

# C-400 90% Design Independent Technical Review Report and Implementation Plan

October 18, 2007

Presented by  
Richard R. Bonczek, Ph.D.



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## ITR Report Status

- Report was prepared by independent team of experts between April and August 2007.
  - Review was requested by Assistant Secretary Jim Rispoli.
  - The team was chartered by the Office of Groundwater and Soil Remediation.
- Report went final on August 15, 2007.
- PPPO and Regulators were briefed on the contents of the final ITR Report on August 28, 2007.
- PPPO is working with HQ to finalize an Implementation Plan to address the final ITR Report's recommendations.



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## ITR Team Members

- Jed Costanza, Georgia Tech
- Eva Davis, U.S. EPA Kerr Laboratory, Ada OK
- **Brian Looney (Project Lead), Savannah River National Laboratory**
- Joe Rossabi, RedoxTech
- Bo Stewart, Praxis Environmental
- Hans Stroo, HGL, Inc.
  
- Beth Moore – DOE (EM-22) – Review Project Manager
- Steve Golian – DOE (EM-22) – Compliance Interface



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- Jed Costanza, Georgia Tech
- Eva Davis, U.S. EPA, Kerr Laboratory, Ada, OK
- Brian ...
- Joe ...
- Bob ...
- Hal ...
- Beth ...
- Steve Golian – DOE (EM-22) – Compliance Interface

**The ITR team supports the remedial action objective (RAO) at C-400 to reduce the TCE source area via subsurface Electrical Resistance Heating (ERH).**

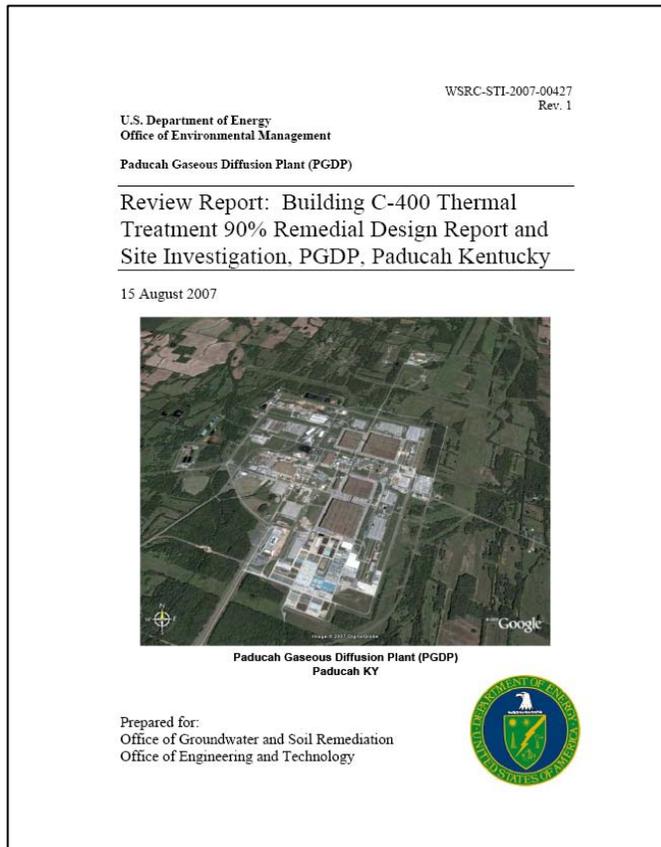
- Page 1 Paragraph 2 of the ITR Report.



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## ITR Report Contents



- The ITR Report summarizes the team's composition and activities.
- The ITR Report makes recommendations in the following five areas:
  - 1) Target Zone Delineation
  - 2) Technology Performance Objectives
  - 3) Design
  - 4) Health and Safety
  - 5) Cost Evaluation



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## Target Zone Delineation

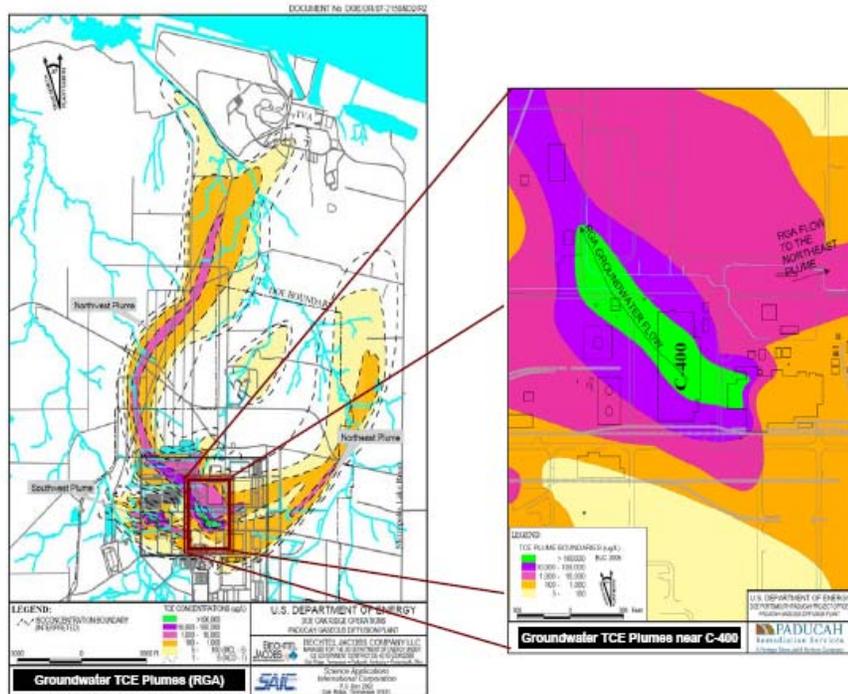


Figure 1. Plumes of TCE in the groundwater (RGA) underlying PGDP (data from 2004)

- Area addressed by remedial action is at C-400 Building.
- Investigations show that this area is the primary source of TCE contamination in the plumes at the PGDP.
- As part of design activities, additional characterization was performed to target the TCE source zone.



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## Target Zone Delineation

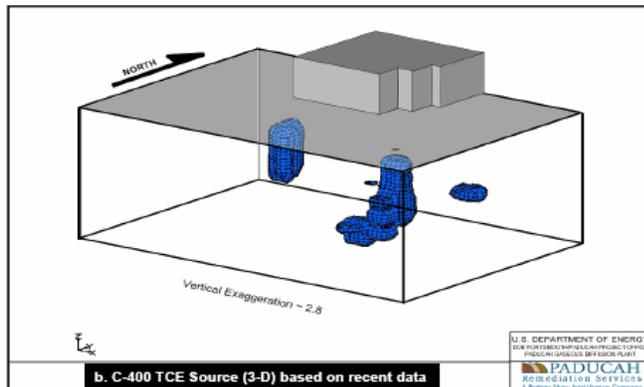
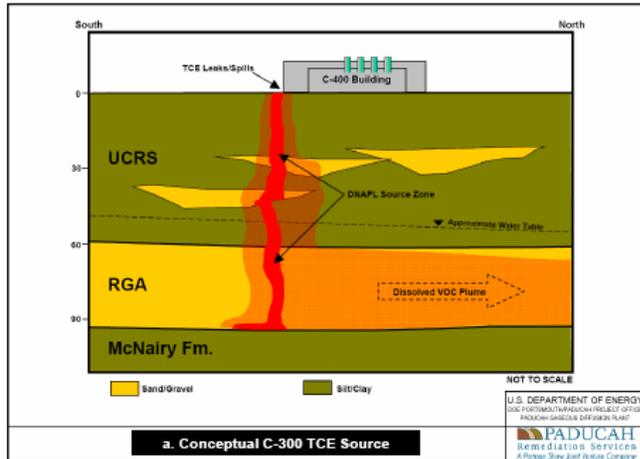


Figure 2. TCE source material in the vicinity of Building C-400

- Conceptual model shows released TCE migrating through soil (UCRS) down into aquifer (RGA).
- Area of higher concentration (DNAPL) delineated by use of “MIP” (Membrane Interface Probe).
- Report recommends:
  - Revisiting the data interpretation to ensure entire source area is treated.
  - collecting additional samples during installation of equipment to verify MIP results.
  - installing monitoring wells downgradient of treatment area as part of the action.



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# Technology Performance Objectives

## Recommendations:

- Maintain focus on overall objective of “permanently and significantly reducing the mass of contaminants in the C-400 Building area source zone.”
- **Develop and refine the definition of “asymptosis” and temperature targets based on technical considerations.**

Consistent with PPO’s previous briefings to the CAB, the team noted that it may take many years to observe a decrease in TCE concentrations in the downgradient groundwater plume after performing the treatment (because of the large mass of TCE already in the plume and the potential existence of TCE sources not addressed by this treatment).



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## Technology Performance Objectives

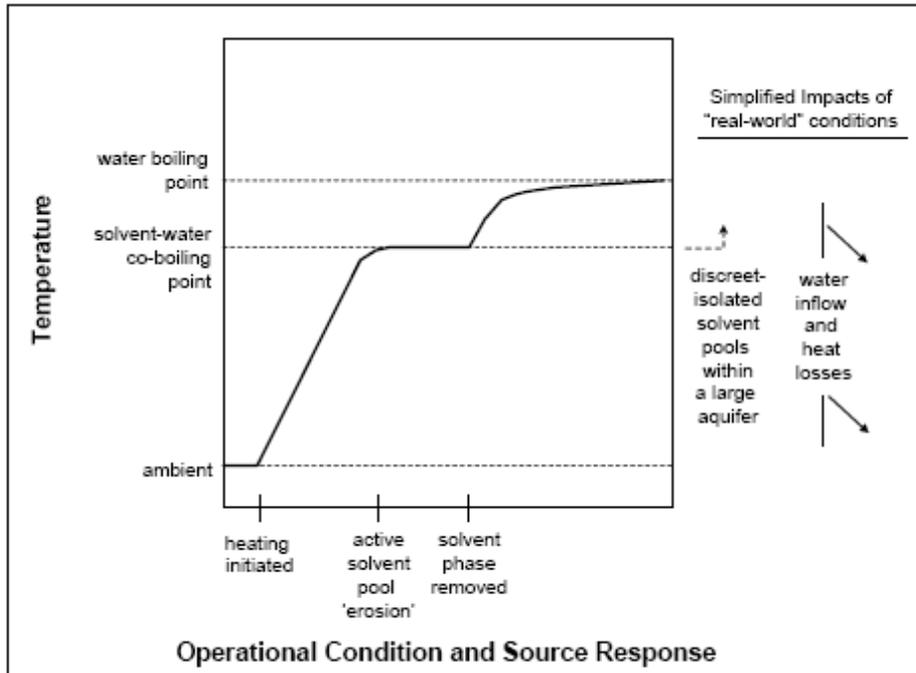


Figure 9. Idealized heating profile for a simple saturated system containing TCE DNAPL and water

Primary recommendation is to work with regulators to define “asymptosis” in the final Design Report to ensure “asymptosis” is appropriately linked to:

- target temperature.
- removal of maximum amount of TCE mass.
- cost effectiveness of removal.



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## Design

### Recommendations:

- Improve modeling to reduce project uncertainties and risk.
- Eliminate the steam heating activity in the design that is being used to heat the area of the previous 6-Phase Treatability Study.
- Consider a Phased Implementation of the Electrical Resistance Heating (ERH) System.
- Consider contingency activities to maximize TCE removal from source areas.\*

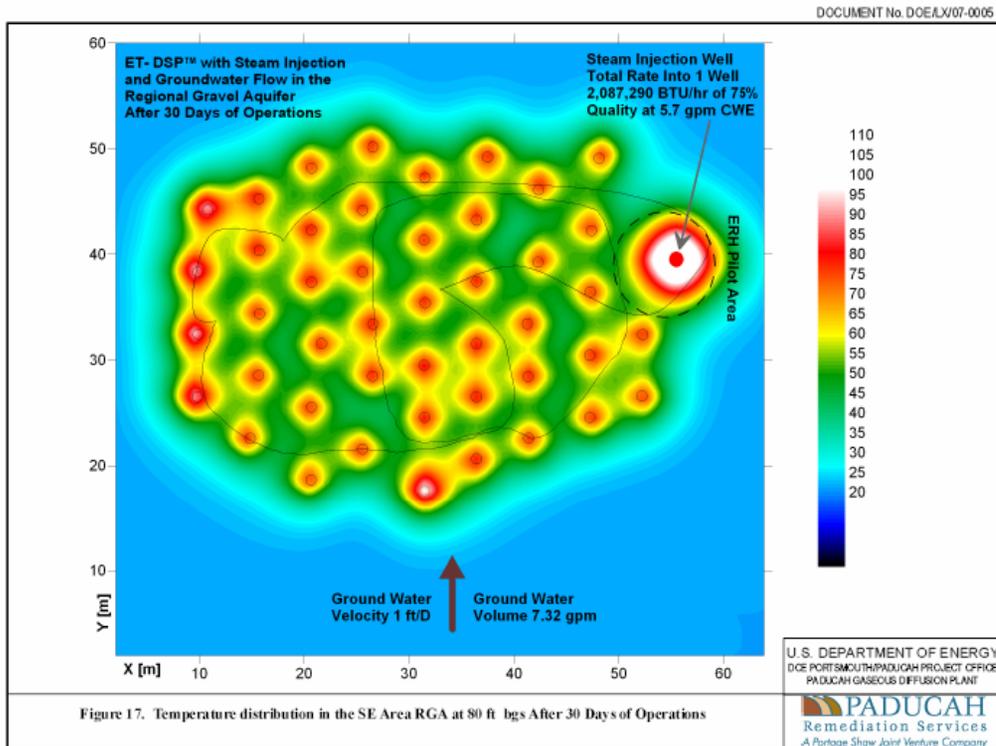
\* PPPO has determined that this recommendation is inconsistent with the C-400 ROD.



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## Design



- Steam is proposed in 90% Design Report to heat area of 6-Phase Treatability Study.
- Recommendation is to consider further:
  - not heating.
  - overdrilling to remove electrodes.



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## Design

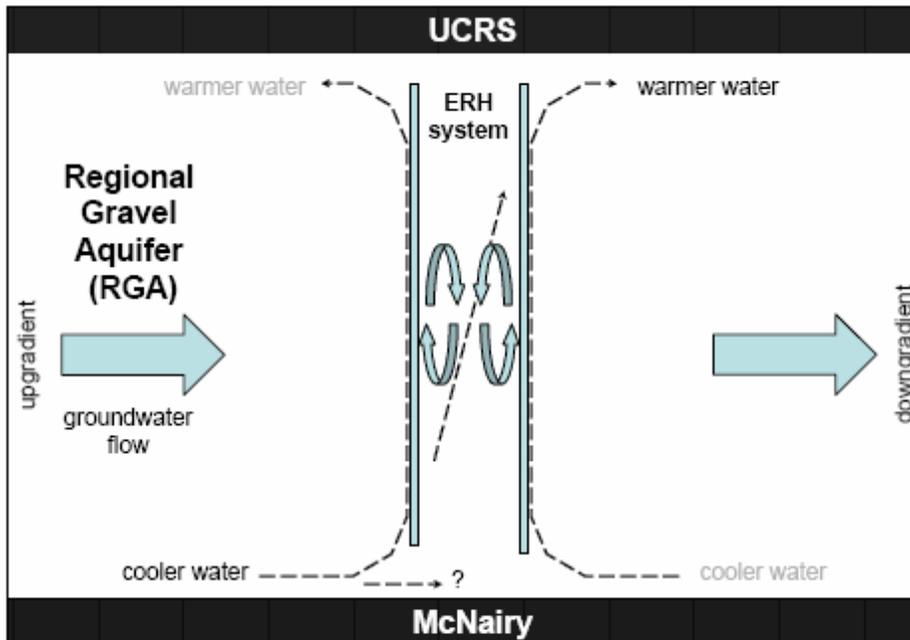


Figure 10. Simplified schematic of convection processes during ERH of the permeable portion of the treatment zone

- Primary concern is uncertainty in the ability of ERH to heat effectively the TCE source area at the bottom of the RGA.
- Technology is complex. Use phased implementation to reduce uncertainties in electrode array design and improve chance of success.



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## Health and Safety

- Health and safety information in design report found to be reasonable
- Specific recommendations are to:
  - Measure  $^{99}\text{Tc}$  and other potential contaminants in vapor stream to mitigate possible exposures.
  - Improve the description of safety interlocks in the design report to complete a more comprehensive evaluation of failure scenarios.

The details mentioned in the specific recommendations are typically described in project work packages developed by contractors at Paducah.



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## Cost Evaluation

### Recommendations:

- Costs are at upper end of those incurred at other sites where ERH technology was used. Further design refinement could reduce some costs (e.g., waste management and disposition).
- A data sharing/communication plan should be developed to maximize the potential for success.
- Technology provider should have role in all phases of the ERH implementation (i.e., be involved when installing and operating the ERH system).



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## OVERALL CONCLUSIONS

The ITR Team:

- “supports the remedial action objective (RAO) at Building C-400 to reduce the TCE source area via subsurface Electrical Resistance Heating (ERH).”
- “supports the regulatory process through which the selected remedy is being implemented.”
- “concur that ERH is a potentially viable remedial technology to meet the RAOs adjacent to C-400.”
- concluded that there are “substantive unresolved issues and system design uncertainties” that need to be addressed when finalizing the ERH design.
- expressed confidence that these issues “can be resolved to maximize the potential to successfully achieve the regulatory goals.”



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## IMPLEMENTATION PLAN

### FINAL IMPLEMENTATION PLAN C-400 INTERIM REMEDIAL ACTION 90% DESIGN DOE-HQ INDEPENDENT TECHNICAL REVIEW RECOMMENDATIONS

This revision of the Implementation Plan incorporates comments received from the Office of Soil and Groundwater Remediation (HQ). These comments (attached to end of this material) were discussed and resolved during a video/teleconference (VTC) held on October 3, 2007. Participants at the meeting included Vince Adams, Claude Magnuson, and Beth Moore (HQ), Reinhard Kners, Rich Bonczek, and Dave Dollins (Portsmouth Paducah Project Office - PPPO); Brian Looney (Savannah River National Laboratory); Mike Clark and Tracey Brindley (Paducah Remediation Services, LLC - PRS); and John Farrell (Performance Results Corporation, LLLC - PRC).

During the VTC, the Portsmouth Paducah Project Office (PPPO) made a commitment to provide a schedule for three upcoming documents so that HQ could plan for the review of these documents. The schedule is as follows:

#### Baseline Schedule Dates

Activity	CFC Design	RAWP	O&M Plan
Begin PPPO Technical Review	11/13/2007	12/17/2007	04/18/2008
End PPPO Technical Review	12/12/2007	01/16/2008	05/01/2008
Begin PPPO Program & HQ Review	12/31/2007	01/18/2008	06/09/2008
End PPPO Program & HQ Review	01/29/2008	02/15/2008	06/20/2008
Transmit to EPA & Kentucky	02/11/2008	02/18/2008	07/22/2008
Approval by EPA & Kentucky	03/12/2008	03/18/2008	10/17/2008 (D2) <sup>1</sup>

<sup>1</sup>Approval of the D2 version of the O&M Plan. Assumes regulator comment resolution on the draft version.

While this schedule is that used by PRS for the formal transmittal of the documents to PPPO and the regulators, stand-alone portions of the documents, such as the model design basis, will be provided to HQ for earlier review to the extent possible.

Note that review of the CFC Design, RAWP, and O&M Plan is consistent with Item 5 under "Evaluate and Redesign the Interim Remedy" in the approved, final Implementation Plan prepared in response to the April 2006 Paducah Site Wide Remedy Review. Item 5 states, "Provide to the Technology Review Team, for review and comment, the 90%, final RADR, and RAWP." Finally, Item 6 under "Evaluate and Redesign the Interim Remedy" in the Implementation Plan prepared in response to the April 2006 Paducah Site Wide Remedy Review states, "Invite a representative from the Technology Review Team to Paducah during remedy implementation." For planning, please note that the fieldwork for installation is scheduled to begin in late April 2008.

- PPPO began working on Implementation Plan after receiving the final report in August 2007.
- The draft Implementation Plan was submitted to HQ for review and comment in mid-September 2007.
- Final Implementation Plan due to HQ by October 19, 2007.



# Solving Cleanup Challenges Through Risk Reduction

## IMPLEMENTATION PLAN

FINAL IMPLEMENTATION PLAN  
C-400 INTERIM REMEDIAL ACTION 90% DESIGN  
DOE-HQ INDEPENDENT TECHNICAL REVIEW RECOMMENDATIONS

#	Recommendation Description	Implementation Action	Date Due
5.1.1	The ITR team determined that the target zone delineation should be modified based on data collected during system installation and based on key data from the 90%RDSI. Subsidiary and cross-linked recommendations are: 5.1.1a, 5.1.1b, 5.3.1, 5.3.4, and 5.3.5.	PPPO recognizes the differences in target zone delineation between the ITR team and the PRS project team. To reconcile these differences, PPPO has instructed PRS to evaluate the ITR findings and observations relative to the RDSI MIP results and interpretations and to revise the RDR appropriately. Because uncertainty concerning the extent of the source zone will remain after the recalibration of the RDSI MIP results, PPPO will ensure that the ERH design is sufficiently flexible to respond to field conditions during installation and operation. The flexibility in the installation and operation will be discussed further in the revised KAWP.	November 2007 <sup>1</sup>
5.1.1a	Collect soil and groundwater samples during the installation of the ERH boreholes with the specific goals of evaluating the MIP dataset and refining the treatment volume. Once the dataset is validated, then the treatment volume can be refined to address areas where TCE DNAPL may be present. This may involve an increase in the lateral and vertical extent of the thermal treatment volume in the Southeast source zone area, and in the potential source zone area to the east.	Refer to Implementation Action for 5.1.1	November 2007
5.1.1b	Increase the vertical extent of the thermal treatment volume in the Southwest source zone area into the low permeability McNairy. Data collection should be integrated into the installation with the contingency to expand both the treatment target zone (e.g., up to 15%) by adding electrodes either below or laterally, and the associated recovery systems. Some boreholes should be extended through the RGA to the McNairy interface in each treatment area.	Refer to Implementation Action for 5.1.1	November 2007

<sup>1</sup> November 2007 is the date that the revised Remedial Design Report will be transmitted to DOE for technical review. Assumes receipt of comments from EPA and Kentucky by mid-October 2007.

- The Implementation Plan lists each recommendation in the ITR Report and provides the expected action and completion date for the action.
- Most actions are expected to be completed as part of development of the final design.
- PPPO will continue to work with HQ and the Regulators to balance regulatory comments and the recommendations when developing the final design.



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