Department of Energy

Portsmouth/Paducah Project Office
1017 Majestic Drive, Suite 200
Lexington, Kentucky 40513
(859) 219-4000

AUG 15 2013

Mr. Ralph Young, Chair
Paducah Citizens Advisory Board
111 Memorial Drive
Paducah, KY 42001

PPPO-02-1938846-13

Dear Mr. Young:

RESPONSE TO THE PADUCAH CITIZENS ADVISORY BOARD RECOMMENDATION 13-02 REALLOCATION OF C-400 PHASE IIB RESOURCES

Reference: Letter from R. Young to R. Blumenfeld, "Paducah Gaseous Diffusion Plant (PGDP) Citizens Advisory Board (CAB) Approved Recommendation 13-02," dated May 22, 2013

The U.S. Department of Energy (DOE) is in receipt of the Paducah Citizens Advisory Board (CAB) Recommendation 13-02, dated May 22, 2013: Reallocation of C-400 Phase IIB Resources. Enclosed, please find the Data Quality Objectives (DQOs) for the C-400 Phase IIB Treatability Study developed by DOE, the U.S. Environmental Protection Agency (EPA), and the Kentucky Department for Environmental Protection (KDEP). The DQOs form the foundation for developing the Treatability Study Work Plan (TSWP) to measure the effectiveness of steam treatment in the Regional Gravel Aquifer (RGA).

The C-400 Phase IIb project has posed unique challenges for technology selection for the project team, regulatory agencies, and independent technical experts. DOE will continue to work with EPA and KDEP to continue to evaluate technical options, develop additional metrics to measure the effectiveness of steam treatment in the lower reaches of the RGA, define specific criteria to measure success, develop necessary information to support evaluation of cost effectiveness of steam to support selection of appropriate treatment technology, and to identify steps for moving forward. DOE will continue to update the CAB through routine briefings to appropriate CAB committees as the development of the TSWP and the project move forward.

If you have any questions or require additional information, please contact Buz Smith at (270) 441-6821.

Sincerely,

Rachel H. Blumenfeld
Acting Paducah Site Lead
Portsmouth/Paducah Project Office

Enclosure:
Summary of DQP Process

e-copy w/enclosure:
eric@pgdpcab.org, EHI/PAD
dave.dollins@lex.doe.gov, PPPO/PAD
jennifer.woodard@lex.doe.gov, PPPO/PAD
jim@pgdpcab.org, EHI/PAD
pad.dmc@swiftstaley.com, SST/Kevil
rachel.blumenfeld@lex.doe.gov, PPPO/PAD
reinhard.knerr@lex.doe.gov, PPPO/PAD
robert.smith@lex.doe.gov, PPPO/PAD
youngrs@bellsouth.net, CAB/PAD

Table 1. Summary of the DQO Process for the C-400 Phase IIb SEE Treatability Study

1: State the Problem	2: Identify the Decision			3: Identify Inputs to the Decision	4: Define the Study Boundaries	5: Develop a Decision Rule	6: Specify Limits on Decision Errors	7: Optimize the Design for Obtaining Data
	Principal Study Questions	**Alternative Actions**	**Decision Statement**					
Problem statement: **How will steam flow in the RGA in the southeast treatment zone?** **Background** Releases of cleaning solvents resulted in a subsurface source zone of TCE and other VOCs at the south end of the C-400 Cleaning Building Area. Steam enhanced extraction has been identified as a possible remedial technology for the RGA formation in the southeast treatment zone.	PSQ-1: Under what conditions can steam be injected into the RGA to develop a technically effective steam front as a basis for preliminary technology design and cost estimation? PSQ-2: How does steam injection using two injection intervals (middle and lower RGA) differ from injection using a single deep injection interval?		DS-1: If a steam front (temperature at depth being at or greater than steam temperature) can be developed across the full thickness of the RGA then the steam front can be considered technically effective, and used as a basis for technology design and cost estimation. DS-2: Assuming requirements for DS-1 are satisfied, how do spacing and injection rate requirements compose a basis for full scale design and cost concepts?	1) Previous investigation results (DOE 2011). 2) Site conceptual model (DOE 2011). - Collection of soil cores as part of TS 3) Information requirements for design of the preferred alternative as follows: - Rate of steam migration in the RGA; - Length of time for steam migration in the RGA; - Heat required to successfully remediate RGA; -Heat required to successfully remediate the RGA in consideration of groundwater velocity impacts; -Steam injection rate required to successfully heat full thickness of RGA; 4) Define metric(s) for effective steam front development. 5) DOE Headquarters approval is required to commit to the agreed treatability scope. 6) The FFA parties must agree on the criteria for success, i.e., what is an acceptable range of injection rates and pressures, and what is an acceptable upper end range for injection well spacing? Data evaluation; - Model(s) must be supported by documented verification/validation (Vendor selection submittal). - Model(s) must reproduce field results from the single well injection test. - Models must be capable of supporting evaluation of full scale design development and evaluation.	Spatial boundaries: The vertical boundary of the study is the full thickness of the RGA. Location of injection well and monitoring array on upgradient edge of Phase IIb treatment area. Schedule boundaries: Treatability study operations are anticipated to require approximately 60-90 days. Operational boundaries: Field investigations and remedial design are constrained by surface and subsurface infrastructure at the C-400 Building. VOCs are present in the subsurface. Administrative boundaries: The treatability test includes subcontracting for a vendor to provide engineering design, construction, and operation of steam injection, engineering and temperature array monitoring. The vendor will also lead in the evaluation of the treatability study data, in full scale design development and optimization, and will provide input for project cost estimation. [Vendor involvement is desired prior to finalization of the Work Plan/Design (D2)].	DR-1: If technically effective steam front propagation in the RGA can be demonstrated then the resulting information can be used to develop design and cost concepts for technology selection. It must be recognized that the conceptual layout presented here for the TS is not the optimal layout for full scale implementation. Superposition of steam from multiple steam injection points will make for a more favorable steam front development at full scale. Thus, modeling using appropriate models will be necessary to determine the appropriate well spacing and injection rates for full scale.	Definitive data quality is assumed for temperature monitoring, and standard engineering parameter monitoring (flow rate, pressure, temperature). Subsurface temperature data to be of sufficient quality to be able to determine rate of steam migration from one individual monitoring point to the next both vertically and horizontally. - Multiple temperature monitoring locations (5 to 10) to capture temperature response in RGA across the spatial extent to f the target zone - Discreet temperature sensors at a maximum vertical spacing of 3-ft. - Horizontal temperature monitoring spacing to include locations that are down-gradient, up-gradient, and cross-gradient locations in regard to groundwater flow direction - Vertical extent of to include full thickness of RGA and extend nominally into McNairy FM, below the RGA, and into the UCRS, above the RGA	Flexibility in operation of treatability study (injection scenarios) to allow for adaptive management approach. Stopping or re-aligning treatability study based on results will allow for efficient collection of required data. Communication of the data and discussion with the stakeholders during the operation will be critical to the success of the TS. The targeted depth of investigation is the full thickness of the RGA unit in the southeast treatment zone, or approximately 60 to 100 ft bgs. Injection scenarios will include single well injection at the base of the RGA, and two-well injection both at the base and mid-point of the RGA. Parameters as established in quality assurance project plan for precision, accuracy, representativeness, completeness, and comparability. Groundwater flow direction

ARAR = applicable or relevant appropriate requirement; CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act; DNAPL = dense nonaqueous-phase liquid; EPA = U.S. Environmental Protection Agency; ERH = electrical resistance heating; FFS = focused feasibility study; FS = feasibility study; GWOU = Groundwater Operable Unit; MCL = maximum contaminant level; NCP = National Contingency Plan; OU = operable unit; PGDP = Paducah Gaseous Diffusion Plant; RAO = remedial action objective; RDSI = Remedial Design Support Investigation; RG = remediation goal; RGA = Regional Gravel Aquifer; TCE = trichloroethene; TS = treatability study; UCRS = Upper Continental Recharge System; USEC = United States Enrichment Corporation; VOC = volatile organic compound