51-03 File Ash Landfill



October 16, 2000

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USEPA, Region II
290 Broadway, 18 Floor
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Mr. Steven Paszko
Bureau of Eastern Remedial Action
Division of Hazardous Waste Remediation
New York State Department of Environmental Conservation
50 Wolf Road
Albany, NY 12233-7010

**Subject:** **Workplan for Additional Hydraulic Performance Monitoring of the Permeable Reactive Barrier (PRB) Wall at the Ash Landfill Site, Seneca Army Depot Activity**

Dear Mr. Vasquez and Mr. Paszko:

The purpose of this letter is to inform you of a pending study at the Permeable Reactive Barrier (PRB) wall at the Ash Landfill site located within the Seneca Army Depot Activity (SEDA). Attached to this cover letter is a description of the Tri-Agency Permeable Reactive Barrier initiative and a workplan for an additional hydraulic performance study of the PRB wall at SEDA. The planned study is being performed as part of a cooperative effort between the U.S. Department of Defense (DoD), U.S. Department of Energy (DOE), and U.S. Environmental Protection Agency (EPA). These three agencies have formed the Tri-Agency PBR Initiative to obtain and evaluate performance data for future implementation of this technology. The PRB at SEDA is one of only a few PRBs in the country that has employed this technology and has been identified by the Tri-Agency Permeable Reactive Barrier Initiative as a site to be included in the performance monitoring effort. Battelle is the prime contractor that is responsible for this effort. Parsons Engineering Science (Parsons ES), as a subcontractor to Battelle, is providing support to Battelle with site coordination and oversight during the installation of the monitoring wells at the PRB.

The work to be performed is described in the attached workplan and includes installation of a network of fourteen (14) new 2-inch monitoring wells to be installed to monitor the hydraulic performance of the continuous reactive wall. This work is being planned for the week of November 6, 2000. The network will be installed at the northern end of the existing PRB. Two (2) of the fourteen (14) monitoring wells will be installed within the reactive barrier wall. The two wells to be installed in the reactive media will be installed with direct push techniques to minimize the disturbance to the reactive media. The wells will be screened at the bottom 3 feet of the aquifer to minimize fluctuations to the water table.

Over the next year, four quarterly groundwater elevation measurements will be collected to provide an indication of the reactive wall's hydraulic performance. Collection of groundwater samples for chemical or microbiological analyses are currently not planned. Following evaluation of the PRB at SEDA and other sites around the country a recommendation report will be issued for future applications of this valuable technology.

Should you have any questions, please do not hesitate to call me at (781) 401-2492 to discuss them.

Sincerely,

**PARSONS ENGINEERING SCIENCE, INC.**

Michael Duchesneau, P.E.
Project Manager

cc: D. Sheets, CEHNC
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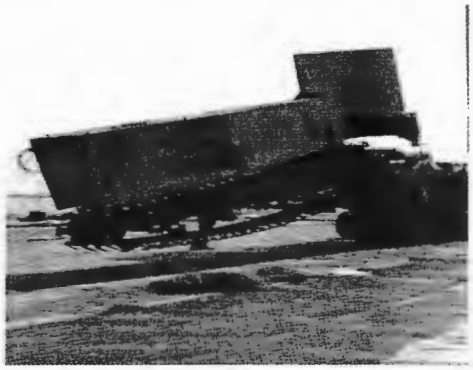
S. White, USACE Omaha

# The Tri-Agency Permeable Reactive Barrier Initiative

**U.S. DoD and DOE representatives conduct a joint evaluation of the hydraulic performance of PRBs at former Lowry Air Force Base**



**U.S. EPA continues to monitor the performance of the PRBs at the Coast Guard Station in Elizabeth City and Denver Federal Center**

The permeable reactive barrier (PRB) technology represents a passive option for long-term treatment of groundwater contamination. PRBs are a potentially more cost-effective treatment option for a variety of dissolved contaminants, such as certain types of chlorinated solvents, heavy metals, and radionuclides. Because these contaminants are present at several government (and private) sites, the **U.S. Department of Defense (DoD), U.S. Department of Energy (DOE),** and **U.S. Environmental Protection Agency (EPA)** are cooperating to evaluate the field performance of several PRBs under a variety of site conditions.

## Objectives

The objectives of the Tri-Agency PRB Initiative are to leverage the technical and financial resources of the three agencies in order to:

- Examine the field performance of multiple PRBs
- Conduct additional field investigations to address any information gaps
- Issue a joint guidance document on the long-term field implementation and monitoring of PRBs for current and potential users of the technology.

A survey of existing PRBs indicated that the two main challenges facing the technology are (1) evaluating the *longevity* (geochemistry) of a PRB and (2) ensuring/verifying its *hydraulic performance.* Therefore, this initiative will focus primarily on these two challenges. In 2001, the three agencies will publish a combined report that summarizes the results and conclusions of this initiative and the recommendations for PRB implementation and long-term monitoring. In addition, each agency will prepare a final report detailing the methodology and results of the investigations at their respective sites. The Tri-Agency PRB Initiative has established an Internet site at http: www.frtr.gov workgroup prb to facilitate the transfer of information to potential users. This site will be updated whenever significant new information or results become available.

## Key Participants

- The **Naval Facilities Engineering Service Center (NFESC)**, Port Hueneme, California and its project partner, **Battelle**, Columbus, Ohio are leading the DoD effort. Other DoD participants include the Army Corps of Engineers (ACE), Air Force Center for Environmental Excellence (AFCEE), and Air Force Research Laboratory (AFRL). DoD's Environmental Security Technology Certification Program (ESTCP) and Strategic Environmental Research and Development Program (SERDP) are sponsoring this project. The DoD field divisions and their local contractors provide site access and some field support.

- **Oak Ridge National Laboratory (ORNL)**, Oak Ridge, Tennessee is coordinating the DOE effort. DOE's Office of Science and Technology (OST)/ Subsurface Contaminant Focus Area (SCFA) provides support for this project. DOE site managers, industrial partners, and university researchers support ORNL in the field investigation.

- The **National Risk Management Research Laboratory's** Subsurface Protection and Remediation Division in Ada, Oklahoma is leading the EPA effort. Other participants include U.S. Coast Guard, U.S. Geological Survey, Federal Highway Administration, General Services Administration, and General Electric Co.

The **Federal Remediation Technology Roundtable** will serve as the forum for general dissemination of project data and results via its Internet site at http://www.frtr.gov/. The **Remedial Technologies Development Forum (RTDF)** Permeable Barrier Action Team and the **Interstate Technology and Regulatory Cooperation (ITRC)** Permeable Barriers Subgroup provide review support and help disseminate the project results to the regulatory and user community.

## Technical Approach

Local site managers independently conduct routine monitoring at all installed PRBs. However, this initiative will focus on a closer investigation of a few sites (e.g., former Naval Air Station Moffett Field, former Lowry Air Force Base, Dover Air Force Base, Watervliet Arsenal, DOE's Monticello site, Bear Creek Valley at Oak Ridge Y-12 plant, Kansas City Plant, Denver Federal Center, and the Coast Guard Site in Elizabeth City). These sites provide a good sampling of different PRB designs, hydrogeologic features, and groundwater chemistries. Other sites may be added if their attributes present suitable features of interest in terms of longevity and hydraulic performance.

Longevity evaluation tools are likely to include inorganic analysis of groundwater, reactive media core collection and analysis, geochemical modeling, and long-term column testing. Hydraulic performance evaluation tools are likely to include aquifer hydraulic property measurements, multiple tracer testing, modeling, and innovative flow measurement tools, such as heat sensors and colloidal borescope. These planned activities may be subject to modification in the future depending on ongoing lessons learned, project priorities, and availability of funds.

## Contacts for Additional Information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**Work Plan**

# *Additional Hydraulic Performance Monitoring of the Permeable Reactive Barrier (PRB) at Seneca Army Depot*

**Prepared by**

**Battelle**
**September 27, 2000**

**For**

**Seneca Army Depot**
**New York**

## Introduction

The permeable reactive barrier (PRB) technology represents a passive option for long-term treatment of groundwater contamination. PRBs are a potentially more cost-effective treatment option for a variety of dissolved contaminants, such as certain types of chlorinated solvents, heavy metals, and radionuclides. Because these contaminants are present at several government (and private) sites, the U.S. Department of Defense (DoD), U.S. Department of Energy (DOE), and U.S. Environmental Protection Agency (EPA) are cooperating to evaluate the field performance of several PRBs under a variety of site conditions.

The objectives of the Tri-Agency PRB Initiative are to leverage the technical and financial resources of the three agencies in order to:

- Examine the field performance of multiple PRBs
- Conduct additional field investigations to address any information gaps
- Issue a joint guidance document on the long-term field implementation and monitoring of PRBs for current and potential users of the technology.

A survey of existing PRBs indicated that the two main challenges facing the technology are (1) evaluating the *longevity* (geochemistry) of a PRB and (2) ensuring/verifying its *hydraulic performance*. Therefore, this initiative will focus primarily on these two challenges. In 2001, the three agencies will publish a combined report that summarizes the results and conclusions of this initiative and the recommendations for PRB implementation and long-term monitoring. In addition, each agency will prepare a final report detailing the methodology and results of the investigations at their respective sites. The Tri-Agency PRB Initiative has established an Internet site at http://www.frtr.gov/prb/ to facilitate the transfer of information to potential users.

The Naval Facilities Engineering Service Center (NFESC), Port Hueneme, California and its project partner, Battelle, Columbus, Ohio are leading the DoD effort. Other DoD participants include the U.S. Army Corps of Engineers (USACE), Air Force Center for Environmental Excellence (AFCEE), and Air Force Research Laboratory (AFRL). DoD's Environmental Security Technology Certification Program (ESTCP) and Strategic Environmental Research and Development Program (SERDP) are sponsoring this project. The DoD field divisions and their local contractors provide site access and some field support.

## Role of the PRB at Seneca Army Depot

The PRB at Seneca Army Depot is of particular interest because it is one of the few continuous reactive barriers at DoD sites. Most of the PRBs at DoD sites were installed while the technology was still in its early stages and are funnel-and-gate systems. The PRB at Seneca provides an opportunity for the DoD Research Team (Battelle/NFESC and USACE) to take a closer look at the hydraulic performance of a continuous reactive barrier (CRB). The DoD Research Team conducted a site visit and preliminary discussions with site representatives in August, 2000. Battelle also reviewed the Draft *Feasibility Memorandum for Groundwater Remediation Alternatives Using Zero-Valent Iron Continuous Reactive Wall at the Ash Landfill* (Parsons Engineering Science, 2000). One challenge that the DoD Research Team has encountered at several PRB installations is the difficulty in verifying how well the actual hydraulic performance (measured in terms of groundwater capture zone width and residence time in the reactive medium) of the field barrier matches the design expectations. In addition to evaluating the field hydraulic performance of several funnel-and-gate systems, the DoD Research Team would like to study the capture zone and residence time achieved by the continuous barrier at Seneca. This Work Plan describes the technical approach proposed by the DoD Research Team for evaluating the flow characteristics of the PRB at Seneca.

## Technical Approach

**Figures 1 and 2** show the fourteen additional monitoring wells (BAT-1 to –14) proposed near the northern end of the Seneca PRB. Two of the proposed wells, BAT-7 and BAT-8) are located in the iron medium to obtain gradients through the reactive cell. All wells will be developed and surveyed. The objective of the proposed monitoring is to determine the flow divide upgradient of the barrier and observe any seasonal shifts in flow direction and capture. These monitoring wells will be used primarily to conduct **quarterly water level measurements**. **Slug tests** will also be conducted in these wells to characterize the aquifer hydraulic conductivity (K) distribution. The K distribution and gradients near the barrier will be used to model and estimate flow velocity, flow direction, and residence time in the aquifer and iron. Limited resources prevent the DoD Research Team from conducting similar monitoring on the southern end of the barrier at this time. The northern end was selected because there are fewer aquifer heterogeneities at this end. The aquifer at the southern end has a more heterogeneous geology and may require a more extensive monitoring network.

The proposed wells will be 2-inch diameter PVC wells screened at the bottom 3 ft of the aquifer. Because of water table fluctuations, the deep screens will ensure contact with the groundwater at all times. The wells will be completed similar to the existing wells in and around the PRB. The DoD Research Team plans to coordinate the installation of the wells with the Seneca Army Depot on-site contractor, Parsons Engineering Science, Inc. to ensure proper well placement and integrity of the barrier. The 2-inch diameter of the wells will allow the use of specialized hydraulic monitoring sensors (e.g., heat flow sensors or colloidal borescope), if determined to be necessary by the DoD Research Team; this will depend on the results of the first round of water level measurements in these wells. The DoD Research Team is not planning any sampling and analysis of these wells for chemical or microbiological parameters, at this time

## Distribution of Field Data Reports/ Technology Transfer Considerations

Any data or data reports generated in this study of the Seneca barrier will be provided to the site representatives for review. Following this review, the data and data reports will be available to any

other stakeholders. Eventually, the DoD Research Team hopes that the experience gained on the PRB technology at this site will serve as a guide for future applications at sites under the purview of the members of the Tri-Agency Initiative, namely, DoD, DOE, and EPA. The results of this study may also serve as a guide for recommendations made on future applications in the Tri-Agency report due in 2001.

## Proposed Schedule

Work Plan - September 27, 2000
Monitoring Well Installation/Well Development/Surveying – Week of November 6, 2000
First Water Level Monitoring, Slug Test Event – November 20, 2000
Second Water Level Monitoring Event – February 20, 2001
Third Water Level Monitoring Event – May 20, 2001
Fourth Water Level Monitoring Event – August 20, 2001.

## List of DoD Research Project Contacts

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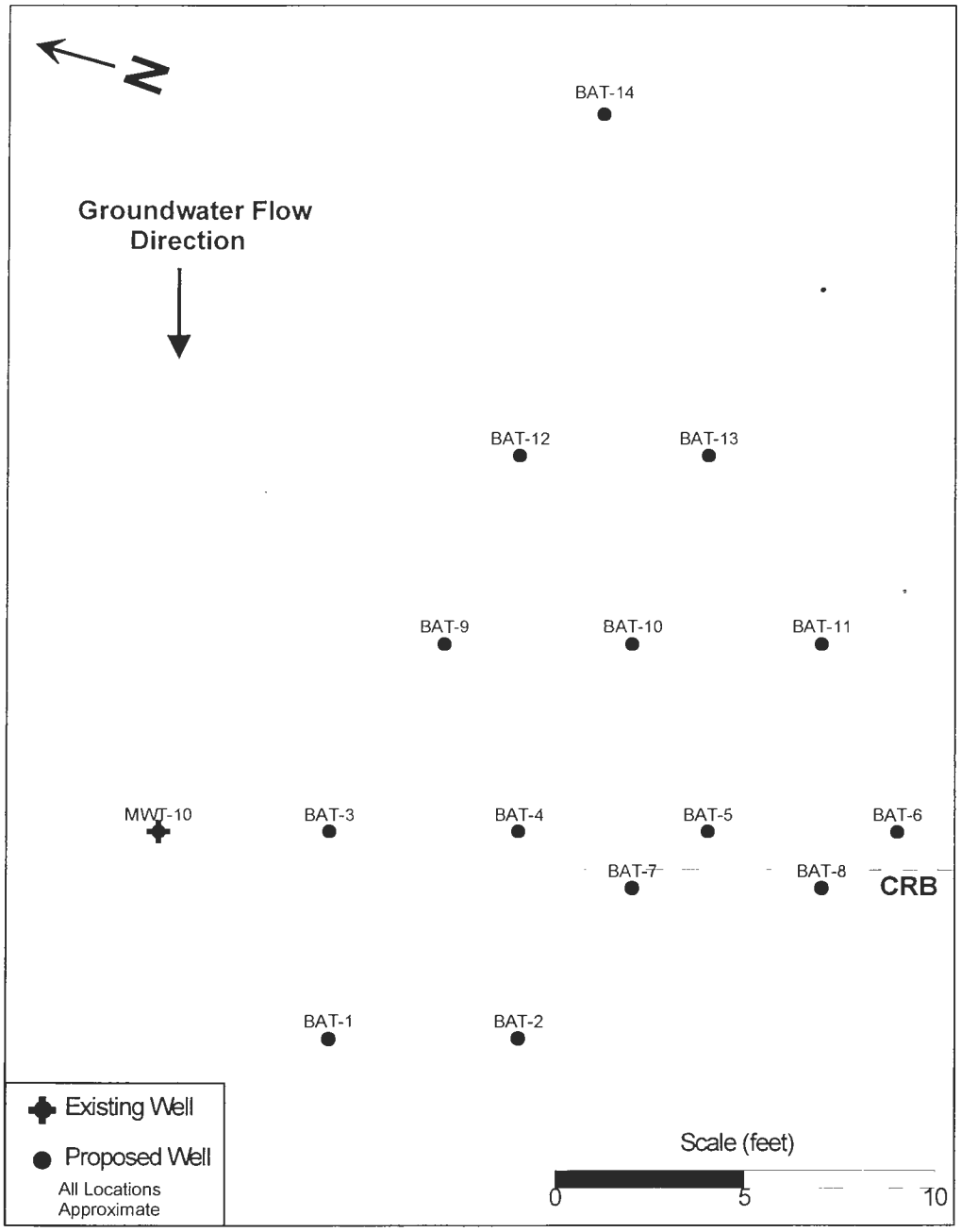


**Figure 1. Proposed Monitoring Well Layout at North End of CRB at Seneca Army Depot.**

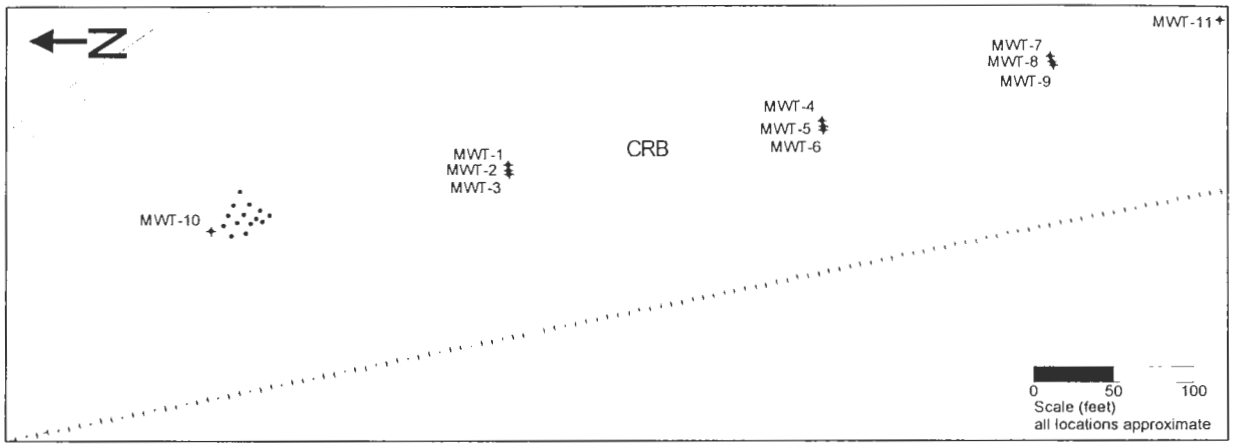


**Figure 2. Overview of CRB at Seneca Army Depot Showing Existing and Proposed Monitoring Wells.**

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