DOE/LX/07-0013&D1

Update to the End State Vision for the Paducah Gaseous Diffusion Plant Paducah, Kentucky

DOE/LX/07-0013&D1

Update to the End State Vision for the Paducah Gaseous Diffusion Plant Paducah, Kentucky

Date Issued—May 2008

Prepared for the
U.S. DEPARTMENT OF ENERGY
Office of Environmental Management

Prepared by
PADUCAH REMEDIATION SERVICES, LLC
managing the
Environmental Remediation Activities at the
Paducah Gaseous Diffusion Plant
under contract DE-AC30-06EW05001

THIS PAGE INTENTIONALLY LEFT BLANK

PREFACE

This *Update to the End State Vision for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky,* (formerly *Risk-Based End State Vision and Variance Report for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*), DOE/LX/07-0013&D1, which originally was prepared to meet requirements set forth in a memorandum from Jessie Roberson to Distribution dated September 22, 2003, as amended by clarification contained in a memorandum entitled "Risk Based End State Guidance Clarification" dated December 23, 2003 (DOE 2003a), and in the notes from the U.S. Department of Energy (DOE) Risk-Based End State (RBES) Next Steps Workshop, October 6 and 7, 2004. This revision also includes a summary of interaction with stakeholders through July 2007.

The presentation of material in this document is consistent with DOE Policy, DOE P 455.1, entitled *Use of Risk-Based End States* (DOE 2003b), the standardized approach set forth in a guidance document entitled *Guidance for Developing a Site-Specific End State Vision* (dated September 11, 2003) (DOE 2003c), as amended by the "Risk Based End State Guidance Clarification," and the notes from the DOE RBES Next Steps Workshop, October 6 and 7, 2004. The document is a tool for communicating the Paducah Gaseous Diffusion Plant's (PGDP's) end state vision to stakeholders (i.e., DOE, the U.S. Environmental Protection Agency, the Commonwealth of Kentucky, and the general public). As discussed in the notes from the DOE Next Steps Workshop, this document will be updated as needed to reflect actual decisions from the ongoing Comprehensive Environmental Response, Compensation, and Liability Act process at the site.

Although this report presents potential actions to address hazards that could be used to reach the PGDP's end state, this report is not a decision document. Rather, discussions of potential specific mechanisms are included to provide an analytical framework that DOE will use to further evaluate the cleanup activities and the strategic approaches at PGDP to determine if it is appropriate to pursue changes in the PGDP baseline. Any decision to pursue changes to the baseline will include factors beyond those presented in this document, including input from stakeholders. If DOE ultimately decides to seek changes to the current compliance agreements, decisions, or statutory/regulatory requirements, then those changes will be made in accordance with applicable requirements and procedures.

THIS PAGE INTENTIONALLY LEFT BLANK

CONTENTS

FIGURES

THIS PAGE INTENTIONALLY LEFT BLANK

TABLES

THIS PAGE INTENTIONALLY LEFT BLANK

ACRONYMS

1,1,1-TCA	l,1,1-trichloroethane
ACL	Alternate Concentration Limit
ACO	Administrative Consent Order
amsl	above mean sea level
ARAR	applicable or relevant and appropriate requirement
ASTM	American Society for Testing and Materials
ATSDR	Agency for Toxic Substances Disease Registry
BGOU	Burial Grounds Operable Unit
BRA	baseline risk assessment
BWMA	Ballard Wildlife Management Area
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
ClF_3	chlorine trifluoride
CSM	conceptual site model
CSOU	Comprehensive Site Operable Unit
D&D	decontamination and decommissioning
DMSA	DOE Material Storage Area
DNAPL	dense nonaqueous-phase liquid
DOC	U.S. Department of Commerce
DOE	U.S. Department of Energy
DUF_6	uranium hexafluoride
ELCR	excess lifetime cancer risk
EM	Environmental Management
EPA	U.S. Environmental Protection Agency
FFA	Federal Facility Agreement
FS	feasibility study
FY	fiscal year
GDP	gaseous diffusion plant
GWOU	Groundwater Operable Unit
HI	hazard index
HQ	hazard quotient
HU	hydrogeologic unit
IDW	investigation-derived waste
KDWM	Kentucky Division of Waste Management
KPDES	Kentucky Pollutant Discharge Elimination System
LLW	low-level waste
MCL	maximum contaminant level
NCP	National Contingency Plan
NOAEL	No Observed Adverse Effects Level
NPL	National Priorities List
NSDD	North-South Diversion Ditch
OU	operable unit
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PGDP	Paducah Gaseous Diffusion Plant
ppb	parts per billion
ppm	parts per million
PRG	preliminary remediation goal
RAO	remedial action objective

RBES	risk-based end state
RCRA	Resource Conservation and Recovery Act
RGA	Regional Gravel Aquifer
RI	Remedial Investigation
RL	remediation level
ROD	Record of Decision
SI	Site Investigation
SMP	Site Management Plan
SOU	Soils Operable Unit
SWMU	solid waste management unit
SWOU	Surface Water Operable Unit
^{99}Tc	technetium-99
TCE	trichloroethene
TI	technical impracticability
TLD	thermoluminescent dosimeter
trans-1,2-DCE	*trans*-1,2-dichloroethene
TRE	toxicity reduction evaluation
TSCA	Toxic Substances Control Act
TVA	Tennessee Valley Authority
^{234}U	uranium-234
^{235}U	uranium-235
^{238}U	uranium-238
UCRS	Upper Continental Recharge System
UF_6	uranium hexafluoride
USEC	United States Enrichment Corporation
USV	Upper Screening Value
VC	vinyl chloride
Water Policy	The Action Memorandum for the Water Policy at PGDP
WKWMA	West Kentucky Wildlife Management Area
WMA	Wildlife Management Area
WMP	Watershed Monitoring Program

EXECUTIVE SUMMARY

In 2002, the U.S. Department of Energy's (DOE's) Office of Environmental Management (EM) established a set of corporate projects to lead EM's response to the *Top to Bottom Review* (DOE 2002a). One of these projects has resulted in the production of policy and guidance that directs DOE sites to submit a site-specific end state vision document. In accordance with that policy (DOE Policy 455.1, *Use of Risk-based End States)* and its implementing guidance *(Guidance for Developing a Site-specific Risk-based End State Vision)*, as amended, and the notes from the DOE Risk-Based End State (RBES) Next Steps Workshop, the Paducah Gaseous Diffusion Plant (PGDP) has prepared this End State Vision Document for PGDP. Similarly, consistent with the notes from the DOE RBES Next Steps Workshop, this report is a dynamic document that will be updated as needed to reflect actual decisions from the ongoing Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process at the site.

> This report presents potential actions to address hazards that could be used to reach the current planned end state and potential end state alternative. These presentations are not meant to be pre-decisional, but are meant to introduce examples of actions that may be completed. The selection of specific actions will be made in accordance with applicable law and agreements.

This report uses a standardized approach to meet the objectives contained in the guidance. This approach relies on the presentation of a series of maps and conceptual site models (CSMs) that depict the relationship between PGDP and its surroundings. The maps and CSMs are intended to present and allow comparisons between current and future land uses; depict hazards and risks to affected or potentially affected populations or receptors; serve as a planning tool for site management; facilitate communication of risks during discussions with stakeholders; allow tracking of expected and actual cleanup results; and serve as a communication tool for public meetings in regard to cleanup activities, current PGDP missions and requirements, and future land use. The maps follow a standardized hierarchical approach that depicts the end state vision in regional-, site-, and hazard-specific contexts. The CSMs are produced only in a hazard-specific context. In the CSMs and their associated text, various responses to achieve site cleanup are presented. These presentations are not meant to be pre-decisional, but are meant to introduce examples of actions that may be completed to reach the current planned end state or potential end state alternative. The selection of specific actions will be made in accordance with applicable law and agreements.

Using the information in this report, as well as information developed during implementation of cleanup and investigation activities at PGDP, DOE will continue to evaluate the cleanup activities and the strategic approaches at PGDP to determine if it is appropriate to pursue changes in the PGDP baseline. Any decision to pursue changes to the baseline will include factors beyond those presented in this report, including input from stakeholders. If DOE ultimately decides to seek changes to current compliance agreements, decisions, or statutory/regulatory requirements, then those changes will be made in accordance with applicable requirements and procedures.

Currently, PGDP, located in Paducah, Kentucky, is the nation's only operating uranium enrichment facility. Missions performed at PGDP are the enrichment mission, a uranium conversion mission, and an environmental cleanup mission. The enrichment mission began in the early 1950s and involves producing enriched uranium for commercial uses through a gaseous diffusion process. At present, the facilities and infrastructure used to produce enriched uranium are leased to the United States Enrichment Corporation (USEC). The uranium conversion mission, involves the construction and operation of a facility that will convert depleted uranium hexafluoride (DUF_6) currently stored at PGDP to less reactive uranium forms and the subsequent disposal of the converted uranium. Finally, the environmental cleanup mission involves work performed under a Federal Facility Agreement (FFA) and other environmental compliance agreements. The current portion of the cleanup mission under the FFA is to investigate and address existing environmental contamination and to decontaminate and decommission (D&D) those facilities currently leased to USEC once the gaseous diffusion plant (GDP) ceases operation. The portion of the EM cleanup mission addressed by other agreements includes, for example, the characterization and appropriate disposal of legacy waste and materials found in DOE Material Storage Areas (DMSAs) and continuation of waste management activities.

Consistent with the end state visions guidance and the missions at PGDP, the following nine hazard areas were identified at PGDP. (Please see Table ES.1 for summary information about each of these hazard areas.)

> Table ES.1 summarizes the hazard areas discussed in the PGDP End State Vision Document. This table includes these:
>
> - a qualitative estimate of the extent of contamination included in the hazard area;
> - the sources of contamination (e.g. , media, waste, infrastructure) associated with the hazard area;
> - the main classes of contaminants found in the contaminant sources;
> - the environmental media that may be impacted by contaminants at or migrating from the contaminant sources;
> - the status of the investigations and cleanup of the sources in the hazard areas; and
> - a summary of the types of risk assessment information currently available for each hazard area.

- Hazard Area 1 – Groundwater Operable Unit (GWOU): This hazard area encompasses both the sources of contamination to groundwater (i.e., spill areas) and contaminants migrating via groundwater from burial grounds located in the industrialized area of PGDP and three dissolved-phase plumes. [Two of these plumes (i.e., the Northwest and Northeast Plumes) extend off DOE-owned property.]

- Hazard Area 2 – Surface Water Operable Unit (SWOU): This hazard area encompasses the sources of surface water contamination (i.e., waste, sediment, and soils) found within the industrialized portion of PGDP, including plant ditches. This hazard area also includes two creeks, Bayou and Little Bayou Creek, located outside of the industrialized portion of PGDP, which run both on and off DOE property.

- Hazard Area 3 – Burial Grounds Operable Unit (BGOU) (Group 1). This hazard area includes two burial grounds that contain buried waste and/or soil that are not believed to serve as a source of groundwater contamination, but for which the current planned end state and potential end state alternative differ.

- Hazard Area 4 – Soils Operable Unit (SOU). This hazard area encompasses all areas containing contaminated soils that do not impact the GWOU or SWOU and that are not part of other hazard areas. This hazard area also encompasses the soil and rubble areas that have been identified both on and off DOE property that may contain contaminated soils or materials (DOE 2007b).

- Hazard Area 5 – Permitted Landfills. This hazard area includes two permitted, closed landfills, and the currently operating permitted landfill. Also, as a planning assumption, this hazard area includes under future conditions, a potential CERCLA Cell, that would be used to dispose of debris and other materials generated during GDP D&D.

- Hazard Area 6 – BGOU (Group 2). This hazard area includes four areas that contain buried waste and/or soil that are not believed to serve as a source of groundwater contamination and for which the current planned end state and potential end state alternative do not differ.

- Hazard Area 7 – Legacy Waste and DMSAs. This hazard area encompasses legacy waste found at storage locations at PGDP and potentially contaminated debris, surfaces, and soil found in DMSAs located throughout PGDP.

Table ES.1. PGDP Summary Table of Hazard Areas in the End State Vision Document

Hazard Area[a]	Contaminant Extent	Source Media	Main contaminants[b]	Media potentially impacted	Remediation status	Status of Risk Information	
						Ecological receptors	Health Risks
1 GWOU	Diffuse, includes plumes and sources	Soil, waste, DNAPL	Solvents, radionuclides	GW, SW, Sediment	SI complete for SW Plume. Sampling ongoing for Little Bayou seeps. RI complete for C-747 Burial Yard. RCRA closure of C-404 Burial Ground. Removal Action complete for C-747-C Oil Landfarm. Interim ROD for NW and NE Plume. ROD for C-400 source area signed. Implementation of ROD remedy ongoing. TCE degradation analysis initiated. Sitewide groundwater model being revised.	SRAs complete	BRA complete
2 SWOU	Sources, drainage system, ditches, creeks	Soil, scrap, sediment	Metals, PCBs, PAHs, radionuclides	SW, Sediment	Limited SIs complete for Sewer System. Removal Action complete for scrapyards. ROD for NSDD in industrial area. SI completed for internal ditches and Bayou and Little Bayou Creeks.	SRA for some areas	SRA for some areas
3 BGOU (Group 1)	2 sites	Waste, soil	Metals, PAHs, radionuclides	Soil	RI complete for C-747-B Burial Ground. SI complete for Landfill Borrow Area. RI complete for BGOU.	SRAs for 2 sites	BRAs for 2 sites
4 SOU	Dispersed	Soil	Metals, PAHs, PCB, radionuclides	Soil	SIs complete for some areas RI scoping initiated for sitewide SOU. Investigation underway for soil areas.	Not available	SRAs for some areas
5 Permitted Landfills	3 sites & potential CERCLA Cell	Waste, soil	Solvents, metals, asbestos, radionuclides	Soil, GW, SW, Sediment	SI completed for closed C-746-S and C-746-T Landfills. Groundwater Assessment being planned for C-746-U. Scoping and conceptual design initiated for potential CERCLA Cell.	SRA for 1 site	BRA for 1 site
6 BGOU (Group 2)	4 sites	Waste, soil	Metals, PAHs, radionuclides	Soil, GW, SW, Sediment	RI complete for BGOU. ROD and Corrective Actions implemented for C-746-K Landfill.	SRAs complete	BRAs complete
7 Legacy Waste and DMSAs	Dispersed, includes DMSAs	Waste, soil	Metals, PCBs, PAHs, solvents, radionuclides	Soil, SW, Sediment	Characterization and removal in progress.	Not applicable	Not applicable
8 Cylinder yard and conversion facility	"Hot spots"	Facility, cylinders, soil	Uranium hexafluoride	Soil, SW, Sediment	Conversion facilities being constructed Investigation of facilities and cylinder yards will occur when mission is complete.	Not applicable	Not applicable

Table ES.1 PGDP Summary Table of Hazard Areas in the End State Vision Document (Continued)

Hazard Area[a]	Contaminant Extent	Source Media	Main contaminants[b]	Media potentially impacted	Remediation status	Status of Risk Information	
						Ecological receptors	Health Risks
9 Gaseous Diffusion Plant Facilities	"Hot spots," buildings	Facilities, soil	PCBs, metals, solvents, radionuclides, asbestos.	Soil, SW, sediment	RA complete for C-402 and C-405, ongoing for C-746-B, and pending for remainder of inactive facilities and C-410/C-420 Feed Plant. Investigation of operating facilities will occur after plant shutdown	Not available	SRAs for C-410/ C-420 and C-340

Notes:

BGOU – Burial Grounds Operable Unit
BRA – Baseline Risk Assessment
CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act
DMSA – DOE Material Storage Area
DNAPL – dense nonaqueous- phase liquid
GW – Groundwater
GWOU – Groundwater Operable Unit
L.Bayou – Little Bayou Creek
NE – Northeast
NSDD – North- South Diversion Ditch
NW – Northwest
RA – Remedial Action
RCRA – Resource Conservation and Recovery Act
RI – Remedial Investigation
ROD – Record of Decision
SI – Site Investigation
SOU – Soils Operable Unit
SRA – Screening Risk Assessment
SW – Surface Water
SWOU – Surface Water Operable Unit

[a] Please see Chapter 4 for additional information about the sites included in each hazard area.
[b] Primary solvent contaminants include trichloroethene; *cis*- and *trans*-1,2-dichloroethene; vinyl chloride; 1,1-dichloroethene; carbon tetrachloride; chloroform; ethylbenzene; benzene; tetrachloroethene; and xylenes.
Primary radionuclide contaminants include ^{234}U, ^{235}U, ^{238}U, ^{99}Tc, 137Cs, ^{230}Th, ^{232}Th, ^{241}Am, ^{237}Np, ^{238}Pu, ^{239}Pu, ^{240}Pu, ^{226}Ra, ^{90}Sr, and ^{60}Co.
Primary metal contaminants include antimony, arsenic, beryllium, cadmium, chromium, copper, lead, manganese, mercury, molybdenum, nickel selenium, silver, thallium, uranium, vanadium, and zinc.
Semivolatile organic compound contaminants in addition to PCBs and PAHs include dioxins, furans, and pyrene.
PAHs included as contaminants are benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, acenaphthene, acenaphthylene, anthracene, fluoranthene, naphthalene, and pheneanthrene.
PCBs included as contaminants are Aroclor 1016, 1221, 1232, 1242, 1248, 1254, and 1260.

- Hazard Area 8 – Cylinder Yards and DUF_6 Conversion Facility. This hazard area is composed of the cylinder yards that contain DUF_6 in cylinders and the conversion facility currently under construction.

- Hazard Area 9 – GDP Facilities. This hazard area is composed of the GDP facilities and infrastructure that will undergo D&D once the current uranium enrichment mission is ended. This hazard area also includes any sources to the GWOU and SWOU not addressed in the other hazard areas.

Each of these hazard areas, except for the portions of the dissolved-phase groundwater plumes and Bayou and Little Bayou Creeks located off DOE property, is in a location where current and future expected land uses are industrial or recreational. Some areas overlying the groundwater plumes or adjacent to the creeks in areas not on DOE property are rural residential.

Under current conditions, risks at all hazard areas are at or below levels of risk that fall near the bottom of EPA's acceptable risk range for site-related exposures (10^{-6}). This level of risk, which is called a *de minimis* level of risk in this report, is attained under current conditions through access and institutional controls. However, unmitigated risks or risks that potentially could exist in the absence of these controls exceed the upper end of EPA's acceptable risk range for site-related exposures (10^{-4}) at some locations. These risks are driven by the presence of chlorinated solvents [primarily trichloroethene (TCE) and its breakdown products] in groundwater and by the presence of polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), metals, and radionuclides (primarily the uranium isotopes) in soil and sediment.

Under the potential end state alternative, risk at all hazard areas will be at *de minimis* levels. These levels will be attained through the following actions:

- Continued access and institutional controls (e.g., capping, enhanced controls on groundwater use);

- Response action at major source areas to reduce the concentration of TCE and other solvents in subsurface that acts as a long-term source of groundwater contamination;

- Monitored natural attenuation of secondary sources of groundwater contamination (TCE source areas) and the dissolved-phase plumes with continued access and enhanced institutional controls;

- Natural attenuation to reduce TCE concentrations in groundwater discharged to surface water;

- Excavation and on and off-site disposal of contaminated surface soil and sediment to attain a target risk of 1×10^{-4} to receptors consistent with current and future land use and average PCB concentrations within exposure units of 25 ppm in industrial areas and 1 ppm in recreational areas;

- Capping of burial grounds;

- Characterization and on- and off-site disposal of legacy waste; and

- On- and off-site disposal of debris from D&D of facilities and infrastructure.

In order to identify variances between the potential end state alternative and the current PGDP baseline, a current planned end state also is presented for each of the hazard areas. Under the current planned end state, risk at all hazard areas also will be at *de minimis* levels. These levels will be attained through the following actions:

- Continued access and institutional controls (e.g., capping, maintain current controls on groundwater use);

- Response actions at major and secondary source areas to reduce the concentration of TCE and other solvents in subsurface that acts as a long-term source of groundwater contamination;

- Response actions to reduce TCE concentrations in the dissolved-phase plumes;

- Monitored natural attenuation of sources of groundwater contamination (TCE source areas) and the dissolved-phase plumes following completion of response action to reduce TCE concentrations;

- Natural attenuation to reduce TCE concentrations in groundwater discharged to surface water;

- Construction of sediment control basins;

- Excavation and on- and off-site disposal of surface and subsurface soil and sediment to attain a target risk of 1×10^{-6} for hypothetical residents and an average PCB concentration of 1 ppm within exposure units in industrial and recreational areas;

- Excavation and on- and off-site disposal of wastes from burial grounds;

- Characterization and on- and off-site disposal of legacy waste; and

- On- and off-site disposal of debris from D&D of facilities and infrastructure.

Note that, except for the on-site portion of the North-South Diversion Ditch (NSDD) and the DMSAs (which are part of Hazard Areas 2 and 7, respectively), no final cleanup levels for soil or groundwater have been established at PGDP. (The PGDP FFA does not establish specific cleanup targets.) The cleanup levels discussed above are values projected to be used under either the potential end state alternative or current planned end state. For the on-site portion of the NSDD, the cleanup levels were established in an interim Record of Decision (DOE 2002b) and were set using an industrial worker scenario (cancer risk target of 1×10^{-4}, hazard target of 3, and radiation dose target of 25 mrem/yr). For the DMSAs, the cleanup levels for final closure were established in an Agreed Order (DOE 2003d) and were set using a residential scenario (cancer risk target of 1×10^{-6} and hazard target of 1). It is the regulators' position that meeting the closure requirements under the Agreed Order does not relieve DOE from the requirement to meet CERCLA cleanup standards; therefore, even after meeting the clean closure standards under the Agreed Order, additional response actions may be required for some DMSAs under CERCLA.

Using this information, the following nine variances were identified (potential end state alternative response action listed first):

1. Enhanced institutional controls to limit groundwater use versus continuation of PGDP Water Policy to limit groundwater use – affects Hazard Areas 1, 5, 6, and 9;

2. Active treatment of the primary groundwater source area using heating technologies and monitored natural attenuation with either enhanced institutional controls or continuation of the PGDP Water Policy, versus active treatment of multiple groundwater source areas using heating technologies, with monitored natural attenuation and continuation of the PGDP Water Policy – affects Hazard Areas 1 and 9;

3. Monitored natural attenuation for groundwater source areas (burial ground), with capping and either enhanced institutional controls or continuation of the PGDP Water Policy, versus excavation of groundwater source areas (burial grounds), with continuation of the PGDP Water Policy – affects Hazard Area 1;

4. Monitored natural attenuation for the dissolved-phase groundwater plumes, with either enhanced institutional controls or continuation of the PGDP Water Policy, versus active treatment for the dissolved-phase plume using oxidation technologies, with monitored natural attenuation and continuation of the PGDP Water Policy – affects Hazard Area 1.

5. Continued monitoring of discharges of groundwater to surface water versus actions to reduce contaminant levels in groundwater discharged to surface water – affects Hazard Area 1;

6. Cleanup levels for soil and sediment in industrial areas set at targets of 1×10^{-4} (under an industrial scenario) and PCBs of 25 ppm and cleanup levels for soil and sediment in recreational areas set at targets of 1×10^{-4} (under a recreational scenario) and PCBs of 1 ppm versus cleanup levels for soil and sediment in industrial and recreational areas set at targets of 1×10^{-6} (under a residential scenario) and PCBs of 1 ppm – affects Hazard Areas 2, 4, 8, and 9;

7. Continued monitoring of contaminant levels in surface water at outfalls following "hot spot" removal versus "hot spot" removal and construction of sediment control basins to reduce contaminant migration in surface water and continued monitoring – affects Hazard Area 2;

8. Capping of certain burial grounds versus excavation of certain burial grounds – affects Hazard Area 3; and

9. Cleanup levels for soil and/or decontamination of surfaces associated with DMSAs in industrial areas set at targets of 1×10^{-4} (industrial) and PCBs of 25 ppm versus targets of 1×10^{-6} (residential) and PCBs of 1 ppm – affects Hazard Area 7.

Subsequent to identifying the variances, the following challenges to achieving the potential end state alternative were identified:

- Public and regulator acceptance of the range of options included in enhanced institutional controls is uncertain.

- DOE policy may limit options that may be included in enhanced institutional controls.

- Current planned end state assumes that monitored natural attenuation for groundwater contamination will need to be augmented by source and plume actions to reduce contaminant concentrations within a "reasonable" period.

- Regulators' position is that technical impractibility (TI) waiver would be available only after a demonstrated, site-specific technology failure.

- Regulators' position is that the current fence line, as opposed to the DOE property boundary, should be used as the point of exposure for the purpose of developing cleanup levels.

- Regulators' position that capping and institutional controls are inadequate to achieve long-term protection to human health and environment, meaning burial grounds should be excavated.

- Commonwealth of Kentucky's position is that all cleanup activities must attain cleanup levels established using residential exposure scenario and a cancer risk and hazard target of 1×10^{-6} and 1, respectively, rather than using an exposure scenario consistent with expected future use and a cancer risk and hazard target of 1×10^{-4} and 1, respectively.

- Commonwealth of Kentucky's position is that all PCB cleanup activities in industrial areas must attain a 1 ppm cleanup level rather than a Toxic Substances Control Act (TSCA)-based 25 ppm cleanup level.

- Need for additional data for some hazard areas before a decision can be made.

Recommendations to address these challenges are as follows:

- Initiate further discussions with the public to determine acceptability of acquisition of property rights ranging from deed notices and permanent groundwater use restrictions to property purchase.

- Initiate further discussions with the regulators to determine willingness to consider enhanced institutional controls in conjunction with monitored natural attenuation in lieu of certain source and plume actions.

- Initiate further discussions with the regulators to discuss willingness to consider establishing points of compliance and exposure at property boundary based on enhanced institutional controls and monitoring.

- Revisit DOE policy concerning acquisition of property rights (ranging from deed notices and permanent groundwater use restrictions to property purchase).

- Complete technical investigations [e.g., BGOU Remedial Investigation (RI), etc.] to support discussions with the regulators and public.

- Initiate discussions with regulators to 1) determine the appropriateness of requiring a demonstrated failure, given the national performance data, and 2) determine what would be required to decide whether a TI waiver should apply.

- Initiate further discussions with regulators to 1) seek agreement that cleanup standards for proposed actions will be set based upon current and future land use for the area in question, 2) gain agreement that cleanup standards will be set based on the CERCLA risk range (10^{-6} to 10^{-4}), and 3) seek agreement that national TSCA cleanup standards for PCBs for low occupancy (e.g., industrial) areas (25 ppm) should be adopted for industrial areas and that national TSCA standards for PCBs for high occupancy (e.g., 1 ppm) should be adopted for recreational areas.

The potential end state alternative, current planned end state, and the variances between the two end states that are presented in the report were discussed with the stakeholders at a series of meetings held in January, February, March, and April 2004 and an update was subsequently presented in October 2005. A summary of these activities and the stakeholder comments and input received is presented the appendix to the report.

This 2007 update contains the following significant changes when compared to the previous report:

- Updated information for the SWOU, based on the recently completed SWOU (On-Site) Site Investigation;

- Updated information for the GWOU, based on the recently initiated implementation of ROD remedy;

- Added information regarding the identification of soil and rubble areas that may contain contaminated soils or materials both on and off DOE property;

- Modified title to be consistent with the Portsmouth DOE Facility document; and

- Added information regarding PGDP cleanup strategy consistent with the Site Management Plan.

Solid Waste Management Unit 3 moved from Hazard Area 3 (BGOU – Group 1) to Hazard Area 1 (GWOU) to be consistent with the GWOU strategy and some recently collected information regarding possible contaminant migration from this unit.

THIS PAGE INTENTIONALLY LEFT BLANK

1. INTRODUCTION

This report delineates the end state vision for the Paducah Gaseous Diffusion Plant (PGDP) located in Paducah, Kentucky. It was prepared following the guidance contained in *Guidance for Developing Site-specific Risk-based End State Vision*, dated September 11, 2003 (DOE 2003c); U.S. Department of Energy (DOE) Policy, DOE P 455.1, *Use of Risk-based End States* (DOE 2003b), as amended by clarification contained in a memorandum entitled "Risk Based End State Guidance Clarification," dated December 23, 2003 (DOE 2003a); and notes from the DOE Risk-Based End State (RBES) Next Steps Workshop, October 2004. This report also incorporates changes made in response to input from various stakeholders, including members of the general public, Citizens Advisory Board (CAB), various local civil business organizations, and DOE headquarters. This report and subsequent revisions will provide information that can be used to establish clearly articulated and technically achievable cleanup goals that will focus the continuing cleanup at PGDP; serve as the primary tool for communicating the end state vision for PGDP to the involved parties [i.e., stakeholders from DOE, the U.S. Environmental Protection Agency (EPA), the Commonwealth of Kentucky, and the public]; and, using maps and figures, summarize the PGDP end state vision so that any cleanup decisions made can be compared to the end state vision so that the variances between the potential end state alternative and the current PGDP cleanup strategy can be identified. Using the document in this manner is consistent with the *Top to Bottom Review of the EM Program* (DOE 2002a), which recommended moving DOE's Environmental Management (EM) program to an accelerated, risk-based cleanup strategy and aligning the EM program so that its scope is consistent with an accelerated, risk-based cleanup and closure mission.

Objectives of the End of State Vision Document

- Provide information to be used to establish clearly articulated and technically achievable cleanup goals.
- Present maps and figures that can be used ensure that cleanup decisions are consistent with the end state vision.
- Provide a tool for communicating the end state vision for PGDP to the involved parties.
- Summarize the potential end state alternative so that variance between it and the current cleanup strategy can be identified.

The end state vision presented here is driven by the current and expected future land use for areas at and around PGDP and the exposures that may occur to receptors in these areas. The future land use presented is consistent with that established in several meetings held among the involved parties since the beginning of site cleanup. These descriptions of current and future land use are consistent with those discussed in the fiscal year (FY) 2006 revision of *Site Management Plan, Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (SMP) (DOE 2005) and in other remedial investigation (RI) and feasibility study (FS) reports. It should be recognized that attainment of the end state vision will take longer than the 20 years commonly used as a planning horizon by local zoning boards for community changes due to the location and persistence of some contaminants and the uncertainty about the continued operation of the operating gaseous diffusion plant (GDP); therefore, it is possible that the land uses presented in this report will differ in the future, resulting in the need to modify the end state vision.

Definition of End States

As used in this document, end states are representations of site conditions and associated information that reflect the planned future use of the property and are appropriately protective of human health and the environment consistent with that use. They form the basis for the exposure scenarios developed in baseline risk assessments that help establish remediation levels (RLs) used to develop remedial alternatives in feasibility studies.

The exposures considered in formulating the end state vision were derived consistent with EPA's risk assessment guidance documents (e.g., EPA 1989, 1996, and 2000) and PGDP's risk methods document (DOE 2000a). These exposures, which are documented in a series of conceptual site models (CSMs) in Chapters 4 and 5 of this report, are based on realistic scenarios that consider reasonable pathways of exposure, rational time frames, and expected receptor populations.

The report contains two important comparisons. These are a comparison between the current state and the potential end state alternative and a comparison between the potential end state alternative and the current cleanup baseline end state. (The current cleanup baseline end state or current planned end state is the state the site would achieve upon executing the actions proposed in PGDP's current agreements and other planning documents.) The first of these comparisons is used to depict the risk reduction that would be achieved at the potential end state alternative. The second of these comparisons is used to identify variances between the potential end state alternative and current planned end state and to explore the risk balance between the potential end state alternative and the current planned end state during both response action implementation and at the two end states. (Please see Chapter 5 for a complete discussion of risk balancing between the two end states.)

Although potential actions to address site problems are identified in the report, this report is not a decision document. Once the end state vision is developed, DOE will evaluate further the cleanup activities and the strategic approaches at PGDP to determine if it is appropriate to pursue changes in the PGDP baseline. Any decision to pursue changes to the baseline will include factors beyond those presented in the report, including input from involved parties. If DOE ultimately decides to seek changes to the current compliance agreements, decisions, or statutory/regulatory requirements, then those changes will be made in accordance with applicable requirements and procedures.

1.1 ORGANIZATION OF THE REPORT

This report is presented in six chapters and an appendix that summarizes the stakeholder input process. Figure 1.1 is a diagram taken from guidance material that depicts the process used when producing the initial revisions of the report. Chapter 1 presents some general information about the report, PGDP, and the status of cleanup at PGDP; Chapters 2 through 4 present descriptions of the PGDP in regional, site-specific, and hazard-specific contexts. Chapter 5 includes the variance report and identifies differences between the current planned end state and the potential end state alternative. Chapter 6 includes the references used to prepare the report. The appendix presents a summary of the stakeholder input process undertaken in connection with production of the PGDP End State Vision Document.

The information presented in Chapters 2 through 4 consists primarily of a series of maps that depict the relationship between PGDP and its surroundings. These maps are intended to present and allow comparisons between current and future land use; depict hazards and risks to affected or potentially affected populations or receptors; serve as a planning tool for site management; facilitate communication of risks during discussions with stakeholders; allow tracking of expected and actual cleanup results; and serve as a communication tool for public meetings in regard to cleanup activities, current PGDP mission and requirements, and future land use. The maps follow a standardized hierarchical approach that depicts the PGDP in regional, site, and hazard-specific contexts. The regional context maps are presented in Chapter 2. These maps show the relationship of PGDP to the surrounding region (i.e., surrounding counties) and include information about major watersheds (e.g., the Ohio River watershed), population centers, and other significant regional features. The site context maps are presented in Chapter 3. These maps depict the area immediately adjacent to PGDP, as well as the land inside the PGDP property boundaries. Finally, the potential end state alternative hazard-specific context maps are presented in Chapter 4. These maps contain the greatest detail and depict the hazard areas (e.g., disposal cells, landfills, underground plumes, and burial grounds) at PGDP that pose potential hazards to human health and the environment. These hazard-specific context maps are presented in concert with a series of CSMs that depict how receptors are or may be exposed to contamination both currently and when the potential end state alternative for PGDP is attained.

Variances between the potential end state alternative and the current cleanup baseline end state (i.e., current planned end state) are presented in Chapter 5. These variances were identified through comparisons between the potential end state alternative maps, CSMs, and narrative presented in Chapter 4 and the current planned end state maps, CSMs, and narrative presented in Chapter 5 and through discussions with the involved parties. (The format of the maps and CSMs in Chapter 5 matches that found in Chapter 4.) In addition to identifying the variances in Chapter 5, the potential impacts of the variances (including discussions of risk balancing), the challenges to achieving the potential end state alternative, and recommendations on how to resolve the challenges also are presented. This information is to be used by DOE to determine whether to pursue changes to the current baseline.

1.2 SITE MISSION

In October 2003, PGDP reached its 51st anniversary of operation. Although originally one of three uranium enrichment plants in the U.S., as of 2002, only PGDP was operating. Currently, the United States Enrichment Corporation (USEC) operates the uranium enrichment plant at PGDP. This corporation was established on October 24, 1992, when the President signed the Energy Policy Act of 1992. The charter of USEC under this act is to provide profitable and competitive uranium enrichment services. USEC has leased the gaseous diffusion uranium enrichment production facilities from DOE since July 1, 1993, but DOE has retained the nonleased facilities and is responsible for the decontamination and decommissioning (D&D) and cleanup for environmental conditions that existed before July 1, 1993. It currently is anticipated that USEC will continue to operate the gaseous diffusion uranium enrichment production facilities through at least 2010.

In addition to the enrichment mission, PGDP has both a uranium conversion mission and an environmental cleanup mission. The uranium conversion mission involves the construction and operation of a facility that will convert depleted uranium hexafluoride (DUF_6) to less reactive uranium oxides. The contract to construct this facility was awarded and construction began in 2004. Currently, it is anticipated that the conversion facility will operate for two or three decades.

The current DOE-EM cleanup mission at PGDP includes work under the Federal Facility Agreement (FFA) and other environmental compliance agreements. The current portion of the cleanup mission under the FFA is to investigate and address existing environmental contamination and to D&D those facilities currently leased to USEC once the GDP ceases operation. The scope of these activities through 2019 is delineated in the FY 2006 SMP (DOE 2005). This scope, which reflects investigation and cleanup of areas not impacted by the operating GDP, is to complete the following five strategic initiatives.

1) Groundwater Operable Unit (OU) (GWOU) Strategic Initiative – This strategic initiative includes investigation, baseline risk assessment (BRA), evaluation of removal/remedial actions, and selection and implementation of actions necessary to achieve protection of human health from exposure to groundwater contamination that could result in unacceptable risk. The projects associated with implementation of this strategy are source actions at the C-400 Building and other sources to the major solvent plumes at PGDP (e.g., the C-747-C Oil Landfarm, C-749 Uranium Burial Ground, and C-747 Contaminated Burial Yard); and an investigation of the C-746-S&T Landfills. The completion date for this initiative is 2010.

2) Surface Water OU (SWOU) Strategic Initiative – This strategic initiative includes the investigation, BRA, evaluation of removal/remedial actions, and selection and implementation of actions necessary to achieve protection of human health and the environment from exposure to contamination in “hot spots” associated with internal plant ditches; outfall ditches; and Sections 3, 4, and 5 of the North-South Diversion Ditch (NSDD). In addition, the initiative includes evaluation of

the need for additional sediment-control measures at PGDP and evaluation and potential implementation of actions to address legacy releases associated with the PGDP storm sewer system and potential contamination in Bayou and Little Bayou Creeks. The completion date for this initiative is 2017.

3) Burial Grounds OU (BGOU) Strategic Initiative – This strategic initiative includes investigation, BRA, evaluation of remedial alternatives, and selection and implementation of actions necessary to protect human health and the environment from exposure to contamination found at eight burial grounds and additional disposal areas that might exist beneath scrapyards. The completion date for this initiative is 2019.

4) D&D OU Strategic Initiative – This strategic initiative includes a phased investigation and evaluation and implementation of removal actions for two major inactive process facilities and 15 smaller inactive facilities. The completion date for this initiative is 2017. This initiative does not include the D&D of the GDP facilities currently leased to USEC. Leased facilities will undergo D&D after the GDP ceases operation.

5) Soils OU (SOU) Strategic Initiative – This strategic initiative includes the investigation, BRA, evaluation of removal alternatives, and selection and implementation of actions necessary to achieve protection of human health and the environment from exposure to contamination in “hot spots” associated with soils underlying scrapyards, outside DOE Material Storage Areas (DMSAs), soil and rubble areas that have been identified that may contain contaminated soils or materials both on and off DOE property, and plant areas not impacted by either the uranium enrichment or conversion missions. The completion date for this initiative is 2017.

In addition to actions related to the five strategic initiatives discussed above, the FFA portion of the DOE-EM mission includes cleanup of areas impacted by the uranium enrichment and conversion missions. The scope of this cleanup will include D&D of the GDP followed by the Comprehensive Site OU (CSOU). The CSOU will include the investigation, BRA, evaluation of remedial alternatives, and selection and implementation of actions necessary to achieve protection of human health and the environment. While the planning associated with the scope of the CSOU will begin six months before GPD shutdown, the potential end state alternative and current planned end state to be achieved by the CSOU is discussed in this report. The completion date for the CSOU is uncertain due to the lease status of the GDP.

The portions of the DOE-EM mission included in other environmental compliance agreements are characterization and appropriate disposal of legacy waste and materials found in DMSAs and continuation of waste management. The scope of the legacy waste activities is to characterize, treat, and dispose of thousands of containers of DOE waste currently in storage at PGDP. The scope of the DMSA activities is to characterize, place in proper storage, treat, and dispose of excess materials found in 160 DMSAs.

The scope of the ongoing waste management activities is to characterize and properly disposition any newly generated waste and to operate the C-746-U Sanitary Landfill and other landfills, if any additional landfills are constructed during PGDP cleanup and GDP D&D. [The potential end state alternative does consider the potential construction of a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Cell to be used for on-site disposal of materials derived from D&D of the GDP.] Waste management’s mission will continue until site cleanup is complete, including that portion of the cleanup that is under the CSOU.

1.3 STATUS OF CLEANUP PROGRAM

In response to the discovery of trichloroethene (TCE) and technetium-99 (^{99}Tc) in residential wells north of PGDP in 1988, DOE immediately provided a temporary alternate water supply to affected residences and sampled all surrounding residential wells. Following this initial response, DOE and EPA entered into an Administrative Consent Order (ACO) that required monitoring residential wells potentially affected by contamination, providing alternative drinking water to residents with contaminated wells, and investigating the nature and extent of off-site contamination.

The ACO activities delineated two off-site groundwater contamination plumes, referred to as the Northwest and Northeast Plumes; identified several potential on-site source areas requiring additional investigation; and resulted in several interim activities. Upon signature of the FFA in February 1998, the FFA parties declared the ACO requirements satisfied and terminated the ACO because the remaining cleanup would be continued under the authority of the FFA. A series of RI/FSs was conducted under the FFA, including completing the evaluation of all major contaminant sources impacting groundwater and surface water. In accordance with the ACO and FFA investigations, DOE implemented actions that focused on reducing potential risks associated with off-site contamination. Examples of significant actions initiated and completed to date include the following:

- Imposed institutional controls (fencing and posting) to restrict public access to contaminated areas in certain outfall ditches and surface water areas (1993).

- Extended municipal water lines as a permanent source of drinking water to affected residents to eliminate exposure to contaminated groundwater (1995).

- Constructed and implemented groundwater treatment systems for both the Northwest and Northeast Plumes to reduce contaminant migration (1995 and 1997, respectively).

- Constructed hard-piping to reroute surface runoff around highly contaminated portions of the NSDD to reduce potential migration of surface contamination (1995).

- Excavated soil with high concentrations of polychlorinated biphenyls (PCBs) in certain on-site areas to reduce off-site migration and potential direct-contact risks to plant workers (1998).

- Removed and disposed of "drum mountain," a contaminated scrap pile potentially contributing to surface water contamination to eliminate potential direct-contact risks to plant workers and reduce off-site migration (2000).

- Applied in situ treatment of TCE-contaminated soils at the cylinder drop test site using innovative technology (i.e., the LASAGNA™ technology) to eliminate a potential source of groundwater contamination (2002).

- Removed petroleum-contaminated soil from Solid Waste Management Unit (SWMU) 193 to eliminate a potential source of groundwater contamination (2002).

- Completed installation of a sediment control basin to control the potential migration of contamination during the scrap metal removal action and initiated removal and disposal of approximately 54,000 tons of scrap metal to eliminate potential direct contact risks to plant workers and a source of surface water contamination (2002).

- Completed hard-piping and installation of a detention basin and excavated the on-site portions of the NSDD, which removed a source of potential direct-contact risk to plant workers and surface water contamination (2004).

- Completed removal and disposal of approximately 54,000 tons of scrap metal to eliminate potential direct-contact risk to plant workers and a source of surface water contamination.

Appendix 1 of the FY 2006 SMP (DOE 2005) contains a summary of the status of all actions taken to date that have been documented through a Record of Decision (ROD) or Action Memorandum. More detailed information on the status of each OU is available in the FFA Semiannual Progress Report (DOE 2003e). In addition to the completed actions, DOE has an ongoing integrated environmental monitoring program that assesses contaminant effects and depicts trends in effects over time. Results from this program are reported in the Annual PGDP Environmental Reports (DOE 2002c).

Figures 1.2 through 1.4 illustrate the overall strategy for the SWOU (On-Site), the GWOU, and the SOU. Not specifically illustrated is the BGOU, however, the BGOU is inherently included within the GWOU strategy since the burial grounds are contributors to groundwater contamination.

The aforementioned response actions are steps in reducing site risks. While no known imminent threats currently exist, as verified by conclusions in the Agency for Toxic Substances and Disease Registry's Health Assessment (ATSDR 2002), and in a report from the Commonwealth of Kentucky entitled *Report of the Commonwealth of Kentucky's Task Force Examining State Regulatory Issues at the Paducah Gaseous Diffusion Plant* (KY 2000), several major challenges remain at PGDP. These challenges, depicted in Figure 1.5 and discussed in more detail in Chapter 4, include, in summary, legacy waste, DMSAs, PCBs and radionuclides in creeks and soils, off-site solvent plumes, burial grounds, and on-site sources of groundwater contamination. Primary contaminants associated with these challenges are chlorinated solvents (primarily TCE and its breakdown products), PCBs, polycyclic aromatic hydrocarbon (PAHs) compounds, several metals (antimony, arsenic, cadmium, chromium, and lead), ^{99}Tc, and uranium isotopes (^{234}U, ^{235}U, and ^{238}U). A complete list of the significant contaminants of potential concern at PGDP taken from completed BRAs is in Table 1.1.

1.4 GOAL OF PGDP CLEANUP STRATEGY

The goal of the PGDP cleanup strategy is to maximize the use of on- and off-site locations consistent with current and reasonably anticipated future use patterns. This end state goal was derived considering current and past land use, existing lease commitments, future missions at PGDP, the nature of site contamination, and input from involved parties.

Table 1.1. Significant Contaminants of Potential Concern at PGDP[a]

Metals/Inorganic Chemicals	Organic Compounds	Radionuclides
Antimony	Acrylonitrile	Americium-241
Arsenic	Benzene	Cesium-137
Beryllium	***Carbon tetrachloride***	Cobalt-60
Cadmium	***Chloroform***	Neptunium-237
Chromium III	***1,1-Dichloroethene***	Plutonium-238
Chromium VI	***1,2-Dichloroethene (mixed)***	Plutonium-239
Copper	***trans-1,2-Dichloroethene***	Plutonium-240
Iron	***cis-1,2-Dichloroethene***	Radium-226
Lead	Ethylbenzene	Radon-222
Manganese	Pyrene	Stontium-90
Mercury	Tetrachloroethene	***Technetium-99***
Molybdenum	***Trichloroethene***	Thorium-228
Nickel	Dioxins/Furans	Thorium-230
Selenium	***Polycyclic aromatic hydrocarbons***	Thorium-232
Silver	***Polychlorinated biphenyls***	***Uranium-234***
Thallium	***Vinyl chloride***	***Uranium-235***
Uranium	Xylenes	***Uranium-238***
Vanadium		
Zinc		

Primary contaminants associated with site challenges are highlighted in bold, italic font.
[a]This list of chemicals, compounds, and radionuclides was compiled from the results of baseline risk assessments performed at PGDP between 1990 and 2000 (e.g., DOE 1996a, 1996b, 1997a, 1998a, 1999a, 1999b, 2000b, 2000c, and 2001a). Asbestos also was determined to be of concern at the PGDP during a scrap removal activity. This contaminant, which has not been the focus of a BRA at the PGDP, also may be of concern during any future scrap removal, waste disposal, or GDP D&D activities.

To achieve the goal, specific site cleanup objectives were established. These objectives serve as the guiding principles used when developing more detailed remedial action objectives (RAOs) that focus on specific OU problems. The cleanup objectives were developed considering current and reasonably anticipated future land use, exposure pathways, and potentially affected receptors. These cleanup objectives are as follows:

- Ensure response actions are protective under both current and reasonably anticipated future land use.
- Implement a remediation approach that uses OUs, with an emphasis on accelerated actions.
- Establish priorities that emphasize accelerated risk reduction while considering opportunities to deploy mortgage-reduction activities intended to reduce long-term surveillance and maintenance cost.
- Ensure that enforceable milestones and funding requests are based on clearly defined work scope and objectives.

Under each of these objectives, protectiveness is defined either in terms of chemical-specific applicable or relevant and appropriate requirements (ARARs) or in terms of calculated risk-based concentrations consistent with the National Contingency Plan (NCP) (i.e., the implementing regulations of CERCLA). The ARARs used are compiled as appropriate when response action decisions are made. The risk-based concentrations also are calculated when the response action decision is made and, for human health, are based on an exposure scenario and risk target agreed to by the regulatory agencies. (Please see Chapter 4 for additional information, as the scenario and targets vary by area.) For nonhuman receptors, the risk-based concentrations are estimates of concentrations of substances present in the environmental media that will protect ecological receptors at the site (DOE 2000a).

THIS PAGE INTENTIONALLY LEFT BLANK

FIGURES

THIS PAGE INTENTIONALLY LEFT BLANK

DOE P 455.1
"Once Sites develop their risk-based end state vision, they will re-evaluate their cleanup activities and strategic approaches to determine if it is appropriate to change site baseline documents and renegotiate agreements."

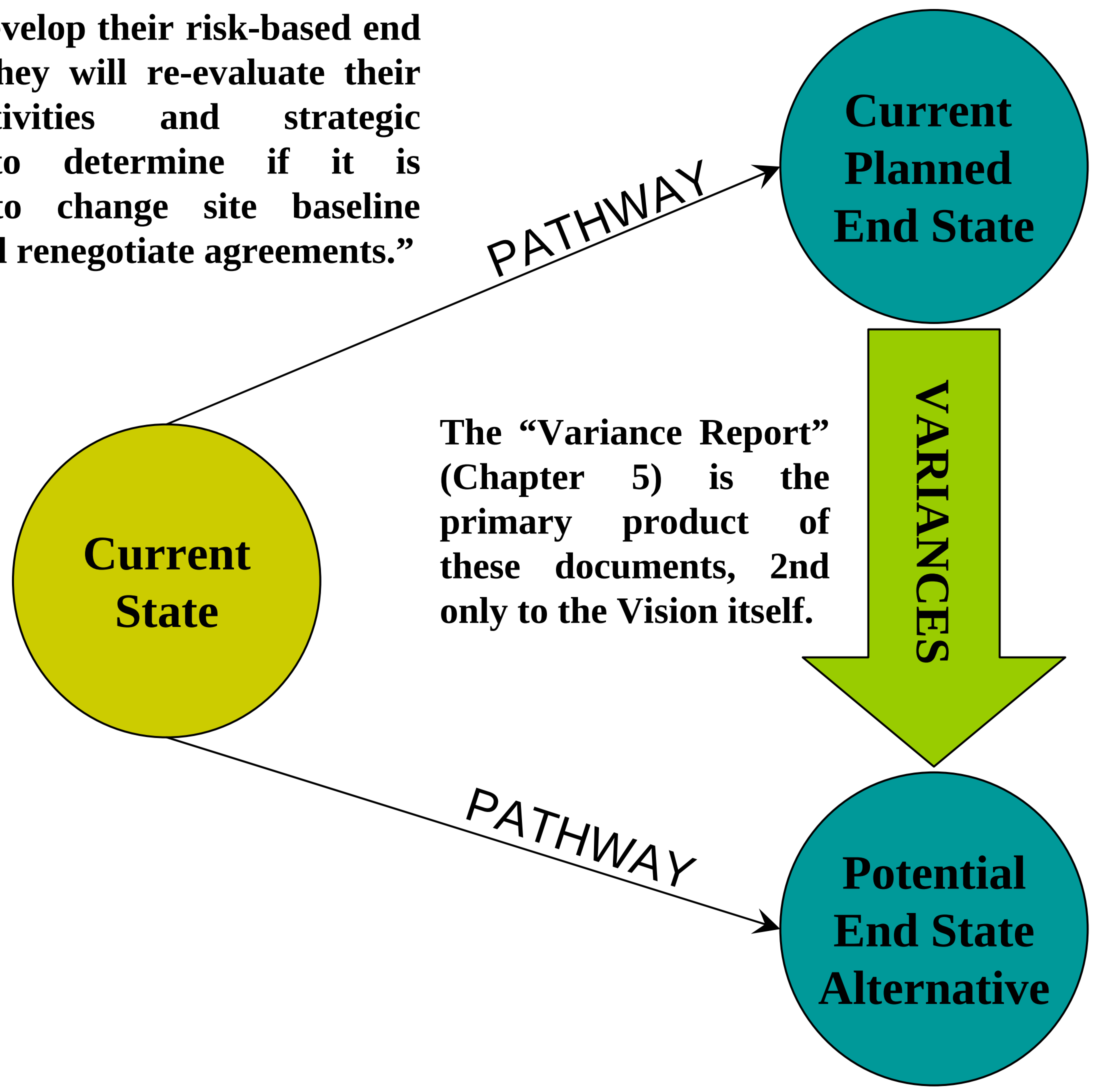


Figure 1.1. Conceptual Product Diagram for the End State Vision Document

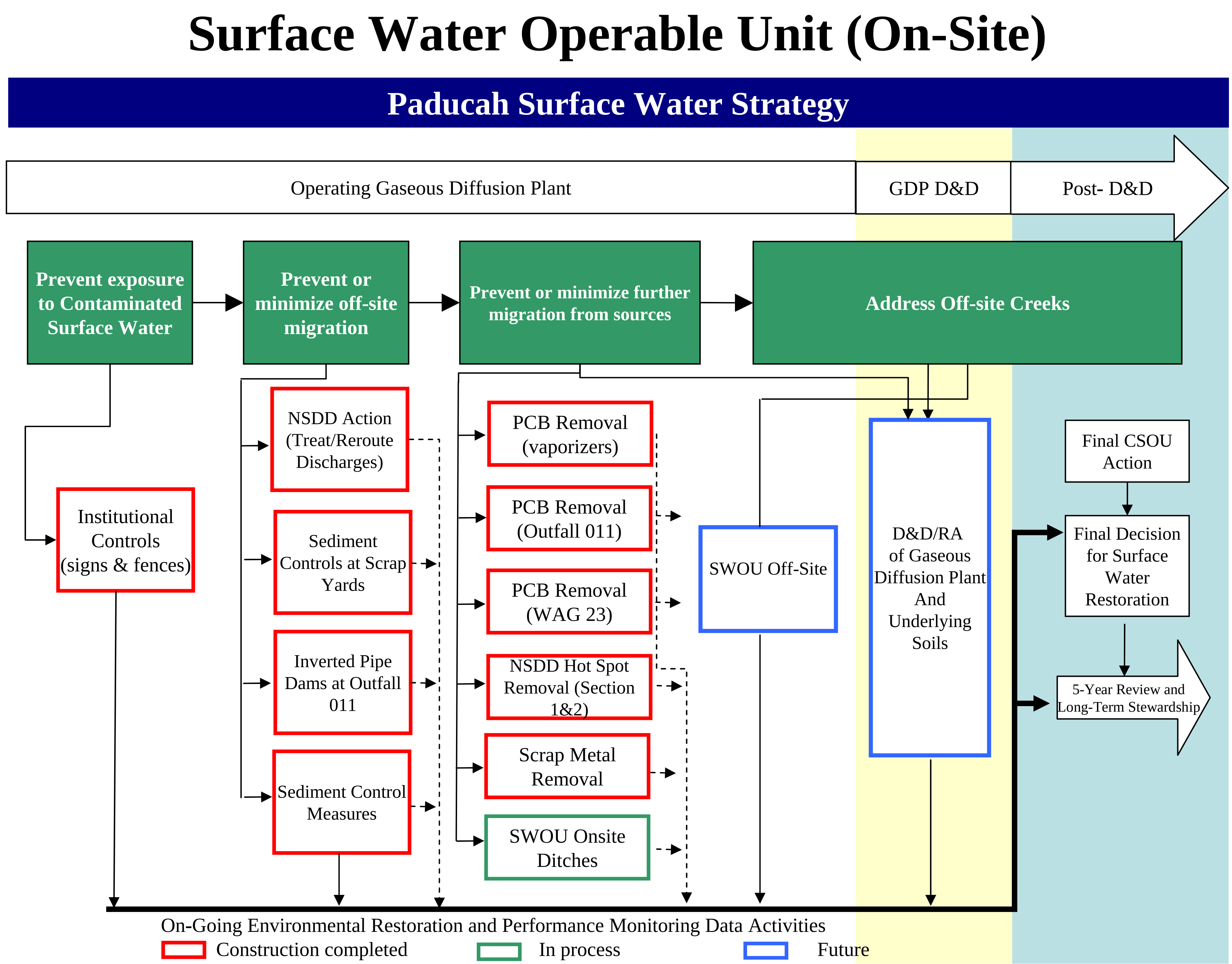
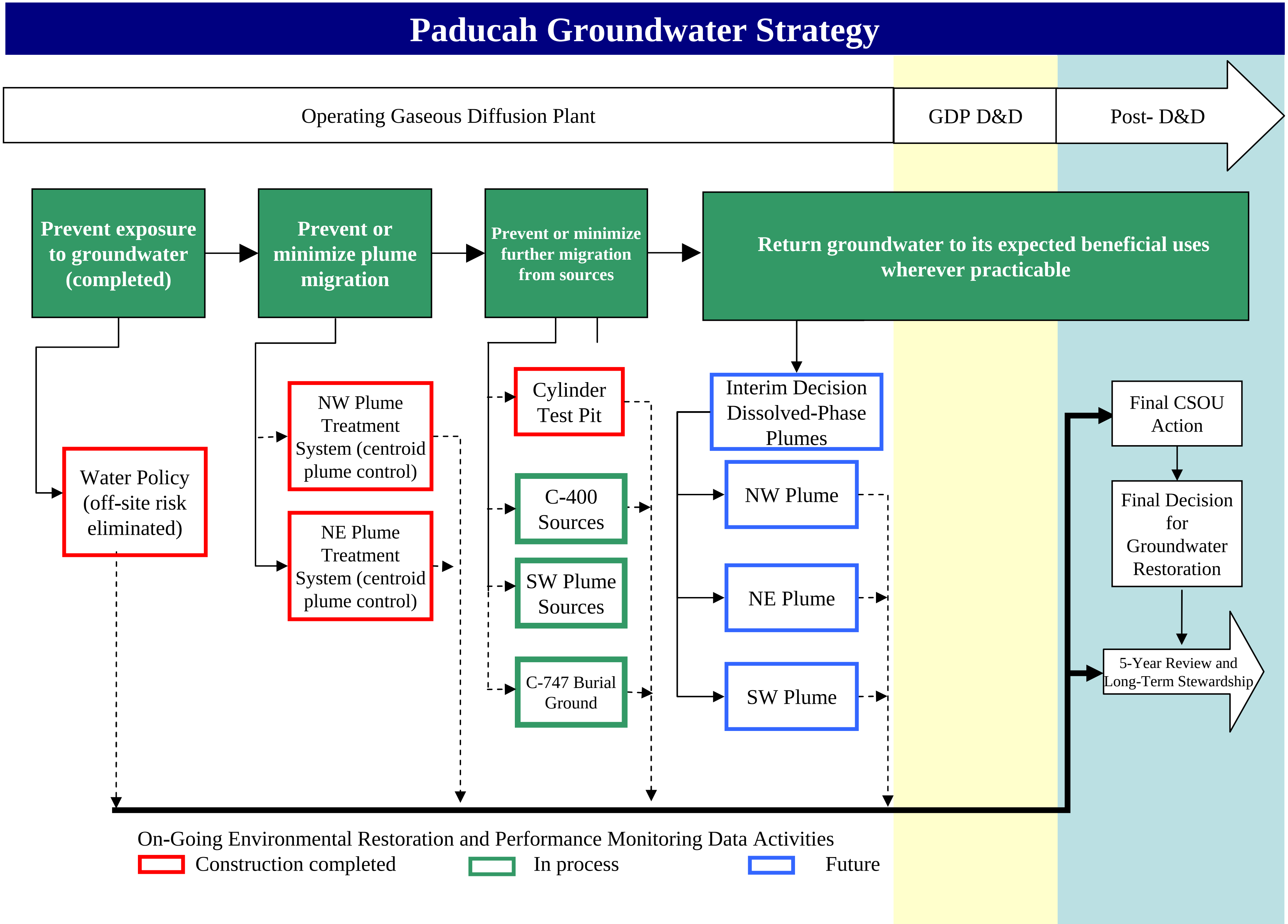


Figure 1.2. SWOU Strategy

Groundwater Operable Unit



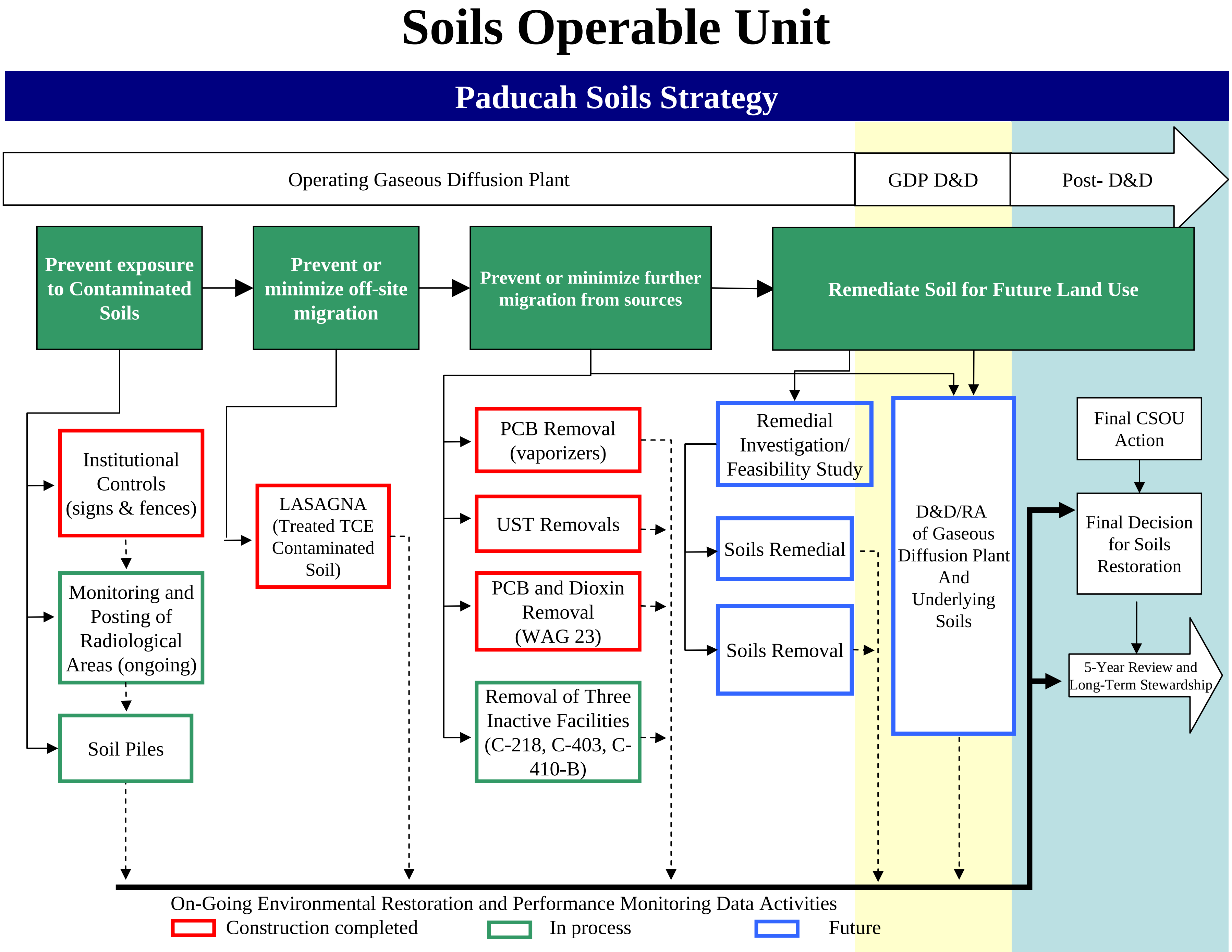


Figure 1.4. SOU Strategy

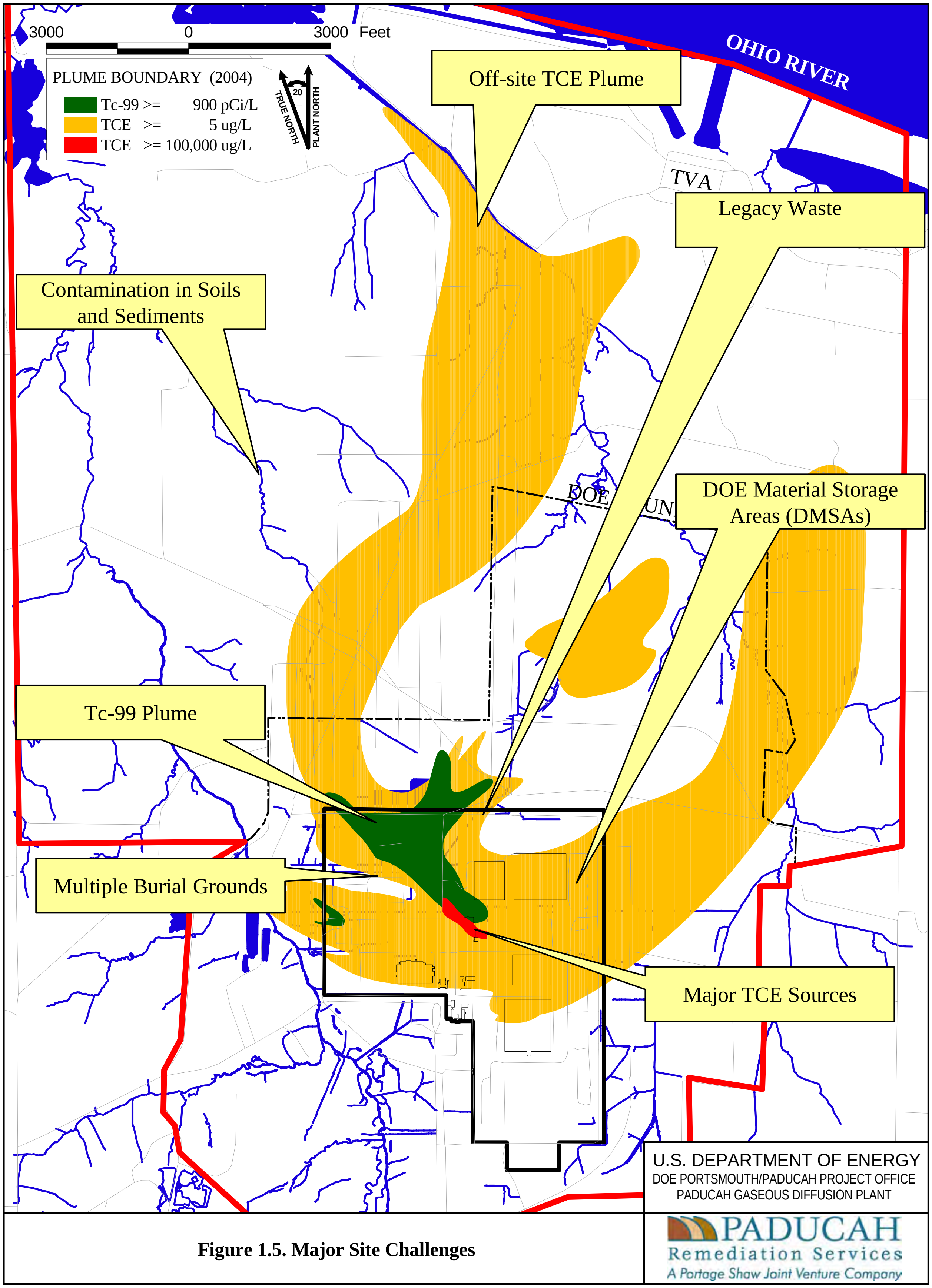


Figure 1.5. Major Site Challenges

Figure No. C5AC90005sk020r3.apr
DATE 11-08-06

THIS PAGE INTENTIONALLY LEFT BLANK

2. REGIONAL CONTEXT DESCRIPTION

This chapter presents the regional context description. This description is intended to place PGDP within its larger contiguous regional area and depict its relationship to possible off-site pathways and ecological or human receptors of concern. The maps presented in this section depict the boundaries of all contiguous local and county governments and encompass all regional watersheds (e.g., the Ohio River), habitat and ecology areas, and other off-site areas that could be affected by contamination migrating from the site. Regional maps are presented for both the current state and potential end state alternative.

2.1 PHYSICAL AND SURFACE INTERFACE

This section discusses and depicts the regional administrative boundaries, major transportation and infrastructure features, major surface configuration features, and significant hazard areas at PGDP under both the current state and potential end state alternative. Administrative boundaries included are those for city, county, and state governments; federal and state properties, including the PGDP property boundary; and legal ownership (i.e., private versus governmental ownership). Transportation and infrastructure features included are major highways, roads, and railroads; dams and power plants; and major lakes, streams, and rivers.

2.1.1 Current State

Figure 2.1a depicts all physical and surface features under current conditions on a single map. The following narrative references this map.

<u>Administrative Boundaries:</u> As depicted in Figure 2.1a, PGDP is located in western McCracken County, Kentucky, approximately 3.5 miles south of the Ohio River and approximately 10 miles west of the city of Paducah. The DOE-owned property at PGDP encompasses 3,556 acres. The industrial portion of PGDP is situated within a fenced security area consisting of approximately 748 acres. Within this area are the numerous buildings and offices, support facilities, equipment storage areas, and active and inactive waste management units that comprise the GDP. Outside the fenced security area are approximately 822 acres that are not surrounded by the main security fence, but are controlled for security purposes. The remaining 1,986 acres is leased to the Commonwealth of Kentucky as part of the West Kentucky Wildlife Management Area (WKWMA). The entire WKWMA covers approximately 6,823 acres. A second wildlife management area, the Ballard Wildlife Management Area (BWMA) is in Ballard County, Kentucky, approximately 11 miles west of PGDP. The Shawnee Steam Plant, a Tennessee Valley Authority-owned (TVA-owned) power plant, is immediately north of PGDP.

Another administrative boundary shown on Figure 2.1a is that for the PGDP Water Policy. The PGDP Water Policy is a removal action completed under the ACO (DOE 1994). Through this action, DOE offered municipal water to all existing private residences and businesses within the area affected by contaminated groundwater originating at PGDP. In return, the affected residences and businesses agreed not to drill new water supply wells or use existing water wells and to allow PGDP personnel property access to sample groundwater. (Please see Chapter 4 for additional discussion of the PGDP Water Policy.)

In addition to Paducah, cities and towns in Kentucky near PGDP are Barlow, La Center, and Kevil. Counties surrounding McCracken County are Ballard County (KY) to the west, Carlisle County (KY) to the southwest, Graves County (KY) to the south, Marshall County (KY) to the east, Livingston County

(KY) to the northeast, Massac County (IL) to the north, and Pulaski County (IL) to the northwest. Property surrounding the DOE-owned PGDP, Kentucky-owned WKWMA, and TVA-owned steam plant is privately owned. The nearest schools are Heath Elementary, Middle, and High Schools. These are 1.86 miles southeast of the plant in the unincorporated community in Heath, KY. The nearest hospitals are in Paducah.

Transportation and Infrastructure: As depicted in Figure 2.1a, PGDP is near the following major roads: U.S. Highway 60 and Kentucky Highways 358, 725, and 996. Additional major roads at greater distance are Interstate 24 and U.S. Highway 62. A rail spur services PGDP and connects to the Illinois Central Gulf Railroad. The nearest airport is Barkley Regional Airport, located approximately about 3.7 miles southeast of the site.

As noted, PGDP is approximately 3.5 miles south of the Ohio River. This river is navigable along its entire length and, near PGDP, has a downstream connection to the Mississippi River and an upstream connection to the Tennessee River. Dams (i.e., Lock and Dams No. 52 and 53) are located on the Ohio River both upstream and downstream from PGDP. In addition, the Kentucky Lock and Dam is located on the Tennessee River near its confluence with the Ohio River.

Surface Configuration: PGDP is located in the Jackson Purchase Region of western Kentucky, at the northern tip of the Mississippi Embayment portion of the Atlantic Coastal Plain physiographic province. The area is bounded on the north and east by the Highland Rim portion of the Interior Low Plateau physiographic province, an area of low plateaus. The Mississippi Embayment is a large sedimentary trough oriented north–south that received sediments from the middle of the North American continent. Major rivers running across this region are the Mississippi River to the west of PGDP, the Ohio River to the north of PGDP, and the Tennessee and Cumberland Rivers to the east of PGDP. Wetlands are found along the Ohio and Mississippi Rivers.

The region encompassing PGDP is characterized by low relief. Elevations vary 350 to 400 ft above mean sea level (amsl). Streams are common throughout the region, with many having eroded small valleys that are up to 20 ft below adjacent areas. Near PGDP, the two principal streams are Bayou Creek and Little Bayou Creek.

Hazard Areas of Concern: As depicted in Figure 2.1a, the hazard areas associated with PGDP include two major groundwater plumes that exist off DOE-owned property and four landfills located outside the main industrialized area of PGDP. Contamination also has been found in sediments along Bayou and Little Bayou Creeks in off-site areas.

The only active National Priorities List (NPL) sites near PGDP are found to the east in Calvert City, KY. These are the 2.75-acre Airco site and the 2-acre B.F. Goodrich site. These NPL sites are approximately 22 miles from PGDP. Please see the text box for information about these sites.

NPL Sites near PGDP

Airco site - An industrial landfill located approximately 2 miles northeast of Calvert City, Marshall County, KY, near the southern bank of the Tennessee River. From the mid-1950s until 1971, it is estimated that the landfill accepted 18,000 tons of caustics, acids, volatile organic compounds, zinc, mercuric acetate, and mercuric chloride. Disposals from 1971 to 1980 consisted of 14,000 tons of metal-contaminated coal ash, as well as polyvinyl chlorides, ferric hydroxide sludge, and construction wastes. The landfill was capped and closed in 1981. Groundwater, sediments, and soil are contaminated with PCBs, PAHs, and solvents from the former waste disposal practices.

The B.F. Goodrich site is a 2-acre industrial landfill that lies adjacent to the Airco site. Wastes disposed of from 1969 to 1972 consisted of 54,000 tons of construction waste and plant trash, 370 yd^3 of salt-brine sludge, and 2 million gallons of liquid chlorinated organics (in several burn pits). From 1973 to 1980, the only waste disposed of at the site was excavation dirt. The landfill was closed under a state-approved closure plan in 1980. Groundwater, soil, and sediments are contaminated with solvents from the former waste disposal activities.

An additional, much larger NPL site was previously located in Mayfield, KY, approximately 15 miles from PGDP; however, this NPL site was determined to require no further action by the U.S. EPA in October 2000. This site is a 58-acre landfill located near a tire manufacturing plant. The landfill received approximately 152 tons of hazard wastes between 1970 and 1979. The investigation and risk assessment of the site was completed in the summer of 1993. Based on this study, EPA determined that no cleanup action was necessary because the site did not exhibit a threat to human health or the environment; however, the landfill continues to be monitored by the Commonwealth of Kentucky.

A closed municipal landfill is found to the east of PGDP. This landfill was used by McCracken County until it was closed, and it now is a park containing soccer fields.

A coal-fired power plant, the Shawnee Steam Plant, is located to the north of, and is contiguous to, PGDP. Another steam plant, Electric Energy, Inc., is located across the Ohio River in Joppa, IL. (See also Figure 2.1a.) The steam plants could be a potential source of some past or current air pollution at PGDP; however, there is no data available to determine if any impacts currently exist or occurred in the past.

The water taken from the Ohio River for use in cooling at PGDP is a source of potential contamination. This water contains sediments contaminated with PCBs originating at upstream industrial sites. When these sediments are allowed to settle out at the PGDP water treatment plant, the concentrations of PCBs and metals in these sediments often are above PGDP-specific no action levels taken from DOE 2000a.

2.1.2 Potential End State Alternative

Figure 2.1b depicts all physical and surface features under potential end state alternative conditions on a single map. The following narrative references this figure.

Administrative Boundaries: As depicted in Figure 2.1b, DOE-owned property is not expected to increase under the potential end state alternative. However, the potential end state alternative includes enhanced institutional controls that would replace the existing PGDP Water Policy and be implemented on both DOE- and non-DOE-owned property. These controls could range from implementation of legal agreements with surrounding landowners to place enforceable restrictions on groundwater use to DOE's acquiring rights from surrounding property owners and directly implementing restrictions on groundwater and property use. Depending on the actions chosen to implement enhanced institutional controls, DOE-owned property could increase.

Transportation and Infrastructure: As depicted in Figure 2.1b, three significant changes in transportation and infrastructure are anticipated. These are construction of the Olmstead Dam on the Ohio River, the completion of I-69, and the construction of I-66. The Olmstead Dam will replace Ohio River Lock and Dams No. 52 and 53 and be located near Olmstead, IL. I-69 will cross north to south across western Kentucky, running from Fulton, KY, to Evansville, IN. Near PGDP, I-69 is planned to follow the current Purchase Parkway until the Parkway's end at I-24. I-66 is planned to run from east to west across all of Kentucky. Near PGDP, I-66 will follow a corridor that exits from I-24 near Paducah, KY, and crosses the Mississippi River south of its confluence with the Ohio River. In Missouri, I-66 will intersect with I-57.

Surface Configuration: As depicted in Figure 2.1b, no changes in surface configuration are expected by the end of the current planning horizon.

Hazard Areas of Concern: As depicted in Figure 2.1b, on a regional scale, the surface hazard areas found at PGDP will change significantly by the end of the current planning horizon under the potential end state alternative. By that time, all potentially contaminated sediments in Bayou and Little Bayou Creek will be addressed; all potentially contaminated surface soils and sediments in the secure area of PGDP will be addressed; and the GDP, including those facilities that currently are inactive and those that currently are operating, will undergo D&D. Hazard areas not at PGDP (i.e., NPL sites, Shawnee Steam Plant, and Ohio River sediments) should change little in this time frame. The NPL sites are expected to change little because each of the NPL sites consists of a landfill that is not targeted for excavation.

Furthermore, the Shawnee Steam Plant can be expected to be upgraded, as appropriate, and to continue to operate. Finally, some improvements in Ohio River sediments can be expected if regional releases of contaminants are kept at a low level; however, significant improvement in PCBs is unlikely, given their persistence in the environment.

2.2 HUMAN AND ECOLOGICAL LAND USE

Material in this section discusses and depicts the human activities, land cover, and ecological activities at PGDP under both the current state and potential end state alternative. Human activities included are limited to a regional representation of population centers (i.e., locations of towns and cities) and density. Land cover depictions are based on area usage and include residential, commercial, industrial, agricultural, nonagricultural vegetated, and wetlands/water uses. Ecological activities included are conservation and ecological areas, watershed delineations, and biota habitats. Note that hazard areas of concern are discussed in Section 2.1 and are not discussed further here.

2.2.1 Current State

The figure in this section depicts the human and ecological land use information under current conditions.

Human Activities: As depicted in Figure 2.2a, and discussed earlier, cities and towns in Kentucky near PGDP are Paducah, Wickliffe, Barlow, La Center, and Kevil. Populations of these and other incorporated cities and towns in Ballard and McCracken Counties in the 2000 census (DOC 2003) are listed in Table 2.1. Population and density of McCracken County and surrounding counties is in Table 2.2.

Table 2.1. Population of Cities in Ballard and McCracken Counties, Kentucky (DOC 2003)

County	Population
Ballard Cty	8,158
Barlow	715
Blandville	99
Kevil	574
La Center	1,038
Wickliffe	794
McCracken Cty	64,790
Lone Oak	454
Paducah	26,307

Table 2.2. Population Density and Total Population for Counties Near PGDP (DOC 2003)

County	Density	Population
Kentucky	101.7	4,065,556
Ballard	33.0	8,158
Carlisle	27.8	5,345
Graves	66.6	36,900
Livingston	31.0	9,769
McCracken	261	64,790
Marshall	96.8	30,808
Illinois	223.4	12,482,301
Massac	63.4	15,081
Pulaski	36.6	7,167

As depicted in Figure 2.2a and shown in Tables 2.1 and 2.2, population density and total population in areas near PGDP were low, relative to the average for the Commonwealth of Kentucky and the U.S. in the 2000 census. Except for McCracken County, which includes the city of Paducah, and Marshall County, which includes several small cities, population density is less than the Kentucky and U.S. average. For McCracken County, approximately 41% of the total population lives within the boundaries of Paducah.

The total population within a 10-mile radius of PGDP was estimated at 32,292 in 2003 (DOC 2003). The closest communities near PGDP are the unincorporated communities of Grahamville and Heath, located 1 to 2 miles east. The closest residences to the site are approximately 3,280 ft north and 3,609 ft east of PGDP.

Land Cover: As depicted in Figure 2.2a, land cover in the region near PGDP is dominated by agricultural and non-agricultural vegetated use. With the exception of PGDP and TVA's Shawnee Steam Plant, little industrial land use occurs near PGDP. Several commercial properties are found in and near to Paducah.

Within a 5-mile radius of the plant, approximately 90% of the area was identified as being agricultural or forested land in a PGDP environmental report (MMES 1993). This report also noted that urban and industrial lands comprise less than 4% of the surrounding area, and surface-water bodies cover approximately 5%. A public health assessment produced by the Agency for Toxic Substances Disease Registry (ATSDR 2002) for PGDP notes that there are approximately 400 active farms in McCracken County, Kentucky, with 45 to 50 operating in the area near PGDP.

Ecological Activities: As depicted in Figure 2.2a, ecological activities near PGDP are dominated by agricultural use, nonagricultural vegetated use, and wetlands. As discussed above, approximately 90% of the area is agricultural land or forested. Wetlands of significant size are found along the Ohio, Mississippi, and Tennessee Rivers.

Hazard Areas of Concern: Please see Section 2.1 for a depiction and discussion of hazard areas of concern under current conditions.

2.2.2 Potential End State Alternative

The figure in this section depicts the human and ecological land use information under the potential end state alternative.

Human Activities: As depicted in Figure 2.2b, the location of cities and towns and population density are expected to change little within the planning horizon used. This projection is consistent with the past population counts for Ballard and McCracken Counties shown in Table 2.3, which presents total population from 1960 to 2000 and with population changes between 1980 and 2000 for Paducah, shown in Table 2.4. However, ATSDR reports (ATSDR 2002) that information obtained from the Census Bureau and McCracken County Seat suggests that McCracken County's population is expected to keep growing, with the addition of new housing subdivisions west of Paducah toward Ballard County providing the bulk of the growth. ATSDR also notes that there is an ongoing initiative to bring new industries into the area. These changes undoubtedly will affect the make-up of the population near PGDP, but the rate of change is uncertain given the lack of previous population changes.

Land Cover: As depicted in Figure 2.2b, little change is expected in the land use in the region near PGDP within the period considered. As discussed in ATSDR 2002, however, a gradual transition from agricultural use to low-density housing (i.e., residences on lots averaging from 1 to 5 acres) and recreational use is possible. In that report, ATSDR states that this transition is indicated by the increasing subdivision of farmland for residential development along U.S. 60, west of Paducah, and the recent expansion of that road into a four-lane highway.

Table 2.3. Historical Total Population of Ballard and McCracken Counties, Kentucky (DOC 2003)

County	1960	1970	1980	1990	2000
Ballard	8,618	8,276	8,798	7,902	8,286
McCracken	57,306	58,281	61,310	62,839	65,514

Table 2.4. Historical Total Population of Paducah, Kentucky (ATSDR 2002; DOC 2003)

City	1980	1990	2000
Paducah	8,618	27,256	26,307
% Change		-7%	-3%

Ecological Activities: As depicted in Figure 2.2b, little change is expected in ecological activities. As noted above, the only changes expected in the long-term are a decrease in agricultural land and an increase in low-density housing.

Hazard Areas of Concern: Please see Section 2.1 for a depiction and discussion of hazard areas of concern under end-state conditions.

2.3 CUSTOM CONFIGURATION – SEISMIC ISSUES AT PGDP

Figure 2.3 depicts the regional tectonic map for PGDP. This map is pertinent to PGDP because the site is close to the New Madrid and Wabash Seismic Zones. PGDP's proximity to these zones makes the potential for earthquakes an important consideration when evaluating and selecting the future use of the PGDP site. The importance of the consideration of seismic issues is highlighted by the recently completed *Seismic Investigation Report for Siting of a Potential On-Site CERCLA Waste Disposal Facility at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE 2003f). In that report, potential faulting at and near PGDP was identified.

FIGURES

THIS PAGE INTENTIONALLY LEFT BLANK

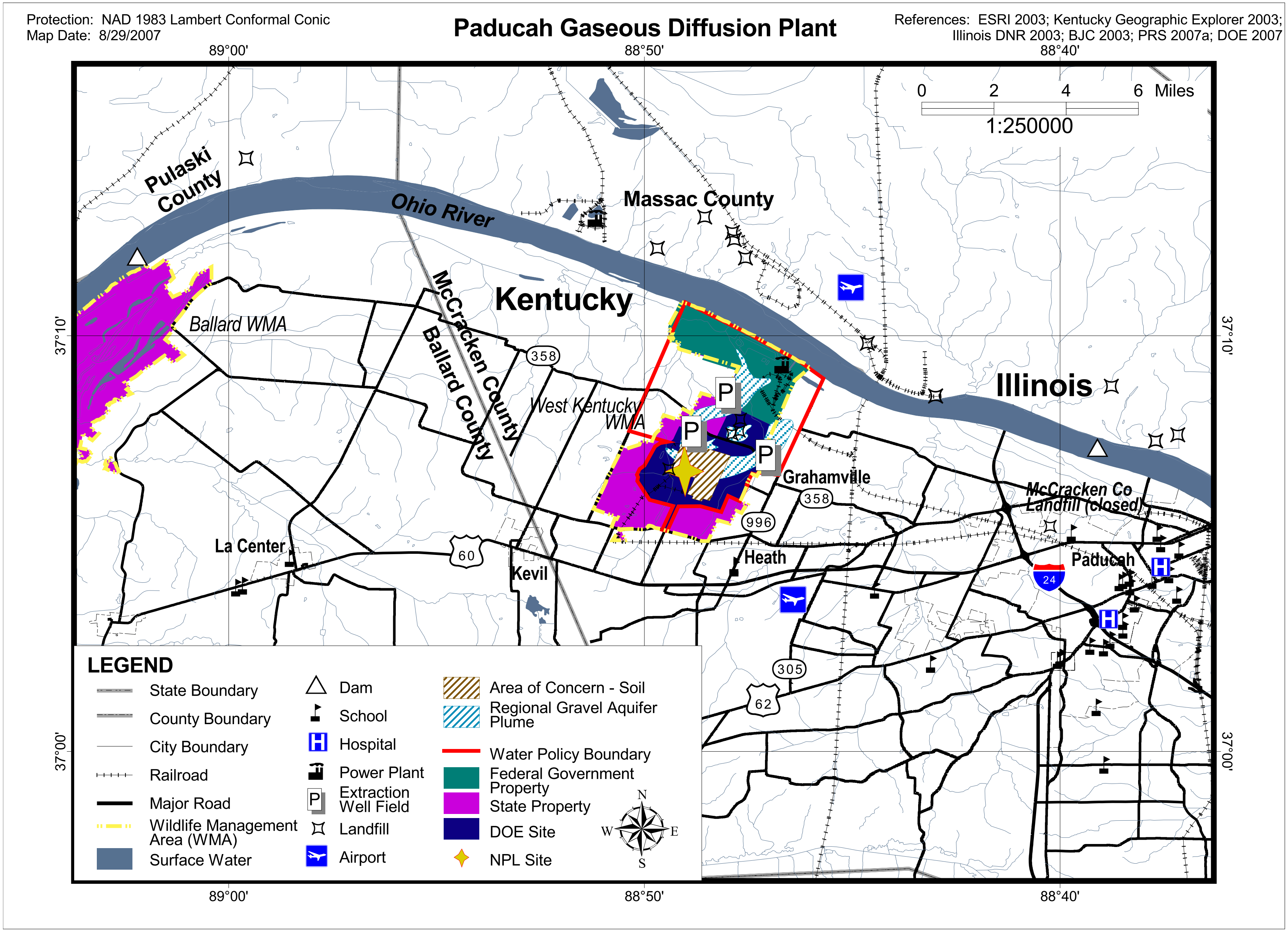


Figure 2.1a. Regional Physical and Surface Interface - Current State

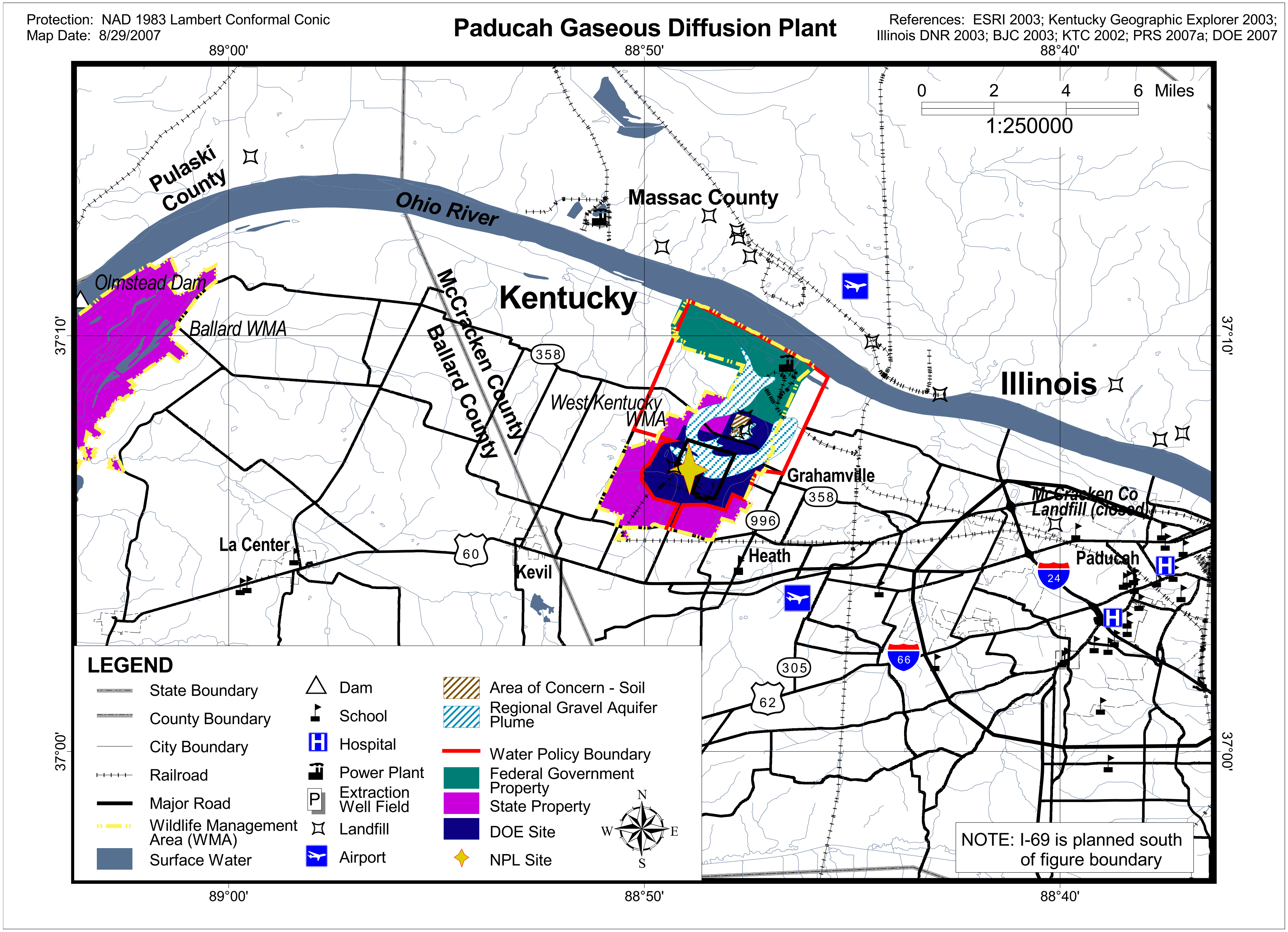


Figure 2.1b. Regional Physical and Surface Interface - Potential End State Alternative

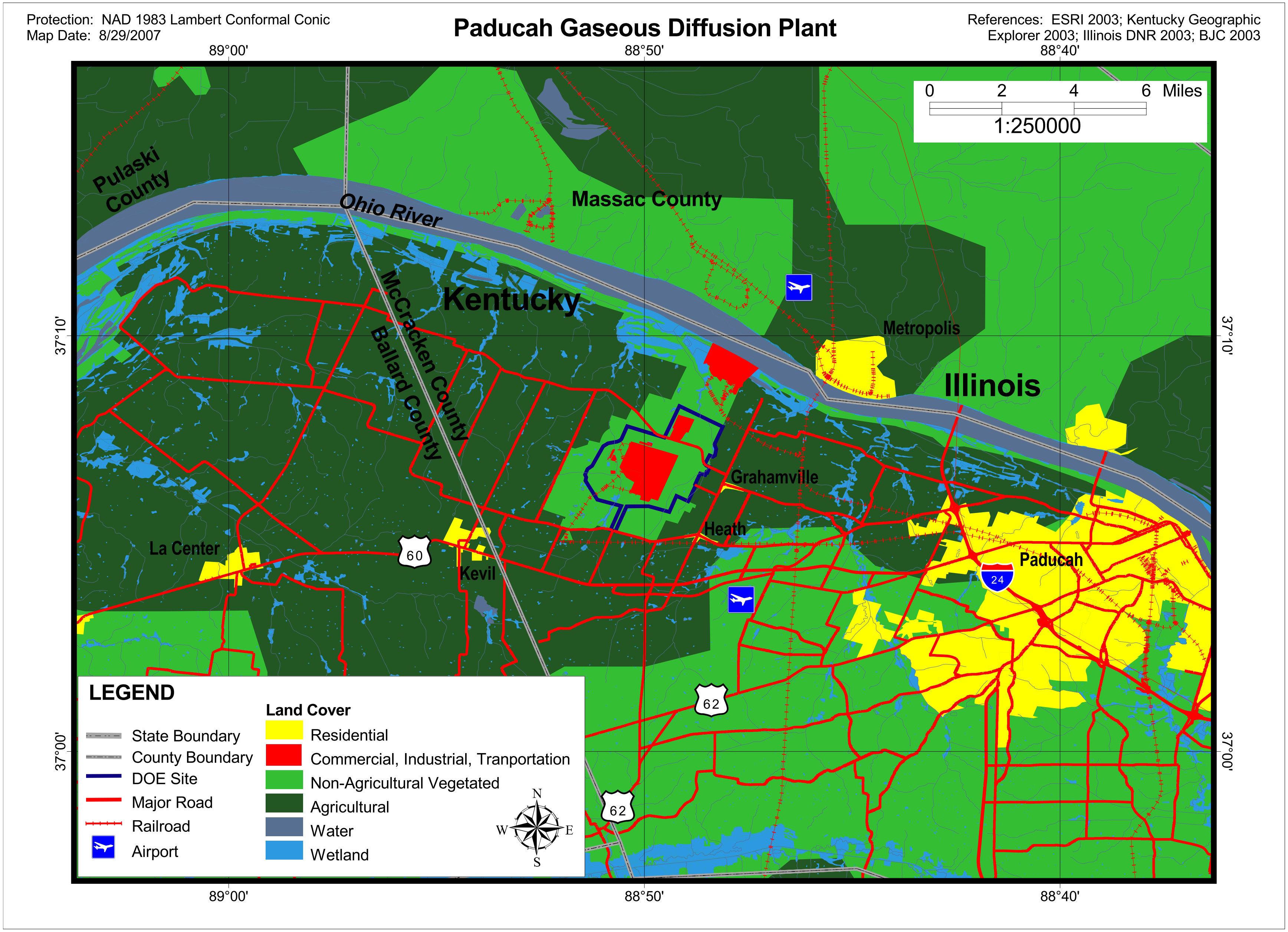


Figure 2.2a. Regional Human and Ecological Land Use - Current State

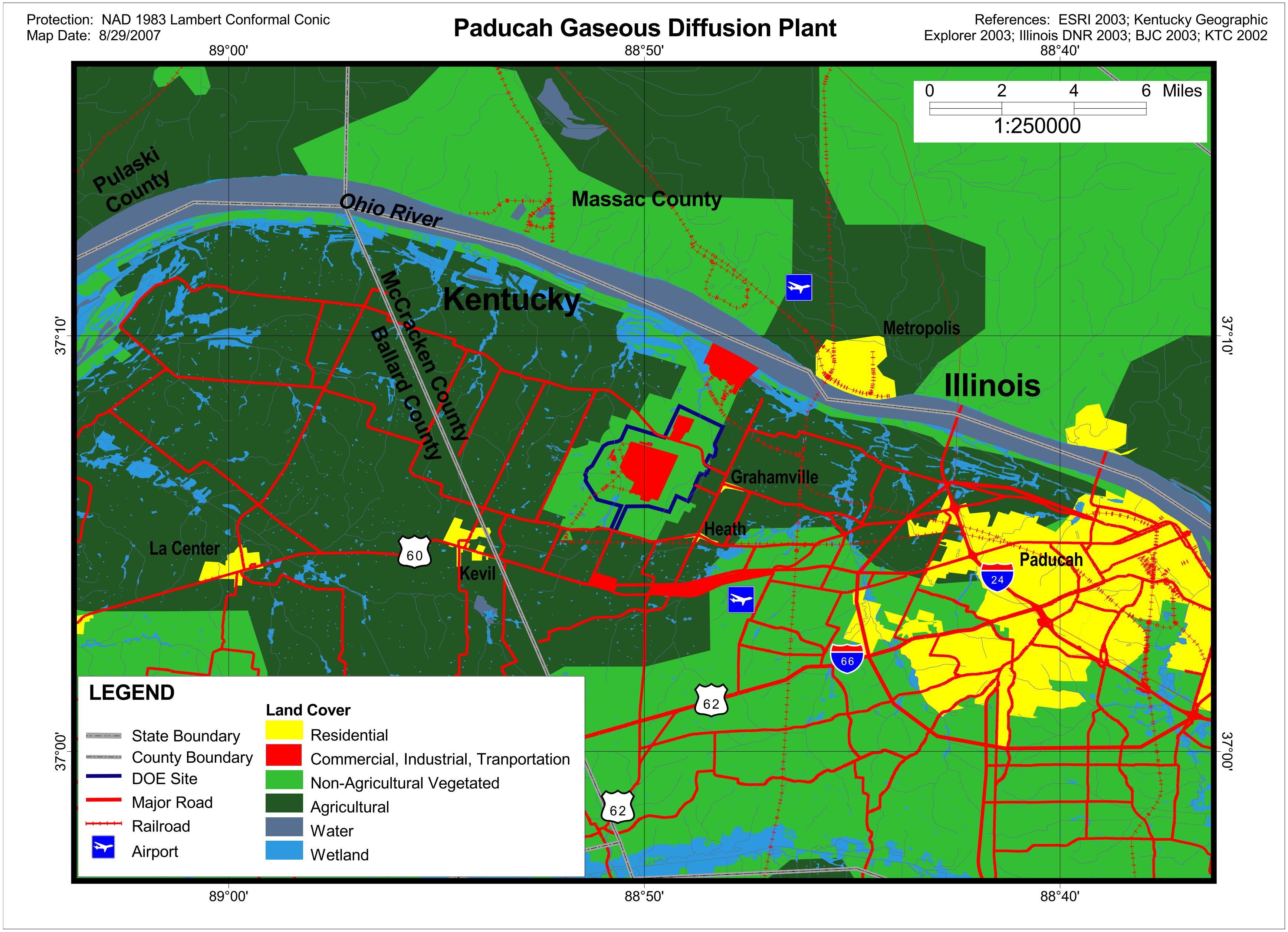


Figure 2.2b. Regional Human and Ecological Land Use - Potential End State Alternative

3. SITE-SPECIFIC DESCRIPTION

This chapter presents the site context description. This description presents information similar to that in Chapter 2, except at a greater level of detail. Generally, the maps presented here are similar to the sitewide maps that have appeared in the various RI documents (e.g., DOE 1996a, 1996b, 1997a, 1998a, 1999a, 1999b, 2000b, 2000c) and FS reports (e.g., 2001) prepared for PGDP.

The maps presented in this chapter are intended to show all areas and human and ecological receptors of concern near PGDP that might be affected by contamination originating on the site. The maps presented in this section depict the boundaries of all contiguous local and county governments and encompass site watersheds (i.e., Bayou and Little Bayou Creek), habitat and ecology areas, and other areas that could be affected by contamination migrating from the site. Site maps are presented for both current and potential end state alternative land use.

Additionally, Section 3.5 of this chapter presents information that has been collected to date concerning the hydrogeology and contaminant plumes at the PGDP. Custom configuration figures in this section are a geological cross-section and a map that shows the contaminant levels currently found in groundwater in source areas and within the plumes.

3.1 PHYSICAL AND SURFACE INTERFACE

Material in this section discusses and depicts the local administrative boundaries, transportation and infrastructure features, and surface configuration features and their relationship with hazard areas of concern at PGDP under both the current state and potential end state alternative. Administrative boundaries included are those for local governments; federal and state properties, including the PGDP property boundary and fence lines; and legal ownership (i.e., private versus federal ownership.) Transportation and infrastructure features included are highways, roads, and railroads; utility lines; and power plants. Surface configuration features included are Bayou Creek and Little Bayou Creek watersheds and major drainages leading from PGDP. Information presented about hazard areas of concern includes locations of contaminated surface water, sediment, and soil; waste cells (i.e., burial grounds); groundwater plumes; and contaminated buildings. Other information includes locations of monitoring wells, drinking water wells, and relevant institutional controls.

3.1.1 Current State

Figure 3.1a depicts all physical and surface features under current conditions on a single map. The following narrative references this map.

<u>Administrative Boundaries:</u> As depicted in Figure 3.1a, the DOE-owned PGDP is surrounded by the state-owned WKWMA, the TVA-owned steam plant, and private property. As noted in Chapter 2, PGDP encompasses 3,556 acres, with the industrial portion of PGDP situated within a fenced security area that consists of approximately 748 acres. Within this area are the numerous buildings and offices, support facilities, equipment storage areas, and active and inactive waste management units that comprise PGDP. Outside the fenced security area are approximately 822 acres that are not surrounded by the main security fence, but are controlled for security purposes. The remaining 1,986 acres is leased to the Commonwealth of Kentucky as part of the WKWMA. The entire WKWMA covers approximately 6,823 acres. Another administrative boundary shown on Figure 3.1a is that for the PGDP Water Policy. As discussed in Section 2.1, the PGDP Water Policy is a removal action completed under the ACO (DOE 1994), through which

DOE offered municipal water to all existing private residences and businesses within the area affected by contaminated groundwater originating at PGDP. In return, the affected residences and businesses agreed not to drill new water supply wells or use existing water wells and to allow PGDP personnel property access to sample groundwater. (Please see Chapter 4 for additional discussion of the PGDP Water Policy.)

No incorporated towns or cities are visible on the site-context map; however, the unincorporated community of Heath borders the eastern and southeastern sides of PGDP. The nearest schools are Heath Elementary, Middle, and High Schools located about 1.86 miles southeast of PGDP in Heath.

Transportation and Infrastructure: As depicted in Figure 3.1a, several state and county roads run near PGDP, with the main entrance road running from U.S. Highway 60 northeast into the plant. About 17.5 miles of paved roadway (concrete or asphalt) are in the industrialized portion of PGDP, and additional patrol roads and paved access roads branch to the plant's periphery. In addition, a railroad spur services PGDP and there are slightly more than 17 miles of track within the industrialized area. The spurs connect to the Illinois Central Gulf Railroad. No airports are visible on the site-context map. (The nearest airport is Barkley Regional Airport located approximately about 3.7 miles southeast of PGDP.)

Surface Configuration: The PGDP region is characterized by low relief. Elevations vary from 290 ft amsl at the Ohio River, located approximately 3.5 miles to the north, to 380 ft amsl on the plant site. Two main topographic features dominate the landscape: a loess-covered terrace, at 350-380 ft amsl elevation, and the Ohio River floodplain zone, dominated by alluvial sediments, at 300-320 ft amsl.

The terrain of the PGDP area is modified slightly by the branching drainage systems associated with Bayou Creek and Little Bayou Creek. These northerly flowing streams, which meet 3.5 miles north of the site and discharge into the Ohio River, have eroded small valleys that are approximately 20 ft below the adjacent plain and ultimately discharge to the Ohio River. Bayou Creek is a perennial stream, and its drainage extends from approximately 2.5 miles south of PGDP to the Ohio River. Drainage flows toward the river along a 9-mile course that passes along the western boundary of the industrialized area of the plant. Little Bayou Creek, an intermittent stream south of PGDP, originates in the WKWMA and flows north toward the Ohio River along a 6.5-mile course that includes parts of the eastern boundary of the industrialized area of plant. Effluents from PGDP operations constitute ~85% of the normal flow in Bayou Creek and nearly 100% of the normal flow in Little Bayou Creek (Kornegay et al. 1991).

The average elevation at PGDP is 380 ft amsl, or about 80 ft above the average water level of the Ohio River near the plant. Storm water and effluent from the plant flow into a series of man-made ditches and storm sewers that direct flow off of plant property through outfall ditches. These outfall ditches, which contain a specific point that is monitored for compliance with regulatory discharge limits, carry storm water and/or effluent into Bayou and Little Bayou Creeks.

Hazard Areas of Concern: Several hazard areas are visible in Figure 3.1a. These consist of the process buildings, landfills, and contaminated soils and sediments found on DOE-owned property and two major dissolved-phase solvent plumes found off DOE-owned property. In addition, contaminated sediments are found along Bayou and Little Bayou Creeks both on and off DOE property. Two groundwater pump-and-treat systems also are visible in Figure 3.1a. These systems are located near the centers of the Northeast and Northwest Plumes and are used to control the migration of the high-concentration centroids of these plumes. The system for the Northwest Plume consists of two pumping areas, and that for the Northeast Plume consists of a single pumping area. (Note that these pump-and-treat systems do not hydraulically contain the plumes and are not intended to "remediate" the dissolved-phase plumes.) The plumes also are monitored by several wells located within the plumes and along their peripheries. (Please see Section 3.5 for additional information on groundwater flow and the contaminant plumes at the PGDP.)

3.1.2 Potential End State Alternative

Figure 3.1b depicts all physical and surface features under potential end state alternative on a single map. The following narrative references this figure.

Administrative Boundaries: As depicted in Figure 3.1b, DOE-owned property is not expected to increase under the potential end state alternative. However, the potential end state alternative does include enhanced institutional controls that would replace the existing PGDP Water Policy and be implemented on both DOE- and non-DOE-owned property. These controls could range from implementation of legal agreements with surrounding landowners to place enforceable restrictions on groundwater use to DOE's acquiring rights from surrounding property owners and directly implementing restrictions on groundwater and property use. Depending on the actions chosen to implement enhanced institutional controls, DOE-owned property could increase.

Transportation and Infrastructure: No significant transportation or infrastructure changes are visible on the site-context map. The changes in roads, railroads, and other infrastructure (e.g., utility lines) that may occur after GDP D&D are unknown, but these are expected to remain if PGDP is reindustrialized.

Surface Configuration: As depicted in Figure 3.1b, no changes in surface configuration are expected by the end of the current planning horizon; however, Little Bayou Creek may become an intermittent stream if PGDP ceases discharging effluent to it.

Hazard Areas of Concern: As depicted in Figure 3.1b, on a site-specific scale, the surface hazard areas found at PGDP will change significantly by the end of the current planning horizon under the potential end state alternative. As noted in Chapter 2, when the end state is attained, all potentially contaminated sediments in Bayou and Little Bayou Creeks will be addressed; all potentially contaminated surface soils and sediments in the industrialized area of PGDP will be addressed; and the GDP, including those facilities that currently are inactive and those that currently are operating, will undergo D&D. Hazard areas expected to remain are the permitted landfills (potentially including a newly constructed CERCLA Cell, which is assumed to be used for on-site disposal of materials from the D&D of the GDP), the subsurface sources of the groundwater plumes and the dissolved-phase plumes, and the capped burial grounds. (Please see Section 3.5 for additional information on groundwater flow and the contaminant plumes at the PGDP.)

3.2 HUMAN AND ECOLOGICAL LAND USE

Material in this section discusses and depicts the human activities, land cover, and ecological activities and their relationship to hazard areas of concern at PGDP under both the current state and potential end state alternative. Human activities included are land use and water supply information. Ecological activities included are conservation and ecological areas, watersheds, wetlands and floodplains, and biota habitat. Information presented about hazard areas of concern matches that in Section 3.1.

3.2.1 Current State

Human Activities:

Several small communities are within 5 miles of PGDP. The closest communities, both unincorporated, are Grahamville, located 1 mile to the east, and Heath, located approximately 2 miles to the southeast. These areas support multiple private houses and lots, with the nearest residing approximately 3,000 ft from the industrial area. Areas south of PGDP are mainly rural and include a trailer park on Woodville Road. West of PGDP, the population density is low, and the setting is rural.

Land Cover:

Current human activities at and around PGDP are depicted on Figure 3.2a1, and include the following land uses:

- Residential,
- Manufacturing/Industrial,
- Agricultural, and
- Ecological/Preservation.

The immediate area of PGDP is identified as a manufacturing and industrial area and is surrounded by the WKWMA for a minimum of approximately 1 mile in all directions. The WKWMA is an ecological preservation zone that is bordered on the west, east, and south by areas currently used for agricultural purposes. Residential areas are shown on the figure to the southeast of PGDP and across the Ohio River to the north.

Ecological Activities:

The area surrounding PGDP supports a variety of ecological resources including the following:

- Vegetation,
- Wildlife,
- Aquatic regions,
- Wetlands, and
- Threatened and endangered species.

Each of these categories is discussed in the following section (DOE 2001a and DOE 2003g).

The upland habitats in the PGDP area support a variety of plant and wildlife species. Because much of the DOE-owned property and WKWMA terrestrial habitat is managed for multiple uses, the diversity of habitat is excellent. Forest and shrub tracts alternate with fencerows and transitional edge habitats along roads and transmission-line corridors. Fencerow communities are dominated by elm, locust, oak, and maple, with an often thick understory of sumac, honeysuckle, blackberry, and grape. Herbaceous growth in these areas includes clover, plantain, and numerous grasses.

The terrestrial community is described by the dominant vegetation-sites that characterize the community. The communities range from oak-hickory forest, in areas that have been relatively undisturbed, to managed fencerows and agricultural lands. Significant areas of the DOE-owned property and WKWMA include vegetation managed for consumption by wildlife, especially northern bobwhite quail.

Most of the area within the WKWMA has been cleared of vegetation at some time. Approximately 2,000 acres in the WKWMA consist of old field grasslands. Approximately 800 acres within the WKWMA are in scrub or shrub habitat. The Kentucky Department of Fish and Wildlife Resources staff mows 600 to 700 acres; control burns 200 to 400 acres; plants 150 acres of food plots (for wildlife); and sprays, strip-discs, or otherwise actively manages an additional 100 to 500 acres annually on the WKWMA.

Wildlife commonly found in the PGDP area consists of species indigenous to open grassland, thickets, and forest habitats. Observations by ecologists and WKWMA staff have provided a qualitative description of wildlife communities likely to inhabit the vegetation communities in the WKWMA. Open herbaceous areas are frequented by rabbits, mice, and a variety of other small mammals. Birds include red-winged blackbirds, quail, sparrows, and predators such as hawks and owls. In areas that include fencerows, low shrub, and young forests, a variety of wildlife is present including opossum, vole, mole, raccoon, and deer. Birds typically present include red-winged blackbird, loggerhead shrike, mourning dove, northern bobwhite quail, wild turkey, northern cardinal, and western meadowlark. Several groups of coyotes also reside near PGDP. In mature forests, squirrel, various songbirds, and great horned owls may be present. The primary game species hunted for food in the area are deer, wild turkey, northern bobwhite, rabbit, and squirrel. Opossums and raccoons are hunted for dog training and pelts.

Both Bayou and Little Bayou Creeks and tributaries support a variety of aquatic life including several species of sunfish, as well as spotted and largemouth bass, bullheads, and creek chub. Inhabitants of shallow streams, characteristic of the two main area creeks, are dominantly bluegill, green and longear sunfish, and central stonerollers.

In addition to stream habitats, approximately 13 fishing ponds are located near PGDP, primarily in the WKWMA. Most of the ponds north of PGDP are used for public fishing. Ponds to the south of PGDP have been posted with consumption warnings, due to contamination from operations of an ordnance works that operated during World War II. Pond areas generally are dominated by largemouth bass, bluegill, and to a lesser extent, green sunfish.

Aquatic habitats are used by muskrat and beaver. Many species of water birds, including wood duck, geese, heron, and species of migratory birds, also use these areas. Numerous other smaller ponds and abandoned gravel pits usually contain water and may have functioning ecosystems.

Habitats that have soil and hydrology capable of supporting vegetation adapted for hydric environments are considered wetlands. These habitats include marshes (wetlands dominated by herbaceous species) and swamps (wetlands dominated by woody species), as well as variations between terrestrial and aquatic habitats. Near PGDP, there are numerous areas where these conditions prevail, particularly in the region adjacent to the Ohio River. Within the WKWMA, approximately 4,000 acres have been identified as having hydric soil capable of supporting wetlands (Figure 3.2a2). Some of these systems include a special-status species, the water hickory. Approximately 400 acres of this area are Tupelo Swamp, and another 600 acres are bottomland hardwood. The Tupelo Swamp, which is located near the Ohio River, is considered very unusual by state and federal land managers and is thought to be only one of three similar systems left in the United States. Most of the remainder of the wetlands in the PGDP vicinity is in agricultural use or is in some stage of succession to wetland scrub. Other wetland habitats are found associated with the shorelines of ditches and creeks (riparian vegetation), although many of these are incised and have only marginal areas of wetlands.

Eleven federally listed, proposed, or candidate species have been identified as potentially occurring at or near PGDP. None of the species has been reported as sighted on the DOE-owned property; however, potential summer habitat and suitable forage habitat exist on DOE-owned property for one listed species, the Indiana bat (Figure 3.2a3), and Indiana bats have been captured in the PGDP vicinity.

Hazard Areas of Concern: Please see Section 3.1 for a depiction and discussion of hazard areas of concern under current conditions.

3.2.2 Potential End State Alternative

Human Activities:

Figures 3.2b1 and 3.2b2 present the expected future land use and future zoning in the area, respectively. As shown in Figure 3.2b2, the areas south of PGDP are anticipated to remain urban and rural residential. As discussed in Section 2.2.2, a gradual transition from agricultural use to low-density housing (i.e., residences on lots averaging from 1 to 5 acres) and recreational use is possible. Note that the change from agriculture use to low-density housing is not reflected in Figure 3.2b1 because the area where the transition from agricultural use to low-density housing may occur is unknown. However, this transition is consistent with the increasing subdivision of farmland for residential development along U.S. 60, west of Paducah, and the recent expansion of that road into a four-lane highway.

The variance between the future land-use map (Figure 3.2b1) and the zoning map (Figure 3.2b2) is notable for the area encompassed by the WKWMA. As shown in Figure 3.2b1, the planned future use of the WKWMA, for purposes of cleanup decisions and the potential end state alternative, is ecological/preservation; however, as shown in Figure 3.2b2, the WKWMA currently is zoned manufacturing and industrial. This variance, while notable on the map, is of little practical significance because zoning for manufacturing and industrial does not preclude the anticipated ecological/preservation future land-use. (Note that if future land-use were changed to manufacturing and industrial from ecological/preservation, then the cleanup levels for the affected areas would be greater.)

Land Cover:

Land uses for the potential end state alternative are presented on Figure 3.2b1 and include the following:

- Residential,
- Commercial,
- Manufacturing/Industrial,
- Agricultural, and
- Ecological/Preservation.

The potential end state alternative land use is almost identical to the current state land uses, with the manufacturing/industrial PGDP area surrounded by the ecological/preservation area of the WKWMA, which subsequently is bordered by agricultural areas. Residential areas under the potential end state alternative are to the southeast of PGDP and across the Ohio River to the north. Additionally, a commercial area that is identified on the zoning map is found to the southeast of the plant.

The most significant differences between Figures 3.2a1 and 3.2b1 are the removal of several hazard areas and the absence of the current extraction well system.

Ecological Activities:

Ecological resources in the PGDP area for the potential end state alternative will be consistent with the current state. Changes in the size of the WKWMA in the future may result in changes to the areas inhabited by terrestrial and aquatic species.

Hazard Areas of Concern:

Please see Section 3.2 for a depiction and discussion of hazard areas of concern under potential end state alternative conditions.

3.3 LEGAL OWNERSHIP

Material in this section discusses and depicts the legal ownership of areas at and around PGDP under the current state and potential end state alternative. The ownership (surface and subsurface) classes considered are private and government (i.e., state, federal, and local).

3.3.1 Current State

As depicted in Figure 3.3a state government-owned property (i.e., the state-owned portion of the WKWMA) borders PGDP on the south, west, and north sides; federal, government-owned property (i.e., the TVA Shawnee Steam Plant) borders the PGDP north side; and private property borders PGDP on the east and south sides. Private property, in turn, surrounds the portion of the WKWMA bordering PGDP.

No incorporated communities are near enough to PGDP to appear on the site-context maps; however, the privately owned property to the east of PGDP does consist of homes located on relatively small lots (approximately 1 acre or less). This area is the unincorporated community of Heath.

The nearest schools also are located in Heath and are to the southeast of PGDP. These schools (i.e., Heath elementary, middle, and high schools) are approximately 1.86 miles from the boundary of DOE-owned property.

As noted earlier, portions of PGDP containing infrastructure needed for uranium enrichment are leased to USEC. Infrastructure leased to USEC includes the process buildings, electrical switchyards, an administration building, and several maintenance and support buildings. In total, USEC leases 421 acres of the 748 acres within the secure area of PGDP.

An additional facility being built at PGDP is the depleted uranium hexafluoride conversion facility (DUF_6 Conversion Facility). This facility currently is under construction and will be located in the southeast corner of the DOE-owned property. It will cover 9 acres.

3.3.2 Potential End State Alternative

As depicted in Figure 3.3b, DOE-owned property is not expected to increase under the potential end state alternative. However, the potential end state alternative includes enhanced institutional controls that would replace the existing PGDP Water Policy and be implemented on both DOE- and non-DOE-owned property. These controls could range from implementation of legal agreements with surrounding landowners to place enforceable restrictions on groundwater use to DOE's acquiring rights from surrounding property owners and directly implementing restrictions on groundwater and property use. Therefore, depending on the actions chosen to implement enhanced institutional controls, DOE-owned property could increase.

3.4 DEMOGRAPHICS

Information presented in this section discusses and depicts the population density and other pertinent demographic information for the area near PGDP under the current state and potential end state alternative. Demographic data presented includes population data and housing and socioeconomic data.

3.4.1 Current State

As depicted in Figure 3.4a, the population density immediately around PGDP under current conditions is between 151 and 500 individuals per square mile. Specific demographic information from the 1980, 1990, and 2000 censuses about census tract 0315, block group 2, which is the block group for the area containing PGDP, is presented in Table 3.1.

As shown in Table 3.1, the area immediately around PGDP had a small net population gain from 1980 to 2000. The block group was over 90% white in the censuses and the percentage white has increased between censuses. There were slightly more elderly persons than children under age 10 in 1990, as the percentage of children declined, and the percentage of elderly people increased during that time.

For the 1990 census, there were 2.57 individuals per household, and nearly 90% of all households were owner-occupied, which is typical of rural areas. Over 71% of persons age 25 and older had at least a high school education, and median income was $27,560. Fewer than 13% lived below the poverty level, which is relatively low for western Kentucky. Over three-quarters of housing units in the area had water from sources other than a private well (ATSDR 2002).

For the 2000 census, there were 2.48 individuals per household (a –3.5% change) and an 87% rate of home ownership (a –2.2% change). Over 71% of persons age 25 and older had at least a high school education, and the median household income was $37,308 (a 35% change). Fewer than 8% lived below the poverty level (a change of –39%) compared to a statewide average of 12.7%. The rate of private well use was similar to the 1990 census at 24%.

3.4.2 Potential End State Alternative

By the end of the period considered, demographics are not expected to change markedly in areas near PGDP. As discussed in Chapter 2, the population size and the rate at which the population increases can be expected to become greater as the area around PGDP changes from agricultural use to low-density housing. However, the overall population density can be expected to remain below 500 individuals per square mile (Figure 3.4b). Additionally, the socioeconomic status can be expected to remain stable as industry is recruited to replace any jobs lost as the PGDP mission changes. Note that there is a chance that the inflation-adjusted median household income could fall if the PGDP mission changes abruptly, because PGDP is a major regional employer that pays relatively high wages.

Table 3.1. Demographic Information for the Area Near PGDP Under Current State (ATSDR 2002 and DOC 2003)[a]

Information	1980	1990	2000
Population			
Total population	1,383	1,366	1,442
Percent change[b]		-1.2%	+5.6%
Density per square mile	46	45	47.5
Percent change		-2.2%	+5.6%
Race			
% Caucasian	91.4%	92.9%	94.4%
Percent change		+1.6%	+1.6%
Age			
Under Age 10	16.1%	12.4%	10.9%
Percent change		-23%	-12%
Age 65 and Over	11.5%	13.0%	14.7%
Percent change		+13%	+13%
Socioeconomic Information			
Total households	NA	531	581
Percent change			+9.4%
Individuals per household	NA	2.57	2.48
Percent change			-3.5%
% households owned	NA	88.5%	86.3%
Percent change			-2.5%
Individuals age 25 and older	NA	927	974
Percent change			+5.1%
% with at least high school diploma	NA	71.4%	71.4%
Percent change			None
Median income, $	NA	$27,560	$37,308
Percent change			+35%
% below poverty level	NA	12.7%	7.7%
Percent change			-39%
Employed age 16 and older	NA	673	603
Percent change			-10%
% in blue collar job	NA	38.6%	
Percent change			
% in white collar job	NA	61.4%	
Percent change			
Water Source			
Housing units	NA	580	631
Percent change			+8.8%
% with water from well	NA	24.3%	24.1%
Percent change			-0.8%
% with other water supply	NA	75.7%	75.9%
Percent change			+0.3%

"NA" indicates that the information was not available at the time this draft of the report was prepared.
[a] Information presented is for census tract 0315, block group 2.
[b] Percent change is relative to the previous census in all cases.

3.5 CUSTOM CONFIGURATION – HYDROGEOLOGY AND CONTAMINANT PLUMES AT PGDP

This section includes a brief discussion of the hydrogeology and the contaminant plumes at PGDP. This information is pertinent to understanding the current state, potential end state alternative, and current planned end state at the PGDP because the major off-site hazard issue to be addressed at the PGDP concerns contamination found in groundwater. Additional information regarding the hydrogeology at the

PGDP may be found in the *Feasibility Study for the Groundwater Operable Unit at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE 2001a).

The flow system near PGDP exists primarily within the unconsolidated sediments that overlie the bedrock. Specific components for the regional groundwater flow system, shown in Figure 3.5a1, have been identified and are defined in the following subsections.

3.5.1 Bedrock Aquifer

The top of the limestone bedrock appears beneath PGDP at 335 to 350 ft bgs. Groundwater production from the bedrock aquifer comes from fissures and fractures and from the weathered rubble zone near the top of the bedrock. The bottom of a 5- to 20-ft thick rubble zone that overlies the bedrock generally marks the base of the active groundwater flow system beneath PGDP. Through 2003, no contamination associated with the PGDP has been found in the bedrock aquifer or overlying rubble zone.

3.5.2 McNairy Flow System

This component consists of intermingled lenses of sand, silt, and clay. The sand in the McNairy Formation is an excellent aquifer in the southeastern part of the Jackson Purchase Region; however, near PGDP, the McNairy Formation contains significant amounts of silt and clay making it less useful as an aquifer. Regionally, the groundwater in the McNairy Formation flows north and northwest.

The McNairy Formation appears beneath the PGDP at depths ranging from approximately 100 to 350 ft. Near the PGDP, the upper to middle portions of the McNairy Formation are predominately silty and clayey fine sands, and the lower 40 to 50% is composed of sands. In some portions of the McNairy Formation, where coarser-grained sediments are in contact with the overlying Regional Gravel Aquifer (RGA), the groundwater flow mimics the flow of the RGA. Some contamination associated with the PGDP (primarily TCE) has been found in the upper portions of the McNairy Formation near source areas at the C-400 Building. (See Chapter 4 for a discussion of contaminant sources at the PGDP.)

3.5.3 Terrace Gravel and Eocene Sands

A thick clay terrace exists in the southern part of the DOE-owned property. The Terrace Gravel and Eocene sands overlie the clay terrace. South and west of the PGDP, the groundwater in this system discharges to Bayou Creek, but closer to the northern limit of the terrace the groundwater discharges directly into the RGA. Low concentrations of contamination associated with the PGDP have been found in the terrace gravels and Eocene sands in the industrialized portions of the PGDP. (See Chapter 4 for a discussion of contaminant sources at the PGDP.)

3.5.4 Regional Gravel Aquifer

This aquifer consists primarily of the coarse sand and gravel and overlies the McNairy Formation. Sands in the overlying deposits and the underlying McNairy Formation, where they occur in contact with the lower continental deposits, are included in the RGA. The RGA is found throughout the plant area and to the north, but pinches out to the south along the Porters Creek Clay terrace. Regionally, the RGA includes the sediments deposited in the distant past by the ancestral Ohio River.

The RGA is the primary aquifer beneath PGDP and, with relatively high hydraulic conductivities,[1] is the dominant groundwater flow system in the area extending from PGDP to the Ohio River. Regional groundwater flow within the RGA trends north–northeast toward the Ohio River, but east-west trends in the local geology and leaks from PGDP utilities cause groundwater flow to be directed locally to the northeast and northwest of the plant.

The RGA is the dominant pathway by which groundwater contamination migrates off-site. The Northeast Plume, the Northwest Plume, and the Southwest Plume exist in the RGA. Figures 3.5a2 and 3.5a3 display the most recent mapping of TCE and ^{99}Tc plumes in the RGA, respectively. Since the flow in the RGA is affected by leakage from PGDP utilities, the areas affected by the plumes may change in the future when this leakage ceases. However, the rate of leakage is unknown, so the anticipated effects on the plumes has not been quantified, or modeled.

3.5.5 Upper Continental Recharge System

The Upper Continental Recharge System (UCRS) consists of the upper continental deposits and the thick, overlying, shallow deposits. The predominant groundwater flow in the UCRS is vertically downward into the RGA, hence the term "recharge system." The presence of steep, but undetermined, vertical gradients for most areas of PGDP has limited the ability to map a water table at PGDP.[2] Regionally, the thickness of the saturated UCRS ranges from 0 to 50 ft. Contamination associated with the PGDP is found in the UCRS at many areas within the industrialized areas at the PGDP; however, no contamination associated with the PGDP has been found in the UCRS outside of these industrialized areas because of the vertical flow.

---

[1] The hydraulic gradient varies spatially, but is on the order of 1.0E-4 to 1.0E-3 m/m. Hydraulic conductivities from the RGA have been reported as ranging from 1.0E to 1.0E+0 cm/s.

[2] Vertical hydraulic gradients generally range from 0.5 to 1 m/m. Measurements of UCRS hydraulic conductivity range from 1.7E-08 to 3.2E+00 cm/s.

THIS PAGE INTENTIONALLY LEFT BLANK

FIGURES

THIS PAGE INTENTIONALLY LEFT BLANK

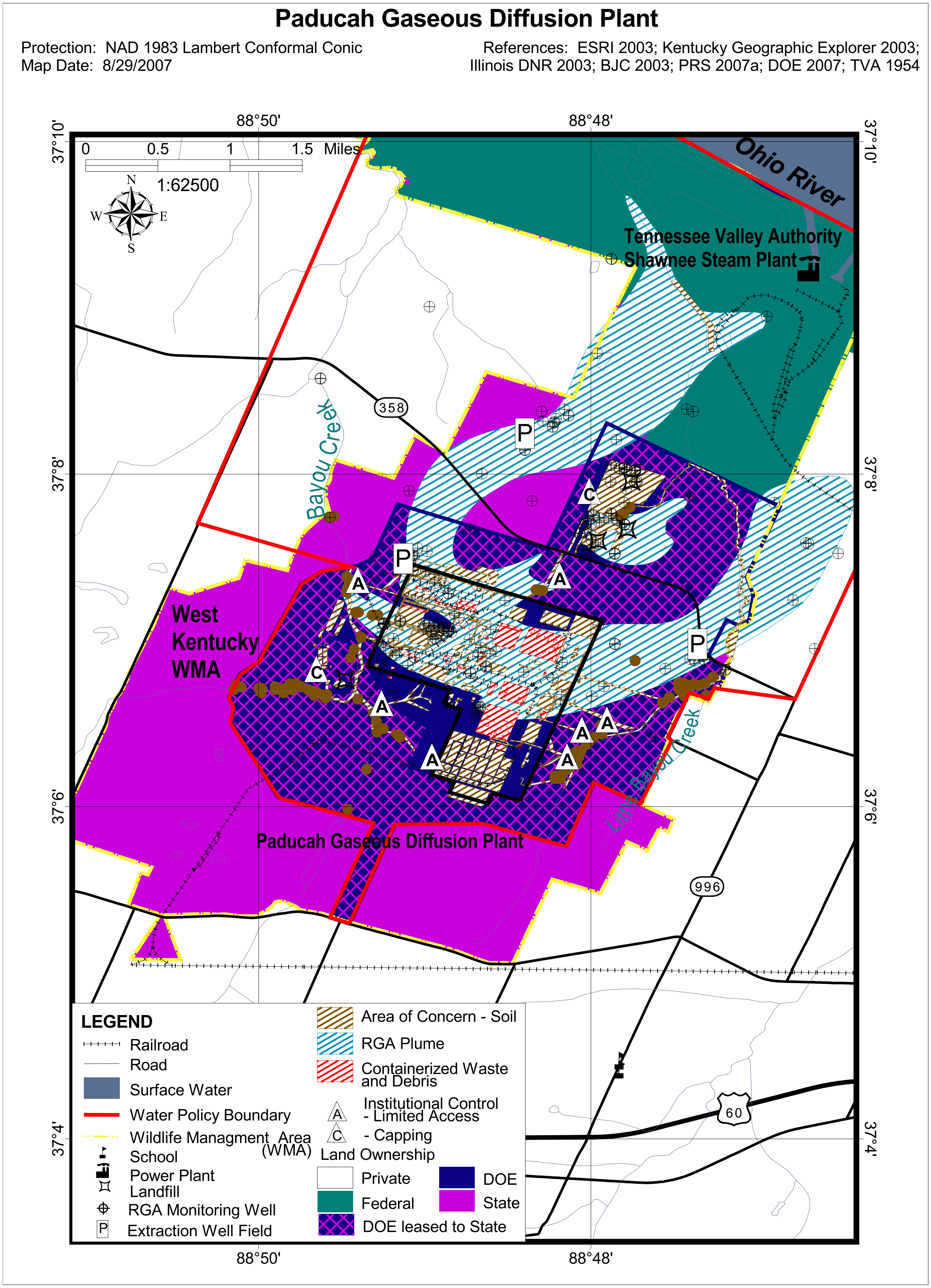


Figure 3.1a. Site Physical and Surface Interface - Current State

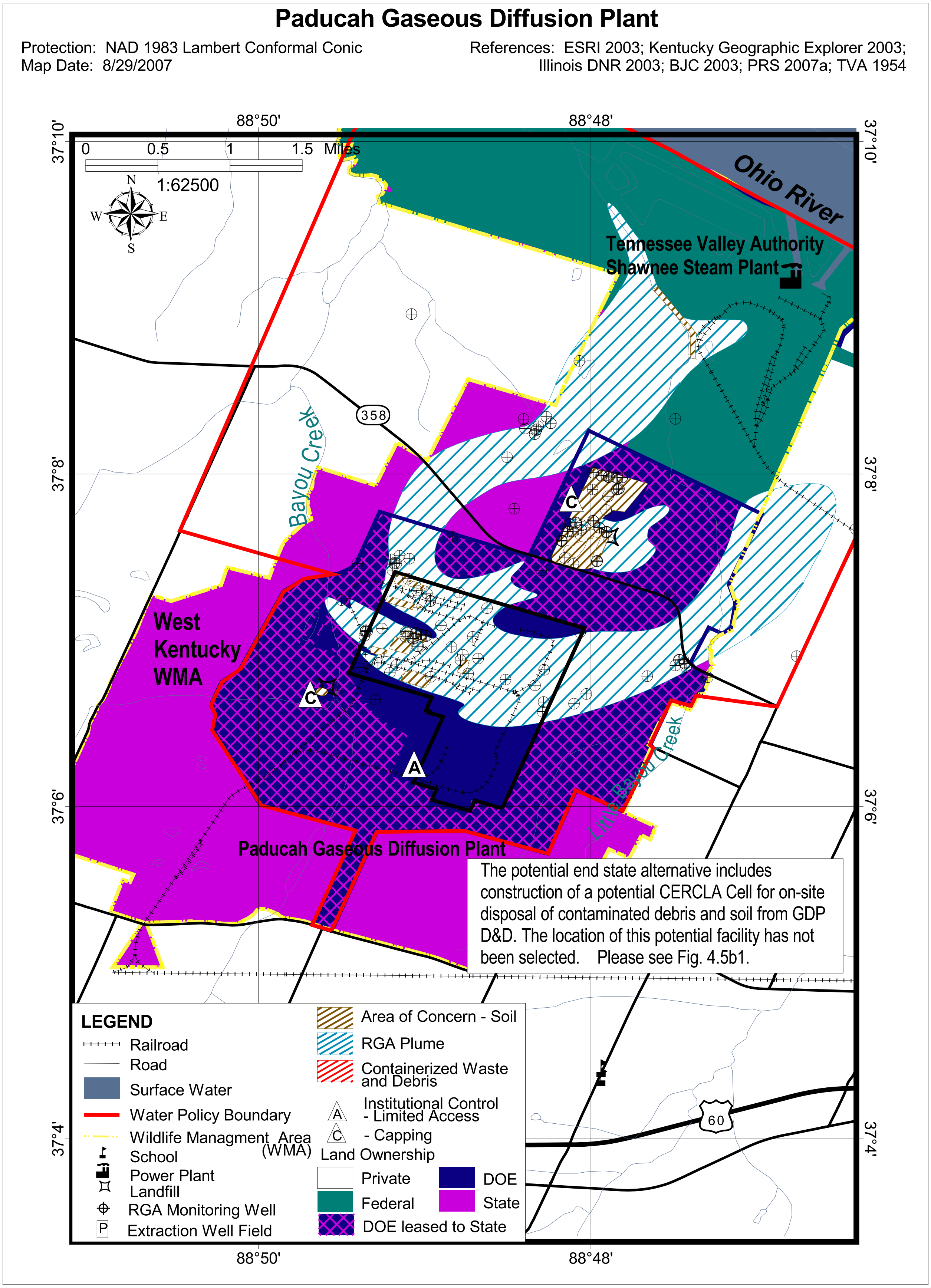


Figure 3.1b. Site Physical and Surface Interface - Potential End State Alternative

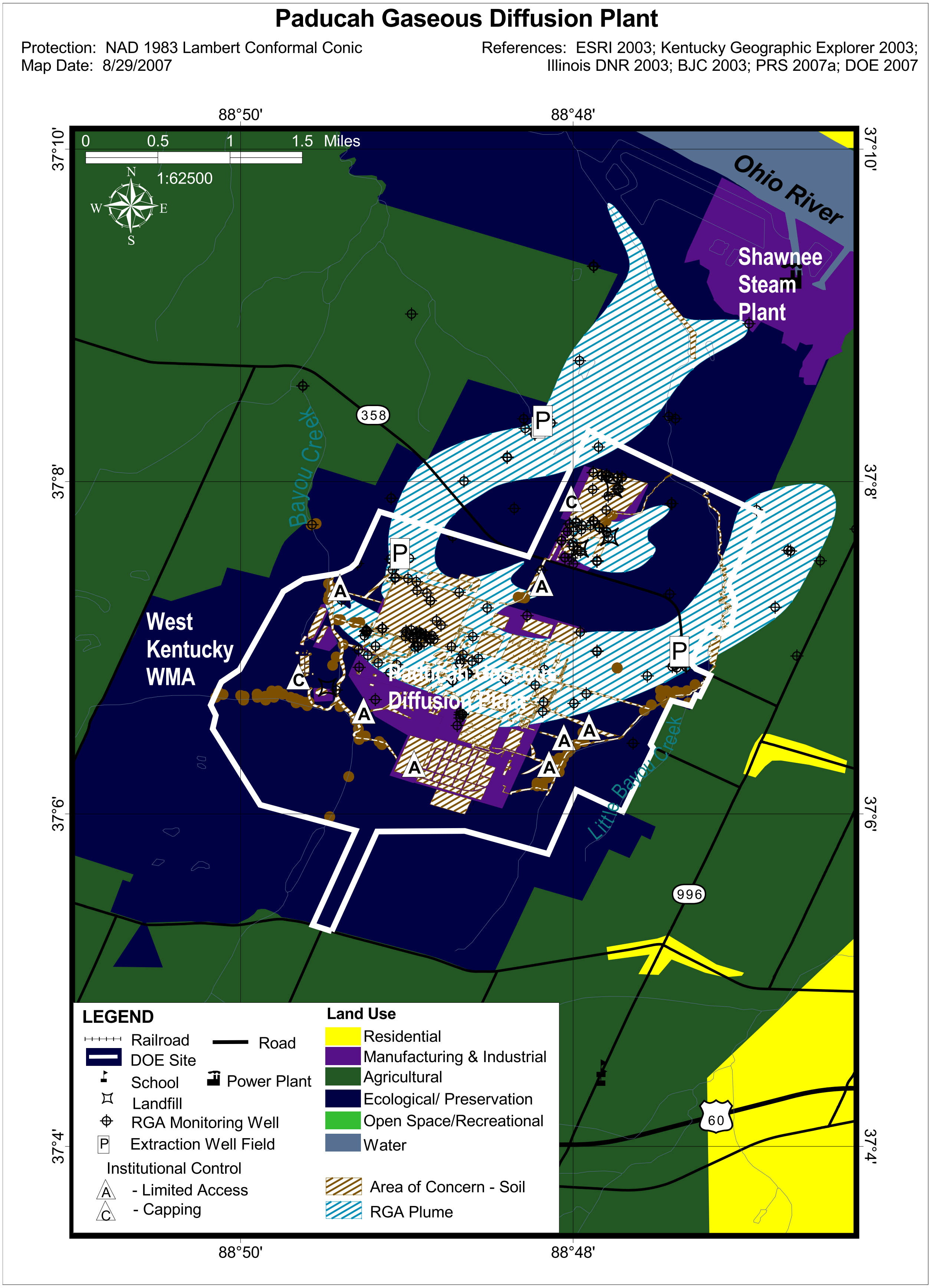


Figure 3.2a1. Site Human and Ecological Land Use - Current State

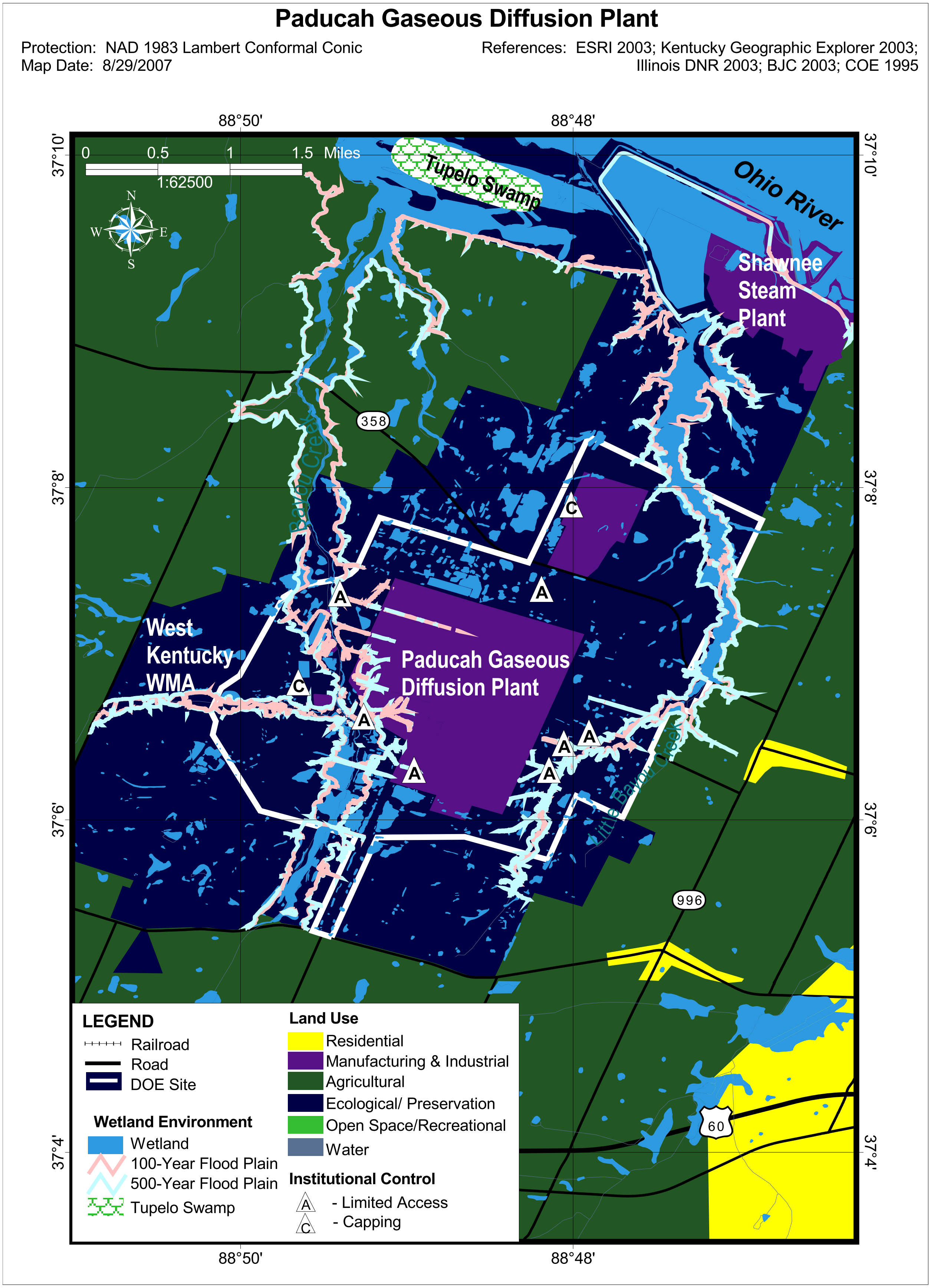


Figure 3.2a2. Site Humand and Ecological Land Use, Wetlands - Current State

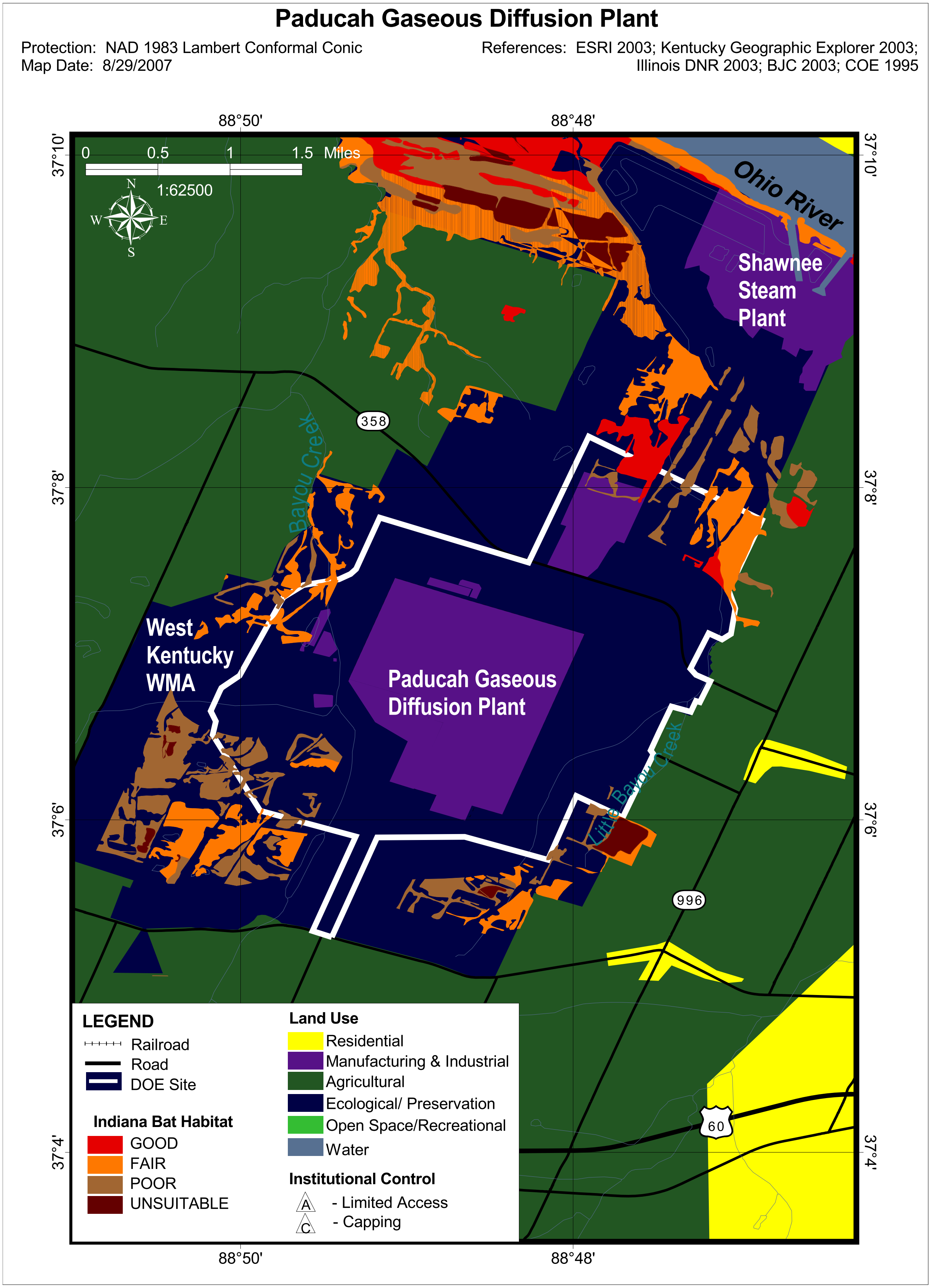


Figure 3.2a3. Site Humand and Ecological Land Use, Indiana Bat Habitat - Current State

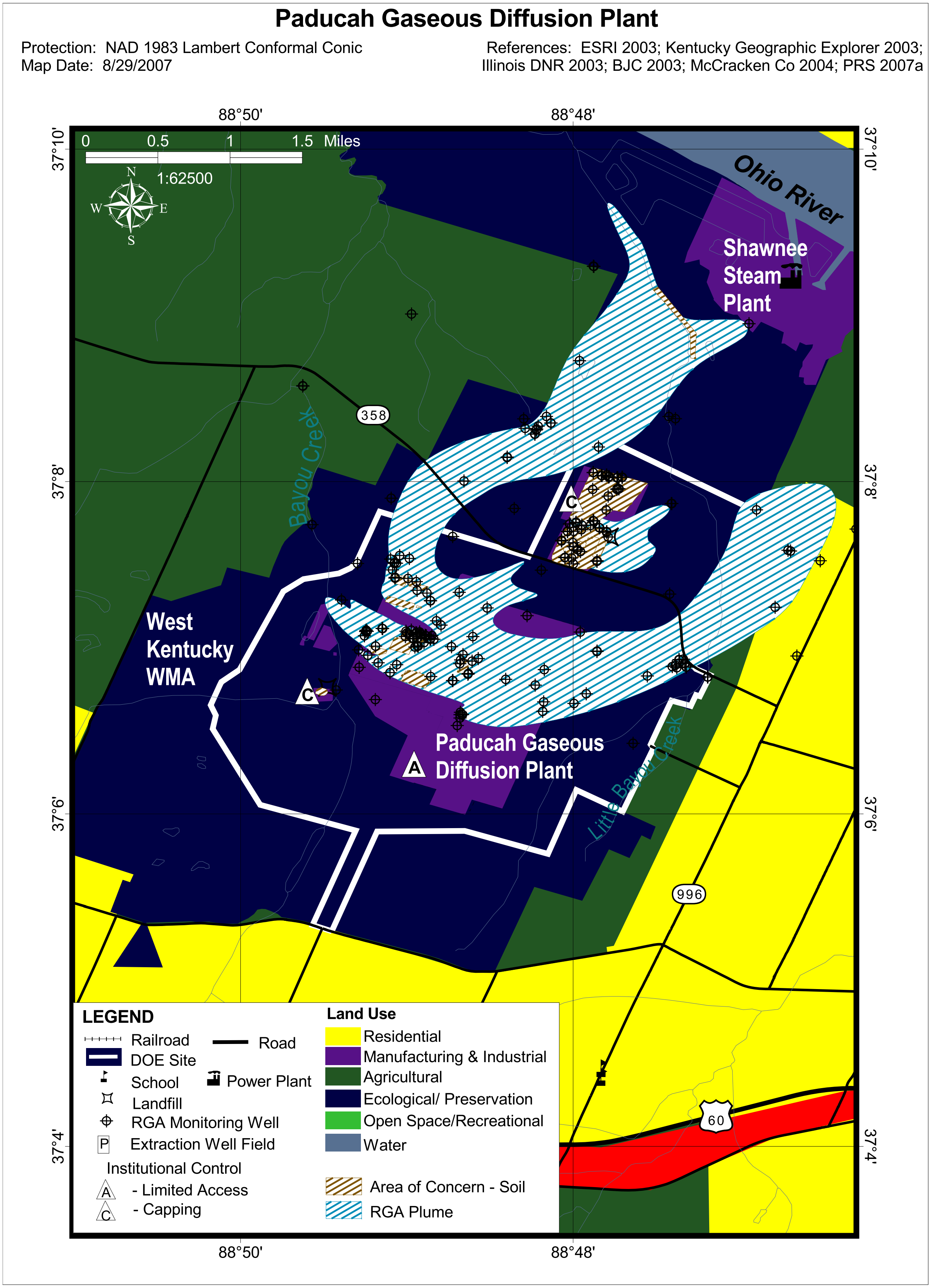


Figure 3.2b1. Site Human and Ecological Land Use - Potential End State Alternative

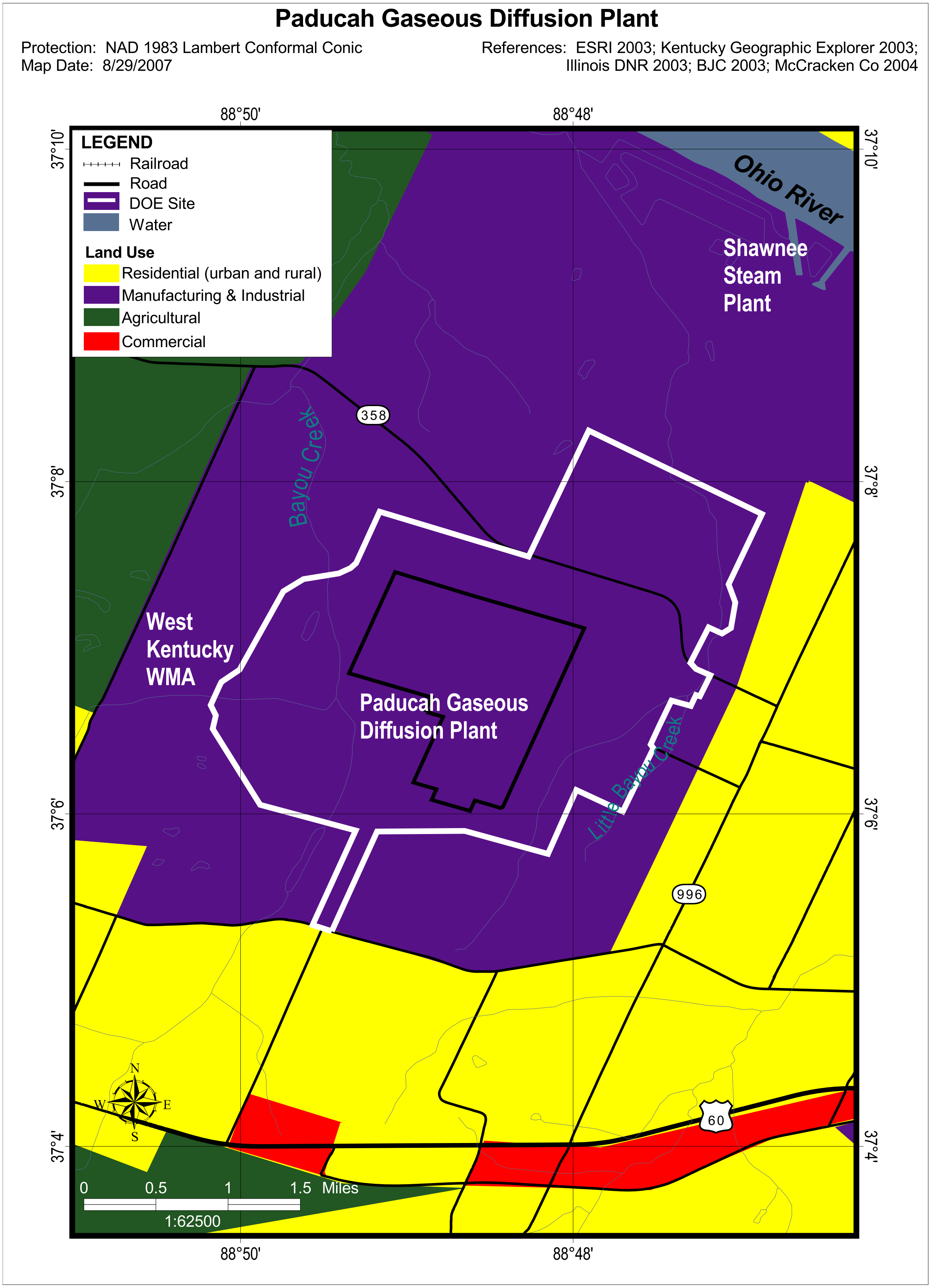


Figure 3.2b2. Site Custom Configuration - Future Zoning

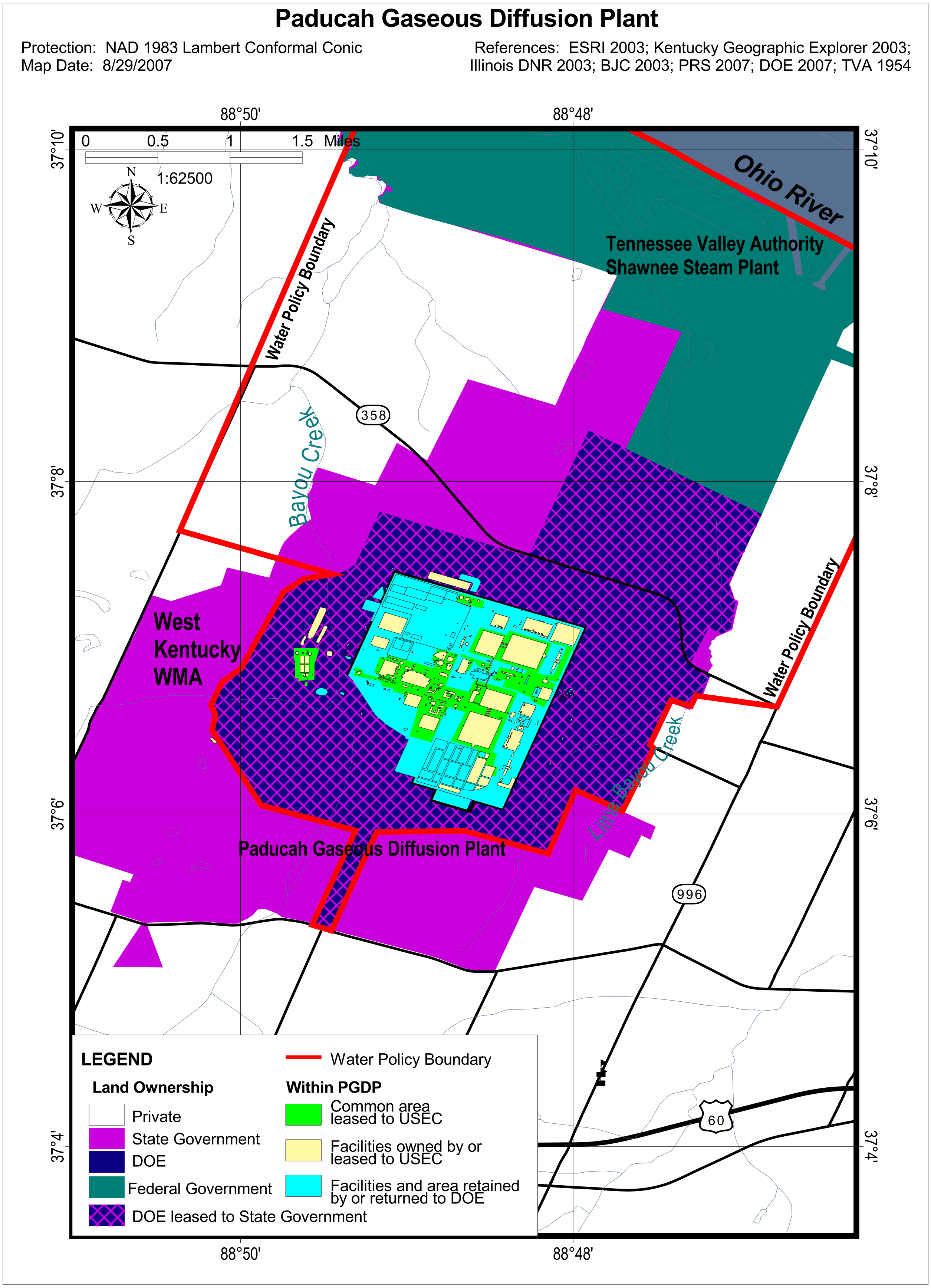


Figure 3.3a. Site Legal Ownership - Current State

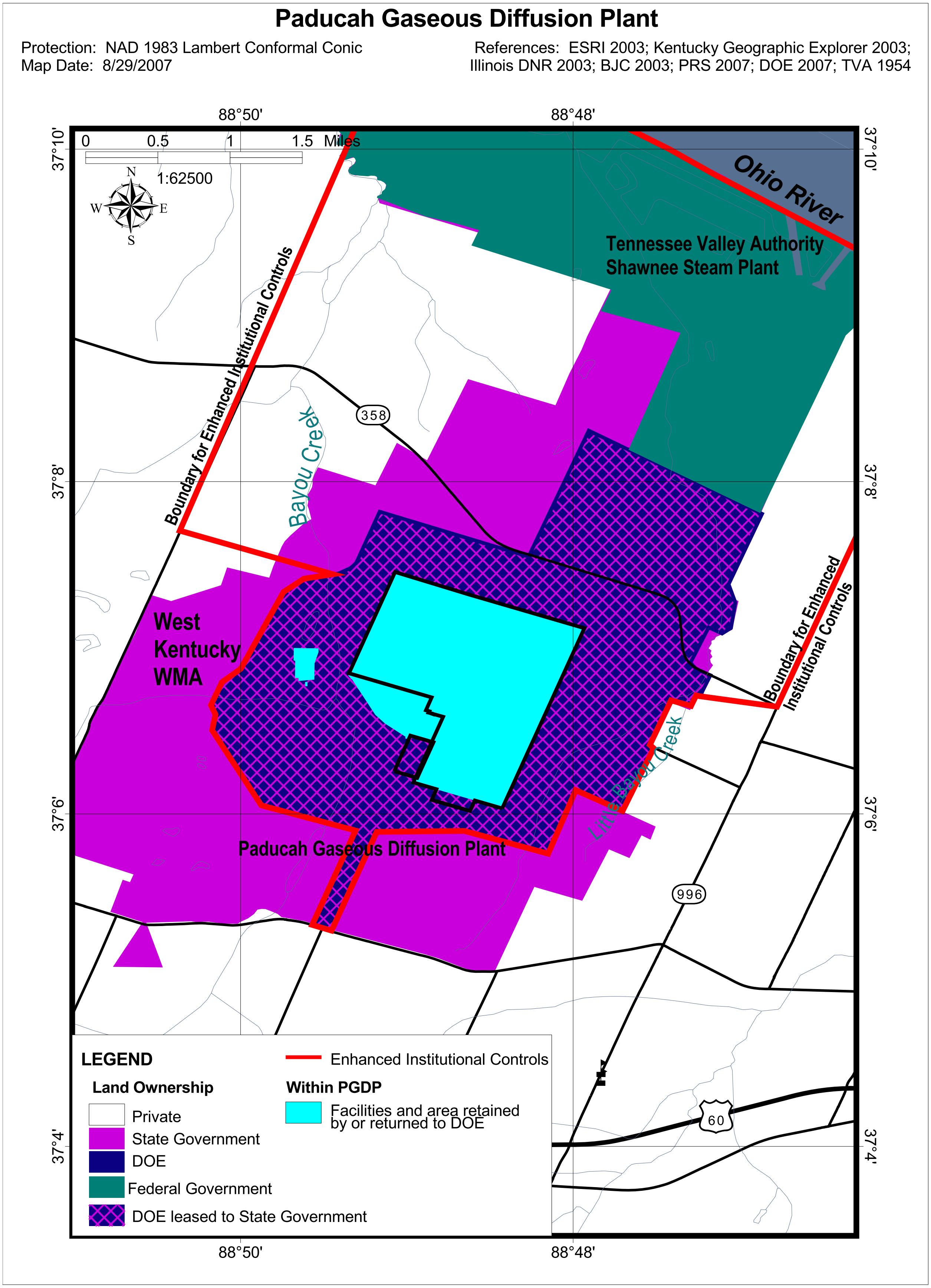


Figure 3.3b. Site Legal Ownership - Potential End State Alternative

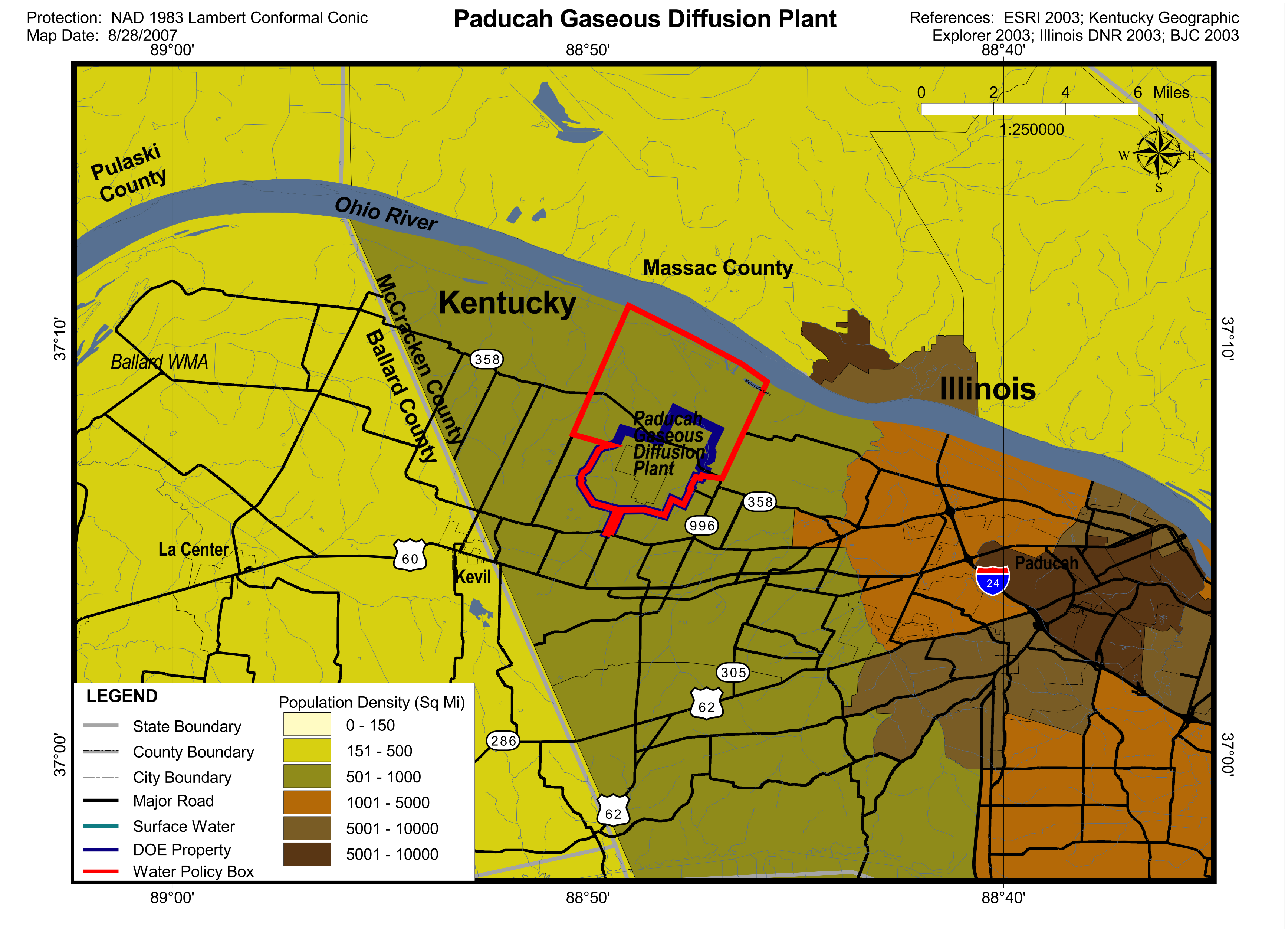


Figure 3.4a. Site Population Density - Current State

Protection: NAD 1983 Lambert Conformal Conic
Map Date: 8/28/2007

Paducah Gaseous Diffusion Plant

References: ESRI 2003; Kentucky Geographic Explorer 2003; Illinois DNR 2003; BJC 2003; KTC 2002

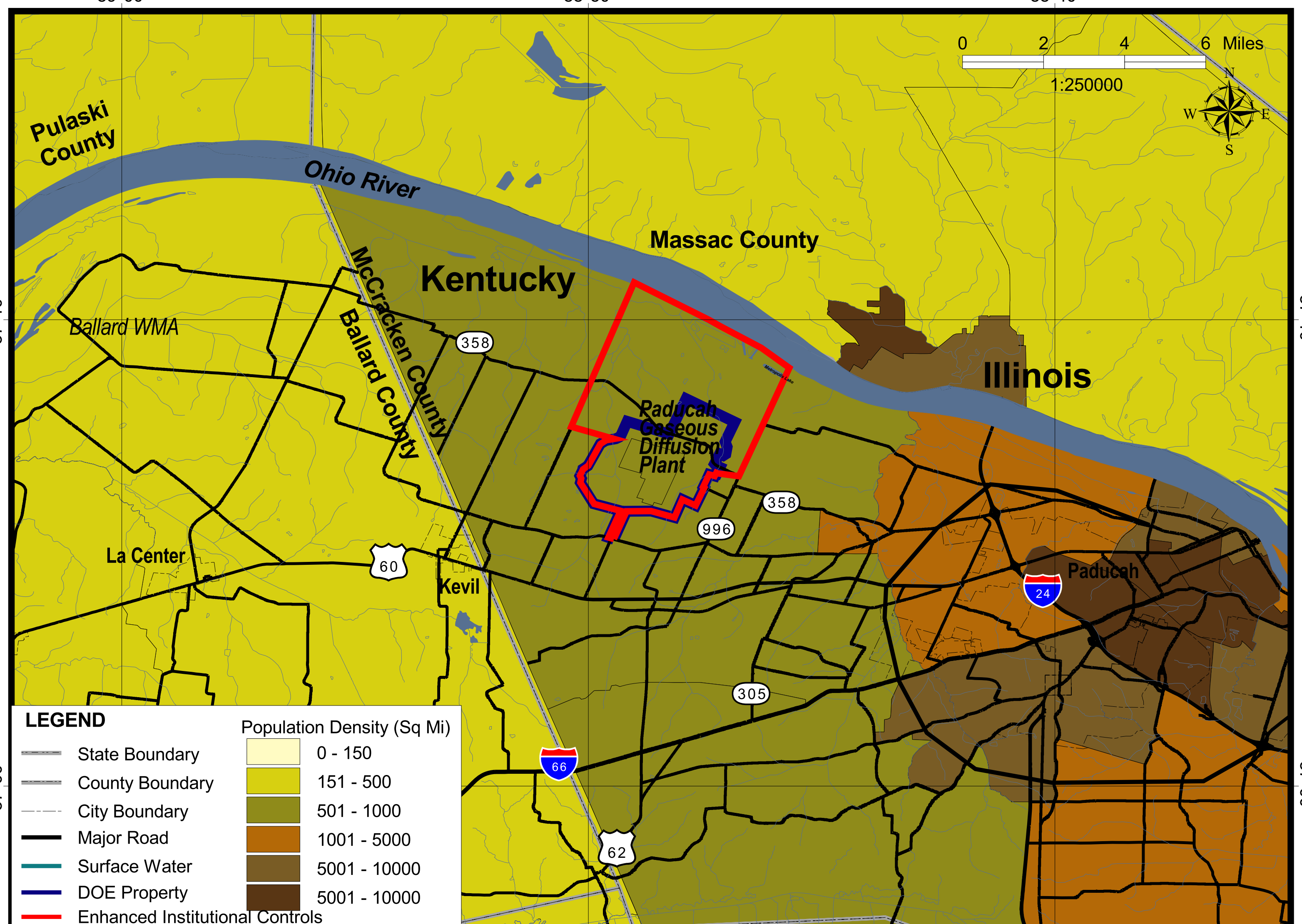


Figure 3.4b. Site Population Density - Potential End State Alternative

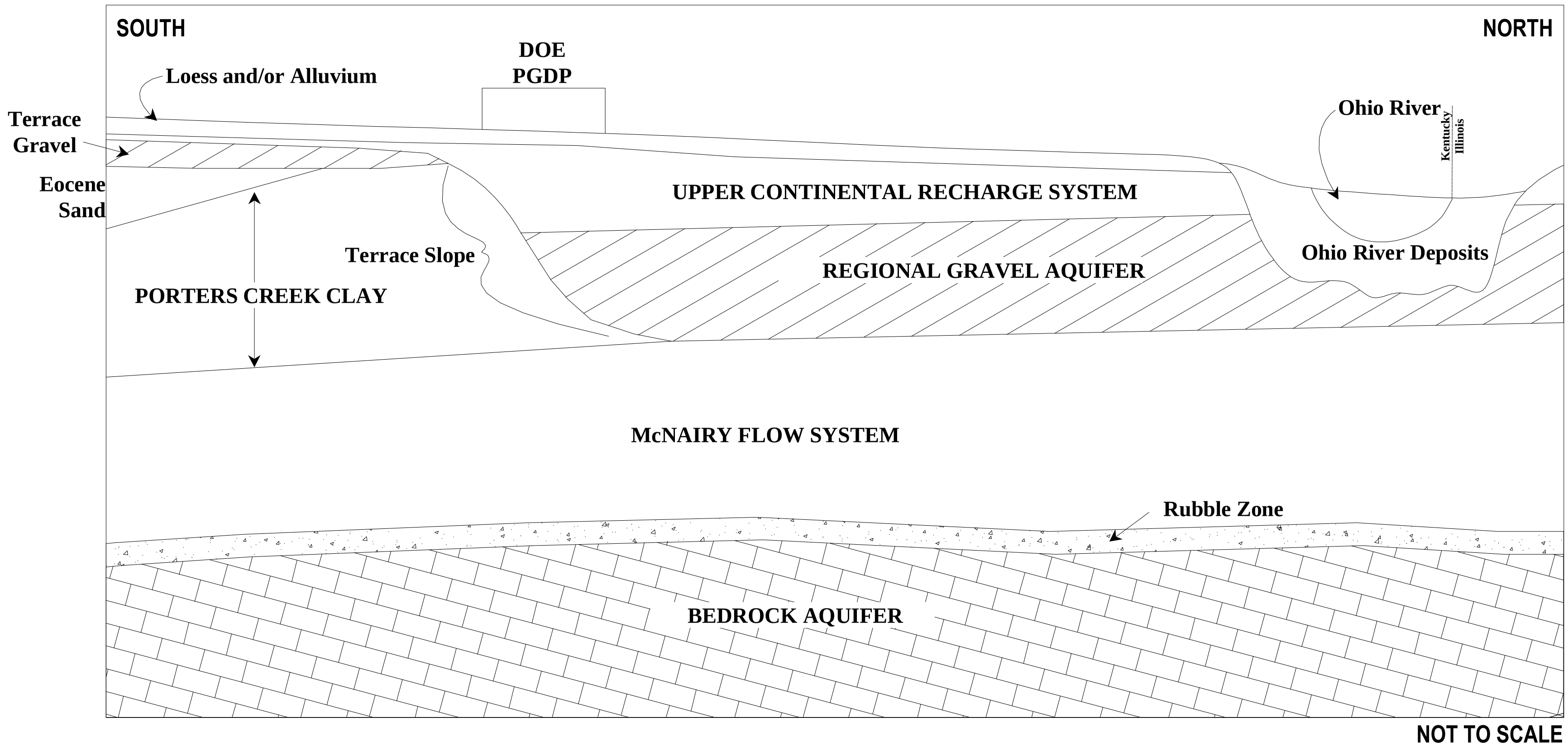


Figure 3.5a1. Schematic of Hydrgeologic Relationships Near the PGDP

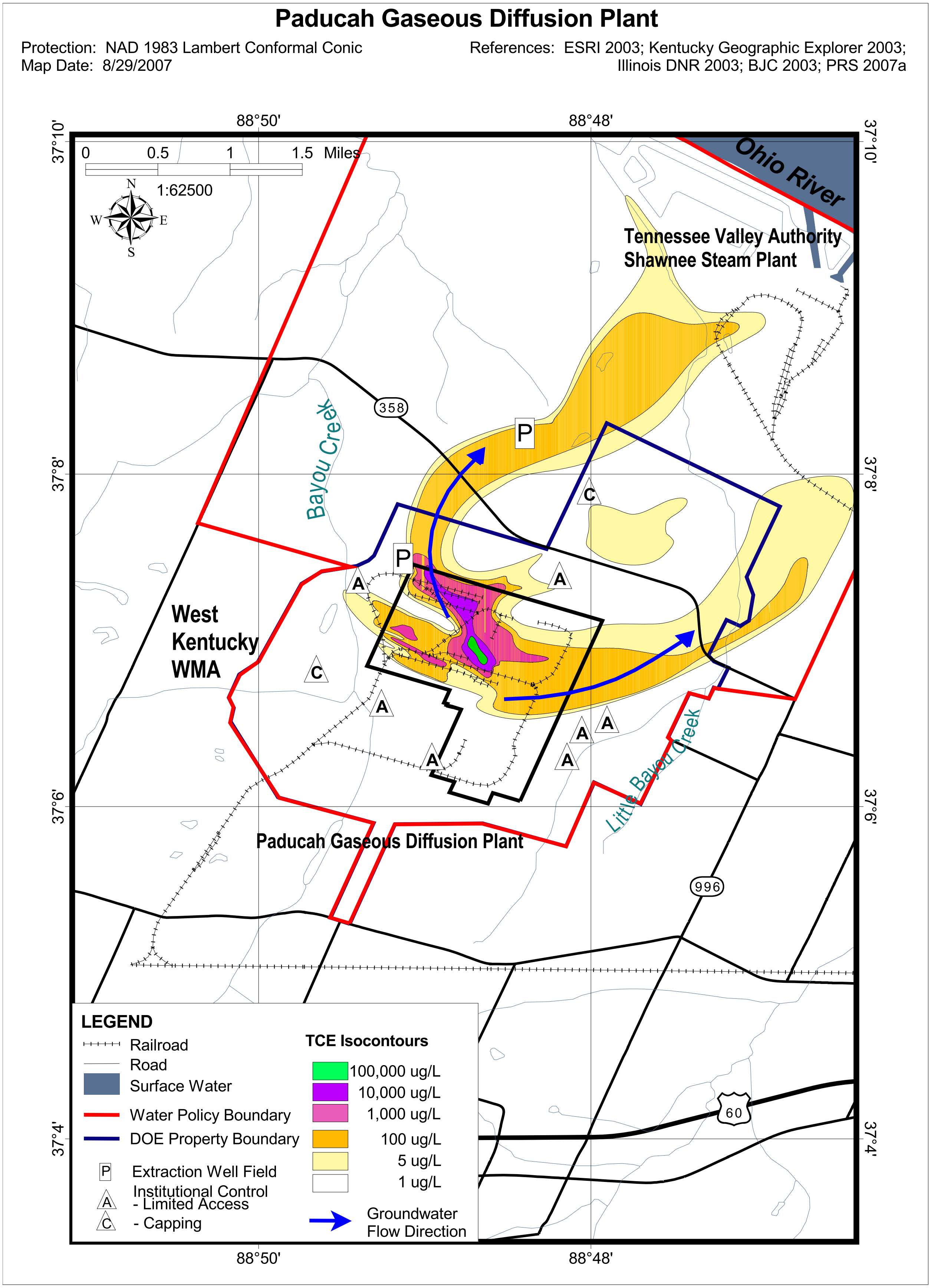


Figure 3.5a2. PGDP Trichloroethene Plumes - Current State

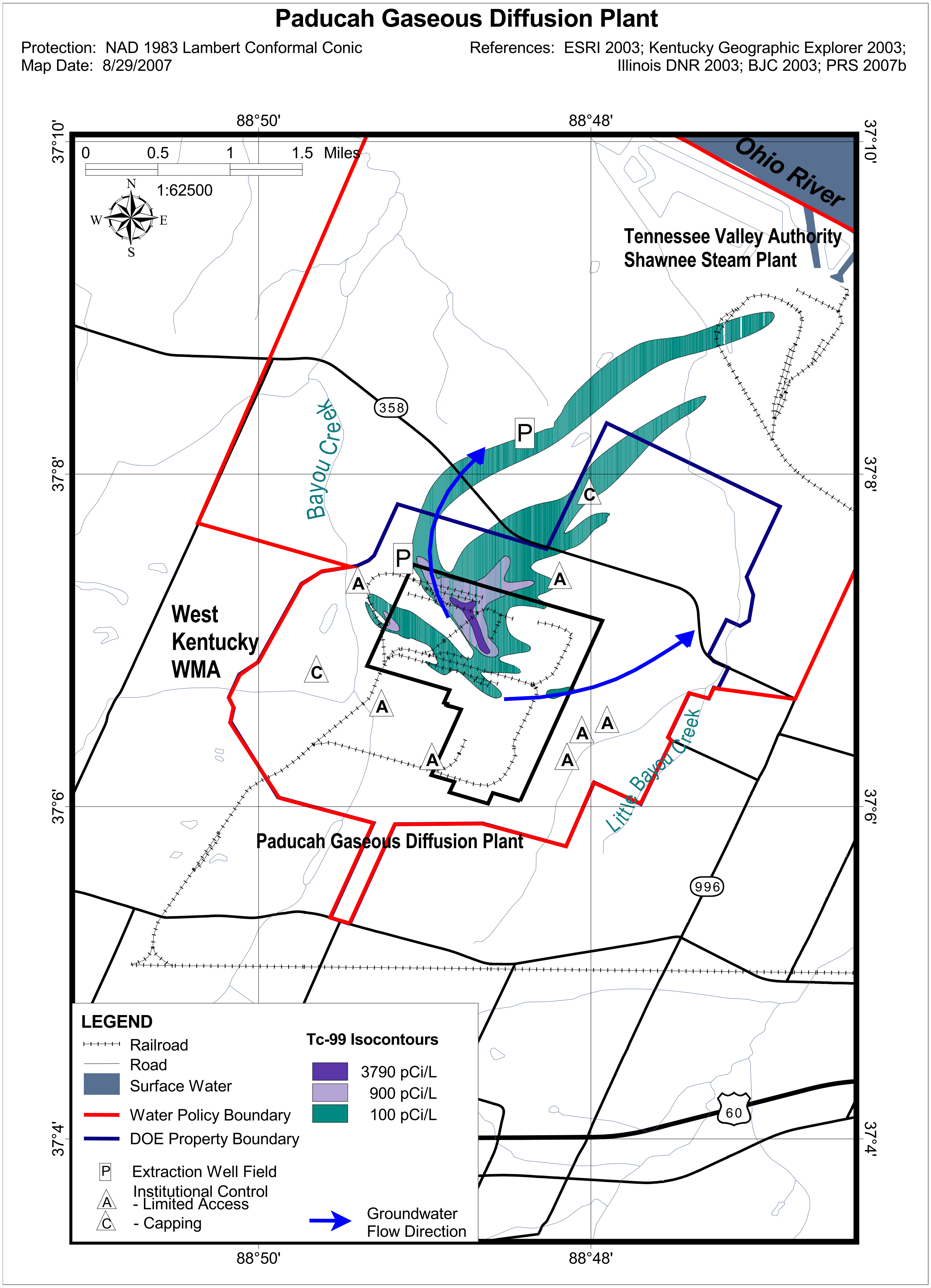


Figure 3.5a3. PGDP Technetium-99 Plumes - Current State

4. HAZARD-SPECIFIC CONTEXT DESCRIPTION FOR THE POTENTIAL END STATE ALTERNATIVE

This chapter presents the hazard-specific context description for the potential end state alternative. This description provides the greatest detail for the key hazard areas of concern at PGDP that were developed with a focus on reduction of risks to human health and the environment to *de minimis* levels (i.e., were risk-based). The information presented is that necessary to qualify or quantify the nature of the hazard present, the potential of the hazard to have an impact (and degree of impact) on human health and the environment, and any mitigation of the hazard identified. Hazard specific maps and CSMs are presented for both current and potential end state alternative land use. Note that hazard-specific maps for the current planned end state are presented in Chapter 5. Both the potential end state alternative maps and CSMs in this chapter and the current planned end state maps and CSMs in Chapter 5 are used to support the forthcoming variance discussion.

> This chapter presents potential actions to address hazards that could be used to reach the potential end state alternative. These presentations are not meant to be pre-decisional, but are meant to introduce examples of actions that may be completed to reach end state. The selection of specific actions will be made in accordance with applicable law and agreements.

The CSMs presented are intended to communicate risk information to DOE managers, the regulatory community, and the general public. They provide summary level information regarding the hazard, pathways, receptors, and barriers (if applicable) between hazards and the receptors. The five major elements of the CSMs are as follows:

1) A description of the hazard area of concern being depicted in the map;

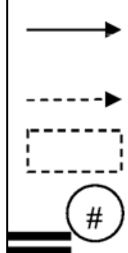
2) Identification of the primary and secondary sources of contamination;

3) Identification of the current and potential future release, transport, and exposure mechanisms;

4) Identification of the current and potential future receptors believed to be at risk; and

5) Identification of current and planned barriers or mechanisms that will prevent or limit potential exposure to at-risk receptors.

KEY to CSM Diagrams



Active transport, uptake, or exposure pathway

Blocked transport, uptake, or exposure pathway

Source contaminant removed

Engineered barrier or administrative control – sequentially numbered

Barriers to Exposure

On the CSMs, barriers to exposure are numbered sequentially starting with those present under current conditions and continuing through the potential barriers under the potential end state alternative and current planned end state. In the narrative discussing the CSMs, the numbers attached to the barriers (e.g., c, d, e) are included for illustration.

The CSMs were developed following guidance presented in American Society for Testing and Materials (ASTM) Standard E 1689-95, *Standard Guide for Developing Conceptual Site Models for Contaminated Sites,* as extended by the DOE guidance material concerning development of the earlier revisions of this report (DOE 2003c) and the guidance materials' associated clarification memorandum (DOE 2003a).

As noted earlier, the CSMs are presented for both the current state and potential end state alternative for each hazard area. The goal of this presentation is to highlight the current protective barriers and mechanisms in place at each hazard site (if any) and the barriers and mechanisms that are anticipated to be included when the end state is attained. The purpose of the CSMs, therefore, is to clarify what already has been done at each hazard site and what DOE would do to manage potential and actual risks to attain the end state.

The narrative that accompanies the CSMs includes a description of the mechanisms envisioned to be in place when the end state is attained. Discussion of potential specific mechanisms is necessary to provide an analytical framework and is not meant to be pre-decisional. As noted in Chapter 1, the selection of specific actions will be made in the appropriate decision documents after receipt of stakeholder and public input, as required in accordance with applicable law and agreements.

Each of the mechanisms or barriers discussed later as examples that may be used to reach the potential end state alternative may fail to permanently mitigate risk. For example, institutional controls (which include the PGDP Water Policy, enhanced institutional controls, and property and excavation restrictions at the PGDP) rely both on the cooperation of potential receptors and continued enforcement to be effective in mitigating risk over the long- and short-term. Similarly, engineered barriers (such as soil cover and caps) require maintenance to continue to function as designed and mitigate risk over the long- and short-term; therefore, both institutional controls and engineered controls may be less sustainable in mitigating risk than some other actions. For example, removal of source material through a source action, such as resistance heating for solvents in soil and groundwater or excavation and off-site disposal of buried materials from burial grounds, is sustainable and mitigates risks permanently because the contaminated material is removed from the environment. Similarly, natural attenuation, which also results in the permanent removal of contaminated material from the environment, is an effective mechanism that can reduce risk over the long-term when used in combination with access controls.

Nine hazard areas are considered in this chapter. These hazard areas are depicted under the current state and potential end state alternative in Figures 4.0a1 and 4.0b1, respectively. These areas, developed to be consistent with the PGDP site mission and cleanup strategy presented in Chapter 1, are as follows.

- Hazard Area 1: This hazard area is composed of the GWOU. It encompasses both the sources of contamination to groundwater and the three dissolved-phase plumes. Sources considered are those below the C-400 Cleaning Building located in the center of the industrialized area of PGDP, two burial grounds located in the west-central portion of the industrialized area of PGDP, the C-720 Building located in the southern part of PGDP, and an oil landfarm.

- Hazard Area 2: This hazard area is composed of the SWOU. It encompasses the sources of surface water contamination found within the industrialized portion of PGDP; the plant ditches and outfalls found inside the industrialized portion of PGDP; the NSDD, a portion of which is located outside the industrialized portion of PGDP; and Bayou and Little Bayou Creeks, which are found outside the industrialized area and run both on and off DOE property.

- Hazard Area 3: This hazard area is composed of two areas included in the BGOU that contain buried waste and/or soil that are not believed to serve as a source of groundwater contamination, but for which the current planned end state and potential end state alternative differ. One of these areas is burial grounds located in the northwestern part of the industrialized area of PGDP. The other area is located in the north-central part of the PGDP, outside of the industrialized area.

- Hazard Area 4: This hazard area is composed of units that make up the SOU. It encompasses all areas containing contamination that do not impact the GWOU or SWOU. This hazard area also encompasses the soil and rubble areas that may contain contaminated soils or materials that have been identified both on and off DOE property. As depicted later in this chapter, this hazard area includes all areas inside the industrialized portion of PGDP that are not part of other hazard areas, including those that are part of Hazard Area 9.

- Hazard Area 5: This hazard area is composed of two permitted, closed landfills; the currently operating permitted landfill; and, under future conditions, a potential “CERCLA Cell” that would be used to dispose of debris and other materials generated during GDP D&D. The two closed landfills and the operating landfills are located in the north-central portion of PGDP, outside the industrialized area. The site of the potential CERCLA Cell has not been determined at this time.

- Hazard Area 6: This hazard area is composed of four areas included in the BGOU that contain buried waste and/or soil that are not believed to serve as a source of groundwater contamination, but for which the current planned end state and potential end state alternative do not differ. These include a landfill located to the southwest of the industrialized portion of PGDP, adjacent to Bayou Creek, and three burial grounds located in the northwestern part of the industrialized area of PGDP.

- Hazard Area 7: This hazard area is composed of legacy waste found at storage locations at PGDP and potentially contaminated debris, surfaces, and soil found in DMSAs located throughout PGDP.

- Hazard Area 8: This hazard area is composed of the cylinder yards that contain DUF_6 and a facility currently being planned to convert the DUF_6 to more stable uranium oxides before off-site shipment. The cylinder yards are located throughout the site, and the largest yard is in the southeast corner of the industrialized area of PGDP. The planned conversion facility will be located adjacent to this yard.

- Hazard Area 9: This hazard area is composed of the GDP facilities and infrastructure that will undergo D&D as part of either the D&D OU strategic initiative (see Chapter 1) or the final GDP D&D. This hazard area also encompasses any sources to groundwater and surface water not addressed in other hazard areas.

4.1 HAZARD AREA 1 – GWOU

This hazard area is composed of the facilities and SWMUs listed below. This hazard area is depicted in Figure 4.1a1. A description of each facility and SWMU is provided in the following section.

- C-720 Maintenance and Storage Building
- C-400 Cleaning Facility
- SWMU 1: C-747-C Oil Land Farm
- SWMU 2: C-749 Uranium Burial Ground
- SWMU 3: C-404 Low-level Radioactive Waste Burial Ground
- SWMU 4: C-747 Contaminated Burial Ground
- SWMU 201: Northwest Groundwater Plume
- SWMU 202: Northeast Groundwater Plume
- SWMU 210: Southwest Groundwater Plume
- Little Bayou Creek Groundwater Plume Seeps

4.1.1 Current State

<u>Sources</u>

The *C-720 Maintenance and Storage Building* was built in 1950 and is located in the southern part of the industrialized area of PGDP. The building is composed of structural steel and corrugated transite siding, occupies about 6.5 acres, and contains several repair and machine shops as well as other support operations. From the early 1950s to present, the C-720 Building has been used for the fabrication, assembling, cleaning, and repairing of process equipment. Various shops housed within the C-720 Building include the compressor shop, machine shop, paint shop, instrument shop, vacuum pump shop, welding shop, and valve shop. Based on past and current activities in these shops, the potential contaminants associated with the C-720 Building include volatile organic compounds, semivolatile organic compounds, metals, PCBs, and radionuclides.

During RIs (DOE 1999b), three areas were identified as potential sources of contamination at the C-720 Building. These were SWMU 209 (the Compressor Shop Pit Sump), AOC 211 (the spill site located to the northeast of the building), and the floor drain system in the C-720 Building. Subsequently, TCE and its breakdown products were identified at elevated concentrations in subsurface soil around the building. The highest concentrations [i.e., 68, 450, and 0.4 ppm of TCE, *trans*-1,2-dichloroethene (*trans*-1,2-DCE), and vinyl chloride (VC), respectively] were found in shallow (<35 ft bgs) subsurface soil near the southeast corner of the building and suggest the presence of dense nonaqueous-phase liquids (DNAPLs) in this area. A Site Investigation (SI) (DOE 2006a) was conducted in 2005 to further determine the extent to which the C-720 Building is a contributing source to the Southwest Plume. Sampling indicates that the extent of contamination at the two source areas at the east end of the C-720 Building is similar in size to that defined in the earlier RI. Average TCE concentrations within this source varied from 0.1 ppm at 50 to 60 ft bgs to 11.9 ppm at 20 to 30 ft bgs. Concentrations of all other volatile organce compounds are smaller and are confined to the upper portions of the UCRS.

What is DNAPL?

DNAPLs are liquid chemicals that do not readily dissolve in water and are denser than water. Once in the ground, DNAPLs can migrate downward through the subsurface, with a portion being trapped in the pore spaces in the soil and the remaining portion continuing to migrate downward.

In the subsurface, DNAPL serves as a continuing source of groundwater contamination as it slowly goes into solution with water. Because DNAPL is difficult to locate in the subsurface and oftentimes exists in the pore spaces in the soil, achieving cleanup has been shown to be very difficult.

The *C-400 Cleaning Building* was built in the early 1950s, is located near the center of the industrialized section of PGDP, and covers about 4 acres. Primary activities taking place in the C-400 Building are cleaning machinery parts, disassembling and testing of cascade components, and laundering plant clothes.

Suspected sources of leaks and spills at the C-400 Building include degreaser and cleaning tank pits, drains and sewers, the east side plenum/fan room basement, tanks and sumps outside the building, and various other processes. These sources have resulted in contamination of soil and groundwater by volatile organic compounds (primarily TCE and its breakdown products), semivolatile organic compounds, and various metals and radionuclides.

Both the C-400 RI (DOE 1999a) and the Remedial Design Support Investigation (July through August 2006) of the C-400 Interim Remedial Action identified three TCE leak and spill sites near the south end of the C-400 Building. The southeast C-400 Building spill sites include SWMU 11 (which is where a drain line from the degreaser sump was connected to a storm sewer) and SWMU 533 (which is where transfer pumps and piping moved solvents to and from a storage area associated with the building). The highest concentrations of solvents in the soil and groundwater were found southeast and southwest of the C-400 Building. As noted above, the area to the southeast contains SWMUs 11 and 533. The area of soil contamination to the southwest of the building has not been linked to a particular C-400 process.

Elevated concentrations of TCE and its breakdown products suggest that DNAPL source areas exist within the subsurface soils to the southeast and southwest of the C-400 Building. In the southeast C-400 area, the C-400 RI documented soil contamination as high as 11,055 ppm TCE, 102 ppm *trans*-1,2-DCE, and 29 ppm vinyl chloride. The maximum TCE concentration detected in the underlying aquifer (i.e., the Regional Groundwater Aquifer or RGA) was 701 ppm. (64% of the maximum solubility of TCE in water), suggesting that the DNAPL has penetrated the RGA and is acting as a secondary source of groundwater contamination. For the area of soil contamination to the southwest of the C-400 Building, the RI reported soil contamination ranging up to 168 ppm TCE and 15 ppm *trans*-1,2-DCE.

A Membrane Interface Probe survey was used to measure the amount of volatile otganic compounds in subsurface soils to the south and southeast of the C-400 Building. This was performed as part of the Remedial Design Support Investigation to help characterize the extent of the three DNAPL zones. The largest DNAPL zone of the three spill sites is associated with SWMU 533. DNAPL extends from near land surface down to the base of the RGA, where it forms a large DNAPL pool at depths of 90 to 100 ft. Most of the DNAPL associated with the other two leak sites is retained in the soils above the RGA.

The *C-747-C Oil Landfarm* (SWMU 1) is located in the western part of the industrialized portion of PGDP. It was used for landfarming of waste oils contaminated with TCE, uranium, PCBs, and 1,1,1-TCA. These waste oils are believed to have been derived from a variety of plant processes. When in operation, the landfarm consisted of two 1,125 ft^2 (0.026 acre) plots that were plowed to a 1 to 2 ft depth. (The entire SWMU covers about 2.4 acres.) Waste oils were spread on the surface every 3 to 4 months, then the surface was limed and fertilized. Several investigations collected data on SWMU 1, with the most recent being the Southwest Plume SI (DOE 2006a). These investigations identified solvents (TCE and its breakdown products), PCBs, dioxins, semivolatile organic compounds, heavy metals, and radionuclides as potential contaminants in soil and groundwater.

After use of the landfarm was discontinued in 1979, a cover (<12 inches) of soil was placed over the two disposal plots. As part of a subsequent removal action, approximately 23 yd^3 of dioxin-contaminated soil was excavated from SWMU 1.

The *C-749 Uranium Burial Ground* (SWMU 2) was used for the disposal of containerized and uncontainerized uranium and uranium-contaminated wastes, is located in the west-central portion of the industrialized portion of PGDP, and covers about 1.4 acres. The wastes were buried in 16- to 17-ft deep pits and then covered with 2 to 4 ft of soil. These wastes included uranium shavings in oils and solvents (i.e., TCE). Three major investigations have been conducted at SWMU 2, with the most recent being a post-ROD site investigation (DOE 1997b). The main contaminants at SWMU 2 are pyrophoric uranium and other radionuclides, heavy metals, solvents, and PCBs.

Pyrophoric Uranium

Pyrophoric uranium consists of small pieces of uranium metal. When exposed to air, the small pieces of metal spontaneously combust creating uranium oxides, that become air-borne. Because combustion occurs spontaneously, the cleanup of pyrophoric uranium is difficult.

In 1982, a 6-inch clay cap was installed over the burial pits. In 1984, a pit was excavated, resulting in the recovery of 40 drums. The liquids found in four of the drums were transferred to new drums. All the drums were placed in overpack drums, reburied, and recapped with 6 inches of clay and 18 inches of soil.

The *C-404 Low-level Radioactive Waste Burial Ground* (SWMU 3) is located in the west-central portion of the industrialized portion of PGDP, covers approximately 2.9 acres, and originally was constructed as an aboveground holding pond with a tamped floor and clay dike walls. Liquid uranium-bearing wastes were treated in the pond in the 1950s. This activity was discontinued in 1957, when all free liquids were removed from the unit. From 1957 to 1977, solid contaminated scrap was placed in the site. At that time, burial of containerized and bulk wastes on top of the filled-in pond area was begun. The unit was closed as a Resource Conservation and Recovery Act (RCRA)-hazardous waste landfill in 1987. This closure included construction of a multilayer cap consisting of 2 ft of compacted clay, a 36-mil Hypalon liner, 1 ft of granular fill, geotextile fabric, and 2 ft of vegetative cover.

In the holding pond area, the waste consists of uranium precipitated from aqueous solutions, uranium tetrafluoride, uranium metal, uranium oxides, and contaminated trash. The upper tier of waste contains the same type of wastes as well as smelter furnace liners and approximately 450 drums of extraction procedure toxic hazardous wastes. The main contaminants at SWMU 3 consist of radionuclides, metals, solvents, and PCBs. An RI for the BGOU, including this SWMU, was completed in 2007. Results from this RI are expected in early 2008.

Groundwater Contamination at the PGDP

As noted in Section 3.5, the primary aquifer affected by contamination at PGDP is called the Regional Gravel Aquifer or RGA. This aquifer consists primarily of course sand and gravel and extends from 45 to 100 ft bgs. Regionally, the RGA is a very productive aquifer and is a major source of drinking water.

Primary contaminants from PGDP found in off-site locations in this aquifer are TCE and its breakdown products and ^{99}Tc. Contaminants found in groundwater below the industrialized portion of PGDP and not in off-site locations include several metals, volatile organic compounds (e.g., carbon tetrachloride and tetrachloroethene), and radionuclides (primarily uranium isotopes) (DOE 2001a).

The *C-747 Contaminated Burial Yard* (SWMU 4) operated from 1951 through 1958 and is located on about 7.4 acres in the west-central portion of the industrialized area of PGDP, south of SWMU 2. It was used for disposal of contaminated and uncontaminated trash, some of which was burned. The site consists of several pits excavated to about 15 ft. The waste was placed in the pits and covered with 2 to 3 ft of soil. This waste consists of scrap equipment with surface contamination and other materials. A 6 inch clay cap was installed in 1982, and, in 2000, a fence was placed around the SWMU, preventing access by the general plant population. The former RI occurred in 1999 (DOE 2000b). The contaminants found included radionuclides, heavy metals, solvents, semivolatile organic compounds, and PCBs. A follow-up site investigation focused on identifying the sources of the Southwest Plume and included additional sampling near the C-747 Burial Yard. This investigation concluded that SWMU 4 is a source of TCE and its breakdown products and ^{99}Tc found in the Southwest Plume. An SI (DOE 2006a) was conducted in 2005 to further determine the extent to which SWMU 4 is a contributing source to the Southwest Plume. Additional investigation and risk assessment will be conducted under the BGOU for this unit.

The *Northwest Dissolved-Phase Plume* originates at the C-400 Building and extends to near the TVA Shawnee Steam Plant, which is off DOE-owned property. The plume covers over 1,100 acres, and the size of the plume has changed little since it was identified in 1989. Near the steam plant, some discharges to the surface occur at seeps along Little Bayou Creek. (Please see text below for additional discussion concerning the seeps). The principal contaminant in the plume is TCE. Other contaminants found near source areas are TCE breakdown products and ^{99}Tc. SWMU 2 is another potential source of TCE that is found in the Northwest Dissolved-Phase Plume.

Concentrations of TCE based on more recent sampling events in the plume range from 240 ppm near the C-400 Building to less than 5 ppb near the steam plant. (See Figure 3.5a2.) The maximum concentrations currently seen in an area off DOE property to the north of PGDP are slightly less than 1,000 ppb, or 200 times TCE's maximum contaminant level (MCL).

Currently, two pump-and-treat systems are used to control the migration of the high concentration areas of the plume. These systems were installed under an interim ROD that was signed in 1993 (DOE 1993).

The *Northeast Dissolved-Phase Plume* also originates at the C-400 Building and extends toward the Ohio River into areas off DOE-owned property. The plume covers over 1,000 acres, and the size of the plume has changed little since it was identified in 1989. No surface discharges are known to occur within the Northeast Dissolved-Phase Plume. The principal plume contaminant is TCE. Other contaminants found near source areas are TCE breakdown products.

Concentrations of TCE in the plume based on more recent sampling events range from 240 ppm near the C-400 Building to less than 5 ppb at the plume's leading edge. (See Figure 3.5a2.) The maximum concentration currently seen in an area off DOE property to the northeast of PGDP is 500 ppb.

Currently, a pump-and-treat system is used to control migration of the high concentration area of the plume. This system was installed under an interim ROD that was signed in 1995 (DOE 1995).

The *Southwest Plume* is thought to potentially originate at the vicinity of the C-720 Building, SWMU 1, and SWMU 4, and extends west toward the DOE property line. The plume covers over 180 acres. The Southwest Plume does not currently extend to areas off DOE-owned property, and determining its future rate of migration is part of an investigation that is currently underway. Similarly, the primary source of the plume has not been definitively identified, and identifying the sources was part of a recent site investigation. The primary contaminants associated with the Southwest Plume are solvents (primarily TCE and its breakdown products) and radionuclides (^{99}Tc).

The *Little Bayou Creek Groundwater Plume Seeps* are located near the TVA Shawnee Steam Plant to the north of PGDP. These seeps lie approximately 6,700 to 11,500 ft from the industrialized portion of PGDP and cover an area of about 10 acres. As noted above, these seeps contain TCE and other solvents thought to be discharged from the Northwest Dissolved-Phase Groundwater Plume. The concentrations of TCE in samples of surface water collected at the seeps range from 2 to 580 ppb, based on more recent sampling events.

<u>Pathways</u>

In the current CSM for the GWOU (see Figure 4.1a2), solvents existing as DNAPLs in subsurface soil and in groundwater are the primary sources of contamination. [As noted earlier, metals and radionuclides also are found in groundwater below the PGDP at concentrations above MCLs and health-based limits; however, except for ^{99}Tc, no plumes of these contaminants have been defined in on-site and off-site areas PGDP. The ^{99}Tc plume is not discussed in the CSM because this contaminant is not found at concentrations greater than its MCL (4 mrem/yr) in areas off DOE property, and the ^{99}Tc plume has changed little since it was first identified in 1989. However, groundwater modeling for the C-400 Building does indicate that concentrations of ^{99}Tc in the plume may exceed its MCL at a location on the DOE property boundary in the future. Please see Figure 3.5a3 for information about the ^{99}Tc plume.] The solvent plumes extend to areas off DOE property, and a portion of the plume discharges to surface water seeps. Once in surface water, contaminants could affect ecological receptors or enter the food chain.

Using this CSM, the media of concern for Hazard Area 1 are subsurface soil, groundwater, and surface water. Receptors potentially exposed to subsurface soil are workers. Receptors potentially exposed to groundwater are workers and residents. Receptors potentially exposed to surface water are workers, visitors, and ecological receptors. In addition, the resident, visitor, and ecological receptor potentially are exposed through the food chain. (Please see the CSM for a definition of all receptors.)

Under current conditions, the barriers to exposure are access controls to prevent exposure to subsurface soil① and the PGDP Water Policy②. (Please see the text box for additional information concerning the

PGDP Water Policy

The PGDP Water Policy was implemented through an Action Memorandum in 1994 (DOE 1994). Under the water policy:

- DOE provides municipal water to all existing residences and businesses within the area affected by groundwater contamination from the PGDP.
- DOE has paid to connect affected residences and businesses to a public water supply, if these were not already connected.
- DOE pays water bills of affected residences.

In return for the replacement water supply, the affected residences and businesses agree neither to drill any new water supply wells within the affected area nor use water from existing wells. (Existing wells were locked to prevent unauthorized use.) In addition, the residences and businesses agree to permit PGDP personnel property access to sample groundwater from existing wells.

The PGDP Water Policy is implemented through lease agreements that are renewed every 5 years. Currently, there are no plans to terminate the PGDP Water Policy.

PGDP Water Policy.) The impacts of discharges to surface water are minimized through natural attenuation④, which includes biodegradation, chemical degradation, and other natural processes. Finally, a "hot spot" pump-and-treat③, which consists of extraction wells within the high TCE concentration areas of the Northwest and Northeast Dissolved-Phase Plumes, is used to control the spread of high TCE concentration areas.

Risk Levels

As shown in Figure 4.1a2, no exposure pathways currently are complete for the GWOU due to the presence of barriers to exposure; however, baseline or unmitigated risks that could be present if the barriers did not exist have been assessed. Tables 4.1a, 4.2a, and 4.2b summarize these results for a resident potentially exposed to groundwater in off-site areas near the PGDP property boundary, both under current conditions and assuming continued migration of contaminants from source areas to the point of exposure. Additionally, the unmitigated risk potentially posed to a recreational user exposed to groundwater discharged to the surface along Little Bayou Creek is presented. Note that these results show that the primary contaminants posing risks at off-site locations are solvents, with TCE and its breakdown products being most prominent.

Table 4.1b summarizes the results for ecological receptors exposed to contamination at locations along Little Bayou Creek near the seeps. These results show that unacceptable impacts to ecological receptors from the contaminants associated with the Northwest Dissolved-Phase Plume that are released from the seep (i.e., TCE and its degradation products and ^{99}Tc) are not expected under the current state.

4.1.2 Potential End State Alternative

This section focuses on the barriers and actions that may be used to achieve the potential end state alternative and the risks that may remain at the end state. Please see Section 4.1.1 for a discussion of sources and pathways of exposure.

Barriers and Actions

Barriers to exposure at the end state (see Figures 4.1b1 and 4.1b2) are continued access controls to prevent exposure to subsurface soil ① and implementation of enhanced institutional controls to limit access to and use of contaminated groundwater⑤. (Please see the text box for a discussion of the enhanced institutional controls.) Discharges to surface water are addressed under the potential end state alternative through natural attenuation④. Contaminants in source zones and in the plumes not addressed by source actions are addressed through monitored natural attenuation⑥. The burial grounds are capped⑦ to mitigate potential contaminant migration and limit exposure. Finally, a source action is planned at the C-400 area to reduce DNAPL concentrations in subsurface soil and the RGA⑧. (Note that the source action planned under the potential end state alternative is resistance heating and would address solvents only. Because this action would not reduce concentrations of metals and radionuclide to MCLs and would not reduce solvent concentrations in the plumes, long-term monitoring would be required after this source action is completed.)

Enhanced Institutional Controls

Enhanced institutional controls under the potential end state alternative would be implemented on what is currently both DOE and non-DOE-owned property. These controls would replace the PGDP Water Policy and be implemented to prevent the use of contaminated groundwater by residents and recreational users. (The PGDP Water Policy would continue until the enhanced controls are in place.) Enhanced institutional controls implemented could range from legal agreements with the surrounding landowners to place enforceable restrictions on groundwater use to property purchase, which would allow DOE to directly implement restrictions on groundwater and property use. As with other response actions, the selection of the specific institutional control will be made in the appropriate decision documents after receipt of stakeholder and public inputs, as required in accordance with applicable law and agreements.

Table 4.1a. Risk Assessment Summary[a] for Residential Exposure to Groundwater Drawn from the RGA at a Point within the Off-site Northwest and Northeast Plumes and for Recreational Exposure to Groundwater Discharged to the Surface at Seeps Along Little Bayou Creek

Location[b]	Land Use	Risk[c]	Risk Scenario[d]	Contaminant Description	Representative Concentration (mg/L)	Baseline Risk Level[e]	PRG[f] (mg/L)	Basis for PRG[g]	Actual or Expected Post Cleanup Concentration[h]
NW Plume Off-site	Residential	Y	Residential	TCE	1.39	ELCR = 1E-03 HI=120	0.005	MCL	NA
				Cadmium	0.0161	ELCR = 6E-04 HI = 2	0.005	MCL	NA
NE Plume Off-site	Residential	Y	Residential	TCE	0.754	ECLR = 5E-04 HI = 64	0.005	MCL	NA
				1,1-DCE	0.006	ELCR = 6E-04 HI = NA	0.007	MCL	NA
Seeps (1997 data)	Recreational	N	Recreational	TCE	0.051 (maximum)	18 of 88 results (1 location) exceeded no action level	0.0218	Risk-Based	NA
				Cadmium	0.026 (maximum)	1 of 39 results exceeded no action level	0.00457	Risk-Based	NA
Seeps (2000 data)	Recreational	N	Recreational	TCE	0.44 (maximum)	49 of 71 results (12 locations) exceeded no action level	0.0127	Risk-Based	NA
				Antimony	0.0035 (maximum)	1 of 15 results exceeded no action level	0.00312	Risk-Based	NA

NA = not applicable
[a] Results for Northwest and Northeast Plumes are taken from DOE 2001a. Results for seeps are from an unnumbered information sheet entitled, *Seeps Along Little Bayou Creek, Northwest Groundwater Plume,* dated July 2001. Risks presented are "unmitigated" or baseline risks, which assume exposure with no barriers.
[b] Contaminant concentrations used for the assessment were the upper 95% confidence limit on the average concentrations of all groundwater results collected from wells in the off-site areas of the Northwest and Northeast Plumes.
[c] "Y" indicates the result came from a baseline risk assessment. "N" indicates the result came from a screening level risk assessment.
[d] Residential scenario considered lifetime (40 year) exposure by a resident to groundwater used in the home as drinking water, while showering, and for general household uses. Recreational scenario considered direct exposure to water while wading.
[e] "ELCR" is the excess lifetime cancer risk level. Values from E-06 to E-04 are within EPA's acceptable risk range for site related exposures. "HI" is the hazard index, a measure for potential systemic toxicity. Values greater than 1 indicate that a deleterious health effect is possible.
[f] "PRG" is the preliminary remediation goal used when considering potential response actions.
[g] "MCL" is maximum contaminant level. "Risk-Based" is value derived using a scenario appropriate to the land use and a target risk of either 1E-06 (cancer) or 1 (hazard). *h* Under potential end state alternative, the potential action is monitored natural attenuation; therefore, no values are available at this time.

Table 4.1b. Risk Assessment Summary for Ecological Exposures to Soil Associated with Seeps Along Little Bayou Creek[a]

Location	Land Use	Risk[b]	Risk Scenario	Contaminant Description	Representative Concentration [c] (mg/kg or mg/L)	Frequency above USV Level[d]	USV[e] (mg/kg or mg/L)	Basis for USV	Actual or Expected Post Cleanup Concentration or Risk Level
Little Bayou Seeps - Sediment	Industrial	N	Ecological	Chromium	196	2 / 8	90	Abiotic value	NA
				PCBs	0.6	15 / 42	0.3	Abiotic value	NA
				Benzo(a)anthracene	1	3 / 3	0.4	Abiotic value	NA
				Benzo(a)pyrene	0.8	1 / 3	0.8	Abiotic value	NA
				Chrysene	1.1	1 / 3	0.9	Abiotic value	NA
				Fluoranthene	3	1 / 3	2.3	Abiotic value	NA
				Phenanthrene	2.3	1 / 3	0.5	Abiotic value	NA
Little Bayou Seeps - Surface Water	Ecological	N	Ecological	Aluminum	4.9	18 / 30	0.8	Abiotic value	NA
				Cadmium	0.05	19 / 39	0.002	Abiotic value	NA
				Copper	0.1	30 / 39	0.007	Abiotic value	NA
				Lead	0.3	19 / 39	0.04	Abiotic value	NA
				Silver	0.03	4 / 11	0.001	Abiotic value	NA
				Zinc	0.2	28 / 39	0.07	Abiotic value	NA

NA = not applicable

[a] Results for seeps are from an unnumbered information sheet entitled, Seeps Along Little Bayou Creek, Northwest Groundwater Plume, dated July 2001. Risks presented are "unmitigated" or baseline risks, which assume exposure with no barriers.

[b] "Y" indicates the result came from a baseline risk assessment. "N" indicates the result came from a screening level risk assessment.

[c] Contaminant concentrations used for the assessment were the maximum detected concentration.

[d] Values exceeding upper screening values (USVs) indicate that a deleterious health effect is possible.

[e] "USVs" are chemical concentrations in sediment and surface water (i.e., abiotic media) that pose a high probability of causing adverse effects to ecological receptors.

Table 4.2a. Risk Assessment Summary for Residential Exposure to Groundwater at Off-site Location Impacted by Sources at the C-400 Building (Northwest and Northeast Dissolved-Phase Plume) [a]

Contaminant	Max Modeled Concentration over 1,000 years (mg/L or pCi/L)[b]	Cancer Risk[c]	Hazard[d]	Dose (mrem/yr)[e]
Results for the Northwest and Northeast Dissolved-Phase Plumes				
		NA		
Copper	1.19E+01	NA	2E+01	NA
Benzene	6.16E-03	2E-05	1E+00	NA
Chloroform	1.37E-03	6E-06	4E+00	NA
Dichloroethene, 1,1-	2.36E-01	5E-03	2E+00	NA
Dichloroethene, cis-1,2-	1.98E+01	NA	7E+02	NA
Naphthalene	3.96E-01	NA	1E+02	NA
Trichloroethene	8.08E+00	5E-03	5E+02	NA
Vinyl chloride	6.29E-02	2E-03	2E+00	NA
Technetium-99	1.70E+04	1E-03	NA	1.7E+01

NA = not applicable to this pathway   Max = maximum

[a] Values in the table are from a draft sitewide risk assessment completed for the PGDP. The risks reported are baseline or unmitigated risks that assume no barriers to exposure. The points of exposure considered are within the Northwest and Northeast Plume at the DOE property boundary.

[b] Contaminant concentrations reported are the maximum expected over the next 1,000 years at the point of exposure, if no source actions are implemented at the C-400 Building source areas.

[c] Cancer risk to a resident that uses groundwater in the home as drinking water, while showering, and for other purposes. A lifetime exposure (40 years) is assumed.

[d] Hazard index for a child resident exposed as discussed above. Hazard index for an adult would be less.

[e] Dose to an adult resident exposure as discussed above. The dose to a child would be less.

Table 4.2b. Risk Assessment Summary for Residential Exposure to Southwest Plume Sources [a]

Contaminant	Exposure Point Concentration (mg/L or pCi/L)	Cancer Risk [b]	Hazard [c]	Dose (mrem/yr)
Results for the Southwest Plume (C-720 Building)				
Arsenic	4.26E-03	1.22E-04	9.42E-01	NA
Barium	4.22E-01	NA	4.07E-01	NA
Chromium	3.80E-01	NA	2.16E-02	NA
Cobalt	2.86E-02	NA	3.16E-02	NA
Copper	5.50E-02	NA	9.88E-02	NA
Iron	3.12E+01	NA	6.94E+00	NA
Manganese	4.25E+00	NA	1.21E+01	NA
Nickel	7.01E-01	NA	2.33E+00	NA
Dichloroethene, 1,1-	5.40E-02	1.15E-03	2.19E+00	NA
Trichloroethene	7.38E-01	4.28E-04	4.62E+01	NA
Vinyl chloride	2.10E-03	6.01E-05	6.87E-02	NA
Dichloroethene, *cis*-1,2-	1.40E-02	NA	1.13E-00	NA
Dichloroethene, *trans*-1,2-	5.40E-02	NA	2.55E-01	NA
Technetium-99	9.34E+01	6.65E-06	NA	NA
Results for the Southwest Plume (SWMU 1)				
Arsenic	4.36E-03	1.25E-04	9.64E-01	NA
Barium	4.62E-01	NA	4.45E-01	NA
Chromium	2.97E-02	NA	1.69E-03	NA
Cobalt	2.11E-01	NA	2.33E-01	NA
Iron	5.57E+00	NA	1.24E+00	NA
Manganese	3.97E+00	NA	1.13E+01	NA
Nickel	1.47E-01	NA	4.89E-01	NA
Zinc	3.15E-02	NA	6.99E-03	NA
Dichloroethene, 1,1-	7.00E-04	1.49E-05	2.84E-02	NA
Chloroform	3.20E-03	1.47E-05	1.11E+01	NA
Trichloroethene	7.80E-01	4.52E-04	7.05E+01	NA
Dichloroethene, *cis*-1,2-	6.70E-02	NA	2.73E+00	NA
Technetium-99	2.39E+01	1.70E-06	NA	NA
Results for the Southwest Plume (SWMU 4)				
Barium	3.14E-01	NA	3.03E-01	NA
Chromium	2.51E-01	NA	1.42E-02	NA
Cobalt	2.95E-03	NA	3.26E-03	NA
Iron	6.02E+00	NA	1.34E+00	NA
Manganese	1.40E+00	NA	4.00E+00	NA
Nickel	2.32E-01	NA	7.71E-01	NA
Dichloroethene, 1,1-	2.53E-02	5.37E-04	1.03E+00	NA
Dichloroethane, 1,2-	4.74E-02	3.22E-04	1.02E+01	NA
Acetone	4.90E-02	NA	1.78E-01	NA
Benzene	1.60E-02	4.15E-05	3.18E+00	NA
Bromomethane	4.10E-03	NA	1.05E+00	NA
Carbon tetrachloride	1.03E-01	5.66E-04	5.40E+01	NA
Chloroform	1.30E-01	5.97E-04	4.52E+02	NA
Dibromochloromethane	2.00E-03	1.25E-05	3.64E-02	NA
Methylene chloride	4.81E-02	1.13E-05	7.01E-02	NA
Tetrachloroethene	4.00E-03	6.88E-06	4.75E-02	NA
Trichloroethene	5.97E+00	3.46E-03	3.74E+02	NA
Vinyl chloride	1.90E-02	5.44E-04	6.22E-01	NA
Dichloroethene, *cis*-1,2-	4.30E-01	NA	1.57E+01	NA
Dichloroethene, *trans*-1,2-	3.44E-02	NA	6.27E-01	NA
Technetium-99	1.66E+02	1.18E-05	NA	NA

NA = not applicable to this pathway or not available   Max = maximum

[a] Southwest Plume risk values are taken from the preliminary document for the Southwest Plume Site Investigation, D2 (DOE 2006a), Appendix G, Pages G-116 to G-126. The point of exposure for the Southwest Plume was assumed to be a location on the DOE property boundary where the plume is projected to leave DOE property at some time in the future. Values presented are those at the source.

[b] Cancer risk to a resident that uses groundwater in the home as drinking water, while showering, and for other purposes.

[c] Hazard index for a child resident exposed as discussed above. Hazard index for an adult would be less.

Under the potential end state alternative, the potential receptors affected during implementation of the response actions (see Figure 4.1b3) are the environmental sampler, remediation worker, maintenance worker, general site worker, disposal worker, transportation worker, the public, and ecological receptors. The environmental sampler could be exposed during sampling activities. The maintenance worker could be exposed while maintaining access controls. The remediation worker and ecological receptors could be exposed during completion of the heating technology for subsurface soil and groundwater at the C-400 Building and while constructing the burial ground cap. The general site worker could be exposed during implementation of the source actions. The disposal worker could be exposed while accepting waste derived from implementing the source actions at C-400. The transportation worker, public, and ecological receptor could be exposed during transportation of waste to an off-site disposal location.

Projected Risk Levels

At the end state, risks to all potential receptors would be at *de minimis* levels using barriers to prevent exposure. Because contamination would continue to exist at levels above MCLs, monitored natural attenuation, which may require approval of an alternative concentration limit (ACL) petition and/or a technical impractability (TI) waiver, would be required until MCLs are met.

4.2 HAZARD AREA 2 – SWOU

This hazard area is composed of the facilities and SWMUs listed below, which are sources of contamination to the SWOU and include contaminated sediments and soils. Major contributing sources are the outfalls and their associated internal ditches and areas, NSDD, Little Bayou and Bayou Creeks, the storm sewers and the former scrapyards which are depicted in Figure 4.2a1. A description of each facility and SWMU is presented in the following section.

- SWMUs 60, 61, 62, 63, 66, 67, 68, 69, 168, and 526: Internal plant ditches and outfalls including SWMUs 92 and 97
- SWMUs 58 and 59: NSDD
- SWMU 64: Little Bayou Creek
- SWMU 65: Bayou Creek
- SWMU 102: Storm sewer systems
- SWMUs 13, 14, 15, 16, and 520: Scrapyards

4.2.1 Current State

Sources

The *Internal Plant Ditches and Outfalls* are part of the original construction of PGDP. These originally were designed to convey plant effluents to one of the surrounding creeks. Currently, the water quality of each effluent ditch is regulated by a Kentucky Pollutant Discharge Elimination System (KPDES) permit. Each ditch has an established monitoring station where water quality is tested regularly, in accordance with the conditions of the facility permit. The SWMUs making up the internal plant ditches and outfalls and their approximate sizes are as follows:

- SWMU 60: Outfall 002 ditch located on the east side of PGDP; 4.2 acres
- SWMU 61: Outfall 013 ditch located on the east side of PGDP; 1.9 acres
- SWMU 62: Outfall 009 ditch located on the southwest side of PGDP; 5.3 acres
- SWMU 63: Outfall 008 ditch located on the west side of PGDP; 7.8 acres
- SWMU 66: Outfall 010 ditch located on the east side of PGDP; 5.8 acres
- SWMU 67: Outfall 011 ditch located on the east side of PGDP; 0.6 acres
- SWMU 68: Outfall 015 ditch located on the west side of PGDP; 5.5 acres
- SWMU 69: Outfall 001 ditch located on the west side of PGDP; 13.8 acres
- SWMU 168: Outfall 012 ditch located on the east side of PGDP; 0.8 acres

In addition, the internal plant drainage system is SWMU 526 including SWMU 92 and 97. The area covered by this system is greater than 100 acres. The storm sewer system (SWMU 102) is approximately 16,360 linear feet.

The primary contaminants in the internal plant ditches and outfalls are PCBs, metals, and radionuclides. (In the past, dioxins and furans potentially were identified at very low concentrations in some areas; however, it is uncertain if these analytes still are present in ditch sediments.) The SWOU (On-Site) SI (DOE 2007a) identified potential “hot spots” in four of the seven internal plant ditches (outfalls 001, (SWMU 69), 008 (SWMU 63), 010 (SWMU 66) and 015 (SWMU 68).

The *NSDD* (SWMUs 58 and 59) is located in the north-central portion of PGDP and was part of the original plant construction. At one time, this ditch served as Outfall 003 and conveyed plant effluent from sources in the central portion of PGDP, including the C-400 Building to the north, with ultimate discharge to Little Bayou Creek. However, this ditch no longer conveys effluents, and the portion located within the industrialized portion of PGDP (SWMU 59), which is about 2,600 ft long, has undergone remediation (i.e., excavation) under a ROD (DOE 2002b). The portion of the ditch located outside the industrialized portion of PGDP (SWMU 58), which is about 8,400 ft long, was also investigated as part of the SWOU (On-Site) SI (DOE 2007a). The principal contaminants associated with the sediments and soils of the NSDD are radionuclides, metals, and PCBs. Potential “hot spots” were identified in Section 3 and Section 5 of the NSDD during the investigation.

Little Bayou Creek (SWMU 64) is a perennial stream that begins approximately 0.4 miles south of PGDP (off DOE property) and flows along the east side of PGDP (within the DOE property, but outside of the industrialized portion of PGDP) to a confluence with Bayou Creek that is off DOE property. The ultimate discharge point of Little Bayou and Bayou Creeks is the Ohio River. Little Bayou Creek has received effluent from the process facilities located on the east side of PGDP since operation of the plant began. The east side of the plant contains the most heavily industrialized area of the plant, including the main uranium processing buildings.

Previous investigations of Little Bayou Creek have been limited to site investigations. No RIs of Little Bayou Creek have been completed. The primary contaminants found within Little Bayou Creek sediments are metals, PCBs, and radionuclides.

Bayou Creek (SWMU 65) is a perennial stream that flows generally northward along the western boundary of PGDP from approximately 2.5 miles south of the plant to the Ohio River. Both upstream and downstream reaches extend beyond the DOE property boundaries. The ultimate discharge point of Bayou Creek is the Ohio River. Bayou Creek has received effluent from the process facilities located on the west and south sides of PGDP since operation of the plant began. Additional contaminant sources include facilities located outside the main industrial area, but adjacent to Bayou Creek. These include the C-746-K Landfill (SWMU 8) and the C-611 Water Treatment Plant.

Previous investigations of Bayou Creek have been limited to site investigations. No RIs of Bayou Creek have been completed. The primary contaminants found in Bayou Creek are metals, PCBs, and radionuclides.

The *Storm Sewer Systems* (SWMU 102) carry precipitation runoff from building roof drains and ground surfaces within the industrialized portion of PGDP to various regulated outfalls around the plant. Materials from spills and leaks also may have been transported by the storm sewer system. Portions of the storm sewer system have been qualitatively evaluated during the various site and RIs performed for source areas. These evaluations have determined that the storm sewer system is a potential transport pathway to the SWOU. Limited investigations of contaminant levels within the storm sewer system and within the bedding materials surrounding the sewers have been performed, and areas of the storm sewer system have been sampled as part of investigations supporting cleanup activities for the GWOU and SWOU. Potential contaminants thought to have a source at the storm sewer systems are solvents, semivolatile organic compounds, PCBs, metals, and radionuclides. Further investigation during the SWOU (On-Site) SI (DOE 2007a) indicates that there have been no releases of uranium, PCB, or TCE for the storm sewers associated with C-333-A, C-337-A, C-340, C-535, and C-537 above the maximum MCLs.

The *Scrapyards* consisted of several SWMUs, covering a total of approximately 23 acres, located in the industrialized portion of PGDP. These scrapyards contained both clean and contaminated scrap derived from plant processes. The majority of these scrapyards were located on the north side of the industrialized portion of PGDP. These SWMUs and their approximate sizes are as follows:

- SWMU 13: C-746-P Clean Scrapyard; 6.8 acres
- SWMU 14: C-746-E Contaminated Scrapyard; 5.9 acres
- SWMU 15: C-746-C Scrapyard; 5.4 acres
- SWMU 16: C-746-D Classified Scrapyard; 2.2 acres
- SWMU 520: Scrap Material West of C-746-A; 2.9 acres

The material in each of these scrapyards has been removed as part of a CERCLA action (DOE 2001b) that resulted in on- and off-site disposal of the scrap. Contaminants for the scrapyards were semivolatile organic compounds, PCBs, metals, and radionuclides.

<u>Pathways</u>

In the current CSM for the SWOU (see Figure 4.2a2), bank soil, sediment, and waste from past enrichment operations (i.e., scrap) are identified as current sources of contamination. Contaminants found in these sources are available for direct contact on-site or for transport to areas outside the industrialized area of PGDP. Once in the environment, contaminants could directly affect ecological receptors or enter the food chain.

Using this CSM, the scrap, sediments (including bank soils), and surface water are of concern for Hazard Area 2. Receptors potentially exposed to scrap are workers, visitors, and ecological receptors. Receptors potentially exposed to sediment and surface water are also workers, visitors, and ecological receptors. The resident, visitor, and ecological receptor potentially are exposed through the food chain.

Under current conditions, the only barrier to exposure is access controls to prevent exposure to scrap and contaminated sediments①. In addition, monitoring of effluents is ongoing to ensure that any future releases are identified quickly②. (As noted above, the material from the scrapyards has been removed as part of a CERCLA action. Demobilization activities and development of the CERCLA documents for this action are underway. Once these activities are completed and approval from EPA and KDWM that the action has met the removal action objectives is received, the scrap will no longer will be a source of contamination.)

Risk Levels

As shown in Figure 4.2a2, no exposure pathways currently are complete for the SWOU due to presence of barriers to exposure; however, the baseline or unmitigated risks that could be present if the barriers did not exist have been assessed. Tables 4.3a, 4.3b, and 4.3c summarize these results (updated based on more recent data collection efforts) for a recreational user and ecological receptors, respectively, potentially exposed to contaminated sediment found in four outfall ditches and to the portion of the NSDD located outside the industrialized area of PGDP. Tables 4.4a and 4.4b summarize the potential risks to a recreational user and worker potentially exposed to surface water contaminated by migration of contaminants from scrap and sediments found in the industrialized portion of PGDP. The points of exposure considered in Table 4.4a and Table 4.4b are where Bayou and Little

Table 4.3a. Risk Assessment Summary[a] for Recreational User Exposure to Contaminated Sediments Found in Outfall Ditches and Portions of NSDD Located Outside of the Industrialized Portion of the PGDP

Location[b]	Land Use	Risk[c]	Risk Scenario[d]	Contaminant Description	Representative Concentration (mg/kg or pCi/g)	Baseline Risk Level[e]	PRG *f* (mg/kg or pCi/g)	Basis for PRG[g]	Actual or Expected Post Cleanup Concentration or Risk Level[h]
Outfall 8 ditch sediment/soils (discharges to Bayou Creek)	Industrial	N	Recreational user	Antimony	2	HI = 1	2	Risk-Based	Average concentration to achieve ELCR = 1E-4 and HI = 1.
				Iron	17,341	HI = 2	8,830	Risk-Based	Average concentration to achieve ELCR = 1E-4 and HI = 1.
				Manganese	818	HI = 4	193	Risk-Based	Average concentration to achieve ELCR = 1E-4 and HI = 1.
				Vanadium	26	HI = 2	14	Risk-Based	Average concentration to achieve ELCR = 1E-4 and HI = 1.
Outfall 10 ditch sediment/soils (discharges to Little Bayou Creek)	Industrial	N	Recreational user	Antimony	2	HI = 1	2	Risk-Based	Average concentration to achieve ELCR = 1E-4 and HI = 1.
				Iron	19,765	HI = 2	8,830	Risk-Based	Average concentration to achieve ELCR = 1E-4 and HI = 1.
				Vanadium	35	HI = 3	14	Risk-Based	Average concentration to achieve ELCR = 1E-4 and HI = 1.
Outfall 11 ditch sediment/soils (discharges to Little Bayou Creek)	Industrial	N	Recreational user	Uranium	391	HI = 5	87	Risk-Based	Average concentration to achieve ELCR = 1E-4 and HI = 1.
				Vanadium	43	HI = 3	14	Risk-Based	Average concentration to achieve ELCR = 1E-4 and HI = 1.
				Total PAHs	8	ELCR = 6E-4	0.0133	Risk-Based	Average concentration to achieve ELCR = 1E-4 and HI = 1.
				Total PCBs	21	ELCR = 2E-4	32[i]	TSCA	25 mg/kg
				U-238	52	ELCR = 1E-4	4	Risk-Based	Average concentration to achieve ELCR = 1E-4 and HI = 1.
Outfall 15 ditch sediment/soils (discharges to Little Bayou	Industrial	N	Recreational user	Antimony	2	HI = 1	2	Risk-Based	Average concentration to achieve ELCR = 1E-4 and HI = 1.
				Cs-137	52	ELCR = 3E-4	0.18	Risk-Based	Average concentration to achieve ELCR = 1E-4 and HI = 1.

Table 4.3a. Risk Assessment Summary[a] for Recreational User Exposure to Contaminated Sediments Found in Outfall Ditches and Portions of NSDD Located Outside of the Industrialized Portion of the PGDP (Continued)

Location[b]	Land Use	Risk[c]	Risk Scenario[d]	Contaminant Description	Representative Concentration (mg/kg or pCi/g)	Baseline Risk Level[e]	PRG *f* (mg/kg or pCi/g)	Basis for PRG[g]	Actual or Expected Post Cleanup Concentration or Risk Level[h]
NSDD – Hot Spot[j]	Industrial	Y	Recreational user	Antimony	14	HI= 9	2	Risk-Based	Average concentration to achieve ELCR = 1E-4 and HI = 1.
				Iron	11,177	HI=1	8,830	Risk-Based	Average concentration to achieve ELCR = 1E-4 and HI = 1.
				Uranium	328	HI=4	87	Risk-Based	Average concentration to achieve ELCR = 1E-4 and HI = 1.
				Total PCBs	2.7	ELCR=4E-6	25	TSCA	25 mg/kg
NSDD-Excluding The Hot Spot[k]	Industrial	Y	Recreational user	Antimony	10	HI=6	2	Risk-Based	Average concentration to achieve ELCR = 1E-4 and HI = 1.
				Iron	9,331	HI=1	8,830	Risk-Based	Average concentration to achieve ELCR = 1E-4 and HI = 1.
				Uranium	164	HI=2	87	Risk-Based	Average concentration to achieve ELCR = 1E-4 and HI = 1.

TSCA = Toxic Substances Control Act
[a] Results for outfall ditches taken from BJC 2003a. Results for NSDD Sections 3, 4, and 5 taken from BJC 2003b. Risks presented are "unmitigated" or baseline risks, which assume exposure with no barriers.
[b] Contaminant concentrations used for the assessment were the upper 95% confidence limit on the average concentrations of all sediment samples collected along the outfall
ditch or NSDD. For the NSDD, Section 3 of the ditch is that portion closest to the industrialized area, and Section 5 of the ditch is that portion farthest from the industrialized area.
Section 4 of the ditch lies between Sections 3 and 5 and is that portion of the ditch located near the landfills found outside of the industrialized area (see Section 5).
[c] "Y" indicates the result came from a baseline risk assessment. "N" indicates the result came from a screening level risk assessment.
[d] Recreational user exposure includes child/teen (140 d/yr, 6 yr) and adult (104 d/yr, 34 yr).
[e] "ELCR" is the excess lifetime cancer risk level. Values from E-06 to E-04 are within EPA's acceptable risk range for site related exposures. "HI" is the hazard index, a measure for potential systemic toxicity. Values greater than 1 indicate that a deleterious health effect is possible.
[f] "PRG" is the preliminary remediation goal used when considering potential response actions.
[g] "Risk-Based" is value derived using a scenario appropriate to the land use and a target risk of either 1E-06 (cancer) or 1 (hazard). For this table, value reported is that for the default recreational user at risk level 1E-6 and hazard of 1.
[h] Risk and hazard targets projected to be used when calculating cleanup concentrations under the potential end state alternative.
[i] The PRG for Total PCBs has been changed from 0.127 ppm to 32 ppm to reflect levels consistent with those identified in the preliminary Engineering Evaluation/Cost Analysis for the SWOU (On-Site) Removal Action.
[j] The NSDD Hot Spot is defined as that area inside Section 3 of the NSDD which contains exposure units (EUs) 01 and 02 [SWOU (On-Site) SI (DOE 2007a)].
[k] The NSDD Excluding the Hot Spot contains a subsection of Section 3 of the NSDD, which contains EU 3 and all of Sections 4 and 5 of the NSDD [SWOU (On-Site) SI (DOE 2007a)].

Table 4.3b. Risk Assessment Summary[a] for Future Industrial Worker Exposure to Contaminated Sediments Found in Outfall Ditches Located Inside the Industrialized Portion of the PGDP

Location[b]	Land Use	Risk[c]	Risk Scenario	Contaminant Description	Representative Concentration (mg/kg or pCi/g)	Baseline Risk Level[d]	PRG[e] (mg/kg or pCi/g)	Basis for PRG[f]	Actual or Expected Post Cleanup Concentration or Risk Level[g]
Outfall 001 (EU 13 Hot Spot)	Industrial	Y	Future Industrial user	Antimony	9.9	HI=0.2	4	Risk-Based	Average concentration to achieve ELCR = 1E-4 and HI = 1.
Outfall 001 (EU 14 Hot Spot)	Industrial	Y	Future Industrial user	Antimony	15	HI=0.2	4	Risk-Based	Average concentration to achieve ELCR = 1E-4 and HI = 1.
				Total PCB	22	ELCR=3E-6	25	TSCA	25 mg/kg
				Total PAH (as BaPE)	184	ELCR=4E-4	0.03	Risk-Based	Average concentration to achieve ELCR = 1E-4 and HI = 1.
Outfall 001 (EU 15 Hot Spot)	Industrial	Y	Future Industrial user	Antimony	10	HI=0.1	4	Risk-Based	Average concentration to achieve ELCR = 1E-4 and HI = 1.
				Uranium	642	HI=0.2	200	Risk-Based	Average concentration to achieve ELCR = 1E-4 and HI = 1.
				Total PCB	52	ELCR=7E-6	25	TSCA	25 mg/kg
				Total PAH (as BaPE)	5	ELCR=1E-5	0.03	Risk-Based	Average concentration to achieve ELCR = 1E-4 and HI = 1.
Outfall 001 (EU 16 Hot Spot)	Industrial	Y	Future Industrial user	Antimony	10	HI=0.1	4	Risk-Based	Average concentration to achieve ELCR = 1E-4 and HI = 1.
				Iron	182,000	HI=0.5	20,000	Risk-Based	Average concentration to achieve ELCR = 1E-4 and HI = 1.
Outfall 001 (EU 18 Hot Spot)	Industrial	Y	Future Industrial user	Antimony	10	HI=0.1	4	Risk-Based	Average concentration to achieve ELCR = 1E-4 and HI = 1.
Outfall 001 (EU 20 Hot Spot)	Industrial	Y	Future Industrial user	Antimony	10	HI=0.1	4	Risk-Based	Average concentration to achieve ELCR = 1E-4 and HI = 1.
Outfall 008 Hot Spot (EUs 08 and 11)	Industrial	Y	Future Industrial user	Antimony	10	HI = 0.1	4	Risk-Based	Average concentration to achieve ELCR = 1E-4 and HI = 1.
				Total PCBs	32	HI = 4E-6	25	TSCA	25 mg/kg
Outfall 010 Hot Spot (EU 10)	Industrial	N	Future Industrial user	Antimony	10	HI = 0.1	4	Risk-Based	Average concentration to achieve ELCR = 1E-4 and HI = 1.
				Total PCBs	19	HI = 3E-6	25	TSCA	25 mg/kg
				Total PAH (as BaPE)	3	ELCR=6E-6	0.03	Risk-Based	Average concentration to achieve ELCR = 1E-4 and HI = 1.

Table 4.3b. Risk Assessment Summary[a] for Future Industrial Worker Exposure to Contaminated Sediments Found in Outfall Ditches Located Inside the Industrialized Portion of the PGDP (Continued)

Location[b]	Land Use	Risk[c]	Risk Scenario	Contaminant Description	Representative Concentration (mg/kg or pCi/g)	Baseline Risk Level[d]	PRG[e] (mg/kg or pCi/g)	Basis for PRG[f]	Actual or Expected Post Cleanup Concentration or Risk Level[g]
Outfall 011 Hot Spot (EU 01)	Industrial	N	Future Industrial user	Antimony	17	HI = 0.3	4	Risk-Based	Average concentration to achieve ELCR = 1E-4 and HI = 1.
				Iron	14,665	HI=0.1	20,000	Risk-Based	Average concentration to achieve ELCR = 1E-4 and HI = 1.
				Uranium	920	HI=0.1	200	Risk-Based	Average concentration to achieve ELCR = 1E-4 and HI = 1.
				Total PAH (as BaPE)	1	ELCR=3E-4	0.03	Risk-Based	Average concentration to achieve ELCR = 1E-4 and HI = 1.
Outfall 015 Hot Spot (EUs 1-7 and 8)	Industrial	N	Future Industrial user	Antimony	11	HI = 0.2	4	Risk-Based	Average concentration to achieve ELCR = 1E-4 and HI = 1.
				Uranium	920	HI=0.3	200	Risk-Based	Average concentration to achieve ELCR = 1E-4 and HI = 1.
Within the Fence Excluding Hot Spots	Industrial	N	Future Industrial user	Antimony	11	HI=0.2	4	Risk-Based	Average concentration to achieve ELCR = 1E-4 and HI = 1.

TSCA = Toxic Substances Control Act

[a] Results for outfall ditches taken from SWOU (On-Site) SI (DOE 2007a).

.[b] Contaminant concentrations used for the assessment were the upper 95% confidence limit on the average concentrations of all sediment samples collected along the respective outfalls as defined in SWOU (On-Site) SI (DOE 2007a).

.[c] "Y" indicates the result came from a baseline risk assessment. "N" indicates the result came from a screening level risk assessment.

[d] "ELCR" is the excess lifetime cancer risk level. Values from E-06 to E-04 are within EPA's acceptable risk range for site related exposures. "HI" is the hazard index, a measure for potential systemic toxicity. Values greater than 1 indicate that a deleterious health effect is possible.

[e] "PRG" is the preliminary remediation goal used when considering potential response actions and is based on a ELCR of 1E-4 and a HI=1.

[f] "Risk-Based" is value derived using a scenario appropriate to the land use and a target risk of either 1E-06 (cancer) or 1 (hazard). For this table, value reported is that for the default.

[g] Risk and hazard targets projected to be used when calculating cleanup concentrations under the potential end state alternative.

Table 4.3c. Risk Assessment Summary[a] for Ecological Receptors Exposure to Contaminated Sediments Found in Outfall Ditches and Portions of NSDD Located Outside of the Industrialized Portion of the PGDP

Location	Land Use	Risk[b]	Risk Scenario	Contaminant Description	Maximum Concentration [c] (mg/kg)	Frequency above USV Level[d]	USV [e] (mg/kg)	Basis for USV	Actual or Expected Post Cleanup Concentration or Risk Level
Outfall 001 - sediment	Industrial	N	Ecological	Arsenic	33.7	3 / 6	17	Abiotic value	NA
				Nickel	73.5	2 / 6	36	Abiotic value	NA
				Benzo(a)anthracene	0.69	2 / 6	0.385	Abiotic value	NA
				Phenanthrene	0.69	3 / 6	0.515	Abiotic value	NA
				PCBs	35.1	16 / 25	0.277	Abiotic value	NA
Outfall 008 - sediment	Industrial	N	Ecological	Mercury	3.28	1 / 6	0.486	Abiotic value	NA
				Fluoranthene	2.8	1 / 4	2.23	Abiotic value	NA
				Phenanthrene	2.8	1 / 4	0.515	Abiotic value	NA
				Pyrene	2.8	1 / 4	0.875	Abiotic value	NA
				PCBs	1.4	4 / 8	0.277	Abiotic value	NA
Outfall 010 - sediment	Industrial	N	Ecological	None	NA	NA	NA	NA	NA
Outfall 011 - sediment	Industrial	N	Ecological	Chromium	160	1 / 2	90	Abiotic value	NA
				Benz(a)anthracene	1.1	1 / 2	0.385	Abiotic value	NA
				Benzo(a)pyrene	1.2	1 / 2	0.782	Abiotic value	NA
				Chrysene	1.3	1 / 2	0.862	Abiotic value	NA
				Fluoranthene	2.9	1 / 2	2.23	Abiotic value	NA
				Phenanthrene	2.3	2 / 2	0.515	Abiotic value	NA
				Pyrene	2.3	1 / 2	0.875	Abiotic value	NA
				PCBs	55	52 / 66	0.277	Abiotic value	NA
Outfall 015 - sediment	Industrial	N	Ecological	PCBs	0.8	2 / 6	0.277	Abiotic value	NA

Table 4.3c. Risk Assessment Summary[a] for Ecological Receptors Exposure to Contaminated Sediments Found in Outfall Ditches and Portions of NSDD Located Outside of the Industrialized Portion of the PGDP (Continued)

Location	Land Use	Risk[b]	Risk Scenario	Contaminant Description	Maximum Concentration[c] (mg/kg)	Frequency above USV Level[d]	USV[e] (mg/kg)	Basis for USV	Actual or Expected Post Cleanup Concentration or Risk Level
Sections 3,4 and 5 of the NSDD[f]	Industrial	N	Ecological	Antimony	9.99	47/94	2	Abiotic value	NA
				Arsenic	57.1	43/94	5.9	Abiotic value	NA
				Cadmium	4.91	5/94	0.27	Abiotic value	NA
				Chromium	473	94/94	37.3	Abiotic value	NA
				Copper	234	90/94	30	Abiotic value	NA
				Iron	82600	94/94	2000	Abiotic value	NA
				Lead	58.9	23/94	12	Abiotic value	NA
				Manganese	4470	94/94	614	Abiotic value	NA
				Mercury	0.76	21/94	0.16	Abiotic value	NA
				Nickel	150	74/94	16	Abiotic value	NA
				Selenium	27.9	1/94	0.05	Abiotic value	NA
				Silver	10.6	47/94	0.00038	Abiotic value	NA
				Vanadium	104	94/94	0.2	Abiotic value	NA
				Zinc	196	78/ 94	4.7	Abiotic value	NA
				Total PAHs	1.61	NA	1.61	Abiotic value	NA
				Total PCBs	28.9	84/408	0.032	Abiotic value	NA

NA = not applicable
[a]Results for are taken from BJC 2003a. Risks presented are "unmitigated" or baseline risks, which assume exposure with no barriers.
[b] "Y" indicates the result came from a baseline risk assessment. "N" indicates the result came from a screening level risk assessment.
[c] Contaminant concentrations used for the assessment were the maximum detected concentration.
[d] "USV" is the upper screening value.
[e] USVs are chemical concentrations in abiotic media that pose a high probability of adverse effects to ecological receptors based on ingestion of soil/sediment or ingestion of food so exposed.
[f] Results for NSDD are taken from SWOU (On-Site) SI (DOE 2007a). Risks presented are "unmitigated" or baseline risks, which assume exposure with no barriers.

Bayou Creek leave DOE-owned property and at the confluence of Bayou and Little Bayou Creeks near the Ohio River.

The contaminants included in Table 4.4a are PCBs, PAHs, and ^{238}U. Only results for these contaminants are shown because only these contaminants were determined in the draft sitewide risk assessment to migrate from the industrialized portions of PGDP and result in potentially measurable concentrations in surface water. Table 4.4b shows the results of migration modeling from the SWOU (On-Site) SI (DOE 2007a). The modeling performed as part of the SI report for the outfalls and their associated internal ditches indicates that no contaminants are migrating in surface water (dissolved or through sediment) from the ditches to surrounding creeks at concentrations that may adversely impact human health.

Risks Posed by Consumption of Plants and Animals

Since the 1950s, the PGDP has produced an Annual Site Environmental Report (e.g., DOE 2006b). These reports, which are based on thousands of environmental samples collected at or near the PGDP as part of an integrated monitoring program, present the data collected and the details of the PGDP environmental management program. As part of these reports, concentrations of selected contaminants found in animals (i.e., game) and plants have been reported and evaluated. (Note that recent reports do not contain information concerning plants because DOE no longer operates any major air emissions sources; therefore, contamination of plants is not expected.)
In the most recent report (DOE 2006b), the contaminant concentrations in deer and fish were evaluated. For deer, this evaluation determined the following when considering consumption of venison:

- Concentrations of PCBs were below the standard (3 ppm for red meat) set by the Food and Drug Administration and would pose risks near or below *de minimis* levels; risk was calculated to be 5.8 chances of cancer development (over a lifetime) per 100,000 people eating deer;
- Concentrations of metals present were not elevated; and
- Radionuclide dose essentially was zero, which is less than the DOE limit and EPA benchmark for exposure by the public (i.e., 100 and 15 mrem/yr, respectively).

For fish, this evaluation determined the following when considering PCB concentrations and consumption:

- Concentrations of PCBs present in fish taken near the PGDP were greater than those in fish from a background location;
- Fish consumption (assuming average PCB concentrations) should be limited to 4 oz. of fish /month for healthy adults; and
- Pregnant or nursing women and children under 15 years should not eat any fish.

4.2.2 Potential End State Alternative

This section focuses on the barriers and actions that may be used to achieve the potential end state alternative and the risks that may remain at the end state. Please see Section 4.2.1 for a discussion of sources and pathways of exposure.

Barriers and Actions

The barriers to exposure at the potential end state alternative (see Figures 4.2b1 and 4.2b2) are continued access controls to prevent exposure to scrap① until such time as the scrap is removed. Source actions are planned under the potential end state alternative to remove the sources of surface water contamination (i.e., scrap, soil, and sediments)③. Finally, monitoring of effluents would continue to ensure that any future releases are identified quickly②.

Under the potential end state alternative, potential receptors affected during implementation of the response actions (see Figure 4.2b3) are the environmental sampler, maintenance worker, remediation worker, general site worker, disposal worker, transportation worker, the public, and ecological receptors. The environmental sampler could be exposed during sampling activities. The maintenance worker could be exposed while performing maintenance activities. The remediation worker and ecological receptors could be exposed during completion of source actions (anticipated to be characterization and disposal of scrap and excavation of sediments). The general site worker also could be exposed during implementation of the source actions. The disposal worker could be exposed while accepting waste from the scrap disposal and excavation activities. The transportation worker, public, and ecological receptor could be exposed during transportation of waste to an off-site disposal location.

Table 4.4a. Risk Assessment Summary[a] for Exposure to Maximum Modeled Concentrations in Surface Water from Sources at the PGDP

Receptor	Bayou Creek	Little Bayou Creek	Confluence
	Risks[b]		
Recreational Swimmer	1.94E-05	6.49E-07	3.93E-06
Recreational Wader	2.23E-05	3.14E-07	4.33E-06
Industrial Worker	1.30E-05	1.84E-07	2.53E-06
Residential Fish Ingestion*	3.74E-03	1.39E-04	1.87E-03
	Hazards[c]		
Recreational Swimmer	6.04E-02	8.92E-03	1.77E-02
Recreational Wader	6.46E-02	1.06E-02	1.88E-02
Industrial Worker	2.75E-02	4.51E-03	8.01E-03
Residential Fish Ingestion*	3.67E-03	1.13E-03	1.98E-03
	Doses[d] (mrem/yr)		
Recreational Swimmer	7.79E-04	2.42E-02	8.73E-03
Recreational Wader	NA	NA	NA
Industrial Worker	NA	NA	NA
Residential Fish Ingestion*	1.82E-02	1.98E+00	2.74E-01

NA = not applicable
[a] Values in the table are from a draft sitewide risk assessment completed for the PGDP in 2007. The risks reported are baseline or unmitigated risks that assume no barriers to exposure. The points of exposure considered were where Bayou and Little Bayou Creeks leave DOE-owned property and at the confluence of these creeks near the Ohio River. Contaminant concentrations used in this assessment are the maximum expected over 30 years from present, assuming no source actions. Contaminants in derivation of risk, hazard, and dose values are PCBs, PAHs, and ^{238}U.
[b] Cancer risk to a recreational user assumes lifetime exposure at the point of exposure (i.e., over 40 years).
[c] Hazard index is for a child recreational user. Hazard index for an adult would be less.
[d] Dose is not age dependent under the scenario assessed; therefore, the values presented are relevant to all age cohorts.
* Fish ingestion results based on average modeled concentrations.

Table 4.4b. Modeled Contaminant Concentrations[a] of PGDP Surface Water at Multiple Receptor Locations

Action level	Total PCBs	Uranium-238
Industrial Worker (Action)	1.65E-02 mg/L	NA
Industrial Worker (No Action)	1.65E-04 mg/L	NA
Child Recreational (Action)	1.12E-02 / 9.61E-03 mg/L	4.91E+03 pCi/L
Child Recreational (No Action)	1.12E-04 / 9.61E-05 mg/L	4.91E+01 pCi/L

	SWMM Predicted Surface Water Concentrations[c]			
	Total PCBs		**Uranium-238**	
Receptor Location[b]	**Average (mg/L)**	**Maximum (mg/L)**	**Average (pCi/L)**	**Maximum (pCi/L)**
Outfall 001	**1.18E-04**	**5.27E-04**	1.06E+01	**5.15E+01**
Outfall 008	**1.84E-04**	**8.11E-04**	1.94E+00	9.26E+00
Outfall 010	**4.21E-04**	**1.70E-03**	0.00E+00	0.00E+00
Outfall 015	**1.58E-04**	**6.68E-04**	4.07E+00	1.73E+01
B09 (IP for Bayou Creek)	8.50E-06	1.46E-05	4.40E-02	8.18E-01
B06 (from OF 008)	4.80E-07	1.98E-05	5.06E-03	2.27E-01
L05 (from OF 010)	2.16E-06	1.91E-05	0.00E+00	0.00E+00
B07 (from OF 015)	5.57E-07	4.13E-05	7.70E-03	7.13E-01
L07 (IP for Little Bayou Creek)	1.37E-06	7.93E-06	0.00E+00	0.00E+00

NA = not applicable
[a]Values in the table are from the SWOU (On-Site) SI (DOE 2007a).
[b] Outfall concentrations are at the pipe, and creek concentrations are immediately downgradient of the outfalls.
[c] Predicted concentrations are based on 30-year simulations.
IP = Integrator Point.
OF = Outfall.
L04, L05, and L07 are discharge points in Little Bayou Creek.
B06, B07, and B09 are discharge points in Bayou Creek.
Bolded values represent exceedance of one or more of no action level values.

Projected Risk Levels

At the end state, risks to all potential receptors would be at *de minimis* levels due either to the presence of barriers that prevent exposure or the removal of scrap and contaminated sediments and soil. The risk target for cleanup levels for sediments under the potential end state alternative at locations inside the industrialized area is an industrial risk of 1E-04. The PCB concentration target for sediments in industrial areas is 25 ppm. The risk target for cleanup levels for sediments under the potential end state alternative at locations outside the industrialized area is a recreational risk of 1E-04. The PCB concentration target for sediments in recreational use areas is 1 ppm. For both the industrial worker and the recreational user, these target risks will be determined using the average contaminant concentration (defined as the 95% upper confidence limit of the mean concentration) within the exposure unit appropriate for the area's land use. Similarly, the PCB concentration target will be the average concentration within the exposure unit.

4.3 HAZARD AREA 3 – BGOU (GROUP 1)

This hazard area is composed of a burial ground located in the northwestern corner of the industrialized portion of PGDP and one landfill to the north of the industrialized portion of the plant. This hazard area is depicted in Figure 4.3a1. A description of each facility and SWMU is presented in the following section. Note that none of these burial grounds currently is accepting waste, and waste in each currently is covered with soil. The following are the burial grounds included.

- SWMU 6: C-747-B Burial Ground
- SWMU 145: Residential/Inert Landfill Borrow Area (and old NSDD Channel)

4.3.1 Current State

Sources

The *C-747-B Burial Ground* (SWMU 6) is located in the northwest portion of the industrialized portion of PGDP and covers about 0.83 acres. It accepted waste from 1960 to 1976. It consists of five burial pits of various sizes containing contaminated equipment and drums of metal scrap. Each pit contains a specific type of waste. After placement of the waste, each pit was covered with 3 to 5 ft of soil. The southern half of the area is a storage yard for contaminated vehicles that no longer are functional. An RI for the burial ground was completed in 1999 (DOE 2000c). Contaminants determined to be associated with this burial ground are metals, radionuclides, and PCBs. A second RI for the BGOU, including this SWMU, was completed in 2007. Results from this RI are expected in early 2008.

The *Residential/Inert Landfill Borrow Area (and old NSDD Channel)* (SWMU 145) is located outside the industrialized portion of PGDP, but on DOE-owned property, immediately north of Ogden Landing Road. This area covers about 44 acres. It consists of areas containing materials disposed of when the GDP was under construction and immediately thereafter (called the "P-Landfill") and a section of the NSDD that was filled with debris when a new channel was constructed for the ditch. An investigation of the old NSDD channel, which covers about 1.5 acres, was performed in 1999 to determine the types of materials that may have been placed in that area. Two test pits were excavated, and only construction debris was found. Contaminants believed to be associated with the NSDD channel and other portions of SWMU 145 are radionuclides and metals. An RI for the BGOU, including this SWMU, was completed in 2007. Results from this RI are expected in early 2008.

Pathways

In the current CSM for the BGOU (Group 1) (see Figure 4.3a2), waste materials from plant operations and surface and subsurface soil are current sources of contamination. Contaminants found in waste and soil are available for direct contact on-site. Migration of contamination from these burial grounds is not expected due to the nature of the wastes. Ecological receptors potentially could contact contaminants at the burial grounds resulting in contamination entering the food chain, but impacts from this pathway would be limited because the burial grounds are located in industrialized areas.

Using this CSM, the waste materials, surface soil, and subsurface soil are of concern for Hazard Area 3. Receptors potentially exposed to waste material and soil are workers, visitors, and ecological receptors. In addition, the ecological receptor potentially is exposed through the food chain.

Under current conditions, the only barrier to exposure that prevents exposure to waste and soil at SWMUs 6 and 145 is access controls①. (Note that although waste is covered with soil at SWMU 6, contaminants were found in the soil cover during the RI of SWMU 6, indicating exposure to contamination is possible at SWMU 6 if access controls are violated. A similar condition may exist at SWMU 145.)

Risk Levels

As shown in Figure 4.3a2, no pathways currently are complete for the BGOU (Group 1); however, the baseline or unmitigated risks that could be present if the barriers did not exist have been assessed for SWMU 6. Tables 4.5a and 4.5b summarize these results for an industrial worker and ecological receptors, respectively, potentially exposed to surface soil at this burial ground. (Results are not shown for SWMU 145 because assessments using representative data are not available for these areas.)

4.3.2 Potential End State Alternative

This section focuses on the barriers and actions that may be used to achieve the potential end state alternative and the risks that may remain at the end state. Please see Section 4.3.1 for a discussion of sources and pathways of exposure.

Barriers and Actions

The barriers to exposure at the potential end state alternative (see Figures 4.3b1 and 4.3b2) are continued access controls① and capping② to prevent exposure to waste and soil.

Under the potential end state alternative, potential receptors during implementation of the response actions (see Figure 4.3b3) are the maintenance worker and remediation worker. The maintenance worker could be exposed during site maintenance activities performed as part of access controls. The remediation worker could be exposed while capping the burial grounds.

Projected Risk Levels

At the end state, risks to all potential receptors would be at *de minimis* levels due to the barriers that prevent exposure.

Table 4.5a. Risk Assessment Summary[a] for Industrial Worker Exposure to Contaminated Surface Soil Found at SWMU 6: C-747-B Burial Ground

Location[b]	Land Use	Risk[c]	Risk Scenario[d]	Contaminant Description	Representative Concentration (mg/kg or pCi/g)	Baseline Risk Level[e]	PRG *f* (mg/kg or pCi/g)	Basis for PRG[g]	Actual or Expected Post Cleanup Concentration or Risk Level
C-747-B Burial Ground	Industrial	N	Industrial	Arsenic	3.22	ELCR = 6E-6	0.523	Risk-Based	*De minimis* – due to cap
				Manganese	472	HI = 1	452	Risk-Based	*De minimis* – due to cap
				Uranium	114	HI = 0.5	202	Risk-Based	*De minimis* – due to cap
				Vanadium	21	HI = 0.6	33.2	Risk-Based	*De minimis* – due to cap
				Total PAHs	0.34	ELCR = 2E-5	0.021	Risk-Based	*De minimis* – due to cap

[a] Values in the table are from a draft sitewide risk assessment completed for the PGDP (DOE 2003h). Risks presented are "unmitigated" or baseline risks, which assume exposure with no barriers.
[b] Contaminant concentrations used for the assessment were the upper 95% confidence limit on the average concentrations of all soil samples collected at the burial ground.
[c] "Y" indicates the result came from a baseline risk assessment. "N" indicates the result came from a screening level risk assessment.
[d] Industrial worker exposure (250 d/yr for 25 yr).
[e] "ELCR" is the excess lifetime cancer risk level. Values from E-06 to E-04 are within EPA's acceptable risk range for site related exposures. "HI" is the hazard index, a measure for potential systemic toxicity. Values greater than 1 indicate that a deleterious health effect is possible.
[f] "PRG" is the preliminary remediation goal used when considering potential response actions.
[g] "Risk-Based" is value derived using a scenario appropriate to the land use and a target risk of either 1E-06 (cancer) or 1 (hazard). For this table, value reported is that for the default industrial worker at risk level 1E-6 and hazard of 1.

Table 4.5b. Risk Assessment Summary[a] for Ecological Receptors Exposed to Contaminated Surface Soil Found at SWMU 6: C-747-B Burial Ground

Location	Land Use	Risk[b]	Risk Scenario	Contaminant Description	Representative Concentration [c] (mg/kg)	Baseline Risk Level[d]	PRG [e] (mg/kg)	Basis for PRG	Actual or Expected Post Cleanup Concentration or Risk Level
C-747-B Burial Ground	Industrial	Y	Ecological –Plants	Nickel	43.2	HQ = 1	NA	NA	NA
				Zinc	128	HQ = 3	NA	NA	NA
			Ecological – Soil invertebrates	Zinc	128	HQ = 1	NA	NA	NA
			Ecological – Woodcock	Zinc	78.4	HQ = 3	NA	NA	NA
				Di-n-butyl phthalate	0.986	HQ = 1	NA	NA	NA

NA = not applicable
[a] Results are taken from DOE 2000c. Risks presented are "unmitigated" or baseline risks, which assume exposure with no barriers. Only constituents considered above background were included.
[b] "Y" indicates the result came from a baseline risk assessment. "N" indicates the result came from a screening level risk assessment.
[c] Contaminant concentrations used for the assessment were the maximum detected concentration (for plants, invertebrates, and microbes), and the lower of the maximum detected concentration or the upper 95% confidence limit on the mean concentration (for wildlife species).
[d] "HQ" is the hazard quotient, a measure for potential systemic toxicity. Values greater than 1 indicate that the receptor may be harmed.
[e] "PRG" is the preliminary remediation goal used when considering potential response actions. Ecological PRGs have not been established.

4.4 HAZARD AREA 4 – SOU

This hazard area is composed of surface soils found within the industrialized areas of PGDP that are not included in other hazard areas. This hazard area is depicted in Figure 4.4a1.

4.4.1 Current State

Sources

This hazard area is composed of units that make up the SOU. It encompasses all areas inside the industrialized portion of PGDP (approximately 40 acres) that contain potential contamination that is not suspected of impacting the GWOU or SWOU. An RI of these areas has not been completed to date, but currently is being scoped. Samples collected as part of other projects indicate that contaminants associated with the SOU are metals, PAHs, PCBs, and radionuclides.

This hazard area also encompasses the soil and rubble areas that have been identified both on and off DOE property that may contain contaminated soils or materials (DOE 2007b). These soil and rubble areas are being investigated and identified for removal action, as appropriate.

Pathways

In the current CSM for the SOU (see Figure 4.4a2), past spills and releases from operations are identified as the primary source of contamination, and surface soil is identified as the current source of contamination. Contaminants found in soil are available for direct contact on-site. Migration of contamination from the SOU areas is not expected (i.e., uncertain pathway); however, it is possible that ecological receptors could contact contaminants within source areas resulting in contamination entering the food chain.

Using this CSM, the medium of concern for Hazard Area 4 is surface soil. Receptors potentially exposed to soil are workers, visitors, and ecological receptors. In addition, the ecological receptor potentially is exposed through the food chain. Under current conditions, the only barrier to exposure is access controls to prevent exposure to soil①.

Risk Levels

As shown in Figure 4.4a2, no pathways currently are considered complete for the SOU; however, the baseline or unmitigated risks that could be present if the barriers did not exist have been assessed for some areas included in the SOU. Table 4.6 summarizes the results for an industrial worker exposed to surface soil at some of the areas included in the SOU. A summary for ecological risks is not available.

4.4.2 Potential End State Alternative

This section focuses on the barriers and actions that may be used to achieve the potential end state alternative and the risks that may remain at the end state. Please see Section 4.4.1 for a discussion of sources and pathways of exposure.

Table 4.6. Risk Assessment Summary[a] for Industrial Worker Exposure to Contaminated Surface Soil Found at Selected Areas in the SOU

Location[b]	Land Use	Risk[c]	Risk Scenario[d]	Contaminant Description	Representative Concentration (mg/kg or pCi/g)	Baseline Risk Level[e]	PRG *f* (mg/kg or pCi/g)	Basis for PRG[g]	Actual or Expected Post Cleanup Concentration or Risk Level[h]
C-728 Clean Waste Oil Tank	Industrial	N	Industrial	Manganese	415	HI = 1	452	Risk-Based	Average concentration to achieve ELCR = 1E-4 and HI=1
				Vanadium	19.8	HI = 0.6	33.2	Risk-Based	Average concentration to achieve ELCR = 1E-4 and HI=1
				Total PCBs	104	ELCR = 5E-4	PCB at 25	TSCA	25 mg/kg
C-615 Sewage Treatment Plant	Industrial	N	Industrial	Manganese	511	HI = 1	452	Risk-Based	Average concentration to achieve ELCR = 1E-4 and HI=1
				Uranium	1,850	HI = 9	202	Risk- based	Average concentration to achieve ELCR = 1E-4 and HI=1
				Total PCBs	46.4	ELCR = 2E-4	PCB at 25	TSCA	25 mg/kg
				Cs-137	3.05	ELCR = 4E-5	0.0858	Risk- based	Average concentration to achieve ELCR = 1E-4 and HI=1
C-540-A PCB Staging Area	Industrial	N	Industrial	Manganese	232	HI = 1	452	Risk- based	Average concentration to achieve ELCR = 1E-4 and HI=1
				Vanadium	27.8	HI = 1	33.2	Risk- based	Average concentration to achieve ELCR = 1E-4 and HI=1
				Total PCBs	93.4	ELCR = 5E-4	PCB at 25	TSCA	25 mg/kg
C-541-A PCB Waste Staging Area	Industrial	N	Industrial	Arsenic	13.4	ELCR = 3E-5	0.523	Risk- based	Average concentration to achieve ELCR = 1E-4 and HI=1
				Manganese	704	HI = 2	452	Risk- based	Average concentration to achieve ELCR = 1E-4 and HI=1
				Uranium	4,140	HI = 20	202	Risk- based	Average concentration to achieve ELCR = 1E-4 and HI=1
				Total PAHs	0.15	ELCR = 7E-6	0.0212	Risk- based	Average concentration to achieve ELCR = 1E-4 and HI=1
				Total PCBs	7.11	ELCR = 4E-5	PCB at 25	TSCA	25 mg/kg

[a] Values in the table are from a draft sitewide risk assessment completed for the PGDP (DOE 2003h). Risks presented are "unmitigated" or baseline risks, which assume exposure with no barriers.
[b] Contaminant concentrations used for the assessment were the upper 95% confidence limit on the average concentrations of all soil samples collected within that area mentioned.
[c] "Y" indicates the result came from a baseline risk assessment. "N" indicates the result came from a screening level risk assessment.
[d] Industrial worker exposure (250 d/yr for 25 yr).
[e] "ELCR" is the excess lifetime cancer risk level. Values from E-06 to E-04 are within EPA's acceptable risk range for site related exposures. "HI" is the hazard index, a measure for potential systemic toxicity. Values greater than 1 indicate that a deleterious health effect is possible.
[f] "PRG" is the preliminary remediation goal used when considering potential response actions.
[g] "Risk-Based" is value derived using a scenario appropriate to the land use and a target risk of either 1E-06 (cancer) or 1 (hazard). For this table, value reported is that for the default industrial worker at risk level 1E-6 and hazard of 1. "TSCA" is based upon Toxic Substances Control Act.
[h] Risk and hazard targets projected to be used to attain the potential end state alternative.

Barriers and Actions

The barriers to exposure at the potential end state alternative (see Figures 4.4b1 and 4.4b2) are continued access controls to prevent exposure to soil①. In addition, source actions to remove the "hot spot" soil② also are planned under the end state.

Under the potential end state alternative, potential receptors during implementation of the response actions (see Figure 4.4b3) are the maintenance worker, remediation worker, general site worker, disposal worker, transportation worker, the public, and ecological receptors. The maintenance worker potentially could be exposed during site maintenance activities performed as part of access controls. The remediation worker, general site worker, and ecological receptors potentially could be exposed during the excavation of contaminated soil "hot spots." The disposal worker potentially could be exposed while accepting waste, and the transportation worker, public, and ecological receptors potentially could be exposed during transportation of waste to an off-site disposal location.

Projected Risk Levels

At the end state, risks to all potential receptors would be at *de minimis* levels due to the barriers that prevent exposure and removal of contaminated soil. The risk target for cleanup levels under the potential end state alternative is a worker risk of 1E-04. The PCB concentration target is 25 ppm. Attainment of the target risk will be determined using the average contaminant concentration (defined as the 95% upper confidence limit of the mean concentration) within the exposure unit appropriate for the area's land use. Similarly, the PCB concentration target will be the average concentration within the exposure unit.

4.5 HAZARD AREA 5 – PERMITTED LANDFILLS

This hazard area is composed of the permitted landfills found at PGDP. This hazard area is depicted in Figure 4.5a1. A description of each landfill is presented in the following section. The permitted landfills included currently are these.

- SWMU 9: C-746-S Residential Landfill
- SWMU 10: C-746-T Inert Landfill
- SWMU 208: C-746-U Landfill

(Note that a potential CERCLA Cell is another permitted landfill that may exist at PGDP when the potential end state alternative is attained. This potential facility is discussed in Section 4.5.2.)

4.5.1 Current State

Sources

The *C-746-S Residential Landfill* (SWMU 9) is located to the north of the industrialized portion of PGDP. This unit covers about 5.0 acres and was the PGDP sanitary landfill from 1981 to 1995. Before the construction and permitting of the C-746-S Landfill, the area was used for the disposal of scrap and waste. C-746-S consists of 6 cells, each of which was lined with 12 inches of clay. The landfill permit allowed the disposal of industrial operations refuse, debris, and combustible and noncombustible garbage. Trash was compacted daily and covered with 6 inches of soil.

The Kentucky Division of Waste Management (KDWM) issued a permit for the construction of the C-746-S Residential Landfill in April of 1981. DOE complied with required modifications to landfill operations in July 1993, designed to promote groundwater and surface water protection, and completed a certified closure of the last landfill cell in June of 1995. A continuing groundwater and surface water monitoring program is in place to trigger corrective action requirements, should actions be needed.

An RI for the C-746-S Landfill has not been completed. The landfill is a potential source of solvents, metals, and radionuclides. An SI to determine if the landfill is a source of solvent contamination was completed in February 2006. Further investigation of the area was performed. Results from this RI are expected in early 2008.

The *C-746-T Inert Landfill* (SWMU 10) is located adjacent to the C-746-S Landfill (SWMU 9). It covers about 8.4 acres and was used for the disposal of industrial trash from 1985 through 1992. Common buried debris includes concrete, wood, and rock, with steam plant fly ash used as filler material. The C-746-T operating permit required that the waste be covered with clay and a vegetative cover for closure. The KDWM issued a permit for the construction of the C-746-T Inert Landfill in February of 1985. DOE completed a certified closure of the landfill in November of 1992. A continuing groundwater and surface water monitoring program is in place to trigger corrective action requirements, should actions be needed.

An RI for the C-746-T Landfill has not been completed. The landfill is a potential source of solvents, metals, radionuclides, and asbestos. An SI to determine if the landfill is a source of solvent contamination was completed in February 2006. Further investigation of the area was performed as part of the BGOU RI. Results from this RI are expected in early 2008.

The *C-746-U Landfill* (SWMU 208) is an operating Subtitle D solid waste landfill located directly north of the C-746-S&T Landfills. It covers 59.7 acres and includes a liner and leachate collection system. This landfill started receiving waste in 1997. Waste accepted includes construction debris, industrial waste, asbestos material, incinerator ash, tires, paper, cardboard, and plastics. Leachate from the C-746-U Landfill is treated at PGDP before being released to KPDES permitted outfalls. No releases to groundwater from this landfill are known to have occurred.

In August 2006, KDWM issued a letter to DOE that placed the C-746-U Landfill into groundwater contamination assessment. The letter stated that contaminants had exceeded either MCLs or statistical limits calculated relative to concentrations found in upgradient wells. A groundwater assessment plan has been developed to identify the actions that DOE will take to determine if the contamination is coming from the C-746-U Landfill or from another source. Once the source is identified, appropriate cleanup actions will occur.

<u>Pathways</u>

In the current CSM for the Permitted Landfills (see Figure 4.5a2), buried waste and soil are identified as current sources of contamination. Contaminants from these sources may migrate to both the groundwater and surface water; however, these are uncertain pathways due to the presence of leachate collection systems. Once in surface water, contaminants could affect ecological receptors or enter the food chain; however, this pathway is uncertain as well.

Using this CSM, buried waste, subsurface soil, groundwater, and surface water are of concern for Hazard Area 5. Receptors potentially exposed to waste and soil are workers, visitors, and ecological receptors. Receptors potentially exposed to groundwater are workers and residents. Receptors potentially exposed to surface water are workers, visitors, and ecological receptors. In addition, the visitor, resident, and ecological receptor potentially are exposed through the food chain.

Under current conditions, barriers to exposure are the current land cover① and access controls②, which prevent exposure to waste and soil; continuation of the PGDP Water Policy④, and the landfill cap and leachate collection system③, which minimizes contaminant migration. In addition, the landfills are monitored to ensure that these systems are working properly. (Please see Section 4.1.1 for a discussion of the PGDP Water Policy.)

Risk Levels

Risk assessment results using adequate data are not available for the permitted landfills; therefore, it is not possible to report unmitigated or baseline risks. However, because all pathways are incomplete, all unmitigated risks can be assumed to be at *de minimis* levels.

4.5.2 Potential End State Alternative

This section focuses on the barriers and actions that may be used to achieve the potential end state alternative and the risks that may remain at the end state. The sources and pathways of exposure are discussed in Section 4.5.1, except for a potential CERCLA cell, which is described below. The potential CERCLA Cell for PGDP is a facility that has not yet been sited. Figure 4.5b1 shows the locations investigated as part of a siting study. This unit would provide PGDP with waste disposal alternatives for CERCLA-derived waste, such as low-level, Toxic Substances Control Act (TSCA), mixed, and hazard wastes. The waste would be generated from environmental restoration and D&D activities and, potentially, legacy and DMSA waste disposal. Decision documents to determine if a CERCLA Cell is a viable waste disposal option for the PGDP have not been completed; therefore, this facility is only one of several waste disposal options that could be used at the PGDP to attain the potential end state alternative.

Barriers and Actions

Barriers to exposure at the end state are similar to those currently in place. (See Figures 4.5b1 and 4.5b2.) These barriers are the current land cover① and access controls②, which prevent exposure to waste and soil; implementation of enhanced institutional controls, which will limit access to and use of groundwater⑤, and the landfill cap, leachate collection system, and monitoring③, which minimizes contaminant migration. (Please see Section 4.1.2 for a discussion of enhanced institutional controls under the potential end state alternative.) Under the potential end state alternative, potential receptors in the treatment train (see Figure 4.5b3) are the maintenance worker and environmental sampler. The maintenance worker could be exposed while maintaining the access controls and landfill containment systems. The environmental sampler could be exposed during routine sampling activities.

Projected Risk Levels

At the end state, risks to all potential receptors would be at *de minimis* levels because barriers would prevent exposure.

4.6 HAZARD AREA 6 – BGOU (GROUP 2)

This hazard area is composed of the facilities and SWMUs listed below. This hazard area is depicted in Figure 4.6a1. A description of each facility and SWMU is presented in the following section.

- SWMU 5: C-746-F Burial Ground
- SWMU 7: C-747-A Burial Ground
- SWMU 8: C-746-K Landfill
- SWMU 30: C-747-A Burn Area

4.6.1 Current State

Sources

The *C-746-F Burial Ground* (SWMU 5) is located in the northwest part of the industrialized portion of PGDP and covers approximately 6.3 acres. This burial ground was used for the disposal of radionuclide-contaminated and uncontaminated classified scrap beginning in 1965. An RI for the burial ground was completed in 1999 (DOE 2000c). Contaminants determined to be associated with this burial ground are uranium, ^{99}Tc, tritium, Cobalt-60, and metals. A second RI for the BGOU, including this SWMU, was completed in 2007. Results from this RI are expected in early 2008.

The *C-747-A Burial Ground* (SWMU 7) is located in the extreme northwest corner of the industrialized portion of PGDP and covers approximately 2.9 acres. This burial ground was used for disposal of miscellaneous debris from 1957 to 1979. Within the boundaries of the burial ground are three burial pits that cover approximately 23,100 ft^2 and contain noncombustible, contaminated and uncontaminated trash and equipment; one burial pit that covers approximately 2,100 ft^2 and contains contaminated concrete; and another burial pit that covers 9,000 ft^2 and contains uranium-contaminated scrap metal and equipment. An RI for the burial ground was completed in 1997 (DOE 1998a). Contaminants found include metals, VC, semivolatile organic compounds, PCBs, and radionuclides. A second RI for the BGOU, including this SWMU, was completed in 2007. Results from this RI are expected in early 2008.

The *C-746-K Landfill* (SWMU 8) is located to the southwest of the industrialized portion of PGDP and covers about 6.8 acres. This unit was used as a sanitary landfill from the early 1950s through the early 1980s. The landfill is known to contain sanitary trash (burned and unburned) and fly ash from coal-burning operations. Before 1967, trenches were cut in the ash to form burn pits. After 1967, the trash was buried in the ash without burning. Sludge from the C-615 Sewage Treatment Plant was reported to have been used as fill material. C-746-K possibly contains some slightly radionuclide-contaminated trash.

DOE closed the landfill in 1982 by covering the landfill with a 6-inch clay cap and a 18-inch vegetative cover. Seepage points were identified in a ditch adjacent to the unit in January of 1992. This landfill subsequently underwent an RI. A ROD was signed for this landfill (DOE 1998b). Corrective actions taken (1992) include installation of riprap along creek bank to prevent direct contact with the seeps, recontouring of the landfill cap to promote rainfall runoff, implementation of institutional controls, and long-term monitoring. The DOE placed deed restrictions on the landfill in 1997. Possible contaminants associated with the landfill are solvents and metals.

The *C-747-A Burn Area* (SWMU 30) is located to the west of the C-747-A Burial Ground and covers approximately 2.9 acres. The C-747-A Burn Area was operated from 1951 to 1970 for burning and disposal of combustible trash, some of which may have been contaminated with uranium. Burning was done at an incinerator, which subsequently has been demolished, and portions of it are buried within this SWMU's boundary. During operation of the C-747-A Burn Area, a waste burial pit was used for disposal of contaminated and uncontaminated trash, ash, and debris. An RI for the SWMU was completed in 1997 (DOE 1998a). Contaminants found include solvents, radionuclides, metals, semivolatile organic compounds, and PCBs.

Pathways

In the current CSM for the BGOU (Group 2) (see Figure 4.6a2), waste materials from plant operations and surface and subsurface soil are identified as current sources of contamination. Contaminants found in waste and soil are available for direct contact on-site. For all but the C-746-K Landfill (SWMU 8), migration of contamination from these burial grounds to surface water or groundwater is not expected due to the nature of the wastes. Similarly, for all but the C-746-K Landfill, ecological receptors potentially could contact contaminants at the burial grounds resulting in contamination entering the food chain, but impacts from this pathway would be limited because the burial grounds are located in industrialized areas. For the C-746-K Landfill, releases to surface water are known to have occurred in the past; these releases may impact ecological receptors in Bayou Creek in an area outside the industrialized portion of PGDP. Using this CSM, the waste materials, soil, groundwater, and surface water are of concern for Hazard Area 6. Receptors potentially exposed to waste and soil are workers, visitors, and ecological receptors. Receptors potentially exposed to groundwater are workers and residents. Receptors potentially exposed to surface water are workers, visitors, and ecological receptors. In addition, the visitor, resident, and ecological receptor potentially could be exposed through the food chain.

Under current conditions, the barriers to exposure are the current land cover① and access controls②, which prevent exposure to waste and subsurface soil (and surface water at the C-746-K Landfill), and continuation of the PGDP Water Policy③. (Please see Section 4.1.1 for a discussion of the PGDP Water Policy.)

Risk Levels

As shown in Figure 4.6a2, only the biota pathway though surface water currently is considered complete for the BGOU (Group 2); and, as discussed previously, this pathway is complete only for the C746-K Landfill. Representative ecological and human health risk assessments for this surface water pathway are not available; however, baseline (i.e., unmitigated) risk results for exposure by ecological receptors and humans to soils at the landfill are available and are presented in Table 4.7. Additionally, unmitigated risk results that could be present if barriers did not exist at the C-747-A Burial Ground (SWMU 7) are available. These results are presented in Table 4.8.

4.6.2 Potential End State Alternative

This section focuses on the barriers and actions that may be used to achieve the potential end state alternative and the risks that may remain at the end state. Please see Section 4.6.1 for a discussion of sources and pathways of exposure.

Barriers and Actions

Barriers to exposure at the end state are depicted in Figures 4.6b1 and 4.6b2. These are the current land cover① and access controls②, which prevent exposure to waste and subsurface soil; enhanced institutional controls, which will limit use of and access to groundwater⑤; and the landfill cap④, which mitigates contaminant migration. (Please see Section 4.1.2 for a discussion of enhanced institutional controls under the potential end state alternative.)

Under the potential end state alternative, potential receptors in the treatment train (see Figure 4.6b3) are the maintenance worker, remediation worker, environmental sampler, and ecological receptor. The maintenance worker could be exposed while maintaining the access controls and current cover. The remediation worker and ecological receptor could be exposed while the landfill caps are installed. The environmental sampler could be exposed during routine sampling activities.

Projected Risk Levels

At the end state, risks to all potential receptors would be at *de minimis* levels because barriers limit exposure or mitigate contaminant migration.

Table 4.7. Risk Assessment Summary[a] for Industrial Worker and Ecological Receptor Exposure to Contaminated Surface Soil Found at SWMU 8: C-747-K Landfill

Location[b]	Land Use	Risk[c]	Risk Scenario[d]	Contaminant Description	Representative Concentration (mg/kg or pCi/g)	Baseline Risk Level[e]	PRG [f] (mg/kg or pCi/g)	Basis for PRG[g]	Actual or Expected Post Cleanup Concentration or Risk Level
C-746-K Landfill	Industrial	N	Industrial	Arsenic	11.5	ELCR = 2E-5	0.52	Risk-Based	*De minimis* – due to cap
				Antimony	3.7	HI = 1	3.8	Risk-Based	*De minimis* – due to cap
				Manganese	2,110	HI = 5	452	Risk-Based	*De minimis* – due to cap
				Vanadium	45	HI = 1	33.2	Risk-Based	*De minimis* – due to cap
				Total PAHs	0.35	ELCR = 2E-5	0.02	Risk-Based	*De minimis* – due to cap
C-746-K Landfill	Industrial	N	Ecological – Terrestrial Plants	Aluminum	7,000	HQ = 159	NA	NA	NA
				Chromium	11.6	HQ = 15	NA	NA	NA
				Manganese	1,140	HQ = 6	NA	NA	NA
				Vanadium	17.8	HQ = 11	NA	NA	NA
C-746-K Landfill	Industrial	N	Ecological – Earthworms	Chromium	11.6	HQ = 39	NA	NA	NA
				Mercury	0.15	HQ = 2	NA	NA	NA
C-746-K Landfill	Industrial	N	Ecological – Microflora	Aluminum	7,000	HQ = 13	NA	NA	NA
				Chromium	11.6	HQ = 2	NA	NA	NA
				Iron	12,700	HQ = 93	NA	NA	NA
				Manganese	1,140	HQ = 28	NA	NA	NA
C-746-K Landfill	Industrial	N	Ecological – Herbivorous Wildlife (meadow vole)	Aluminum	7,000	HQ = 12	NA	NA	NA
C-746-K Landfill	Industrial	N	Ecological – Omnivorous Wildlife (white-footed mouse)	Aluminum	7,000	HQ = 19	NA	NA	NA
C-746-K Landfill	Industrial	N	Ecological – Vermivorous Wildlife (short-tailed shrew)	Aluminum	7,000	HQ = 307	NA	NA	NA
				Arsenic	3.78	HQ = 4	NA	NA	NA
				Mercury	0.15	HQ = 1	NA	NA	NA
				Vanadium	17.8	HQ = 3	NA	NA	NA

NA = value is not available at this time.
[a] Values in the table are from a draft sitewide risk assessment completed for the PGDP (DOE 2003h). Risks for ecological receptors are from 1996a. In all cases, risks presented are "unmitigated" or baseline risks, which assume exposure with no barriers.
[b] Contaminant concentrations used for the assessment were the upper 95% confidence limit on the average concentrations of all sediment samples collected from soil and/and or sediment at the C-746K Landfill.
[c] "Y" indicates the result came from a baseline risk assessment. "N" indicates the result came from a screening level risk assessment.
[d] Industrial worker exposure (250 d/yr for 25 yr). All ecological exposures are assumed to be lifetime exposures.
[e] "ELCR" is the excess lifetime cancer risk level. Values from E-06 to E-04 are within EPA's acceptable risk range for site related exposures. "HI" is the hazard index, a measure for potential systemic toxicity. Values greater than 1 indicate that a deleterious health effect is possible. "HQ" is a hazard quotient for ecological receptors. A value greater than 1 indicates that a deleterious effect on the ecological receptor is possible.
[f] "PRG" is the preliminary remediation goal used when considering potential response actions.
[g] "Risk-Based" is value derived using a scenario appropriate to the land use and a target risk of either 1E-06 (cancer) or 1 (hazard). For this table, value reported is that for the default industrial worker at risk level 1E-6 and hazard of 1.

Table 4.8. Risk Assessment Summary[a] for Industrial Worker Exposure to Contaminated Surface Soil Found at SWMU 7: C-747-A Burial Ground

Location[b]	Land Use	Risk[c]	Risk Scenario[d]	Contaminant Description	Representative Concentration (mg/kg or pCi/g)	Baseline Risk Level[e]	PRG *f* (mg/kg or pCi/g)	Basis for PRG[g]	Actual or Expected Post Cleanup Concentration or Risk Level
C-747-A Burial Ground	Industrial	N	Industrial	Beryllium	24.4	HI = 3	9.5	Risk-Based	*De minimis* – due to cap
				Manganese	341	HI = 1	452	Risk-Based	*De minimis* – due to cap
				Uranium	361	HI = 2	202	Risk-Based	*De minimis* – due to cap
				Vanadium	30.9	HI = 1	33.2	Risk-Based	*De minimis* – due to cap
				Total PAHs	0.94	ELCR = 5E-5	0.021	Risk-Based	*De minimis* – due to cap
				U-238	530	ELCR = 3E-4	1.71	Risk-Based	*De minimis* – due to cap
C-747-A Burial Ground	Industrial	Y	Ecological – Terrestrial Plants	Aluminum	14,800	HQ = 296	NA	NA	NA
				Chromium	44	HQ = 44	NA	NA	NA
				Uranium	1400	HQ = 280	NA	NA	NA
				Vanadium	52	HQ = 26	NA	NA	NA
			Ecological – Soil microbes	Aluminum	14,800	HQ = 25	NA	NA	NA
				Iron	30,000	HQ = 150	NA	NA	NA
				Manganese	11,600	HQ = 12	NA	NA	NA
			Ecological – Earthworms	Chromium	44	HQ = 110	NA	NA	NA
			Ecological – Deer	Aluminum	9,670	HQ = 41	NA	NA	NA
				Vanadium	29.5	HQ = 2	NA	NA	NA
			Ecological – Mouse	Aluminum	9670	HQ = 60	NA	NA	NA
				Arsenic	7.21	HQ = 4	NA	NA	NA
				Chromium	32.2	HQ = 3	NA	NA	NA
				PCB-1260	0.295	HQ = 5	NA	NA	NA
			Ecological – Shrew	Aluminum	9670	HQ = 620	NA	NA	NA
				PCB-1260	0.295	HQ = 33.2	NA	NA	NA

NA = not available
[a] Values in the table are from a draft sitewide risk assessment completed for the PGDP (DOE 2003h). Risks for ecological receptors are from 1998a. In all cases, risks presented are "unmitigated" or baseline risks, which assume exposure with no barriers.
[b] Contaminant concentrations used for the assessment were the upper 95% confidence limit on the average concentrations of all soil samples collected at the burial ground.
[c] "Y" indicates the result came from a baseline risk assessment. "N" indicates the result came from a screening level risk assessment.
[d] Industrial worker exposure (250 d/yr for 25 yr). All ecological exposures are assumed to be lifetime exposures.
[e] "ELCR" is the excess lifetime cancer risk level. Values from E-06 to E-04 are within EPA's acceptable risk range for site related exposures. "HI" is the hazard index, a measure for potential systemic toxicity. Values greater than 1 indicate that a deleterious health effect is possible. "HQ" is a hazard quotient for ecological receptors. A value greater than 1 indicates that a deleterious effect on the ecological receptor is possible.
[f] "PRG" is the preliminary remediation goal used when considering potential response actions.
[g] "Risk-Based" is value derived using a scenario appropriate to the land use and a target risk of either 1E-06 (cancer) or 1 (hazard). For this table, value reported is that for the default industrial worker at risk level 1E-6 and hazard of 1.

4.7 HAZARD AREA 7 – LEGACY WASTE AND DMSAS

This area consists of the legacy waste found at storage locations at PGDP and potentially contaminated debris, surfaces, and soil found in DMSAs located throughout PGDP. This hazard area is depicted in Figure 4.7a1. The following facilities hold containerized legacy waste in storage.

C-746-A	C-746-V	C-310	C-337
C-746-B	C-746-M	C-331	C-752-A
C-746-H3	C-752-C	C-333	C-753-A
C-746-Q	C-733	C-335	

These facilities contain DMSAs, including 18 outside locations.

Outside – Locations 1-18	C-333 – Locations 1-43	C-409 – Locations 1-2
C-310 – Locations 1-5	C-337 – Locations 1-45	C-720 – Locations 1-4
C-331 – Locations 1-24	C-400 – Locations 1-8	

4.7.1 Current State

Sources

Legacy Waste areas contain investigation-derived waste (IDW) classified as low-level waste (LLW), PCBs, nonhazardous, and hazardous waste streams. The process buildings (C-331, C-333, C-335, and C-337) contain DMSAs that contain some legacy waste. The C-746-A and C-746-B Warehouses cover about 1.7 acres and contain 55-gal drums of material contaminated with hazardous substances and radionuclides. Most of the containers in these facilities are labeled as PCB and/or radiologically contaminated and may contain soils or liquid wastes. C-746-A is a permitted hazard waste storage area. The C-746-H3 Pad is a waste storage area that is approximately 1.3 acres. It contains nonhazardous IDW. C-746-M is a nonhazardous waste storage facility used to store PCB contaminated wastes. C-746-Q is a 2.3-acre building used to store low-level and hazardous waste containers. This facility is included in the RCRA Part B Permit. C-746-V and C-753-A are storage areas that contain LLW and PCB containers. C-752-A is a hazardous waste, permitted storage facility that stores LLW, PCB, and hazardous waste containers. Both liquids and solids are stored in this facility.

During FY 2007, legacy wastes stored in outside facilities (C-746-V and C-746-H3) were all disposed at either the C-746-U Landfill or at off-site disposal facilities, in accordance with applicable waste disposal requirements.

DMSAs are comprised of 160 areas located throughout PGDP. The inside DMSAs are small; however, the total area covered by the outside DMSAs is over 3 acres. The DMSAs contain many types of materials, such as process equipment, tanks, scrap metal, miscellaneous equipment, pallets, motors, trash, personal protective equipment/plastic containers, piping, empty transformers, PCB and LLW containers, rail cars, vehicles, fire extinguishers, and fork lifts. The material has been stored in these areas for many years and characterization is an ongoing activity. To date, more than half of the DMSAs have been fully characterized.

Pathways

Under the current CSM for Legacy Waste and DMSAs (see Figure 4.7a2), stored waste and surface soil are identified as current sources of contamination. Contaminants found in either location are available for direct contact on-site. Additionally, contaminants in surface soil potentially could migrate to surface water and sediment, but this is an uncertain pathway. Once in the environment, contaminants could directly affect ecological receptors or enter the food chain.

Using this CSM, waste, soil, sediments, and surface water are of concern for Hazard Area 7. Receptors potentially exposed to stored waste are workers and ecological receptors. Receptors potentially exposed to soil are workers and ecological receptors. Receptors potentially exposed to sediment and surface water are workers, visitors, and ecological receptors; however, this is an uncertain pathway. In addition, the resident, visitor, and ecological receptor are potentially exposed through the food chain, another uncertain pathway.

Under current conditions, the only barrier to exposure is access restrictions① to prevent access to the waste and soil.

Projected Risk Levels

A risk assessment has not been performed for any Legacy Waste or DMSA sites; however, because access to all areas is controlled, risks are at *de minimis* levels.

Unmitigated risks to legacy wastes may exceed *de minimis* levels because contaminant levels could be high in some of this waste; however, the unmitigated risks associated with the DMSAs are uncertain. For DMSAs characterized to date, data indicate that uncontrolled exposure to materials may result in levels of risk that are *de minimis*, but this result may differ as more characterization is performed.

4.7.2 Potential End State Alternative

This section focuses on the barriers and actions that may be used to achieve the potential end state alternative and the risks that may remain at the end state. Please see Section 4.7.1 for a discussion of sources and pathways of exposure.

Barriers and Actions

No barriers to exposure are required at the end state (see Figures 4.7b1 and 4.7b2) because all legacy waste and materials in the DMSAs are characterized and disposed of in an off-site location or in a permitted landfill at PGDP②. Additionally, any contaminated surfaces are decontaminated③ and contaminated soil is excavated and disposed of in an off-site location④ or in a permitted landfill at PGDP. (Please see Section 4.5 for a discussion of risks at permitted landfills at PGDP.)

Under the potential end state alternative, potential receptors during implementation of the response actions (see Figure 4.7b3) are the remediation worker, general site worker, disposal worker, transportation worker, the public, and ecological receptors. The remediation worker, general site worker, and ecological receptor could be exposed during the characterization and disposal of waste, decontamination of surfaces, and excavation of soil. The landfill worker and disposal worker could be exposed while accepting waste, including excavated soil. The transportation worker, public, and ecological receptor could be exposed during transportation of waste and soil to an off-site disposal location.

Projected Risk Levels

At the end state, risks to all potential receptors would be at *de minimis* levels due to characterization and disposal of waste and soil. The risk target for cleanup levels for soil and surfaces under the potential end state alternative is an industrial worker risk of 1E-04. The PCB concentration target is 25 ppm. Attainment of the target risk will be determined using the average contaminant concentration (defined as the 95% upper confidence limit of the mean concentration) within the exposure unit appropriate for the area's land use. Similarly, the PCB concentration target will be the average concentration within the exposure unit.

4.8 HAZARD AREA 8 – CYLINDER YARDS AND CONVERSION FACILITY SITE

This hazard area is composed of 20 cylinder yards and the DUF_6 Conversion Facility that is being built will be operated, and undergo D&D as part of the EM mission at PGDP. This hazard area is depicted in Figure 4.8a1. Please see the following section for a description of these areas.

4.8.1 Current State

Sources

The 20 cylinder yards are located throughout the site and together cover approximately 105 acres. These yards are used to store cylinders containing depleted uranium hexafluoride (UF_6). The yards are primarily gravel or concrete covered and contain cylinders held in place with creosote wood and concrete saddles. Most of the cylinders are 12 ft long and 4 ft in diameter, with a nominal wall thickness of 5/16 inch. The largest storage area at PGDP is in the southeast corner of the site. There are about 40,351 cylinders of depleted UF_6 stacked two layers high at Paducah; 28,351 of them were generated by DOE and about 12,000 were generated by USEC. The cylinders generated by USEC are not the responsibility of DOE and currently fall outside the EM mission.

DOE is building a facility to convert its UF_6 to a more stable form for long-term storage, use, or permanent disposal. (Disposal will be at an off-site location.) The planned site of the DUF_6 Conversion Facility is located west of the south cylinder yards and south of the main plant entrance and will cover an area of about 23 acres, including support facilities. Conversion to oxide for use or long-term storage would begin as soon as possible, with conversion to metal only if uses for the metal are identified.

Pathways

The current CSM for the Cylinder Yards and DUF_6 Conversion Facility (see Figure 4.8a2) identified the facility infrastructure, cylinders, and associated soils as current sources of contamination. Contaminants found associated with the facility infrastructure, cylinders, and soil are available for direct contact on-site. Additionally, contaminants in surface soil potentially could migrate to surface water and sediment, but this is an uncertain pathway. Once in the environment, contaminants could directly affect ecological receptors or enter the food chain.

Using this CSM, the contaminants from the facility infrastructure and cylinders and in soil, sediments, and surface water are of concern for Hazard Area 8. Receptors potentially exposed to facility infrastructure, cylinders, and associated soil are workers and ecological receptors. Receptors potentially exposed to sediment and surface water are workers, visitors, and ecological receptors. In addition, the resident, visitor, and ecological receptor potentially are exposed through the food chain.

Under current conditions, the only barrier to exposure is access restrictions① to prevent exposure to the cylinders and soil. Additionally, any runoff impacting surface water, an uncertain pathway, is attenuated naturally.

Risk Levels

No risk information is available for the Cylinder Yards and DUF_6 Conversion Facility. Risks, however, are at *de minimis* levels because of the access restrictions. Unmitigated risks could be higher if, under unmitigated conditions, receptors are exposed to contamination for longer periods. The primary contributor to this risk would be from gamma emissions from the radioactive materials stored in the cylinders.

4.8.2 Potential End State Alternative

This section focuses on the barriers and actions that may be used to achieve the potential end state alternative and the risks that may remain at the end state. Please see Section 4.8.1 for a discussion of sources and pathways of exposure.

Barriers and Actions

At the end state, (see Figures 4.8b1 and 4.8b2) all sources of contamination are removed. The completion of the conversion mission③ includes off-site disposal of converted uranium; D&D of infrastructure, followed by on-site disposal④; and excavation of any contaminated soil⑤.

Under the potential end state alternative, potential receptors during implementation of the response actions (see Figure 4.8b3) are the industrial worker, remediation worker, landfill worker, general site worker, and ecological receptor. The industrial worker would be exposed while working in the conversion facility. The remediation worker, general site worker, and ecological receptor could be exposed during the D&D of the facility infrastructure and excavation of soil. The landfill worker and general site worker could be exposed while waste is transported to, and accepted at, the potential on-site CERCLA Cell.

Projected Risk Levels

At the end state, risks to all potential receptors would be at *de minimis* levels due to D&D of facility infrastructure, completion of the conversion mission, and excavation of any contaminated soils. The risk target for cleanup levels for soil under the potential end state alternative is an industrial worker risk of 1E-04. The PCB concentration target is 25 ppm. Attainment of the target risk will be determined using the average contaminant concentration (defined as the 95% upper confidence limit of the mean concentration) within the exposure unit appropriate for the area's land use. Similarly, the PCB concentration target will be the average concentration within the exposure unit.

4.9 HAZARD AREA 9 – GDP FACILITIES

This hazard area is composed primarily of the buildings and infrastructure currently leased to USEC for the enrichment of uranium. Please see Figure 4.9a1 for a depiction of the location of these buildings. The buildings and infrastructure include all of the following.

- C-331, C-333, C-335, and C-337 process buildings and associated switchyards and cooling towers
- C-710 Technical Service Building
- C-724/725 Paint Shop

- Sewage Treatment Plant
- Water Treatment Plants
- C-720 Building
- C-400 Cleaning Building

This hazard area also includes two large buildings and 15 smaller facilities that currently are at various stages of D&D as part of the D&D OU (see Chapter 1). These two large buildings are the C-410/420 Feed Plant and the C-340 Metals Plant. Please see the following section for additional information about these buildings and their associated contamination.

4.9.1 Current State

Sources

Process Buildings C-331, C-333, C-335, and C-337 are located along the east side of PGDP and cover approximately 12, 25, 12, and 25 acres, respectively. These buildings house equipment and facilities for the processing of uranium. These facilities could have multiple environmental impacts, including releases of Freon™ to the atmosphere, lubrication oil leaks, radionuclide contamination, PCB contamination, lead-based paint usage, TCE, ^{99}Tc and chromate water releases, and asbestos containing materials. Associated cooling towers are used to cool and recirculate process water used in the process buildings. The cooling tower system consists of recirculating pumps, evaporative cooling towers, catch basins, and associated piping and equipment. Heavy metals are the primary potential contaminants associated with the cooling tower system; however, PCBs and chlorinated solvents also are potential contaminants for the cooling tower systems.

The *C-710 Technical Services Building* is located in the central portion of the plant security area and occupies approximately 2.0 acres. The building and area consists of a gas cylinder storage area and office space for laboratories, a shop, and storage. Environmental impacts include UF_6, fluorine, mercury, arsenic acetone, iso-octane, hexane, methylene chloride, TCE, chlorine trifluoride (ClF3), PCBs, uranium, concentrated acids, chromated water, lead, and asbestos containing materials.

The *C-724/7245 Shops* house the primary facility maintenance-related paint shops at PGDP and cover about 0.33 acres. Potential environmental contamination sources include paint-related contaminants such as TCA, xylene, chromium VI, barium, total solvable phosphorus, titanium dioxide, and volatile organic compounds.

The *C-611 Water Treatment Plant* is a 15-acre area that consists of a treatment building and a series of lagoons. It is located on the west side of PGDP. Historical contamination consists of PCBs, mercury, ClF3, nitric acid spills, radiological contamination, TCE releases from degreaser usage, and oil and grease.

The *C-615 Sewage Disposal Plant* is located in the southwest corner of the plant area and covers about 1.2 acres. This facility receives effluent discharges from within PGDP and treats those effluents before discharge to KPDES Outfall 004. The Sewage Disposal Plant has several sources of potential environmental impact including PCBs, uranium, chlorine, lead, and asbestos contaminated material.

The *C-410/C-420 Feed Plant* complex is located in the central portion of the industrialized area of PGDP and covers about 2.7 acres. The C-410/C-420 complex was constructed to produce UF_6 from uranium trioxide through a series of chemical reactions. Groundwater and soils in the vicinity of the C-410/C-420 complex were investigated as part of a remedial investigation (DOE 1999a). Contaminants found include solvents, PCBs, metals, and radionuclides. This facility currently is the subject of a removal action (DOE 2002d).

The *C-340 Metals Plant* is located in the east-central portion of the industrialized portion of PGDP and covers about 0.87 acres. The facility was erected in 1957 with operations in the metals plant continuing until 1975. Final lockdown of the facility occurred in 1991. D&D activities began in 1992. Site investigations for the area of the C-340 Metals Plant (DOE 2000d) identified solvents, PCBs, metals, and radionuclides as contaminants.

The *C-720 Building* and the *C-400 Cleaning Building* are described in Section 4.1.1. As noted there, these buildings cover approximately 6.5 and 4.0 acres, respectively.

Pathways

Under the current CSM for the GDP Facilities (see Figure 4.9a2), contaminated infrastructure and soils were identified as current sources of contamination. Contaminants associated with infrastructure and soil may migrate to groundwater and be transported to areas off DOE property. Additionally, contaminants may migrate to surface water and sediment and be transported to locations off DOE property. Finally, groundwater could be discharged to surface water. Once in surface water, contaminants could affect ecological receptors or enter the food chain.

Using this CSM, the contaminated infrastructure, soil, groundwater, surface water, and sediments are of concern for Hazard Area 9. Receptors potentially exposed to contaminated infrastructure and soil are workers, visitors, and ecological receptors. Receptors potentially exposed to groundwater are workers and residents. Receptors potentially exposed to surface water are workers, visitors, and ecological receptors. In addition, the resident, visitor, and ecological receptor are potentially exposed through the food chain.

Barriers to exposure under the current state (see Figures 4.9a1 and 4.9a2) are access and excavation restrictions, which prevent exposure to contaminants in soil①, and continuation of the PGDP Water Policy②. (Please see Section 4.1.1 for a discussion of the PGDP Water Policy.) Discharges to surface water are addressed under the potential end state alternative through natural attenuation④. Finally, a "hot spot" pump-and-treat③, which consists of extraction wells within the high TCE concentration areas of the Northwest and Northeast Dissolved-Phase Plumes, presently, is used to control the spread of high TCE concentration areas.

Risk Levels

Risk information is not available; however, risks are at *de minimis* levels because there are no complete pathways. Unmitigated risks could exceed *de minimis* levels under current conditions in many areas because the GDP is operating industrial facility.

4.9.2 Potential End State Alternative

This section focuses on the barriers and actions that may be used to achieve the potential end state alternative and the risks that may remain at the end state. Please see Section 4.9.1 for a discussion of sources and pathways of exposure.

Barriers and Actions

> **D&D at the PGDP**
>
> No decision documents have been completed for final D&D of the GDP; therefore, the final disposition of these facilities is unknown. During preparation of the End State Vision Document, stakeholders indicated that any D&D decisions should include consideration of options ranging from demolition and disposal to decontamination and reuse. (Please see the Stakeholder Input Appendix.)
>
> Although the end state discussed here is for demolition and disposal, this is a planning assumption and is not meant to preclude the consideration and implementation of other options. As noted earlier, the selection of specific actions will be made in the appropriate decision documents after receipt of stakeholder and public input, as required in accordance with applicable law and agreements.

Barriers to exposure at the end state (see Figures 4.9b1 and 4.9b2) are continued access and excavation restrictions, which prevents exposure to contaminants in soil①, and implementation of enhanced institutional controls⑤, which will limit access to and prevent use of groundwater. (Please see Section 4.1.2 for a discussion of enhanced institutional controls under the potential end state alternative.) Source actions are planned to meet the end state. These source actions include D&D of infrastructure with disposal in a potential on-site CERCLA Cell⑥ and excavation of soil with disposal in the potential CERCLA Cell⑦. Discharges to surface water currently are planned to be addressed through natural attenuation④, and monitored natural attenuation will be used to address contamination in source zones and groundwater⑧.

Under the potential end state alternative, receptors potentially exposed during implementation of the response actions (see Figure 4.9b3) are the general site worker, environmental sampler, remediation worker, and landfill worker; additionally, if off-site disposal is required, the transportation worker, disposal worker, and the public could be exposed. (Off-site disposal of wastes derived from D&D of the C-340 and C-410/420 Buildings is possible if the D&D occurs before the potential CERCLA Cell is constructed and operating.) The general site worker and ecological receptors could be exposed during infrastructure D&D, excavation of soil, and disposal of waste. The environmental sampler could be exposed during sampling activities. The remediation worker could be exposed during completion of infrastructure D&D and soil excavation. The landfill and disposal workers could be exposed while accepting D&D waste and soil. Finally, the transportation worker, public, and ecological receptors could be exposed during transportation of waste to an off-site disposal location.

Projected Risk Levels

At the end state, risks to all potential receptors would be at *de minimis* levels using barriers to prevent exposure and through removal of infrastructure and contaminated soil. The soil cleanup risk targets would be for an industrial worker risk of 1E-04. The PCB target would be 25 ppm. For soils, attainment of the target risk will be determined using the average contaminant concentration (defined as the 95% upper confidence limit of the mean concentration) within the exposure unit appropriate for the area’s land use. Similarly, the PCB concentration target in soil will be the average concentration within the exposure unit. Because contamination in groundwater would continue to exist at levels above MCLs, monitored natural attenuation would be required for groundwater until MCLs are met.

THIS PAGE INTENTIONALLY LEFT BLANK

FIGURES

THIS PAGE INTENTIONALLY LEFT BLANK

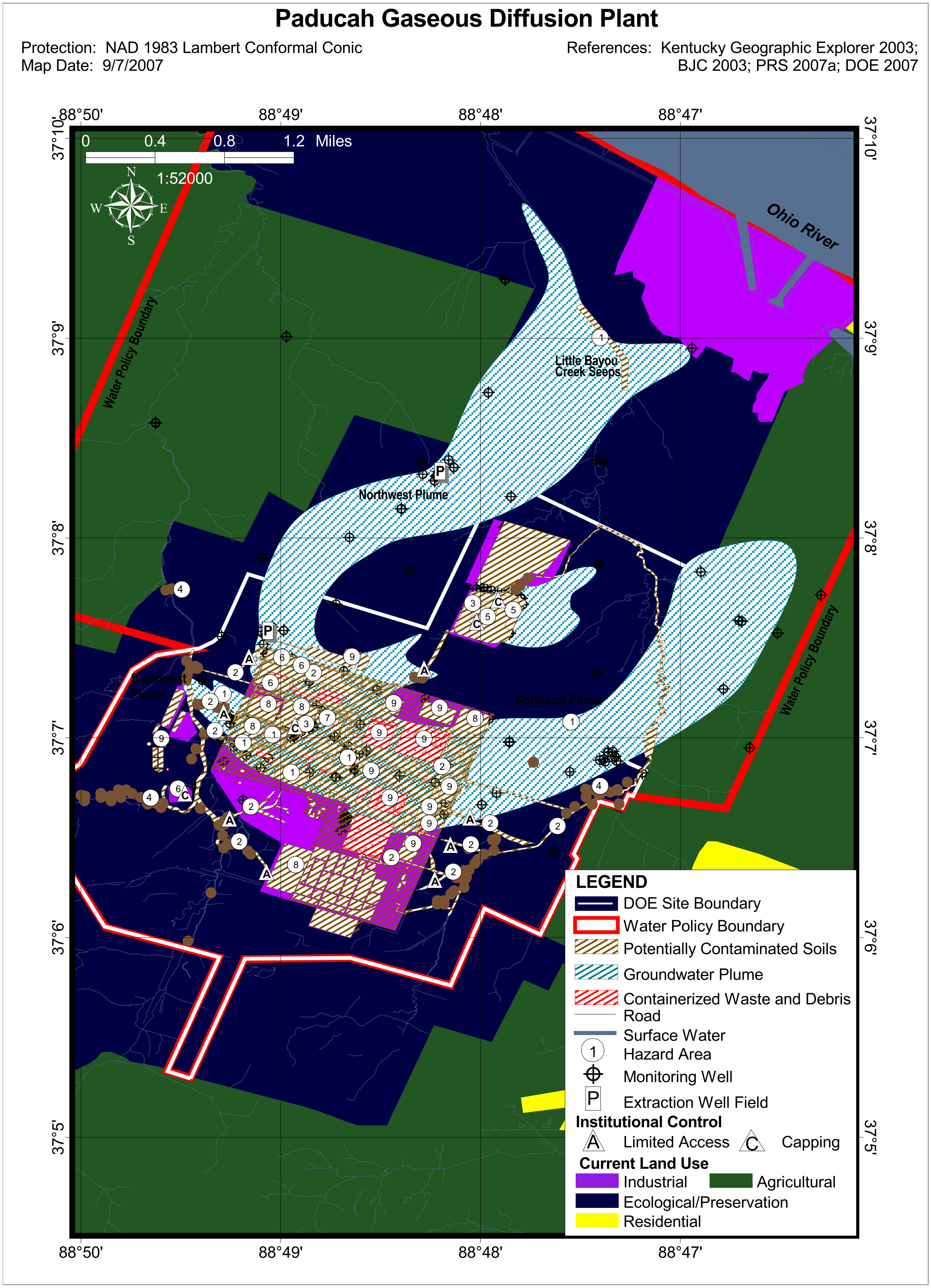


Figure 4.0a1. Hazard Areas - Current State

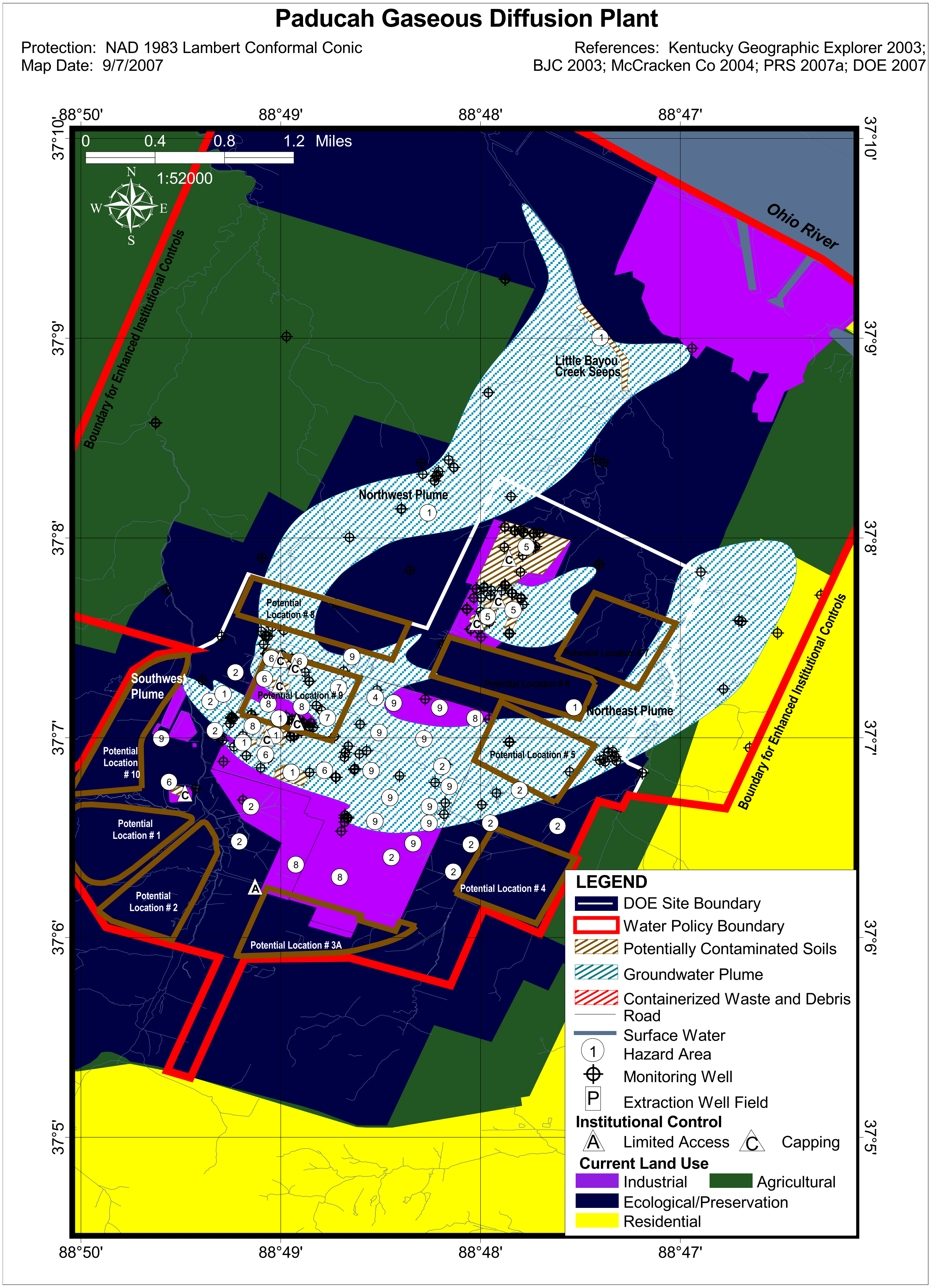


Figure 4.0b1. Hazard Areas - Potential End State Alternative

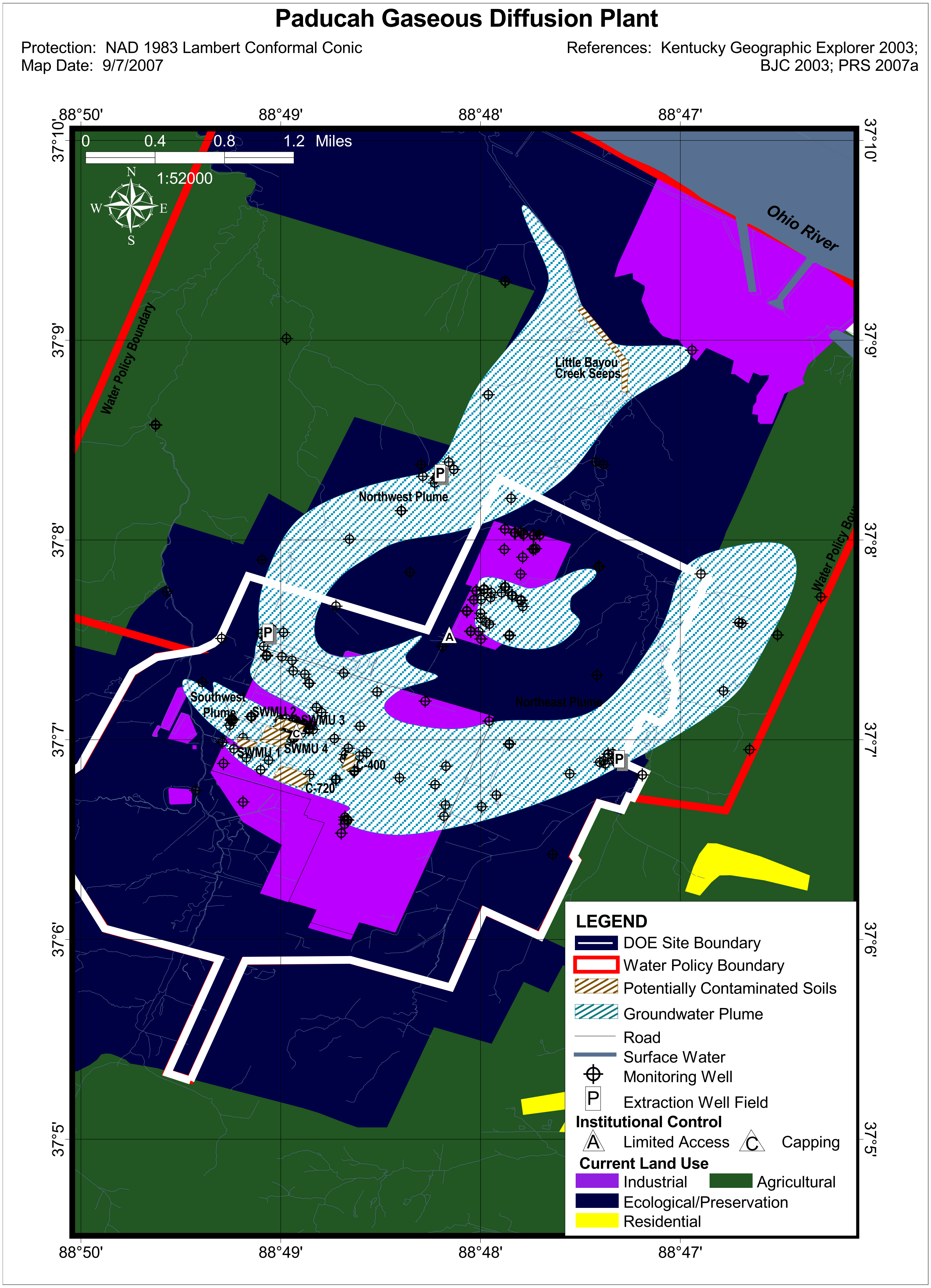
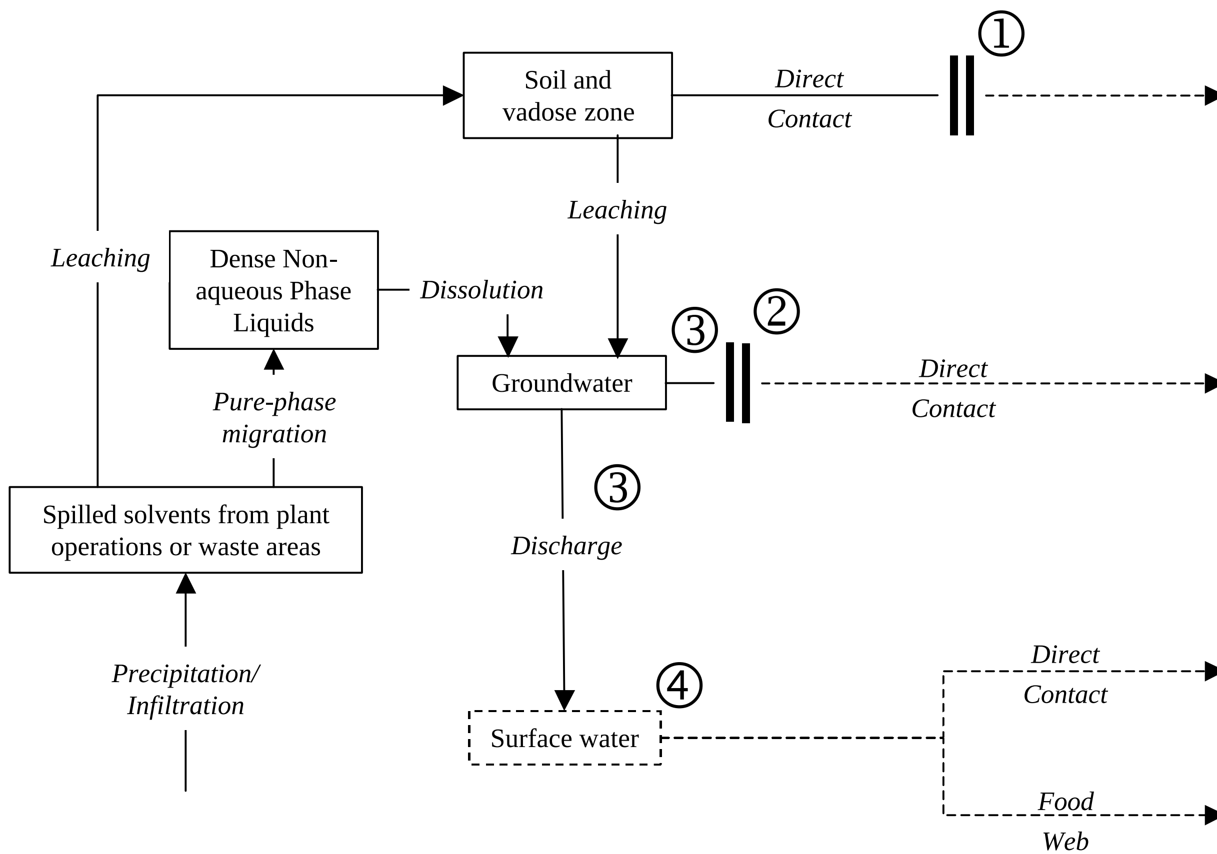


Figure 4.1a1. Hazard Area 1: GWOU - Current State

Hazard Area 1: Groundwater Operable Unit – Current State



Potential Receptor Exposed			
Worker	Resident	Visitor	Ecological
R/F/D/I			
R/F/D/I	F/D/I		
F/D/I		F/D/I	F/D/I
	F	F	F

Current Controls or Actions
① Access and excavation restrictions.
② PGDP Water Policy.
③ "Hot spot" pump-and-treat.
④ Attenuation

Receptor Key
Worker – includes workers exposed during inside and outside activities, including the remediation worker.
Resident – includes residents engaged in all but recreation activities.
Visitor – includes recreational users, intruders, and trespassers.
Ecological – includes on- and off-site aquatic and terrestrial ecological receptors.

Exposure Route Key
R = External Exposure
F = Ingestion
D = Dermal
I = Inhalation

Figure 4.1a2. Hazard Area 1: GWOU CSM – Current State

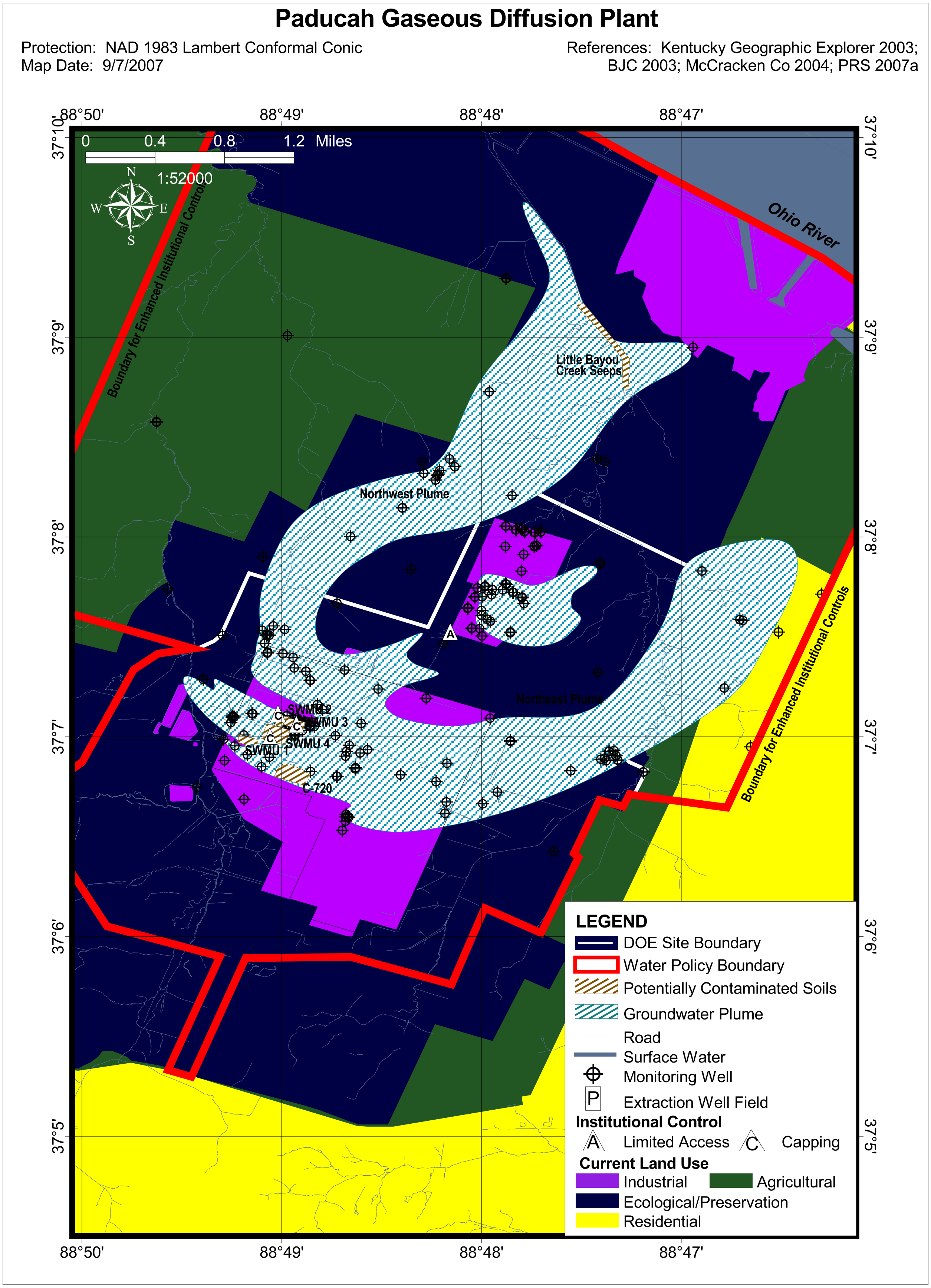
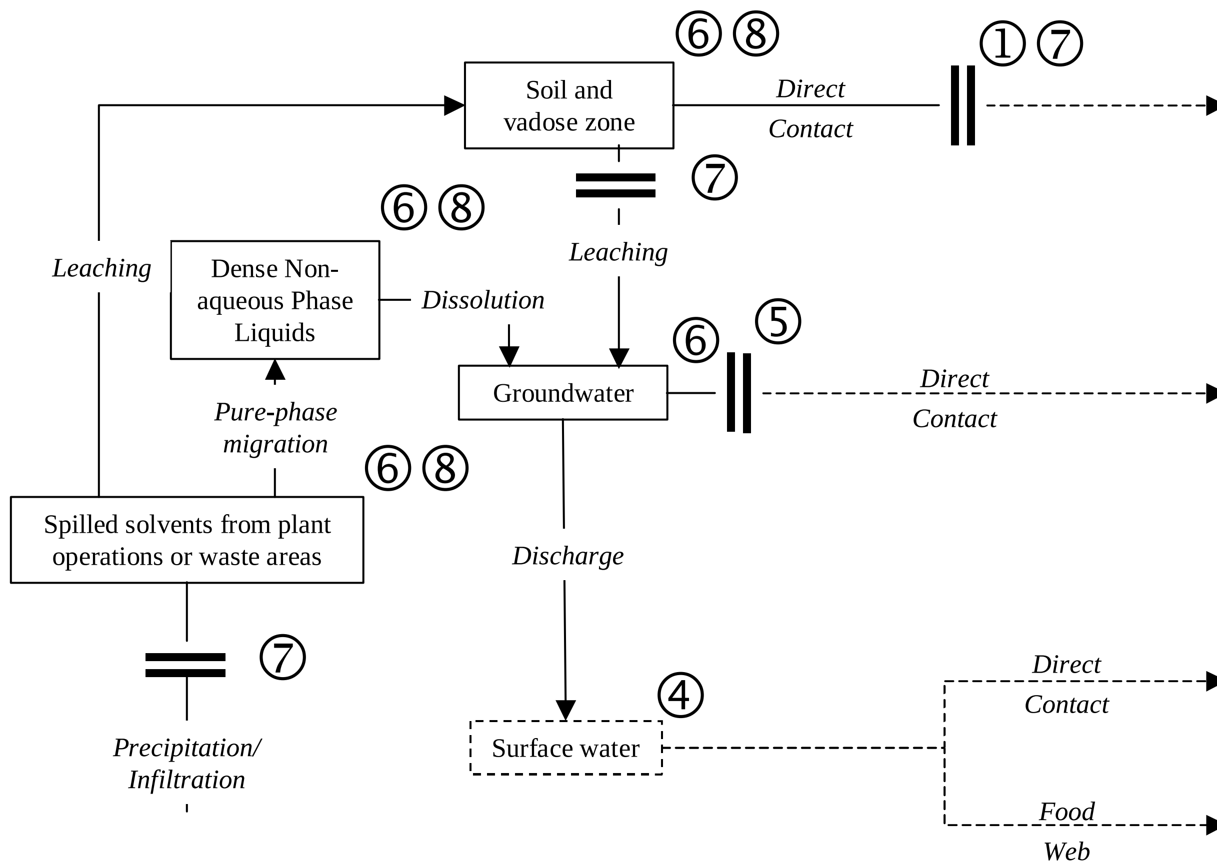


Figure 4.1b1. Hazard Area 1: GWOU - Potential End State Alternative

Hazard Area 1: Groundwater Operable Unit – Potential End State Alternative



Potential Receptor Exposed			
Worker	Resident	Visitor	Ecological
R/F/D/I			
R/F/D/I	F/D/I		
F/D/I		F/D/I	F/D/I
	F	F	F

<u>RBES Controls or Actions</u>
① Access and excavation restrictions.
④ Attenuation.
⑤ Enhanced institutional controls to limit access and use of groundwater.
⑥ Monitored natural attenuation of sources and dissolved phase plume.
⑦Cap at burial grounds.
⑧ Source reduction/removal.

<u>Receptor Key</u>
Worker – includes workers exposed during inside and outside activities, including the remediation worker.
Resident – includes residents engaged in all but recreation activities.
Visitor – includes recreational users, intruders, and trespassers.
Ecological – includes on- and off-site aquatic and terrestrial ecological receptors.

<u>Exposure Route Key</u>
R = External Exposure
F = Ingestion
D = Dermal
I = Inhalation

Figure 4.1b2. Hazard Area 1: GWOU CSM - Potential End State Alternative

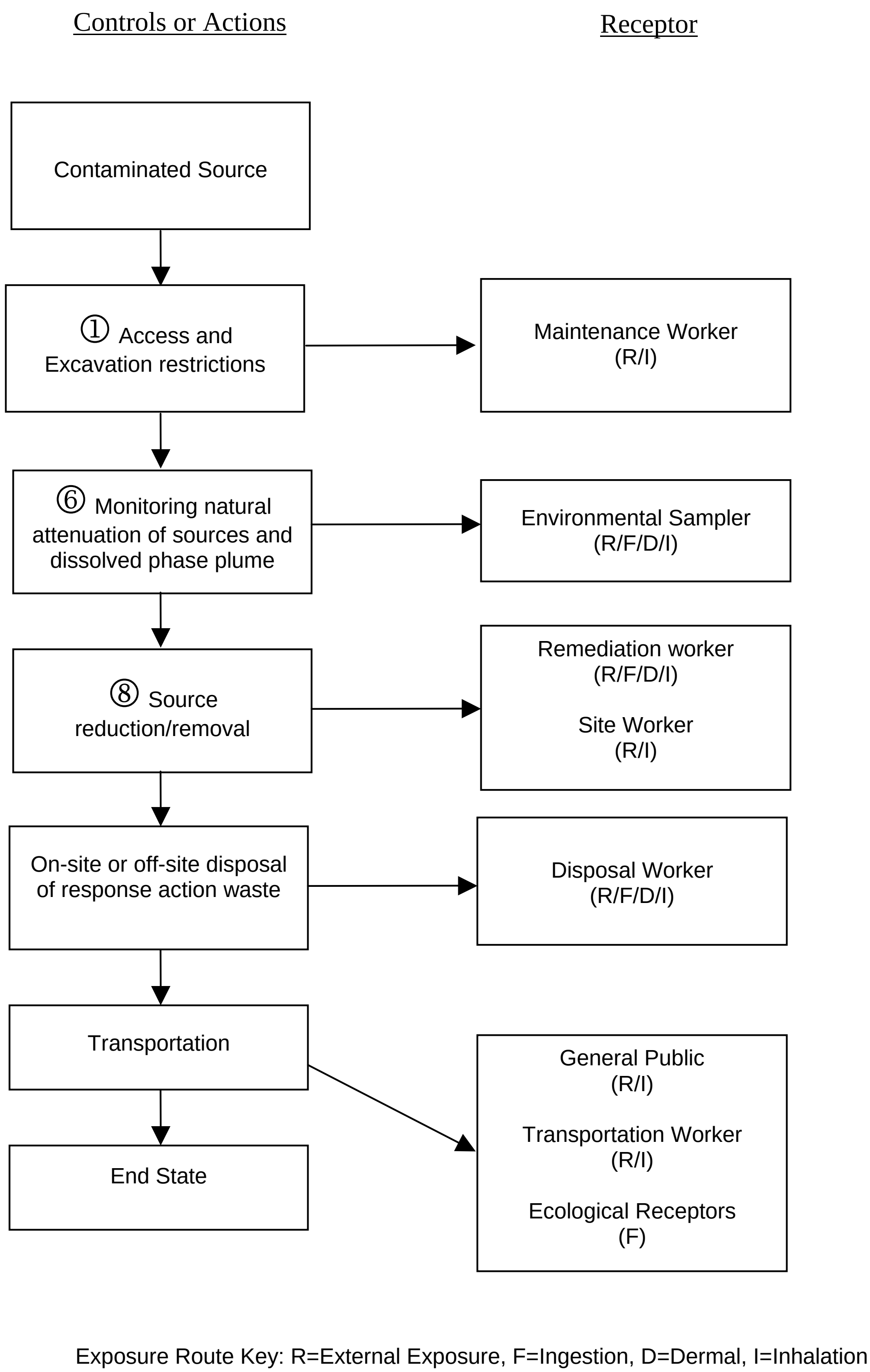


Figure 4.1b3. Hazard Area 1 GWOU Treatment Train –Potential End State Alternative

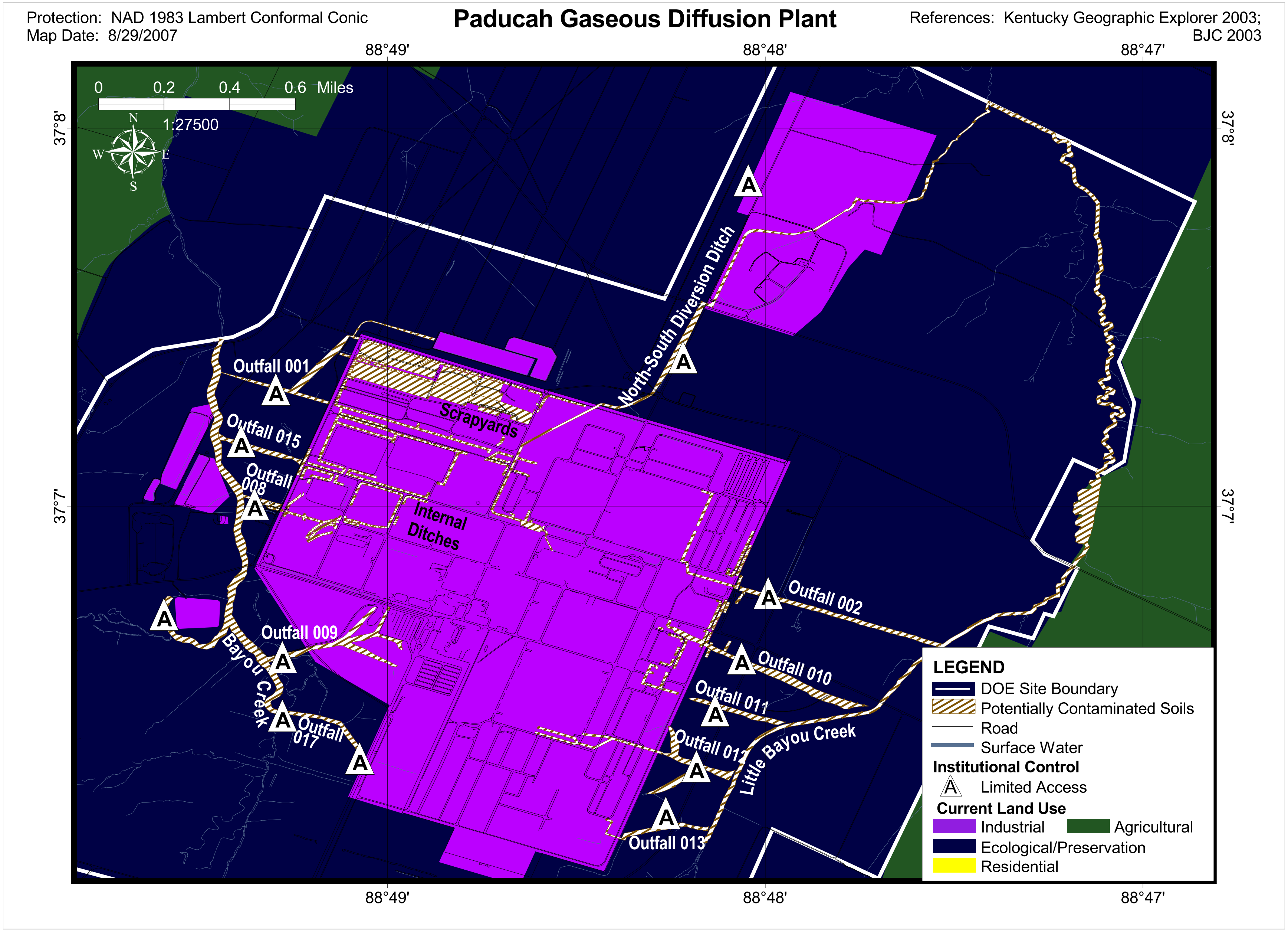
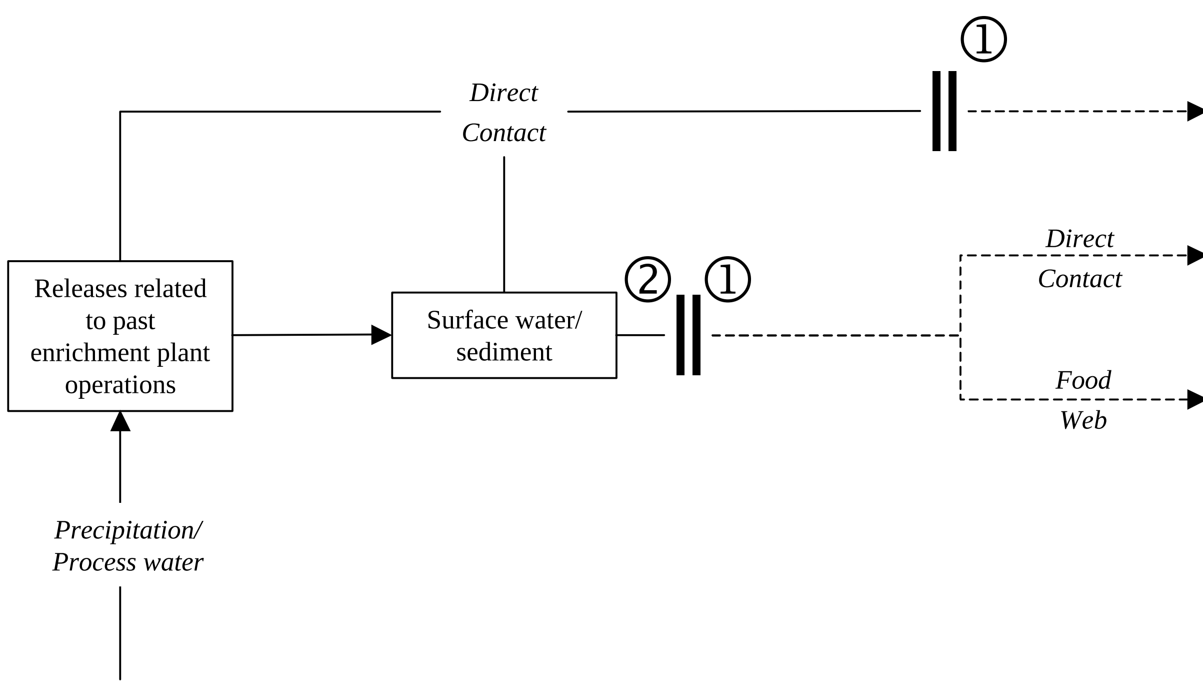


Figure 4.2a1. Hazard Area 2: SWOU - Current State

Hazard Area 2: Surface Water Operable Unit – Current State



Potential Receptor Exposed			
Worker	Resident	Visitor	Ecological
R/F/D/I		R/F/D/I	R/F/D/I
F/D/I		F/D/I	F/D/I
	F	F	F

Current Controls and Action
① Access and use restrictions/posted warnings.
② Environmental monitoring.

Receptor Key
Worker – includes workers exposed during inside and outside activities, including the remediation worker.
Resident – includes residents engaged in all but recreation activities.
Visitor – includes recreational users, intruders, and trespassers.
Ecological – includes on- and off-site aquatic and terrestrial ecological receptors.

Exposure Route Key
R = External Exposure
F = Ingestion
D = Dermal
I = Inhalation

Figure 4.2a2. Hazard Area 2: SWOU CSM – Current State

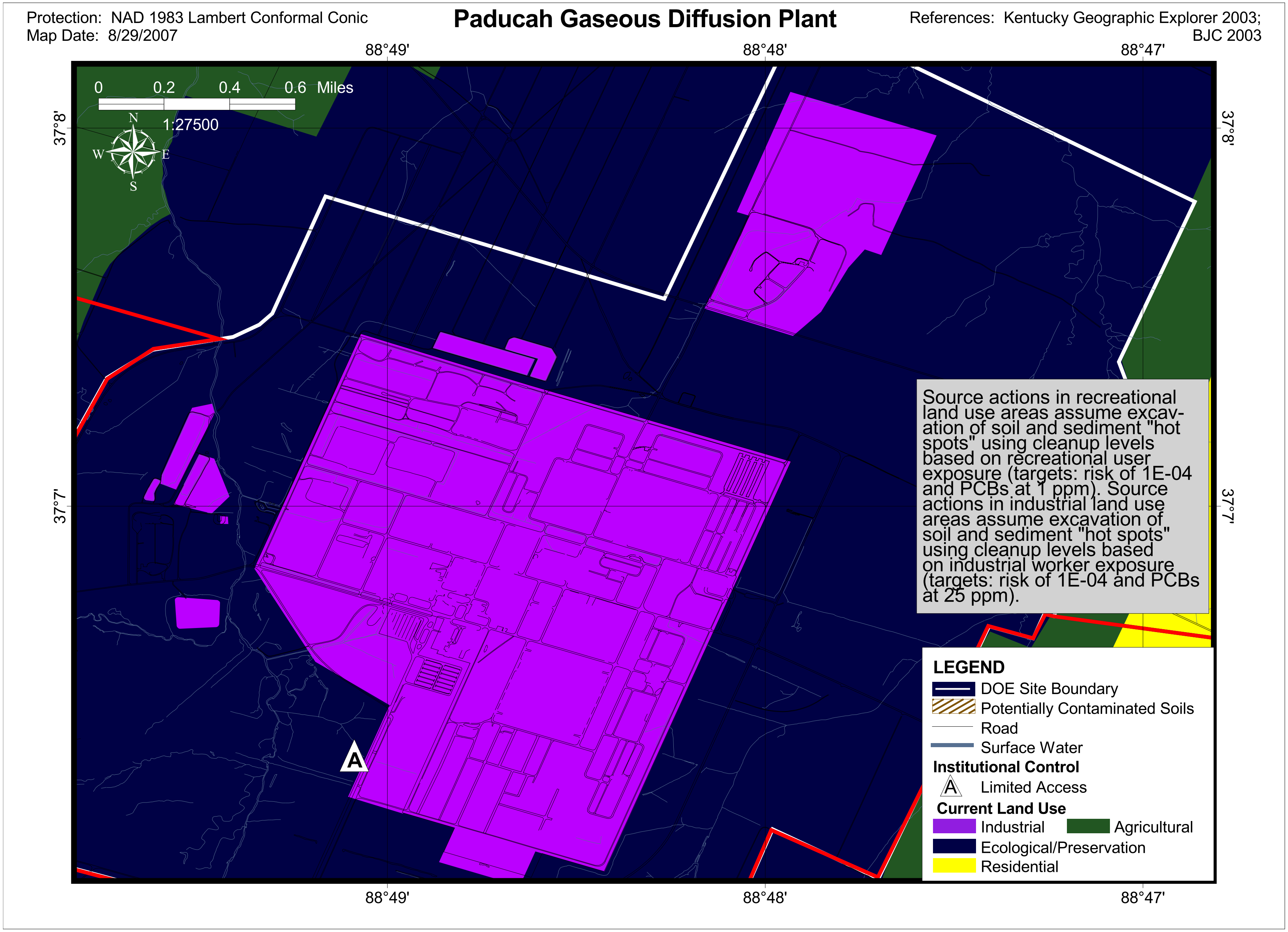
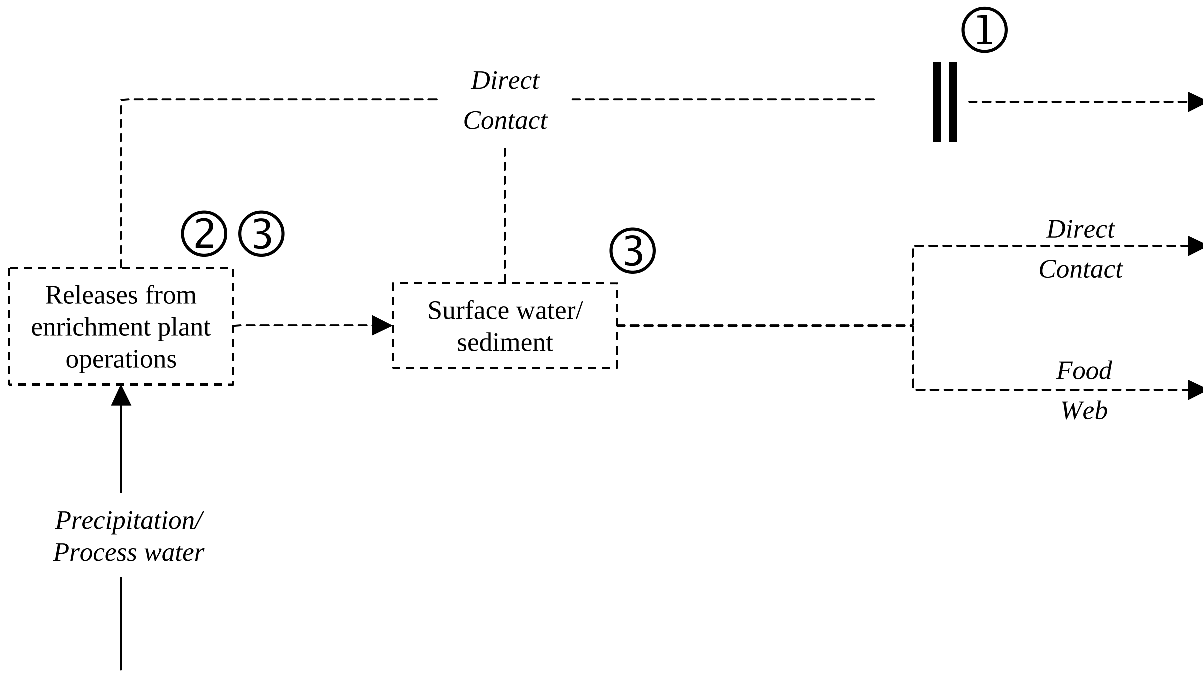


Figure 4.2b1. Hazard Area 2: SWOU - Potential End State Alternative

Hazard Area 2: Surface Water Operable Unit – Potential End State Alternative



Potential Receptor Exposed			
Worker	Resident	Visitor	Ecological
R/F/D/I		R/F/D/I	R/F/D/I
F/D/I		F/D/I	F/D/I
	F	F	F

RBES Controls and Action
① Access restrictions.
② Environmental monitoring.
③ Scrap removal and excavation of "hot spots" (target in industrial areas based on average exposure over entire unit: worker risk of 1E-04, PCBs at 25 ppm; target in recreational areas: recreational user risk of 1E-04, PCBs at 1ppm).

Receptor Key
Worker – includes workers exposed during inside and outside activities, including the remediation worker.
Resident – includes residents engaged in all but recreation activities.
Visitor – includes recreational users, intruders, and trespassers.
Ecological – includes on- and off-site aquatic and terrestrial ecological receptors.

Exposure Route Key
R = External Exposure
F = Ingestion
D = Dermal
I = Inhalation

Figure 4.2b2. Hazard Area 2: SWOU CSM – Potential End State Alternative

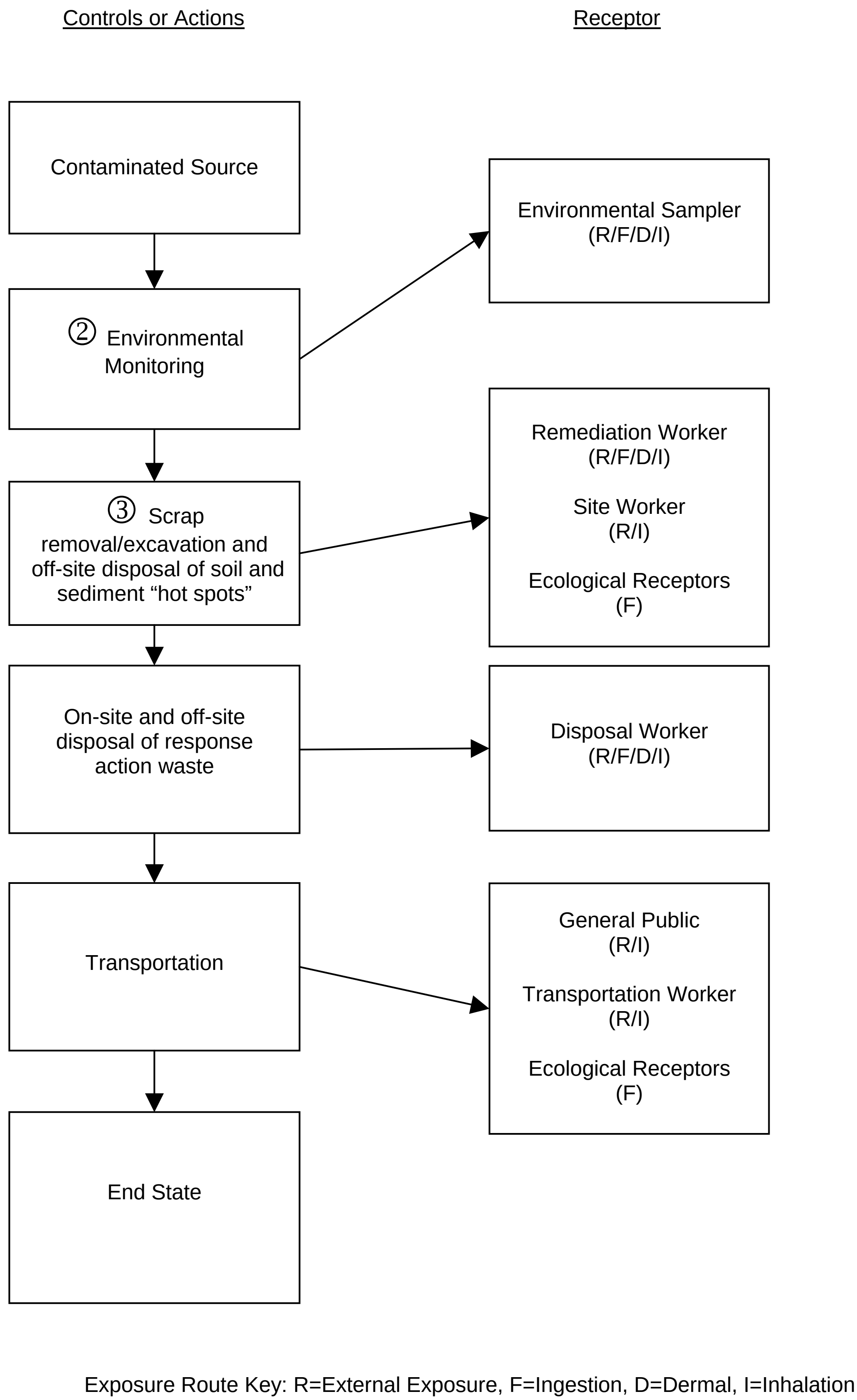


Figure 4.2b3. Hazard Area 2 SWOU Treatment Train – Potential End State Alternative

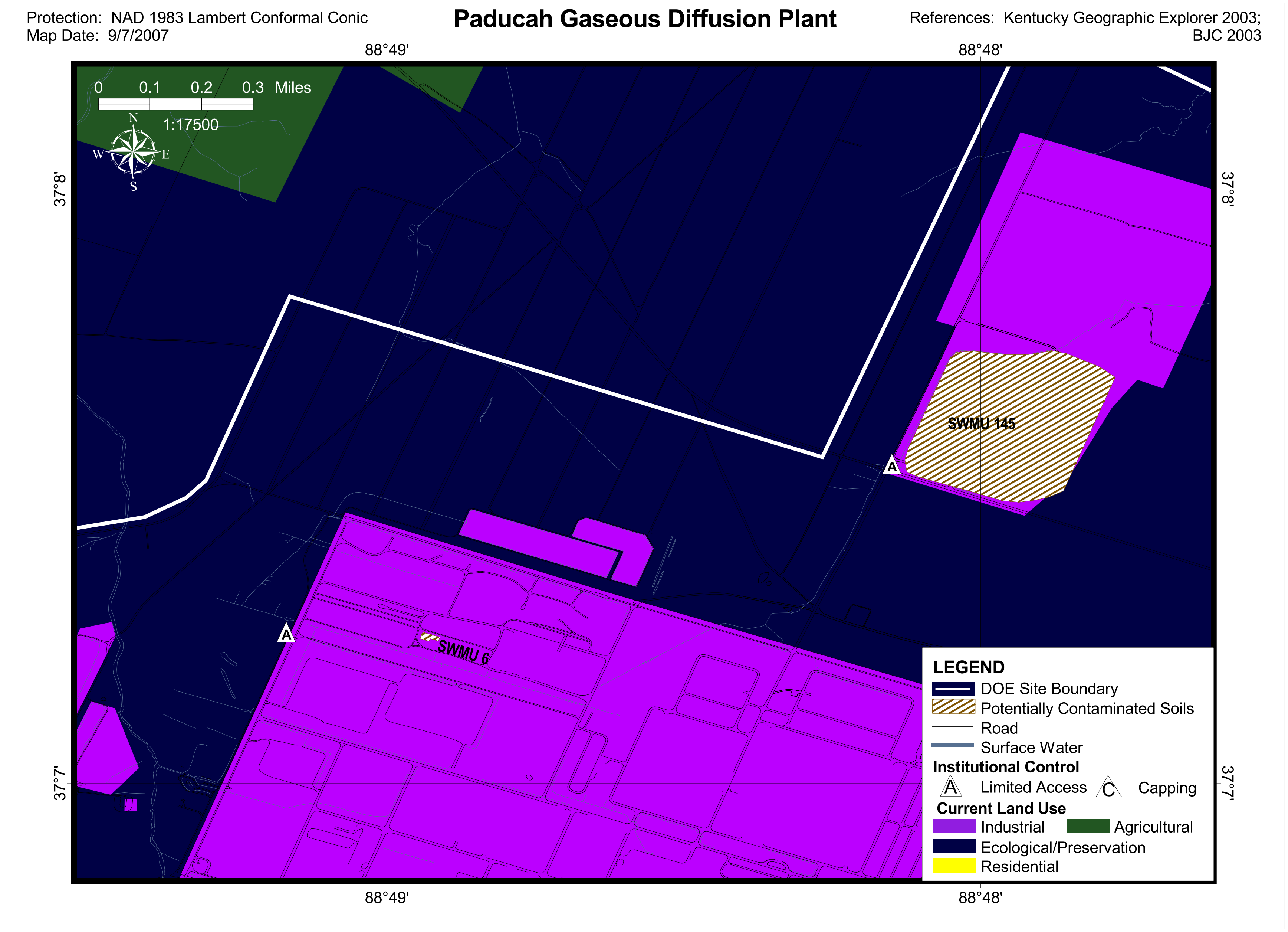
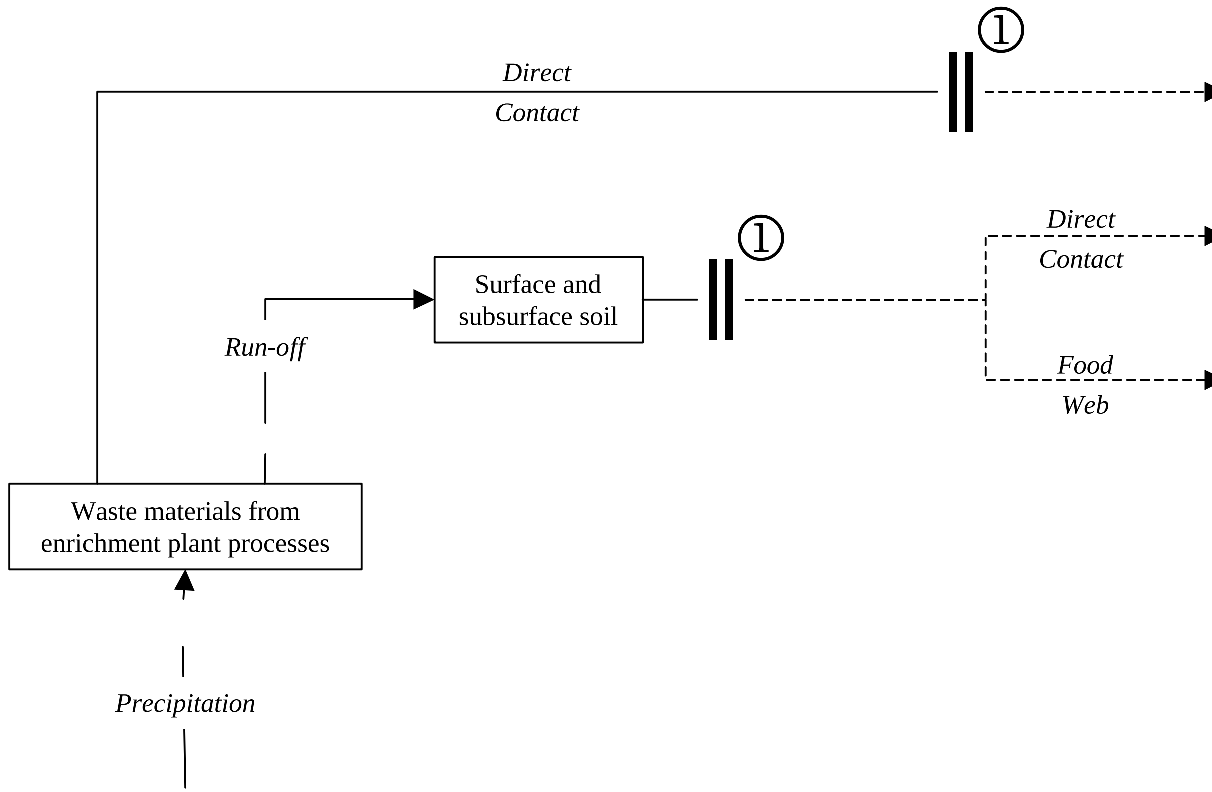


Figure 4.3a1. Hazard Area 3: BGOU (Group 1) - Current State

Hazard Area 3: Burial Grounds Operable Unit (Group 1) – Current State



Potential Receptor Exposed			
Worker	Resident	Visitor	Ecological
R/F/D/I		R/F/D/I	R/F/D/I
R/F/D/I		R/F/D/I	R/F/D/I
			F

Current Controls and Actions
① Access and excavation restrictions.

Receptor Key
Worker – includes workers exposed during inside and outside activities, including the remediation worker.
Resident – includes residents engaged in all but recreation activities.
Visitor – includes recreational users, intruders, and trespassers.
Ecological – includes on- and off-site aquatic and terrestrial ecological receptors.

Exposure Route Key
R = External Exposure
F = Ingestion
D = Dermal
I = Inhalation

Figure 4.3a2. Hazard Area 3: BGOU (Group 1) CSM – Current State

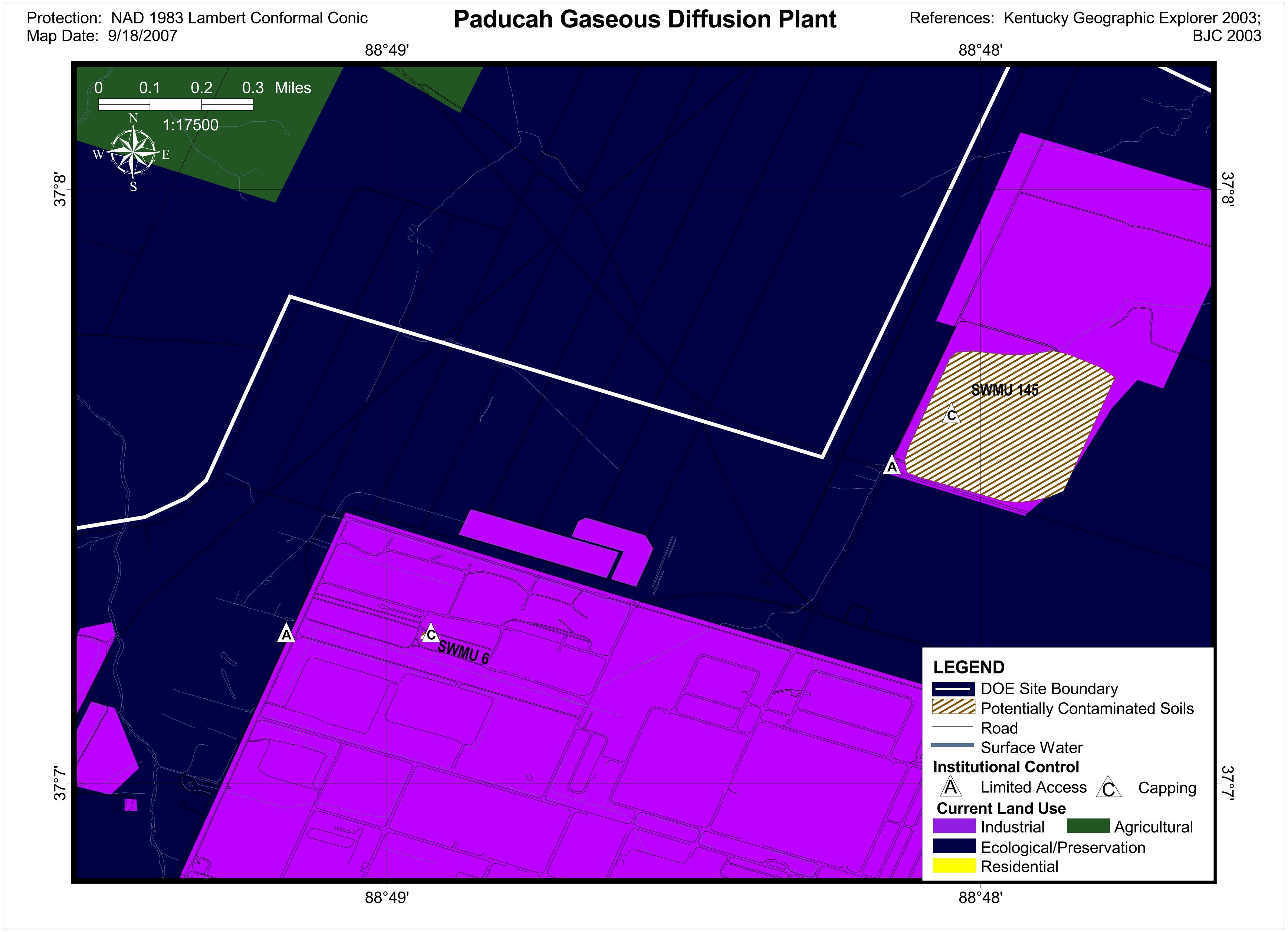
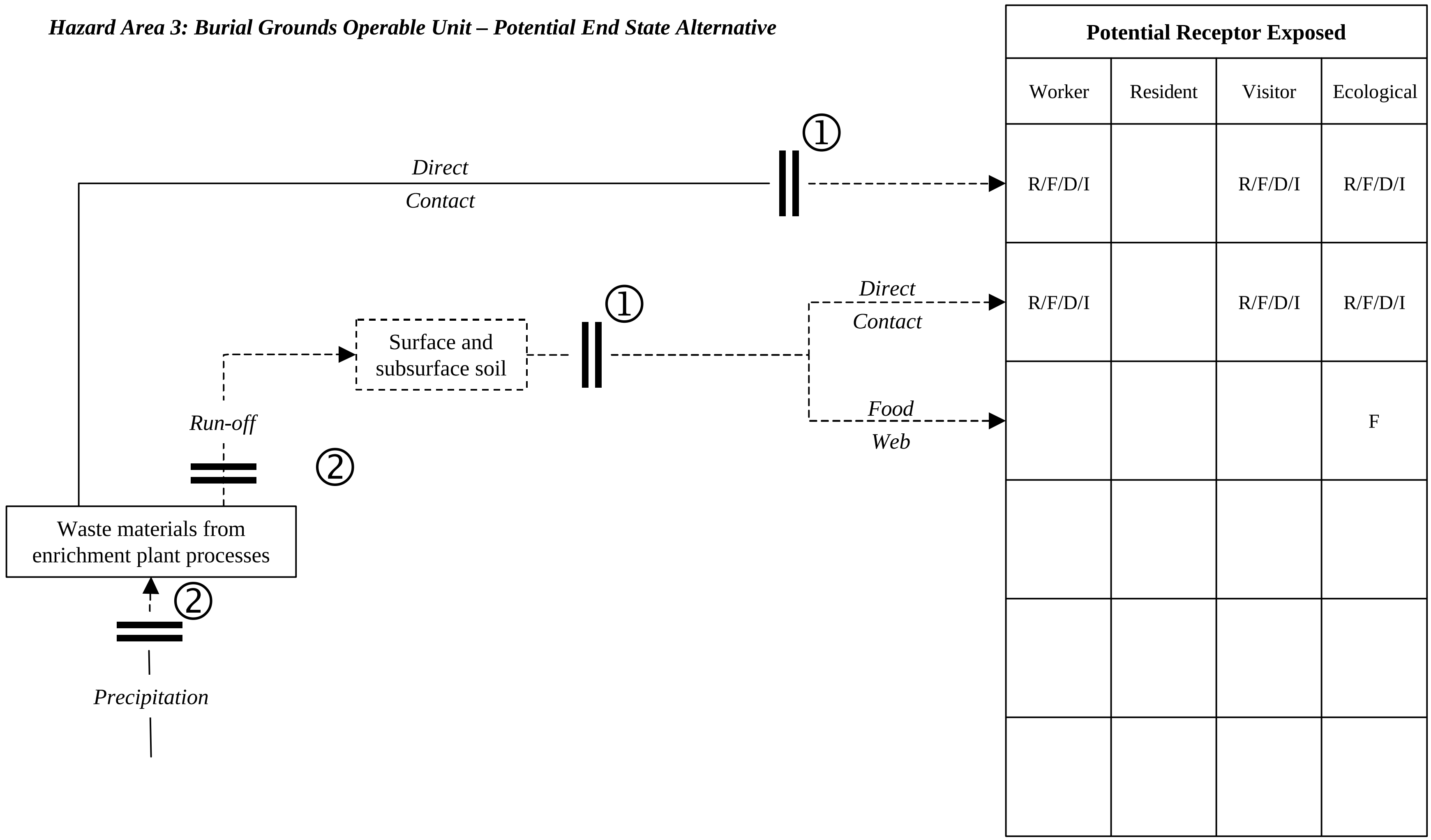


Figure 4.3b1. Hazard Area 3: BGOU (Group 1) - Potential End State Alternative

Hazard Area 3: Burial Grounds Operable Unit – Potential End State Alternative



<u>RBES Controls and Actions</u>
① Access and excavation restrictions.
② Capping.

<u>Receptor Key</u>
Worker – includes workers exposed during inside and outside activities, including the remediation worker.
Resident – includes residents engaged in all but recreation activities.
Visitor – includes recreational users, intruders, and trespassers.
Ecological – includes on- and off-site aquatic and terrestrial ecological receptors.

<u>Exposure Route Key</u>
R = External Exposure
F = Ingestion
D = Dermal
I = Inhalation

Figure 4.3b2. Hazard Area 3: BGOU (Group 1) CSM – Potential End State Alternative

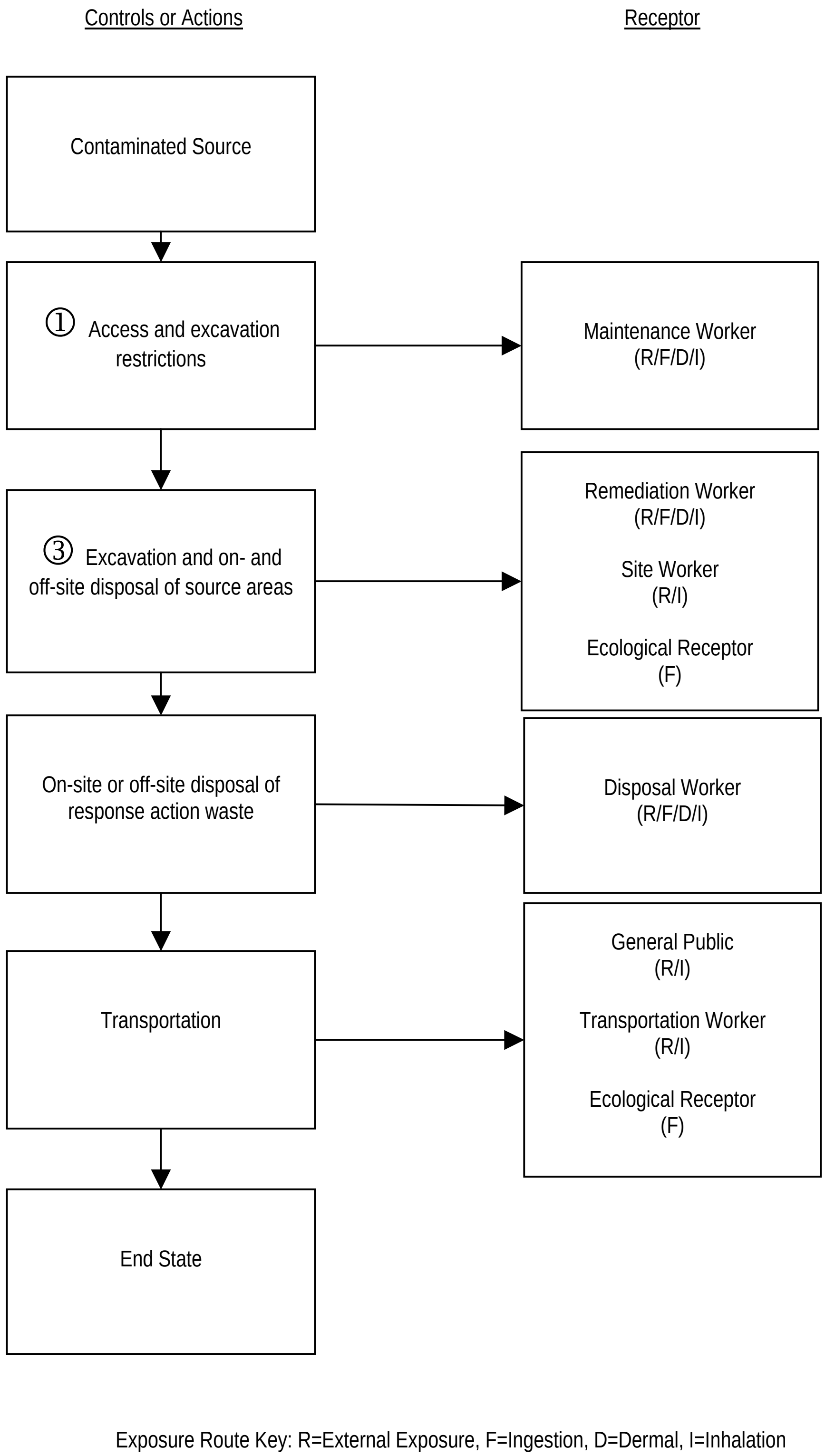


Figure 4.3b3. Hazard Area 3: BGOU (Group 1) Treatment Train – Potential End State Alternative

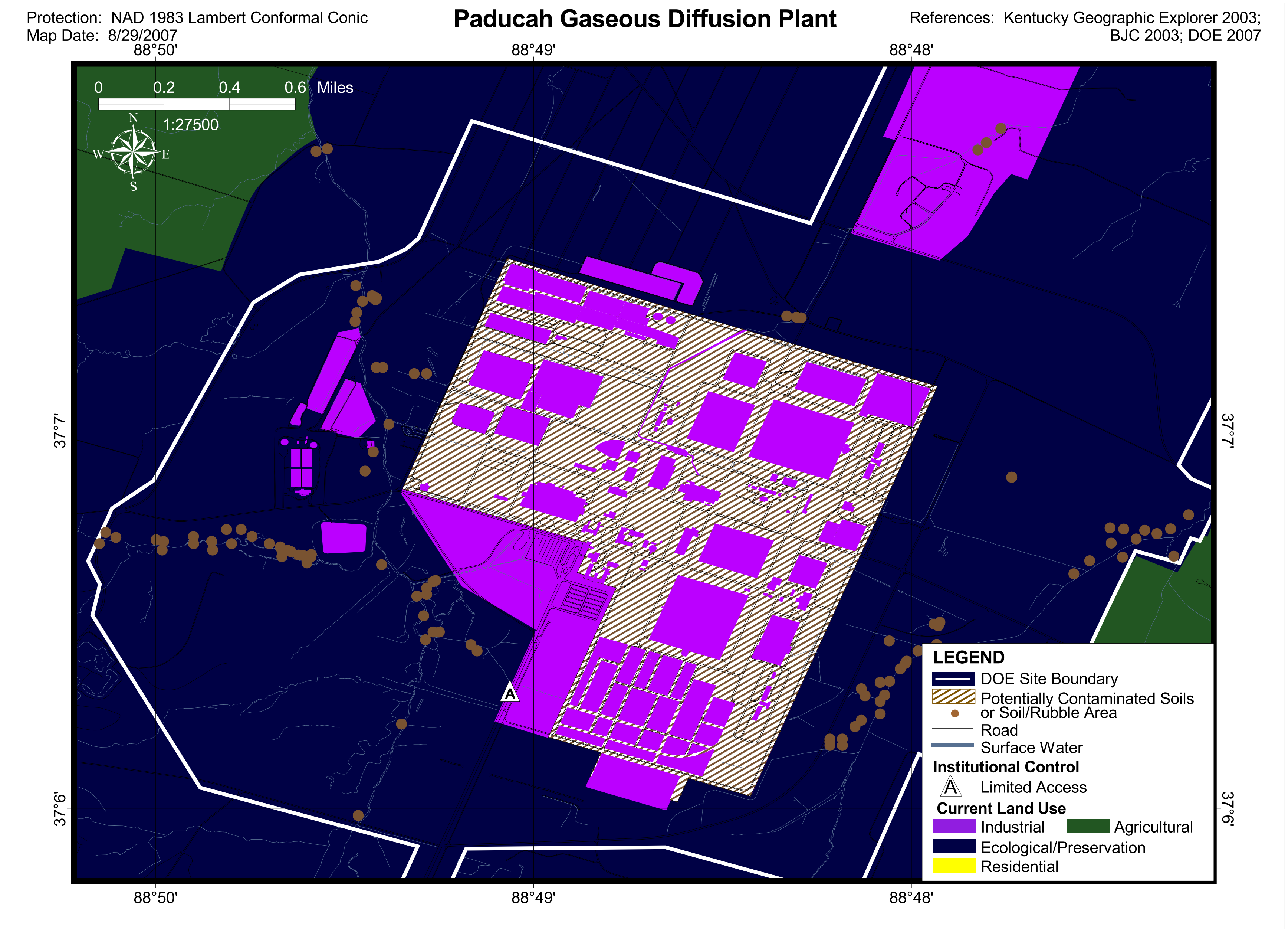
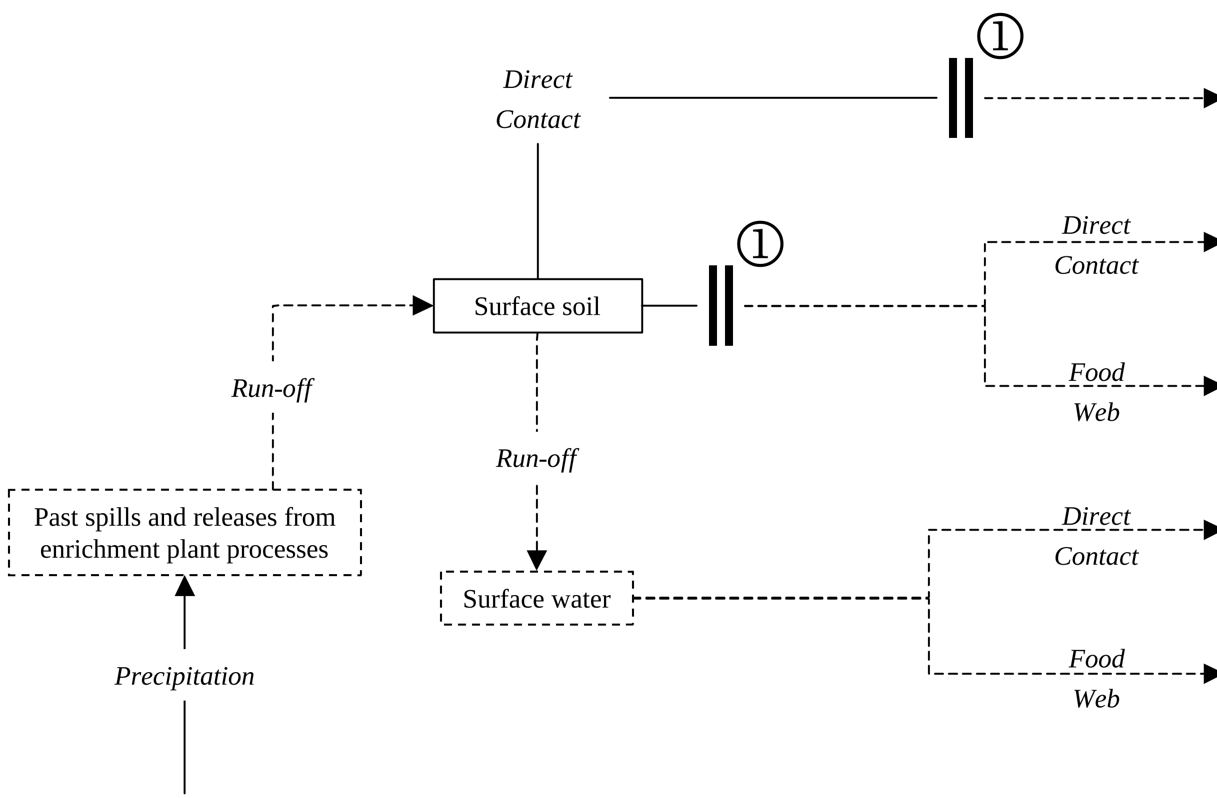


Figure 4.4a1. Hazard Area 4: SOU - Current State

Hazard Area 4: Surface Soils Operable Unit – Current State



Potential Receptor Exposed			
Worker	Resident	Visitor	Ecological
R/F/D/I		R/F/D/I	R/F/D/I
R/F/D/I		R/F/D/I	R/F/D/I
	F	F	F
F/D/I		F/D/I	F/D/I
	F	F	F

Current Controls and Actions
① Access and excavation restrictions.

Receptor Key
Worker – includes workers exposed during inside and outside activities, including the remediation worker.
Resident – includes residents engaged in all but recreation activities.
Visitor – includes recreational users, intruders, and trespassers.
Ecological – includes on- and off-site aquatic and terrestrial ecological receptors.

Exposure Route Key
R = External Exposure
F = Ingestion
D = Dermal
I = Inhalation

Figure 4.4a2. Hazard Area 4: SOU CSM – Current State

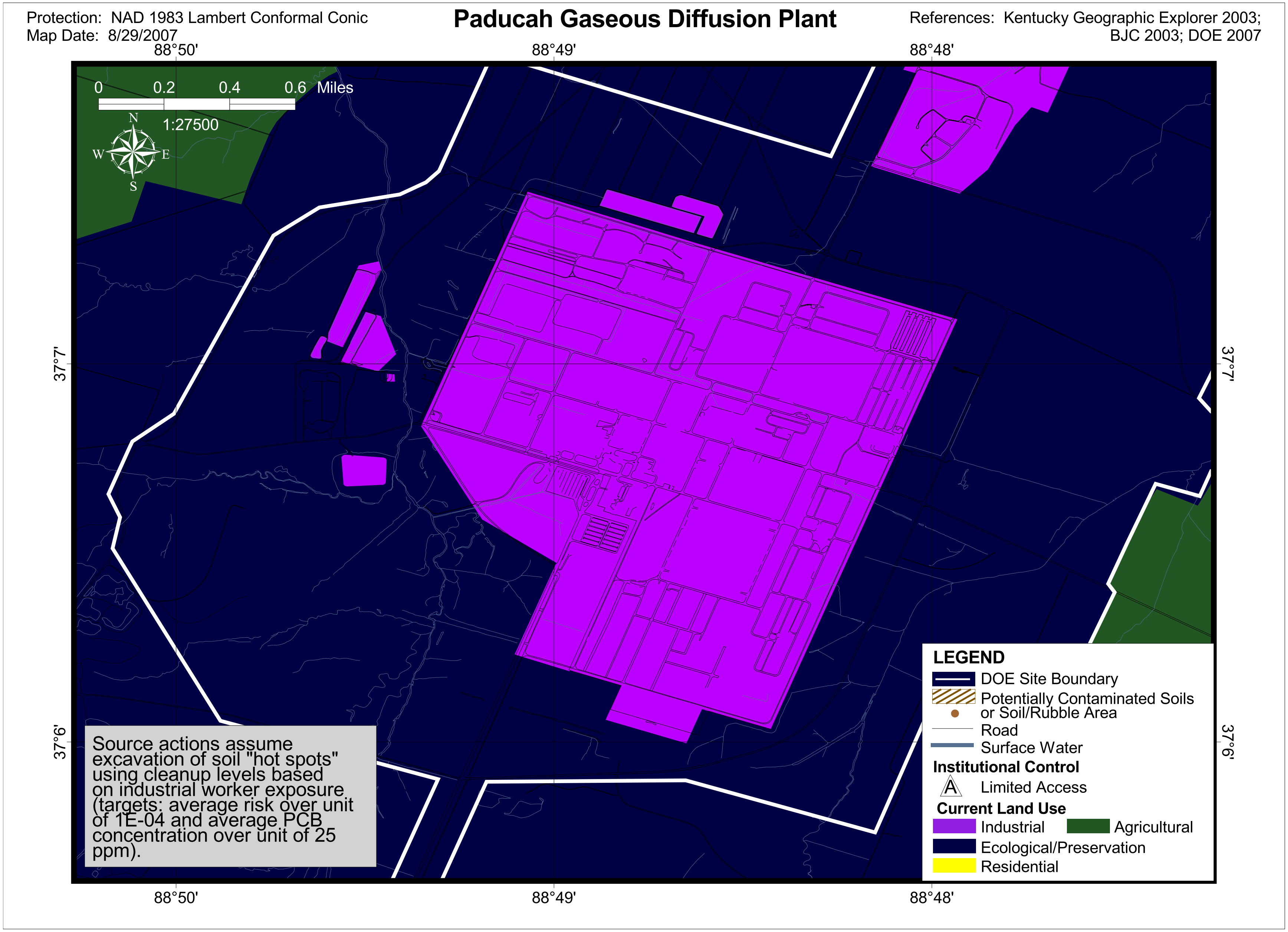
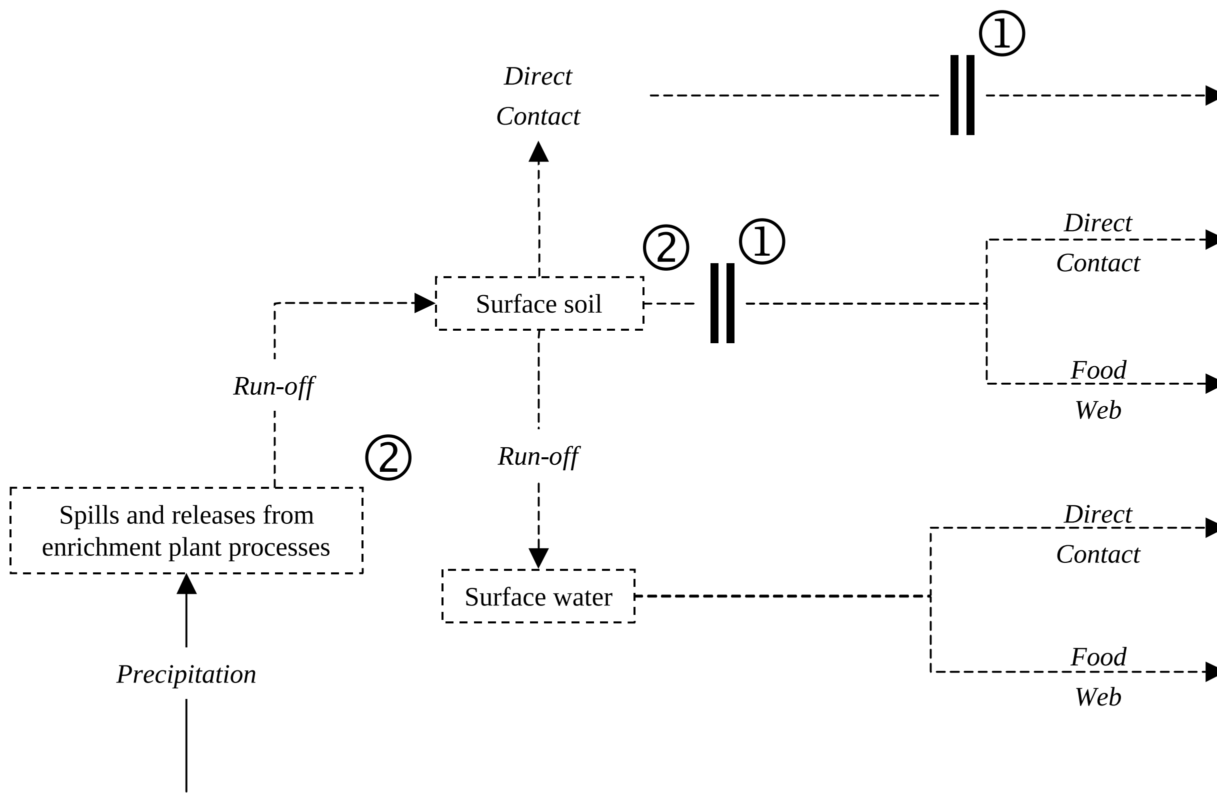


Figure 4.4b1. Hazard Area 4: SOU - Potential End State Alternative

Hazard Area 4: Surface Soils Operable Unit – Potential End State Alternative



Potential Receptor Exposed			
Worker	Resident	Visitor	Ecological
R/F/D/I		R/F/D/I	R/F/D/I
R/F/D/I		R/F/D/I	R/F/D/I
	F	F	F
F/D/I		F/D/I	F/D/I
	F	F	F

RBES Controls and Actions
① Access and excavation restrictions.
② Excavation of "hot spots" (target based on average exposure over entire unit: worker risk of 1E-04, PCBs at 25 ppm).

Receptor Key
Worker – includes workers exposed during inside and outside activities, including the remediation worker.
Resident – includes residents engaged in all but recreation activities.
Visitor – includes recreational users, intruders, and trespassers.
Ecological – includes on- and off-site aquatic and terrestrial ecological receptors.

Exposure Route Key
R = External Exposure
F = Ingestion
D = Dermal
I = Inhalation

Figure 4.4b2. Hazard Area 4: SOU CSM – Potential End State Alternative

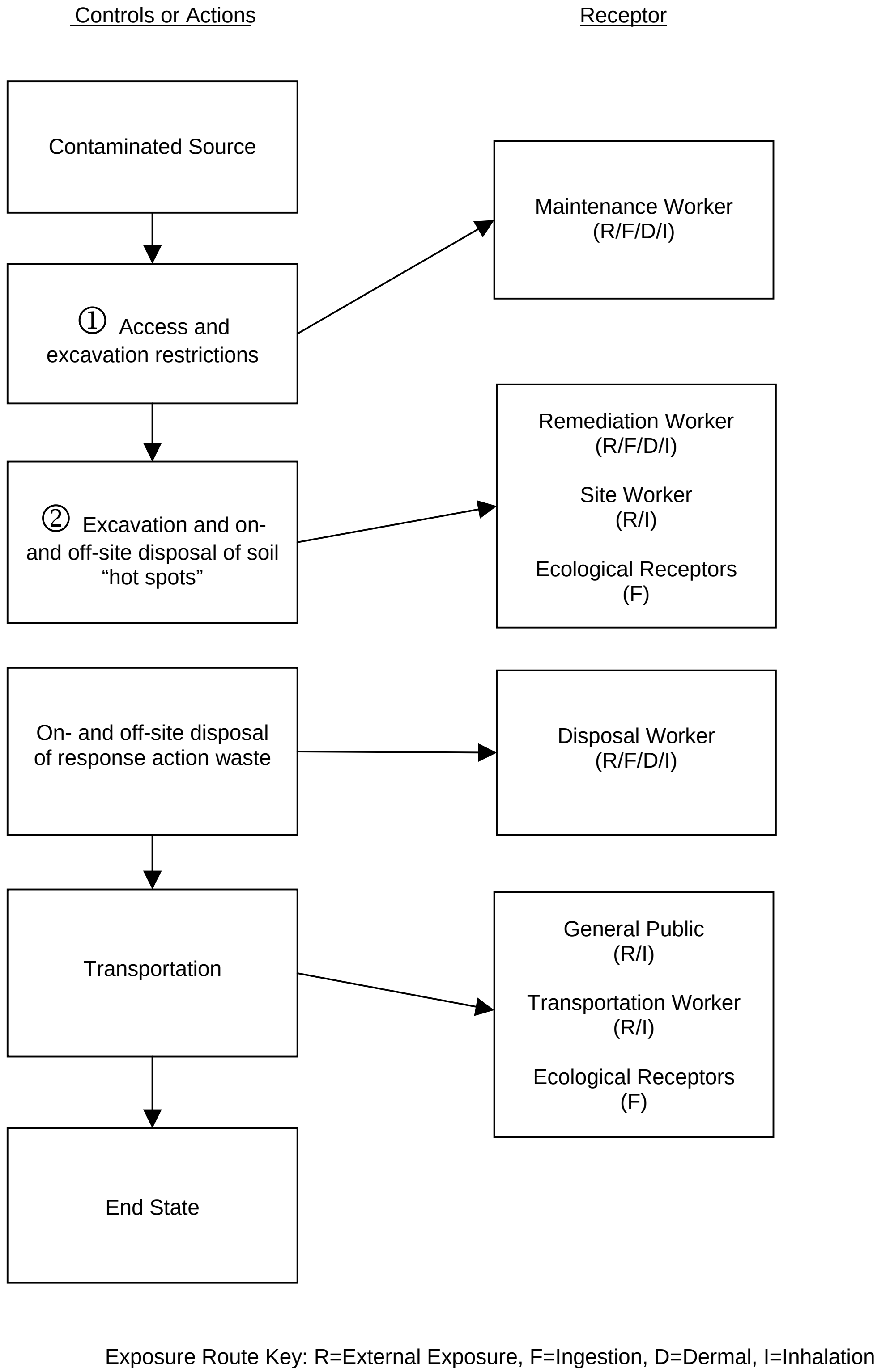


Figure 4.4b3. Hazard Area 4: SOU Treatment Train – Potential End State Alternative

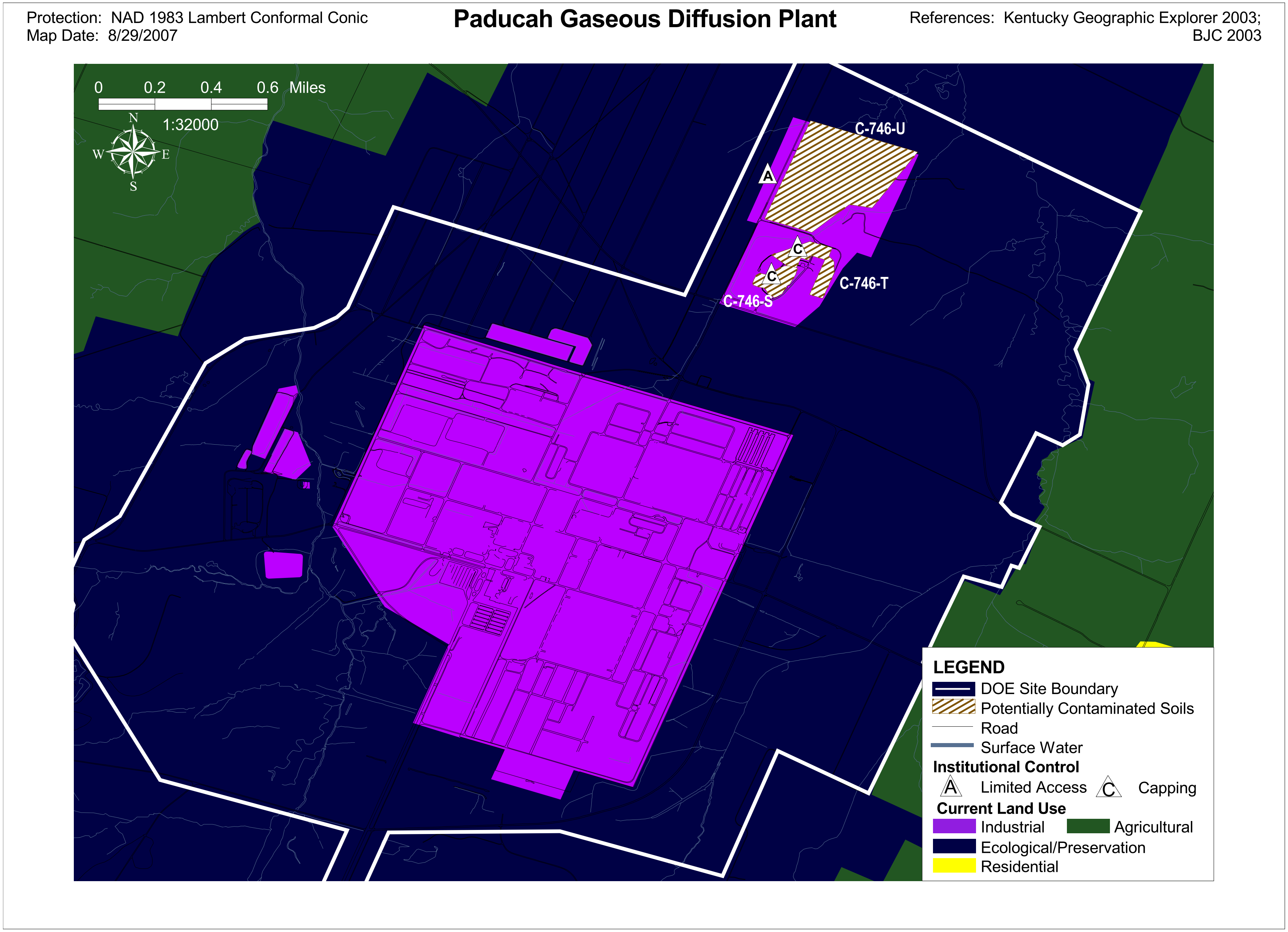
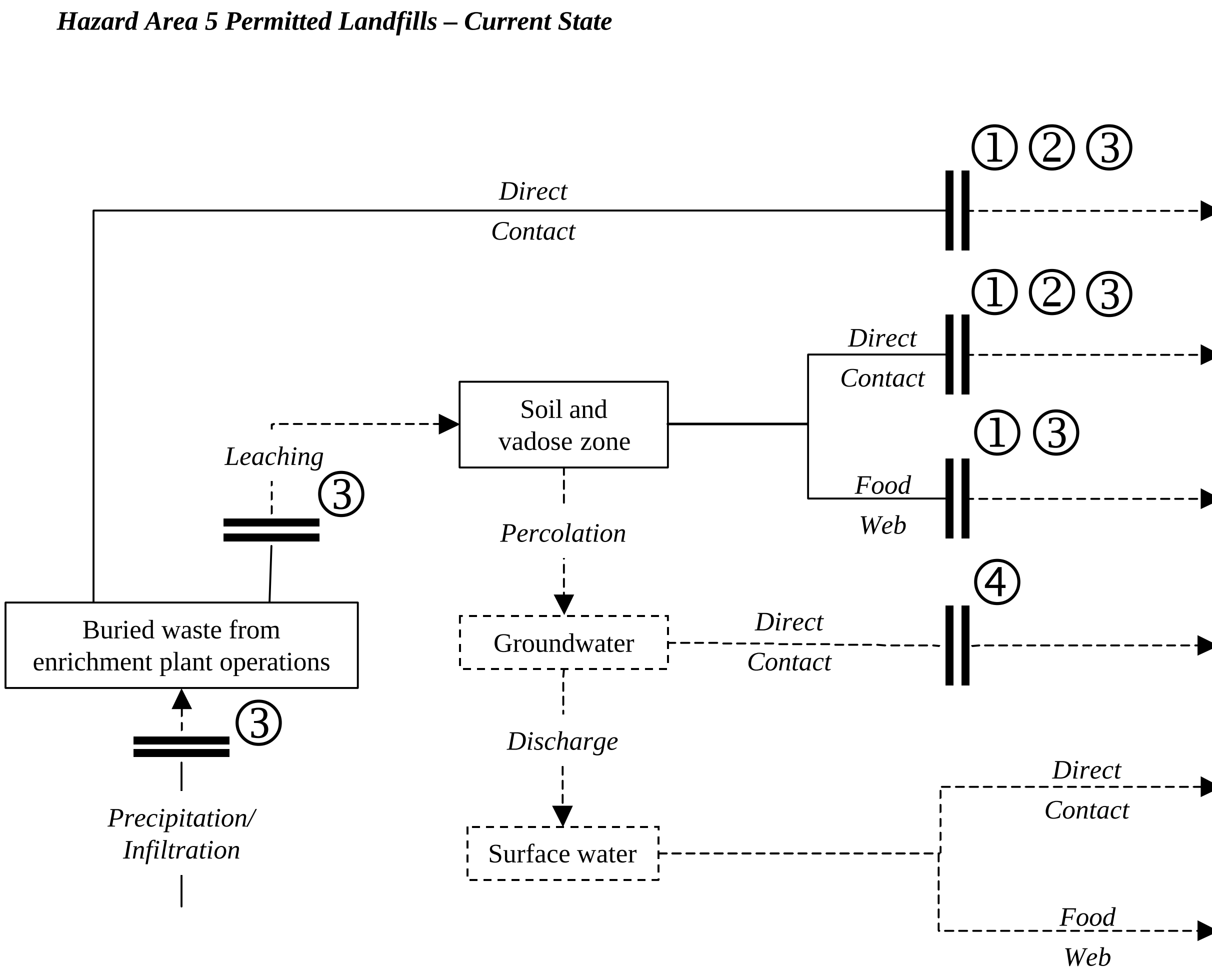


Figure 4.5a1. Hazard Area 5: Permitted Landfills - Current State



Potential Receptor Exposed			
Worker	Resident	Visitor	Ecological
R/F/D/I		R/F/D/I	R/F/D/I
R/F/D/I		R/F/D/I	R/F/D/I
		F	F
R/F/D/I	R/F/D/I		
F/D/I		F/D/I	F/D/I
	F	F	F

Current Controls and Actions
① Current land cover.
② Access and excavation restrictions
③ Landfill cap, leachate collection system, and monitoring.
④ PGDP Water Policy.

Receptor Key
Worker – includes workers exposed during inside and outside activities, including the remediation worker.
Resident – includes residents engaged in all but recreation activities.
Visitor – includes recreational users, intruders, and trespassers.
Ecological – includes on- and off-site aquatic and terrestrial ecological receptors.

Exposure Route Key
R = External Exposure
F = Ingestion
D = Dermal
I = Inhalation

Figure 4.5a2. Hazard Area 5: Permitted Landfills CSM – Current State

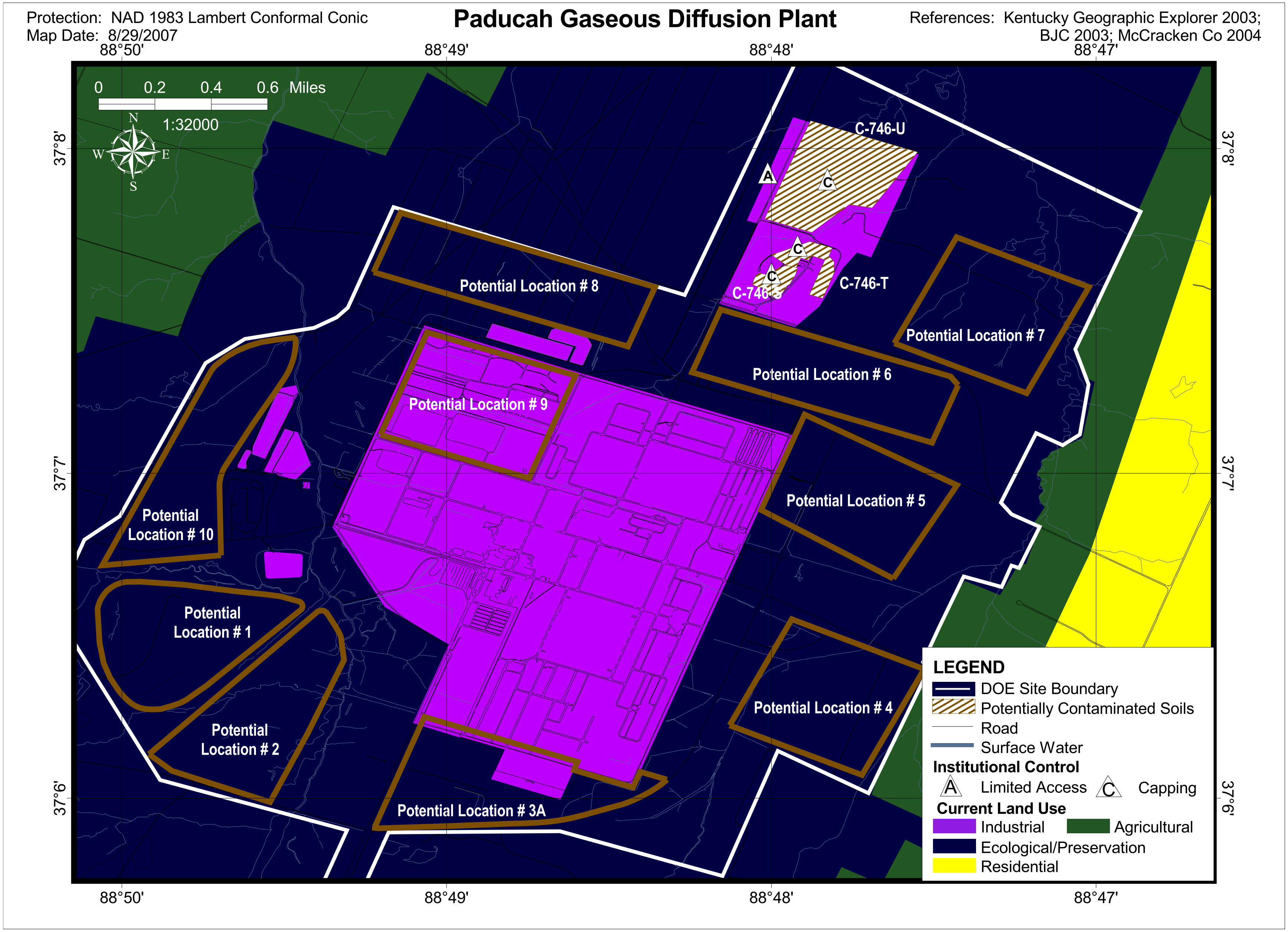
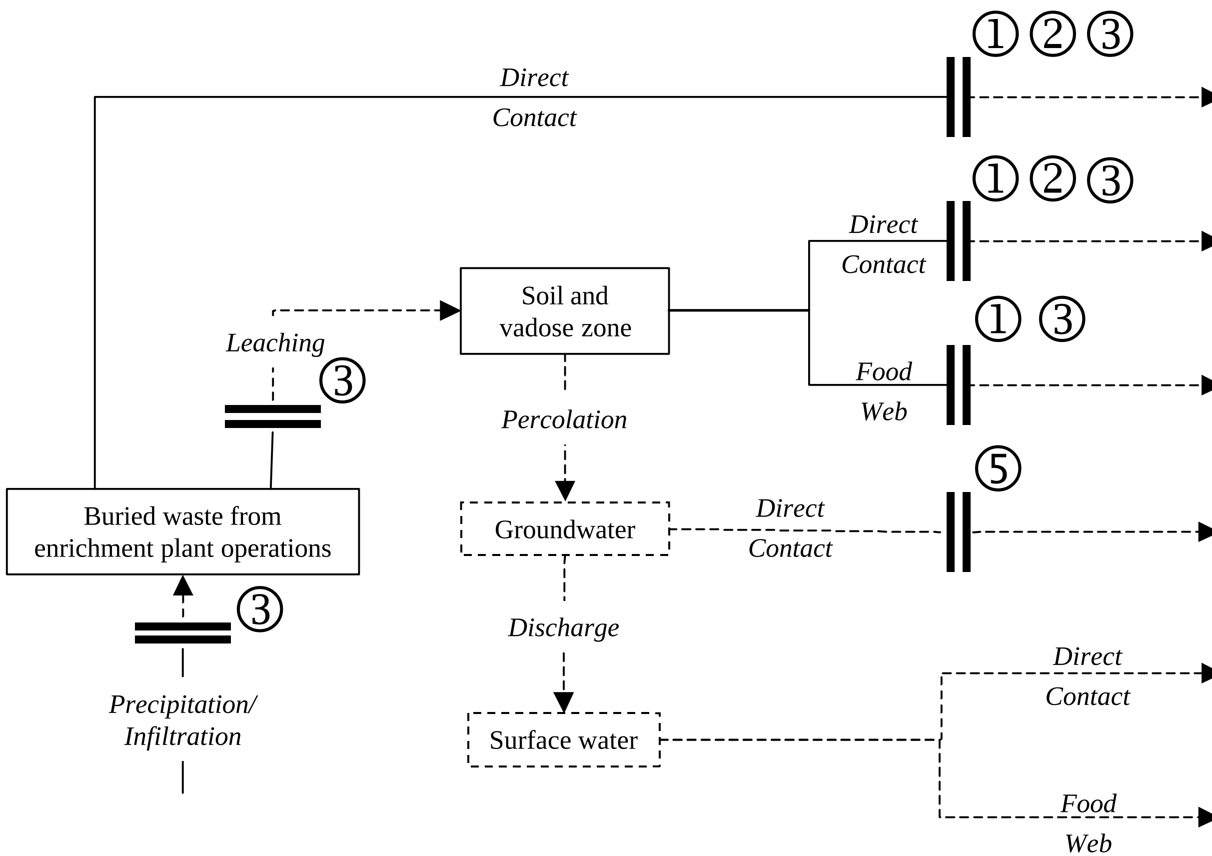


Figure 4.5b1. Hazard Area 5: Permitted Landfills - Potential End State Alternative

Hazard Area 5 Permitted Landfills – Potential End State Alternative



Potential Receptor Exposed			
Worker	Resident	Visitor	Ecological
R/F/D/I		R/F/D/I	R/F/D/I
R/F/D/I		R/F/D/I	R/F/D/I
		F	F
R/F/D/I	R/F/D/I		
F/D/I		F/D/I	F/D/I
	F	F	F

RBES Controls and Actions
① Current land cover.
② Access and excavation restrictions
③ Landfill cap, leachate collection system, and monitoring.
⑤ Enhanced institutional controls to limit access and use of groundwater.

Receptor Key
Worker – includes workers exposed during inside and outside activities, including the remediation worker.
Resident – includes residents engaged in all but recreation activities.
Visitor – includes recreational users, intruders, and trespassers.
Ecological – includes on- and off-site aquatic and terrestrial ecological receptors.

Exposure Route Key
R = External Exposure
F = Ingestion
D = Dermal
I = Inhalation

Figure 4.5b2. Hazard Area 5: Permitted Landfills CSM – Potential End State Alternative

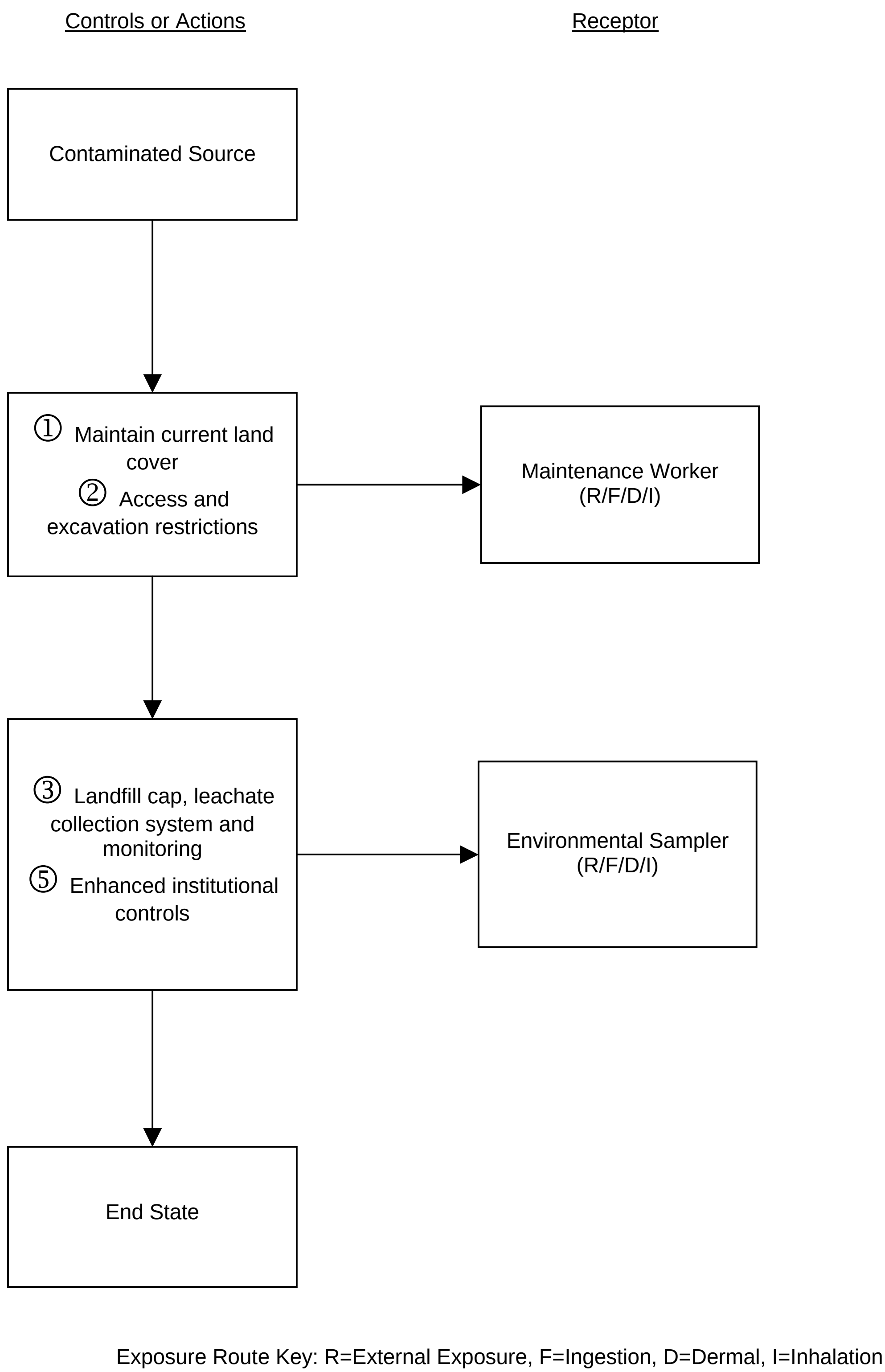


Figure 4.5b3. Hazard Area 5: Permitted Landfills Treatment Train – Potential End State Alternative

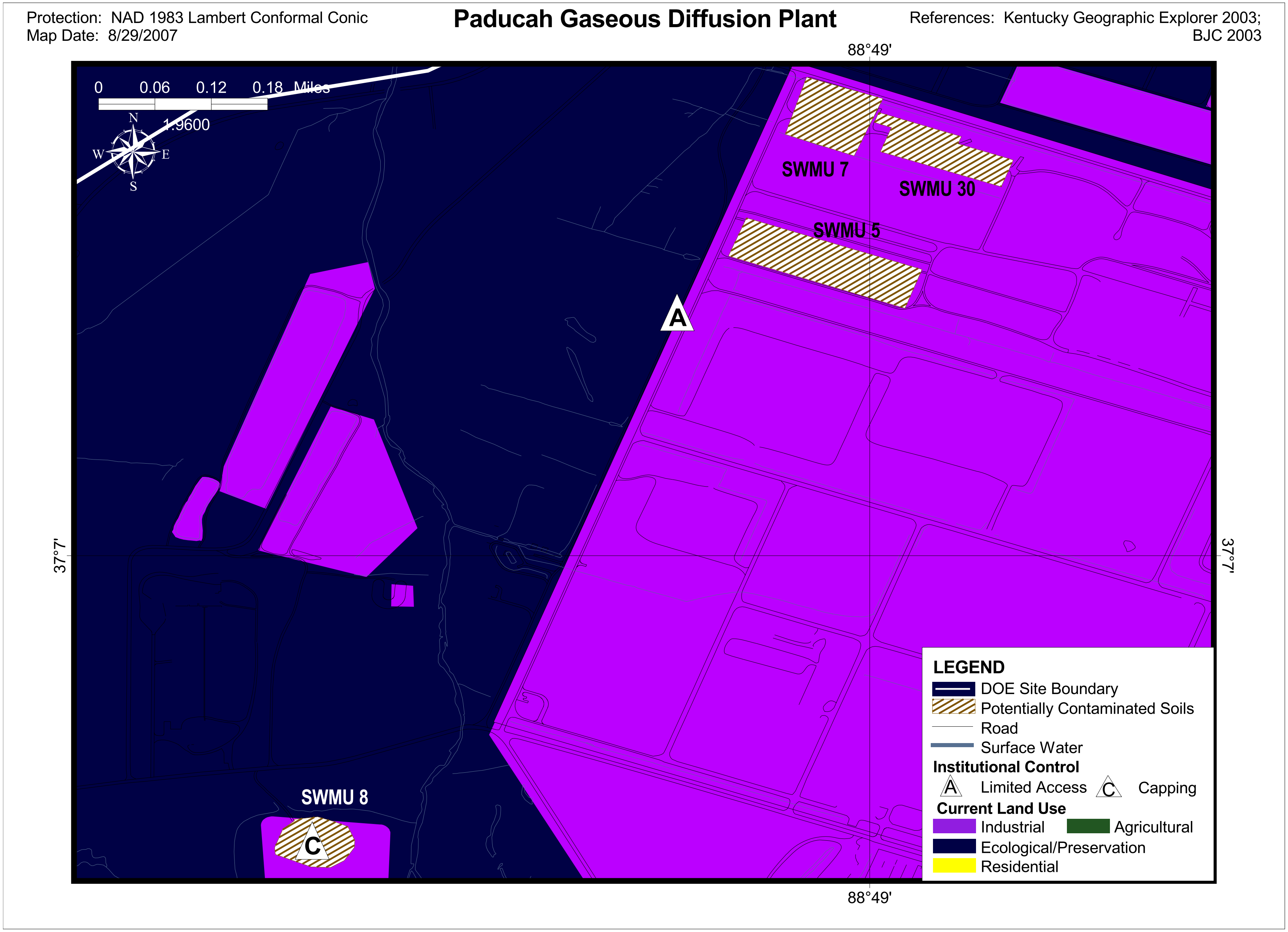
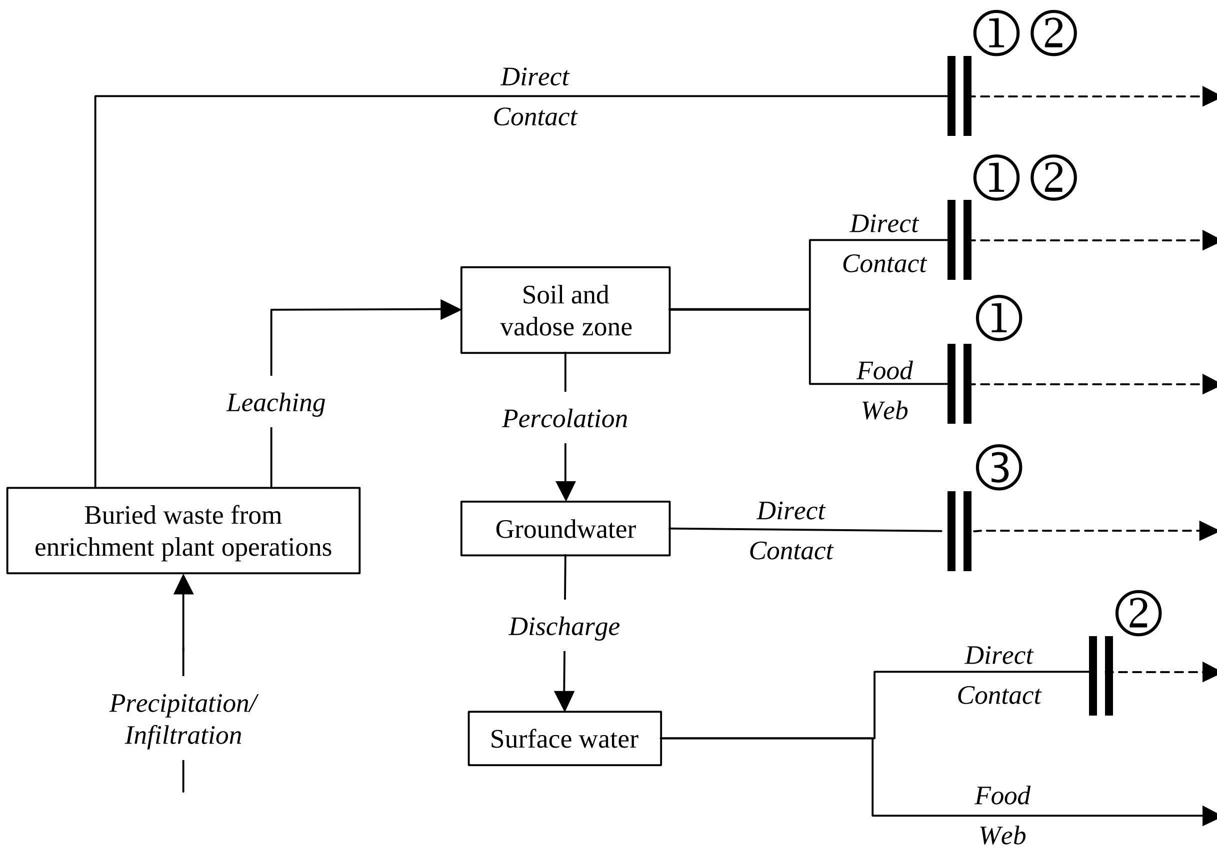


Figure 4.6a1. Hazard Area 6: BGOU (Group 2) - Current State

Hazard Area 6 Burial Grounds (Group 2) – Current State



Potential Receptor Exposed			
Worker	Resident	Visitor	Ecological
R/F/D/I		R/F/D/I	R/F/D/I
R/F/D/I		R/F/D/I	R/F/D/I
		F	F
R/F/D/I	R/F/D/I		
F/D/I		F/D/I	F/D/I
	F	F	F

<u>Current Controls and Actions</u>
① Current land cover.
② Access and excavation restrictions.
③ PGDP Water Policy.

<u>Receptor Key</u>
Worker – includes workers exposed during inside and outside activities, including the remediation worker.
Resident – includes residents engaged in all but recreation activities.
Visitor – includes recreational users, intruders, and trespassers.
Ecological – includes on- and off-site aquatic and terrestrial ecological receptors.

<u>Exposure Route Key</u>
R = External Exposure
F = Ingestion
D = Dermal
I = Inhalation

Figure 4.6a2. Hazard Area 6: BGOU (Group 2) CSM – Current State

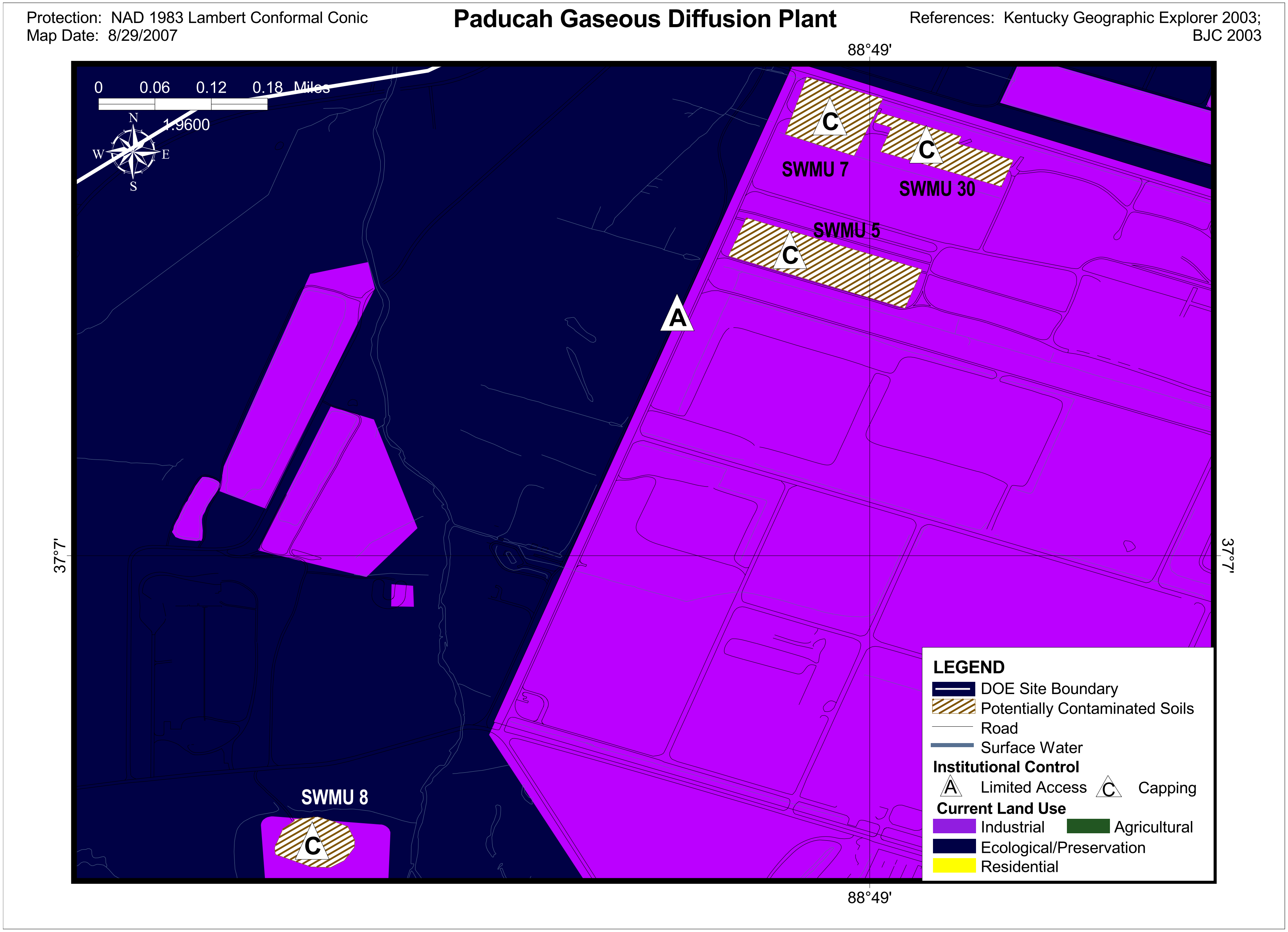
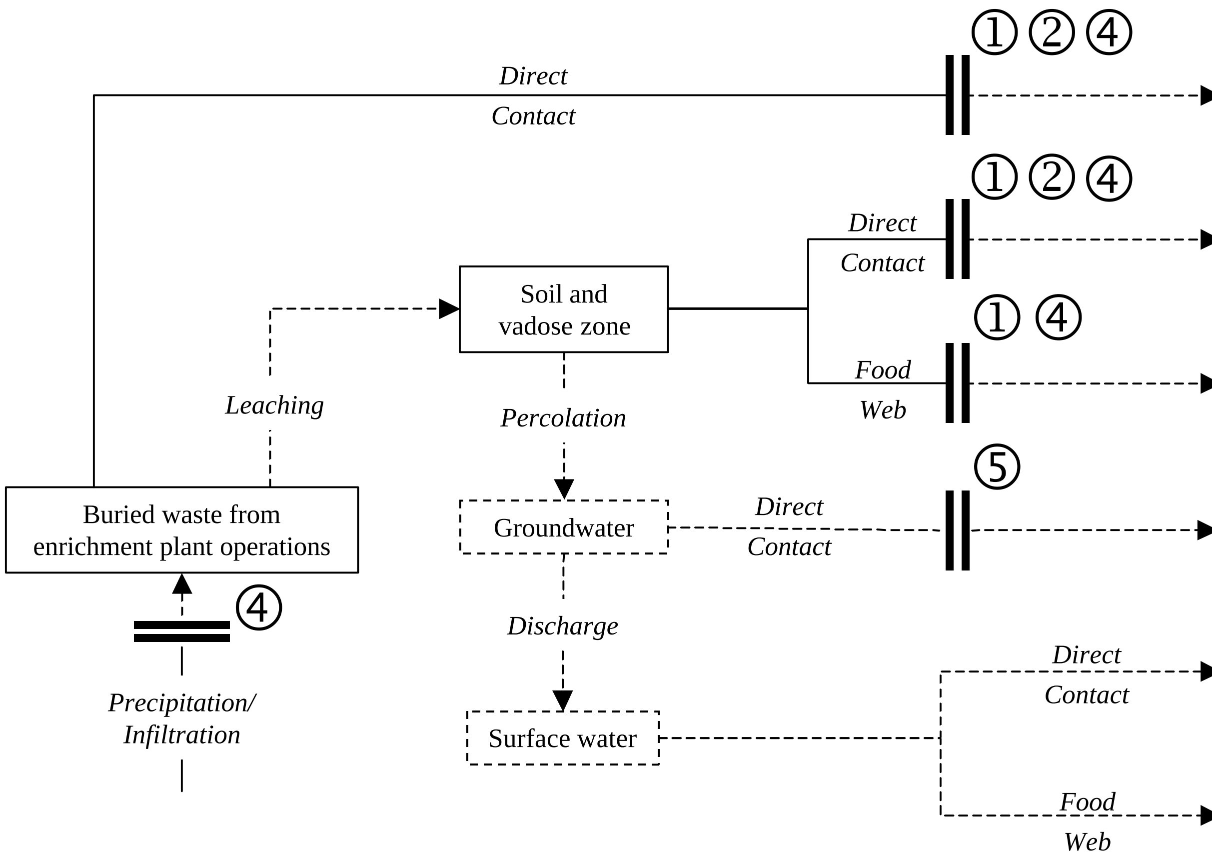


Figure 4.6b1. Hazard Area 6: BGOU (Group 2) - Potential End State Alternative

Hazard Area 6 Burial Grounds (Group 2) – Potential End State Alternative



Potential Receptor Exposed			
Worker	Resident	Visitor	Ecological
R/F/D/I		R/F/D/I	R/F/D/I
R/F/D/I		R/F/D/I	R/F/D/I
		F	F
R/F/D/I	R/F/D/I		
F/D/I		F/D/I	F/D/I
	F	F	F

<u>RBES Controls and Actions</u>
① Current land cover.
② Access and excavation restrictions
④ Landfill cap and monitoring.
⑤ Enhanced institutional controls to limit access and use of groundwater.

<u>Receptor Key</u>
Worker – includes workers exposed during inside and outside activities, including the remediation worker.
Resident – includes residents engaged in all but recreation activities.
Visitor – includes recreational users, intruders, and trespassers.
Ecological – includes on- and off-site aquatic and terrestrial ecological receptors.

<u>Exposure Route Key</u>
R = External Exposure
F = Ingestion
D = Dermal
I = Inhalation

Figure 4.6b2. Hazard Area 6: BGOU (Group 2) CSM – Potential End State Alternative

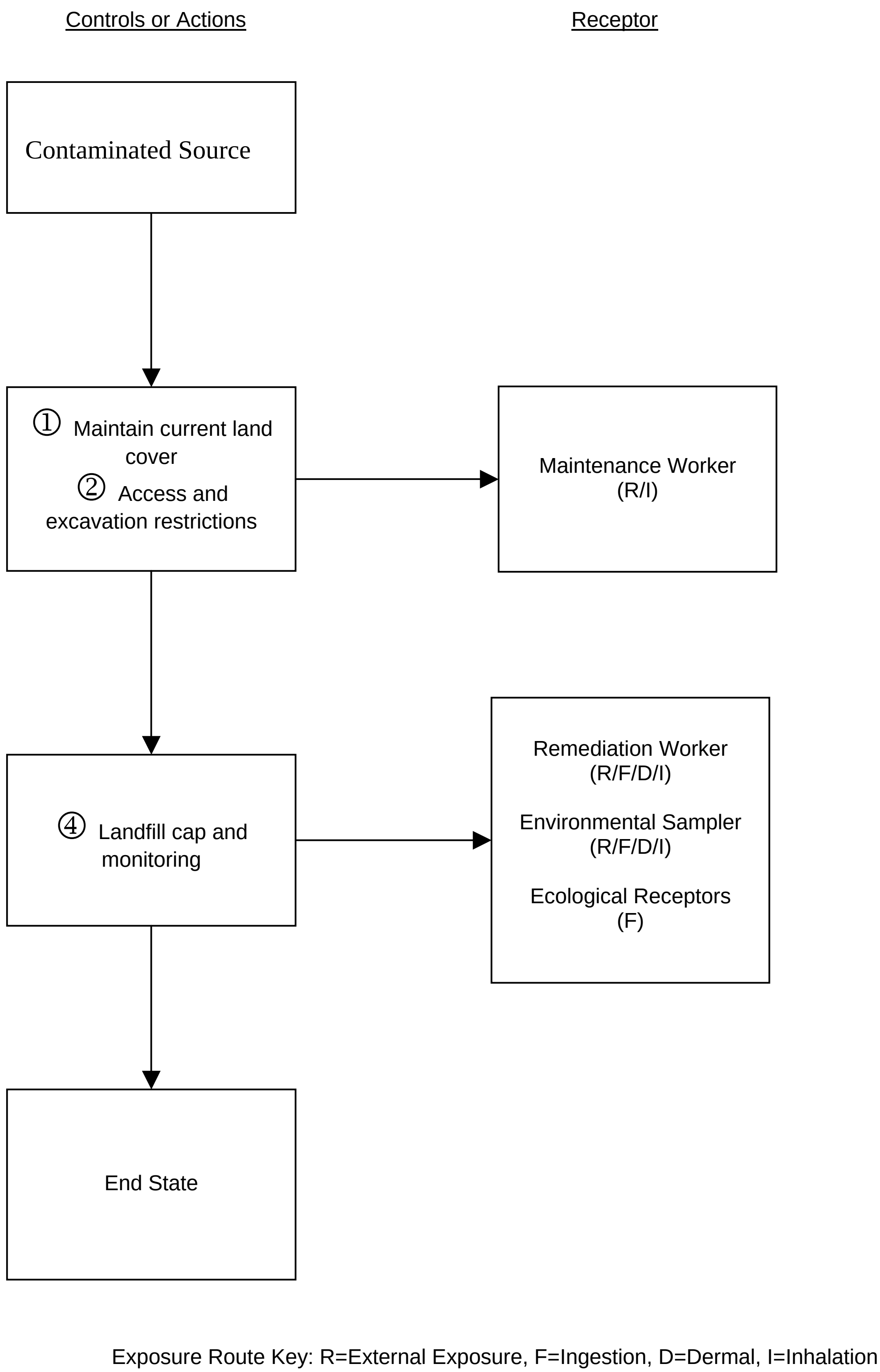


Figure 4.6b3. Hazard Area 6: BGOU (Group 2) Treatment Train – Potential End State Alternative

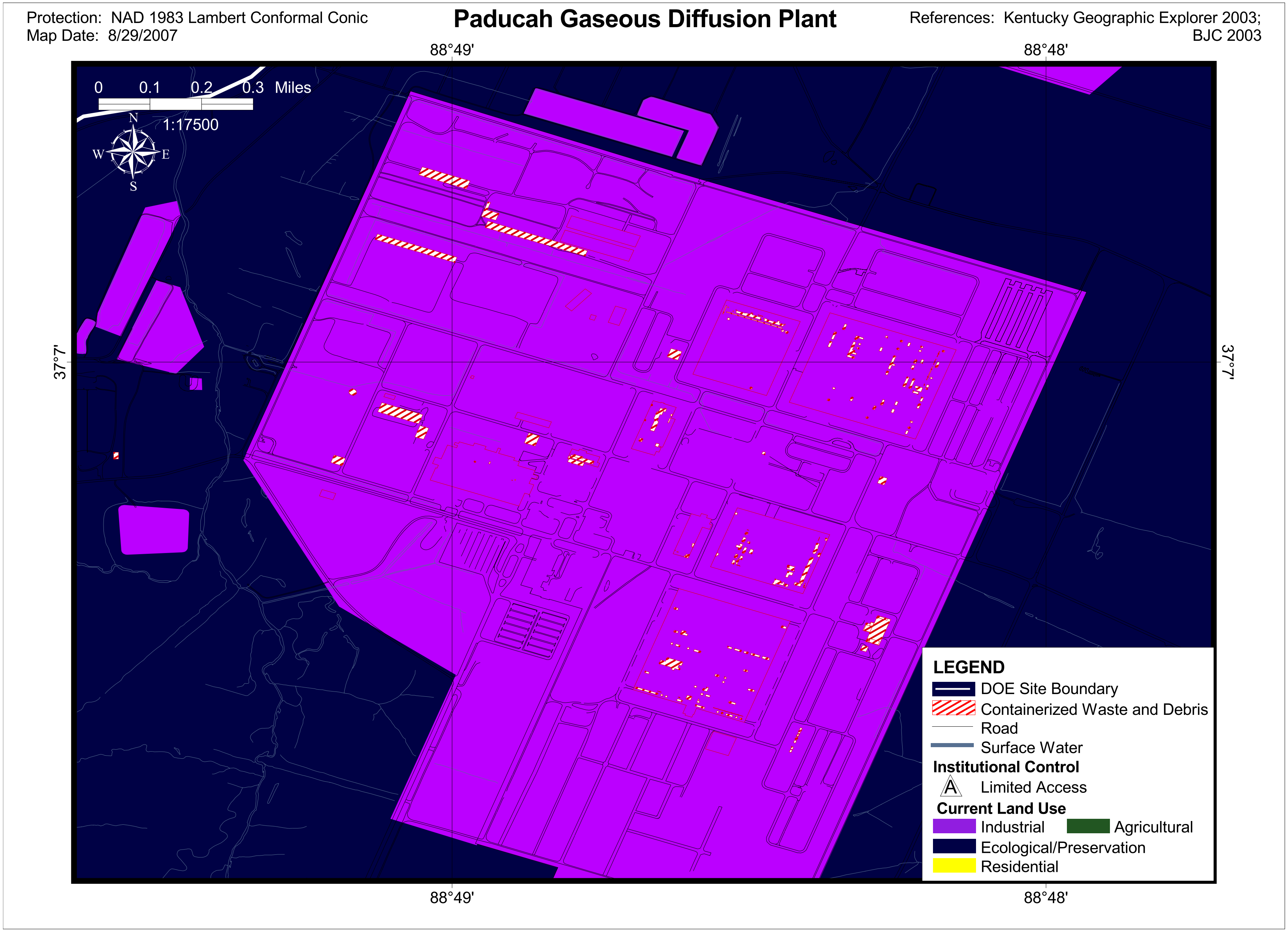
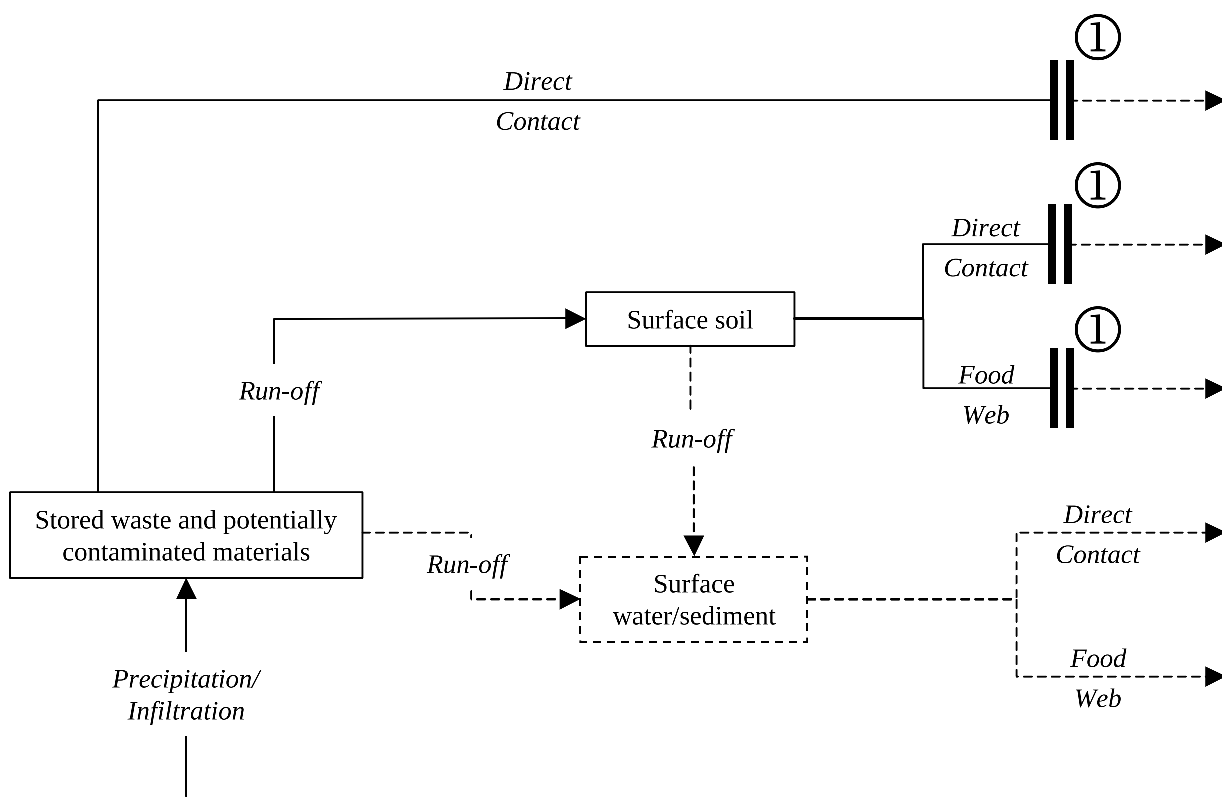


Figure 4.7a1. Hazard Area 7: Legacy Waste and DMSAs - Current State

Hazard Area 7 Legacy Waste and DOE Material Storage Areas – Current State



Potential Receptor Exposed			
Worker	Resident	Visitor	Ecological
R/F/D/I			R/F/D/I
R/F/D/I			R/F/D/I
			F
F/D/I		F/D/I	F/D/I
	F	F	F

<u>Current Controls and Actions</u>
① Access restrictions.

<u>Receptor Key</u>
Worker – includes workers exposed during inside and outside activities, including the remediation worker.
Resident – includes residents engaged in all but recreation activities.
Visitor – includes recreational users, intruders, and trespassers.
Ecological – includes on- and off-site aquatic and terrestrial ecological receptors.

<u>Exposure Route Key</u>
R = External Exposure
F = Ingestion
D = Dermal
I = Inhalation

Figure 4.7a2. Hazard Area 7: Legacy Waste and DMSAs CSM – Current State

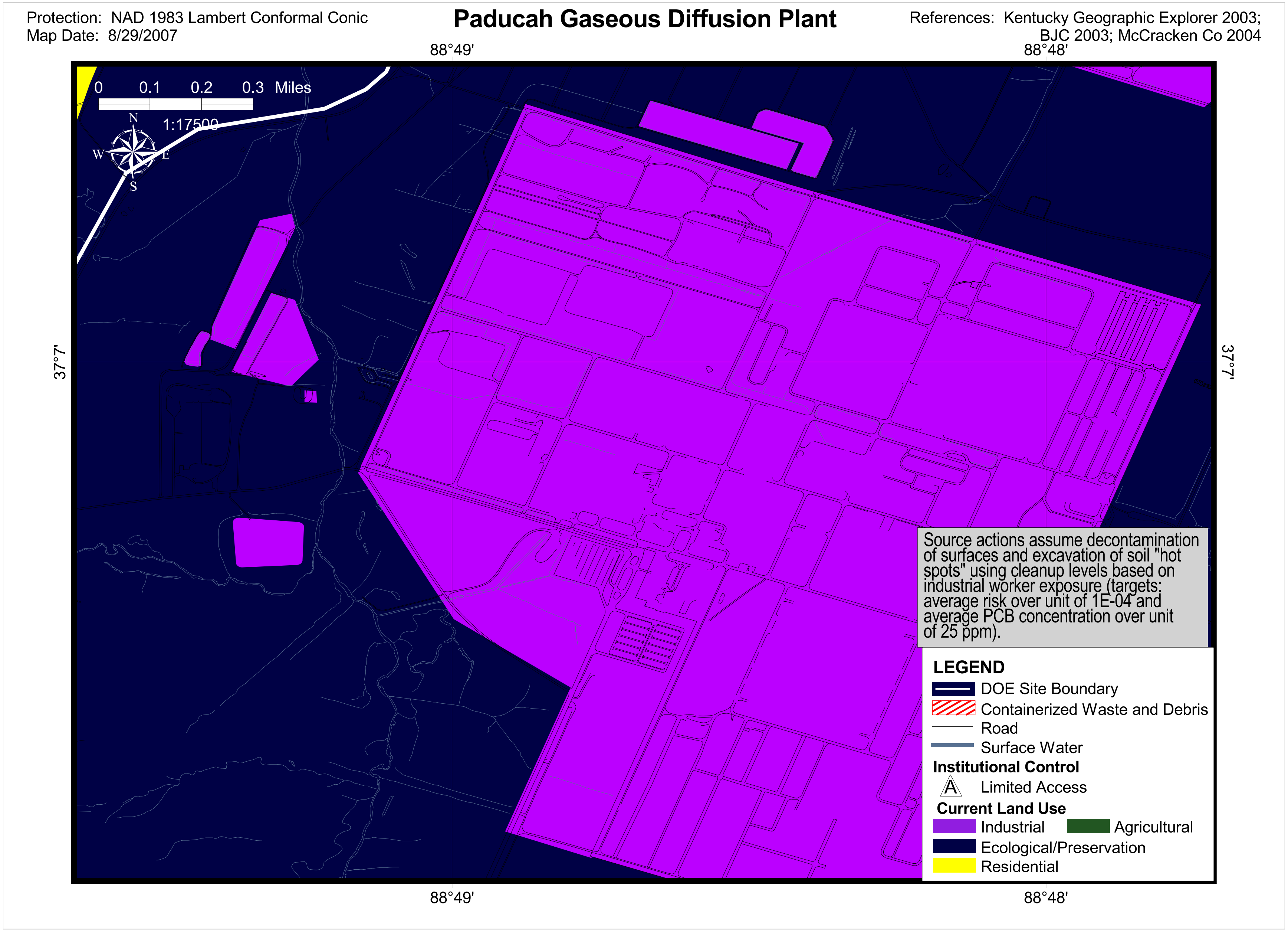
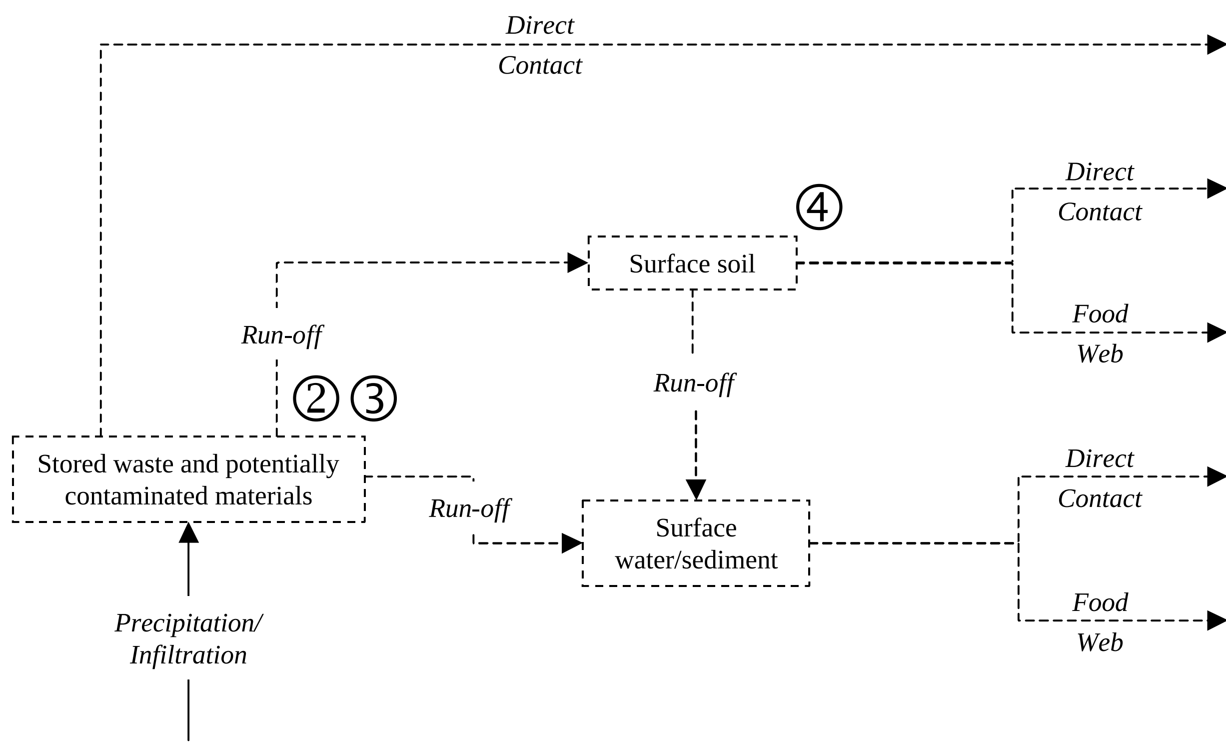


Figure 4.7b1. Hazard Area 7: Legacy Waste and DMSAs - Potential End State Alternative

Hazard Area 7 Legacy Waste and DOE Material Storage Areas – Potential End State Alternative



Potential Receptor Exposed			
Worker	Resident	Visitor	Ecological
R/F/D/I			R/F/D/I
R/F/D/I			R/F/D/I
			F
F/D/I		F/D/I	F/D/I
	F	F	F

<u>RBES Controls and Actions</u>
② Characterization and disposal.
③ Decontamination of surfaces (target based on average exposure over entire unit: worker risk of 1E-04, PCBs at 25 ppm).
④ Excavation of "hot spots" (target based on average exposure over entire unit: worker risk of 1E-04, PCBs at 25 ppm).

<u>Receptor Key</u>
Worker – includes workers exposed during inside and outside activities, including the remediation worker.
Resident – includes residents engaged in all but recreation activities.
Visitor – includes recreational users, intruders, and trespassers.
Ecological – includes on- and off-site aquatic and terrestrial ecological receptors.

<u>Exposure Route Key</u>
R = External Exposure
F = Ingestion
D = Dermal
I = Inhalation

Figure 4.7b2. Hazard Area 7: Legacy Waste and DMSAs CSM – Potential End State Alternative

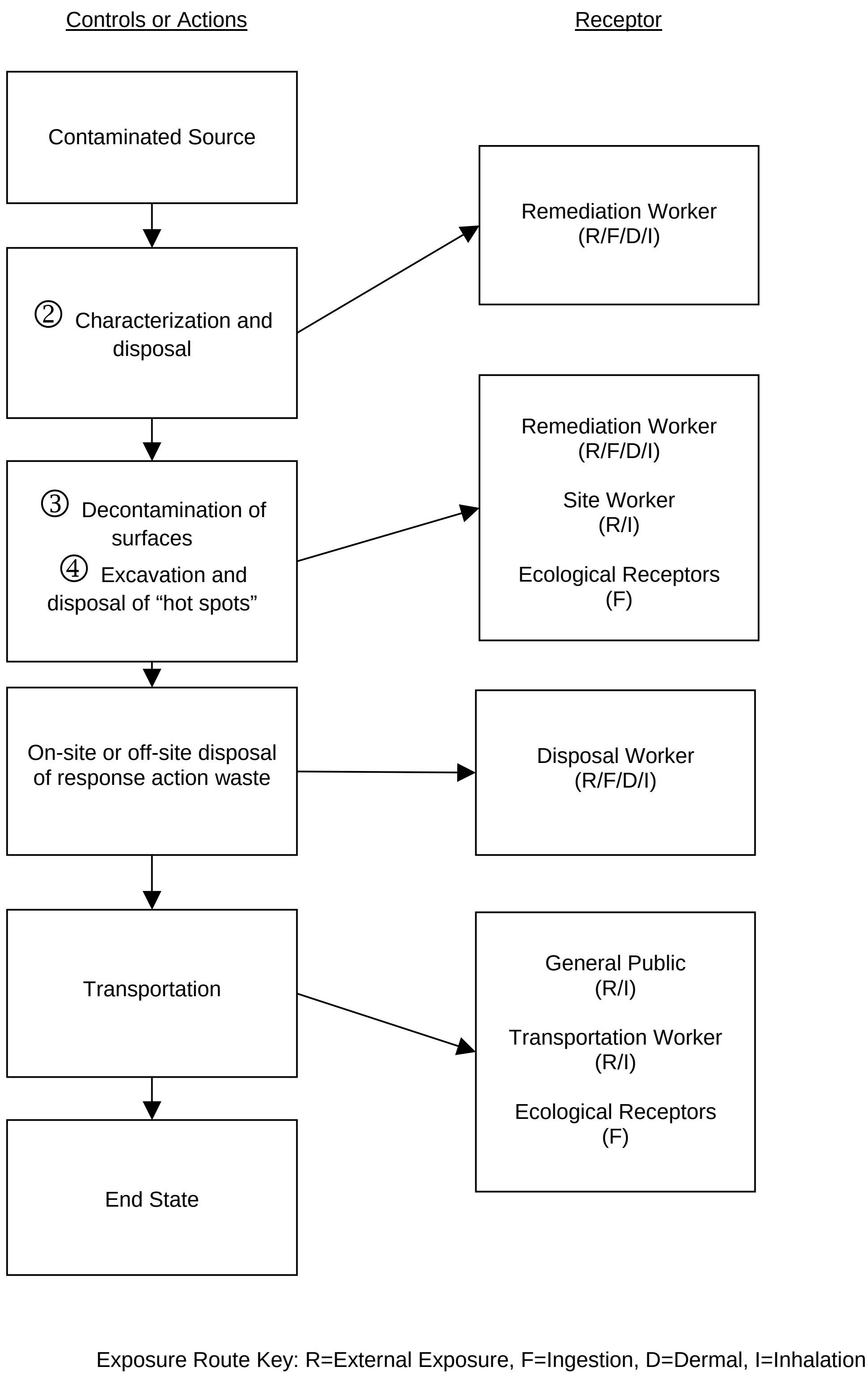


Figure 4.7b3. Hazard Area 7: Legacy Waste and DMSAs Treatment Train – Potential End State Alternative

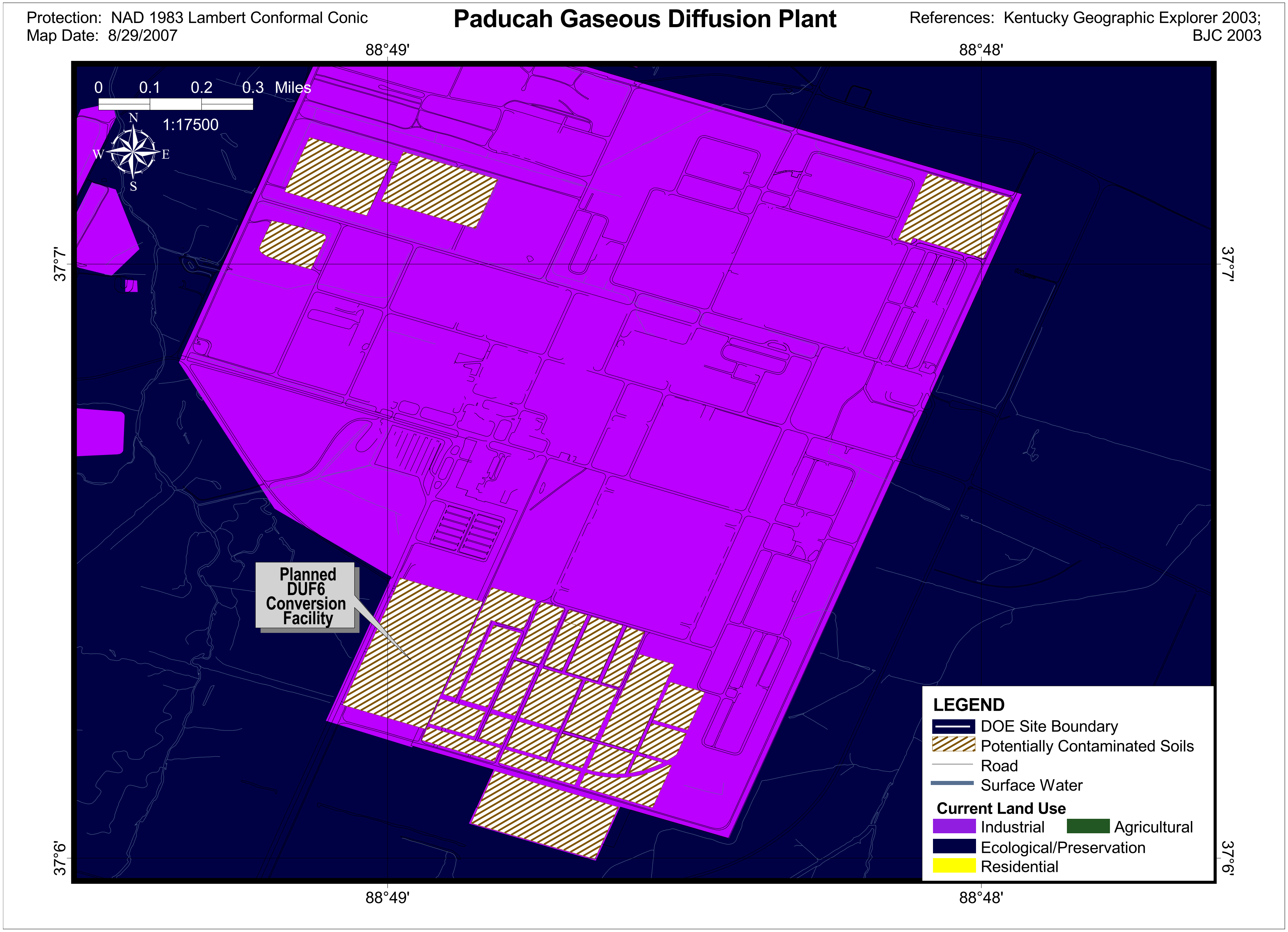
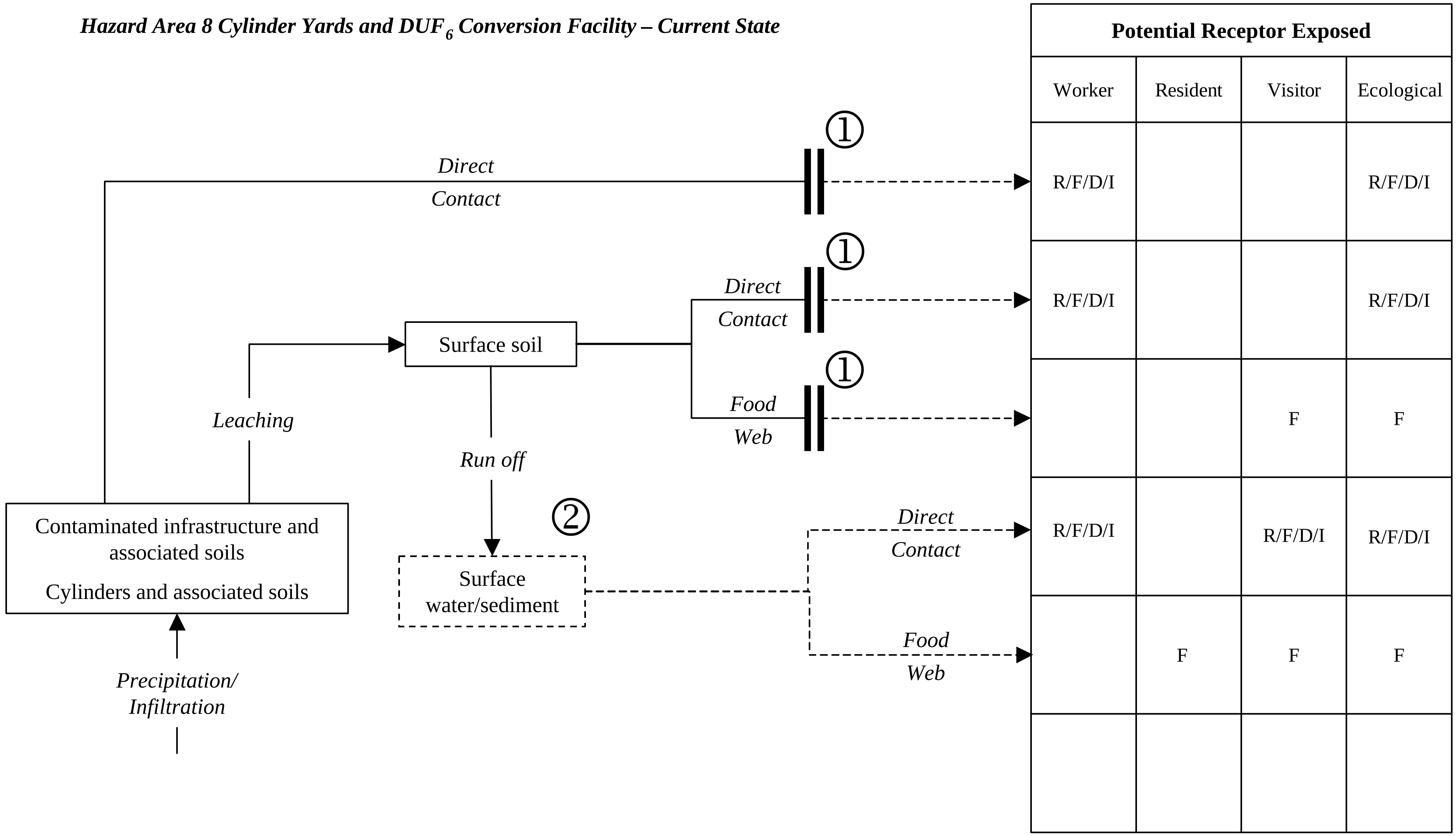


Figure 4.8a1. Hazard Area 8: Cylinder Yards and DUF_6 Conversion Facility - Current State



<u>Current Controls and Actions</u>
① Access restrictions.
② Attenuation

<u>Receptor Key</u>
Worker – includes workers exposed during inside and outside activities, including the remediation worker.
Resident – includes residents engaged in all but recreation activities.
Visitor – includes recreational users, intruders, and trespassers.
Ecological – includes on- and off-site aquatic and terrestrial ecological receptors.

<u>Exposure Route Key</u>
R = External Exposure
F = Ingestion
D = Dermal
I = Inhalation

Figure 4.8a2. Hazard Area 8: Cylinder Yards and DUF$_6$ Conversion Facility CSM – Current State

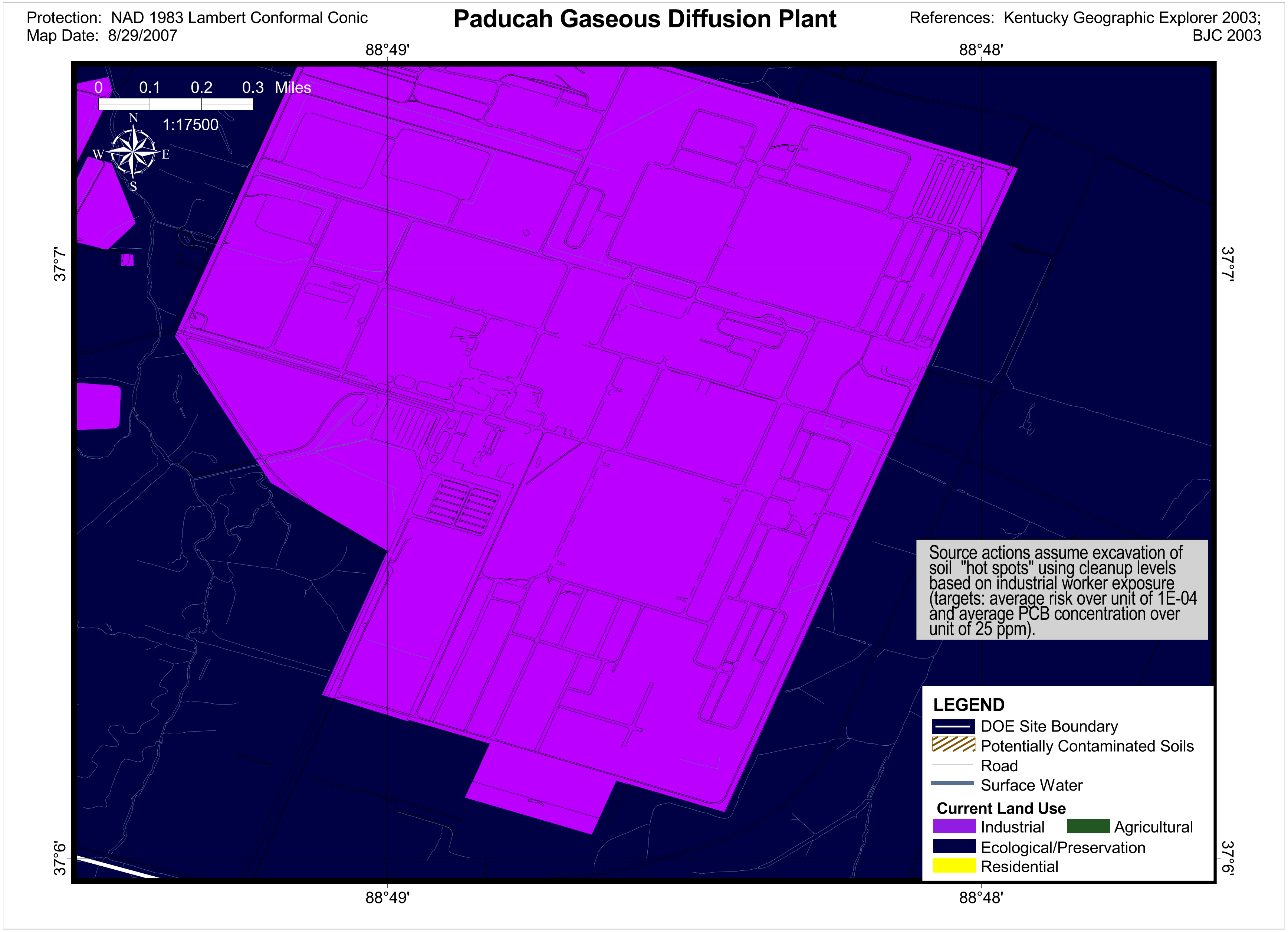
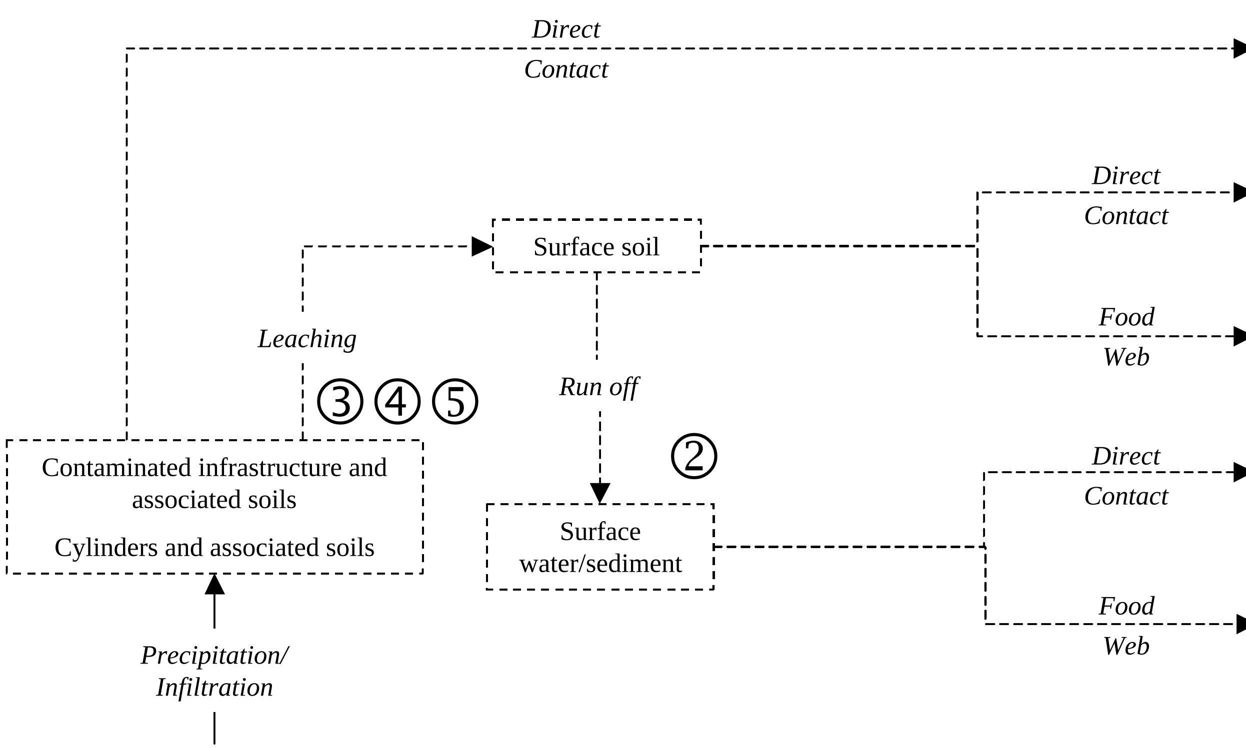


Figure 4.8b1. Hazard Area 8: Cylinder Yards and DUF_6 Conversion Facility - Potential End State Alternative

Hazard Area 8 Cylinder Yards and DUF_6 Conversion Facility – Potential End State Alternative



Potential Receptor Exposed			
Worker	Resident	Visitor	Ecological
R/F/D/I			R/F/D/I
R/F/D/I			R/F/D/I
		F	F
R/F/D/I		R/F/D/I	R/F/D/I
	F	F	F

RBES Controls and Actions
② Attenuation
③ Conversion of depleted UF_6 and disposal.
④ D&D of infrastructure.
⑤ Excavation of “hot spots” in surface soil (target based on average exposure over entire unit: worker risk of 1E-04, PCBs at 25 ppm).

Receptor Key
Worker – includes workers exposed during inside and outside activities, including the remediation worker.
Resident – includes residents engaged in all but recreation activities.
Visitor – includes recreational users, intruders, and trespassers.
Ecological – includes on- and off-site aquatic and terrestrial ecological receptors.

Exposure Route Key
R = External Exposure
F = Ingestion
D = Dermal
I = Inhalation

Figure 4.8b2. Hazard Area 8: Cylinder Yards and DUF_6 Conversion Facility CSM – Potential End State Alternative

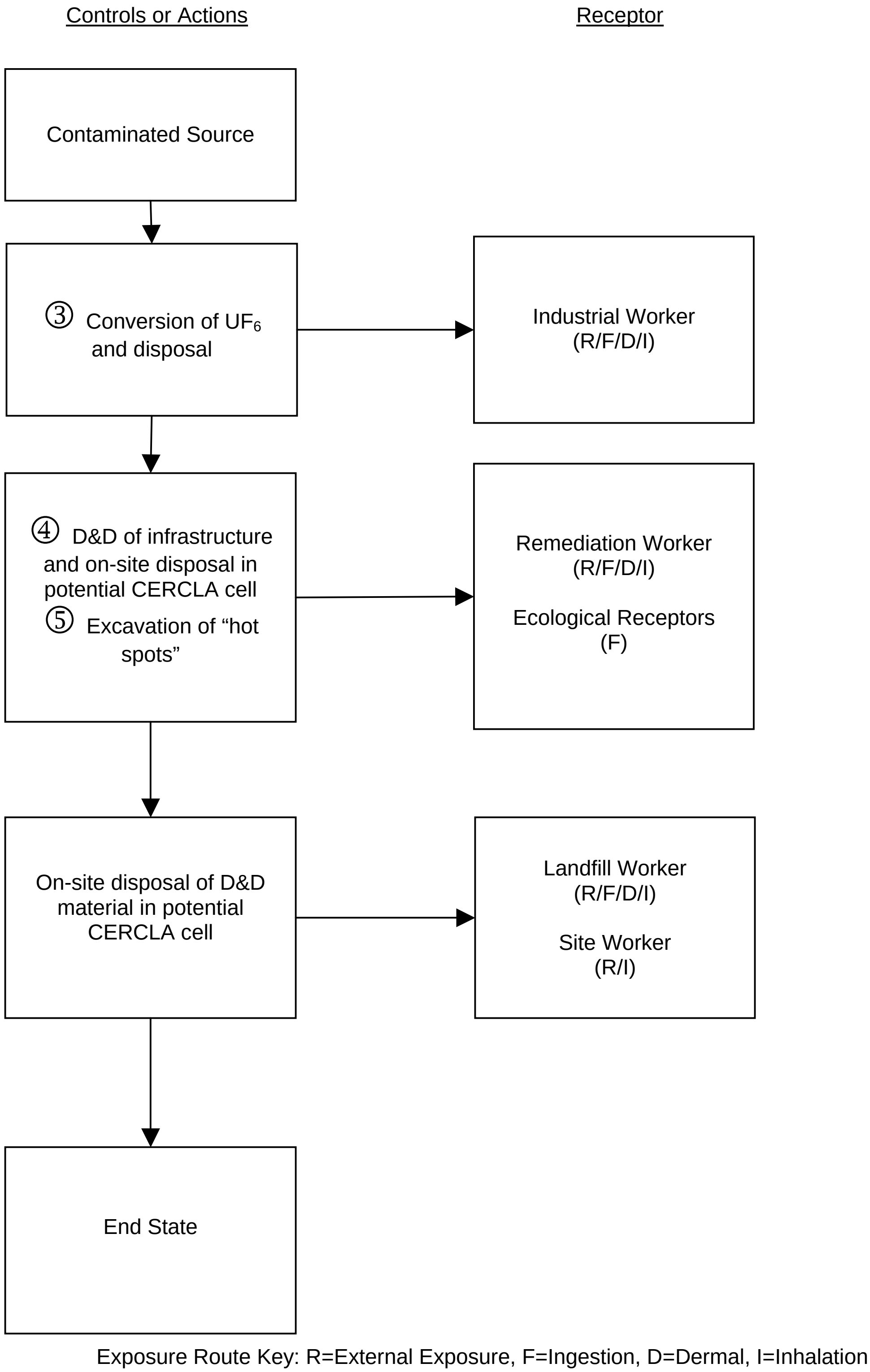


Figure 4.8b3. Hazard Area 8: Cylinder Yards and DUF_6 Conversion Facility Treatment Train – Potential End State Alternative

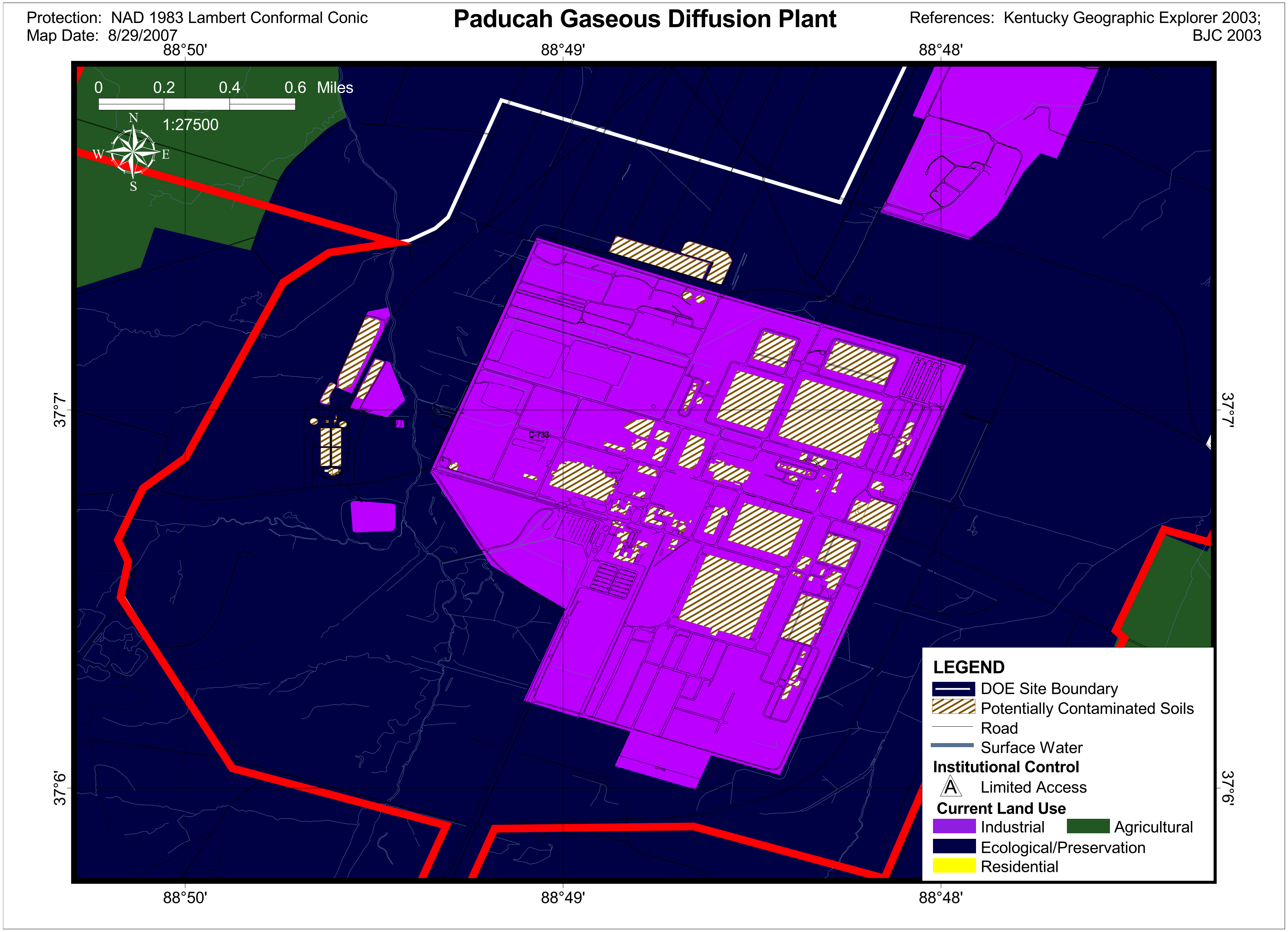
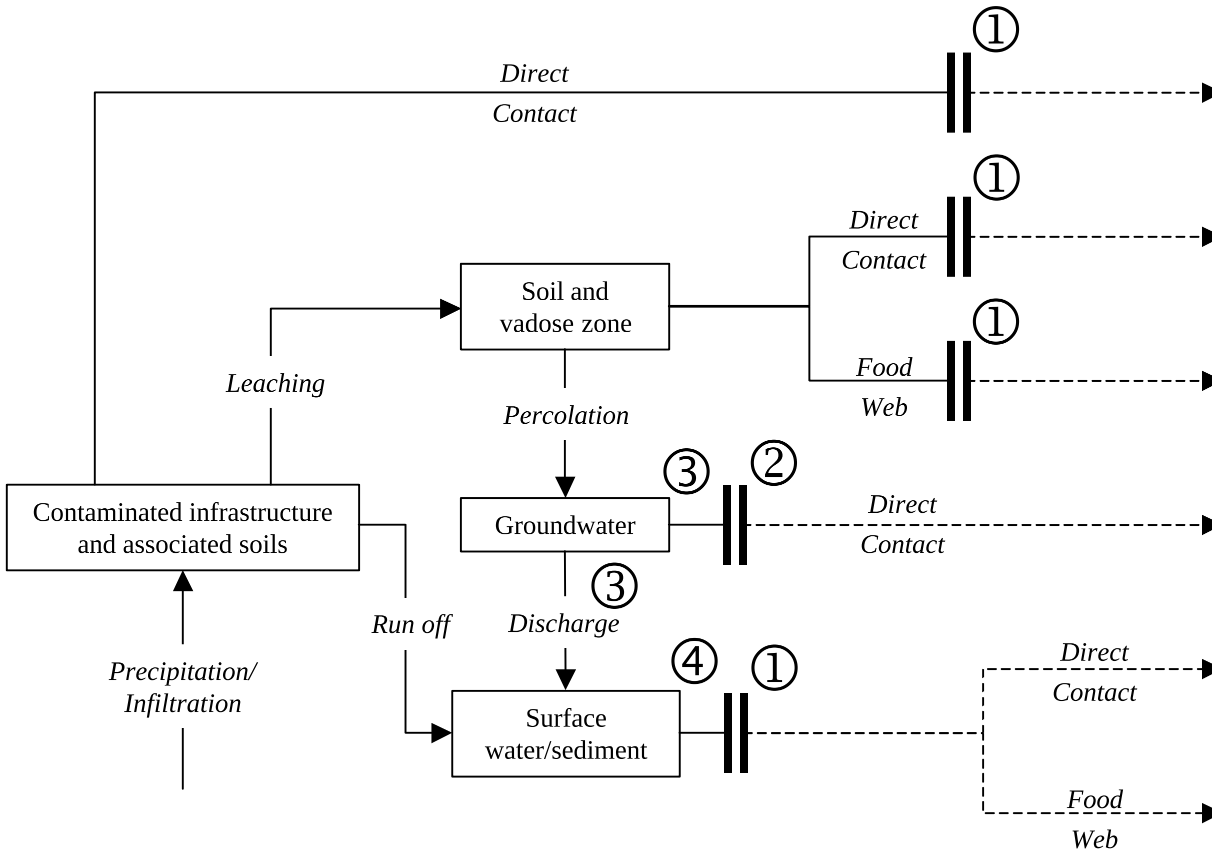


Figure 4.9a1. Hazard Area 9: GDP Facilities - Current State

Hazard Area 9 GDP Facilities – Current State



Potential Receptor Exposed			
Worker	Resident	Visitor	Ecological
R/F/D/I		R/F/D/I	R/F/D/I
R/F/D/I		R/F/D/I	R/F/D/I
	F	F	F
	R/F/D/I		
R/F/D/I		R/F/D/I	R/F/D/I
	F	F	F

Current Controls and Actions
① Access and excavation restrictions.
② PGDP Water Policy.
③ "Hot spot" pump-and-treat.
④ Natural attenuation.

Receptor Key
Worker – includes workers exposed during inside and outside activities, including the remediation worker.
Resident – includes residents engaged in all but recreation activities.
Visitor – includes recreational users, intruders, and trespassers.
Ecological – includes on- and off-site aquatic and terrestrial ecological receptors.

Exposure Route Key
R = External Exposure
F = Ingestion
D = Dermal
I = Inhalation

Figure 4.9a2. Hazard Area 9: GDP Facilities CSM – Current State

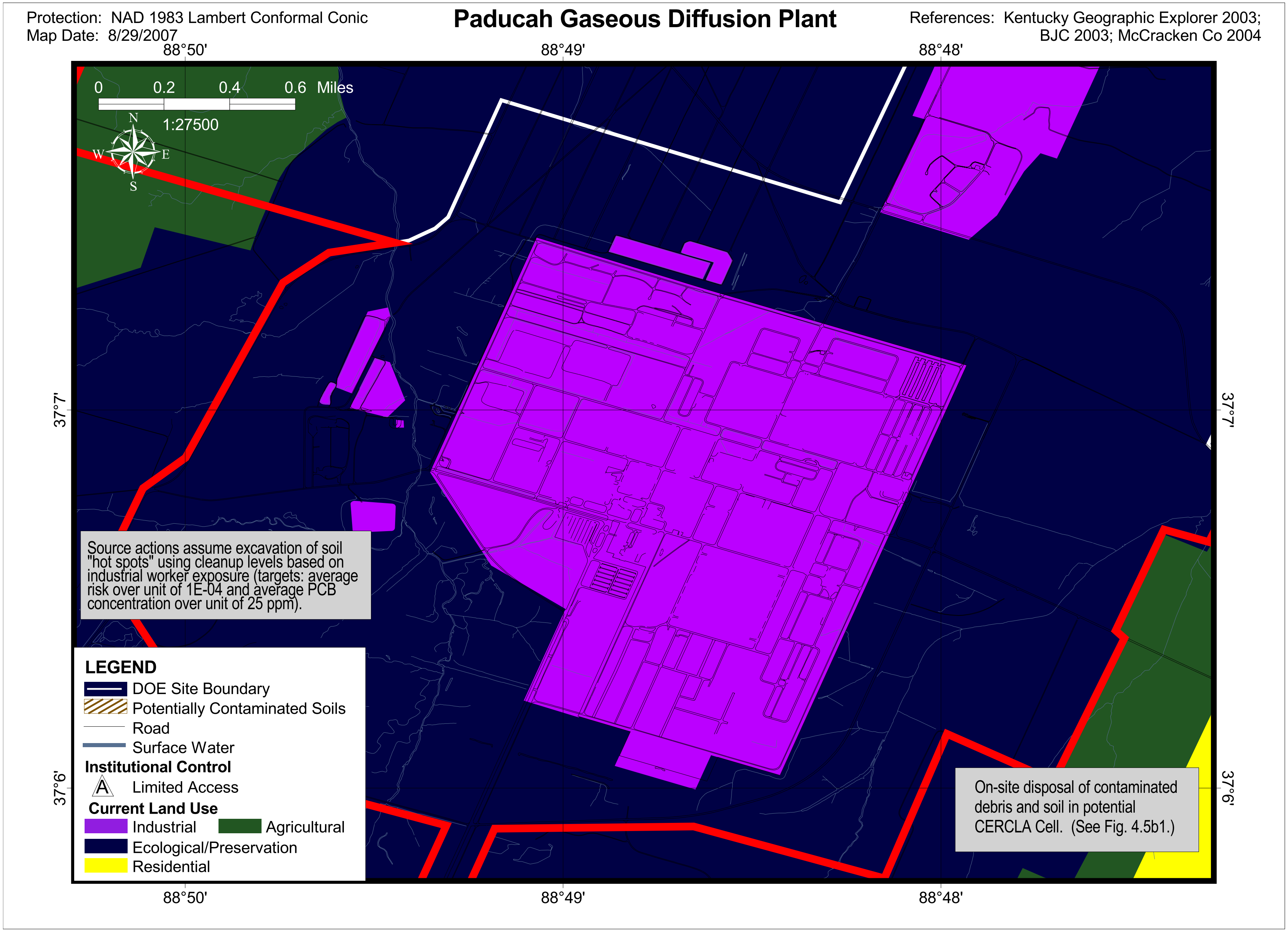
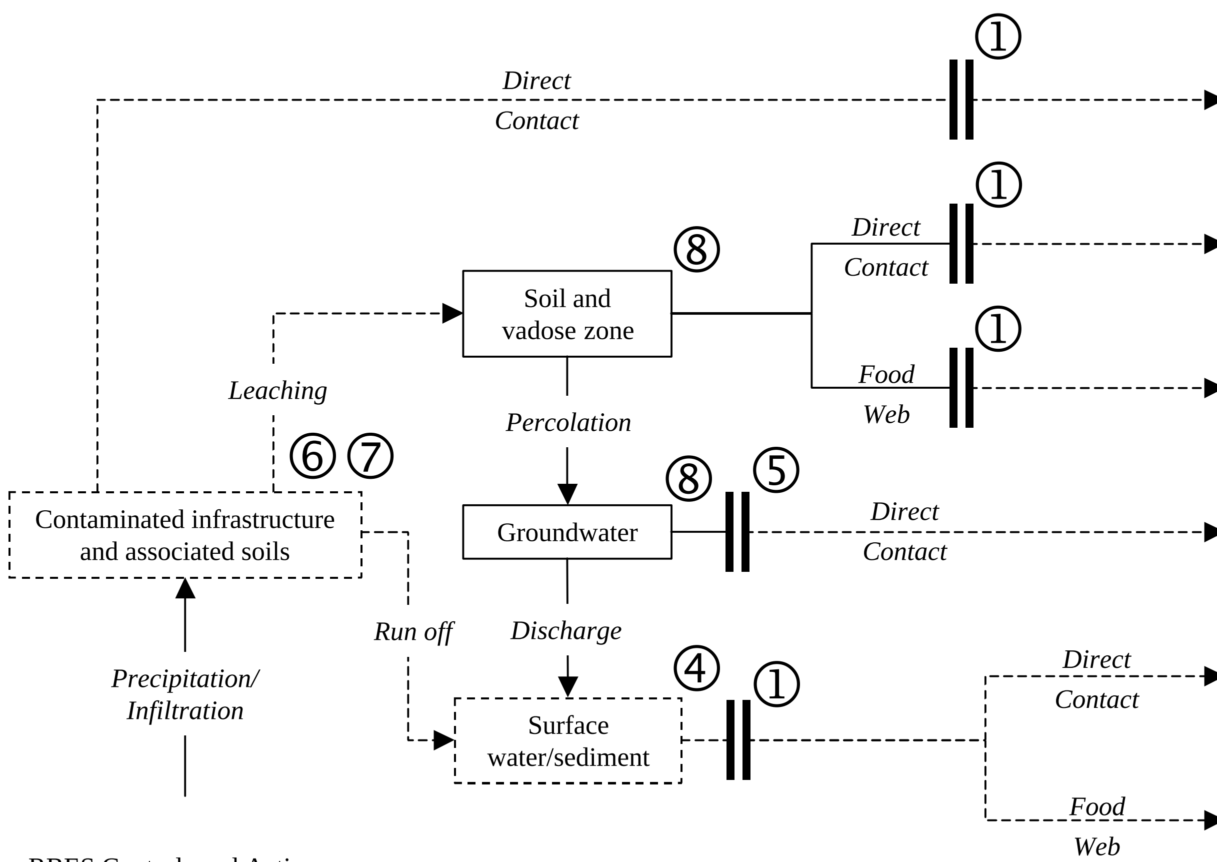


Figure 4.9b1. Hazard Area 9: GDP Facilities - Potential End State Alternative

Hazard Area 9 GDP Facilities – Potential End State Alternative



Potential Receptor Exposed			
Worker	Resident	Visitor	Ecological
R/F/D/I		R/F/D/I	R/F/D/I
R/F/D/I		R/F/D/I	R/F/D/I
	F	F	F
	R/F/D/I		
R/F/D/I		R/F/D/I	R/F/D/I
	F	F	F

RBES Controls and Actions
① Access and excavation restrictions.
④ Attenuation.
⑤ Enhanced institutional controls to limit access to and use of groundwater.
⑥ D&D of infrastructure and disposal in potential CERCLA Cell.
⑦ Excavation of soil "hot spots" (target based on average exposure over entire unit: worker risk of 1E-04, PCBs at 25 ppm).
⑧ Monitored natural attenuation of sources and plume.

Receptor Key
Worker – includes workers exposed during inside and outside activities, including the remediation worker.
Resident – includes residents engaged in all but recreation activities.
Visitor – includes recreational users, intruders, and trespassers.
Ecological – includes on- and off-site aquatic and terrestrial ecological receptors.

Exposure Route Key
R = External Exposure
F = Ingestion
D = Dermal
I = Inhalation

Figure 4.9b2. Hazard Area 9: GDP Facilities CSM – Potential End State Alternative

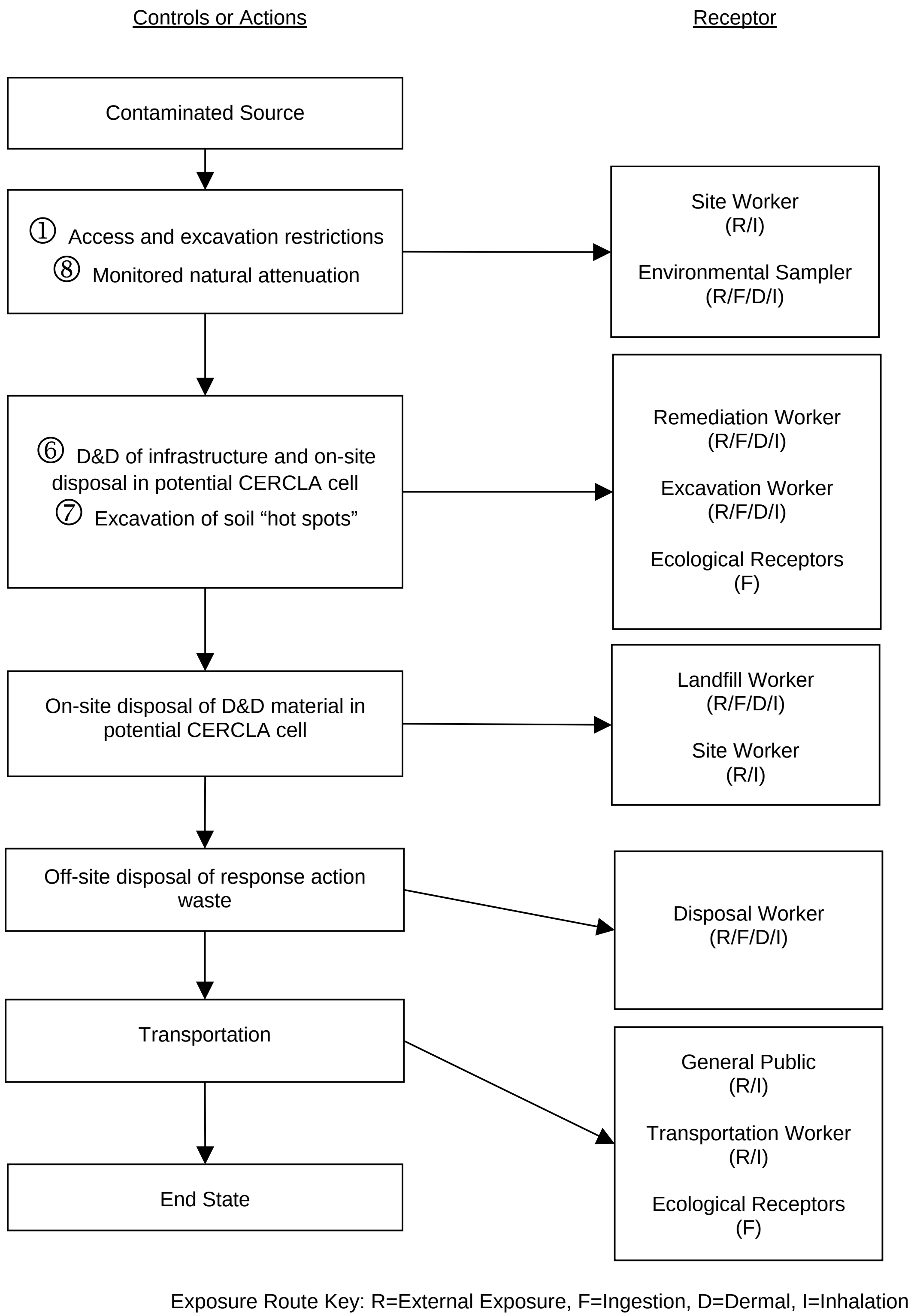


Figure 4.9b3. Hazard Area 9: GDP Facilities Treatment Train – Potential End State Alternative

THIS PAGE INTENTIONALLY LEFT BLANK.

5. VARIANCE REPORT

This chapter contains discussions identifying and explaining the variances between the current planned end state and the potential end state alternative. To set the context for this discussion, maps, CSMs, and treatment trains for each of the hazard areas under the current planned end state are presented and discussed. Subsequently, variances are summarized by hazard area and over hazard areas. This summary includes a description of the variances; descriptions of impacts in terms of scope, cost, schedule, and risk (including risk balancing between the end states); challenges to achieving the potential end state alternative; and recommendations/next steps.

5.1 CURRENT PLANNED END STATE DESCRIPTIONS

This section presents the maps, CSMs, and treatment trains for each of the hazard areas under the current planned end state (see Figure 5.0c1). In addition, a short narrative is included for each of the hazard areas. This narrative includes the assumptions used to complete the current planned end state. This narrative includes the following information:

- Discussions of barriers and actions that eliminate those pathways under the current planned end state and

- Projected risk levels for affected receptors when the current planned end state is achieved.

For information on the areas and SWMUs included in each of the hazard areas, current pathways to the environment, and unmitigated risk levels, please see the information referenced in Chapter 4. As with the potential end state alternative descriptions presented in Chapter 4, risk estimates for the current planned end state are presented using qualitative statements that compare the risks at the current planned end state to those unmitigated and mitigated risks found under the current state.

5.1.1 Hazard Area 1 – GWOU

This hazard area encompasses both the sources of contamination to groundwater and the three dissolved-phase plumes. Sources considered are the C-400 Cleaning Building, located in the center of the industrialized area of PGDP; two burial grounds, located in the west-central portion of the industrialized area of PGDP; the C-720 Building, located in the southern part of PGDP; and an oil landfarm. **Please see Section 4.1.1 for a description of the sources and pathways of exposure under the current state.**

Barriers and Actions

Barriers to exposure at the current planned end state (see Figures 5.1c1 and 5.1c2) are continued access controls to prevent exposure to subsurface soil① and continuation of the PGDP Water Policy②, which provides an alternate water supply to residences affected by the dissolved-phase plumes. (Please see Section 4.1.1 for a discussion of the PGDP Water Policy.) Source actions are planned under the current planned end state to reduce DNAPL concentrations in subsurface soil and the aquifer⑧ and to remove the potential DNAPL source at two burial grounds⑧. A plume action also is planned to reduce contaminant concentrations in the dissolved-phase plume⑨. Natural attenuation④ will address discharges to surface water, and monitored natural attenuation will address residual contamination in source zones and groundwater after completion of the source actions⑥.

Under the current planned end state, potential receptors affected during implementation of the response actions (see Figure 5.1c3) are the environmental sampler, maintenance worker, remediation worker, general site worker, disposal worker, transportation worker, the public, and ecological receptors. The environmental sampler could be exposed during sampling activities. The maintenance worker could be exposed while maintaining controls. The remediation worker and ecological receptors could be exposed during completion of source actions (anticipated to be a heating technology for subsurface soil and groundwater and excavation for burial ground waste) and completion of the dissolved-phase plume action (anticipated to be an oxidation technology such as C-Sparge™). The general site worker could be exposed during implementation of the source actions. The disposal worker could be exposed while accepting waste derived from the burial ground excavation and derived from implementing the source actions. The transportation worker, public, and ecological receptor could be exposed during transportation of waste to an off-site disposal location.

Projected Risk Levels

At the current planned end state, risks to all potential receptors would be at *de minimis* levels using barriers to prevent exposure. In addition, source concentrations and plume concentrations would be reduced; however, preliminary modeling indicates that even after implementation of a heating technology in source zones, contributions of solvents to groundwater would result in solvent concentrations in groundwater greater than MCLs (i.e., the assumed target cleanup level). Additionally, other groundwater contaminants (i.e., metals and radionuclides) would continue to be present in some areas at concentrations greater than their MCLs. Because contamination would continue to exist at levels above MCLs after the source actions, monitored natural attenuation would be required until MCLs for all contaminants are met.

5.1.2 Hazard Area 2 – SWOU

This hazard area encompasses the sources of surface-water contamination found within the industrialized portion of PGDP; the plant ditches and outfalls found inside the industrialized portion of PGDP; the NSDD, a portion of which is located outside the industrialized portion of PGDP; and Bayou and Little Bayou Creeks, which are found outside the industrialized area and run both on and off DOE property. **Please see Section 4.2.1 for a description of the sources and pathways of exposure under the current state.**

Barriers and Actions

The barriers to exposure at the current planned end state (see Figures 5.2c1 and 5.2c2) are continued access controls to prevent exposure to source material①. Source actions are planned under the current planned end state to remove the sources of surface water contamination (i.e., scrap and sediments)④. To ensure that migration to areas outside the industrialized area is slowed, migration controls (i.e., sediment control basins)⑤ would be employed. Finally, monitoring of effluents would continue to ensure that any future releases are identified quickly②.

Under the current planned end state, potential receptors during implementation of the response actions (see Figure 5.2c3) are the environmental sampler, maintenance worker, remediation worker, general site worker, disposal worker, transportation worker, the public, and ecological receptors. The environmental sampler could be exposed during sampling activities. The maintenance worker could be exposed while maintaining controls. The remediation worker and ecological receptor could be exposed during completion of source actions (anticipated to be characterization and disposal of scrap and excavation of sediments). The general site worker also could be exposed during implementation of the source actions. The disposal worker could be exposed while accepting waste from the scrap disposal and excavation activities. The transportation worker, public, and ecological receptor could be exposed during transportation of waste to an off-site disposal location.

Projected Risk Levels

At the current planned end state, risks to all potential receptors would be at *de minimis* levels due either to the presence of barriers that prevent exposure or to the removal of source material. The risk target for cleanup levels under the current planned end state at locations both inside and outside the industrialized area is a residential risk of 1E-06. The PCB concentration target in all areas is 1 ppm. Attainment of the target risk will be determined using the average contaminant concentration (defined as the 95% upper confidence limit of the mean concentration) within the exposure unit. Similarly, the PCB concentration target will be the average concentration within the exposure unit.

5.1.3 Hazard Area 3 – BGOU (Group 1)

This hazard area is composed of two areas included in the BGOU that contain buried waste and/or soil that are not believed to serve as a source of groundwater contamination, but for which the current planned end state and potential end state alternative differ. One of these areas is a burial ground located in the northwestern part of the industrialized area of PGDP. The other area is located in the north-central part of the PGDP, outside of the industrialized area. **Please see Section 4.3.1 for a description of the sources and pathways of exposure under the current state.**

Barriers and Actions

The barriers to exposure at the current planned end state (see Figures 5.3c1 and 5.3c2) are continued access controls to prevent exposure to waste and soil①. Excavation and off-site disposal of waste and soil also are planned under the current planned end state③.

Under the current planned end state, potential receptors during implementation of the response actions (see Figure 5.3c3) are the maintenance worker, remediation worker, general site worker, disposal worker, transportation worker, the public, and ecological receptor. The maintenance worker could be exposed during site maintenance activities performed as part of access controls. The remediation worker, general site worker, and ecological receptor could be exposed during the burial ground excavations. The disposal worker could be exposed while accepting waste, and the transportation worker, public, and ecological receptor could be exposed during transportation of waste to an off-site disposal location.

Projected Risk Levels

At the current planned end state, risks to all potential receptors would be at *de minimis* levels due either to the barriers to prevent exposure or to the removal of waste and soil. Risk targets for cleanup levels during excavation have not been established at this time.

5.1.4 Hazard Area 4 – SOU

This hazard area encompasses all areas containing contamination that do not impact the GWOU or SWOU. It includes all areas inside the industrialized portion of PGDP that are not part of other hazard areas, including those that are part of Hazard Area 9. **Please see Section 4.4.1 for a description of sources and pathways of exposure under the current state.**

Barriers and Actions

The barriers to exposure at the current planned end state (see Figures 5.4c1 and 5.4c2) are continued access controls to prevent exposure to waste and soil①. In addition, source actions to remove the waste and soil③ also are planned under the current planned end state.

Under the current planned end state, potential receptors during implementation of the response actions (see Figure 5.4c3) are the maintenance worker, remediation worker, general site worker, disposal worker, transportation worker, the public, and ecological receptors. The maintenance worker could be exposed during site maintenance activities performed as part of access controls. The remediation worker, general site worker, and ecological receptor could be exposed during the excavation of contaminated waste and soil. The disposal worker could be exposed while accepting waste, and the transportation worker, public, and ecological receptor could be exposed during transportation of waste to an off-site disposal location.

Projected Risk Levels

At the current planned end state, risks to all potential receptors would be at *de minimis* levels due to the barriers to prevent exposure or removal of source material. The risk target for cleanup levels under the current planned end state is a residential risk of 1E-06. The PCB concentration target is 1 ppm. Attainment of the target risk will be determined using the average contaminant concentration (defined as the 95% upper confidence limit of the mean concentration) within the exposure unit. Similarly, the PCB concentration target will be the average concentration within the exposure unit.

5.1.5 Hazard Area 5 – Permitted Landfills

This hazard area is composed of two permitted, closed landfills, the currently operating permitted landfill, and, under future conditions, a potential "CERCLA Cell" that would be used to dispose of debris and other materials generated during GDP D&D. The two closed landfills and the operating landfills are located in the north-central portion of PGDP, outside the industrialized area. The site of the potential CERCLA Cell has not been determined at this time. **Please see Section 4.5.1 for a discussion of sources and pathways of exposure under the current state.**

Barriers and Actions

Barriers to exposure at the current planned end state match those currently in place. (See Figures 5.5c1 and 5.5c2.) These barriers are the current land cover① and access controls②, which prevent exposure to waste and soil; continuation of the PGDP Water Policy④, which provides an alternate water supply to any residences affected by contaminated groundwater; and the landfill cap and leachate collection system③, which minimizes potential for contaminant migration. In addition, the landfills are monitored to ensure that these systems are working properly. (Please see Section 4.1.1 for a discussion of the PGDP Water Policy.)

Under the current planned end state, potential receptors that are part of the treatment train (see Figure 5.5c3) are the maintenance worker and environmental sampler. The maintenance worker could be exposed while maintaining the access controls and landfill containment systems. The environmental sampler could be exposed during routine sampling activities.

Projected Risk Levels

At the current planned end state, risks to all potential receptors would be at *de minimis* levels because barriers prevent exposure.

5.1.6 Hazard Area 6 – BGOU (Group 2)

This hazard area is composed of four areas included in the BGOU that contain buried waste and/or soil that are not believed to serve as a source of groundwater contamination, but for which the current planned end state and potential end state alternative do not differ. These include a landfill located to the southwest of the industrialized portion of PGDP, adjacent to Bayou Creek, and three burial grounds located in the northwestern part of the industrialized area of PGDP. **Please see Section 4.6.1 for a description of sources and pathways of exposure under the current state.**

<u>Barriers and Actions</u>

Barriers to exposure at the current planned end state are depicted in Figure 5.6c1 and 5.6c2. These barriers are the current land cover① and access controls② that prevent exposure to waste and subsurface soil; continuation of the PGDP Water Policy③ that provides an alternate water supply to any residences affected by contaminated groundwater; and the landfill cap④, which mitigates contaminant migration. (Please see Section 4.1.1 for a discussion of the PGDP Water Policy.)

Under the current planned end state, potential receptors in the treatment train (see Figure 5.6c3) are the maintenance worker, remediation worker, environmental sampler, and ecological receptor. The maintenance worker could be exposed while maintaining the access controls and current cover. The remediation worker and ecological receptor could be exposed while installing the landfill cap. The environmental sampler could be exposed during routine sampling activities.

<u>Projected Risk Levels</u>

At the current planned end state, risks to all potential receptors would be at *de minimis* levels because barriers limit exposure or mitigate contaminant migration.

5.1.7 Hazard Area 7 – Legacy Waste and DMSAs

This hazard area is composed of legacy waste found at storage locations at PGDP and potentially contaminated debris, surfaces, and soil found in DMSAs located throughout PGDP. **Please see Section 4.7.1 for a description of the sources and pathways of exposure under the current state.**

<u>Barriers and Actions</u>

No barriers to exposure are required at the current planned end state (see Figures 5.7c1 and 5.7c2) because all legacy waste and materials in the DMSAs would have been characterized and disposed of in an off-site location or in a permitted landfill at PGDP②. Additionally, any contaminated surfaces are decontaminated③ and contaminated soil is excavated and disposed of in an off-site location or in a permitted landfill at PGDP④.

Under the current planned end state, potential receptors during implementation of the response actions (see Figure 5.7c3) are the remediation worker, general site worker, disposal worker, transportation worker, the public, and ecological receptor. The remediation worker, general site worker, and ecological receptor could be exposed during the characterization and disposal of waste, decontamination of surfaces, and excavation of soil. The landfill worker and disposal worker could be exposed while accepting waste, including excavated soil. The transportation worker, public, and ecological receptor could be exposed during transportation of waste and soil to an off-site disposal location.

<u>Projected Risk Levels</u>

At the current planned end state, risks to all potential receptors would be at *de minimis* levels due to characterization and disposal of waste and soil. The risk target for cleanup levels for soil under the current planned end state is a residential risk of 1E-06. The PCB concentration target is 1 ppm. Attainment of the target risk will be determined using the average contaminant concentration (defined as the 95% upper confidence limit of the mean concentration) within the exposure unit. Similarly, the PCB concentration target will be the average concentration within the exposure unit.[3]

5.1.8 Hazard Area 8 – Cylinder Yards and DUF_6 Conversion Facility

This hazard area is composed of the cylinder yards that contain DUF_6 and a facility currently being planned to convert the DUF_6 to more stable uranium oxides before off-site shipment. The cylinder yards are located throughout the site, and the largest yard is in the southeast corner of the industrialized area of PGDP. The planned conversion facility will be located adjacent to this yard. **Please see Section 4.8.1 for a description of the sources and pathways of exposure under the current state.**

<u>Barriers and Actions</u>

At the current planned end state (see Figures 5.8c1 and 5.8c2), all sources of contamination are removed. The completion of the conversion mission③ includes off-site disposal of converted uranium; D&D of infrastructure, followed by on-site disposal④; and excavation of any contaminated soil⑤. In addition, any contamination in runoff is attenuated naturally by the time it reaches surface water②.

Under the current planned end state, potential receptors during implementation of the response actions (see Figure 5.8c3) are the industrial worker, remediation worker, landfill worker, general site worker, and ecological receptor. The industrial worker would be exposed while working in the conversion facility. The remediation worker, general site worker, and ecological receptor could be exposed during the D&D of the facility infrastructure and excavation of soil. The landfill worker and general site worker could be exposed while waste is transported to, and accepted at, the potential on-site CERCLA Cell.

<u>Projected Risk Levels</u>

At the current planned end state, risks to all potential receptors would be at *de minimis* levels due to D&D of facility infrastructure, completion of the conversion mission, and excavation of any contaminated soils. The risk target for cleanup levels for soil under the current planned end state is a residential risk of 1E-06. The PCB concentration target is 1 ppm. Attainment of the target risk will be determined using the average contaminant concentration (defined as the 95% upper confidence limit of the mean concentration) within the exposure unit. Similarly, the PCB concentration target will be the average concentration within the exposure unit.

5.1.9 Hazard Area 9 – GDP Facilities

This hazard area is composed of the GDP facilities and infrastructure that will undergo D&D as part of either the D&D OU strategic initiative (see Chapter 1) or the final GDP D&D. This hazard area also encompasses any sources to groundwater and surface water not addressed in other hazard areas. **Please see Section 4.9.1 for a description of the sources and pathways of exposure under the current state.**

---

[3] Cleanup at DMSAs is subject to an Agreed Order (DOE 2003d). It is the regulators' position that meeting the closure requirements under the Agreed Order does not relieve DOE from the requirement to meet CERCLA cleanup standards; therefore, even after meeting the clean closure standards under the Agreed Order, additional response actions may be required for some DMSAs under CERCLA.

Additionally, please see Section 4.9.2 for a discussion of the range of options that may be considered when the GDP undergoes D&D.

Barriers and Actions

Barriers to exposure at the current planned end state (see Figures 5.9c1 and 5.9c2) are continued access and excavation restrictions, which prevents exposure to contaminants in soil① and continuation of the PGDP Water Policy②, which provides an alternate water supply to affected residences. (Please see Section 4.1.1 for a discussion of the PGDP Water Policy.) Source actions are planned to meet the current planned end state. These source actions include D&D of infrastructure with disposal in a potential on-site CERCLA Cell⑥, excavation of soil with disposal in the potential CERCLA Cell⑨, and treatment to reduce DNAPL concentrations in subsurface soil and the aquifer⑩. Discharges to surface water are addressed through natural attenuation④, and monitored natural attenuation will be used to address residual contamination in source zones and groundwater after completion of the source actions⑧.

Under the current planned end state, receptors potentially exposed during implementation of the response actions (see Figure 5.9c3) are the general site worker, environmental sampler, remediation worker, landfill worker, ecological receptor; additionally, if off-site disposal is required, the transportation worker, disposal worker, and the public potentially could be exposed. (Off-site disposal of wastes derived from D&D of the C-340 and C-410/420 Buildings is possible if the D&D occurs before the potential CERCLA Cell is constructed and operating.) The general site worker and ecological receptor could be exposed during infrastructure D&D, excavation of soil, and disposal of waste. The environmental sampler could be exposed during sampling activities. The remediation worker could be exposed during completion of infrastructure D&D, soil excavation, and source actions to address groundwater contamination (anticipated to be a heating technology for subsurface soil and groundwater). The landfill and disposal workers could be exposed while accepting D&D waste, soil, and other waste derived when implementing the source actions for groundwater. Finally, the transportation worker, public, and ecological receptor could be exposed during transportation of waste to an off-site disposal location.

Projected Risk Levels

At the current planned end state, risks to all potential receptors would be at *de minimis* levels using barriers to prevent exposure. In addition, source concentrations and plume concentrations would be reduced; however, contamination above MCLs (i.e., the assumed target cleanup level) would remain in groundwater. Because contamination would continue to exist at levels above MCLs, monitored natural attenuation would be required. The risk target for cleanup levels for soil and building surfaces under the current planned end state is a residential risk of 1E-06. The PCB concentration target is 1 ppm. Attainment of the target risk will be determined using the average contaminant concentration (defined as the 95% upper confidence limit of the mean concentration) within the exposure unit. Similarly, the PCB concentration target will be the average concentration within the exposure unit.

5.2 VARIANCES BETWEEN CURRENT PLANNED END STATE AND POTENTIAL END STATE ALTERNATIVE

This section presents tables identifying the variances between the current planned end state and the potential end state alternative. It begins with two tables that 1) compare the barriers and mechanisms and the risks (including risk balancing) under the two end states (Table 5.1) and 2) summarize the differences in the barriers and mechanisms under the two end states (Table 5.2). This section concludes with two large tables (Tables 5.3 and 5.4) that explore in greater detail the variances within and across hazard

Risk Balancing

This section and its associated tables include discussions of risk balancing between the two end states for all hazard areas. These discussions include the identification of the differences in potential risks that could be posed to human and ecological receptors during the implementation of potential response actions and when each of the end states is achieved.

For example, at Hazard Area 3 (BGOU Group 1), the potential end state alternative is capping with continued access and excavation restrictions, and the current planned end state is excavation with on- and off-site disposal of excavated material and continued access and excavation restrictions. Therefore, at the end states, the risks posed by the contamination to workers and the neighboring public would be identical (i.e., at *de minimis* levels) because the access and excavation restrictions prevent exposure to contaminated materials. However, the sustainability of the two end states do differ because excavation and on- and off-site disposal is a more permanent remedy for the waste in the burial grounds than capping, which would require continued maintenance in order to mitigate risk to receptors. Additionally, the unmitigated risk under the potential end state alternative to workers and the public would be greater than that under the current planned end state. This results because the potential end state alternative relies on maintenance of a cap and access and excavation restrictions to prevent exposure to waste and residually contaminated media, while the current planned end state relies on the maintenance of access and excavation restrictions to prevent exposure to residually contaminated media only.

Similarly, the risks posed to receptors during implementation of each end state's potential response actions can also be balanced. Under the potential end state alternative actions, the receptors potentially exposed are limited to the remediation workers installing the cap and the workers maintaining access controls. However, under the potential current planned end state actions, the receptors potentially exposed are the remediation worker, general site worker, and ecological receptor that could be exposed to waste during burial ground excavation; the maintenance worker that could be exposed while maintaining access controls, the disposal worker that could be exposed when accepting waste for disposal, and the transportation worker, public, and ecological receptors that could be exposed while transporting waste.

Therefore, cumulative risk over all receptors posed during implementation of response actions under the potential end state alternative would be less than that under the current planned end state. This is because no receptors are exposed to waste under the potential end state alternative, but several workers could be exposed to waste under the current planned end state.

areas. These tables also include discussions of the scope, schedule, cost, and risk impacts of the variances; challenges related to the variance preventing the implementation of the potential end state alternative; and recommendations for addressing these challenges. (Note that in some cases cost and schedule information is not available. In these cases, the effect of the variance on cost and schedule is qualitatively estimated.)

The relative importance of the varying cleanup levels discussed in Tables 5.1 and 5.2 is illustrated in Figure 5.10 and 5.11. Figure 5.10 shows where PCBs have been sampled for, but have not been detected at concentrations greater than 1 ppm (grey dot); have been detected at a concentration greater than 1 ppm but less than 25 ppm (blue dot); and have been detected at a concentration greater than 25 ppm (red dot). Figure 5.11 shows where ^{238}U has been sampled for, but has not been detected at concentrations greater than 1.71 pCi/g (grey dot); has been detected at a concentration greater than 1.71 pCi/g, but less than 171 pCi/g (blue dot); and has been detected at a concentration greater than 171 pCi/g (red dot). (Note that 1.71 pCi/g and 171 pCi/g equate to cancer risk targets to an industrial worker of 1E-06 and 1E-04, respectively.) By comparing the size of the "blue dot" areas to the "red dot" areas in the figures, the areas that would require excavation under a 1 ppm PCB cleanup level or a 1E-06 target cancer risk are easily seen to be much greater than those that would require excavation under a 25 ppm PCB cleanup level or a 1E-04 target cancer risk. Similarly, the count of analyses performed and the number of results falling within each of the categories shown on the map also can be used to indicate the variance in potential excavation amounts. The figure has been updated to include recent data collected in support of the remediation program. These counts are as follows:

<u>PCBs—</u>

Total analyses (equals sum of grey, blue and red dots) is 6,253.

PCBs < 1 ppm or not detected (equals number of grey dots) is 5,645 (90% of all samples).

PCBs ≥ 1 ppm (equals number of blue and red dots) is 608 (10% of all samples). PCBs ≥ 25 ppm (equals number of red dots) is 113 (1.8% of all samples).

^{238}U—

Total analyses (equals sum of grey, blue and red dots) is 4,240.

$^{238}U < 1.71$ pCi/g or not detected (equals number of grey dots) is 1,745 (41% of all samples).

$^{238}U \geq 1.71$ pCi/g (equals number of blue and red dots) is 2,495 (59% of all samples). $^{238}U \geq 171$ pCi/g (equals number of red dots) is 64 (1.5% of all samples).

Based upon these counts, it can be estimated that 6 times (10%/1.8%) as much soil would need to be excavated using a 1 ppm versus 25 ppm PCB target, and 39 times (59%/1.5%) as much soil would need to be excavated using 1E-06 cancer risk target versus a 1E-04 cancer risk target. Note, however, that these results are uncertain, because both PCB and ^{238}U sampling results are lacking for large portions of PGDP.

Table 5.1. Comparison by Hazard Area Between Barriers and Mechanisms Used for the Current Planned End State and Potential End State Alternative

Current Planned End State	Potential End State Alternative
Hazard Area 1: GWOU	
Access and excavation restrictions.	Same.
PGDP Water Policy.	Enhanced institutional controls.
Source treatment (i.e., resistance heating) at multiple sites with monitored natural attenuation.	Source treatment (i.e., resistance heating) at a single site with monitored natural attenuation.
Source removal (i.e., excavation) at burial grounds with monitored natural attenuation.	Cap burial grounds with monitored natural attenuation.
Active contaminant reduction (e.g., oxidation) in the dissolved-phase plumes with monitored natural attenuation.	Monitored natural attenuation.
Natural attenuation of contaminants discharged to surface water at seeps on Little Bayou Creek.	Same.

<u>Risk Balancing</u>

- When end state is achieved:
  - Risks to all receptors would approach *de minimis* levels under both end states due to response actions and access restrictions.
  - Risks under the potential end state alternative would be lower than under the current planned end state because actions completed under enhanced institutional controls would be more likely to prevent groundwater use.
  - Ignoring controls on groundwater use, the residual risks from contaminant transport from solvent source areas would be lower under the current planned end state than under the potential end state alternative because a greater amount of solvents are removed.
  - Under the current planned end state, the monitoring period for solvents could be shorter because a greater amount of solvents is removed.
  - Under both the current planned end state and potential end state alternative, discharges to Little Bayou Creek would need to be monitored to ensure contaminant concentrations in seeps do not increase.
  - The sustainability of the potential end state alternative is greater because enhanced institutional controls would have greater permanence than the PGDP Water Policy.

- During implementation of potential response actions:
  - With source treatment and removal under the current planned end state, additional receptors (e.g., excavation, landfill, and transportation workers, the public, and ecological receptors) may be exposed during remediation, transportation, and waste disposal. Therefore, remediation risks may be greater under the current planned end state than under the potential end state alternative.
  - Physical hazards to remediation workers would be greater during implementation under the current planned end state than under the potential end state alternative due to the installation of a greater number of treatment systems and greater use of reactive materials.

Table 5.1. Comparison by Hazard Area Between Barriers and Mechanisms Used for the Current Planned End State and Potential End State Alternative (Continued)

Current Planned End State	Potential End State Alternative
Hazard Area 2: SWOU	
Access and excavation restrictions.	Same.
Environmental monitoring with ecological risk assessment performed during CSOU.	Same.
Scrap removal.	Same.
In industrial areas, complete excavation of sediment and soil source areas; target risk based on residential risk of 1E-06, PCBs at 1 ppm.	In industrial areas, excavation of "hot spots" in soil and sediment; target risk based on worker risk of 1E-04, PCBs at 25 ppm.
In recreational areas, complete excavation of source areas; target risk based on residential risk of 1E-06, PCBs at 1 ppm.	In recreational areas, excavation of "hot spots" in soil and sediment; target risk based on recreational user risk of 1E-04, PCBs at 1 ppm.
Migration controls (i.e., sediment control basins).	No migration controls.

<u>Risk Balancing</u>

- When end state is achieved:
  - Risks to all receptors would approach *de minimis* levels under both end states due to response actions and access restrictions.
  - Residual risks (ignoring access restrictions) due to direct contact after excavation of source areas would be less under the current planned end state than under the potential end state alternative due to the use of lower target cleanup levels; however, residual risks under both end states would be within or below EPA's risk range. Additionally, the current planned end state cleanup targets based on residential use are inconsistent with the planned future uses.
  - Residual risks (ignoring access restrictions) due to contaminant migration would be the same under both end states because source areas are removed.
  - Sustainability of the response actions do not differ between end states.

- During implementation of potential response actions:
  - Remediation risks to remediation workers, general plant workers, landfill workers, transportation workers, the public, and ecological receptors would be greater under the current planned end state than under the potential end state alternative because the use of lower cleanup targets would result in a greater extent of excavation and a greater amount of waste to be transported and disposed of in approved landfills.
  - Physical hazards to remediation workers would be greater during implementation under the current planned end state than under the potential end state alternative due to the need to excavate and transport a greater amount of material.

Table 5.1. Comparison by Hazard Area Between Barriers and Mechanisms Used for the Current Planned End State and Potential End State Alternative (Continued)

Current Planned End State	Potential End State Alternative
Hazard Area 3: BGOU (Group 1)	
Access and excavation restrictions.	Same.
Excavate burial grounds.	Cap burial grounds.

Risk Balancing

- When end state is achieved:
  - Risks to all receptors would approach *de minimis* levels under both end states due to access and excavation restrictions.
  - Ignoring access restriction, residual risks in on-site areas from direct contact with waste and contaminated media in burial grounds would be lower under the current planned end state than under the potential end state alternative because under the current planned end state waste would be removed from the burial grounds and disposed of in approved landfills.
  - Residual risk from migration of contaminants from burial grounds through the groundwater pathway could be lower under the current planned end state than under the potential end state alternative because waste material would be excavated and disposed of in a lined landfill at either an on-site or off-site location.
  - Excavation and disposal is a more sustainable response action than capping because maintenance of the cap would be required.

- During implementation of potential response actions:
  - Remediation risks to remediation workers, general plant workers, landfill workers, transportation workers, the public, and ecological receptors would be greater under the current planned end state than under the potential end state alternative because the chance of exposure to waste material and contaminated soils would greater when waste and soils are excavated, transported, and disposed of at an off-site location than when the waste and contaminated materials are capped.
  - Physical hazards to remediation workers would be greater under the current planned end state than under the potential end state alternative due to the need to excavate and transport waste material from burial grounds.

Table 5.1. Comparison by Hazard Area Between Barriers and Mechanisms Used for the Current Planned End State and Potential End State Alternative (Continued)

Current Planned End State	Potential End State Alternative
Hazard Area 4: SOU	
Access and excavation restrictions.	Same.
Complete excavation of soil source areas; target risk based on residential risk of 1E-06, PCBs at 1 ppm.	Excavation of “hot spots” in soil; target risk based on worker risk of 1E-04, PCBs at 25 ppm.

<u>Risk Balancing</u>

- When end state is achieved:
  - Risks to all receptors would approach *de minimis* levels under both end states due to response actions and access and excavation restrictions.
  - Residual risks after excavation of source areas without access restrictions would be less under the current planned end state than under the potential end state alternative due to the use of lower target cleanup levels; however, residual risks under both end states would be within or below EPA’s risk range. Additionally, the current planned end state cleanup targets based on residential use are inconsistent with the planned future uses.
  - The sustainability of the cleanup under the potential response actions does not differ between end states.

- During implementation of potential response actions:
  - Remediation risks to remediation workers, general plant workers, landfill workers, transportation workers, the public, and ecological receptors would be greater under the current planned end state than under the potential end state alternative because the use of lower cleanup targets would result in a greater extent of excavation and a greater amount of waste to dispose of in approved landfills.
  - Physical hazards to remediation workers would be greater during implementation under the current planned end state than under the potential end state alternative due to the need to excavate and transport a greater amount of material.

Table 5.1. Comparison by Hazard Area Between Barriers and Mechanisms Used for the Current Planned End State and Potential End State Alternative (Continued)

Current Planned End State	Potential End State Alternative
Hazard Area 5: Permitted Landfills	
Maintain current land cover.	Same.
Access and excavation restrictions.	Same.
Landfill cap and leachate collection system.	Same.
PGDP Water Policy.	Enhanced institutional controls.

Risk Balancing

- When end state is achieved:
  - Risks to all receptors would approach *de minimis* levels under both end states due to land cover, caps, and leachate collection system along with access restrictions.
  - If landfill fails, the risks under the potential end state alternative would be lower than under the current planned end state due to the actions completed under enhanced institutional controls, which are more likely to prevent groundwater use.
  - The sustainability of the potential end state alternative is greater because enhanced institutional controls would have greater permanence than the PGDP Water Policy.

- During implementation of potential response actions:
  - Risks to receptors during remediation do not differ.

Hazard Area 6: BGOU (Group 2)	
Maintain current land cover.	Same.
Access and excavation restrictions.	Same.
PGDP Water Policy.	Enhanced institutional controls.
Landfill cap.	Same.
Monitoring.	Same.

Risk Balancing

- When end state is achieved:
  - Risks to all receptors would approach *de minimis* levels under both end states due to response actions and access and excavation restrictions.
  - Under both end states, monitoring would ensure that releases are detected early so that appropriate actions could be taken.
  - If contaminants do migrate from the burial grounds, the risks under the potential end state alternative would be lower than under the current planned end state due to the actions completed under enhanced institutional controls, which are more likely to prevent groundwater use.
  - The sustainability of the potential end state alternative is greater because enhanced institutional controls would have greater permanence that the PGDP Water Policy.

- During implementation of potential response actions:
  - Risks to receptors during remediation do not differ.

Table 5.1. Comparison by Hazard Area Between Barriers and Mechanisms Used for the Current Planned End State and Potential End State Alternative (Continued)

Current Planned End State	Potential End State Alternative
Hazard Area 7: Legacy Wastes and DMSAs	
Characterization and disposal.	Same.
For DMSAs, decontamination of surfaces; target risk based on residential risk of 1E-06, PCBs at 1 ppm.	For DMSAs, decontamination of surfaces; target risk based on worker risk of 1E-04, PCBs at 25 ppm.
For DMSAs, excavation of soil; target risk based on residential risk of 1E-06, PCBs at 1 ppm.	For DMSAs, excavation of "hot spots" in soil; target risk based on worker risk of 1E-04, PCBs at 25 ppm.

Risk Balancing

- When end state is achieved:
  - Risk from waste to all receptors would approach *de minimis* levels due to disposal.
  - Due to the use of lower target cleanup levels, risks from residual contamination in DMSAs under the current planned end state may be lower than those under the potential end state alternative; however, residual risks under both end states would be within or below EPA's risk range. Additionally, the current planned end state cleanup targets are inconsistent with the planned future uses.
  - The sustainability of the cleanup under the potential response actions does not differ between end states.

- During implementation of potential response actions:
  - Remediation risks to remediation workers, general plant workers, landfill workers, transportation workers, the public, and ecological receptors would be greater under the current planned end state than under the potential end state alternative because the use of lower target cleanup targets would result in a greater extent of excavation and a greater amount of waste to dispose of in approved landfills.
  - Physical hazards to remediation workers would be greater during implementation under the current planned end state than under the potential end state alternative due to the need to excavate and transport a greater amount of material.

Table 5.1. Comparison by Hazard Area Between Barriers and Mechanisms Used for the Current Planned End State and Potential End State Alternative (Continued)

Current Planned End State	Potential End State Alternative
Hazard Area 8: Cylinder Yards and DUF_6 Conversion Facility	
Natural attenuation of runoff.	Same.
Conversion and disposal of UF_6.	Same.
D&D of infrastructure.	Same.
Excavation of soil source areas; target risk based on residential risk of 1E-06, PCBs at 1 ppm.	Excavation of "hot spots" in soil; target risk based on worker risk of 1E-04, PCBs at 25 ppm.

Risk Balancing

- When end state is achieved:
  - Risks to all receptors would be at *de minimis* levels under both end states due to D&D and removal.
  - Residual risks after excavation of source areas would be less under the current planned end state than under the potential end state alternative due to the use of lower target cleanup levels; however, residual risks under both end states would be within or below EPA's risk range. Additionally, the current planned end state cleanup targets based on residential use are inconsistent with the planned future uses.
  - The sustainability of the cleanup under the potential response actions does not differ between end states.

- During implementation of potential response actions:
  - Remediation risks to remediation workers, general plant workers, landfill workers, transportation workers, the public, and ecological receptors would be greater under the current planned end state than under the potential end state alternative because the use of lower cleanup targets would result in a greater extent of excavation and a greater amount of waste to dispose of in approved landfills.
  - Physical hazards to remediation workers would be greater during implementation under the current planned end state than under the potential end state alternative due to the need to excavate and transport a greater amount of material.

Table 5.1. Comparison by Hazard Area Between Barriers and Mechanisms Used for the Current Planned End State and Potential End State Alternative (Continued)

Current Planned End State	Potential End State Alternative
Hazard Area 9: GDP Facilities	
Access and excavation restrictions.	Same.
PGDP Water Policy	Enhanced institutional controls.
Natural attenuation of contaminants discharged to surface water at seeps on Little Bayou Creek.	Same.
D&D of infrastructure and disposal in potential on-site CERCLA Cell.	Same.
Excavation of soil source areas; target risk based on residential risk of 1E-06, PCBs at 1 ppm.	Excavation of "hot spots" in soil; target risk based on worker risk of 1E-04, PCBs at 25 ppm.
Source treatment with monitored natural attenuation.	Monitored natural attenuation.
Active contaminant reduction (e.g., oxidation) in the dissolved- phase plumes with monitored natural attenuation.	Monitored natural attenuation.

Risk Balancing

- When end state is achieved:
  - Risks to all receptors approach *de minimis* levels under both end states due to access restrictions and infrastructure removal.
  - Risks under the potential end state alternative would be lower than under the current planned end state because actions completed under enhanced institutional controls would be more likely to prevent groundwater use.
  - Under both the current planned end state and potential end state alternative, discharges to Little Bayou Creek would need to be monitored to ensure contaminant concentrations in seeps do not increase.
  - Ignoring controls on groundwater use, the residual risks from contaminant transport from solvent source areas would be lower under the current planned end state than under the potential end state alternative because a greater amount of solvents are removed.
  - Under the current planned end state, the monitoring period for solvents could be shorter because a greater amount of solvents is removed.
  - Residual risks (ignoring access restrictions) after excavation of source areas would be less under the current planned end state than under the potential end state alternative due to the use of lower target cleanup levels; however, residual risks under both end states would be within or below EPA's risk range. Additionally, the current planned end state cleanup targets based on residential use are inconsistent with the planned future uses.
  - The sustainability of the potential end state alternative is greater because enhanced institutional controls would have greater permanence that the PGDP Water Policy.

- During implementation of potential response actions:
  - For groundwater, with source treatment and removal under the current planned end state, additional receptors (e.g., excavation, landfill, and transportation workers; the public; and ecological receptors) may be exposed during remediation and waste disposal. Therefore, remediation risk may be greater under the current planned end state than under the potential end state alternative.
  - Use of lower target cleanup levels under the current planned end state would result in a greater extent of excavation and a greater amount of waste, resulting in higher remediation risks to workers and the public and greater impacts on ecological receptors than under the potential end state alternative; however, this variance is likely to be minimal because the soil would be only a small portion of the waste generated during D&D.
  - Physical hazards to remediation workers would be greater during implementation under the current planned end state than under the potential end state alternative due to 1) installation of a greater number of treatment systems and greater use of reactive materials and 2) need to excavate and transport a greater amount of material.

Table 5.2. Comparison Between Barriers and Mechanisms Used for the Current Planned End State and Potential End State Alternatives

Current Planned End State Actions	Potential End State Alternative Actions
Continued access and institutional controls (e.g., capping, controls on groundwater use).	Same.
Response actions at multiple locations to reduce the concentration of TCE and other solvents in subsurface areas that act as sources of groundwater contamination, and natural attenuation.	Response action at a single location to reduce the concentration of TCE and other solvents in subsurface at the location and monitored natural attenuation, with continued access and institutional controls.
Response actions to reduce TCE concentrations in the dissolved-phase plumes, and natural attenuation.	Monitored natural attenuation of sources of the dissolved-phase plumes, with continued access and institutional controls.
Monitored natural attenuation of sources of groundwater contamination and the dissolved-phase plumes following completion of response action to reduce TCE concentrations.	Monitored natural attenuation of sources of groundwater contamination and the dissolved-phase plumes with continued access and institutional controls following completion of source action at one location.
Natural attenuation to reduce TCE concentrations in groundwater discharged to surface water.	Same.
Construction of sediment control basins.	No migration controls.
Excavation and on- and off-site disposal of surface and subsurface soil and sediment to attain a target risk of 1E-06 for hypothetical residents and an average PCB concentration of 1 ppm within exposure units in industrial and recreational areas.	Excavation and on- and off-site disposal of contaminated surface soil and sediment to attain a target risk of 1E-04 to receptors consistent with current and future land use (i.e., industrial or recreational as appropriate) and an average PCB concentrations within exposure units of 25 ppm in industrial areas and 1 ppm in recreational areas.
Excavation and on- and off-site disposal of wastes from burial grounds.	Capping of burial grounds.
Characterization and on- and off-site disposal of legacy waste.	Same.
On- and off-site disposal of debris from D&D of facilities and infrastructure.	Same.

Table 5.3. Variance Report by Hazard Area

(Please see Figures 5.12 and 5.13 for maps of the potential end state alternative and current planned end state, respectively, that depict these variances.)

ID. No.	Description of Variance	Impacts	Challenges in Achieving Alternative	Recommendations
Hazard Area 1: GWOU				
V-1.1	**Current Planned End State:** Continuation of PGDP Water Policy **Alternative:** Enhanced institutional controls	Scope: The current planned end state includes continuation of the current PGDP Water Policy[a]. The potential end state alternative includes enhanced institutional controls[b], which would supercede the current PGDP Water Policy. Under both end states, the goal would be to reduce risks to residents from exposure to groundwater to *de minimis* levels[c]. Cost: The cost variance has not been determined to date. The cost of water currently provided under the PGDP Water Policy ranges from $70,000 to $100,000 per year. Depending upon the specific enhanced institutional controls, the cost variance of the enhanced institutional controls could include some cost avoidance (if the PGDP Water Policy is replaced). Additionally, there could be some cost avoidance under other actions as well as discussed elsewhere in this variance report (e.g., excavation of burial grounds versus capping). However, the implementation of enhanced institutional controls would include costs for acquisition of rights to restrict groundwater use and continued monitoring to ensure continued long-term effectiveness of the enhanced institutional controls. Schedule: The PGDP Water Policy currently is in place. Implementation of the enhanced institutional controls would be a future planned CERCLA response action. Risk: The expected risk variance is zero under both the PGDP Water Policy and enhanced institutional controls because each would prevent exposure to contaminated groundwater, resulting in no risk. Enhanced institutional controls, however, would be more sustainable and, therefore, would result in greater long-term effectiveness because they would involve legally enforceable property restrictions and deed notices. (The agreements with landowners under the PGDP Water Policy do not restrict groundwater use, but only commit DOE to provide municipal water to replace the groundwater in return for the property owner's commitment not to use the groundwater. Thus, current or future property-owners could return to using groundwater in the home, completing this exposure pathway, and potentially raising risk from *de minimis* levels[c].)	Public and regulator acceptance of range of options included in enhanced institutional controls is uncertain. The regulatory position is that the current fence line (located well inside the property boundary) should be used as the point of exposure for determining compliance with MCLs. DOE policy may limit options available under the enhanced institutional controls.	Initiate further discussion with the public and regulators to determine acceptability of acquisition of property rights ranging from deed notices and permanent groundwater use restrictions to property purchase. Initiate further discussion with regulators: • to discuss willingness to consider enhanced institutional controls in conjunction with monitored natural attenuation in lieu of certain source and plume actions. • to discuss willingness to consider establishing points of compliance and exposure at the property boundary. Revisit DOE policy concerning acquisition of property rights (ranging from deed notices and permanent groundwater use restrictions to property purchase).

Table 5.3. Variance Report by Hazard Area (Continued)

(Please see Figures 5.12 and 5.13 for maps of the potential end state alternative and current planned end state, respectively, that depict these variances.)

ID. No.	Description of Variance	Impacts	Challenges in Achieving Alternative	Recommendations
V-1.2	**Current Planned End State:** Treatment to attain source reduction at multiple sites with monitored natural attenuation (with either PGDP Water Policy or enhanced institutional controls; see V-1.1) and a point of compliance at the PGDP fence line. **Alternative:** Treatment to attain source reduction at one site with monitored natural attenuation (with either PGDP Water Policy or enhanced institutional controls; see V-1.1) and a point of compliance at the DOE property boundary, in accordance with CERCLA requirements.	<u>Scope:</u> The current planned end state assumes implementation of DNAPL source reduction actions at multiple sites using in situ heating technologies in combination with monitored natural attenuation with a point of exposure established at the PGDP fence line. The potential end state alternative includes a source reduction action using this technology at one location (i.e., C-400, which is believed to be the primary source of solvent contamination at PGDP) in combination with monitored natural attenuation with a point of exposure established at the DOE property boundary or at a downgradient location in accordance with the requirements of CERCLA. <u>Cost:</u> The combined cost of implementing in situ heating technology at the DNAPL source areas (i.e., C-400, C-720, and oil landfarm) is estimated to range from $75,000,000 to $140,000,000. The cost of implementing at the C-400 only is approximately $50,000,000. The cost per year for monitored natural attenuation essentially would be the same under both the current planned end state and potential end state alternative; however, the duration of the monitoring/attenuation period could differ between the current planned end state (hundreds of years) and the potential end state alternative (potentially thousands of years). <u>Schedule:</u> Under the current planned end state, the construction and performance of the currently planned source actions would be implemented by 2010, with associated monitoring/attenuation potentially continuing for hundreds of years. A remedial design for the C-400 DNAPL source action currently is undergoing review by the regulatory agencies. Under the potential end state alternative, the construction and performance of the currently planned source action would be implemented by 2010 (the current SMP milestone for the Remedial Action Completion Report is 2011), with associated monitoring/attenuation potentially continuing for thousands of years. Under both end states additional investigations to identify other source areas, if any, will be performed as part of the SOU and GDP D&D. <u>Risk:</u> The only variance in risk between the current planned end state and the potential end state alternative is the amount of time necessary to achieve MCLs. The PGDP Water Policy and/or enhanced institutional controls would eliminate	Public and regulator acceptance of range of options included in enhanced institutional controls is uncertain. The regulators' position is that monitored natural attenuation would need to be supplemented by source actions at multiple locations to reduce contaminant concentrations to MCLs in a "reasonable" timeframe (e.g., ≤ 100 years); however, even with source reduction, it would take hundreds of years to reach MCLs for the contaminants addressed (i.e., solvents), and contamination not addressed by the action (i.e., metals and radionuclides) would remain above MCLs, as well. (With source reduction at only one area, the monitoring period potentially could be thousands of years.) Despite national performance data indicating that no	Initiate further discussion with the public and regulators to determine acceptability of acquisition of property rights ranging from deed notices and permanent groundwater use restrictions to property purchase. Complete technical investigations at remaining sources and reach agreement with regulators on potential for contaminant migration. Initiate discussion with regulators to 1) determine the

Table 5.3. Variance Report by Hazard Area (Continued)

(Please see Figures 5.12 and 5.13 for maps of the potential end state alternative and current planned end state, respectively, that depict these variances.)

ID. No.	Description of Variance	Impacts	Challenges in Achieving Alternative	Recommendations
		risks to the public from off-site migration of DNAPL under both end states. However, the current planned end state could reduce the amount of time necessary to meet MCLs, thereby shortening the time period that the PGDP Water Policy or enhanced institutional controls would have to remain in effect. Implementation of in situ heating technology at multiple sites under the current planned end state could result in exposures of remediation workers to contaminated soil and groundwater and, potentially, gases, as well as physical hazards. Implementation of the source action could pose a risk of exposure to gases to general plant workers. Workers involved in disposal of materials contaminated during implementation of the source action also could be exposed. Finally, samplers involved in groundwater monitoring activities could be exposed. Except for risks to samplers, the magnitude of these risks has not been estimated at this time. Risks to remediation workers, general plant workers, and workers involved in disposal of materials contaminated during implementation of the *in situ* heating technology under the potential end state alternative would be less because only a single location would be addressed. Risks to samplers involved in groundwater monitoring activities under the potential end state alternative would be similar to those under the current planned end state; however, an assessment of these risks under current sampling protocols determined that risks to samplers are at *de minimis* levels[c].	technologies currently exist that can reduce DNAPLs in source areas to MCLs within a "reasonable" period, the regulators' position is that TI aivers would be available only after a demonstrated, site-specific technology failure. The regulators' position is that the current fence line (located well inside the property boundary) should be used as the point of exposure for determining compliance with MCLs.	appropriateness of requiring a demonstrated failure, given the national performance data, and 2) determine what would be required to decide whether TI waiver should apply Initiate further discussion with regulators to determine willingness to consider establishing points of compliance and exposure at property boundary.
V-1.3	**Current Planned End State:** Excavation to remove suspected sources of groundwater contamination at burial grounds **Alternative:** Capping and monitored natural attenuation (with either PGDP Water Policy or enhanced institutional controls; see V-1.1)	Scope: The current planned end state assumes the investigation and subsequent complete excavation of three burial grounds (C-749 Uranium Burial Ground, C-404 Low-level Radioactive Waste Burial Ground, and C-747 Contaminated Burial Yard) suspected to be sources of groundwater contamination, subsequent off-site disposal of excavated materials, and monitoring to determine the effectiveness of source removal. This has been updated from two to three burial grounds to include the C-404 Low-level Radioactive Waste Burial Ground due to more recent data evaluations that indicate an increased potential to be a source of groundwater contamination. The potential end state alternative assumes the investigation and subsequent capping and monitoring for these burial grounds. Cost: The variance between the combined cost of excavating the three burial grounds, off-site disposal of excavated material, and monitoring under the current planned end state and compared to the combined cost for capping and monitoring under the potential end state alternative is estimated to range from \$85,000,000 to \$418,000,000, which now includes the addition of the third burial ground.	It is the regulators' position that capping, access controls, and/or enhanced institutional controls are inadequate to achieve long-term protectiveness for in situ management of contamination at burial grounds; therefore, their preference is to remove the burial grounds to prevent them from serving as long-term sources of groundwater contamination. Public and regulator acceptance of range of	Complete technical investigations at remaining sources and reach agreement with regulators on potential for contaminant migration. Initiate further discussion with the public and regulators to

Table 5.3. Variance Report by Hazard Area (Continued)

(Please see Figures 5.12 and 5.13 for maps of the potential end state alternative and current planned end state, respectively, that depict these variances.)

ID. No.	Description of Variance	Impacts	Challenges in Achieving Alternative	Recommendations
		Schedule: The source action under the current planned end state would be completed by 2030. Capping under the potential end state alternative would be complete by 2019. Monitoring would follow both actions. Risk: The only potential risks posed by these burial grounds under current conditions are from possible migration of contaminants through groundwater to off-site residents and from direct contact at the burial ground by on-site industrial workers. However, the PGDP Water Policy and/or enhanced institutional controls would eliminate risks to the public from contaminant migration under both end states, and current access controls mitigate risk from direct contact by on-site industrial workers. Excavation of the burial grounds under the current planned end state would remove the suspected source term, thereby reducing the amount of time taken to meet MCLs and shortening any monitoring period and the need for access controls. Capping of the burial grounds under the potential end state alternative would limit potential contact to the burial grounds and reduce possible migration of contamination to groundwater, but would require long-term monitoring and access controls. Off-site risks from contaminant migration would be controlled using enhanced institutional controls (see V-1.1). Excavation of the burial grounds would result in substantial risks to remediation workers through direct contact with wastes. (Note that one of the burial grounds to be excavated under the current planned end state contains pyrophoric uranium [i.e., uranium that spontaneously burns when exposed to air], which would pose significant inhalation risk and physical hazard to remediation workers.) Additionally, general site workers could be put at risk from exposure through inhalation of resuspended dust and vapors during excavation. Potential risks to the public and ecological receptors also would be increased during transportation of waste to the off-site disposal location. Finally, samplers involved in monitoring activities could be exposed. The magnitude of these risks has not been estimated at this time. Capping of the burial grounds under the potential end state alternative would result in potential risks to remediation workers through direct contact with surface soil at the burial grounds, but not through direct contact with waste. Samplers involved in monitoring activities also could be at risk of exposure. The magnitude of these risks has not been estimated at this time.	options included in enhanced institutional controls is uncertain.	determine acceptability of acquisition of property rights ranging from deed notices and permanent groundwater use restrictions to property purchase.

Table 5.3. Variance Report by Hazard Area (Continued)

(Please see Figures 5.12 and 5.13 for maps of the potential end state alternative and current planned end state, respectively, that depict these variances.)

ID. No.	Description of Variance	Impacts	Challenges in Achieving Alternative	Recommendations
		Note that risks to remediation and general site workers would be smaller under the potential end state alternative than under the current planned end state because, under the potential end state alternative, waste would not be dug up and moved, and the duration of the activity would be shorter.		
V-1.4	**Current Planned End State:** Treatment to reduce contaminant concentrations in the dissolved-phase plume and a point of compliance at the PGDP fence line. **Alternative:** Monitored natural attenuation (with either PGDP Water Policy or enhanced institutional controls; see V-1.1) and a point of compliance at the DOE property boundary, in accordance with CERCLA requirements.	Scope: The current planned end state assumes implementation of oxidation technologies (e.g., C-Sparge™) to remove TCE and other solvents from the dissolved-phase plumes followed by monitored natural attenuation. The potential end state alternative does not assume actions for the dissolved-phase plume and consists solely of monitored natural attenuation. Cost: The cost for implementing oxidation technologies in the dissolved-phase plumes has not been determined. The cost per year for monitored natural attenuation essentially would be the same under both the current planned end state and potential end state alternative; however, the duration of the monitoring/ attenuation period could differ between the current planned end state (hundreds of years) and the potential end state alternative (potentially thousands of years). Schedule: Under the current planned end state, the construction and performance of the plume actions would be implemented by 2019 with associated monitoring/attenuation potentially continuing for decades. Additionally, any actions to address the dissolved-phase plumes under the current planned end state would need to follow source actions to be cost-effective. (See V-1.2 and V-1.3). Under the potential end state alternative, no additional construction beyond installation of additional monitoring wells would be required; however, monitoring/ attenuation potentially could continue for thousands of years. Risk: The only variance in risk between the current planned end state and the potential end state alternative is the amount of time necessary to achieve MCLs. The PGDP Water Policy and/or enhanced institutional controls would eliminate risks to the public from TCE and other solvents in the dissolved-phase plumes under both end states. The current planned end state could reduce the length of time that the PGDP Water Policy or enhanced institutional controls would have to remain in effect depending on the extent and effectiveness of plume treatment. Note, however, that the oxidation technologies would not address other potential contaminants found in groundwater in on-site areas at PGDP (i.e., metals and radionuclides).	The regulators' position is that monitored natural attenuation would need to be supplemented by source actions at multiple locations to reduce contaminant concentrations to MCLs in a "reasonable" timeframe (e.g., ≤ 100 years); however, even with source reduction, it would take hundreds of years to reach MCLs for the contamination addressed (i.e., sediments), and contaminants not addressed by the action (i.e., metals and radionuclides) would remain above MCLs, as well. (With source reduction at only one area, the monitoring period potentially could be thousands of years.) Despite national performance data indicating that no technologies currently exist that can reduce TCE and solvent concentrations in large plumes to MCLs within a reasonable timeframe, the regulators' position is that TI waivers would be available only after a demonstrated,	Complete technical investigations of plume migration and attenuation and reach agreement with regulators on these issues. Initiate discussion with regulators to 1) determine the appropriateness of requiring a demonstrated failure, given the national performance data, and 2) determine what would be required to decide whether TI waiver should apply

Table 5.3. Variance Report by Hazard Area (Continued)

(Please see Figures 5.12 and 5.13 for maps of the potential end state alternative and current planned end state, respectively, that depict these variances.)

ID. No.	Description of Variance	Impacts	Challenges in Achieving Alternative	Recommendations
		Implementation of oxidation technologies would result in exposures of remediation workers to contaminated groundwater, as well as physical hazards. Workers involved in disposal of materials contaminated during implementation of the action also could be exposed. Finally, samplers involved in groundwater monitoring activities also could be exposed. Except for risks to samplers, the magnitude of these risks has not been estimated at this time. Risks under the potential end state alternative are limited to samplers involved in groundwater monitoring activities. An assessment of these risks under current sampling protocols determined that risks to samplers are at *de minimis* levels[c].	site-specific technology failure. The regulators' position is that the current fence line (located well inside the property boundary) should be used as the point of exposure. Public and regulator acceptance of range of options included in enhanced institutional controls is uncertain.	Initiate further discussion with regulators to determine willingness to consider establishing points of compliance and exposure at property boundary. Initiate further discussion with the public and regulators to determine acceptability of acquisition of property rights ranging from deed notices and permanent groundwater use restrictions to property purchase.
V-1.5	**Current Planned End State:** Actions to reduce solvent concentrations in groundwater discharged to surface water or control these discharges **Alternative:** Continued monitoring of surface water concentrations at discharge point	<u>Scope:</u> The current planned end state assumes implementation of measures to reduce the solvent concentrations in the groundwater discharged to Little Bayou Creek and/or measures to control these discharges followed by monitoring. The potential end state alternative assumes continued monitoring. <u>Cost:</u> The cost of measures to reduce concentration in discharges and/or control discharges under the current planned end state has not been determined. Monitoring costs per year essentially would be the same under both the current planned end state and the potential end state alternative. <u>Schedule:</u> A schedule for implementation of the current planned end state actions is not available; however, the duration of monitoring under both the end states would be similar unless source and plume actions are taken. (See V-1.2, V-1.3, and V-1.4.) <u>Risk:</u> Screening human health and ecological risk assessments have determined that risks at the discharge point are at *de minimis* levels[c] for recreational user and ecological receptors. Modeling has indicated that contaminant concentrations could increase in the future, but these results, and estimates of risks derived using them, are uncertain. A baseline risk assessment has not been completed.	Regulatory position is that releases at the seeps present unacceptable risks to human health and the environment. Commonwealth of Kentucky regulators' position has been that Kentucky policy requires cleanup actions to either attain an E-06 risk assuming residential exposure or be supplemented with institutional controls and/or engineering barriers to attain that risk level.	Complete technical investigations for impacts of releases and reach agreement with regulators concerning risks posed to human health and the environment. Initiate further discussion with regulators: • to seek agreement that cleanup standards for proposed actions will be set based upon current and future use at the area in question. • to gain agreement that cleanup standards for proposed action will be set based on the CERCLA risk

Table 5.3. Variance Report by Hazard Area (Continued)

(Please see Figures 5.12 and 5.13 for maps of the potential end state alternative and current planned end state, respectively, that depict these variances.)

ID. No.	Description of Variance	Impacts	Challenges in Achieving Alternative	Recommendations
		Implementation of a technology to attenuate or control discharges would result in increased risks to remediation workers. Additionally, damage to the environment at the discharge point during implementation could lead to increased ecological risks. Finally, samplers involved in monitoring activities could be exposed. The magnitude of these risks has not been estimated at this time. Risks under the potential end state alternative are limited to samplers involved in monitoring activities. The magnitude of these risks has not been estimated at this time.		range (i.e., E-06 to E-04).
Hazard Area 2: SWOU				
V-2.1	**Current Planned End State:** Excavation of source sediments and soils **Alternative:** Excavation of sediments and soils "hot spots"	Scope: The current planned end state assumes excavation of contaminated source sediments and soils to levels that achieve a target risk of 1E-06 under a residential scenario and a PCB concentration of 1 ppm. The potential end state alternative assumes excavations of "hot spots" in sediment and soil using a target risk and PCB future land use of areas currently in the industrialized areas of PGDP is industrial and that the future use of areas currently outside of the industrialized areas but on DOE property is recreational.) Under the potential end state alternative, therefore, the action in industrial areas would achieve a target risk of 1E-04 to a worker and a PCB concentration of 25 ppm. The action in recreational areas would achieve a target risk of 1E-04 to a recreational user and a PCB concentration of 1 ppm. Cost: Based on existing PCB and ^{238}U sampling results, approximately 7 to 17 times as much soil and sediment would be required to be removed under the current planned end state cleanup target than under the potential end state alternative cleanup target, resulting in a cost variance of proportional size. Because many areas have not been fully characterized, there is a high degree of uncertainty in this estimate. Schedule: The investigation of the SWOU (On-Site) is complete. The investigation of the remainder of the SWOU is ongoing. The completion dates under the current planned end state and potential end state alternative are 2021 and 2017, respectively. Risk: Under the current state, the only potential risks posed by sediment and soils to humans are from direct contact by industrial workers and recreational users with these media. However, these risks currently are mitigated through institutional and	Commonwealth of Kentucky regulators' position is that Kentucky policy requires cleanup actions either to attain an E-06 risk assuming residential exposure or be supplemented with institutional controls and/or engineering barriers to attain that risk level. Commonwealth of Kentucky regulators' position is that Kentucky policy requires that cleanup of PCBs in soils and sediments located in industrial areas must attain 1 ppm (as opposed to federal TSCA regulations allowing ≤ 25 ppm for "low occupancy areas" [e.g., industrial areas] ≤1 ppm for "high occupancy areas" [e.g., residential areas], and >1 ppm to ≤ 10 ppm for "high occupancy areas" if covered by a cap with institutional controls).	Initiate further discussion with regulators: • to seek agreement that cleanup standards for proposed actions will be set based upon current and future land use for area in question. • to gain agreement that cleanup standards for proposed actions will be set based on the CERCLA risk range (i.e., E-06 to E-04). • to seek agreement that national TSCA PCB cleanup standards for low occupancy (e.g., industrial) areas (25 ppm) should be adopted for industrial areas and that national TSCA PCB cleanup standards for high occupancy (e.g., residential) areas (1 ppm) should be adopted for recreational areas.

Table 5.3. Variance Report by Hazard Area (Continued)

(Please see Figures 5.12 and 5.13 for maps of the potential end state alternative and current planned end state, respectively, that depict these variances.)

ID. No.	Description of Variance	Impacts	Challenges in Achieving Alternative	Recommendations
		access controls that limit exposure. Ecological receptors could be at risk in some industrial and nonindustrial areas; however, a baseline ecological risk assessment confirming this has not been completed. Potential risk in all areas under the current planned end state would be reduced to E-06 using a residential scenario in industrial and recreational areas. Additionally, protection of ecological receptors would be demonstrated by an ecological risk assessment. Potential risk under the potential end state alternative would be reduced to a value falling within EPA's acceptable risk range for site-related exposures (i.e., E-06 to E-04) using a worker scenario for industrial areas and a recreational user scenario in recreational areas. Additionally, protection of ecological receptors would be demonstrated by an ecological risk assessment. Risks during excavation and disposal under both the current planned end state and potential end state alternative would affect remediation workers, general site workers, transportation workers (on- and off-site disposal anticipated), landfill workers, the public, and ecological receptors. The magnitude of these risks under the current planned end state and potential end state alternative have not been assessed at this time; however, because a greater amount of material would be excavated under the current planned end state than under the potential end state alternative, risks to all receptors would be expected to be greater under the current planned end state than under the potential end state alternative.		
V-2.2	**Current Planned End State:** Construction of basins to control sediment migration **Alternative:** No basins with "hot spot" removal (see V-2.1)	<u>Scope:</u> Under the current planned end state, construction of two basins to control sediment migration to areas outside the industrialized portions of the site is planned. Under the potential end state alternative, no basins are planned because "hot spot" removal would prevent migration of contaminated material. <u>Cost:</u> The variance between constructing and maintaining basins under the current planned end state and not constructing the basins under the potential end state alternative is estimated to range from $7,000,000 to $11,000,000. <u>Schedule:</u> The investigation to determine if sediment control basins for control of sediment migration are needed is ongoing. The decision for their construction will follow completion of that investigation. A completion date for construction would be selected as part of a decision to construct basins.	Lack of representative data to make the appropriate decision.	Complete investigation and risk assessment to determine if risks from migration of contaminants require action. Initiate further discussions with the public and regulators following completion of the investigation/ evaluation to reach consensus as to whether additional actions are necessary.

Table 5.3. Variance Report by Hazard Area (Continued)

(Please see Figures 5.12 and 5.13 for maps of the potential end state alternative and current planned end state, respectively, that depict these variances.)

ID. No.	Description of Variance	Impacts	Challenges in Achieving Alternative	Recommendations
		Risk: An analysis of the potential impact of contaminant migration from on-site ditches to recreational use areas under current conditions determined that direct contact risks to recreational users and workers were at *de minimis* levels[c]. Under the current planned end state, remediation workers would be exposed to physical hazards during construction of the basins; however, risks from exposure to contamination would be at *de minimis* levels[c] because the basins would be constructed in clean areas. Additionally, ecological receptors would be at risk due to habitat disruption. Under the potential end state alternative, construction would not occur, and no receptors would be at risk.		
Hazard Area 3: BGOU (Group 1)				
V-3.1	**Current Planned End State:** Excavation of burial grounds **Alternative:** Capping of burial grounds with access controls	Scope: Under the current planned end state, certain burial grounds are to be excavated and materials disposed of in on- and off-site locations. Under the potential end state alternative, these burial grounds are capped to limit exposure, and the caps are maintained, including monitoring. For both end states, the goal of the action is to reduce risk to workers by eliminating or limiting exposure to contamination associated with the burial grounds. Cost: The variance between the cost of excavating the burial grounds and disposing of the materials under the current planned end state versus capping and monitoring the burial grounds under the potential end state alternative is estimated to range from \$185,000,000 to \$1,000,000,000, reflecting current basis of estimating. Schedule: The source action under the current planned end state would be completed by 2030. Capping under the potential end state alternative would be complete by 2019. Monitoring under the potential end state alternative could continue for several decades. Risk: The only potential risks posed to humans are from direct contact at the burial ground by on-site industrial workers. Risks are driven by the presence of uranium isotopes, arsenic, PAHs, and PCBs in surface soils; however, current access controls mitigate risk from direct contact by on-site industrial workers. Screening ecological risk assessments determined that ecological risks for contact at the burial grounds were at *de minimis* levels[c] assuming future industrial use of the areas encompassing the burial grounds. Excavation of the burial grounds would result in substantial risks to remediation	It is the regulators' position that capping and access controls are inadequate to achieve long-term protectiveness for in situ management of contamination at burial grounds; therefore, their preference is to remove the burial grounds to achieve long-term protectiveness. It is the regulators' position that existing data are insufficient to characterize the contents and releases from the burial grounds.	Complete technical investigations at remaining sources and reach agreement with regulators effectiveness and sustainability of capping as a protective remedy.

Table 5.3. Variance Report by Hazard Area (Continued)

(Please see Figures 5.12 and 5.13 for maps of the potential end state alternative and current planned end state, respectively, that depict these variances.)

ID. No.	Description of Variance	Impacts	Challenges in Achieving Alternative	Recommendations
		workers through direct contact with wastes. Additionally, general site workers could be put at risk from exposure through inhalation of resuspended dust and vapors during excavation. Potential risks to the public and ecological receptors also would be increased during transportation of waste to the off-site disposal location. Finally, samplers involved in monitoring activities could be exposed. The magnitude of these risks has not been estimated at this time. Capping of the burial grounds under the potential end state alternative would result in potential risks to remediation workers through direct contact with surface soil at the burial grounds. Samplers involved in monitoring activities also could be at risk of exposure. The magnitude of these risks has not been estimated at this time. Note that risks to remediation and general site workers would be smaller under the potential end state alternative than under the current planned end state because, under the potential end state alternative, waste would not be dug up and moved, and the duration of the activity would be shorter.		
Hazard Area 4: SOU				
V-4.1	**Current Planned End State:** Excavation of soil **Alternative:** Excavation of soil "hot spots"	Scope: The current planned end state assumes excavation of contaminated soil to levels that achieve a target risk of 1E-06 under a residential scenario and a PCB concentration of 1 ppm. The potential end state alternative assumes excavations of "hot spots" in soil using a target risk of 1E-04 under a worker scenario, the most likely future use of the affected areas per past agreements with the regulators and the public. The PCB concentration target under the potential end state alternative would be 25 ppm. Cost: Based on existing PCB and ^{238}U sampling results, approximately 7 to 17 times as much soil would need to be removed under the current planned end state cleanup target than under the potential end state alternative cleanup target, resulting in a cost variance of proportional size. Because many areas have not been fully characterized, there is a high degree of uncertainty in this estimate. Schedule: The investigation of the SOU is not complete. For the current planned end state, the completion date is 2019. For the potential end state alternative, the completion date is 2015. Risk: Under the current state, the only potential risks posed by surface soils are from direct contact by on-site industrial workers. However, these risks currently are mitigated through institutional and access controls that limit exposure. The	Commonwealth of Kentucky regulators' position is that Kentucky policy requires cleanup actions to either attain an E-06 risk assuming residential exposure or be supplemented with institutional controls and/or engineering barriers to attain that risk level. Commonwealth of Kentucky regulators' position is that Kentucky policy requires that cleanup of PCBs in soils and sediments located in industrial areas must attain 1 ppm (as opposed to federal TSCA regulations allowing ≤25 ppm for "low occupancy areas" [e.g., industrial areas] ≤1 ppm for "high occupancy areas" [e.g.,	Initiate further discussion with regulators: • to seek agreement that cleanup standards for proposed actions will be set based upon current and future land use for the area in question. • Seek agreement that cleanup standards for proposed actions will be set based on the CERCLA risk range (i.e., E-06 to E-04). • to seek agreement that national TSCA PCB cleanup standards for low occupancy (e.g., industrial) areas (25 ppm) should be adopted for industrial areas and that national TSCA PCB cleanup standards for high occupancy

Table 5.3. Variance Report by Hazard Area (Continued)

(Please see Figures 5.12 and 5.13 for maps of the potential end state alternative and current planned end state, respectively, that depict these variances.)

ID. No.	Description of Variance	Impacts	Challenges in Achieving Alternative	Recommendations
		ecological risks were determined to be at *de minimis* levels[c] as long as the area remains industrial. Potential risk under the current planned end state would be reduced to E-06 using a residential scenario in an industrial area. Potential risk under the potential end state alternative would be reduced to a value falling within EPA's acceptable risk range for site-related exposures (i.e., E-06 to E-04) using a worker scenario for these industrial areas. Risks during excavation and disposal under both the current planned end state and potential end state alternative would affect remediation workers, general site workers, transportation workers (off-site disposal anticipated), landfill workers, and the public. The magnitude of these risks under the current planned end state and potential end state alternative have not been assessed at this time; however, because a greater amount of material would be excavated under the current planned end state than under the potential end state alternative, risks over the duration of the response action likely would be greater under the current planned end state than under the potential end state alternative.	residential areas], and >1 ppm to ≤ 10 ppm for "high occupancy areas" if covered by a cap with institutional controls).	(e.g., residential) areas (1 ppm) should be adopted for recreational areas.
Hazard Area 5: Permitted Landfills				
V-5.1	**Current Planned End State:** Continuation of PGDP Water Policy **Alternative:** Enhanced institutional controls	Scope: The current planned end state includes continuation of the current PGDP Water Policy[a]. The potential end state alternative includes enhanced institutional controls[b], which would take the place of the current PGDP Water Policy. Under both end states, the goal would be to reduce risks to residents from exposure to groundwater to *de minimis* levels[c]. Cost: The cost variance has not been determined to date. The cost of water currently provided under the PGDP Water Policy ranges from $70,000 to $100,000 per year. Depending upon the specific enhanced institutional controls, the cost variance of the enhanced institutional controls could include some cost avoidance (if the PGDP Water Policy is replaced). Additionally, there could be some cost avoidance under other actions as well as discussed elsewhere in this variance report (e.g., excavation of burial grounds versus capping). However, the implementation of enhanced institutional controls would include costs for acquisition of rights to restrict groundwater use and continued monitoring to ensure continued long-term effectiveness of the enhanced institutional controls. Schedule: The PGDP Water Policy currently is in place. Implementation of the enhanced institutional controls would be a future planned CERCLA response action.	Public and regulator acceptance of range of options included in enhanced institutional controls in uncertain. DOE policy may limit options available under the enhanced institutional controls. The regulators' position is that the current fence line (located well inside the property boundary) should be used as the point of exposure	Initiate further discussion with the public and regulators to determine acceptability of acquisition of property rights ranging from deed notices and permanent groundwater use restrictions to property purchase. Revisit DOE policy concerning acquisition of property rights (ranging from deed notices and permanent groundwater use restrictions to property purchase). Initiate further discussion with regulators: • to discuss willingness to consider enhanced institutional controls in

Table 5.3. Variance Report by Hazard Area (Continued)

(Please see Figures 5.12 and 5.13 for maps of the potential end state alternative and current planned end state, respectively, that depict these variances.)

ID. No.	Description of Variance	Impacts	Challenges in Achieving Alternative	Recommendations
		Risk: The expected risk variance is zero under both the PGDP Water Policy and enhanced institutional controls because each would prevent exposure to contaminated groundwater, resulting in no risk. Enhanced institutional controls, however, would be more sustainable and, therefore, would result in greater long-term effectiveness because they would involve legally enforceable property restrictions and deed notices. (The agreements with landowners under the PGDP Water Policy do not restrict groundwater use, but only commit DOE to provide municipal water to replace the groundwater in return for the property owner's commitment not to use the groundwater. Thus, current or future property owners could decide to return to using groundwater in the home, completing this exposure pathway and potentially raising risk from *de minimis* levels[c].)	for determining compliance with MCLs.	conjunction with monitored natural attenuation in lieu of source and plume actions. • to discuss willingness to consider establishing points of compliance and exposure at the property boundary.
Hazard Area 6: BGOU (Group 2)				
V-6.1	**Current Planned End State:** Continuation of PGDP Water Policy **Alternative:** Enhanced institutional controls	Scope: The current planned end state includes continuation of the current PGDP Water Policy[a]. The potential end state alternative includes enhanced institutional controls[b], which would supercede the current PGDP Water Policy. Under both end states, the goal would be to reduce risks to residents from exposure to groundwater to *de minimis* levels[c]. Cost: The cost variance has not been determined to date. The cost of water currently provided under the PGDP Water Policy ranges from $70,000 to $100,000 per year. Depending upon the specific enhanced institutional controls, the cost variance of the enhanced institutional controls could include some cost avoidance (if the PGDP Water Policy is replaced). Additionally, there could be some cost avoidance under other actions as well as discussed elsewhere in this variance report (e.g., excavation of burial grounds versus capping). However, the implementation of enhanced institutional controls would include costs for acquisition of rights to restrict groundwater use and continued monitoring to ensure continued long-term effectiveness of the enhanced institutional controls. Schedule: The PGDP Water Policy currently is in place. Implementation of the enhanced institutional controls would be a future planned CERCLA response action. Risk: The expected risk variance is zero under both the PGDP Water Policy and enhanced institutional controls because each would prevent exposure to contaminated groundwater, resulting in no risk. Enhanced institutional controls, however, would be more sustainable and, therefore, would result in greater longterm effectiveness because they would involve legally enforceable property	Public and regulator acceptance of range of options included in enhanced institutional controls in uncertain. DOE policy may limit options available under the enhanced institutional controls. The regulators' position is that current fence line (located well inside the property boundary) should be used as the point of exposure for determining compliance with MCLs.	Initiate further discussion with the public and regulators to determine acceptability of acquisition of property rights ranging from deed notices and permanent groundwater use restrictions to property purchase. Revisit DOE policy concerning acquisition of property rights (ranging from deed notices and permanent groundwater use restrictions to property purchase). Initiate further discussion with regulators: • to discuss willingness to consider enhanced institutional controls in conjunction with monitored natural attenuation in lieu of certain source and plume actions. • to discuss willingness to

Table 5.3. Variance Report by Hazard Area (Continued)

(Please see Figures 5.12 and 5.13 for maps of the potential end state alternative and current planned end state, respectively, that depict these variances.)

ID. No.	Description of Variance	Impacts	Challenges in Achieving Alternative	Recommendations
		restrictions and deed notices. (The agreements with landowners under the PGDP Water Policy do not restrict groundwater use, but only commit DOE to provide municipal water to replace the groundwater in return for the property owner's commitment not to use the groundwater. Thus, current or future property-owners could return to using groundwater in the home, completing this exposure pathway and potentially raising risk from *de minimis* levels[c].)		consider establishing points of compliance and exposure at the property boundary.
Hazard Area 7: Legacy Waste and DMSAs				
V-7.1	**Current Planned End State:** Excavation of soil and/or decontamination of surface areas. **Alternative:** Excavation of soil and/or decontamination of surface areas.	Scope: Upon completion of characterization and disposition of all wastes and debris contained in legacy waste storage areas and DMSAs, those areas that are discovered to contain hazardous waste will be subject to the closure requirements outlined in the Agreed Order and/or RCRA Permit. Under the current planned end state, the Agreed Order provides that "final clean closure" of any underlying soils and/or surface areas must achieve a risk level of 1E-06 and hazard index of 1 under a residential scenario without use of institutional controls or engineering barriers and a PCB target level of 1 ppm. Under the potential end state alternative, excavation of any contaminated soils and/or decontamination of surface areas would target a risk level of 1E-04 and hazard index of 1 under an industrial scenario in accordance with CERCLA and a PCB target level of 25 ppm, with the option of using institutional controls or engineering barriers. Cost: Because characterization of the DMSAs and legacy waste storage areas is not complete, any potential impacts to underlying soils and/or surfaces are not known at this time; therefore, estimated costs are not available. Schedule: The Agreed Order requires characterization to be complete for all DMSAs by 2009. The Agreed Order also defines timeframes for submittal of closure plans after completion of characterization for those DMSAs and waste storage areas determined to contain hazardous wastes. Risk: Under the current state, the only potential risks posed by surface soils and/or surface areas are from direct contact by on-site industrial workers. Characterization data collected to date indicates that these direct contact risks may approach *de minimis* levels[c]. Additionally, any risks are mitigated through institutional and access controls that limit exposure. No ecological risk assessment is available. Potential risk under the current planned end state would be reduced to E-06 using a residential scenario in industrial areas. Potential risk under the potential end state alternative would be reduced to a value falling between E-06 and E-04 using an industrial scenario.	The Agreed Order provides that "final clean closure" of any underlying soils and/or surface areas must achieve a 1E-06 and hazard index of 1 under a residential scenario without use of institutional controls or engineering barriers. It's the Commonwealth of Kentucky's position that cleanup of PCBs in soils located in industrial areas must attain 1 ppm (as opposed to federal TSCA regulations allowing ≤ 25 ppm for "low occupancy areas" [e.g., industrial areas] ≤1 ppm for "high occupancy areas" [e.g., residential areas], and >1 ppm to ≤ 10 ppm for "high occupancy areas" if covered by a cap with institutional controls).	Initiate further discussion with regulators: • to seek agreement that cleanup standards for proposed actions will be set based upon current and future land use for the area in question. • to gain agreement that cleanup standards for proposed actions will be set based on the CERCLA risk range (i.e., E-06 to E-04). • to seek agreement that national TSCA PCB cleanup standards for low occupancy (e.g., industrial) areas (25 ppm) should be adopted for industrial areas and that national TSCA PCB cleanup standards for high occupancy (e.g., residential) areas (1 ppm) should be adopted for recreational areas.

Table 5.3. Variance Report by Hazard Area (Continued)

(Please see Figures 5.12 and 5.13 for maps of the potential end state alternative and current planned end state, respectively, that depict these variances.)

ID. No.	Description of Variance	Impacts	Challenges in Achieving Alternative	Recommendations
		Excavation and/or decontamination activities under both the current planned end state and potential end state alternative would pose a potential risk to remediation workers, general site workers, transportation workers (off-site disposal anticipated), landfill workers, the public, and ecological receptors. The magnitude of these risks under the current planned end state and potential end state alternative have not been assessed at this time; however, because a greater amount of material potentially would be available for exposure under the current planned end state than under the potential end state alternative, risks over the duration of the response action likely would be greater under the current planned end state than under the potential end state alternative.		
Hazard Area 8: Cylinder Yards and DUF_6 Conversion Facility				
V-8.1	**Current Planned End State:** Excavation of soil **Alternative:** Excavation of soil "hot spots"	Scope: The current planned end state assumes excavation of contaminated soils following completion of the DUF_6 conversion mission to levels that achieve a target risk of 1E-06 under a residential scenario and a PCB concentration of 1 ppm. The potential end state alternative assumes excavation of "hot spots" in soil using a target risk of 1E-04 under a worker scenario, the most likely future use of the affected areas per past agreements with the regulators and the public. The PCB concentration under the potential end state alternative would be 25 ppm. Cost: Based on existing PCB and ^{238}U sampling results, approximately 7 to 17 times as much soil would need to be removed under the current planned end state cleanup target than under the potential end state alternative cleanup target, resulting a cost variance of proportional size. Because many areas have not been fully characterized, there is a high degree of uncertainty in this estimate. Schedule: No schedule is available because the conversion mission is expected to last for decades. Risk: Under the current state, the only potential risks posed by surface soils are from direct contact by on-site industrial workers. However, these risks currently are mitigated through institutional and access controls that limit exposure. The ecological risks are expected to be at *de minimis* levels[c] as long as the area remains industrial. Potential risk under the current planned end state would be reduced to E-06 using a residential scenario in an industrial area. Potential risk under the potential end state alternative would be reduced to a value falling within EPA's acceptable risk range for site-related exposures (i.e., E-06 to E-04) using a worker scenario for these industrial areas. Risks during excavation under both the current	Commonwealth of Kentucky regulators' position is that Kentucky policy requires cleanup actions to attain either an E-06 risk assuming residential exposure or be supplemented with institutional controls and/or engineering barriers to attain that risk level. Commonwealth of Kentucky regulators' position is that Kentucky policy requires that cleanup of PCBs in soils and sediments located in industrial areas must attain 1 ppm (as opposed to federal TSCA regulations allowing ≤ 25 ppm for "low occupancy areas" [e.g., industrial areas] ≤1 ppm for "high occupancy areas" [e.g., residential areas], and >1 ppm to ≤ 10 ppm for "high occupancy areas" if covered by a cap with institutional	Initiate further discussion with regulators: • to seek agreement that cleanup standards for proposed actions will be set based upon current and future land use for the area in question. • to gain agreement that cleanup standards for proposed actions will be set based on the CERCLA risk range (i.e., E-06 to E-04). • to seek agreement that national TSCA PCB cleanup standards for low occupancy (e.g., industrial) areas (25 ppm) should be adopted for industrial areas and that national TSCA PCB cleanup standards for high occupancy (e.g., residential) areas (1 ppm) should be adopted for recreational areas.

Table 5.3. Variance Report by Hazard Area (Continued) (Please see Figures 5.12 and 5.13 for maps of the potential end state alternative and current planned end state, respectively, that depict these variances.)				
ID. No.	**Description of Variance**	**Impacts**	**Challenges in Achieving Alternative**	**Recommendations**
		planned end state and potential end state alternative would affect remediation workers, general site workers, transportation workers (off-site disposal anticipated), landfill workers, and the public. The magnitude of these risks under the current planned end state and potential end state alternative have not been assessed at this time; however, because a greater amount of material would be excavated under the current planned end state than under the potential end state alternative, risks over the duration of the response action likely would be greater under the current planned end state than under the potential end state alternative.	controls).	
Hazard Area 9: GDP Facilities				
V-9.1	**Current Planned End State:** Continuation of PGDP Water Policy **Alternative:** Enhanced institutional controls	<u>Scope:</u> The current planned end state includes continuation of the current PGDP Water Policy[a]. The potential end state alternative includes enhanced institutional controls[b], which would supercede the current PGDP Water Policy. Under both end states, the goal would be to reduce risks to residents from exposure to groundwater to *de minimis* levels[c]. <u>Cost:</u> The cost variance has not been determined to date. The cost of water currently provided under the PGDP Water Policy ranges from $70,000 to $100,000 per year. Depending upon the specific enhanced institutional controls, the cost variance of the enhanced institutional controls could include some cost avoidance (if the PGDP Water Policy is replaced). Additionally, there could be some cost avoidance under other actions as well as discussed elsewhere in this variance report (e.g., excavation of burial grounds versus capping). However, the implementation of enhanced institutional controls would include costs for acquisition of rights to restrict groundwater use and continued monitoring to ensure continued long-term effectiveness of the enhanced institutional controls. <u>Schedule:</u> The PGDP Water Policy currently is in place. Implementation of the enhanced institutional controls would be a future planned CERCLA response action. <u>Risk:</u> The expected risk variance is zero under both the PGDP Water Policy and enhanced institutional controls because each would prevent exposure to contaminated groundwater, resulting in no risk. Enhanced institutional controls, however, would be more sustainable and, therefore, would result in greater long-term effectiveness because they would involve legally enforceable property restrictions and deed notices. (The agreements with landowners under the PGDP Water Policy do not restrict groundwater use, but only commit DOE to provide municipal water to replace the groundwater in return for the property owner's	Public and regulator acceptance of range of options included in enhanced institutional controls is uncertain. DOE policy may limit options available under the enhanced institutional controls. The regulators' position is that the current fence line (located well inside the property boundary) should be used as the point of exposure for determining compliance with MCLs.	Initiate further discussion with the public and regulators to determine acceptability of acquisition of property rights ranging from deed notices and permanent groundwater use restrictions to property purchase. Revisit DOE policy concerning acquisition of property rights (ranging from deed notices and permanent groundwater use restrictions to property purchase). Initiate further discussion with regulators: • to discuss willingness to consider enhanced institutional controls in conjunction with monitored natural attenuation in lieu of certain source and plume actions. • to discuss willingness to consider establishing points of compliance and exposure at the property boundary.

Table 5.3. Variance Report by Hazard Area (Continued)

(Please see Figures 5.12 and 5.13 for maps of the potential end state alternative and current planned end state, respectively, that depict these variances.)

ID. No.	Description of Variance	Impacts	Challenges in Achieving Alternative	Recommendations
		commitment not to use the groundwater. Thus, current or future property owners could return to using groundwater in the home, completing this exposure pathway and potentially raising risk from *de minimis* levels[c].)		
V-9.2	**Current Planned End State:** Excavation of soil **Alternative:** Excavation of soil "hot spots"	Scope: Excavation of contaminated soils is planned under both the current planned end state and potential end state alternative as part of D&D of the GDP. The current planned end state assumes excavation of contaminated soils to levels that achieve a target risk of 1E-06 under a residential scenario and a PCB concentration of 1 ppm. The potential end state alternative assumes excavation of "hot spots" in soil using a target risk of 1E-04 under a worker scenario, the most likely future use of the affected areas per past agreements with the regulators and the public. The PCB concentration under the potential end state alternative would be 25 ppm. Cost: Based on existing PCB and ^{238}U sampling results, approximately 7 to 17 times as much soil would need to be removed under the current planned end state cleanup target than under the potential end state alternative cleanup target, resulting in a cost variance of proportional size. However, because most areas associated with GDP D&D have not been fully characterized, there is a very high degree of uncertainty in this estimate. Schedule: The schedule for GDP D&D and the subsequent CSOU will be determined 6 months before GDP shutdown. Risk: Under the current state, the only potential risks posed by surface soils are from direct contact by on-site industrial workers. However, these risks currently are mitigated through institutional and access controls that limit exposure. The ecological risks likely are at *de minimis* levels[c] because the GDP facilities are in industrialized areas of PGDP. Potential risk under the current planned end state would be reduced to E-06 using a residential scenario in industrial areas. Potential risk under the potential end state alternative would be reduced to a value falling within EPA's acceptable risk range for site-related exposures (i.e., E-06 to E-04) using a worker scenario for these industrial areas. Risks during excavation under both the current planned end state and potential end state alternative would affect remediation workers, general site workers, transportation workers (off-site disposal anticipated), landfill workers, the public, and ecological receptors. The magnitude of these risks under the current planned end state and potential end state alternative have not been assessed at this time; however, because a greater amount of material would be excavated under the current planned end state than under the potential end state alternative, risks over	Commonwealth of Kentucky regulators' position is that Kentucky policy requires cleanup actions to attain either an E-06 risk assuming residential exposure or be supplemented with institutional controls and/or engineering barriers to attain that risk level. Commonwealth of Kentucky regulators' position is that Kentucky policy requires that cleanup of PCBs in soils and sediments located in industrial areas must attain 1 ppm (as opposed to federal TSCA regulations allowing ≤25 ppm for "low occupancy areas" [e.g., industrial areas] ≤1 ppm for "high occupancy areas" [e.g., residential areas], and >1 ppm to ≤ 10 ppm for "high occupancy areas" if covered by a cap with institutional controls).	Initiate further discussion with regulators: • to seek agreement that cleanup standards for proposed actions will be set based upon current and future land use for the area in question. • to gain agreement that cleanup standards for proposed actions will be set based on the CERCLA risk range (i.e., E-06 to E-04). • to seek agreement that national TSCA PCB cleanup standards for low occupancy (e.g., industrial) areas (25 ppm) should be adopted for industrial areas and that national TSCA PCB cleanup standards for high occupancy (e.g., residential) areas (1 ppm) should be adopted for recreational areas.

Table 5.3. Variance Report by Hazard Area (Continued)

(Please see Figures 5.12 and 5.13 for maps of the potential end state alternative and current planned end state, respectively, that depict these variances.)

ID. No.	Description of Variance	Impacts	Challenges in Achieving Alternative	Recommendations
		the duration of the response action likely would be greater under the current planned end state than under the potential end state alternative.		
V-9.3	**Current Planned End State:** Treatment to attain source reduction with monitored natural attenuation (with either PGDP Water Policy or enhanced institutional controls; see V-1.1) and a point of compliance at the PGDP fence line. **Alternative:** Monitored natural attenuation (with either PGDP Water Policy or enhanced institutional controls; see V-1.1) and a point of compliance at the DOE property boundary in accordance with CERCLA requirements.	<u>Scope:</u> The current planned end state assumes implementation of DNAPL source reduction actions at additional sites using in situ heating technologies in combination with monitored natural attenuation as part of D&D of the GDP or as part of the CSOU. The potential end state alternative does not assume additional source actions and consists solely of monitored natural attenuation with a point of exposure established at the DOE property boundary or at a downgradient location in accordance with the requirements of CERCLA. <u>Cost:</u> The combined costs of implementing in situ heating technology at the DNAPL source areas associated with D&D of the GDP are unknown. The cost per year for monitored natural attenuation essentially would be the same under both the current planned end state and potential end state alternative; however, the duration of the monitoring/ attenuation period could differ between the current planned end state (hundreds of years) and the potential end state alternative (potentially thousands of years). <u>Schedule:</u> The schedule for GDP D&D and the subsequent CSOU will be determined 6 months before GDP shutdown. Additional schedule information is not available at this time. <u>Risk:</u> The only variance in risk between the current planned end state and the potential end state alternative is the amount of time necessary to achieve MCLs. The PGDP Water Policy and/or enhanced institutional controls would eliminate risks to the public from off-site migration of DNAPL under both end states. However, the current planned end state could reduce the amount of time necessary to meet MCLs, thereby shortening the time period that the PGDP Water Policy or enhanced institutional controls would have to remain in effect. Implementation of in situ heating technology under the current planned end state could result in exposures of remediation workers to contaminated soil and groundwater and, potentially, gases, as well as physical hazards. Implementation of the source action could pose a risk of exposure to gases to general plant workers. Workers involved in disposal of materials contaminated during implementation of the source action also could be exposed. Finally, samplers involved in groundwater monitoring activities could be exposed. Except for risks to samplers, the magnitude of these risks has not been estimated at this time.	The regulators' position is that monitored natural attenuation would need to be supplemented by source actions at multiple locations to reduce contaminant concentrations to MCLs in a "reasonable" timeframe (e.g., ≤ 100 years); however, even with source reduction, it would take hundreds of years to reach MCLs for the contaminants addressed (i.e., solvents), and contamination not addressed by the action (i.e., metals and radionuclides) would remain above MCLs, as well. (With source reduction at only one area, the monitoring period potentially could be thousands of years.) Despite national performance data indicating that no technologies currently exist that can reduce DNAPLs in source areas to MCLs within a "reasonable" period, the regulators' position is that TI waivers would be available only after a demonstrated, site-specific technology failure. The regulators' position is that the current fence line (located	Complete technical investigations at remaining sources and reach agreement with regulators on potential for contaminant migration. Initiate discussions with regulators to 1) determine the appropriateness of requiring a demonstrated failure, given the national performance data, and 2) determine what would be required to decide whether TI waiver should apply. Initiate further discussion with regulators to determine

Table 5.3. Variance Report by Hazard Area (Continued)

(Please see Figures 5.12 and 5.13 for maps of the potential end state alternative and current planned end state, respectively, that depict these variances.)

ID. No.	Description of Variance	Impacts	Challenges in Achieving Alternative	Recommendations
		Risks under the potential end state alternative are limited to samplers involved in groundwater monitoring activities. An assessment of these risks under current sampling protocols determined that risks to samplers are at *de minimis* levels[c].	well inside the property boundary) should be used as the point of exposure.	willingness to consider establishing points of compliance and exposure at property boundary.
			Public and regulator acceptance of range of options included in enhanced institutional controls is uncertain.	Initiate further discussion with the public and regulators to determine acceptability of acquisition of property rights ranging from deed notices and permanent groundwater use restrictions to property purchase.

[a] The PGDP Water Policy is a removal action instituted to limit the use of potentially contaminated groundwater by off-site residences. This policy is discussed in *Action Memorandum for the Water Policy at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/OR/06-1201&D2, U.S. Department of Energy, Paducah, KY, June 1994 (DOE 1994).

[b] Enhanced institutional controls under the potential end state alternative would be implemented on both DOE- and non-DOE-owned property. These controls could range from implementation of legal agreements with surrounding landowners to place enforceable restrictions on groundwater use to DOE's acquiring rights from surrounding property owners and directly implementing restrictions on groundwater and property use.

[c] "*De minimis*" levels of risk, as used here, are defined as risks determined to be at or below the lower limit of EPA's acceptable risk range for site-related exposures (i.e., E-06) by the receptor(s) mentioned.

Table 5.4. Variance Report over Hazard Areas[a]

(Please see Figures 5.12 and 5.13 for maps of the potential end state alternative and current planned end state, respectively, that depict these variances.)

ID. No.	Description of Variance/Hazard Areas Affected	Impacts	Challenges in Achieving Alternative	Recommendations
V-1	**Current Planned End State:** Continuation of PGDP Water Policy **Alternative:** Enhanced institutional controls **Hazard Areas Affected:** 1: GWOU 5: Permitted Landfills 6: BGOU (Group 2) 9: GDP Facilities	Scope: The current planned end state includes continuation of the current PGDP Water Policy[b]. The potential end state alternative includes enhanced institutional controls[c], which would supercede the current PGDP Water Policy. Under both end states, the goal would be to reduce risks to residents from exposure to groundwater to *de minimis* levels[d]. Cost: The cost variance has not been determined to date. The cost of water currently provided under the PGDP Water Policy ranges from $70,000 to $100,000 per year. Depending upon the specific enhanced institutional controls, the cost variance of the enhanced institutional controls could include some cost avoidance (if the PGDP Water Policy is replaced). Additionally, there could be some cost avoidance under other actions as well as discussed elsewhere in this variance report (e.g., excavation of burial grounds versus capping). However, the implementation of enhanced institutional controls would include costs for acquisition of rights to restrict groundwater use and continued monitoring to ensure continued long-term effectiveness of the enhanced institutional controls. Schedule: The PGDP Water Policy currently is in place. Implementation of the enhanced institutional controls would be a future planned CERCLA response action. Risk: The expected risk variance is zero under both the PGDP Water Policy and enhanced institutional controls because each would prevent exposure to contaminated groundwater, resulting in no risk. Enhanced institutional controls, however, would be more sustainable and, therefore, would result in greater long-term effectiveness because they would involve legally enforceable property restrictions and deed notices. (The agreements with landowners under the PGDP Water Policy do not restrict groundwater use, but only commit DOE to provide municipal water to replace the groundwater in return for the property owner's commitment not to use the groundwater. Thus, current or future property-owners could return to using groundwater in the home, completing this exposure pathway, and potentially raising risk from *de minimis* levels[d].)	Public and regulator acceptance of range of options included in enhanced institutional controls in uncertain. DOE policy may limit options available under the enhanced institutional controls. The regulators position is that the current fence line (located well inside the property boundary) should be used as the point of exposure for determining compliance with MCLs.	Initiate further discussion with the public and regulators to determine acceptability of acquisition of property rights ranging from deed notices and permanent groundwater use restrictions to property purchase. Revisit DOE policy concerning acquisition of property rights (ranging from property easements and use restrictions to property purchase). Initiate further discussion with regulators: • to discuss willingness to consider enhanced institutional controls in conjunction with monitored natural attenuation in lieu of certain source and plume actions. • to discuss willingness to consider establishing points of compliance and exposure at the property boundary.

Table 5.4. Variance Report over Hazard Areas[a] (Continued)

(Please see Figures 5.12 and 5.13 for maps of the potential end state alternative and current planned end state, respectively, that depict these variances.)

ID. No.	Description of Variance/Hazard Areas Affected	Impacts	Challenges in Achieving Alternative	Recommendations
V-2	**Current Planned End State:** Treatment to attain source reduction at multiple sites with monitored natural attenuation (with either PGDP Water Policy or enhanced institutional controls; and a point of compliance at the PGDP fence line see V-1) **Alternative:** Treatment to attain source reduction at one site with monitored natural attenuation (with either PGDP Water Policy or enhanced institutional controls; see V-1) and a point of compliance at the DOE property boundary in accordance with CERCLA requirements. **Hazard Areas Affected:** 1: GWOU 9: GDP Facilities	<u>Scope:</u> The current planned end state assumes implementation of DNAPL source reduction actions at multiple sites using in situ heating technologies in combination with monitored natural attenuation with a point of exposure established at the PGDP fence line. The potential end state alternative includes a source reduction using this technology at one location (i.e., C-400, which is believed to be the primary source of solvent contamination at PGDP) in combination with monitored natural attenuation with a point of exposure established at the DOE property boundary or at a downgradient location in accordance with the requirements of CERCLA. <u>Cost:</u> Cost over all potential sites is unknown. However, for Hazard Area 1 alone, the combined cost of implementing in situ heating technology at the DNAPL source areas (i.e., C-400, C-720, and oil landfarm) is estimated to range from $75,000,000 to $140,000,000. The cost of implementing at the C-400 only is approximately $50,000,000. The cost per year for monitored natural attenuation essentially would be the same under both the current planned end state and potential end state alternative; however, the duration of the monitoring/attenuation period could differ between the current planned end state (hundreds of years) and the potential end state alternative (potentially thousands of years). <u>Schedule:</u> Under the current planned end state and the potential end state alternative for Hazard Area 1, all currently planned source actions would be completed by 2010 (the current SMP milestone for the Remedial Action Completion Report is 2011); however, associated monitoring/attenuation under the current planned end state would continue for hundreds of years. The monitoring/attenuation under the potential end state alternative could continue for thousands of years. Also, under both end states investigations to identify other source areas, if any, will be performed as part of the SOU and GDP D&D. No schedule information is available for the Hazard Area 9. The schedule for GDP D&D and the subsequent CSOU will be determined 6 months before GDP shutdown. <u>Risk:</u> The only variance in risk between the current planned end state and the potential end state alternative for both hazard areas is the amount of time necessary to achieve MCLs. The PGDP Water Policy and/or enhanced institutional controls would eliminate risks to the public from off-site migration of DNAPL under both end states. However, the current planned end state could reduce the amount of time necessary to meet MCLs, thereby shortening the time period that the PGDP Water	The regulators' position is that monitored natural attenuation would need to be supplemented by source actions at multiple locations to reduce contaminant concentrations to MCLs in a "reasonable" timeframe (e.g., $\leq$ 100 years); however, even with source reduction, it would take hundreds of years to reach MCLs for the contaminants addressed (i.e., solvents), and contamination not addressed by the action (i.e., metals and radionuclides) would remain above MCLs, as well. (With source reduction at only one area, the monitoring period potentially could be thousands of years.) Despite national performance data indicating that no technologies currently exist that can reduce DNAPLs in source areas to MCLs within a "reasonable" period, the regulators' position is hat TI waivers would be available only after a demonstrated, site-specific technology failure.	Complete technical investigations at remaining sources and reach agreement with regulators on potential for contamination migration. Initiate discussion with the regulators to 1) determine the appropriateness of requiring a demonstrated failure, given the national performance data, and 2) determine what would be required to decide whether TI waiver should apply.

Table 5.4. Variance Report over Hazard Areas[a] (Continued)

(Please see Figures 5.12 and 5.13 for maps of the potential end state alternative and current planned end state, respectively, that depict these variances.)

ID. No.	Description of Variance/Hazard Areas Affected	Impacts	Challenges in Achieving Alternative	Recommendations
		Policy or enhanced institutional controls would have to remain in effect. Implementation of in situ heating technology at multiple sites under the current planned end state could result in exposures of remediation workers to contaminated soil and groundwater and, potentially, gases, as well as physical hazards. Implementation of the source action could pose a risk of exposure to gases to general plant workers. Workers involved in disposal of materials contaminated during implementation of the source action also could be exposed. Finally, samplers involved in groundwater monitoring activities could be exposed. Except for risks to samplers, the magnitude of these risks has not been estimated at this time. Risks to remediation workers, general plant workers, and workers involved in disposal of materials contaminated during implementation of the in situ heating technology under the potential end state alternative would be less because only a single location would be addressed. Risks to samplers involved in groundwater monitoring activities under the potential end state alternative would be similar to those under the current planned end state; however, an assessment of these risks under current sampling protocols determined that risks to samplers are at *de minimis* levels[d].	Public and regulator acceptance of range of options included in enhanced institutional controls in uncertain. The regulators' position is that the current fence line (located well inside the property boundary) should be used as the point of exposure for determining compliance with MCLs.	Initiate further discussion with the public and regulators to determine acceptability of acquisition of property rights ranging from deed notices and permanent groundwater use restrictions to property purchase. Initiate further discussion with regulatory agencies to determine willingness to consider establishing points of compliance and exposure at property boundary.
V-3	**Current Planned End State:** Excavation to remove suspected sources of groundwater contamination at burial grounds **Alternative:** Capping and monitored natural attenuation (with either PGDP Water Policy or enhanced institutional controls; see V-1) **Hazard Areas**	Scope: The current planned end state assumes the investigation and subsequent complete excavation of three burial grounds (C-749 Uranium Burial Ground, C-404 Low-level Radioactive Waste Burial Ground, and C-747 Contaminated Burial Yard) suspected to be sources of groundwater contamination, subsequent off-site disposal of excavated materials, and monitoring to determine the effectiveness of source removal. This has been updated from two to three burial grounds to include the C-404 Low-level Radioactive Waste Burial Ground due to more recent data evaluations that indicate an increased potential to be a source of groundwater contamination. The potential end state alternative assumes the investigation and subsequent capping and monitoring for these burial grounds. <u>Cost:</u> The variance between the combined cost of excavating the three burial grounds, off-site disposal of excavated material, and monitoring under the current planned end state compared to and the combined cost for capping and monitoring under the potential end state alternative is estimated to range from $85,000,000 to $418,000,000, which now includes the addition of the third burial ground. <u>Schedule:</u> The source action under the current planned end state would be completed by 2030. Capping under the potential end state alternative would be complete by	It is the regulators' position that capping, access controls, and/or enhanced institutional controls are inadequate to achieve long-term protectiveness for in situ management of contamination at burial grounds; therefore, their preference is to remove the burial grounds to prevent them from serving as long-term sources of groundwater contamination. Public and regulator acceptance of range of options included in enhanced institutional	Complete technical investigations at remaining sources and reach agreement with regulators on potential for contaminant migration. Initiate further discussion with the public and regulators to determine

Table 5.4. Variance Report over Hazard Areas[a] (Continued)

(Please see Figures 5.12 and 5.13 for maps of the potential end state alternative and current planned end state, respectively, that depict these variances.)

ID. No.	Description of Variance/Hazard Areas Affected	Impacts	Challenges in Achieving Alternative	Recommendations
	Affected: 1: GWOU	2019. Monitoring would follow both actions. <u>Risk:</u> The only potential risks posed by these burial grounds under current conditions are from possible migration of contaminants through groundwater to off-site residents and from direct contact at the burial ground by on-site industrial workers. However, the PGDP Water Policy and/or enhanced institutional controls would eliminate risks to the public from contaminant migration under both end states, and current access controls mitigate risk from direct contact by on-site industrial workers. Excavation of the burial grounds under the current planned end state would remove the suspected source term, thereby reducing the amount of time taken to meet MCLs and shortening any monitoring period and the need for access controls. Capping of the burial grounds under the potential end state alternative would limit potential contact to the burial grounds and reduce possible migration of contamination to groundwater, but would require long-term monitoring and access controls. Off-site risks from contaminant migration would be controlled using enhanced institutional controls (see V-1). Excavation of the burial grounds would result in substantial risks to remediation workers through direct contact with wastes. (Note that one of the burial grounds to be excavated under the current planned end state contains pyrophoric uranium [i.e., uranium that spontaneously burns when exposed to air], which would pose significant inhalation risk and physical hazard to remediation workers.) Additionally, general site workers could be put at risk from exposure through inhalation of resuspended dust and vapors during excavation. Potential risks to the public and ecological receptors also would be increased during transportation of waste to the off-site disposal location. Finally, samplers involved in monitoring activities could be exposed. The magnitude of these risks has not been estimated at this time. Capping of the burial grounds under the potential end state alternative would result in potential risks to remediation workers through direct contact with surface soil at the burial grounds, but not through direct contact with waste. Samplers involved in monitoring activities also could be at risk of exposure. The magnitude of these risks has not been estimated at this time. Note that risks to remediation and general site workers would be smaller under the potential end state alternative than under the current planned end state because,	controls in uncertain.	acceptability of acquisition of property rights ranging from deed notices and permanent groundwater use restrictions to property purchase.

Table 5.4. Variance Report over Hazard Areas[a] (Continued)

(Please see Figures 5.12 and 5.13 for maps of the potential end state alternative and current planned end state, respectively, that depict these variances.)

ID. No.	Description of Variance/Hazard Areas Affected	Impacts	Challenges in Achieving Alternative	Recommendations
		under the potential end state alternative, waste would not be dug up and moved, and the duration of the activity would be shorter.		
V-4	**Current Planned End State:** Treatment to reduce contaminant concentrations in the dissolved-phase plume and a point of compliance at the PGDP fence line **Alternative:** Monitored natural attenuation (with either PGDP Water Policy or enhanced institutional controls; see V-1) and a point of compliance at the DOE property boundary in accordance with CERCLA requirements. **Hazard Areas Affected:** 1: GWOU	Scope: The current planned end state assumes implementation of oxidation technologies (e.g., C-Sparge™) to remove TCE and other solvents from the dissolved-phase plumes followed by monitored natural attenuation. The potential end state alternative does not assume actions for the dissolved-phased plumes and consists solely of monitored natural attenuation. Cost: The cost for implementing oxidation technologies in the dissolved-phase plumes has not been determined. The cost per year for monitored natural attenuation essentially would be the same under both the current planned end state and potential end state alternative; however, the duration of the monitoring/ attenuation period could differ between the current planned end state (hundreds of years) and the potential end state alternative (potentially thousands of years). Schedule: Under the current planned end state, the construction and performance of the plume actions would be implemented by 2019 with associated monitoring/attenuation potentially continuing for decades. Additionally, any actions to address the dissolved-phase plumes under the current planned end state would need to follow source actions to be cost-effective. (See V-1.2 and V-1.3). Under the potential end state alternative, no additional construction beyond installation of additional monitoring wells would be required; however, monitoring/ attenuation potentially could continue for thousands of years. Risk: The only variance in risk between the current planned end state and the potential end state alternative is the amount of time necessary to achieve MCLs. The PGDP Water Policy and/or enhanced institutional controls would eliminate risks to the public from TCE and other solvents in the dissolved-phase plumes under both end states. The current planned end state could reduce the length of time that the PGDP Water Policy or enhanced institutional controls would have to remain in effect depending on the extent and effectiveness of plume treatment. Note, however, that the oxidation technologies would not address other potential contaminants found in groundwater in on-site areas at PGDP (i.e., metals and radionuclides). Implementation of oxidation technologies would result in exposures of remediation workers to contaminated groundwater, as well as physical hazards. Workers involved in disposal of materials contaminated during implementation of the action also could be exposed. Finally, samplers involved in groundwater monitoring	The regulators' position is that monitored natural attenuation would need to be supplemented by source actions at multiple locations to reduce contaminant concentrations to MCLs in a "reasonable" timeframe (e.g., ≤ 100 years); however, even with source reduction, it would take hundreds of years to reach MCLs for the contaminants addressed (i.e., solvents), and contamination not addressed by the action (i.e., metals and radionuclides) would remain above MCLs, as well. (With source reduction at only one area, the monitoring period potentially could be thousands of years.) Despite national performance data indicating that no technologies currently exist that can reduce TCE and solvent concentrations in large plumes to MCLs within a reasonable time frame, the regulators' position is that TI waivers would be available only after a demonstrated, site-specific	Complete technical investigations of plume migration and attenuation and reach agreement with regulators on these issues. Initiate discussion with the regulators to 1) determine the appropriateness of requiring a demonstrated failure, given the national performance data, and 2) determine what would be required to decide whether TI waiver should apply.

Table 5.4. Variance Report over Hazard Areas[a] (Continued)

(Please see Figures 5.12 and 5.13 for maps of the potential end state alternative and current planned end state, respectively, that depict these variances.)

ID. No.	Description of Variance/Hazard Areas Affected	Impacts	Challenges in Achieving Alternative	Recommendations
		activities also could be exposed. Except for risks to samplers, the magnitude of these risks has not been estimated at this time. Risks under the potential end state alternative are limited to samplers involved in groundwater monitoring activities. An assessment of these risks under current sampling protocols determined that risks to samplers are at *de minimis* levels[d].	technology failure. Public and regulator acceptance of range of options included in enhanced institutional controls in uncertain. The regulators' position is that the current fence line (located well inside the property boundary) should be used as the point of exposure for determining compliance with MCLs.	Initiate further discussion with the public and regulators to determine acceptability of acquisition of property rights ranging from deed notices and permanent groundwater use restrictions to property purchase. Initiate further discussion with regulators to determine willingness to consider establishing points of compliance and exposure at property boundary.
V-5	**Current Planned End State:** Actions to reduce solvent concentrations in groundwater discharged to surface water and/or control these discharges **Alternative:** Continued monitoring of surface water concentrations at discharge point	Scope: The current planned end state assumes implementation of measures to reduce the solvent concentrations in the groundwater discharged to Little Bayou Creek and/or measures to control these discharges followed by monitoring. The potential end state alternative assumes continued monitoring. Cost: The cost of measures to reduce concentration in discharges and/or control discharges under the current planned end state has not been determined. Monitoring costs per year essentially would be the same under both the current planned end state and the potential end state alternative. Schedule: A schedule for implementation of the current planned end state actions is not available; however, the duration of monitoring under both the end states would be similar unless source and plume actions are taken. (See V-2, V-3, and V-4.) Risk: Screening human health and ecological risk assessments have determined that risks at the discharge point are at *de minimis* levels[d] for recreational user and ecological receptors. Modeling has indicated that contaminant concentrations could	Regulatory position is that releases at seeps present unacceptable risks to human health and the environment. Commonwealth of Kentucky regulators' position has been that Kentucky policy requires cleanup actions to either attain an E-06 risk assuming residential exposure or be supplemented with institutional controls and/or engineering barriers to attain that risk level.	Complete technical investigations for impacts of releases and reach agreement with regulators concerning risks posed to human health and the environment. Initiate further discussion with regulators: • to seek agreement that cleanup standards for proposed actions will be set based upon current and future land use for the area in question.

Table 5.4. Variance Report over Hazard Areas[a] (Continued)

(Please see Figures 5.12 and 5.13 for maps of the potential end state alternative and current planned end state, respectively, that depict these variances.)

ID. No.	Description of Variance/Hazard Areas Affected	Impacts	Challenges in Achieving Alternative	Recommendations
	Hazard Areas Affected: 1: GWOU	increase in the future, but these results and estimates of risks derived using them are uncertain. A baseline risk assessment has not been completed. Implementation of a technology to attenuate or control discharges would result in increased risks to remediation workers. Additionally, damage to the environment at the discharge point during implementation could lead to increased ecological risks. Finally, samplers involved in monitoring activities could be exposed. The magnitude of these risks has not been estimated at this time. Risks under the potential end state alternative are limited to samplers involved in monitoring activities. The magnitude of these risks has not been estimated at this time.		• to gain agreement that cleanup standards for proposed actions will be set based on the CERCLA risk range (i.e., E-06 to E-04).
V-6	**Current Planned End State:** Excavation of source areas **Alternative:** Excavation of soil or sediment "hot spots" **Hazard Areas Affected:** 2: SWOU 4: SOU 8: Cylinder Yards and DUF_6 Conversion Facility 9: GDP Facilities	Scope: The current planned end state assumes excavation of contaminated source sediments and soils to levels that achieve a target risk of 1E-06 under a residential scenario and a PCB concentration of 1 ppm in all areas. The potential end state alternative assumes excavations of "hot spots" in sediment and soil using a target risk and PCB concentration consistent with the agreed future land use. (All parties have agreed that future land use of areas currently in the industrialized areas of PGDP is industrial and that the future use of areas currently outside of the industrialized areas, but on DOE property, is recreational.) Therefore, under the potential end state alternative, the action in industrial areas would achieve a target risk of 1E-04 to a worker and a PCB concentration of 25 ppm. The action in recreational areas would achieve a target risk of 1E-04 to a recreational user and a PCB concentration of 1 ppm. Cost: Based on existing PCB and ^{238}U sampling results, approximately 7 to 17 times as much soil and sediment would be required to be removed under the current planned end state cleanup target than under the potential end state alternative cleanup target, resulting in a cost variance of proportional size. Because many areas have not been fully characterized, there is a high degree of uncertainty in this estimate. Schedule: The investigation of the Hazard Area 2 (SWOU) is ongoing. The completion dates under the current planned end state and potential end state alternative are 2021 and 2017, respectively. The investigation of Hazard Area 4 (SOU) is not complete. For the current planned end state, the completion date is 2019. For the potential end state alternative, the completion date is 2015.	Commonwealth of Kentucky regulators' position is that Kentucky policy requires cleanup actions to either attain an E-06 risk assuming residential exposure or be supplemented with institutional controls and/or engineering barriers to attain that risk level. Commonwealth of Kentucky regulators' position is that Kentucky policy requires that cleanup of PCBs in soils and sediments located in industrial areas must attain 1 ppm (as opposed to federal TSCA regulations allowing $\leq$25 ppm for "low occupancy areas" [e.g., industrial areas] $\leq$ 1 ppm for "high occupancy areas" [e.g., residential areas], and	Initiate further discussion with regulators: • to seek agreement that cleanup standards for proposed actions will be set based upon current and future land use for the area in question. • to gain agreement that cleanup standards for proposed actions will be set based on the CERCLA risk range (i.e., E-06 to E-04). • to seek agreement that national TSCA PCB cleanup standards for low occupancy (e.g., industrial) areas (25 ppm) should be adopted for industrial areas and that national TSCA PCB cleanup standards for high occupancy (e.g.,

Table 5.4. Variance Report over Hazard Areas[a] (Continued)

(Please see Figures 5.12 and 5.13 for maps of the potential end state alternative and current planned end state, respectively, that depict these variances.)

ID. No.	Description of Variance/Hazard Areas Affected	Impacts	Challenges in Achieving Alternative	Recommendations
		For Hazard Area 8, no schedule is available because the conversion mission is expected to last for decades. For Hazard Area 9, the schedule for GDP D&D and the subsequent CSOU will be determined 6 months before GDP shutdown. <u>Risk:</u> Under the current state, the only potential risks posed by sediment and soils to humans are from direct contact by industrial workers and recreational users with these media. However, these risks currently are mitigated through institutional and access controls that limit exposure. Ecological receptors could be at risk in some industrial and nonindustrial areas; however, a baseline ecological risk assessment confirming this has not been completed. Potential risk in all areas under the current planned end state would be reduced to E-06 using a residential scenario in industrial and recreational areas. Additionally, protection of ecological receptors would be demonstrated by an ecological risk assessment. Potential risk under the potential end state alternative would be reduced to a value falling within EPA's acceptable risk range for site-related exposures (i.e., E-06 to E-04) using a worker scenario for industrial areas and a recreational user scenario in recreational areas. Additionally, protection of ecological receptors would be demonstrated by an ecological risk assessment. Risks during excavation and disposal under both the current planned end state and potential end state alternative would affect remediation workers, general site workers, transportation workers (off-site disposal anticipated), landfill workers, the public, and ecological receptors. The magnitude of these risks under the current planned end state and potential end state alternative have not been assessed at this time; however, because a greater amount of material would be excavated under the current planned end state than under the potential end state alternative, risks to all receptors would be expected to be greater under the current planned end state than under the potential end state alternative.	>1 ppm to ≤ 10 ppm for "high occupancy areas" if covered by a cap with institutional controls).	residential) areas (1 ppm) should be adopted for recreational areas.
V-7	**Current Planned End State:** Construction of basins to control sediment migration **Alternative:** No basins, with "hot spot" removal (see	<u>Scope:</u> Under the current planned end state, construction of two basins to control sediment migration to areas outside the industrialized portions of the site is planned. Under the potential end state alternative, no basins are planned because "hot spot" removal would prevent migration of contaminated material. <u>Cost:</u> The variance between constructing and maintaining basins under the current planned end state and not constructing the basins under the potential end state alternative is estimated to range from $7,000,000 to $11,000,000.	Lack of representative data to make the appropriate decision.	Complete investigation and risk assessment to determine if risks from migration of contaminants require action. Initiate further discussions with the public and regulators following

Table 5.4. Variance Report over Hazard Areas[a] (Continued)

(Please see Figures 5.12 and 5.13 for maps of the potential end state alternative and current planned end state, respectively, that depict these variances.)

ID. No.	Description of Variance/Hazard Areas Affected	Impacts	Challenges in Achieving Alternative	Recommendations
	V-6) **Hazard Areas Affected:** 2: SWOU	Schedule: The investigation to determine if sediment control basins for control of sediment migration are needed is ongoing. The decision for their construction will follow completion of that investigation. A completion date for construction would be selected as part of a decision to construct basins. Risk: An analysis of the potential impact of contaminant migration from on-site ditches to recreational use areas under current conditions determined that direct contact risks to recreational users and workers were at *de minimis* levels[d]. Under the current planned end state, remediation workers would be exposed to physical hazards during construction of the basins; however, risks from exposure to contamination would be at *de minimis* levels[d] because the basins would be constructed in clean areas. Additionally, ecological receptors would be at risk due to habitat disruption. Under the potential end state alternative, construction would not occur, and no receptors would be at risk.		completion of the investigation/ evaluation to reach consensus on methods to be used to control sediment migration.
V-8	**Current Planned End State:** Excavation of burial grounds **Alternative:** Capping of burial grounds, with access controls **Hazard Areas Affected:** 3: BGOU (Group 1)	Scope: Under the current planned end state, certain burial grounds are to be excavated and materials disposed of in on- and off-site locations. Under the potential end state alternative, these burial grounds are capped to limit exposure, and the caps are maintained, including monitoring. For both end states, the goal of the action is to reduce risk to workers by eliminating or limiting exposure to contamination associated with the burial grounds. Cost: The variance between the cost of excavating the burial grounds and disposing of the materials off-site under the current planned end state versus capping and monitoring the burial grounds under the potential end state alternative is estimated to range from $185,000,000 to $1,000,000,000, reflecting current basis of estimating. Schedule: The source action under the current planned end state would be completed by 2030. Capping under the potential end state alternative would be complete by 2019. Monitoring under the potential end state alternative could continue for several decades. Risk: The only potential risks posed to humans are from direct contact at the burial ground by on-site industrial workers. Risks are driven by the presence of uranium isotopes, arsenic, PAHs, and PCBs in surface soils; however, current access controls mitigate risk from direct contact by on-site industrial workers. Screening ecological risk assessments determined that ecological risks for contact at the burial grounds were at *de minimis* levels[d] assuming future industrial use of the areas encompassing	It is the regulators' position that capping and access controls are inadequate to achieve long-term protectiveness for in situ management of contamination at burial grounds; therefore, their preference is to remove the burial grounds to achieve long-term protectiveness. It is the regulators' position that existing data are insufficient to characterize the contents and releases from the burial grounds.	Complete technical investigations at remaining sources and reach agreement with regulators on potential impacts. Initiate further discussions with the public and regulators following completion of the investigation/ evaluation to reach consensus as to whether additional actions are necessary.

Table 5.4. Variance Report over Hazard Areas[a] (Continued)

(Please see Figures 5.12 and 5.13 for maps of the potential end state alternative and current planned end state, respectively, that depict these variances.)

ID. No.	Description of Variance/Hazard Areas Affected	Impacts	Challenges in Achieving Alternative	Recommendations
		the burial grounds. Excavation of the burial grounds would result in substantial risks to remediation workers through direct contact with wastes. Additionally, general site workers could be put at risk from exposure through inhalation of resuspended dust and vapors during excavation. Potential risks to the public and ecological receptors also would be increased during transportation of waste to the off-site disposal location. Finally, samplers involved in monitoring activities could be exposed. The magnitude of these risks has not been estimated at this time. Capping of the burial grounds under the potential end state alternative would result in potential risks to remediation workers through direct contact with surface soil at the burial grounds. Samplers involved in monitoring activities also could be at risk of exposure. The magnitude of these risks has not been estimated at this time. Note that risks to remediation and general site workers would be smaller under the potential end state alternative than under the current planned end state because, under the potential end state alternative, waste would not be dug up and moved, and the duration of the activity would be shorter.		
V-9	**Current Planned End State:** Excavation of soil and/or decontamination of surface areas. **Alternative:** Excavation of soil and/or decontamination of surface areas. **Hazard Areas Affected:** 7: Legacy Waste and DMSAs	<u>Scope:</u> Upon completion of characterization and disposition of all wastes and debris contained in legacy waste storage areas and DMSAs, those areas that are discovered to contain hazardous waste will be subject to the closure requirements outlined in the Agreed Order and/or RCRA Permit. Under the current planned end state, the Agreed Order provides that "final clean closure" of any underlying soils and/or surface areas must achieve a risk level of 1E-06 and hazard index of 1 under a residential scenario without use of institutional controls or engineering barriers and a PCB target level of 1 ppm. Under the potential end state alternative, excavation of any contaminated soils and/or decontamination of surface areas would target a risk level of 1E-04 and hazard index of 1 under an industrial scenario in accordance with CERCLA and a PCB target level of 25 ppm, with the option of using institutional controls or engineering barriers. <u>Cost:</u> Because characterization of the DMSAs and legacy waste storage areas is not complete, any potential impacts to underlying soils and/or surfaces are not known at this time; therefore, estimated costs are not available.	The Agreed Order provides that "final clean closure" of any underlying soils and/or surface areas must achieve a 1E-06 and hazard index of 1 under a residential scenario without use of institutional controls or engineering barriers. It is the Commonwealth of Kentucky's position that cleanup of PCBs in soils located in industrial areas must attain 1 ppm (as opposed to federal TSCA regulations allowing ≤ 25 ppm for "low occupancy areas" [e.g., industrial areas]	Initiate further discussion with regulators: • to seek agreement that cleanup standards for proposed actions will be set based upon current and future land use for the area in question. • to gain agreement that cleanup standards for proposed actions will be set based on the CERCLA risk range (i.e., E-06 to E-04). • to seek agreement that national TSCA PCB cleanup standards for low occupancy (e.g.,

Table 5.4. Variance Report over Hazard Areas[a] (Continued)

(Please see Figures 5.12 and 5.13 for maps of the potential end state alternative and current planned end state, respectively, that depict these variances.)

ID. No.	Description of Variance/Hazard Areas Affected	Impacts	Challenges in Achieving Alternative	Recommendations
		Schedule: The Agreed Order requires characterization to be complete for all DMSAs by 2009. The Agreed Order also defines timeframes for submittal of closure plans after completion of characterization for those DMSAs and waste storage areas determined to contain hazardous wastes. Risk: Under the current state, the only potential risks posed by surface soils and/or surface areas are from direct contact by on-site industrial workers. Characterization data collected to date indicates that these direct contact risks may approach *de minimis* levels[d]. Additionally, any risks are mitigated through institutional and access controls that limit exposure. No ecological risk assessment is available. Potential risk under the current planned end state would be reduced to E-06 using a residential scenario in industrial areas. Potential risk under the potential end state alternative would be reduced to a value falling between E-06 and E-04 using an industrial scenario. Excavation and/or decontamination activities under both the current planned end state and potential end state alternative would pose a potential risk to remediation workers, general site workers, transportation workers (off-site disposal anticipated), landfill workers, the public, and ecological receptors. The magnitude of these risks under the current planned end state and potential end state alternative have not been assessed at this time; however, because a greater amount of material potentially would be available for exposure under the current planned end state than under the potential end state alternative, risks over the duration of the response action likely would be greater under the current planned end state than under the potential end state alternative.	≤1 ppm for "high occupancy areas" [e.g., residential areas], and >1 ppm to ≤ 10 ppm for "high occupancy areas" if covered by a cap with institutional controls).	industrial) areas (25 ppm) should be adopted for industrial areas and that national TSCA PCB cleanup standards for high occupancy (e.g., residential) areas (1 ppm) should be adopted for recreational areas.

[a] In this table, the "Impact" discussion is summarized over all hazard areas. Please see Table 5.1 for a discussion of the schedule, cost, and risk impacts of variances upon individual hazard areas.
[b] The PGDP Water Policy is a removal action instituted to limit the use of potentially contaminated groundwater by off-site residences. This policy is discussed in *Action Memorandum for the Water Policy at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/OR/06-1201&D2, U.S. Department of Energy, Paducah, KY, June 1994 (DOE 1994).
[c] Enhanced institutional controls under the potential end state alternative would be implemented on both DOE- and non-DOE-owned property. These controls could range from implementation of legal agreements with surrounding landowners to place enforceable restrictions on groundwater use to DOE's acquiring rights from surrounding property owners and directly implementing restrictions on groundwater and property use.
[d] "*De minimis*" levels of risk, as used here, are defined as risks determined to be at or below the lower limit of EPA's acceptable risk range for site-related exposures (i.e., E-06) by the receptor(s) mentioned.

THIS PAGE INTENTIONALLY LEFT BLANK

FIGURES

THIS PAGE INTENTIONALLY LEFT BLANK

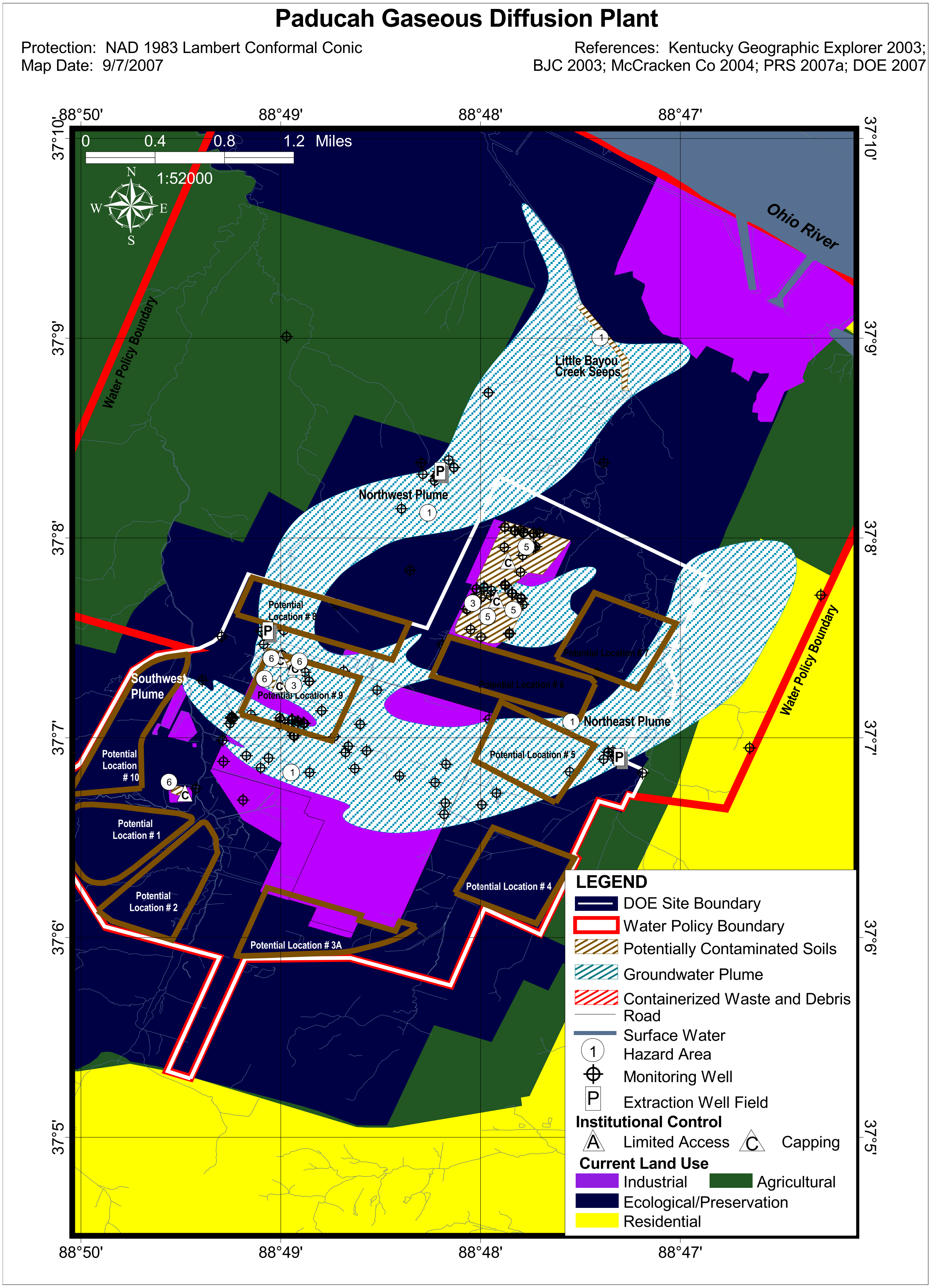


Figure 5.0c1. Hazard Areas - Current Planned End State

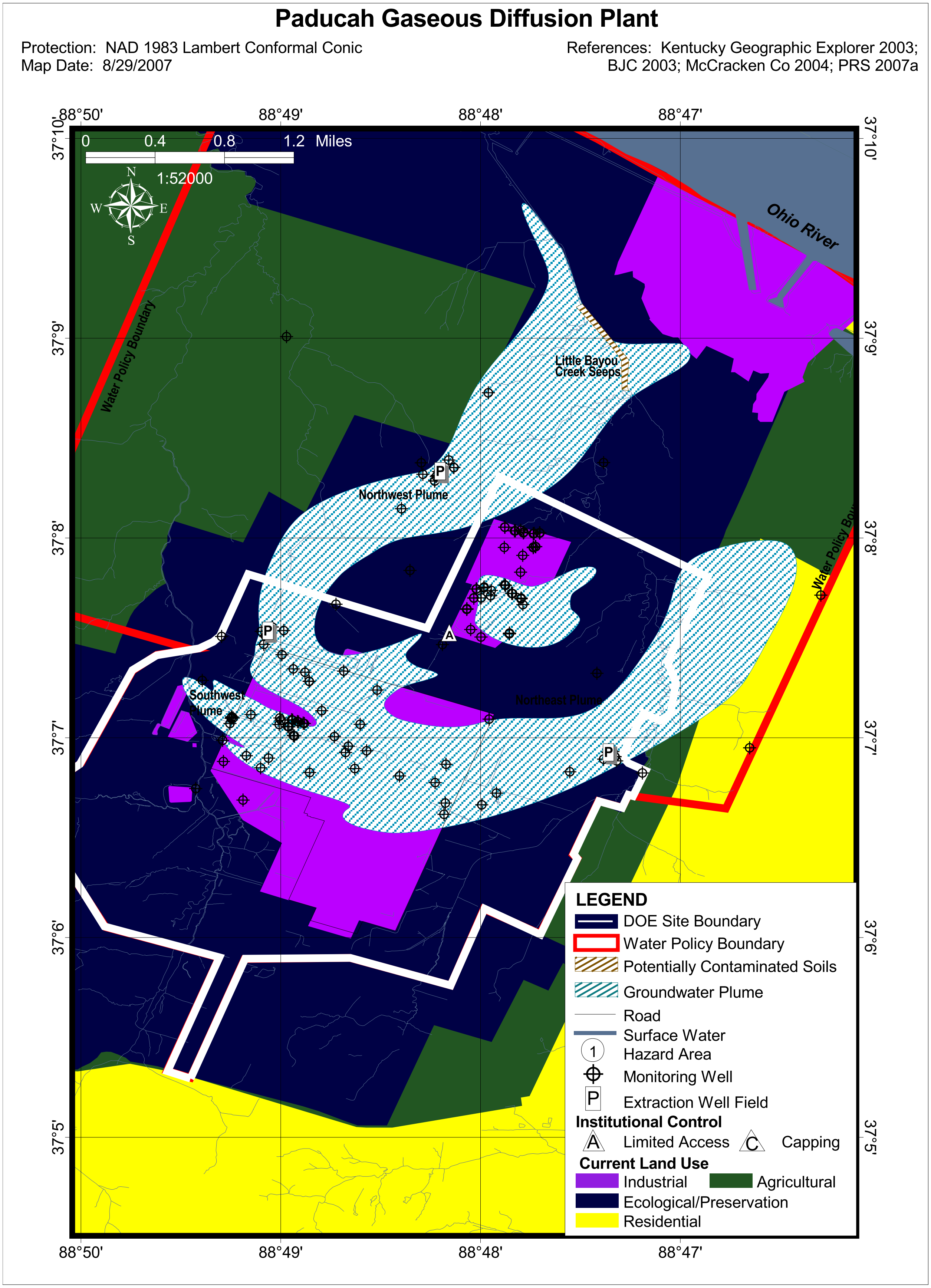
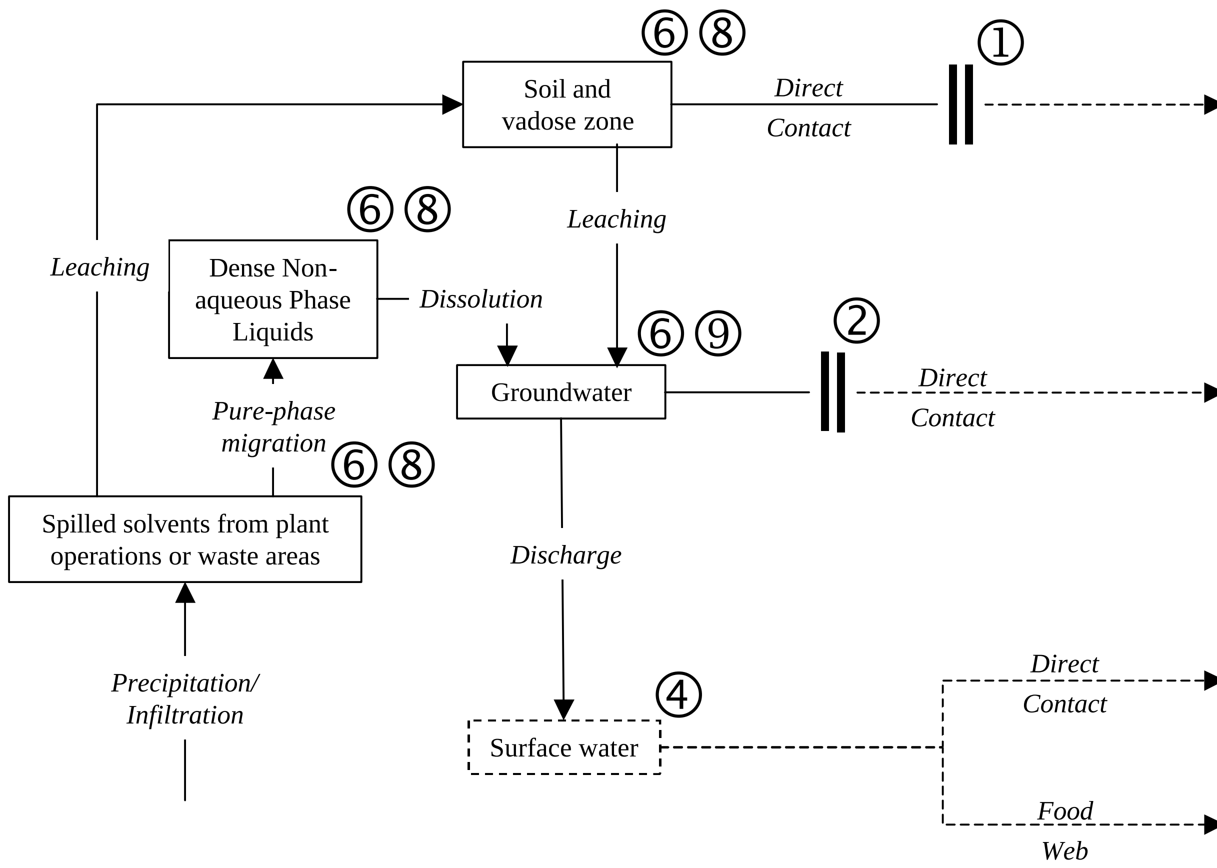


Figure 5.1c1. Hazard Area 1: GWOU - Current Planned End State

Hazard Area 1: Groundwater Operable Unit – Current Planned End State



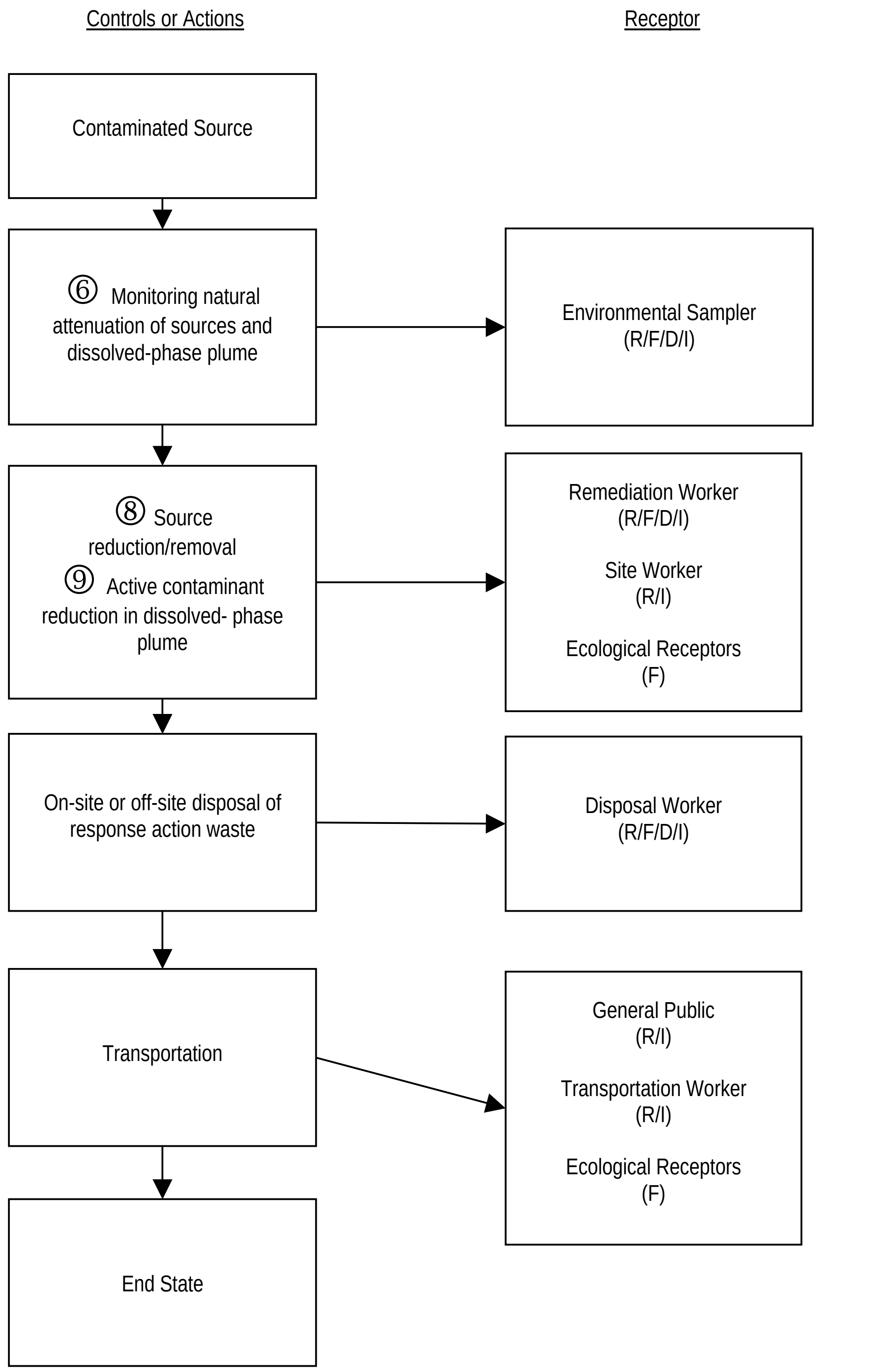
Potential Receptor Exposed			
Worker	Resident	Visitor	Ecological
R/F/D/I			
R/F/D/I	F/D/I		
F/D/I		F/D/I	F/D/I
	F	F	F

Current Planned Controls or Actions
① Access and excavation restrictions.
② PGDP Water Policy.
④ Natural attenuation.
⑥ Monitored natural attenuation of sources and dissolved phase plume.
⑧ Source reduction/removal.
⑨ Active contaminant reduction in dissolved phase plume

Receptor Key
Worker – includes workers exposed during inside and outside activities, including the remediation worker.
Resident – includes residents engaged in all but recreation activities.
Visitor – includes recreational users, intruders, and trespassers.
Ecological – includes on- and off-site aquatic and terrestrial ecological receptors.

Exposure Route Key
R = External Exposure
F = Ingestion
D = Dermal
I = Inhalation

Figure 5.1c2. Hazard Area 1: GWOU CSM – Current Planned End State



Exposure Route Key: R=External Exposure, F=Ingestion, D=Dermal, I=Inhalation

Figure 5.1c3. Hazard Area 1: GWOU Treatment Train – Current Planned End State

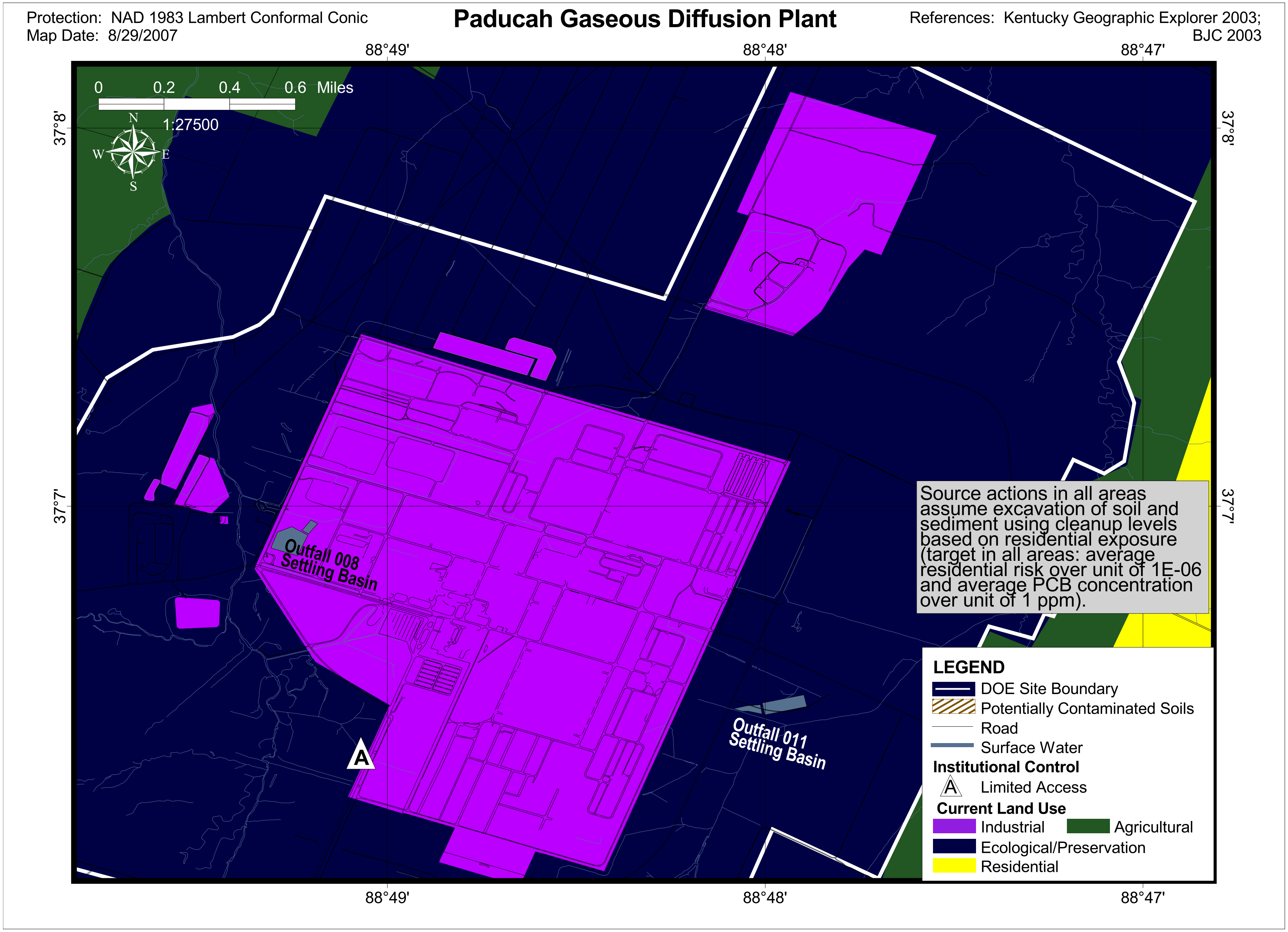
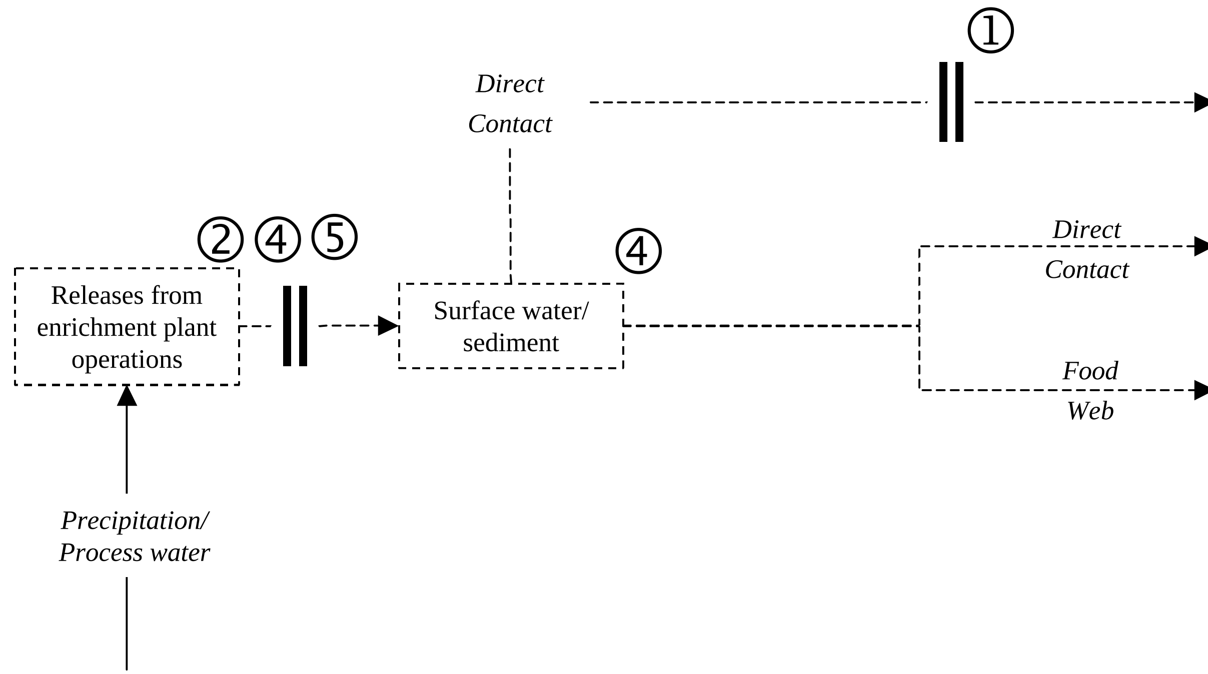


Figure 5.2c1. Hazard Area 2: SWOU - Current Planned End State

Hazard Area 2: Surface Water Operable Unit – Current Planned End State



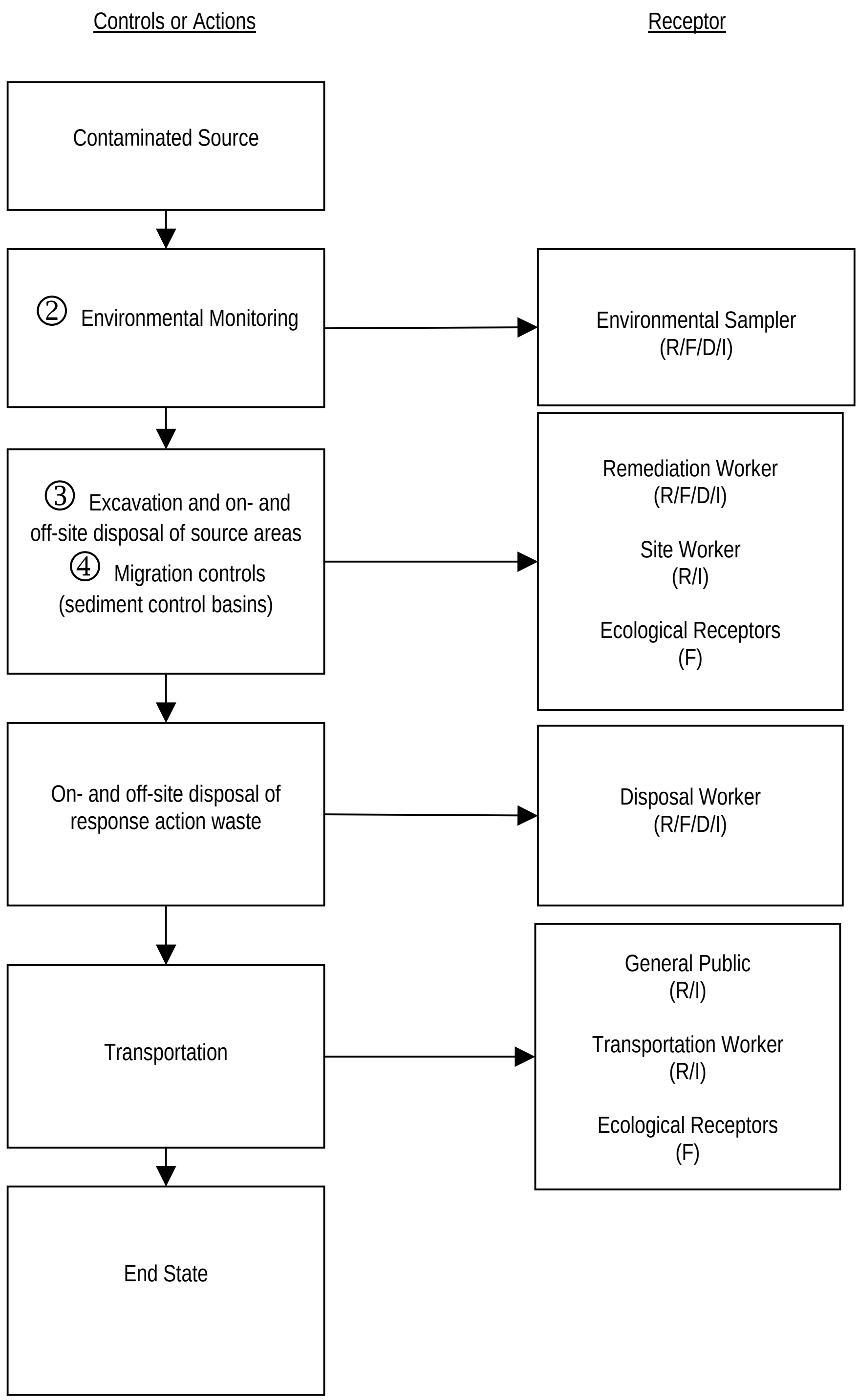
Potential Receptor Exposed			
Worker	Resident	Visitor	Ecological
R/F/D/I		R/F/D/I	R/F/D/I
F/D/I		F/D/I	F/D/I
	F	F	F

Current Planned Controls and Action
① Access restrictions.
② Environmental monitoring.
④ Scrap removal and excavation of source areas (target in all areas based on average exposure over entire unit:residential risk of 1E-06, PCBs at 1 ppm).
⑤ Migration controls (sediment control basins).

Receptor Key
Worker – includes workers exposed during inside and outside activities, including the remediation worker.
Resident – includes residents engaged in all but recreation activities.
Visitor – includes recreational users, intruders, and trespassers.
Ecological – includes on- and off-site aquatic and terrestrial ecological receptors.

Exposure Route Key
R = External Exposure
F = Ingestion
D = Dermal
I = Inhalation

Figure 5.2c2. Hazard Area 2: SWOU CSM – Current Planned End State



Exposure Route Key: R=External Exposure, F=Ingestion, D=Dermal, I=Inhalation

Figure 5.2c3. Hazard Area 2: SWOU Treatment Train – Current Planned End State

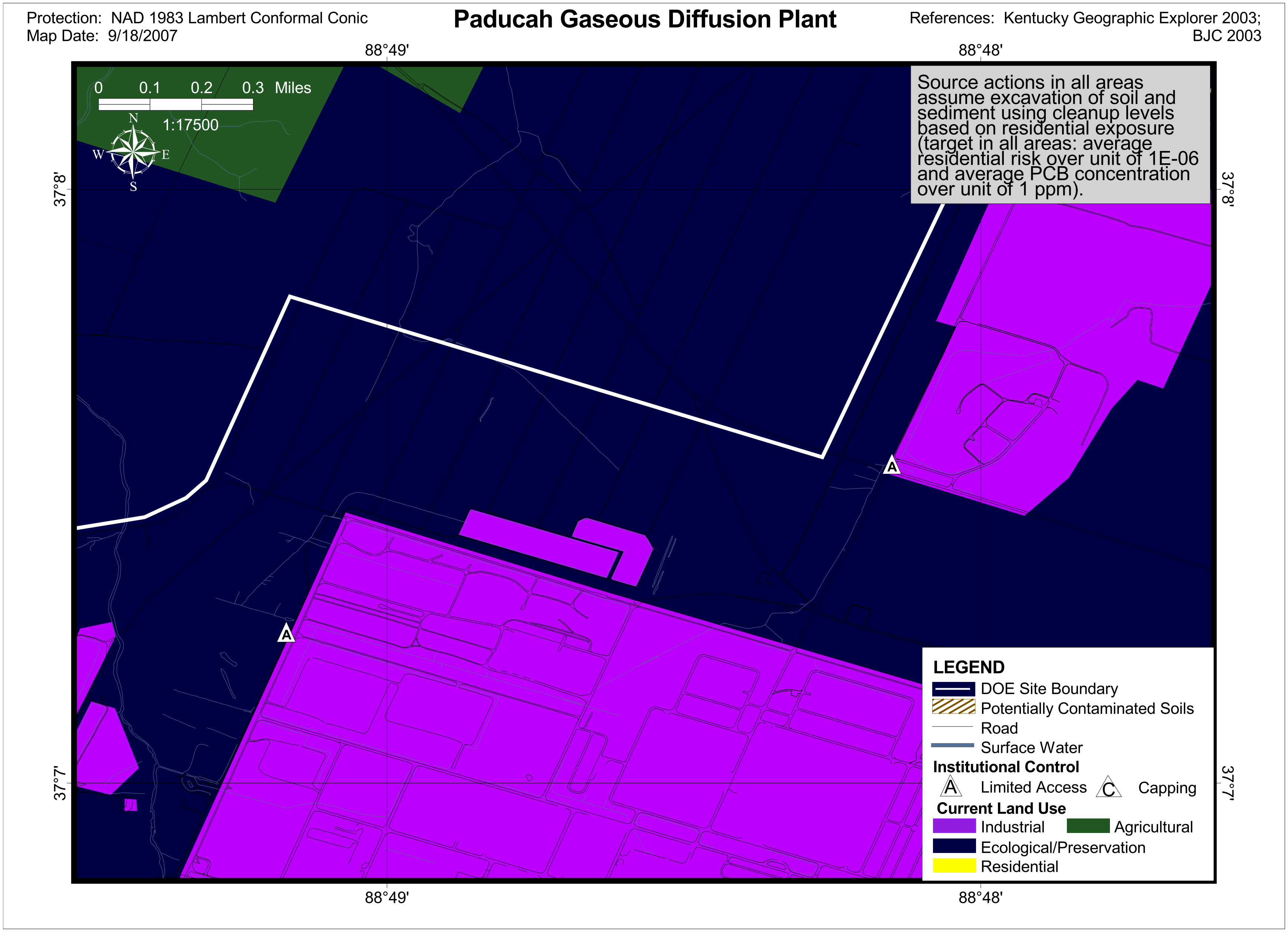
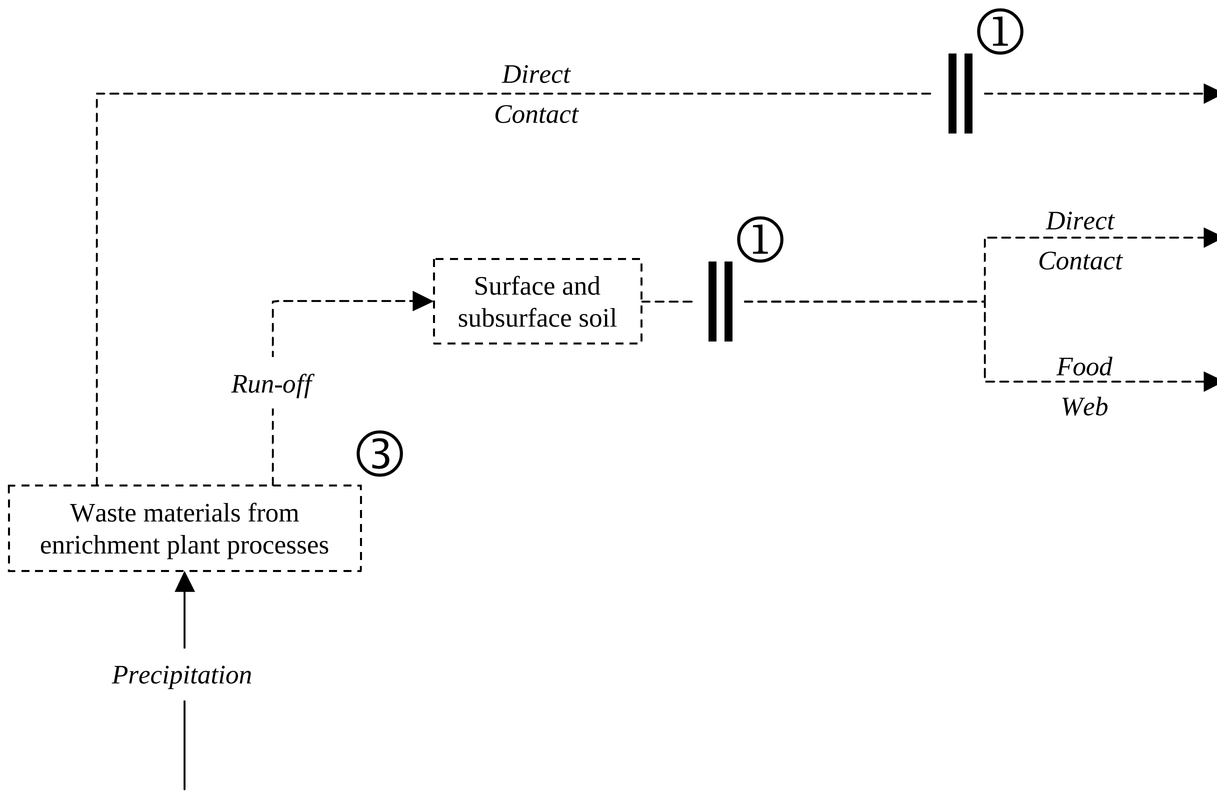


Figure 5.3c1. Hazard Area 3: BGOU (Group 1) - Curent Planned End State

Hazard Area 3: Burial Grounds Operable Unit (Group 1) –Current Planned End State



Potential Receptor Exposed			
Worker	Resident	Visitor	Ecological
R/F/D/I		R/F/D/I	R/F/D/I
R/F/D/I		R/F/D/I	R/F/D/I
			F

Current Planned Controls and Actions
① Access and excavation restrictions.
③ Excavation of burial grounds.

Receptor Key
Worker – includes workers exposed during inside and outside activities, including the remediation worker.
Resident – includes residents engaged in all but recreation activities.
Visitor – includes recreational users, intruders, and trespassers.
Ecological – includes on- and off-site aquatic and terrestrial ecological receptors.

Exposure Route Key
R = External Exposure
F = Ingestion
D = Dermal
I = Inhalation

Figure 5.3c2. Hazard Area 3: BGOU (Group 1) CSM – Current Planned End State

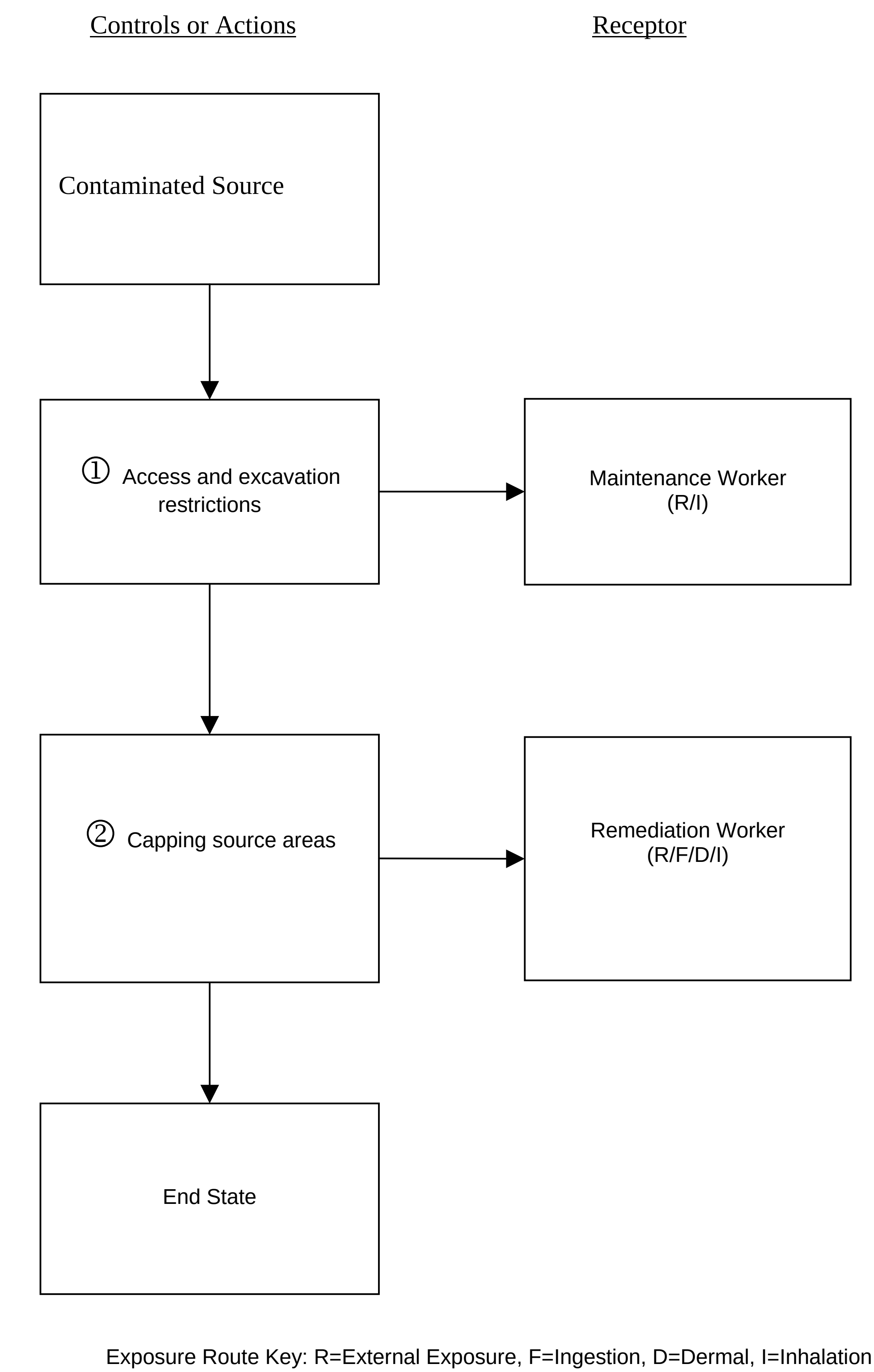


Figure 5.3c3. Hazard Area 3: BGOU (Group 1) Treatment Train – Current Planned End State

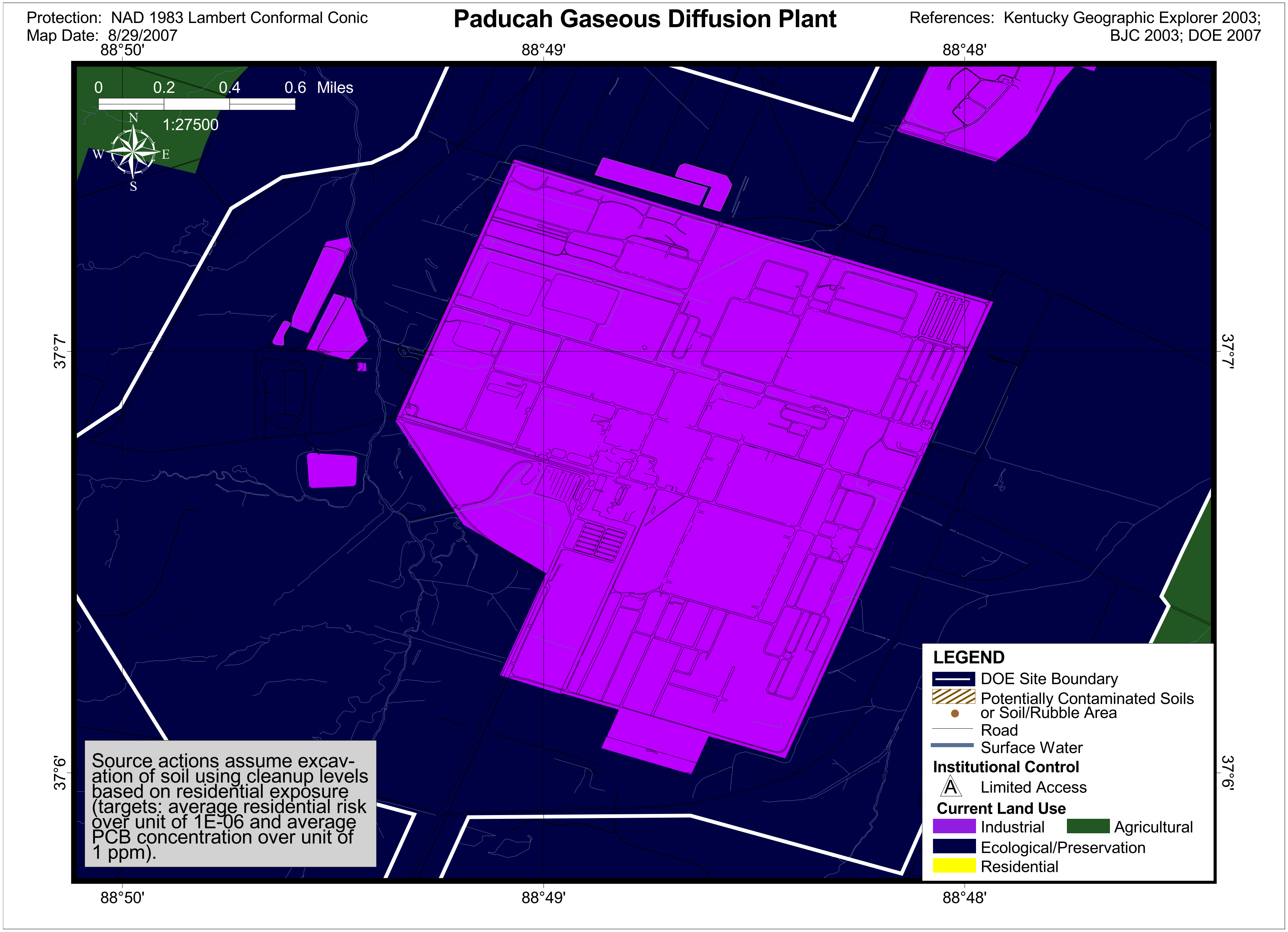
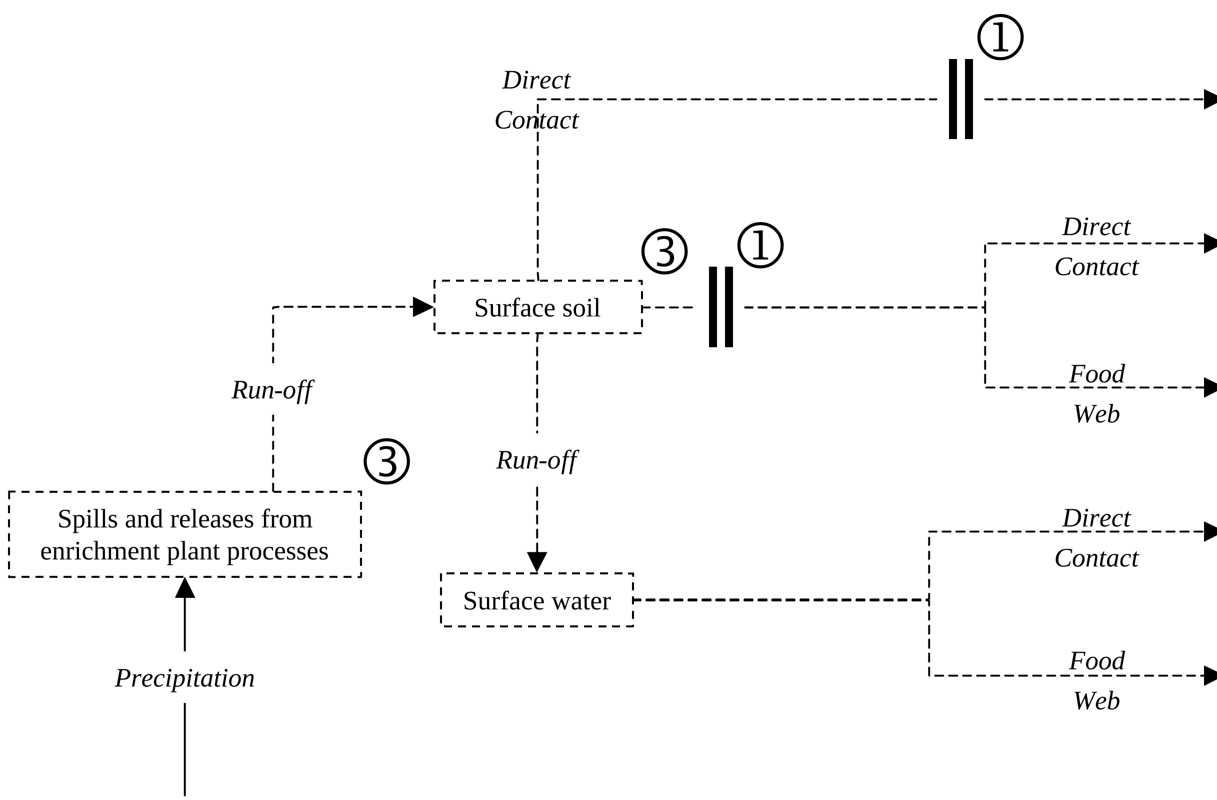


Figure 5.4c1. Hazard Area 4: SOU - Current Planned End State

Hazard Area 4: Surface Soils Operable Unit – Current Planned End State



Potential Receptor Exposed			
Worker	Resident	Visitor	Ecological
R/F/D/I		R/F/D/I	R/F/D/I
R/F/D/I		R/F/D/I	R/F/D/I
	F	F	F
F/D/I		F/D/I	F/D/I
	F	F	F

Current Planned Controls and Actions
① Access and excavation restrictions.
③ Excavation of soil (target based on average exposure over entire unit: residential risk of 1E-06, PCBs at 1 ppm).

Receptor Key
Worker – includes workers exposed during inside and outside activities, including the remediation worker.
Resident – includes residents engaged in all but recreation activities.
Visitor – includes recreational users, intruders, and trespassers.
Ecological – includes on- and off-site aquatic and terrestrial ecological receptors.

Exposure Route Key
R = External Exposure
F = Ingestion
D = Dermal
I = Inhalation

Figure 5.4c2. Hazard Area 4: SOU CSM – Current Planned End State

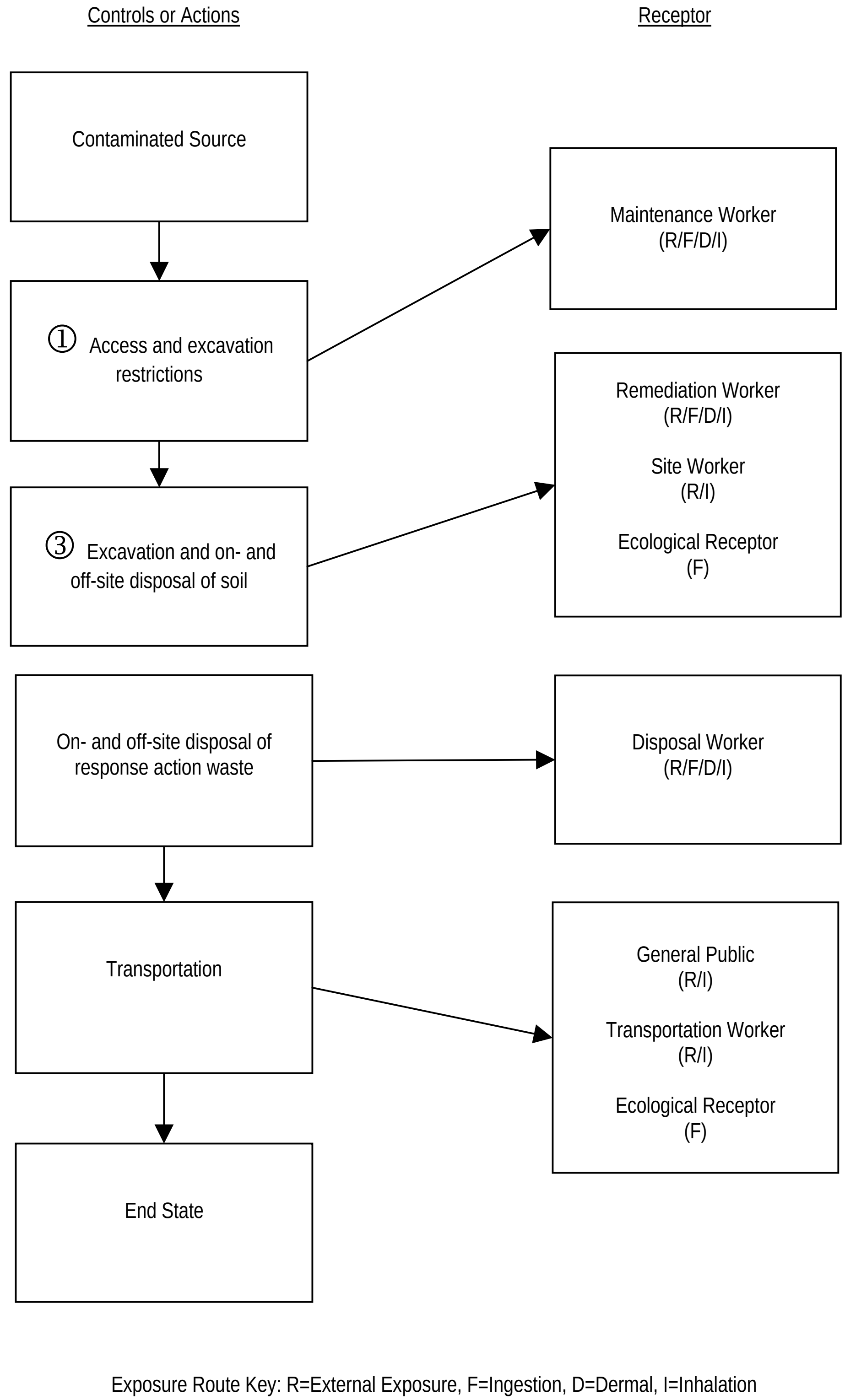


Figure 5.4c3. Hazard Area 4: SOU Treatment Train – Current Planned End State

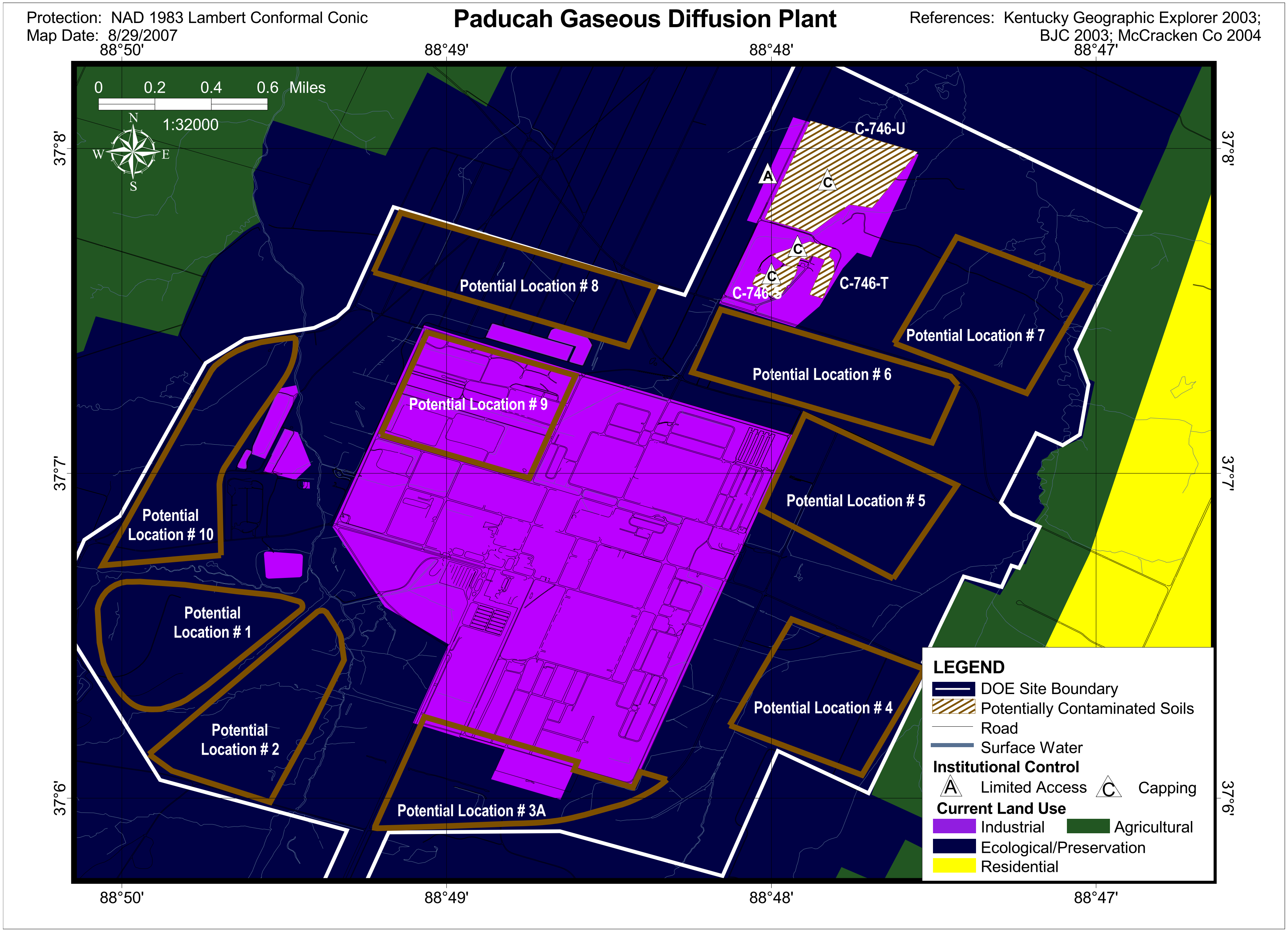
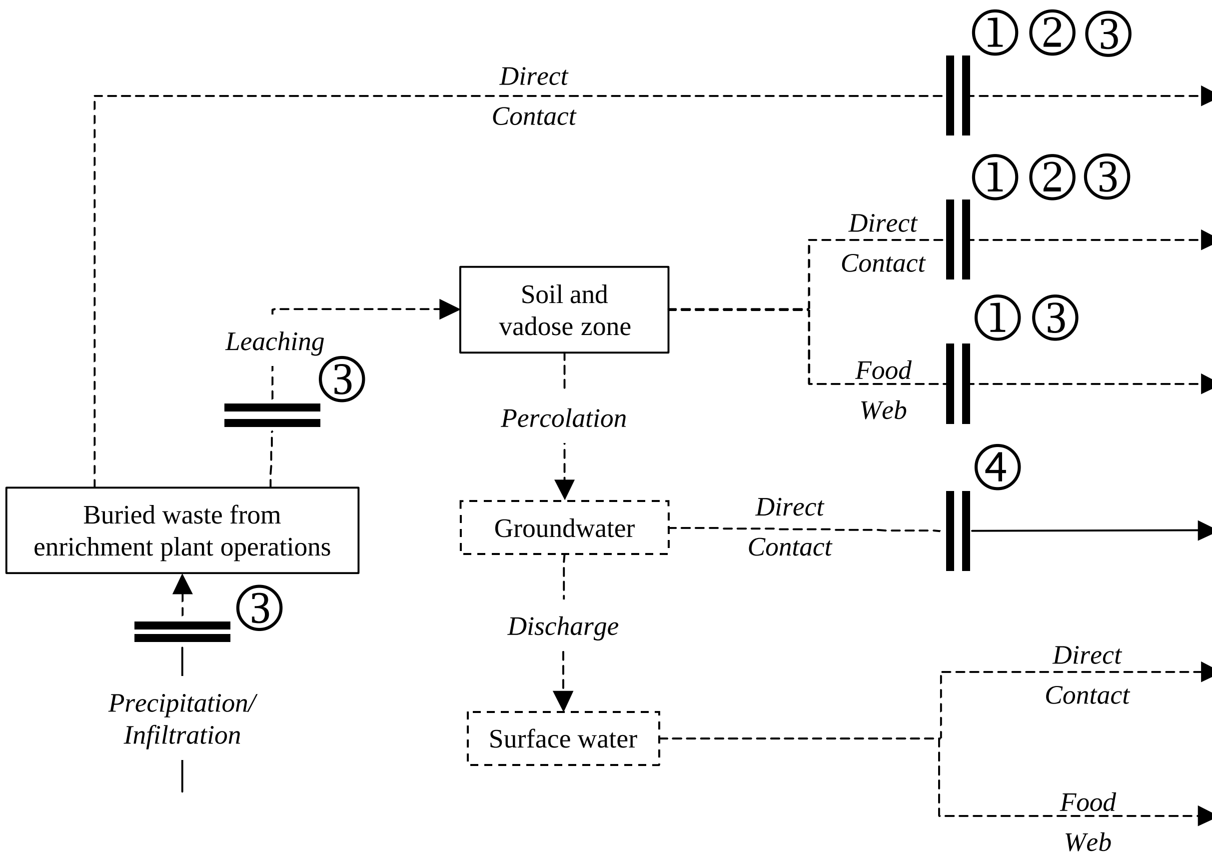


Figure 5.5c1. Hazard Area 5: Potential Landfills - Current Planned End State

Hazard Area 5 Permitted Landfills – Current Planned End State



Potential Receptor Exposed			
Worker	Resident	Visitor	Ecological
R/F/D/I		R/F/D/I	R/F/D/I
R/F/D/I		R/F/D/I	R/F/D/I
		F	F
R/F/D/I	R/F/D/I		
F/D/I		F/D/I	F/D/I
	F	F	F

<u>Current Planned Controls and Actions</u>
① Current land cover.
② Access and excavation restrictions
③ Landfill cap, leachate collection system, and monitoring.
④ PGDP Water Policy.

<u>Receptor Key</u>
Worker – includes workers exposed during inside and outside activities, including the remediation worker.
Resident – includes residents engaged in all but recreation activities.
Visitor – includes recreational users, intruders, and trespassers.
Ecological – includes on- and off-site aquatic and terrestrial ecological receptors.

<u>Exposure Route Key</u>
R = External Exposure
F = Ingestion
D = Dermal
I = Inhalation

Figure 5.5c2. Hazard Area 5: Permitted Landfills CSM – Current Planned End State

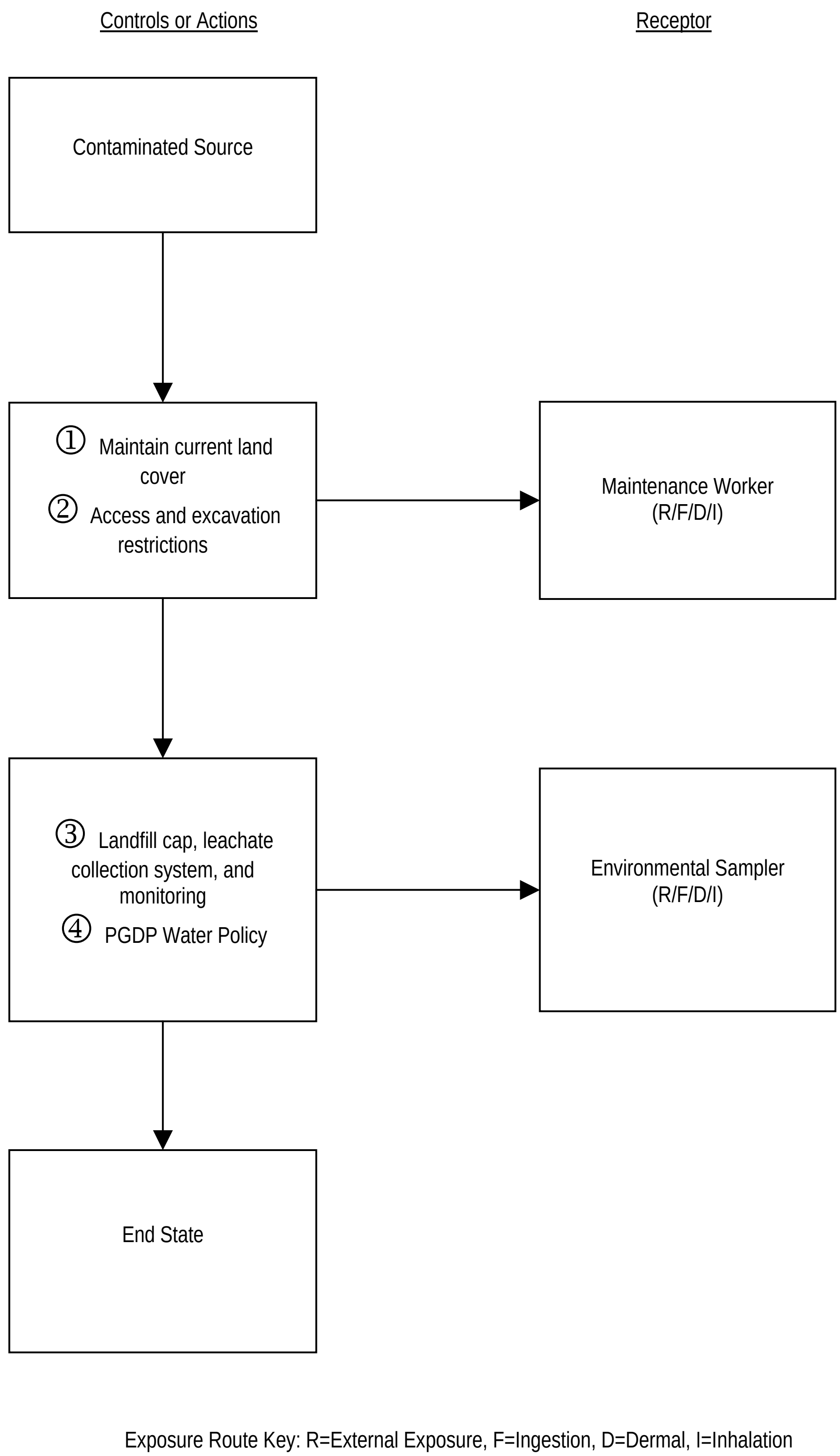


Figure 5.5c3. Hazard Area 5: Permitted Landfills Treatment Train – Current Planned End State

Protection: NAD 1983 Lambert Conformal Conic
Map Date: 8/29/2007

Paducah Gaseous Diffusion Plant

References: Kentucky Geographic Explorer 2003; BJC 2003

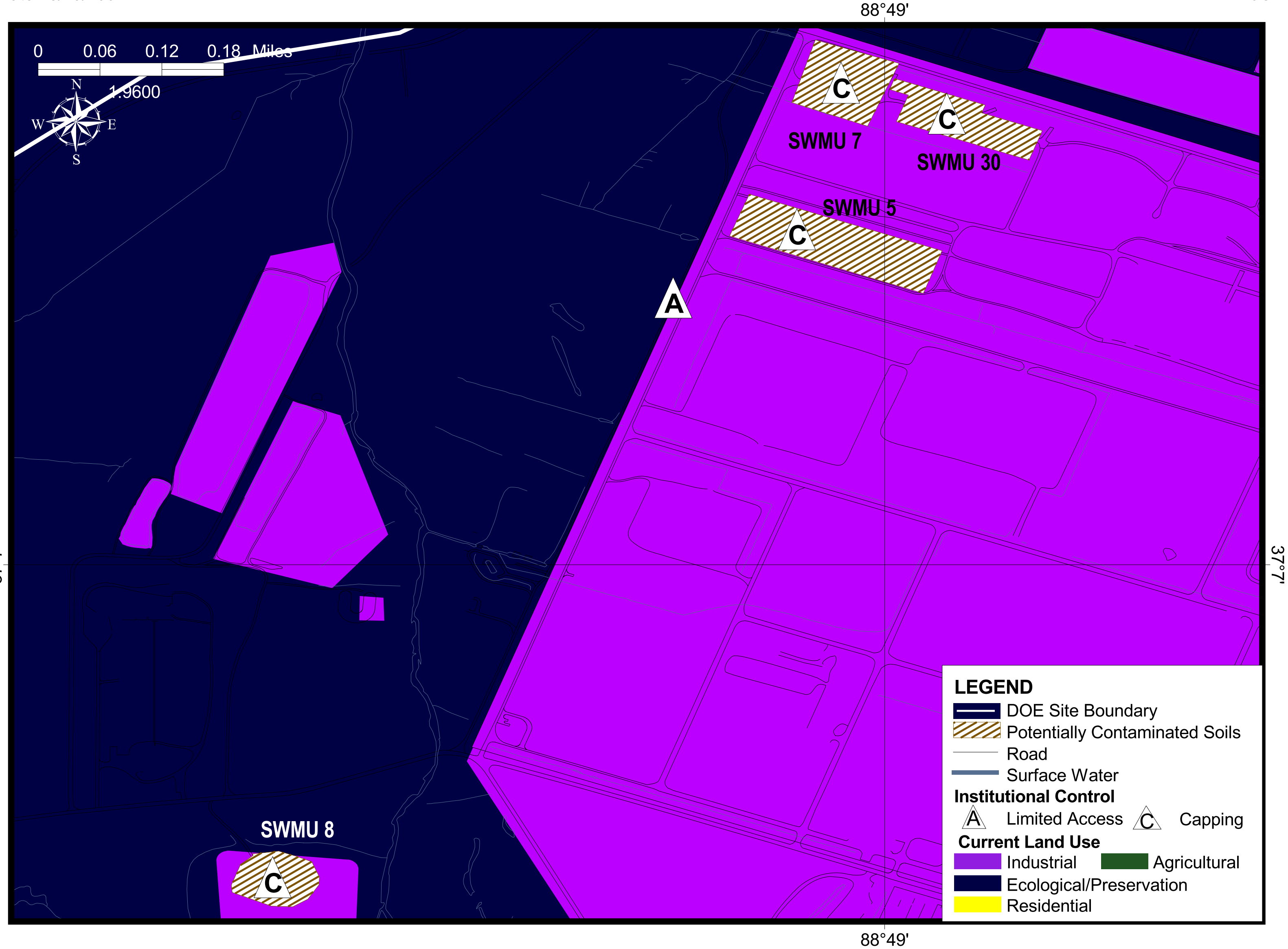
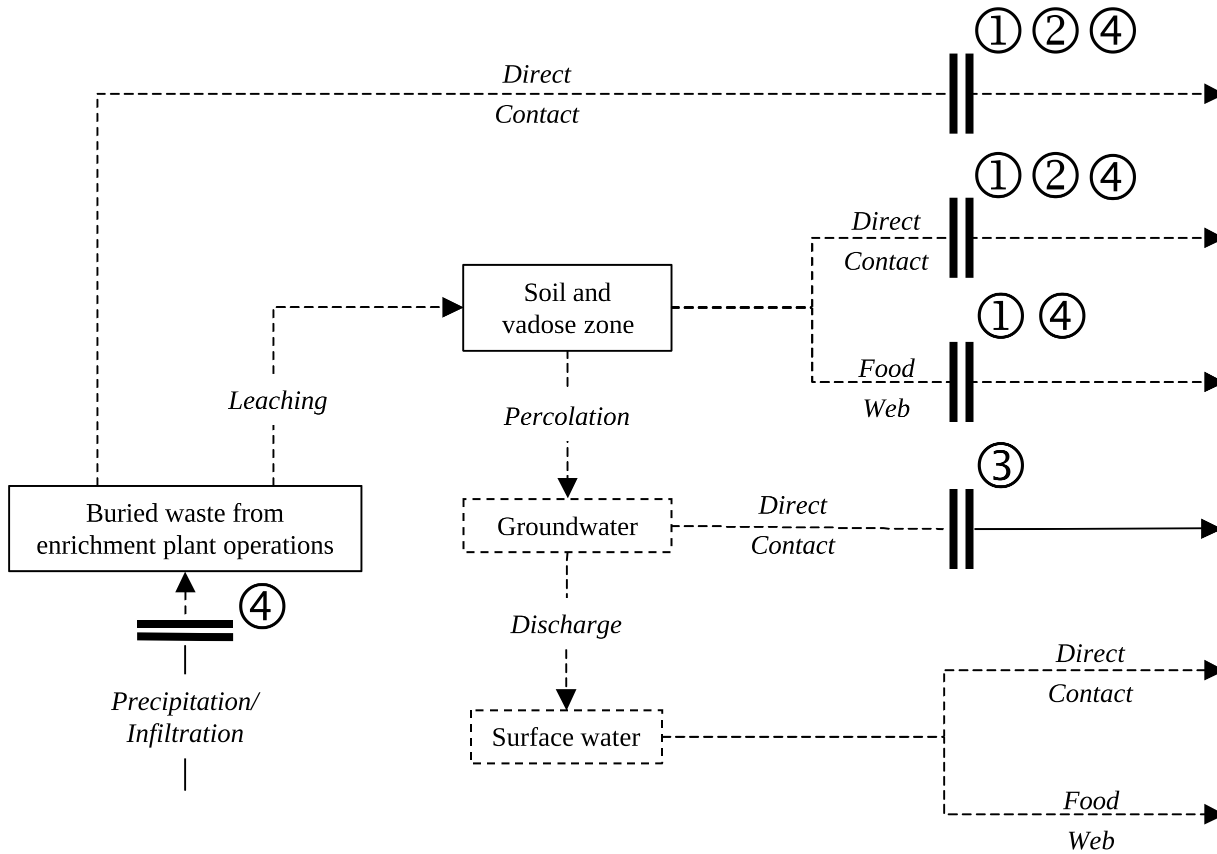


Figure 5.6c1. Hazard Area 6: BGOU (Group 2) - Current Planned End State

Hazard Area 6 Burial Grounds Operable Unit (Group 2) – Current Planned End State



Potential Receptor Exposed			
Worker	Resident	Visitor	Ecological
R/F/D/I		R/F/D/I	R/F/D/I
R/F/D/I		R/F/D/I	R/F/D/I
		F	F
R/F/D/I	R/F/D/I		
F/D/I		F/D/I	F/D/I
	F	F	F

<u>Current Planned Controls and Actions</u>
① Current land cover.
② Access and excavation restrictions
③ PGDP Water Policy.
④ Landfill cap and monitoring.

<u>Receptor Key</u>
Worker – includes workers exposed during inside and outside activities, including the remediation worker.
Resident – includes residents engaged in all but recreation activities.
Visitor – includes recreational users, intruders, and trespassers.
Ecological – includes on- and off-site aquatic and terrestrial ecological receptors.

<u>Exposure Route Key</u>
R = External Exposure
F = Ingestion
D = Dermal
I = Inhalation

Figure 5.6c2. Hazard Area 6: BGOU (Group 2) CSM – Current Planned End State

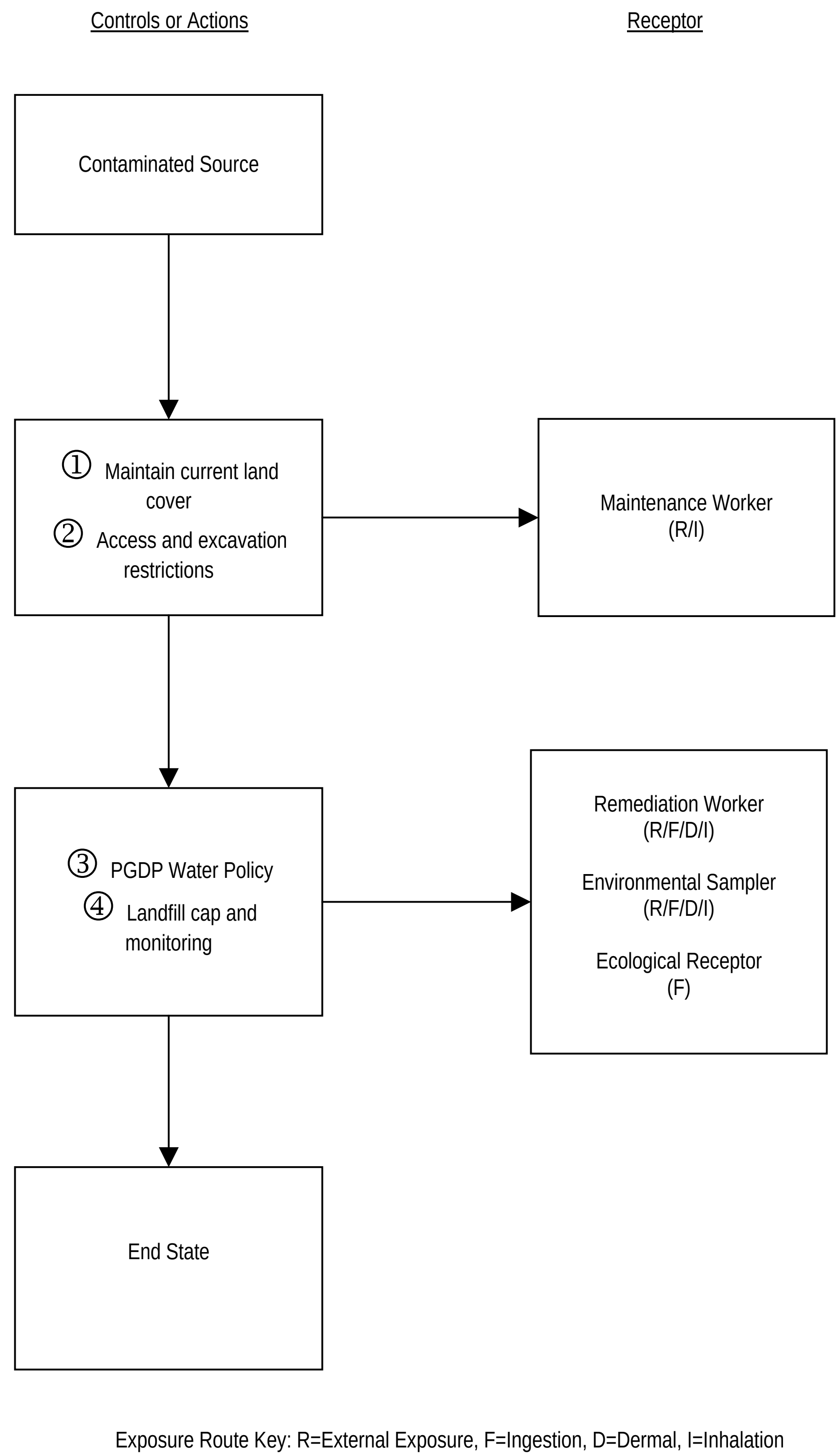


Figure 5.6c3. Hazard Area 6: BGOU (Group 2) Treatment Train – Current Planned End State

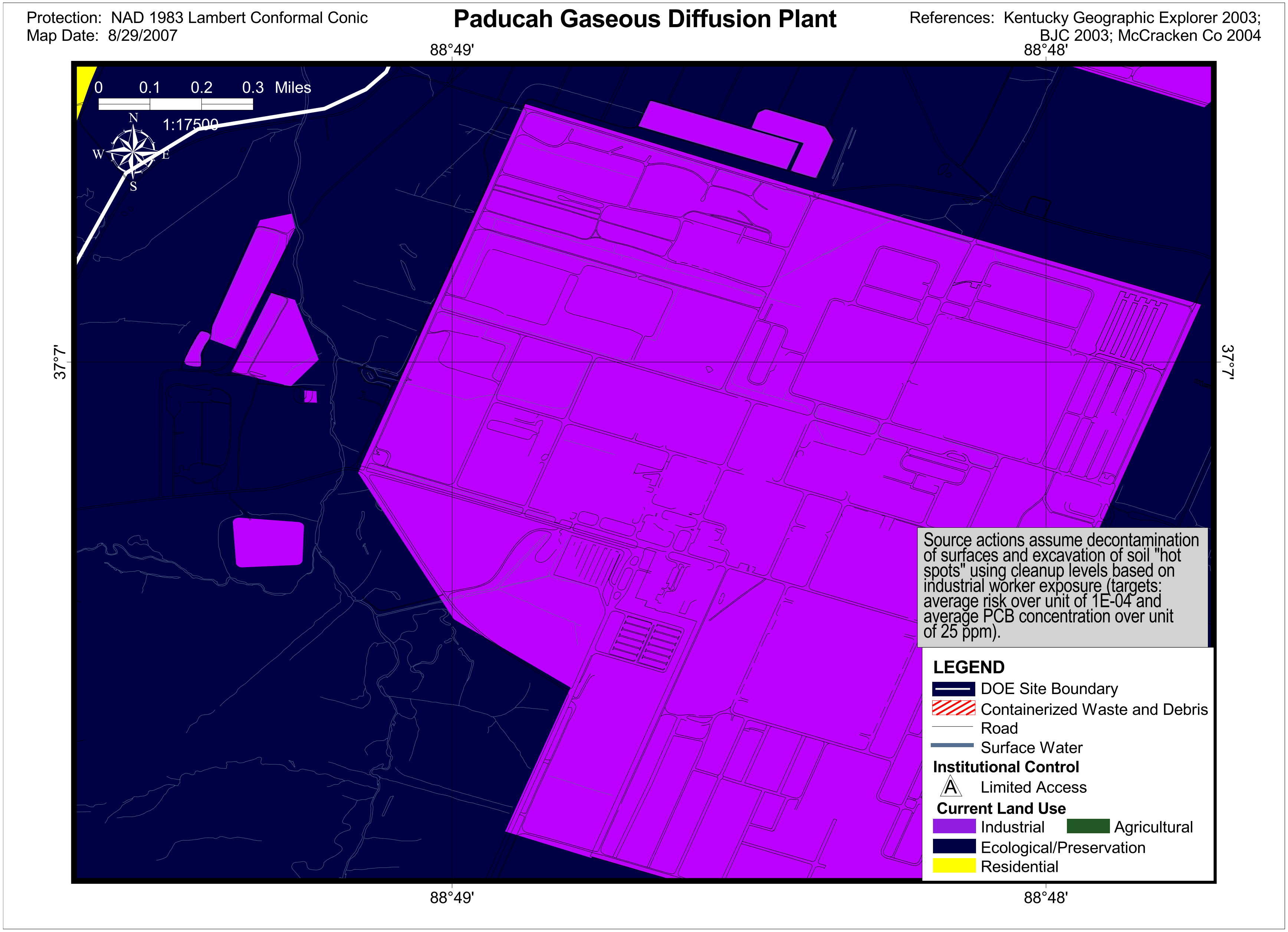
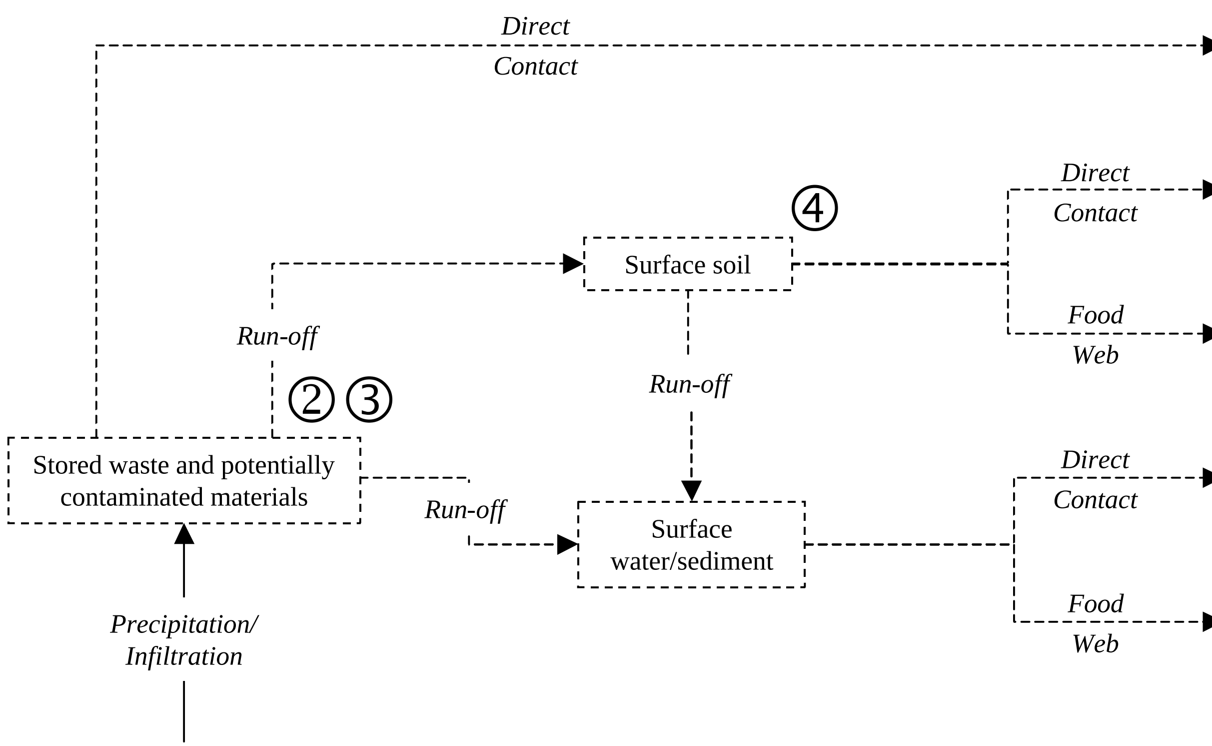


Figure 5.7c1. Hazard Area 7: Legacy Waste and DMSAs - Current Planned End State

Hazard Area 7 Legacy Waste and DOE Material Storage Areas – Current Planned End State



Potential Receptor Exposed			
Worker	Resident	Visitor	Ecological
R/F/D/I			R/F/D/I
R/F/D/I			R/F/D/I
			F
F/D/I		F/D/I	F/D/I
	F	F	F

Current Planned Controls and Actions
② Characterization and disposal.
③ Decontamination of surfaces (target based on average exposure over entire unit: residential risk of 1E-06, PCBs at 1 ppm).
④ Excavation of soil (target based on average exposure over entire unit: residential risk of 1E-06, PCBs at 1 ppm).

Receptor Key
Worker – includes workers exposed during inside and outside activities, including the remediation worker.
Resident – includes residents engaged in all but recreation activities.
Visitor – includes recreational users, intruders, and trespassers.
Ecological – includes on- and off-site aquatic and terrestrial ecological receptors.

Exposure Route Key
R = External Exposure
F = Ingestion
D = Dermal
I = Inhalation

Figure 5.7c2. Hazard Area 7: Legacy Waste and DMSAs CSM – Current Planned End State

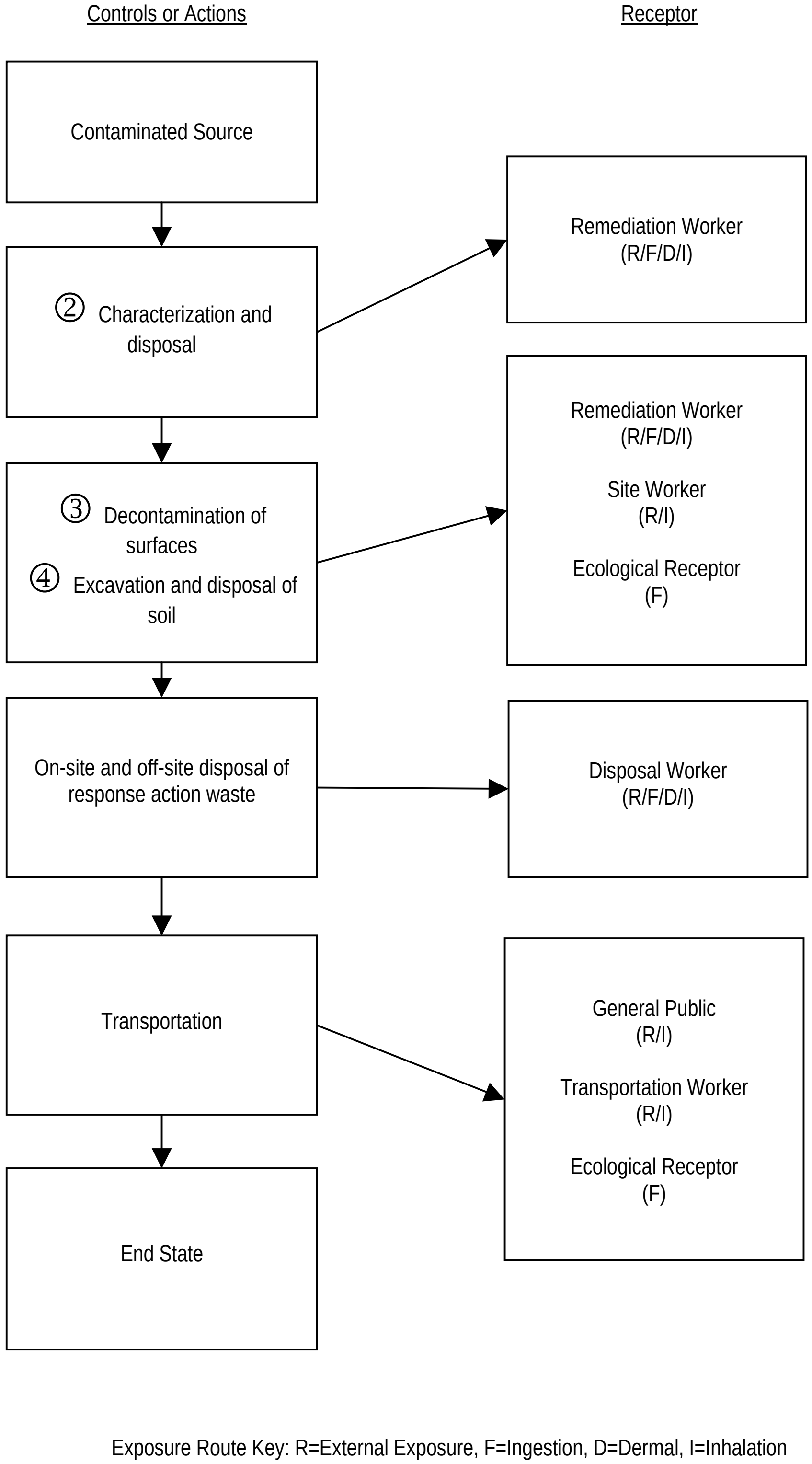


Figure 5.7c3. Hazard Area 7: Legacy Waste and DMSAs Treatment Train – Current Planned End State

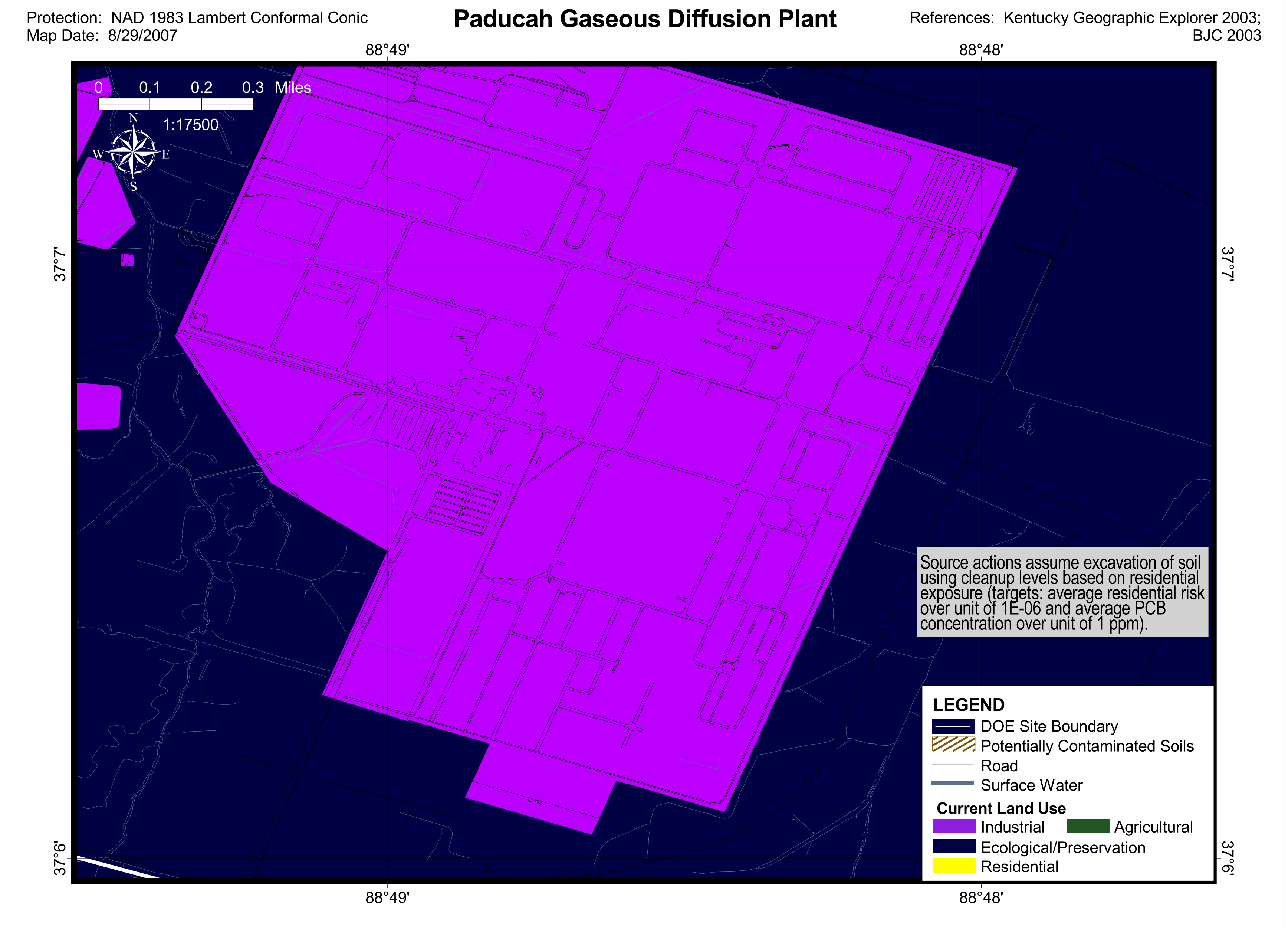
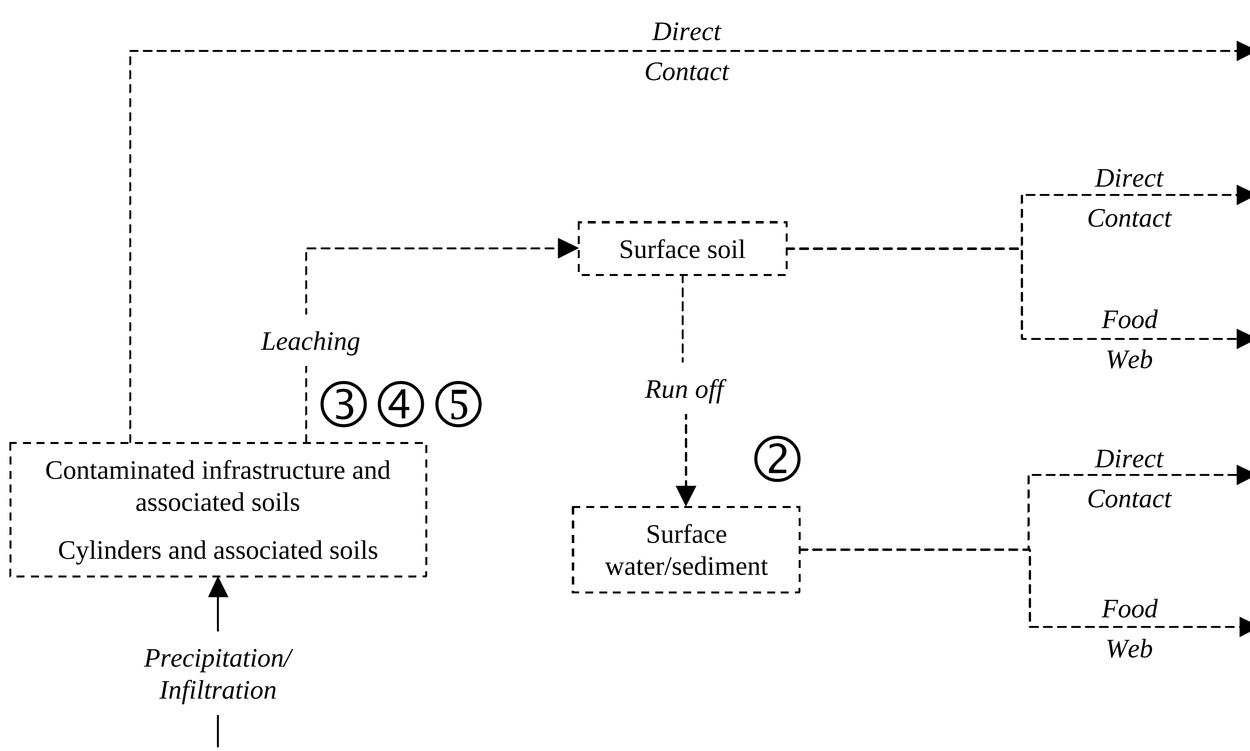


Figure 4.8a1. Hazard Area 8: Cylinder Yards and DUF_6 Conversion Facility - Current Planned End State

Hazard Area 8 Cylinder Yards and DUF_6 Conversion Facility – Current Planned End State



Potential Receptor Exposed			
Worker	Resident	Visitor	Ecological
R/F/D/I			R/F/D/I
R/F/D/I			R/F/D/I
		F	F
R/F/D/I		R/F/D/I	R/F/D/I
	F	F	F

<u>Current Planned Controls and Actions</u>
② Attenuation
③ Conversion of depleted UF_6 and disposal.
④ D&D of infrastructure.
⑤ Excavation of surface soil (target based on average exposure over entire unit: residential risk of 1E-06, PCBs at 1 ppm).

<u>Receptor Key</u>
Worker – includes workers exposed during inside and outside activities, including the remediation worker.
Resident – includes residents engaged in all but recreation activities.
Visitor – includes recreational users, intruders, and trespassers.
Ecological – includes on- and off-site aquatic and terrestrial ecological receptors.

<u>Exposure Route Key</u>
R = External Exposure
F = Ingestion
D = Dermal
I = Inhalation

Figure 5.8c2. Hazard Area 8: Cylinder Yards and DUF_6 Conversion Facility CSM – Current Planned End State

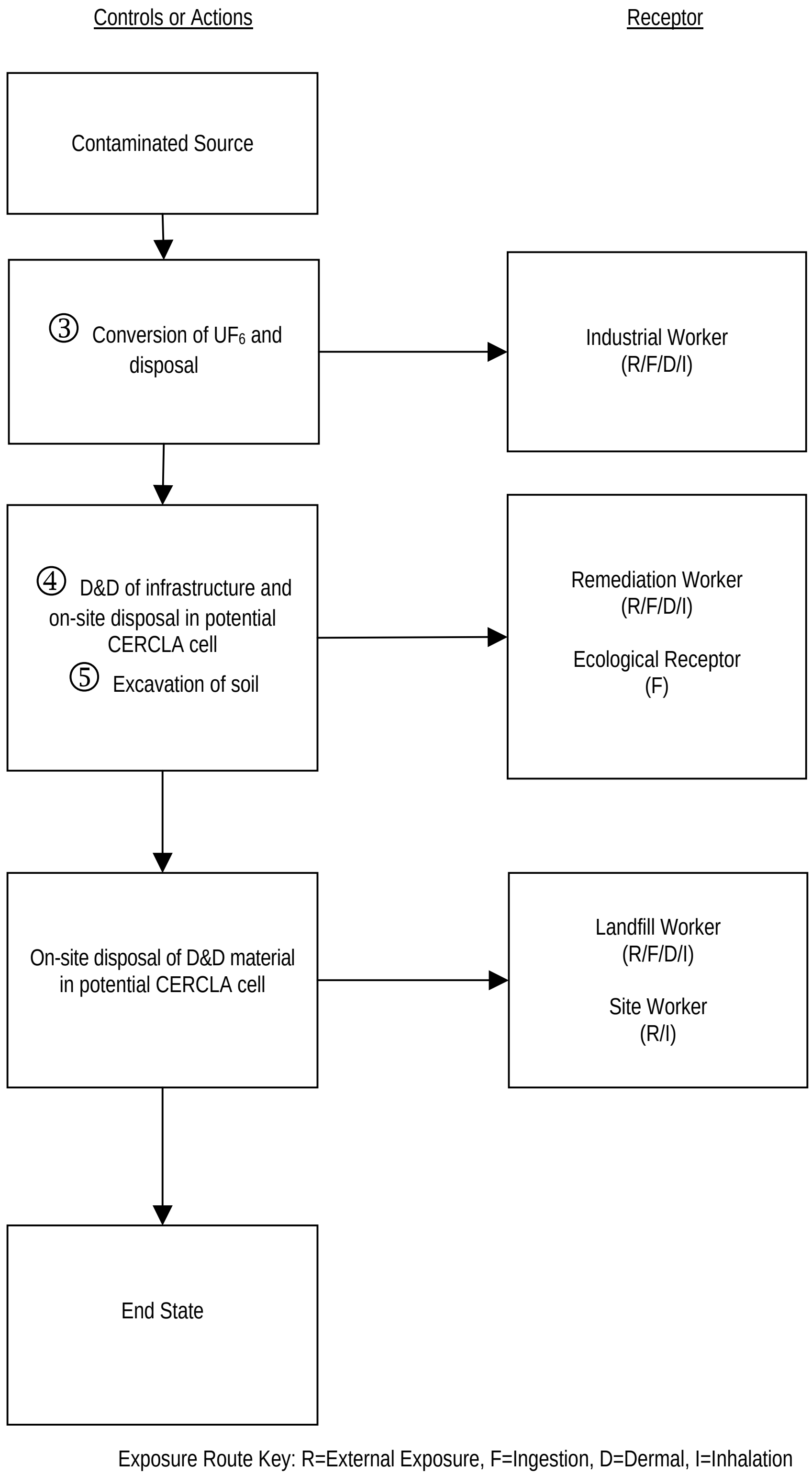


Figure 5.8c3. Hazard Area 8: Cylinder Yards and DUF_6 Conversion Facility Treatment Train – Current Planned End State

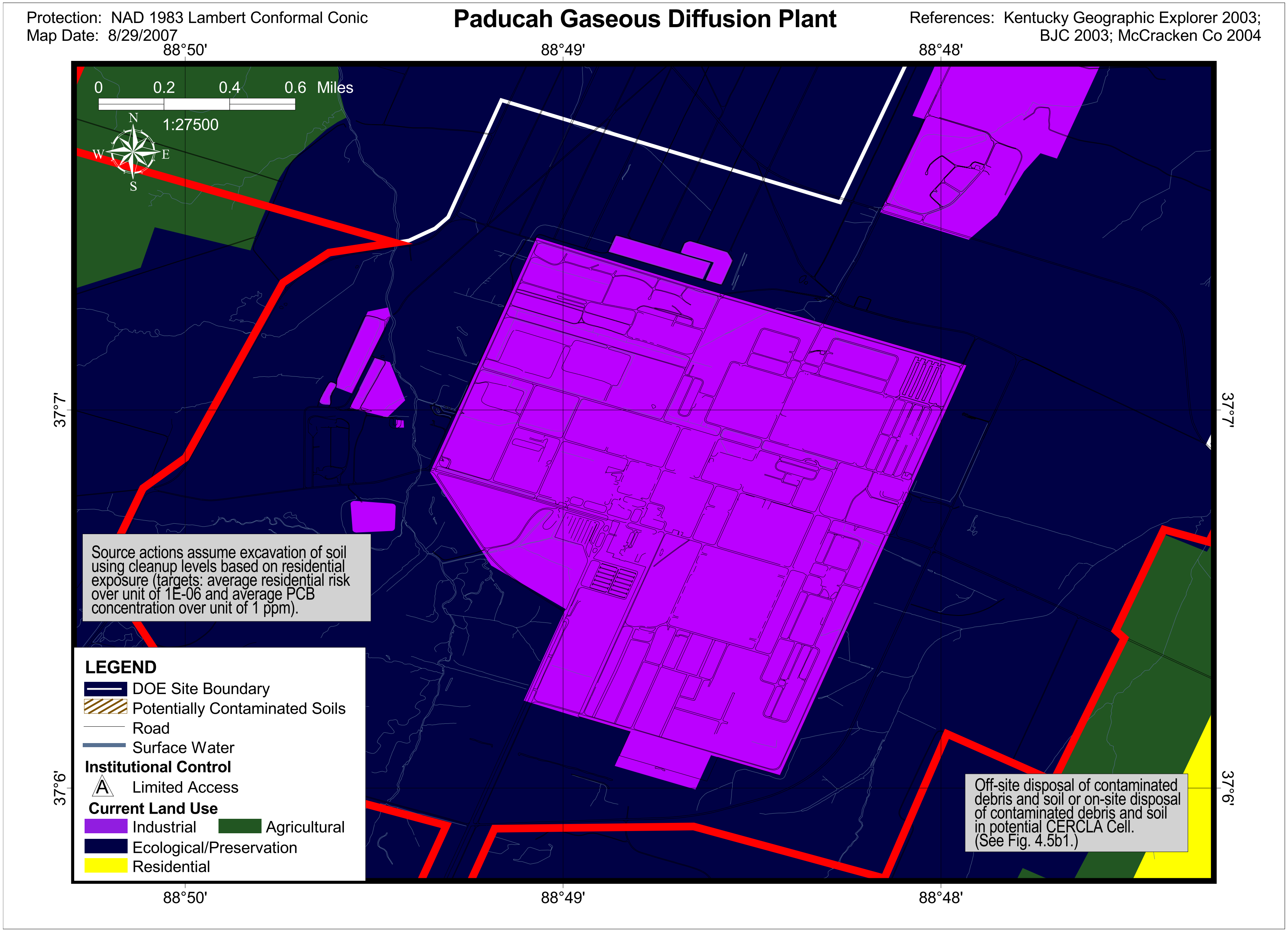
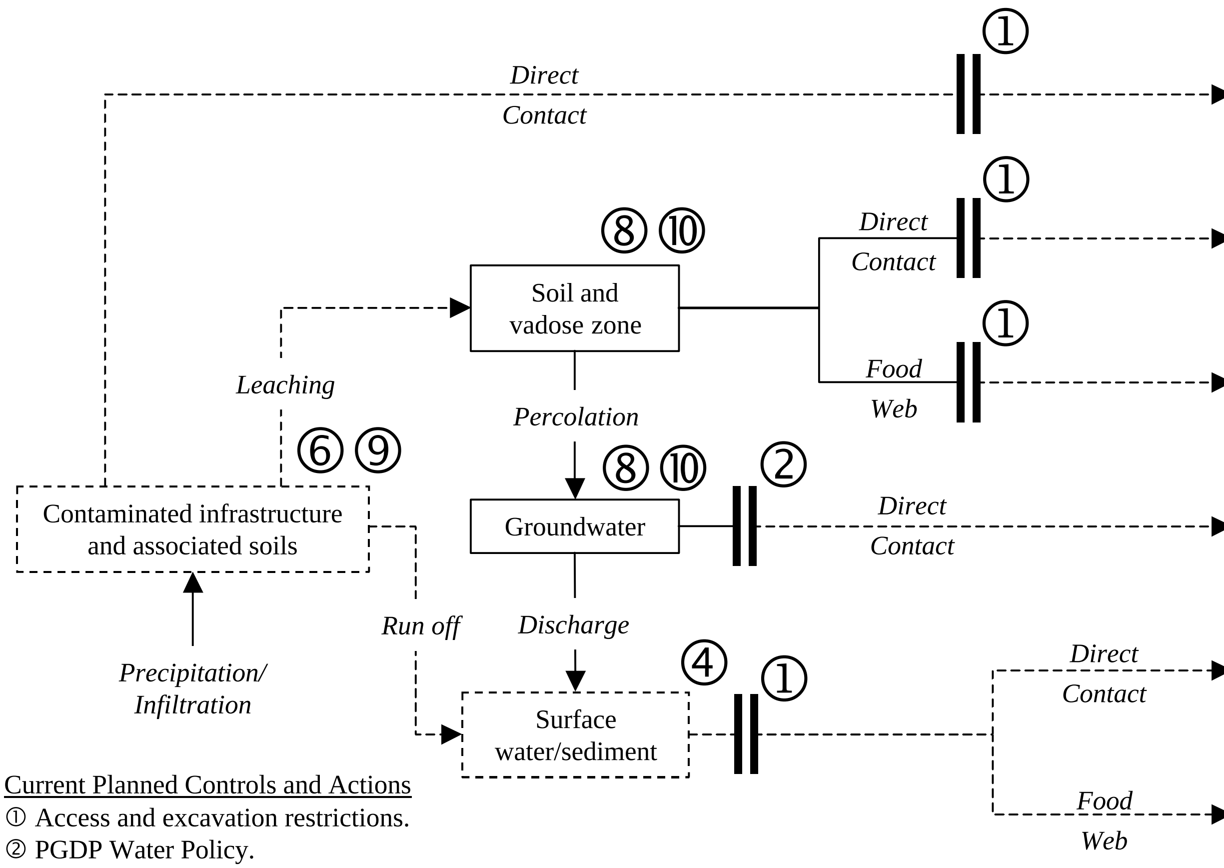


Figure 5.9c1. Hazard Area 9: GDP Facilities - Current Planned End State

Hazard Area 9 GDP Facilities – Current Planned End State



Potential Receptor Exposed			
Worker	Resident	Visitor	Ecological
R/F/D/I		R/F/D/I	R/F/D/I
R/F/D/I		R/F/D/I	R/F/D/I
	F	F	F
	R/F/D/I		
R/F/D/I		R/F/D/I	R/F/D/I
	F	F	F

<u>Current Planned Controls and Actions</u>
① Access and excavation restrictions.
② PGDP Water Policy.
④ Attenuation
⑥ D&D of infrastructure and disposal in potential CERCLA Cell.
⑧ Monitored natural attenuation of sources and plume.
⑨ Excavation of soil (target based on average exposure over entire unit: residential risk of 1E-06, PCBs at 1 ppm).
⑩ Source reduction/removal and active contaminant reduction in dissolved phase plume.

<u>Receptor Key</u>
Worker – includes workers exposed during inside and outside activities, including the remediation worker.
Resident – includes residents engaged in all but recreation activities.
Visitor – includes recreational users, intruders, and trespassers.
Ecological – includes on- and off-site aquatic and terrestrial ecological receptors.

<u>Exposure Route Key</u>
R = External Exposure
F = Ingestion
D = Dermal
I = Inhalation

Figure 5.9c2. Hazard Area 9: GDP Facilities CSM – Current Planned End State

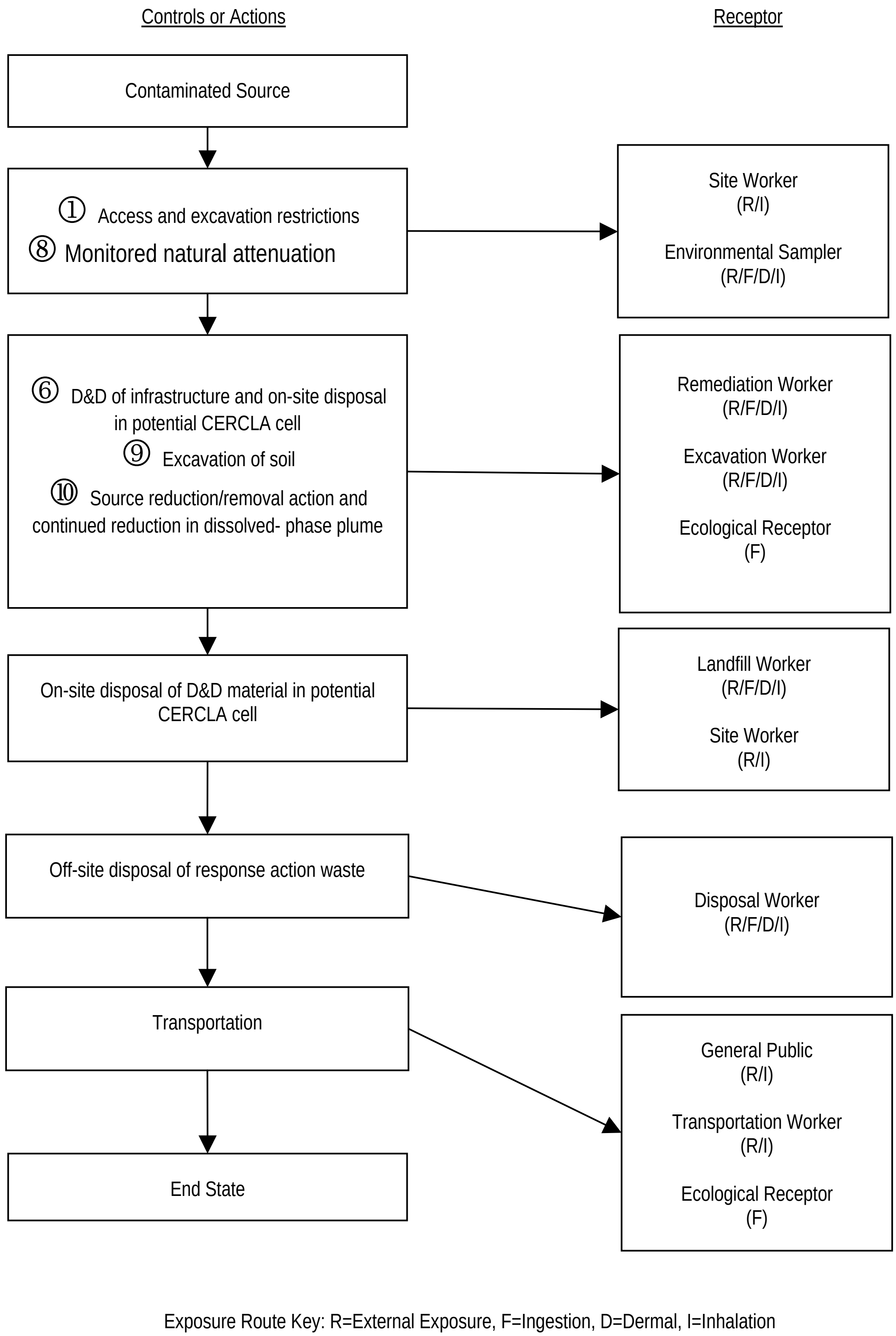


Figure 5.9c3. Hazard Area 9: GDP Facilities Treatment Train – Current Planned End State

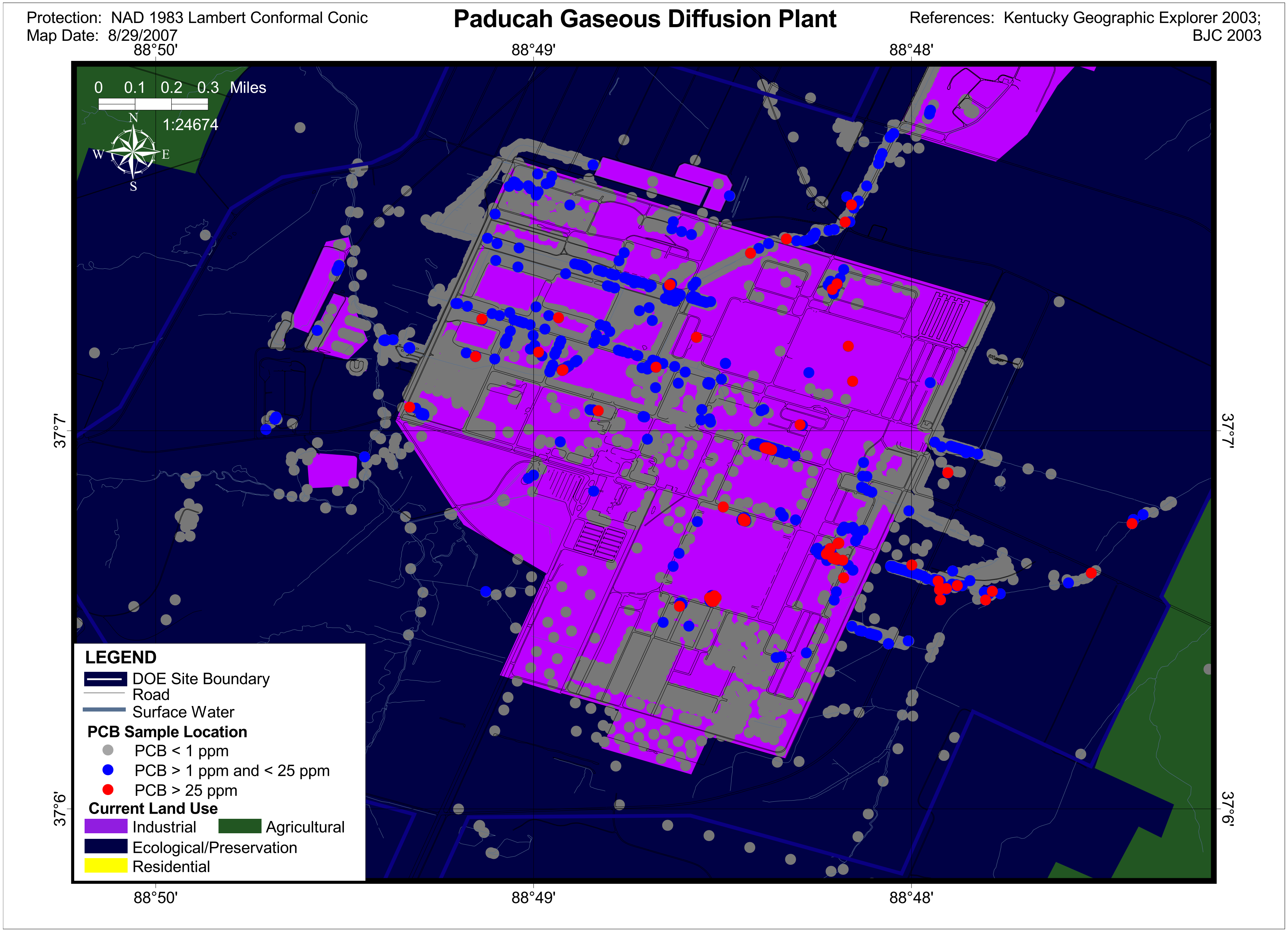


Figure 5.10. PCB Detected in Shallow Soil

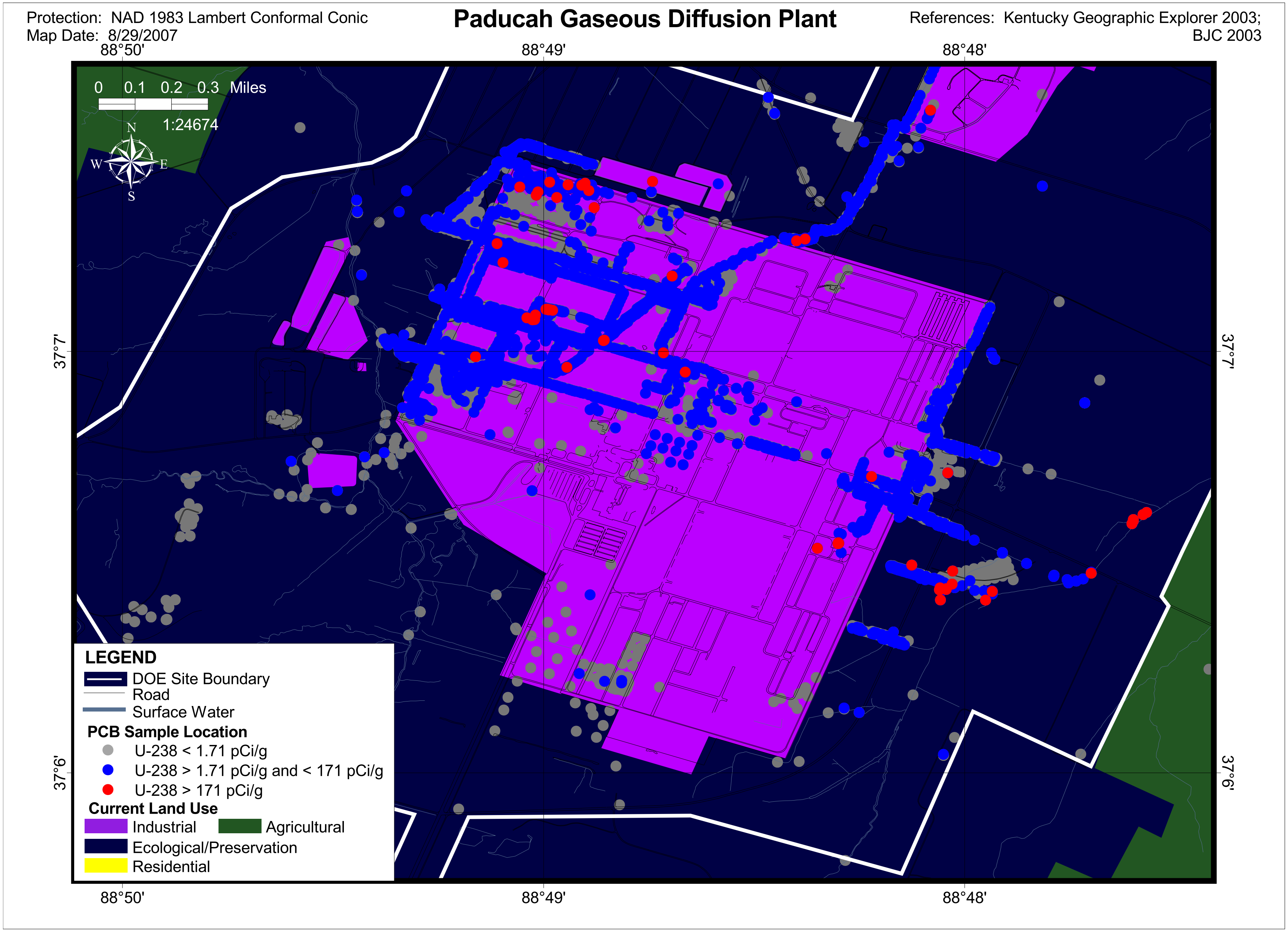


Figure 5.11. ^{238}**U Detected in Shallow Soil**

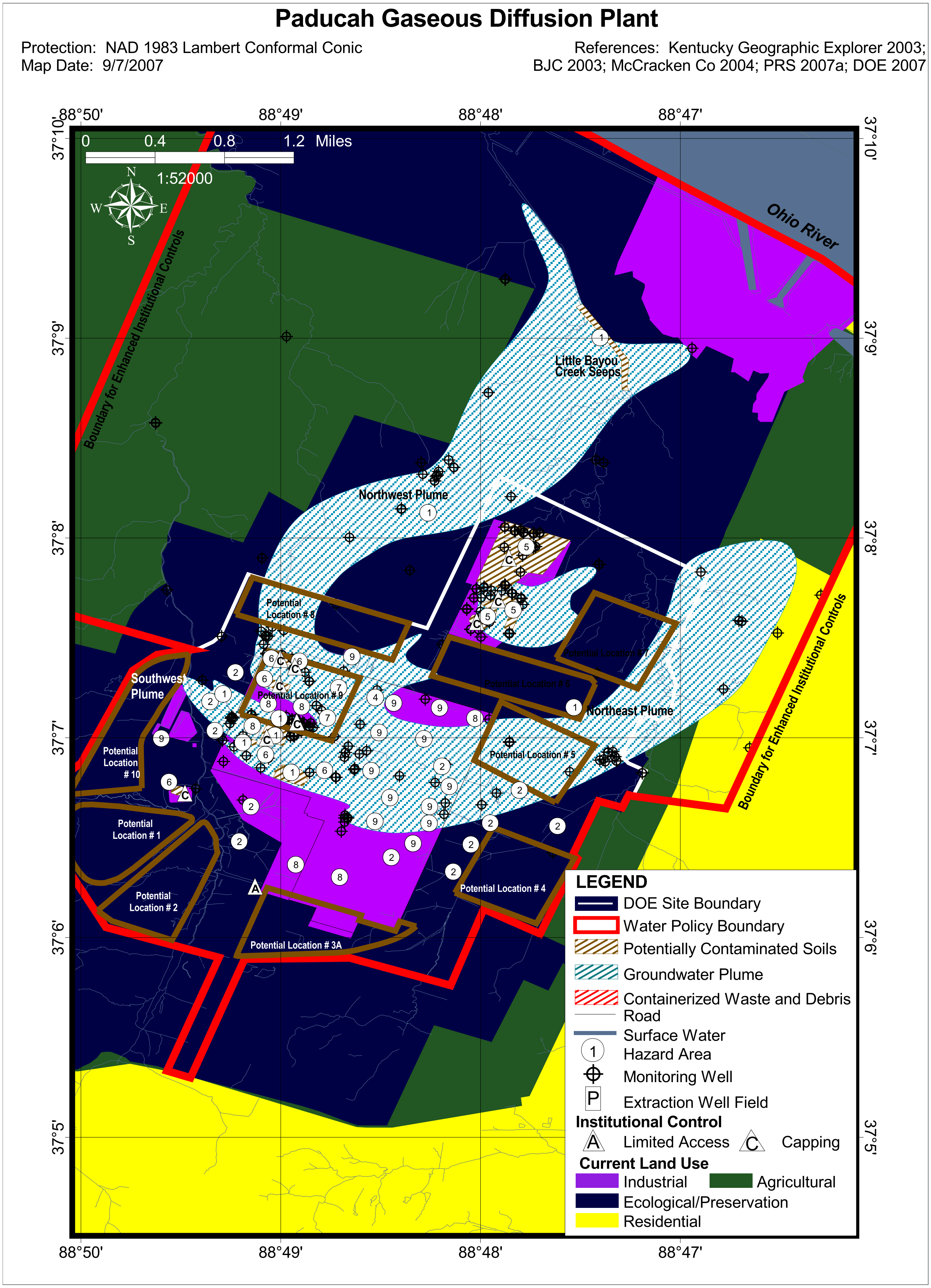


Figure 5.12. Hazard Areas - Potential End State Alternative

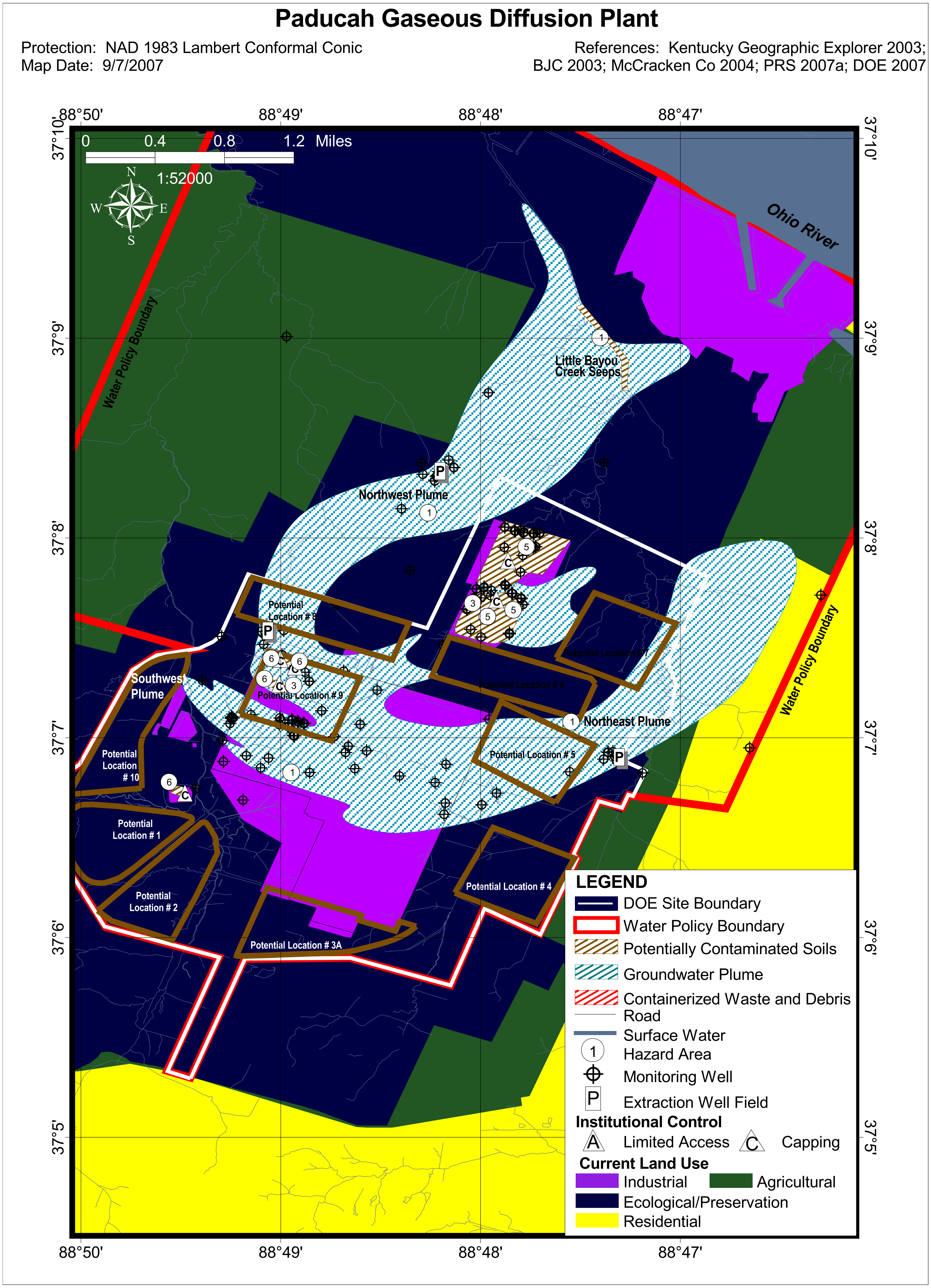


Figure 5.13. Hazard Areas - Current Planned End State

6. REFERENCES

ATSDR (Agency for Toxic Substances and Disease Registry) 2002. *Public Health Assessment, Paducah Gaseous Diffusion Plant (U.S. DOE),* Paducah, McCracken County, Kentucky, EPA Facility ID: KY8890008982, May 21.

BJC 2003. Available Geographic Information System shape files. Accessed from the internal network.

BJC 2003a. *Estimates of Risk Posed to Human Health by Contamination Found in Sediment and Soil in Outfalls 001, 008, 010, 011, and 015 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky,* BJC/PAD-519, March.

BJC 2003b. *Estimates of Risk Posed to Human Health by Contamination Found in Sections 3, 4, and 5 of the NSDD at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky,* BJC/PAD-507, February.

COE 1995. *Environmental Investigations at the Paducah Gaseous Diffusion Plant and Surrounding Area, McCracken County, Kentucky,* Five Volumes, U.S. Army Corps of Engineers, Waterways Experiment Station.

DOC (U. S. Department of Commerce) 2003. U.S. Census Bureau. Accessed in November 2003 at http://www.census.gov/.

DOE (U.S. Department of Energy) 1993. *Record of Decision for Interim Remedial Action for the Northwest Dissolved Phase Plume at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky,* DOE/OR/06-1143&D4, July.

DOE 1994. *Action Memorandum for the Water Policy at the Paducah Gaseous Diffusion Plant, Paducah Kentucky,* DOE/OR/06-1201&D2, June.

DOE 1995. *Record of Decision for Interim Remedial Action at the Northeast Plume, Paducah Gaseous Diffusion Plant, Paducah, Kentucky,* DOE/OR/06-1356&D2, June.

DOE 1996a. *Resource Conservation and Recovery Act Facility Investigation/Remedial Investigation Report for Waste Area Grouping 1 and 7 at Paducah Gaseous Diffusion Plant, Paducah, Kentucky,* DOE/OR/07-1404&D2, April.

DOE 1996b. *Resource Conservation and Recovery Act Facility Investigation/Remedial Investigation Report for Kentucky Ordnance Works Solid Waste Management Units 94, 95, and 157 at Paducah Gaseous Diffusion Plant, Paducah, Kentucky,* DOE/OR/07-1404&D2, April.

DOE 1997a. *Resource Conservation and Recovery Act Facility Investigation/Remedial Investigation Report for Waste Area Grouping 17 at Paducah Gaseous Diffusion Plant, Paducah, Kentucky,* DOE/OR/07-1404&D2, April.

DOE 1997b. *Data Summary and Interpretation Report for Interim Remedial Design at Solid Waste Management Unit 2 of Waset Area Grouping 22 at the Paducah Gaseous Diffusion Plant Paducah, Kentucky,* DOE/OR/07-1549&D1, February.

DOE 1998a. *Resource Conservation and Recovery Act Facility Investigation/Remedial Investigation for Solid Waste Management Units 7 and 30 of Waste Area Grouping 22 at Paducah Gaseous Diffusion Plant, Paducah, Kentucky,* DOE/OR/07-1604&D2, January.

DOE 1998b. *Record of Decision for Waste Area Groups 1 and 7 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/OR/06-1407&D3, February.

DOE 1999a. *Remedial Investigation Report for Waste Area Group 6 at the Paducah Gaseous Diffusion Plant*, Paducah, Kentucky, DOE/OE/07-1727&D2, May.

DOE 1999b. *Remedial Investigation Report for Waste Area Grouping 27 at the Paducah Gaseous Diffusion Plant*, Paducah, Kentucky, DOE/OR/07-1727&D2, June.

DOE 2000a. *Methods for Conducting Risk Assessments and Risk Evaluations at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky,* DOE/OR/07-1506&D2, December.

DOE 2000b. *Remedial Investigation Report for Waste Area Grouping 28 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky,* DOE/OR/07-1846&D2, August.

DOE 2000c. *Remedial Investigation Report for Waste Area Grouping 3 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky,* DOE/OR/07-1846&D2, September.

DOE 2000d. *Site Evaluation Report for Waste Area Grouping 8 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/OR/07-1867&D1, June.

DOE 2001a. *Feasibility Study for the Groundwater Operable Unit at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky,* DOE/OR/07-1857&D2, August.

DOE 2001b. *Action Memo for Scrap Metal Disposition at the Paducah Gaseous Diffusion Plant,* OE/OR/07-1965&D2, October.

DOE 2002a. “Top to Bottom Review,” unnumbered report developed by the Department of Energy’s Office of Environmental Management, February 4.

DOE 2002b. *Record of Decision for Interim Remedial Action at the North-South Diversion Ditch at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky,* DOE/OR/07-1948&D2, August.

DOE 2002c. *Paducah Site Annual Site Environmental Report for Calendar Year 2001*, BJC/PAD-219, September 2002.

DOE 2002d. *Action Memorandum for the C-410 Infrastructure Removal at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky,* DOE/OR/07-2002&D1, May.

DOE 2003a. “Risk-Based End State Guidance Clarification,” memorandum from Eugene C. Schmitt to Distribution, dated December 23.

DOE 2003b. “Use of Risk-based End States,” DOE Policy DOE P 455.1, July 15.

DOE 2003c. “Guidance for Developing Site-Specific Risk-based End State Vision,” unnumbered report developed by the Department of Energy’s Office of Environmental Management, September 11.

DOE 2003d. Agreed Order between Commonwealth of Kentucky Natural Resources and Environmental Protection Cabinet and the U. S. Department of Energy, File Nos. DWM-31434-042 (includes DWM-00062, DWM-02162, and DWM-02163), DAQ-31740-030, and DOW-26141-042, October.

DOE 2003e. *U.S. Department of Energy Paducah Gaseous Diffusion Plant Federal Facility Agreement Semiannual Progress Report for Fiscal Year 2003*, Paducah, Kentucky, DOE/OR/07-2072/V2, U.S. Department of Energy, Paducah, Kentucky, October.

DOE 2003f. *Seismic Investigation Report for Siting of a Potential On-Site CERCLA Waste Disposal Facility at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/OR/07-2038&D2, May.

DOE 2003g. *Risk and Performance Evaluation of the C-746-U Landfill at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/OR/07-2041&D2R1, November 5.

DOE 2003h. *Sitewide Risk Assessment Model and Environmental Baseline for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/OR/07-2104&D0, September.

DOE 2005. *Site Management Plan, PGDP, Paducah, Ky*. Annual Revision F4-06, DOE/OR/07-2280&D2, U.S. Department of Energy, July.

DOE 2006a. *Site Investigation Report for the Southwest Groundwater Plume at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/OR/07-2180&2, U.S. Department of Energy, Paducah, KY, Preliminary Report Issued - May.

DOE 2006b. *Paducah Site Annual Site Environmental Report for Calendar Year 2004,* DOE/OR/07-2233/V1, Department of Energy, Paducah, KY, May.

DOE 2007a. *Surface Water Operable Unit (On-Site) Site Investigation and Baseline Risk Assessment Report at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-001&D2, U.S. Department of Energy, Paducah, KY, April.

DOE 2007b. *Sampling and Analysis Plan for Soil Piles at the Paducah Gaseous Diffusion Plant Paducah, Kentucky*, DOE/LX/07-0015&D2/R1, U.S. Department of Energy, Paducah KY, Preliminary Report Issued - August.

EPA (U.S. Environmental Protection Agency) 1989. *Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual, Part A, Baseline Risk Assessment*, OSWER Directive 9285.7-01a, Office of Emergency and Remedial Response, Washington, DC.

EPA 1996. *Soil Screening Guidance: Technical Background Document*, EPA/540/R-95/128, Office of Solid Waste and Emergency Response, Washington, DC, May.

EPA 2000. *Supplemental Guidance to RAGS: Region 4 Bulletins, Human Health Risk Assessment, Interim Guidance,* Office of Health Assessment, Atlanta, GA. Accessed at http://www.epa.gov/region4/waste/oftecser/otsguid.htm.

ESRI 2003. Downloaded from the ESRI World Basemap Data, Accessed at http://www.esri.com/data/download/basemap/index.html.

Illinois DNR 2003. Statewide data downloaded from the Illinois Natural Resources Geospatial Clearinghouse. Accessed at http://www.isgs.uiuc.edu/nsdihome/ISGSindex.html.

Kentucky Geographic Explorer 2003. Accessed at http://kygeonet.state.ky.us/.

Kornegay, F. C., et al. 1991. *Paducah Gaseous Diffusion Plant Environmental Report for 1990,* ES/ESH-18/V3, Martin Marietta Energy Systems, Inc., Oak Ridge, TN.

KY (Commonwealth of Kentucky) 2000. *Report of the Commonwealth of Kentucky's Task Force Examining State regulatory Issues at the Paducah Gaseous Diffusion Plant*, April.

McCracken County 2004. Map taken from McCracken County Planning and Zoning file, prepared in ArcView, secured from file of Steve Doolittle.

MMES (Martin Marietta Energy Systems) 1993. *Paducah Gaseous Diffusion Plant Environmental Report for 1992*, KY/E-164, Martin Marietta Energy Systems, Inc., Paducah, KY, September.

PRS 2007a. *Trichloroethene and Technetium-99 Groundwater Contamination in the Regional Gravel Aquifer for Calendar Year 2005 at the Paducah Gaseous Diffusion Plant Paducah, Kentucky*, PRS/PROJ/0019, Paducah Remediation Services, LLC, Paducah, KY, May.

TVA 1954. Maps entitled "Shawnee Steam Plant Reservation," 421B509-1 and 421B509-2, Tennessee Valley Authority Maps and Survey Branch, Chattanooga, TN, November.

APPENDIX
STAKEHOLDER INPUT

THIS PAGE INTENTIONALLY LEFT BLANK

STAKEHOLDER INPUT

This appendix delineates the efforts made to solicit stakeholder input during the development of the 2005 End State Vision Annual Update for PGDP. The various events and efforts DOE has undertaken through June 2, 2005, are presented, along with viewgraphs, handouts, and other materials from the various meetings and workshops that have taken place.

- On January 15, 2004, the DOE Site-Specific Advisory Board for the Paducah Gaseous Diffusion Plant, known as the Paducah Citizens Advisory Board (CAB), was briefed on the RBES background, purpose, and process. The Announcements page of the DOE Environmental Information Center Web site (http://www.bechteljacobs.com/pad_eic_announce.shtml) and a community bulletin board carried on the Paducah-area cable network advertises CAB meetings. The briefing was part of the scheduled monthly meeting of the CAB. Several members of the general public attended the CAB meeting. The briefing package is included as Attachment 1 of this appendix.

- On January 31, 2004, the Draft (D0/R2) Paducah RBES document was completed and forwarded to DOE Headquarters.

- On February 2, 2004, the Draft (D0/R2) RBES document was placed in the McCracken County Public Library and in the DOE Environmental Information Center (EIC). On February 3, 2004, the document was posted on the EIC public Web site. Notice of the availability of the D0/R2 RBES document for review and comment was mailed to approximately 2,500 stakeholders and was posted on the EIC public Web site. Display advertisements (identical to the postcards mailed to the stakeholders) announcing the availability of the RBES document appeared in the *Paducah Sun* on February 1 and February 4. The notice of availability also included notice of a February 5 public meeting. The postcard/advertisement is included in Attachment 2 of this appendix.

- On February 5, 2004, a public meeting to explain the RBES process and to encourage input was held at the West Kentucky Community and Technical College in Paducah. This meeting was attended by the Paducah Portsmouth Program (PPPO) Office Manager and Chief Operating Officer (COO) on behalf of DOE. In addition to newspaper ads, a Web announcement, and postcard mailing announcing the meeting, key stakeholders were telephoned to assure they were aware of the meeting. Twenty-eight stakeholders, representing local government, the Kentucky Congressional delegation, a regional environmental organization, the CAB, state regulators, area businesses, and other entities attended. Near the conclusion of this meeting, the designated DOE contact for comments and questions was identified and a February 26, 2004, stakeholder workshop was announced. The presentation shown at this meeting and the handout materials excerpted from the D0/R2 RBES document also are included in Attachment 2 of this appendix. These handouts also were made available at later stakeholder workshops and were provided to all members of the CAB.

- On February 9, 2004, John Tanner, the chair of the CAB, began a series of presentations on the RBES to community groups. The groups receiving presentations included the Citizens for Truth (ACT) (February 9, 2004), the Paducah Area Community Reuse Organization (PACRO) (February 18, 2004), the Ballard County Chamber of Commerce (February 19, 2004), Paper, Allied-Industrial, Chemical, and Energy Workers International Union, Local 5-650 (PACE) (March 2, 2004), and the Community and Business Development Committee of the Paducah Chamber of Commerce (March 9, 2004). Following these presentations, the CAB received letters of support from PACRO and ACT. The presentation used on March 9, 2004, and the letters received by the CAB are in Attachment 3 to this appendix.

- On February 16, 2004, April 1, 2004, and April 22, 2004, articles on the RBES process appeared in the *Paducah Sun*. The February 16, 2004, article told readers how to find the document, pointed out that DOE was accepting comments, and included the date, time, and location of the February 26 workshop. Stakeholder comments quoted in this article have been treated as comments to DOE on the RBES. The April 1, 2004, article reviewed the contents of the D1 RBES report and provided parts of an 2005 End State Vision Annual Update for PGDP. developed by the Paducah Area Community Reuse Organization (PACRO). The April 22, 2004, article discussed future use of the PGDP site and presented PACRO's proposed process for plant transition. These articles are included as Attachment 4 to this appendix.

- On February 19, 2004, the status of the RBES document was a significant topic of discussion at the monthly meeting of the CAB. This meeting was attended by the PPPO COO on behalf of DOE. Again, several members of the general public were in attendance, and interested stakeholders were encouraged to participate in the scheduled February 26 workshop. There was no prepared RBES presentation at this meeting.

- On February 26, 2004, the first of two stakeholder workshops was held at the EIC in Paducah, Kentucky. This meeting was attended by the PPPO COO on behalf of DOE. The workshop was announced on the EIC public Web site and in an advertisement that appeared in the *Paducah Sun* February 22 through 24, 2004. Key stakeholders who had not attended the February 5 public meeting also were notified by telephone. Sixteen stakeholders participated in this workshop. Materials summarizing comments received prior to the workshop and materials explaining various hazard areas were prepared and projected to support discussion. These materials are included in Attachment 5 of this appendix.

- On March 1, 2004, the PPPO COO participated in a Paducah-based radio call-in program about the RBES effort. A local environmental activist, formerly Chair of the CAB, also participated in the one-hour program. The discussion covered the purpose, general approach, and some of the specific content of the D0/R2 RBES document. Two members of the public called in questions. During the program, the second stakeholder workshop was announced. The radio station, WKYX AM, reaired the program on March 17, 2004.

- An announcement of the second (March 11) workshop was placed on the EIC public Web site, and an advertisement announcing the March 11 workshop appeared in the *Paducah Sun* March 7 through March 9. Again, key stakeholders who might not be aware of the second workshop were contacted by telephone. A copy of the ad announcing this workshop is included in Attachment 6 of this appendix.

- On March 9, 2004, a teleconference with DOE Headquarters was held to discuss comments on the D0/R2 RBES report. The PPPO was represented by the COO during this conference call.

- On March 11, 2004, the second stakeholder workshop was held at the EIC. DOE Headquarters' comments on the draft document, stakeholder comments received since the February 26 workshop, and anticipated changes for the final document were discussed with seven participating stakeholders. Information projected to support discussion at this workshop also is included in Attachment 6 of this appendix.

- On March 18, 2004, the status of the revised (D2) RBES document was discussed during the monthly CAB meeting at the EIC. This meeting was attended by the PPPO Manager and COO on behalf of DOE. The CAB presented to DOE their vision of an end-state for PGDP. This material is included in Attachment 7 of this appendix.

- On April 15, 2004, DOE notified the CAB of the extended public participation period and a new September 1, 2004, deadline for the final RBES report.

- On April 30, 2004, the CAB Waste Task Force sent questions regarding the RBES to DOE. These questions and the responses prepared by DOE are presented in Attachment 8 of this appendix.

- On April 30, 2004, the D2R2 RBES document was posted on the EIC public web site. The document was placed in the EIC and the McCracken County Public Library on the same day.

- On May 11, 2004, a presentation concerning the RBES was made by PPPO Office Manager to the Paducah Chamber of Commerce. This materials used in this presentation are included in Attachment 9 of this appendix.

- On June 1, 2004, DOE sent letters to several community groups offering presentations on the RBES. Appendix 10 of this appendix presents the addressees of the June 1 letter and a copy of the letter. Subsequently, presentations were made to the Paducah Board of Realtors (June 18, 2004) and Greater Paducah Economic Development Council and Paducah Chamber of Commerce (July 15, 2004). The June 18 presentation did not use prepared materials; however, the presentation materials used at the July 15 presentation are included in Attachment 10 of this appendix.

- An announcement of the third (June 3) workshop was placed on the EIC public Web site, and an advertisement announcing the June 3 workshop appeared in the *Paducah Sun* April 30 through May 2, 2004 Key stakeholders were contacted by telephone. A copy of the ad announcing this workshop is included in Attachment 11 of this appendix.

- On June 3, 2004, the third stakeholder workshop was held at the EIC. DOE Headquarters' comments on the draft document, stakeholder comments received since the arch 11 workshop, and anticipated changes for the final document were discussed. Information projected to support discussion at this workshop is included in Attachment 11 of this appendix.

- On June 17, 2004, the status of the revised RBES document was discussed during the monthly CAB meeting at the EIC. This meeting was attended by the PPO Office Manager on behalf of DOE. The material handed-out at the meeting is included in Attachment 12 of this appendix.

- On July 15, 2004, John Russell, a member of the CAB Waste Operations Task Force, presented an overview of the burial grounds at the PGDP and their current planned and risk-based end state to the CAB at the monthly CAB meeting. The presentation used is included in Attachment 13 of this appendix.

- In summer 2004, DOE determined that the development of the final RBES documents would be delayed until after a workshop to be held in October 2004. The notes from this workshop appear in Attachment 14. In response to these notes, the title of the document was changed to *2005 End State Vision Annual Update for PGDP* and a D2R3 revision of the document was prepared.

- All public and stakeholder comments received in writing are provided in Attachment 15 of this appendix. These include comments from the public, regulatory agencies, public groups, and DOE HQs.

- Summary tables of the public and stakeholder comments are included as Attachment 16.

- The D2R3 2005 End State Vision Annual Update for PGDP was released in June 2005. A summary of changes to the document since production of the DO/R2 revision are included as Attachment 17.

- A copy of the stakeholder update presentation dated October 18, 2005, summarizing the status of the End State Vision Process for PGDP is included as Attachment 18.

THIS PAGE INTENTIONALLY LEFT BLANK

Attachment 1

JANUARY 15, 2004, CAB MEETING BRIEFING PACKAGE

THIS PAGE INTENTIONALLY LEFT BLANK

Risk-Based End States

Presentation to the
PGDP Citizens Advisory Board

January 15, 2004

Background

- Underlying fundamental principle of CERCLA and RCRA is to implement cleanup actions protective of human health and the environment.

- DOE conducted a Top-to-Bottom Review of DOE cleanup plans nationwide in 2002 to ensure risk-based approaches were being implemented consistent with the intent of CERCLA and RCRA:
  - Mitigate immediate risks
  - Focus resources on areas providing the greatest risk-reduction
  - Cleanup solutions consider both current and future land use

- Top-to-Bottom Review concluded that many DOE sites were not maximizing risk-based approaches into their cleanup plans.

- In response to these findings, DOE-HQ required each site to develop a Risk-Based End State Strategy (RBES) Document.

Risk Based End States Strategy Document

What is a risk-based end state?

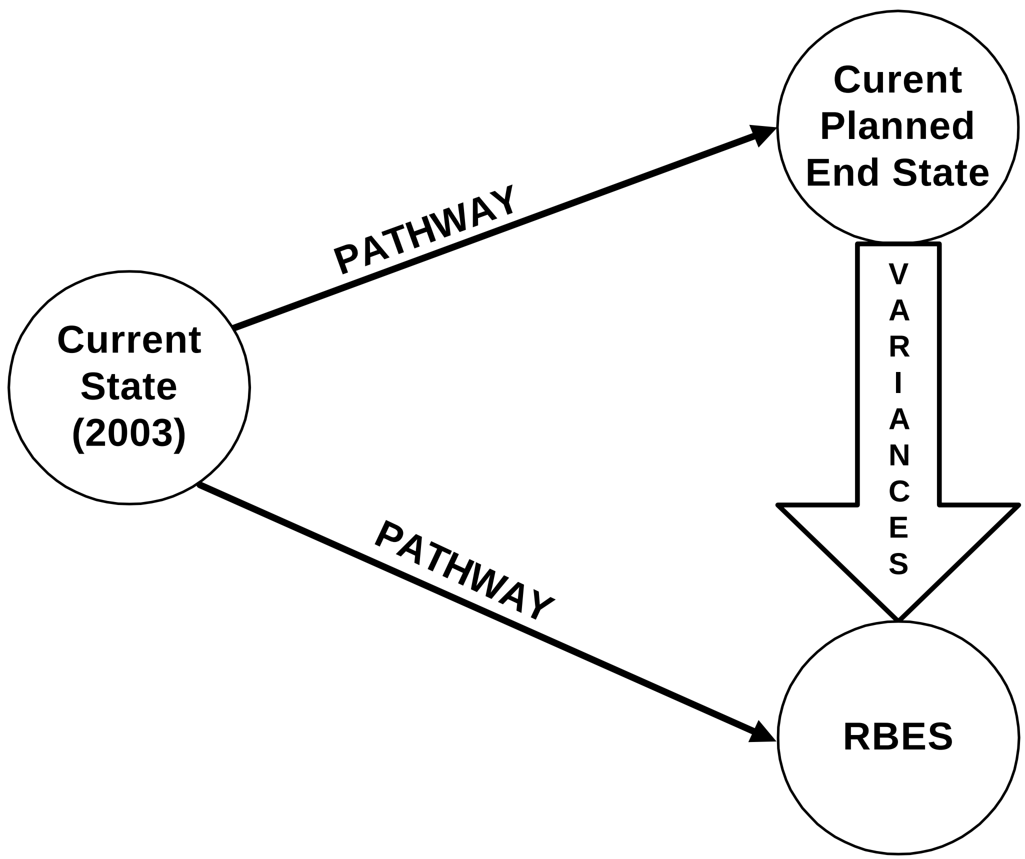
- An end state that is based on the appropriate planned future land use and is protective of human health and the environment for that land use.
- Should be sustainable and based on the exposure scenarios consistent with the future land use of both the site and areas that bound the site.
- Should describe any hazards remaining and their projected levels, potential receptors and pathways, and their barriers.
- Timeframe is the current DOE Environmental Management (EM) mission completion date.

Whose input helps define the risk-based end state?

- Department of Energy
- Regulators and Stakeholders (e.g., surrounding community, interested citizens, affected industries)
- Affected governments

Risk Based End States Strategy Document

CONCEPTUAL RBES ANALYSIS



Risk Based End States Strategy Document

Key points associated with the RBES Document:

- Contains planning assumptions and does not reflect a decision.
- Consistent with the intent of applicable laws, regulations and published EPA guidance
- If there is a difference between the RBES and current cleanup plans, DOE will change its current planned course of action, only under the following conditions:
  - Value of improvement in protection of human health and environment
  - Benefit to the taxpayer
- Any proposed changes to the current cleanup plans that could result from the RBES process would be made in accordance with all applicable requirements and procedures.

Risk Based End States Strategy Document

Status of the Paducah RBES Document:

- Discussions have been initiated with the Regulators to obtain input
- Public meeting planned
- Draft RBES Document due to DOE-HQ by February 1, 2004
- Efforts to obtain Stakeholder input will continue during DOE-HQ review
- Final RBES tentatively scheduled for completion in March of 2004

Attachment 2

FEBRUARY 5, 2004, PUBLIC MEETING MATERIALS

THIS PAGE INTENTIONALLY LEFT BLANK

U.S. Department of Energy
PUBLIC MEETING

DOE will hold a public meeting Thursday, February 5, 2004 at 7:00 p.m. to discuss the draft Risk-Based End State Vision document for the Paducah Gaseous Diffusion Plant. The document is a planning tool to assure environmental cleanup efforts are consistent with the site's future use planning. The Department is seeking public input during the review period.

The draft is available at *www.bechteljacobs.com/pad_reports.shtml* or the Environmental Information Center, 115 Memorial Dr., Paducah, KY.

For more information, call (270) 441-5023.

7:00 p.m. - Thursday, February 5, 2004
Crounse Hall, Room 101
West Kentucky Community and Technical College
4810 Alben Barkley Drive, Paducah, KY

THIS PAGE INTENTIONALLY LEFT BLANK

Risk-Based End State Vision

Public Meeting

February 5, 2004

Purpose of the Meeting

- Get stakeholders involved in the Risk-Based End State (RBES) process
- Explain the RBES initiative
- Plan future opportunities for stakeholder participation

A DOE Initiative

- In 2002, DOE's Office of Environmental Management (EM) conducted an independent Top-to-Bottom Review of DOE cleanup projects across the country

- Based on the Top-to-Bottom Review, EM required each DOE site to develop a Risk-Based End State Vision document

  – EM issued guidance establishing the requirements for the RBES document

    ➢ Guidance documents are available at www.em.doe.gov/office.html (Select Hot Topics, then select Risk-Based End State Cleanup Project)
    ➢ Internet access available at the DOE Environmental Information Center, 115 Memorial Drive, Paducah, KY, (270) 554-6979

Key Points About the Draft RBES Document

- It is a draft
- Stakeholders have input
- It is <u>not</u> a decision document
- It is an analytical tool

What is a Risk-Based End State?

- The condition of the property after cleanup…
- That would be protective of human health and the environment…
- Taking into account reasonably foreseeable future use of the property (i.e., industrial, recreational, residential)…
- And potential contaminants and hazards

Why define a Risk-Based End State?

- Ensure today’s cleanup actions are protective for tomorrow’s foreseeable future uses of the site
- Start with the end in mind – know your destination

Development of the Draft RBES Document

- Identified reasonably foreseeable future land use
- Identified acceptable risk levels for people and the environment consistent with future use
- Identified where current cleanup plans are going
- Identified variances between the Risk-Based End State and the Current Planned End State

What about the variances?

- After <u>final</u> RBES document submitted to EM in DOE Headquarters, DOE will …
  - Review the variances - nationally and locally
  - Consider whether to pursue potential changes to current cleanup plans
    - There may be no changes

What if DOE decides to pursue changes?

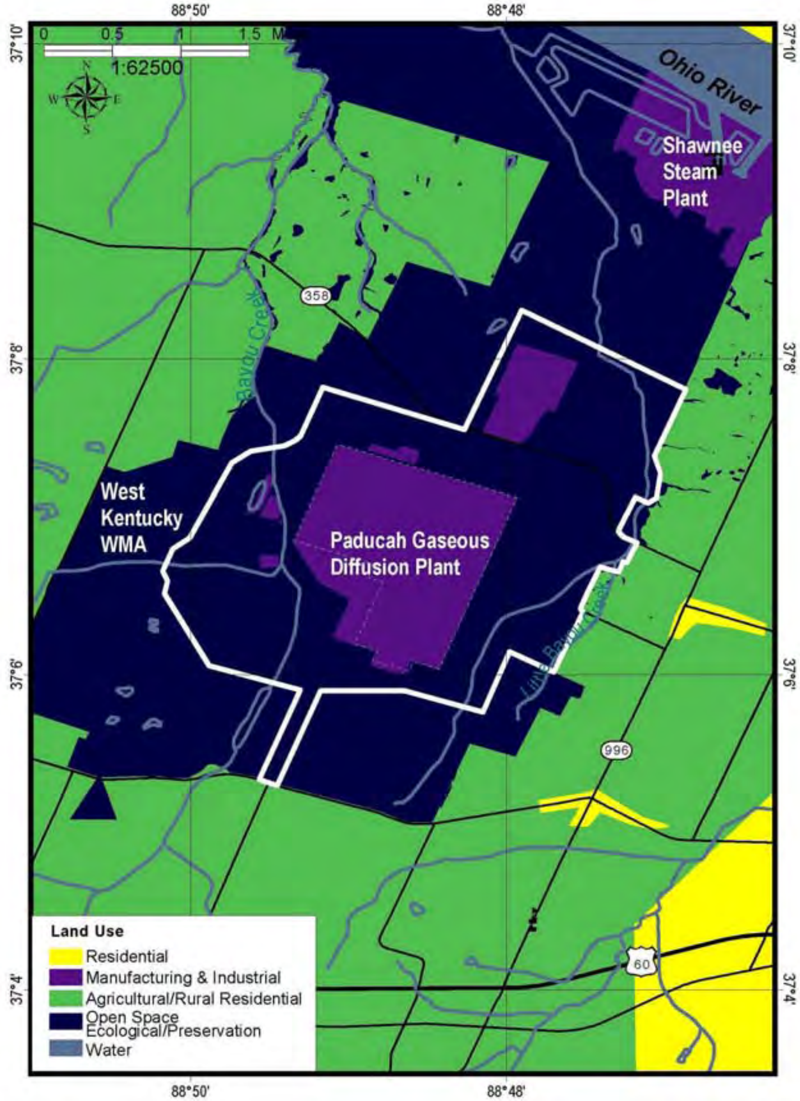
- Any proposed changes to current cleanup plans would have to be made in accordance with all applicable requirements and procedures, including public participation and regulatory approval.

Reasonably Foreseeable Future Land Use

- The reasonably foreseeable land use identified in the RBES document is the same as current land use
- Based on currently approved Site Management Plan under the Federal Facility Agreement
  - Industrial land use for areas currently viewed as industrial
  - Recreational land use for the rest of the DOE property

Reasonably Foreseeable Future Land Use

(Same as current land use)



Examples of Variances Between End States

- Cleanup levels for soils and sediment in industrial areas
  - Current Planned End State (CPES): Residential Use, including access controls, with maximum risk at one in a million and PCB cleanup level of 1 part per million (ppm)
  - RBES: Industrial Use, including access controls, with risk in the EPA acceptable risk range (one in ten thousand to one in one million) and PCB cleanup level of 25 ppm

Examples of Variances Between End States

- Groundwater Institutional Controls
  - CPES: Maintain current water policy, using renewable leases, until contaminant levels reach drinking water standards (hundreds to thousands of years)
  - RBES : Enhanced institutional controls to sustainably restrict access to groundwater until contaminant levels reach drinking water standards (hundreds to thousands of years)

Examples of Variances Between End States

- Potential sources of groundwater contamination
  - CPES: Monitored natural attenuation to drinking water standards (at least hundreds of years) with current water policy and active source reduction for solvents (TCE)
  - RBES: Monitored natural attenuation to drinking water standards (potentially thousands of years) in conjunction with enhanced institutional controls

Key Points

- This is a draft
- We want stakeholder input
- This is not a decision document
- DOE may or may not pursue changes

Any proposed changes to current cleanup plans would have to be made in accordance with all applicable requirements and procedures, including public participation and regulatory approval.

How to Find the Draft RBES Document

The Draft RBES Document is available

- on the internet at
  www.bechteljacobs.com/pad_reports.shtml

- or -

- at the DOE Environmental Information Center
  115 Memorial Drive
  Paducah, KY 42001
  (270) 554-3004
  M-F   9 a.m. to 5 p.m.

Schedule

- You are encouraged to begin submitting comments

- DOE has scheduled an RBES Workshop to address comments and assist with input:

  7:00 p.m., Thursday, February 26, 2004
  DOE Environmental Information Center
  115 Memorial Drive, Paducah, KY

- Comments received by February 20 can be addressed in the February 26 Workshop.

- Stakeholders can continue to submit comments after the workshop, but please keep in mind that the final document is due to DOE Headquarters by March 30, 2004.

- Your comments are <u>always</u> welcome.

Direct Comments and Questions to:

David Dollins
Paducah Operations Oversight Group
U.S. Department of Energy
P.O. Box 1410
Paducah, KY 42002

E-mail: dollinsdw@oro.doe.gov

Phone: (270) 441-6819
Fax: (270) 441-6801

DOE/OR/07-2119&D0/R2
SECONDARY DOCUMENT

DRAFT

Risk-Based End State Vision and Variance Report for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky

This document is approved for public release per review by:

2-2-04

BJC Classification & Information Office Date

THIS PAGE INTENTIONALLY LEFT BLANK

DOE/OR/07-2119&D0/R2
SECONDARY DOCUMENT

DRAFT

Risk-Based End State Vision and Variance Report for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky

Date Issued–January 2004

Prepared for the
U.S. DEPARTMENT OF ENERGY
Office of Environmental Management

Environmental Management Activities at the
Paducah Gaseous Diffusion Plant
Paducah, Kentucky 42001

managed by
Bechtel Jacobs Company LLC

for the
U.S. DEPARTMENT OF ENERGY
under contract DE-AC05-03OR22980

THIS PAGE INTENTIONALLY LEFT BLANK

PREFACE

This *Draft Risk-Based End State Vision and Variance Report for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky,* DOE/OR/07-2119&D0R2, was prepared to meet requirements set forth in a memorandum from Jessie Roberson to Distribution (including William E. Murphie) dated September 22, 2003, as amended by clarification contained in a memorandum entitled “Risk Based End State Guidance Clarification” dated December 23, 2003. The presentation of material in this document is consistent with U.S. Department of Energy (DOE) Policy, DOE P 455.1, entitled *Use of Risk-Based End States* and the standardized approach set forth in a guidance document entitled *Guidance for Developing a Site-Specific End State Vision* (dated September 11, 2003), as amended by the “Risk Based End State Guidance Clarification.” When finalized, this document will be used as the primary tool for communicating the Paducah Gaseous Diffusion Plant’s (PGDP’s) risk-based end state vision to the involved parties (i.e., DOE, the Environmental Protection Agency, the Commonwealth of Kentucky, and the general public). This report will be modified and resubmitted after receipt and resolution of comments from DOE headquarters and other stakeholders.

Although this report presents potential actions to address hazards that could be used to reach the PGDP’s risk-based end state, this report is not a decision document. Rather, discussions of potential specific mechanisms are included to provide an analytical frame-work that DOE will use to further evaluate the cleanup activities and the strategic approaches at PGDP to determine if it is appropriate to pursue changes in the PGDP baseline. Any decision to pursue changes to the baseline will include factors beyond those presented in the risk-based end state report, including input from involved parties. If DOE ultimately decides to seek changes to the current compliance agreements, decisions, or statutory/regulatory requirements, then those changes will be made in accordance with applicable requirements and procedures.

THIS PAGE INTENTIONALLY LEFT BLANK

CONTENTS

EXECUTIVE SUMMARY

In 2002, the Department of Energy's (DOE's) Office of Environmental Management (EM) established a set of corporate projects to lead EM's response to the *Top to Bottom Review*. One of these projects has resulted in the production of policy and guidance that directs DOE sites to submit a site-specific Risk-based End State (RBES) vision document. In accordance with that policy (DOE Policy 455.1, *Use of Risk-based End States*) and its implementing guidance (*Guidance for Developing a Site-specific Risk-based End State Vision*), as amended, the Paducah Gaseous Diffusion Plant (PGDP) has prepared this draft RBES vision and variance report for PGDP.

> Note that stakeholders have not had an opportunity to provide input to this draft RBES report, including the variances identified. Once stakeholder input is received, this draft RBES report and the variance summary it contains will be modified as appropriate.
>
> Additionally, this draft report presents potential actions to address hazards that could be used to reach the RBES. These presentations are not meant to be pre-decisional but are meant to introduce examples of actions the may be completed to reach the RBES. The selection of specific actions will be made in accordance with applicable law and agreements.

This draft report uses a standardized approach to meet the objectives for the RBES report contained in the guidance. This approach relies on the presentation of a series of maps and conceptual site models (CSMs) that depict the relationship between PGDP and its surroundings. The maps and CSMs are intended to present and allow comparisons between current and future land uses; depict hazards and risks to affected or potentially affected populations or receptors; serve as a planning tool for site management; facilitate communication of risks during discussions with stakeholders; allow tracking of expected and actual cleanup results; and serve as a communication tool for public meetings in regard to cleanup activities, current PGDP missions and requirements, and future land use. The maps follow a standardized hierarchical approach that depicts the PGDP RBES in regional-, site-, and hazard-specific contexts. The CSMs are produced only in a hazard-specific context. In the CSMs and their associated text, various responses to achieve site cleanup are presented. These presentations are not meant to be pre-decisional, but are meant to introduce examples of actions that may be completed to reach the RBES. The selection of specific actions will be made in accordance with applicable law and agreements.

Once the final RBES vision is developed, DOE will further evaluate the cleanup activities and the strategic approaches at PGDP to determine if it is appropriate to pursue changes in the PGDP baseline. Any decision to pursue changes to the baseline will include factors beyond those presented in the RBES report, including input from involved parties. If DOE ultimately decides to seek changes to current compliance agreements, decisions, or statutory/regulatory requirements, then those changes will be made in accordance with applicable requirements and procedures.

Currently, PGDP, located in Paducah, Kentucky, is the nations only operating uranium enrichment facility. Missions performed at PGDP are the enrichment mission, a uranium conversion mission, and an environmental cleanup mission. The enrichment mission began in the early 1950s and involves producing enriched uranium for commercial uses through a gaseous diffusion process. At present, the facilities and infrastructure used to produce enriched uranium are leased to the United States Enrichment Corporation (USEC). The uranium conversion mission, which was recently initiated, involves the construction and operation of a facility that will convert depleted uranium hexafluoride (DUF_6) currently stored at PGDP less reactive uranium forms and the subsequent disposal of the converted uranium. Finally, the environmental cleanup mission involves work performed under a Federal Facility Agreement (FFA), as well as some work outside of the FFA. The current portion of the cleanup mission under the FFA is to investigate and address existing environmental contamination and to D&D those facilities currently leased to USEC once the GDP ceases operation. The portion of the cleanup mission not included in the FFA includes the characterization and appropriate disposal of legacy waste and materials found in DOE Material Storage Areas (DMSAs) and continuation of waste management activities.

Consistent with the RBES guidance and the missions at PGDP, the following nine hazard areas were identified at PGDP:

- Hazard Area 1 – Groundwater Operable Unit (GWOU): This hazard area encompasses both the sources of contamination to groundwater and the three dissolved phase plumes that originate within the industrialized area of PGDP and extend off-site.

- Hazard Area 2 – Surface Water Operable Unit (SWOU): This hazard area encompasses the sources of surface water contamination found within the industrialized portion of PGDP, including plant ditches, and two creeks, Bayou and Little Bayou Creek, located outside of the industrialized portion of PGDP, which run both on and off DOE property.

- Hazard Area 3 – Burial Grounds Operable Unit (BGOU) (Group 1). This hazard area includes three burial grounds that contain buried waste and/or soil that are not believed to serve as a source of groundwater contamination but for which the current planned end state and RBES differ.

- Hazard Area 4 – Surface Soils Operable Unit (SSOU). This hazard area encompasses all areas containing contaminated soils that do not impact the GWOU or SWOU and that are not part of other hazard areas.

- Hazard Area 5 – Permitted Landfills. This hazard area includes two permitted, closed landfills, the currently operating permitted landfill, and, under future conditions, a potential "CERCLA Cell" that would be used to dispose of debris and other materials generated during GDP D&D.

- Hazard Area 6 - BGOU (Group 2). This hazard area includes of four areas that contain buried waste and/or soil that are not believed to serve as a source of groundwater contamination but for which the current planned end state and RBES do not differ.

- Hazard Area 7 - Legacy Waste and DMSAs. This hazard area encompasses legacy waste found at storage locations at PGDP and potentially contaminated debris, surfaces, and soil found in DOE Material Storage Areas (DMSAs) located throughout PGDP.

- Hazard Area 8 – Cylinder Yards and DUF_6 Conversion Facility. This hazard area is composed of the cylinder yards that contain DUF_6 in cylinders and the conversion facility currently under construction.

- Hazard Area 9 – GDP Facilities. This hazard area is composed of the GDP facilities and infrastructure that will undergo decommissioning and decontamination (D&D) once the current uranium enrichment mission is ended. This hazard area also includes any sources to the GWOU and SWOU not addressed in the other hazard areas.

Each of these hazard areas, except for the portions of the dissolved phase groundwater plumes and Bayou and Little Bayou Creek located off DOE property, is in locations where current and future expected land uses are industrial or recreational. Some areas overlying the groundwater plumes or adjacent to the creeks are rural residential.

Under current conditions, risks at all hazard areas are at or below levels of risk that fall near the bottom of EPA's acceptable risk range for site-related exposures (E-06). This level of risk, which is called a *de minimis* level of risk in this report, is attained under current conditions through access and institutional controls. However, unmitigated risks or risks that potentially could exist in the absence of these controls exceed the upper end of EPA's acceptable risk range for site-related exposures (E-04) at some locations. These risks are driven by the presence of chlorinated solvents (primarily trichloroethene [TCE] and its breakdown products) in groundwater and by the presence of polychlorinated biphenyls (PCBs), polynuclear aromatic hydrocarbons (PAHs), metals, and radionuclides (primarily the uranium isotopes) in soil and sediment.

Under the RBES, risk at all hazard areas will be at *de minimis* levels. These levels will be attained through the following actions:

- Continued access and institutional controls (e.g., capping, controls on groundwater use);
- Monitored natural attenuation of sources of groundwater contamination (TCE source areas) and the dissolved phase plumes with continued access and institutional controls;
- Excavation and on and off site disposal of contaminated surface soil and sediment to attain a target risk of 1E-04 to receptors consistent with current and future land use and an average PCB concentrations within exposure units of 25 ppm in industrial areas and 1 ppm in recreational areas;
- Characterization and off site disposal of legacy waste; and
- On- and off-site disposal of debris from D&D of facilities and infrastructure.

In order to identify variances between the RBES and the current PGDP baseline, a current planned end state also is presented for each of the hazard areas. Under the current planned end state, risk at all hazard areas also will be at *de miminis* levels. These levels will be attained through the following actions:

- Continued access and institutional controls (e.g., capping, controls on groundwater use);
- Response actions to reduce the concentration of TCE and other solvents in subsurface areas that act as sources of groundwater contamination;
- Response actions to reduce TCE concentrations in the dissolved phase plumes;
- Monitored natural attenuation of sources of groundwater contamination (TCE source areas) and the dissolved phase plumes following completion of response action to reduce TCE concentrations;
- Active measures to reduce TCE concentrations in groundwater discharged to surface water;
- Construction of sediment control basins;
- Excavation and off-site disposal of surface and subsurface soil and sediment to attain a target risk of 1E-06 for hypothetical residents and an average PCB concentration of 1 ppm within exposure units in industrial and recreational areas;
- Excavation and off-site disposal of wastes from burial grounds; and
- On- and off-site disposal of debris from D&D of facilities and infrastructure.

Using this information, the following ten variances were identified (RBES response action listed first):

1) Enhanced institutional controls to limit groundwater use versus continuation of PGDP Water Policy to limit groundwater use – affects Hazard Areas 1, 6, and 9;

2) Monitored natural attenuation for groundwater source areas, with either enhanced institutional controls or continuation of the PGDP Water Policy, versus active treatment of groundwater source areas using heating technologies, with continuation of the PGDP Water Policy – affects Hazard Areas 1 and 9;

3) Monitored natural attenuation for groundwater source areas, with either enhanced institutional controls or continuation of the PGDP Water Policy, versus excavation of groundwater source areas (burial grounds), with continuation of the PGDP Water Policy – affects Hazard Area 1;

4) Monitored natural attenuation for the dissolved phase groundwater plumes, with either enhanced institutional controls or continuation of the PGDP Water Policy, versus active treatment for the dissolved phase plume using oxidation technologies, with continuation of the PGDP Water Policy – affects Hazard Area 1.

5) Continued monitoring of discharges of groundwater to surface water versus actions to reduce contaminant levels in groundwater discharged to surface water – affects Hazard Area 1;

6) Cleanup levels for soil and sediment in industrial areas set at targets of 1E-04 (under an industrial scenario) and PCBs of 25 ppm and cleanup levels for soil and sediment in recreational areas set at targets of 1E-04 (under a recreational scenario) and PCBs of 1 ppm versus cleanup levels for soil and sediment in industrial and recreational areas set at targets of 1E-06 (under a residential scenario) and PCBs of 1 ppm – affects Hazard Areas 2, 4, 8, and 9;

7) Continued monitoring of contaminant levels in surface water at outfalls versus construction of sediment control basins to reduce contaminant migration in surface water – affects Hazard Area 2;

8) Capping of certain burial grounds versus excavation of certain burial grounds – affects Hazard Area 3;

9) Construction of potential CERCLA Cell versus no construction – affects Hazard Area 5; and

10) Cleanup levels for soil and/or decontamination of surfaces in industrial areas set at targets of 1E-04 (industrial) and PCBs of 25 ppm versus targets of 1E-06 (residential) and PCBs of 1 ppm – affects Hazard Area 7.

Subsequent to the delineation of the variances between the RBES and the current planned end state, barriers in achieving the RBES and recommendations to address these barriers are discussed. In the discussion, the affected organizations that DOE needs to work with are identified, the affected organizations' views are noted, and a path forward for DOE is presented.

D R A F T

Draft Risk-Based End State Vision and Variance Report for the Paducah Gaseous Diffusion Plant

TABLE OF VARIANCES

D R A F T

Table 5.1 Variance report by hazard area

ID. No.	Description of Variance	Impacts	Barriers in Achieving RBES	Recommendations
Hazard Area 1: Groundwater Operable Unit				
V-1.1	**Current Planned End State**: Continuation of PGDP Water Policy **RBES**: Enhanced institutional controls	Scope: The current planned end state includes continuation of the current PGDP Water Policy[a]. The RBES includes enhanced institutional controls[b], which would supercede the current PGDP Water Policy. Under both end states, the goal would be to reduce risks to residents from exposure to groundwater to *de minimis* levels[c]. Cost: The cost variance has not been determined to date. The current PGDP Water Policy costs range from $70,000 to $100,000 per year. Depending upon the specific enhanced institutional controls, the cost variance of the enhanced institutional controls could include some cost avoidance (if the PGDP Water Policy is terminated). However, the implementation of enhanced institutional controls would include costs for acquisition of rights to restrict groundwater use and continued monitoring to ensure continued long-term effectiveness of the enhanced institutional controls. Schedule: The PGDP Water Policy is currently in place. Implementation of the enhanced institutional controls would be a future planned CERCLA response action. Risk: The expected risk variance is zero under both the PGDP Water Policy and enhanced institutional controls because each would prevent exposure to contaminated groundwater, resulting in no risk. Enhanced institutional controls, however, would be more sustainable and, therefore, would result in greater long-term effectiveness because they would involve legally enforceable property restrictions and deed notices. (The agreements with landowners under the PGDP Water Policy do not restrict groundwater use, but only commit DOE to provide municipal water to replace the groundwater in return for the property owner's commitment not to use the groundwater. Thus, current or future property-owners could return to using groundwater in the home, completing this exposure pathway, and potentially raising risk from *de minimis* levels[c].)	DOE policy may limit options available under the enhanced institutional controls.	Initiate further discussions with the public and regulators. Revisit DOE policy.

Table 5.1 (continued)

ID. No.	Description of Variance	Impacts	Barriers in Achieving RBES	Recommendations
V-1.2	**Current Planned End State**: Treatment to attain source reduction **RBES**: Monitored natural attenuation (with either PGDP Water Policy or enhanced institutional controls; see V-1.1)	Scope: The current planned end state assumes implementation of DNAPL source reduction actions using *in situ* heating technologies in combination with monitored natural attenuation. The RBES does not assume source actions and consists solely of monitored natural attenuation with a point of exposure established at the DOE property boundary or at a downgradient location in accordance with the requirements of CERCLA. Cost: The combined cost of implementing *in situ* heating technology at the DNAPL source areas (i.e., C-400, C-720, and oil landfarm) is estimated to range from $75,000,000 to $140,000,000. The cost per year for monitored natural attenuation essentially would be the same under both the current planned end state and RBES; however, the duration of the monitoring/attenuation period could differ between the current planned end state (hundreds of years) and the RBES (potentially thousands of years). Schedule: Under the current planned end state, the construction and performance of the source actions would be implemented by 2010, with associated monitoring/attenuation potentially continuing for hundreds of years. A draft proposed plan for the C-400 DNAPL source action is currently scheduled for delivery to the regulatory agencies in January 2004. Under the RBES, no additional construction beyond installation of additional monitoring wells would be required; however, monitoring/ attenuation potentially could continue for thousands of years. Risk: The only variance in risk between the current planned end state and the RBES is the amount of time necessary to achieve MCLs. The PGDP Water Policy and/or enhanced institutional controls would eliminate risks to the public from off-site migration of DNAPL under both end states. However, the current planned end state could reduce the amount of time necessary to meet MCLs, thereby shortening the time period that the PGDP Water Policy or enhanced institutional controls would have to remain in effect. Implementation of *in situ* heating technology under the current planned end state could result in exposures of remediation workers to contaminated soil and groundwater and, potentially, gases, as well as physical hazards.	The regulators' position is that monitored natural attenuation would need to be supplemented by source actions to reduce contaminant concentrations to MCLs in a "reasonable" timeframe (e.g., = 100 years); however, even with source reduction, it would take hundreds of years to reach MCLs. (Without source reduction, the period potentially could be thousands of years.) Despite national performance data indicating that no technologies currently exist that can reduce DNAPLs in source areas to MCLs within a "reasonable" period, the regulators' position is that technical impractability (TI) waivers would be available only after a demonstrated, site-specific technology failure. The regulators' position is that the current fence	Initiate further discussions with the public and regulators.

Table 5.1 (continued)

ID. No.	Description of Variance	Impacts	Barriers in Achieving RBES	Recommendations
		Implementation of the source action could pose a risk of exposure to gases to general plant workers. Workers involved in disposal of materials contaminated during implementation of the source action could also be exposed. Finally, samplers involved in groundwater monitoring activities could be exposed. Except for risks to samplers, the magnitude of these risks has not been estimated at this time. Risks under the RBES are limited to samplers involved in groundwater monitoring activities. An assessment of these risks under current sampling protocols determined that risks to samplers are at *de minimis* levels[c].	line (located well inside the property boundary) should be used as the point of exposure.	
V-1.3	**Current Planned End State**: Excavation to remove suspected sources of groundwater contamination at burial grounds **RBES**: Capping and monitored natural attenuation (with either PGDP Water Policy or enhanced institutional controls; see V-1.1)	<u>Scope:</u> The current planned end state assumes complete excavation of two burial grounds (C-749 Uranium Burial Ground and C-747 Contaminated Burial Yard) suspected to be sources of groundwater contamination, subsequent off-site disposal of excavated materials, and monitoring to determine the effectiveness of source removal. The RBES assumes capping and monitoring for these burial grounds. <u>Cost</u>: The variance between the combined cost of excavating the two burial grounds, off-site disposal of excavated material, and monitoring under the current planned end state and the combined cost for capping and monitoring under the RBES is estimated to range from $176,000,000 to $349,000,000. <u>Schedule</u>: The source action under the current planned end state would be completed by 2030. Capping under the RBES would be complete by 2019. Monitoring would follow both actions. <u>Risk</u>: The only potential risks posed by these burial grounds under current conditions are from possible migration of contaminants through groundwater to off-site residents and from direct contact at the burial ground by on-site industrial workers. However, the PGDP Water Policy and/or enhanced institutional controls would eliminate risks to the public from contaminant migration under both end states, and current access controls mitigate risk from direct contact by on-site industrial workers. Excavation of the burial grounds under the current planned end state would remove the suspected source term, thereby reducing the amount of	It is the regulators' position that capping, access controls, and/or enhanced institutional controls are inadequate to achieve long-term protectiveness for *in situ* management of contamination at burial grounds; therefore, their preference is to remove the burial grounds to prevent them from serving as long-term sources of groundwater contamination.	Initiate further discussions with the public and regulators.

Table 5.1 (continued)

ID. No.	Description of Variance	Impacts	Barriers in Achieving RBES	Recommendations
		time taken to meet MCLs and shortening any monitoring period and the need for access controls. Capping of the burial grounds under the RBES would limit potential contact to the burial grounds and reduce possible migration of contamination to groundwater, but would require long-term monitoring and access controls. Off-site risks from contaminant migration would be controlled using enhanced institutional controls (see V-1.1). Excavation of the burial grounds would result in substantial risks to remediation workers through direct contact with wastes. (Note that one of the burial grounds to be excavated under the current planned end state contains pyrophoric uranium [i.e., uranium that spontaneously burns when exposed to air], which would pose significant inhalation risk and physical hazard to remediation workers.) Additionally, general site workers could be put at risk from exposure through inhalation of resuspended dust and vapors during excavation. Potential risks to the public and ecological receptors would also be increased during transportation of waste to the off-site disposal location. Finally, samplers involved in monitoring activities could be exposed. The magnitude of these risks has not been estimated at this time. Capping of the burial grounds under the RBES would result in potential risks to remediation workers through direct contact with surface soil at the burial grounds, but not through direct contact with waste. Samplers involved in monitoring activities could also be at risk of exposure. The magnitude of these risks has not been estimated at this time. Note that risks to remediation and general site workers would be smaller under the RBES than the current planned end state because, under the RBES, waste would not be dug up and moved, and the duration of the activity would be shorter.		
V-1.4	**Current Planned End State**: Treatment to reduce contaminant concentrations in the dissolved phase plume	Scope: The current planned end state assumes implementation of oxidation technologies (e.g., C-Sparge™) to remove TCE and other solvents from the dissolved phase plumes followed by monitored natural attenuation. The RBES does not assume plume actions and consists solely of monitored natural attenuation.	The regulators' position is that monitored natural attenuation would need to be supplemented by source actions to reduce contaminant concentrations to MCLs	Initiate further discussions with the public and regulators.

Table 5.1 (continued)

ID. No.	Description of Variance	Impacts	Barriers in Achieving RBES	Recommendations
	RBES: Monitored natural attenuation (with either PGDP Water Policy or enhanced institutional controls; see V-1.1)	Cost: The cost for implementing oxidation technologies in the dissolved phase plumes has not been determined. The cost per year for monitored natural attenuation essentially would be the same under both the current planned end state and RBES; however, the duration of the monitoring/ attenuation period could differ between the current planned end state (hundreds of years) and the RBES (potentially thousands of years). Schedule: Under the current planned end state, the construction and performance of the plume actions would be implemented by 2019 with associated monitoring/attenuation potentially continuing for decades. Additionally, any actions to address the dissolved phase plumes under the current planned end state would need to follow source actions to be cost-effective. (See V-1.2 and V-1.3). Under the RBES, no additional construction beyond installation of additional monitoring wells would be required; however, monitoring/ attenuation potentially could continue for thousands of years. Risk: The only variance in risk between the current planned end state and the RBES is the amount of time necessary to achieve MCLs. The PGDP Water Policy and/or enhanced institutional controls would eliminate risks to the public from TCE and other solvents in the dissolved phase plumes under both end states. The current planned end state could reduce the length of time that the PGDP Water Policy or enhanced institutional controls would have to remain in effect depending on the extent and effectiveness of plume treatment. Note, however, that the oxidation technologies would not address other potential contaminants found in groundwater in on-site areas at PGDP (i.e., metals and radionuclides). Implementation of oxidation technologies would result in exposures of remediation workers to contaminated groundwater, as well as physical hazards. Workers involved in disposal of materials contaminated during implementation of the action could also be exposed. Finally, samplers involved in groundwater monitoring activities could also be exposed. Except for risks to samplers, the magnitude of these risks has not been estimated at this time.	in a "reasonable" timeframe (e.g., = 100 years); however, even with source reduction, it would take hundreds of years to reach MCLs. (Without source reduction, the period potentially could be thousands of years.) Despite national performance data indicating that no technologies currently exist that can reduce TCE and solvent concentrations in large plumes to MCLs within a reasonable time frame, the regulators' position is that TI waivers would only be available after a demonstrated, site-specific technology failure. The regulators' position is that the current fence line (located well inside the property boundary) should be used as the point of exposure.	

Table 5.1 (continued)

ID. No.	Description of Variance	Impacts	Barriers in Achieving RBES	Recommendations
		Risks under the RBES are limited to samplers involved in groundwater monitoring activities. An assessment of these risks under current sampling protocols determined that risks to samplers are at *de minimis* levels[c].		
V-1.5	**Current Planned End State**: Actions to reduce solvent concentrations in groundwater discharged to surface water or control these discharges **RBES**: Continued monitoring of surface water concentrations at discharge point	<u>Scope</u>: The current planned end state assumes implementation of measures to reduce the solvent concentrations in the groundwater discharged to Little Bayou Creek and/or measures to control these discharges followed by monitoring. The RBES assumes continued monitoring. <u>Cost</u>: The cost of measures to reduce concentration in discharges and/or control discharges under the current planned end state has not been determined. Monitoring costs per year essentially would be the same under both the current planned end state and the RBES. <u>Schedule:</u> A schedule for implementation of the current planned end state actions is not available. However, the duration of monitoring under both the end states would be similar unless source and plume actions are taken. (See V-1.2, V-1.3, and V-1.4.) <u>Risk:</u> Screening human health and ecological risk assessments have determined that risks at the discharge point are at *de minimis* levels[c] for recreational user and ecological receptors. Modeling has indicated that contaminant concentrations could increase in the future, but these results and estimates of risks derived using them are uncertain. A baseline risk assessment has not been completed. Implementation of a technology to attenuate or control discharges would result in increased risks to remediation workers. Additionally, damage to the environment at the discharge point during implementation could lead to increased ecological risks. Finally, samplers involved in monitoring activities could be exposed. The magnitude of these risks has not been estimated at this time. Risks under the RBES are limited to samplers involved in monitoring activities. The magnitude of these risks has not been estimated at this time.	Commonwealth of Kentucky regulators' position is that Kentucky policy requires cleanup actions to either attain an E-06 risk assuming residential exposure or be supplemented with institutional controls and/or engineering barriers to attain that risk level.	Initiate further discussions with the public and regulators.
Hazard Area 2: Surface Water Operable Unit				
V-2.1	**Current Planned End State**:	<u>Scope:</u> The current planned end state assumes excavation of contaminated source sediments and soils to levels that achieve a target risk of 1E-06	Commonwealth of Kentucky regulators'	Initiate further discussions with the

Table 5.1 (continued)

ID. No.	Description of Variance	Impacts	Barriers in Achieving RBES	Recommendations
	Excavation of source sediments and soils **RBES**: Excavation of sediments and soils “hot spots”	under a residential scenario and a PCB concentration of 1 ppm. The RBES assumes excavations of “hot spots” in sediment and soil using a target risk and PCB concentration consistent with the agreed future land use. (All parties have agreed that future land use of areas currently in the industrialized areas of PGDP is industrial and that the future use of areas currently outside of the industrialized areas but on DOE property is recreational.) Therefore, under the RBES, the action in industrial areas would achieve a target risk of 1E-04 to a worker and a PCB concentration of 25 ppm. The action in recreational areas would achieve a target risk of 1E-04 to a recreational user and a PCB concentration of 1 ppm. <u>Cost:</u> Based on existing PCB and ^{238}U sampling results, approximately 7 to 17 times as much soil and sediment would be required to be removed under the current planned end state cleanup target than under the RBES cleanup target, resulting in a cost variance of proportional size. Because many areas have not been fully characterized, there is a high degree of uncertainty in this estimate. <u>Schedule:</u> The investigation of the SWOU is ongoing. The completion dates under the current planned end state and RBES are 2021 and 2017, respectively. <u>Risk:</u> Under the current state, the only potential risks posed by sediment and soils to humans are from direct contact by industrial workers and recreational users with these media. However, these risks are currently mitigated through institutional and access controls that limit exposure. Ecological receptors could be at risk in some industrial and non-industrial areas; however, a baseline ecological risk assessment confirming this has not been completed. Potential risk in all areas under the current planned end state would be reduced to E-06 using a residential scenario in industrial and recreational areas. Additionally, protection of ecological receptors would be demonstrated by an ecological risk assessment. Potential risk under the RBES would be reduced to a value falling within EPA’s acceptable risk range for site-related exposures (i.e., E-06 to E-04) using a worker scenario for industrial areas and a recreational user scenario in recreational	position is that Kentucky policy requires cleanup actions either to attain an E-06 risk assuming residential exposure or be supplemented with institutional controls and/or engineering barriers to attain that risk level. Commonwealth of Kentucky regulators’ position is that Kentucky policy requires that cleanup of PCBs in soils and sediments located in industrial areas must attain 1 ppm (as opposed to federal TSCA regulations allowing =25 ppm for “low occupancy areas” [e.g., industrial areas] =1 ppm for “high occupancy areas” [e.g., residential areas], and >1 ppm to = 10 ppm for “high occupancy areas” if covered by a cap with institutional controls).	public and regulators.

Table 5.1 (continued)

ID. No.	Description of Variance	Impacts	Barriers in Achieving RBES	Recommendations
		areas. Additionally, protection of ecological receptors would be demonstrated by an ecological risk assessment. Risks during excavation and disposal under both the current planned end state and RBES would affect remediation workers, general site workers, transportation workers (off-site disposal anticipated), landfill workers, the public, and ecological receptors. The magnitude of these risks under the current planned end state and RBES have not been assessed at this time; however, because a greater amount of material would be excavated under the current planned end state than under the RBES, risks to all receptors would be expected to be greater under the current planned end state than under the RBES.		
V-2.2	**Current Planned End State**: Construction of basins to control sediment migration **RBES**: No basins with “hot spot” removal (see V-2.1)	<u>Scope:</u> Under the current planned end state, construction of two basins to control sediment migration to areas outside the industrialized portions of the site is planned. Under the RBES, no basins are planned because “hot spot” removal would prevent migration of contaminated material. <u>Cost:</u> The variance between constructing and maintaining basins under the current planned end state and not constructing the basins under the RBES is estimated to range from $7,000,000 to $11,000,000. <u>Schedule:</u> The investigation to determine if sediment control basins for control of sediment migration are needed is ongoing. The decision for their construction will follow completion of that investigation. A completion date for construction would be selected as part of a decision to construct basins. <u>Risk:</u> An analysis of the potential impact of contaminant migration from on-site ditches to recreational use areas under current conditions determined that direct contact risks to recreational users and workers were at *de minimis* levels[c]. Under the current planned end state, remediation workers would be exposed to physical hazards during construction of the basins; however, risks from exposure to contamination would be at *de minimis* levels[c] because the basins would be constructed in clean areas. Additionally, ecological receptors would be at risk due to habitat disruption.	Lack of representative data to make the appropriate decision.	Complete investigation and risk assessment to determine if risks from migration of contaminants require action. Initiate further discussions with the public and regulators following completion of the investigation/ evaluation.

Table 5.1 (continued)

ID. No.	Description of Variance	Impacts	Barriers in Achieving RBES	Recommendations
		Under the RBES, construction would not occur, and no receptors would be at risk.		
Hazard Area 3: Burial Grounds Operable Unit (Group 1)				
V-3.1	**Current Planned End State**: Excavation of burial grounds **RBES**: Capping of burial grounds with access controls	Scope: Under the current planned end state, certain burial grounds are to be excavated and materials disposed of in an off-site location. Under the RBES, these burial grounds are capped to limit exposure, and the caps are maintained, including monitoring. For both end states, the goal of the action is to reduce risk to workers by eliminating or limiting exposure to contamination associated with the burial grounds. Cost: The variance between the cost of excavating the burial grounds and disposing of the materials off-site under the current planned end state versus capping and monitoring the burial grounds under the RBES is estimated to range from $185,000,000 to $298,000,000. Schedule: The source action under the current planned end state would be completed by 2030. Capping under the RBES would be complete by 2019. Monitoring under the RBES could continue for several decades. Risk: The only potential risks posed to humans are from direct contact at the burial ground by on-site industrial workers. Risks are driven by the presence of uranium isotopes, arsenic, PAHs, and PCBs in surface soils; however, current access controls mitigate risk from direct contact by on-site industrial workers. Screening ecological risk assessments determined that ecological risks for contact at the burial grounds were at *de minimis* levels[c] assuming future industrial use of the areas encompassing the burial grounds. Excavation of the burial grounds would result in substantial risks to remediation workers through direct contact with wastes. Additionally, general site workers could be put at risk from exposure through inhalation of resuspended dust and vapors during excavation. Potential risks to the public and ecological receptors would also be increased during transportation of waste to the off-site disposal location. Finally, samplers involved in monitoring activities could be exposed. The magnitude of these risks has not been estimated at this time.	It is the regulators' position that capping and access controls are inadequate to achieve long-term protectiveness for *in situ* management of contamination at burial grounds; therefore, their preference is to remove the burial grounds to achieve long-term protectiveness. It is the regulators' position that existing data are insufficient to characterize the contents and releases from the burial grounds.	Conduct investigation to better characterize the burial grounds. Initiate further discussions with the public and regulators following completion of the investigation/ evaluation.

Table 5.1 (continued)

ID. No.	Description of Variance	Impacts	Barriers in Achieving RBES	Recommendations
		Capping of the burial grounds under the RBES would result in potential risks to remediation workers through direct contact with surface soil at the burial grounds. Samplers involved in monitoring activities could also be at risk of exposure. The magnitude of these risks has not been estimated at this time. Note that risks to remediation and general site workers would be smaller under the RBES than under the current planned end state because, under the RBES, waste would not be dug up and moved, and the duration of the activity would be shorter.		
Hazard Area 4: Surface Soils Operable Unit				
V-4.1	**Current Planned End State**: Excavation of soil **RBES**: Excavation of soil "hot spots"	Scope: The current planned end state assumes excavation of contaminated soil to levels that achieve a target risk of 1E-06 under a residential scenario and a PCB concentration of 1 ppm. The RBES assumes excavations of "hot spots" in soil using a target risk of 1E-04 under a worker scenario, the most likely future use of the affected areas per past agreements with the regulators and the public. The PCB concentration target under the RBES would be 25 ppm. Cost: Based on existing PCB and ^{238}U sampling results, approximately 7 to 17 times as much soil would need to be removed under the current planned end state cleanup target than under the RBES cleanup target, resulting a cost variance of proportional size. Because many areas have not been fully characterized, there is a high degree of uncertainty in this estimate. Schedule: The investigation of the SSOU is not complete. For the current planned end state, the completion date is 2019. For the RBES, the completion date is 2015. Risk: Under the current state, the only potential risks posed by surface soils are from direct contact by on-site industrial workers. However, these risks are currently mitigated through institutional and access controls that limit exposure. The ecological risks were determined to be at *de minimis* levels[c] as long as the area remains industrial.	Commonwealth of Kentucky regulators' position is that Kentucky policy requires cleanup actions to either attain an E-06 risk assuming residential exposure or be supplemented with institutional controls and/or engineering barriers to attain that risk level. Commonwealth of Kentucky regulators' position is that Kentucky policy requires that cleanup of PCBs in soils and sediments located in industrial areas must attain 1 ppm (as opposed to federal	Initiate further discussions with the public and regulators.

Table 5.1 (continued)

ID. No.	Description of Variance	Impacts	Barriers in Achieving RBES	Recommendations
		Potential risk under the current planned end state would be reduced to E-06 using a residential scenario in an industrial area. Potential risk under the RBES would be reduced to a value falling within EPA's acceptable risk range for site-related exposures (i.e., E-06 to E-04) using a worker scenario for these industrial areas. Risks during excavation and disposal under both the current planned end state and RBES would affect remediation workers, general site workers, transportation workers (off-site disposal anticipated), landfill workers, and the public. The magnitude of these risks under the current planned end state and RBES have not been assessed at this time; however, because a greater amount of material would be excavated under the current planned end state than under the RBES, risks over the duration of the response action likely would be greater under the current planned end state than under the RBES.	TSCA regulations allowing =25 ppm for "low occupancy areas" [e.g., industrial areas] =1 ppm for "high occupancy areas" [e.g., residential areas], and >1 ppm to = 10 ppm for "high occupancy areas" if covered by a cap with institutional controls).	
Hazard Area 5: Permitted Landfills				
V-5.1	**Current Planned End State**: No construction of potential CERCLA Cell; continued off-site disposal of CERCLA-derived waste **RBES**: Potential construction of CERCLA Cell; on-site disposal of CERCLA-derived waste	<u>Scope:</u> The current planned end state does not include the potential construction of a CERCLA Cell for on-site disposal of CERCLA-derived wastes. The RBES includes the potential construction of such a facility. <u>Cost:</u> The cost estimates for on-site disposal of CERCLA-derived waste, which would include the construction, operation, maintenance, and monitoring of a potential CERCLA Cell under the RBES are not complete. It is uncertain if these costs would be less than those incurred under the current planned end state, which considers transporting and disposing of CERCLA-derived waste at an off-site location. <u>Schedule:</u> The schedule for completing the evaluation of the cost-effectiveness and construction of a potential CERCLA Cell has not been established. <u>Risk:</u> No risk assessments have been completed for a potential CERCLA Cell because this would be a newly constructed facility. However, off-site disposal of waste under the current planned end state potentially could expose transportation workers and the public to waste during transportation and landfill workers during disposal. On-site disposal of waste under the	Commonwealth of Kentucky's regulators' position is that site conditions (e.g., seismic conditions and climate) are not appropriate for construction of a potential CERCLA Cell. Commonwealth of Kentucky's regulators' position is that CERCLA-derived waste should not remain at PGDP. Regulators' position is that additional data is required to justify the on-site disposal of	Complete technical evaluation. Continue discussions with the public and regulators.

Table 5.1 (continued)

ID. No.	Description of Variance	Impacts	Barriers in Achieving RBES	Recommendations
		RBES could expose remediation workers and landfill workers; exposure to the public would be minimized through access controls at a CERCLA Cell. Under the RBES, potential risks from exposure to CERCLA-derived waste could be greater because this waste would remain onsite; however, the potential risks to workers, recreational users, and the public from on-site disposal would be minimized by the engineered barriers (i.e., capping and leachate collection system) and access controls included in the potential CERCLA Cell design. Additionally, potential risks from environmental contamination across the site associated with soils, sediments, and GDP infrastructure could be lower because more of these materials may be removed and disposed of in a potential CERCLA Cell, where the chance of uncontrolled contact would be minimized.	CERCLA-derived waste in a potential CERCLA Cell.	
Hazard Area 6: Burial Grounds Operable Unit (Group 2)				
V-6.1	**Current Planned End State**: Continuation of PGDP Water Policy **RBES**: Enhanced institutional controls	<u>Scope:</u> The current planned end state includes continuation of the current PGDP Water Policy[a]. The RBES includes enhanced institutional controls[b], which would supercede the current PGDP Water Policy. Under both end states, the goal would be to reduce risks to residents from exposure to groundwater to *de minimis* levels[c]. <u>Cost:</u> The cost variance has not been determined to date. The current PGDP Water Policy costs range from $70,000 to $100,000 per year. Depending upon the specific enhanced institutional controls, the cost variance of the enhanced institutional controls could include some cost avoidance (if the PGDP Water Policy is terminated). However, the implementation of enhanced institutional controls would include costs for acquisition of rights to restrict groundwater use and continued monitoring to ensure continued long-term effectiveness of the enhanced institutional controls. <u>Schedule:</u> The PGDP Water Policy currently is in place. Implementation of the enhanced institutional controls would be a future planned CERCLA response action. <u>Risk:</u> The expected risk variance is zero under both the PGDP Water Policy and enhanced institutional controls because each would prevent exposure to contaminated groundwater, resulting in no risk. Enhanced	DOE policy may limit options available under the enhanced institutional controls.	Initiate further discussions with the public and regulators. Revisit DOE policy.

Table 5.1 (continued)

ID. No.	Description of Variance	Impacts	Barriers in Achieving RBES	Recommendations
		institutional controls, however, would be more sustainable and, therefore, would result in greater long-term effectiveness because they would involve legally enforceable property restrictions and deed notices. (The agreements with landowners under the PGDP Water Policy do not restrict groundwater use, but only commit DOE to provide municipal water to replace the groundwater in return for the property owner's commitment not to use the groundwater. Thus, current or future property-owners could return to using groundwater in the home, completing this exposure pathway and potentially raising risk from *de minimis* levels[c].)		
Hazard Area 7: Legacy Waste and DOE Material Storage Areas				
V-7.1	**Current Planned End State**: Excavation of soil and/or decontamination of surface areas. **RBES**: Excavation of soil and/or decontamination of surface areas.	Scope: Upon completion of characterization and disposition of all wastes and debris contained in legacy waste storage areas and DMSAs, those areas that are discovered to contain hazardous waste will be subject to the closure requirements outlined in the Agreed Order and/or RCRA Permit. Under the current planned end state, the Agreed Order provides that "final clean closure" of any underlying soils and/or surface areas must achieve a 1E-06 and hazard index of 1 under a residential scenario without use of institutional controls or engineering barriers and a PCB target level of 1 ppm. Under the RBES, excavation of any contaminated soils and/or decontamination of surface areas would target a 1E-04 and hazard index of 1 under an industrial scenario in accordance with CERCLA and a PCB target level of 25 ppm, with the option of using institutional controls or engineering barriers. Cost: Because characterization of the DMSAs and legacy waste storage areas is not complete, any potential impacts to underlying soils and/or surfaces are not known at this time; therefore, estimated costs are not available. Schedule: The Agreed Order requires characterization to be complete for all DMSAs by 2009. The Agreed Order also defines timeframes for submittal of closure plans after completion of characterization for those DMSAs and waste storage areas determined to contain hazardous wastes.	The Agreed Order provides that "final clean closure" of any underlying soils and/or surface areas must achieve a 1E-06 and hazard index of 1 under a residential scenario without use of institutional controls or engineering barriers. It's the Commonwealth of Kentucky's position that cleanup of PCBs in soils located in industrial areas must attain 1 ppm (as opposed to federal TSCA regulations allowing =25 ppm for "low occupancy areas" [e.g., industrial areas] =1 ppm for "high occupancy areas" [e.g., residential areas], and >1 ppm to = 10 ppm for	Continue discussions with the public and regulators.

Table 5.1 (continued)

ID. No.	Description of Variance	Impacts	Barriers in Achieving RBES	Recommendations
		Risk: Under the current state, the only potential risks posed by surface soils and/or surface areas are from direct contact by on-site industrial workers. Characterization data collected to date indicates that these direct contact risks may approach *de minimis* levels[c]. Additionally, any risks are mitigated through institutional and access controls that limit exposure. No ecological risk assessment is available. Potential risk under the current planned end state would be reduced to E-06 using a residential scenario in industrial areas. Potential risk under the RBES would be reduced to a value falling between E-06 and E-04 using an industrial scenario. Excavation and/or decontamination activities under both the current planned end state and RBES would pose a potential risk to remediation workers, general site workers, transportation workers (off-site disposal anticipated), landfill workers, the public, and ecological receptors. The magnitude of these risks under the current planned end state and RBES have not been assessed at this time; however, because a greater amount of material potentially would be available for exposure under the current planned end state than under the RBES, risks over the duration of the response action likely would be greater under the current planned end state than under the RBES.	"high occupancy areas" if covered by a cap with institutional controls).	
Hazard Area 8: Cylinder Yards and DUF_6 Conversion Facility				
V-8.1	**Current Planned End State**: Excavation of soil **RBES**: Excavation of soil "hot spots"	Scope: The current planned end state assumes excavation of contaminated soils following completion of the DUF_6 conversion mission to levels that achieve a target risk of 1E-06 under a residential scenario and a PCB concentration of 1 ppm. The RBES assumes excavation of "hot spots" in soil using a target risk of 1E-04 under a worker scenario, the most likely future use of the affected areas per past agreements with the regulators and the public. The PCB concentration under the RBES would be 25 ppm. Cost: Based on existing PCB and ^{238}U sampling results, approximately 7 to 17 times as much soil would need to be removed under the current planned end state cleanup target than under the RBES cleanup target, resulting a cost variance of proportional size. Because many areas have not been fully characterized, there is a high degree of uncertainty in this estimate.	Commonwealth of Kentucky regulators' position is that Kentucky policy requires cleanup actions to attain either an E-06 risk assuming residential exposure or be supplemented with institutional controls and/or engineering barriers to attain that risk level.	Initiate further discussions with the public and regulators.

Table 5.1 (continued)

ID. No.	Description of Variance	Impacts	Barriers in Achieving RBES	Recommendations
		<u>Schedule:</u> No schedule is available because the conversion mission is expected to last for decades. <u>Risk:</u> Under the current state, the only potential risks posed by surface soils are from direct contact by on-site industrial workers. However, these risks are currently mitigated through institutional and access controls that limit exposure. The ecological risks are expected to be at *de minimis* levels[c] as long as the area remains industrial. Potential risk under the current planned end state would be reduced to E-06 using a residential scenario in an industrial area. Potential risk under the RBES would be reduced to a value falling within EPA's acceptable risk range for site-related exposures (i.e., E-06 to E-04) using a worker scenario for these industrial areas. Risks during excavation under both the current planned end state and RBES would affect remediation workers, general site workers, transportation workers (off-site disposal anticipated), landfill workers, and the public. The magnitude of these risks under the current planned end state and RBES have not been assessed at this time; however, because a greater amount of material would be excavated under the current planned end state than under the RBES, risks over the duration of the response action likely would be greater under the current planned end state than under the RBES.	Commonwealth of Kentucky regulators' position is that Kentucky policy requires that cleanup of PCBs in soils and sediments located in industrial areas must attain 1 ppm (as opposed to federal TSCA regulations allowing =25 ppm for "low occupancy areas" [e.g., industrial areas] =1 ppm for "high occupancy areas" [e.g., residential areas], and >1 ppm to = 10 ppm for "high occupancy areas" if covered by a cap with institutional controls).	
Hazard Area 9: GDP Facilities				
V-9.1	**Current Planned End State**: Continuation of PGDP Water Policy **RBES**: Enhanced institutional controls	<u>Scope:</u> The current planned end state includes continuation of the current PGDP Water Policy[a]. The RBES includes enhanced institutional controls[b], which would supercede the current PGDP Water Policy. Under both end states, the goal would be to reduce risks to residents from exposure to groundwater to *de minimis* levels[c]. <u>Cost:</u> The cost variance has not been determined to date. The current PGDP Water Policy costs range from \$70,000 to \$100,000 per year. Depending upon the specific enhanced institutional controls, the cost variance of the enhanced institutional controls could include some cost avoidance (if the PGDP Water Policy is terminated). However, the implementation of enhanced institutional controls would include costs for	DOE policy may limit options available under the enhanced institutional controls.	Initiate further discussions with the public and regulators. Revisit DOE policy.

Table 5.1 (continued)

ID. No.	Description of Variance	Impacts	Barriers in Achieving RBES	Recommendations
		acquisition of rights to restrict groundwater use and continued monitoring to ensure continued long-term effectiveness of the enhanced institutional controls. Schedule: The PGDP Water Policy is currently in place. Implementation of the enhanced institutional controls would be a future planned CERCLA response action. Risk: The expected risk variance is zero under both the PGDP Water Policy and enhanced institutional controls because each would prevent exposure to contaminated groundwater, resulting in no risk. Enhanced institutional controls, however, would be more sustainable and, therefore, would result in greater long-term effectiveness because they would involve legally enforceable property restrictions and deed notices. (The agreements with landowners under the PGDP Water Policy do not restrict groundwater use but only commit DOE to provide municipal water to replace the groundwater in return for the property owner's commitment not to use the groundwater. Thus, current or future property-owners could return to using groundwater in the home, completing this exposure pathway and potentially raising risk from *de minimis* levels[c].)		
V-9.2	**Current Planned End State**: Excavation of soil **RBES**: Excavation of soil "hot spots"	Scope: Excavation of contaminated soils is planned under both the current planned end state and RBES as part of D&D of the GDP. The current planned end state assumes excavation of contaminated soils to levels that achieve a target risk of 1E-06 under a residential scenario and a PCB concentration of 1 ppm. The RBES assumes excavation of "hot spots" in soil using a target risk of 1E-04 under a worker scenario, the most likely future use of the affected areas per past agreements with the regulators and the public. The PCB concentration under the RBES would be 25 ppm. Cost: Based on existing PCB and ^{238}U sampling results, approximately 7 to 17 times as much soil would need to be removed under the current planned end state cleanup target than under the RBES cleanup target, resulting in a cost variance of proportional size. However, because most areas associated with GDP D&D have not been fully characterized, there is a very high degree of uncertainty in this estimate.	Commonwealth of Kentucky regulators' position is that Kentucky policy requires cleanup actions to attain either an E-06 risk assuming residential exposure or be supplemented with institutional controls and/or engineering barriers to attain that risk level. Commonwealth of Kentucky regulators' position is that	Initiate further discussions with the public and regulators.

Table 5.1 (continued)

ID. No.	Description of Variance	Impacts	Barriers in Achieving RBES	Recommendations
		Schedule: The schedule for GDP D&D and the subsequent Comprehensive Site Operable Unit (CSOU) will be determined 6 months before GDP shutdown. Risk: Under the current state, the only potential risks posed by surface soils are from direct contact by on-site industrial workers. However, these risks are currently mitigated through institutional and access controls that limit exposure. The ecological risks likely are at *de minimis* levels[c] because the GDP facilities are in industrialized areas of PGDP. Potential risk under the current planned end state would be reduced to E-06 using a residential scenario in industrial areas. Potential risk under the RBES would be reduced to a value falling within EPA's acceptable risk range for site-related exposures (i.e., E-06 to E-04) using a worker scenario for these industrial areas. Risks during excavation under both the current planned end state and RBES would affect remediation workers, general site workers, transportation workers (off-site disposal anticipated), landfill workers, the public, and ecological receptors. The magnitude of these risks under the current planned end state and RBES have not been assessed at this time; however, because a greater amount of material would be excavated under the current planned end state than under the RBES, risks over the duration of the response action would likely be greater under the current planned end state than under the RBES.	Kentucky policy requires that cleanup of PCBs in soils and sediments located in industrial areas must attain 1 ppm (as opposed to federal TSCA regulations allowing =25 ppm for "low occupancy areas" [e.g., industrial areas] =1 ppm for "high occupancy areas" [e.g., residential areas], and >1 ppm to = 10 ppm for "high occupancy areas" if covered by a cap with institutional controls).	
V-9.3	**Current Planned End State**: Treatment to attain source reduction **RBES**: Monitored natural attenuation (with either PGDP Water Policy or enhanced institutional controls; see V-1.1)	Scope: The current planned end state assumes implementation of DNAPL source reduction actions using *in situ* heating technologies in combination with monitored natural attenuation as part of D&D of the GDP or as part of the CSOU. The RBES does not assume source actions and consists solely of monitored natural attenuation with a point of exposure established at the DOE property boundary or at a downgradient location in accordance with the requirements of CERCLA. Cost: The combined costs of implementing *in situ* heating technology at the DNAPL source areas associated with D&D of the GDP are unknown. The cost per year for monitored natural attenuation would be essentially the same under both the current planned end state and RBES; however, the	The regulators' position is that monitored natural attenuation would need to be supplemented by source actions to reduce contaminant concentrations to MCLs in a "reasonable" timeframe (e.g., = 100 years); however, even with source reduction, it would take hundreds of	Initiate further discussions with the public and regulators.

Table 5.1 (continued)

ID. No.	Description of Variance	Impacts	Barriers in Achieving RBES	Recommendations
		duration of the monitoring/ attenuation period could differ between the current planned end state (hundreds of years) and the RBES (potentially thousands of years). <u>Schedule:</u> The schedule for GDP D&D and the subsequent CSOU will be determined 6 months before GDP shutdown. <u>Risk:</u> The only variance in risk between the current planned end state and the RBES is the amount of time necessary to achieve MCLs. The PGDP Water Policy and/or enhanced institutional controls would eliminate risks to the public from off-site migration of DNAPL under both end states. However, the current planned end state could reduce the amount of time necessary to meet MCLs, thereby shortening the time period that the PGDP Water Policy or enhanced institutional controls would have to remain in effect. Implementation of *in situ* heating technology under the current planned end state could result in exposures of remediation workers to contaminated soil and groundwater and, potentially, gases, as well as physical hazards. Implementation of the source action could pose a risk of exposure to gases to general plant workers. Workers involved in disposal of materials contaminated during implementation of the source action could also be exposed. Finally, samplers involved in groundwater monitoring activities could be exposed. Except for risks to samplers, the magnitude of these risks has not been estimated at this time. Risks under the RBES are limited to samplers involved in groundwater monitoring activities. An assessment of these risks under current sampling protocols determined that risks to samplers are at *de minimis* levels[c].	years to reach MCLs. (Without source reduction, the period potentially could be thousands of years.) Despite national performance data indicating that no technologies currently exist that can reduce DNAPLs in source areas to MCLs within a "reasonable" period, the regulators' position is that TI waivers would only be available after a demonstrated, site-specific technology failure. The regulators' position is that the current fence line (located well inside the property boundary) should be used as the point of exposure.	

[a] The PGDP Water Policy is a removal action instituted to limit the use of potentially contaminated groundwater by off-site residences. This policy is discussed in *Action Memorandum for the Water Policy at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/OR/06-1201&D2, United States Department of Energy, Paducah, KY, June 1994 (DOE 1994).

[b] Enhanced institutional controls under the RBES would be implemented on both DOE- and non-DOE-owned property. These controls could range from implementation of legal agreements with surrounding landowners to place enforceable restrictions on groundwater use to DOE's acquiring rights from surrounding property owners and directly implementing restrictions on groundwater and property use.

[c] "*De minimis*" levels of risk, as used here, are defined as risks determined to be at or below the lower limit of EPA's acceptable risk range for site-related exposures (i.e., E-06) by the receptor(s) mentioned.

THIS PAGE INTENTIONALLY LEFT BLANK

Attachment 3

MATERIALS FROM JOHN TANNER (CAB) PRESENTATIONS

THIS PAGE INTENTIONALLY LEFT BLANK

PADUCAH GASEOUS DIFFUSION PLANT
CITIZENS ADVISORY BOARD

End State Vision for PGDP

Presentation to the

Paducah Area Chamber of Commerce

Community and Business Development Committee

Bill Tanner, Chair

March 9, 2004

Background

- The Paducah Gaseous Diffusion Plant (PGDP) Citizens Advisory Board (CAB) is a U.S. Department of Energy (DOE) Environmental Management (EM) Site-Specific Advisory Board (SSAB) that is chartered to provide advice to local DOE site officials concerning cleanup standards, environmental restoration, waste management and disposition, future land use, long-term stewardship, risk assessment and management, and science and technology activities
- The PGDP CAB is one of nine SSABs nation-wide:

Background

- In November 2002, the CAB asked DOE for input regarding a list of topics that the Board would work from for the upcoming year
- DOE responded that the CAB should focus on long-term stewardship and develop an End State Vision for PGDP
- The CAB has been seeking input and has conducted research to develop a preliminary vision that incorporates the needs of the community

Background

Current Situation at PGDP:

The U.S. Department of Energy owns the site and is responsible for the environmental remediation of the property

USEC leases certain areas from DOE to enrich uranium. USEC is expected to continue operations for another 6 to 8 years and has not decided if the plant will be shut down or be used as a backup facility to its sister plant in Portsmouth, OH

- Reindustrialization has already begun by the decision to build the Depleted Uranium Hexafluoride (DUF6) Conversion Facility
- Decisions made today will provide guidance for future generations

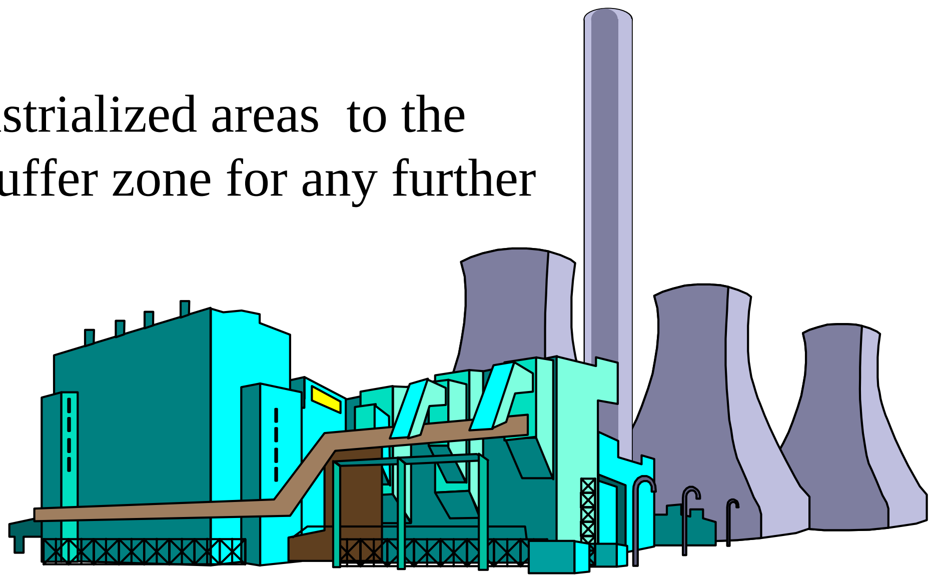
End State Vision

Goal:

- To protect human health and the environment while preparing for a viable economic future for the Paducah site

Implementation of Goal:

- Continued industrial use of existing industrialized areas
- Continued recreational/wildlife use of those areas presently leased to West Kentucky Wildlife Management Area (WKWMA)
  - DOE should deed non-industrialized areas to the WKWMA but maintain a buffer zone for any further reindustrialization efforts



Specifics to Achieve End State Vision

It is recommended that:

- DOE investigate ways to modify security/access for the reindustrialization process to move forward
- DOE consult with the Paducah Area Reuse Organization (PACRO) and the Greater Paducah Economic Development Council (GPEDC) to investigate buildings currently scheduled for Decontamination and Decommissioning (D&D) to determine any possible value
  - Buildings scheduled for re-use should be completely decontaminated
- DOE thoroughly characterize any contamination remaining at the site
  - Contracts with reindustrialization companies should include an indemnity clause that states they are not responsible for existing contamination (Brownfield regulations)

Specifics to Achieve End State Vision

It is recommended that:

- DOE use the footprint of the four large process buildings for disposition instead of an on-site CERCLA waste disposal facility
  - Proposed CERCLA cell would be a 70 acre, 112 feet tall hazardous waste landfill that may impact reindustrialization
  - Encapsulate waste, mixed with concrete, in buildings
  - May simplify future monitoring
- DOE remove all burial grounds
  - Reindustrialization without top secret dump sites is more attractive to interested companies
- DOE rehabilitate infrastructure
- DOE resolve issue of institutional controls for off-site groundwater contamination
  - Enter a long-term agreement with those affected by DOE's Water Policy

Specifics to Achieve End State Vision

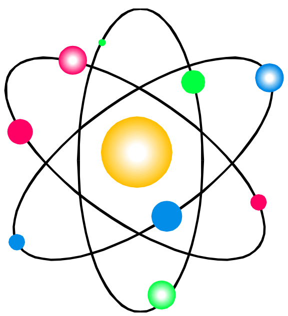
It is recommended that:

- DOE consider the taxpayer when making financial decisions
  - Concern that local taxpayers will be left the cost of rehabilitation later
  - Need to look into the current cost to DOE versus the cost to the taxpayer on a long-term basis
- DOE's Office of Environmental Management (EM) keep public informed about the transition process to the Office of Legacy Management (LM)
  - Address monitoring of the air and water and spread of remaining pollutants

EM → **LM** →

Reindustrialization Possibilities

- Encourage environmental remediation companies with innovative technologies to occupy area (do not want new polluters or re-polluters)
  - Possible examples of companies that might meet reindustrialization criteria:
    - ✓ UK is researching ways to remove neptunium from nickel
    - ✓ UK is researching use of converted depleted uranium in batteries
    - ✓ Establish facility for Hazardous Material (HAZMAT) Training as well as Emergency Response Training that can be utilized by companies in the tri-state area
    - ✓ Governor's office is looking into the possibility of locating a research technology park in western Kentucky



Summary

- The CAB is working toward making a recommendation to DOE incorporating the draft End State Vision for PGDP
- The CAB, as the community's representative to DOE, is seeking your input to finalize this recommendation
- The CAB would also appreciate a letter of endorsement from your group or organization
- We hope that a unified voice will lead to the success of this recommendation and positively influence DOE's decision making process

March 17, 2004

MEMORANDUM

TO: Bill Tanner, Chairman
Citizen Advisory Board
111 Memorial Drive
Paducah, KY 42001

FROM: John Anderson, Director
Paducah-Area Community Reuse Organization
PO Box 588
Mayfield, KY 42066

RE: PACRO submits the following comments to the CAB's request for support or the End State Vision (enclosure 1)

First, PACRO believes the subject is far too detailed and complex to respond to DOE under the imposed deadline. The PACRO agrees with the individual comments with the exceptions outlined, PACRO has undertaken an effort to develop a professionally prepared Master Plan, which will draw upon the expertise of a nationally recognized site development firm to analyze the best uses for the site, in competition with the many other industrial sites that are available across the country. Since DOE is unable to provide information relative to the ultimate use of the end state decision document, PACRO requests that final action on the document be deferred until this plan has been prepared.

Next, PACRO comments follow each of the twelve (12) CAB recommendations below to achieve the goal of the "End State Vision":

1. DOE is encouraged to structure environmental remediation activities to allow continued nuclear and non-nuclear industrial use of the existing industrialized area and to continue recreation/wildlife use of those areas presently leased to WKWMA.
   - Qualified support of #1, PACRO does not support the line "and to continue recreation/wildlife use of those areas presently leased to WKWMA". This limits the flexibility of reindustrialization and appears to fall outside the charter of the CAB in recommending property ownership by a specific entity.
2. DOE begins investigating means to modify security access to non-USEC leased area, allowing the reindustrialization process to move forward.
   - PACRO supports #2.
3. DOE begin consultation with PACRO, GPEDC, and other involved parties to inventory and investigate buildings and facilities to determine reindustrialization potential value.
   - PACRO supports the development of a Master Plan for the site, that includes the above CAB recommendation.

4. DOE decontaminate the buildings, facilities, and surrounding grounds (scheduled for reuse) to the highest level necessary, allowing this community every opportunity to obtain non-nuclear tenants for the site.
   - PACRO will support only after the publication of a Master Plan for the site.
5. DOE begin physical rehabilitation for infrastructure facilities identified as having potential for the reindustrialization process.
   - PACRO will support only after the publication of the Master Plan.
6. DOE thoroughly characterize any contamination remaining at the site and adjoining property, after all environmental remediation activities are complete. This will allow the issuance of state and federal "covenant not to sue", or an equivalent document, for future tenants and property owners.
   - PACRO supports protection for new property owners, such as found in"10 CFR770" and the current case law, as well as, any further protection that can be agreed upon for example legislation similar to the Brownsfield legislation to hold future owners harmless.
7. DOE investigate all possible alternatives to the proposed Comprehensive Environmental Recovery, Compensation, and Liability Act waste disposal facility. Realizing the four gaseous diffusion process buildings have little, if any, potential for reindustrialization, an above-ground concrete encapsulation of final D&D waste, utilizing the footprints of these buildings, is more acceptable to this community and the results may lower long-term costs for both Environmental Management (EM) and Legacy Management (LM).
   - Qualified support of #7, the first issue is where is the best place to put this: a) outside the fence as you approach the fenced area (may never get the prospective client in to the site; or b) inside the fence in the recommended buildings, which has the potential to run the client off once he arrives.
     Secondly, the CAB recommendation goes beyond inside versus outside and is very specific about how to dispose of the waste, support implies support for inside over outside and the technique, PACRO does not have the technical expertise to support the technical solution , as well.
8. DOE plan and initiate removal of all burial grounds within the industrial area. The potential for contaminant migration in the air, soil, groundwater and surface water is greatly increased if the burial grounds remain. The unexcavated burial grounds will negatively impact future industrial options for the site.
   - Abstain from support of #8. After hearing both DOE and the CAB points on this issue, it appears that #8 if accepted over the objections of DOE will increase both money and time spent on clean up without necessarily impacting on reindustrialization. However, this is a technical issue that PACRO does not have the expertise to offer a recommendation on. If certain burial grounds were safely remediated in place, could the impact to potential reindustrialization, could be a show stopper, a limitation, minor inconvenience, etc. There maybe some variation on how DOE might be remediated in place in a manner that minimizes or eliminates impacts to reindustrialization.
9. DOE, within two years, resolve the issue of institutional controls, compensation, or "buy out" with the property owners affected by off-site groundwater contamination.

- Qualified support of #9 based on the outcome of a thorough Master Plan study of the property suggested for purchase. On Thursday night, one of the CAB members present stated she had seen a DOD President that would allow for PACRO or another entity to purchase the property outside the DOE property, but inside the water policy box. This needs to be fully discussed prior to full PACRO support. Additionally, the time frame of two years, based on the time it has taken the Park Authority to move appears too short.

10. DOE begin a public information/involvement process as soon as possible to educate the community on the transition from the Office of EM to the Office of LM, specifically addressing issues such as, but not limited to, long-term taxpayer costs (is the best financial decision for EM also the best financial decision for taxpayers throughout LM activities) LM monitoring of ht site, and if necessary, responding to new or migrating contaminants.
    - Unqualified support of #10. Since the cleanup agreements extend to the end of the next decade, there should be a strong justification for the urgency of getting legacy management involved so soon if DOE is to be influenced.
11. DOE remove sources and potential sources of off-site groundwater contamination.
    - Abstain, on #11, based on the lack of technical expertise. How does DOE remove a potential source?
12. DOE is encouraged to begin immediately working with the local communities to explore possibilities which address the three concerns listed above. The CAB offers the following as a means to begin achieving the common goal of this community:
    - ✓ Provide on-site facilities for environmental remediation/innovative technology companies.
    - ✓ Provide on-site facilities for the research being performed by the University of Kentucky for neptunium removal from nickel and use of converted depleted uranium. Upon success of this research, provided the necessary production facilities.
    - ✓ Explore the potential for the on-site development of Hazardous Material and Emergency Response Training Facility.
    - ✓ Explore the possibility of establishing an energy research technology park at the site.
    - PACRO supports all avenues to reindustrialization, not just the limited list supported by the CAB.

THIS PAGE INTENTIONALLY LEFT BLANK

ACT

(Active Citizens for Truth)
6715 Metropolis Lake Road
West Paducah, KY 42086

March 18, 2004

Mr. William Tanner, President
Citizens Advisory Board
131 Memorial Drive
Paducah, KY 42003

RE: CONSENSUS RECOMMENDATION: 04-07

Dear Mr. Tanner:

Active Citizens for Truth (ACT) applauds the efforts of the Paducah Gaseous Diffusion Plant (PGDP) Citizens Advisory Board (CAB) for their attempt to breach the gap that exists between the Department of Energy, Kentucky regulators, elected officials, as well as business and community interests. It is our hope that consensus recommendation **04-07**, entitled "End State Vision for the Paducah Gaseous Diffusion Plant Site," can become the inauguration of reconciliation between these varying interests. On March 18, 2004, ACT Members voted to endorse CAB recommendation **04-07**; as a first step in furthering a unified approach for solving the problems that exist at the Paducah Gaseous Diffusion Plant and its environs.

ACT members wish to make it known that this is not a blanket endorsement for everything that might evolve out of this proposal. Obviously, the very general nature of this recommendation necessitates continued consensus building as a more detailed view of the end state evolves. Further, it is our belief that the stated goal "to protect human health and the environment while preparing for a viable economic future for the Paducah site" is an illustrious destination worth pursuing. Re-industrialization using innovative technology for remediation has the potential to advance this goal. ACT does not and will not support re-industrialization efforts that include (but not limited to) environmental remediation companies using incineration technologies; treatment, storage, and disposal technologies; any other technologies that bring additional waste to the Paducah site for treatment and/or disposal. Specific to the achievement of the end state, ACT also finds that the encapsulation of on-site CERCLA waste is subjective to engineering design and practices, type of shielding material, containment and monitoring, and so forth.

And finally, while ACT continues to endorse a long-term Water Policy agreement, we are also seeking other solutions.

Saying this, ACT members grant their endorsement of Consensus Recommendation: **04-07**.

Sincerely,

Ruby English

Ruby English,
ACT Committee Chairperson

Attachment 4

FEBRUARY 16, APRIL 1, AND APRIL 22, 2004, *PADUCAH SUN* ARTICLES

THIS PAGE INTENTIONALLY LEFT BLANK

The Paducah Sun Online Edition

Monday, February 16, 2004;Paducah, Kentucky

"Vision" sought on future for Paducah plant

Public support is asked by a citizens' group for complete cleanup that will allow use of the factory for other purposes.

By **Joe Walker** jwalker@paducahsun.com--
270.575.8650

A citizens' group wants the Department of Energy to clean up the Paducah uranium enrichment plant to be fit for other use after it closes early next decade.

But a draft "vision" falls short of that goal and public support is needed to persuade federal bureaucrats not to leave the factory uninhabitable once most of its 1,300 workers are gone, the group says.

Among other things, the DOE plan assumes that massive groundwater contamination beneath the plant would be left for nature to clean up, rather than spend as much as $140 million trying to eliminate sources of the pollution.

"We don't believe that will get us to the point that the plant is safe for humans and the environment," said Bill Tanner, chairman of the plant citizens' advisory board. "We're also concerned that it wouldn't permit reindustrialization, so it would have a severe economic impact."

The issue gained greater significance last month when USEC Inc. announced that starting in 2010, it will replace the outdated plant with gas centrifuge technology in Piketon, Ohio. Closing the Paducah plant is expected to take several years after USEC gradually switches from one technology to the other.

DOE officials say the vision document is merely a tool that looks at hazards and health risks. They say it isn't binding and doesn't affect agreements such as one signed last fall with the state of Kentucky to accelerate cleanup. Mark York, spokesman for the Kentucky Environmental and Public Protection Cabinet, said the state will respond to the plan by Friday's deadline.

Comments received by Friday will be addressed at a 7 p.m. workshop on Feb. 26 at the DOE Information Center, 115 Memorial Drive. The department will take comments after that, but plans to submit a final document to Washington headquarters by March 30.

Seeking consensus, Tanner is talking with community leaders, plant neighbors, environmental groups and others. He will meet Wednesday with the executive committee of the Paducah Area Community Reuse Organization, which is promoting other industrial uses for the plant. The citizens' board will discuss the plan again Thursday at its monthly meeting in the same building as the information center.

"We're trying to get their input, but more importantly we're asking these groups to provide a letter of endorsement," Tanner said. "We have to start somewhere, and if we're able to provide headquarters with more unified voice, we'll get more attention."

Tanner said the board recommends that:

Work start immediately with DOE, PACRO and the Greater Paducah Economic Development Council to determine which plant buildings have potential for other industrial use. They should not be torn down but cleaned up enough to be safe for new occupants.

Governmental laws be checked so that new tenants aren't liable for past contamination. Brownfield regulations exclude superfund sites such as the Paducah plant, but DOE regulations do indemnify certain companies that use government property.

DOE establish long-term agreements to provide free municipal water to 121 customers — mostly homes and some businesses — in return for not using wells that are or could become contaminated. Agreements are now for five years, said Tanner, superintendent of West McCracken Water District. "They need to remove that doubt and make it permanent,"

Currently, DOE spends $70,000 to $100,000 a year providing city water. The plan calls for continuing that practice, but also taking other measures ranging from putting enforceable restrictions on groundwater use to acquiring property rights.

Tanner said there is no technology to clean up the groundwater, but the board wants to be sure that "we've done all we can do" scientifically before the water is left to nature. Regulators insist on source cleanup, but even so, it will take hundreds of years to make the aquifer reach drinking water standards, DOE says. Without cleanup, it could take thousands of years.

Director John Anderson said a chief PACRO concern is the condition of buildings and other resources that make the plant marketable. Among other things, the group wants to clean and recycle contaminated nickel, but there is a national safety ban by DOE on putting scrap metal at its plants into commercial use.

"The concern we have is that we work through this as a community," Anderson said. "I don't think it needs to be just the advisory board and PACRO. The whole community and DOE have roles to play."

PACRO faces extinction because of Energy

Department cutbacks. Tanner said his board is concerned and may recommend other means to keep PACRO alive to help market the plant.

Last August, seven of the board's 18 members quit, claiming DOE was hiding information about conditions at the plant and rejecting board recommendations. One was former chairman Mark Donham, who continues to attend meetings.

Donham said he is worried about many "variances" in the new end-use plan compared with an older one, such as not cleaning up sources of groundwater pollution and not digging up uranium burial grounds. He said $1 billion has been spent so far with little to show for cleanup.

"This should be of great concern to Paducah," he said, "because there is going to be no reindustrialization of that site with a contaminated groundwater plume under it and uranium still buried there."

The draft is available on the Web at www.bechteljacobs.com/pad_reports.shtml or at the DOE Environmental Information Center, 115 Memorial Drive, 554-3004. Office hours are 9 a.m. to 5 p.m. weekdays.

Healthcare Questions? Ask Housecall

The Paducah Sun Online Edition

News Sports Classified Obituaries

Thursday, April 01, 2004;Paducah, Kentucky

Reader Options

Front Page
News
Sports
Weather
Obituaries
Editorials
Classifieds
Archives

Business
Region
Life & Leisure
Religion
Home & Garden
Outdoors
Entertainment
Weddings, Engagements & Anniversaries
eXtra!
Snitch

Unlikely DOE cleanup at plant

The Bush administration tells the local Citizens Advisory Board is told the site will have no use besides hazardous waste storage.

By **Joe Walker** jwalker@paducahsun.com-- *270.575.8650*

The Department of Energy seems uninterested in cleaning up its Paducah nuclear fuel plant enough to attract other industrial users after the factory closes early next decade.

That's the view of Bill Tanner, chairman of the plant Citizens Advisory Board, which sent 12 recommendations Tuesday to DOE officials in Washington. The group wants the department to clean up the plant sufficiently to protect the public and preserve jobs after operator USEC Inc. replaces it with a new gas centrifuge plant in Piketon, Ohio, around 2010.

"I'm afraid the Paducah site will never be usable for anything else," Tanner said. "I think it will basically end up being just a dedicated hazardous waste site."

Tanner said his concern stems from working with DOE officials in recent months as the board compiled the recommendations. DOE has taken a much more conservative approach to the cleanup during the Bush administration, he said.

Tanner cited a recent speech in which Jessie Roberson, DOE assistant secretary for environmental management, said cleanup would be achieved based on the health risk that contamination poses. "I think that's the handwriting on the wall," he said.

A DOE draft "vision" document assumes that massive groundwater contamination beneath the Paducah plant would be left for nature to clean up, rather than spend as much as $140 million trying to eliminate sources of the pollution. The board wants DOE to clean up the sources and eliminate all burial grounds to prevent pollution from migrating.

The recommendations were accompanied by support letters from the Paducah Area Community Reuse Organization, a DOE-funded economic development group, and from the Active Citizens for Truth, a plant neighbor group. Tanner said he hopes to secure similar letters from other local organizations this month. Various community leaders have said it is critical that the 1,300-worker plant be cleaned up enough to have an industrial life after it closes.

Other recommendations:

Clean up the plant for further industrial use and continued recreational use of the wildlife management land around the plant.

Characterize any post-closure contamination with the idea of eliminating liability for future industrial users.

Move "reindustrialization" forward by making parts of the plant more accessible, decontaminating buildings, improving infrastructure, and talking with PACRO and other groups about the value and reuse potential of plant assets.

Rather than building a controversial landfill, consider using the plant's four huge process buildings (the two largest ones cover 26 acres) to store hazardous waste sealed in concrete. The buildings have little value for future industrial use.

Within two years, establish permanent agreements with 121 homes and businesses that now receive free municipal water because of real or threatened groundwater contamination, or "buy out" owners of contaminated property.

As soon as possible, educate the community on issues such as the long-term taxpayer costs of dealing with environmental problems after the plant closes.

Provide plant facilities for companies dealing with cleanup technology and for University of Kentucky research to clean up and recycle plant waste, such as nickel and depleted uranium. Explore plant development of hazardous material and emergency response training facilities, and an energy research technology park.

Building a consensus for the recommendations has shown how little people really know about plant cleanup, Tanner said. "They think DOE is cleaning it up, and when it's done, the plant will be clean, which isn't necessarily the case."

The Paducah Sun Online Edition

News Sports Classified Obituaries

Reader Options

Thursday, April 22, 2004;Paducah, Kentucky

Front Page
News
Sports
Weather
Obituaries
Editorials
Classifieds
Archives

Business
Region
Life & Leisure
Religion
Home & Garden
Outdoors
Entertainment
Weddings, Engagements & Anniversaries
eXtra!
Snitch

Money sought by PACRO to buy land

The group hopes to use $15 million to purchase land around the plant.

By **Joe Walker** jwalker@paducahsun.com--
270.575.8650

An economic development group is seeking nearly $18 million from Congress to help develop a regional industrial park and find new uses for the Paducah nuclear fuel plant after it closes early next decade.

Of the request, $15 million would be used to buy neighboring private land that either is contaminated or threatened by groundwater pollution. Land purchases may be 10 to 15 years away, assuming the money is granted, a study is done saying the property would be best used industrially and land owners agree to sell, said John Anderson, director of the Purchase Area Community Reuse Organization.

"This isn't something that will happen right away. A lot of things have to fall into place to make this possible," he said. "Some people will favor it; some will oppose it."

Although they are interested, members of the Kentucky delegation are taking a "wait-and-see" approach because of federal budgetary problems, Anderson said. PACRO itself could become defunct unless Congress steps in. The Department of Energy no longer plans to fund the group, established in 1997 to offset nuclear plant job losses.

At Wednesday's executive committee meeting, Anderson said the money is being sought in three phases over several years:

$500,000 for an initial nuclear plant master plan, $586,800 to market the Purchase Area Regional Industrial Park in northern Graves County and $995,000 to run gas lines from Mayfield to the regional park.

$500,000 for tests to determine if contaminated scrap nickel at the plant can be sufficiently cleaned for commercial reuse. PACRO hopes to create jobs through recycling 9,700 tons of nickel, whose value has been estimated at $8 million to $10 million.

$15 million to buy land around the nuclear plant that homeowners and business owners say is devalued. Portions of the money would come annually from the plant cleanup budget, perhaps over 10 to 15 years. The plan would save the government about $100 million of the more than $1 billion cost of trying to clean up the massive groundwater contamination, which stretches from the plant to the Ohio River.

PACRO would buy the land and resell it to one or more industrial firms, assuming an independent study shows the idea is preferable and in the best interest of the community. The study of private-land use would be part of a second master plan. The first would deal with industrial use of the plant and adjacent government land after the plant closes.

DOE officials "don't oppose" buying private land as long as the department doesn't own the property, Anderson said. The plan has tentative support of the plant's citizens' advisory board, which includes some plant neighbors.

Plant board Chairman Bill Tanner has expressed serious doubt that DOE will clean up the plant for continued industrial use. In late March, the board gave the agency 12 recommendations to clean up the plant sufficiently to protect the public and preserve jobs after operator USEC Inc. replaces it with a new gas centrifuge plant in Piketon, Ohio, around 2010.

Within two years, the board wants the Energy Department to establish permanent agreements with 121 homes and businesses that now receive free municipal water because of real or threatened groundwater contamination, or "buy out" owners of contaminated property. If all goes well, purchase offers would someday be made to those with free water, Anderson said.

"We don't want condemnation proceedings, and the congressional delegation doesn't want condemnation proceedings," he said. "If people don't want to sell their property at a reasonable price, then they should be allowed to keep it as long as they want."

Attachment 5

FEBRUARY 26, 2004, WORKSHOP MATERIALS

THIS PAGE INTENTIONALLY LEFT BLANK

U.S. Department of Energy
RISK-BASED END STATE
PUBLIC WORKSHOP

DOE will host a public workshop Thursday, February 26, 2004 at 7:00 p.m. to discuss the Draft Risk-Based End State Vision document for the Paducah Gaseous Diffusion Plant. The document is an analytical tool to assure environmental cleanup efforts are consistent with the site's future use planning. The workshop is an opportunity to discuss details of the document and provide an exchange of information to aid in the comment process.

The draft is available at *www.bechteljacobs.com/pad_reports.shtml* or the Environmental Information Center, 115 Memorial Dr., Paducah, KY.

For more information, call (270) 441-6819.

7:00 p.m. - Thursday, February 26, 2004
Environmental Information Center
115 Memorial Drive, Paducah, KY

THIS PAGE INTENTIONALLY LEFT BLANK

Common Points Raised by Stakeholder Comments for Groundwater Operable Unit

1. The Water Policy (in its current form or in some other form) needs to be made permanent.
2. There needs to be an attempt to clean up the groundwater and its sources of contamination before using natural attenuation only.
3. Without cleanup, including source actions, the plume will continue to spread and eventually extend beyond the Water Policy box.
4. Burial ground sources of groundwater contamination should not simply be capped.

Common Points Raised by Stakeholder Comments for Surface Water Operable Unit

1. Addressing hot spots inside the fence using cleanup goals set at a target risk of E-04 for the industrial worker and PCBs at 25 ppm will not adequately address risks.
2. Addressing hot spots outside the fence using cleanup goals set at a target risk of E-04 for the recreational user and PCBs at 1 ppm will not adequately address risks.
3. Sediment control basins may be necessary if cleanup does not prevent contaminant migration.
4. The report needs to better consider risks from consumption of contaminated animals.

Common Points Raised by Stakeholder Comments for Burial Grounds Operable Unit

1. Current characterization of the burial grounds is inadequate to allow capping to be used as the only remedy. Capping will not work because the burial grounds are not lined, and some parts of them are below the shallow water table.
2. Capping is being considered to reduce cost only.

Common Points Raised by Stakeholder Comments for Surface Soils Operable Unit

1. Addressing hot spots inside the fence using cleanup goals set at a target risk of E-04 for the industrial worker and PCBs at 25 ppm will not adequately address risks.

General Points Raised by Stakeholder Comments

1. Bioremediation needs to be considered for plume remediation.
2. Document contains some omissions and errors (e.g., the “P-Landfill” not discussed, figure legend incorrect).
3. A more detailed study of the CERCLA Cell, including alternative storage facilities, is appropriate.
4. Land use map (i.e. recreational use outside the fence) is inconsistent with McCracken County zoning.

HAZARD AREA 1
GROUNDWATER OPERABLE UNIT

Current Planned End State	Risk-Based End State
Access and excavation restrictions	Same
PGDP Water Policy	Enhanced institutional controls
Source reduction and removal (e.g., C-400 TCE) with monitored natural attenuation	Monitored natural attenuation
Excavate burial grounds (e.g., SWMU 4)	Cap burial grounds
Active contaminant reduction in dissolved phase plume with monitored natural attenuation	Monitored natural attenuation

- Risk after completion is the same for either scenario because exposure to contaminated groundwater is prevented.
- Enhanced institutional controls are more sustainable.
- RBES Takes Longer to Attain Maximum Contaminant Level (MCLs).
- Risks to remediation and site workers greater under the CPES because contact with contaminated materials is possible during source reduction and execution.
- Monitored natural attenuation required under both scenarios.
- Contaminants above MCLs would remain after TCE is removed as part of source reduction and removal actions.

HAZARD AREA 2
SURFACE WATER OPERABLE UNIT

Current Planned End State	**Risk-Based End State**
Access restrictions	Same
Environmental Monitoring	Same
Inside the fence soils and sediment excavation (residential scenario; 1E-06; PCBs at 1 ppm)	Inside the fence soils and sediment excavation (industrial scenario; 1E-04; PCBs at 25 ppm)
Outside the fence soils and sediment excavation (residential scenario; 1E-06; PCBs at 1 ppm)	Outside the fence soils and sediment excavation (recreational scenario; 1E-04; PCBs at 1 ppm)
Scrap removal	Same
Migration controls (sediment control basins)	Removal of “hot spots” in soil and sediment

- Risks differ but residual risks are within or below EPA risk range for site-related exposure (E-06 to E-04) under either scenario.
- RBES PCB cleanup levels consistent with Toxic Substance Control Act (TSCA) for industrial and recreational areas, as appropriate.
- Under RBES an ecological risk assessment will be conducted to demonstrate protectiveness (Comprehensive Site Operable Unit)

HAZARD AREA 3
BURIAL GROUNDS OPERABLE UNIT (GROUP 1)

Current Planned End State	Risk-Based End State
Access and excavation restrictions	Same
Excavate burial grounds	Cap burial grounds

HAZARD AREA 6
BURIAL GROUNDS OPERABLE UNIT (GROUP 2)

Current Planned End State	Risk-Based End State
Current land cover	Same
Access and excavation restrictions	Same
PGDP Water Policy	Enhanced institutional controls
Cap and monitor	Same

- Risk after completion is the same for either scenario because exposure to contaminated materials is prevented.
- Enhanced institutional controls are more sustainable.
- Risks to remediation and site workers greater under the CPES because contact with contaminated materials is possible during source reduction and execution.
- Under RBES (Group 1), no transportation risk because no offsite disposal.

HAZARD AREA 4
SURFACE SOILS OPERABLE UNIT

Current Planned End State	**Risk-Based End State**
Access and excavation restrictions	Same
Inside the fence soils and sediment excavation (residential scenario; 1E-06; PCBs at 1 ppm)	Inside the fence soils and sediment excavation (industrial scenario; 1E-04; PCBs at 25 ppm)

- Risks differ but residual risks are within or below EPA risk range for site-related exposure (E-06 to E-04) under either scenario.
- RBES PCB cleanup levels consistent with Toxic Substance Control Act (TSCA) for industrial areas.

THIS PAGE INTENTIONALLY LEFT BLANK

COMMENTS FROM THE PGDP RBES PUBLIC WORKSHOP
February 26, 2004

The following are comments made at the PGDP RBES Public Workshop that were recorded by Richard Bonczek, the primary author of the PGDP RBES Vision and Variance Report. These comments and other questions were discussed during the workshop and, in some instances, the RBES Vision and Variance Report was modified in response to these comments. Even though changes to the report were not appropriate or necessary for some comments, all comments received during the workshop are included in this summary to ensure that these comments are available for current and future consideration. An audio recording of the workshop is available by contacting Greg Cook of the BJC Public Affairs office.

1) Charlie Quinton - Is the USGS[1] involved in the preparation of the document? They may have data that would be useful (i.e., seismic information).
2) KYDEP[2] – The state will have comments on the PGDP RBES. Their comments are in review right now and should show up soon.
3) KDFWR[3] – Current enhanced institutional control discussion needs to be reviewed and improved.
4) KDFWR – Are the enhanced institutional controls proposed consistent with future use of some areas as wetland habitat?
5) Bill Tanner – Will the enhanced institutional controls result in moving the current PGDP Water Policy box? Will the west boundary of the box be moved closer to the PGDP and the east boundary be moved further from the PGDP?
6) KDFWR – Ecological risk discussions need to be added to the document.
7) KDFWR – It is not clear how DOE can clean to ecological standards when an ecological risk assessment has not been performed.
8) Bill Tanner – The uncertainty in the future water balance at the site due to enrichment plant shutdown needs to be discussed.
9) Vicki Jurka – It is possible that the concentration of TCE[4] in groundwater will go up in the future when the enrichment plant shuts down. This needs to be discussed.
10) Vicki Jurka – The document needs to consider how future industrial releases from other (new) processes may affect DNAPL[5] releases in the future. This interaction may limit future use of the site.
11) Bill Tanner – The guidance used to prepare the current draft of the document differs from that discussed with the CAB[6] in September 2003. This change in guidance should have been more widely discussed.
12) Vicki Jurka – Changes in the state of materials disposed of in the landfill as they age needs to be discussed. Will the migration potential of these materials change over time? (Bill Tanner also asked second question.)
13) KYDEP – Generally, the current planned end state presented in the report is inconsistent with the state's current cleanup plan. Specifically, the state's cleanup goal for PCBs in sediment is 0.1 ppm and not 1 ppm as presented in the report. The 0.1 ppm value is taken from the Rockwell court case decision.

---

[1] USGS = United States Geological Survey
[2] KYDEP = Comment made by representative from the Commonwealth of Kentucky Department of Environmental Protection
[3] KDFWR = Comment made by representative from the Commonwealth of Kentucky Department of Fish and Wildlife Resources.
[4] TCE = Trichloroethene; the primary groundwater contaminant at the PGDP.
[5] DNAPL = Dense non-aqueous phase liquids; TCE is a DNAPL.
[6] CAB = PGDP Citizens' Advisory Board

THIS PAGE INTENTIONALLY LEFT BLANK

Attachment 6

MARCH 11, 2004, WORKSHOP MATERIALS

THIS PAGE INTENTIONALLY LEFT BLANK

U.S. Department of Energy
RISK-BASED END STATE PUBLIC WORKSHOP

DOE will host a second public workshop Thursday, March 11, 2004 at 7:00 p.m. to discuss the Draft Risk-Based End State Vision document for the Paducah Gaseous Diffusion Plant. The document is an analytical tool to assure environmental cleanup efforts are consistent with the site's future use planning. The workshop is an opportunity to discuss details of the document and provide an exchange of information to aid in the comment process.

The draft is available at *www.bechteljacobs.com/pad_reports.shtml* or the Environmental Information Center, 115 Memorial Dr., Paducah, KY.

For more information, call (270) 441-6819.

7:00 p.m. - Thursday, March 11, 2004
Environmental Information Center
115 Memorial Drive, Paducah, KY

THIS PAGE INTENTIONALLY LEFT BLANK

Public Participation Summary

- CAB presentation – January 15
- Draft document completed – January 31
- Placed in EIC - February 2
- Posted document to Web site - February 3
- Public Meeting – February 5
- CAB discussion at board meeting – February 19
- First Stakeholder Workshop – February 26
- Radio Call-In Show – March 1
- Second Stakeholder Workshop – March 11
- CAB discussion at board meeting – March 18
- Comments by March 18 will be included in the March 30 submission to HQ
- Comments after March 18 will be forwarded to HQ

Current Status

- Received DOE HQ comments – March 5
- Discussed comments with HQ – March 9
- Initiated document revision – March 10
- Revised document due to HQ – March 30

Anticipated Document Revision

1. Add public participation appendix
2. Add additional schedule and cost information
3. Incorporate various editorial changes
4. Add discussion clarifying enhanced institutional controls
5. Discuss the chance that actions like capping landfills -- used to achieve the CPES and the RBES --might fail
6. Add discussion of plume migration, including projected contaminant reduction over time and effect of potential changes in water balance on future plume state

Anticipated Document Revision (cont'd.)

- Add discussion of seismic factors affecting permitted landfills
- Expand ecological risk discussions for hazard areas
- Increase discussion of radiological risk
- Clarify options for D&D for PGDP
- Enhance recommendations in the variance table

Examples of Changes to Recommendations

Enhanced Institutional Controls

Original RBES:

- "Initiate further discussions with the public and regulators."

Expected changes:

- Initiate further discussion with the public:
  - to determine acceptability of acquisition of property rights ranging from permanent restrictions to property purchase.
- Initiate further discussion with regulators:
  - to discuss willingness to consider enhanced institutional controls in conjunction with monitored natural attenuation in lieu of source and plume actions.
  - to discuss willingness to consider establishing points of compliance and exposure at the property boundary based on enhanced institutional controls and monitoring.

Examples of Changes to Recommendations

Enhanced Institutional Controls (cont'd.)

- Revisit DOE policy concerning acquisition of property rights (ranging from property easements and use restrictions to property purchase).

Examples of Changes to Recommendations

Risk Scenarios

Original RBES:

- "Initiate further discussions with the public and regulators."

Expected changes:

- Initiate further discussion with regulators:
  - to seek agreement that cleanup standards for proposed actions will be set based upon current and future land use for the area in question.
  - to gain agreement that cleanup standards for proposed actions will be set based on CERCLA risk range (10^{-6} to 10^{-4})

Examples of Changes to Recommendations

PCBs

Original RBES:

- "Initiate further discussions with the public and regulators."

Expected changes:

- Initiate discussion with regulators to seek agreement that national TSCA cleanup standards for low occupancy (e.g., industrial), areas (25 ppm) should be adopted for industrial areas and that national TSCA standards for high occupancy (e.g., residential) areas (1 ppm) should be adopted for recreational areas.

Path Forward/Schedule

- Continue to collect additional public comments
- Continue document revision and review
- Document delivered to DOE HQ – March 30

THIS PAGE INTENTIONALLY LEFT BLANK

COMMENTS FROM THE PGDP RBES PUBLIC WORKSHOP
March 11, 2004

The following are comments made at the PGDP RBES Public Workshop that were recorded by Richard Bonczek, the primary author of the PGDP RBES Vision and Variance Report. These comments and other questions were discussed during the workshop and, in some instances, the RBES Vision and Variance Report was modified in response to these comments. Even though changes to the report were not appropriate or necessary for some comments, all comments received during the workshop are included in this summary to ensure that these comments are available for current and future consideration. An audio recording of the workshop is available by contacting Greg Cook of the BJC Public Affairs office.

1) Bill Tanner (and others) – Stated that DOE needs to provide a more comprehensive path forward for what will occur after the final RBES is delivered on March 30, 2004.
2) Bill Tanner – Questioned if the public participation appendix being prepared for the revised RBES will be available at the March 18, 2004 CAB[1] meeting.
3) Vicky Jurka – Questioned how DOE can justify purchasing property as part of enhanced institutional controls if property is not contaminated. If property is purchased, then all property owners need to be treated equally.
4) Ruby English – Questioned how DOE would compensate property owners if deed restrictions become part of the enhanced institutional controls. Recommended that DOE hold a series of meetings explaining the reason for and methods to be used to implement institutional controls.
5) Vicky Jurka – Stated that the CAB has produced and distributed letter asking property owners about their feelings concerning property purchase.
6) Bill Tanner – Stated that the CAB started working on recommendations concerning property purchase 2 years ago. CAB will revisit again soon and would like to see final resolution of issue within 2 years.
7) Vicky Jurka – Stated that other DOE locations have used an entity like PACRO[2] when purchasing property.
8) Vicky Jurka – Reiterated her belief that the RBES process is being used to avoid real clean-up. Also, noted that if groundwater sources are not cleaned up, then the McNairy Formation will be impacted. (Concerns about the McNairy Formation and contamination were also voiced by John Turner.)
9) John Anderson – Requested that DOE provide information regarding property purchase at other DOE facilities.
10) KDFWR[3] – Requested that the discussion of ecological risk in the RBES include ecological cleanup levels.
11) John Tanner – Stated that the CAB will be providing a series of end state recommendations at next week's CAB meeting.
12) John Anderson (PACRO) – Provided a memorandum entitled "Paducah End State Vision" and led discussion of this memorandum.
13) Vicki Jurka – Would like to see additional discussion of risks at C-746-U Landfill in the RBES. Concerned that DOE is concentrating waste streams by using the landfill.
14) Ruby English – Stated that the report needs more information about the contaminant plumes and their migration.
15) KDFWR – Stated (with agreement with others) that DOE's presentation of the RBES process and the document contents needs to be simpler. DOE used too much jargon in the presentation.

---

[1] CAB – Citizen's Advisory Board
[2] PACRO – Paducah Area Community Reuse Organization
[3] KDFWR – Kentucky Department of Fish and Wildlife Resoures

THIS PAGE INTENTIONALLY LEFT BLANK

Attachment 7

CAB END STATE VISION FOR THE PADUCAH GASEOUS DIFFUSION PLANT

THIS PAGE INTENTIONALLY LEFT BLANK

PADUCAH GASEOUS DIFFUSION PLANT
CITIZENS ADVISORY BOARD

111 Memorial Drive • Paducah, Kentucky 42001 • (270) 554-3004 • PaducahCAB@bellsouth.net • www.oakridge.doe.gov/pgdpssab

March 30, 2004

Mr. William E. Murphie
U.S. Department of Energy
Portsmouth/Paducah Project Office
1017 Majestic Drive
Suite 200
Lexington, KY 40513

Subject: Paducah Gaseous Diffusion Plant (PGDP) Citizens Advisory Board (CAB) Consensus Recommendation 04-07

Dear Mr. Murphie:

On behalf of the PGDP CAB, I am pleased to forward you the following recommendation adopted by consensus at the March 18, 2004 Board meeting:

Recommendation 04-07, which states the CAB's End State Vision for the PGDP.

The recommendation contains 12 different items we believe are crucial to the development of an end state vision that protects human health and the environment, while preparing for a viable economic future for the Paducah site.

Based on the significance of this issue to the entire community, we request very detailed responses to our concerns addressed in the enclosed recommendation. The Paducah CAB has invested considerable amounts of time developing this recommendation and expects the Department of Energy's (DOE's) response to reflect that level of effort so that we may clearly understand how each of the items will be incorporated into DOE's actions.

Recognizing that DOE requires sufficient time to respond accordingly, the Paducah CAB respectfully requests a response by October 1, 2004, at the beginning of Fiscal Year 2005. If you have any questions or require further information, please contact me at (270-442-3337) or the Board office (270-554-3004).

Sincerely,

Bill Tanner
Chair

BT:kp
LTR-PAD/CAB-LL-04-0027

Enclosure: Recommendation 04-07

Distribution:

c: J. Anderson, PACRO
G. Bazzell, DOE-PAD
J. Bierer, Fernald CAB
J. Brannon, NNM CAB
Senator Jim Bunning
W. L. Davis, KDFW/Frankfort
D. W. Dollins, DOE-PAD
Senator Richard Durbin
R. English, ACT
Senator Peter Fitzgerald
P. Foley, PACE
T. C. Freeman, Bunning Field Representative
R. D. George, BJC/Kevil
Representative Charles Geveden
V. Holm, Rocky Flats CAB
S. Kay, Roberts and Kay/Lexington
P. L. Link, BJC/Kevil
Senator Bob Leeper
Senator Mitch McConnell
T. Martin, Hanford Advisory Board
D. Mast, Whitfield Field Representative
D. Mosby, ORSSAB
McCracken County Judge Executive Danny Orazine
Mayor Bill Paxton
PGDP CAB Members
C. Phillips, NTS CAB
Representative Frank Rashe
E. Scott, RCB/Frankfort
Congressman John Shimkus
E. Spalding, Paducah Chamber of Commerce
T. Taylor, KDWM/Frankfort
J. Thomas, Ballard Chamber of Commerce
T. Thomas, McConnell Field Representative
G. E. VanSickle, BJC/Kevil
S. Waisley, DOE-HQ
W. Waters, SRS CAB
Congressman Ed Whitfield
D. Williams, EPA/Atlanta
P. W. Willison, BJC/Oak Ridge
M. Wilson, INEEL CAB
File-EMEF-DMC-PAD-RC

111 Memorial Drive • Paducah, Kentucky 42001 • (270) 554-3004 • PaducahCAB@bellsouth.net • www.oakridge.doe.gov/pgdpssab

Consensus Recommendation: 04-07

Title: <u>End State Vision for the Paducah Gaseous Diffusion Plant Site</u>

Background:

In November 2002, the Paducah Gaseous Diffusion Plant (PGDP) Citizens Advisory Board (CAB) requested that the U.S. Department of Energy (DOE) provide a list of topics for the CAB to work from in developing recommendations. In DOE's response, the CAB was asked to focus on long term stewardship, specifically the CAB's End State Vision for the PGDP site.

In June 2003, the Long-Range Strategy/Stewardship task force began the process of obtaining input from the community for an End State Vision. The first meeting was attended by representatives of the CAB, DOE, the Kentucky Department of Waste Management, the West Kentucky Wildlife Management Area (WKWMA), the Greater Paducah Economic Development Council (GPEDC), the Paducah Area Community Reuse Organization (PACRO), Active Citizens for Truth (ACT), and the Coalition for Health Concerns. Also present were the McCracken Judge Executive, the Mayor of Paducah, the Paducah City Manager, and members of the public. In more recent meetings, the Board has also discussed this recommendation with the McCracken County Administrator.

Following development of the End State recommendation in draft form, presentations were made to various groups and organizations to obtain comments and suggestions on specific points contained within the recommendation. This information was presented to the PACRO Finance and Executive Committee, the Ballard County Chamber of Commerce, the Paducah Chamber of Commerce, ACT, and to the Paper, Allied-Industrial, Chemical, and Energy Workers Local 5-550. Comments received from these meetings that were applicable have been incorporated into this recommendation. Throughout the eight-month process, the CAB's objective has been to include and represent the community in this matter.

Current Status:

To develop an End State Vision, certain facts concerning the current situation of the PGDP site must be considered. The United States Enrichment Corporation (USEC) leases the uranium enrichment facilities from DOE. While USEC has announced plans to build and operate a centrifuge facility in Ohio, replacing the older Paducah operation, there remains a possibility that use of the Paducah site could continue beyond 2010. Additionally, DOE has yet to announce if the Paducah site will transition immediately into Decontamination and Decommissioning (D&D) upon USEC's departure from the site, or if the site will be placed on standby while determining national energy needs.

Another event, redefining Paducah's future, is the construction of a Depleted Uranium Hexafluoride (DUF_6) Conversion Facility. Operation is scheduled to continue until 2030 or beyond and is viewed by the CAB as the first step in reindustrialization of the Paducah site. The progress by DOE in areas such as the North-South Diversion Ditch, the DUF_6 Conversion Facility, Six-Phase Heating Technology, Scrap Metal Removal, and the characterization and disposition of the DOE Material Storage Areas is considered a major step forward in developing a safe, reusable site.

The uncertainty of the future of the gaseous diffusion process coupled with reindustrialization (DUF_6), which has already begun, do in fact help define the End State Vision of this CAB. It is, however, the belief of this CAB that decisions made today regarding the end state of the PGDP will provide guidance for future generations as they implement and update this End State Vision.

Concern:

As the CAB worked toward its End State Vision, three items emerged as primary concerns:

- Environmental remediation as currently planned may not be sufficient to fully protect human health and the environment in the future without the possibility of reoccurring issues.
- Environmental remediation as currently planned may not be sufficient to allow the Paducah community every opportunity in reindustrializing the site, and thereby protecting and building upon the economic impact this site has on the region.
- If this community waited until USEC ceased operations and environmental remediation was completed before acting on its end state vision, many years that could have been productively used for reindustrialization planning and development would be lost.

Goal:

The three concerns stated above share a common and single solution; the level of environmental remediation must be sufficient to allow this community control of its future. Therefore, the goal of the Paducah CAB's End State Vision is as follows:

> *To protect human health and the environment while preparing for a viable economic future for the Paducah site.*

Recommendation:

To achieve the goal of the CAB's End State Vision, the following recommendations are submitted:

1. **DOE is encouraged to structure environmental remediation activities to allow continued nuclear and non-nuclear industrial use of the existing industrialized area and to continue recreation/wildlife use of those areas presently leased to the WKWMA.**
2. **DOE begin investigating means to modify security access to non-USEC leased areas, allowing the reindustrialization process to move forward.**
3. **DOE begin consultation with PACRO, GPEDC, and other involved parties to inventory and investigate buildings and facilities to determine potential reindustrialization value.**
4. **DOE decontaminate the buildings, facilities, and surrounding grounds (scheduled for reuse) to the level necessary to allow this community every opportunity to obtain non-nuclear tenants for the site.**
5. **DOE begin physical rehabilitation of infrastructure facilities identified as having potential for the reindustrialization process.**
6. **DOE thoroughly characterize any contamination remaining at the site and adjoining property, after all environmental remediation activities are complete. This will allow the issuance of state**

and federal "covenant not to sue", or an equivalent document, for future tenants and property owners.

7. **DOE should investigate all possible alternatives to the proposed Comprehensive Environmental Recovery, Compensation, and Liability Act (CERCLA) waste disposal facility. There are four gaseous diffusion process buildings that have little, if any, potential for reindustrialization. The footprints of these buildings could be used for an above-ground concrete encapsulation of final D&D waste. This option is more acceptable to the community and may lower long-term costs for both Environmental Management (EM) and Legacy Management (LM).**
8. **DOE plan and initiate removal of all burial grounds within the industrial area. The potential for contaminant migration in the air, soil, groundwater and surface water is greatly increased if the burial grounds remain. The unexcavated burial grounds will negatively impact future industrial options for the site.**
9. **DOE, within two years, resolve the issue of institutional controls, compensation, or "buy out" with the property owners affected by off-site groundwater contamination.**
10. **DOE begin a public information/involvement process as soon as possible to educate the community on the transition from the Office of EM to the Office of LM, specifically addressing issues such as, but not limited to, long-term taxpayer costs (is the best financial decision for EM also the best financial decision for taxpayers throughout LM activities) LM monitoring of the site, and, if necessary, responding to new or migrating contaminants.**
11. **DOE remove sources and potential sources of off-site groundwater contamination.**
12. **DOE is encouraged to begin immediately working with the local communities to explore possibilities which address the three concerns listed above. The CAB offers the following as a means to begin achieving the common goal of this community:**
    - **Provide on-site facilities for environmental remediation/innovative technology companies.**
    - **Provide on-site facilities for the research being performed by the University of Kentucky for neptunium removal from nickel and use of converted depleted uranium. Upon success of this research, provide the necessary production facilities.**
    - **Explore the potential for the on-site development of Hazardous Material and Emergency Response Training facilities.**
    - **Explore the possibility of establishing an energy research technology park at the site.**

Approved by Consensus March 18, 2004

THIS PAGE INTENTIONALLY LEFT BLANK

Attachment 8

QUESTIONS FROM CAB BGOU TASK FORCE ON RBES AND RESPONSE

THIS PAGE INTENTIONALLY LEFT BLANK

From: Morgan, John Wesley (J31) [morganjw@bechteljacobs.org]
Sent: Wednesday, May 12, 2004 9:31 AM
To: Payne, Kendra Lillian (KP6)
Cc: Link, Patricia Lynn (LL1); Cook, Gregory N (7GC)
Subject: FW: RBES/BGOU questions for the CAB

Response to CAB Waste Task For...

Kendra

Attached in the file below is a response to the BGOU Task Force question regarding the RBES.

John

> -----Original Message-----
> From: Payne, Kendra Lillian (KP6)
> Sent: Friday, April 30, 2004 10:17 AM
> To: Morgan, John Wesley (J31)
> Subject: RBES/BGOU questions for the CAB
>
> The Waste task force is seeking clarification on the BGOU as it related to RBES. The outstanding question they have is why is the BGOU split into two groups in the RBES document. Group 1 includes SWMUs 3, 6 and 145. The current end state is to excavate and the RBES is to cap. Group 2 includes SWMUs 5, 7, 8, and 30 and states the current end state is continuation of Water Policy and the RBES is institutional controls. It appears that group 2 is tied in with groundwater, however, SWMUs 2 and 4 under RBES are not included in the BGOU but the GWOU. Also, there is no mention in RBES of the excavation/capping plans for the SWMUs in group 2. Naturally, this information has confused the task force members. Any clarification you could provide would be helpful. Thanks, Kendra
>
> Kendra L. Payne
> Citizens Advisory Board Support
> SAIC
> 761 Veterans Avenue
> Kevil, KY 42053
> kp6@bechteljacobs.org
> 270-441-5204
>

<<Response to CAB Waste Task Force Comment.doc>>

THIS PAGE INTENTIONALLY LEFT BLANK

Response to CAB Waste Task Force Comment

The units in the BGOU are in three hazard areas. These units and their RBES and CPES (from Table 5.1 of the D2R2 RBES Report) are as follows:

Hazard Area 1 - GWOU: This hazard area includes burial grounds with considerable uncertainty regarding their contribution to groundwater contamination. Included are SWMU 2 (C-749 Uranium Burial Ground) and SWMU 4 (C-747 Contaminated Burial Ground). (Please see pp. 4-4 and 4-5 of the D2R2 RBES Report.)

Current Planned End State	RBES
Hazard Area 1: GWOU	
Access and excavation restrictions.	Same.
PGDP Water Policy.	Enhanced institutional controls.
Source removal (i.e., excavation) at burial grounds with monitored natural attenuation.	Cap burial grounds with monitored natural attenuation.

Hazard Area 3 - BGOU (Group 1): This hazard area includes burial grounds not believed to be a source of groundwater contamination but for which the RBES and CPES differ. Included are SWMU 3 (C-404 Low-level Radioactive Waste Burial Ground), SWMU 6 (C-747-B Burial Ground), and SWMU 145 (Residential/ Inert Landfill Borrow Area (and old NSDD channel). (Please see p. 4-19 of the D2R2 RBES Report.)

Current Planned End State	RBES
Hazard Area 3: BGOU (Group 1)	
Access and excavation restrictions.	Same.
Excavate burial grounds.	Cap burial grounds.

Hazard Area 6 - BGOU (Group 2): This hazard area includes burial grounds not believed to be a source of groundwater contamination but for which the RBES and CPES do not differ. Burial grounds included are SWMU 5 (C-746-F Burial Ground); SWMU 7 (C-747-A Burial Ground); SWMU 8 (C-746-K Landfill); and SWMU 30 (C-747-A Burn Area). (Please see pp. 4-27 and 4-28 of the D2R2 RBES Report.)

Current Planned End State	RBES
Hazard Area 6: BGOU (Group 2)	
Maintain current land cover.	Same.
Access and excavation restrictions.	Same.
PGDP Water Policy.	Enhanced institutional controls.
Landfill cap.	Same.
Monitoring.	Same.

Discussion: For all hazard areas, the RBES, as presented in the D2R2 Report for the burial grounds includes capping and access restrictions. In addition, for the Hazard Areas 1 and 6 burial grounds (i.e., SWMUs 2, 4, 5, 7, 8, and 30), the RBES includes enhanced institutional controls and monitoring. For SWMUs 2 and 4, enhanced institutional controls and monitoring (i.e., monitored natural attenuation) are included in the RBES due to the uncertainty in the contribution of these units to groundwater contamination. For SWMUs 5, 7, 8, and 30, enhanced institutional controls and monitoring are included in the RBES because there is disagreement between DOE and the regulatory agencies concerning the potential for contaminants to migrate from these units.

THIS PAGE INTENTIONALLY LEFT BLANK

Attachment 9

MAY 11, 2004, PRESENTATION TO PADUCAH CHAMBER OF COMMERCE

THIS PAGE INTENTIONALLY LEFT BLANK

Risk-based End State Vision for the Paducah Gaseous Diffusion Plant

Paducah Chamber of Commerce
Community Business and Development Committee

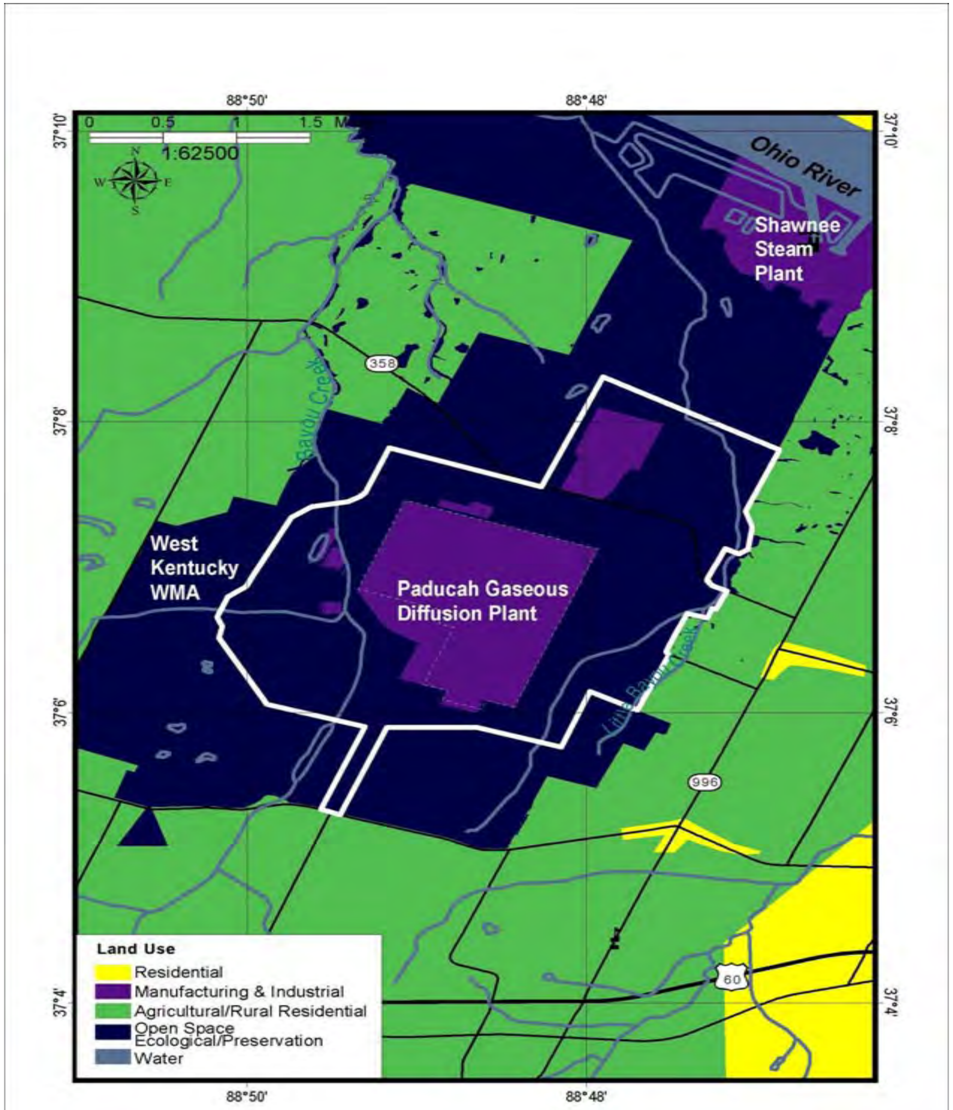
May 11, 2004

RBES PROCESS

- Evaluation to identify alternate cleanup approaches to address site risks as opposed to the assumed actions in the current baseline.
- Recognizes site risks can be mitigated using various approaches, including:
  - Source removal (e.g., excavation); and
  - Taking action to prevent receptors from coming into contact with contaminants and to prevent migration of contaminants (e.g., deed restrictions, capping landfills, etc.).
- RBES process emphasizes that cleanup levels need to be consistent with current and reasonably foreseeable future land use.

The RBES Vision Document is not a decision document.

Current and Reasonably Foreseeable Future Land Use



Summary

- Under the RBES, future use same as current use.
- Continued manufacturing and industrial use inside fence.
- Wildlife management and recreational use of other DOE-owned property.
- Agricultural and rural residential use of surrounding area.

Risk Balancing

- Individuals and wildlife can be put at risk both by contamination in the environment and by attempts to clean up the contamination.
- More intrusive cleanup methods (e.g., excavation and disposal) may be more permanent (because they remove the contaminants), but can result in greater near-term risks to workers, the public, and the environment during implementation.

Document Development

- Divided the site into nine “hazard areas.”
- Identified differences between currently planned approaches and alternate cleanup approaches under the RBES (variance identification).
- Examples of the more significant variances:
  - Types of Institutional Controls (e.g., water policy vs. deed restrictions or property purchase)
  - Burial Ground Actions (e.g., excavation vs. capping)
  - Groundwater Actions (e.g., removal of all sources vs. major sources)
  - Soils Cleanup Levels (clean industrial areas to residential levels vs. clean industrial areas to industrial levels)

DOE's Use of Report

- The RBES Vision report is not a decision document.
- Consider variances and determine if changes should be sought to address national and/or site specific considerations.
  - There may be no changes.
  - Any changes to current plans would be made in accordance with all applicable requirements and procedures, including public participation and regulatory approval.

Stakeholder Involvement – Future

- DOE is planning to seek meetings with area groups, including:
  - Paducah Chamber of Commerce
  - Active Citizens for Truth
  - Ballard County Chamber of Commerce
  - McCracken County and Paducah representatives
  - CAB Update
  - Purchase Area Community Reuse Organization
- Next public meeting scheduled for 6/3.

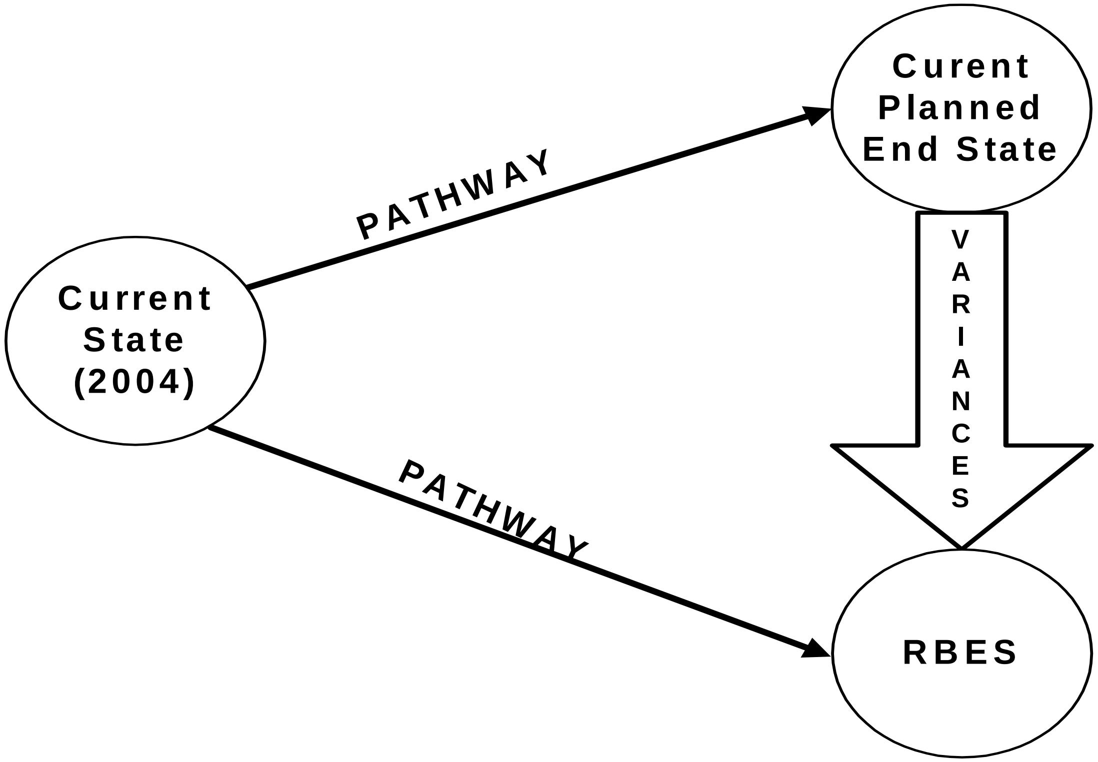
Document Status

- Report follows guidance available at www.em.doe.gov/office.html (see “Hot Topics.”)
- Two draft documents released so far:
  - 1st draft issued January 31, 2004.
  - 2nd revised draft issued April 30, 2004.
- Final draft document to be issued by September 1, 2004.

BACKUP SLIDES

RBES Process

ANALYTICAL TOOL



Comparison of Actions to Attain RBES and CPES

RBES Actions	CPES Actions
Continued access and use controls, including enhanced controls limiting groundwater use.	Continued access and use controls, including continuation of Water Policy.
Reduce solvent concentration at main source (i.e., C-400) using treatment. Address remaining groundwater contamination with natural attenuation.	Reduce solvent concentration at multiple sources (e.g., C-400, C-720, SWMU 1) using treatment. Address remaining groundwater contamination with oxidation of dissolved plume and natural attenuation.
Cap all burial grounds. Continue monitoring and access controls.	Excavate some burial grounds and cap others. Continue monitoring and access controls.
Excavate contaminated sediments and soil to attain cleanup levels consistent with future industrial and recreational use. Continue access controls	Excavate contaminated sediments and soil to attain cleanup levels consistent with future residential use.
Characterization and on- and off-site disposal of legacy waste.	Same.
D&D of facilities and infrastructure followed by on- and off-site disposal of debris.	Same.

Stakeholder Involvement - Past

- DOE guidance requires stakeholder involvement.
  - Current report includes changes due to stakeholder input.
- Public activities to date include:
  - Briefings to Citizens Advisory Board.
  - Participation in radio program.
  - Two public workshops.
  - Receipt of oral and public comments.

Examples of Changes Made in Response to Stakeholder Comments

- Additional time added to schedule to allow for increased public participation.
- Stakeholder participation appendix added to report.
- Discussion of “enhanced institutional controls” expanded.
- Relationship between Water Policy and “enhanced institutional controls” clarified.
- Source action for solvents at C-400 added.
- Discussion of range of actions under D&D added, including note about possible reindustrialization of some facilities.
- Discussion of variances and recommendations on ways to resolve variances increased.

VARIANCE EXAMPLES

PGDP WATER POLICY	ENHANCED INSTITUTIONAL CONTROLS
Implemented in 1994.	No implementation to date. Action subject to CERCLA decision.
Prevent exposure by providing an alternate water source.	Prevent exposure through one or more actions: –Alternate water source with legal agreements limiting groundwater use (e.g., deed restrictions). –Property purchase.
Enforced through 5-year lease agreements. Relies on cooperation of affected residences and businesses.	Enforce through long-term legal agreements offering greater sustainability in risk mitigation than the Water Policy.

VARIANCE EXAMPLES

GROUNDWATER	
CURRENT PLANNED END STATE	**RBES**
Access and excavation restrictions.	Same.
PGDP Water Policy.	Enhanced institutional controls.
Source treatment at all primary and secondary DNAPL source areas with monitored natural attenuation.	Source treatment at just the primary DNAPL source areas (e.g., C-400) with monitored natural attenuation.
Active contaminant reduction (e.g., oxidation) in the dissolved- phase plumes with monitored natural attenuation.	Monitored natural attenuation.
Natural attenuation of contaminants discharged to surface water at seeps on Little Bayou Creek.	Same.

VARIANCE EXAMPLES

BURIAL GROUNDS	
CURRENT PLANNED END STATE	**RBES**
Access and excavation restrictions.	Same.
PGDP Water Policy.	Enhanced institutional controls.
Excavate certain burial grounds.	Cap all burial grounds.

SURFACE SOILS	
CURRENT PLANNED END STATE	**RBES**
Access and excavation restrictions.	Same.
Complete excavation of soil source areas; target risk based on residential risk of 1E-06, PCBs at 1 ppm.	Excavation of "hot spots" in soil; target risk based on worker risk of 1E-04, PCBs at 25 ppm.

THIS PAGE INTENTIONALLY LEFT BLANK

Attachment 10

LETTER SENT TO COMMUNITY GROUPS AND SUBSEQUENT PRESENTATION MATERIALS

THIS PAGE INTENTIONALLY LEFT BLANK

450.5
1152

Department of Energy

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

June 1, 2004

PPPO-01-558-04

Elaine Spalding
President
Paducah Area Chamber of Commerce
P.O. Box 810
Paducah, KY 42003-0810

Dear Ms. Spalding:

STAKEHOLDER INPUT FOR PADUCAH GASEOUS DIFFUSION PLANT RISK BASED END STATE VISION DOCUMENT

The purpose of this letter is to inquire as to your organization's interest in meeting with the Department of Energy (DOE) to discuss the Risk Based End State (RBES) vision document that is being prepared for the Paducah Gaseous Diffusion Plant (PGDP). DOE is developing this document as part of a national initiative for various DOE sites that are undergoing cleanup across the country. The RBES document will be used as an analytical tool for assessing current cleanup plans for the PGDP facility, identifying appropriate and protective future use and risk scenarios, determining whether the current cleanup plans are based on appropriate and protective future use and risk scenarios, and identifying any changes in the current cleanup plans that the Department might wish to pursue in accordance with applicable legal requirements.

DOE already has issued two drafts of the RBES document for the PGDP facility, and has conducted several public meetings to discuss the document and seek stakeholder input. DOE is seeking to expand the opportunity for stakeholder interaction and input by offering to come discuss the RBES process and the PGDP document with various community organizations.

The deadline for submitting a final draft RBES document for the PGDP facility to DOE Headquarters is September 1, 2004. To facilitate our ability to meet this deadline, we would like to meet with your organization some time in June or July. If you would like to meet with DOE to discuss the document, please contact Laura Schachter of my staff at (859) 219-4010, to set up a time for me or a member of my staff to come meet with your organization.

Sincerely,

WE Murphie

William E. Murphie
Manager
Portsmouth/Paducah Project Office

Addresses of Paducah Area Community Groups

Elaine Spalding
President
Paducah Area Chamber of Commerce
P.O. Box 810
Paducah, KY 42003-0810

Julie Thomas
Executive Director
Ballard County Chamber of Commerce
135 N. Fourth Street
Wickliffe, KY 42087

John Anderson
Executive Director
Paducah Area Community Reuse Organization
2000 McCracken Blvd.
Paducah, KY 42001

Ken Wheeler, Chairman
Greater Paducah Economic Development Council
333 Broadway, Suite 603 - P.O. Box 1155
Paducah, KY 42002-1155

Dr. Richard A. Schmidt
Director
Kentucky Consortium for Energy and the Environment
P.O. Box 7380
Paducah, KY 42002

Teresa Harris
Executive Officer
Paducah Board of Realtors
1333 Kentucky Avenue
Paducah, KY 42003

Farrell Beyer
Associated General Contractors
2201 McCracken Blvd.
Paducah, KY 42001

Danny Orazine
McCracken County Judge Executive
McCracken County Courthouse
301 South 6th Street
Paducah, KY 42003

Bob Buchanan
Ballard County Judge Executive
Ballard County Courthouse
P.O. Box 276
Wickliffe, KY 42087

William F. Paxton
Mayor
City of Paducah
P.O. Box 2267
Paducah, KY 42002

Charles Burnley
Mayor
City of Kevil
P.O. Box 83
Kevil, KY 42053

Beth Clanahan
Mayor
City of Metropolis
106 W. 5th Street
Metropolis, IL 62960

Ruby English
Chairman
Active Citizens for Truth
6715 Metropolis Lake Road
West Paducah, KY 42086

Corrine Whitehead
President
Coalition for Health Concerns
1091 U.S. Hwy. 641
Benton, KY 42025

Kristi Hanson/Mark Donham
Regional Association of Concerned Environmentalists
Route 1, Box 308
Brookport, IL 62910

Vickie C. Ladt
President
Rotary Club of Paducah
P.O. Box 398
Paducah, Kentucky 42002-0398

Don Knowles
Paducah Lions Club
P.O. Box, 7201
Paducah, KY 42002-7201

J.W. Cleary
President
NAACP, Paducah-McCracken County Branch
P.O. Box 357
Paducah, KY 42002-0357

Phillip Foley, President
Paper, Allied-Industrial, Chemical and Energy Workers
International Union, Local 5-650
2525 Cairo Road
Paducah, KY 42001

Jay Stoll, President
Security Police Fire Professionals of America
1410 Hobbs Road, MS-2001
Paducah, KY 42001

Status of the Risk-Based End State Vision Process for the Paducah Gaseous Diffusion Plant

Presentation to Greater Paducah Economic Development Council and Paducah Area Chamber of Commerce

July 15, 2004

RBES Process

- Identifies risk-based cleanup approaches to address site contamination
- Compares the risk-based approaches to the approaches assumed in the current cleanup plan
- Recognizes site risks can be mitigated using various approaches, including:
  - Remove the contaminants (e.g., excavation or treatment);
  - Control migration from the source of contamination (e.g., capping or containment); and
  - Limit chance for contact with contaminants (e.g., access and use restrictions)
- RBES process emphasizes that cleanup levels need to be consistent with current and assumed future land use

RBES Vision Document

- Not a decision document
- Serves as a summary of the risk-based analysis that can be used to develop informed cleanup decisions and determine whether changes to current cleanup plan should be considered
- Any changes to current cleanup plan must be made in compliance with legal requirements, including:
  - Public Involvement
  - Protection of human health and the environment
  - Existing regulations, agreements, and schedules

RBES Implementation Phases

Currently, DOE is in this phase

Phase I: Establish Framework
Complexwide Self-Assessment
DOE Policy 455.1
455.1 Implementation Plan
End State Vision Guidance
Public and Intergovernmental Outreach

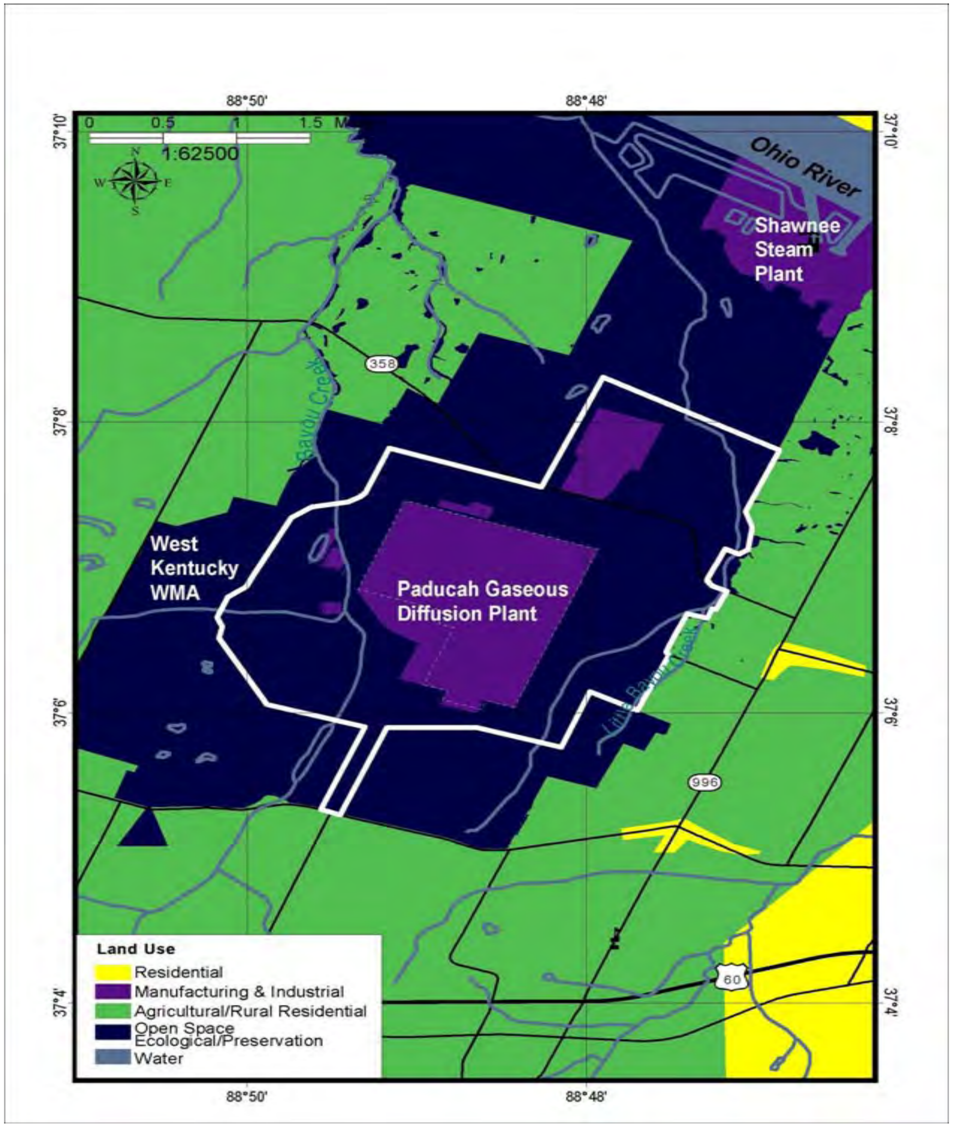
Phase II: Identify Changes
Site-Specific Vision Documents
Variance Analysis and Report
Legislative Recommendations
Public and Intergovernmental Outreach

Phase III: Implement Changes
Renegotiate Agreements as appropriate
Modify PMPs and Site Baselines
Legislative Package and Actions
Regulatory Actions
Public and Intergovernmental Outreach

FY 2003 | **FY 2004** | **FY 2005**

Current and Assumed Future Land Use at Paducah

- The RBES assumed future land use matches the future land use assumptions developed under the current cleanup plan



Current and Assumed Future Land Use

Summary

- Future use same as current use.
- Continued manufacturing and industrial use inside fence.
- Wildlife management and recreational use of other DOE-owned property.
- Agricultural and rural residential use of surrounding area.

Document Development

- Divided the site into “hazard areas” (i.e., locations contributing to risk due to presence of contamination in groundwater, surface water, soils, and waste)
- Determined end state for each hazard area that is consistent with assumed future land use, minimizes risk to humans and the environment, and is sustainable (i.e., the risk-based end state)
- Identified actions at each hazard area that could be used to achieve the risk-based end state

Document Development

- Summarized current planned end state and the actions for each hazard area that are assumed to be used to achieve that end state
- Identified where current planned and RBES approach are consistent and where they differ (variances)
  - Assumed schedule
  - Assumed cost
  - Assumed risks (e.g., method to achieve risk reduction, sources of risk during implementation of actions, risks remaining at each end state)

Risk Balancing

- The analysis in the RBES document considers:
  - the differences in risks to human health and the environment at the risk-based and current planned end states
  - the differences in risks to human health and the environment associated with actions that may be used to achieve the end states
- Individuals and wildlife can be put at risk both by contamination in the environment and by attempts to clean up the contamination
- More intrusive cleanup methods (e.g., excavation and treatment) may be more permanent (because they remove the contaminants), but can result in greater near-term risks to workers, the public, and the environment during implementation

Examples of Consistency End States

- Continuation of access and excavation restrictions
- Treatment to reduce TCE concentration in soil and groundwater at the major source at the PGDP (i.e., near C-400 Cleaning Building)
- Continued monitoring as concentrations in groundwater plumes decrease
- Excavation and disposal of sources of surface water contamination (extent of excavation varies)
- Completion of scrap and waste removal projects (includes DMSAs)
- Conversion and disposal of depleted uranium hexafluoride
- D&D of gaseous diffusion plant infrastructure

Examples of Variances End States

CPES Actions	RBES Actions
Continuation of Water Policy (short-term agreements with existing property owners)	Enhanced Institutional Controls (e.g., legal deed restrictions, property purchases)
Point of exposure for determining risk from contaminant migration at the PGDP fence-line	Point of exposure for determining risk from contaminant migration at the PGDP property boundary
Reduce TCE concentration at multiple source locations using treatment	Reduce TCE concentration at primary source of off-site contamination using treatment (C-400 Proposed Plan)
Excavate some burial grounds and cap remaining. Continue monitoring and access controls	Cap all burial grounds. Continue monitoring and access controls
Soil Cleanup Levels - clean industrial areas to residential levels	Soil Cleanup Levels - clean industrial areas to industrial levels

Document Status

- Report follows guidance available at http://www.em.doe.gov/ (see "Risk-Based End States")
- Paducah RBES documents
  - First draft released on January 31, 2004
  - Most recent draft is: *Risk-Based End State Vision and Variance Report for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE/OR/07-2119&D2/R2) - issued April 30, 2004
  - Includes changes made in response to stakeholder comments received through April 15, 2004
  - Available at: http://www.bechteljacobs.com/pad_reports.shtml

Document Status

- DOE HQ has extended the original September 2004 deadline for the final Paducah RBES document submittal. No new deadline has been announced.
  - Final document will include changes made in response to all additional comments received

Examples of Actions Taken in Response to Comments Received to Date

- Extended the public outreach and comment period by more than six months
- Clarified differences between current water policy and concepts under consideration for enhanced institutional controls
- Added the C-400 Groundwater Action to risk-based end state
- Added discussion of risk balancing
- Expanded discussion of ecological risk
- Added appendix summarizing stakeholder activities and comments, including changes made to the document in response to comments.

Summary of Public Participation

- January 15 – Briefed CAB at monthly meeting on RBES background, purpose, and process
- February 2 – Draft RBES Document placed in McCracken County Library and DOE Environmental Information Center
- February 5 – Held Public Meeting at West Kentucky Community and Technical College
- February 26 – First Stakeholder Workshop on RBES
- March 1 – Participation in radio call-in show on WKYX AM – reaired on March 17
- March 11 – Second Stakeholder Workshop on RBES
- March 18 – Discussion of RBES status at monthly CAB meeting
- April 15 – Notified CAB of extension of public participation period to September 1, 2004
- April 30 – Revised draft RBES Document placed in McCracken County Library and DOE Environmental Information Center
- May 11 – Presentation to Paducah Chamber of Commerce Community Business and Development Committee
- June 3 – Third Stakeholder Workshop on RBES
- June 17 – Update presented at monthly CAB meeting
- June 18 – Presentation to Paducah Board of Realtors

Future Stakeholder Involvement

- Portsmouth/Paducah Project Office is considering whether to hold additional public meetings
- DOE is planning a national RBES meeting in October 2004
- We encourage all stakeholders to continue to review and comment on the RBES document
  - Document is available for review at the McCracken County Public Library and the DOE Environmental Information Center
  - Also available on internet at http://www.bechteljacobs.com/pad_reports.shtml

Attachment 11

JUNE 3, 2004, WORKSHOP MATERIALS

THIS PAGE INTENTIONALLY LEFT BLANK

U.S. Department of Energy
DRAFT RISK-BASED END STATE VISION

The U. S. Department of Energy (DOE) has prepared a revised Draft Risk-Based End State Vision and Variance Report for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky (DOE/OR/07-2119&D2R2) as an analytical tool to assure environmental cleanup efforts are consistent with the site's future use planning. The draft document addresses comments received from the public sector. The Department is seeking additional public input during the extended review period. A public meeting will be held at 7:00 p.m. Thursday, June 3 at the Environmental Information Center, 115 Memorial Drive, Paducah, Kentucky.

Document Availability: The revised draft will be available for review beginning the afternoon of April 30 at the Environmental Information Center; and at the McCracken County Public Library, 555 Washington Street, Paducah, Kentucky, or online at http://www.bechteljacobs.com/pad_reports.shtml.

For more information call (270) 441-6819.

THIS PAGE INTENTIONALLY LEFT BLANK

Status of the Risk-Based End State Vision Process for the Paducah Gaseous Diffusion Plant

Public Workshop
June 3, 2004

RBES PROCESS

- Evaluation to identify alternate cleanup approaches to address site risks as opposed to the assumed actions in the current baseline plan
- Recognizes site risks can be mitigated using various approaches, including:
  - Source removal (e.g., excavation); and
  - Taking action to prevent migration of contaminants and/or receptors from coming into contact with contaminants (e.g., deed restrictions and capping landfills)
- RBES process emphasizes that cleanup levels need to be consistent with current and reasonably foreseeable future land use

RBES VISION DOCUMENT

- Not a decision document
- Serves as an analytical tool to support informed cleanup decisions in conjunction with the following considerations:
  - Public Involvement
  - Protection of human health and the environment
  - Existing regulations, agreements, and schedules

RBES Implementation Phases

Phase I: Establish Framework
Complexwide Self-Assessment
DOE Policy 455.1
455.1 Implementation Plan
End State Vision Guidance
Public and Intergovernmental Outreach

Phase II: Identify Changes
Site-Specific Vision Documents
Variance Analysis and Report
Legislative Recommendations
Public and Intergovernmental Outreach

Phase III: Implement Changes
Renegotiate Agreements as appropriate
Modify PMPs and Site Baselines
Legislative Package and Actions
Regulatory Actions
Public and Intergovernmental Outreach

FY 2003	FY 2004	FY 2005

Current and Reasonably Foreseeable Future Land Use at Paducah

- Under the RBES, future use is the same as current use
- Continued manufacturing and industrial use inside fence
- Wildlife management and recreational use of other DOE-owned property.
- Agricultural and rural residential use of surrounding area

Risk Balancing

- Individuals and wildlife can be put at risk both by contamination in the environment and by attempts to clean up the contamination
- More intrusive cleanup methods (e.g., excavation and disposal) may be more permanent (because they remove the contaminants), but can result in greater near-term risks to workers, the public, and the environment during implementation

Document Development

- Divided the site into “hazard areas” (e.g., groundwater, surface soils and burial grounds)
- Identified differences between current planned approaches and RBES approach

EXAMPLES OF SIGNIFICANT VARIANCES AT THE PGDP

CPES Actions	RBES Actions
Continuation of Water Policy (short-term agreements with existing property owners)	Enhanced Institutional Controls (e.g., legal deed restrictions, property purchases)
Reduce TCE concentration at primary and secondary sources (e.g., C-400, C-720, SWMU 1) using treatment.	Reduce TCE concentration at primary source of off-site contamination (i.e., C-400) using treatment.
Excavate some burial grounds and cap remaining. Continue monitoring and access controls.	Cap all burial grounds. Continue monitoring and access controls.
Soil Cleanup Levels - clean industrial areas to residential levels.	Soil Cleanup Levels - clean industrial areas to industrial levels.

Future Stakeholder Involvement

- DOE is planning to seek individual meetings with various area groups, including:
  - Chamber of Commerce (completed)
  - Environmental groups
  - Local government representatives
  - Area reuse organization

Document Status

- Report follows guidance available at *www.em.doe.gov/office.html* (see “Hot Topics”)
- Paducah Draft RBES documents
  - 1st draft issued January 31, 2004
  - 2nd draft issued April 30, 2004
- Final-draft Paducah RBES document to be submitted to DOE-HQ by September 1, 2004

Attachment 12

JUNE 17, 2004, MATERIALS FROM PRESENTATION TO CAB ON STATUS OF RBES

THIS PAGE INTENTIONALLY LEFT BLANK

Status of the Risk-Based End State Vision Process for the Paducah Gaseous Diffusion Plant

CAB Update
June 17, 2004

RBES Implementation Phases

Phase I: Establish Framework

Complexwide Self-Assessment
DOE Policy 455.1
455.1 Implementation Plan
End State Vision Guidance
Public and Intergovernmental Outreach

Phase II: Identify Changes

Site-Specific Vision Documents
Variance Analysis and Report
Legislative Recommendations
Public and Intergovernmental Outreach

Phase III: Implement Changes

Renegotiate Agreements as appropriate
Modify PMPs and Site Baselines
Legislative Package and Actions
Regulatory Actions
Public and Intergovernmental Outreach

FY 2003	FY 2004	FY 2005

Document Status

- First draft issued January 31, 2004
- Second draft issued April 30
- Final draft due to DOE-HQ September 1, 2004

Comment Status

- Received DOE-HQ comments on first draft
- Second draft issued for public comment on April 30
  - Placed on EIC public web site April 30
  - Placed in EIC and McCracken County Public Library April 30
  - Notice published in the *Paducah Sun* April 30-May 2
- DOE-PPPO letter sent to various organizations June 1
- Public meeting offered June 3
- Will continue to seek comments into August

Impact of Major Comments Received to Date

- Extended the end of the public outreach and comment period from March to August
- Added discussion of risk balancing
- Added the C-400 Groundwater Action
- Expanded discussion of ecological risk
- Clarified differences between current water policy and concepts under consideration for enhanced institutional controls

Future Stakeholder Involvement

- Public meeting in planning for July 15, hosted by Greater Paducah Economic Development Council and Paducah Chamber of Commerce
- Invitation from Active Citizens for Truth pending
- Other invitations expected

BACKUP SLIDES

Risk Balancing

- Individuals and wildlife can be put at risk both by contamination in the environment and by attempts to clean up the contamination

- More intrusive cleanup methods (e.g., excavation and disposal) may be more permanent (because they remove the contaminants), but can result in greater near-term risks to workers, the public, and the environment during implementation

Examples of Significant Variances

CPES Actions	RBES Actions
Continuation of Water Policy (short-term agreements with existing property owners)	Enhanced Institutional Controls (e.g., legal deed restrictions, property purchases)
Reduce TCE concentration at primary and secondary sources (e.g., C-400, C-720, SWMU 1) using treatment.	Reduce TCE concentration at primary source of off-site contamination (i.e., C-400) using treatment.
Excavate some burial grounds and cap remaining. Continue monitoring and access controls.	Cap all burial grounds. Continue monitoring and access controls.
Soil Cleanup Levels - clean industrial areas to residential levels.	Soil Cleanup Levels - clean industrial areas to industrial levels.

THIS PAGE INTENTIONALLY LEFT BLANK

Attachment 13

JUNE 15, 2004, OVERVIEW OF BGOU PRESENTED TO CAB BY JOHN RUSSELL

THIS PAGE INTENTIONALLY LEFT BLANK

Burial Grounds Operable Unit

Presented by Dr. John P. Russell

Waste Operations Task Force

July 15, 2004

Burial Grounds Operable Unit

- SWMU 2 - C-749 Uranium Burial Grounds
- SWMU 3 - C-404 Low-level Radioactive Waste Burial Ground
- SWMU 4 - C-747 Contaminated Classified Burial Ground
- SWMU 5 - C-746-F Classified Burial Ground
- SWMU 6 - C-747-B Burial Ground
- SWMU 7 - C-747-A Burial Ground
- SWMU 30 - C747-A Burn Area
- SWMU 145 - P-Area Residential/Inert Landfill Borrow Area

SWMU 2: C-749 Uranium Burial Ground

SWMU 2: C-749 Uranium Burial Ground

- **Size:** 150 ft X 200 ft X 17 ft – 510,000 ft^3
- **Waste:**
  - Uranium – 245,000 kg or 539,000 lbs Pyrophoric (D003), Uranium oxides, and UF_4
  - Petroleum-based and synthetic oils – 259,900 liters or 59,000 gal
  - Contaminated TCE (F001) – 1,800 liters or 450 gal
- **Physical form:** drums
- Identified in Hazard Area 1 (GWOU) in RBES

<u>Current Planned End State</u>	<u>RBES</u>
Access and excavation restrictions	Same
PGDP Water Policy	Enhanced institutional controls
Source removal at burial grounds monitored with monitored natural attenuation	Cap burial grounds with <u>monitored</u> natural attenuation

SWMU 3: C-404 Landfill

SWMU 3: C-404 Landfill

- Used as sediment basin for uranium-contaminated waste water generated from the C-400 facility from 1952-1957
- Designed with tamped earthen floors and clay dike walls
- Converted to a uranium-contaminated solid waste disposal facility in 1957
- Closed in July 1987 as a Subtitle C landfill, clay cap was installed
- Installed sump at southwest corner to pump leachate into an underground line leading to the NSDD
- Waste:
  - Uranium - 3,000,000 kg or 6,600,000 lbs, some contaminated with TCE, radionuclides, and metals
  - Smelter furnace liners
  - ~450 drums of EP Toxic wastes D006, D008 and D010
- Identified in the RBES Hazard Area 3 (CPES and RBES differ)

Current Planned End State	RBES
Access and excavation restrictions	Same
Excavate burial grounds	Cap burial grounds

SWMU 4: C-747 Contaminated Burial Yard and C-748-B Burial Area

C-747

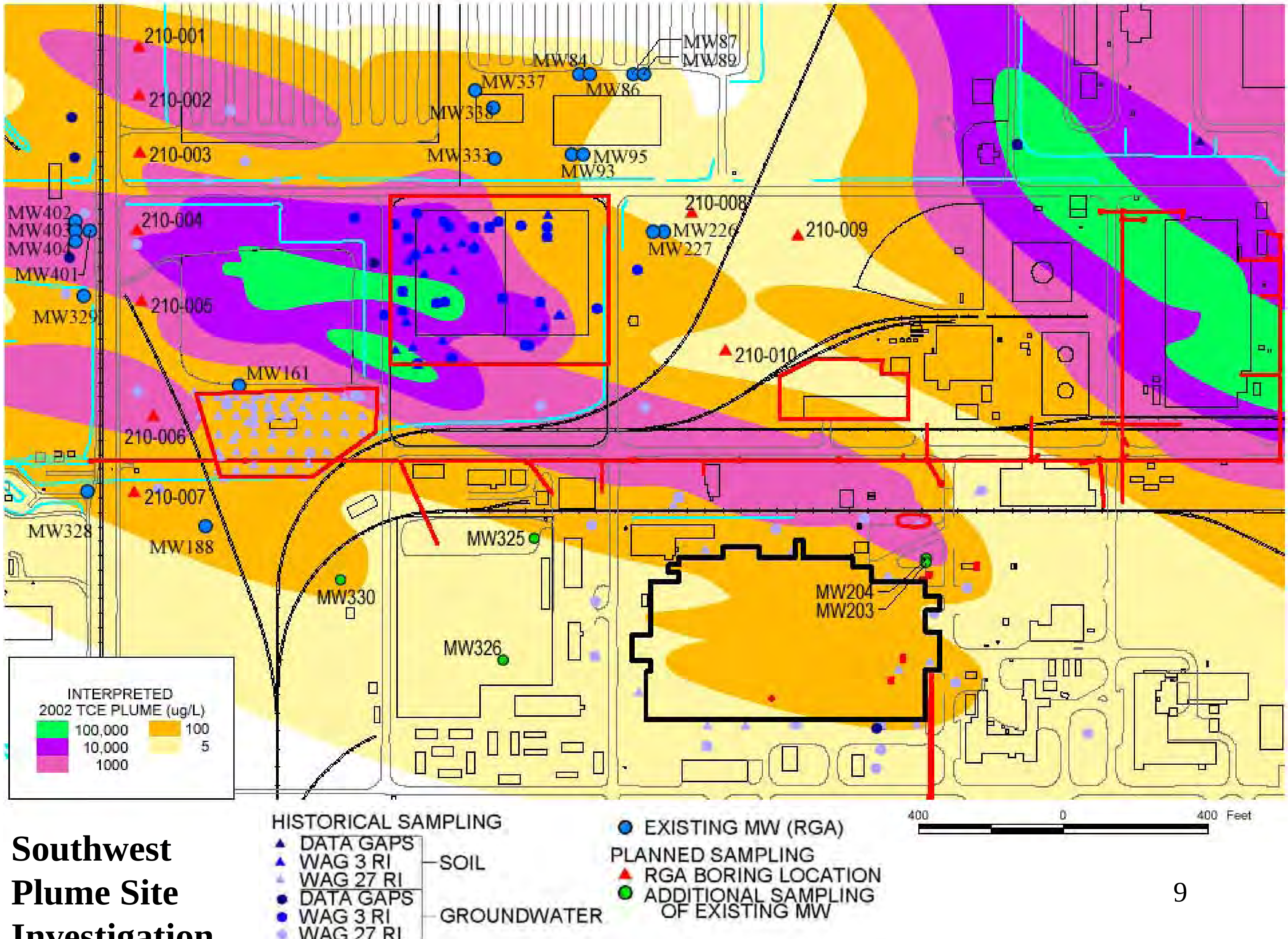
C-748-B

SWMU 4: C-747 Contaminated Burial Yard and C-748-B Burial Area

- Used for burial of uranium-contaminated trash and equipment, some trash burned prior to being covered
- Soils analyses indicate the presence of PCB’s, TCE and it’s degradation productions, various radionuclides of plutonium, uranium, neptunium and radium
- Waste:
  - Contaminated and uncontaminated trash
  - Scrap equipment (steel, Monel, etc.) with surface contamination from the enrichment process
- Identified in the RBES Hazard Area 1 (GWOU)

<u>Current Planned End State</u>	<u>RBES</u>
Access and excavation restrictions	Same
PGDP Water Policy	Enhanced institutional controls
Source removal at burial grounds with monitored natural attenuation	Cap burial grounds with monitored natural attenuation

SWMU 4: C-747 Contaminated Burial Yard and C-748-B Burial Area



Southwest Plume Site Investigation

SWMU 5: C-746-F Classified Burial Yard

SWMU 5: C-746-F Classified Burial Yard

- Used for burial of contaminated and uncontaminated classified scrap from 1965-1987
- Covered with two to three feet of earth
- Wastes:
  - Security classified wastes
  - Radionuclide contaminated wastes including contaminated scrap metal and slag from nickel and aluminum smelters
  - Isolated occurrences of TCE, metals, PCB's dibenzofuran, and polycyclic aromatic hydrocarbons reported from sampling media
- Identified in RBES Hazard Area 6 (CPES and RBES do not differ)
  - Maintain current land cover
  - Access and excavation restrictions
  - PGDP Water Policy (enhanced institutional controls)
  - Landfill Cap
  - Monitoring

SWMU 6: C-747-B Burial Ground

SWMU 6: C-747-B Burial Ground

- Used for burial of various types of solid scrap metal
- Site consists of five separate burial plots, Areas H, I, J, K and L
- Each plot contains a specific waste
- Waste:
  - Magnesium scrap (Areas H&K)
  - Contaminated laboratory exhaust fans (Area I)
  - Aluminum scrap (Area J)
  - Contaminated UF6 condenser (Area L)
- Identified in the RBES in Hazard Area 3 (CPES and RBES differ)

Current Planned End State	RBES
Access and excavation restrictions	Same
Excavate burial grounds	Cap burial grounds

SWMU 7: C-747-A Burial Ground

- Used for burial of a wide variety of solid waste, equipment, and scrap metal from 1957-1979
- Burial pits A-G were excavated, filled and covered with three feet of soil
- Primary radiological contaminant is uranium
- Primary metals are arsenic, beryllium, cadmium, copper, nickel and zinc
- Primary VOC is TCE and degradation products, polyaromatic hydrocarbons and PCB's
- Wastes:
  - Non-combustible mixed waste and some contaminated equipment (Area A - 100,000 cubic ft.)
  - Non-combustible and non-contaminated mixed solid waste and equipment (Areas B, C, and G - quantity unknown)
  - Contaminated concrete (Areas D and E - ~20 tons)
  - Uranium contaminated scrap metal and equipment (Area F - quantity unknown)
- Identified in RBES Hazard Area 6 (CPES and RBES do not differ)
  - Maintain current land cover, access and excavation restrictions, PGDP Water Policy (enhanced institutional controls), landfill cap and monitoring

SWMU 30: C-747-A Burn Area

- Used for burning combustible mixed solid waste
- Waste:
  - Combustible trash and residue
- Identified in RBES Hazard Area 6 (CPES and RBES do not differ)
  - Maintain current land cover
  - Access and excavation restrictions
  - PGDP Water Policy (enhanced institutional controls)
  - Landfill Cap
  - Monitoring

SWMU 145: Area P Construction/Demolition Debris Disposal and Spoils Area

- Used by various subcontractors to discard scrap and waste materials from early 1950's to early 1980's
- Accumulated scrap pile were moved from the plant and covered with dirt
- Area was later permitted for the construction of the S&T Landfill
- Waste:
  - Construction and demolition debris including concrete, roofing materials, wire, wood, welding rods and asbestos containing materials
  - Tarry material containing elevated levels of uranium and technetium was identified at the western perimeter of the C-476-S Landfill in 1999
- Current site of the S&T Landfill investigation, DOJ lawsuit
- Listed in the RBES Hazard Area 3 (CPES and RBES differ)

Current Planned End State	RBES
Access and excavation restrictions	Same
Excavate burial grounds	Cap burial grounds

Attachment 14

COMMENTS FROM DOE HEADQUARTERS AND NOTES FROM DOE RBES NEXT STEPS WORKSHOP

THIS PAGE INTENTIONALLY LEFT BLANK

COMMENTS FROM DOE HEADQUARTERS
and notes from
DOE RBES NEXT STEPS WORKSHOP

Final written comments from DOE HQ were not received when this revision of the PGDP End State Vision Document was prepared. Once received, these comments will be added to the appendix at this location. The notes from the workshop are attached.

THIS PAGE INTENTIONALLY LEFT BLANK

DOE RBES NEXT STEPS WORKSHOP
Summary of Discussion and Outcomes
October 6 and 7, 2004
Chicago, Illinois

Overview

The stated goals for the October 6 and 7 Risk Based End States (RBES) Next Steps Workshop were:

- To reinforce the understanding that the development of potential end-state alternatives is a two-step process. The first step is to develop Vision documents proposing alternatives based on reduced health, safety or environmental risk, and the second is the evaluation of these alternatives based on criteria distinct from risk.

- To identify and develop criteria for evaluating alternatives, ultimately leading to a decision on which to pursue.

- To emphasize the importance of stakeholder involvement in developing the criteria, the process for evaluating alternatives, and continued meaningful interaction.

Workshop participants included approximately 110 people from diverse perspectives including: U.S. Department of Energy Office of Environmental Management (DOE EM) , U.S. DOE Office of Legacy Management (DOE-LM); US DOE site managers; Federal, State, Tribal, and local government, U.S. Environmental Protection Agency (EPA) headquarters and regional offices, staff from the National Governors Association (NGA), the State and Tribal Governments Working Group (STGWG) and the Energy Communities Alliance (ECA), and individuals from the organization Alliance for Nuclear Accountability (ANA). The full list of attendees is provided in Appendix A.

Meeting Summary Structure

This meeting summary is not intended to be a verbatim record of conversations, but instead is meant to provide an overview of the discussions and outcomes of the Workshop. Key action items identified in the meeting and a synopsis of the major questions and comments discussed during the various sessions are noted below. Copies of slides and handouts presented during the meeting can be obtained from DOE's Environmental Management website : www.em.doe.gov (under the Risk Based End States window) and NGA's Federal Facilities Task Force website: www.fftfcleanupnews.org.

This summary is organized in the following manner:

I. Ground Rules for the Meeting

II. Outcomes of the Meeting

A. Closing Comments by Paul Golan, Acting Assistant Secretary of Environmental Management, DOE
B. Closing Comments by Group Participants
C. Common Themes from the Breakout Groups as Identified by the Facilitators

III. Formal Sessions

A. Opening Comments by Paul Golan; Kara Colton, Manager of the NGA Federal Facilities Task Force; Bob Goldsmith, Director Office of Core Technical Group, DOE EM; and John Lehr, staff lead on RBES
B. Panel of Representatives from State, Local, Tribal, and Non-governmental Organizations (NGOs)
C. Panel of Site Managers
D. Summary of Comments by John Greeves, Nuclear Regulatory Commission
E. Summary of Comments by Jim Woolford, Environmental Protection Agency

Appendix A: Participants Lists

Appendix B: Presentations

A. Yellow Group (Facilitator: Catherine Morris, The Keystone Center)
B. Blue Group (Facilitator: Jerry Boese, Ross & Associates)
C. Red Group (Facilitator: Seth Kirshenberg, ECA)
D. Green Group (Facilitator: Kristi Parker Celico, The Keystone Center)

Appendix C: *Final Report of the Federal Facility Environmental Restoration Dialogue Committee: Consensus Principles and Recommendations for Improving Federal Facilities Cleanup*. Excerpt from Chapter 5.

I. Ground Rules for the Meeting

The following ground rules were agreed to at the outset of the meeting:

A. Assume discussions are as individuals and not as formal policy positions on behalf of organizations.
B. Post-meeting, summarize only your own views.
C. Basic rules of engagement include:
   - No personal attacks
   - Propose solutions, don't just criticize
   - Share the time

II. Outcomes of the Meeting

Please note that the following are merely summaries of closing comments and common themes heard during the meeting. They do not represent a consensus of the group.

A. Closing Comments by Paul Golan, Acting Assistant Secretary for Environmental Management

Below is a brief summary of Paul Golan's "take-aways" noted at the end of the workshop.

- One consistent recommendation heard was that RBES policy might be more appropriately called End States policy because it involves consideration of more than risk.
- The conclusions and policies for end states need to be simple and clear. The purpose is to make the program better and more innovative by asking if there are better ways to clean-up DOE facilities.
- End states should be developed through a consensus process with communities and should result in an end state for the DOE facility and individual clean-up sites that all governments and stakeholders can visualize.
- The RBES process needs to be tailored for each clean-up site. However, where there is an opportunity, common problems across clean-up sites should be addressed with common solutions.
- In some cases, it may be appropriate to move forward with the existing clean-up options rather than investigate new alternatives through the RBES process at this point. The focus of the RBES program should be on the "variances" that have the most potential to meet all the current clean up criteria including regulatory acceptance. [DOE used the term "variances" to refer to alternative end states.]
- Communication between DOE headquarters DOE facility site managers, stakeholders, impacted governments and regulators needs to be early and often.
- The clean-up plan ultimately must be sustainable, with clear plans for long-term stewardship, if needed, and adequate funding.
- The meeting summary will be distributed to all the Workshop participants for comment. The outcomes of the meeting should not be viewed as consensus agreements or mandates for Congressional action.

- The Working Group for the RBES Workshop will meet to determine the next steps in the process for development of stakeholder input on RBES Vision documents and evaluation of alternatives using commonly-agreed to criteria.

B. Participants' Outcomes

At the end of the meeting, participants reflected on the day and a half meeting and made the following closing comments as individuals:

Common themes heard and advice to DOE:

- Local and national dialogues are needed. Local dialogues are needed to agree upon long-term end states for the DOE clean-up site. National dialogues are needed to address national policy issues such as long-term stewardship, point of compliance, etc.
- Use a tailored approach for each DOE facility. DOE needs to take into account the current status at each clean-up site and the level of current support for the clean-up plan and apply the RBES policy in a customized fashion.
- Use existing regulatory framework for decision making at the clean-up sites. This policy needs to be implemented within the existing regulatory framework for clean-up. Don't reinvent the wheel.
- Share DOE's business model for cleaning up EM facilities. DOE needs to articulate its business model to the full diversity of stakeholders. Some noted that DOE might need to develop its business model first.
- Accelerated narrowing of variances. DOE, with governmental and public input, should quickly narrow the variances under consideration to reduce the number of variances that should be considered in detail and eliminate the perception that unreasonable alternatives will be pursued.
- Future meetings with governmental entities and stakeholders should build on the energy and ideas of this meeting.
- DOE should work with stakeholders before making further policy decisions regarding the RBES policy.
- DOE should use the RBES process as an opportunity to educate the public and others about the general clean-up process and DOE's intent.
- Some RBES terms need to be changed or clarified to avoid misunderstandings.
- DOE needs to rebuild trust.
- DOE should seek early communication with Tribes and should not treat them as a single entity. Each tribe has unique concerns based on the circumstances of the clean-up site. Combining the objective of accelerated clean-up with the RBES goals of doing clean-up better and smarter may lead to conflicting objectives.

Some of the participants made the following comments when asked what participants hope DOE will **not do** following this meeting:

- Do not just tweak the process.

- Do not take unilateral action to change laws.
- Do not describe this meeting as a consensus effort.
- Do not allow the RBES process to hold up clean-up of sites that are well under way and near completion.
- Do not make the RBES documents to be submitted in December 2004 final documents. Do keep the Vision documents alive and changing with new information
- Do not let worker safety become an excuse for not cleaning-up. The participants recognized the importance of worker safety, but were concerned that the process should balance all risks.
  (The last two bullets were added at the end of the meeting by participants who were unable to comment due to lack of time.)

C. Common Themes from the Breakout Groups as Identified by the Facilitators

Process

- Although there were strongly varying opinions regarding the usefulness of the RBES policy and approach, participants in all four groups noted that periodic review of clean-up approaches is needed to evaluate new information (such as changes in surrounding land use, technology, health effects, etc.) and to make adjustments if appropriate to improve clean up. This should be an on-going dialogue with stakeholders with the goal of building consensus around an end state and land use that is an asset to the community.

- A critical component of a successful review process is early, inclusive and transparent interaction with governmental entities and stakeholders at the local and state level. One of the goals for this communication should be establishing a better understanding of the goals and terminology of the RBES policy.

- The "mis" perception that RBES is on a separate track from the existing regulatory framework including the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), the Resource Conservation and Recovery Act (RCRA), etc.] should be addressed by:
  - Acknowledging the criteria that have been applied to the existing clean-up plans; and
  - Not pursuing changes in clean-up that require changes in regulations or laws without consultation with stakeholders.

- RBES should be flexible enough to take into account differences at each clean-up site. For instance, some sites should not have to develop a Vision document because they are already close to completion of clean-up.

- DOE should identify and "winnow out" variances that can be addressed under the existing regulatory framework or should not be considered further because of clear indicators that they are not actionable changes.

- Some policy issues should be resolved at the national level through collaborative stakeholder processes, including:
  - Groundwater point of compliance
  - Institutional controls
  - Long-term stewardship

- Future land use
- Waste management (including “orphan” waste)
- Understanding what DOE is going to do to secure long-term sustainability
- Definition of risk and risk management
- The disposition of the clean-up sites after EM funding ends.
- Criteria for evaluating the variances

- DOE EM should develop a communication plan for working with diverse stakeholders and Congress to ensure that long term funding and planning are coordinated.

- DOE should identify common lessons learned from current clean-up efforts and share this list with clean-up sites.

- Independent third-party review or technical assistance of risk assessments should not be viewed as an additional approval step. (This was only brought up in one group, but they indicated they spent a lot of time on it.)

Criteria

- Criteria in the existing regulatory framework should be the threshold criteria.
- Criteria for evaluating changes in clean-up approaches must be tailored to each clean-up site.
- Some criteria could be developed at the national level, but there is a need for flexibility in applying criteria at the site-level and finding the appropriate balance among all the criteria by the local site personnel, governmental entities and stakeholders.
- Human health and environmental quality are the most important drivers for clean-up.
- Groups identified a range of criteria that should be considered, but none of the groups reported on the more specific question of how the criteria should be applied.

III. Formal Sessions

A. Opening Remarks

Paul Golan, US DOE Acting Assistant Secretary for Environmental Management
Kara Colton, Manager, National Governors Association (NGA) Federal Facilities Task Force
Bob Goldsmith, Director, Core Technical Group, US DOE Office of Environmental Management
John Lehr, Core Technical Group, US DOE Office of Environmental Management

Paul Golan emphasized the importance of this meeting in opening lines of communication with stakeholders and his interest in exploring better ways of accomplishing clean-up of sites based on good science, stakeholder input and good process.

Kara Colton hoped that the meeting would help improve transparency and communication with stakeholders that had been lacking in the development of some of the Vision documents and cited the importance of having the site managers involved in the discussion during the workshop.

John Lehr outlined the five hallmarks of the RBES program:

- Priority on clean-up
- Ensuring that the end state is consistent with land use
- Commitment to achieving sustainable outcomes

- Admonition to coordinate and interact with stakeholders, regulators and affected governments
- Use of existing regulatory process

He acknowledged some missteps in the process including underestimating the task, but commended the site managers for responding admirably to the new policy requirements. Some of the risk analysis steps may have been done before, but RBES has been important in providing a policy framework for the risk assessment process.

Bob Goldsmith outlined the two step process that has evolved in RBES to clarify the distinction between step 1, the risk assessment phase, which leads to the development of a Vision document, and step 2, the decision stage, where criteria are developed and applied to the alternatives and variances between the Vision document and the existing clean-up plans. Bob also expressed his hope that this workshop could lead to development of some of the criteria that are appropriate for evaluating vision document alternatives. He confirmed a participant's position that the existing CERCLA and RCRA criteria should be applied, but said there may be other criteria that the workshop participants think should be added to the evaluation process.

He announced that EM is considering implementing a program whereby DOE will make funding available to stakeholders so that they can finance additional analysis where there is an information gap or the need for an independent review of the risk assessment.

B. State, Tribal, and Local Government and NGO Panel

Jon Sandoval, Environmental Council of the States
Seth Kirshenberg, Energy Communities Alliance
Dale Vitale, National Association of Attorneys General
Steve Gunderson, National Governors Association
Tom Winston, State and Tribal Government Working Group
Willie Preacher, State and Tribal Government Working Group
Jim Bridgman, Alliance for Nuclear Accountability

Obstacles/Concerns

- RBES has been viewed as a way of "getting around" existing statutes or a way to get a "back door" change in the regulations.
- Ill will and diminished trust have developed as a result of lack of collaboration with stakeholders and regulators; this must be taken into account in the process going forward.
- Many stakeholders are still not involved because they perceive that the decisions have already been made, and clean-up will go forward as planned.
- There has not been enough consideration of pragmatic adjustments to RBES program to accommodate actual clean-up site circumstances. For instance, should RBES be applied to sites if there is not adequate time to implement changes.
- Panel members expressed concern that the intent is simply to move wastes and hazards around rather than clean them up.
- Accelerated clean-up may be in conflict with adequate clean-up.
- Tribes should not be treated as a single entity. Each has a different perspective.
- Need to bring long-term stewardship back into the process for all clean-up sites, not just closure sites. Long-term sustainability must be robust and enforceable

- Prior agreements should be a major consideration because of the level of effort and compromise that went into developing them.

Opportunities

The panelists also outlined a number of opportunities to improve on the process and make RBES more effective. They pointed at opportunities to:

- Mend the communication problems of the past.
- Explore how and to what extent the clean-up sites can implement long-term stewardship plans.
- Learn from DOD/ECOS Sustainability Task Force, which is developing action plans and is designed to build stronger alliances among the stakeholders and DOD.
- Clarify how local government can become involved and part of the solution.
- Achieve an open-ended dialogue that begins today and continues throughout clean-up process.
- Develop a more bottom-up process and provide adequate resources to fund the process.
- Use the experience of some of the clean-up sites that are "success stories" as models for how it can be done.

C. DOE Site Managers Panel

Keith Kline, Manager, US DOE Richland Operations Office
Gerald Boyd, Manager, US DOE Oak Ridge Operations Office
Jeffrey Allison, Manager, US DOE Savannah River Operations Office
William Murphie, Manager, US DOE Portsmouth/Paducah Project Office
Robert Warther, Manager, US DOE Ohio Field Office
Frazer Lockhart, Manager, Rocky Flats Project Office
Bill Leake, Director, Idaho Clean-up Project Division, US DOE Idaho Operations Office

Key Obstacles/Concerns

- Site managers were put in the middle between communities and DOE Headquarters.
- The RBES policy attempts to make "one size fit all."
- The RBES policy is not working the way it was intended.
- The RBES policy has created a lot of ill will in the community and has greatly complicated other issues.
- It is extremely difficult to balance worker safety, long-term risks, and stakeholder concerns.
- Rename the program something other than RBES.
- Some site managers said that there are no obstacles at their sites.

Key Opportunities Noted by Site Managers

- RBES is a tool for incorporating new information, ideas, or technology.
- We have learned a lot from our communities by going through this process.
- Whether it is RBES or some other tool, there needs to be an on-going, comprehensive approach to reviewing and incorporating new information.

D. Summary of Comments by John Greeves, Director, Division of Waste Management and Environmental Protection, Nuclear Regulatory Commission (A copy of Greeves PowerPoint presentation can be found at: www.em.doe.gov and www.fftfcleanupnews.org)

NRC began to implement risk-informed decision-making in the 1980s and shared some lessons learned from their experience.

- Risk assessment policy is important in providing a single source of guidance.
- Risk assessment avoids unnecessary conservatism in clean-up plans.
- Risk communication is necessary but challenging.
- Should try to be consistent in applying risk assessment at each clean-up site.
- You do get smarter as you go along.

E. Summary of Comments by Jim Woolford, Director, Federal Facilities Restoration and Reuse Office, Environmental Protection Agency

Woolford acknowledged the need to use RBES to ground truth whether clean-up sites are on target, pointing out that some sites do not have an understanding of end states and in some cases have not done adequate risk analysis. Noting that the first policy draft of RBES appeared to allow risk to trump everything else, EPA expressed interest in working with DOE to fix the current shortcomings. Woolford also pointed to the 1996 Federal Facility Environmental Restoration Dialogue Committee (FFERDC) consensus document as an effort that has addressed and solved many of the issues that are being addressed by the RBES policy. (The 14 points excerpted from Chapter 5 referred to by Mr. Woolford are found in Appendix C and the full text can be found at www.epa.gov/swerffrr/fferdc.htm)

APPENDIX A. PARTICIPANTS LIST

U.S. DEPARTMENT OF ENERGY RISK BASED END STATES NEXT STEPS MEETING

October 6-7, 2004
Chicago, Illinois

Participants

First Name	Last Name	Title	Company	State
David	Abelson	Executive Director	Rocky Flats Coalition of Local Governments	CO
Thomas	Adams	Program Analyst	Department of Energy/Environmental Support	DC
James	Ajello	Chairman	EMAB	TX
Jeffrey	Allison	Manager	Department of Energy	SC
Lorraine	Anderson	Councilmember	City of Arvada	CO
Kathy	Angleberger	Ms.	USDOE Environmental Management	DC
Joni	Arends	Executive Director	Concerned Citizens for Nuclear Safety	NM
Kristie	Baptiste	Environmental Policy Anaylst	Nez Perce Tribe	ID
Rachel	Blumenfeld	Chief Operating Officer	Department of Energy	KY
Gerald	Boyd	Manager, Oak Ridge Operations	U.S. Department of Energy	TN
Jim	Bridgman	Program Director	Alliance for Nuclear Accountability	DC
Mike	Carter	QA Manager	USEPA	DC
Tony	Carter	Acting Director, Stakeholder Relations	Department of Energy	DC
Nicholas	Ceto	Program Manager	U.S. EPA/Environmental Cleanup Office	WA
Laura	Cusack	Section Manager	Wa State Dept of Ecology	WA
Matthew	Duchesne	Policy Advisor	DOE/EM	DC
Gabriela Lopez	Escobedo	Program Manager	Los Alamos National Laboratory	NM
Dennis	Ferrigno	Dr.	DOE EMAB	CO
Amy	Fitzgerald	Government and Public Affairs Coordinator	City of Oak Ridge	TN
Scott	Flanders		Nuclear Regulatory Commission	MD

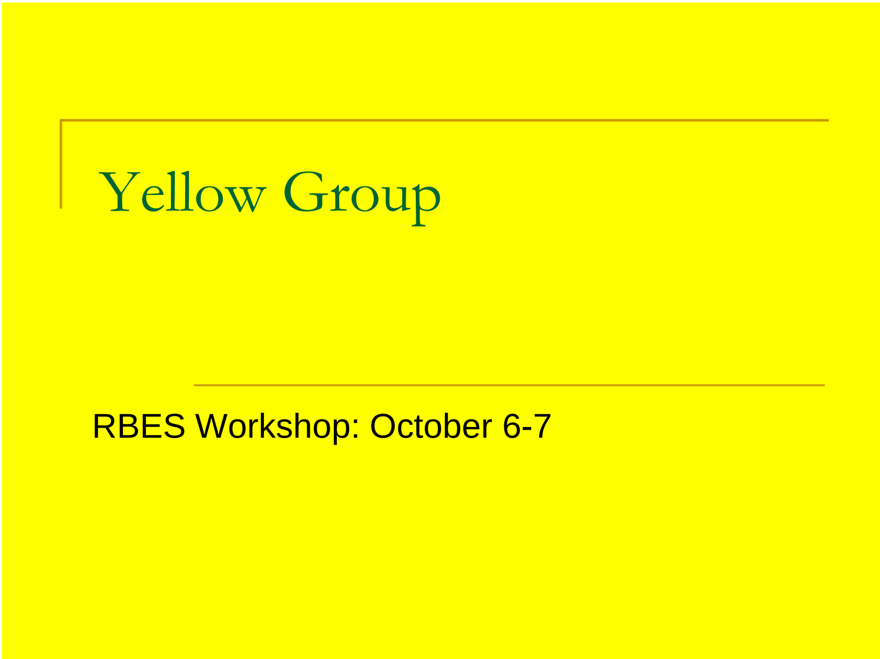
Douglas	Frost	Project Director	DOE Office of Environmental Management	DC
Dave	Geiser	Director, Office of Policy and Site Transition	DOE	DC
Robert	Geller	Federal Facilities Section Chief	Missouri Department of Natural Resources	MO
Luther	Gibson	Member of Oak Ridge Site Specific Advisory Board	DOE EM/SSAB	TN
Mark	Gilbertson	Acting Deputy Asst Secretary	Environmental Cleanup/Acceleration	DC
Annie	Godfrey	Chief, NC/SC/GA Section	EPA Region 4	GA
Paul	Golan	Acting Assistant Secretary Environmental Management	U.S. Department of Energy	DC
Robert	Goldsmith	Director	DOE	DC
Annemarie	Goldstein		INEEL Citizens Advisory Board	ID
Susan	Gordon	Director	Alliance for Nuclear Accountability	WA
John	Greeves	Director	U.S. Nuclear Regulatory Commission	DC
Deborah	Griswold	Team Leader Engineer	U.S. DOE/NNSA Service Center	NM
Steve	Gunderson	Rocky Flats Project Coordinator	Colorado Dept. of Public Health and Environment	CO
Carolyn	Hanson	Project Manager	ECOS	Dc
Brian	Hennessey	Federal Facilities Agreement Program Manager	DOE/Savannah River Site, SC	SC
Robert	Johnson		Nuclear Regulatory Commission	
Randall	Kaltreider		DOE/EM	MD
G. Phil	Keary	Environmental Restoration Manager	NNSA	MO
Seth	Kirshenberg	Executive Director	Energy Communities Alliance	DC
Keith	Klein	Manager	U.S.DOE Richland Operations Office	WA
Dave	Kling	Director, Federal Facilities Enforcement Office	U.S. Environmental Protection Agency	DC
Kenneth	Lapierre	Branch Chief	US EPA/R4 Federal Facilites Branch	DC

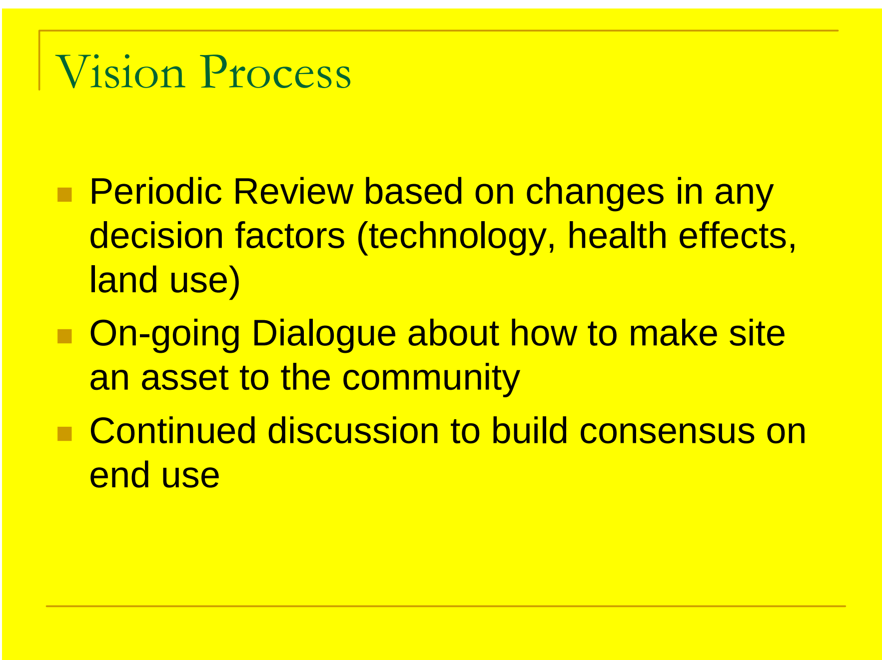
Bill	Leake	Idaho Cleanup Project Division Director	DOE, Idaho Operations Office	ID
John	Lehr	Staff Director Mission RBES	DOE	DC
David	Levenstein	Program Analyst	U.S. EPA	DC
Frazer	Lockhart	Rocky Flats Manager	Department of Energy	CO
Micah	Lowenthal	Senior Program Officer	The National Academies	DC
Peter	Maggiore	Consultant	DOE Office of Environmental Management	NM
John	Malleck	Section Chief	U.S› EPA Region 2	NY
Francis	Martinez	Governor	San Ildefonso Pueblo	NM
Raymond	Martinez	Councilman	San Ildefonso Pueblo	NM
Gregory	McBrien		DOE	DC
Monica	McEaddy	Environmental Engineer	U.S. EPA	DC
Catherine	Morris	Sr. Facilitator	Keystone Center	DC
Roger	Mulder	Director, Pantex Program	Texas State Energy Conservation Office	TX
William	Murphie	Manager	Department of Energy	KY
Ken	Niles	Assistant Director	Oregon Department of Energy	OR
Shirley	Olinger	Acting Assistant Manager for the River Corridor	DOE-RL/AMRC	WA
Inga	Olson		Alliance for Nuclear Accountability	CA
John	Owsley	Director	State of Tennessee	TN
Kristi	Parker Celico	Sr. Facilitator	The Keystone Center	CO
Barbara	Pastina	Dr	The National Academies	DC
Andrew	Persinko		Nuclear Regulatory Commission	
Mary	Picel	Project Manager	Argonne National Laboratory	IL
Anthony	Polk	Director, Soil & Groundwater Project	Department of Energy, Savannah River Operations Office, Office of the Assistant Manager for Closure Project	SC
Charles W.	Powers	Principal Investigator	CRESP	NJ
Willie	Preacher	Tribal DOE Director	Shoshone-Bannock Tribes	ID
John	Rampe		USDOE/RFPO	CO
John P.	Russell		PGDP Citizens Advisory Board	KY
Jennifer A.	Salisbury	Public Board Member	DOE Environmental Management Advisory Board	NM
Jon	Sandoval	Chief of Staff	Dept of Environmental Quality	ID
James	Saric	Project Manager	U.S. EPA Region 5	IL

Gene	Schmitt	Deputy Assistant Secretary	Us Department of Energy	DC
Kathy	Setian	Program Coordinator	U.S EPA Region 9	CA
Shelly	Sherritt		Department of Health and Environmental Control	SC
Ralph	Skinner	Project Manager	USDOE - Oak Ridge	TN
Anthony	Smith	Hanford Cultural Tribe	Nez Perce Tribe	ID
Christopher W.	Smith	Member, Oak Ridge Site Specific Advisory Board	DOE EM/SSAB	TN
Victoria	Soberinsky	Chief of Staff	U.S. Department of Energy	DC
Michael	Sobotta	Hanford Cultural Coordinator	Nez Perce Tribe	ID
Andrew	Szilagyi		DOE	DC
Sara	Szynwelski		Energy Communities Alliance	DC
Tuss	Taylor	DOE Project Program Manager	Kentucky Department for Environmental Protection	KY
Kathleen	Trever		State of Idaho	ID
Dale	Vitale	Senior Deputy Attorney General	National Association of Attorneys General	DC
Engelbrecht	Von Tiesenhausen	Board Member	Community Advisory Board for Nevada Test Site Programs	NV
Andrew	Wallo	Director EH-41	U.S. Department of Energy	DC
Robert	Warther	Manager	USDOE/Ohio Field Office	
Neil	Weber	Director, Dept. of Environmental And Cultural Preservation	Pueblo of San Ildefonso/STGWG	NM
Evelyn	Wight		WPI	MD
David	Wilson		Department of Health and Environmental Control	SC
Michael	Wilson	Program Manager	Department of Ecology	WA
Thomas	Winston	Chief, Southwest District Office and Office of Federal Facilities Oversight	Ohio Environmental Protection Agency	OH
Phillip	Wong	Program Manager	U.S. Department of Energy	CA
Jim	Woolford	Director, Federal Facilities Restoration and Reuse Office	US EPA	DC
Louis	Zeller	Research Director	BREDL, Inc.	NC
Jerry	Boese	Senior Associate	Ross & Associates Environmental Consulting, Ltd.	WA
Telita	Campbell	Administrative Coordinator	NGA Center for Best Practices	DC
Kara	Colton	Senior Policy Analyst	NGA Center for Best Practices	DC
Elijah	Levitt		Ross & Associates	WA

APPENDIX B. BREAK-OUT GROUP REPORTS:

Workshop participants were randomly assigned to break-out groups, with consideration given to achieving a balance of interests and organizations in each group. The goal of the break-out groups was to identify factors that are important in evaluating RBES and ways to measure them. Each group generated ideas on criteria that they believe are important to measure or indicate performance in alternative end states and variances and outlined suggestions for making the RBES process more effective. The presentations of each of the Break-out Groups are attached.





Vision Process

- Bring everyone to the table at the site level
- Develop consensus about End Use Vision
- Identify the "show stoppers" and take them off the menu
  - Does the timing make sense?
  - Does it have community acceptance?
  - Does it pass a subjective Cost-Benefit check?
  - Does it pass a regulatory gut check?
  - Does it open Pandora's box / unravel the fabric?
  - Does it have political support?

Vision Process

- Identify places where risks aren't addressed or can be addressed better

(1) Things that can be handled within existing regulatory framework

MOVE AHEAD

(2) Things that require a fundamental change in approach

APPLY CRITERIA AND/OR

COMMENCE A NATIONAL DIALOGUE w/STAKEHOLDERS

CRITERIA

- Benefits/Value Added
- Opportunity to Enhance Cleanup
- Timing / Where the process stands
- Tribal Treaty Rights/ Risk Assessment
- Sustainability & LR Mgmt Goals
- Robust LT Stewardship
- Consistency
- Stability of site's future mission
- Compliance with "spirit of the law" in addition to the law
- Reliance on regulatory policy
- Technology readiness
- Consideration of Trade-offs to enhance the overall end state
- Does end state support the end use?
- Environmental Justice Impacts
- Worker Impacts
- ST Vs LT Risk
- Security of Transportation
- Practicality
- Financial Strategy / Plan that supports the cleanup in the ST & LT
- Site Land use/ Exposure
- Point of Compliance/Groundwater
- Holistic Approach

Things that Need Clarification

- What is joint understanding of Stewardship/sustainability
- Understanding what DOE is going to do to secure LT sustainability
- Definition of Risk
- What is the status of NNSA's at the end of EM's role?

Blue breakout group

RBES

- PERCEIVED as outside the regulatory process
- DOE views RBES as within regulatory process
- Dialogue needed to fix this
  - Regulators to DOE
  - DOE to regulators and others

Criteria for winnowing

- Group reviewed the CERCLA criteria
  - Noted that ARARs are threshold criteria
- Additional criteria
  - Pursue variances only if NEW INFORMATION is available (applies to cases where these is a signed ROD.
  - Don't pursue **just** "easy" variances
  - Focus on variances where clarity on alternative end states does not exist with public and regulators
  - Focus on discussions about variances are needed to move forward with cleanup and closure.

The Path Forward

- Direct DOE sites to develop, with the public and regulators, a **site-specific process** for moving forward with RBES, including definition of DOE's outreach process.
  - Recognizes every site is different
- DOE would take input received to date and identify which variances it would like to work on, using the agreed-upon site-specific process. Ensure DOE, regulators, and public agree on alternatives to be considered.

Path Forward, continued

- Initiate a national dialogue on selected issues that are currently difficult to deal with on a site-specific basis:
  - Groundwater
  - Point of compliance
  - Institutional controls
  - Long-term stewardship
  - Waste Management (incl, "orphan" waste)
    - Although not an RBES issue per se, this could have an impact on implementing RBES.

3rd Party Review

- Considerable discussion in group
- "validation" is an issue
- Some concerned about 3rd party review appearing to be another approval hoop, or otherwise being in a management (or fiduciary) role.
- "Technical assistance – advisory only" seems to solve disagreement

Additional comments

- Make sure to keep a site-wide framework
- Need for transparency
  - DOE needs to clarify its goals
    - “motives lurking that are not visible”
- Identify areas of agreement

RED

End State Dialogue

General Recommendations on Direction

- Public Participation
  - History of collaboration at sites
  - National policy
  - Ample time
  - Inclusion
- Define the whole process upfront and make it clear
  - Dialogue
  - Regulatory process is starting point
  - Transparency and Openness with information
  - Focus on End State and know where you are heading

General Recommendations on Direction

- Modify the language for clarity
  - End Use Based End States
  - Alternatives
- End States is a tool that can be used to educate Congress/OMB

Process Recommendations

- Involve the public and governmental entities
  - Early, often and locally
- Clarify and re-calibrate the process
- Emphasize that risk is only the beginning of the process
- Understand the limitations of parties DOE is working with at the site
  - Can’t review all portions of the sites meaningfully with regulators
  - Eliminate obviously flawed alternatives (variance) early

Process Recommendations

- Create national criteria that are developed through a process
- Review of cleanup/end states should be updated regularly
- FFERDC/NCP (CERCLA)/Work Shop Examples
  - Capture all important Criteria

Evaluation Criteria

- All criteria are important
- Balance all criteria
- Allow for flexibility
- National Criteria and local criteria
  - Each site is different
- HH and Environment
- Top Criteria Raised
  - Worker Safety
  - Community Acceptance and Community Safety
  - Regulatory Acceptance
  - Long-term protectiveness of remedy (LTS/ICs)
- Cost and Time was important but not at top of list for most people.

Green Group

3 Basic Topics

- What problem is RBES trying to solve and does the group agree it is a problem/challenge/opportunty?
- If a problem, what is the right tool to address?
- Criteria Issue

Current Problem

Fully agree there is a problem/opportunity

3 Problems/Opportunities:

- Easy to look at some clean-up plans and declare parts not science-based, inconsisent, or unclear. (PERCEPTION ISSUE AND/OR REAL PROBLEMS)
- Some plans are not integrated on a site base. No end use in mind. No clear strategic direction.
- Need for innovation. Right thing to do. New information.

Tools/Ideas to Solve

- Current process of RBES has been useful to ID problems.
- Recommend refocus effort a bit at this point
- Have HQers (with input from others) review Vision Documents and draw out lessons learned and common problems.
- Sites (tailor process)
  - use this information to go back and have a discussion with their communities.
  - Where stakeholder agreement of a real problem—use available tools. (reopen remedies,etc.)
  - Systematic review process

Tools/Solutions

Common themes already known:

- Long term stewardship
- Point of Compliance
- Ground water
- Future land Use
- Waste Disposition
- Risk Communication/Management

Sites could use national policy direction on these key issues.

National policy dialogues—provide field managers policy guidance

Tools/Solutions

- Need to operate with more transparency
- Communication Plan
  - Communicate success to Congress(stakeholders will help)
  - DOE communicate business plan and strategic approach to their field offices, states, etc.
- EMS
  - Provide information to Sites, states, other stakeholders

APPENDIX C. ***The Final Report of the Federal Facilities Environmental Restoration Dialogue Committee: Consensus Precipices And Recommendations For Improving Federal Facilities Cleanup***. Excerpt from Chapter 5─Funding and Priority Setting

Regardless of whether protection of human health or the environment (or both) is the starting point for establishing cleanup funding priorities, the Committee affirms that numerous other factors must be considered in setting priorities for sites and projects. As set forth in Principle 9 in chapter 2 the factors listed below should be considered in setting cleanup priorities:
a) cultural, social, and economic factors, including environmental justice considerations;

b) potential or future use of the facility, its effect on the local communities' economy, vitality, livability, and environmental quality;

c) the ecological impacts of the contamination and the proposed action to address it (in those instances where protection of the environment is not used as a primary basis for establishing cleanup funding priorities);

d) intrinsic and future value of affected resources (e.g., groundwater and fisheries);

e) pragmatic considerations such as availability and continuity of skilled workers, labs, cleanup contractors to complete the activity or the feasibility of carrying out the activity in relation to other activities at the facility (i.e., capacity and work flow logic), or both;

f) the overall cost and cost effectiveness of a proposed activity and especially the relative risk reduction value obtained by the proposed expenditure;

g) making land available for other uses, recognizing that land uses may change over time;

h) the importance of reducing infrastructure costs (e.g., $300 million is spent each year to monitor tanks at Hanford and $130 million is spent each year at Rocky Flats to safeguard special nuclear material);

i) the availability of new or innovative technologies that might accelerate or improve the ability to achieve a permanent remedy;

j) Native American treaties, statutory rights (e.g., American Indian Religious Freedom Act), and trust responsibilities;

k) regulatory requirements and the acceptability of the proposed action to regulators and other stakeholders;

l) supporting accomplishment of other high priority agency objectives;

m) life-cycle costs; and

n) actual and anticipated funding levels (the congressional budget appropriation, OMB apportionment, allotments of funds to agencies or departments and the facilities, and out year funding targets).

With regard to anticipated funding levels, the Committee recognizes the constraints on federal agencies to submit budget within OMB target levels, and also recognizes that there may be circumstances that warrant challenging those constraints.

The Committee believes that there is no widely accepted mechanism for integrating human health and environmental risk with other important factors.
However, the Committee recommends, for a risk plus other factors prioritization system to work, the following conditions must be met:

For the prioritization of cleanup actions or studies, the application of standards to remedy selection and the actual selection of remedies should occur independent of the risk ranking. That is, prioritization should only relate to the timing of the action, not how protective the remedy will be.

There must be confidence, among all stakeholders, in the approach for categorizing sites based on relative risk and, similarly, the risk reduction potential of proposed cleanup activities.

There should also be confidence, among all stakeholders, in the methodology used to assign priorities once risk rankings are made.

As part of priority setting, the general range of costs associated with a cleanup activity should be known and generally agreed upon.

The system of assigning risk levels and setting priorities should be transparent and easily understood. That is, it should not only be understood by "experts" and others who are fully immersed in the process, but by members of the public, the press, and elected officials.

While the Committee believes that agencies should issue general guidance on the types of factors to be considered and how they should be applied to priority setting, ultimately, these agencies, in consultation with public stakeholders at each facility, must decide the mix and relative importance of these factors in setting priorities. Each agency should ensure that its approach is understood and utilized within the agency, by regulators and public stakeholders, and by all facilities in a similar manner to provide for comparability among facilities. In many cases, the best way to ensure that everyone is playing by the rules is to review or evaluate rankings after they are made but before funding allocation decisions are made.
In short, the Committee does not believe there is a single best methodology for applying the factors outlined above. Rather, regulating and regulated agencies and public stakeholders at facilities must determine what approach will work best for them.

The Committee does recommend, where possible, agencies and other stakeholders should define, up front, the factors in addition to protection of human health and/or environment that might influence priority setting. Then, when priorities are set, participants in the process should identify which specific factor or factors have caused a site or activity to be assigned a priority category. Participants in the decision-making process might also consider whether each factor moves or "bumps" activities from one priority level to the next level, or are so significant that they "trump" the risk determination.

The evaluation of risk and the establishment of temporal priorities is a dynamic process. Both risk rankings and priorities should be reviewed regularly by all participants, to take into account new information and even new attitudes and perspectives.
Each regulated agency should establish, in consultation with other stakeholders, procedures for reopening rankings and priorities outside of the normal budget cycle, should significant new information be discovered.

No matter what specific prioritization scheme an agency adopts, its success depends upon agreement on the process, up front, by all stakeholders. If there is broad confidence in the process, then cleanup progress will be much less subject to delays and other transactional costs historically characteristic of major federal facility cleanup projects.

Attachment 15

PUBLIC AND STAKEHOLDER COMMENTS RECEIVED IN WRITING

THIS PAGE INTENTIONALLY LEFT BLANK

Dollins, David W

From: Dollins, David W
Sent: Wednesday, February 18, 2004 10:12 AM
To: 'rachel.blumenfe@lex.doe.gov'
Cc: Morgan, John W
Subject: Comments on RBES

FYI

> > -----Original Message-----
> > From: Young,Ralph S
> > Sent: Tuesday, February 03, 2004 1:20 PM
> > To: 'cookgn@bjllc.org'
> > Cc: 'youngrs@vci.net'
> > Subject: Question for DOE Public Meeting - February 5, 2004
> >
> > Greg:
> >
> > Here's my question for DOE concerning the discussion of the "Risk-Based
> End State Vision" document.
> >
> > "Has DOE considered the use of microbes for in-situ bio-remediation of
> chlorinated compounds?" Over the last 15 years, researchers have made a
> lot of progress in this area and there are many demonstration projects in
> progress across the US. Here's a link to one of the leading researchers
> in the field, Dr. Jim Gossett:
> >
> >
> http://www.cee.cornell.edu/faculty/info.cfm?abbrev=faculty&shorttitle=rese
> arch&netid=JMG18
> >
> > I think this technology might be feasible to apply in those areas where
> the pump and treat technology has been less effective.
> >
> > I'm planning to attend the meeting Thursday, but in case I get held up,
> I wanted to enter this question into the public record, so that I could
> get an answer.
> >
> > Thanks
> >
> > Ralph Young
> > Environmental Manager
> > Air Products and Chemicals
> > Calvert City, KY 42029
>
> +

THIS PAGE INTENTIONALLY LEFT BLANK

Dollins, David W

From: Dollins, David W
Sent: Wednesday, February 18, 2004 10:14 AM
To: 'rachel.blumenfe@lex.doe.gov'
Cc: Morgan, John W
Subject: Comments on RBES from John Anderson (PACRO)

FYI

-----Original Message-----
From: JohnL.Anderson@mail.state.ky.us
[mailto:JohnL.Anderson@mail.state.ky.us]
Sent: Wednesday, February 18, 2004 9:16 AM
To: dollinsdw@oro.doe.gov
Cc: sdoo@co.mccracken.ky.us
Subject: Comments for February 5 Meeting on End State

1. PACRO supports the development process being used for Risk Based End State.
2. PACRO supports the Industrial land use for areas currently viewed as industrial.
3. PACRO supports more flexibility in the designation of use for the remaining DOE property other than exclusively recreational. PACRO supports the ownership of that property being transferred to a local industrial development agency that upon clean up to recreational standards has the flexibility to reuse portions of that property for re industrialization.

John Anderson
PACRO Director
1002 Medical Drive
P.O Box 588
Mayfield, KY 42066
Phone: 270-251-6119
Fax: 270-251-6110
E-mail: johnl.anderson@mail.state.ky.us

THIS PAGE INTENTIONALLY LEFT BLANK

COMMONWEALTH OF KENTUCKY
DEPARTMENT OF FISH AND WILDLIFE RESOURCES
C. Thomas Bennett, Commissioner

February 19, 2004

David Dollins
U.S. Department of Energy
Paducah Operations Oversight Group
P.O. Box 1410
Paducah, KY 42002

Re: Risk Based End State Vision and Variance Report for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky; DOE/OR/07-2119&D0/R2

Dear Mr. Dollins:

The Kentucky Department of Fish and Wildlife Resources (KDFWR) has reviewed the Risk Based End State (RBES) Vision and Variance Report for the Paducah Gaseous Diffusion Plant (PGDP), Paducah, Kentucky. Due to the available format and time restraints for the comment period, KDFWR respectfully offers the following initial comments for consideration. Further comments may be deemed necessary after additional review of the entire document, and subsequent documents pertaining to this topic.

Section 3.2.1 - The Ecological Activities Section states that vegetation is managed for consumption by wildlife, especially deer. While the vegetative management practices on West Kentucky Wildlife Management Area (WKWMA) do benefit most wildlife, upland habitat is managed more so for the northern bobwhite (*Colinus virginianus*) and should replace deer as the inferred primarily managed species.

Figure 3.3b - Site Legal Ownership- RBES. This figure indicates land currently leased to WKWMA will continue to be leased to KDFWR, not deeded to the state. While the current lease agreement would remain adequate, KDFWR would be interested in obtaining ownership of the property if the area meets or exceeds state and/or federally issued criteria for cleanup for recreational use.

V-1.1, 6.1, 9.1 - The Current Planned End State (CPES) continues the PGDP water policy. The RBES assumes the use of enhanced institutional controls. . KDFWR feels both of these actions are potentially inadequate in monitoring and remediating potential ecological risk to off site receptors. KDFWR feels that a more aggressive groundwater monitoring and cleanup regiment should be initiated under D&D of the plant.

EDUCATION PAYS

It is unclear as to the mechanism for enhanced institutional controls for non-DOE and DOE owned property. Will this involve deed restriction or similar legal arrangement for non-DOE owned properties?

V- 1.2, 9.3 – The CPES uses a DNAPL source reduction by using heating technologies. The RBES does not include any active reduction of contaminants. Since there would be limited control of groundwater movement to off-site area, KDFWR feels that monitoring the natural attenuation of groundwater would inadequately address the issue of groundwater contamination. KDFWR advocates the proactive stance of attempting to decontaminate the groundwater along with continued monitoring. Risks under the RBES would include the mentioned risk to samplers, but should also include ecological risk and potential risk to recreational users due to the potential for groundwater to return to the surface, thus making a completed pathway to workers and recreational users, as well as ecological receptors.

V- 1.3 - The CPES assumes excavation of burial grounds. The RBES assumes capping and monitoring of the burial grounds. With limited control of groundwater movement to off-site areas, KDFWR feels that capping and monitoring the natural attenuation of groundwater contaminants from the burial grounds is inadequate to address the potential impact these contaminants may have on ecological and human receptors. With no control of current or future rates of contamination into the groundwater, a non-removal activity poses a potential risk to both human and ecological receptors. While the short-term risk to workers, public, ecological receptors using the RBES may be reduced; long-term risk to all three may be much higher with a non-removal plan of action. KDFWR feels that adequate risk assessments, including ecological risk assessments, should be completed for each scenario to determine the best plan of action for the burial grounds site.

V-1.4- The CPES assumes implementation of oxidation technologies to remove trichloroethene (TCE) and other solvents from the phase plume. The RBES does not actively remove contaminants and only monitors natural attenuation. With limited control of groundwater movement to off-site areas, KDFWR feels that monitoring natural attenuation of groundwater contaminants from the dissolved phase plume is inadequate to address the potential impact these contaminants may have on ecological receptors. With no control of current or future rates of contamination into the groundwater, a non-removal plan poses a potential risk to both human and ecological receptors. KDFWR feels that adequate risk assessments, including ecological risk assessments, should be completed for each scenario to determine the best plan of action for the burial grounds site. It appears from the provided map that the TCE plume extends well beyond the property boundaries onto both private and state owned property.

V-1.5 - The CPES recommends active removal to reduce solvent concentrations in groundwater discharge into Little Bayou Creek. RBES does not allow for active cleanup and would only monitor concentrations at the discharge point. KDFWR feels that this action would not be appropriate as contaminated water from the Little Bayou Creek leaves the area and may pose risk to ecological receptors within Little Bayou, Big Bayou, and eventually the Ohio River. Active remediation may be necessary to reduce these potential risk to the levels required by the state.

V-2.1 - The CPES recommends removal of contaminated source sediments and soils to achieve a target risk of 1E-06. The RBES assumes excavation of hotspots in sediment and soil using a target risk and PCB concentration consistent with future land use. The RBES action in industrial areas would achieve a target risk of 1E-04 to a worker and a PCB concentration of 25 ppm. The action in recreational areas would achieve a target risk of 1E-04 to a recreational user and a PCB concentration of 1 ppm. KDFWR feels that the RBES does not adequately remove contamination from either on site or off site areas. With limited control of PCB movement through surface water, the potential for ecological exposures to exceed current acceptable levels is elevated. For example, under the RBES, the proposed levels being left are much higher than the typically used 1E-06 and 1 ppm for industrial and 0.1 ppm for residential soils and sediments.

The list of variances states, "The magnitude of these risks under the CPES and RBES have not been assessed at this time; however, because a greater amount of material would be excavated under the CPES than under the RBES, risks to all receptors would be expected to be greater under the CPES than under the RBES." KDFWR feels this may or may not be true based on the lack of information that has been obtained regarding both plans of action. We feel ecological and human health risk assessments should be performed to determine what potential impacts each action may have. By controlling sediment/soil migration during cleanup activities, potential movement, both onsite and offsite, can be adequately controlled.

V-2.2 - The CPES recommends the construction of 2 basins to control sediment migration into areas outside of the industrialized portions of the site. Under RBES, no such basins would be planned because hot spot removal would prevent migration of contaminated material. KDFWR feels an ecological risk assessment should be performed to determine what impacts the RBES may have on off site receptors. As stated above, the proposed levels of contamination to be left by the RBES are higher than current state levels for both industrial and residential scenarios. Habitat destruction could be kept to a minimum in the construction of sediment basins. Properly choosing site locations for the basins may reduce impact from habitat destruction by constructing the basins in what is currently a poor habitat.

V-3.1- Under the CPES certain burial grounds are to be excavated and disposed of in an offsite area. Under the RBES, the burial grounds would be capped and monitored. KDFWR believes that there has not been adequate characterization of the contaminants. KDFWR also feels that potential off site contamination may occur from the burial grounds and more site and risk characterizations should be completed to determine what affect leaving the material in the ground may have to both ecological and human receptors.

V-4.1, 8.1, 9.2 - The CPES assumes excavation of contaminated soils to achieve the target risk of 1E-06 under a residential scenario and a PCB concentration of 1 ppm. The RBES assumes excavation of hot spots in soil using a target risk of 1E-04 under a worker scenario with concentrations of PCBs 25 ppm. KDFWR feels that the RBES does not adequately remove contamination from either on site or off site areas. With limited control of PCB movement through surface water, the potential for ecological exposures to exceed current acceptable levels is elevated. For example, under the RBES, the proposed levels are much higher than the typically used 1E-06 and 1 ppm for industrial and 0.1 ppm for residential soils and sediments.

V-5.1 - The CPES does not include the potential construction of a CERCLA Cell for on-site disposal of CERCLA-derived wastes. The RCBS includes the potential construction of the facility. KDFWR believes that a more detailed study should be conducted to determine the feasibility of a CERCLA Cell onsite. This study should address the concerns put forth by the Commonwealth of Kentucky.

V- 7.1 - Both the CPES and RBES allow for removal of waste and debris within the legacy waste storage areas. The CPES is covered under an agreed order stating the final closure of the sites must achieve a Hazard Index (HI) of 1 and a 1E-06 for closure without the use of engineering barriers or institutional controls. The RBES excavated soils or surface areas would target areas to a HI of 1 and 1E-04 under an industrial scenario with PCB target levels at 25 ppm. KDFWR feels that the RBES does not adequately remove contamination from on site areas. With limited control of PCB movement through surface water, the potential for ecological exposures to exceed current acceptable levels is elevated. For example, under the RBES, the proposed levels are much higher than the typically used 1E-06 and 1 ppm for industrial and 0.1 ppm for residential soils under the agreed order.

There appears to be a misprint in the figure legend. It shows red points having PCB levels below 25 ppm. When compared to the other two point levels, this should actually read PCB above 25 ppm.

KDFWR appreciates the opportunity to comment on this issue. If you or your agency has any questions or requires additional information, please contact Brad Pendley at 502/564-7109, ext. 366 or via email at brad.pendley@ky.gov.

Sincerely,

C. Tom Bennett
Commissioner

CTB/BEP/kh

cc: Edwin F. Crowell, Asst. Director, Division of Fisheries
Pat Brandon, Purchase Wildlife Regional Supervisor
Tim Kreher, WKWMA Manager
Tuss Taylor, KY Department of Environmental Protection
Gaye Brewer, KY Department of Environmental Protection
John Maybriar, KY Department of Environmental Protection
Environmental Section Files

Working for the future

Paducah Gaseous Diffusion Plant
CITIZENS ADVISORY BOARD

PADUCAH GASEOUS DIFFUSION PLANT
CITIZENS ADVISORY BOARD

111 Memorial Drive • Paducah, Kentucky 42001 • (270) 554-3004 • PaducahCAB@bellsouth.net • www.oakridge.doe.gov/pgdpssab

February 23, 2004

Mr. William Murphie
Portsmouth/Paducah Project Office
U.S. Department of Energy
1017 Majestic Drive
Lexington, KY 40513

Subject: Risk-Based End State Vision and Variance Report Comments Prepared by the Paducah Gaseous Diffusion Plant (PGDP) Citizens Advisory Board (CAB)

Dear Mr. Murphie:

The PGDP CAB has prepared comments, based on discussion held at the February Board meeting, for the *Risk-Based End State Vision and Variance Report for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky (DOE/OR/07-2119&D0/R2)*

The Board advises that the following comments be considered:

- The CAB has been informed that the Department's Risk-Based End States Strategy Document is not a decision document. Since this document includes cleanup alternatives for the PGDP, the Board is concerned that it will become a decision document, without public input.
- The Board also feels the timeline of this document is too aggressive and does not allow adequate time for review, due to the complexity of it's content.

These comments were submitted to David Dollins via email on February 20, 2004 to ensure that they will be addressed at the workshop scheduled for February 26, 2004. We look forward to discussing these concerns further at the upcoming workshop. Your consideration of these comments would be greatly appreciated.

Sincerely,

Bill Tanner, Chair
PGDP Citizens Advisory Board

BT:kp
LTR-PAD/CAB-LL-04-0020

c: Distribution

THIS PAGE INTENTIONALLY LEFT BLANK

February 23, 2004

Dave Dollins
Paducah Operations Oversight Group
United States Department of Energy
P.O. Box 1410
Paducah, KY 42002

Public Comment in the matter of:
Draft Risk-Based End State Vision and Variance Report for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky (DOE/OR/07-2119&D0/R2-Secondary Document)

Comment Period Ends:
February 20, 2004 (extended)

Please include the following comments as part of the permanent file.

Charles Jurka
RT 3, Box 265A
Golconda, IL 62938

Vicki Jurka
RT 3, Box 265A
Golconda, IL 62938

Charles Jurka

Vicki Jurka

Comments:

The landowners, through the PGDP Water Policy, have entered into an agreement to abandon the use of groundwater while purchasing municipal water at DOEs expense. This agreement has a five-year life with variable renewal options. Since its inception, with one exception (landowner refusal), this removal action has performed effectively; meeting the goal of reducing "risks to residents, from exposure to" contaminated "groundwater."

Under the risk-based end state proposal "enhanced institutional controls.. would supersede (annul or replace) the current PGDP Water Policy." One of the proposed institutional controls takes the form of a legal agreement; placing "enforceable restrictions on groundwater." This type of legal agreement would be limited in duration through the law of perpetuity as well as subject to legal interpretation. Another proposal calls for the aquisition "of rights from surrounding property owners and directly implements (ing) restrictions on groundwater and property use." This proposal enjoins the property owner to abstain from using their groundwater and/or property in exchange for an undetermined sum of money. Under the principles of mutual benefit both parties would automatically benefit from this buyer/seller agreement. But through this approach, the landowner realizes a lesser, more undesireable, benefit when relinquishing not only property right but municipal water payments as well.

DOE and its contractors contaminated the landowners groundwater; destroying a self-sufficient economical option for landowner water-production. DOE then ameliorated this harm, through the Water Policy, by paying the costs associated with a new source of "clean" water. The extensive and expansive degree of groundwater contamination, under the current proposed remedial actions, will remain for many generations to come. In all likelihood, legal instruments will not bridge this generational span. The inherent failures of both current and risk-based proposals necessitates the exploration of other options. The most fail-safe, long-range, cost-effective option is the purchase and subsequent DOE control of "realestate" from all Water Policy landowners.

Pages 143-147: Hazard 1, V-1.2 through V-1.5: This draft document makes claims that the only "variance in risk between the current planned end state and the RBES is the amount of time necessary to achieve MCLs." We disagree. The decision making process (scope, cost, schedule, etc.) fails to consider the progression of the curently identified groundwater plumes and the potential impact on landowners , residing out side the Water Policy boundries, who still rely on groundwater sources. It also fails to address the importance of the element of time respecting the migration of unremediated contaminants beyond current Water Policy boundries and/or into the deeper aquifer (McNairy). It should be apparent that the proposed institutional controls will not ameliorate the risk for future generations.

Barriers:

* (143) We endorse the regulators position for "source actions to reduce contaminant concentrations."
* (143) We reject "technical impractability waivers."
* (144) We disagree with calling the fenceline "point of exposure." It would be better identified as the source of all exposures.
* (144-5) After 50 years of dumping by DOE and its contractors, source actions are necessary.

Page 148: Hazard 2, V-2.1: The RBES fails to consider the hazard posed from eating "ecological receptors" after they have been exposed to long-lived PCBs in their environment.

Page 150: Hazard 3, V-3.1: Burial grounds are inconsistent with re-industrialization.

Pages 40 and 142 through 159: Hazard 5: Hazard area 5 includes closed and operating landfills. There are three (P), not two, closed landfills in this industrialized landfill area. These landfills are leaking.They are closer to the residential receptor than any other PGDP/DOE facility. They sit atop a seismically active area. By their very nature, they pose both current and future risk. The operating landfill (C-746-U) is the primary disposal option for legacy waste, in storage at DMSAs, at PGDP. The potential for future expansion of this landfill is great: ongoing EM, proposed D&D, as well as DUF-6 conversion activities drive this concern. These landfills are a contentious community issue. "Table 5.1 Variance Report by Hazard Area" completely ignores these hazards.

Page 12 (para. above 2.1.2): This paragraph requires clarification.

Page 44 (risk levels): Fig.4.1a2 is referenced but does not appear in this draft document (our copy). This appears to be an important reference when determining exposure pathways.

Page 1: "Once finalized, this report will provide information that can be used to establish clearly articulated and technically achievable cleanup goals for

PGDP..." It is our hope that the final document will achieve these goals; as the draft document fails miserably.

Generally:

- This draft document fails to address radiological risk.
- Anticipated recreational use for areas outside the fence is inconsistent with a McCracken County zoning ordinance .
- This draft document makes contradictory statements (eg. pg ES-3, 1st set * #3, 2nd set *#7, off-site/on-site disposal).
- During D&D the NE plume treatment system may be dismantled/removed (pg.5).
- 24% of the population living around PGDP still rely on groundwater (pg.27)
- The timeline for this document, including but not limited to production, notification, availability, and review, was insufficient. This hurried approach generated a poorly prepared document containing many errors (including noticeable omissions).
- The intended use of this document is poorly understood by the public and others; DOE calls it a "living document" with a fast approaching "final" version due date.

Thank you

THIS PAGE INTENTIONALLY LEFT BLANK

Dollins, David W

From: Mark Donham [markkris@earthlink.net]
Sent: Monday, February 23, 2004 2:55 PM
To: Dollins, David W
Cc: Kristi Hanson; Craig Rhodes; merryman@apex.net; gwaldrop@comcast.net; rlamb@apex.net; tillsojd@apci.com
Subject: Risk Based End states

Dave Dollins,
Paducah DOE

Dear Dave,

These are the comments of the Coalition for Nuclear Justice (CNF), which is a project of the Regional Association of Concerned Environmentalists (RACE), a grassroots environmental organization from Southern Illinois and Western Kentucky, active in the area since 1985. RACE has members from the region surrounding the Paducah Gaseous Diffusion Plant (PGDP) that would be adversely impacted by environmentally unsound activities occurring at the facility.

We have some real problems with the Risk Based End states program and site specific plans for Paducah. The RBES process has been flawed from the beginning. It is based on the secretive "Top to Bottom Review" and the agreements with the various states were
> done mostly behind closed doors. We even worked through the CAB and had 4 different consensus occasions when we were involved that asked to be involved in all of this process - but this was just ignored. Now that they you developed these specific
> > plans, it is put out for a quick comment period with an unrealistic turnoround period. This is bogus public participation and shows a continued contempt for the public's concerns
> here and across the DOE complex. As far as the specific variances go, our
> > comments follow each of the variances contained in the ***** ______ ****** below. We use your contractor's own words as the basis for what we comment on.
> > > http://www.bechteljacobs.com/pdf/pad/rbesv/chapter5.pdf
> > >
> > > 5.2 VARIANCES BETWEEN CURRENT PLANNED END STATE AND RBES
> > >
> > > This section presents tables identifying the variances between the
> current planned end state and the RBES. As noted earlier, the first table (Table 5.1) identifies variances within a given hazard area, and the second table (Table 5.2) identifies
> > > variances over hazard areas. When combined over hazard areas, the
> relative importance of each of the variances, as indicated by the number of
> hazard areas affected, are as follows: (In this list, the current planned end
> > state action is listed first and the RBES action is listed second. Also, note
> > that the cost, schedule, and risk discussions do not appear in Table 5.2
> > because these discussions are hazard area specific.)
> > >
> > > · Variance 6 (V-6): Cleanup levels for soil and sediment in industrial
> > areas set at targets of 1E-06(residential) and PCBs of 1 ppm versus targets of
> > > 1E-04 (industrial) and PCBs of 25 ppm; Cleanup levels for sediment in
> > > recreational areas set at targets of 1E-06 (residential) and PCBs of 1
> ppm
> > > versus targets of 1E-04 (recreational) and PCBs of 1 ppm - Hazard

Areas
> 2, 4, 8, and 9.
> > *****We oppose a blanket relaxing of the cleanup standards for pcbs.
> > This will results in many pounds of pcbs being left on site - 25 times
> more to be exact. PCBs have been found in higher than average levels in
> > virtually every living creature that has been tested around the plant.
> This means they likely are in the workers also, in the dust, in the water.
> There needs to be diligence in trying to reduce the pcb exposure to the
ecology
> of the area.
> > In addition, this does not address the private lands which have or
may
> > have been contaminated by the plant. Any comprehensive cleanup plan
> should deal with contaminated private lands.*****
> >
> > >
> > > · Variance 1 (V-1): Continuation of PGDP Water Policy versus Enhanced
> > > institutional controls -Hazard Areas 1, 6, and 9
> > *****The DOE should not try to use the water policy as a political tool.
> > Water should be supplied to those in the water policy separate from any
> > other considerations. Adequate monitoring should occur in order to
> > determine if the plume is spreading. With natural attentuation as the
new
> > cleanup plan, it is likely that the water policy area will expand over
> > time.********
> >
Variance 2 (V-2): Treatment of groundwater source areas versus
> monitored
> > > natural attenuation -Hazard Areas 1 and 9.
> > ******This addresses Variance 2 - 4, as they all relate to
> > groundwater/source cleanup. This is a huge step back from the original
> > committments to clean up the groundwater. We know that the plume both
> > enters the river underground and that it bubbles up in springs close to
> the river and enters the creeks, and then into the river. We have little
> > knowledge of how it actually enters the river underground, or how it
might
> > come up during flooded conditions. However, it has certainly been shown
to be
> > entering the river. If it is allowed to go on by natural attenuation,
> this will go on forever, practically. The one thing that always the CAB
agreed
> > on was that removing the contamination sources should be the highest
> > priority. We agreed with that also. The idea of walking away from this
groundwater plume and not cleaning up the sources is of such magnitude that
it is hard to believe that the
> agency has properly thought this out. For example, won't this cause the
plume to expand
> to an even wider area than it current occupies? How could it not? What
> about the areas where it bubbles to the surface? What are the long term
impacts
> > of this? Shouldn't there be an Environmental Impact Statement done on
this proposal?
> > We also want to know where US EPA stands on this, and whether or not
> this complies with CERCLA.*******
> > >
> > > · Variance 3 (V-3): Excavation of groundwater source areas versus
> > monitored natural attenuation Hazard Area 1.
> > *****See response to Variance 2.*****
> > >
> > > · Variance 4 (V-4): Treatment for the dissolved phase plume versus
> > monitored natural attenuation -Hazard Area 1.
> > *****See response to Variance 2.*****
> > >
> > > · Variance 5 (V-5): Actions to reduce surface water discharges versus

> > > continued monitoring - Hazard Area 1.
> > *****Again, walking away from the committment to try to reduce surface
> water discharges is a significant backtracking on the cleanup. This has
> > implications for neighboring properties, wildlife, recreationalists, and
> the ecology. There will also be cumulative impacts on the discharges
going
> into the creeks and then into the river. This also poses a incremental
> increase in the risk of re-contamination or cross contamination during or
after
> some cleanup action has occurred. Again, the ultimate result of this is
that
> > more contamination will be left on site. With plans to leave the major
> > source areas and to reduce the cleanup standards, the site will be far
> from clean after DOE declares the cleanup over.*******
> >
> > >
> > > · Variance 7 (V-7): Construction of sediment control basins versus no
> > > construction - Hazard Area 2.
> > *******We are not a huge fans of the larger sediment control basins,
because
> we believe they have a potential for becoming another source of
groundwater contamination. The key is to reduce the contamination going
into the watershed - not trying to catch it once it has entered the water.
At that point the damage has been done and
> > it is much more difficult to capture the contaminant. So the focus
should
> > be on stopping the contaminants from entering the watershed, in our
> opinion.*************
> > >
Variance 8 (V-8): Excavation of burial grounds versus capping of
> burial grounds - Hazard Area 3.
> >
*******This is a cost cutting item that DOE has been trying to get into
> > their cleanup plans for many years. There are many hundreds of tons of
> > uranium buried in unlined trenches at the site, having been placed in
> > barrels with PCB oils due to the pyrophoric nature of the uranium at
> issue. (notwithstanding the fact that the CAB was falsly told that the
uranium was covered by peanut oil) There has been some testing of these
trenches, and there is indication
> that barrels are deteriorating, and that some of the trenches penetrate
into
> the water table and the barrels are sitting in water. To cap and leave
this would be a disaster in the making. It is so likely that this area is a
source of
> > groundwater contamination that it makes no sense to wait to dig the
stuff
> > up. Besides, we never thought that the monitoring around the burial
> grounds was adequate to detect leaks. Like Dr. Peter Montague says,
capping an
> unlined landfill is like putting a lid on a leaking bucket. It does no
> good******
> > >
Variance 9 (V-9): Construction of potential CERCLA Cell versus no
> > > construction - Hazard Area 5.
> > ********We are not in favor of the CERCLA cell. However, we fear that
this
> > variance is being used as a way to only shift plans for dumping to the
> 746U landfill, which we are not in favor of either. We do not think that
the
> > Paducah site is a good landfill site for such long lived contaminants
> being so close to a major river. We think the idea of using some of the
existing
> > buildings as containment facilities should be looked at more, but that
the

> > focus should be on better quality containment facilities for the
> > contaminants. What needs to be done is that the contaminants need to be
> > removed from the open environment and contained in facilities that have
> > floors and the capability of observing leaks as soon as they occur with
> easy
> > remediation. If some of the existing buildings could be modified in
some
> > way to accomplish this, then that is certainly something to look at. If
> new facilities need to be built to adequately contain the contamination,
then
> > the agency should build them.*********>
> > >
> >
> > Variance 10: (V-10): Cleanup levels for soil and/or decontamination
of
> > > surfaces in industrial areas set at targets of 1E-06 (residential) and
> > PCBs of 1 ppm versus targets of 1E-04 (industrial) and PCBs of 25 ppm -
> Hazard Area 7.
> > *****We oppose a blanket relaxing of the cleanup standards for pcbs.
This
> > will results in many pounds of pcbs being left on site - 25 times more
to
> be exact. PCBs have been found in higher than average levels in virtually
> > every living creature that has been tested around the plant. This means
> > they likely are in the workers also, in the dust, in the water. There
> needs to be diligence in trying to reduce the pcb exposure to the ecology
of the
> > area.
> > In addition, this does not address the private lands which have or
may
> > have been contaminated by the plant. Any comprehensive cleanup plan
> should deal with contaminated private lands.*****

In summary, we see this RBES process as a publicly unfriendly (in violation of the site community relations play) ploy to allow DOE to walk away from its billion dollar committments it has made in the past decade and half to adequately clean up the site. The public has for all intents and purposes been cut out of the process. There has been no environmental studies of this propsal, and we oppose it. If the DOE wants to amend its cleanup plans, it should start at the beginning and engage the public adequately, do proper environmental studies, and give a rational justification for its decisions. The RBES process has been just the opposite.

Mark Donham
Kristi Hanson
Coalition for Nuclear Justice
RR # 1, Box 308
Brookport, IL 62910
618-564-3367

> >
> >
> >
> > >
> >
>

PACRO

Paducah-Area Community Reuse Organization
P. O. Box 588 - 1002 Medical Drive
Mayfield, Kentucky 42066
Phone: (270) 251-6119 - Fax: (270) 251-6110

March 11, 2004

MEMORANDUM

TO: Department of Energy

FROM: John Anderson, Director ja
Paducah-Area Community Reuse Organization
P.O Box 588
Mayfield, KY 42066

RE: Paducah Site End State Vision

1. BACKGROUND:
   A. The Paducah-Area Community Reuse Organization (PACRO) was formed in August of 1997 by regional community representatives from western Kentucky and southern Illinois in an effort to mitigate potential downsizing and restructuring of the Paducah Gaseous Diffusion Plant (PGDP) workforce as a result of the end of the Cold War and changing Department of Energy (DOE) priorities.
   B. Membership of the PACRO is designed to represent the counties in which the majority of the PGDP workforce lives. Thus, the PACRO impact area includes Ballard, Graves, McCracken and Marshall counties in western Kentucky and Massac County in southern Illinois. The PACRO implemented the following programs; Entrepreneurial Development; Existing Business and Industry; Industrial Parks and Spec Buildings; Workforce Reuse; and Facility Reuse.
   C. The current PGDP operator, USEC, has announced it was moving to Portsmouth, Ohio with a possible closure date of 2010.
2. ISSUE:
   A path forward using the data/comments collected on the Draft End State Vision Document by DOE.
3. RECOMMENDATION:
   A. Select an internationally respected industry site selection firm and the completion of an Industrial Parks Master Plan for the 3,000 + acres of property currently owned by DOE in west McCracken County to perform all tasks of the Scope of Services listed below:

      I. Evaluation of site selected by and completion of Phase II engineering including:
         A. Identify and map utility locations and relocating to industrial park site.

- Electric
- Natural Gas
- Water
- Waste and wastewater
- Rail

B. Environment
- Wetlands
- Historical and archeological
- Hazardous waste

C. Complete topography mapping project

II. Community and economic assessment and planning

A. Projected capital cost
- Cost of infrastructure development
- Research potential grant and other funding sources for development and completion of industrial park

B. Comparable site analysis
- Competitive assessment of competing "world class" industrial parks
- Economic impact analysis of cost and benefits from estimated tax revenues generated by new jobs created.

C. Workforce assessment
- Available workforce; skilled and unskilled
- Available workforce training and retraining

III. Land-use and development of land-use alternatives

A. Planning, design and development for master plan
- Recommendations for efficient development process including incremental project steps to assure proper management and investment protection
- Prepare concept land-use design plan, project phasing (if any)

B. Research and brand identification
- Identify primary industry that will be the most likely occupants of the site
- Branding, image, site name and market positioning of project

4. ADVANTAGE:

A. This approach pioneers the most equitable way to arrive at a variable end state vision for the site. It allows the State Fish and Game, Citizens Advisory Board, as well as, other organizations in the community, like PACRO and GPEDC, with a mission to mitigate the downsizing of USEC, to speak with as close to a single voice as possible for an end state vision.

B. To avoid any perceived favoritism, each participating entity should be offered an opportunity to fund a portion of the study.

C. The results of this approach will be based on the industry location experience of the firm, as well as, the positions of the other community stake holders.

To: **Mr. Bill Murphie**
Department of Energy
Portsmouth/Paducah Project Office
1017 Majestic Drive, Suite 200
Lexington, Kentucky 40513

Mr. Greg Bazzell
US Department of Energy
PGDP Site Office
P.O. Box 1410
Paducah, Kentucky 42002

From: **Steve Hampson, UK-KWRRI**

Thru: **Lindell Ormsbee, UK-KWRRI**

Re: **Risk Based End State Vision and Variance Report for the Paducah Gaseous Plant, Paducah, Kentucky (DOE/OR/07-2119&D0/R2)**

Date: **March 23, 2004**

Attached are UK-KRCEE comments on the Risk Based End State (RBES) Vision and Variance Report for the Paducah Gaseous Plant, Paducah, Kentucky (DOE/OR/07-2119&D0/R2). Our initial review of the Executive Summary and variance tables prompted the expenditure of time to review the entire document.

UK concurs with the use of a risk-based end state (RBES) as a mechanism to further assess the PGDP Environmental Management (EM) program. UK agrees with many of the assumptions made for RBES Hazard Area alternatives. Specific comments for the document text and variance tables are attached.

Please contact Steve Hampson at (502) 564-8390 extension 4507/skhamp1@pop.uky.edu with questions or comments.

c: Dr. John A. Volpe
Mr. Jim Kipp

1. **<u>Section 1, Page 1, Second Paragraph</u>**. UK concurs with the use of a risk-based end state (RBES) as a mechanism to further assess the PGDP EM program. Use of this approach allows a clear path forward for evaluation of accelerated risk based strategies to minimize impacts on public health.

2. **<u>Section 1, Page 2, Second Paragraph.</u>** Are the agreement mechanisms in place that will allow the DOE to renegotiate current compliance approaches and agreements at the PGDP? Given the difficulties and time involved reaching agreements on the recent LOI and current ACO, is attaining RBES modification to current agreements and the current end state a realistic possibility?

3. **<u>Section 2.3, Page 15, First Paragraph.</u>** The statement relative to identification of recent faulting is not correct based on the present state of knowledge and information disseminated to all involved parties. See memorandum of February 26, 2004 from Hampson to Murphie regarding the status of seismic investigations and seismic assessments at the PGDP and its environs.

4. **<u>Section 4.1.1, Page 44, Second and Last Paragraphs.</u>** While ^{99}T does not currently exceed the drinking water MCL in areas outside of the DOE property boundary, the groundwater resource has been contaminated with ^{99}Tc both in and outside of the DOE property boundary. Additionally, ^{99}Tc has been modeled to exceed the MCL at and outside of the property boundary within 1000 years if barriers to migration are not in place. Based on previous assessments presented in this document residents have the potential to be exposed to groundwater above ^{99}Tc MCLs at off-property locations both under current conditions and under any future conditions that do not minimize the migration of ^{99}Tc from source areas to points of exposure.

5. **<u>Section 4.1.1, Page 47, "Pathways", Third Paragraph.</u>** Based on the ITRD evaluation for the PGDP and subsequent implementation of preferred treatment trains, a reduction in source terms is possible at the PGDP. Treatment of groundwater source terms will accelerate risk reduction and result in a reduction of DOE's long-term mortgage at the PGDP only if conducted in conjunction with the treatment trains identified by the ITRD group.

6. **<u>Section 4.1.1, Page 47, "Pathways", Third Paragraph.</u>** Based on modeling it has been demonstrated that capping alone will not minimize the potential for releases from burial grounds. Modeling has indicated that caps must be tied to hydrological barriers in order to minimize infiltration and exfiltration from the burial grounds.

7. **<u>Section 4.2.1, Page 50, "Pathways", Third Paragraph and Section 4.2.2, Page 57, Third Paragraph.</u>** This discussion is not entirely correct. Under current conditions exposures are attributable to bank soils, sediments, scrap metal, and surface water. Without removal of or barriers to contact with bank soils, continued releases having the potential to impact public health will occur.

8. **<u>Section 4.3.1, Page 58, "Pathways", First Paragraph.</u>** How is buried waste a direct contact risk?

9. **<u>Section 4.3.1, Page 58, "Pathways", First Paragraph.</u>** There have been no technically sound and conclusive investigations demonstrating that contaminants are not migrating from these units to groundwater and surface water.

10. **<u>Section 4.3.1, Page 59, "Pathways", Second Paragraph.</u>** The waste is buried and the units are capped and these conditions must be reflected in exposure assumptions for the units. Physical controls of soil cover and caps would clarify the exposure and pathway discussions relative to these units.

11. **<u>Section 4.3.1, Page 60, "Pathways", Table 4.5.</u>** Explain how ^{228}Th is considered without considering the other nuclides in the ^{232}Th decay chain.

12. **<u>Section 4.6.1, Page 70, "Pathways", Second Paragraph.</u>** There have been no technically sound and conclusive investigations demonstrating that contaminants are not migrating from these units to groundwater and surface water.

13. **<u>Section 4.6.1, Page 71, "Pathways", Table 4.7.</u>** See comment 11.

14. **<u>Section 4.6.2, Page 74, "Pathways", Last Paragraph.</u>** Based on modeling it has been demonstrated that capping alone will not minimize the potential for releases from burial grounds. Modeling has indicated that caps must be tied to hydrological barriers in order to minimize infiltration and exfiltration from the burial grounds.

15. **<u>Section 4.7, Page 74, "Pathways", First Paragraph.</u>** What DMSAs and legacy wastes have been or are contaminating soils, surface water, etc.?

16. **<u>Section 4.8.1, Page 77, "Sources".</u>** In the cylinder yards the primary sources of exposure are clearly the cylinders containing DUF6. Direct exposure to the gamma radiation from the cylinders and not the soils is the primary pathway of concern for the cylinder yards. There have been only a few breaches and possible release of DUF6 from the 30,000+ cylinders in the yards. Therefore, contamination of soil zones from Hazard Area 8 should be minor and restricted to a few hot spots.

17. **<u>Section 5.1.1.3, Page 131, "Projected Risk Levels", First Paragraph.</u>** Based on ITRD recommendations, a fence line action was necessary to reduce current TCE concentrations to levels that would allow property-boundary concentrations to approach MCLs. The current planned heating technologies for source zones were never meant to stand alone and were always linked to dissolved phase actions for both 99Tc and TCE within the restricted area, at the fence line, and on DOE property outside of the restricted area.

18. **Section 5.1.2.2, Page 132, "Pathways", 2nd Paragraph.** Recent investigations to collect and evaluate data on the distribution of contaminants in the NSDD have demonstrated that bank soils are the primary source of contaminant releases in the ditches. A barrier to continued releases of contaminants from bank soils would and should be real-time identification and removal of hot spots.

19. **Section 5.1.4.2, Page 134, "Pathways", First Paragraph**. Data exists that establishes past and continuing migration of surface soil and contaminants.

20. **Section 5.1.9.3, Page 134, "Projected Risk Levels", First Paragraph**. Based on reasonable assumptions for future land use, the target risk level for cleanup of soils within the restricted area should be based on industrial and not residential exposures.

21. **Section 5.2, Page 140, Bullets**. Concur with projected radiological and non-radiological cleanup levels for future industrial and recreational use designations at the PGDP. However if the facilities within the restricted area are to be free released and not under the control of the Department of Energy, more restrictive state and/or federal cleanup levels should be applicable.

22. **Page 142, Table 5.1, HA 1, V-1.1.** Enhanced institutional controls provide an excellent approach for control of long-term groundwater usage. However, this should not preclude evaluation and implementation of technologies to reduce source terms and dissolved phase contamination at the PGDP.

23. **Page 143, Table 5.1, HA 1, V-1.2.** If only source reduction were implemented at the PGDP with no concurrent dissolved phase actions it is likely that no significant reduction in groundwater contamination would be achieved. ITRD recommendations consisted of treatment trains to concurrently address sources and dissolved phase contamination.

24. **Page 143, Table 5.1, HA 1, V-1.2.** Based on the current lack of pilot programs at PGDP to demonstrate an inability to achieve reductions in source terms and groundwater contamination it will be difficult for DOE to defend a position pursuing technical impractibility (TI) waivers.

25. **Page 143, Table 5.1, HA 1, V-1.2.** Based on the point of compliance established by the RCRA/CERCLA remediation at the Maxey Flats Nuclear Disposal Site, the PGDP point of compliance should be the DOE property boundary.

26. **Page 144, Table 5.1, HA 1, V-1.3.** Previous site investigations of burial grounds at the PGDP have not provided data that conclusively demonstrates whether the burial grounds are contributing to groundwater contamination. DOE should demonstrate that under the worst case scenario contamination from the burial grounds would not exceed MCLs at the fenceline or the DOE property boundary. Even if there is an impact to groundwater at the fenceline, the pathway for exposure is incomplete because of long-term access controls.

27. **Page 144, Table 5.1, HA 1, V-1.4.** DOE's modeling has shown that capping without hydrological barriers will not prevent infiltration and exfiltration from the burial grounds.

28. **Page 144, Table 5.1, HA 1, V-1.4.** See comment # 23. The ITRD identified a number of technologies that have the potential to significantly reduce contaminant concentrations in the dissolved phase plume.

29. **Page 147, Table 5.1, HA 1, V-1.5.** DOE's modeling indicates that levels of ^{99}Tc in groundwater that are greater than MCLs may discharge to surface water outside of the DOE property boundary. Under the RBES, how does the DOE plan to address the discharge of ^{99}Tc to Little Bayou Creek in the future?

30. **Page 148, Table 5.1, HA 2, V-2.1.** The target risk levels within the restricted area should be based on reasonable future land use which has been established as industrial.

31. **Page 148, Table 5.1, HA 2, V-2.1.** Under KRS 13A "policy" cannot be used establish a standard in the Commonwealth. A standard must be promulgated in an administrative regulation.

32. **Page 148, Table 5.1, HA 2, V-2.1.** Because of the implementation enhanced institutional controls under the RBES, the target risk in industrial areas should be set at 1E-4.

33. **Page 149, Table 5.1, HA 2, V-2.2.** Removal of hot spots negates the necessity for sediment basin in drainage channels. If it is determined that controls are necessary to minimize sediment releases, alternative technologies such as those proposed by Dr. Richard Warner/UK should be evaluated because of the significant cost savings.

34. **Page 149, Table 5.1, HA 3, V-3.1.** DOE has not demonstrated that these units do not contribute to groundwater contamination. DOE's modeling has shown that capping without hydrological barriers will not prevent infiltration and exfiltration from the burial grounds. See comment # 26.

35. **Page 149, Table 5.1, HA 3, V-3.1.** DOE should clarify that the potentially exposed individual would be an industrial worker excavating into the waste. However, this pathway seems unlikely given DOE's implementation of enhanced institutional controls.

36. **Page 149, Table 5.1, HA 4, V-4.1.** We concur with DOE's position to remove hot spots within the restricted area using a target risk of 1E-4. It is not reasonable to apply a residential target risk of 1E-6 to remediation activities conducted within the restricted area.

37. **Page 149, Table 5.1, HA 5, V-5.1.** Climatological conditions are addressed in engineering design and do not preclude the construction of a potential CERCLA Cell.

38. **Page 149, Table 5.1, HA 5, V-5.1.** IS NREPC uniformly applying seismic regulatory requirements to all permitted facilities?

39. **Page 149, Table 5.1, HA 5, V-5.1.** Technical experts do not agree that seismic conditions at the PGDP preclude the construction of a potential CERCLA Cell. See memorandum of February 26, 2004 from Hampson to Murphie regarding the status of seismic investigations and seismic assessments at the PGDP and its environs.

40. **Page 149, Table 5.1, HA 5, V-5.1.** In addition to engineering controls to address climatological and seismic issues, control of waste forms can minimize the potential for release from the CERCLA Cell.

41. **Page 154, Table 5.1, HA 7, V-7.1.** Future land use for the restricted area has been agreed to as industrial. Therefore it is unreasonable to set a residential target risk of 1E-6. Enhanced institutional controls would preclude the construction of residential housing units in this restricted area.

42. **Page 155, Table 5.1, HA 8, V-8.1.** Based on the number of cylinders breached, excavation of hot spots would be cost-effective and accelerate cleanup subsequent to removal of the DUF6 cylinders. Risk assessments have demonstrated that even under a no action scenario, the cylinder yards pose minimal risk.

> -----Original Message-----
> From: Steve Doolittle [<mailto:sdoo@co.mccracken.ky.us>]
> Sent: Tuesday, March 30, 2004 3:30 PM
> To: 'Dollins, David W'
> Subject: DOE's Risk Based End State Vision
>
>
> March 30, 2004
>
> Mr. David Dollins
> Paducah Operations Oversight Group
> US Department of Energy
> PO Box 1410
> Paducah, KY 42002
>
>
> RE: Comment on DOE's End State Vision for the PGDP
>
> Dear David:
>
> On behalf of McCracken County we wish to add these comments to the land use portion of the End State Visioning process.
>
> We support DOE's general determination that current land uses should be maintained. That is, industrial lands should remain industrial and recreational land uses should be maintained. However, we would offer that flexibility should be put in place so that some of the open recreational or open space lands could be offered for some industrialization/reindustrialization opportunities. Local planning agencies should at least be allowed an opportunity at some future point to decide if a re-use of recreational or open area is appropriate.
>
> We recognize DOE's hard work in this area and appreciate the opportunity to be heard.
>
> Steven Doolittle, McCracken County Administrator
>

THIS PAGE INTENTIONALLY LEFT BLANK

Working for the future
Paducah Gaseous Diffusion Plant
CITIZENS ADVISORY BOARD

PADUCAH GASEOUS DIFFUSION PLANT
CITIZENS ADVISORY BOARD

111 Memorial Drive • Paducah, Kentucky 42001 • (270) 554-3004 • PaducahCAB@bellsouth.net • www.oakridge.doe.gov/pgdpssab

NEWS MEDIA CONTACT:
Lynn Link, Bechtel Jacobs Company LLC
(270) 441-5209

FOR IMMEDIATE RELEASE
March 31, 2004

Paducah Gaseous Diffusion Plant
CITIZENS ADVISORY BOARD
Forwards End State Vision Recommendation to DOE

Paducah, KY—The PGDP CAB approved by consensus recommendation to the U.S. Department of Energy (DOE) regarding the end state of the Paducah site at their Board meeting held March 18, 2004. The CAB's primary mission is to provide informed recommendations and advice on major policy issues regarding environmental restoration, waste management and related PGDP activities.

The recommendation, which was submitted to DOE on March 30, lists 12 items the CAB feels are necessary to address the concerns of the community. The goal of this recommendation is to protect human health and the environment while preparing for a viable economic future for the Paducah site. While the recommendation calls for reindustrialization, it encourages in-depth remediation and the health and safety of plant neighbors as well as plant workers.

As the community's voice to DOE regarding cleanup of the PGDP, the CAB's objective was obtain input from all parties affected. Over the last eight months this recommendation has been discussed with city, county and state governments, plant neighbors, local chambers of commerce, economic development groups and the worker's union. To date, the CAB has received letters of support from Active Citizens for Truth and the Paducah-Area Community Reuse Organization. The Board hopes other groups will join them in ensuring that the end state of the Paducah site will benefit the entire community.

The CAB meets on the third Thursday of each month at 5:30 p.m. The meetings, which are open to the public, are held at 111 Memorial Drive, Paducah. For more information, contact the CAB office at 270-554-3004.

THIS PAGE INTENTIONALLY LEFT BLANK

PADUCAH GASEOUS DIFFUSION PLANT
CITIZENS ADVISORY BOARD

111 Memorial Drive • Paducah, Kentucky 42001 • (270) 554-3004 • PaducahCAB@bellsouth.net • www.oakridge.doe.gov/pgdpssab

Consensus Recommendation: 04-07

Title: <u>End State Vision for the Paducah Gaseous Diffusion Plant Site</u>

Background:

In November 2002, the Paducah Gaseous Diffusion Plant (PGDP) Citizens Advisory Board (CAB) requested that the U.S. Department of Energy (DOE) provide a list of topics for the CAB to work from in developing recommendations. In DOE's response, the CAB was asked to focus on long term stewardship, specifically the CAB's End State Vision for the PGDP site.

In June 2003, the Long-Range Strategy/Stewardship task force began the process of obtaining input from the community for an End State Vision. The first meeting was attended by representatives of the CAB, DOE, the Kentucky Department of Waste Management, the West Kentucky Wildlife Management Area (WKWMA), the Greater Paducah Economic Development Council (GPEDC), the Paducah Area Community Reuse Organization (PACRO), Active Citizens for Truth (ACT), and the Coalition for Health Concerns. Also present were the McCracken Judge Executive, the Mayor of Paducah, the Paducah City Manager, and members of the public. In more recent meetings, the Board has also discussed this recommendation with the McCracken County Administrator.

Following development of the End State recommendation in draft form, presentations were made to various groups and organizations to obtain comments and suggestions on specific points contained within the recommendation. This information was presented to the PACRO Finance and Executive Committee, the Ballard County Chamber of Commerce, the Paducah Chamber of Commerce, ACT, and to the Paper, Allied-Industrial, Chemical, and Energy Workers Local 5-550. Comments received from these meetings that were applicable have been incorporated into this recommendation. Throughout the eight-month process, the CAB's objective has been to include and represent the community in this matter.

Current Status:

To develop an End State Vision, certain facts concerning the current situation of the PGDP site must be considered. The United States Enrichment Corporation (USEC) leases the uranium enrichment facilities from DOE. While USEC has announced plans to build and operate a centrifuge facility in Ohio, replacing the older Paducah operation, there remains a possibility that use of the Paducah site could continue beyond 2010. Additionally, DOE has yet to announce if the Paducah site will transition immediately into Decontamination and Decommissioning (D&D) upon USEC's departure from the site, or if the site will be placed on standby while determining national energy needs.

Another event, redefining Paducah's future, is the construction of a Depleted Uranium Hexafluoride (DUF_6) Conversion Facility. Operation is scheduled to continue until 2030 or beyond and is viewed by the CAB as the first step in reindustrialization of the Paducah site. The progress by DOE in areas such as the North-South Diversion Ditch, the DUF_6 Conversion Facility, Six-Phase Heating Technology, Scrap Metal Removal, and the characterization and disposition of the DOE Material Storage Areas is considered a major step forward in developing a safe, reusable site.

The uncertainty of the future of the gaseous diffusion process coupled with reindustrialization (DUF_6), which has already begun, do in fact help define the End State Vision of this CAB. It is, however, the belief of this CAB that decisions made today regarding the end state of the PGDP will provide guidance for future generations as they implement and update this End State Vision.

Concern:

As the CAB worked toward its End State Vision, three items emerged as primary concerns:

- Environmental remediation as currently planned may not be sufficient to fully protect human health and the environment in the future without the possibility of reoccurring issues.
- Environmental remediation as currently planned may not be sufficient to allow the Paducah community every opportunity in reindustrializing the site, and thereby protecting and building upon the economic impact this site has on the region.
- If this community waited until USEC ceased operations and environmental remediation was completed before acting on its end state vision, many years that could have been productively used for reindustrialization planning and development would be lost.

Goal:

The three concerns stated above share a common and single solution; the level of environmental remediation must be sufficient to allow this community control of its future. Therefore, the goal of the Paducah CAB's End State Vision is as follows:

> *To protect human health and the environment while preparing for a viable economic future for the Paducah site.*

Recommendation:

To achieve the goal of the CAB's End State Vision, the following recommendations are submitted:

1. **DOE is encouraged to structure environmental remediation activities to allow continued nuclear and non-nuclear industrial use of the existing industrialized area and to continue recreation/wildlife use of those areas presently leased to the WKWMA.**
2. **DOE begin investigating means to modify security access to non-USEC leased areas, allowing the reindustrialization process to move forward.**
3. **DOE begin consultation with PACRO, GPEDC, and other involved parties to inventory and investigate buildings and facilities to determine potential reindustrialization value.**
4. **DOE decontaminate the buildings, facilities, and surrounding grounds (scheduled for reuse) to the level necessary to allow this community every opportunity to obtain non-nuclear tenants for the site.**
5. **DOE begin physical rehabilitation of infrastructure facilities identified as having potential for the reindustrialization process.**
6. **DOE thoroughly characterize any contamination remaining at the site and adjoining property, after all environmental remediation activities are complete. This will allow the issuance of state**

and federal "covenant not to sue", or an equivalent document, for future tenants and property owners.

7. **DOE should investigate all possible alternatives to the proposed Comprehensive Environmental Recovery, Compensation, and Liability Act (CERCLA) waste disposal facility. There are four gaseous diffusion process buildings that have little, if any, potential for reindustrialization. The footprints of these buildings could be used for an above-ground concrete encapsulation of final D&D waste. This option is more acceptable to the community and may lower long-term costs for both Environmental Management (EM) and Legacy Management (LM).**
8. **DOE plan and initiate removal of all burial grounds within the industrial area. The potential for contaminant migration in the air, soil, groundwater and surface water is greatly increased if the burial grounds remain. The unexcavated burial grounds will negatively impact future industrial options for the site.**
9. **DOE, within two years, resolve the issue of institutional controls, compensation, or "buy out" with the property owners affected by off-site groundwater contamination.**
10. **DOE begin a public information/involvement process as soon as possible to educate the community on the transition from the Office of EM to the Office of LM, specifically addressing issues such as, but not limited to, long-term taxpayer costs (is the best financial decision for EM also the best financial decision for taxpayers throughout LM activities) LM monitoring of the site, and, if necessary, responding to new or migrating contaminants.**
11. **DOE remove sources and potential sources of off-site groundwater contamination.**
12. **DOE is encouraged to begin immediately working with the local communities to explore possibilities which address the three concerns listed above. The CAB offers the following as a means to begin achieving the common goal of this community:**
    - **Provide on-site facilities for environmental remediation/innovative technology companies.**
    - **Provide on-site facilities for the research being performed by the University of Kentucky for neptunium removal from nickel and use of converted depleted uranium. Upon success of this research, provide the necessary production facilities.**
    - **Explore the potential for the on-site development of Hazardous Material and Emergency Response Training facilities.**
    - **Explore the possibility of establishing an energy research technology park at the site.**

Approved by Consensus March 18, 2004

THIS PAGE INTENTIONALLY LEFT BLANK

Attachment 16

SUMMARIES OF PUBLIC AND STAKEHOLDER COMMENTS

THIS PAGE INTENTIONALLY LEFT BLANK

COMMENTS ON

Risk-Based End State Vision and Variance Report for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky

(DOE/OR/07-2119&D0/R2)

(This summary includes all comments received from the public, public organizations, and the regulatory agencies before March 11, 2005)

Category	**Commentor:**	**Comment**
General	MAJOR COMMENTS 1. The document does not cover all risks and contains some inconsistencies. 2. The process being followed is pre-decisional, unfriendly to the public, and inconsistent with community relations plans. 3. A more comprehensive path forward for the RBES process needs to be provided by DOE. 4. DOE should use the data and comments on the RBES report to develop a reindustrialization plan that includes input from all stakeholders. 5. DOE needs to provide information about the transition that will occur between the Office of EM and Office of LM. 6. DOE should provide resources that can be used to explore future reuse of the PGDP.	
	Charles and Vicki Jurka (Written Comment)	Page 1: “Once finalized, this report will provide information that can be used to establish clearly articulated and technically achievable cleanup goals for PGDP…” It is our hope that the final document will achieve these goals; as the draft document fails miserably. Generally: • This draft document fails to address radiological risk. • Anticipated recreational use for areas outside the fence is inconsistent with McCracken County zoning ordinance. • This draft document makes contradictory statements (e.g. Pg ES-3, 1st set #3, 2nd set #7, off-site/on-site disposal). • During D&D the NE plume treatment system may be dismantled/removed (pg. 5). • 24% of the population living around PGDP still rely on groundwater (pg. 27). • The timeline for this document, including but not limited to production, notification, availability, and review, was insufficient. This hurried approach generated a poorly prepared document containing many errors (including noticeable omissions). • The intended us of this document is poorly understood by the public and others: DOE calls it a “living document” with a fast approaching “final” version due date.
	Mark Donham and Kristi Hanson (Written Comment)	We have some real problems with the Risk Based End states program and site specific plans for Paducah. The RBES process has been flawed from the beginning. It is based on the secretive “Top to Bottom Review” and the agreements with the various states were done mostly behind closed doors. We even worked through the CAB and had 4 different consensus occasions when we were involved that asked to be involved in all of this process – but this was just ignored. Now that they you developed these specific plans, it is put out for a quick comment period with an unrealistic turnaround period. This is bogus public participation and shows a continued contempt for the public’s concerns here and across the DOE complex. As far as the specific variances go, our comments follow each of the variances contained in the *****_____***** below. We use your contractor’s own words as the basis for what we comment on.

COMMENTS ON

Risk-Based End State Vision and Variance Report for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky

(DOE/OR/07-2119&D0/R2)

(This summary includes all comments received from the public, public organizations, and the regulatory agencies before March 11, 2005)

Category	Commentor:	Comment
	Mark Donham and Kristi Hanson (Written Comment)	In summary, we see this RBES process as a publicly unfriendly [in violation of the site community relations play (sic)] ploy to allow DOE to walk away from its billion dollar commitments it has made in the past decade and half to adequately clean up the site. The public has for all intents and purposes been cut out of the process. There has been no environmental studies of this proposal, and we oppose it. If the DOE wants to amend its cleanup plans, it should start at the beginning and engage the public adequately, do proper environmental studies, and give a rational justification for its decisions. The RBES process has been just the opposite.
	PGDP CAB (Written Comment)	The PGDP CAB has prepared comments, based on discussion held at the February Board meeting for the *Risk-Based End State Vision and Variance Report for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky (DOE.OR/07-2119&D0/R2).* The Board advises that the following comments be considered: ▪ The CAB has been informed that the Department's Risk-Based End State Strategy Document is not a decision document. Since this document includes cleanup alternatives for the Paducah Gaseous Diffusion Plant, the Board is concerned that it will become a decision document without public input. ▪ The Board also feels that the timeline for this document is too aggressive and does not allow adequate time for review due to the complexity of its content.
	Bill Tanner (and others) (Oral Comment March 11 Workshop)	Stated that DOE needs to provide a more comprehensive path forward for what will occur after the final RBES is delivered on March 30, 2004.
	Vicky Jurka (Oral Comment March 11 Workshop)	Reiterated her belief that the RBES process is being used to avoid real clean-up. Also, noted that if groundwater sources are not cleaned up, then the McNairy Formation will be impacted. (Concerns about the McNairy Formation and contamination were also voiced by John Turner.)
	KDFWR (Oral Comment March 11 Workshop)	Stated (with agreement with others) that DOE's presentation of the RBES process and the document contents needs to be simpler. DOE used too much jargon in the presentation.

COMMENTS ON
Risk-Based End State Vision and Variance Report for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky
(DOE/OR/07-2119&D0/R2)
(This summary includes all comments received from the public, public organizations, and the regulatory agencies before March 11, 2005)

<table>
<tr><th>Category</th><th>Commentor:</th><th>Comment</th></tr>
<tr><td></td><td>PACRO
(Written Comment)</td><td>2. ISSUE
A path forward using the data/comments on the Draft End State Vision Document by DOE.
3. RECOMMENDATION
A. Select an internationally respected industry site selection firm and the completion of an Industrial Parks Master Plan for the 3,000+ acres of property currently owned by DOE in west McCracken County to perform all tasks of the Scope of Services listed below: (Please see PACRO comments dated March 11, 2004, for additional information.)
4. ADVANTAGE
A. This approach pioneers the most equitable way to arrive at a variable end state vision for the site. It allows the State Fish and Game, Citizens Advisory Board, as well as other organizations in the community, like PACRO and GPEDC, with a mission to mitigate the downsizing of USEC, to speak with as close to a single voice as possible for an end state vision.
B. To avoid any perceived favoritism, each participating entity should be offered an opportunity to fund a portion of the study.
C. The results of this approach will be based on the industry experience of the firm, as well as, the positions of other community stakeholders.</td></tr>
</table>

COMMENTS ON

Risk-Based End State Vision and Variance Report for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky

(DOE/OR/07-2119&D0/R2)

(This summary includes all comments received from the public, public organizations, and the regulatory agencies before March 11, 2005)

Category	Commentor:	Comment
	CAB (Written Comment)	Current Status: To develop an End State Vision, certain facts concerning the current situation of the PGDP site must be considered. The United States Enrichment Corporation (USEC) leases the uranium enrichment facilities from DOE. While USEC has announced plans to build and operate a centrifuge facility in Ohio, replacing the older Paducah operation, there remains a possibility that use of the Paducah site could continue beyond 2010. Additionally, DOE has yet to announce if the Paducah site will transition immediately into Decontamination and Decommissioning (D&D) upon USEC's departure from the site, or if the site will be placed on standby while determining national energy needs. Another event, redefining Paducah's future, is the construction of a Depleted Uranium Hexafluoride (DUF_6) Conversion Facility. Operation is scheduled to continue until 2030 or beyond and is viewed by the CAB as the first step in reindustrialization of the Paducah site. The progress by DOE in areas such as the North-South Diversion Ditch, the DUF_6 Conversion Facility, Six-Phase Heating Technology, Scrap Metal Removal, and the characterization and disposition of the DOE Material Storage Areas is considered a major step forward in developing a safe, reusable site. The uncertainty of the future of the gaseous diffusion process coupled with reindustrialization (DUF_6), which has already begun, do in fact help define the End State Vision of this CAB. It is, however, the belief of this CAB that decisions made today regarding the end state of the PGDP will provide guidance for future generations as they implement and update this End State Vision. Concern: As the CAB worked toward its End State Vision, three items emerged as primary concerns: • Environmental remediation as currently planned may not be sufficient to fully protect human health and the environment in the future without the possibility of reoccurring issues. • Environmental remediation as currently planned may not be sufficient to allow the Paducah community every opportunity in reindustrializing the site, and thereby protecting and building upon the economic impact this site has on the region. • If this community waited until USEC ceased operations and environmental remediation was completed before acting on its end state vision, many years that could have been productively used for reindustrialization planning and development would be lost. Goal: The three concerns stated above share a common and single solution; the level of environmental remediation must be sufficient to allow this community control of its future. Therefore, the goal of the Paducah CAB's End State Vision is as follows: To protect human health and the environment while preparing for a viable economic future for the Paducah site.

COMMENTS ON

Risk-Based End State Vision and Variance Report for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky

(DOE/OR/07-2119&D0/R2)

(This summary includes all comments received from the public, public organizations, and the regulatory agencies before March 11, 2005)

<table>
<tr><th>Category</th><th>Commentor:</th><th>Comment</th></tr>
<tr><td rowspan="3"></td><td>CAB
(Written Comments)</td><td>To achieve the goal of the CAB’s End State Vision, the following recommendations are submitted:

10. DOE begin a public information/involvement process as soon as possible to educate the community on the transition from the Office of EM to the Office of LM, specifically addressing issues such as, but not limited to, long-term taxpayer costs (is the best financial decision for EM also the best financial decision for taxpayers throughout LM activities) LM monitoring of the site, and, if necessary, responding to new or migrating contaminants.</td></tr>
<tr><td>CAB
(Written Comments)</td><td>To achieve the goal of the CAB’s End State Vision, the following recommendations are submitted:

12. DOE is encouraged to begin immediately working with the local communities to explore possibilities which address the three concerns listed above. The CAB offers the following as a means to begin achieving the common goal of this community:
• Provide on-site facilities for environmental remediation/innovative technology companies.
• Provide on-site facilities for the research being performed by the University of Kentucky for neptunium removal from nickel and use of converted depleted uranium. Upon success of this research, provide the necessary production facilities.
• Explore the potential for the on-site development of Hazardous Material and Emergency Response Training facilities.
• Explore the possibility of establishing an energy research technology park at the site.</td></tr>
<tr><td>UK-KRCEE
(Written Comment)</td><td><u>Section 1, Page 2, Second Paragraph.</u> Are the agreement mechanisms in place that will allow the DOE to renegotiate current compliance approaches and agreements at the PGDP? Given the difficulties and time involved reaching agreements on the recent LOI and current ACO, is attaining RBES modification to current agreements and the current end state a realistic possibility?</td></tr>
<tr><td rowspan="3">Document Preparation</td><td colspan="2">MAJOR COMMENTS
1. Time allowed for comments is too aggressive.
2. The document is complex, and its intended use is unclear.
3. PACRO and UK support the end-state process but believe that the entire community needs to be involved in the process.
4. The guidance used to complete the document is not consistent with that discussed with the public earlier.
5. A public participation appendix should be included in the report.</td></tr>
<tr><td>PGDP CAB
(Written Comment)</td><td>The Citizen’s Advisory Board has been informed that the Department’s Risk-Based End State Strategy Document is not a decision document. Since this document includes cleanup alternatives for the Paducah Gaseous Diffusion Plant, the Board is concerned that it will become a decision document without public input. The Board also feels that the timeline for this document is too aggressive and does not allow adequate time for review due to the complexity of its content.</td></tr>
<tr><td>PACRO
(Written Comment)</td><td>1. PACRO supports the development process being used for the Risk Based End State.</td></tr>
</table>

COMMENTS ON

Risk-Based End State Vision and Variance Report for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky

(DOE/OR/07-2119&D0/R2)

(This summary includes all comments received from the public, public organizations, and the regulatory agencies before March 11, 2005)

Category	**Commentor:**	**Comment**
	PACRO/SUN (Written Comment)	"The concern we have is that we work through this as a community," Anderson said. "I don't think it needs to be just the advisory board and PACRO. The whole community and DOE have roles to play."
	KDFWR (Written Comment)	Due to the available format and time restraints for the comment period, KDFWR respectfully offers the following initial comments for consideration. Further comments may be deemed necessary after additional review of the entire document, and subsequent documents pertaining to this topic.
	Charles and Vicki Jurka (Written Comment)	• The timeline for this document, including but not limited to production, notification, availability, and review, was insufficient. This hurried approach generated a poorly prepared document containing many errors (including noticeable omissions). • The intended use of this document is poorly understood by the public and others: DOE calls it a "living document" with a fast approaching "final" version due date.
	Bill Tanner (Oral Comment Feb. 26 Workshop)	The guidance used to prepare the current draft of the document differs from that discussed with the CAB in September 2003. This change in guidance should have been more widely discussed.
	Bill Tanner (Oral Comment Feb. 26 Workshop)	Questioned if the public participation appendix being prepared for the revised RBES will be available at the March 18, 2004 CAB meeting.
	UK-KRCEE (Written Comment)	Section 1, Page 1, Second Paragraph. UK concurs with the use of a risk-based end state (RBES) as a mechanism to further assess the PGDP EM program. Use of this approach allows a clear path forward for evaluation of accelerated risk based strategies to minimize impacts on public health.
GWOU Remediation	MAJOR COMMENTS 1. Reindustrialization of the plant is not possible without remediation of the plume. 2. Bioremediation needs to be considered for plume remediation. 3. The Water Policy (in its current form or in some other form) needs to be made permanent. 4. There needs to be an attempt to clean up the groundwater and its sources of contamination before using natural attenuation only. 5. Without cleanup, including source actions, the plume will continue to spread and eventually extend beyond the water policy box. 6. Burial ground sources should not simply be capped. 7. More comprehensive human health and ecological risk assessments are needed when comparing the CPES and RBES. 8. Additional information about plume migrations should be added to the report. This should include a discussion of the impacts of plant shut-down on plume migration. 9. More attention needs to be paid to the ^{99}Tc plume because some modeling results indicate that ^{99}Tc concentrations in groundwater could exceed the MCL in areas off DOE property in the future. 10. A comprehensive groundwater remedy should consider a fence-line action.	

COMMENTS ON

Risk-Based End State Vision and Variance Report for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky

(DOE/OR/07-2119&D0/R2)

(This summary includes all comments received from the public, public organizations, and the regulatory agencies before March 11, 2005)

Category	**Commentor:**	**Comment**
	Ralph Young (Written Comment)	Here's my question for the DOE concerning the discussion of the "Risk-based End State Vision" document, "Has DOE considered the use of microbes for in-situ bio-remediation of chlorinated compounds?" Over the last 15 years, researches have made a lot of progress in this area and there are many demonstration projects in progress across the US. Here's a link to one of the leading researchers in the field, Dr. Jim Gossett: http://www.cee.cornell.edu/faculty/info.cfm?abbrev=faculty&shorttitle=research&netid=JMG18 I think this technology might be feasible to apply in those areas where the pump and treat technology has been less effective.
	CAB/SUN (Written Comment)	Among other things, the DOE plan assumes that massive groundwater contamination beneath the plant would be left for nature to clean up, rather than spend as much as $140 million trying to eliminate the sources of the pollution. "We don't believe that will get us to the point that the plant is safe for humans and the environment," said Bill Tanner, chairman of the plant citizen's advisory board, "We're also concerned that it wouldn't permit reindustrialization, so it would have a severe economic impact."
	CAB/SUN (Written Comment)	…the board recommends that: DOE establish long-term agreements to provide free municipal water to 121 customers – mostly homes and some businesses – in return for not using wells that are or could become contaminated. Agreements are now for five years, said Tanner, superintendent of West McCracken Water District. "They need to remove that doubt and make it permanent."
	CAB/SUN (Written Comment)	Tanner said there is no technology to cleanup the groundwater, but the board wants to be sure that "we've done all we can do" scientifically before the water is left to nature.
	Mark Donham/SUN (Written Comment)	Donham said he is worried about many "variances" in the new end-use plan compared with an older one, such as not cleaning up sources of groundwater pollution and not digging up uranium burial grounds. He said $1 billion has been spent so far with little to show for cleanup.
	KDFWR (Written Comment)	V-1.1, 6-1, 9.1 – The Current Planned End State (CPES) continues that PGDP water policy. The RBES assumes the use of enhanced institutional controls. KDFWR feels both of these actions are potentially inadequate in monitoring and remediating potential ecological risk to offsite receptors. KDFWR feels that a more aggressive groundwater monitoring and cleanup regiment should be initiated under D&D of the plant. It is unclear as to the mechanism for enhanced institutional controls for non-DOE and DOE owned property. Will this involve deed restrictions or similar legal arrangement for non-DOE owned property?

COMMENTS ON
Risk-Based End State Vision and Variance Report for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky
(DOE/OR/07-2119&D0/R2)
(This summary includes all comments received from the public, public organizations, and the regulatory agencies before March 11, 2005)

Category	**Commentor:**	**Comment**
	KDFWR (Written Comment)	V-1.2, 9.3 – The CPES uses a DNAPL source reduction by using heating technologies. The RBES does not include any active reduction of contaminants. Since there would be limited control of groundwater movement to off-site area, KDFWR feels that monitoring the natural attenuation of groundwater would inadequately address the issue of groundwater contamination. KDFWR advocates the proactive stance of attempting to decontaminate the groundwater along with continued monitoring. Risks under the RBES would include the mentioned risk to samplers, but also include ecological risk and potential risk to recreational users due to the potential for groundwater to return to the surface, thus making a completed pathway to workers and recreational users, as well as ecological receptors.
	KDFWR (Written Comment)	V-1.4 – The CPES assumes implementation of oxidation technologies to remove trichloroethene (TCE) and other solvents from the phase plume. The RBES does not actively remove contaminants and only monitors natural attenuation. With limited control of groundwater movement to off-site areas, KDFWR feels that monitoring natural attenuation of groundwater contaminants from the dissolved phase plume is inadequate to address the potential impact these contaminants may have on ecological receptors. With no control of current or future rates of contamination into the groundwater, a non-removal plan poses a potential risk to both human and ecological receptors. KDFWR feels that adequate risk assessments, including ecological risk assessments, should be completed for each scenario to determine the best plan of action for the burial grounds site. It appears from the provided map that the TCE plume extends well beyond the property boundaries onto both private and state owned property.
	KDFWR (Written Comment)	V-1.5 – The CPES recommends active removal to reduce solvent contamination in groundwater discharge into Little Bayou Creek. RBES does not allow for active cleanup and would only monitor concentrations at the discharge point. KDFWR feels that this action would not be appropriate as contaminated water from the Little Bayou Creek leaves the area and may pose risk to ecological receptors within Little Bayou, Big Bayou, and eventually the Ohio River. Active remediation may be necessary to reduce these potential risk to the levels required by the state.

COMMENTS ON
Risk-Based End State Vision and Variance Report for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky
(DOE/OR/07-2119&D0/R2)
(This summary includes all comments received from the public, public organizations, and the regulatory agencies before March 11, 2005)

Category	**Commentor:**	**Comment**
	Charles and Vicki Jurka (Written Comment)	The landowners, through the PGDP Water Policy, have entered into an agreement to abandon the use of groundwater while purchasing municipal water at DOEs expense. This agreement has a five-year life with variable renewal options. Since its inception, with one exception (landowner refusal), this removal action has performed effectively; meeting the goal of reducing "risks to residents, from exposure to" contaminated "groundwater." Under the risk-based end state proposal "enhanced institutional controls, would supersede (annul or replace) the current PGDP Water Policy." One of the proposed institutional controls takes the form of a legal agreement; placing "enforceable restrictions on groundwater." This type of legal agreement would be limited in duration through the law of perpetuity as well as subject to legal interpretation. Another proposal calls for the acquisition "of rights from the surrounding property owners and directly implements (ing) restrictions on groundwater and property use." This proposal enjoins the property owner to abstain from using their groundwater and/or property in exchange for an undetermined sum of money. Under the principles of mutual benefit both parties would automatically benefit from this buyer/seller agreement. But through this approach, the landowner realizes a lesser, more undesirable benefit when relinquishing not only property right but municipal water payments as well. DOE and its contractors contaminated the landowners groundwater; destroying a self-sufficient economic option for landowner water-production. DOE then ameliorated this harm through the Water Policy, by paying the costs associated with a new source of "clean" water. The extensive and expansive degree of groundwater contamination, under the current proposed remedial actions, will remain for many generations to come. In all likelihood, legal instruments will not bridge this generational span. The inherent failures of both current and risk-based proposals necessitates the exploration of other options. The most fail-safe, long-range, cost-effective option is the purchase and subsequent DOE control of "real estate" from <u>all</u> Water Policy landowners.
	Charles and Vicki Jurka (Written Comment)	Pages 143-147: Hazard 1, V-1.2 through V-1.5: This draft document makes claims that the only "variance in risk between the current planned end state and the RBES is the amount of time necessary to achieve MCLs." We disagree. The decision making process (scope, cost, schedule, etc.) fails to consider the progression of the currently identified groundwater plumes and the potential impact on landowners, residing out side the Water Policy boundaries, who still rely on groundwater sources. It also fails to address the importance of the element of time respecting the migration of unremediated contaminants beyond the current Water Policy boundaries and/or into the deeper aquifer (McNairy). It should be apparent that the proposed institutional controls will not ameliorate the risk for future generations. Barriers: • (143) We endorse the regulators position for "source actions for reduce contaminant concentrations." • (143) We reject "technical impractability waivers." • (144) We disagree with calling the fenceline "point of exposure." It would be better identified as the <u>source</u> <u>of</u> <u>all</u> <u>exposures</u>. • (144-5) After 50 years of dumping by DOE and its contractors, source actions are necessary.

COMMENTS ON

Risk-Based End State Vision and Variance Report for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky

(DOE/OR/07-2119&D0/R2)

(This summary includes all comments received from the public, public organizations, and the regulatory agencies before March 11, 2005)

Category	**Commentor:**	**Comment**
	Mark Donham and Kristi Hanson (Written Comment)	The DOE should not try to use the water policy as a political tool. Water should be supplied to those in the water policy separate from any other considerations. Adequate monitoring should occur to determine if the plume is spreading. With natural attenuation as the new cleanup plan, it is likely that the water policy will expand over time.
	Mark Donham and Kristi Hanson (Written Comment)	This addresses Variance 2 – 4, as they all relate to groundwater/source cleanup. This is a huge step back from the original commitments to cleanup the groundwater. We know that the plume both enters the river underground and that it bubbles up in springs close to the river and enters the creeks, and then into the river. We have little knowledge of how it actually enters the river underground, or how it might come up during flooded conditions. However, it has certainly been shown to be entering the river. If it is allowed to go on by natural attenuation, this will go on forever, practically. The one thing that the CAB agreed on was that removing the contamination sources should be the highest priority. We agreed with that also. The idea of walking away from this groundwater plum and not cleaning up the sources is of such a magnitude that it is hard to believe that the agency has properly though this out. For example, won't this cause the plume to expand to an even wider area than it current occupies? How could it not? What about the areas where it bubbles to the surface? What are the long term impacts of this? Shouldn't there be an Environmental Impact Statement done on this proposal? We also want to know where US EPA stands on this, and whether or not this complies with CERCLA.
	Bill Tanner (Oral Comment Feb. 26 Workshop)	The uncertainty in the future water balance at the site due to enrichment plant shutdown needs to be discussed.
	Vicki Jurka (Oral Comment Feb. 26 Workshop)	It is possible that the concentration of TCE in groundwater will go up in the future when the enrichment plant shuts down. This needs to be discussed.
	Vicki Jurka (Oral Comment Feb. 26 Workshop)	The document needs to consider how future industrial releases from other (new) processes may affect DNAPL releases in the future. This interaction may limit future use of the site.
	Ruby English (Oral Comment March 11 Workshop)	Stated that the report needs more information about the contaminant plumes and their migration.
	UK-KRCEE (Written Comment)	Section 4.1.1, Page 44, Second and Last Paragraphs. While ^{99}T does not currently exceed the drinking water MCL in areas outside of the DOE property boundary, the groundwater resource has been contaminated with ^{99}Tc both in and outside of the DOE property boundary. Additionally, ^{99}Tc has been modeled to exceed the MCL at and outside of the property boundary within 1000 years if barriers to migration are not in place. Based on previous assessments presented in this document residents have the potential to be exposed to groundwater above ^{99}Tc MCLs at off-property locations both under current conditions and under any future conditions that do not minimize the migration of ^{99}Tc from source areas to points of exposure.

COMMENTS ON

Risk-Based End State Vision and Variance Report for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky

(DOE/OR/07-2119&D0/R2)

(This summary includes all comments received from the public, public organizations, and the regulatory agencies before March 11, 2005)

Category	Commentor:	Comment
	UK-KRCEE (Written Comment)	Section 4.1.1, Page 47, "Pathways," Third Paragraph. Based on the ITRD evaluation for the PGDP and subsequent implementation of preferred treatment trains, a reduction in source terms is possible at the PGDP. Treatment of groundwater source terms will accelerate risk reduction and result in a reduction of DOE's long-term mortgage at the PGDP only if conducted in conjunction with the treatment trains identified by the ITRD group.
	UK-KRCEE (Written Comment)	Section 5.1.1.3, Page 131, "Projected Risk Levels," First Paragraph. Based on ITRD recommendations, a fence line action was necessary to reduce current TCE concentrations to levels that would allow property-boundary concentrations to approach MCLs. The current planned heating technologies for source zones were never meant to stand alone and were always linked to dissolved phase actions for both 99Tc and TCE within the restricted area, at the fence line, and on DOE property outside of the restricted area.
	UK-KRCEE (Written Comment)	Page 142, Table 5.1, HA 1, V-1.1. Enhanced institutional controls provide an excellent approach for control of long-term groundwater usage. However, this should not preclude evaluation and implementation of technologies to reduce source terms and dissolved phase contamination at the PGDP.
	UK-KRCEE (Written Comment)	Page 143, Table 5.1, HA 1, V-1.2. If only source reduction were implemented at the PGDP with no concurrent dissolved phase actions it is likely that no significant reduction in groundwater contamination would be achieved. ITRD recommendations consisted of treatment trains to concurrently address sources and dissolved phase contamination.
	UK-KRCEE (Written Comment)	Page 143, Table 5.1, HA 1, V-1.2. Based on the current lack of pilot programs at PGDP to demonstrate an inability to achieve reductions in source terms and groundwater contamination it will be difficult for DOE to defend a position pursuing technical impractibility (TI) waivers.
	UK-KRCEE (Written Comment)	Page 144, Table 5.1, HA 1, V-1.4. See comment # 23. The ITRD identified a number of technologies that have the potential to significantly reduce contaminant concentrations in the dissolved phase plume.
	UK-KRCEE (Written Comment)	Page 147, Table 5.1, HA 1, V-1.5. DOE's modeling indicates that levels of ^{99}Tc in groundwater that are greater than MCLs may discharge to surface water outside of the DOE property boundary. Under the RBES, how does the DOE plan to address the discharge of ^{99}Tc to Little Bayou Creek in the future?
	CAB (Written Comment)	To achieve the goal of the CAB's End State Vision, the following recommendations are submitted: 11. DOE remove sources and potential sources of off-site groundwater contamination.
BGOU Remediation	MAJOR COMMENTS 1. Current characterization of the burial grounds is inadequate to allow capping to be used as the only remedy. Capping will not work because the burial grounds are not lined, and some parts of them are below the shallow water table. Additionally, modeling has shown that capping alone would not minimize the potential for releases from the burial grounds. 2. More comprehensive human health and ecological risk assessments are needed when comparing the CPES and RBES. 3. Burial grounds are inconsistent with re-industrialization. 4. Capping is being considered to reduce cost only. 5. The report needs to consider potential changes over time in the state of the materials in burial grounds and landfills. The potential impact these changes may have on contaminant migration needs to be considered. 6. Discussions of risk and exposure pathways should emphasize that contact with waste is unlikely.	

COMMENTS ON
Risk-Based End State Vision and Variance Report for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky
(DOE/OR/07-2119&D0/R2)
(This summary includes all comments received from the public, public organizations, and the regulatory agencies before March 11, 2005)

Category	Commentor:	Comment
	KDFWR (Written Comment)	V-1.3 - The CPES assumes excavation of the burial grounds. The RBES assumes capping and monitoring of the burial grounds. With limited control of groundwater movement to off-site areas, KDFWR feels that capping and monitoring the natural attenuation of groundwater contamination from the burial grounds is inadequate to address the potential impact these contaminants may have on ecological and human receptors. With no control of current or future rates of contamination into the groundwater, a non-removal activity poses a potential risk to both human and ecological receptors. While the short-term risk to worker, public, ecological receptors using the RBES may be reduced; long-term risk to all three may be much higher with a non-removal plan of action. KDFWR feels that adequate risk assessments, including ecological risk assessments, should be completed for each scenario to determine the best plan of action for the burial grounds site.
	KDFWR (Written Comment)	V-3.1 – Under the CPES certain burial grounds are to be excavated and disposed of in an offsite area. Under the RBES, the burial grounds would be capped and monitored. KDFWR believes that there has not been adequate characterization of the contaminants. KDFWR also feels that potential off site contamination may occur from the burial grounds and more site and risk characterizations should be completed to determine what affect leaving the material in the ground may have to both ecological and human receptors.
	Charles and Vicki Jurka (Written Comment)	Page 150: Hazard 3, V-3.1: Burial grounds are inconsistent with re-industrialization.
	Mark Donham and Kristi Hanson (Written Comment)	This is a cost cutting item that DOE has been trying to get into their cleanup plans for many years. There are many hundreds of tons of uranium buried in unlined trenches at the site, having been placed in barrels with PCB oils due to the pyrophoric nature of the uranium at issue. (notwithstanding the fact that the CAB was falsly told that the uranium was covered by peanut oil) There has been some testing of these trenches, and there is indication that barrels are deteriorating, and that some of the trenches penetrate into the water table and the barrels are sitting in water. To cap and leave this would be a disaster in the making. It is so likely that this area is a source of groundwater contamination that it makes no sense to wait to dig the stuff up. Besides, we never thought that the monitoring around the burial grounds was adequate to detect leaks. Like Dr. Peter Montague says, capping an unlined landfill is like putting a lid on a leaking bucket. It does no good.
	Vicki Jurka (Oral Comment Feb. 26 Workshop)	Changes in the state of materials disposed of in the landfill as they age needs to be discussed. Will the migration potential of these materials change over time? (Bill Tanner also asked second question.)
	UK-KRCEE (Written Comment)	<u>Section 4.1.1, Page 47, "Pathways," Third Paragraph.</u> Based on modeling it has been demonstrated that capping alone will not minimize the potential for releases from burial grounds. Modeling has indicated that caps must be tied to hydrological barriers in order to minimize infiltration and exfiltration from the burial grounds.
	UK-KRCEE (Written Comment)	<u>Section 4.3.1, Page 58, "Pathways," First Paragraph.</u> How is buried waste a direct contact risk?
	UK-KRCEE (Written Comment)	<u>Section 4.3.1, Page 58, "Pathways," First Paragraph.</u> There have been no technically sound and conclusive investigations demonstrating that contaminants are not migrating from these units to groundwater and surface water.

COMMENTS ON
Risk-Based End State Vision and Variance Report for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky
(DOE/OR/07-2119&D0/R2)
(This summary includes all comments received from the public, public organizations, and the regulatory agencies before March 11, 2005)

Category	**Commentor:**	**Comment**
	UK-KRCEE (Written Comment)	Section 4.3.1, Page 59, "Pathways," Second Paragraph. The waste is buried and the units are capped and these conditions must be reflected in exposure assumptions for the units. Physical controls of soil cover and caps would clarify the exposure and pathway discussions relative to these units.
	UK-KRCEE (Written Comment)	Section 4.6.1, Page 70, "Pathways," Second Paragraph. There have been no technically sound and conclusive investigations demonstrating that contaminants are not migrating from these units to groundwater and surface water.
	UK-KRCEE (Written Comment)	Section 4.6.2, Page 74, "Pathways," Last Paragraph. Based on modeling it has been demonstrated that capping alone will not minimize the potential for releases from burial grounds. Modeling has indicated that caps must be tied to hydrological barriers in order to minimize infiltration and exfiltration from the burial grounds.
	UK-KRCEE (Written Comment)	Page 144, Table 5.1, HA 1, V-1.3. Previous site investigations of burial grounds at the PGDP have not provided data that conclusively demonstrates whether the burial grounds are contributing to groundwater contamination. DOE should demonstrate that under the worst case scenario contamination from the burial grounds would not exceed MCLs at the fenceline or the DOE property boundary. Even if there is an impact to groundwater at the fenceline, the pathway for exposure is incomplete because of long-term access controls.
	UK-KRCEE (Written Comment)	Page 144, Table 5.1, HA 1, V-1.4. DOE's modeling has shown that capping without hydrological barriers will not prevent infiltration and exfiltration from the burial grounds.
	UK-KRCEE (Written Comment)	Page 149, Table 5.1, HA 3, V-3.1. DOE has not demonstrated that these units do not contribute to groundwater contamination. DOE's modeling has shown that capping without hydrological barriers will not prevent infiltration and exfiltration from the burial grounds. See comment # 26.
	UK-KRCEE (Written Comment)	Page 149, Table 5.1, HA 3, V-3.1. DOE should clarify that the potentially exposed individual would be an industrial worker excavating into the waste. However, this pathway seems unlikely given DOE's implementation of enhanced institutional controls.
	CAB (Written Comment)	To achieve the goal of the CAB's End State Vision, the following recommendations are submitted: 8. DOE plan and initiate removal of all burial grounds within the industrial area. The potential for contaminant migration in the air, soil, groundwater and surface water is greatly increased if the burial grounds remain. The unexcavated burial grounds will negatively impact future industrial options for the site.
SWOU Remediation	MAJOR COMMENTS 1. Addressing hot spots identified using cleanup goals set at target risk of E-4 and PCBs at 25 or 1 ppm (depending on the location) will not adequately address potential ecological and human health risks. 2. Sediment control basins may be necessary if cleanup does not prevent contaminant migration. It would be better to clean up so migration is prevented. 3. More comprehensive human health and ecological risk assessments are needed when comparing the CPES and RBES. 4. The report needs to better consider risks from consumption of contaminated animals. 5. The discussion of contaminated media and exposure pathways should include bank soils. 6. If controls are necessary to minimize migration, then alternatives to sediment control basins should be considered.	

COMMENTS ON
Risk-Based End State Vision and Variance Report for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky
(DOE/OR/07-2119&D0/R2)
(This summary includes all comments received from the public, public organizations, and the regulatory agencies before March 11, 2005)

Category	Commentor:	Comment
	KDFWR (Written Comment)	V-2.1 – The CPES recommends removal of contaminated source sediments and soils to achieve a target risk of 1E-06. The RBES assumes excavation of hotspots in sediment and soil using a target risk and PCB concentrations consistent with future land use. The RBES action in industrial areas would achieve a target risk of 1E-04 to a worker and a PCB concentration of 25 ppm. The action in recreational areas would achieve a target risk of 1E-04 to a recreational user and a PCB concentration of 1 ppm. KDFWR feels that the RBES does not adequately remove contamination from either on site of off site areas. With limited control of PCB movement through surface water, the potential for ecological exposures to exceed current acceptable levels is elevated. For example, under the RBES, the proposed levels being left are much higher than the typically used 1E-06 and 1 ppm for industrial and 0.1 ppm for residential soils and sediments. The list of variances states, “The magnitude of these risks under the CPES and RBES have not been assessed at this time; however, because a greater amount of material would be excavated under the CPES than under the RBES, risks to all receptors would be expected to be greater under the CPES than under the RBES.” KDFWR feels this may or may not be true based on the lack of information that has been obtained regarding both plans of action. We feel ecological and human health risk assessments should be performed to determine what potential impacts each action may have. By controlling sediment/soil migration during cleanup activities, potential movement, both onsite and offsite, can be adequately controlled.
	KDFWR (Written Comment)	V-2.2 – The CPES recommends the construction of 2 basins to control sediment migrations into areas outside the industrialized portion of the site. Under RBES, no such basins would be planned because hot spot removal would prevent migration of contaminated material. KDFWR feels an ecological risk assessment should be performed to determine what impacts the RBES may have on off site receptors. As stated above, the proposed levels of contamination to be left by the RBES are higher than current state levels for both the industrial and residential scenarios. Habitat destruction could be kept to a minimum in the construction of sediment basins. Properly choosing site locations for the basins may reduce impact from habitat destruction by constructing the basins in what is currently a poor habitat.
	Charles and Vicki Jurka (Written Comment)	Page 148: Hazard 2, V-2.1: The RBES fails to consider the hazard posed from eating “ecological receptors” after they have been exposed to long-lived PCBs in their environment.
	Mark Donham and Kristi Hanson (Written Comment)	Again, walking away from a commitment to try to reduce surface water discharges is a significant backtracking on the cleanup. This has implications for neighboring properties, wildlife, recreationalists, and the ecology. There will also be cumulative impacts on the discharges going into the creeks and then into the river. This also poses an incremental increase in the risk of re-contamination or cross contamination during or after some cleanup action has occurred. Again, the ultimate result of this is that more contamination will be left on site. With plans to leave the major source areas and to reduce the cleanup standards, the site will be far from clean after DOE declares the cleanup over.

COMMENTS ON
Risk-Based End State Vision and Variance Report for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky
(DOE/OR/07-2119&D0/R2)
(This summary includes all comments received from the public, public organizations, and the regulatory agencies before March 11, 2005)

<table>
<tr><th>Category</th><th>Commentor:</th><th>Comment</th></tr>
<tr><td rowspan="4"></td><td>Mark Donham and Kristi Hanson
(Written Comment)</td><td>V-7: We are not huge fans of the larger sediment control basins, because we believe that they have a potential for becoming another source of groundwater contamination. The key is to reduce the contamination going into the watershed – not trying to catch it once it has entered the water. At that point the damage has been done and it is much more difficult to capture the contaminant. So the focus should be on stopping the contaminants from entering the watershed, in our opinion.</td></tr>
<tr><td>UK-KRCEE
(Written Comment)</td><td>Section 4.2.1, Page 50, “Pathways,” Third Paragraph and Section 4.2.2, Page 57, Third Paragraph. This discussion is not entirely correct. Under current conditions, exposures are attributable to bank soils, sediments, scrap metal, and surface water. Without removal of or barriers to contact with bank soils, continued releases having the potential to impact public health will occur.</td></tr>
<tr><td>UK-KRCEE
(Written Comment)</td><td>Section 5.1.2.2, Page 132, “Pathways,” 2nd Paragraph. Recent investigations to collect and evaluate data on the distribution of contaminants in the NSDD have demonstrated that bank soils are the primary source of contaminant releases in the ditches. A barrier to continued releases of contaminants from bank soils would and should be real-time identification and removal of hot spots.</td></tr>
<tr><td>UK-KRCEE
(Written Comment)</td><td>Page 149, Table 5.1, HA 2, V-2.2. Removal of hot spots negates the necessity for sediment basin in drainage channels. If it is determined that controls are necessary to minimize sediment releases, alternative technologies such as those proposed by Dr. Richard Warner/UK should be evaluated because of the significant cost savings.</td></tr>
<tr><td rowspan="3">SOU Remediation</td><td colspan="2">MAJOR COMMENT
1. Addressing hot spots identified using cleanup goals set at target risk of E-4 and PCBs at 25 or 1 ppm (depending on the location) will not adequately address potential ecological and human health risks.
2. Existing data indicates that migration from soil areas is continuing.</td></tr>
<tr><td>KDFWR
(Written Comment)</td><td>V4.1, 8.1, 9.2 - The CPES assumes excavation of contaminated soils to achieve the target risk of 1E-06 under a residential scenario and a PCB concentration of 1 ppm. The RBES assumes excavation of hot spots in soil using a target risk of 1E-04 under a worker scenario with concentrations of PCBs 25 ppm. KDFWR feels that the RBES does not adequately remove contamination from either on site or off site areas. With limited control of PCB movement through surface water, the potential for ecological exposures to exceed current acceptable levels is elevated. For example, under the RBES, the proposed levels are much higher than the typically used 1E-06 and 1 ppm for industrial and 0.1 ppm for residential soils and sediments.</td></tr>
<tr><td>UK-KRCEE
(Written Comment)</td><td>Section 5.1.4.2, Page 134, “Pathways,” First Paragraph. Data exists that establishes past and continuing migration of surface soil and contaminants.</td></tr>
<tr><td>Permitted Landfills</td><td colspan="2">MAJOR COMMENTS
1. The “P-Landfill” (located under the S- and T-Landfills) needs to be discussed.
2. The landfills are leaking and this is a point of contention with the public.
3. Changes in the state of materials over time need to be discussed. This discussion should include the impact changes may have on contaminant migration.
4. Additional discussion of risks at the C-746-U Landfill is needed.</td></tr>
</table>

COMMENTS ON

Risk-Based End State Vision and Variance Report for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky

(DOE/OR/07-2119&D0/R2)

(This summary includes all comments received from the public, public organizations, and the regulatory agencies before March 11, 2005)

Category	**Commentor:**	**Comment**
	Charles and Vicki Jurka (Written Comment)	Pages 40 and 142 through 159: Hazard 5: Hazard area 5 includes closed and operating landfills. There are three (P), not two, closed landfills in this industrialized landfill area. These landfills are leaking. They are closer to the residential receptor than any other PGDP/DOE facility. They sit atop a seismically active area. By their very nature, they pose both current and future risk. The operating landfill (C-746-U) is the primary disposal option for legacy waste, in storage DMSAs, at PGDP. The potential for future expansion of this landfill is great: ongoing EM, proposed D&D, as well as DUF-6 conversion activities drive this concern. These landfills are a contentious community issue. "Table 5.1 Variance Report by Hazard Area" <u>completely ignores these hazards</u>.
	Vicki Jurka (Oral Comment Feb. 26 Workshop)	Changes in the state of materials disposed of in the landfill as they age needs to be discussed. Will the migration potential of these materials change over time? (Bill Tanner also asked second question.)
	Vicki Jurka (Oral Comment March 11 Workshop)	Would like to see additional discussion of risks at C-746-U Landfill in the RBES. Concerned that DOE is concentrating waste streams by using the landfill.
Legacy Waste	MAJOR COMMENTS 1. Additional detail is needed concerning migration from legacy wastes and DMSAs.	
	UK-KRCEE (Written Comment)	<u>Section 4.7, Page 74, "Pathways," First Paragraph.</u> What DMSAs and legacy wastes have been or are contaminating soils, surface water, etc.?
Cylinder Yards and Conversion Facility	MAJOR COMMENTS 1. Cylinder yards discussion should note that the primary risk is external exposure to gamma radiation. 2. "Hot spot" excavation would be a cost-effective response action.	
	UK-KRCEE (Written Comment)	<u>Section 4.8.1, Page 77, "Sources."</u> In the cylinder, yards the primary sources of exposure are clearly the cylinders containing DUF_6. Direct exposure to the gamma radiation from the cylinders and not the soils is the primary pathway of concern for the cylinder yards. There have been only a few breaches and possible release of DUF_6 from the 30,000+ cylinders in the yards. Therefore, contamination of soil zones from Hazard Area 8 should be minor and restricted to a few hot spots.
	UK-KRCEE (Written Comment)	<u>Page 155, Table 5.1, HA 8, V-8.1.</u> Based on the number of cylinders breached, excavation of hot spots would be cost-effective and accelerate cleanup subsequent to removal of the DUF6 cylinders. Risk assessments have demonstrated that even under a no action scenario, the cylinder yards pose minimal risk.
Institutional Controls	MAJOR COMMENTS 1. The actions included in and the mechanism to be used to for "enhanced institutional controls" are not adequately described. 2. The only protective option is for DOE to purchase all affected properties. 3. It is not clear if "enhanced institutional controls" will be protective of ecological receptors and environmental resources (e.g., wetlands). 4. The relationship between the current PGDP Water Policy and "enhanced institutional controls" needs to be clarified.	
	KDFWR (Written Comment)	It is unclear as to the mechanism for enhanced institutional controls for non-DOE and DOE owned property. Will this involve deed restrictions or similar legal arrangement for non-DOE owned property?

COMMENTS ON
Risk-Based End State Vision and Variance Report for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky
(DOE/OR/07-2119&D0/R2)
(This summary includes all comments received from the public, public organizations, and the regulatory agencies before March 11, 2005)

Category	**Commentor:**	**Comment**
	Charles and Vicki Jurka (Written Comment)	DOE and its contractors contaminated the landowners groundwater; destroying a self-sufficient economic option for landowner water-production. DOE then ameliorated this harm through the Water Policy, by paying the costs associated with a new source of "clean" water. The extensive and expansive degree of groundwater contamination, under the current proposed remedial actions, will remain for many generations to come. In all likelihood, legal instruments will not bridge this generational span. The inherent failures of both current and risk-based proposals necessitates the exploration of other options. The most fail-safe, long-range, cost-effective option is the purchase and subsequent DOE control of "real estate" from all Water Policy landowners.
	KDFWR (Oral Comment Feb. 26 Workshop)	Are the enhanced institutional controls proposed consistent with future use of some areas as wetland habitat?
	KDFWR (Oral Comment Feb. 26 Workshop)	Current enhanced institutional control discussion needs to be reviewed and improved.
	Bill Tanner (Oral Comment Feb. 26 Workshop)	Will the enhanced institutional controls result in moving the current PGDP Water Policy box? Will the west boundary of the box be moved closer to the PGDP and the east boundary be moved further from the PGDP?
	Vicky Jurka (Oral Comment March 11 Workshop)	Questioned how DOE can justify purchasing property as part of enhanced institutional controls if property is not contaminated. If property is purchased, then all property owners need to be treated equally.
	Ruby English (Oral Comment March 11 Workshop)	Questioned how DOE would compensate property owners if deed restrictions become part of the enhanced institutional controls. Recommended that DOE hold a series of meetings explaining the reason for and methods to be used to implement institutional controls.
	Vicky Jurka (Oral Comment March 11 Workshop)	Stated that the CAB has produced and distributed letter asking property owners about their feelings concerning property purchase.
	Bill Tanner (Oral Comment March 11 Workshop)	Stated that the CAB started working on recommendations concerning property purchase 2 years ago. CAB will revisit again soon and would like to see final resolution of issue within 2 years.
	Vicky Jurka (Oral Comment March 11 Workshop)	Stated that other DOE locations have used an entity like PACRO when purchasing property.
	John Anderson (Oral Comment March 11 Workshop)	Requested that DOE provide information regarding property purchase at other DOE facilities.
	UK-KRCEE (Written Comment)	Page 142, Table 5.1, HA 1, V-1.1. Enhanced institutional controls provide an excellent approach for control of long-term groundwater usage. However, this should not preclude evaluation and implementation of technologies to reduce source terms and dissolved phase contamination at the PGDP.

COMMENTS ON
Risk-Based End State Vision and Variance Report for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky
(DOE/OR/07-2119&D0/R2)
(This summary includes all comments received from the public, public organizations, and the regulatory agencies before March 11, 2005)

Category	**Commentor:**	**Comment**
	UK-KRCEE (Written Comment)	Page 148, Table 5.1, HA 2, V-2.1. Because of the implementation enhanced institutional controls under the RBES, the target risk in industrial areas should be set at 1E-4.
	CAB (Written Comment)	To achieve the goal of the CAB's End State Vision, the following recommendations are submitted: 9. DOE, within two years, resolve the issue of institutional controls, compensation, or "buy out" with the property owners affected by off-site groundwater contamination.
Land Use	MAJOR COMMENTS 1. Future industrial use of the site, including reindustrialization, has considerable support; however, other uses for areas identified as future recreational should be considered. 2. KDFWR would like to see land deeded to them and not leased under the CPES and RBES. 3. Land use map (i.e., Recreational use outside the fence) is inconsistent with McCracken County zoning.	
	PACRO (Written Comment)	2. PACRO supports the industrial land use for areas currently viewed as industrial. 3. PACRO supports more flexibility in the designation of use for the remaining DOE property other than exclusively recreational. PACRO supports the ownership of that property being transferred to a local industrial development agency that upon clean up to recreational standards has the flexibility to reuse portions of that property for reindustrialization.
	CAB/SUN (Written Comment)	…the board recommends that: Work start immediately with DOE, PACRO, and the Greater Paducah Economic Development council to determine which plant buildings have potential for other industrial use. They should not be torn down but cleaned up to be safe enough for new occupants. Governmental laws be checked so that new tenants aren't liable for past contamination. Brownfield regulations exclude superfund sites such as the Paducah plant, but DOE regulations do indemnify certain companies that use government property.
	KDFWR (Written Comment)	Figure 3.3b – Site Legal Ownership – RBES. This figure indicates land currently leased to WKWMA will continue to be leased to KDFWR, not deeded to the state. While the current lease agreement would remain adequate, KDFWR would be interested in obtaining ownership of the property if the area meets or exceeds state and/or federally issued criteria for cleanup for recreational use.
	Charles and Vicki Jurka (Written Comment)	Anticipated recreational use for areas outside the fence is inconsistent with McCracken County zoning ordinance.

COMMENTS ON

Risk-Based End State Vision and Variance Report for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky

(DOE/OR/07-2119&D0/R2)

(This summary includes all comments received from the public, public organizations, and the regulatory agencies before March 11, 2005)

Category	**Commentor:**	**Comment**
	Steven Doolittle, McCracken County Administrator (Written Comment)	On behalf of McCracken County, we wish to add these comments to the land use portion of the End State Visioning process. We support DOE's general determination that current land uses should be maintained. That is, industrial lands should remain industrial and recreational land uses should be maintained. However, we would offer that flexibility should be put in place so that some of the open recreational or open space lands could be offered for some industrialization/reindustrialization opportunities. Local planning agencies should at least be allowed an opportunity at some future point to decide if a re-use of recreational or open area is appropriate. We recognize DOE's hard work in this area and appreciate the opportunity to be heard.
Cleanup Levels	MAJOR COMMENTS 1. Cleanup to standards consistent with future land use is needed. 2. Cleanup levels for recreational areas should meet or exceed those based on state and/or federally issued criteria for cleanup. 3. Proposed cleanup levels under the RBES are much higher than the levels typically used for industrial and residential soils and sediments. 4. Cleanup standards need to consider ecological receptors. 5. Cleanup standards for PCBs listed in the report are not consistent with state's cleanup goal. 6. Point of compliance for actions should be consistent with that used at other sites in Kentucky (i.e., the property boundary). 7. Cleanup levels should be based on regulation and not policy.	
	PACRO (Written Comment)	3. PACRO supports more flexibility in the designation of use for the remaining DOE property other than exclusively recreational. PACRO supports the ownership of that property being transferred to a local industrial development agency that upon clean up to recreational standards has the flexibility to reuse portions of that property for reindustrialization.
	CAB/SUN (Written Comment)	…the board recommends that: Work start immediately with DOE, PACRO, and the Greater Paducah Economic Development council to determine which plant buildings have potential for other industrial use. They should not be torn down but cleaned up to be safe enough for new occupants.
	KDFWR (Written Comment)	Figure 3.3b – Site Legal Ownership – RBES. This figure indicates land currently leased to WKWMA will continue to be leased to KDFWR, not deeded to the state. While the current lease agreement would remain adequate, KDFWR would be interested in obtaining ownership of the property if the area meets or exceeds state and/or federally issued criteria for cleanup for recreational use.
	KDFWR (Written Comment)	V-2.1 – The CPES recommends removal of contaminated source sediments and soils to achieve a target risk of 1E-06. The RBES assumes excavation of hotspots in sediment and soil using a target risk and PCB concentrations consistent with future land use. The RBES action in industrial areas would achieve a target risk of 1E-04 to a worker and a PCB concentration of 25 ppm. The action in recreational areas would achieve a target risk of 1E-04 to a recreational user and a PCB concentration of 1 ppm. KDFWR feels that the RBES does not adequately remove contamination from either on site of off site areas. With limited control of PCB movement through surface water, the potential for ecological exposures to exceed current acceptable levels is elevated. For example, under the RBES, the proposed levels being left are much higher than the typically used 1E-06 and 1 ppm for industrial and 0.1 ppm for residential soils and sediments.

COMMENTS ON

Risk-Based End State Vision and Variance Report for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky

(DOE/OR/07-2119&D0/R2)

(This summary includes all comments received from the public, public organizations, and the regulatory agencies before March 11, 2005)

Category	Commentor:	Comment
	KDFWR (Written Comment)	V4.1, 8.1, 9.2 - The CPES assumes excavation of contaminated soils to achieve the target risk of 1E-06 under a residential scenario and a PCB concentration of 1 ppm. The RBES assumes excavation of hot spots in soil using a target risk of 1E-04 under a worker scenario with concentrations of PCBs 25 ppm. KDFWR feels that the RBES does not adequately remove contamination from either on site or off site areas. With limited control of PCB movement through surface water, the potential for ecological exposures to exceed current acceptable levels is elevated. For example, under the RBES, the proposed levels are much higher than the typically used 1E-06 and 1 ppm for industrial and 0.1 ppm for residential soils and sediments.
	KDFWR (Written Comment)	V-7.1 – Both the CPES and RBES allow for removal of waste and debris within the legacy waste storage areas. The CPES is covered under an agreed order stating the final closure of the sites must achieve a Hazard Index (HI) of 1 and a 1E-06 for closure without the use of engineering barriers or institutional controls. The RBES excavated soils or surface areas would target areas to a HI of 1 and 1E-04 under an industrial scenario with PCB target levels of 25 ppm. KDFWR feels that the RBES does not adequately remove contamination from on site areas. With limited control of PCB movement through surface water, the potential for ecological exposures to exceed current acceptable levels is elevated. For example, under the RBES, the proposed levels are much higher than the typically used 1E-06 and 1 ppm for industrial and 0.1 ppm for residential soils under the agreed order.
	Mark Donham and Kristi Hanson (Written Comment)	We oppose a blanket relaxing of cleanup standards for pcbs. This will results in many pounds of pcbs being left on site – 25 times more to be exact. PCBs have been found in higher than average levels in virtually every living creature that has been tested around the plant. This means they likely are in the workers also, in the dust, in the water. There needs to be diligence in trying to reduce the pcb exposure to the ecology in the area. In addition, this does not address the private lands which have or may have been contaminated by the plant. Any comprehensive cleanup plan should deal with contaminated private lands.
	KDFWR (Oral Comment Feb. 26 Workshop)	Ecological risk discussions need to be added to the document.
	KDFWR (Oral Comment Feb. 26 Workshop)	It is not clear how DOE can clean to ecological standards when an ecological risk assessment has not been performed.
	KYDEP (Oral Comment Feb. 26 Workshop)	Generally, the current planned end state presented in the report is inconsistent with the state's current cleanup plan. Specifically, the state's cleanup goal for PCBs in sediment is 0.1 ppm and not 1 ppm as presented in the report. The 0.1 ppm value is taken from the Rockwell court case decision.
	KDFWR (Oral Comment March 11 Workshop)	Requested that the discussion of ecological risk in the RBES include ecological cleanup levels.
	UK-KRCEE (Written Comment)	Section 4.3.1, Page 60, "Pathways," Table 4.5. Explain how ^{228}Th is considered without considering the other nuclides in the ^{232}Th decay chain.
	UK-KRCEE (Written Comment)	Section 4.6.1, Page 71, "Pathways," Table 4.7. See comment 11.

COMMENTS ON

Risk-Based End State Vision and Variance Report for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky

(DOE/OR/07-2119&D0/R2)

(This summary includes all comments received from the public, public organizations, and the regulatory agencies before March 11, 2005)

Category	**Commentor:**	**Comment**
	UK-KRCEE (Written Comment)	Section 5.1.9.3, Page 134, "Projected Risk Levels," First Paragraph. Based on reasonable assumptions for future land use, the target risk level for cleanup of soils within the restricted area should be based on industrial and not residential exposures.
	UK-KRCEE (Written Comment)	Section 5.2, Page 140, Bullets. Concur with projected radiological and non-radiological cleanup levels for future industrial and recreational use designations at the PGDP. However, if the facilities within the restricted area are to be free released and not under the control of the Department of Energy, more restrictive state and/or federal cleanup levels should be applicable.
	UK-KRCEE (Written Comment)	Page 143, Table 5.1, HA 1, V-1.2. Based on the point of compliance established by the RCRA/CERCLA remediation at the Maxey Flats Nuclear Disposal Site, the PGDP point of compliance should be the DOE property boundary.
	UK-KRCEE (Written Comment)	Page 148, Table 5.1, HA 2, V-2.1. The target risk levels within the restricted area should be based on reasonable future land use which has been established as industrial.
	UK-KRCEE (Written Comment)	Page 148, Table 5.1, HA 2, V-2.1. Under KRS 13A "policy" cannot be used establish a standard in the Commonwealth. A standard must be promulgated in an administrative regulation.
	UK-KRCEE (Written Comment)	Page 148, Table 5.1, HA 2, V-2.1. Because of the implementation enhanced institutional controls under the RBES, the target risk in industrial areas should be set at 1E-4.
	UK-KRCEE (Written Comment)	Page 149, Table 5.1, HA 4, V-4.1. We concur with DOE's position to remove hot spots within the restricted area using a target risk of 1E-4. It is not reasonable to apply a residential target risk of 1E-6 to remediation activities conducted within the restricted area.
	UK-KRCEE (Written Comment)	Page 154, Table 5.1, HA 7, V-7.1. Future land use for the restricted area has been agreed to as industrial. Therefore, it is unreasonable to set a residential target risk of 1E-6. Enhanced institutional controls would preclude the construction of residential housing units in this restricted area.
CERCLA Cell	MAJOR COMMENTS 1. A more detailed study of the CERCLA Cell is appropriate. 2. Alternatives to the CERCLA Cell for long-term storage (e.g., indoor storage) of waste need to be considered. 3. The CERCLA Cell is opposed by some, and it is only mentioned to allow more liberal use of the C-746-U Landfill. 4. The United States Geological Service (USGS) should be involved in the preparation of the document. 5. Seismic issues discussed in the report should be consistent with recently developed information.	
	KDFWR (Written Comment)	V-5.1 – The CPES does not include the potential construction of a CERCLA Cell for on-site disposal of CERCLA-derived wastes. The RBES includes the potential construction of the facility. The KDFWR believes that a more detailed study should be conducted to determine the feasibility of a CERCLA Cell onsite. This study should address the concerns put forth by the Commonwealth of Kentucky.

COMMENTS ON
Risk-Based End State Vision and Variance Report for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky
(DOE/OR/07-2119&D0/R2)
(This summary includes all comments received from the public, public organizations, and the regulatory agencies before March 11, 2005)

Category	Commentor:	Comment
	Mark Donham and Kristi Hanson (Written Comment)	We are not in favor of the CERCLA cell. However, we fear that this variance is being used as a way to only shift plans for dumping to the 746U landfill, which we are not in favor of either. We do not think that the Paducah site is a good landfill site for such long lived contaminants being so close to a major river. We thank (sic) the idea of using some of the existing buildings as containment facilities should be looked at more, but that the focus should be on better quality containment facilities for the contaminants. What needs to be done is that the contaminants need to be removed from the open environment and contained in facilities that have floors and the capability of observing leaks as soon as they occur with easy remediation. If some of the existing buildings could be modified in some way to accomplish this, then that is certainly something to look at. If new facilities need to be built to adequately contain the contamination, then the agency should build them.
	Charlie Quinton (Oral Comment Feb. 26 Workshop)	Is the USGS involved in the preparation of the document? They may have data that would be useful (i.e., seismic information).
	UK-KRCEE (Written Comment)	<u>Section 2.3, Page 15, First Paragraph.</u> The statement relative to identification of recent faulting is not correct based on the present state of knowledge and information disseminated to all involved parties. See memorandum of February 26, 2004 from Hampson to Murphie regarding the status of seismic investigations and seismic assessments at the PGDP and its environs.
	UK-KRCEE (Written Comment)	<u>Page 149, Table 5.1, HA 5, V-5.1.</u> Climatological conditions are addressed in engineering design and do not preclude the construction of a potential CERCLA Cell.
	UK-KRCEE (Written Comment)	<u>Page 149, Table 5.1, HA 5, V-5.1.</u> IS NREPC uniformly applying seismic regulatory requirements to all permitted facilities?
	UK-KRCEE (Written Comment)	<u>Page 149, Table 5.1, HA 5, V-5.1.</u> Technical experts do not agree that seismic conditions at the PGDP preclude the construction of a potential CERCLA Cell. See memorandum of February 26, 2004 from Hampson to Murphie regarding the status of seismic investigations and seismic assessments at the PGDP and its environs.
	UK-KRCEE (Written Comment)	<u>Page 149, Table 5.1, HA 5, V-5.1.</u> In addition to engineering controls to address climatological and seismic issues, control of waste forms can minimize the potential for release from the CERCLA Cell.
	CAB (Written Comment)	To achieve the goal of the CAB's End State Vision, the following recommendations are submitted: 7. DOE should investigate all possible alternatives to the proposed Comprehensive Environmental Recovery, Compensation, and Liability Act (CERCLA) waste disposal facility. There are four gaseous diffusion process buildings that have little, if any, potential for reindustrialization. The footprints of these buildings could be used for an above-ground concrete encapsulation of final D&D waste. This option is more acceptable to the community and may lower long-term costs for both Environmental Management (EM) and Legacy Management (LM).

COMMENTS ON
Risk-Based End State Vision and Variance Report for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky
(DOE/OR/07-2119&D0/R2)
(This summary includes all comments received from the public, public organizations, and the regulatory agencies before March 11, 2005)

Category	**Commentor:**	**Comment**
Reindustrialization	MAJOR COMMENTS 1. Reindustrialization should be considered. Transfer of property and reuse of buildings is supported. 2. For reindustrialization to work, liability of new tenants needs to be determined. 3. Reindustrialization will be impossible if the groundwater and burial ground problems are not addressed. 4. If contamination is left in place, then the impact of future releases from other (new) processes needs to be considered. 5. Before initiating reindustrialization, a master plan is needed for all structures and areas.	
	PACRO (Written Comment)	3. PACRO supports more flexibility in the designation of use for the remaining DOE property other than exclusively recreational. PACRO supports the ownership of that property being transferred to a local industrial development agency that upon clean up to recreational standards has the flexibility to reuse portions of that property for reindustrialization.
	CAB/SUN (Written Comment)	…the board recommends that: Work start immediately with DOE, PACRO, and the Greater Paducah Economic Development council to determine which plant buildings have potential for other industrial use. They should not be torn down but cleaned up to be safe enough for new occupants. Governmental laws be checked so that new tenants aren't liable for past contamination. Brownfield regulations exclude superfund sites such as the Paducah plant, but DOE regulations do indemnify certain companies that use government property.
	PACRO/SUN (Written Comment)	Director John Anderson said a chief PACRO concern is the condition of buildings and other resources that make the plant marketable. Among other things, the group wants to clean and recycle contaminated nickel, but there is a national safety ban by DOE on putting scrap metal at its plants into commercial use.
	Mark Donham/SUN (Written Comment)	"This should be of great concern to Paducah," he said, "because there is going to be no reindustrialization of that site with a contaminated groundwater plume under it and uranium still buried there."
	Charles and Vicki Jurka (Written Comment)	Page 150: Hazard 3, V-3.1: Burial grounds are inconsistent with re-industrialization.
	Vicki Jurka (Oral Comment Feb. 26 Workshop)	The document needs to consider how future industrial releases from other (new) processes may affect DNAPL releases in the future. This interaction may limit future use of the site.

COMMENTS ON
Risk-Based End State Vision and Variance Report for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky
(DOE/OR/07-2119&D0/R2)
(This summary includes all comments received from the public, public organizations, and the regulatory agencies before March 11, 2005)

Category	**Commentor:**	**Comment**
	CAB (Written Comment)	To achieve the goal of the CAB's End State Vision, the following recommendations are submitted: 1. DOE is encouraged to structure environmental remediation activities to allow continued nuclear and non-nuclear industrial use of the existing industrialized area and to continue recreation/wildlife use of those areas presently leased to the WKWMA. 2. DOE begin investigating means to modify security access to non-USEC leased areas, allowing the reindustrialization process to move forward. 3. DOE begin consultation with PACRO, GPEDC, and other involved parties to inventory and investigate buildings and facilities to determine potential reindustrialization value. 4. DOE decontaminate the buildings, facilities, and surrounding grounds (scheduled for reuse) to the level necessary to allow this community every opportunity to obtain non-nuclear tenants for the site. 5. DOE begin physical rehabilitation of infrastructure facilities identified as having potential for the reindustrialization process. 6. DOE thoroughly characterize any contamination remaining at the site and adjoining property, after all environmental remediation activities are complete. This will allow the issuance of state and federal "covenant not to sue," or an equivalent document, for future tenants and property owners. 7. DOE should investigate all possible alternatives to the proposed Comprehensive Environmental Recovery, Compensation, and Liability Act (CERCLA) waste disposal facility. There are four gaseous diffusion process buildings that have little, if any, potential for reindustrialization. The footprints of these buildings could be used for an above-ground concrete encapsulation of final D&D waste. This option is more acceptable to the community and may lower long-term costs for both Environmental Management (EM) and Legacy Management (LM). 8. DOE plan and initiate removal of all burial grounds within the industrial area. The potential for contaminant migration in the air, soil, groundwater, and surface water is greatly increased if the burial grounds remain. The unexcavated burial grounds will negatively impact future industrial options for the site.
Site Description	MAJOR COMMENTS 1. The explanation concerning the reason for management practices needs to be corrected. 2. The reason why some contamination originates from Ohio River water needs to be better explained.	
	KDFWR (Written Comment)	Section 3.2.1 – The Ecological Activities Section states that vegetation is managed for consumption by wildlife, especially deer. While the vegetative management practices on West Kentucky Wildlife Management Area (WKWMA) do benefit most wildlife, upland habitat is managed more so for the northern bobwhite (*Calinus virginianus*) and should replace deer as the inferred primarily managed species.
	Charles and Vicki Jurka (Written Comment)	Page 12 (para. Above 2.1.2): This paragraph requires clarification. (This paragraph is presented below.) "The sediments found in water taken from the Ohio River for use as cooling water are a source of potential contamination at the PGDP. These sediments have been contaminated with PCBs through upstream industrial discharges, and flocculated materials (i.e., sludge) at the PGDP water treatment plant, which treats water taken from the Ohio River, often contain levels of PCBs and metals above PGDP-specific no action levels taken from DOE 2000a."

COMMENTS ON
Risk-Based End State Vision and Variance Report for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky
(DOE/OR/07-2119&D0/R2)
(This summary includes all comments received from the public, public organizations, and the regulatory agencies before March 11, 2005)

Category	**Commentor:**	**Comment**
Figure Error	MAJOR COMMENT 1. Errors were identified. All figures need to be checked.	
	KDFWR (Written Comment)	There appears to be a misprint in the figure legend. It shows red points having PCB levels below 25 ppm. When compared to the other two point levels, this should actually read PCB above 25 ppm.
	Charles and Vicki Jurka (Written Comment)	Page 44 (risk levels): Fig. 4.1a2 is referenced but does not appear in this draft document (our copy). This appears to be an important reference when determining exposure pathways.

THIS PAGE INTENTIONALLY LEFT BLANK

Attachment 17

SUMMARY OF CHANGES MADE TO EARLIER DRAFTS OF THE PGDP RBES IN RESPONSE TO STAKEHOLDER COMMENTS

THIS PAGE INTENTIONALLY LEFT BLANK

Summary of Changes Made to
Risk-Based End State Vision and Variance Report for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky
(DOE/OR/07-2119&D0/R2)
in Response to Stakeholder Comments

Category	**Change**
General	• Additional risk summary tables, including tables concerning ecological risks, added. • Document was reviewed to remove inconsistencies. • Discussions of the sustainability of response actions added. This discussion notes that source removal is the most sustainable response action. • Sizes of source areas added and checked as appropriate. • Added information covering the trade-off in risks between potential response actions planned under the RBES and planned under the current planned end state. (This discussion of risk balancing is included in the tables describing the potential response action planned under the RBES and the current planned end state to address site risks.)
Document Preparation	• Additional time has been added to the document preparation schedule to allow for increased public participation. • The document has been edited and repetitive information has been deleted. In addition, summary tables were added. • A public participation appendix was added to the revised document. This appendix includes a listing of all public participation activities, copies of handouts and viewgraphs used at meetings, copies of written comments, and summaries of comments received ordered by category.
GWOU Remediation	• Additional discussion of the current PGDP Water Policy was added to the report, including the relationship between the current water policy and potential "enhanced institutional controls. • A source action at the primary groundwater source area was added to the RBES. • The current basis for the TI waiver (i.e., national performance data and presence of other contaminants in groundwater, such as metals) was added to the variance discussion. • A discussion of geology and hydrology added to the report. • A discussion of the plume and its past and potential future migration was added to the RBES. • Additional discussion of the ^{99}Tc plume was added.
BGOU Remediation	• The revised discussion of risks posed by waste found in the landfill emphasizes that contact with waste is unlikely.
SWOU Remediation	• Bank soil was added as a medium of concern. • A discussion of risks posed by consumption of game was added.
SOU Remediation	• No specific changes in response to comments received.
Permitted Landfills	• A discussion of the "P-Landfill" was added. • Document was reviewed to ensure that RBES included mechanisms to monitor for future releases.
Legacy Waste	• No specific changes made in response to comments received.
Cylinder Yards and Conversion Facility	• Discussion of risks from external exposure to gamma radiation added to the revised RBES.
Institutional Controls	• Major revisions made in the description of "enhanced institutional controls." • The relationship between the current water policy and potential "enhanced institutional controls" clarified.
Land Use	• No specific changes made in response to comments received. • Discrepancies between the current zoning and future land-use maps discussed.

Summary of Changes Made to
Risk-Based End State Vision and Variance Report for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky
(DOE/OR/07-2119&D0/R2)
in Response to Stakeholder Comments

Category	**Change**
Cleanup Levels	• Discussion concerning status of cleanup standards for ecological receptors added. • Discussions of proposed point of compliance under the RBES and its basis added.
CERCLA Cell	• Additional discussion of the CERCLA Cell as only one option for waste disposal added. • Seismic discussion modified to address recent information on seismic issues.
Reindustrialization	• Discussion about actions that may occur under D&D added. This discussion recognizes that reuse of some facilities may be possible.
Site Description	• Explanation concerning management practices corrected. • Discussion of Ohio River water as a potential source of PCB contamination revised. • Descriptions of locations of ecological resources added.
Variance Discussion	• Schedule, cost, and risk information added to Table 5.2 (Table 5.4 in the revised report). • Maps summarizing the RBES and CPES added provided as support to variance discussions. • Enhanced the discussion of the challenges that could prevent DOE from attaining agreement with stakeholders to pursue the RBES as opposed to the current planned end state. • Enhanced the discussion of the ways in which DOE can work with stakeholders to address the challenges preventing agreement to pursue the RBES as opposed to the current planned end state.
Figure Error	• Editorial corrections made in response to specific comments. • Complete edit of document performed.

Summary of Changes Made to
Risk-Based End State Vision and Variance Report for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky
(DOE/OR/07-2119&D2/R2)
in Response to Stakeholder Comments

Category	**Change**
Figure Error	• Editorial corrections made in response to specific comments. • Complete edit of document performed.
General	• Revised title to be consistent with notes from DOE RBES Next Steps Workshop (contained in Attachment 6 to the Appendix). • Changed RBES to "potential end state alternative" throughout document to be consistent with a recommendation in notes from DOE RBES Next Steps Workshop. • Included statements in document that notes that the End State Vision Document is a dynamic report that will be updated annually to reflect actual decisions from the ongoing CERCLA process at the PGDP.
Document Preparation	• Revised appendix to direct public to location where the D2R3 revision of the End State Vision Document is available for review.

THIS PAGE INTENTIONALLY LEFT BLANK

Attachment 18

STATUS OF THE END STATE VISION PROCESS
FOR THE PADUCAH GASEOUS DIFFUSION PLANT
STAKEHOLDER UPDATE
OCTOBER 18, 2005

THIS PAGE INTENTIONALLY LEFT BLANK

Status of the End State Vision Process for the Paducah Gaseous Diffusion Plant

Stakeholder Update

October 18, 2005

U.S. Department of Energy
Notice of Availability
2005 END STATE VISION UPDATE

The U. S. Department of Energy (DOE) has issued the 2005 End State Vision Annual Update for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky (DOE/OR/07-2119&D2R3). This document updates the Draft Risk-Based End State Vision and Variance Report (DOE/OR/07-2119&D2R2) published in 2004. The End State Vision document will be updated annually to communicate the end state vision; address comments received from stakeholders, including the general public; and reflect current environmental cleanup efforts and decisions.

A public meeting will be held at 6:30 p.m., Tuesday, October 18 at the Environmental Information Center, 115 Memorial Drive, Paducah, Kentucky, to discuss the 2005 End State Vision Annual Update with stakeholders. Comments are encouraged, and may be sent to David Dollins, U.S. Department of Energy, P.O. Box 1410, Paducah, KY 42001. Mr. Dollins may also be contacted at (270) 441-6819.

Document Availability: The 2005 End State Vision Annual Update is now available for review at the Environmental Information Center; the McCracken County Public Library, 555 Washington Street, Paducah, Kentucky; and online at http://www.bechteljacobs.com/pad_reports.shtml.

Meeting Objectives

- Provide general background and history.
- Summarize major changes associated with the FY2005 Annual Update.
- Respond to public comments and questions.
- Outline recent cleanup activities affecting future annual updates.

Document Description

- A planning tool, updated annually, to assure today's environmental cleanup efforts are protective for tomorrow's reasonably foreseeable future use of the site (i.e., industrial, recreational, residential):
    - ➢ The document is not a decision document.
- Identifies the potential contaminants and hazards as they currently exist.
- Identifies variances between currently planned end state and potential alternative end state.

Document History - Summary

- First draft issued January 31, 2004.
- Public Meeting to introduce End State Project held February 5, 2004.
- Public Workshops held February 26 and March 11, 2004.
- Second draft issued April 30, 2004.
  - Placed on EIC public web site on April 30, 2004.
  - Placed in EIC and McCracken County Public Library on April 30, 2004.
- DOE-PPPO letter sent to various organizations on June 1, 2004.
- Public Workshop offered June 3, 2004.
- DOE Workshop held October 6 and 7, 2004.
- 2005 End State Vision Annual Update for PGDP issued August 28, 2005.
  - Placed on EIC public web site on August 28, 2005 at this address:
    - http://www.bechteljacobs.com/pad_reports.shtml.
  - Placed in EIC and McCracken County Public Library on August 28, 2005.

Full history of Public Participation,
including lists of comments received, is presented in
the Appendix to the 2005 End State Vision Annual Update.

Summary of FY 2005 Annual Update

- Did not make substantive changes to the end state alternatives, variances, or risk balancing.
- Added discussion of dynamic nature of document and indicated it will be updated annually to reflect cleanup decisions from the on-going CERCLA process and to incorporate public comments on the end state process.
- Updated Appendix to include notes from the DOE October 2004 Workshop and slides from presentations made since the release of the second draft of the End State Vision Document.
- Revised document title and related references to Risk-based End State to be consistent with notes from DOE October 2004 Workshop:
  - ➢ Changed title from “Risk-based End State” to “End State Vision” and the acronym “RBES” to “end state alternative.”

FY 2006 Annual Update Process

- Incorporate recent cleanup activities, such as:
  - ROD for C-400 Cleaning Building TCE Source Remediation signed, selecting Electrical Resistance Heating technology.
  - Field work initiated for the Site Investigation for On-Site Ditches and NSDD (outside the security fence).
  - Completed the Site Investigation of the Southwest Plume and issued report to EPA and Kentucky for review and approval.
- Incorporate any public comments received on FY 2005 document.
- Continue to notify public and solicit stakeholder comments on future updates to End State Vision Document.

BACKUP SLIDES

Major Variances

Current Planned End State Actions	End State Alternative Actions
Continuation of Water Policy (short-term agreements with existing property owners).	Enhanced Institutional Controls (e.g., legal deed restrictions, property purchases).
Reduce TCE concentration at primary and secondary sources (e.g., C-400, C-720, SWMU 1) using treatment.	Reduce TCE concentration at primary source of off-site contamination (i.e., C-400) using treatment.
Excavate some burial grounds and cap remaining. Continue monitoring and access controls.	Cap all burial grounds. Continue monitoring and access controls.
Soil Cleanup Levels - clean industrial areas to residential levels.	Soil Cleanup Levels - clean industrial areas to industrial levels.
Sediment Cleanup Levels - clean industrial areas to residential levels.	Sediment Cleanup Levels - clean industrial areas to industrial levels.
Characterization and on- and off-site disposal of legacy waste.	Same
D&D of facilities and infrastructure followed by on- and off-site disposal of debris.	Same

Examples of Risk Balancing

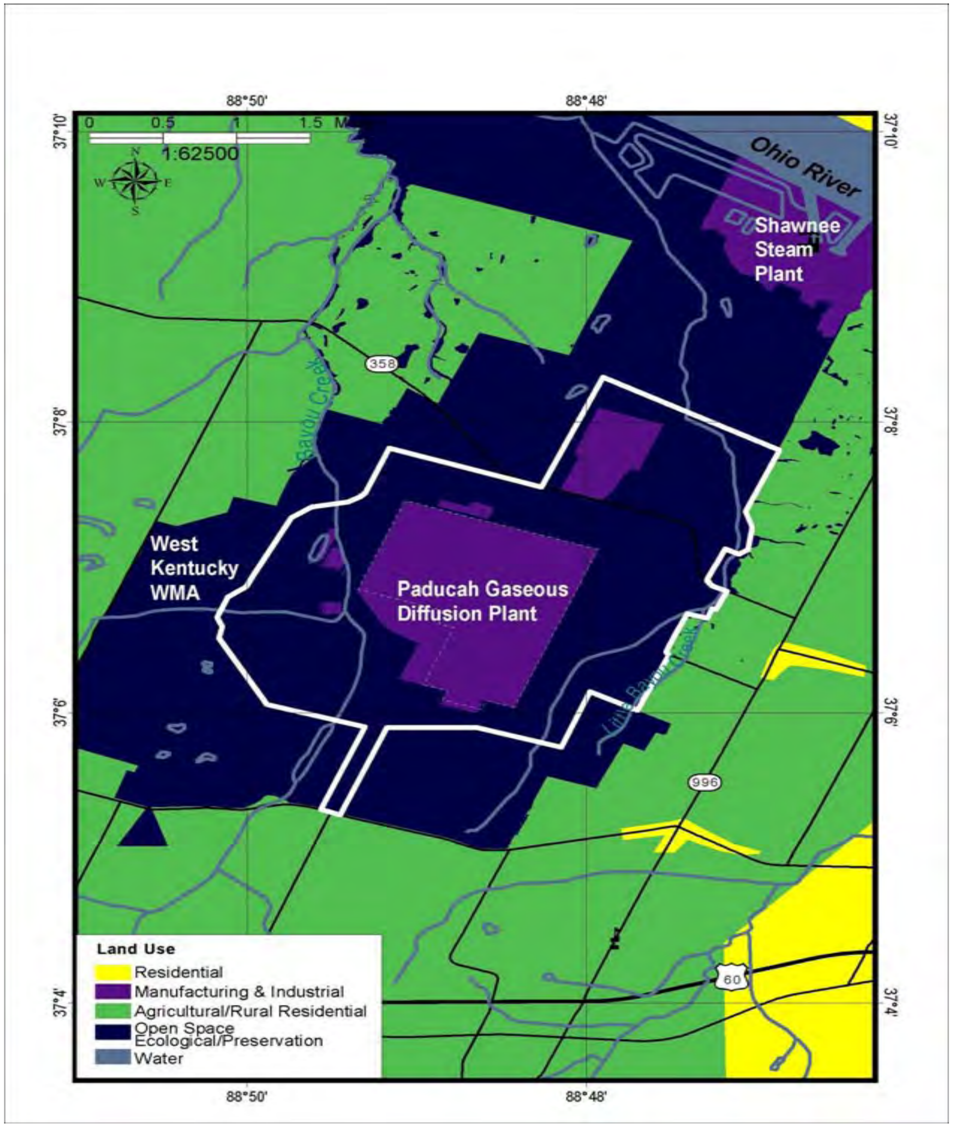
- Individuals and wildlife can be put at risk both by contamination in the environment and by attempts to clean up the contamination.

- More intrusive cleanup methods (e.g., excavation and disposal) may be more permanent (because they remove the contaminants), but can result in greater near-term risks to workers, the public, and the environment during implementation.

FY 2006 Appropriations Bill

Within the funds provided, the Department shall undertake a study of the potential purchase of property or options to purchase property that is located above the plume of contaminated groundwater near the facility site. The study shall evaluate the adequate protection of human health and the environment from exposure to contaminated groundwater and consider whether such purchase, when taking into account the cost of remediation, long-term surveillance, and maintenance, is in the best interest of taxpayers.

Current and Reasonably Foreseeable Future Land Use



Summary

- Under the end state alternative, future use same as current use.
- Continued manufacturing and industrial use inside fence.
- Wildlife management and recreational use of other DOE-owned property.
- Agricultural and rural residential use of surrounding area.