



## Biosolids Standards for Metals and Other Trace Substances

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Biosolids is a term for domestic wastewater sludge that meets standards for use as a fertilizer or soil conditioner. Biosolids standards include limitations for metals and other trace substances, pathogen reduction, vector requirements and best management practices. This publication outlines requirements for metals and other trace substances.

Applying biosolids to land uses the available nitrogen, phosphorus and potash as fertilizer for growing crops. It is an environmentally-sound practice, sanctioned by the U.S. Environmental Protection Agency (EPA) and the Missouri Department of Natural Resources (DNR).

### Background

EPA regulations, under Title 40 Code of Federal Regulations Part 503 (40 CFR 503), establish the minimum national standards for the use and disposal of domestic sludge. The standards include limitations for the land application of biosolids.

The DNR incorporated the EPA standards into the state requirements under the Missouri Clean Water Law and regulations. The state rules also include additional requirements not covered in the EPA standards. Complying with state regulations automatically meets the EPA standards.

### Standards for biosolids land application

The amount of metals and other pollutants in the biosolids determines the acceptability for land application and loading rates that will protect crops, soils and the environment.

There are concentration-based limits and pounds-

per-acre limits. State guidelines for trace compounds also apply when an EPA standard has not been published for a specific pollutant.

### Ceiling concentration

You may apply biosolids on land if the ceiling concentrations are not exceeded (see Table 1). When necessary, it is permissible to mix the material with lower concentration biosolids or other suitable materials, such as sawdust, to meet the concentration limits.

### Low metals concentration

Low metals-concentration biosolids have reduced requirements because of their higher quality (see Table 2). You may safely apply these biosolids for 100 years or longer at typical agronomic loading rates. Records are required for each application site.

Biosolids ceiling concentration*	
Pollutant	(mg/kg dry weight)
Arsenic	75
Cadmium	85
Chromium	3,000
Copper	4,300
Lead	840
Mercury	57
Molybdenum	75
Nickel	420
Selenium	100
Zinc	7,500

\*Do not exceed two dry tons per acre per year if the sludge concentration exceeds any of these limits.

Table 1. Concentration-based limits (40 CFR 503).

Concentration limits for unrestricted use (non-tracking of sites) is established on a case-by-case basis by DNR.

<b>Biosolids low metals concentration*</b>	
<b>Pollutant</b>	<b>(mg/kg dry weight)</b>
Arsenic	41
Cadmium	39
Chromium	1,200
Copper	1,500
Lead	300
Mercury	17
Molybdenum	18
Nickel	420
Selenium	36
Zinc	2,800

\*You may apply low metals biosolids without tracking cumulative metals limits, provided the cumulative application of biosolids does not exceed 500 dry tons per acre.

Table 2. Biosolids low metals concentration (40 CFR 503).

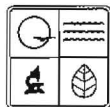
## Pounds-per-acre limits

Each pollutant in Table 3 has an annual and a total cumulative loading limit, based on the allowable pounds per acre for various soil categories. See Table 4 for pollutants that do not have a published EPA standard.

<b>Pollutant</b>	<b>Pounds per acre limits by soil Cation Exchange Capacity (CEC)</b>					
	<b>CEC 15+</b>		<b>CEC 5-15</b>		<b>CEC 0-5</b>	
	<b>Annual</b>	<b>Total*</b>	<b>Annual</b>	<b>Total*</b>	<b>Annual</b>	<b>Total*</b>
Arsenic	1.8	36.0	1.8	36.0	1.8	36.0
Cadmium	1.7	35.0	0.9	9.0	0.4	4.5
Chromium	133.0	2,670.0	100.0	1,000.0	50.0	500.0
Copper	66.0	1,335.0	25.0	250.0	12.0	125.0
Lead	13.0	267.0	13.0	267.0	13.0	133.0
Mercury	0.7	15.0	0.7	15.0	0.7	15.0
Molybdenum	0.8	16.0	0.8	8.0	0.8	8.0
Nickel	19.0	347.0	19.0	250.0	12.0	125.0
Selenium	4.5	89.0	4.5	44.0	1.6	16.0
Zinc	124.0	2,492.0	50.0	500.0	25.0	250.0

\*Total cumulative loading limits for soils with equal or greater than 6.0 pH (salt-based test).

Table 3. Pounds per acre limits by soil Cation Exchange Capacity (CEC in milliequivalents/100 grams) (Missouri Department of Natural Resources).



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## Guidelines for land application of other trace substances<sup>1</sup>

<b>Pollutant</b>	<b>Cumulative loading Pounds per acre</b>
Aluminum	4,000*
Beryllium	100
Cobalt	50
Fluoride	800
Manganese	500
Silver	200
Tin	1,000
Dioxin	(10 ppt in soil)**
Other substance	***

(1) *Design of Land Treatment Systems for Industrial Waste*, 1979. Michael Ray Overcash, North Carolina State University and *Land Treatment of Municipal Wastewater*, EPA, 1981.

\*This applies to a soil with a pH between 6.0 and 7.5 (salt-based test). Case-by case review is required for higher pH soils.

\*\*Total Dioxin Toxicity Equivalents (TEQ) in soils, based on a risk assessment under 40 CFR 744, May, 1991.

\*\*\*Case-by-case review. Concentrations in sludge should not exceed the 95th percentile of the National Sewage Sludge Survey, EPA, October 1989.

Table 4. Guidelines for land application of other trace substances.