

An Investigation into Biosolids Sampling and Handling Methods for U.S. EPA-Approved Microbial Detection Techniques

Biosolids are highly processed materials produced from the solid residual byproducts (sludge) of wastewater treatment operations. They are often used as a fertilizer or soil amendment.

One important goal of wastewater and solids treatment is to reduce the potential pathogenic activity of bacteria, viruses, and other microorganisms found in untreated wastewater. Protecting human health and the environment depends in large part on monitoring to detect and quantify pollutants in sewage sludge and processed and treated solids (i.e. biosolids).

Although the precision and accuracy of laboratory methods used to quantify constituents in biosolids has been a subject of emphasis, errors, and variability in the data that result from differences in sampling and handling practices can be overlooked. This research found that sample collection practices vary widely among wastewater utilities and that available sampling guidance may be somewhat inconsistent. Some guidance contains conflicting details or offers insufficient detail on the specifics of proper sample collection and handling procedures for measuring microbial content in biosolids materials. The research team explored a wide range of practices:

- The necessity for purging pipes/spigots prior to collecting liquid samples, and associated alternatives.
- Frequency and location of sample collection relative to data quality.
- Effectiveness of sampling tools and containers for both collection and handling prior to analysis.
- Implications of proper sample containment, storing, and cooling procedures.
- Sterilization procedures; implications of sample composites versus discrete samples in terms of representativeness of samples for biosolids that have been stored.
- Suitability of multiple microbial measures.

Sampling Guidance Supports Part 503 Sewage Sludge Regulations

Consistent insights into the practicality and applicability of various protocols can result in more reliable microbial measurements which, in turn, promote regulatory and stakeholder confidence.

This research developed scientifically defensible approaches for collecting and handling representative biosolids samples intended for microbial analysis. The project team examined the current practices and optional strategies in sampling and handling biosolids or processed sludge against a background of regulatory compliance via microbial testing. The result is guidance on the best approaches for sampling and handling three types of biosolids materials – liquid, cake and compost – to best assure protection of human health and the environment.

The researchers recommend that testers collect multiple discrete samples from each batch of biosolids and analyze each for microbial content. They recommend collecting three to ten samples, if staff and budgets allow. Have a cooler available at the sampling



This research developed scientifically defensible approaches for collecting and handling biosolids samples used for microbial analysis.

BENEFITS

- Provides guidance on collecting representative samples of biosolids for testing.
- Describes methods for identifying presence of non-compliant Class A or Class B pockets of biosolids.
- Helps WWTPs make informed choices when designing a sampling strategy that fits their facility's processes and material flow configuration.

RELATED PRODUCTS

Examination of Reactivation and Regrowth of Fecal Coliforms in Centrifuge Dewatered Anaerobically Digested Sludges (03CTS13T)

Evaluation of Bacterial Pathogen and Indicator Densities After Dewatering of Anaerobically Digested Biosolids: Phase II & III (04CTS3T)

Biosolids Quality Control and Quality Assurance Procedures, Managing Microbial Populations: Guidance for Samplers (04HHE7FG)

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point. Put one-liter samples in sterile containers and place on ice immediately. For process monitoring, collect samples after the last treatment process when the biosolids are being mixed or are in motion, e.g., as liquid or cake is transported to storage. Sample analysis should begin soon after sample.

WERF Responds to Samplers' Need for Training Tools and Materials

A survey and beta test of this project underlined the importance of accurately conveying technical, regulatory, and science-based information to extremely diverse audiences, particularly where high performance and public confidence are goals.

The survey of utilities found some gaps in sampler practices and training:

- Actual sampling practices varied widely as did batch sizes and sampling quantities. There appears to be little if any differences in sampling methods for Class A and Class B material.
- 78% of samplers learned sampling technique from a demonstration by another utility employee before they began collecting samples for microbial analysis on their own. However, only 51% indicated that they had actually collected samples with any supervision before “soloing.”
- Few utilities used charts or pocket guides as a training tool. Many managers and samplers cited the need for more in-depth soil and biosolids sample procedures.

The overall survey results suggest that protocols, instructions, and communication strategies must be appropriate for a diverse audience, but should give special attention to plant technicians. Sampling methods and training approaches should be simplified to the extent possible without compromising effectiveness. Improving the communications among and between professionals within the industry, as well as creating more consistent guidance and training tools, could help improve accountability and implementation of proper practices.

The research team used feedback from the beta testing to create several tools and products, including a sampling guide designed for field use at actual sampling locations, *Biosolids Quality Control and Quality Assurance Procedures, Managing Microbial Populations: Guidance for Samplers* (O4HHE7FG). The field guide is available at www.werf.org.

Sampling Tips

- Compost and other solid products stored in piles should be sampled after first removing the top 6” of material.
- Analyzing multiple discrete samples of biosolids is more effective for identifying variability in microbial content of different batches of biosolids processed than is the analysis of composite samples.
- Collecting and analyzing samples collected on multiple days helps obtain a more “representative” sample and helps capture biosolids variability.
- One-liter samples, as specified in U.S. EPA Methods 1680, 1681, and 1682 for biosolids analysis, are adequate in size and require relatively short cooling times.

CONTRACTORS

Sharon C. Long, Ph.D.
Wisconsin State Laboratory of Hygiene and University of Wisconsin (previously with the University of Massachusetts)

Victor D'Amato, PE, MSEE
Tetra Tech, Inc. (previously with ARCADIS U.S., Inc.)

PROJECT TEAM

Anita Bahe, Ph.D.
Glenn Cassidy, Ph.D.
Lynx Group International, LLC

Leah D. Cronan
Nicholas S. Keuler, M.S.
Kristine L. Lund
Jun Zhang
University of Wisconsin

Justin DeMello
Cora Olson
University of Massachusetts

Robert Rubin, Ph.D.
North Carolina State University

James P. Scisson, Jr.
URS Consultants (formerly with ARCADIS U.S., Inc.)

PROJECT SUBCOMMITTEE

William Cairns, Ph.D. (Chair)
Trojan Technologies, Inc.

Randi McCuin
Clancy Environmental Consultants, Inc.

Nancy Penney
Water Corporation of Western Australia

Geeta Rijal, Ph.D.
Metropolitan Water Reclamation District of Greater Chicago

Daniel R. Shelton, Ph.D.
USDA/ARS/NRI/ECL

James Smith, Jr., D.Sc.
U.S. EPA-NMRL

Prakasam Tata, Ph.D., Q.E.P.
Tata Associates International

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