Columbia Analytical Services (CAS); an Excel spreadsheet showing complete results from CAS; an Excel spreadsheet showing all results, including those provided by the District's Water Quality Laboratory; and a summary sheet showing the results as compared to DEQ clean fill levels for metals and DEQ Risk-Based Concentrations for organics. Where results obtained by the District's Water Quality Lab differed from those obtained by CAS, due to sample heterogeneity and different digestion procedures, the higher concentration was used in characterization and risk analysis.

Our review indicates that the constituents in the street sweeping fines that exceed DEQ Clean Fill standards are: benzo-a-pyrene (exceeds residential and urban residential soil risk-based concentration); antimony (exceeds province background levels for clean fill); and zinc (exceeds province background values for clean fill). Arsenic exceeds the risk-based concentration, but is below the clean fill level. Based on these results, the street sweeping fines are proposed for beneficial use as described in section 2 A. and B. above.

(2) The use is productive, including:

(a) There is an identified or reasonably likely use for the material that is not speculative;

This application proposes the beneficial uses of non-residential construction and utility trench fill and soil amendment, which are productive and are not speculative. The use of street sweeping fines debris as non-residential construction and utility trench is productive because it replaces clean fill, which can be conserved for use in more restrictive settings, such as residential locations and sensitive environments. The use of street sweeping fines as a soil amendment is productive because it improves soil quality. Both of the proposed beneficial uses are productive because they conserve the limited space in a landfill for material that is required to be placed there.

There are several identified sites where the District can use the material. For example, the District is in the early stages of planning a new material processing facility, which will require non-residential construction fill for constructing berms as visual barriers and landscaping at the facility.

The District owns and operates four wastewater treatment plants, several large sewage pump stations, a Field Operations complex, and administrative offices, all of which periodically require

landscaping and soil amendments. As improvements are constructed at these sites, particularly the treatment plants, there is a steady need for fill material. The District will be able to productively use street sweeping fines as a non-residential construction fill at these sites.

In addition to using the material on District property, the District has had requests for street sweeping fines for use on property controlled by other public agencies and private property owners. Staff from the City of Forest Grove has expressed an interest in using street sweeping fines as non-residential construction fill in medians and shoulders of public right of ways. Also, a Washington County farmer would like to use street sweeping fines as non-residential construction fill on his acreage.

(b) The use is a valuable part of a manufacturing process, an effective substitute for a valuable raw material or commercial product, or otherwise authorized by the Department and does not constitute disposal; and

As described above, the street sweeping fines are an effective substitute for common fill in certain settings. Street sweeping fines are an effective component in soil amendments, providing medium to coarse sand to improve soil texture and beneficial microorganism.

(c) The use is in accordance with applicable engineering standards, commercial standards, and agricultural or horticultural practices.

The use of street sweeping fines as non-residential construction and utility trench fill is proposed only in situations where it meets the applicable engineering standards. For example, street sweeping fines will meet standards required for construction or trench backfill where native backfill is approved. Other situations may require an engineer to evaluate the material's physical properties and approve the material if it meets the requirements of the specific application.

(3) The use will not create an adverse impact to public health, safety, welfare, or the environment, including:

(a) The material is not a hazardous waste under ORS 466.005;

Street sweeping fines are not a hazardous waste. They are not listed as hazardous wastes. By knowledge of process, they do not exhibit the characteristics of ignitability, corrosivity or reactivity. The chemical analysis shows that they do not have the characteristic of toxicity.

(b) Until the time a material is used according to a beneficial use determination, the material must be managed, including any storage, transportation, or processing, to prevent releases to the environment or nuisance conditions;

Prior to use, the street sweeping fines will be stored on-site at the District's material processing facility, which is not accessible to the public. The area where the material is stored drains to a sump which is pumped to the wastewater treatment plant, preventing discharges of non-stormwater to the MS4 or environment. The material retains moisture so it does not tend to be windblown. The screened material does not tend to cause odor issues. Incoming material is

delivered to the site via a hook lift truck carrying a 20 yard container. Outgoing screened loads would be transported via hook lift truck or dump truck. Incoming and outgoing loads will be covered during transportation.

The District is currently in the planning phase for a new materials processing facility. The new facility will be designed and operated to prevent releases to the environment and nuisance conditions during processing and storage of sweeper fines.

(c) Hazardous substances in the material meet one of the criteria in this subsection,

- (A) Do not significantly exceed the concentration in a comparable raw material or commercial product,
- (B) Do not exceed naturally occurring background concentrations; or
- (C) Will not exceed acceptable risk levels, including evaluation of persistence and potential bioaccumulation, when the material is managed according to a beneficial use determination;

The hazardous substances in street sweeping fines do not exceed acceptable risk levels for the proposed beneficial uses. For the four constituents listed below, amplifying information is provided to detail how they do not exceed acceptable risk levels:

antimony: The DEQ Risk-Based Concentrations table does not include antimony. EPA Region 9's regional risk-based screening level for antimony in residential soils is 31.0 mg/kg. (see <http://www.epa.gov/region09/superfund/prg/>) The street sweeping fines contain 1.15 mg/kg antimony. This meets criterion (C) for the proposed uses.

zinc: The DEQ Risk-Based Concentrations table does not include zinc. EPA Region 9's regional risk-based screening level for zinc in residential soils is 23,000 mg/kg. The street sweeping fines contain 177 mg/kg zinc. This meets criterion (C) for the proposed uses.

arsenic: Arsenic in street sweeping fines at 1.91 mg/kg exceeds the DEQ Risk-Based Concentration for residential (0.39 mg/kg), urban residential (1.0 mg/kg) and occupational 1.7 mg/kg scenarios. However, it meets criterion (B) because it is below the clean fill level (15.58 mg/kg Willamette Valley) due to high naturally occurring background concentrations in native soils.

benzo-a-pyrene: Benzo-a-pyrene at 0.059 mg/kg exceeds the DEQ Risk-Based Concentration for residential (0.015 mg/kg) and urban residential (0.034 mg/kg) exposure, but is less than the occupational Risk-Based concentration of 0.27 mg/kg and the Region 9 industrial soil risk-based screening level of 0.39 mg/kg. This meets criterion (C) for the proposed uses.

(d) The use will not result in the increase of a hazardous substance in a sensitive environment;

District will not use street sweeping fines in in sensitive environments and will require prospective users to sign appropriate documentation that their use will not place the fines in sensitive environments.

(e) The use will not create objectionable odors, dust, unsightliness, fire, or other nuisance conditions;

Street sweeping fines tend to have the same smell as typical soil. As proposed, street sweeping fines will not create more dust than the material it is replacing. Street sweeping fines resemble mulch or soil and are not unsightly; they are not flammable and do not create other nuisance conditions.

(f) The use must comply with applicable federal, state, and local regulations.

All beneficial use of street sweeping fines will comply with applicable federal, state and local regulations.

Tier 2 Information

The information required for a Tier 1 application;

See above.

Sampling and analysis that provides chemical, physical, and biological characterization of the material and that identifies potential contaminants in the material or the end product, as applicable;

See Tier 1 information above for description of sampling and physical and chemical characterization. See Attachment C, D and E for analytical results including chemical, physical, and biological testing results respectively. The contaminants identified that limit beneficial use are antimony, zinc and benzo-a-pyrene. Although arsenic exceeds the Risk-Based Screening levels, it does not exceed the DEQ clean fill standards.

A risk screening comparing the concentration of hazardous substances in the material to existing, DEQ approved, risk-based screening level values, and demonstrating compliance with acceptable risk levels;

The table below compares the levels of antimony, zinc, and benzo-a-pyrene found in District's street sweeping fines with risk-based screening levels published by Oregon DEQ and US EPA. All other hazardous contaminants were found below DEQ risk-based concentrations or clean fill levels.

CONTAMINANTS IN STREET SWEEPING FINES COMPARED TO RISK-BASED LEVELS (mg/kg)						
Contaminant	District Street Sweeping Fines	DEQ Risk-Based Concentration			EPA Region 9 Regional Risk- Based Screening Level	
		Residential	Urban Residential	Occupational	Residential	Industrial
antimony	1.15	na	na	na	31	410
zinc	177	na	na	na	23,000	310,000
benzo-a-pyrene	0.059	0.015	0.034	0.27	0.015 (carcinogenic)	0.21 (carcinogenic)

Location or type of land use where the material will be applied, consistent with the risk scenarios used to evaluate risk;

The street sweeping fines will be used only on commercial, industrial, agricultural and other non-residential land, consistent with level of contaminants relative to the DEQ and EPA risk-based levels.

Contact information of property owner(s) if this is a site-specific land application proposal, including name, address, phone number, e-mail, site address and site coordinates (latitude and longitude); and

This is not a site-specific proposal. The District will require property owner information whenever street sweeping fines are distributed under the beneficial use determination.

A description of how the material will be managed to minimize potential adverse impacts to public health, safety, welfare, or the environment.

The District currently operates a material processing yard at the Forest Grove Wastewater Treatment Plant. This site is not accessible to the public. The area where the material is stored drains to a sump which is pumped back into the plant treatment process, so that run off does not flow off site. The material is fairly well compacted and remains somewhat moist. It does not become windblown and does not have an objectionable odor. When the material is transported to a point of use, the load will be covered.

The District's new material processing facility, which is in the planning stages, will be designed, constructed, and operated to comply with all local, state and federal rules to minimize potential impacts to public health, safety, welfare or the environment.

If the District provides street sweeping fines to other persons or entities to use under this beneficial use determination, they will be required to enter into a use agreement that will detail the uses approved by DEQ under a general beneficial use determination and any conditions required under such an approval.

Attachment (C)

Street Sweeping Fines Chemical Characterization Data

(Excel and PDF files submitted electronically only)

Carlson Testing, Inc.

Bend Office (541) 330-9155
Geotechnical Office (503) 601-8250
Eugene Office (541) 345-0289
Salem Office (503) 589-1252
Tigard Office (503) 684-3460

December 6, 2012
T1207586

Clean Water Services (Field Ops) -- Ryan Sandhu PE
2025 SW Merlo Court
Beaverton, Oregon 97006

Re: Clean Water Services -- Material Processing Yard Improvements
1345 Fern Hill Road -- Forest Grove, Oregon
Sieve Analysis, Moisture Content, Organic Matter, Bulk Density (Unit Weight) & Voids in Aggregate

As requested, Carlson Testing Inc. has completed a sieve analysis, moisture content, organic matter and bulk density (unit weight) and voids in aggregate testing conducted on a sample of soil and rock blend that was sampled by your representative on November 16, 2012 from the sweeper screened street sweeper debris and delivered to our Tigard facility on November 16, 2012. Testing was completed on December 3, 2012. No specifications were applied at client's request. Following is the test results:

SIEVE ANALYSIS -- ASTM C117 & C136:			
SIEVE SIZE		PERCENT PASSING	INFORMATIONAL ONLY
19mm	¾"	100	---
12.5mm	½"	99	---
6.3mm	¼"	94	---
4.75mm	#4	90	---
2.36mm	#8	74	---
1.18mm	#16	58	---
0.600mm	#30	42	---
0.300mm	#50	28	---
0.150mm	#100	18	---
0.075mm	#200	12.0	---

MOISTURE CONTENT -- ASTM D2216:
Moisture Content -- 28.9

ORGANIC MATTER CONTENT -- ASTM D2974
Organic Matter Content -- 5.9%
Ash Content -- 94.1%

BULK DENSITY (UNIT WEIGHT) AND VOIDS IN AGGREGATE -- ASTM C29/C29M-97:
Testing Method -- Shoveling
Bulk Density -- 58.9 lb/ft³

Testing Method - Jigging
Bulk Density -- 66.7 lb/ft³

Testing Method - Rodding
Bulk Density -- 64.1 lb/ft³

Our reports pertain to the material tested/inspected only. Information contained herein is not to be reproduced, except in full, without prior authorization from this office. Under all circumstances, the information contained in this report is provided subject to all terms and conditions of CTI's General Conditions in effect at the time this report is prepared. No party other than those to whom CTI has distributed this report shall be entitled to use or rely upon the information contained in this document.

Respectfully submitted,
CARLSON TESTING, INC.



Greg Leeper
Project Manager

kk

cc: Clean Water Services (Field Ops) -- Ryan Sandhu PE

sandur@cleanwaterservices.org

8430 SW Hunziker St., Tigard, OR 97223
PO Box 23814, Tigard, OR 97281

Attachment (D)



EARTHFORT

635 SW WESTERN BLVD
CORVALLIS, OR 97333

June 7, 2013

Clean Water Services
2025 SW Merlot Ct
Beaverton, OR 97123

RE: Sample 01-116351

Hi Steve,

After reviewing the results from the Sample 1 you submitted to us for biological analysis I have the following to offer.

1. This material contains agronomically beneficial microorganisms. The bacterial populations are very good; the fungal content is on the low side, but beneficial. Also, the protozoa populations overall are very good. Addition of this material to farmland or a landscape will help to enhance the natural conditions of the soil treated.
2. We did find metal in the material, I recommend an enhancement to the process of removing this from the finished product.

If you have any further questions or require more detailed information feel free to contact me.

Sincerely,

Matthew Slaughter, AAS, CMSC
Certified Master Soil Consultant
President and Lab Director
Earth Fortification Supplies Company
635 SW Western Blvd
Corvallis, OR 97333
+1 541-257-2612
www.earthfort.com

TEL: (541) 257-2612 FAX: (541) 752-5142
EMAIL: INFO@EARTHFORT.COM WEBSITE: WWW.EARTHFORT.COM

Attachment (E)



Biological Analysis Soil Amendment

Report prepared for:
Clean Water Services
Steve Keanon
2025 SW Merlot Ct
Beverton, OR 97123 USA

Report Sent: 5/31/2013
Sample#: 01-116351 | Submission: 01-023070
Unique ID: Sample 1
Plant

Invoice Number: 9955
Sample Received: 5/22/2013

keanons@cleanwaterservices.org

Sample Received: 5/22/2013

Consulting fees may apply

For interpretation of this report please contact:
Earthfort Labs
info@earthfort.com
(541) 257-2612

Organism	Dry Weight	Active Bacteria (µg/g)	Total Bacteria (µg/g)	Active Fungi (µg/g)	Total Fungi (µg/g)	Hyphal Diameter (µm)	Nematode detail (# per gram or # per mL) Classified by type and identified to genus. (If section is blank, no nematodes identified.)
Results	0.760	64.7	868	12.7	188	2.85	
Comments	In Good Range	Above range	In range	In range	Below range		
Expected Range	Low: 0.2 High: 0.8	3 30	300 3000	3 30	300 3000		
Biomass Data	Protozoa (Numbers/g)		Total Nematodes #/g		Mycorrhizal Colonization (%)		
	Flagellates	Amoebae	Ciliates		ENDO	ECTO	
Results	6060	60605	372	1.47	Not Ordered	Not Ordered	
Comments	Low	Good	Good	Low			
Expected Range	Low: 10000 High: 100000	10000 100000	0 2000	10 100			
Organism Biomass Ratios	Total Fungi to Tot Bacteria	Active to Total Fungi	Active to Total Bacteria	Active Fungi to Act Bacteria	Nitrogen Cycling Potential (lbs/ac)		
Results	0.22	0.07	0.07	0.20	100-150		
Comments	Good	Good	Good	Good			
Expected Range	Low: 0.01 High: 10	0.01 0.1	0.01 0.1	0.01 10			

635 SW Western Blvd
(541) 257-2612 | info@earthfort.com
www.oregonfoodweb.com
Covallis, OR 97333 USA

Clean Water Services
Steve Keanon
2025 SW Merlot Ct
Beverton, OR 97123 USA

Report Sent: 5/31/2013
Sample#: 01-116351 | Submission: 01-023070
Unique ID: Sample 1
Plant
Invoice Number: 9955
Sample Received: 5/22/2013

keanon@cleanwaterservices.org

Dry Weight: Within normal moisture levels.

Active Bacteria: Bacterial activity above expected level.

Total Bacteria: Good bacterial biomass.

Active Fungi: Fungal activity within normal levels.

Total Fungi: Low fungal biomass, inoculum and foods may be required.

Hypheal Diameter: Good balance of fungi.

Protozoa: Lacking species diversity.

Total Nematodes: Low numbers, low diversity.

Mycorrhizal Col.:

TF/TB: Bacterial dominated.

AF/TF: Good fungal activity.

AB/TB: Good bacterial activity.

AF/AB: Bacterial dominated, becoming more bacterial.

Interpretation Comments:

Actinobacteria Biomass = 6.03 ug/g
Fairly good fungal diversity, hypheal diameter: 1.5 to 4um

For interpretation of this report please contact:
Earthfort Labs
info@earthfort.com
(541) 257-2612
Consulting fees may apply

Attachment (E)

635 SW Western Blvd Corvallis, OR 97333 USA
(541) 257-2612 | info@earthfort.com
www.oregonfoodweb.com