

## P&T Transition to ISCO

Benfield Industries  
Waynesville, NC  
2001–2018  
Chemical Company  
Superfund Site/NPL

P&T Objectives: PAHs to  
MCL

Risk Scenario—Impact to  
groundwater

In 2001 a P&T system was installed at this site to treat PAH in groundwater and discharge to a local wastewater treatment system. From 2001 to 2007, the system extracted and discharged more than 22 million gallons of groundwater.

In 2007 a USEPA contractor conducted a streamlined remediation system evaluation (RSE-Lite), which is an optimization evaluation of remedial operations at a site. The RSE-Lite concluded that the groundwater extraction system at the site was no longer an effective groundwater remedy, and that MNA may be a more appropriate groundwater remedy.

Between 2010 and 2011, USEPA conducted an MNA evaluation. The evaluation report concluded that MNA would not be an appropriate groundwater remedy for the site because it would likely not achieve remedial levels within a reasonable time. The USEPA concluded that persistent concentrations of PAHs in the site groundwater may be the result of residual contaminant mass at or just below the water table, sorbed to the soil. Additional site assessment was recommended to evaluate the magnitude and extent of this residual contamination. In 2012, the USEPA conducted additional field work to better characterize the residual soil contamination.

Four alternatives were evaluated in the 2015 ROD amendment. ISCO was selected followed by ISB, if warranted, to permanently destroy the residual soil contamination through on-site treatment.

Initial Condition  
Optimization Review  
Outcome

LEGEND  
● MONITORING WELL  
⊙ ABANDONED MONITORING WELL  
■ EXTRACTION WELL  
▲ PIEZOMETER  
△ ABANDONED PIEZOMETER  
— 2720 — GROUNDWATER ELEVATION CONTOUR (2-FOOT INTERVAL)  
2719.09 GROUNDWATER ELEVATION (FEET)



In 2017, the USEPA initiated a pilot-scale treatability study using ISCO in the area where elevated levels of PAHs were detected. They found that ISCO using alkaline activated persulfate was effective in reducing PAH concentrations in soil.

Lines of evidence used to support the changes:

1. The P&T remedy removed considerable water from the clean saprolite rather than focusing extraction on the contaminated groundwater in the alluvium
2. Unsaturated source zones were not fully characterized.
3. PAHs consistently detected above cleanup levels since December 2004.

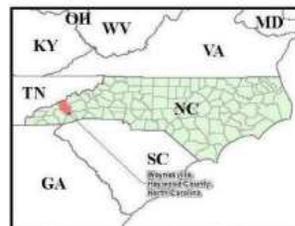
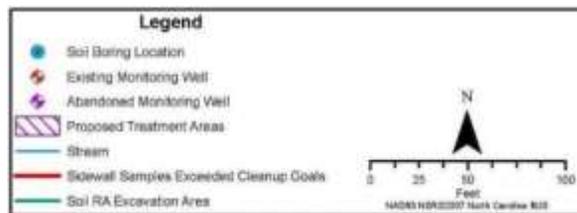
The FY2015 ROD amendment changed the remedy from P&T to in situ treatment of source contamination.

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The optimization study began with a trial of MNA, which was the least expensive option. When MNA was ruled out, ISCO was posed as a potential remedy. This targeted approach required better characterization of the contaminated “hot-spot.” The optimization report suggested 10 geoprobe borings and temporary wells would be installed near MW03SH for delineation and possible oxidant delivery. A bench-scale study was performed to compare potassium permanganate, sodium persulfate, and hydrogen peroxide for ISCO and calcium peroxide for ISB. Based on the results from the bench-scale study, a field-scale pilot test of chemical oxidation was done in 2018. ISCO using alkaline activated persulfate was found to be an effective method to reduce the PAH concentrations in soil and groundwater at the Benfield Industries site. Contaminant reduction was also observed in groundwater during the peroxide injection events; however, peroxide proved to be too reactive to be used effectively.

Excavation may also be a reasonable remedial approach, depending on the extent and depth of the contamination, the amount of dewatering necessary to reach the contamination, the amount of contaminated material to be disposed of, and the classification of that material (hazardous or nonhazardous).



Benfield Industries Site  
USEPA ID#: NCD981026479  
Waynesville, Haywood County  
North Carolina

**Figure 4  
Proposed Areas for  
Soil Treatment**

- Initial Condition
- Optimization Review
- Outcome

Stakeholders: This site was redeveloped in 2004 and now houses a manufacturing and warehouse facility owned and operated by Haywood Vocational Opportunities, Inc.

### P&T Actions Conclusion

P&T Transition to ISCO

Time Span: 5 years

O&M cost savings: ~\$23,000/year

Remedy effectiveness and/or risk reduction: Addressed discrete, immobile source zones

Resiliency benefits: The P&T system had a history of flooding. Targeted, discrete ISCO applications would eliminate this climate vulnerability.