

Management Options

- Continued monitoring of gw and surface water
- Downgradient control / treatment of plume
- Contaminant source control

Options Analysis Matrix

	Financial	Regulatory	Public Relations	Liability	Technical	Safety	
General Objectives :	Cost effective, protective of HH&E	Control off-site COC migration, plume stability	Maintain positive relationships	Eliminate / minimize	Long-term effectiveness, no O&M	Minimize H&S exposure	Scoring Results
Option A	5	1	1	1	1	5	14
Monitoring		Does not control migration or stability	May be viewed as not responsive to problem	No immediate impact, liability may increase	Not effective in reducing mobility, toxicity or volume	Minimal exposure	
Option B	1	4	5	5	3	3	21
Downgradient Control		Plume migration control, may not control stability	Highly visible, may have positive short-term results	Positive impact, off-site migration is curtailed	Reduces mobility, toxicity, not volume	Some exposure during installation and operation	
Option C	4	5	4	3	5	3	24
Source Control		May have longer-term effect on migration and stability	Highly visible, results may be longer-term	Longer-term, positive impact on liability	Reduces mobility, toxicity and volume	Some exposure during installation and operation	

* Note: Scale is based on 5 to 1, where 5 is the most positive impact on each category while a 1 represents the most negative impact.

Reasons for Choosing Source Control

- Source area is relatively small and well-defined
- Source control may be effective in controlling migration and plume growth
- Fits with plans for future site use, no O&M requirements, cost effective

Source Control Alternatives Evaluated

- Excavation with off-site incineration
- Containment through capping
- Soil vapor extraction with off-gas treatment
- In-situ contaminant destruction through ZVI saturation

Remedial Alternatives Analysis Matrix

	Financial	Regulatory	Public Relations	Liability	Technical	Safety	
General Objectives :	Cost effective, protective of HH&E	Control COC migration, plume stability	Maintain positive relationships	Eliminate / minimize	Constructability, Long-term effectiveness, No O&M	Minimize H&S exposure	Scoring Results
Option A	1	5	4	5	3	1	19
Excavate and incinerate		Total removal of COC	Hauling issues, preference for permanent remedy	Permanent removal of material	Constructability issues; no O/M	Much exposure to COC's	
Option B	5	2	2	2	3	5	19
Containment by capping		COC remains untreated, migration may be controlled	Not perceived as a final solution	Minimum reduction in liability	Some on-going maintenance	Minimal exposures	
Option C	3	3	5	4	3	4	22
Soil vapor extraction		No assurance that all COC's are removed	No impact in community	Mass reduction and assoc. liability reduction	Some effectiveness questions, some on-going O/M	Potential exposures to vapors, condensate	
Option D	4	4	5	4	4	3	24
Zero-valent iron treatment		COC's are treated or contained	No impact in community	Mass reduction and assoc. liability reduction	Minimal on-going maintenance	Potential exposure during mixing	

* Note: Scale is based on 5 to 1, where 5 is the most positive impact on each category while a 1 represents the most negative impact.

Laboratory Testing

- Representative soil samples from contaminated area
- Series of beaker tests to establish optimum mix ratios
- Results show almost immediate destruction of CT
- Formation and eventual destruction of daughter products
- Unexpected formation of low levels of PCE and Hexachlorobutadiene

Pilot Testing

- Desired low-cost, quick method to field test laboratory findings
- >\$50K to mobilize full-scale equipment

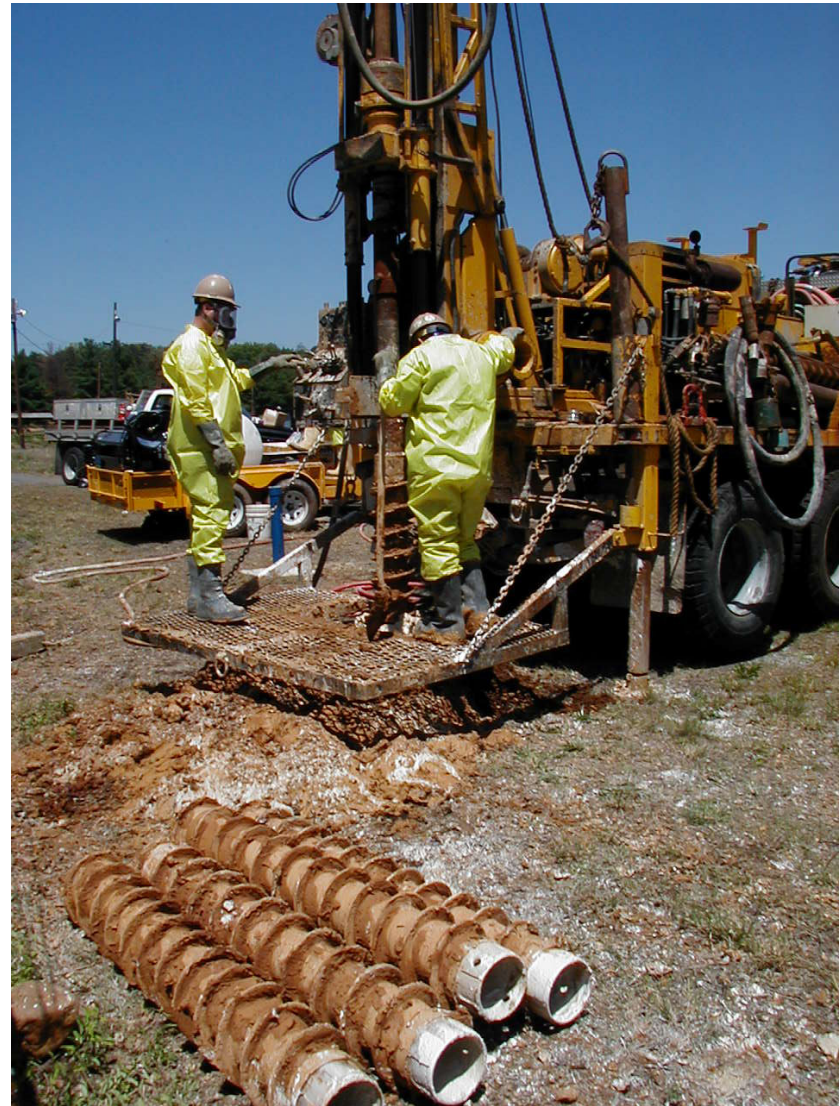
Pilot Test Equipment



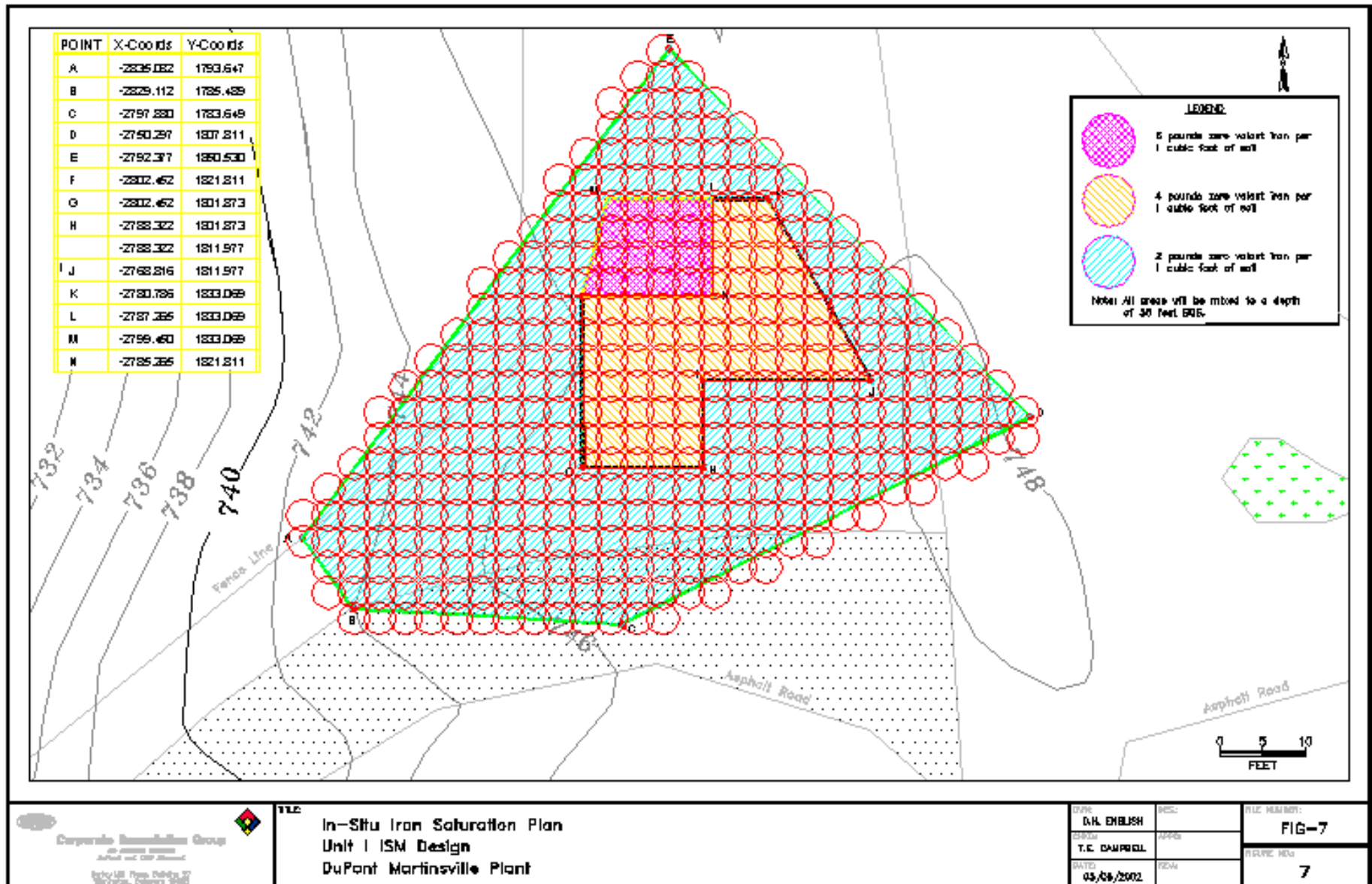
The ZVI and Clay Mix



Injecting ZVI / Clay Mix



Lay-out of Three Treatment Zones



Full-Scale Implementation

(Oct-Dec 02)

- 8 to 10 person crew
- Equipment
 - Link-Belt Crane
 - Casagrande Mixing Unit with 8 ft diameter auger
 - Excavator
 - Batch Plant
 - Fork-Lift





Project QA/QC Parameters

- Post-mixing soil iron and clay content at various depths
- Post-remediation soil sampling at various depths
- Long-term downgradient groundwater and surface water monitoring program







