



Recommendation No. 145

October 23, 2001

Groundwater Mixing Zones

Background

Natural attenuation makes use of natural processes to contain the spread of contamination and reduce the concentration and amount of pollutants at contaminated sites. When natural attenuation is proposed as a remedy for site clean up, it is called monitored natural attenuation (MNA). The Savannah River Site (SRS) is successfully using MNA as a remediation tool at several environmental restoration projects (Ref. 1).

One component of the MNA formula is the use of groundwater mixing zones. According to the State of South Carolina Water Classifications and Standards (R.61-68), a mixing zone for groundwater is a hydrogeologically controlled three-dimensional flow path in the subsurface, which constitutes the pathway for waste constituents to migrate from a source. Simply put, groundwater-mixing zones are areas down gradient from a source of contamination where concentrations are decreasing as a result of contaminant degradation, volatilization and/or mixing with natural waters of the formation.

The South Carolina Department of Health and Environmental Control (DHEC) allows for the use of groundwater mixing zones only under certain situations (Ref.2). Specifically, all of the following requirements must be met:

1. The contamination source must be under control.
2. The contaminant plume in question is confined to a shallow aquifer that will not be used as a source for drinking water.
3. The contaminant plume in question occurs within the bounds of the property and will remain on the property.
4. The contaminants in question are not dangerously toxic, mobile, nor persistent.

If these conditions can be met, an application can be submitted to DHEC that proposes to use numeric standards other than those for Class GB groundwater. This is an essential part of a MNA restoration project. Important tools used in a groundwater mixing zone application are groundwater flow/contaminant transport models. These models are useful in demonstrating that the four conditions stated above could be met (Ref. 3).

Comment

A presentation on the proposed amendments to R.61-68 was made to the DHEC Board by DHEC staff last year. One aspect of the proposed amendments specifically addressed surface water mixing zones. At that time, one board member moved to have all mixing zones eliminated within three (3) years (Ref. 3). The motion failed but the SRS CAB has concerns about the technical understanding and practical implementation of mixing zones, especially groundwater mixing zones.

The Savannah River Site (SRS) Citizens Advisory Board (CAB) supports the use of groundwater mixing zones as a remediation tool at applicable restoration sites. Furthermore, the SRS CAB believes that there are opportunities to expand the use of groundwater mixing zones at SRS. The SRS CAB is impressed with the 3D-groundwater modeling efforts implemented at SRS, and with the vadose zone contaminant migration application (VZCOMML). The SRS CAB recognizes the importance of the two-pronged approach in demonstrating the potential impacts to groundwater and in the application of groundwater mixing zones (Ref. 4).

The SRS CAB having been educated on Groundwater Modeling Technology and Vadose Zone Containment Migration Software (VZCOMM) and having a better understanding of that science, believes that the use of Mixing Zones is a viable and cost effective solution to groundwater issues at the SRS.

Recommendation

The SRS CAB applauds the regulatory agencies (SCDHEC & EPA) and the SRS in the prudent use of this technology and offers the following recommendations.

1. The three agencies finalize a streamlined protocol, analogous to the Plug-In ROD concept, on mixing zone applications.
2. The three agencies continue to solicit stakeholder input (SRS CAB and the public) during the initial phases of remedy selection on any restoration site.
3. The three agencies provide a Plan of Action & Milestones (POAM) for the protocol and present it to the SRS CAB at the January 2002 Board meeting.

References

1. Gaining Regulator Acceptance of Natural Attenuation as a Remediation Tool, M. B. Hughes. WSRC-MS-2000-00455.
2. State of South Carolina Water Classifications and Standards (R.61-68), April 20, 2001.
3. Monitored Natural Attenuation (MNA), Mixing Zone (MZ), and L-Area Burning Rubble Pit (LBRP), presentation to the SRS CAB Combined Committee Meeting by Alice L. Stieve, Ph.D., August 28, 2001.
4. Vadose Zone Contaminant Migration Software, presentation to the ER Committee by Gregory Rucker, October 2, 2001.
5. Minutes of Board of Health and Environmental Control, December 14, 2000.

Agency Responses

[*Department of Energy-SR*](#)

[*Department of Health and Environmental Control*](#)

[*U.S. Environmental Protection Agency*](#)