# Referentielijst toepassingen ijzerschermen Wereldwijd

**Existing references world wide;**

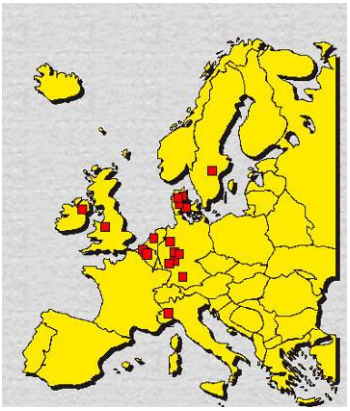
- **Full-Scale Projects**
  - Aircraft Maintenance Facility, Southern Oregon, OR
  - Caldwell Trucking, Northern New Jersey, NJ
  - Copenhagen Freight Yard, Copenhagen, Denmark
  - F.E. Warren Air Force Base, Cheyenne, WY
  - Federal Highway Administration Facility, Lakewood, CO
  - Former Industrial Site, Brunn am Gebirge, Austria
  - Former Manufacturing Site, Seattle, WA
  - Former Manufacturing Site, Fairfield, NJ
  - Haardkrom Site, Kolding, Denmark
  - Industrial Site, SC
  - Industrial Site, Coffeyville, KS
  - Industrial Site, Belfast, Northern Ireland, Ireland
  - Intersil Semiconductor Site, Sunnyvale, CA
  - Kansas City Plant, Kansas City, MO
  - Lowry Air Force Base, CO
  - Rocky Flats Environmental Technology Site (East Trenches Plume), Golden, CO
  - Rocky Flats Environmental Technology Site (Mound Site), Golden, CO
  - Seneca Army Depot Activity, Romulus, NY
  - Shaw Air Force Base, Sumter, SC
  - Somersworth Sanitary Landfill Superfund Site, Somersworth, NH
  - Vapokon Petrochemical Works, Søndersø, Denmark
  - Watervliet Arsenal, Watervliet, NY

- **Pilot-Scale Projects**
  - Alameda Point, Alameda, CA
  - Area 5, Dover Air Force Base, Delaware, DE
  - Borden Aquifer, Ontario, Canada
  - Cape Canaveral Air Station, FL
  - DuPont, Oakley, CA
  - DuPont, Kinston, NC
  - Former Dry-Cleaning Site, Rheine, Westphalia, Germany
  - Launch Complex 34, Cape Canaveral Air Force Station, Cape Canaveral, FL
  - Massachusetts Military Reservation CS-10 Plume, Falmouth, MA
  - Moffett Federal Airfield, Mountain View, CA
  - SAFIRA Test Site, Bitterfeld, Germany
  - Savannah River Site TNX Area, Aiken, SC
  - U.S. Coast Guard Support Center, Elizabeth City, NC
  - X-625 Groundwater Treatment Facility, Portsmouth Gaseous Diffusion Plant, Piketon, OH

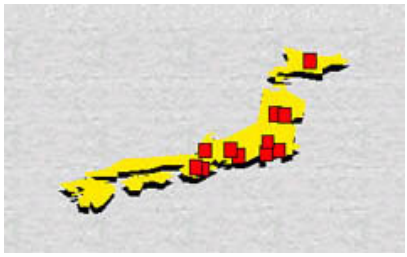
**More than 125 PRBs installed worldwide**

- **United States**

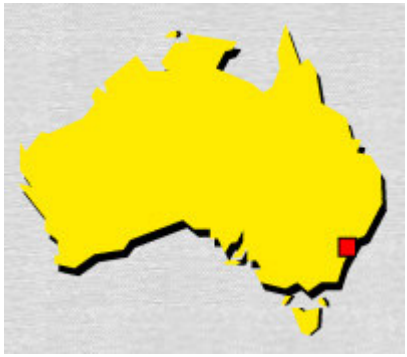
**Europe**



- **Japan**



**Australia**



## Over Fifteen-Year Performance Of The Borden Iron Wall

By Tamra J. Reynolds, M.Sc. Candidate, University of Waterloo, Waterloo, Ontario

The first field demonstration of a granular iron permeable reactive barrier (PRB) was installed in 1991 at CFB Borden, Ontario, downgradient from a source of dissolved PCE and TCE. The iron wall consists of 22% non-commercial granular iron by weight mixed with 78% coarse sand, and has dimensions 5.5 x 1.6 x 2.2 m (l x w x h). The performance of the wall was evaluated throughout 5 years of operation (O'Hannesin, 1993; O'Hannesin and Gillham, 1998). Though the source of PCE and TCE was removed in 1998, the wall remains in place. Now, ten years after the initial installation, further tests are in progress to evaluate the in situ reactivity of the iron. In the current work, an In Situ Microcosm (ISM) technique (Gillham et al., 1990) is being used to determine half lives for TCE, which are then compared with those measured previously. The ISM is a stainless steel cylinder that isolates about 5 L of the iron/sand wall and contains valves and tubing to allow amendment and sampling of groundwater from the ground surface with only minimal disturbance of the in situ material.

The initial field study gave a TCE half life of 117 hours, assuming the kinetics of degradation to be pseudo-first order. After 5 years, the TCE half life was found to be 142 hours, while the current study, using the results from ISMs installed in the iron/sand wall, gave an average TCE half life of 139 hours. Considering the uncertainty typical of field data, the TCE half lives are remarkably similar. Core material was also collected from various locations across the iron wall and used in laboratory columns. The columns were maintained at 10°C to simulate field conditions, and Borden groundwater, amended with 10 mg/L TCE, was pumped through the columns at a velocity of approximately 20 cm/day. The nine columns indicated an average TCE half life of 20 hours compared to 8 hours in the control column consisting of 22% original iron source and 78% coarse sand. These results are similar to the control column results reported in O'Hannesin, 1993 (19.7 hour TCE half life for a column flow velocity of 32 cm/day) and O'Hannesin and Gillham, 1998 (55 hour TCE half life for a column flow velocity of 8.9 cm/day). The results of the field and laboratory experiments provide evidence of consistent performance of the iron over the past 15 years. Although the results of the present study are preliminary and site specific, they provide promising evidence regarding the long term performance of permeable reactive barriers.

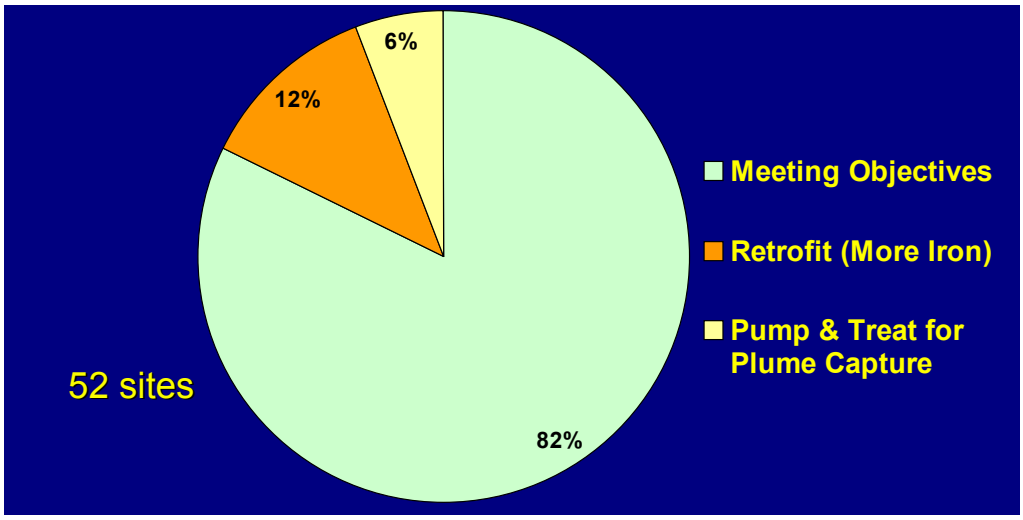
References:


- Gillham, R.W., Starr, R.C. and Miller, D.J., 1990. A Device for In Situ Determination of Geochemical Transport Parameters. 2. Biochemical Reactions. Groundwater, V.28, no. 6, pp. 858-862.
- O'Hannesin, S.F., 1993. A field demonstration of a permeable reaction wall for the in situ abiotic degradation of halogenated aliphatic organic compounds. M.Sc. diss., Department of Earth Sciences, University of Waterloo, Waterloo, Ontario, Canada.
- O'Hannesin, S.F. and Gillham, R.W., 1998. Long-Term performance of an In Situ "Iron Wall" for Remediation of VOCs. Groundwater, V.36, no. 1, pp. 164-169.


Construction of the First Research PRB at Borden, ON

*Construction of the First Research PRB at Borden, ON*

**Are PRBs meeting regulatory objectives; an evaluation of 52 full-scale applications**




**Evaluation by ETI, Waterloo, Ontario, Canada**

- most PRB applications are meeting regulatory objectives;
- system hydraulics and unexpected concentration levels are the main cause of inadequate performance;
- ongoing refinement/improvement of construction methods is minimizing adverse impacts due to construction.

More specific evaluated data on PRBs are published by the U.S. Environmental Protection Agency:

- Permeable Reactive Barrier Technologies for Contaminant Remediation (EPA/600R-98/125, September 1998).