



Paducah Gaseous Diffusion Plant
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Consensus Recommendation: 10-02

Approved March 18, 2010 by the Paducah Gaseous Diffusion Plant Citizens Advisory Board

Title: Accelerate Remediation of Solid Waste Management Unit (SWMU) 4

BACKGROUND

The Paducah Gaseous Diffusion Plant (PGDP) site is located on a 3,422-acre reservation in McCracken County in Western Kentucky that contains an active uranium enrichment facility and surrounding support facilities. The PGDP began enriching uranium for the United States Government in the early 1950s and has been in continuous operation since that time. The PGDP is owned by the U.S. Department of Energy (DOE). The enrichment and support facilities have been leased to the U.S. Enrichment Corporation (USEC) since 1993. DOE retains control of the non-leased areas of the plant.

DOE is conducting environmental remediation (ER) and Decontamination and Decommissioning (D&D) activities at PGDP in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA). PGDP was placed on the National Priorities List (NPL) in 1994. DOE, the U.S. Environmental Protection Agency (EPA), and the Commonwealth of Kentucky entered into a Federal Facilities Agreement (FFA) in 1998 that establishes the regulatory framework for CERCLA projects at PGDP. The three FFA parties have recently initiated a streamlined process to accelerate the approval of removal actions under the jurisdiction of the FFA.

The ER activities at PGDP have been categorized into the following six operable units (OU): Surface Water, Soils, Burial Grounds (BG), Groundwater, Decontamination and Decommissioning, and Comprehensive Site. The BGOU includes 10 Solid Waste Management Units (SWMU). Seven of these SWMUs (2, 3, 4, 5, 6, 7, and 30) are located within the secure area of the plant while the other three (9, 10, and 145) are located in controlled areas of the reservation outside the secure area.

From the early years of production until the 1980s it was common practice nationally to bury hazardous substances in unlined burial grounds. The SWMUs that comprise the BGOU are unlined burial grounds of various sizes and depths, containing a myriad of hazardous materials. Some wastes are buried below the water table of the area and thus contribute to groundwater contamination. There are three large groundwater plumes (Northeast, Northwest, and Southwest) originating at the site. The Northeast and Northwest plumes are contaminated with trichloroethylene (TCE) and technetium-99 (⁹⁹Tc) and extend beyond the site boundary. DOE has implemented a water policy box to provide city water to residents affected by these plumes. The Southwest plume is also contaminated with TCE, but does not yet extend beyond the site boundary.

Remedial Investigation Report for the Burial Grounds Operable Unit at the Paducah Gaseous Diffusion Plant, Paducah Kentucky (DOE/LX/07-0030&D2) (RI) was issued in February 2010.

This RI examined 8 of the 10 SWMUs in the BGOU (SWMUs 2, 3, 4, 5, 6, 7, 30, and 145) to (1) characterize the contaminant source zones, (2) define the extent of the source zones and contamination in the soil and secondary sources, (3) determine surface and subsurface transport mechanisms and pathways, and (4) support the evaluation of remedial technologies. SWMUs 9 and 10 have been closed and were not included in the RI.

TCE, a highly mobile and highly toxic cleaning solvent, was found to be present in several of the SWMUs. In addition, heavy metal contamination (including uranium) and radiological contamination (primarily ⁹⁹Tc) were also found. The baseline risk assessment (BRA) in the RI examined potential exposures to (1) future on-site industrial users, (2) future on-site excavation workers, (3) future on-site recreational users, (4) future on-site rural residents, and (5) future off-site rural residents. Fate and transport modeling was used to predict those analytes that would exceed maximum contaminant level (MCL) at various points of exposure (POE) ranging from the SWMU boundary to the Ohio River. The BRA results indicated that excess lifetime cancer risk (ELCR) exceeds the upper end of the EPA acceptable risk range and that the hazard index (HI) exceeds 1.0 for all SWMUs evaluated. Therefore, remediation of these 8 SWMUs will be further evaluated in a Feasibility Study (FS).

While remediation of all evaluated SWMUs will be considered in the FS, addressing those sources with high predicted offsite concentrations of TCE and its degradation products in groundwater appears to offer the greatest opportunity for near-term reduction of offsite contamination and its attendant risk to the public health and safety. TCE trends indicate the likely presence of TCE dense nonaqueous-phase liquid (DNAPL) in the waste cells and the soils underlying the cells of SWMU 4 as well as in the matrix of the Regional Gravel Aquifer (RGA). (See the attached figure.) SWMU 4 is the primary source for the Southwest groundwater plume. The Southwest groundwater plume, while not yet offsite, may contaminate a wider area of the RGA. In addition, the contribution of TCE to the groundwater plume could mask the effectiveness of the electric resistance heating (ERH) project to treat the TCE DNAPL at C-400.

Full remediation of SWMU 4 will consist of two distinct and separate phases. The first phase is a removal action to excavate the burial pits and adjacent contaminated soils down to native soil (i.e., the undisturbed soils below the burial pits) and excavation of additional soils within the SWMU 4 boundary that is contaminated to unacceptable levels. DOE may continue excavation activities below native soil if it appears reasonable to do so (i.e., easily removed contaminants). The excavation of SWMU 4 will remove and dispose of the metals, radioactively contaminated materials, and remaining TCE sources within the burial pits. The second phase of the remediation addresses removal of any TCE DNAPL in the soils and the groundwater associated with SWMU 4. It is anticipated that electric resistance heat (ERH) similar to that being used for the C-400 DNAPL removal will be employed to remove the SWMU 4 DNAPL. Because the presence of metals in the burial pits would render ERH ineffective, it is essential that the removal action be completed prior to DNAPL removal.

The SWMU 4 removal action is currently scheduled to be performed over the period from FY 2015 through 2017. The baseline funding for this phase of the remediation is estimated at \$190 million which does not include management reserve, fee, or contingency. The DNAPL removal using ERH would be performed in FY 2017 and 2018 at an estimated baseline cost of approximately \$20 million. These activities are critical for meeting DOE's 2019 BGOU Site Management Plan (SMP) milestone commitment under the FFA.

Acceleration of the removal action (excavation) for SWMU 4 could significantly reduce the impact of TCE contamination of the groundwater by eliminating existing TCE sources within the burial ground. It would further allow acceleration of TCE DNAPL removal phase of the remediation and reallocation of baseline funding to accelerate remediation of other BGs. A commitment by July 2010 to fund up to \$200 million for the accelerated removal action for SMWU 4 would allow completion of this phase of the remediation as early as FY 2013 with an overall cost savings of \$3.6 million. This would also provide confidence that DOE will meet its 2019 BGOU SMP milestone commitment.

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Additional employees have been hired under the American Reinvestment and Recovery Act (ARRA). They are currently employed in accelerated D&D of C-340, C-410, and East End Smelter. These D&D efforts are expected to be completed in the summer of 2010. These employees have already been through the security clearance process and extensive training has equipped them with the skills needed to work in hazardous environments. A commitment to fund an accelerated SMWU 4 removal action will enable DOE to take advantage of this workforce to efficiently and safely complete the removal action for this classified burial ground. The smooth transition of labor allows for continued momentum and successes to be had within the PGDP ER program.

Recommendation:

The PGDP Citizens Advisory Board recommends that DOE:

- 1. Fund up to \$200 million by July 2010 to accelerate the removal action for SWMU 4 at PGDP.**
- 2. To the extent possible, reallocate baseline funding to accelerate SWMU 4 TCE DNAPL removal and remediation of SWMUs 2, 3, 5, 6, 7, 30, and 145 as determined by the FS.**

Acceleration of the SMWU 4 removal action would eliminate TCE sources within the burial ground which feed the Southwest Plume contamination. This would be accomplished up to 4 years in advance of the current baseline schedule with an estimated cost savings of \$3.6 million. Acceleration of this project would allow DOE to make use of a fully trained work force with security clearance, prevent further contamination to the Regional Groundwater Aquifer, and to reduce the risk to human health and safety and the environment.