

# Leachate and Runoff Analysis Synopsis

## DRAFT

### California

#### California Integrated Waste Management Board: Compost Demonstration Project (March 1997)

Leachate analysis consisted of measuring the concentrations of potassium, sodium, calcium, magnesium, zinc, boron, nitrate, phosphate, pH, specific conductance, and percentages of organics and saturation. The constituent of concern from this analysis is the concentration of **specific conductivity**, ranging between 1,050 and 1,110  $\mu\text{mhos}/\text{cm}^2$ .

#### Regional Water Quality Control Board - Region 5: Discharge of Green Waste for Composting - Analysis No. 1

Leachate samples from this facility were collected by the Regional Water Quality Control Board - Region 5 over a period spanning from January 19, 1998 to February 2, 2004. The constituents analyzed consist of: iron, lead, total nitrogen, total phosphorous, Total Organic Carbon (TOC), specific conductance, and Total Suspended Solids (TSS). Of concern are the concentrations of **specific conductivity** (ranging from 1,200 to 2,900  $\mu\text{mhos}/\text{cm}^2$ ), and **iron** with concentrations ranging from 28.9 to 123  $\text{mg}/\text{l}^{20}$ .

#### Regional Water Quality Control Board - Region 5: Discharge of Green Waste for Composting - Analysis No. 2

Leachate samples were collected from four (4) different facilities during the spring of 2006 by the Regional Water Quality Control Board - Region 5. The constituents analyzed consisted of: ammonia (as nitrogen), total kjeldahl nitrogen (TKN), pH, specific conductance and Total Dissolved Solids (TDS). Constituents of concern consist of **specific conductivity** with a concentrations ranging from 3,300 to 12,000  $\mu\text{mhos}/\text{cm}^2$ , and **TDS** with a concentration ranging from 2,600 to 11,000  $\text{mg}/\text{l}^3$

#### Regional Water Quality Control Board - R8 - Surface Runoff from Composting Yards

Leachate as surface runoff was analyzed and consisted of measuring the concentrations of ammonia, nitrate, nitrite as nitrogen, total nitrogen, ortho-phosphorous, biochemical and chemical oxygen demands (BOD and COD respectively), coliform, E. coli, pH, specific conductance, TDS, TSS, and TOC. Constituents of concern from this analysis are the concentrations of **specific conductivity** being 2,400  $\mu\text{mhos}/\text{cm}^2$ , and **TDS**, ranging between 1,570 and 1,800  $\text{mg}/\text{l}^3$ .

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#### Oregon

##### State of Oregon, DEQ: Water Quality Analysis of Samples Collected from Incoming Feedstock

The State of Oregon, Department of Environmental Quality sampled the feedstock runoff from nine (9) composting facilities. The constituents analyzed consisted of: copper, iron, manganese, nickel, zinc, aluminum, lead, ammonia (as nitrogen), phosphorous, BOD, E. coli, pH, TDS, and TSS. Constituents of concern consist of **copper** with concentrations ranging from 0.023 to 4.46 mg/l<sup>17</sup>; **iron** with concentrations ranging from 3.83 to 998 mg/l<sup>20</sup>; **manganese** with concentrations ranging from 0.26 to 42.2 mg/l<sup>14</sup>; **nickel** with concentrations ranging from 0.008 to 0.758 mg/l<sup>18</sup>; **zinc** with concentrations ranging from 0.07 to 9.01 mg/l<sup>19</sup>; **aluminum** with concentrations ranging from 2.63 to 1,310 mg/l<sup>15</sup>; **arsenic** with concentrations ranging from <0.01 to 0.32 mg/l<sup>16</sup>; **E. coli** with concentrations ranging from 2,200 to >1,940,000 MPN; and **TDS** with concentrations ranging from <10 to 16,000 mg/l<sup>3</sup>.

##### State of Oregon, DEQ: Water Quality Analysis of Samples Collected at the Point of Discharge

The State of Oregon, Department of Environmental Quality sampled the feedstock runoff from six (6) composting facilities. The constituents analyzed consisted of: copper, iron, manganese, nickel, zinc, aluminum, lead, ammonia (as nitrogen), phosphorous, BOD, E. coli, pH, TDS, and TSS. Constituents of concern consist of **iron** with concentrations ranging from 5.2 to 18.7 mg/l<sup>20</sup>; **manganese** with concentrations ranging from 0.509 to 22.2 mg/l<sup>14</sup>; **nickel** with concentrations ranging from 0.008 to 0.281 mg/l<sup>18</sup>; **aluminum** with concentrations ranging from 2.24 to 16.50 mg/l<sup>15</sup>; **arsenic** with concentrations ranging from <0.01 to 0.088 mg/l<sup>16</sup>; **E. coli** with concentrations ranging from 6,100 to 967680 MPN; and **TDS** with concentrations ranging from ~190 to 5,000 mg/l<sup>3</sup>.

##### State of Oregon, DEQ: Water Quality Analysis of Samples Collected at Active Composting Sites

The State of Oregon, Department of Environmental Quality sampled the feedstock runoff from seven (7) composting facilities. The constituents analyzed consisted of: copper, iron, manganese, nickel, zinc, aluminum, lead, ammonia (as nitrogen), phosphorous, BOD, E. coli, pH, TDS, and TSS. Constituents of concern consist of **copper** with concentrations ranging from <0.02 to 5.69 mg/l<sup>17</sup>; **iron** with concentrations ranging from 2.01 to 52.20 mg/l<sup>20</sup>; **manganese** with concentrations ranging from 0.644 to 12.2 mg/l<sup>14</sup>; **nickel** with concentrations ranging from 0.009 to 0.34 mg/l<sup>18</sup>; **zinc** with concentrations ranging from 0.109 to 6.9 mg/l<sup>19</sup>; **aluminum** with concentrations ranging from ~1.48 to 48.6 mg/l<sup>15</sup>; **arsenic** with concentrations ranging from <0.02 to 0.13 mg/l<sup>16</sup>; **E. coli** with concentrations ranging from 40 to >967680 MPN; and **TDS** with concentrations ranging from ~200 to 24,000 mg/l<sup>3</sup>.

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#### Washington

##### Clean Washington Center: Report No. CM-00-2 Yard Debris Compost Runoff

Study analyzes the concentration of potassium, copper, zinc, ammonia, TKN, phosphorous, BOD, fecal coliform, and TSS. The only constituent of concern is **fecal coliform** reported to range from 110 to  $4.9 \times 10^6$  MPN/100ml.

##### Clean Washington Center: Compost Facility Runoff

Study analyzes the concentrations of the following constituents; potassium, copper, zinc, ammonia, total nitrogen, TKN, ortho-phosphorous, phosphorous, BOD, fecal coliform, pH, specific conductance, TSS. Constituents of concern are **specific conductivity** with concentrations ranging from 52 to 2,100  $\mu\text{mhos}/\text{cm}^2$  and **fecal coliform** with concentrations ranging from 200 to  $24 \times 10^6$  MPN/100ml.

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## Leachate and Runoff Analysis Synopsis

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#### Other Studies

##### BioCycle: Composting Facility Storm Water

This study performed two analysis, the one consisting of stormwater with leachate and the other consisting of stormwater without leachate. Both analysis focused on the following constituents: copper, zinc, lead, ammonia (as nitrogen), phosphorous, BOD, E. coli, pH, specific conductance and TDS. Samples of stormwater with leachate has a **specific conductivity** ranging from 1,200 to 2,400  $\mu\text{mhos}/\text{cm}^2$ , and **TDS** ranging from 592 to 1,210  $\text{mg}/\text{l}^3$ . One sample of stormwater without leachate had a **specific conductivity** of 900  $\mu\text{mhos}/\text{cm}^2$ .

##### United State Composting Council

Study analyzes the concentration of pH and TSS from 8 sampling site compiled from 6 separate facilities No concentrations of concern.

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## Leachate and Runoff Analysis Synopsis

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#### View Data from a Different Vanatage Point - Feedstock Composting Leachate

State of Oregon and California Regional Water Board (R5) Report Information

##### Feedstock<sup>5,9,11</sup> Consisting of 100% "green waste" (10%-100% Leaves, 60%-100% Yard Waste and 40% Wood Waste)

Constituents of concern consist of **copper** with concentrations ranging from 0.015 to 1.62 mg/l<sup>17</sup>; **iron** with concentrations ranging from 2.01 to 998 mg/l<sup>20</sup>; **manganese** with concentrations ranging from 0.026 to 42.2 mg/l<sup>14</sup>; **nickel** with concentrations ranging from 0.008 to 0.758 mg/l<sup>18</sup>; **zinc** with concentrations ranging from 0.07 to 9.01 mg/l<sup>19</sup>; **aluminum** with concentrations ranging from 1.99 to 1,310 mg/l<sup>15</sup>; **arsenic** with concentrations ranging from <0.01 to 0.32 mg/l<sup>16</sup>; **E. coli** with concentrations ranging from 40 to >967680 MPN; **specific conductivity** with concentrations ranging from 1,200 to 12,000 µmhos/cm<sup>2</sup>; and **TDS** with concentrations ranging from <10 to 11,000 mg/l<sup>3</sup>.

##### Feedstock<sup>6,10</sup> Consisting of "green waste" (55% Leaves, 40% - 60% Yard Waste, and 40% Wood Waste), and Manure (>1%)

Constituents of concern consist of **iron** with concentrations ranging from 12.30 to 46.90 mg/l<sup>20</sup>; **manganese** with concentrations ranging from 0.93 to 12.2 mg/l<sup>14</sup>; **aluminum** with concentrations ranging from 8.71 to 40.10 mg/l<sup>15</sup>; **E. coli** with concentrations ranging from 64,640 to >1,940,000 MPN; and **TDS** with concentrations ranging from <10 to ~5,100 mg/l<sup>3</sup>.

##### Feedstock<sup>7</sup> Consisting of "green waste" (85-95% Yard Waste and 0-95% Wood Waste), Manure (0.5-4.7%), and "food waste"(0.25%Veg.Waste).

Constituents of concern consist of **copper** with concentrations ranging from 0.038 to 1.090 mg/l<sup>17</sup>; **iron** with concentrations ranging from 2.14 to 402 mg/l<sup>20</sup>; **manganese** with concentrations ranging from 0.509 to 17mg/l<sup>14</sup>; **nickel** with concentrations ranging from 0.012 to 0.101 mg/l<sup>18</sup>; **zinc** with concentrations ranging from 0.175 to 5.92 mg/l<sup>19</sup>; **aluminum** with concentrations ranging from 7 to ~316 mg/l<sup>15</sup>; **arsenic** with concentrations ranging from 0.01 to 0.18 mg/l<sup>16</sup>; **E. coli** with concentrations ranging from 39,726 to >967680 MPN; and **TDS** with concentrations ranging from ~120 to 5,400 mg/l<sup>3</sup>.

##### Feedstock<sup>8</sup> Consisting of "green waste" (40-58% Wood Waste and 0-10% Straw), Manure (2-10%), and "food waste" (20-50% Fruit Waste).

Constituents of concern consist of **iron** with concentrations ranging from 12.2 to 75.5 mg/l<sup>20</sup>; **manganese** with concentrations ranging from 0.778 to 11.7 mg/l<sup>14</sup>; **aluminum** with concentrations ranging from 4.04 to 85.6 mg/l<sup>15</sup>; **E. coli** with concentrations ranging from 8,720 to >967680 MPN; and **TDS** with concentrations ranging from 1,300 to 9,200 mg/l<sup>3</sup>.

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#### View Data from a Different Vanatage Point - Feedstock Composting Leachate (continued)

Feedstock<sup>12</sup> Consisting of 100% Manure

Constituents of concern consist of **copper** with concentrations ranging from 2.74 to 5.69 mg/l<sup>17</sup>; **iron** with concentrations ranging from 13.30 to 45.6 mg/l<sup>20</sup>; **manganese** with concentrations ranging from 2.68 to 5.22 mg/l<sup>14</sup>; **nickel** with concentrations ranging from <0.2 to 0.34 mg/l<sup>18</sup>; **zinc** with concentrations ranging from 3.2 to 6.9 mg/l<sup>19</sup>; **aluminum** with concentrations ranging from 6.7 to 15.4 mg/l<sup>15</sup>; **E. coli** with concentrations ranging from 55,100 to 967,680 MPN; and **TDS** with concentrations ranging from 12,000 to 24,000 mg/l<sup>3</sup>.

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### Annotations

- <sup>1</sup> - California Department of Public Health, Drinking Water Standards: Primary Maximum Contaminant Level (MCL)
  - <sup>2</sup> - California Department of Public Health, Drinking Water Standards: Secondary Maximum Contaminant Level (MCL) = 900/1,600 (recommended/upper range). [E.C.]
  - <sup>3</sup> - California Department of Public Health, Drinking Water Standards: Secondary Maximum Contaminant Level (MCL) = 500/1,000 (recommended/upper range). [TDS]
  - <sup>4</sup> - California Department of Public Health, Drinking Water Standards: Action Level
  - <sup>5</sup> - Feedstock consists of: Yard Debris 100%, Manure 0%, Other 0%
  - <sup>6</sup> - Feedstock consists of: Yard Debris 60%, Manure >1%, Other 40%-Wood Waste
  - <sup>7</sup> - Feedstock consists of: Yard Debris 85-95%, Manure 0.5-4.7%, Other 0-95%-Wood Waste, 0.25%-Vegetable Food Waste
  - <sup>8</sup> - Feedstock consists of: Yard Debris 0%, Manure 2-10%, Other 40-58%-Wood Waste, 20-50%-Fruit Food Waste, 0-10% Straw
  - <sup>9</sup> - Feedstock consists of: Yard Debris 0%, Manure 0%, Other 100%-Leaves
  - <sup>10</sup> - Feedstock consists of: Yard Debris 40%, Manure >1%, Other 55%-Leaves
  - <sup>11</sup> - Feedstock consists of: Yard Debris 90%, Manure 0%, Other 10%-Wood Waste
  - <sup>12</sup> - Feedstock consists of: Yard Debris 0%, Manure 100%, Other 0%
  - <sup>13</sup> - California Department of Public Health, Drinking Water Standards: Action Level = 0.015 mg/l [Lead]
  - <sup>14</sup> - California Department of Public Health, Drinking Water Standards: Secondary Maximum Contaminant Level (MCL) = 0.05 mg/l [Manganese]
  - <sup>15</sup> - California Department of Public Health, Drinking Water Standards: Primary Maximum Contaminant Level (MCL) = 1 mg/l [Aluminum]
  - <sup>16</sup> - California Department of Public Health, Drinking Water Standards: Primary Maximum Contaminant Level (MCL) = 0.010 mg/l [Arsenic]
  - <sup>17</sup> - California Department of Public Health, Drinking Water Standards: Primary Maximum Contaminant Level (MCL) = 1.0 mg/l [Copper]
  - <sup>18</sup> - California Department of Public Health, Drinking Water Standards: Primary Maximum Contaminant Level (MCL) = 0.1 mg/l [Nickel]
  - <sup>19</sup> - California Department of Public Health, Drinking Water Standards: Secondary Maximum Contaminant Level (MCL) = 5 mg/l [Zinc]
  - <sup>20</sup> - California Department of Public Health, Drinking Water Standards: Secondary Maximum Contaminant Level (MCL) = 0.3 mg/l [Iron]
- ND - Non Detect

California State Water Resources Control Board  
DRAFT: Summary of Analytical Results for Composting Leachate and Runoff Data

Analyte	Unit	CA Title 22 CCR	California Integrated Waste Management Board Compost Demonstration Project (March 1997)				Regional Water Quality Control Board - R5 Discharges of Green Waste for Composting - Study No. 1						Regional Water Quality Control Board - R5 Discharges of Green Waste for Composting - Study No. 2		
			Pile Height 0" - 6"		Pile Height 6" - 12"		1/19/98	3/24/98	10/26/00	12/9/01	3/6/02	1/10/03	2/2/04	Facility 1 Basin Runoff 5/1/2006	Facility 2 Basin runoff 5/1/2006
			East Half	West Half	East Half	West Half									
<b>Alkali Metals</b>															
Potassium	mg/l		179	250	203	261									
Sodium	meq/l		3.6	5.4	3.2	4.9									
<b>Alkaline Earth Metals</b>															
Calcium	meq/l		5.5	4.2	5.4	4.4									
Magnesium	meq/l		1.7	1.5	1.9	1.5									
<b>Transition Metals</b>															
Copper	mg/l	1.0 <sup>17</sup>													
Iron	mg/l	0.3 <sup>20</sup>						79	39	123	54.8	28.9			
Manganese	mg/l	0.05 <sup>14</sup>													
Nickel	mg/l	0.1 <sup>18</sup>													
Zinc	mg/l	5 <sup>19</sup>	1.2	1.4	1.2	1.5									
<b>Metals</b>															
Aluminium	mg/l	1 <sup>15</sup>													
Lead	mg/l	0.015 <sup>13</sup>						0.01	0.07	0.14	0.04	0.03			
<b>Metaloides</b>															
Arsenic	mg/l	0.010 <sup>16</sup>													
Boron	mg/l		0.1	0.1	0.1	0.1									
<b>Nonmetals</b>															
Ammonia (as Nitrogen)	mg/l												3.7	130	
Nitrate (as NO <sub>3</sub> <sup>-</sup> )	mg/l	45 <sup>1</sup>	9	7.3	7	8.3									
Nitrate (as NO <sub>2</sub> <sup>-</sup> )	mg/l														
Nitrogen (Total)	mg/l	10 <sup>1</sup>						0.9	<0.02	0.1	0.7	1.1			
Nitrogen (Total Kjeldahl)	mg/l												56	190	
Ortho-Phosphorus	mg/l														
Phosphorus (Total)	mg/l							32	0.62	12	7	2.1			
Phosphate (as Phosphorus)	mg/l		11.5	17.8	13.8	19.8									
<b>Organic</b>															
Biochemical Oxygen Demand															
Coliform (Total)	MPN														
E. coli	MPN														
Organics Percentage	%		0.6	0.8	1.5	0.8									
Total Organic Carbon	mg/l						190	220	590	296	471				
<b>Physical Properties</b>															
Chemical Oxygen Demand	mg/l														
pH			7.6	7.7	7.6	7.7							9.29	7.71	
Saturation	%		25	23.5	25.5	24									
Specific Conductivity (EC)	µmhos/cm	900/1,600 <sup>2</sup>	1,080	1,110	1,050	1,080	1,200	1,900	2,670	1,827	2,900	2,600	2,080	3,300	5,300
Total Dissolved Solids	mg/l	500/1,000 <sup>3</sup>												2,600	3,400
Total Suspended Solids	mg/l						600	90	3,620	2,390	2,900	930	750		

California State Water Resources Control Board  
DRAFT: Summary of Analytical Results for Composting Leachate and Runoff Data

Analyte	Unit	CA Title 22 CCR	Regional Water Quality Control Board - R5 Study No. 2 (continued)		Regional Water Quality Control Board - R8 Surface Runoff from Composting Yards		
			Facility 3 Pond Runoff 5/1/2006	Facility 4 Basin Runoff 4/18/2007	(2/15/01)	(3/15/01)	
					NW Pond	Catch Basin	Windrow Pond
<b>Alkali Metals</b>							
Potassium	mg/l						
Sodium	meq/l						
<b>Alkaline Earth Metals</b>							
Calcium	meq/l						
Magnesium	meq/l						
<b>Transition Metals</b>							
Copper	mg/l	1.0 <sup>17</sup>					
Iron	mg/l	0.3 <sup>20</sup>					
Manganese	mg/l	0.05 <sup>14</sup>					
Nickel	mg/l	0.1 <sup>18</sup>					
Zinc	mg/l	5 <sup>19</sup>					
<b>Metals</b>							
Aluminium	mg/l	1 <sup>15</sup>					
Lead	mg/l	0.015 <sup>13</sup>					
<b>Metalloides</b>							
Arsenic	mg/l	0.010 <sup>16</sup>					
Boron	mg/l						
<b>Nonmetals</b>							
Ammonia (as Nitrogen)	mg/l		11	270	1.8	0.1	0.2
Nitrate (as NO <sub>3</sub> <sup>-</sup> )	mg/l	45 <sup>1</sup>			ND	ND	ND
Nitrate (as NO <sub>2</sub> <sup>-</sup> )	mg/l				ND	ND	ND
Nitrogen (Total)	mg/l	10 <sup>1</sup>			1.8	0.1	0.2
Nitrogen (Total Kjeldahl)	mg/l		61	360			
Ortho-Phosphorus	mg/l					4.36	5.53
Phosphorus (Total)	mg/l				1.19	4.67	9.67
Phosphate (as Phosphorus)	mg/l						
<b>Organic</b>							
Biochemical Oxygen Demand					15	210	98
Coliform (Total)	MPN					500	1,700,000
E. coli	MPN					300	500,000
Organics Percentage	%						
Total Organic Carbon	mg/l				158		
<b>Physical Properties</b>							
Chemical Oxygen Demand	mg/l				470	880	720
pH			8.3	7.363	7.95		
Saturation	%						
Specific Conductivity (EC)	µmhos/cm	900/1,600 <sup>2</sup>	3,800	12,000	2,400		
Total Dissolved Solids	mg/l	500/1,000 <sup>3</sup>	4,200	11,000	1,570	1,700	1,800
Total Suspended Solids	mg/l				44	176	200

California State Water Resources Control Board  
DRAFT: Summary of Analytical Results for Composting Leachate and Runoff Data  
State of Oregon: Department of Environmental Quality

		CA Title 22 CCR	Water Quality Analysis of Samples Collected for Incoming Feedstock															
			Facility 1-1 <sup>5</sup>		Facility 2-2 <sup>6</sup>		Facility 3-1 <sup>7</sup>			Facility 4-1 <sup>12</sup>	Facility 4-2 <sup>12</sup>	Facility 5-1 <sup>5</sup>	Facility 5-2 <sup>5</sup>	Facility 6-1 <sup>8</sup>			Facility 7-1 <sup>9</sup>	
			1/10/06	1/30/06	12/23/05	1/13/06	12/1/05	12/22/05	1/18/06	1/4/06	2/8/06	12/23/05	1/13/06	12/1/05	12/19/05	1/17/06	12/29/05	1/30/06
<b>Alkali Metals</b>																		
Potassium	mg/l																	
Sodium	meq/l																	
<b>Alkaline Earth Metals</b>																		
Calcium	meq/l																	
Magnesium	meq/l																	
<b>Transition Metals</b>																		
Copper	mg/l	1.0 <sup>17</sup>	0.111	0.095	0.085	0.113	<b>1.090</b>	0.091	0.428	<b>4.460</b>	<b>2.740</b>	<b>1.620</b>	0.250	0.191	0.470	0.198	0.048	0.036
Iron	mg/l	0.3 <sup>20</sup>	<b>33.00</b>	<b>51.50</b>	<b>28.70</b>	<b>46.90</b>	<b>402.00</b>	<b>24.70</b>	<b>135.00</b>	<b>24.10</b>	<b>13.30</b>	<b>998.00</b>	<b>135.00</b>	<b>53.70</b>	<b>27.40</b>	<b>75.50</b>	<b>3.83</b>	<b>5.72</b>
Manganese	mg/l	0.05 <sup>14</sup>	<b>3.32</b>	<b>1.51</b>	<b>2.97</b>	<b>5.23</b>	<b>17.00</b>	<b>1.04</b>	<b>8.01</b>	<b>2.68</b>	<b>3.71</b>	<b>42.20</b>	<b>4.61</b>	<b>1.82</b>	<b>1.90</b>	<b>11.20</b>	<b>2.10</b>	<b>1.33</b>
Nickel	mg/l	0.1 <sup>18</sup>	0.029	0.033	0.023	0.036	0.280	0.021	<b>0.101</b>	<0.2	<0.2	<b>0.758</b>	<b>0.152</b>	0.062	0.052	0.075	0.029	0.016
Zinc	mg/l	5 <sup>19</sup>	0.52	0.50	0.35	0.63	<b>5.92</b>	0.41	2.01	~3.3	3.20	<b>9.01</b>	0.99	0.45	0.54	1.04	0.23	0.17
<b>Metals</b>																		
Aluminium	mg/l	1 <sup>15</sup>	<b>26.60</b>	<b>38.80</b>	<b>~27.7</b>	<b>40.10</b>	<b>~316</b>	<b>22.70</b>	<b>108.00</b>	<b>6.70</b>	<b>15.40</b>	<b>1,310.00</b>	<b>131.00</b>	<b>61.60</b>	<b>23.80</b>	<b>85.60</b>	<b>2.63</b>	<b>4.91</b>
Lead	mg/l	0.015 <sup>13</sup>	<b>0.03</b>	<b>0.06</b>	<b>0.05</b>	<b>0.07</b>	<b>1.16</b>	<b>0.07</b>	<b>0.24</b>	<0.5	<0.5	<b>1.94</b>	<b>0.34</b>	<b>0.16</b>	<0.1	<b>0.79</b>	<b>0.02</b>	<b>0.02</b>
<b>Metalloides</b>																		
Arsenic	mg/l	0.010 <sup>16</sup>	0.03	<0.020	0.02	<0.020	<b>0.18</b>	0.02	<b>0.07</b>	<0.5	<0.5	<b>0.32</b>	<0.1	<0.05	<0.1	<b>0.09</b>	<0.020	<0.020
Boron	mg/l																	
<b>Nonmetals</b>																		
Ammonia (as Nitrogen)	mg/l		9.00	4.00	4.20	6.60	~320	5.60	41.00	~290	~840	660.00	102.00	13.60	27.00	1.80	1.50	2.10
Nitrate (as NO <sub>3</sub> <sup>-</sup> )	mg/l	45 <sup>1</sup>																
Nitrate (as NO <sub>2</sub> <sup>-</sup> )	mg/l																	
Nitrogen (Total)	mg/l	10 <sup>1</sup>																
Nitrogen (Total Kjeldahl)	mg/l																	
Ortho-Phosphorus	mg/l																	
Phosphorus (Total)	mg/l		14.70	7.57	6.59	14.40	~89.9	6.46	~38.1	~162	~112	163.00	15.50	23.30	60.80	18.00	9.51	6.97
Phosphate (as Phosphorus)	mg/l																	
<b>Organics</b>																		
Biochemical Oxygen Demand			650	110	560	820	1,600	130	2,100	~16,000	1,400	1,300	150	840	~74,000	15,000	340	1,440
Coliform (Total)	MPN																	
E. coli	MPN		~970,000	98,000	483,840	>1,940,000	>967,680	>967,680	>967,680	967,680	180,000	>967,680	103,000	34,658	99,240	26,000	6,100	2,200
Organics Percentage	%																	
Total Organic Carbon	mg/l																	
<b>Physical Properties</b>																		
Chemical Oxygen Demand	mg/l																	
pH			6.20	7.00	6.10	~5.8	~6.3	6.70	5.80	7.90	8.10	6.70	~8.3	~6.3	4.50	4.70	~7.6	7.60
Saturation	%																	
Specific Conductivity (EC)	µmhos/cm	900/1,600 <sup>2</sup>																
Total Dissolved Solids	mg/l	500/1,000 <sup>3</sup>	<b>1,300</b>	38	~360	<b>1,000</b>	<b>1,300</b>	~120	<b>1,500</b>	<b>16,000</b>	<b>12,000</b>	<b>~2,300</b>	<b>2,500</b>	<b>2,400</b>	<b>~9,200</b>	<b>3,800</b>	<b>1,300</b>	<b>860</b>
Total Suspended Solids	mg/l		1,100	1,800	~680	1,400	24,000	~1,100	3,100	9,100	2,000	~49,000	3,500	700	520	570	180	190

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		CA Title 22 CCR	Incoming Feedstock (continued)						Water Quality Analysis of Samples Collected at Point of Discharge										
			Facility 8-1 <sup>10</sup>		Facility 9-1 <sup>11</sup>		Facility 1-2 <sup>5</sup>		Facility 3-3 <sup>7</sup>			Facility 5-1 <sup>9</sup>		Facility 7-3 <sup>9</sup>		Facility 8-3 <sup>10</sup>		Facility 9-3 <sup>11</sup>	
			12/21/05	1/30/06	12/27/05	1/10/06	1/10/06	1/30/06	12/1/05	12/25/05	1/18/06	1/13/06		1/30/06	12/21/05	1/30/06	12/27/05	1/10/06	
<b>Alkali Metals</b>																			
Potassium	mg/l																		
Sodium	meq/l																		
<b>Alkaline Earth Metals</b>																			
Calcium	meq/l																		
Magnesium	meq/l																		
<b>Transition Metals</b>																			
Copper	mg/l	1.0 <sup>17</sup>	0.040	0.054	0.057	0.023	0.015	0.045	0.045	0.038	0.052	0.111	0.109	<0.05	<0.05	<0.05	0.043	0.310	
Iron	mg/l	0.3 <sup>20</sup>	<b>24.30</b>	<b>28.60</b>	<b>13.10</b>	<b>6.14</b>	<b>8.09</b>	<b>10.70</b>	<b>16.80</b>	<b>18.70</b>	<b>9.32</b>	<b>18.20</b>	<b>18.10</b>	<b>5.20</b>	<b>12.70</b>	<b>12.30</b>	<b>10.30</b>	<b>8.33</b>	
Manganese	mg/l	0.05 <sup>14</sup>	<b>1.05</b>	<b>0.93</b>	<b>2.73</b>	<b>0.26</b>	<b>0.959</b>	<b>0.690</b>	<b>0.958</b>	<b>0.509</b>	<b>1.400</b>	<b>6.480</b>	<b>22.200</b>	<b>2.170</b>	<b>1.550</b>	<b>4.350</b>	<b>2.120</b>	<b>2.180</b>	
Nickel	mg/l	0.1 <sup>18</sup>	0.015	0.016	0.025	0.008	0.008	0.008	0.013	0.012	0.030	0.086	<b>0.281</b>	0.022	<0.02	0.020	0.024	0.022	
Zinc	mg/l	5 <sup>19</sup>	0.23	0.31	0.32	0.07	0.089	0.112	0.205	0.175	0.210	0.385	2.420	0.220	<0.15	0.150	0.182	0.218	
<b>Metals</b>																			
Aluminium	mg/l	1 <sup>15</sup>	<b>18.20</b>	<b>21.70</b>	<b>~11.5</b>	<b>6.40</b>	<b>5.28</b>	<b>7.84</b>	<b>~13.3</b>	<b>16.30</b>	<b>7.94</b>	<b>16.50</b>	<b>2.24</b>	<b>2.96</b>	<b>9.76</b>	<b>8.71</b>	<b>~7.3</b>	<b>5.03</b>	
Lead	mg/l	0.015 <sup>13</sup>	<b>0.03</b>	<b>0.04</b>	<b>0.02</b>	<0.01	<0.01	<0.01	<b>0.03</b>	<b>0.03</b>	<0.05	<b>0.09</b>	<0.05	<0.05	<0.05	<0.05	<0.02	<0.02	
<b>Metalloides</b>																			
Arsenic	mg/l	0.010 <sup>16</sup>	0.01	0.01	0.01	<0.010	<0.01	<0.01	0.013	0.010	<0.05	<b>0.088</b>	<0.05	<0.05	<0.05	<0.05	0.026	0.022	
Boron	mg/l																		
<b>Nonmetals</b>																			
Ammonia (as Nitrogen)	mg/l		1.40	4.90	6.10	0.64	1.9	2.2	8.9	3.5	52.0	138.0	2.4	4.6	23.0	~69	16.0	12.9	
Nitrate (as NO <sub>3</sub> <sup>-</sup> )	mg/l	45 <sup>1</sup>																	
Nitrate (as NO <sub>2</sub> <sup>-</sup> )	mg/l																		
Nitrogen (Total)	mg/l	10 <sup>1</sup>																	
Nitrogen (Total Kjeldahl)	mg/l																		
Ortho-Phosphorus	mg/l																		
Phosphorus (Total)	mg/l		3.46	9.17	12.10	1.36	3.98	2.55	4.32	2.41	6.12	23.00	92.20	12.20	10.90	~15.4	9.10	11.10	
Phosphate (as Phosphorus)	mg/l																		
<b>Organics</b>																			
Biochemical Oxygen Demand			54	280	480	58	130	41	42	24	190	1,900	21,000	760	200	1,400	580	620	
Coliform (Total)	MPN																		
E. coli	MPN		64,640	69,000	483,840	100,000	48,000	15,000	240,660	154,920	967,680	693,000	6,600	6,100	62,600	220,000	115,880	100,000	
Organics Percentage	%																		
Total Organic Carbon	mg/l																		
<b>Physical Properties</b>																			
Chemical Oxygen Demand	mg/l																		
pH			6.50	6.40	5.80	6.70	7.2	7.1	~7.4	7.0	7.5	~7.5	~5.1	7.6	7.3	7.2	5.5	5.8	
Saturation	%																		
Specific Conductivity (EC)	µmhos/cm	900/1,600 <sup>2</sup>																	
Total Dissolved Solids	mg/l	500/1,000 <sup>3</sup>	~170	<10	240	110	470	260	<b>510</b>	~190	<b>1,600</b>	<b>5,000</b>	<b>4,900</b>	<b>1,600</b>	<b>~870</b>	<b>2,800</b>	<b>~650</b>	<b>1,000</b>	
Total Suspended Solids	mg/l		620	1,300	560	110	100	200	150	~320	170	350	360	260	~970	420	250	180	

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		Water Quality Analysis of Samples Collected at Active Composting Locations																
		CA Title 22 CCR	Facility 3-2 <sup>7</sup>			Facility 4-1 <sup>12</sup>	Facility 4-2 <sup>12</sup>	Facility 5-3 <sup>5</sup>		Facility 6-2 <sup>8</sup>		Facility 6-3 <sup>8</sup>	Facility 7-2 <sup>9</sup>		Facility 8-2 <sup>10</sup>		Facility 9-2 <sup>11</sup>	
			12/1/05	12/22/05	1/18/06	1/4/06	2/8/06	12/23/05	1/13/06	12/1/05	12/19/05	1/17/06	12/29/05	1/30/06	12/21/05	1/30/06	12/27/05	1/10/06
<b>Alkali Metals</b>																		
Potassium	mg/l																	
Sodium	meq/l																	
<b>Alkaline Earth Metals</b>																		
Calcium	meq/l																	
Magnesium	meq/l																	
<b>Transition Metals</b>																		
Copper	mg/l	1.0 <sup>17</sup>	<0.05	0.35	<0.2	<b>5.69</b>	<b>4.81</b>	0.129	<0.05	0.199	0.79	<0.1	0.034	<0.02	<0.2	<0.2	0.055	0.089
Iron	mg/l	0.3 <sup>20</sup>	<b>2.14</b>	<b>43.10</b>	<b>11.00</b>	<b>45.60</b>	<b>31.80</b>	<b>33.00</b>	<b>11.70</b>	<b>12.20</b>	<b>39.60</b>	<b>52.20</b>	<b>2.01</b>	<b>3.80</b>	<b>29.90</b>	<b>16.40</b>	<b>8.25</b>	<b>17.1</b>
Manganese	mg/l	0.05 <sup>14</sup>	<b>0.644</b>	<b>3.060</b>	<b>1.600</b>	<b>5.220</b>	<b>4.400</b>	<b>2.560</b>	<b>1.860</b>	<b>0.778</b>	<b>2.200</b>	<b>11.700</b>	<b>1.240</b>	<b>0.646</b>	<b>12.200</b>	<b>8.160</b>	<b>1.400</b>	<b>2.72</b>
Nickel	mg/l	0.1 <sup>18</sup>	<0.02	0.086	0.095	<b>0.340</b>	<b>0.300</b>	0.065	0.058	0.035	0.068	0.067	0.013	0.009	<0.08	<0.08	0.024	0.0386
Zinc	mg/l	5 <sup>19</sup>	<0.15	1.190	<0.6	<b>6.900</b>	~6.2	0.48	0.17	0.19	0.4	0.45	0.166	0.109	<0.6	<0.6	0.245	0.496
<b>Metals</b>																		
Aluminium	mg/l	1 <sup>15</sup>	~1.48	<b>44</b>	<b>7</b>	<b>11.2</b>	<b>13.5</b>	<b>48.6</b>	<b>16.6</b>	<b>11.7</b>	<b>41.6</b>	<b>4.04</b>	<b>1.99</b>	<b>3.52</b>	<b>13.6</b>	<b>8.9</b>	~5.07	<b>16.4</b>
Lead	mg/l	0.015 <sup>13</sup>	<0.05	<b>0.18</b>	<0.2	<0.5	<0.5	<b>0.107</b>	<0.05	<0.05	<0.1	<0.1	<0.02	<0.02	<0.2	<0.2	<b>0.021</b>	<b>0.031</b>
<b>Metalloides</b>																		
Arsenic	mg/l	0.010 <sup>16</sup>	<0.05	<b>0.13</b>	<0.02	<0.05	<0.05	<b>0.074</b>	<b>0.056</b>	<0.05	<0.1	<0.1	<0.02	<0.02	<0.2	<0.2	0.024	0.039
Boron	mg/l																	
<b>Nonmetals</b>																		
Ammonia (as Nitrogen)	mg/l		~41	66	~350	~118	~370	5.9	78	6.9	11.8	~24	2.1	0.77	1.3	~56	15	23
Nitrate (as NO <sub>3</sub> <sup>-</sup> )	mg/l	45 <sup>1</sup>																
Nitrate (as NO <sub>2</sub> <sup>-</sup> )	mg/l																	
Nitrogen (Total)	mg/l	10 <sup>1</sup>																
Nitrogen (Total Kjeldahl)	mg/l																	
Ortho-Phosphorus	mg/l																	
Phosphorus (Total)	mg/l		~13.4	25.2	~24.1	~211	~160	13.1	11	8.84	13.9	~144	17.6	5	34.9	~24.2	15.7	20.3
Phosphate (as Phosphorus)	mg/l																	
<b>Organics</b>																		
Biochemical Oxygen Demand			45	200	95	800	1,400	230	260	73	170	11,000	190	27	6,700	1,800	540	810
Coliform (Total)	MPN																	
E. coli	MPN		39,726	967,680	48,384	110,000	55,100	282,720	1,480	8,720	99,240	>968,000	1,200	40	346,560	570,000	87,040	100,000
Organics Percentage	%																	
Total Organic Carbon	mg/l																	
<b>Physical Properties</b>																		
Chemical Oxygen Demand	mg/l																	
pH			~7.6	7.8	8.4	8.8	8.2	7.5	~7.8	~7.6	7.8	5.1	~7.5	7.7	7	6.8	5.4	5.8
Saturation	%																	
Specific Conductivity (EC)	µmhos/cm	900/1,600 <sup>2</sup>																
Total Dissolved Solids	mg/l	500/1,000 <sup>3</sup>	<b>900</b>	~200	<b>5,400</b>	<b>20,000</b>	<b>24,000</b>	~1,900	<b>2,700</b>	<b>1,300</b>	~2,000	<b>7,000</b>	<b>880</b>	430	~5,100	~3,400	<b>730</b>	<b>1,700</b>
Total Suspended Solids	mg/l		24	~2,200	67	3,700	8,500	~690	110	410	860	1,800	85	53	530	420	340	670

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State of Washington

Analyte	Unit	CA Title 22 CCR	Clean Washington Center Report No. CM-00-2			Clean Washington Center Compost Facility Runoff
			Yard Debris	Storm Water	Raw Sewage	Runoff
<b>Alkali Metals</b>						
Potassium	mg/l		170 - 4,500			167 - 4,640
Sodium	meq/l					
<b>Alkaline Earth Metals</b>						
Calcium	meq/l					
Magnesium	meq/l					
<b>Transition Metals</b>						
Copper	mg/l	1.0 <sup>17</sup>	0.07 - 0.8	0.1		0.033 - 0.821
Iron	mg/l	0.3 <sup>20</sup>				
Manganese	mg/l	0.05 <sup>14</sup>				
Nickel	mg/l	0.1 <sup>18</sup>				
Zinc	mg/l	5 <sup>19</sup>	0.1 - 1.5	0.6		0.107 - 1.490
<b>Metals</b>						
Aluminium	mg/l	1 <sup>15</sup>				
Lead	mg/l	0.015 <sup>13</sup>		0.4		
<b>Metaloides</b>						
Arsenic	mg/l	0.010 <sup>16</sup>				
Boron	mg/l					
<b>Nonmetals</b>						
Ammonia (as Nitrogen)	mg/l		23 - 1,600		12 - 50	32 - 1,600
Nitrate (as NO <sub>3</sub> <sup>-</sup> )	mg/l	45 <sup>1</sup>				
Nitrate (as NO <sub>2</sub> <sup>-</sup> )	mg/l					
Nitrogen (Total)	mg/l	10 <sup>1</sup>				0 - 8
Nitrogen (Total Kjeldahl)	mg/l		85 - 2,600		20 - 85	14 - 3,000
Ortho-Phosphorus	mg/l					0 - 90
Phosphorus (Total)	mg/l		10 - 170		6 - 20	4 - 170
Phosphate (as Phosphorus)	mg/l					
<b>Organics</b>						
Biochemical Oxygen Demand			390 - 3,200		100 - 300	20 - 3,200
Coliform (Total)	MPN					
E. coli	MPN			406x10 <sup>3</sup>		
Fecal Coliform	MPN		110 - 4.9x10 <sup>6</sup>		>10 <sup>6</sup>	200 - 24x10 <sup>6</sup>
Organics Percentage	%					
Total Organic Carbon	mg/l					
<b>Physical Properties</b>						
Chemical Oxygen Demand	mg/l					
pH						6.7 - 9.5
Saturation	%					
Specific Conductivity (EC)	µmhos/cm	900/1,600 <sup>2</sup>				52 - 2,100
Total Dissolved Solids	mg/l	500/1,000 <sup>3</sup>				
Total Suspended Solids	mg/l		2,000 - 20,000	130	100 - 350	1,100 - 19,600

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Analyte	Unit	CA Title 22 CCR	BioCycle Composting Facility Storm Water						United States Composting Council (USCC) Sampling Sites							
			Combined with Leachate			Separated from Leachate			1	2	3	4	5	6	7	8
			Pond 1	Pond 2	Pond 3	Separator	Pond 1	Bioswale								
<b>Alkali Metals</b>																
Potassium	mg/l															
Sodium	meq/l															
<b>Alkaline Earth Metals</b>																
Calcium	meq/l															
Magnesium	meq/l															
<b>Transition Metals</b>																
Copper	mg/l	1.0 <sup>17</sup>	0.69	0.036	0.048	0.06	ND	ND								
Iron	mg/l	0.3 <sup>20</sup>														
Manganese	mg/l	0.05 <sup>14</sup>														
Nickel	mg/l	0.1 <sup>18</sup>														
Zinc	mg/l	5 <sup>19</sup>	0.28	0.15	0.17	0.3	ND	ND								
<b>Metals</b>																
Aluminium	mg/l	1 <sup>15</sup>														
Lead	mg/l	0.015 <sup>13</sup>	<b>0.05</b>	<b>0.025</b>	ND	<b>0.05</b>	ND	ND								
<b>Metalloides</b>																
Arsenic	mg/l	0.010 <sup>16</sup>														
Boron	mg/l															
<b>Nonmetals</b>																
Ammonia (as Nitrogen)	mg/l		33	9	0.12	10	0.3	0.19								
Nitrate (as NO <sub>3</sub> <sup>-</sup> )	mg/l	45 <sup>1</sup>														
Nitrate (as NO <sub>2</sub> <sup>-</sup> )	mg/l															
Nitrogen (Total)	mg/l	10 <sup>1</sup>														
Nitrogen (Total Kjeldahl)	mg/l															
Ortho-Phosphorus	mg/l															
Phosphorus (Total)	mg/l		ND	ND	ND	ND	ND	ND								
Phosphate (as Phosphorus)	mg/l															
<b>Organics</b>																
Biochemical Oxygen Demand			442	121	13	97	14	13								
Coliform (Total)	MPN															
E. coli	MPN		5,000	3,000	30	1,600	ND	ND								
Organics Percentage	%															
Total Organic Carbon	mg/l															
<b>Physical Properties</b>																
Chemical Oxygen Demand	mg/l															
pH			7.5	7.5	8	6.54	7.8	7.6	8.84	9.67	8.64	9.25	8.09	8.2	9.19	9.59
Saturation	%															
Specific Conductivity (EC)	µmhos/cm	900/1,600 <sup>2</sup>	<b>2,400</b>	<b>1,700</b>	<b>1,200</b>	<b>900</b>										
Total Dissolved Solids	mg/l	500/1,000 <sup>3</sup>	<b>1,210</b>	<b>852</b>	<b>592</b>	462										
Total Suspended Solids	mg/l								47	110	500	180	2,520	92	164	174