S DOE/OR/06-1201&D2

Action Memorandum for the Water Policy at the Paducah Gaseous Diffusion Plant Paducah, Kentucky

CLEARED FOR PUBLIC RELEASE

June 1994

Jacobs Engineering Group, Inc.
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June 9, 1994

Mr. Jimmie C. Hodges
U.S. Department of Energy
Paducah Site Office
P.O. Box 1410
Paducah, KY 42001

Subject: Transmittal of *Action Memorandum for the Water Policy at the Paducah Gaseous Diffusion Plant* (DOE/OR/06-1201&D2)

Dear Mr. Hodges:

Enclosed please find the draft final *Action Memorandum for the Water Policy at the Paducah Gaseous Diffusion Plant*, document number DOE/OR/06-1201&D2. This report is being submitted to the Department of Energy (DOE) in accordance with DOE's Fiscal Year 1994 compliance milestone commitments. The Jacobs ER Team has prepared the Action Memorandum in accordance with the requirements and responsibilities under the Technical Support Contract, No. DE-AC05-93OR22028, Task Order No. 35H-830-36.

In addition to the draft final Action Memorandum, a Comment Response Summary which addresses comments received from the Environmental Protection Agency and the Kentucky Department for Environmental Protection is included.

If you require additional copies of the Action Memorandum or have questions concerning this document, please contact our Paducah Site Manager Don J. Wilkes, at (502) 462-2550.

Sincerely,

Don J. Wilkes for

Sheldon Meyers
Program Manager

Enclosures

cc: Carlos Alvarado, DOE
David Dollins, DOE
Robert Edwards, DOE
Don J. Wilkes, Jacobs

Department of Energy
Oak Ridge Operations
Paducah Site Office
P.O. Box 1410
Paducah, KY 42001

June 9, 1994

Mr. Tony Able
Remedial Project Manager
United States Environmental Protection Agency
Region IV
345 Courtland Street, N. E.
Atlanta, Georgia 30365

Ms. Caroline Patrick Haight, Director
Division of Waste Management
Kentucky Department for Environmental Protection
14 Reilly Road, Frankfort Office Park
Frankfort, Kentucky 40601

ACTION MEMORANDUM FOR THE WATER POLICY AT THE PADUCAH GASEOUS DIFFUSION PLANT (PGDP)

Dear Mr. Able and Ms. Haight:

Enclosed for review is the draft final *Action Memorandum for the Water Policy at the Paducah Gaseous Diffusion Plant (PGDP)*. The Action Memorandum incorporates responses to comments received from the Environmental Protection Agency (EPA) and Kentucky Department for Environmental Protection (KDEP). In addition to the draft final Action Memorandum, a Comment Response Summary document is included for your review and information.

If you have any questions or require additional information, please call Carlos R. Alvarado at (502) 441-6804.

Sincerely,

Robert C. Edwards

for Jimmie C. Hodges, Site Manager
Paducah Site Office

EO-24:Dollins

Enclosure

cc: T. Taylor, KDEP/Frankfort

DOE/OR/06-1201&D2

Action Memorandum for the Water Policy at the Paducah Gaseous Diffusion Plant Paducah, Kentucky

June 1994

Prepared by
Jacobs Engineering Group, Inc.
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DE-AC05-93OR22028

Prepared for
U.S. Department of Energy
Environmental Restoration Division

Jacobs Engineering Group, Incorporated. Contributed to the preparation of this document and should not be considered an independent contractor in its review.
DOE Contract No. DE-AC05-93OR22028

DOE/OR/06-1201&D2

Action Memorandum for the Water Policy at the Paducah Gaseous Diffusion Plant Paducah, Kentucky

June 1994

CONTENTS

This Action Memorandum has been prepared in accordance with the format prescribed in the *Superfund Removal Procedures Action Memorandum Guidance* (EPA/540/P-90/004 December 1990).

FIGURES

TABLES

APPENDICES

A. *Engineering Evaluation/Cost Analysis for the Water Policy at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE/OR/06-1142&D3, July 1993)

B. *Comment Response Summary for the May 19, 1993 Draft Engineering Evaluation/Cost Analysis for the Water Policy at the Paducah Gaseous Diffusion Plant (DOE/OR/06-1142&D2)*

ATTACHMENTS

1. August 13, 1993 U.S. Environmental Protection Agency EE/CA Concurrence Letter

2. August 25, 1993 Kentucky Department for Environmental Protection EE/CA Approval Letter

3. Status of Agency for Toxic Substances and Disease Registry (ATSDR) Activities

4. Enforcement Information

5. Concurrence Memo for Nationally Significant or Precedent-Setting Actions

6. Administrative Record Index

7. Summary of Residential Water Well Sampling Results

8. Water Policy Removal Documentation Schedule

9. Response to Significant Comments Received during EE/CA Public Comment Period

10. Paducah Gaseous Diffusion Plant Water Policy

LIST OF ACRONYMS AND ABBREVIATIONS

^{99}Tc	technetium-99
^{235}U	uranium-235
^{237}Np	neptunium-237
^{238}U	uranium-238
ACO	Administrative Order by Consent
AES	Automated Estimating System
ARAR	applicable or relevant and appropriate requirement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CWA	Clean Water Act
DES	Disaster and Emergency Services
DNAPL	dense nonaqueous phase liquid
DOE	Department of Energy
EE/CA	Engineering Evaluation/Cost Analysis
EPA	Environmental Protection Agency
FFA	Federal Facility Agreement
GAC	granular activated carbon
HRS	Hazard Ranking System
KDEP	Kentucky Department for Environmental Protection
MCL	maximum contaminant level
MMUS	Martin Marietta Utility Services, Inc.
NCP	National Contingency Plan
NEPA	National Environmental Policy Act
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NRC	Nuclear Regulatory Commission
pCi/l	picocurie(s) per liter
PGDP	Paducah Gaseous Diffusion Plant
RCRA	Resource Conservation and Recovery Act
RGA	Regional Gravel Aquifer
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
SAP	Sampling and Analysis Plan

SDWA	Safe Drinking Water Act
TBC	to be considered
TCE	trichloroethene/trichloroethylene
TSCA	Toxic Substances Control Act
TSD	treatment, storage, and/or disposal
TVA	Tennessee Valley Authority
UF_6	uranium hexaflouride
USEC	United States Enrichment Corporation
WKWMA	West Kentucky Wildlife Management Area
µg/l	microgram(s) per liter

ACTION MEMORANDUM

I. PURPOSE

The purpose of this Action Memorandum is to request and document approval of the removal action described herein for the Paducah Gaseous Diffusion Plant (PGDP), Paducah, McCracken County, Kentucky.

II. SITE CONDITIONS AND BACKGROUND

A. Site Description

1. Removal site evaluation

In August 1988, trichloroethene (TCE), an organic solvent, and technetium-99 (^{99}Tc), a beta emitting radionuclide, were detected in four private wells north of the PGDP facility. At that time, the analyses indicated TCE levels in these wells ranging from 1.5 to approximately 950 µg/l, and ^{99}Tc levels ranging from 25 pCi/l to approximately 400 pCi/l (Ashburn et al., 1988).The Safe Drinking Water Act (SDWA) regulations (40 C.F.R. Part 141) contain drinking water standards known as maximum contaminant levels (MCLs). Although the MCL for beta emitters was not exceeded, the TCE concentrations in the ground water did exceed the MCL for TCE. In order to protect human health, a temporary water supply was provided to all residents whose wells contained detectable levels of TCE (≥1 µg/l) and gross beta (≥25 pCi/l). Extension of a local water district pipeline furnished a more permanent source of water to portions of the affected area. The U.S. Department of Energy (DOE) paid for the water line extension and provided water at no monetary cost to affected residents. Also, a sampling and analysis plan was initiated to monitor movement of the contaminants in the ground water.

As a result of the discovery of contaminants in the ground water, the U.S. Environmental Protection Agency (EPA) and DOE entered into an "Administrative Order by Consent" (ACO) under Sections 104 and 106 of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA) for the purpose of addressing the off-site contamination. Pursuant to the ACO, PGDP conducted an investigation to determine the nature and extent of contamination. The site investigation concluded that TCE and ^{99}Tc were the principal contaminants of concern in the off-site ground water. Initial investigation results were documented in *Results of the Site Investigation, Phase I* (CH2M Hill, 1992a). The extent of contamination was further

characterized in *Draft Results of the Site Investigation, Phase II* (CH2M Hill, 1991). The DOE submitted a revised version of this document to EPA and the Commonwealth of Kentucky in April 1992.

The study of the ground water and associated contaminant plumes in the vicinity of PGDP has continued and been documented in the *Report of the Paducah Gaseous Diffusion Plant Groundwater Investigation, Phase III* (Clausen et al, 1992a). A *Proposed Plan for Interim Remedial Action of the Northwest Plume* (DOE, 1993a) proposing ground water extraction and treatment to reduce the spread of contamination from the source and centroid of the Northwest Plume has been developed, and the *Record of Decision for Interim Remedial Action of the Northwest Plume* (DOE, 1993b) was signed by DOE on July 15, 1993 and by EPA on July 22, 1993. The Commonwealth of Kentucky and EPA jointly issued a letter of approval of the Northwest Plume interim corrective measures workplan and ROD on July 26, 1993.

2. Physical location

The PGDP facility is located in McCracken County in western Kentucky, approximately 3.5 miles south of the Ohio River and 20 miles east of the confluence of the Ohio River and the Mississippi River. Paducah, Kentucky is located approximately 10 miles east of the plant. Several small communities (including Heath and Grahamville to the east, and Kevil to the southwest) are located within a five-mile radius of the DOE property boundaries.

The Shawnee Steam plant, which is owned and operated by the Tennessee Valley Authority (TVA), is located along the northern boundary of DOE property. A majority of the DOE property is immediately surrounded by property either deeded or leased to the public or to the Commonwealth of Kentucky as part of the West Kentucky Wildlife Management Area (WKWMA). Figure 1-1 of Appendix A presents the location of PGDP and other significant area features.

3. Site characteristics

The PGDP is an active uranium enrichment facility owned by DOE. Effective July 1, 1993, DOE leased the plant production operations facilities to the United States Enrichment Corporation (USEC) which in turn contracted with Martin Marietta Utility Services, Inc. (MMUS) to provide operations

and maintenance services. Martin Marietta Energy Systems, Inc. (MMES) manages the environmental restoration and waste management activities for DOE.

The PGDP enriches fuel for commercial reactors. Construction of the plant began in 1951, and the plant began operation in 1952. Gaseous diffusion is a physical separation process used to enrich uranium. Commercially produced uranium hexafluoride (UF_6) is composed of mostly uranium-238 (^{238}U), with a small percentage of uranium-235 (^{235}U). The gaseous diffusion process is based on the fact that a UF_6 molecule containing fissionable ^{235}U is slightly lighter than a UF_6 molecule containing ^{238}U. As the UF_6 passes through the gaseous diffusion plant's cascade system, enrichment of the ^{235}U from the UF_6 feed takes place. The process produces enriched uranium and depleted uranium tails.

4. Release or threatened release into the environment of a hazardous substance, or pollutant, or contaminant

Off-site ground water contamination originating from PGDP is almost exclusively TCE and ^{99}Tc (Clausen et al., 1992a) both of which are hazardous substances as defined by Section 101(14) of CERCLA. The Regional Gravel Aquifer (RGA), which underlies the PGDP area, has been found to contain multiple plumes of contaminated ground water. As shown in Figure 1, a plume originating from the northwest corner of the plant is the largest (approximately 1,024 acres) off-site plume (Clausen et al., 1992a). The Northwest Plume has the greatest off-site concentration of TCE and ^{99}Tc contaminants with TCE concentrations in excess of 1,000 µg/l. Two other plumes impacting the off-site ground water are the Off-site ^{99}Tc Plume and the Northeast TCE Plume. These plumes extend for some distance to the north and northeast from the plant site (Clausen et al., 1992a). Ground water contamination from the PGDP facility is spreading generally northward toward the Ohio River. The area potentially affected by future migration of TCE and ^{99}Tc contaminants is the focus of this proposed removal action.

Trichloroethene is a highly volatile, colorless organic liquid solvent used extensively for degreasing fabricated metal parts. Historically, TCE has been commonly used for both residential and industrial purposes. This solvent has been produced commercially in the United States since 1925. Beginning in 1952, TCE was used as a cleaning solvent, or degreaser, at the plant, but its use ceased July 1, 1993. The TCE source of the plumes appears to be free phase TCE in the aquifer beneath the plant. Trichloroethene, which is a dense, non-aqueous phase liquid (DNAPL), is more dense than water (specific gravity of

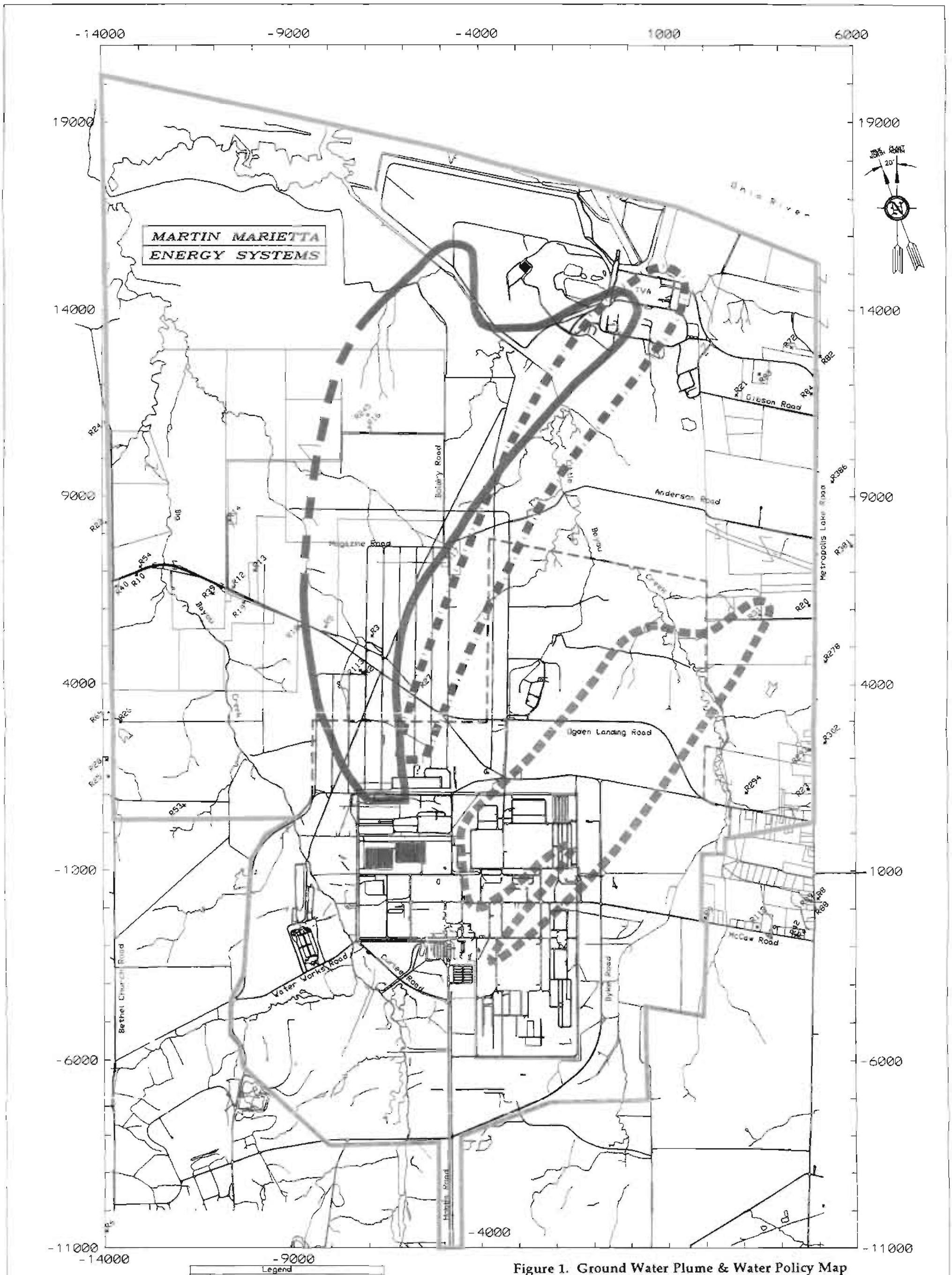

Figure 1. Ground Water Plume & Water Policy Map

Map Source
Modified from J. E. Clausen et. al. 1992.
Report of the PGDP Groundwater Investigation
Phase 3, KY/E-150,
Martin Marietta Energy Systems, Inc.,
Paducah Gaseous Diffusion Plant

1.46) and only slightly water soluble. Upon reaching the water table, free phase TCE continues to sink until it encounters a low permeability layer which inhibits further vertical migration.

Technetium-99 is a fission by-product, introduced at PGDP by uranium reprocessing. The most likely source of ^{99}Tc in the ground water has resulted from past handling and disposal practices of TCE contaminated with ^{99}Tc, and scrap metal contaminated with ^{99}Tc.

Currently, contaminated residential wells are not being utilized for domestic purposes. However, domestic use of ground water could become a potential problem for those residents with wells located in the path of the contaminant plumes. Potential adverse effects from domestic use of the contaminated ground water include the possibility of an increase in cancer and other health risks (CH2M Hill, 1991b). Consequently, the objective of this removal action is to eliminate the exposure pathway for inhalation, ingestion, and direct contact with contaminated ground water.

5. NPL status

In May 1994, PGDP was listed on the National Priorities List (NPL) by EPA. Section 120 of CERCLA requires that all federal facilities listed on the NPL enter into a Federal Facilities Agreement (FFA) with the EPA. Negotiations between DOE, PGDP, EPA, and the Commonwealth of Kentucky concerning the development of an FFA are currently in progress.

6. Maps, pictures and other graphic representations

Figure 1-1 of Appendix A graphically illustrates the location of the PGDP facility and the vicinity. Figure 3-2 of Appendix A graphically illustrates the three identified plumes originating from the PGDP facility and the area affected by the Water Policy. Attachment 7 contains a summary of the sampling results of the six contaminated residential water wells. Figure 1 of this Action Memorandum indicates the locations of these six contaminated wells and other relevant information.

B. Other Actions to Date

1. Previous actions

Following the August 1988 discovery of ground water contamination in residential wells north of the plant, immediate action was taken to protect human health. A temporary water supply was provided to the residents whose

wells contained contaminants at concentrations at or above PGDP detection levels (1 µg/l TCE and 25 pCi/l ^{99}Tc). The DOE/PGDP action levels for this removal action are numerically equivalent to these detection levels. The DOE paid for the extension of a local municipal water line along Kentucky Highway 358 westward from near Little Bayou Creek to the location of residential well R18 to provide water at no cost to the affected residents (Ashburn et al., 1988). Regular sampling of potentially affected residential wells for TCE, ^{99}Tc, and gross alpha and beta activity was initiated. A list of the residential wells previously sampled by PGDP under the initial Water Policy is provided in Table 1, along with the sampling frequency. In addition, extensive ground water monitoring activities were initiated to monitor the movement of the ground water contaminant plume. Over 250 plant and off-site wells were sampled at least once, to identify the extent of ground water contamination. Based on the results of this sampling, PGDP developed a sampling and analysis plan.

A two-phased site investigation was initiated in May 1989 under the Administrative Order by Consent (ACO) which included a survey of area well users, the installation of more than 80 monitoring wells, and the sampling and analysis of ground water from residential and monitoring wells in the area. The results of these investigations are documented in *Results of the Site Investigation, Phase I* (CH2M Hill, 1991a), and in *DraftResults of the Site Investigation, Phase II* (CH2M Hill, 1992). An assessment of the risks to human health and the environment from exposure to contamination originating at PGDP was conducted using the data generated from the two-phased site investigation. The risk assessment results are documented in the *Draft Results of the Public Health and Ecological Assessment, Phase II* (CH2M Hill, 1991b). Additional ground water investigations and monitoring activities have led to the identification of three offsite contaminant plumes at PGDP. A summary of the findings of ground water research and investigations at PGDP can be found in the *Report of the Paducah Gaseous Diffusion Plant Groundwater Investigation, Phase III* (Clausen et al., 1992a).

DOE prepared an engineering evaluation/cost analysis (EE/CA) for a removal action to address the continued need for protection of human health (DOE, 1993c). The EE/CA was approved by the EPA on August 13, 1993 and the Commonwealth of Kentucky on August 25, 1993 (Attachments 1 and 2, respectively). The EE/CA was made available for public review and comment from August 12 to September 12, 1993. Responses to significant comments received during the EE/CA

Table 1. Residential Wells Previously Sampled by PGDP under the Initial Water Policy

Weekly	Monthly	Bi-monthly	Semi-annually
R10	R2	R8	R90
R12	R3	R9	R381
R13	R5	R20	
R14	R6	R22	
R19	R16	R23	
R39	R17	R24	
R40	R18	R25	
R54	R21	R26	
R294	R27	R28	
	R31	R41	
	R43	R42	
	R72	R53	
	R82	R69	
	R83	R79	
	R84	R88	
	R113	R89	
	R245	R112	
	R302	R278	
		R293	
		R368	
		R386	

This listing superseded on Novemer 1, 1993.

All ground water samples obtained from these wells are analyzed for pH, temperature, tubidity, TCE, ^{99}Tc, and gross alpha and beta activity.

public comment period are contained in Attachment 9. This Action Memorandum documents the alternative selection decision for this removal action.

Interim actions have been initiated to provide containment and treatment of the contaminated ground water plumes. A *Technical Memorandum for Interim Remedial Action of the Northwest Plume* (DOE, 1993d) was developed to evaluate ground water extraction and treatment to reduce the spread of contamination from the source and centroid of the Northwest plume. The *Proposed Plan for Interim Remedial Action of the Northwest Plume* (DOE, 1993a) summarizing the interim alternatives was approved by EPA on April 15, 1993. The *Record of Decision for Interim Remedial Action of the Northwest Plume* (DOE, 1993b) was signed by DOE on July 15, 1993 and by the EPA on July 22, 1993.

2. Current actions

Consistent with the PGDP Water Policy (Attachment 10), potable water is being supplied at DOE's expense to those residences whose well water is contaminated by PGDP sources at levels above PDGP detection limits (1 μg/l TCE and 25 pCi/l ^{99}Tc). As of May 31, 1994, 95 residences with signed water use agreements had been connected to municipal water supply lines by PGDP. Residential wells in the projected contaminant plume migration pathways, i.e., within the Water Sampling Box, are currently sampled for pH, temperature, turbidity, TCE, ^{99}Tc, and gross alpha and beta activity. The sampling is performed in accordance with the PGDP Sampling and Analysis Plan (SAP) found in the *Paducah Gaseous Diffusion Plant Ground Water Protection Program Plan* (Clausen et al., 1992b). A list of the residential wells currently sampled by PGDP under the Water Policy is provided in Table 2, along with the sampling frequency and analyses performed. The locations of these wells are indicated in Figure 2.

Additional interim remedial actions for addressing ground water contamination near PGDP are currently planned. These actions include evaluation of other approaches to control the sources and the movement of the most contaminated portions of the three ground water contaminant plumes. An interim remedial action involving extraction wells and a pilot scale treatability study to evaluate the effectiveness of an innovative technology utilizing iron filings for addressing the Northwest Plume is currently underway pursuant to an interim Record of Decision (ROD) (DOE, 1993)c. Additional studies are currently underway to evaluate increased ground water extraction with treatment and/or barrier wall systems as potential remedial alternatives for addressing DNAPLs contamination, which have been identified as the source of the Northwest Plume.

C. State and Local Authorities' Role

State and local authorities have provided instrumental guidance and assistance since contamination of the private wells was initially discovered.

1. State and local actions to date

Local authorities provided assistance primarily when the ground water contamination was initially discovered. McCracken County Disaster and Emergency Services (DES) personnel physically provided a temporary water supply for the affected residences. Local officials were briefed on the situation

Table 2. Residential Wells Sampled by PGDP under the Water Policy

Residential Wells Sampled on a Weekly Basis	Residential Wells Sampled on a Monthly Basis	Residential Wells Sampled on a Semi-Annual Basis
R294	R2	R9
	R5	R12
	R17	R13
	R18	R14
	R293	R19
	R302	R20
		R21
		R23
		R31
		R39
		R43
		R72
		R82
		R83
		R84
		R90
		R381

This listing became effective November 1, 1993.

All ground water samples obtained from these wells are analyzed for pH, temperature, tubidity, TCE, ^{99}Tc, and gross alpha and beta activity.

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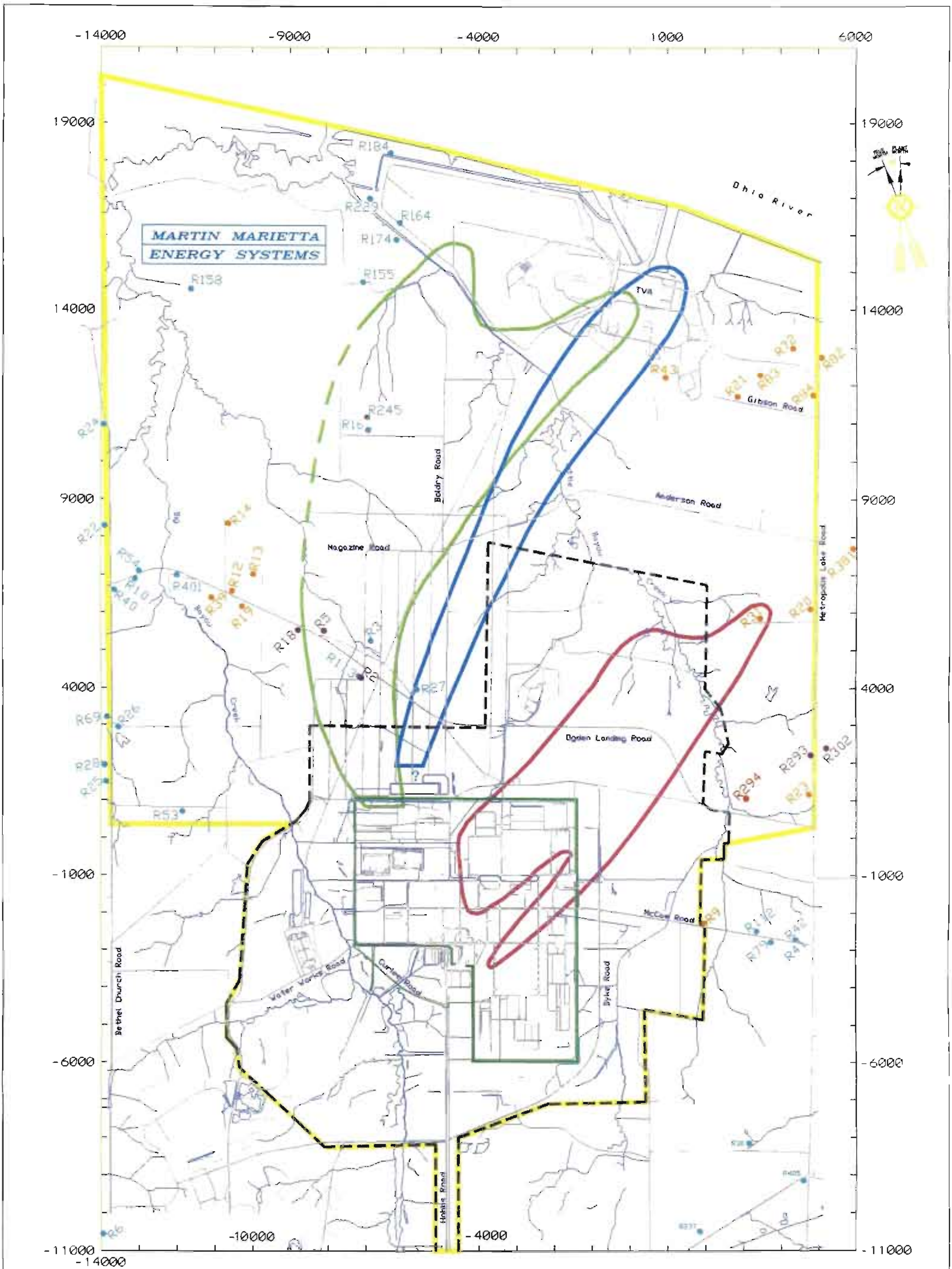
and provided needed support. The PGDP Environmental Advisory Committee, which includes local community representatives, and the PGDP Neighborhood Council, which includes residents adjacent to the site, were also briefed on the situation. Local television and radio stations cooperated by providing pertinent information to the community. The West McCracken Water District physically installed the municipal water line extension west of Metropolis Lake Road. All of these actions by local authorities have minimized the potential for human exposure to contaminated ground water originating from the PGDP facility. In addition, the local community provided significant comments on the EE/CA during the public comment period (see Attachment 9).

Commonwealth of Kentucky authorities also provided assistance when the ground water contamination was initially discovered. The Kentucky Radiation Control Branch laboratory assisted in the analysis of ground water samples. The Commonwealth's Health Department assisted in the evaluation of the analytical results and the determination of which wells were approved for domestic use. The Kentucky Natural Resources and Environmental Protection Cabinet has and continues to provide regulatory oversight of response



LEGEND

- Northeast TCE Plume
- Off-Site Tc-99 Plume
- Northwest (TCE and Tc-99) Plume
- PGDP Water Policy Affected Area
- DOE Property Boundary
- PGDP Boundary
- R294 Weekly Monitoring
- R5 Monthly Monitoring
- R19 Semi-Annual Monitoring
- R159 All Other Wells

Figure 2 – Residential Wells Sampled Under the PGDP Water Policy

Map Source
Modified from J. L. Clausen et. al. 1992.
Report of the PGDP Groundwater Investigation
Phase 3, KY/E-150,
Martin Marietta Energy Systems, Inc.,
Paducah Gaseous Diffusion Plant
Compiled from data provided by CH2MHill

1/4 1/2 1 Mile
1 INCH = 2400 FEET

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activities. The Commonwealth of Kentucky also participated in the preparation of the ACO. These actions by state authorities also have minimized the potential for human exposure to contaminated ground water originating from the PGDP facility. In addition, state agencies provided significant comments on a draft version of the EE/CA. The Commonwealth of Kentucky also provided formal approval of the EE/CA on August 25, 1993 (see Attachment 2).

2. Potential for continued state/local response

The Commonwealth of Kentucky will continue to provide regulatory oversight for ground water monitoring and remediation activities and ensure that ground water remediation activities fulfill applicable regulatory requirements. The Commonwealth will also ensure that DOE continues to notify area residents about releases of hazardous constituents to the environment.

III. THREATS TO PUBLIC HEALTH OR WELFARE OR THE ENVIRONMENT, AND STATUTORY AND REGULATORY AUTHORITIES

During the Phase II site investigation, two contaminants of concern, TCE and ^{99}Tc, were identified in the ground water (CH2M Hill, 1991b). These two contaminants were detected at concentrations in excess of the respective MCLs in ground water samples obtained from monitoring and residential wells located north of the PGDP.

A. Threats to the Public Health or Welfare

A threat to public health and welfare presently exists because of elevated levels of TCE and ^{99}Tc contaminants in the ground water. Trichloroethene has been classified as a probable human carcinogen, meaning sufficient carcinogenic evidence exists for animals, but inadequate evidence exists for humans. Technetium-99 is a radionuclide and a known human carcinogen. Potential exposure pathways for the various contaminants in the ground water are ingestion, inhalation, and direct contact. The Water Policy inhibits human exposure to the ground water contaminants by prohibiting use of residential wells. The potential for ingestion, inhalation, or direct contact with the contaminants in the ground water originating from PGDP has been eliminated by providing municipal water services to private residences and businesses within the affected area.

In addition, risks associated with the installation of the municipal water lines were evaluated. The West McCracken Water District was contracted for the work involved in providing the municipal water supply to affected residences and businesses. The process included digging trenches to install the water lines at an average depth of four

feet. Because the contaminated ground water plume is located in the Regional Gravel Aquifer (RGA) approximately 40 feet below the surface, workers were not exposed to ground water contaminants during installation of the municipal water lines. At present, there are no known hazardous substances or pollutants associated with the soil in which the trenching took place. Therefore, workers involved in digging the trenches were not exposed to any contamination. Other risks related to the installation of the municipal water system were addressed by the contractor's health and safety plan, and included hazards common to construction sites such as heavy equipment operation, shoring, etc.

B. Threats to the Environment

There are no vulnerable or sensitive populations, habitats, or natural resources in the area which will be impacted by implementation of this action.

There is no documentation regarding actual exposure to the ground water contaminants, TCE and ^{99}Tc, by any aquatic or terrestrial wildlife living within or near the area affected by the ground water contamination plumes originating at PGDP. The potential for ecological exposure via ground water does not appear to represent a problem at this time.

Implementation of municipal water service posed no threat to sensitive ecosystems or endangered species. The soil excavated during installation of the water line was not contaminated and thus was used for backfill once the extension of the line was completed. Construction of the system did not involve or generate any hazardous waste, mitigating concerns of accidental spills, releases, or fires.

IV. ENDANGERMENT DETERMINATION

Actual or threatened releases of hazardous substances from the plumes originating from the PGDP, if not addressed by implementation of the response action selected in this Action Memorandum, would have presented an imminent and substantial endangerment to public health, welfare, and/or the environment.

V. PROPOSED ACTIONS AND ESTIMATED COSTS

Three proposed actions were evaluated in the EE/CA: (a) no action, that is, continuation of the existing Water Policy; (b) installation of carbon adsorption/ion exchange treatment systems for individual residential wells; and (c) the proposed action of installing municipal water lines to serve residences and businesses in the affected area. The no-action alternative was

determined to be less cost effective and required continued sampling of private wells. The carbon adsorption/ion exchange treatment system alternative was determined to be less cost effective, required labor-intensive maintenance of each system, and required proper handling, storage and disposal of contaminated filter media, i.e., spent carbon would be considered hazardous waste and waste resin would be considered low level radioactive waste. The proposed municipal water supply alternative was determined to be the most cost effective removal action and will not require extensive sampling of private wells to protect human health.

A. Proposed Actions

1. Proposed action description

Municipal water service was offered to all existing private residences and businesses within the area affected by contaminated ground water originating at PGDP. The affected area is shown in Figures 1 and 2.

The affected area is generally bounded by the Ohio River to the north, DOE property boundary to the south, Metropolis Lake Road to the east, and Bethel Church Road to the west. Specifically, on the west side, the boundary follows the DOE property boundary northwest to the intersection with Big Bayou Creek. At that point, it moves west to the intersection of Bethel Church Road and the centerline of a powerline easement just south of Bobo Lane. Property fronting the north end of Bethel Church Road is included in the affected area north of the intersection with the powerline easement to the Ohio River. Specifically, on the east side, the boundary follows the DOE property boundary northwest to the southern point of private property that fronts Ogden Landing Road (identified in McCracken County Property Valuation Office records as #20-27-1A). At that point, it moves east along the southern edge of properties that front the south side of Ogden Landing Road to the intersection of Ogden Landing Road with Metropolis Lake Road. Property fronting on both sides of Metropolis Lake Road is included in the affected area north of this intersection of the roads to the Ohio River.

The intent of the proposed PGDP Water Policy is to provide water service comparable to that currently available to, and used by, residences and businesses in the affected area.

The removal action includes the following points:

- The DOE formally offered to provide municipal water to all existing residences and businesses within the affected area surrounding PGDP (Figures 1 and 2). They

also offered to pay for connection of those residences which were not yet connected to a public water supply. (This area included both sides of Metropolis Lake and Bethel Church roads in the affected area.) These residences and businesses were responsibile for cooperating and working with the West McCracken Water District to connect the water supply.

- The DOE offered to pay the reasonable costs of water bills in the affected area through December 1997, at which time the Water Policy will be re-evaluated and a determination will be made regarding whether the Policy will continue, undergo modification, or be eliminated. The determination of what constitutes a reasonable cost will be decided by DOE. Determination of a reasonable cost of water consumption for residents is based on the historical usage of the applicable wells, i.e., costs due to increases in water usage as a result of increases in agricultural use of water, livestock watering, or subdivision of property will not be reimbursed under this action.

- After initial implementation of the Water Policy, residences or businesses outside the affected area or those that move into the area may connect into the West McCracken Water District municipal water supply at their own expense. DOE is not responsible for the water bills of new residents or new businesses.

- Water Use agreements which delineate the respective responsibilities of the residents, businesses, and DOE have been developed with each household or business which receives free water. As of May 31, 1994, 96 residents and businesses had signed water use agreements and were connected to the extended municipal water supply. (Four residents and businesses had not signed agreements. Three of these four are connected to municipal water. The other one of these four is located at the extreme western edge of the affected area, i.e., residential well number R24, and is not located in nor down gradient of any plumes. Therefore, none of the four residences and businesses choosing not to sign an agreement are considered at risk.) Provisions included in the agreements specify that the resident or businesses may not drill new water supply wells or use existing water wells. Also, PGDP personnel are permitted property access for ground water sampling purposes. Locks will be installed by

PGDP personnel in the near future to prevent unauthorized use of the existing water wells.

- Existing PGDP monitoring wells continue to be sampled regularly to track migration of ground water contaminant plumes. Additional monitoring wells will be installed in conjuction with other environmental restoration projects at PGDP (Clausen, et al., 1992b). The number of residential wells currently sampled on a regular basis has been significantly reduced from the orginal Water Policy guidelines, since residences and businesses in the affected area are now provided with municipal water. Consistent with the present Water Policy, residential wells within the Water Sampling Box (Figure 4-1 of Appendix A) are sampled as stated in the most recent PGDP Sampling and Analysis Plan (Clausen et al., 1992b) which conforms to requirements of the ACO. Table 2 contains a list of those residential wells sampled under the PGDP Water Policy. The frequency of ground water sampling at each location is identified. All ground water samples are analyzed for pH, temperature, turbidity, TCE, ^{99}Tc, and gross alpha and beta emitting radionuclides. The analyses are currently conducted in accordance with Level 2 data quality objectives. (Level 3 data quality objectives are available when necessary.) No residential or business wells outside of the boundaries of the Water Sampling Box will be regularly sampled by PGDP. The boundaries of the Water Sampling Box are illustrated in Figure 4-1 of Appendix A. Sample schedules normally will not be changed to accommodate a sample request inside the boundary without adequate technical rationale.

2. Contribution to remedial performance

The purpose of long-term remedial action is to eliminate, reduce, or control risks to human health and the environment. Implementation of this removal action is consistent with that purpose. Potential threats to public health require attention prior to initiation of long term remediation. This action prohibits exposure to contaminated water from residential wells until a permanent remedy has been successfully completed, or other actions have formally been deemed appropriate.

3. Description of alternative technologies

One alternative technology which was considered as a potential removal action was carbon adsorption/ion exchange treatment

for the individual wells. Under this option, a carbon adsorption/ion exchange system would have been placed at each contaminated residential well to remove TCE and ^{99}Tc from the well water. Treating contaminated water using granular, activated carbon (GAC) adsorption has been proven effective on a broad range of organic compounds, including TCE (Nyer, 1985 and Eckenfelder, 1989). TCE adsorption occurs when contaminated water is passed through columns of GAC. Periodic sampling is required to ensure that the adsorption capacity of the carbon has not been exceeded, resulting in contaminant breakthrough. When the GAC becomes saturated with adsorbed compounds (contaminants), the carbon must be replaced. The spent GAC would have required characterization, handling, treatment, storage, and/or disposal as a hazardous waste.

An ion exchange unit could be added to each GAC system for the removal of ^{99}Tc from the ground water. Ion exchange is a well documented, commonly used technique for the removal of "hardness" from home drinking water. The unwanted ion in the water, which is, in this case, pertechnetate anion containing ^{99}Tc, replaces a more desirable ion in an ion exchange resin. The resin must be replaced when it becomes saturated with contaminant ions. The spent resins contaminated with ^{99}Tc would have required characterization and storage as low-level radioactive waste.

The long- and short-term likelihood of exposure to TCE and ^{99}Tc would have been decreased, but considerable risk to workers charged with maintaining or sampling the systems, in addition to those responsible for transporting and storing the wastes, would have remained.

The total capital cost of the carbon adsorption/ion exchange treatment alternative was estimated at $1,255,216 using Automated Estimating System (AES) software. The annual operating cost of the alternative was estimated to be $408,300/year (DOE, 1993c).

Provision of municipal water is the selected removal action because as documented in the EE/CA (DOE, 1993c), it is more protective of human health, is cost-effective, and is a proven, dependable solution. The estimated capital and annual operating cost of providing municipal water is significantly less than that of the carbon adsorption/ion exchange treatment systems. Supplying municipal water is a less cumbersome removal action since contaminated waste material is not generated and, therefore, requires no special provisions for handling, treatment, storage, or disposal. Clean, potable water

can be assured without frequent sampling and the associated analytical costs which would be required by the carbon adsorption/ion exchange alternative.

4. **EE/CA**

An EE/CA (DOE, 1993c), completed in July 1993, was prepared to provide background information regarding the site, document the need for a non-time critical removal action, evaluate removal action alternatives, provide rationale to support selection of a preferred removal action, and indicate the role of the local community in the process. The EE/CA was formally available for public review and comment from August 12 through September 12, 1993. Responses to significant public comments are included in Attachment 9 of this Action Memorandum.

5. **Applicable or relevant and appropriate requirements (ARARs)**

The Superfund Amendments and Reauthorization Act of 1986 (SARA) amended CERCLA to require compliance with applicable or relevant and appropriate requirements (ARARs) for remedial actions. In particular, Section 121 of CERCLA specifies that remedial actions for cleanup of hazardous substances must comply with requirements or standards under federal (or more stringent state) environmental laws that are applicable or relevant and appropriate to the hazardous substances or particular circumstances at a site. However, the statute does not require removal actions to comply with ARARs of other environmental statutes. The National Contingency Plan (NCP) requires on-site CERCLA removal actions to identify and comply with federal and state ARARs to the extent practicable, considering the urgency of the situation, and the scope of the removal action to be taken. DOE, in its lead agency capacity, has met the identified federal and state ARARs to the extent practicable because no emergency existed. The activities undertaken for this removal action have been planned over a period of time that allowed ARARs to be met.

Although a removal action is not technically required to adhere to strict ARAR standards, every effort is being made to comply with those standards that prevent, minimize, or mitigate damage to the public health, welfare, and the environment. If DOE is unable to meet an ARAR, then DOE will invoke a waiver provision pursuant to 40 C.F.R. §300.430(f)(1)(ii)(C).

In general, ARARs can be categorized into three basic groups: chemical-specific ARARs, location-specific ARARs, and action-specific ARARs. In the absence of federal- or state-promulgated

regulations, there are many criteria, advisories, guidance values, and proposed standards that are not legally binding but may serve as useful guidelines for setting protective cleanup levels. These guidelines are not potential ARARs but are to-be-considered (TBC) guidance.

There are no chemical-specific ARARs, since no water or waste is being removed and/or treated during this project. The overall objective of this removal action is to prohibit the use of contaminated ground water and provide a safe, alternate water supply to the residents in the affected area. No violations of county zoning ordinances will occur. There are no threatened or endangered species or critical habitats, archaeological, or historic structures, or floodplains that would be affected by the proposed action.

Federal and state, action- and location-specific ARARs which have been identified are detailed in the following paragraphs and summarized in Table 3.

Federal ARARs

Location-specific ARARs which apply to construction of the water line are under federal jurisdiction. During construction of the water line, trenching operations disturbed surface soils. Bayou Creek, commonly referred to as Big Bayou Creek was crossed at two locations. Although crossing the Big Bayou Creek could have triggered Clean Water Act (CWA) Section 404 requirements, Nationwide Permit 12 for utility line backfill and bedding, 33 C.F.R. §330.5(a)(12), was applicable during the dredging activities in the creek.

A nationwide permit is a general permit which may authorize activities throughout the nation, with little, if any, delay or paperwork. Nationwide Permit 12 allows the discharge of material for backfill or bedding of utility lines, including outfall and intake structures, provided there is no change in preconstruction bottom contours. Any excess material must be removed to an upland disposal area. The municipal water supply piping qualifies as a utility line for the transportation of a liquid. Moreover, certain requirements applicable to all nationwide permits listed in 33 C.F.R. §§330.5(b) and 330.7 must be met. These requirements pertain to the impact of the construction activity on aquatic life, public water supply intakes, and proper maintenance of any structure or fill. Regulations found in 33 C.F.R. §330.7 detail notification procedures which must be followed prior to beginning work under any nationwide permit. The removal action meets all requirements found in 33 C.F.R. §§330.5(b) and 330.7.

Table 3. Applicable or Relevant and Appropriate Requirements (ARARs) for the PGDP Water Policy Action Memorandum

Actions	Requirements	Prerequisites	Federal Citation[a]	Kentucky Citation[b]
LOCATION-SPECIFIC				
Drainage of material for backfill or bedding for utility lines	Nationwide Permit 12 allows discharge of material for backfill or bedding of utility lines, provided there is no change in preconstruction bottom contours	Dredge drainage ditch for placement of utility line - **Applicable**	33 C.F.R. §330.5 (a) (12); 33 C.F.R. §330.5 (b); 33 C.F.R. §330.7	
ACTION-SPECIFIC				
Site preparation	Reasonable precaution must be taken to prevent particulate matter from becoming airborne	Handling, processing, construction, road grading, and land clearing activities - **Applicable**		401 KAR §63:010
Operation of public water system	Operate public water system in accordance with health standards of 401 KAR 8:010-8:700	Operation of a public water system - **Applicable**		401 KAR §8:030
Extension of existing public water system	Avoid locating at site which has significant risk of earthquakes, floods, fires, or other disasters that could cause a breakdown and not in a hundred year floodplain	Extension to a public water system -**Applicable**		401 KAR §8:100(1)
Disinfect new water main	Disinfect with chlorine or chlorine compounds and be flushed. Bacteriological samples must be taken and demonstrated negative before the system can be used	Disinfection of new water main - **Applicable**		401 KAR §8:150(4)
Surface water control	Implement good site planning and best management practices to control storm water discharges; comply with storm water runoff requirements of KPDES Permit KYP 100000	Construction activities at industrial sites involving disturbance of 5 acres total land. **Applicable** if over 5 acres disturbed; **Relevant and Appropriate** if less than 5 acres disturbed.	40 C.F.R. Part 122; 57 Fed. Reg. 41176	

[a] C.F.R. = Code of Federal Regulations.

[b] KAR = Kentucky Administrative Record

State ARARs

The as-constructed water line is an extension of the existing water lines for the West McCracken Water District, a "public water system." A public water system is defined as "any system owned by any person, for the provision to the public of piped water for human consumption ..." It is also a "community water system" since it will "... serve at least fifteen (15) service connections used by year-round residents or regularly serves at least twenty-five (25) year-round residents" 401 KAR §8:010(1)(58).

Public water systems must be operated in accordance with the health standards of 401 KAR §§8:010-8:700 by a certified operator [401 KAR §8:030]. West McCracken Water District is certified and is in compliance with the regulations for safe operation of a water system. The West McCracken Water District provides water to the community which meets maximum contaminant levels listed in 401 KAR §§8:200, 8:400, 8:420, 8:500, and 8:550.

Preliminary plans for a new system or extension to any existing system must be submitted to the Kentucky Department for Environmental Protection (KDEP) before any financial commitment is made. Under CERCLA §121(e), DOE is not required to meet administrative requirements. However, DOE must comply with the substantive requirements. Provision of preliminary plans would be considered an administrative requirement. Substantive requirements include demonstrating efforts to avoid locating the expanded facility at a site which has "a significant risk of earthquakes, floods, fires or other disasters which could cause a breakdown ..." and not being located on a one hundred year floodplain [401 KAR §8:100(1)]. The water line extension will not disrupt any of these areas.

Before a new water main may be used, the system must be thoroughly disinfected with chlorine or chlorine compounds, and later be thoroughly flushed. Bacteriological samples must be taken and demonstrated to be negative before the system can be used [401 KAR §8:150 (4)].

Care must be taken during construction of the piping to prevent the emission of fugitive dust. Such emission is prohibited by 401 KAR §63:010, which lists acceptable dust suppression methods, including application of water on the surface of the earth. Open-bodied trucks, which transport materials likely to become airborne, must be covered at all times during operation.

Storm water discharges from activities at industrial sites involving construction operations that result in the disturbance of greater than five acres (total) of land have been included in the final rule for National Pollutant Discharge Elimination System (NPDES) permits for storm water discharges (40 C.F.R. Part 122). Kentucky is developing storm water regulations, however, until these regulations are promulgated, 40 C.F.R. Part 122 applies. This rule specifies that Best Management Practices and sediment and erosion controls must be implemented to control storm water runoff (57 Fed. Reg. 41176, September 9, 1992). Kentucky does have a general permit in place which regulates storm water runoff from construction sites (KYP100000). This general permit is applicable to the construction activities associated with this removal action.

This action has not generated hazardous waste subject to additional regulation. If hazardous waste or contamination were discovered, it would have been handled according to applicable Resource Conservation and Recovery Act (RCRA) and Toxic Substances Control Act (TSCA) regulations.

6. Project schedule

Implementation of the PGDP Water Policy effectively consists of two distinct phases of action.

The first phase of action was the northward extension of two branch municipal water lines along Metropolis Lake Road near the Tennessee Valley Authority's Shawnee Steam Plant and the Ohio River. This extension was completed in May 1993.

The second phase of action was the proposed extension of the Ogden Landing Road municipal water line along Bethel Church Road and Ogden Landing Road to the remaining affected residences and businesses. The actual construction of the Ogden Landing Road municipal water line extension began in January 1994. The affected residences and businesses were attached to the line as it became available. As of May 31, 1994, extension of the municipal water lines within the affected area had been completed.

B. Estimated Costs

Table 4 summarizes cost estimates for the removal action. The total projected capital cost for construction activities has been estimated as $793,265. (Note that this estimate was updated by a reduction of $140,013 from the estimate contained in the EE/CA. Although final construction costs are not yet available, current information indicates

Table 4. Removal Action Cost Estimate

Construction*		
(Total estimated construction costs)	$701,858	
Force account*		
(WMWD superintendent)	2,760	
Engineering design and easements*	54,514	
Engineering inspections*	34,133	
Total Projected Capital Construction Cost		$793,265
Water bills*	$60,000/yr	
Sampling and testing*	65,700/yr	
Annual Operating Expense		$125,700/yr
Present Worth Cost of Total Project		
(7% discount rate, 3.5% inflation rate, 5 year operating period)		**$1,381,971**

*Costs are based directly on information provided by Energy Sytems.

the construction costs will be within budget upon completion of the project.) Based on estimates of $60,000 per year for water bills and $65,700 per year for sampling and analytical costs, the annual operating expense has been estimated as $125,700. Assuming a seven percent discount rate and an inflation rate of 3.5 percent, the present worth cost of the total project has been estimated as $1,381,971 for the first five years.

VI. EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN

If implementation of the selected removal action, extension of municipal water lines to residences and businesses within the affected area, had been delayed or eliminated, the initial PGDP Water Policy would have remained in effect. That policy included sampling of numerous private water wells which could be affected by the plume of ground water contamination and providing bottled water to those residences and businesses with contaminated residential wells.

Residents could be subject to direct contact, ingestion, and inhalation of the contaminants in the ground water if they are allowed to use their private water wells until the presence of contaminants is detected by analytical methods. In addition, the continued use of residential wells located in the

path of the ground water plumes would affect the movement of the plume(s), therefore, the risk to those residents in the path of the ground water plumes would have been increased if the proposed removal action had not been implemented in a timely manner.

In addition, if the initial Water Policy were to have remained in effect, extensive ground water sampling would have been required to monitor those residential wells located in the path of the contaminant plumes. As indicated in the EE/CA, the previous monitoring scenario was less cost-effective than timely implementation of the removal action.

VII. OUTSTANDING POLICY ISSUES

Removal Action Workplan

Prior to implementation of a non-time critical removal action, a Removal Action Workplan is usually appropriate. Such a work plan is subject to EPA approval prior to implementation of the selected approval action. Due to the municipal water line construction schedule, the use of a formal Removal Action Workplan was not advantageous to this removal action. The municipal water line extensions near the centroid of the Northwest Plume and near the northern end of Metropolis Lake Road had already been completed prior to submittal of the draft (D1) Action Memorandum to EPA and KDEP. Design of the Ogden Landing Road water line extension had also been completed. During the Commonwealth of Kentucky's review of the draft Action Memorandum, a contract was awarded and design and construction of the water line extension was nearly completed. The West McCracken Water District was responsible for the design and construction of the water line extension. The PGDP provided oversight and directly funded the removal action. Sections II(B)(2) and V(A)(1) of this Action Memorandum contain detailed information regarding ground water sampling and analysis activities. Based upon these facts, a Removal Action Workplan is not necessary for this action.

Plugging and Abandonment of Contaminated Private Wells

The existing private water wells which DOE has and/or will take responsibility for in the affected area will not be plugged and abandoned. Each individual well will be secured with a lock and controlled strictly by DOE. The wells will be limited to use by DOE and regulatory personnel for ground water monitoring purposes. When it has been determined that the ground water has been remediated and is safe to use, custody of the wells will be returned to the respective owners consistent with the water use agreements.

VIII. ENFORCEMENT

The DOE claims responsibility for this removal action. The DOE's responsibilities as lead agency include providing funds and performing the

proposed removal action promptly and properly. The DOE is firmly committed to fulfilling these responsibilities.

IX. RECOMMENDATIONS

This decision document represents the selected removal action for the Water Policy at the Paducah Gaseous Diffusion Plant site located near Paducah, Kentucky, developed in accordance with CERCLA as amended, and consistent with the NCP. This decision is based on the administrative record for the site. A draft administrative record index for the PGDP Water Policy is contained in Attachment 6 of this document.

Conditions at the PGDP site meet the NCP Section 300.415 (b)(2) criteria for a removal action. Approval of the proposed removal action is recommended. The total project ceiling has been estimated at $1,381,971 (present worth cost).

REFERENCES

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DOE, 1993a, *Proposed Plan for Interim Remedial Action of the Northwest Plume, Paducah Gaseous Diffusion Plant, Paducah, Kentucky,* DOE/OR/06-1127, U.S. DOE, March 17, 1993.

DOE, 1993b, *Record of Decision for Interim Remedial Action of the Northwest Plume at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky,* DOE/OR-06-1143, U.S. DOE, July 1993.

DOE, 1993c, *Engineering Evaluation/Cost Analysis for the Water Policy at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky.* DOE/OR/06-1142, U.S. DOE, July 1993.

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Nyer, Evan K., *Groundwater Treatment Technology,* Van Nostrand Reinhold, New York, N.Y., 1985, pages 61-80.

33 C.F.R. §§330.5 (a), 330.5 (b), 330.7

40 C.F.R. §300.415 (b)(2) (National Contingency Plan)

40 C.F.R. §300.430

401 KAR 8:010(1)(58),8:030, 8:100(1), 8:150(4), 8:200, 8:400, 8:420, 8:500, 8:550 and 63:010

Appendix A

DOE/OR/06-1142&D3

Engineering Evaluation/Cost Analysis for the Water Policy at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky

July 1993

DOE/OR/06-1142&D3

Engineering Evaluation/Cost Analysis for the Water Policy at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky

July 1993

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DE-AC05-91OR21950

Prepared for
U.S. Department of Energy
Enrichment Restoration Division

Table of Contents

LIST OF ACRONYMS

ACO	Administrative Order by Consent
ARARs	Applicable or Relevant and Appropriate Requirements
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DOE	United States Department of Energy
EE/CA	Engineering Evaluation/Cost Analysis
Energy Systems	Martin Marietta Energy Systems, Inc.
EPA	United States Environmental Protection Agency
GAC	granular activated carbon
MCL	maximum contaminant level
MMES	Martin Marietta Energy Systems, Inc.
MMUS	Martin Marietta Utility Systems, Inc.
µg/l	micrograms per liter
NCP	National Contingency Plan
pCi/l	picocuries per liter
PGDP	Paducah Gaseous Diffusion Plant
RGA	Regional Gravel Aquifer
SARA	Superfund Amendments and Reauthorization Act
^{99}Tc	Technetium-99
TCE	Trichloroethylene/Trichloroethene
TVA	Tennessee Valley Authority
UCRS	Upper Continental Recharge System
USEC	United States Enrichment Corporation
WKWMA	West Kentucky Wildlife Management Area

TABLES

FIGURES

EXECUTIVE SUMMARY

The United States Department of Energy (DOE) is conducting cleanup activities at the Paducah Gaseous Diffusion Plant (PGDP) under its Environmental Restoration and Waste Management Program. Remedial efforts are necessary to address contamination which resulted from past waste handling and disposal practices. These remedial activities are being conducted in compliance with the requirements of the Commonwealth of Kentucky, the United States Environmental Protection Agency (EPA), and the DOE.

In August 1988, ground water contamination originating from PGDP was found in four residential wells north of the plant. Provision of alternative water supplies was initiated at that time to address an immediate need, the protection of public health and welfare. The policy of supplying water from an alternative source to residents whose wells have been affected by the ground water contamination from PGDP has continued to the present. Currently, all residences and businesses that have contamination in their wells due to operations from PGDP have been furnished with potable water.

Ground water contamination from PGDP is spreading generally northward toward the Ohio River. The area potentially affected by future migration of contaminants is the focus of the planned removal action. During the analysis segment of this project, the current PGDP water policy will remain in effect. The Engineering Evaluation/Cost Analysis (EE/CA) will document the selection of a preferred alternative addressing the continued need for protection of human health due to the presence of ground water contamination originating from PGDP. Providing an alternative water source for all potentially impacted residences and businesses is the preferred alternative that DOE is considering as a non-time critical removal action under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

Public review and comment on all possible alternatives are encouraged by DOE. After the 30-day public comment period, which is presently scheduled August 12 to September 12, 1993, the EE/CA will be modified to reflect the community input received. Following completion of this process, an Action Memorandum will be signed to document the alternative selection decision.

The EE/CA addressing the removal action alternatives provides background information on the site, evaluates the removal action alternatives, provides the reasons for selection of the preferred alternative, and outlines the public's role in helping DOE make a final decision on a removal action.

1. SITE AND AFFECTED ENVIRONMENT

1.1 SITE BACKGROUND

The Paducah Gaseous Diffusion Plant (PGDP) is owned by the United States Department of Energy (DOE). Effective July 1, 1993, DOE leased the plant production operations facilities to the U.S. Enrichment Corporation (USEC) which in turn contracted with Martin Marietta Utility Systems, Inc. (MMUS) to provide operations and maintenance services. Martin Marietta Energy Systems, Inc. (MMES) manages the environmental restoration and waste management activities for DOE.

The PGDP is a uranium enrichment facility which supplies fuel for both commercial reactors and military defense reactors. Construction of the plant began in 1951, and the plant was in operation by 1952. Gaseous diffusion is a physical separation process used to enrich uranium. Commercially produced uranium hexafloride (UF_6) is composed of mostly uranium-238 (^{238}U); with a small percentage of uranium-235 (^{235}U). The gaseous diffusion process is based on the fact that a UF_6 molecule containing fissionable ^{235}U is slightly lighter than a UF_6 molecule containing ^{238}U. As the UF_6 passes through the gaseous diffusion plant's cascade system, enrichment of the ^{235}U from the UF_6 feed takes place. The process produces enriched uranium and depleted uranium tails.

In August 1988, trichloroethylene (TCE), an organic solvent, and technetium-99 (^{99}Tc), a radionuclide, were detected in private wells north of PGDP. As a result of this discovery, the United States Environmental Protection Agency (EPA) and DOE entered into an "Administrative Order by Consent" (ACO) under § 104 and 106 of the *Comprehensive Environmental Response, Compensation and Liability Act of 1980* (CERCLA) for the purpose of addressing the off-site contamination. Pursuant to the ACO, PGDP conducted an investigation to determine the nature and extent of contamination. The site investigation concluded that TCE and ^{99}Tc were the principal contaminants of concern in the off-site ground water. Initial investigation results were documented in *Results of the Site Investigation, Phase I* (CH_2M Hill, 1991 a). The extent of contamination was further characterized in *Draft Results of the Site Investigation, Phase II* (CH_2M Hill Southeast, 1991). A revised version of this document was submitted to EPA and the Commonwealth of Kentucky in April 1992.

Further study of the ground water and associated contamination plumes in the vicinity of PGDP has continued and has been documented in the *Report of the Paducah Gaseous Diffusion Plant Groundwater Investigation Phase III* (Clausen et al., 1992 b). An interim remedial action Technical Memorandum proposing ground water extraction and treatment to reduce the spread of contamination from the source and centroid of the northwest plume has been developed, and the record of decision for this plan was signed by EPA on July 22, 1993. The Commonwealth of Kentucky does not plan to sign the ROD but will issue a Letter of Approval.

1.2 SITE DESCRIPTION

1.2.1 Setting and Land Use

The Paducah Gaseous Diffusion Plant is located in McCracken County in western Kentucky approximately 3.5 miles south of the Ohio River and 20 miles east of the confluence of the Ohio River and the Mississippi River. Paducah, Kentucky, is the closest municipality to the PGDP and is located approximately 10 miles east of the plant. Several small communities (including Heath and Grahamville to the east, and Kevil to the southwest) are situated within a five-mile radius of the DOE property boundaries.

The Shawnee Steam plant, which is owned and operated by the Tennessee Valley Authority (TVA), is located along the northern boundary of DOE property. A majority of the DOE property is immediately surrounded by property either deeded or leased to the public or to the Commonwealth of Kentucky as part of the West Kentucky Wildlife Management Area (WKWMA). Figure 1-1 presents the location of PGDP and other significant area features.

1.2.2 Geology

The PGDP is located in the Jackson Purchase Region of western Kentucky which is an area characterized by relatively flat terrain. The plant site lies at the northern end of the Mississippi Embayment within the Coastal Plain Province. The Mississippi Embayment is characterized by unconsolidated sediments overlying a Paleozoic bedrock complex. In the vicinity of the PGDP, bedrock occurs at depths of approximately 350 feet below land surface.

The PGDP site is underlain at depth by Coastal Plain deposits of the McNairy and Porters Creek Clay formations. The McNairy Formation consists of silt, sand, and micaceous to lignitic clay. The Porters Creek Clay consists mostly of a dark bluish-gray to black montmorillonitic, highly plastic, and relatively impermeable clay with small amounts of silt and fine-grained micaceous and glauconitic sand (CH_2M Hill Southeast, 1992). Scour channels from an ancient river system are thought to have eroded the top of the Coastal Plain deposits in the PGDP area to form a terrace.

Continental Deposits overlie the Coastal Plain formations in the Jackson Purchase Region (Olive, 1980). The Lower Continental Deposits consist of reddish-brown chert gravel interbedded with sand. Upper unit lithologies are mainly clayey silt with discontinuous lenses of sand or gravel. Deposits of wind-blown (loess) and recent alluvial flood plain sediments, consisting of clayey silt or silty clay, lie at the surface (CH_2M Hill Southeast, 1992).

1.2.3 Hydrology

The subsurface hydrological regime in the PGDP area is divided into three hydrologic formations: (1) the Upper Continental Recharge System (UCRS), (2) the Regional Gravel Aquifer (RGA), and (3) the McNairy Flow System (Clausen et al., 1992 b).

The UCRS is contained within surficial sediments of the Upper Continental Deposits. Sand or gravel lenses in the Upper Continental Deposits are not hydraulically interconnected over large areas due to the heterogeneity of this unit (CH_2M Hill Southeast, 1992). Ground

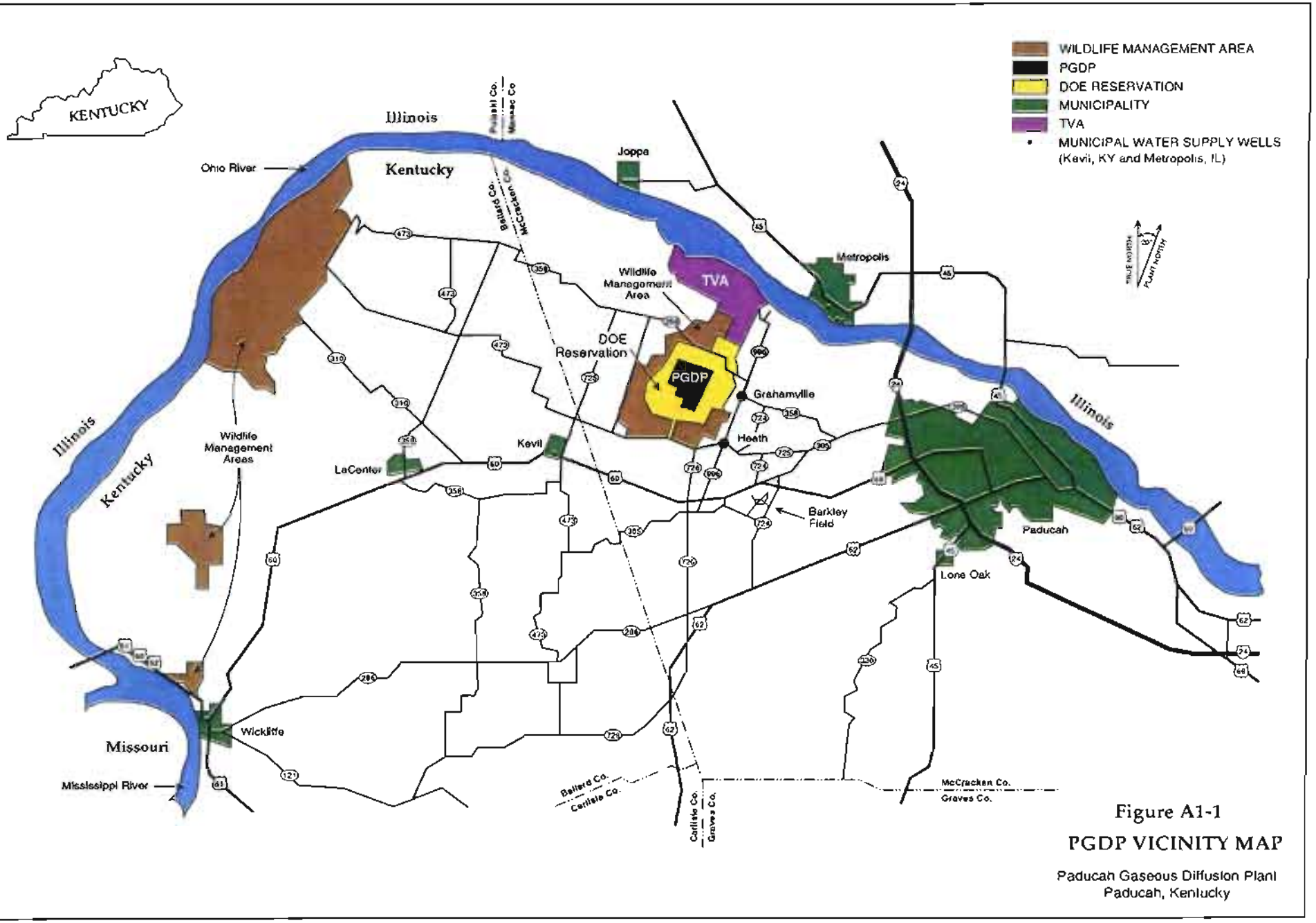


Figure A1-1

PGDP VICINITY MAP

Paducah Gaseous Diffusion Plant
Paducah, Kentucky

water flow direction within the UCRS is predominately downward into the underlying RGA (Clausen et al., 1992 b).

The RGA is composed of sands and gravels within the Lower Continental Deposits. This aquifer is continuous from the southern part of the PGDP site to the flood plain of the Ohio River. Ground water within the RGA typically moves laterally northward (CH_2M Hill Southeast, 1992). Ground water contamination plumes containing TCE and ^{99}Tc which originated from the PGDP are located within this aquifer.

The McNairy Flow System is contained within the McNairy Formation. This system is continuous within the plant site, although individual permeable sand lenses within the system may not be continuous. Communication between permeable layers of the McNairy Flow System and the RGA occurs along an angular unconformity between the Coastal Plain sediments and the Lower Continental Deposits. The horizontal hydraulic conductivity of the McNairy Flow System is several orders of magnitude less than that of the RGA; this suggests that most flow in the PGDP area takes place within the RGA (CH_2M Hill Southeast, 1992).

1.3 SITE CONDITIONS THAT JUSTIFY A REMOVAL ACTION

As a result of the August 1988 discovery of TCE and ^{99}Tc contamination in four residential wells north of PGDP, immediate action was necessary to protect human health. At that time, analysis revealed TCE levels in these wells ranged from 1.5 to approximately 950 µg/l, and ^{99}Tc levels ranged from 25 pCi/l to approximately 400 pCi/l (Ashburn et al., 1988). According to drinking water standards, the maximum contaminant level (MCL) for TCE is 5 µg/l and the MCL for ^{99}Tc is 900 pCi/l. A temporary water supply was provided to residents whose wells contained contamination greater than or equal to detection levels for TCE and ^{99}Tc. Extension of a local water district pipeline furnished a more permanent source of water to parts of the area. DOE paid for the water line extension and provided water at no cost to affected residents. Also, a sampling and analysis plan was initiated to monitor movement of the contamination in the ground water.

Subsequent investigations were conducted in which the Regional Gravel Aquifer, which underlies the PGDP area, was found to contain multiple plumes of contaminated ground water. A plume originating in the northwest corner of the plant is the largest (approximately 1,024 acres) and best understood off-site plume (see Figure 1-2) (Clausen et al, 1992 b). The Northwest Plume has the highest off-site concentration of contaminants, with TCE concentrations in excess of 1,000 µg/l. Two other plumes impacting the off-site ground water are the Off-site ^{99}Tc Plume and the Northeast TCE Plume. These plumes extend for some distance to the north and northeast from the plant site (Clausen et al., 1992 b).

Trichloroethylene is a highly volatile, colorless liquid used extensively for degreasing of fabricated metal parts. TCE has been a commonly used solvent for residential as well as industrial purposes. This solvent has been produced commercially in the United States since 1925, and utilized at PGDP continuously since 1952. The TCE source of the plumes appears to be free phase TCE in the aquifer beneath the plant. TCE is an organic solvent which is heavier than water and only slightly soluble. Upon reaching the water table, TCE,

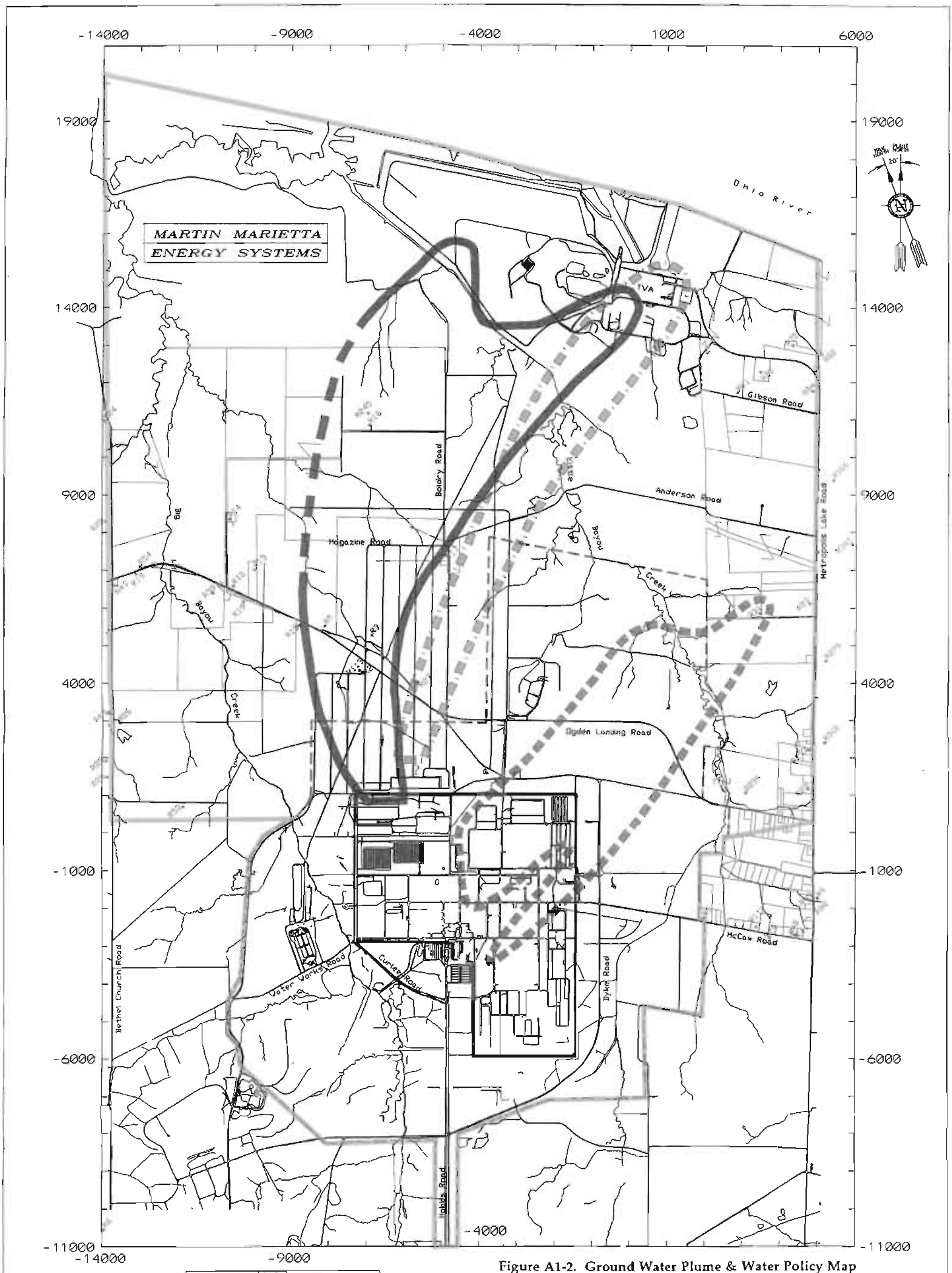


Figure A1-2. Ground Water Plume & Water Policy Map

Map Source
Modified from J. L. Clausen et. al. 1992.
Report of the PGDP Groundwater Investigation
Phase 3, KY/E-150,
Martin Marietta Energy Systems, Inc.,
Paducah Gaseous Diffusion Plant

which is a dense, non-aqueous phase liquid (DNAPL), continues to sink until it encounters an impermeable zone that prevents further vertical migration.

Technetium-99 is a fission by-product, introduced at PGDP through the reprocessing of uranium. The most likely source of ^{99}Tc in the ground water is due to the historic handling or disposal of TCE contaminated with ^{99}Tc and scrap metal contaminated with ^{99}Tc.

The main goal of the present PGDP water policy is to minimize potential human exposure to ground water contamination originating from the site. The policy of supplying potable water to residents whose wells are found to be contaminated by plant sources has continued since 1988. Municipal water has been provided to residents with well contamination above action levels (1 µg/l TCE and 25 pCi/l ^{99}Tc). To date, DOE has provided municipal water to seven residences and paid their water bills as a result of this policy. Routine sampling of wells is continuing to track movement of ground water contamination plumes. Residential wells in the projected path of the contamination plumes have been sampled regularly as directed by the ACO. Sampling is currently performed in accordance with the PGDP Sampling and Analysis Plan found within the *Paducah Gaseous Diffusion Plant Ground Water Protection Program Plan*. (Clausen et al, 1992 a).

The purpose of the proposed water policy is also to protect human health. This policy is presented as an alternative in Section 3. The proposed water policy would supply municipal water and pay the water bills of all residences and businesses in the affected area outlined in Figure 1-2, regardless of whether the wells are presently contaminated. As a result of contaminant plume migration, many of these wells may become contaminated in the future. The boundary for the area which will be affected by the proposed water policy is the result of projecting the migration pathway of the contaminated plumes, and then expanding the area outward to the nearest physical boundary. A detailed description of this boundary is given in Section 4. A reduction in residential well sampling would be possible with this policy, because residents in the area would no longer be drinking well water and would no longer be at risk of exposure to contaminants in the ground water. This reduction in sampling as shown in the *Addendum to Sampling Analysis Plan* (Clausen, 1992) will result in substantially decreased cost. However, some residential wells will continue to be sampled in addition to monitoring wells for the purpose of tracking contamination plumes.

The intent of this removal action is to address those residences and businesses that might be impacted by future plume migration. The alternatives proposed for this action are individual home carbon adsorption/ion exchange treatment systems, alternative water supply in the form of the proposed water policy, and the no action alternative as required for comparison purposes. The current water policy will remain in effect during the alternative selection process.

Currently, contaminated residential wells are not being utilized for domestic purposes. However, the domestic use of ground water may be a potential problem to future residents. Potential adverse effects from domestic use of the contaminated ground water include the possibility of an increase in cancer and other health risks (CH_2M Hill, 1991 b). Consequently, the driver for this removal action is to eliminate the exposure pathway for inhalation and ingestion of contaminated ground water.

Until final remedial actions addressing the ground water contamination plumes are selected and implemented, use of well water from the affected area will remain potentially hazardous to human health. Provision of alternative water supplies, limiting access to contaminated wells, or using household water treatment systems are actions which are included under the definition of a removal action in § 104 of CERCLA and *National Oil and Hazardous Substances Pollution Contingency Plan* (NCP), 40 C.F.R. § 300.415 (b)(5)(d)(9). A removal is described as the taking of actions as necessary "to prevent, minimize, or mitigate damage to the public health or welfare or to the environment" which may have resulted from a release or threatened release of hazardous substances. The selection of removal action protocol to document this action is appropriate and consistent with regulatory requirements. This removal action will in no way preclude the implementation of subsequent removal actions or remedial actions which may expand the scope of the action.

2. REMOVAL ACTION OBJECTIVES

The primary objective of the proposed removal action is to minimize the potential threat to human health and welfare resulting from exposure to the chemical and radioactive contaminants in the ground water. This action was addressed as a non-time critical removal action, because potable water has been provided to currently affected residents as a result of the existing PGDP water policy.

2.1 STATUTORY AUTHORITY

The Department of Energy has the authority to respond to releases or threats of releases from a contaminated site under § 104 of CERCLA as amended by the *Superfund Amendments and Reauthorization Act of 1986*, 42 U.S.C.A. § 9604 (1992) The President delegated response authority to DOE in the Executive Order No. 12,580, 52 *FR* 2923 (1987) for DOE sites. By Executive Order 12,580, DOE has the authority to undertake investigations, monitoring, surveys, testing and other information gathering as may be deemed necessary to identify a release or threat of release under CERCLA § 104(b)(1).

The Department of Energy, after determining a release has occurred, has the authority to undertake planning, engineering, and other studies or investigations appropriate for directing response actions under CERCLA. Once DOE has completed these investigations, pursuant to *Hazardous Substance Response - Removal Actions*, 40 C.F.R. § 300.415 *et. seq.*, the NCP, 40 C.F.R. § 300.415 *et. seq*. requires DOE to implement removal actions to prevent, limit, or mitigate potential risks which are associated with the site.

The statutory limits of Superfund-financed removal actions are one (1) year and $2 million, as specified in CERCLA § 104(c)(1). These limits do not specifically apply to removal actions which are authorized under CERCLA § 104(b) since DOE actions are not financed by Superfund monies. However, they are considered as guidelines for such actions. These limits may be waived for actions which are required to mitigate an immediate risk or which are otherwise appropriate and consistent with site remediation. The proposed removal action satisfies the first waiver condition because the current strategy under the water policy would mitigate the immediate risk of drinking the ground water.

DOE will conduct an engineering evaluation and cost analysis (EE/CA) or its equivalent, as appropriate, as a part of removal actions in those cases where adequate planning time is available before the start of removal [40 C.F.R. § 300.415 (b) (4) (i)]. An EE/CA is an analysis of removal alternatives for a site [40 C.F.R. § 300.415 (b) (4) (i)].

2.2 SCOPE AND PURPOSE

The scope of the proposed removal action is to supply potable water to residences and businesses within the area surrounding the PGDP which could be affected by migration of ground water contamination originating from the plant. The boundaries defining this area are shown on Figure 1-2. The purpose of this action is to reduce any potential public health hazard that might result from exposure to ground water contaminants.

2.3 SCHEDULE

The engineering evaluation/cost analysis document (EE/CA) is scheduled for public review on August 12, 1993, and it will remain available to the public through September 12, 1993. The document will be available at the Paducah Public Library and the DOE Information Resource Center located at the Science Applications International Corporation (SAIC) Office in Kevil, Kentucky. The preferred alternative will be documented in an Action Memorandum. A draft version of the Action Memorandum is scheduled to be submitted to EPA and the Commonwealth of Kentucky by October 26, 1993. Final review and approval of the Action Memorandum by EPA and the Commonwealth is scheduled to begin November 29, 1993.

In order to have municipal water available to residents in the area, West McCracken Water District in cooperation with DOE has begun construction of additional water lines. The Metropolis Lake Road Water Line has been completed. The Ogden Landing Road Water Line is in the design phase and is expected to be completed by Spring 1994. If the proposed water policy is selected as the preferred alternative, all residents in the affected area should be connected to municipal water by Spring 1994. To ensure protection of human health, the present water policy will continue in effect until a decision is made.

2.4 COMPLIANCE WITH REGULATORY REQUIREMENTS

The *Superfund Amendments and Reauthorization Act of 1986* (SARA) amended CERCLA to require DOE's compliance with applicable or relevant and appropriate requirements (ARARs) for remedial actions. In particular, Section 121 of CERCLA specifies that remedial actions (RAs) for cleanup of hazardous substances must comply with requirements or standards under federal (or more stringent state) environmental laws that are applicable or relevant and appropriate to the hazardous substances or particular circumstances at a site. However, CERCLA does not require removal actions to comply with ARARs of other environmental statutes. Moreover, the NCP requires on-site CERCLA removal actions to identify and comply with federal and state ARARs to the extent practicable, considering the urgency of the situation, and the scope of the removal action to be taken.

Regardless of the nature of the removal action, DOE will strive to comply with those ARARs that are most crucial to the proper stabilization of the site and the protection of public health and the environment. In the event DOE determines that compliance with an ARAR is not practicable, DOE will seek a waiver under 40 C.F.R. § 300.430 (f) (i) (ii) (c).

In general, ARARs can be categorized into three basic groups: chemical-specific ARARs; location-specific ARARs; and action-specific ARARs. In the absence of federal- or state-promulgated regulations, there are many criteria, advisories, guidance values, and proposed standards that are not legally binding but may serve as useful guidelines for setting protective cleanup levels. These guidelines are not potential ARARs but are to-be-considered guidance. Specific ARARs for the preferred alternative chosen for this removal action will be addressed in the Action Memorandum.

3. REMOVAL ACTION ALTERNATIVES

Alternatives for the proposed removal action were developed in accordance with the NCP (EPA, 1990) and EPA guidance (EPA, 1989).

3.1 IDENTIFICATION OF ALTERNATIVES

The Department of Energy has considered only three alternatives for this proposed action because of its limited scope. The three alternatives identified are no action, carbon adsorption treatment systems for individual wells, and the provision of an alternative water supply by connection to municipal water lines. These alternatives apply to the residences and businesses that have been determined to be within the projected migration path of ground water contamination originating from PGDP and are not presently connected to municipal water.

3.1.1 No Action

The no action alternative is considered in accordance with CERCLA regulations, and provides a baseline for comparison with other alternatives. The no action alternative would mean no further action, since the current PGDP water policy would remain in effect. The present water policy consists of supplying potable water to residences whose wells are found to be contaminated by plant sources. Potable water has been provided to residences with well contamination above action levels (1 µg/l TCE and 25 pCi/l ^{99}Tc). To date, DOE has provided municipal water to seven residences and paid their water bills as a result of this policy.

Routine sampling of wells is continuing to track movement of ground water contamination plumes. Residential wells that are in the contamination migration pathway but are not currently contaminated, will be sampled weekly. Sampling is currently performed in accordance with the PGDP Sampling and Analysis Plan found within the *Paducah Gaseous Diffusion Plant Ground Water Protection Program Plan* (Clausen et al, 1992 a). Residential wells are currently sampled regularly for gross alpha, gross beta, TCE, and ^{99}Tc. A table showing residential wells sampled under the current water policy in addition to associated costs is presented in Section 3.3.

3.1.2 Carbon Adsorption/ Ion Exchange Treatment Systems

A carbon adsorption/ion exchange treatment system on each residential well could be used to remove TCE and ^{99}Tc from well water. Treating contaminated water using granular, activated carbon adsorption has been proven to be effective on a broad range of organic compounds, including TCE, as well as some inorganics (heavy metals) (Nyer, 1985 and Eckenfelder, 1989). Granular activated carbon (GAC) systems installed on two local residential wells have proven effective in removing TCE to below detection levels. Documentation regarding the removal effectiveness of ^{99}Tc by a GAC system is not available, although undocumented sources indicated a GAC system could remove ^{99}Tc from water. A treatability study would be necessary to test the effectiveness of a GAC system in removing ^{99}Tc before it could be used to provide potable water. As a result, an ion exchange unit will be added to each GAC system to remove ^{99}Tc.

Under this option, a carbon adsorption/ion exchange system would be placed at each affected residences or business. The treatment system would be placed on the influent water line downstream of the pump (Figure 3-1). Well water would be filtered for suspended solids before it enters and then again as it exits the treatment system. The ion exchange unit would be installed in the water line after the sampling port and before the GAC system.

Ion exchange is a well documented, commonly utilized technique for the removal of "hardness" from home drinking water. Basically, the unwanted ion in the water, the pertechnetate anion containing ^{99}Tc in this case, replaces a more desirable ion on an ion exchange resin. Dowex SBR™ resin has been shown to be particularly effective for the removal of ^{99}Tc from surrogate ground water (Del Cul et al., 1991). The resin must be replaced when it approaches saturation with contaminant ions. Spent resins contaminated with ^{99}Tc would have to be stored as low-level radioactive waste.

TCE adsorption onto the GAC occurs when contaminated water is passed through columns of GAC. When the GAC approaches saturation with adsorbed compounds (contaminants), the carbon must be replaced with new, unused carbon. The useful life of GAC varies depending on the type and concentrations of contaminants present and the contact time. Sampling is required to ensure that adsorption capacity of the carbon is not exceeded, resulting in contaminant breakthrough. Spent GAC would have to be stored as a hazardous waste. On carbon adsorption systems used for drinking water purposes, ultraviolet treatment is used after the adsorption process to inhibit biological activity in the water. The treatment systems would be equipped with valves to allow sampling. Wells with carbon adsorption/ion exchange systems would have restricted access and would only be accessed for sampling and maintenance.

3.1.3 Municipal Water Supply

This alternative consists of providing municipal water through pipelines to residents and businesses within the area that could potentially be affected by migration of ground water contamination originating from PGDP. Six- to eight-inch municipal service main line extensions will be constructed as part of this alternative as shown in Figure 3-2. Agreements will be signed with residents and businesses in the area to restrict use of their wells, and to allow access by PGDP personnel for sampling or testing. These agreements would be executed prior to any water connection being accomplished to ensure permission for DOE to have the water district connect residences and businesses to the municipal water supply. DOE will pay reasonable costs of water bills through December 1997, at which time the policy will be re-evaluated. This date was chosen for re-evaluation to remain consistent with the policy of reviewing ongoing remedial action every five years as required by Section 121(c) of CERCLA.

3.2 EVALUATION OF ALTERNATIVES

Evaluation of the removal action alternatives is in accordance with NCP and EPA guidance. Evaluation criteria are:

- Protection of human health and the environment
- Compliance with ARARs

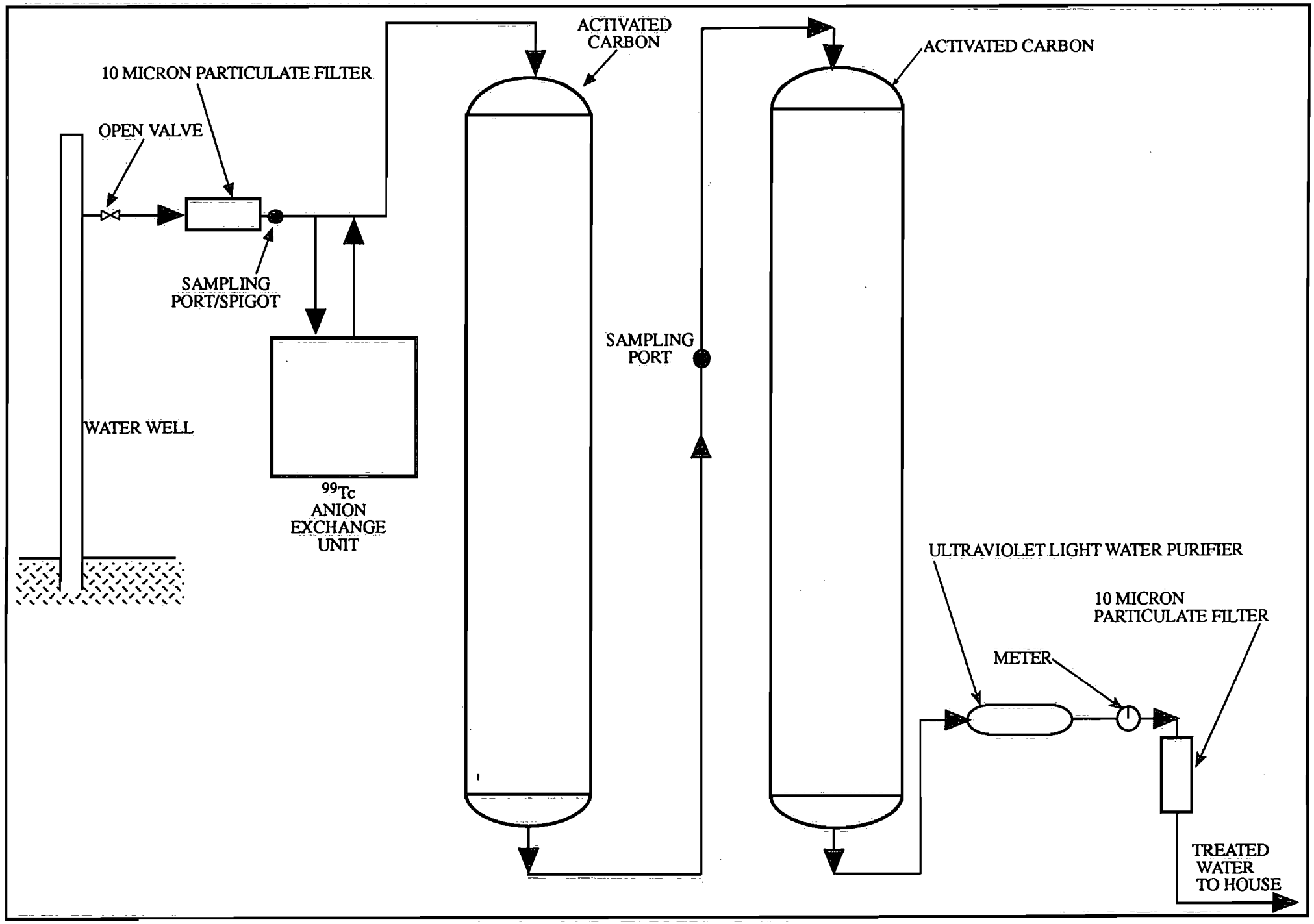
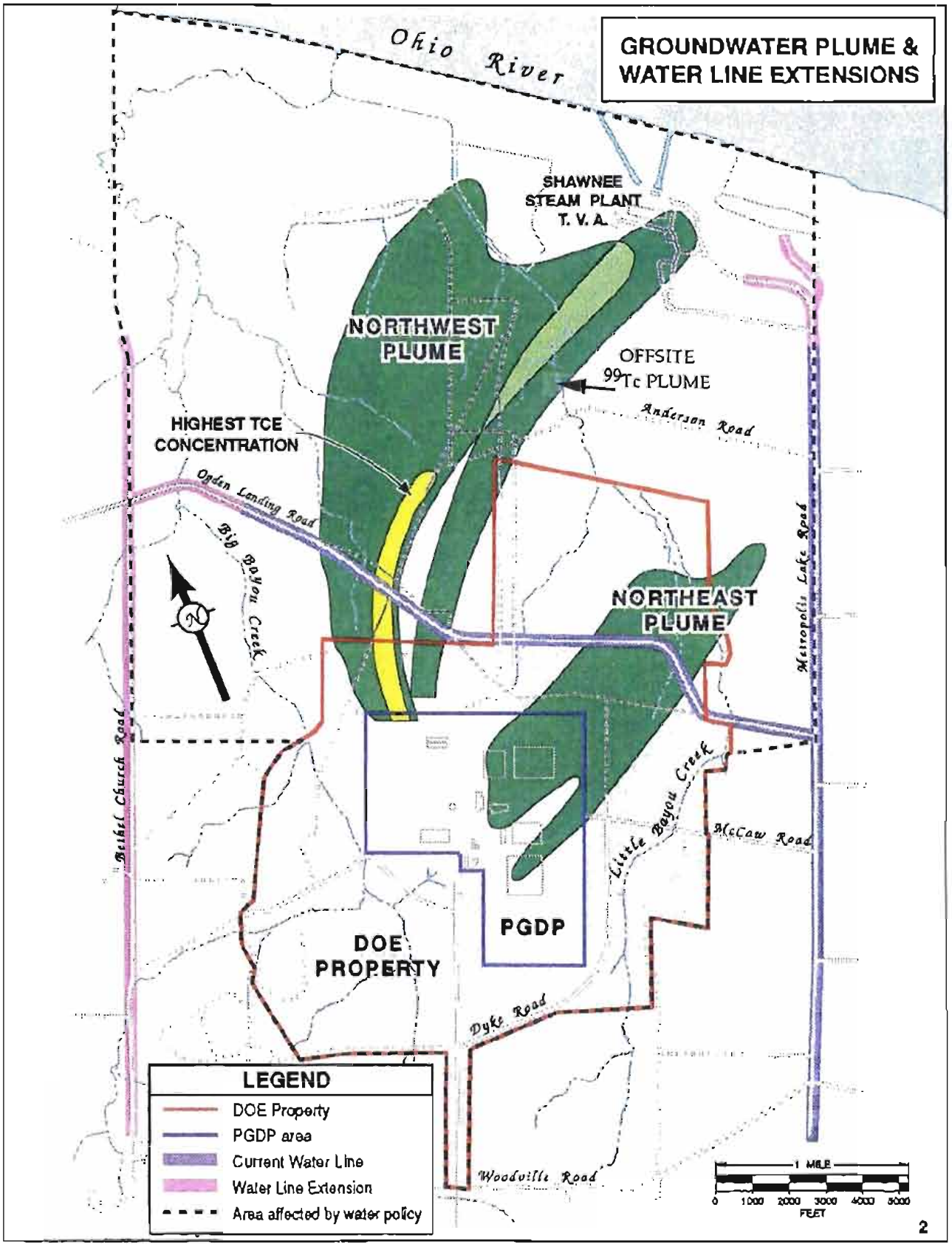


Figure 3-1. Two-Vessel Granular Carbon Adsorption System with Anion Exchange Unit



*Adapted from Clausen, et al., 1992

Figure A3-2. Ground Water Plume & Water Line Extension

- Long-term effectiveness and permanence
- Reduction of contaminant toxicity, mobility, and volume
- Short-term effectiveness
- Implementability
- Cost
- State acceptance
- Community acceptance

Table 3-1 reflects a comparison of the evaluation criteria for each alternative.

3.2.1 Protection Of Human Health And The Environment

The no action alternative would ensure protection of human health, because the current water policy would remain in effect. Under the current policy, potable water will be provided to those residences whose wells have been found to be contaminated by plant sources. Regular sampling of residential wells projected to be in the migration path of the contamination plumes will continue. As a result, the potential for public exposure to ground water contamination is greatly reduced.

Carbon adsorption/ion exchange treatment systems could reduce TCE and ^{99}Tc in well water to below detection limits. The well water would then be potable after passing through the treatment system. Contaminants removed from the water would become concentrated within the resin and granular carbon. Concentrated TCE and ^{99}Tc would be hazardous to human health. Access to the well and treatment system should be restricted to allow authorized personnel only. Replacing the spent resin and carbon would require safe work practices. Water from the system should be tested often and the resin and carbon replaced regularly to prevent breakthrough of contaminants. Protection of human health is dependent upon proper maintenance of the carbon adsorption/ion exchange system. The spent carbon may have to be disposed of or stored as hazardous waste. The resin would have to be stored as a low level radioactive waste.

Providing municipal water to the affected area would reduce significantly the potential for exposure to ground water contamination. Municipal water would be piped directly to all residences and businesses in the affected area regardless of whether their well was presently contaminated. Usage restrictions to control unauthorized use of the potentially contaminated wells, and prohibitions on drilling of new water supply wells by those receiving free water, would mitigate the potential for exposure to contaminated ground water.

3.2.2 Compliance With ARARs

The no action alternative would satisfy ARARs, because it would satisfy the general response objectives for protection of human health. State and local drinking water quality standards would be achieved as a result of the present water policy. Under the other two alternatives — a carbon adsorption/ion exchange treatment system and municipal water supply — ARARs would be achieved. The municipal water authority would ensure attainment of all applicable drinking water standards.

Table 3-1. Evaluation of Alternatives

Alternative	Protection of Human Health	Compliance with ARARs	Long-Term Effectiveness	Reduction of Toxicity, Mobility, and Volume	Short-term effectiveness	Implementability	Capital Investment/ Annual Operating Cost	Evaluation Results
1- NO ACTION	No change. Current water policy would continue in effect.	ARARs would be achievable	Decreased risk of exposure to contaminated ground water. Reliable and adequate water source.	Does not alter well water contamination.	Resticted access to contaminated wells would protect public. Possibility of direct worker contact with contaminated water limited to well sampling.	No technical barriers exist for implementation. All materials and services required are readily available.	$0 Capital Investment/ $370,816annual operating expense. Present worth cost = $1,736,688.	Less cost effective. Requires well samplling to ensure protection of public health.
2- CARBON ADSORPTION/ ION EXCHANGE TREATMENT SYSTEM	Provides immediate protection.	ARARs would be achievable.	Decreased risk of exposure to contaminated ground water.Adequate water source.Failure could result from contaminant breakthrough if not maintained properly.	Well water contaminants would be trapped within the treatment system. Toxicity and volume of contaminants in the well water would be removed to below detection levels.	Restricted access to well treatment area would protect public. Workers who maintain or sample systems in addition to those who transport and store wastes could be at risk of exposure to contaminates.	No technical barriers exist for implementation. All materials and services required are readily available.	$1,255,216 Capital Invetment/ $408,300 annual operating expense. Present worth cost = $3,167,458.	Less cost-effective. Requires proper maintenance in addition to disposal or storage of hazardous waste and storage of low level radioactive waste.
3-MUNICIPAL WATER SUPPLY	Provides immediate protection.	ARARs would be achievable.	Decreased risk of exposure to contaminated ground water. Reliable and adequate water source.	Does not alter well water contamination.	Resticted access to contaminated wells would protect public. As a result of decreased sampling requirements, less possibility of direct worker contact with contaminated water.	No technical barriers exist for implementation. All materials and services required are readily available.	$933,278 Capital Investment/ $125,700 annual operating expense. Present worth cost = $1,521,984.	Cost-effective. Sampling of wells not necessary to protect human health.

3.2.3 Long-Term Effectiveness And Permanence

The no action alternative would lessen the long-term potential for exposure. If a residential well is contaminated by plant sources, a temporary water supply would be immediately provided to the affected residence. Currently, all seven residences found to have contaminated wells have been connected to municipal water which has provided a more permanent source of potable water.

After carbon adsorption/ion exchange treatment, potential for exposure to contaminants within the well water would be reduced for area residents and businesses. If the system is properly maintained, long-term likelihood of exposure to TCE and ^{99}Tc would be decreased. However, a breakthrough of contaminants could occur if the resin and carbon is not replaced regularly.

The use of municipal water by all residences and businesses in the affected area and only allowing authorized use of existing wells would effectively lessen the long-term potential for exposure to contaminated ground water. This proposed water policy will be re-evaluated in December 1997, and a decision made on whether it will be continued, be modified, or ended.

None of these alternatives are meant to be permanent solutions for dealing with the ground water contamination in the area. Containment or treatment of the ground water will be addressed by dealing with each plume and its individual characteristics. The Northwest Plume will be addressed first. The interim record of decision for remedial action addressing this plume was signed by DOE on July 15, 1993 and by the EPA on July 22, 1993.

3.2.4 Reduction Of Toxicity, Mobility, And Volume

Within the carbon adsorption/ion exchange treatment system, mobility of the contaminants would be reduced as a result of entrapment within the resin and granular carbon. Since the adsorption system would remove TCE and ^{99}Tc from the well water to below detection limits, toxicity and volume of contaminants in the treated water would be greatly diminished ensuring safe drinking water for homes and businesses. This alternative is only intended to provide potable water in the affected area. It is not intended to remediate ground water contamination plumes.

In contrast, providing potable water under the current water policy or the municipal water supply alternative would not reduce the toxicity, mobility, or volume of contaminants present in the ground water. The objective for the current water policy is to provide potable water to those with wells contaminated by plant sources. The objective of the municipal water supply alternative is to replace well water for all residences and businesses in the outlined area. Under this proposed policy, municipal water will be supplied by constructing additional pipelines and connecting residences and businesses that may be affected by migration of the ground water contaminants in the future.

3.2.5 Short-Term Effectiveness

Under the current water policy, workers sampling wells might be exposed to contaminated ground water and should follow safe work practices. Restricted access to wells would protect the public.

Properly maintained carbon adsorption/ion exchange treatment systems would provide effective short-term protection. Workers maintaining the treatment systems would need to adhere to safe working practices, because they potentially could be exposed to contaminants. As a result of restricted access to wells that could eventually become contaminated, the potential for contaminant exposure to the public would be controlled in the short-term.

During the construction of municipal water lines, the community or workers would not be at risk of exposure to ground water contamination. The Ogden Landing Road Water Line is in the design phase and is expected to be completed by Spring 1994. The remaining residences and businesses in the outlined area should be connected to the water lines by that time. This alternative would involve allowing only authorized personnel to have access to wells that eventually could become contaminated.

3.2.6 Implementability

Since the current water policy is presently in effect, residential wells in the projected contamination migration pathway will continue to be sampled regularly. Residential wells found to be contaminated by plant sources will be provided with potable water. No technical barriers exist for continued implementation of this policy.

Although the carbon adsorption/ion exchange system would pose no significant technical barrier for implementation, a potential problem associated with the systems would be that workers maintaining the systems could be exposed to contamination. In addition, access to potentially contaminated wells and treatment systems would need to be restricted to protect the public. Spent carbon would have to be handled, transported, and stored as a hazardous waste, and spent resin would be handled, transported, and stored as a low level radioactive waste. Storage space for hazardous waste and low level radioactive waste at PGDP is limited and could be a problem.

Installing municipal water lines is an established conventional procedure. Presently, Metropolis Lake Road Water Main has been completed in compliance with the existing PGDP water policy. The Ogden Landing Road Water Main is expected to be completed by Spring 1994. By that time, the remaining residences and businesses in the outlined area should be connected to the water lines. There are no technical barriers to implementing the water supply alternative.

3.2.7 Cost

The no action alternative, which is a continuation of the existing water policy, would require no additional capital cost. The annual operating cost of this alternative is $370,816/year. This figure includes $366,300/year for sampling and testing. and $4,516/year

for the cost of water bills of the seven residences currently connected to municipal water. The present worth cost of this alternative assuming a discount rate of 7%, an inflation rate of 3.5%, and five years of operation is $1,736,688.

The total capital cost of the municipal water supply alternative (proposed water policy) is $933,278, as estimated by Energy Systems. The annual operating expense for this proposed policy is $125,700. This figure includes $60,000/year for the cost of water bills and $65,700/year for sampling and testing. The present worth cost of this alternative assuming a discount rate of 7%, an inflation rate of 3.5%, and five years of operation is $1,521,984.

The total capital cost of the carbon adsorption/ion exchange system option is $1,255,216, as estimated by SAIC using Automated Estimating System (AES) software. A copy of the AES cost estimate for the treatment option is included as Appendix A. The annual operating expense of the carbon adsorption/ion exchange system option is $408,300/year. This figure includes $366,300/year for sampling and testing, $13,500/year for carbon filter maintenance, and $28,500/year for storage of spent ion exchange resin as well as for storage of the spent carbon as a low-level radioactive waste. The present worth cost of this alternative assuming a discount rate of 7%, an inflation rate of 3.5%, and five years of operation is $3,167,458.

The capital investment cost of the proposed water policy is $321,938 less than the carbon adsorption/ion exchange option. Because costs of storage and additional sampling and testing are required for the treatment system alternative, the annual operating expenses of the proposed water policy are $282,600/year less than the carbon adsorption/ion exchange option.

The annual operating expense of the proposed water policy is $245,116/year less than the current water policy. With the proposed water policy, less sampling and testing is required to monitor the ground water quality since residents in the affected area will no longer be drinking the ground water. The payback period for the capital investment in the proposed water policy, based on annual operating expense savings, is 3.8 years. This corresponds to an annual rate of return of 26.3%. After comparing the present worth costs of the three alternatives, the municipal water supply is the most cost effective option.

3.2.8 Commonwealth of Kentucky Acceptance

The Commonwealth of Kentucky reviewed the EE/CA and DOE received their comments on July 14, 1993. Following their review, significant comments have been incorporated into the document and a written response to comments has been provided. The final review by the Commonwealth is scheduled to take place July 29 to August 12, 1993. Again, significant comments will be addressed.

3.2.9 Community Acceptance

A 30-day public comment period is required on the EE/CA and any supporting documentation (EPA, 1990). This EE/CA is scheduled to be available for public review from August 12 to September 12, 1993 at the Paducah Public Library and the DOE Information Resource Center at the SAIC office in Kevil, Kentucky. Before the EE/CA is made public, a notice of availability will be published in the major local newspaper, *The Paducah Sun*. A

written response to significant comments will be prepared and addressed. [40 C.F.R. § 300.415 (m)(4)].

3.3 IDENTIFICATION OF THE PREFERRED ALTERNATIVE

Provision of municipal water has been identified as the preferred alternative. This option is the most protective of human health, cost-effective, and dependable solution. The estimated capital cost and annual operating cost of the preferred alternative is significantly less expensive than the capital and annual operating cost of the carbon adsorption/ion exchange treatment systems. Supplying municipal water is less cumbersome since waste material is not generated and, therefore, requires no special provisions for handling, treatment, or storage. Clean water can be assured without frequent sampling and associated analytical costs which would be required by the other alternatives. Table 3-2 and Table 3-3 provide a comparison of the residential wells sampled and associated costs for the present water policy and the proposed water policy.

Table 3-2. Residential Wells Sampled By PGDP Under Current Water Policy

Weekly (Sampling Costs $210,600)	Monthly (Sampling Costs $97,200)	Bi-monthly (Sampling Costs $56,700)	Semi-annually (Sampling Costs $1,800)
R10	R2	R8	R90
R12	R3	R9	R381
R13	R5	R20	
R14	R6	R22	
R19	R16	R23	
R39	R17	R24	
R40	R18	R25	
R54	R21	R26	
R294	R27	R28	
	R31	R41	
	R43	R42	
	R72	R53	
	R82	R69	
	R83	R79	
	R84	R88	
	R113	R89	
	R245	R112	
	R302	R278	
		R293	
		R368	
		R386	

Total Annual Sampling Costs = $366,300
Annual Cost of Sampling ($366,300) + Annual Water Bills for 7 residences ($4,516) =
Total Operating Cost of Current Water Policy = $370,816

Table 3-3. Residential Wells Sampled Under Proposed Water Policy

Weekly (Sampling Costs $23,400)	Monthly (Sampling Costs $27,000)	Semi-annually (Sampling Costs $15,300)
R294	R2	R9
	R5	R12
	R18	R13
	R293	R14
	R302	R19
		R20
		R21
		R23
		R31
		R39
		R43
		R72
		R82
		R83
		R84
		R90
		R381

Total Annual Sampling Costs = $65,700
Annual Cost of Sampling ($65,700) + Annual Water Bills for 93 residences ($60,000) =
Total Operating Cost of Proposed Water Policy = $125,700

NET ANNUAL SAVINGS = $245,116

4. DESCRIPTION OF THE PROPOSED ACTION

Municipal water service will be offered to all existing private residences and businesses within the area affected by contaminated ground water originating at PGDP. This affected area is shown on Figure 1-2.

According to the proposed water policy, the affected area is generally bounded by the Ohio River to the north, DOE property boundary to the south, Metropolis Lake Road to the east, and Bethel Church Road to the west. Specifically, on the west side, the boundary follows the DOE property boundary northwest to the intersection with Big Bayou Creek. At that point, it moves west to the intersection of Bethel Church Road and the centerline of a powerline easement just south of Bobo Lane. Property fronting on the north end of Bethel Church Road is included in the affected area north of the intersection with the powerline easement to the Ohio River. Specifically, on the east side, the boundary follows the DOE property boundary northwest to the southern point of private property that fronts on Ogden Landing Road (identified in McCracken County Property Valuation Office records as #20-27-1A). At that point, it moves east along the southern edge of properties that front on the south side of Ogden Landing Road to the intersection of Ogden Landing Road with Metropolis Lake Road. Property fronting on both sides of Metropolis Lake Road is included in the affected area north of this intersection of the roads to the Ohio River.

The intent of the proposed PGDP water policy is to provide water service comparable to that currently available to and used by residences and businesses in the affected area. Increases in water usage as a result of increases in agricultural use of water, livestock watering, or subdivision of property will not be paid for under this policy.

The proposed PGDP water policy consists of the following points:

- DOE will offer to provide municipal water to all existing residences or businesses within the affected area surrounding PGDP (Figure 1-2), and pay for connection of those residences not already on city water. (This area will include both sides of Metropolis Lake and Bethel Church roads in the affected area.) These residences and businesses will cooperate and work with the West McCracken Water District to connect the water supply.

- DOE will offer to pay the reasonable costs of water bills in the affected area through December 1997, at which time the policy will be re-evaluated and a determination will be made regarding whether it will continue, be modified, or ended. The determination of what is a reasonable cost will be decided by DOE.

- After implementation of this policy, residences or businesses outside the affected area or those that move into the area may hook up to the municipal water supply at their own expense. DOE will not pay the water bills of new residents or businesses.

- Agreements will be developed with each household or business receiving free water delineating the respective responsibilities of the residents and DOE. Provisions included in the agreement will specify that residents may not drill new supply wells or use existing wells. Also, PGDP personnel will be permitted

property access for water sampling purposes. Locks will be provided to control unauthorized use of existing wells.

- Existing PGDP monitoring wells will continue to be sampled regularly to track migration of contamination plumes. Plans are underway for more monitoring wells to be installed. The number of residential wells currently sampled on a regular basis will be significantly reduced, since all residences and businesses in the affected area will be provided with municipal water. Residential wells within the water sampling box (Figure 4-1) will be sampled as stated in the most recent PGDP Sampling and Analysis Plan (Clausen et al., 1992 a and Clausen, 1992) which conforms to requirements of the ACO. No residential or business well outside the boundaries as shown on Figure 4-1 will be sampled by PGDP. Sample schedules normally will not be changed to accommodate a sample request inside the boundary if there is not a good technical reason driving the schedule change.

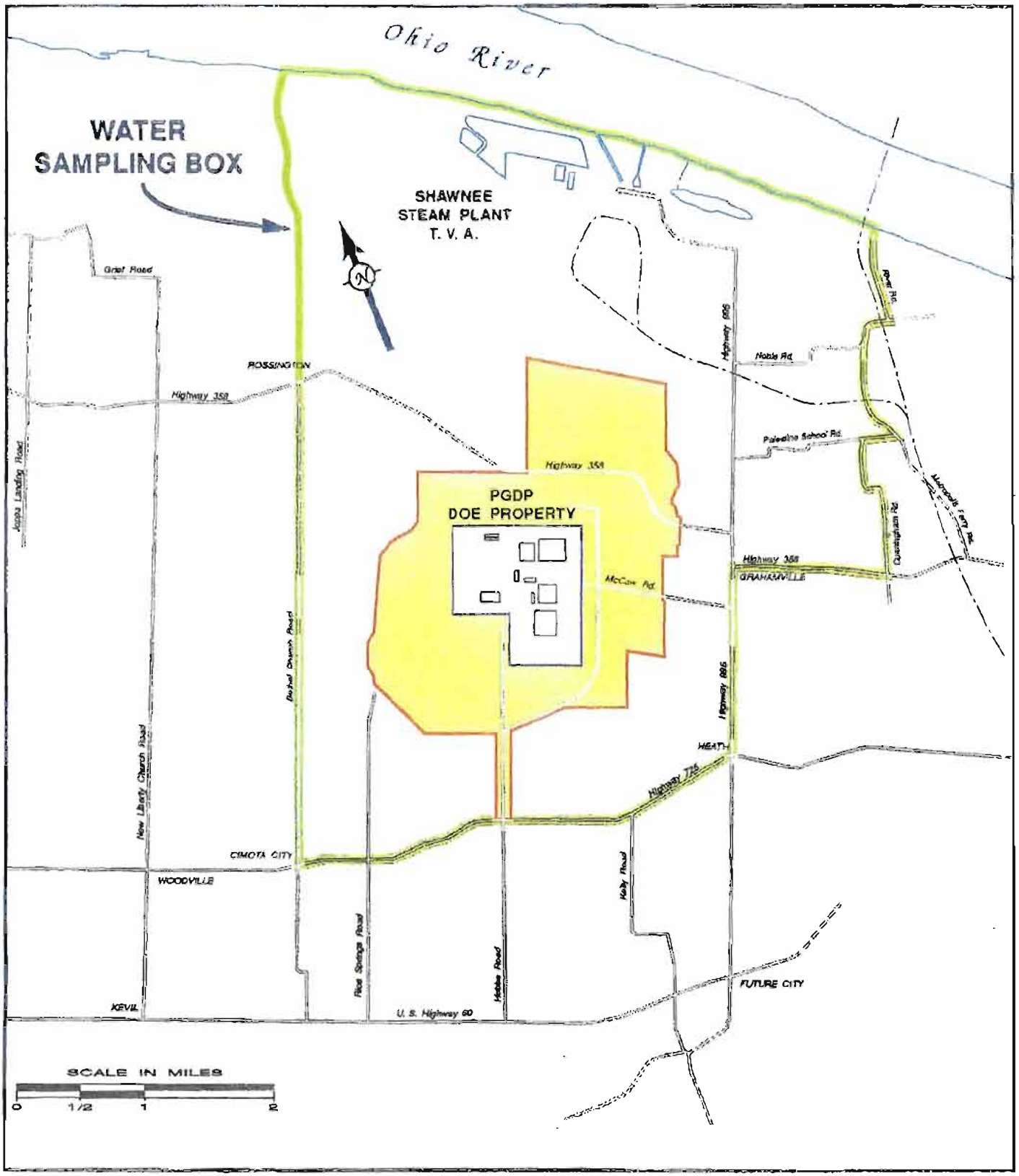


Figure A4-1. Water Sampling Box

5. REFERENCES

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Appendix A
to the EE/CA

WATER TR. SYS. FOR RESIDENCES

Creation Date 04/08/93
Revision Number ... 0

Estimating Job Number .. 0001

Project Estimator.. JPF
WBS ..... 1.0.0.0 Water Tr. Sys for residences
Cost Code ..... 4000 BUILDING MODIFICATIONS
Participant ..... 51 FIXED PRICE CONSTRUCTION
Contracting Type .. S
B/M Attribute ..... Water Tr. Sys for residences

Project Engineer ..... JPF
Building/Area .....
Plant Site 0
Level of Estimate ..... P
Funding Type ..... CAPITAL EQUIPM

Discipline ..... H Environmental Control
B/M Title ..... Water Tr. Sys for residences

Discipline Estimator ... JPF
Quantity Take-Off By ... jpf
Trace Number H.1.1 0

Standard Value File PADJUL92.val
Estimate File: C:\HOUSE.est 5-13-93 2:51p

Expiration Date: 11/15/93

ITEM	DESCRIPTION	MATERIAL				LABOR				TOTAL COST
		Qty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate	Total	M + L
1	2952 SECVICE TANKS CARBON FOR T.C.E., REMOVAL, CONTINENTAL WATER SYSTEMS, MEMPHIS, TN	54.00	EA	120.00	6480	0		0.00	0	6480
2	S23 SANITRON ULTRAVIOLET STERILIZER, CONTINENTAL WATER SYSTEMS, MEMPHIS, TN	27.00	EA	756.00	20412	0		0.00	0	20412
3	20" 10 MICRON SEDIMENT FILTER, CONTINENTAL WATER SYSTEMS, MEMPHIS, TN	27.00	EA	45.00	1215	0		0.00	0	1215
4	INSTALLATION OF WATER TREATMENT SYSTEM LABOR, CONTINENTAL WATER SYSTEMS, MEMPHIS, TN.	27.00		0.00	0	9450	UC	1.00	9450	9450
5	STORAGE BLDG. 5'X5'X6' FOR STORING ACTIVATED CARBON SYSTEM	27.00	EA	695.00	18765	0		0.00	0	18765
6	ION EXCHANGE RESIN TANK, STAN BALLARD, CONTINENTAL WATER SYSTEMS, MEMPHIS, TN	27.00	EA	252.35	6813	0		0.00	0	6813
7	ION EXCHANGE RESIN FOR REIDENTIAL UNITS, CONTINENTAL WATER SYSTEMS, MEMPHIS, TN	27.00	EA	765.60	20671	0		0.00	0	20671
8	ION EXCHANGE RESIN TANK MONITOR	27.00	EA	50.00	1350	0		0.00	0	1350
9	ION EXCHANGE RESIN TREATMENT SYSTEM INSTALLATION, CONTINENTAL WATER SYSTEMS, MEMPHIS, TN	27.00	EA	0.00	0	9450	UC	1.00	9450	9450
10	INSTALLATION OF PLUMBING AND ELECTRICAL	27.00		0.00	0	5400	Z	25.00	135000	135000

ITEM	DESCRIPTION	MATERIAL				LABOR				TOTAL COST
		Qty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate	Total	M + L
11	HEALTH AND SAFETY PERSONNEL	0.00		0.00	0	2000	2	76.00	152000	152000
	TOTAL DIRECT				75706				305900	381606
	TAX			6.00%	4542					4542
	SUBTOTAL				80248				305900	386148
	TOTAL INDIRECT			26.00%	20864			26.00%	79534	100398
	TOTAL				101112	26300			385434	486546

WATER TR. SYS. FOR RESIDENCES

WBS ..... 1.0.0.1 Water Tr. Sys. Const.Mgt.Fee
Cost Code ..... 9000 CONST MGMT/SUPPORT SERVICES
Participant ..... 99 SPECIAL
Contracting Type .. S
B/M Attribute .....

Building/Area .....
Plant Site .....
Level of Estimate ..... P
Funding Type ..... CAPITAL EQUIP

Discipline ..... H Environmental Control
B/M Title ..... Res.Water Tr.Sys Const.Mgt Fee

Discipline Estimator ... JPF
Quantity Take-Off By ... jpf
Trace Number H.2.2 0
Expiration Date: 11/15/93

Standard Value File PADJUL92.val
Estimate File: C:\HOUSE.est 5-13-93 2:51p

ITEM	DESCRIPTION	MATERIAL				LABOR				TOTAL COST
		Qty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate	Total	M + L
1	CONSTRUCTION MANAGEMENT	0.00		0.00	0	4522	Z	50.57	228678	228678
	TOTAL DIRECT				0				228678	228678
	TOTAL				0	4522			228678	228678

WBS ..... 1.0.0.2 Water Tr. Sys. Eng. Design
Cost Code ..... 9999 ENGINEERING
Participant ..... 99 SPECIAL
Contracting Type .. S
B/M Attribute .....

Building/Area .....
Plant Site .....
Level of Estimate ..... P
Funding Type ..... CAPITAL EQUIPM

Discipline ..... H Environmental Control
B/M Title ..... Res.Water Tr.Sys Const.Mgt Fee

Discipline Estimator ... JPF
Quantity Take-Off By ... jpf
Trace Number H.2.3 0

Standard Value File PADJUL92.val
Estimate File: C:\HOUSE.est 5-13-93 2:51p
Expiration Date: 11/15/93

ITEM	DESCRIPTION	MATERIAL				LABOR				TOTAL COST
		Qty.	Unit	Unit Pr.	Total	Hours	Cft.	Rate	Total	M + L
1	ENGINEERING DEISGN	0.00		0.00	0	4248	Z	50.51	214566	214566
	TOTAL DIRECT				0				214566	214566
	TOTAL				0	4248			214566	214566

Disciplines
H: Environmental Control

Total Labor Hours: 35070

COST SUMMARY

	MATERIAL	LABOR	TOTAL COST
Line Item Cost	75706	749144	824850
Total Tax	4542	0	4542
SUBTOTAL	80248	749144	829392
Total Indirect	20864	79534	100398
SUBTOTAL	101112	828678	929790
Contingency	35389	290037	325426
SUBTOTAL	136501	1118715	1255216
Market Adjustment			0
TOTAL			1255216

Appendix B

COMMENT RESPONSE SUMMARY

for the
May 19, 1993 Draft

ENGINEERING EVALUATION/COST ANALYSIS FOR THE WATER POLICY AT THE PADUCAH GASEOUS DIFFUSION PLANT, DOE/OR/06-1142&D2

Paducah, Kentucky

Prepared by
Science Applications International Corporation
Under Contract DE-AC05-91OR21950

Prepared by
United States Department of Energy
Paducah Gaseous Diffusion Plant
Paducah, Kentucky

COMMENT RESPONSE SUMMARY Engineering Evaluation/Cost Analysis for the Water Policy at the Paducah Gaseous Diffusion Plant DOE/OR/06-1142&D2			
Comment Number	Para. or Sect./Para.	Reviewer Comment	Comment Response
Jeff Cummins 1.	Pg. 16, Sec. 3.2.7	The annual operating cost for sampling and analysis is reduced from $366,000 for Options 1 and 2 to $65,000 for Option 3. It is stated that the selection of Option 3 represents a savings in operating costs of $241,000/year over the "no action" Option 1. It is stated on p. 19 that residential wells within the sampling box will be sampled according to the PGDP SAP (Clausen et al., 1992 and Clausen 1992). The difference in sampling and analysis costs is unclear since the current SAP will be followed for either option. Please clarify the reduction in operating costs for Option 3.	The current sampling and analysis plan which is found within the *Paducah Gaseous Diffusion Plant Ground Water Protection Program Plan* (Clausen et al., 1992) is being followed under the current water policy. The *Addendum to Sampling Analysis Plan* (Clausen, 1992) will be followed when the proposed water policy is in effect. Wording in the document has been changed to reflect this. Two tables have been added to Section 3.3 that show residential wells sampled and associated costs sampling for both the current water policy and the proposed water policy.
2.	Pg. 18, Sec. 4	What criteria will DOE use in determining reasonable cost of water consumption for residents affected by the water policy?	DOE will make that determination on the basis of historical usage of the specific well.

COMMENT RESPONSE SUMMARY Engineering Evaluation/Cost Analysis for the Water Policy at the Paducah Gaseous Diffusion Plant DOE/OR/06-1142&D2			
Comment Number	Para. or Sect./Para.	Reviewer Comment	Comment Response
3.	General	The water policy calls for the restriction of use by the owners of affected wells in exchange for the provision of potable water. In the event that those wells are determined to be no longer suited for their intended purpose, abandonment of the wells will be required as specified in 401 KAR 6:310. The Water Policy EE/CA does not address the potential abandonment of wells within the affected area.	The issue of well abandonment will be addressed in the Action Memorandum following receipt of public comments from the EE/CA.

COMMENT RESPONSE SUMMARY Engineering Evaluation/Cost Analysis for the Water Policy at the Paducah Gaseous Diffusion Plant DOE/OR/06-1142&D2			
Comment Number	Para. or Sect./Para.	Reviewer Comment	Comment Response
KY Radiation Control Branch 4.	General	The Radiation Control Branch (RCB) staff supports the Department of Energy's (DOE) decision to provide municipal water to residents and businesses within the area that could be potentially affected by the migration of ground water contamination originating from Paducah Gaseous Diffusion Plant (PGDP). The RCB staff concurs with DOE in their assessment that this option is the "most protective of human health, cost effective, and dependable solution." After completion of the municipal water supply to residents and businesses in the affected area; time, money, and energy can be redirected towards the important issue of source control that is necessary to reduce long-term risk to the public from the contaminated water supply.	Noted.

COMMENT RESPONSE SUMMARY Engineering Evaluation/Cost Analysis for the Water Policy at the Paducah Gaseous Diffusion Plant DOE/OR/06-1142&D2			
Comment Number	Para. or Sect./Para.	Reviewer Comment	Comment Response
KY Hazardous Waste Branch 5.	General	The Water Policy document DOE/OR/06-1142&D2 was received May 19, 1993. The Policy has been on the table for over a year with an understanding that city water would be provided in a timely manner to all residences and businesses within a given area. The plan looks adequate, however once again DOE proposes a slow and lengthy schedule. DOE has given a date of Spring 1994 for final completion for the installation of all water lines. The construction of a few miles of water lines should not take a year.	Noted.

COMMENT RESPONSE SUMMARY Engineering Evaluation/Cost Analysis for the Water Policy at the Paducah Gaseous Diffusion Plant DOE/OR/06-1142&D2			
Comment Number	Para. or Sect./Para.	Reviewer Comment	Comment Response
EPA Region IV 6.	General	The document should provide a more detailed summary of the ongoing alternate water provisions, water treatment and residential well monitoring action.	A description of the present water policy appears on page 6 of the document. Some changes and additions have been made. The paragraph now reads as follows: "The main goal of the present PGDP water policy is to minimize potential human exposure to ground water contamination originating from the site. The policy of supplying potable water to residents whose wells are found to be contaminated by plant sources has continued since 1988. Municipal water has been provided to residents with well contamination above action levels (1 μg/l TCE and 25 pCi/l ^{99}Tc). To date, DOE has provided municipal water to seven residences and paid their water bills as a result of this policy. Routine sampling of wells is continuing to track movement of ground water contamination plumes. Residential wells in the projected path of the contamination plumes have been sampled regularly as directed by the ACO. Sampling is performed in accordance with the PGDP Sampling and Analysis Plan

COMMENT RESPONSE SUMMARY Engineering Evaluation/Cost Analysis for the Water Policy at the Paducah Gaseous Diffusion Plant DOE/OR/06-1142&D2			
Comment Number	Para. or Sect./Para.	Reviewer Comment	Comment Response
(6. Cont.)			found within the *Paducah Gaseous Diffusion Plant Ground Water Protection Program Plan* (Clausen et al., 1992 a)." A paragraph describing the current policy has also been added to Sec. 3.1.1 under the no action alternative on page 10. The following sentences and chart have been added to describe the referenced sampling and analysis plan: "Residential wells are currently sampled regularly for gross alpha, gross beta, TCE, and ^{99}Tc. A table showing residential wells sampled under the current water policy in addition to associated costs are presented in Section 3.3." The no action alternative or current water policy is now included in all the sections discussing evaluation criteria.

COMMENT RESPONSE SUMMARY Engineering Evaluation/Cost Analysis for the Water Policy at the Paducah Gaseous Diffusion Plant DOE/OR/06-1142&D2			
Comment Number	Para. or Sect./Para.	Reviewer Comment	Comment Response
(6. Cont.)			Carbon adsorption treatment systems were installed on two residential wells found to be contaminated with TCE. After further study, it was found to be highly unlikely that these wells were contaminated by plant sources. These wells were referenced in this document only as a basis for design and costing of similar systems.
7.	General	Greater detail should be provided for post-Action Memo activities. Consistent with the draft FFA (3/10/93), a Removal Action Work Plan should be prepared to specify the activities and schedule of the removal action. This level of detail is necessary to ensure any modification to the ongoing action is consistent with the requirements of the ACO.	It was determined at the comment resolution meeting that the information requested in the work plan format would be incorporated into the Action Memorandum.
8.	General	The basis for and the timing of the December 1997 review of the removal action must be specified.	Sentence was added to the end of Section 3.1.3: "The December 1997 date was chosen for re-evaluation to remain consistent with the policy of reviewing ongoing remedial action every five years as required by Section 121 (c) of CERCLA."

COMMENT RESPONSE SUMMARY Engineering Evaluation/Cost Analysis for the Water Policy at the Paducah Gaseous Diffusion Plant DOE/OR/06-1142&D2			
Comment Number	Para. or Sect./Para.	Reviewer Comment	Comment Response
9.	General	It should be made clear that this removal action in no way precludes the implementation of subsequent removal actions or remedial actions which may expand the scope of the action.	Sentence added to end of Section 1.3: "The removal action will in no way preclude the implementation of subsequent removal actions which may expand the scope of action."
10.	Pg. 1, Sec. 1.1	The final sentence has an editorial error and should be updated as appropriate.	Error has been corrected. The record of decision was signed by EPA on July 22, 1993.
11.	Pg. 7, Sec. 2	The final paragraph should express the federal regulatory requirements of the NCP and not refer to the NCP as "EPA's intent."	Section 2.1, last paragraph now reads: "DOE will conduct an engineering evaluation and costs analysis (EE/CA) its equivalent, as appropriate, as a part of removal actions in those cases where adequate planning time is available before the state of removal [40 C.F.R. § 300.415 (b)(4)(i)]. An EE/CA is an analysis of removal alternatives for a site [40 C.F.R. § 300.415 (b)(4)(i)].
12.	Pg. 8, Sec. 2.3	The schedule should include development, review, and approval of a Removal Action Work Plan in a manner consistent with the draft FFA.	See response to comment 7.

COMMENT RESPONSE SUMMARY Engineering Evaluation/Cost Analysis for the Water Policy at the Paducah Gaseous Diffusion Plant DOE/OR/06-1142&D2			
Comment Number	Para. or Sect./Para.	Reviewer Comment	Comment Response
13	Pg. 8, Sec. 2.3	The discussion of the present water policy and the activities underway should be made more clear in this section and other sections of the document as appropriate.	The second paragraph of Section 2.3 now reads: "In order to have municipal water available to residents of the area, West McCracken Water District in cooperation with DOE has begun construction of additional water lines. The Metropolis Lake Road Water Line has been completed. The Ogden Landing Road Water Line is in the design phase and is expected to be completed by Spring 1994. If the proposed water policy is selected as the preferred alternative, all residents in the affected area should be connected to municipal water by Spring 1994. To ensure protection of human health, the present water policy will continue in effect until a decision is made." In addition, see response to comment 6.

COMMENT RESPONSE SUMMARY Engineering Evaluation/Cost Analysis for the Water Policy at the Paducah Gaseous Diffusion Plant DOE/OR/06-1142&D2			
Comment Number	Para. or Sect./Para.	Reviewer Comment	Comment Response
14.	Pg. 8, Sec. 2.4	By definition, a "non-time-critical" removal action allows for a sufficient planning period for which appropriate ARARs can be evaluated due to its non-time-critical nature. Therefore, waivers of ARARs which are pertinent to the scope of the non-time-critical removal action shall be met or an ARAR waiver shall be processed in accordance with the ARAR waiver provisions of 40 C.F.R. § 300.430 (f)(1)(ii)(c). This should be expressed in this section of the EE/CA.	Section 2.4, 2nd paragraph, last sentence now reads: "In the event DOE determines that compliance with an ARAR is not practicable, DOE will seek a waiver under C.F.R. § 300.430 (f)(i)(ii)(c)."
15.	Pg. 9, Sec. 3.1.1	This section would more appropriately be titled "No Further Action" since this alternative entails an ongoing action. This section should provide a detailed description of the ongoing action, including identification of the S & A activities and the location of those residents sampled and/or currently provided with an alternative water supply or a treatment system. This information should be displayed graphically on maps of appropriate scale.	This section has been expanded to include a description of ongoing action including sampling and analysis. A map showing the location of those residential wells sampled will be added to the document. In addition, see response to comments 6 and 12.

COMMENT RESPONSE SUMMARY Engineering Evaluation/Cost Analysis for the Water Policy at the Paducah Gaseous Diffusion Plant DOE/OR/06-1142&D2			
Comment Number	Para. or Sect./Para.	Reviewer Comment	Comment Response
16.	Pg. 18, Sec. 4	The description of the east and west property boundaries would be made clearer if larger scale maps were included to highlight these boundaries.	A larger scale map will be provided within the document.
17.	Pg. 19, Sec. 4	The S & A Plan should be described and not simply referenced. It is stated that the S & A Plan will be followed. However, earlier statements in the document indicate that cost associated with the S & A activities will be reduced by expanding the alternative water supply. This apparent contradiction should be clarified.	More information regarding the Sampling and Analysis Plan has been provided in Section 3.1.1. Tables 3-2 and 3-3 show which residential wells are currently sampled and which residential wells will be sampled under the proposed water policy. All associated costs are also displayed on these tables.

ATTACHMENT 1

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IV

345 COURTLAND STREET, N.E.
ATLANTA, GEORGIA 30365

AUG 13 1993

4WD-FFB

Mr. Robert C. Sleeman
Environmental Restoration Division
U. S. Department of Energy
Oak Ridge Operations
P. O. Box 2001
Oak Ridge, Tennessee 37831-8541

Re: Engineering Evaluation/Cost Analysis (July 1993)
for the Water Policy Removal Actior
Paducah Gaseous Diffusion Plant
EPA ID. No. KY8 890 008 982

Dear Mr. Sleeman:

The Environmental Protection Agency (EPA) has completed a review of the referenced document. EPA concurs with the above referenced document; however, the document does not adequately provide a detailed description of the ongoing action, including identification of the S&A activities and the location of those residents sampled and/or currently provided with an alternate water supply or a water treatment system. This issue was documented in EPA's comments on the May 1993 Engineering Evaluation/Cost Analysis for the Water Policy Removal Action.

The EPA expects this issue to be addressed in further detail in the draft Action Memorandum. The draft Action Memorandum and Responsiveness Summary should be made available for EPA and Kentucky review prior to DOE's issuance of the final Action Memorandum.

Additionally, the EPA expects that a Removal Action Work Plan will be developed after the Action Memorandum to provide a detailed description of the removal action and the ongoing sampling and analysis activities. This work plan will be reviewed to ensure consistency with the requirements of Section V.J. of the CERCLA §106 Administrative Consent Order.

If you have any questions, please contact me at (404) 347-3016.

Sincerely,

C. B. Warren for

Jeffrey L. Crane, Senior RPM
DOE Remedial Section
Federal Facilities Branch
Waste Management Division

cc: Robert Edwards, DOE-PGDP
Pat Haight, KDEP
John Volpe, RCB

ATTACHMENT 2

COPY

1321K.930901.003

PHILLIP J. SHEPHERD
SECRETARY

BRERETON C. JONES
GOVERNOR

COMMONWEALTH OF KENTUCKY
NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
FRANKFORT OFFICE PARK
14 REILLY ROAD
FRANKFORT, KENTUCKY 40601

August 25, 1993

Mr. Donald Booher
Site Manager
Paducah Site Office
P.O. Box 1410
Paducah, Kentucky 42001

RE: Approval for Engineering Evaluation/Cost Analysis
for the Water Policy, DOE/OR/06-114&D3, July 1993
U.S. DOE Paducah Gaseous Diffusion Plant (PGDP)
McCracken County, Kentucky
EPA ID #KY8-890-008-982

Dear Mr. Booher:

The Division of Waste Management has reviewed the above referenced document. The Division concurs with DOE on the matter of supplying municipal water to all businesses and residences in the affected area adjacent to the PGDP. This action is necessary to protect human health and the welfare of the citizens of McCracken County which may be affected by the contaminants.

The Division encourages the speedy completion of the water lines. With the Water Policy in operation, greater effort can be directed towards the known environmental problems at the PGDP.

If you have any questions, please contact Jack Stickney at (502) 564-6716, extension 675.

Sincerely,

Caroline P. Haight, Director
Division of Waste Management

CPH/ssb

cc: Robert Edwards, DOE
Tuss Taylor, KYDEP
Gretchen Maxson, CHR
Robert Ware, DOW

ATTACHMENT 3

Status of Agency for Toxic Substances and Disease Registry (ATSDR) Activities

The Agency for Toxic Substances and Disease Registry (ATSDR) performed a Health Consultation in 1989. This consisted of ATSDR's review of a 1988 Energy Systems document titled *Paducah Groundwater Contamination Detailed History and Summary of Future Actions.* The Health Consultation consisted of a March 1, 1989 memorandum from ATSDR to Ms. Nancy Dean, EPA WMD SSIB Federal Facilities Unit Project Manager. The memorandum provided comments on the Energy Systems document. In summary, ATSDR stated, "The proposal to offer extensive medical evaluations and surveys to residents who were exposed to TCE and Tc-99 is not prudent and does not represent sound environmental public health advice [because] the exposures to TCE and Tc-99 [from contaminated ground water] are reported to have ceased in August, 1988."

Based on an ATSDR quarterly report for DOE attached to M.M. Bashor's August 12, 1993 letter to Clayton Gist of DOE, the PGDP site has "not [yet] been categorized by ATSDR." ATSDR currently has a scoping site visit and site categorization scheduled for Federal Fiscal Year 1994.

ATTACHMENT 4

Enforcement Information

DOE claims responsibility for this removal action. DOE's responsibilities as the lead federal agency, include providing funds and performing removal action promptly and properly. DOE is firmly committed to fulfilling these responsibilities

ATTACHMENT 5

A "Concurrence Memo for Nationally Significant or Precedent-Setting Actions" is not applicable to the PGDP site, but has been addressed as an Attachment for completeness.

ATTACHMENT 6

AR File - PGDP Water Policy

ISSUED DATE	DOCUMENT NUMBER	TITLE	AUTHOR ORG	RECEIPIENT ORG	TYPE	FG	RS	FI	ACCESS NUMBER
01-JAN-80		GEOLOGIC MAPS OF THE JACKSON PURCHASE REGION, KENTUCKY			PB	01	13		940504004
01-JAN-85		CARBON ADSORPTION			PB	01	13		940504003
01-JUL-87	KY/B-262 AND KY/B-263	PRELIMINARY ASSESSMENT PADUCAH GASEOUS DIFFUSION PLANT SOLID WASTE MANAGEMENT UNITS	REMEDIAL ACTION PROGRAM - PGDP, PADUCAH, KENTUCKY	U. S. DEPARTMENT OF ENERGY	R	01	13		910807035
23-NOV-88		ADMINISTRATIVE ORDER BY CONSENT (ACO)	U.S. DEPARTMENT OF JUSTICE, WASHINGTON, D.C.	USEPA, WASHINGTON, D.C./U.S. DEPARTMENT OF ENERGY	L	02	19		910909023
23-DEC-88	KY/H-41, REV. 1	PADUCAH GROUNDWATER CONTAMINATION DETAILED HISTORY AND SUMMARY	ER-PGDP, PADUCAH, KENTUCKY	U.S. DEPARTMENT OF ENERGY	R	08	37		910806008
01-JAN-89		ADSORPTION			PB	01	13		940504002
01-MAR-89		FINAL COMMUNITY RELATIONS PLAN FOR PADUCAH GASEOUS DIFFUSION PLANT, PADUCAH, KENTUCKY	COMMUNITY RELATIONS DEPARTMENT, PGDP, PADUCAH, KENTUCKY	U.S. DEPARTMENT OF ENERGY	PB	21	65		910820014
22-MAR-91	KY/ER-4	RESULTS OF THE SITE INVESTIGATION, PHASE I AT THE PADUCAH GASEOUS DIFFUSION PLANT	CH2M HILL, OAK RIDGE, TENNESSEE	U. S. DEPARTMENT OF ENERGY	R	08	37		910730000
16-JUL-91	KY8 890 008 982	NOTICE OF RCRA (HSWA) FINAL PERMIT DECISION/ISSUANCE OF HSWA PERMIT FOR 1984 RCRA AMENDMENTS U.S. DEPARTMENT OF ENERGY AND MARTIN MARIETTA ENERGY SYSTEMS, INC. PGDP, PADUCAH, KENTUCKY/ PERMIT MODIFICATIONS	USEPA, REGION IV, ATLANTA, GA	U.S. DEPARTMENT OF ENERGY	G	02	17		940407002
25-OCT-91		TECHNETIUM-99 REMOVAL FROM PROCESS SOLUTIONS AND CONTAMINATED GROUNDWATER	DEPARTMENT OF CHEMISTRY, K-25 PLANT, OAK RIDGE, TENNESSEE		PB	01	13		930426010

ISSUED DATE	DOCUMENT NUMBER	TITLE	AUTHOR ORG	RECEIPIENT ORG	TYPE	FG	RS	FI	ACCESS NUMBER
01-DEC-91	DOE/OR 1013	SUMMARY OF ALTERNATIVES FOR REMEDIATION OF OFF-SITE CONTAMINATION	USEPA, REGION IV, ATLANTA, GA/ STATE OF KENTUCKY	U.S. DEPARTMENT OF ENERGY	R	08	38		920827802
27-DEC-91	KY/SUB/13B-97777C P-03/1991/1 VOL 6	RESULTS OF THE PUBLIC HEALTH AND ECOLOGICAL ASSESSMENT, PHASE II	CH2M HILL, OAK RIDGE, TENNESSEE	U.S DEPARTMENT OF ENERGY	R	08	38		920827801
03-JAN-92	KY/ER-2, REV. 1	PADUCAH GASEOUS DIFFUSION PLANT GROUNDWATER PROTECTION PROGRAM	PGDP		G	09	85		920116010
01-APR-92	KY/SUB/13B-97777C P-03/1991/1 VOL 1	RESULTS OF THE SITE INVESTIGATION, PHASE II AT THE PADUCAH GASE	CH2M HILL/TMA/EBERLINE/CC: JOHNSON & MALHOTRA/SAIC/MMES	PGDP	R	08	38		920714151
01-APR-92	KY/SUB/13B-97777C P-03/1991/1 VOL 2	RESULTS OF THE SITE INVESTIGATION, PHASE II AT THE PADUCAH GASE	CH2M HILL/TMA/EBERLINE/CC: JOHNSON & MALHOTRA/SAIC/MMES	PGDP	R	08	38		920714152
01-APR-92	KY/SUB/13B-97777C P-03/1991/1 VOL 3	RESULTS OF THE SITE INVESTIGATION, PHASE II AT THE PADUCAH GASE	CH2M HILL/TMA/EBERLINE/CC: JOHNSON & MALHOTRA/SAIC/MMES	PGDP	R	08	38		920714153
01-APR-92	KY/SUB/13B-97777C P-03/1991/1 VOL 4A	RESULTS OF THE SITE INVESTIGATION, PHASE II AT THE PADUCAH GASE	CH2M HILL/TMA/EBERLINE/CC: JOHNSON & MALHOTRA/SAIC/MMES	PGDP	R	08	38		920714154
01-APR-92	KY/SUB/13B-97777C P-03/1991/1 VOL 4B	RESULTS OF THE SITE INVESTIGATION, PHASE II AT THE PADUCAH GASE	CH2M HILL/TMA/EBERLINE/CC: JOHNSON & MALHOTRA/SAIC/MMES	PGDP	R	08	38		920714155
01-APR-92	KY/SUB/13B-97777C P-03/1991/1 VOL 5A	RESULTS OF THE SITE INVESTIGATION, PHASE II AT THE PADUCAH GASE	CH2M HILL/TMA/EBERLINE/CC: JOHNSON & MALHOTRA/SAIC/MMES	PGDP	R	08	38		920714156
01-APR-92	KY/SUB/13B-97777C P-03/1991/1 VOL 5B	RESULTS OF THE SITE INVESTIGATION, PHASE II AT THE PADUCAH GASE	CH2M HILL/TMA/EBERLINE/CC: JOHNSON & MALHOTRA/SAIC/MMES	PGDP	R	08	38		920714157
01-APR-92	KY/SUB/13B-97777C P-03/1991/1 VOL 5C	RESULTS OF THE SITE INVESTIGATION, PHASE II AT THE PADUCAH GASE	CH2M HILL/TMA/EBERLINE/CC: JOHNSON & MALHOTRA/SAIC/MMES	PGDP	R	08	38		920714158

ISSUED DATE	DOCUMENT NUMBER	TITLE	AUTHOR ORG	RECEIPIENT ORG	TYPE	FG	RS	FI	ACCESS NUMBER
01-OCT-92	KY/ER 2 ADDENDUM 1, REV. 1/LTR.KY/ER93-098	PADUCAH GASEOUS DIFFUSION PLANT GROUNDWATER PROTECTION PROGRAM PLAN - ADDENDUM TO SAMPLING ANALYSIS PLAN	ER-PGDP, PADUCAH, KENTUCKY		R	09	85		930318001
25-NOV-92	KY/E 150	REPORT OF THE PADUCAH GASEOUS DIFFUSION PLANT GROUNDWATER INVESTIGATION, PHASE III	ER-PGDP, PADUCAH, KENTUCKY	U. S. DEPARTMENT OF ENERGY	R	09	43		921216051
01-MAR-93	VOL. 1, NO. 1	PGDP ER INFORMATION BULLETIN - PROPOSED PLAN WITH EPA/STATE OF KENTUCKY	CR-PGDP, PADUCAH, KENTUCKY		R	21	71		930330014
05-MAR-93		REVISED PADUCAH WATER POLICY	U.S. DEPARTMENT OF ENERGY	USEPA, REGION IV, ATLANTA, GA/ STATE OF KENTUCKY	C	08	40		930319009
26-MAR-93		JUSTIFICATION FOR PROPOSED APPROACH - REVISED WATER POLICY	U.S. DEPARTMENT OF ENERGY	USEPA, REGION IV, ATLANTA, GA/ STATE OF KENTUCKY	C	08	40		931014001
05-APR-93		CONDITIONAL CONCURRENCE ON REVISED PADUCAH WATER POLICY	STATE OF KENTUCKY	U.S. DEPARTMENT OF ENERGY	C	08	40		930511004
06-APR-93		TRANSCRIPT OF PUBLIC HEARING APRIL 6, 1993, HEATH ELEMENTARY SCHOOL GYMNASIUM	GENERAL PUBLIC		R	21	69		930426009
15-APR-93		CONCURRENCE ON PROPOSAL OF WATER POLICY REMOVAL ACTION DOCUMENTATION	U.S. DEPARTMENT OF ENERGY	USEPA, REGION IV, ATLANTA, GA/ STATE OF KENTUCKY	C	08	40		930511006
21-APR-93		CONCURRENCE ON PROPOSAL OF REMOVAL ACTION DOCUMENTATION OF ALTERNATE WATER SUPPLY RESPONSE ACTION PADUCAH GASEOUS DIFFUSION PLANT	USEPA, REGION IV, ATLANTA, GA	U.S. DEPARTMENT OF ENERGY	C	08	40		930511003
17-MAY-93	DOE/OR/06-1142&D2	ENGINEERING EVALUATION/COST ANALYSIS FOR THE WATER POLICY AT THE PADUCAH GASEOUS DIFFUSION PLANT, PADUCAH, KENTUCKY	U.S. DEPARTMENT OF ENERGY	USEPA, REGION IV, ATLANTA, GA/ STATE OF KENTUCKY	R	08	40		930526026

AR File - PGDP Water Policy

ISSUED DATE	DOCUMENT NUMBER	TITLE	AUTHOR ORG	RECEIPIENT ORG	TYPE	FG	RS	FI	ACCESS NUMBER
26-MAY-93		COMMENTS AND RESPONSE SUMMARY (USEPA AND STATE OF KENTUCKY) - 5/19/93 DRAFT ENGINEERING EVALUATION/COST ANALYSIS FOR THE WATER POLICY AT THE PADUCAH GASEOUS DIFFUSION PLANT - DOE/OR/06-1142&D2	SAIC, OAK RIDGE, TENNESSEE	U.S. DEPARTMENT OF ENERGY	R	08	40		930820001
13-JUL-93		COMMENTS ON THE ENGINEERING/COST ANALYSIS FOR THE WATER POLICY AT THE PGDP. U.S. DOE PADUCAH GASEOUS DIFFUSION PLANT MCCRACKEN COUNTY, KENTUCKY	STATE OF KENTUCKY	U.S. DEPARTMENT OF ENERGY/ PLANT MGR.- PGDP	C	08	40		930915001
29-JUL-93	DOE/OR/06-1142&D3	ENGINEERING EVALUATION/COST ANALYSIS FOR THE WATER POLICY AT THE PADUCAH GASEOUS DIFFUSION PLANT, PADUCAH, KENTUCKY	U.S. DEPARTMENT OF ENERGY	USEPA, REGION IV, ATLANTA, GA/ STATE OF KENTUCKY	R	08	40		930816004
30-JUL-93		PHASE I AND PHASE II VALIDATED DATA PACKAGES AND CHAIN OF CUSTODY FORMS	CH2M HILL, OAK RIDGE, TENNESSEE	U.S. DEPARTMENT OF ENERGY	C	20	85		930730003
13-AUG-93		CONCURRENCE ON THE ENGINEERING EVALUATION/COST ANALYSIS (JULY 1993) FOR THE WATER POLICY REMOVAL ACTION AT PADUCAH GASEOUS DIFFUSION PLANT	USEPA, REGION IV, ATLANTA, GA	U.S. DEPARTMENT OF ENERGY	C	08	40		930928024
25-AUG-93		APPROVAL FOR ENGINEERING EVALUATION/COST ANALYSIS FOR THE WATER POLICY, DOE/OR/ 06-1142&D3, JULY, 1993 U.S. DOE PADUCAH GASEOUS DIFFUSION PLANT, MCCRACKEN COUNTY KENTUCKY	STATE OF KENTUCKY	U.S. DEPARTMENT OF ENERGY	C	08	40		930915002
08-SEP-93		COMMENTS ON THE ENGINEERING EVALUATION/ COST ANALYSIS FOR THE WATER POLICY	AREA RESIDENT	CR-PGDP, PADUCAH, KENTUCKY	C	21	66		930928026
22-OCT-93	DOE/OR/06-1201&D1	ACTION MEMORANDUM FOR THE WATER POLICY AT THE PADUCAH GASEOUS DIFFUSION PLANT PADUCAH, KENTUCKY	U.S. DEPARTMENT OF ENERGY	USEPA, REGION IV, ATLANTA, GA/ STATE OF KENTUCKY	R	08	40		931029011

ISSUED DATE	DOCUMENT NUMBER	TITLE	AUTHOR ORG	RECEIPIENT ORG	TYPE	FG	RS	FI	ACCESS NUMBER
09-NOV-93		COMMENTS ON THE DRAFT ACTION MEMORANDUM FOR THE WATER POLICY AT PGDP, PADUCAH, KENTUCKY	USEPA, REGION IV, ATLANTA, GA	U.S DEPARTMENT OF ENERGY	C	08	40		931115023
19-DEC-93		PUBLIC NOTICE - NOTICE OF AVAILABILITY - AR FILE FOR WAGS 1 AND 7 AND PGDP WATER POLICY	THE PADUCAH SUN	GENERAL PUBLIC	PB	21	67		940516017
28-APR-94		CONDITIONAL APPROVAL AND COMMENTS ON THE ACTION MEMORANDUM FOR THE WATER POLICY AT THE PGDP, PADUCAH, KENTUCKY DOE/OR/ 06-1206&D1	STATE OF KENTUCKY	U.S. DEPARTMENT OF ENERGY/ ERWM-MGR, PADUCAH,KENTUCKY	C	08	40		940517012

ATTACHMENT 7

The following analytical results have not undergone quality assurance validation. This information should be utilized for informational purposes only. Any questions should be directed to the DOE or the ERWM Program at PGDP.

Q&TSD Sampling Results

Well No.	Sample No.	Date Sampled	Run No.	PGDP Results TCE (µg/l)	PGDP Results Tc (pCi/l)	ORNL Results TCE (µg/l)	ORNL Results Tc (pCi/l)
5	1457	8-10-88	1	--	<50	--	--
	1473	8-12-88		5	--	--	--
	1474	8-12-88		--	--	--	--
	1524	8-13-88		5	--	3	--
	1561	8-16-88		4	<25	--	--
	1615	8-18-88		<1	<25		
	1614	8-18-88		<1	<25		
						ORGDP Results	
						TCE (µg/l)	Tc (pCi/l)
	1561	8-16-88				2	
	1700	8-22-88			3	<25	
	1922	9-13-88		metals	--	--	
	2161	10-7-88		<1	--	--	--
	2162	10-7-88		<1	--	--	--
	2928	12-20-88		1	<25	--	--
	454	2-21-89		<1	<25	--	--
	716	3-17-89		<1	<25	--	--
		Gross alpha = 9 pCi/l Gross beta = 4 pCi/l					
	947	4-18-89		<1	<25	--	--
		Gross alpha = 1.5 pCi/l Gross beta = 1 pCi/l					
	1244	5-18-89		<1	<25	--	--
	1521	6-14-89		--	--	--	--
		Radiochemical scan					
	1593	6-22-89		7	<25	--	--
		Gross alpha = -.8 pCi/l Gross beta = 4 pCi/l					
	1965	7-27-89		2	<25	--	--
		Gross alpha = 1.4 pCi/l Gross beta = -5 pCi/l					
	2289	8-22-89		2	<25	--	--
		Gross alpha = 1.2 pCi/l Gross beta = 3 pCi/l					

Q&TSD Sampling Results (continued)

Well No.	Sample No.	Date Sampled	Run No.	PGDP Results TCE (µg/l)	PGDP Results Tc (pCi/l)	ORNL Results TCE (µg/l)	ORNL Results Tc (pCi/l)
5 (cont.)	2718	9-27-89		+1	< 25	--	--
		Gross alpha = 1.6 pCi/l Gross beta = 9 pCi/l Uranium = <0.001 mg/l					
	2981	10-20-89		+1	< 25	--	--
		Gross alpha = 0.2 pCi/l Gross beta = 4 pCi/l					
	3484	11-22-89		2	< 25	--	--
		Gross alpha = 2 pCi/l Gross beta = 4 pCi/l					
	No sample collected in December due to frozen faucet.						
	No sample collected in January.						
	No sample collected in February.						
	1090	3-23-90		2	< 25	--	--
		Gross alpha = .4 pCi/l Gross beta = 1 pCi/l					
	1353	4-17-90		+1	< 25	--	--
		Gross alpha = .5 pCi/l Gross beta = 19 pCi/l					
	1634	5-10-90		<1	< 25	--	--
		Gross alpha = 1.5 pCi/l Gross beta = 3 pCi/l					
	1958	6-6-90		4	< 25	--	--
		Gross alpha = .3 pCi/l Gross beta = 1 pCi/l					
	2265	7-6-90		2	< 25	--	--
		Gross alpha = -3.2 pCi/l Gross beta = 0 pCi/l					
	2707	8-7-90		+1	< 25	--	--
		Gross alpha = .8 pCi/l Gross beta = 2 pCi/l					
	3020	9-18-90		4	< 25	--	--
		Gross alpha = -1.6 pCi/l Gross beta = -1 pCi/l Uranium = <0.001 mg/l					
	3375	10-5-90		+1	< 25	--	--
		Gross alpha = 2.9 pCi/l Gross beta = 0 pCi/l					

Q&TSD Sampling Results (continued)

Well No.	Sample No.	Date Sampled	Run No.	PGDP Results TCE (µg/l)	PGDP Results Tc (pCi/l)	ORNL Results TCE (µg/l)	ORNL Results Tc (pCi/l)
5 (cont.)	3914	11-28-90		4	<25		
		Gross alpha = 1.0 pCi/l Gross beta = 7 pCi/l Uranium = <0.001 mg/l					
	4137	12-13-90		2	<25	--	--
		Gross alpha = 3.4 pCi/l Gross beta = 6 pCi/l					
	240	1-15-91		<1	<25	--	--
		Gross alpha = 3.2 pCi/l Gross beta = 3 pCi/l					
	367	2-1-91		1	<25	--	--
		Gross alpha = 2.0 pCi/l Gross beta = 12 pCi/l					
	Sample not taken in March due to leaky tank.						
	Sample not taken in April due to leaky tank.						
	Sample not taken in May due to pump out of order.						
	2098	6-25-91		<1	<25	--	--
		Gross alpha = 0.8 pCi/l Gross beta = 2 pCi/l					
	2337	7-17-91		<1	<25	--	--
		Gross alpha = 0.4 pCi/l Gross beta = 8 pCi/l					
	2957	8-21-91		<1	<25	--	--
		Gross alpha = 1.4 pCi/l Gross beta = 5 pCi/l					
	3116	9-10-91		<1	<25	--	--
		Gross alpha = 0.3 pCi/l Gross beta = 0 pCi/l					
	3488	10-9-91		<1	<25	--	--
		Gross alpha = -1.7 pCi/l Gross beta = -4 pCi/l					
	4092	11-13-91		1	<25	--	--
		Gross alpha = 5.6 pCi/l Gross beta = 10 pCi/l					
	4303	12-3-91		1	<25	--	--
		Gross alpha = -2.7 pCi/l Gross beta = -3 pCi/l Uranium = <0.001 mg/l					

Q&TSD Sampling Results (continued)

Well No.	Sample No.	Date Sampled	Run No.	PGDP Results TCE (µg/l)	PGDP Results Tc (pCi/l)	ORNL Results TCE (µg/l)	ORNL Results Tc (pCi/l)
5 (cont.)	182	1-13-92		< 1	< 25	--	--
		Gross alpha = 2.0 pCi/l Gross beta = -2 pCi/l					
	4467	2-12-92		< 1	< 25	--	--
		Gross alpha = 2.5 pCi/l Gross beta = 4 pCi/l Uranium = < 0.001 mg/l Metals = Data available					
	4644	3-27-92		< 1	< 25	--	--
		Gross alpha = -2.0 pCi/l Gross beta = 2 pCi/l					
	4812-92	4-24-92		1	< 25	--	--
		Gross alpha = 0 pCi/l Gross beta = 0.5 pCi/l					
	4957-92	5-13-92		< 1	< 25	--	--
		Gross alpha = 1.5 pCi/l Gross beta = 1 pCi/l Uranium = < 0.001 mg/l					
	5171	6-23-92		1	< 25	--	--
		Gross alpha = 2.3 pCi/l Gross beta = 2 pCi/l					
	5331	7-23-92		3	< 25	--	--
		Gross alpha = 3.7 pCi/l Gross beta = 2 pCi/l					
	5515	8-18-92		1	< 25	--	--
		Gross alpha = 1.5 pCi/l Gross beta = -3 pCi/l Uranium = < 0.001 mg/l					
	5715	9-11-92		1	< 25	--	--
		Gross alpha = -5.4 pCi/l Gross beta = -1 pCi/l					
	6039	10-20-92		1	< 25	--	--
		Gross alpha = -3.4 pCi/l Gross beta = -6 pCi/l Additional Data Available					
	6169	11-10-92		1	< 25	--	--
		Gross alpha = .6 pCi/l Gross beta = -3 pCi/l Uranium = < 0.001 mg/l Metals = Data available					

Q&TSD Sampling Results (continued)

Well No.	Sample No.	Date Sampled	Run No.	PGDP Results TCE (µg/l)	PGDP Results Tc (pCi/l)	ORNL Results TCE (µg/l)	ORNL Results Tc (pCi/l)
5 (cont.)	6317	12-10-92		<1	<25	--	--
		Gross alpha = 1.3 pCi/l Gross beta = 4 pCi/l					
	4216	1-27-93		<1	<25	--	--
		Gross alpha = -2.3 pCi/l Gross beta = 10 pCi/l					
	4309	2-1-93		<1	<25	--	--
		Gross alpha = -.7 pCi/l Gross beta = 1 pCi/l Uranium = <0.001 mg/l					

No sample collected in May due to well being inoperable.

No sample collected in June due to well being inoperable.

No sample collected in July due to well being inoperable.

No sample collected in August due to well being inoperable.

Q&TSD Sampling Results

Well No.	Sample No.	Date Sampled	Run No.	PGDP Results		ORNL Results	
				TCE (μg/l)	Tc (pCi/l)	TCE (μg/l)	Tc (pCi/l)
16	1521	8-13-88		< 1	< 50	< 1	< 50
	1558	8-15-88		< 1	--	--	--
						ORGDP Results	
						TCE (μg/l)	Tc (pCi/l)
	1569	8-16-88		< 1	--	< 5	--
	1692	8-22-88		< 1	< 25		
	1806	8-30-88		< 1	< 25	--	--
	1867	9-6-88		< 1	< 25	--	--
	1916	9-12-88		< 1	< 25	--	--
	1980	9-19-88		< 1	< 25	--	--
	2072	9-26-88		< 1	< 25	--	--
	2132	10-3-88		< 1	< 25	--	--
	2219	10-10-88		< 1	< 25	--	--
	2305	10-17-88		< 1	< 25	--	--
	2357	10-24-88		< 1	< 25	--	--
	2421	10-31-88		< 1	< 25	--	--
	2525	11-7-88		< 1	< 25	--	--
	2588	11-14-88		< 1	< 25	--	--
		Rn-222 = 440 pCi/l					
	2645	11-21-88		< 1	< 25	--	--
		Rn-222 = 301 pCi/l					
	2700	11-28-88		< 1	< 25	--	--
		Rn-222 = 323 pCi/l					
	2781	12-5-88		< 1	< 25	--	--
	2873	12-12-88		< 1	< 25	--	--
	2937	12-19-88		< 1	< 25	--	--
	3002	12-27-88		< 1	< 25	--	--
	9	1-3-89		< 1	< 25	--	--
	62	1-9-89		< 1	< 25	--	--
		Gross alpha = -0.6 pCi/l Gross beta = -1 pCi/l Gross alpha = 0.8 pCi/l Gross beta = -1 pCi/l					
	135	1-16-89		< 1	< 1	--	--
	177	1-23-89		< 1	< 25	--	--
	251	1-30-89		< 1	< 25	--	--

Q&TSD Sampling Results (continued)

Well No.	Sample No.	Date Sampled	Run No.	PGDP Results TCE (µg/l)	PGDP Results Tc (pCi/l)	ORNL Results TCE (µg/l)	ORNL Results Tc (pCi/l)
16 (cont.)	289	2-6-89		< 1	< 25	--	--
	337	2-13-89		< 1	< 25	--	--
	410	2-17-89		< 1	< 25	--	--
	434	2-21-89		< 1	< 25	--	--
	487	2-27-89		< 1	< 25	--	--
	554	3-6-89		< 1	< 25	--	--
	622	3-13-89		< 1	< 25	--	--
	726	3-20-89		< 1	< 25	--	--
		Gross alpha = 13.1 pCi/l Gross beta = 4 pCi/l Rn-222 = 393 pCi/l					
	776	3-28-89		< 1	< 25	--	--
		Rn-222 = 486 pCi/l					
	840	4-3-89		< 1	< 25	--	--
		Rn-222 = 510 pCi/l					
	884	4-10-89		< 1	NA	--	--
	929	4-17-89		< 1	< 25	--	--
		Gross alpha = 1.2 pCi/l Gross beta = 4 pCi/l					
	989	4-24-89		< 1	< 25	--	--
		Rn-222 = 554 pCi/l					
	1066	5-1-89		< 1	< 25	--	--
	1140	5-8-89		< 1	< 25	--	--
	1205	5-15-89		< 1	< 25	--	--
	1270	5-22-89		< 1	< 25	--	--
		Gross alpha = 7.3 pCi/l Gross beta = 7 pCi/l					
	1329	5-30-89		< 1	< 25	--	--
	1392	6-5-89		< 1	< 25	--	--
	1471	6-13-89		2	< 25	--	--
	1519	6-14-89		--	--	--	--
		Radiochemical scan					
	1555	6-16-89		< 1	--	--	--
	1558	6-16-89		< 1	--	--	--
	1577	6-21-89		< 1	< 25	--	--
		Gross alpha = 3.6 pCi/l Gross beta = 6 pCi/l					

Q&TSD Sampling Results (continued)

Well No.	Sample No.	Date Sampled	Run No.	PGDP Results TCE (µg/l)	PGDP Results Tc (pCi/l)	ORNL Results TCE (µg/l)	ORNL Results Tc (pCi/l)
16 (cont.)	1964	7-21-89		< 1	< 25	--	--
		Gross alpha = -2 pCi/l Gross beta = 3.8 pCi/l					
	2320	8-25-89		< 1	< 25	--	--
		Gross alpha = 3 pCi/l Gross beta = 12 pCi/l					
	2716	9-27-89		< 1	< 25	--	--
		Gross alpha = 4.2 pCi/l Gross beta = 21 pCi/l Uranium = <0.001 mg/l					
	2963	10-19-89		< 1	< 25	--	--
		Gross alpha = 3.4 pCi/l Gross beta = 9 pCi/l					
	3486	11-22-89		+ 1	< 25	--	--
		Gross alpha = 1.5 pCi/l Gross beta = 8 pCi/l					
	3676	12-13-89		7	< 25	--	--
		Gross alpha = 2.5 pCi/l Gross beta = 1 pCi/l Uranium = <0.001 mg/l					
	208	1-17-90		< 1	< 25	--	--
		Gross alpha = .9 pCi/l Gross beta = 3 pCi/l					
	408	2-6-90		< 1	< 25	--	--
		Gross alpha = 3.8 pCi/l Gross beta = 13 pCi/l					
	756	3-2-90		< 1	< 25	--	--
		Gross alpha = -2.3 pCi/l Gross beta = 7 pCi/l Rn-222 = 289 pCi/l					
	1282	4-18-90		< 1	< 25	--	--
		Gross alpha = 3 pCi/l Gross beta = 12 pCi/l					
	1507	5-18-90		< 1	< 25	--	--
		Gross alpha = -2 pCi/l Gross beta = 17 pCi/l					

Q&TSD Sampling Results (continued)

Well No.	Sample No.	Date Sampled	Run No.	PGDP Results TCE (µg/l)	PGDP Results Tc (pCi/l)	ORNL Results TCE (µg/l)	ORNL Results Tc (pCi/l)
16 (cont.)	1956	6-6-90		6	<25	--	--
		Gross alpha = -.5 pCi/l Gross beta = 5 pCi/l Uranium = <0.001 mg/l					
	2558	7-25-90		<1	<25	--	--
		Gross alpha = -1.5 pCi/l Gross beta = -2 pCi/l					
	2835	8-15-90		3	<25	--	--
		Gross alpha = 8.5 pCi/l Gross beta = 8 pCi/l					
	3018	9-18-90		5	<25	--	--
		Gross alpha = -2.5 pCi/l Gross beta = -4 pCi/l Uranium = <0.001 mg/l					
	3382	10-22-90		<1	<25	--	--
		Gross alpha = -0.6 pCi/l Gross beta = 2 pCi/l					
	3912	11-28-90		4	<25	--	--
		Gross alpha = -2.3 pCi/l Gross beta = 40 pCi/l Uranium = <0.001 mg/l					
	4140	12-18-90		+1	<25	--	--
		Gross alpha = 2.7 pCi/l Gross beta = 12 pCi/l					
	260	1-17-91		<1	<25	--	--
		Gross alpha = 9.8 pCi/l Gross beta = 22 pCi/l					

No sample taken in February due to leaks.

No sample collected in March, well out of order.

No sample collected in April, well out of order.

No sample collected in May, well out of order.

No sample collected in June, well out of order.

No sample collected in July, well out of order.

No sample collected in August, well out of order.

No sample collected in September, well out of order.

No sample collected in October, well out of order.

No sample collected in November, well out of order.

No sample collected in December, well out of order.

Q&TSD Sampling Results (continued)

Well No.	Sample No.	Date Sampled	Run No.	PGDP Results		ORNL Results	
				TCE (μg/l)	Tc (pCi/l)	TCE (μg/l)	Tc (pCi/l)
16 (cont.)	No sample collected in January (1992), well out of order.						
	No sample collected in February, well out of order.						
	No sample collected in March, well out of order.						
	No sample collected in April, well out of order.						
	No sample collected in May, well out of order.						
	No sample collected in June, well out of order.						
	No sample collected in July, well out of order.						
	No sample collected in August, well out of order.						
	No sample collected in September, well out of order.						
	No sample collected in October, well out of order.						
	No sample collected in November, well out of order.						
	No sample collected in December, well out of order.						
	No sample collected in January (1993), well out of order.						
	No sample collected in February, well out of order.						
	No sample collected in March, well out of order.						
	No sample collected in April, well out of order.						
	No sample collected in May, well out of order.						
	No sample collected in June, well out of order.						
	No sample collected in July, well out of order.						
	No sample collected in August, well out of order.						

Q&TSD Sampling Results

Well No.	Sample No.	Date Sampled	Run No.	PGDP Results TCE (µg/l)	PGDP Results Tc (pCi/l)	ORNL Results TCE (µg/l)	ORNL Results Tc (pCi/l)
17	1520	8-13-88		51	71	55	73
	1560	8-16-88		40	83	--	--
						ORGDP Results	
						TCE (µg/l)	Tc (pCi/l)
	1560					47	--
	1698	8-22-88		4[illegible]	69	--	--
	1602	8-18-88	1	1.1	25	--	--
			2	1.2			
	1613	8-18-88		< 1	< 25	--	--
	1613	8-18-88		total coliform house		--	--
	1613	8-18-88		total coliform water tank		< 1	
	752	3-23-89		250	309	--	--
		Gross alpha = 4.5 pCi/l Gross beta = 308 pCi/l Rn-222 = 300 pCi/l TOX = 199 µg/l					
	1005	4-25-89		350	342	--	--
		Gross alpha = 3.8 pCi/l Gross beta = 296 pCi/l Rn-222 = 247 pCi/l					
	1305	5-25-89		440	395	--	--
		Gross alpha = 5.1 pCi/l Gross beta = 331 pCi/l					
	1518	6-14-89		--	--	--	--
		Radiochemical scan					
	1594	6-21-89		3	410	--	--
		Gross alpha = 9 pCi/l Gross beta = 344 pCi/l					
	1966	7-27-89		320	365	--	--
		Gross alpha = -5 pCi/l Gross beta = 337 pCi/l					
	2699	9-27-89		20	203	--	--
		Gross alpha = 4.8 pCi/l Gross beta = 212 pCi/l Uranium = < 0.001 mg/l					
	2987	10-24-89		190	124	--	--
		Gross alpha = -1 pCi/l Gross beta = 185 pCi/l					

Q&TSD Sampling Results (continued)

Well No.	Sample No.	Date Sampled	Run No.	PGDP Results TCE (µg/l)	PGDP Results Tc (pCi/l)	ORNL Results TCE (µg/l)	ORNL Results Tc (pCi/l)
17 (cont.)	3539	11-30-89		145	143	--	--
		Gross alpha = -2 pCi/l Gross beta = 175 pCi/l					
	3675	12-13-89		120	123	--	--
		(state sampling) Gross alpha = 1 pCi/l Gross beta = 191 pCi/l Uranium = <0.001 mg/l					
	209	1-18-90		100	81	--	--
		Gross alpha = 1.5 pCi/l Gross beta = 91 pCi/l					
	670	2-21-90		65	89	--	--
		Gross alpha = 2.3 pCi/l Gross beta = 68 pCi/l					
	922	3-14-90		100	111	--	--
		Gross alpha = 6.4 pCi/l Gross beta = 67 pCi/l Uranium = <0.001 mg/l					
	1428	4-27-90		220	163	--	--
		Gross alpha = 18.9 pCi/l Gross beta = 176 pCi/l					
	1858	5-24-90		200	167	--	--
		Gross alpha = 5.3 pCi/l Gross beta = 141 pCi/l					
	1955	6-6-90		240	175	--	--
		Gross alpha = -2.6 pCi/l Gross beta = 191 pCi/l Uranium = <0.001 mg/l					
	2568	7-26-90		220	161	--	--
		Gross alpha = 9.6 pCi/l Gross beta = 179 pCi/l					
	2841	8-15-90		180	190	--	--
		Gross alpha = 10 pCi/l Gross beta = 150 pCi/l					
	3017	9-18-90		180	155	--	--
		Gross alpha = -5.5 pCi/l Gross beta = 177 pCi/l Uranium = <0.001 mg/l					

Q&TSD Sampling Results (continued)

Well No.	Sample No.	Date Sampled	Run No.	PGDP Results TCE (µg/l)	PGDP Results Tc (pCi/l)	ORNL Results TCE (µg/l)	ORNL Results Tc (pCi/l)
17 (cont.)	3567	10-24-90		140	95	--	--
		Gross alpha = 1.1 pCi/l Gross beta = 140 pCi/l					
	3911	11-28-90		120	95	--	--
		Gross alpha = 1.1 pCi/l Gross beta = 123 pCi/l Uranium = <0.001 mg/l					
	4139	12-20-90		76	112	--	--
		Gross alpha = 2.3 pCi/l Gross beta = 105 pCi/l					
	262	1-29-91		150	126	--	--
		Gross alpha = -1.4 pCi/l Gross beta = 104 pCi/l					
	684	2-22-91		270	266	--	--
		Gross alpha = 8.6 pCi/l Gross beta = 234 pCi/l					
	703	3-13-91		390	326	--	--
		Gross alpha = 0.2 pCi/l Gross beta = 401 pCi/l Uranium = <0.001 mg/l					
	1047	4-2-91		320	356	--	--
		Gross alpha = -2.8 pCi/l Gross beta = 350 pCi/l					
	1351	5-7-91		370	293	--	--
		Gross alpha = 0 pCi/l Gross beta = 317 pCi/l					
	2100	6-25-91		300	237		
		Gross alpha = 2.2 pCi/l Gross beta = 210 pCi/l					
	2387	7-22-91		290	190	--	--
		Gross alpha = 0 pCi/l Gross beta = 198 pCi/l					
	2959	8-21-91		210	252	--	--
		Gross alpha = -2.3 pCi/l Gross beta = 164 pCi/l					
	2794	9-10-91		180	205	--	--
		Gross alpha = -0.5 pCi/l Gross beta = 175 pCi/l					

Q&TSD Sampling Results (continued)

Well No.	Sample No.	Date Sampled	Run No.	PGDP Results TCE (µg/l)	PGDP Results Tc (pCi/l)	ORNL Results TCE (µg/l)	ORNL Results Tc (pCi/l)
17 (cont.)	3489	10-9-91		176	190	--	--
		Gross alpha = -2.3 pCi/l Gross beta = 130 pCi/l					
	4093	11-14-91		170	163	--	--
		Gross alpha = 5.9 pCi/l Gross beta = 161 pCi/l					
	4260	12-2-91		180	120	--	--
		Gross alpha = 4.3 pCi/l Gross beta = 145 pCi/l Uranium = <0.001 mg/l					
	183	1-13-92		158	160	--	--
		Gross alpha = 2.7 pCi/l Gross beta = 124 pCi/l					
	4421	2-12-92		130	161	--	--
		Gross alpha = 5.1 pCi/l Gross beta = 121 pCi/l Uranium = <0.001 mg/l Metals = Data available					
	4645	3-27-92		260	171	--	--
		Gross alpha = -2.8 pCi/l Gross beta = 157 pCi/l					
	4814	4-24-92		290	239	--	--
		Gross alpha = -1.0 pCi/l Gross beta = 149 pCi/l					
	4955	5-13-92		340	243	--	--
		Gross alpha = -0.4 pCi/l Gross beta = 160 pCi/l Uranium = <0.001 mg/l					
	5172	6-23-92		340	244	--	--
		Gross alpha = 0.4 pCi/l Gross beta = 183 pCi/l					
	5332	7-23-92		250	287	--	--
		Gross alpha = 0.6 pCi/l Gross beta = 136 pCi/l					
	5513	8-18-92		270	202.2	--	--
		Gross alpha = 2.9 pCi/l Gross beta = 127 pCi/l Uranium = <0.001 mg/l					

Q&TSD Sampling Results (continued)

Well No.	Sample No.	Date Sampled	Run No.	PGDP Results TCE (µg/l)	PGDP Results Tc (pCi/l)	ORNL Results TCE (µg/l)	ORNL Results Tc (pCi/l)
17 (cont.)	5716	9-11-92		220	199	--	--
		Gross alpha = 5.4 pCi/l Gross beta = 127 pCi/l					
	6040	10-20-92		210	174	--	--
		Gross alpha = -2.7 pCi/l Gross beta = 181 pCi/l Additional Data Available					
	6167	11-10-92		220	215	--	--
		Gross alpha = 3.0 pCi/l Gross beta = 119 pCi/l Uranium = <0.001 mg/l					
	6318	12-10-92		160	191	--	--
		Gross alpha = 0 pCi/l Gross beta = 135 pCi/l					

No sample collected (residents request) for January (1993).

No sample collected (residents request) for February.

No sample collected (residents request) for March.

No sample collected (residents request) for April.

No sample collected (residents request) for May.

No sample collected (residents request) for June.

No sample collected (residents request) for July.

No sample collected (residents request) for August.

Q&TSD Sampling Results

Well No.	Sample No.	Date Sampled	Run No.	PGDP Results TCE (µg/l)	PGDP Results Tc (pCi/l)	ORNL Results TCE (µg/l)	ORNL Results Tc (pCi/l)
18	1519	8-13-88		1.5	<50	1	<50
						ORGDP Results	
						TCE (µg/l)	Tc (pCi/l)
	1564	8-16-88		<1	<25	<5	--
	1609	8-18-88		<1	<25	--	--
	1609	8-18-88					
		Belt kitchen total coliform potable water			<1		
	1609	8-18-88					
		Belt water tank total coliform potable water			<1		
	1699	8-22-88		+1	<25	--	--
	1923	9-13-88		metals	--	--	--
	2752	11-30-88					
		turbidity = 19NTU diss solids = 149 mg/l sus solids = <4 mg/l					
	189	1-24-89		<1	<25	--	--
		Gross alpha = 7.0 pCi/l Gross beta = 8 pCi/l TOX = 6 µg/l					
	499	2-27-89		<1	<25	--	--
	715	3-17-89		<1	<25	--	--
		Gross alpha = .7 pCi/l Gross beta = 3 pCi/l					
	946	4-28-89		<1	<25	--	--
		Gross alpha = 1.7 pCi/l Gross beta = 9 pCi/l					
	1243	5-18-89		<1	<25	--	--
	1559	6-23-89		<1	<25	--	--
		Gross alpha = 1.2 pCi/l Gross beta = 1 pCi/l					
	1963	7-21-89		<1	<25	--	--
		Gross alpha = 2.6 pCi/l Gross beta = 3 pCi/l					
	2290	8-22-89		+1	<25	--	--
		Gross alpha = 2.6 pCi/l Gross beta = 3 pCi/l					

Q&TSD Sampling Results (continued)

Well No.	Sample No.	Date Sampled	Run No.	PGDP Results TCE (µg/l)	PGDP Results Tc (pCi/l)	ORNL Results TCE (µg/l)	ORNL Results Tc (pCi/l)
18 (cont.)	2689	9-26-89		< 1	< 25	--	--
		Gross alpha = 1.5 pCi/l Gross beta = 5 pCi/l					
	2982	10-20-89		< 1	< 25	--	--
		Gross alpha = -0.8 pCi/l Gross beta = 4 pCi/l					
	3485	11-22-89		+1	< 25	--	--
		Gross alpha = 3.9 pCi/l Gross beta = 5 pCi/l					
	3745	12-19-89		< 1	< 25	--	--
		Gross alpha = -3.2 pCi/l Gross beta = 5 pCi/l					
	202	1-16-90		< 1	< 25	--	--
		Gross alpha = -2.1 pCi/l Gross beta = 9.0 pCi/l					
	754	3-2-90		< 1	< 25	--	--
		Gross alpha = -2.7 pCi/l Gross beta = -4 pCi/l					
	1211	4-5-90		< 1	< 25	--	--
		Gross alpha = 2.5 pCi/l Gross beta = 0 pCi/l					
	1635	5-10-90		< 1	< 25	--	--
		Gross alpha = 2.7 pCi/l Gross beta = 2 pCi/l					
	1993	6-7-90		< 1	< 25	--	--
		Gross alpha = -1.3 pCi/l Gross beta = 3 pCi/l					
	2256	7-3-90		< 1	< 25	--	--
		Gross alpha = 2.3 pCi/l Gross beta = 4 pCi/l					
	2706	8-3-90		< 1	< 25	--	--
		Gross alpha = 1 pCi/l Gross beta = 3 pCi/l					
	3047	9-6-90		< 1	< 25	--	--
		Gross alpha = 6.1 pCi/l Gross beta = 19 pCi/l					
	3381	10-5-90		< 1	< 25	--	--
		Gross alpha = -1.7 pCi/l Gross beta = -2 pCi/l					

Q&TSD Sampling Results (continued)

Well No.	Sample No.	Date Sampled	Run No.	PGDP Results TCE (µg/l)	PGDP Results Tc (pCi/l)	ORNL Results TCE (µg/l)	ORNL Results Tc (pCi/l)
18 (cont.)	3774	11-9-90		< 1	< 25	--	--
		Gross alpha = 6.9 pCi/l Gross beta = 14 pCi/l					
	4138	12-18-90		< 1	< 25	--	--
		Gross alpha = 8.0 pCi/l Gross beta = 11 pCi/l					
	43	1-15-91		< 1	< 25	--	--
		Gross alpha = 1.1 pCi/l Gross beta = 4 pCi/l					
	368	2-1-91		< 1	< 25	--	--
		Gross alpha = 3.3 pCi/l Gross beta = 11 pCi/l					
	692	3-4-91		5	< 25	--	--
		Gross alpha = -1.4 pCi/l Gross beta = -6 pCi/l					
	1048	4-2-91		< 1	< 25	--	--
		Gross alpha = 2.5 pCi/l Gross beta = 2 pCi/l					
	1441	5-10-91		< 1	< 25		
		Gross alpha = -4.5 pCi/l Gross beta = 13 pCi/l					
	2097	6-25-91		< 1	< 25	--	--
		Gross alpha = 4.2 pCi/l Gross beta = 4 pCi/l					
	2336	7-17-91		< 1	< 25	--	--
		Gross alpha = 4.1 pCi/l Gross beta = 12 pCi/l					
	2958	8-21-91		< 1	< 25	--	--
		Gross alpha = 2.1 pCi/l Gross beta = 4 pCi/l					
	3206	9-16-91		< 1	< 25	--	--
		Gross alpha = 5.7 pCi/l Gross beta = 20 pCi/l					
	3487	10-9-91		< 1	< 25	--	--
		Gross alpha = -4.3 pCi/l Gross beta = -2.0 pCi/l					
	4091	11-13-91		< 1	< 25	--	--
		Gross alpha = 1.4 pCi/l Gross beta = 5 pCi/l					

Q&TSD Sampling Results (continued)

Well No.	Sample No.	Date Sampled	Run No.	PGDP Results TCE (µg/l)	PGDP Results Tc (pCi/l)	ORNL Results TCE (µg/l)	ORNL Results Tc (pCi/l)
18 (cont.)	4459	12-13-91		<1	<25	--	--
		Gross alpha = -1.0 pCi/l Gross beta = -1.0 pCi/l					
	181	1-13-92		<1	<25	--	--
		Gross alpha = 2.3 pCi/l Gross beta = -3 pCi/l					

No sample collected in February, well not working.
No sample collected in March, well not working.
No sample collected in April, well not working.
No sample collected in May, well not working.
No sample collected in June, well not working.
No sample collected in July, well not working.
No sample collected in August, well not working.
No sample collected in September, well not working.
No sample collected in October, well not working.
No sample collected in November, well not working.
No sample collected in December, well not working.
No sample collected in January (1993), well not working.
No sample collected in February, well not working.
No sample collected in March, well not working.
No sample collected in April, well not working.
No sample collected in May, well not working.
No sample collected in June, well not working.
No sample collected in July, well not working.
No sample collected in August, well not working.

Q&TSD Sampling Results

Well No.	Sample No.	Date Sampled	Run No.	PGDP Results TCE (µg/l)	PGDP Results Tc (pCi/l)	ORNL Results TCE (µg/l)	ORNL Results Tc (pCi/l)
31	1525	8-13-88		< 1	< 25	< 5	--
	2921	12-15-88		< 1	--	--	--
	229	1-26-89		< 1	< 25	--	--
	729	3-21-89		< 1	< 25	--	--
	1246	5-18-89		< 1	< 25	--	--
	1914	7-18-89		< 1	< 25	--	--
	2639	9-20-89		< 1	< 25	--	--
	3441	11-27-89		< 1	< 25	--	--
	28	1-4-90		< 1	< 25	--	--
	788	3-2-90		< 1	< 25	--	--
		PCB = < 0.5 µg/l Uranium = < 0.001 mg/l					
	2163	6-21-90		< 1	< 25	--	--
	2427	7-17-90		< 1	< 25	--	--
	3042	9-6-90		< 1	< 25	--	--
	3201	9-19-90		< 1	--	--	--
	3258	9-24-90		< 1	< 25	--	--
	3323	10-1-90		< 1	< 25	--	--
		Gross alpha = -4.5 pCi/l Gross beta = 0 pCi/l Rn-222 = 208 pCi/l					
	3403	10-8-90		< 1	< 25	--	--
	3466	10-15-90		< 1	< 25	--	--
	3546	10-22-90		< 1	< 25	--	--
	3633	10-29-90		< 1	< 25	--	--
	3732	11-5-90		< 1	< 25	--	--
		Gross alpha = 11.9 pCi/l Gross beta = 25 pCi/l Rn-222 = 788 pCi/l					
	3783	11-12-90		< 1	< 25	--	--
	3866	11-19-90		< 1	< 25	--	--
	3949	11-26-90		< 1	< 25	--	--
		Rn-222 = 178 pCi/l					
	4034	12-3-90		< 1	< 25	--	--
		Gross alpha = 4.5 pCi/l Gross beta = 3 pCi/l Rn-222 = 195 pCi/l					

Q&TSD Sampling Results (continued)

Well No.	Sample No.	Date Sampled	Run No.	PGDP Results TCE (µg/l)	PGDP Results Tc (pCi/l)	ORNL Results TCE (µg/l)	ORNL Results Tc (pCi/l)
31 (cont.)	4094	12-10-90		< 1	< 25	--	--
	4190	12-17-90		< 1	< 25	--	--
	4265	12-26-90		< 1	< 25	--	--
	4301	12-31-90		< 1	< 25	--	--
	58	1-7-91		< 1	< 25	--	--
		Gross alpha = 3.7 pCi/l Gross beta = 2 pCi/l Rn-222 = 204 pCi/l					
	231	1-14-91		< 1	< 25	--	--
	278	1-21-91		< 1	< 25	--	--
	328	1-28-91		< 1	< 25	--	--
	378	2-4-91		< 1	< 25	--	--
		Gross alpha = 6.2 pCi/l Gross beta = 13 pCi/l Rn-222 = 166 pCi/l					
	447	2-11-91		< 1	< 25	--	--
	519	2-19-91		< 1	< 25	--	--
	600	2-25-91		< 1	< 25	--	--
	688	3-4-91		< 1	< 25	--	--
		Gross alpha = 3.8 pCi/l Gross beta = 12 pCi/l Rn-222 = 229 pCi/l					
	772	3-11-91		< 1	< 25	--	--
	825	3-18-91		< 1	< 25	--	--
	955	3-25-91		< 1	< 25	--	--
	1040	4-1-91		< 1	< 25	--	--
		Gross alpha = -0.3 pCi/l Gross beta = -1 pCi/l Rn-222 = 211 pCi/l					
	1131	4-8-91		< 1	< 25	--	--
	1182	4-15-91		< 1	< 25	--	--
	1233	4-22-91		< 1	< 25	--	--
	1316	4-29-91		< 1	< 25	--	--
	1402	5-6-91		< 1	< 25	--	--
		Gross alpha = 2.6 pCi/l Gross beta = 12 pCi/l Rn-222 = 189 pCi/l					

Q&TSD Sampling Results (continued)

Well No.	Sample No.	Date Sampled	Run No.	PGDP Results TCE (μg/l)	PGDP Results Tc (pCi/l)	ORNL Results TCE (μg/l)	ORNL Results Tc (pCi/l)
31 (cont.)	1458	5-13-91		2	< 25	--	--
	1560	5-20-91		< 1	< 25	--	--
	No sample collected 5-28-91, well out of order.						
	1735	6-3-91		< 1	< 25	--	--
		Gross alpha = 13.1 pCi/l Gross beta = 11 pCi/l Rn-222 = 138 pCi/l					
	1829	6-10-91		< 1	< 25	--	--
	No sample collected in July, pump out.						
	No sample collected in August, pump out.						
	No sample collected in September, pump out.						
	No sample collected in October, pump out.						
	No sample collected in November, pump out.						
	No sample collected in December, pump out.						
	No sample collected in January (1992), pump out.						
	No sample collected in February, pump out.						
	No sample collected in March, pump out.						
	No sample collected in April, pump out.						
	No sample collected in May, pump out.						
	No sample collected in June, pump out.						
	No sample collected in July, pump out.						
	No sample collected in August, pump out.						
	No sample collected in September, pump out.						
	No sample collected in October, pump out.						
	No sample collected in November, pump out.						
	No sample collected in December, pump out.						
	No sample collected in January (1993), pump out.						
	No sample collected in February, pump out.						
	No sample collected in March, pump out.						
	No sample collected in April, pump out.						
	No sample collected in May, pump out.						
	No sample collected in June, pump out.						
	No sample collected in July, pump out.						
	No sample collected in August, pump out.						

Q&TSD Sampling Results

Well No.	Sample No.	Date Sampled	Run No.	PGDP Results		ORNL Results	
				TCE (μg/l)	Tc (pCi/l)	TCE (μg/l)	Tc (pCi/l)
245	1522	8-13-88		< 1	< 50	< 1	< 50
	1575	8-16-88		< 1	--	< 5	--
	1704	8-22-88		< 1	< 25	--	--
	1807	8-30-88		< 1	< 25	--	--
	1868	9-6-88		< 1	< 25	--	--
	1917	9-12-88		< 1	< 25	--	--
	1981	9-19-88		< 1	< 25	--	--
	2073	9-26-88		< 1	< 25	--	--
	2133	10-3-88		< 1	< 25	--	--
	2220	10-10-88		< 1	< 25	--	--
	2306	10-17-88		< 1	< 25	--	--
	2358	10-24-88		< 1	< 25	--	--
	2422	10-31-88		< 1	< 25	--	--
	2526	11-7-88		< 1	< 25	--	--
	2589	11-14-88		< 1	< 25	--	--
		Rn-222 = 357 pCi/l					
	2646	11-21-88		< 1	< 25	--	--
		Rn-222 = 389 pCi/l					
	2701	11-28-88		< 1	< 25	--	--
		Rn-222 = 400 pCi/l					
	2782	12-15-88		< 1	< 25	--	--
	2874	12-12-88		< 1	< 25	--	--
	2938	12-19-88		< 1	< 25	--	--
	3003	12-27-88		< 1	< 25	--	--
	10	1-3-89		< 1	< 25	--	--
	63	1-9-89		< 1	< 25	--	--
		Gross alpha = 0.8 pCi/l Gross beta = -1 pCi/l					
	136	1-16-89		< 1	< 25	--	--
	178	1-23-89		< 1	< 25	--	--
	252	1-30-89		< 1	< 25	--	--
	290	2-6-89		< 1	< 25	--	--
	338	2-13-89		< 1	< 25	--	--
	411	2-17-89		< 1	< 25	--	--
	435	2-21-89		< 1	< 25	--	--
	488	2-27-89		< 1	< 25	--	--

Q&TSD Sampling Results (continued)

Well No.	Sample No.	Date Sampled	Run No.	PGDP Results TCE (µg/l)	PGDP Results Tc (pCi/l)	ORNL Results TCE (µg/l)	ORNL Results Tc (pCi/l)
245 (cont.)	555	3-6-89		< 1	< 25	--	--
	623	3-13-89		< 1	< 25	--	--
	727	3-20-89		< 1	< 25	--	--
		Gross alpha = 1 pCi/l Gross beta = 9 pCi/l Rn-222 = 379 pCi/l					
	no sample taken - well not working						
	841	4-3-89		< 1	< 25	--	--
		Rn-222 = 389 pCi/l					
	885	4-10-89		< 1	< 25	--	--
	930	4-17-89		< 1	< 25	--	--
		Gross alpha = 2.5 pCi/l Gross beta = 1 pCi/l					
	990	4-24-89		< 1	NA	--	--
		Rn-222 = 435 pCi/l					
	1067	5-1-89		< 1	< 25	--	--
	1141	5-8-89		< 1	< 25	--	--
	1206	5-15-89		< 1	< 25	--	--
	1271	5-22-89		< 1	< 25	--	--
		Gross alpha = 2.7 pCi/l Gross beta = 10 pCi/l					
	1330	5-30-89		< 1	< 25	--	--
	1393	6-5-89		< 1	< 25	--	--
	1472	6-13-89		< 1	< 25	--	--
	1520	6-14-89		--	--	--	--
		Radiochemical scan					
	1556	6-16-89		< 1	--	--	--
	1578	6-21-89		< 1	< 25	--	--
		Gross alpha = 0.6 pCi/l Gross beta = 17 pCi/l					
	1961	7-27-89		< 1	< 25	--	--
		Gross alpha = 2.1 pCi/l Gross beta = 6 pCi/l					
	2321	8-25-89		< 1	< 25	--	--
		Gross alpha = 2.7 pCi/l Gross beta = 7 pCi/l					

Q&TSD Sampling Results (continued)

Well No.	Sample No.	Date Sampled	Run No.	PGDP Results TCE (µg/l)	PGDP Results Tc (pCi/l)	ORNL Results TCE (µg/l)	ORNL Results Tc (pCi/l)
245 (cont.)	2717	9-27-89		< 1	< 25	--	--
		Gross alpha = 7.6 pCi/l Gross beta = 24 pCi/l Uranium = < 0.001 mg/l					
	2964	10-19-89		< 1	< 25	--	--
		Gross alpha = 4.2 pCi/l Gross beta = 13 pCi/l					
	3487	11-22-89		+ 1	< 25	--	--
		Gross alpha = 0.5 pCi/l Gross beta = 4 pCi/l					
	3677	12-13-89		5	< 25	--	--
		Gross alpha = 0.2 pCi/l Gross beta = 0 pCi/l Uranium = < 0.001 mg/l					
	207	1-17-90		< 1	< 25	--	--
		Gross alpha = .8 pCi/l Gross beta = 6 pCi/l					
	409	2-6-90		< 1	< 25	--	--
		Gross alpha = 3.4 pCi/l Gross beta = 7 pCi/l					
	755	3-2-90		< 1	< 25	--	--
		Gross alpha = .6 pCi/l Gross beta = -1 pCi/l Rn-222 = 104 pCi/l					
	1283	4-18-90		< 1	< 25	--	--
		Gross alpha = 1.7 pCi/l Gross beta = 6 pCi/l					
	1508	5-18-90		< 1	< 25	--	--
		Gross alpha = 1.2 pCi/l Gross beta = 5 pCi/l					
	1957	6-6-90		4	< 25	--	--
		Gross alpha = 1.2 pCi/l Gross beta = 2 pCi/l Uranium = < 0.001 mg/l					
	2559	7-25-90		< 1	< 25	--	--
		Gross alpha = 6.8 pCi/l Gross beta = 0 pCi/l Rn-222 = 41 pCi/l					

Q&TSD Sampling Results (continued)

Well No.	Sample No.	Date Sampled	Run No.	PGDP Results TCE (µg/l)	PGDP Results Tc (pCi/l)	ORNL Results TCE (µg/l)	ORNL Results Tc (pCi/l)
245 (cont.)	2836	8-15-90		2	< 25	--	--
		Gross alpha = 1.1 pCi/l Gross beta = 2 pCi/l					
	3019	9-18-90		4	< 25	--	--
		Gross alpha = -.7 pCi/l Gross beta = -3 pCi/l					
	3383	10-22-90		< 1	< 25	--	--
		Gross alpha = -0.8 pCi/l Gross beta = 4 pCi/l					
	3913	11-28-90		3	< 25	--	--
		Gross alpha = 0.8 pCi/l Gross beta = 1 pCi/l Uranium = <0.001 mg/l					
	4141	12-18-90		< 1	< 25	--	--
		Gross alpha = 4.3 pCi/l Gross beta = 12 pCi/l					
	261	1-17-91		< 1	< 25	--	--
		Gross alpha = 2.8 pCi/l Gross beta = 7 pCi/l					
		No sample collected in February due to electrical problems.					
		No sample collected in March due to electrical problems.					
		No sample collected in April due to electrical problems.					
		No sample collected in May due to electrical problems.					
		No sample collected in June due to electrical problems.					
		No sample collected in July due to electrical problems.					
		No sample collected in August due to electrical problems.					
		No sample collected in September due to electrical problems.					
		No sample collected in October due to electrical problems.					
		No sample collected in November due to electrical problems.					
		No sample collected in December due to electrical problems.					
		No sample collected in January (1992) due to electrical problems.					
		No sample collected in February due to electrical problems.					
		No sample collected in March due to electrical problems.					
		No sample collected in April due to electrical problems.					
		No sample collected in May due to electrical problems.					
		No sample collected in June due to electrical problems.					
		No sample collected in July due to electrical problems.					
		No sample collected in August due to electrical problems.					

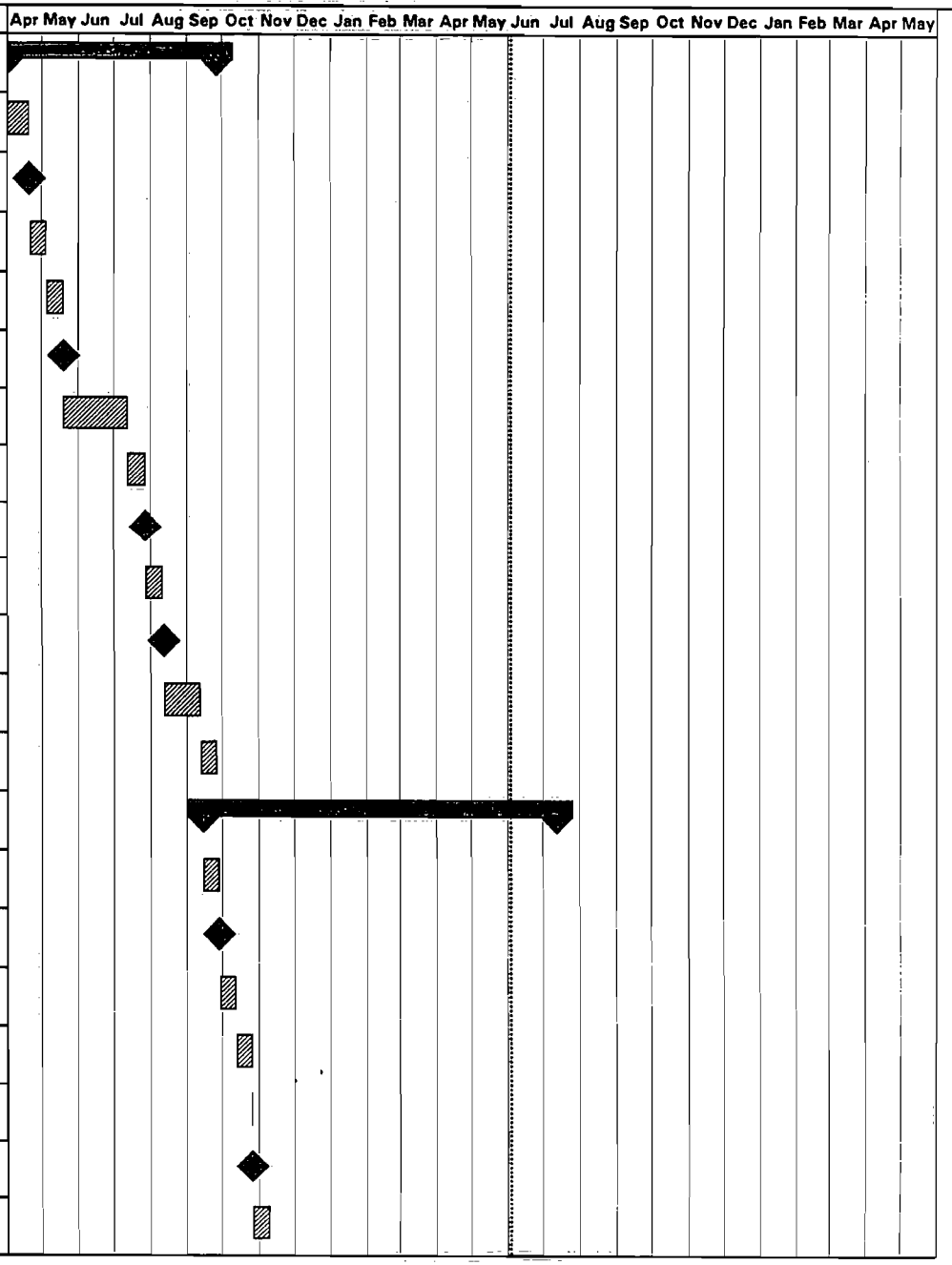
Q&TSD Sampling Results (continued)

Well No.	Sample No.	Date Sampled	Run No.	PGDP Results		ORNL Results	
				TCE (μg/l)	Tc (pCi/l)	TCE (μg/l)	Tc (pCi/l)
245 (cont.)	No sample collected in September due to electrical problems.						
	No sample collected in October due to electrical problems.						
	No sample collected in November due to electrical problems.						
	No sample collected in December due to electrical problems.						
	No sample collected in January (1993) due to electrical problems.						
	No sample collected in February due to electrical problems.						
	No sample collected in March due to electrical problems.						
	No sample collected in April due to electrical problems.						
	No sample collected in May due to electrical problems.						
	No sample collected in June due to electrical problems.						
	No sample collected in July due to electrical problems.						
	No sample collected in August due to electrical problems.						

ATTACHMENT 8

PGDP Water Policy Schedule

Name	Duration	Start Date	Finish Date
EE/CA	179d	4/1/93	9/26/93
SAIC PREPARE EE/CA	20d	4/1/93	4/20/93
SAIC ISSUE DRAFT D0 EE/CA TO MMES & DOE	0d	4/20/93	4/20/93
MMES & DOE REVIEW DRAFT D0 EE/CA	14d	4/21/93	5/4/93
SAIC INCORPORATE MMES & DOE COMMENTS	15d	5/5/93	5/19/93
DOE ISSUE DRAFT D1 EE/CA TO EPA & KDEP	0d	5/19/93	5/19/93
EPA & KDEP REVIEW OF DRAFT D1 EE/CA	55d	5/19/93	7/12/93
SAIC INCORPORATE EPA & KDEP COMMENTS	16d	7/12/93	7/27/93
DOE ISSUE DRAFT FINAL D2 EE/CA TO EPA & KDEP	0d	7/27/93	7/27/93
EPA & KDEP REVIEW OF DRAFT FINAL D2 EE/CA	15d	7/28/93	8/11/93
DOE ISSUE EE/CA TO PUBLIC FOR REVIEW	0d	8/12/93	8/12/93
PUBLIC REVIEW OF EE/CA	32d	8/12/93	9/12/93
PREPARE RESPONSE TO SIGNIFICANT COMMENTS	14d	9/13/93	9/26/93
ACTION MEMORANDUM	301d	9/15/93	7/12/94
SAIC PREPARE ACTION MEMORANDUM (AM)	14d	9/15/93	9/28/93
SAIC ISSUE D0 DRAFT AM TO DOE & MMES	0d	9/28/93	9/28/93
MMES & DOE REVIEW DRAFT D0 AM	14d	9/29/93	10/12/93
SAIC INCORPORATE DOE & MMES COMMENTS	14d	10/13/93	10/26/93
DOE RELEASE VERIFICATION	1d	10/26/93	10/26/93
DOE ISSUE D1 DRAFT AM TO EPA & KDEP	0d	10/26/93	10/26/93
EPA REVIEW D1 DRAFT AM	14d	10/27/93	11/9/93



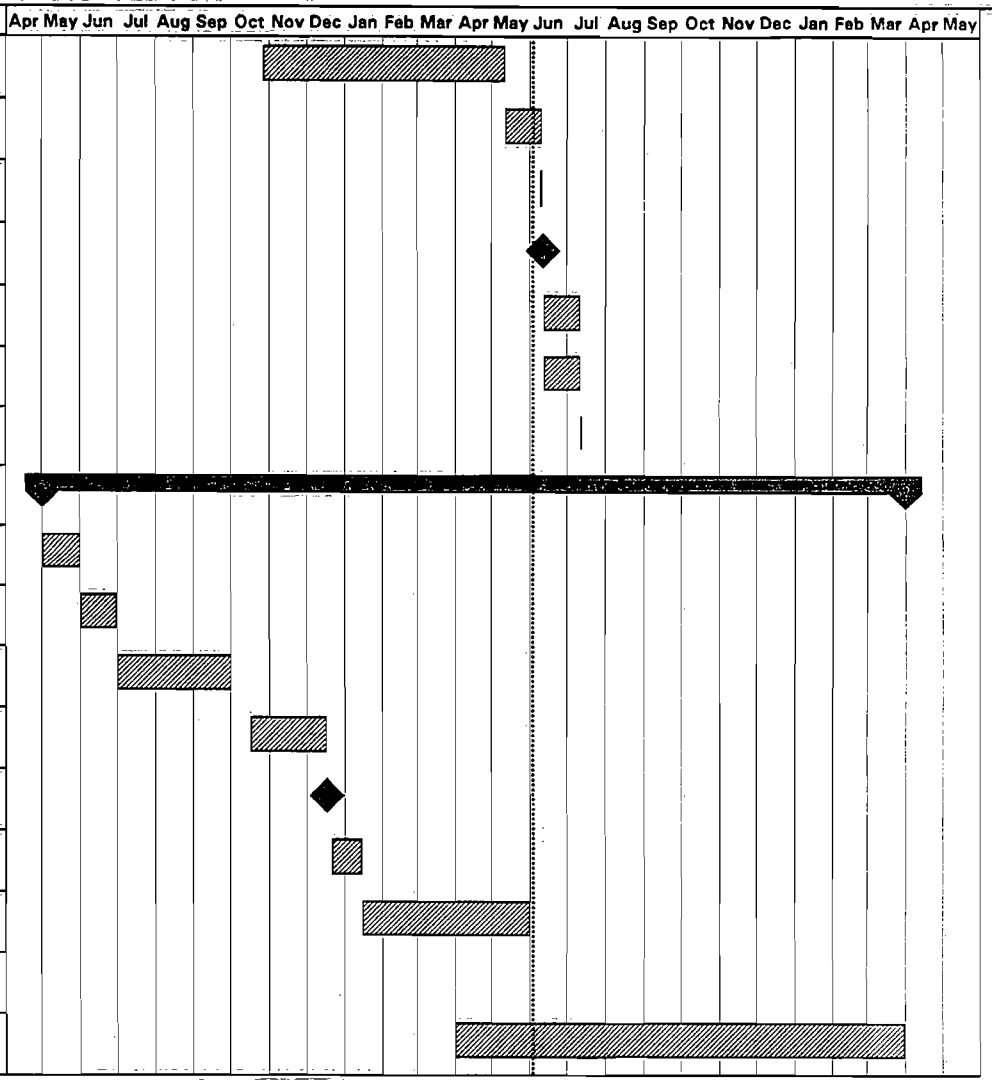
Revised June 2, 1994

Summary

Milestone

PGDP Water Policy Schedule

Name	Duration	Start Date	Finish Date
KDEP REVIEW D1 DRAFT AM	197d	10/27/93	5/11/94
JACOBS ENG INCORPORATE EPA & KDEP COMMENTS	30d	5/12/94	6/10/94
DOE RELEASE VERIFICATION	2d	6/9/94	6/10/94
DOE ISSUE D2 DRAFT FINAL AM TO EPA & KDEP	0d	6/11/94	6/11/94
EPA REVIEW D2 DRAFT FINAL AM	30d	6/12/94	7/11/94
KDEP REVIEW D2 DRAFT FINAL AM	30d	6/12/94	7/11/94
EPA & KDEP APPROVAL OF AM	1d	7/12/94	7/12/94
FIELD ACTIVITIES	700d	5/1/93	3/31/95
ENERGY SYSTEMS DEVELOP SRD	32d	5/1/93	6/1/93
ENERGY SYSTEMS DESIGN PROCUREMENT	30d	6/1/93	6/30/93
FLORENCE & HUTCHESON DESIGN	93d	7/1/93	10/1/93
KDOW REVIEW WATER LINE DESIGN	62d	10/17/93	12/17/93
KDOW APPROVAL OF WATER LINE DESIGN	0d	12/17/93	12/17/93
AWARD CONTRACT/MOBILIZE CONTRACTOR	25d	12/21/93	1/14/94
INITIATE WATER LINE CONSTRUCTION	137d	1/15/94	5/31/94
WATER LINE CONSTRUCTION COMPLETE	1d	5/31/94	5/31/94
MK FERGUSON PRIVATE WELL LOCKING AND CAPPING	365d	4/1/94	3/31/95



Revised June 2, 1994

Summary

Milestone

ATTACHMENT 9

PUBLIC COMMENT RESPONSE SUMMARY
Engineering Evaluation/Cost Analysis for the Water Policy at the Paducah Gaseous Diffusion Plant
DOE/OR/06-1142&D3

Comment Number	Paragraph or Section	Reviewer Comment	Response to Comment
1	Section 3	Comment from Ronald Lamb: "I wish to submit my comments on the Engineering Evaluation/Cost Analysis for the new water policy at the Paducah Gaseous Diffusion Plant. They are as follows: "No Action: This plan offers no protection for the residents Northwest of the plant. It is documented in Congressional testimony that the Department of Energy and it's operators knowingly allowed the residents to continue their use of the drinking water after finding contamination of radioactivity and solvents in the early 80's. Under the current water policy, we feel that the Department of Energy or operators cannot be trusted with our safety. We also feel that it is expensive and does nothing to alleviate the problem of not having a safe water supply. "Carbon Adsorption/Ion Exchange Treatment: This plan offers little protection to the residents northwest of the plant. Due to varying usage of water, filters may have a shorter life expectancy than others. This could possibly put residents at more risk by concentrating the contaminants in a smaller package. The filters from this plan would have to e stored as a mixed waste; and since the Department of Energy and it's operators have not developed an effective solution for their waste this would compound an already serious situation. This plan is expensive in terms of sampling, maintenance, and storage of waste, and does nothing to alleviate the problem of exposure to residents and the workers involved. "Municipal Water Supply: We, the residents, already had a safe water supply prior (sic) to your operations. I am greatly saddened for the loss of this aquifer and feel it should be restored to it's (sic) original state before the Department of Energy and it's (sic) operators came. Since that is impossible, you should supply the municipal water. This would reduce the risk of further exposure and would be cost effective in terms of less sampling and maintenance. There is one other option that probably should have been considered. The purchase of the property from residents who would choose to sell."	This comment has been interpreted as being generally supportive of the EE/CA. Regarding the loss of an aquifer, interim actions have been initiated toward remediation of the contaminated ground water plumes. The number one priority of PGDP is to safeguard the health and safety of its employees and plant neighbors, as well as to operate in an environmentally safe and efficient manner. Whenever contamination has been discovered, immediate action has been taken to sever the pathway to prevent exposure. PGDP has an extensive detection and monitoring system to help prevent undue risks. The comment regarding the purchase of residential property has been carefully reviewed. This option was eliminated prior to preparation of the EE/CA. Because the contaminants are in the ground water and not in surficial soils, controlling or prohibiting access to the property would not provide protection of human health or the environment in excess of the proposed action to supply municipal water. The U.S. Government performs relocation assistance for "displaced persons" when it exercises its eminent domain rights in a "taking". Case law has developed a number of factors to evaluate when such a taking does occur. In the instant case, there is no evidence to suggest that a taking has occurred.

PUBLIC COMMENT RESPONSE SUMMARY
Engineering Evaluation/Cost Analysis for the Water Policy at the Paducah Gaseous Diffusion Plant
DOE/OR/06-1142&D3

Comment Number	Paragraph or Section	Reviewer Comment	Response to Comment
2	Sections 3.2.1 & 3.2.3	Comment from Christopher J. Marshall of Martin-Marietta Energy Systems: "I hope this statement is satisfactory for the record as a public comment. "During the canvas of the residents living in the affected area of the water policy to have them sign license agreements, I heard several comments from them regarding the future use of their wells under the policy. "One resident, Mr. Terry Jones, stated to me that he did not want his well in any way plugged or abandoned by the water policy. Mr. Jones is currently on well water, although the municipal line has been in from of his house for several years. Mr. Jones has a plant monitoring well on his property, between the plume and his residential well (sic). Mr. Jones wants to use his well in the future if the water policy is terminated. He does not want his well to be plugged or abandoned in any way. I told Mr. Jones that the present water policy would accommodate locking/capping out his well, with the intent of eventually returning the well to Mr. Jones, at the possible termination of the water policy, in the same condition as it was turned over to DOE when he signed the license agreement. Mr. Jones signed the license agreement based on this statement. "Another resident, Mr. Jerry Hyde stated to me that he wants to be able to use his well in the future if he has the opportunity to ever use it again. Plugging or abandoning the well would prohibit that use. "These are comments from the residents as told to me. I hope they can be of use to you. Please call me if you have any questions."	DOE will cap and lock the residential wells in the affected area to prevent unauthorized use. The PGDP Water Policy will be periodically re-evaluated until final Records of Decision are signed to address all ground water contaminant plumes in the area originating from PGDP. An initial re-evaluation is currently scheduled for December, 1997. It is anticipated that control and use of the wells in the affected area will eventually be returned to the landowners.

ATTACHMENT 10

Paducah Gaseous Diffusion Plant
Water Policy

Policy

It is the intent of the PGDP Environmental Restoration Program to offer municipal water service in accordance with this Policy to all existing private residences and businesses within the projected migration area of the contaminated groundwater originating at PGDP (affected area).

Procedure

For all existing residences and businesses within the affected area currently using well water (users), PGDP will, at the U.S. Department of Energy's (DOE's) expense:

- Offer to connect all users to municipal water supply lines.
- Offer to pay the reasonable costs of water bills for "users" whose wells are currently contaminated from the plant or whose wells might potentially become contaminated from the plant, as determined by DOE. Any determination as to the reasonableness of a water bill shall be made by DOE.
- Provide locks for securing wells in the affected area to control unauthorized use of the wells and to ensure access by PGDP for sampling or testing.
- Continue to monitor the extent of contamination to determine movement of contaminated groundwater
- Continue paying reasonable cost of water bills for residences and businesses through December 1997. At that time DOE will re-evaluate this policy and determine whether to continue, modify or terminate it. The long-term responsibilities of DOE in respect to this water policy is expected to ultimately be stipulated in a Record of Decision (ROD). When the ROD is issued, it will supersede whatever policy is in effect at that time.

Those outside the affected area and/or new residences and businesses will be allowed to connect to a municipal water supply at their own expense. Agreements will be developed with each user who is provided water which delineate the responsibilities of both parties, including a provision that no additional water supply wells may be drilled in the affected area. All users will cooperate and work directly with the West McCracken Water District to connect to the water supply.

New residences and businesses that are offered access to a municipal water supply at their own expense within the affected area will not be provided free water under this policy.

It is the intent of PGDP to provide water service comparable to that currently available to and used by people within the affected area. Increases in water usage as a result of increases in agricultural use of water, livestock watering or subdivision of property will not be paid for under this policy.

The implementation of municipal water service to the affected area will modify PGDP's current off-site well sampling policy. These modifications are:

- No residential well that lies outside the boundaries of the water sampling box will be sampled.

- Sample schedules normally will not be changed to accommodate a sample request inside the boundary if there is not a good technical reason driving the schedule change.

The PGDP water policy will be periodically evaluated and modified as conditions warrant.

Exceptions to this policy may be made on a case-by-case basis.

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