

Biosolid Analysis Year 2009

Source	Siletz	Lab analysis #	City of Siletz	Date	
File No.	81276		Siletz STP	*used in spreadsheet	Representative sample
Phone No.	(541)4442128		commercial lab		
Contact	Bill Turnbull				

Nutrient and metals analysis are an average of representative sampling events taken over the year biosolids are land applied.
 Nutrient and metal concentrations are determined from the current year's representative solids analysis.
 Site loading rates for nutrients and metal must be adjusted based on current analysis to meet authorized site loading rates.

COLOR KEY

	requires entered value
	calculated value
	replace 1 with coefficient from selection

SOLIDS ANALYSIS

Cake Biosolid	1	0.85	Replace the 1 with the appropriate decimal
Liquid Biosolid	0.5	0.5	Dewater (10-50%) and Liquid
% Total Solids	3.29		
% Volatile Solids	67.9		

PATHOGEN REDUCTION

Class A Biosolid			Put X next to Class A if true
Class B Biosolid		X	Put X next to Class B if true
	Alt.	1	Cite 503.32 Alternative

Fecal Coliform <2,000,000 /dry gr. Total Solids
 org.-100ml/1 dry gr.

VECTRO ATTRACTION REDUCTION (DIGESTION METHOD)

Volatile Solids Reduction Method	Opt.	1	Cite 503.33 Option
----------------------------------	------	---	--------------------

Source 2009
 File No. Siletz 81276

VOLATILE SOLIDS REDUCTION (DIGESTION METHOD)

Volatile Solids Reduction Method 1 Cite 503.33 option

Anaerobic D. 1 0.2 Replace the 1 with the appropriate decimal
 Aerobic D. 0.3 0.3 Replace the 1 with the appropriate decimal
 Drying Bed 1 0.15 Replace the 1 with the appropriate decimal
 Gal/yr. 777,000

* Note If cake biosolids are generated then is total cubic yards instead of total gallons
 Note biosolid cake conversion is 0.65 ton/ yd³

Dry TS US ton/yr.	106.60	Pounds Equation lb. TS/yr. = %TS x 8.34 x gal/yr.	0	Cubic yards hauled
lb. TS/yr.	213198		0	Total US tons
Total US tons	106.60		0	
			0	

Conversion
 US-> Metric tons multiply by 1.11 Total Metric tons 95.9390649
 Metric -> US tons multiply by 0.9

NUTRIENT ANALYSIS

	%	mg/kg dry-wt.		
Total Organic	4.91	49100	Organic N = (%TKN-%NH4) Inorganic N = (%NH4 + %NO3)	
TKN	6.08	60800		
NH4	1.17	11700		
NO3	0.01	100		
Phosphorus	3.35	33500		
Potassium	0.25	2500		
	mg/kg dry-wt.	lb. / yr.	lb./ac-yr.	kg/ha
Phosphorus	33500	7142.1304	142.84261	159.98372
Potassium	2500	532.9948	10.65990	11.93908

pH 6.8

Source 2009
 File No. Siletz
 81276

NITROGEN	mg/kg dry-wt.	lb. / yr.	lb./ac-yr.	kg/ha
Total Organic	4.91	3140.4054	62.8081	70.3451
TKN	6.08	3888.7301	259.2487	290.3585
NH4	1.17	1247.2078	24.9442	27.9375
NO3	0.01	21.3198	0.42640	0.47756
lb. mineralized organic N/dry ton			29.4600	
lb. inorganic N/dry ton			0.2380	
Total lb. available N/ ton			29.698	

NUTRIENT LOADING

Crop nitrogen loading rate N lb./acre	100.000	112	kg/ha
Total acres land applied for year.	50		
Number dry tons land applied per acre	2.13	4.78	metric ton/ha
lb. Nitrogen per dry ton	41.36		
Total lb. Org-N produced per year	3140.41		
Total lb. NH4 produced per year	1247.21		
Total lb. NO3 produced per year	21.32		#DIV/0! lb. N / yd ³
Total lb. Available N per year	4408.93		0.01 lb. N / gallon
Min. number of acres required per year (Nitrogen)	44.09		

Source 2003
 File No. 81276
 Siletz

BIOSOLID METALS ANALYSIS AND CALCULATIONS

Sample calculation:

$$(((5.0 \text{ mg As}/1000000 \text{ mg TS} \times 140000 \text{ lb. Total Solids}) = 0.07 \text{ lb. As/yr.}$$

$$(((5.0 \text{ mg As}/ 1000000 \text{ mg TS}) \times 140000 \text{ lb. TS}) / 52 \text{ ac} = 0.013 \text{ lb. As/ac-yr.}$$

$$(\text{EPA cumulative loading } 41 \text{ total lb. As/ac} / 0.013 \text{ lb. As/ac/yr.}) = 2719.3 \text{ yr. site life for As}$$

$$(0.013 \text{ lb. As/ac-yr.}) \times 1.12 \text{ conversion factor} = 0.015 \text{ kg/ha-yr.}$$

$$(2.6 \text{ tons biosolid is equivalent to a loading rate of } 100 \text{ lb. total available N/ac}) .$$

Metal Analysis	mg/kg dry-wt.
Arsenic	5
Cadmium	2.6
Chromium	34.8
Copper	476
Lead	35.3
Mercury	2.8
Molybdenum	6
Nickel	23.1
Selenium	5
Zinc	836

Metals	Biosolid concentration mg/kg	Ceiling Limits 503.13 Table 1 Conc. mg/kg	Ceiling Limits 503.13 Table 1 metal lb./ton biosolid	Yearly lb. Metal per ton biosolids	Yearly Loading lb./ac-yr.	Yearly Loading kg/yr.
Arsenic	5	75	0.150	1.06599	0.02132	0.024
Cadmium	2.6	85	0.170	0.55431	0.01109	0.012
Chromium	34.8	1200	2.400	7.41929	0.14839	0.166
Copper	476	4300	8.600	101.48221	2.02964	2.273
Lead	35.3	840	1.680	7.52589	0.15052	0.169
Mercury	2.8	57	0.114	0.59695	0.01194	0.013
Molybdenum	6	75	0.150	1.27919	0.02558	0.029
Nickel	23.1	420	0.840	4.92487	0.09850	0.110
Selenium	5	100	0.200	1.06599	0.02132	0.024
Zinc	836	7500	15.000	178.23346	3.56467	3.992

There is no Ceiling limit for Chromium, table value is a past limit that is no longer valid, used here for loading calculations only.

Source 2003
 File No. 81276
 Siletz

Metals	Analysis Biosolid conc. mg/kg	Cumulative Pollutant Limits		Yearly lb. Metal per ton biosolids	Biosolid Loading lb./ac-yr.	Biosolid Loading kg/ha-yr.
		CFR 503.13 Table 2 mg/ha	40 CFR 503.13 Table 2 metal lb./ac biosolid			
<i>Arsenic</i>	5	41	45.920	0.700	0.0140	0.016
<i>Cadmium</i>	2.6	39	43.680	0.364	0.0073	0.008
<i>Chromium</i>	34.8	1200	1344.000	4.872	0.0974	0.109
<i>Copper</i>	476	1500	1680.000	66.640	1.3328	1.493
<i>Lead</i>	35.3	300	336.000	4.942	0.0988	0.111
<i>Mercury</i>	2.8	17	19.040	0.392	0.0078	0.009
<i>Molybdenum</i>	6	75	84.000	0.840	0.0168	0.019
<i>Nickel</i>	23.1	420	470.400	3.234	0.0647	0.072
<i>Selenium</i>	5	100	112.000	0.700	0.0140	0.016
<i>Zinc</i>	836	2800	3136.000	117.040	2.3408	2.622

There are no limits for Chromium or Molybdenum under Table 2, Mo concentration comes from Table 1. Ceiling Limit.

Metals	Biosolid Analysis mg/kg	Pollutant Conc. Limits		Loading lb./ac-yr.	Loading kg/ha-yr.	Site Life in years
		Table 3 mg/ha	Table 3 lb. Metal per /ac biosolid			
<i>Arsenic</i>	5	41	45.920	0.021	0.024	1717
<i>Cadmium</i>	2.6	39	43.680	0.011	0.012	3141
<i>Chromium</i>	34.8	1200	1344.000	0.148	0.166	7221
<i>Copper</i>	476	1500	1680.000	2.030	2.273	660
<i>Lead</i>	35.3	300	336.000	0.151	0.169	1780
<i>Mercury</i>	2.8	17	19.040	0.012	0.013	1271
<i>Molybdenum</i>	6	75	84.000	0.026	0.029	2617
<i>Nickel</i>	23.1	420	470.400	0.098	0.110	3807
<i>Selenium</i>	5	100	112.000	0.021	0.024	4188
<i>Zinc</i>	836	2800	3136.000	3.565	3.992	701

There are no limits for Chromium or Molybdenum under Table 3, Mo concentration comes from Table 1. Ceiling Limit.

40 CFR 503.13 Tables 1-4.

T1, Ceiling loading, bulk biosolids sold or given away, bag or container, can not exceed pollutant concentration Table 1.

T2, Cumulative Loading, has to meet Table 1 and 2 limits, no lawn/garden Class A no ability to tract.

T3, Pollutant Concentration , bulk biosolid land applied on agriculture land, forest, public contact site or reclamation site has to meet Tables 1 & 3.

T4, Annual Pollutant loading Rate, for land application of Class A biosolid given away in bag or container, has to meet Table 1 & 4.