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science in ACTION
INNOVATIVE RESEARCH FOR A SUSTAINABLE FUTURE

Robert S. Kerr Environmental Research Center

Ada, OK

Introduction

The Robert S. Kerr Environmental Research Center (RSKERC) in Ada, Oklahoma, is EPA's center of expertise for groundwater remediation and ecosystem restoration research. RSKERC provides critical research in response to EPA office, partner, and stakeholder needs. This research is led by the Ground Water and Ecosystems Restoration Division (GWERD), an EPA research and development division headquartered in RSKERC. GWERD directly supports three of EPA's six National Research Programs that provide the scientific foundation needed to protect public health and the environment:

- Sustainable and Healthy Communities
- Safe and Sustainable Water Resources
- Chemical Safety for Sustainability

GWERD scientist analyzing water samples for nitrate/nitrite

Facility and Staff

Main campus: The 16-acre main campus includes the RSKERC building, the annex, and an addition containing the library and conference center. It also includes facilities for storing compressed gases, bulk chemicals and hazardous waste. Combined it contains over 80,000 ft^2 of laboratory, office, storage, and support space.

Gaar Corner: RSKERC's 110-acre field site, located 14 miles west of the main campus, provides an additional 3,000 ft^2 of research, laboratory, shop and storage space.

Staff: RSKERC houses 46 federal employees and about 45 contractors, students, and post-docs. Over 80% are research staff. The remainder provide critical technical and administrative support.

Capabilities

RKSERC contains state-of-the-science laboratories, analytical equipment, instrumentation, and field equipment used to study the transport and transformation of contaminants in soil, groundwater, and surface water.

Field equipment for specialized subsurface investigations are maintained for subsurface investigations of soil, subsoil, vadose zone, and groundwater. These include geotechnical probes for rotary, direct-push, and percussion techniques to explore and sample the subsurface environment.

General Parameters Laboratory is equipped with capillary ion electrophoresis and flow injection analyzers used to analyze water samples and soil extracts for nutrients and other constituents. It contains mass spectrometers used to measure stable isotopes and employs automated techniques for carbon analysis of solid and liquid samples.

RSKERC Capabilities (Cont.)

Scanning Electron Microscope (SEM) Laboratory houses SEM/Energy Dispersive X-Ray (EDX) microscopes used to examine a wide range of sample types and element concentrations and their spatial distributions in solid samples.

Trace Gas Laboratory is equipped with gas chromatographs and mass spectrometers used to analyze water samples for dissolved gases and soil and water samples for greenhouse gases.

Metals Laboratory contains inductively coupled plasma (ICP)-optical emission spectrometry and ICP-mass spectrometry instruments used to analyze aqueous and solid samples for trace metals and metalloids.

Gaar Corner includes a mixture of woodlands, open fields, and ponds for ecosystem and groundwater research studies. It contains three logging wells, a calibration well, three monitoring wells, and a leak test well for testing equipment to assess well integrity.

Technical Support and Assistance

The Ground Water Technical Support Center (GWTSC), headquartered in RSKERC, provides technical support and assistance on remediation of groundwater and subsurface contamination to EPA and EPA partners. GWTSC technical assistance activities focus on assessing and cleaning up groundwater, aquifer materials, and soils. GWTSC's field scientists and technicians travel nationwide to drill and install monitoring wells, gather soil core samples, and sample groundwater. Model expertise is provided to EPA and other users by the **Center for Subsurface Modeling Support.**

GWERD scientists installing monitoring wells in Rhode Island

Science Contributions

RSKERC's research supports the development of strategies and technologies to protect and restore groundwater, surface water, and ecosystems affected by human-made and natural events. RSKERC researchers develop technologies and strategies that lay the groundwork for new policies and procedures needed to assess, protect, and cleanup contaminated water resources and ecosystems.

Active research topics include:

- Private drinking water well vulnerability to contamination from leaking underground storage tanks.
- Tools to estimate contaminant concentrations and movement to improve site cleanup.
- Effects of green infrastructure stormwater controls on the subsurface environment.
- Improved guidelines for aquifer exemptions granted at subsurface mining systems.
- New and improved technologies and strategies to assess and clean up contaminated sites.
- Models to understand potential sources of nitrogen enrichment in watersheds.
- Decision support systems and models to understand and quantify final ecosystem goods and services.
- Fertilizer management effects on nitrate in groundwater.
- Fate and transport of nanomaterials in the subsurface.

Notable scientific products and achievements include:

- Case studies addressing hydraulic fracturing impacts on drinking water at five sites.
- Pioneering or testing many of the modern techniques used to clean up Superfund sites and other contaminated environments.
  - Improved cleanup techniques for non-aqueous phase liquids in subsurface environments.
  - Advances in the use of chemical oxidation, chemical raduction, bioremediation, thermal treatment, and nanomaterials.
  - Permeable reactive barriers and monitored natural attenuation to remediate metal, chlorinated solvent, and other organic pollutant contamination.
- Pioneering or testing new techniques to achieve Clean Water Act Goals.
  - Pinpointing the effects of concentrated animal feeding operations on groundwater quality.
  - New stream, floodplain, and riparian zone restoration techniques.

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