



U.S. Environmental Protection Agency Biosolids Program



Elizabeth Resek, Biosolids Lead
Office of Water, Office of Science and Technology
Health and Ecological Criteria Division



Meeting CWA Requirements

Section 405(d) of the Clean Water Act (CWA) requires EPA to:

Establish numeric limits and management practices that protect public health and the environment from the reasonably anticipated adverse effects of chemical and microbial pollutants during the use or disposal of sewage sludge.

Review biosolids (sewage sludge) regulations every two years to identify additional toxic pollutants that occur in biosolids (i.e., biennial reviews) and set regulations for those pollutants if sufficient scientific evidence shows they may harm human health or the environment.



PFOA and PFOS Biosolids Risk Assessments

- The EPA completed problem formulation for PFOA and PFOS in biosolids.
 - Identified in EPA PFAS Action Plan: <https://www.epa.gov/pfas/epas-pfas-action-plan>

- Problem formulation is part of risk assessment (RA) framework:
 - Articulates the purpose for assessment.
 - Defines problem.
 - Determines conceptual plan for analyzing and characterizing risk (EPA 2014, EPA 1998).

- Problem formulation provides information on:
 - Chemical's sources and occurrence.
 - Fate and transport in the environment.
 - Toxicological characteristics and factors affecting toxicity.
 - Analysis plan describing the scientific approach.

- Includes engagement with states and tribes, risk managers, scientists, and members of the biosolids community regarding foreseeable science and implementation issues.



Modeling Approach

- Currently under development for presentation to the EPA Science Advisory Board in 2021
 - Prioritization approach
 - Biosolids Screening Tool for deterministic, screening-level assessment
 - Probabilistic Risk Assessment framework for chemicals that fail at the screening level
- Modeling for biosolids will be based on publicly available, previously peer-reviewed models for leaching, runoff, erosion, air dispersal, and plant uptake to the greatest extent possible
- Approach for PFAS will be consistent, to the extent appropriate, with all other chemical risk assessment for biosolids



Next Steps

- Problem Formulation
 - Meetings completed December 2020
 - Draft document Spring 2021
- Science Advisory Board review of modeling approach Spring 2021
- Risk Assessment – estimated completion in 2022 for internal review, followed by public comment
- If EPA determines that PFOA or PFOS in biosolids may adversely affect public health or the environment, risk managers will consider options for numerical limitations and best management practices for these compounds (as there are with current Part 503 pollutant limits).
 - If regulatory limits are advised, they will go through a standard regulatory process including inter-Agency and OMB review as well as public comment.



Biosolids Biennial Reviews

- Review publicly available information on occurrence, fate and transport in the environment, human health and ecological effects, and other relevant information for pollutants found in biosolids.
- Data may be used to conduct risk screens and refined risk assessments for pollutants found in biosolids.
- Biosolids Biennial Report No.8 (reporting period 2018-2019) now posted. <https://www.epa.gov/biosolids/biennial-reviews-sewage-sludge-standards>



Biosolids List in EPA's CompTox Chemicals Dashboard

- Biosolids List in EPA's publicly available **CompTox Chemicals Dashboard** was curated from past biennial reviews and sewage sludge surveys representing the Agency's understanding of chemicals found in biosolids.
https://comptox.epa.gov/dashboard/chemical_lists/BIOSOLIDS
- CompTox Chemicals Dashboard primer videos:
<https://www.epa.gov/chemical-research/comptox-chemicals-dashboard-primer-videos>



LIST: Chemicals in biosolids

Search BIOSOLIDS Chemicals

Identifier substring search

Window Snip

List Details

Description: Biosolids are produced from wastewater treatment processes and can be beneficially used. The Clean Water Act (CWA) Section 405(d)(2)(C) requires the EPA to review federal biosolids standards every two years to identify additional toxic pollutants that occur in biosolids and set regulations for those pollutants if sufficient scientific evidence shows they may harm human health or the environment. The [biennial review process](#) is intended to fulfil the CWA requirement to identify additional pollutants that occur in biosolids. This list of chemicals is assembled from multiple biennial review documents containing peer-reviewed literature and the results of [three national sewage sludge surveys](#). Regulatory limits for pollutants in biosolids are defined in [40 CFR Section 503.13](#), which contains numerical limits, for nine metals (i.e., arsenic, cadmium, copper, lead, mercury, molybdenum, nickel, selenium, and zinc). To view all the microbial pollutants found in biosolids see Table A-2. Microbial Pollutants Identified in Biosolids in the [2016-2017 Biennial Review](#).

Number of Chemicals: 395

395 chemicals

Select all

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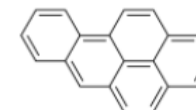
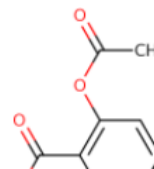
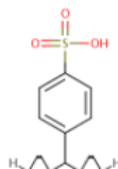
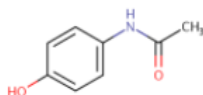
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Stakeholder Engagement

Biosolids Webinar Series

- Kicked-off in Fall 2019.
- Register for future webinars on EPA's biosolids website:
<https://www.epa.gov/biosolids>

EPA Biosolids Website

- Completely overhauled and launched in July 2020.

EPA Commitment to Continued Engagement

- Participation in stakeholder-led meetings and calls.
- Follow-up to December 2020 meeting.

<https://www.epa.gov/biosolids/epa-national-biosolids-meeting-summary-december-8-10-2020>



Additional Activities

National Defense Authorization Act Interim Guidance on Destruction and Disposal of PFAS and PFAS-Containing Materials

- Completed December 2020 and went out for public comment.
- EPA Biosolids Team participated on Agency-wide workgroup.

Resource Recovery

- A consistent process for evaluating products derived from sewage sludge that are intended for land application is needed.
- 40 CFR Part 503 does not consider or anticipate current and future innovative resource recovery technologies and products.
- Work in this area is ongoing.



EPA Office of Research and Development Biosolids Research

**Pathogen
and Vector
Attraction
Reduction**

Inform the update to the *“Environmental Regulations and Technology: Control of Pathogens and Vector Attraction in Sewage Sludge”* report (EPA/625/R-92/013).

**ARBs
and ARGs**

Evaluate types and prevalence of antibiotic resistant bacteria (ARB) and antibiotic resistance genes (ARGs) in biosolids to inform management strategies.

**Emerging
Contaminants
(CECs)**

Application of non-targeted analysis to municipal wastewater and residuals and method development and evaluation of CECs in wastewater and biosolids.



EPA Office of Research and Development Biosolids Research

PFAS Analytical Methods

Development and validation of a PFAS isotope dilution method for biosolids.

- Collaboration with DoD
- 40 different PFAS
- Single validation data collection is complete

PFAS Prevalence and Pretreatment

Research on the occurrence, fate, and transport of PFAS in wastewater treatment plants and biosolids. Identify sources and evaluate pretreatment strategies.

Treatment Strategies

Treatment strategies for biosolids, including incineration and pyrolysis.



EPA Office of Research and Development Biosolids Research

Risk Assessments

Provide OW-OST with information to support the development of chemical risk assessments.

- Computational toxicology
- Evaluate chemicals in biosolids for risk assessment prioritization

Contaminants and Land Application

Characterize contaminants in land applied biosolids.

- Liquid and solid forms
- Metals and coliforms
- Emerging contaminants (alkylphenol ethoxylates, PFAS)
- Leaching test methods

Contaminants and Soils

Characterization of soils by evaluating contaminants (PFAS, PAH, metals) as a function of loading and soil depth.



Biosolids Related Research Grants

🔹 **National Priorities RFA (Closed January 5, 2021): Evaluation of Pollutants in Biosolids**

🔹 **Awarded Grants: Practical Methods to Analyze and Treat Emerging Contaminants (PFAS) in Solid Waste, Landfills, Wastewater/Leachates, Soils, and Groundwater to Protect Human Health and the Environment**

🔹 **Awarded National Priorities Grants: Research on PFAS Impacts in Rural Communities and Agricultural Operations**



Biosolids Research Gaps

- Based on future occurrence evaluations, assess the fate and transport of emerging contaminants (including PFAS) in land-applied biosolids.
- Examine the destruction of emerging contaminants in alternative biosolids management processes (e.g., thermal treatment).
- Develop frameworks for emerging contaminant risk management in agriculture (e.g., reducing plant uptake).
- Characterize biochar derived from the pyrolysis of biosolids and develop frameworks for beneficial use.
- Compare/contrast pyrolysis and alternative technologies (e.g., E-Beam) with existing management strategies using lifecycle assessment approaches.
- Assess microbial contamination of surface and groundwater after land application of biosolids



Thank You!

Biosolids Team

Liz Resek, Lead resek.elizabeth@epa.gov

Elyssa Arnold arnold.elyssa@epa.gov

Tess Richman, ORISE Fellow richman.tess@epa.gov

Lauren Questell, ORISE Fellow questell.lauren@epa.gov