SRNL is a DOE National Laboratory
operated by Savannah River Nuclear Solutions.

We put science to work.™

Innovations

from Savannah River National Laboratory

U.S. DEPARTMENT OF ENERGY • SAVANNAH RIVER SITE • AIKEN • SC

srnl.doe.gov

Partners in Success

National Laboratories
Savannah River National Laboratory
Lawrence Berkeley National Laboratory
Pacific Northwest National Laboratory
Sandia National Laboratory

Department of Energy
Office of Environmental Management
Savannah River Operations Office

Universities
Clemson University
Oregon State University
North Carolina State University
Cornell University

Contractors
Savannah River Nuclear Solutions

Commercial
GSI Environmental
EOS Remediation
Redox-Tech

Other Government Agencies
U.S. Environmental Protection Agency
S.C. Department of Health and Environmental Control
U.S. Geological Survey
Interstate Technology

Office of Science Contributions

- Basic science on the geochemistry, mobility, precipitation and sorption of target contaminants such as radioactive strontium, uranium and iodine
- Push-pull testing of subsurface conditions
- Alternatives for future system modifications and refinements (e.g., humate and alkaline silicates)

Contact Information
SRNL Office of Communications
803.725.4396

Engineered groundwater solutions provide sustainable remediation

This innovative solution provides a more energy efficient and sustainable approach to protect the environment from the spread of hazardous chemicals. Where treatment of contaminated groundwater currently requires the active, expensive, and energy intensive process of pumping water to the surface for treatment, this new approach demonstrates that natural groundwater flow can be engineered to create groundwater retention and treatment zones where specifically designed geo-chemical processes can be used to permanently capture hazardous material in place. Successful application of this approach has been demonstrated at the DOE Savannah River Site, exceeding all regulatory expectations, saving hundreds of millions of dollars, and shaving years off of the remediation schedule. This safe, low-cost technology has the potential to be used worldwide to remediate contaminated groundwater

The Problem

The decommissioning of F Area at SRS involves long-term remediation management of a complex chemical/radiological contaminant plume that could impact the surrounding Savannah River water drainage. A pump and treat system had been deployed, but the cost and effectiveness of that approach was not meeting EM program needs and local regulatory requirements.

Limits of Current Practice

The standard practice for remediating metals and long-lived radionuclides in groundwater is to drill wells at the perimeter of a groundwater plume, pump the contaminated water to the surface, and treat that water to remove contaminants. The process incurs risk of exposure to workers and generates a secondary waste stream that must be managed. This system is expensive to operate, time intensive, and labor intensive. The standard practice works, but was limited in meeting goals in a cost effective manner. Through collaboration and innovative thinking, a better approach is now available that lets the water be treated underground, without the expense or exposure risk associated with bringing it to the surface.

New Approach

The concept is simple, find a way to work with the natural flow of underground water instead of fighting against it. By increasing the retention time that water is able to stay in a specific zone, the hazardous material can be treated in place, without ever being brought to the surface.

Savannah River National Laboratory™
OPERATED BY SAVANNAH RIVER NUCLEAR SOLUTIONS

Savannah River NUCLEAR SOLUTIONS℠
FLUOR • NEWPORT NEWS NUCLEAR • HONEYWELL

Innovations from Savannah River National Laboratory

New Approach *(continued)*

Engineered structures are designed to work with the natural groundwater flow fields. "Gates" or underground dams are inserted into the contaminated area. These gates allow for the injection of a solution into the water to stabilize metals. At the Savannah River Site, the injection material (silver chloride) was used to capture iodine-129. This simple injection system is used to deliver the solution to specific areas in the contaminated plume. Groundwater monitoring was also developed and deployed in order to verify the effectiveness of this passive, natural approach.

Installation of funnel and gate controls for groundwater treatment

F Area Funnel and Gate, Base Injection

Return on Investment ~$415 Million

1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008

EM Funding: $1.2M

Development

Concept Development

- Concept of base injection and initial development
- Bench-scale tests, calculations, regulatory support
- Test plan for pilot study of in situ treatment media
- Base injection column studies, limestone pilot study, support to initial field test of base injection, regulatory support
- Support to second field test of base injection concept for I-129 and Tc-99
- Support to third field injection test, regulatory support

EM Funding: $1.4M

Deployment

Implementation

- Support to initial deployment of base injection/ construction of funnel and gate
- Support deployment of base injection/funnel and gate
- Optimization of base injection
- Development of silver chloride treatment for I-129

NOVEMBER 2015 13CC00015KPIS019