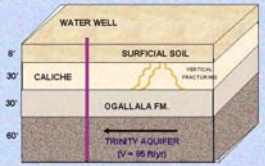
REMEDIATION OF Cr[VI] IN GROUND WATER AT A SITE IN WEST TEXAS

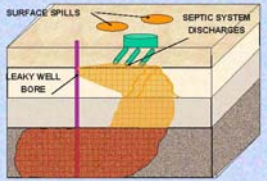
Roger W. Lee, Ph.D., U.S. Geological Survey, WRD

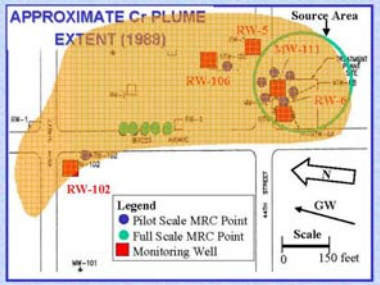
The disposal of wastewater by an industrial plating facility in West Texas in the 1960s-1970s has resulted in hexavalent chromium (Cr[VI]) contamination in a shallow aquifer. The site became a U.S. Environmental Protection Agency (USEPA) Superfund site in 1986.

SITE HYDROGEOLOGY



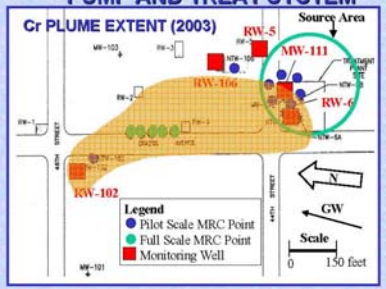
Cr CONTAMINATION 1954-1978





A pump and treat (P&T) remedy for ground water was conducted for about 10 years using ferrous sulfate to remove Cr[VI] from shallow ground water. The remedy had limited success in lowering Cr[VI] concentrations, and was not able to achieve clean up levels specified in USEPA's Record of Decision.

PUMP AND TREAT SYSTEM



- P&T system installed in 1990
- Federal to state transfer of site prompted reevaluation, P&T system deemed ineffective
- Pumping halted at parts of site in August 2003
- Metals Remediation Compound (*MRC™) pilot test initiated August 22, 2003
- Full Scale Application of MRC, December 16, 2003
- Estimated annual P&T cost $400,000/year

*Any use of trade, firm, or product names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

A remediation technology was needed that could effectively lower the concentration of Cr in ground-water to 0.1 mg/L. A slow release metals remediation product, Metals Remediation Compound (MRC™), was chosen for *in situ* ground-water remediation at this site. MRC™ can produce a long-term, effective, and low-cost remedy that removes dissolved chromium, including Cr[VI], from ground water via *in situ* immobilization. Pilot testing and full scale testing of this *in situ* treatment was initiated in 2003.

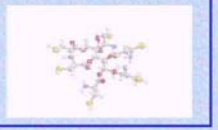
Injection well installation

Preparation of MRC

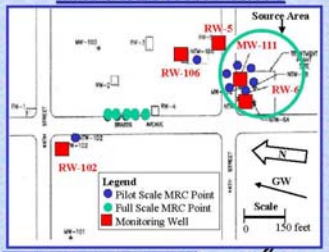
Static Addition of MRC

Pressure Addition of MRC

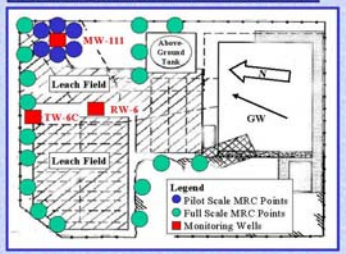
- MRC is an injectable material that slowly releases its organosulfur compound and lactic acid via hydrolysis of ester bonds by water or enzymatic action by microbes
- The products interact with aqueous Cr[VI] to:
  1. Reduce Cr[VI] to Cr[III] and precipitate as hydroxide or oxide
  2. Precipitate Cr as sulfide



MRC INJECTION POINTS



SOURCE AREA MRC INJECTIONS



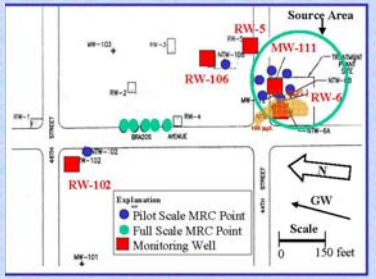
RESULTS OF MRC PILOT TEST

Well	Pre MRC Treatment Concentration (3/11/2003, day -152)	Post MRC Treatment Concentration (10/3/2003, day 42)	Percent Reduction
RW-102	107 ug/L	<10 ug/L	90.6%
RW-106	690 ug/L	<10 ug/L	98.5%
MW-111	2,620 ug/L	<10 ug/L	99.8%

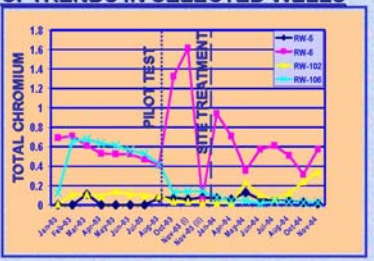
MRC APPLICATION DETAIL

Application Scale	Starting Date	Quantity Applied	Product Cost	Application Rate
Pilot Scale	8/22/03 (day 0)	2,880 lbs.	$27,360	6.0 lbs/ft
Full Scale	12/16/03 (day 116)	15,840 lbs.	$126,720	12.0 lbs/ft

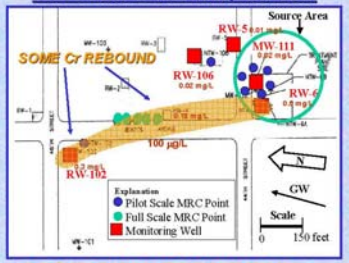
Cr PLUME EXTENT, 1/2004



Cr TRENDS IN SELECTED WELLS



Cr PLUME EXTENT, 11/2004



ADDITIONAL TREATMENT REQUIRED AND PLANNED FOR LATE 2005!

CONCLUSIONS

- Cr[VI] has been substantially lowered in ground water
- Extraction wells have helped distribute MRC
- MRC Pilot and Full Scale Application and Injection costs at $217,000
- A net first year savings of $183,000 compared to P&T
- Monitoring evaluated permanence of the MRC remedy
- *Some rebound observed* from Cr [VI] sources in untreated areas, additional treatment planned to complete the remedy (~$75K)