



**Fact Sheet  
Calendar Year 2013  
Biosolids Land Application Program  
Moccasin Bend WWTP  
NPDES Permit No. TN 0024210  
City of Chattanooga, Tennessee**



**General**

The information contained in this fact sheet is based on information submitted to the EPA and state regulatory agencies as part of the 40 CFR Part 503 Annual Sludge Report for 2013. (40 CFR Part 503.18)

**Quantities Produced and Land Applied**

Annual Quantities

- 67,534 Wet Tons/year
- 27,070 Dry Tons/year
- 24,557 Dry Metric Tons/year

Monthly Quantities

<u>Month</u>	<u>Wet Tons</u>	<u>Dry Tons</u>	<u>Dry Metric Tons</u>
• January	2,632	1,073	973
• February	2,555	1,025	930
• March	4,017	1,710	1,552
• April	8,295	3,451	3,130
• May	8,655	3,423	3,105
• June	5,196	2,211	2,005
• July	4,353	1,852	1,680
• August	5,801	2,406	2,183
• September	6,035	2,473	2,244
• October	9,525	3,602	3,268
• November	6,322	2,355	2,137
• December	4,148	1,489	1,350

Quantities Land Applied by State

<u>State</u>	<u>Wet Tons</u>	<u>Dry Tons</u>	<u>Dry Metric Tons</u>
• TN	67,534	27,070	24,557

Quantities Land Applied by County

	<u>State</u>	<u>County</u>	<u>Wet Tons</u>	<u>Dry Tons</u>	<u>Dry Metric Tons</u>
•	TN	Bledsoe	26,983	11,305	10,256
•	TN	Grundy	7,745	3,150	2,858
•	TN	Hamilton	1,133	440	399
•	TN	Marion	6,282	2,609	2,367
•	TN	Meigs	1,271	534	484
•	TN	Rhea	20,096	7,500	6,804
•	TN	Sequatchie	4,024	1,531	1,389

**Land Application Area**

Total Acres Land Applied - By State

	<u>State</u>	<u>Acres</u>	<u>Hectares</u>
•	TN	5,024	2,033

Number of Farms and Total Acres Land Applied - By County

	<u>State</u>	<u>County</u>	<u>Acres</u>	<u>Hectares</u>	<u>Farms</u>
•	TN	Bledsoe	2,066	836	71
•	TN	Grundy	499	202	15
•	TN	Hamilton	75	30	3
•	TN	Marion	645	261	19
•	TN	Meigs	114	46	6
•	TN	Rhea	1,296	525	75
•	TN	Sequatchie	329	133	6

Total Historic Land Application Acreage - By State

	<u>State</u>	<u>Acres</u>	<u>Hectares</u>
•	AL	7,641	3,092
•	TN	26,421	10,692

Total Historic Land Application Acreage - By County

	<u>State</u>	<u>County</u>	<u>Acres</u>	<u>Hectares</u>
•	AL	Blount	1,079	436
•	AL	Cherokee	40	16
•	AL	DeKalb	1,888	764
•	AL	Etowah	170	69
•	AL	Jackson	2,210	894
•	AL	Madison	100	40
•	AL	Marshall	2,155	872
•	TN	Bledsoe	9,189	3,719
•	TN	Grundy	1,600	647
•	TN	Hamilton	3,071	1,243
•	TN	Marion	5,415	2,191
•	TN	Meigs	1,024	414
•	TN	Rhea	2,263	916
•	TN	Sequatchie	3,860	1,562

**Nutrient or Fertilizer Content**

Data are averaged over 103 sampling events in 2013.

N-P-K and Lime (Ca) Content (% Dry-Wt Basis)

• Total Nitrogen (N)	3.7%
• Organic Nitrogen (N)	3.5%
• Ammonia Nitrogen (N)	0.2%
• Phosphorous (P)	8.2%
• Potassium (K)	0.2%
• Calcium (Ca)	11.7%
• Calcium (CaO equiv.)	3.7%

Other Nutrient Content (% Dry-Wt Basis)

• Iron (Fe)	2.0%
• Boron (B)	0.0%
• Sulfur (S)	0.6%

Total Solids & pH

• Total Solids	47.12%
• pH (std. units)	11.98

## **Potential Value of Nutrients in Biosolids**

### Value of Commercial Nutrients

- Nitrogen (N) \$1,280 /Ton, 100-0-0
- Phosphorous as phosphate (P2O5) \$868 /Ton, 0-100-0
- Potassium as potassium oxide (K2O) \$1,019 /Ton, 0-0-100
- Ag Lime as calcium carbonate (CaCO3) \$37 /Ton, CCE=100

*Prices are scaled up as needed to represent the cost of "pure" nutrients: 100-0-0, 0-100-0, 0-0-100, and CCE=100, respectively.*

*Values are based on regional ag-coop prices, adjusted to include hauling and spreading costs for a typical corn grain crop.*

### Value of Nutrients in Biosolids

- Ammonia Nitrogen (NH4 as N) \$2.47 /Dry Ton
- Organic Nitrogen (as N) \$20.43 /Dry Ton
- Phosphorous as phosphate (P2O5) \$162.47 /Dry Ton
- Potassium as potassium oxide (K2O) \$3.57 /Dry Ton
- Ag Lime as calcium carbonate (CaCO3) \$2.45 /Dry Ton
- Total: \$191.39 /Dry Ton

*The current year's and the next two years' mineralization of Organic Nitrogen is used in determining its immediate value. In the first three years, only 45.3% of the Organic Nitrogen is plant available, and only that portion is being assigned monetary value in this calculation. The remaining portion, as well as the other tangible benefits of adding organics to soils, is not included.*

### Total Annual Value of Nutrients in Biosolids Provided to Farmers

- Nitrogen (NH4 and available OrgN as N) \$620,000
- Phosphorous as phosphate (P2O5) \$4,398,000
- Potassium as potassium oxide (K2O) \$97,000
- Ag Lime as calcium carbonate (CaCO3) \$66,000

*Only nutrients for which there is a net-crop need should be included in monetary valuation, on a field-by-field basis. Applications are Nitrogen-based, so the Nitrogen value should be included in its entirety. Liming of fields is typically necessary under normal farming operations, so the Ag Lime value should also be included in its entirety.*

## **Quality Assurance/Quality Control**

- Class B Biosolids (Pathogen Reduction 40 CFR 503.32) -- Biosolids may be land applied with stipulated restrictions and setbacks as defined in the regulations (40 CFR Part 503.14).
- Vector Attraction Reduction - Addition of Alkali (40 CFR 503.33(b)(6)) -- Biosolids are stabilized by the addition of lime kiln dust and raising the pH to greater than 12.0 for two (2) hours and retaining pH at or above 11.5 for an additional 22 hours as required by regulation.

1. Pollutant Concentrations (40 CFR Part 503.13 Table 3)

<u>Pollutant</u>	<u>Monthly Avg. Allowable conc. (mg/kg)</u>	<u>Measured Conc. (mg/kg)</u>	<u>% of Allowable Conc.</u>
Arsenic	41	3.62	8.8%
Cadmium	39	4.65	11.9%
Chromium	N/A	23.18	N/A
Copper	1,500	125.78	8.4%
Lead	300	18.45	6.1%
Mercury	17	0.21	1.2%
Molybdenum	N/A	13.76	N/A
Nickel	420	46.19	11.0%
Selenium	100	5.95	6.0%
Zinc	2,800	531.63	19.0%

Data are averaged over 103 sampling events in 2013.

2. Pathogens [40 CFR Part 503.32(a) and (b)]

Class A Biosolids

	<u>Annual Sampling Events</u>	<u>Avg Measured Conc.</u>	<u>Allowable Conc. (dry-wt basis)</u>
• <i>Salmonella</i>	15	<2.7	<3 MPN / 4 grams
• Viable Helminth Ova	15	<1	<1 Ova / 4 grams
• Fecal Coliform	69	<1000	<1,000 CFU / gram
• Enteric Virus	15	<1	<1 PFU / 4 grams

Class B Biosolids

	<u>Annual Sampling Events</u>	<u>Avg Measured Conc.</u>	<u>Allowable Conc. (dry-wt basis)</u>
• Fecal Coliform	69	<1000	<2,000,000 CFU / gram

CFU = Colony Forming Unit  
 MPN = Most Probable Number  
 PFU = Plaque Forming Unit

## **Monitoring Requirements**

- Minimum Monitoring Requirements (40 CFR Part 503.16, Table 1) -- For a plant generating greater than or equal to 15,000 metric tons per year, the required minimum monitoring frequency is once per month.
- City Monitoring Practices:

Total Solids, pH (grab samples)	Daily
Nutrients (N, P and K); Other Nutrients (Ca, Fe, B, and S) Regulated Metals; Fecal Coliform; and Total Solids (composite sample)	Once/Week
Pathogens for Class A and Class B biosolids	Once/Month
Pathogens (Dewatering Feed Solids)	Once/Quarter
PCB and TCLP	Once/Year

## **Production Methods**

- Wastewater Treatment Process:

The Moccasin Bend WWTP has a treatment capacity of 140 million gallons per day (MGD). The plant operates the following liquid treatment unit processes:

  1. Screening sand grit removal;
  2. Primary settling and scum removal;
  3. High purity oxygen activated sludge biological treatment;
  4. Final clarification;
  5. Chlorine disinfection;
  6. Sodium bisulfite dechlorination; and
  7. CSO/wet-weather treatment with a capacity of 80 MGD includes screenings and grit removal, polymer-aided primary treatment and chlorine disinfection.
- Biosolids Treatment Process:

The Moccasin Bend WWTP has dewatering capacity of 120 dry tons per day. If solids inventory require, dewatering processes can be ramped up to a capacity of 160 dry tons per day. The plant currently operates the following solids treatment unit processes:

  1. Gravity thickening of primary and waste-activated solids;
  2. Thermophilic/mesophilic anaerobic digestion of primary solids;
  3. Waste-activated solids are blended with digested primary solids;
  4. Chemical conditioning of blended solids with polymer followed by dewatering via two (2) 60 dry ton per day high "G" centrifuges or two (2) 50 dry ton per day low "G" centrifuges;
  5. Dewatered solids from the centrifuges are lime stabilized with lime kiln dust to produce Class B biosolids;
  6. A second dewatering process available consists of chemical conditioning of blended solids with lime slurry and ferric chloride followed by hot water vacuum filter presses capable of processing approximately 43 dry tons per day;
  7. The biosolids produced from these processes are combined and land applied on agricultural sites.

## **Other Considerations**

### *Environmental and Conserved Natural Resources Value*

- 484 tons of Nitrogen were recycled, rather than going to landfill.
- 19,700 mmBTU (million BTU) of natural gas was conserved, since farmers didn't need to purchase manufactured chemical fertilizer.
- That's 19,700,000 cubic feet of natural gas.
- If used to generate power, that natural gas could make 5,780,000 kW-hrs of electricity.
- That could run 352 typical 1875W hair dryers for a year.
- 1,190 tons of CO2 didn't end up in the atmosphere.