EXECUTIVE SUMMARY

WERF

WATER ENVIRONMENT RESEARCH FOUNDATION

BIOSOLIDS

Evaluation of Best Management Practices for Sustainable Groundwater Protection at Biosolids Land Application Sites

More than half of the biosolids produced in the United States is used as a fertilizer or as a soil amendment. The intent of this research was to assist wastewater utilities, environmental regulators, and other biosolids stakeholders in evaluating the effectiveness of biosolids land application best management practices (BMPs) to mitigate the potential risk of groundwater contamination at biosolids land application sites.

This report can assist wastewater utilities, environmental regulators, and other stakeholders evaluate the effectiveness of biosolids land application best management practices (BMPs).

Advances in Risk Assessment Methodology Prove Useful

All biosolids land application activities must comply with Title 40 of the Code of Federal Regulations (40 CFR) Part 503 – "Standards for the Use or Disposal of Sewage Sludge" rule. During the development of Part 503, the U.S. Environmental Protection Agency (EPA) evaluated 14 fate and transport pathways by which humans and ecological receptors could become exposed to pollutants contained in land applied biosolids. Two of the pathways were: 1) pollutant exposure through public consumption of well water that was contaminated by pollutants from biosolids; and 2) pollutant exposure through public consumption of surface water that was contaminated by surface runoff or through impaired groundwater. While neither of these pathways was originally found by the EPA to be the limiting pathway for setting the Part 503 pollutants limits, utilities and practitioners have indicated interest in continuing to provide assurance that groundwater is protected at land application sites.

To draw scientifically defensible conclusions regarding the efficacy of BMPs to protect groundwater quality, the full range of implemented BMPs at biosolids land application sites would be evaluated. Moreover, the range of environmental factors that may impact BMP effectiveness in protecting groundwater resources (including those that may be exacerbated by global climate change) should be considered when characterizing the potential risks associated with biosolids land application to groundwater quality. These environmental factors include soil type, climatic conditions, and vegetative cover. Given the vital importance of protecting public health and the environment from any reasonably anticipated adverse effects associated with biosolids beneficial use, WERF undertook this study to provide biosolids stakeholders with the latest scientific information to support biosolids management decisions regarding groundwater protection.

WERF Provides a Risk Characterization Screening Tool (RCST)

EPA recently developed the Multimedia, Multi-pathway, Multi-receptor Exposure and Risk Assessment (3MRA) technology, which is a first generation screening level risk assessment tool. With its land application unit (LAU) model, 3MRA enables users to conduct screening-level risk-based assessments of potential human and ecological health risks resulting from long-term (chronic) exposure to pollutants released from land-based waste management units, including biosolids land application sites. The Utah Water

BENEFITS

- Describes the range of groundwater protection BMPs currently in practice.
- Highlights the role of environmental factors and biosolids beneficial use operational practices that can potentially impact groundwater quality.
- Provides an interactive, computer-based Risk Characterization Screening Tool to assess potential groundwater impacts from land application and apply BMPs.
- Offers technical guidance for applying the RCST methodology in estimating the potential impact of: 1) extreme environmental conditions (particularly those influenced by global climate change), 2) risk uncertainty, 3) nutrient loadings, and 4) biosolids "microconstituents" on groundwater quality

RELATED PRODUCTS

Assessing Bioavailability of Metals in Biosolids-Amended Soils: Root Exudates and their Effects on Solubility of Metals (97REM5)

RELATED ONGOING RESEARCH

Biosolids Pathogens Research Challenge (SRSK2R08, SRSK3R08)

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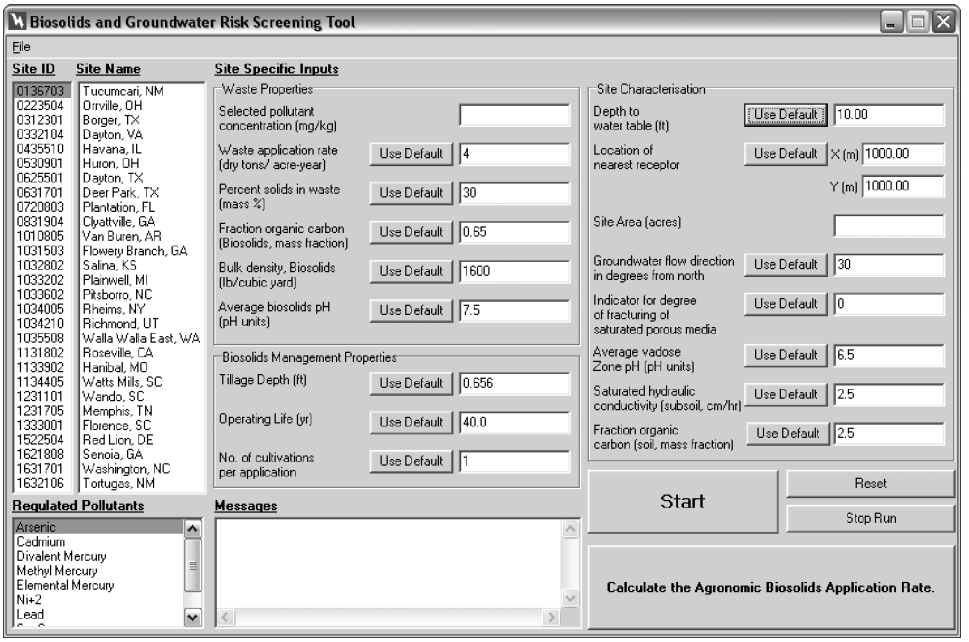

A View of the Biosolids and Groundwater Risk Characterization Screening Tool (RCST).

Research Laboratory, in conjunction with EPA Region 8 and the Utah Division of Water Quality, developed a computer-based biosolids groundwater risk characterization screening tool (RCST) based on the 3MRA technology. The output of the RCST is a non-carcinogenic human health risk estimate based on groundwater ingestion.

To execute the RCST, the user provides regulated biosolids pollutant concentration data, biosolids application rate, distance to nearest receptor, site area, and depth to water table. The user then selects one of 28 sets of environmental data (soils, climate, hydrogeology, etc.) that is most similar to biosolids land application site being evaluated. The RCST then computes a hazard quotient (HQ) for each pollutant selected by the user.

A HQ value of less than one indicates the potential non-carcinogenic health risk associated with groundwater quality impairment by that particular pollutant is negligible at the specific conditions analyzed. A HQ value that is equal to or greater than one suggests the possibility that biosolids land application practice is impairing groundwater quality and may represent a significant risk to public health.

The HQ values were found to be significantly less than one, even when the concentrations of regulated biosolids pollutants were raised to a level equivalent to 10X the ceiling concentration limit specified in the Part 503 regulations. Only under extreme biosolids application and pollutant concentration conditions would possible risks be unreasonable with regard to the protection of public health.

The RCST is available to biosolids stakeholders, through computer software and an instruction manual on a compact disk (CD) which are included with the report. Once opened, the CD automatically loads the user-friendly software onto the user's computer desktop. Easy-to-follow instructions embedded in the software help the user navigate through the system set-up and allow the user to execute the software using default or site-specific data.

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Hampton Roads Sanitation District – Virginia Beach, Virginia

Columbus Water Works – Columbus, Georgia

City of Lansing Water Reclamation Facility – Lansing, Michigan

Fourche Creek Wastewater Treatment Plant – Little Rock, Arkansas

Central Valley Wastewater Treatment Plant – Salt Lake City, Utah

Four Mile Creek Wastewater Treatment Facility – Wichita, Kansas

Truckee Meadows Water Reclamation Facility – Reno, Nevada

Southwest Wastewater Treatment Facility – Philadelphia, Pennsylvania

West Point Wastewater Treatment Plant – Seattle, Washington