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Environmental Restoration Division
Portsmouth Environmental Restoration Program

Applicable or Relevant and Appropriate Requirements (ARARs) for Remedial Actions at the Paducah Gaseous Diffusion Plant

A Compendium of Environmental Laws and Guidance

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PADUCAH GASEOUS DIFFUSION PLANT
Paducah, Kentucky 42001
managed by
MARTIN MARIETTA ENERGY SYSTEMS, INC.
for the
U.S. DEPARTMENT OF ENERGY
under contract DE-AC05-84OR21400

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ACRONYMS

ACL	Alternate concentration limit
ACO	Administrative Consent Order
AEA	Atomic Energy Act
ALARA	As low as reasonably achievable
ANPRM	Advance Notice of Proposed Rulemaking
ARAR	Applicable or relevant and appropriate requirement
BDAT	Best demonstrated available technology
BDT	Best demonstrated technology
CAA	Clean Air Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CSF	Carcinogen slope factor
CWA	Clean Water Act
DCG	Derived concentration guide
DOE	U. S. Department of Energy
DOI	U. S. Department of Interior
EO	Executive Order
EPA	U. S. Environmental Protection Agency
FFCA	Federal Facilities Compliance Agreement
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FR	*Federal Register*
HA	Health Advisory
HSWA	Hazardous and Solid Waste Amendments of 1984
ICRP	International Commission on Radiological Protection
IRIS	*Integrated Risk Information System*
KAR	Kentucky Administrative Regulation
KAS	Kentucky Academy of Science
KDFW	Kentucky Department of Fish and Wildlife
KNPC	Kentucky Nature Preserves Commission
LDR	Land disposal restrictions
LLW	Low-level waste
MCL	Maximum contaminant level
MCLG	Maximum contaminant level goal
NA	Not available
NAAQS	National Ambient Air Quality Standards
NCP	National Contingency Plan
NEPA	National Environmental Policy Act
NESHAPs	National Emission Standards for Hazardous Air Pollutants
NPDES	National Pollutant Discharge Elimination System
NPDWS	National Primary Drinking Water Standards
NPL	National Priorities List
NPRM	Notice of Proposed Rulemaking
NRC	Nuclear Regulatory Commission
NSDWS	National Secondary Drinking Water Standards

NSPS	New Source Performance Standards
ODW	Office of Drinking Water
OSHA	Occupational Safety and Health Administration
OSWER	Office of Solid Waste and Emergency Response
PCB	Polychlorinated biphenyl
PGDP	Paducah Gaseous Diffusion Plant
RCRA	Resource Conservation and Recovery Act
RfC	Reference Concentration
RfD	Reference dose
RI/FS	remedial investigation/feasibility study
SARA	Superfund Amendments and Reauthorization Act
SDWA	Safe Drinking Water Act
SEN	Secretary of Energy Notice
TBC	To be considered
TRU	Transuranic
TSCA	Toxic Substances Control Act
TSD	Treatment, storage, and disposal facilities
UIC	Underground injection control
UST	Underground storage tank
WKWMA	West Kentucky Wildlife Management Area
WQC	Water quality criteria

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EXECUTIVE SUMMARY

Section 121 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 specifies that remedial actions for cleanup of hazardous substances found at sites placed on the National Priorities List (NPL) by the U.S. Environmental Protection Agency (EPA) must comply with applicable or relevant and appropriate requirements (ARARs) or standards under federal and state environmental laws. To date, the U.S. Department of Energy (DOE) Paducah Gaseous Diffusion Plant (PGDP) has not been on the NPL. Although DOE and EPA have entered into an Administrative Consent Order (ACO), the prime regulatory authority for cleanup at PGDP will be the Resource Conservation and Recovery Act (RCRA).

This report supplies a preliminary list of available federal and state ARARs that might be considered for remedial response at PGDP in the event that the plant becomes included on the NPL or the ACO is modified to include CERCLA cleanup. A description of the terms "applicable" and "relevant and appropriate" is provided, as well as definitions of chemical-, location-, and action-specific ARARs. ARARs promulgated by the federal government and by the state of Kentucky are listed in tables. In addition, the major provisions of RCRA, the Safe Drinking Water Act, the Clean Water Act, the Clean Air Act, and other acts, as they apply to hazardous and radioactive waste cleanup, are discussed.

In the absence of ARARs, CERCLA §121 provides for the use of nonpromulgated federal criteria, guidelines, and advisories in evaluating the human risk associated with remedial action alternatives. Such nonpromulgated standards are classified as "to-be-considered" guidance. A discussion of available guidance is given, and human-health-effects data are tabulated. Summary tables list the available federal standards and guidance information.

1. INTRODUCTION

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 was passed by Congress and signed into law on December 11, 1980 (Public Law 96-510). This act was intended to provide for "liability, compensation, cleanup, and emergency response for hazardous substances released into the environment and the cleanup of inactive waste disposal sites." The Superfund Amendments and Reauthorization Act (SARA), adopted on October 17, 1986 (Public Law 99-499), did not substantially alter the original structure of CERCLA but provided extensive amendments to it.

In particular, §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 which are applicable or relevant and appropriate to the hazardous substances or particular circumstances at a site. Inherent in the interpretation of applicable or relevant and appropriate requirements (ARARs) is the assumption that protection of human health and the environment is ensured. The preamble to Subpart E, "Hazardous Substance Response," of the final National Contingency Plan (NCP) (55 *FR* 8687-8775, March 8, 1990) discusses the identification and use of ARARs as the remedial investigation/feasibility study (RI/FS) progresses for a site. The U.S. Environmental Protection Agency (EPA) has provided two reports entitled *CERCLA Compliance with Other Laws Manual*, Vols. I and II (EPA 1988, 1989), which are intended as guidance documents for CERCLA compliance with environmental and public health statutes in implementing remedial actions. Much of the information found in this report was developed from those documents. Subpart K of the NCP, "Federal Facilities," is intended to provide guidance to federal agencies conducting response actions at federal facilities and, when proposed, will be considered for response actions at the Paducah Gaseous Diffusion Plant (PGDP) [Notice of Proposed Rulemaking (NPRM) February 1992, Final Rule expected November 1992].

The U.S. Department of Energy (DOE) owns PGDP, which is managed by Martin Marietta Energy Systems, Inc. PGDP is an operating uranium enrichment facility and has functioned as such since 1952. PGDP is in the Ohio River Basin, situated ~3.7 miles south of the Ohio River; Big Bayou Creek and Little Bayou Creek are located west and east of the plant, respectively, and receive effluents and runoff from the plant. These creeks join downgradient from the plant before flowing into the Ohio River. The plant is located in a predominantly rural area, surrounded by scattered homes and farms. Three groundwater systems have been identified in the area. Although the regional gravel aquifer is the primary source of drinking water for area wells, the shallow groundwater system supplies drinking water to several residences east of the plant. The deep groundwater system is not typically utilized for drinking water in this area. PGDP operates a "nontransient, noncommunity" public water treatment facility.

In August, 1988, off-site sampling of private drinking water wells in the vicinity of PGDP indicated the presence of various contaminants associated with the uranium enrichment process, including trichloroethylene (TCE), TCE degradation products, and ^{99}Tc. On November 23, 1988, EPA and DOE entered into an Administrative Consent Order (ACO) under §§104 and 106 of CERCLA. The objectives of the ACO were to determine the extent

of the threat to human health and the environment from off-site contamination of groundwater from PGDP and to establish workplans and schedules for developing and implementing response actions according to CERCLA. The objectives of the ACO only include the off-site groundwater contamination and the on-site sources of that contamination. This investigation is being conducted in two phases. The purpose of Phase I is to determine the nature and extent of off-site groundwater contamination, while Phase II will evaluate the on-site sources of the groundwater contamination.

A final Hazardous and Solid Waste Amendments (HSWA) permit for PGDP was issued by EPA on July 16, 1991 (effective August 19, 1991) (EPA Permit Number KY8 890 008 982). Appendix A-1(a) of this permit contains a list of all of the known solid waste management units (SWMUs) and areas of concern requiring a Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI), and Appendix A-1(b) contains a list of all of the known SWMUs and areas of concern that are suspected of contributing to off-site releases. These latter sites are the focus of the Phase II study under the ACO. However, in the EPA Region IV response to the DOE/Energy Systems comments regarding the draft EPA HSWA permit for PGDP, it is stated that although the investigations and assessments stipulated in the ACO are to be implemented under CERCLA, the prime regulatory authority for cleanup will be RCRA and the PGDP HSWA permit (Response No. 1 and Figure 1 of the Response). According to EPA, this concept would prevail unless the ACO is modified to include site cleanup or unless PGDP is placed on the National Priorities List (NPL).

The purpose of this report is to supply a preliminary list of available federal and state chemical-, location-, and action-specific ARARs that might be considered for PGDP in the event that the ACO is modified or that the site is placed on the NPL and remediation proceeds under CERCLA. The process of ARAR identification is an iterative one that is continually changing as the RI/FS progresses; actual ARARs are identified only on a site-specific basis. Therefore, this list of ARARs represents a compilation of potential ARARs, of which subsets will be used or additional ARARs added as site-specific contamination at PGDP is characterized and remedial actions selected. No attempt will be made in this report to determine whether the regulations will be either applicable or relevant and appropriate. This will be done on a site-specific basis.

It is understood that DOE will comply with the requirements of the National Environmental Policy Act (NEPA) as specified in DOE Order 5440.1D (*National Environmental Policy Act Compliance Program*). Further, DOE Order 5400.4 (*Comprehensive Environmental Response, Compensation, and Liability Act Requirements*) calls for integration of NEPA and CERCLA requirements for DOE remedial actions at CERCLA sites. This issue has been reaffirmed in the Secretary of Energy Notice of February 5, 1990 (SEN-15-90), which was issued to ensure that DOE's NEPA activities are carried out in a centralized and uniform manner. Therefore, the regulations found in NEPA will not be addressed in this report as ARARs.

Similarly, DOE addresses occupational safety in DOE Orders 5480.11 (*Radiation Protection for Occupational Workers*), 5480.4 (*Environmental Protection, Safety, and Health Protection Standards*), 5483.1A (*Occupational Safety and Health Program for Contractors at GOCO Facilities*), and 5480.9 (*Construction Safety and Health Program*). However, ARARs apply to those federal and state regulations that are designed to protect the environment, and do not generally apply to occupational safety regulations. Therefore, the DOE orders related to occupational safety and the regulations promulgated by the Occupational Safety and Health

Administration (OSHA) are not addressed as ARARs unless they specifically apply to remedial action goals.

The following is a listing of the definitions of terms used throughout this report:

Applicable requirements are "those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site" (52 *FR* 32496, August 27, 1987).

Relevant and appropriate requirements are "those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that, while not applicable to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site" (52 *FR* 32496).

Requirements under federal or state law may be *either* applicable *or* relevant and appropriate to CERCLA cleanup actions, but not both. However, requirements must be *both* relevant *and* appropriate for compliance to be necessary. In the case where a federal and a state ARAR are available, or where there are two potential ARARs addressing the same issue, the more stringent regulation must be selected. However, CERCLA §121(d)(4) provides several ARAR waiver options that may be invoked, providing that the basic premise of protection of human health and the environment is not ignored. A waiver is available for state standards that have not been applied uniformly in similar circumstances across the state. In addition, CERCLA §121(d)(2)(C) forbids state standards that effectively prohibit land disposal of hazardous substances.

CERCLA on-site remedial response actions must only comply with the substantive requirements of a regulation and not the administrative requirements to obtain federal, state, or local permits [CERCLA §121(e)]. To ensure that CERCLA response actions proceed as rapidly as possible, EPA has reaffirmed this position in the final NCP (55 *FR* 8756). **Substantive requirements** pertain directly to the actions or conditions at a site, while **administrative requirements** facilitate their implementation. EPA recognizes that certain of the administrative requirements such as consultation with state agencies, reporting, etc., are accomplished through the state involvement and public participation requirements of the NCP. These administrative requirements should be observed if they are useful in determining cleanup standards at the site (55 *FR* 8757).

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 guidance for setting protective cleanup levels. These are not potential ARARs but are **"to-be-considered" (TBC)** guidance.

2. CHEMICAL-SPECIFIC ARARs

"Chemical-specific requirements set health or risk-based concentration limits or discharge limitations in various environmental media for specific hazardous substances, pollutants, or contaminants" (52 *FR* 32496). These requirements generally set protective cleanup levels for the chemicals of concern in the designated media or else indicate a safe level of discharge that may be incorporated when considering a specific remedial activity. A variety of hazardous substances, including radioactive, nonradioactive, and mixed hazardous wastes have been disposed of for many years at PGDP. Metals, organic chemicals, and radionuclides have been detected in all environmental media: air, surface water, groundwater, soil, and sediment.

Although limited in number, chemical-specific standards have been established under several statutes, including RCRA, the Safe Drinking Water Act (SDWA), the Clean Water Act (CWA), and the Clean Air Act (CAA).

2.1 GROUNDWATER AND SURFACE WATER

Table 1 lists available chemical-specific ARARs that have been promulgated under federal law for contaminated groundwater or surface water that may be used for drinking water at PGDP. The regulations for air are described in Sects. 2.2 and 5.2.

As stated in the NCP (55 *FR* 8666), the goal of EPA's approach to cleanup of contaminated groundwater is to return usable groundwater to its beneficial use within a given time frame that is reasonable for the particular circumstances at a CERCLA site. Classes I and IIA represent current sources of drinking water of varying value; Class IIB represents potential sources of drinking water. Groundwater at PGDP has been used for private drinking water and therefore may be classified as Class I or Class II groundwater.

In the NCP, EPA states the preference for SDWA maximum contaminant levels (MCLs) and nonzero maximum contaminant level goals (MCLGs) or other health-based standards, criteria, or guidance for cleanup of Class I and Class II groundwater at CERCLA sites (55 *FR* 8732). Alternate concentration limits (ACLs) may also be used when active restoration of the groundwater to MCLs or nonzero MCLGs is not practicable (55 *FR* 8754).

2.1.1 Resource Conservation and Recovery Act

Subtitle C of RCRA lists maximum concentration levels for 14 chemicals; the concentration of these chemicals in groundwater at the plant boundary of a RCRA-permitted treatment, storage, or disposal (TSD) facility may not exceed the stated maximum concentration level [Title 40, Code of Federal Regulations, Part 264, §94 (40 CFR 264.94)]. In addition, background concentrations or ACLs are established in 40 CFR 264.94 as groundwater protection standards. Table 1 lists RCRA MCLs; however, as mentioned above, EPA has specified SDWA MCLs for cleanup of Class I and Class II groundwater. This approach is consistent with the substantive requirements of RCRA MCLs, ACLs, or background limits (53 *FR* 51433). The newly promulgated regulations for municipal landfills (56 *FR* 50978, October 9, 1991) establish all SDWA MCLs by reference, ACLs, or background concentrations as groundwater protection standards (40 CFR 258.55). Although not legally applicable to the remedial action sites found at PGDP, these may prove relevant

Table 1. Chemical-specific federal ARARs for protection of human health[a,b]

Chemical	RCRA[c] MCLs[d] (μg/L)	Safe Drinking Water Act MCLs (μg/L)	Safe Drinking Water Act MCLGs[e,f] (μg/L)	Kentucky MCLs[d,g] (μg/L)
Acrylamide[h]		TT[i]	0	
Alachlor[h]		2	0	
Aldicarb[j]		3	1	
Aldicarb sulfone[j]		2	1	
Aldicarb sulfoxide[j]		4	1	
Arsenic[k]	50	50		50
Asbestos (fibers >10μm)[h]		7[l]	7[l]	
Atrazine[h]		3	3	
Barium[j]	1,000	2,000	2,000	1,000
Benzene[m]		5	0	5
Cadmium[n]	10	5	5	10
Carbofuran[h]		40	40	
Carbon tetrachloride[m]		5	0	5
Chlordane[h]		2	0	
Chromium (total)[n]	50	100	100	50
Copper[p]		1300	1300	
1,2-Dibromo-3-chloropropane[h]		0.2	0	
o-Dichlorobenzene[h]		600	600	
p-Dichlorobenzene[m]		75	75	75
1,2-Dichloroethane[m]		5	0	5
1,1-Dichloroethylene[m]		7	7	7
cis-1,2-Dichloroethylene[h]		70	70	
trans-1,2-Dichloroethylene[h]		100	100	
2,4-Dichlorophenoxyacetic acid (2,4-D)[n]	100	70	70	100
1,2-Dichloropropane[h]		5	0	
Endrin[k]	0.2	0.2		0.2
Epichlorohydrin[h]		TT[i]	0	

Table 1 (continued)

Chemical	RCRA[c] MCLs[d] (μg/L)	Safe Drinking Water Act MCLs (μg/L)	Safe Drinking Water Act MCLGs[e,f] (μg/L)	Kentucky MCLs[d,g] (μg/L)
Ethylbenzene[h]		700	700	
Ethylene dibromide[h]		0.05	0	
Fluoride[q]		4,000	4,000	4,000
Heptachlor[h]		0.4	0	
Heptachlor epoxide[h]		0.2	0	
Lead	50	15[p]	0	50
Lindane (gamma-HCCH)[n]	4	0.2	0.2	4
Mercury[r]	2	2	2	2
Methoxychlor[n]	100	40	40	100
Monochlorobenzene[h]		100	100	
Nitrate (as N)[n]		10,000	10,000	10,000
Nitrite (as N)[h]		1,000	1,000	
Nitrate + Nitrite (as N)[h]		10,000	10,000	
Pentachlorophenol[j]		1	0	
Polychlorinated biphenyls[k]		0.5	0	
Selenium[n]	10	50	50	10
Silver[v]	50			50
Styrene[h]		100	100	
Tetrachloroethylene[h]		5	0	
Toluene[h]		1,000	1,000	
Toxaphene[n]	5	3	0	5
1,1,1-Trichloroethane[m]		200	200	200
Trichloroethylene[m]		5	0	5
Trihalomethanes (total)[k,w]		100		100
2,4,5-Trichlorophenoxy-propionic acid (2,4,5-TP)[n]	10	50	50	10

Table 1 (continued)

Chemical	RCRA[c] MCLs[d] (μg/L)	Safe Drinking Water Act MCLs (μg/L)	Safe Drinking Water Act MCLGs[e,f] (μg/L)	Kentucky MCLs[d,g] (μg/L)
Vinyl chloride[m]		2	0	2
Xylenes (total)[h]		10,000	10,000	

[a]ARAR = applicable or relevant and appropriate requirements.

[b]Federally promulgated regulations under RCRA, the Safe Drinking Water Act, and the Clean Air Act are included in this table. EPA is currently evaluating use of federal water quality criteria for protection of human health as ARARs.

[c]RCRA = Resource Conservation and Recovery Act (40 CFR 264.94).

[d]MCL = maximum contaminant level; RCRA MCLs are properly termed "maximum concentration limits."

[e]MCLG = maximum contaminant level goal.

[f]Proposed MCLGs are not considered ARARs until promulgated and are listed in Table 2.

[g]Kentucky Public and Semipublic drinking Water Regulations, Title 401 Kentucky Administrative Record (KAR) Chapter 8:250-420.

[h]56 *FR* 3526 (January 30, 1991). Effective July 30, 1992.

[i]TT = treatment technology.

[j]56 *FR* 30266 (July 1, 1991). Effective January 1, 1993.

[k]40 *FR* 59570 (December 24, 1975). A new MCL for Endrin has been proposed (see Table 2).

[l]Million fibers per liter.

[m]52 *FR* 25690 (July 8, 1987).

[n]The final MCL/MCLG was set for this chemical (56 *FR* 3526, January 30, 1991), and supercedes the original interim SDWA MCL. Effective July 30, 1992; interim MCLs remain in effect until that time.

[o]56 *FR* 26460 (June 7, 1991). This "action level," when measured in the 90th percentile at the consumer's tap, triggers initiation of corrosion control studies and treatment requirements. Effective December 7, 1992. Interim MCL of 50 μg/L for lead remains in effect until that time.

[q]MCL - 51 *FR* 11396 (April 2, 1986); applies to community water systems only. MCLG - 50 *FR* 47141 (November 14, 1985).

[r]The interim SDWA MCL was revoked for this chemical (56 *FR* 3526, January 30, 1991) and a secondary MCL established instead (see Table 3). Effective July 30, 1992; interim MCL remains in effect until that time.

[w]Total trihalomethanes refers to the sum of the concentration of chloroform, bromodichloromethane, dibromochloromethane, and bromoform.

and appropriate for cleanup of groundwater at some of the sites. ACLs may be calculated for chemicals without an MCL using a risk-based approach (56 *FR* 51026).

2.1.2 Safe Drinking Water Act

EPA has promulgated primary and secondary drinking water regulations applicable to public water systems that have at least 15 service connections or serve an average of at least 25 people daily at least 60 days of the year. National Primary Drinking Water Standards (NPDWS) are established in 40 CFR 141 and include MCLs and MCLGs. New drinking water standards promulgated for eight synthetic organic chemicals (52 *FR* 25690, July 8, 1987) added a new category of suppliers referred to as noncommunity, nontransient systems that regularly serve at least 25 people for 6 months of the year. Table 1 lists SDWA MCLs and MCLGs.

MCLs are enforceable standards that take into consideration human-health effects, available treatment technologies, and costs of treatment. MCLGs are strictly health-based standards that disregard cost or treatment feasibility and are not legally enforceable. MCLs are legally applicable to water "at the tap" but are not applicable to cleanup of groundwater or surface water. However, they may be considered as relevant and appropriate in situations where groundwater or surface water may be used for drinking water. CERCLA §121(d)(2)(A) specifically mentions that remedial actions must require a level or standard of control that at least attains MCLGs and federal ambient water quality criteria (WQC) where such goals or criteria are relevant and appropriate under the circumstances of the release. Although MCLGs and WQC are nonenforceable guidelines, Congress elevated them to a higher status by specifically mentioning them in CERCLA. Therefore, promulgated MCLGs are listed in Table 1. At present, EPA is planning to use the SDWA MCLs for remedial action compliance for carcinogens which have an MCLG of zero and any nonzero MCLG for systemic toxicants (55 *FR* 8752).

The SDWA amendments of 1986 mandated that EPA propose MCLs and MCLGs for contaminants in drinking water which may cause any adverse effect on human health. Proposed MCLs/MCLGs have appeared in 55 *FR* 30370 (July 25, 1990). Table 2 lists the proposed MCLs/MCLGs. When the proposed MCLs/MCLGs are promulgated and become effective, they will be considered relevant and appropriate for cleanup at PGDP (a final rule is expected February 1992).

EPA has revised its drinking water standards for lead and copper, eliminating the MCL and replacing it with an "action level" of 15 μg/L and 1300 μg/L, respectively (56 *FR* 26460, June 7, 1991), applicable to community and nontransient, noncommunity water systems. Included in the national primary drinking water regulation is a treatment technique requirement. If the "action level" for lead or copper is exceeded at the tap, a state is required to analyze source-water samples and to decide what treatment levels are necessary to minimize lead or copper levels delivered to users from the affected distribution system. Because PGDP operates a nontransient, noncommunity public water system, these "action levels" will be legally applicable at PGDP. In the event that the amount of lead or copper at the tap exceeds the "action levels" (see the final rule for a description of the monitoring techniques), the source-water treatment requirements may become ARARs for cleanup of lead- or copper-contaminated groundwater at PGDP.

Table 2. Proposed Safe Drinking Water Act maximum contaminant level goals (MCLGs) and maximum contaminant levels (MCLs)[a]

Chemical	Proposed MCLG (μg/L)	Proposed MCL (μg/L)
Adipates [di(ethylhexyl)adipate]	500	500
Antimony	3	10/5[b]
Beryllium	0	1
Cyanide	200	200
Dalapon	200	200
Dichloromethane (methylene chloride)	0	5
Dinoseb	7	7
Diquat	20	20
Endothall	100	100
Endrin	2	2
Glycophosate	700	700
Hexachlorobenzene	0	1
Hexachlorocyclopentadiene	50	50
Nickel	100	100
Oxamyl (Vydate)	200	200
Polyaromatic hydrocarbons (PAHs)		
Benzo(a)pyrene	0	0.2
Benz(a)anthracene[c]	0	0.1
Benzo(b)fluoranthene[c]	0	0.2
Benzo(k)fluoranthene[c]	0	0.2
Chrysene[c]	0	0.2
Dibenz(a,h)anthracene[c]	0	0.3
Indenopyrene[c]	0	0.4
Phthalates [di(ethylhexyl) phthalate]	0	4
Picloram	500	500
Simazine	1	1
Sulfate[d]	400,000/500,000	400,000/500,000
Thallium	0.5	2/1[d]
2,3,7,8-Tetrachlorodibenzo-*p*-dioxin (dioxin)	0	0.00005
1,2,4-Trichlorobenzene	9	9
1,1,2-Trichloroethane	3	5

[a]55 *FR* 30370 (July 25, 1990). A final rule is expected March 1992.
[b]EPA proposes two MCLs for public comment based on two practical quantitation limits.
[c]In addition to an MCL/MCLG for benzo(a)pyrene, EPA proposes, as a second option for public comment, MCLs/MCLGs for these PAHs.
[d]Two options are presented for public comment.

The Kentucky Administrative Regulation (KAR) lists MCLs for public water systems [Kentucky Public and Semipublic Drinking Water Regulations, Title 401 KAR 8:250 (inorganic chemicals); 8:400 (organic chemicals); 8:420 (volatile organics); 8:500 (trihalomethanes); and 8:550 (radionuclides)]. In most cases, the Kentucky MCLs are identical to the federal MCLs; however, several of the recently adopted federal MCLs are less stringent than the state MCLs, and therefore the more stringent Kentucky MCLs would be

relevant and appropriate for cleanup of groundwater and surface water that may be used for drinking water purposes at PGDP. However, the Kentucky Office of Drinking Water plans to revise the state drinking water regulations to adopt the federal MCLs when they become effective (July 30, 1992). The revised state MCLs would be expected to become effective mid-1993 (Schiefferle 1991).

National Secondary Drinking Water Standards (NSDWS) regulate contaminants that affect the aesthetic qualities related to public acceptance of drinking water and are implemented in 40 CFR 143.3 as secondary maximum contaminant levels (SMCLs). These regulations are not federally enforceable, but rather are intended to serve as guidelines for use by states in regulating water supplies. Kentucky has promulgated secondary drinking water regulations in Title 401 KAR 8:600 (see Table 3). The regulations stipulate that suppliers of public and semipublic drinking water systems treat existing sources of water so that the water meets the secondary standards listed in Table 3. In that context, the secondary standards would not be legally applicable to cleanup of groundwater or surface water, but may be considered as relevant and appropriate in instances where these media may provide private drinking water sources. EPA has proposed NSDWS for ten additional contaminants (54 *FR* 22062, May 22, 1989; 55 *FR* 30370 July 25, 1990). When these are promulgated they will be incorporated into the Kentucky secondary drinking water regulations (Schiefferle 1991); therefore, they are included in Table 3 for completeness. A final rule for two of the proposed NSDWS has appeared (56 *FR* 3526, January 30, 1991).

2.1.3 Clean Water Act

CERCLA §121(d)(2)(A) specifically states that remedial actions shall at least attain federal ambient WQC established under the CWA if they are relevant and appropriate. In determining whether any WQC are relevant and appropriate, one must consider the "designated or potential use of the surface or groundwater, the environmental media affected, the purposes for which the criteria were developed, and the latest information available" [CERCLA §121(d)(2)(B)]. Federal WQC are derived for the protection of freshwater aquatic organisms and for the protection of human health from the consumption of contaminated drinking water and/or aquatic organisms.

Table 4 lists ambient WQC for the protection of human health. EPA has derived WQC for ingestion of drinking water and aquatic organisms and for the ingestion of aquatic organisms alone. Since neither of these categories is relevant and appropriate for consideration of contaminated groundwater, WQC derived for the ingestion of drinking water alone are also included in Table 4. The EPA Region IV Water Quality Standards Unit has adjusted WQC for human health based on recent human toxicity information [Reference Doses (RfDs) and carcinogen slope factors (CSFs)] obtained from the EPA *Integrated Risk Information System (IRIS)*. The values presented in Table 4 reflect the EPA Region IV revised WQC and are current as of October 1991 (EPA 1991a). They are intended to supercede all previous WQC.

As part of the federal requirement for a triennial review of state water quality standards, Kentucky will consider adopting the EPA Region IV WQC (late 1993); however, to date, Kentucky has not adopted the revised EPA Region IV WQC into their promulgated regulations (Anderson 1991). Therefore, the current Kentucky WQC are listed in Table 5. Because the state WQC are promulgated regulations, they will be legally applicable to cleanup of surface water that may be used for domestic water supplies.

Table 3. Federal and Kentucky secondary drinking water regulations[a]

Chemical	Federal SMCL[a] (mg/L)	Kentucky SMCL[b] (mg/L)
Aluminum	0.05–0.02[c,d]	
Chloride	250	250
Color	15 (color units)	15 (color units)
Copper	1	1
o-Dichlorobenzene	0.01[e]	
p-Dichlorobenzene	0.005[e]	
Ethylbenzene	0.03[e]	
Fluoride	2.0	2.0
Hexachlorocyclopentadiene	0.008[f]	
Hydrogen sulfide		0.05
Iron	0.3	0.3
Manganese	0.05	0.05
Odor	3 (threshold odor number)	3 (threshold odor number)
Pentachlorophenol	0.03[e]	
Phenols		0.001
pH	6.5–8.5	6.5–8.5
Silver	0.1[c]	
Styrene	0.01[e]	
Sulfate	250	250
Toluene	0.04[e]	
TDS (total dissolved solids)	500	500
Xylene	0.02[e]	
Zinc	5	5

[a]SMCL = secondary maximum contaminant level. Final rule [44 *FR* 42198 (July 19, 1979)].

[b]Kentucky Public and Semipublic Drinking Water Regulations, Title 401, KAR 8:600

[c]NSDWS final rule [56 *FR* 3526 (January 30, 1991)]. Effective date July 30, 1992.

[d]Level recommended to prevent posttreatment precipitation in the distribution system.

[e]Proposed NSDWS (54 *FR* 22062, May 22, 1989). EPA has deferred setting final standards for these chemicals pending further study (56 *FR* 3572, January 30, 1991).

[f]Proposed NSDWS (55 *FR* 30370, July 25, 1990); final rule expected February 1992.

Table 4. Federal ambient water quality criteria (WQC) for the protection of human health (μg/L)

Chemical	WQC for aquatic organisms and drinking water[a]	WQC for aquatic organisms alone[a]	WQC for drinking water alone[b]
Acenaphthene	20 (org)[c]	NA	2,100
Acrolein	320	780	
Acrylonitrile	0 (0.059)	0 (0.67)	0 (0.065)
Aldrin	0 (1.3E-04)[d]	0 (1.4E-04)	0 (2.1E-03)
Anthracene	9,567.2	107,692	10,500
Antimony	14	4,308	14
Arsenic	0 (0.018)	0 (0.14)	0 (0.02)
Asbestos	0 (30,000 fibers/L)	NA	
Benzene	0 (1.18)	0 (71.28)	0 (1.2)
Benzidine	0 (1.2E-04)	0 (5.4E-04)	0 (1.5E-04)
Benzo(a)anthracene	0 (2.8E-03)	0 (0.031)	
Benzo(a)pyrene	0 (2.8E-03)	0 (0.031)	
Benzo(k)fluoranthene	0 (2.8E-03)	0 (0.031)	
3,4-Benzofluoranthene	0 (2.8E-03)	0 (0.031)	
Beryllium	0 (7.7E-03)	0 (0.13)	0 (8.1E-03)
Bromoform	0 (4.38)	0 (363.5)	0 (4.4)
Carbon tetrachloride	0 (0.254)	0 (4.42)	0 (0.27)
Chlordane	0 (5.8E-04)	0 (5.9E-04)	0 (0.03)
Chlorinated benzenes			
Monochlorobenzene	20 (org)	NA	700
1,2-Dichlorobenzene	2,667	17,432	3,150
1,3-Dichlorobenzene	400	2,600	
1,4-Dichlorobenzene	400	2,600	
1,2,4,5-Tetrachlorobenzene	38	48	
Pentachlorobenzene	74	85	
Hexachlorobenzene	0 (7.5E-04)	0 (7.7E-04)	
Chlorinated ethanes			
1,2-Dichloroethane	0 (0.38)	0 (98.6)	0 (0.38)
1,1,1-Trichloroethane	3,094	173,077	3,150
1,1,2-Trichloroethane	0 (0.605)	0 (41.99)	0 (0.61)
1,1,2,2-Tetrachloroethane	0 (0.172)	0 (10.8)	0 (0.175)
Hexachloroethane	0 (1.95)	0 (8.85)	0 (2.5)
Chlorinated phenols			
2-Chlorophenol	0.1 (org)[c]	NA	175
2,4-Dichlorophenol	0.3 (org)[c]	NA	105
2,4,5-Trichlorophenol	1.0 (org)[c]	NA	
2,4,6-Trichlorophenol	0 (2.1)	0 (6.5)	0 (3.2)
Pentachlorophenol	0 (0.28)	0 (8.2)	0 (0.29)
3-Methyl-4-chlorophenol	3,000 (org)[c]	NA	
Chloroalkyl ethers			
bis-(Chloromethyl) ether	0 (1.6E-04)	0 (0.077)	0 (1.6E-04)
bis-(2-Chloroethyl) ether	0 (0.031)	0 (1.42)	0 (0.032)
bis-(2-Chloroisopropyl) ether	1,389	174,400	1,400
Chlorodibromomethane	0 (0.412)	0 (34.2)	0 (0.417)
Chloroform	0 (5.67)	0 (470.8)	0 (5.74)

Table 4. (continued)

Chemical	WQC for aquatic organisms and drinking water[a]	WQC for aquatic organisms alone[a]	WQC for drinking water alone[b]
Chromium (III)	33,300	673,077	35,000
Chrysene	0 (2.8E-03)	0 (0.031)	
Copper	1,000 (org)[c]	NA	
DDD	0 (8.3E-04)	0 (8.3E-04)	0 (0.15)
DDE	0 (5.9E-04)	0 (5.9E-04)	0 (0.103)
DDT	0 (5.9E-04)	0 (5.9E-04)	0 (0.103)
Dibenz(a,h)anthracene	0 (2.8E-03)	0 (0.031)	
3,3'-Dichlorobenzidine	0 (0.04)	0 (0.77)	0 (0.078)
Dichlorobromomethane	0 (0.27)	0 (22.1)	0 (0.27)
Dichlorodifluoromethane	0 (5.67)	0 (470.8)	
1,1-Dichloroethylene	0 (0.06)	0 (3.2)	0 (0.058)
Dichloropropanes/Dichloropropenes			
cis-1,3-Dichloropropene	10.4	1,691	10.5
trans-1,3-Dichloropropene	10.4	1,691	10.5
Dieldrin	0 (1.4E-04)	0 (1.4E-04)	0 (2.2E-03)
2,4-Dimethylphenol	400 (org)[c]	NA	200
2,4-Dinitrotoluene	0 (0.11)	0 (9.1)	
1,2-Diphenylhydrazine	0 (0.041)	0 (0.54)	0 (0.044)
Endosulfan (*a*-,*b*-)	0.932	1.99	1.8
Ethylbenzene	3,120	28,718	3,500
Fluoranthene	295.5	374.6	1,400
Fluorene	1,275.6	14,358.5	1,400
Halomethanes	0 (5.67)	0 (470.8)	
Heptachlor	0 (2.1E-04)	0 (2.1E-04)	0 (8.1E-03)
Heptachlor epoxide	0 (1.0E-04)	0 (1.0E-04)	0 (3.8E-03)
Hexachlorobutadiene	0 (0.45)	0 (49.7)	0 (0.45)
Hexachlorocyclohexanes (HCCH)			
Alpha-HCCH	0 (0.004)	0 (0.013)	0 (5.5E-03)
Beta-HCCH	0 (0.014)	0 (0.046)	0 (0.02)
Gamma-HCCH	0 (0.019)	0 (0.063)	
Hexachlorocyclopentadiene	1 (org)[c]	NA	245
Indeno(1,2,3-cd)pyrene	0 (2.8E-03)	0 (0.031)	
Isophorone	0 (8.42)	0 (599.7)	0 (8.5)
Mercury	0.151	0.153	
Methyl bromide	48	4,020	49
Methyl chloride	0 (5.67)	0 (470.8)	
Methylene chloride	0 (4.65)	0 (1,578)	0 (4.7)
Nickel	607	4,584	700
Nitrobenzene	17.3	1,863	17.5
Nitrophenols			
2,4-Dinitrophenol	69.7	14,264	70
2,Methyl-4,6-dinitrophenol	13.4	765	
Nitrosamines			
n-Nitrosodimethylamine	0 (6.9E-04)	0 (8.12)	0 (6.8E-04)
n-Nitrosodiphenylamine	0 (4.95)	0 (16.2)	0 (7.1)
n-Nitrosopyrrolidine	0 (0.016)	0 (91.9)	
Pentachlorobenzene	74	85	

Table 4. (continued)

Chemical	WQC for aquatic organisms and drinking water[a]	WQC for aquatic organisms alone[a]	WQC for drinking water alone[b]
Phenol	300 (org)[c]	4,615,385	21,000
Phthalate esters			
Butylbenzyl phthalate	2,984	5,202	7,000
Diethylphthalate	22,631	118,019	10,500
Dimethylphthalate	313,000	2,900,000	
Di-*n*-butylphthalate	2,715	12,100	3,500
Bis-2-ethylhexylphthalate	0 (1.8)	0 (5.9)	0 (2.5)
Polychlorinated biphenyls (PCBs) (1016, 1221, 1242, 1254, 1260)	0 (4.4E–05)	0 (4.5E–05)	0 (4.5E–03)
Polynuclear aromatic hydrocarbons (PAHs)	0 (2.8E–03)	0 (3.11E–02)	
Pyrene	956.7	10,769.2	1,500
2,3,7,8-Tetrachlorodibenzo-*p*-dioxin	0 (1.3E–08)	0 (1.4E–08)	0 (2.2E–07)
1,2,4,5-Tetrachlorobenzene	38	48	
Tetrachloroethylene	0 (0.8)	0 (8.9)	
Thallium	13	48	
Toluene	6,764.8	201,294	70,000
Toxaphene	0 (7.3E–04)	0 (7.5E–04)	0 (0.032)
Trichloroethylene	0 (2.7)	0 (80.7)	
Trichlorofluoromethane	0 (5.67)	0 (470.8)	
Vinyl chloride	0 (2)	0 (525)	
Zinc	5,000 (org)[c]	NA	

[a]The criterion value of zero for all potential carcinogens is listed in the table. Concentrations in parentheses for potential carcinogens correspond to a risk of 10^{-6}.

[b]These adjusted criteria, for drinking water ingestion only, are estimated using a reference dose or carcinogen potency factor and a body weight of 70 kg and water ingestion rate of 2 L/d.

[c]Criteria designated as organoleptic are based on taste and odor effects rather than on human-health effects. Health-based WQC are not available for these chemicals.

[d]Read as 1.3×10^{-4}.

NA = not available.

Source: EPA 1991a. EPA Region IV Criteria Charts (October).

Table 5. Kentucky ambient water quality criteria (WQC) for the protection of human health (μg/L)[a,b]

Chemical	WQC for aquatic organisms and drinking water	WQC for aquatic organisms alone
Acrolein	320	780
Acrylonitrile (C)	0 (5.8 E-02)[c]	0 (6.5 E-01)
Aldrin (C)	0 (7.4 E-05)	0 (7.9 E-05)
Antimony	146	45,000
Asbestos (C)	0 (30,000 fibers/L)	
Barium	1,000	
Benzene (C)	0 (6.6 E-01)	0 (40)
Benzidine (C)	0 (1.2 E-04)	0 (5.3 E-04)
Beryllium (C)	0 (6.8 E-03)	0 (1.2 E-01)
Cadmium	10	10
Carbon tetrachloride (C)	0 (4.0 E-01)	0 (6.9)
Chlordane (C)	0 (0.46 E-03)	0 (4.8 E-04)
Chloride	250,000	NA
Chlorinated benzenes		
Monochlorobenzene	488	NA
Dichlorobenzenes (all isomers)	400	2,600
1,2,4,5-Tetrachlorobenzene	38	48
Pentachlorobenzene	74	85
Hexachlorobenzene (C)	0 (0.72 E-03)	0 (7.4 E-04)
Chlorinated ethanes		
1,2-Dichloroethane (C)	0 (9.4 E-01)	0 (243)
1,1,1-Trichloroethane	18,400	1,030,000
1,1,2-Trichloroethane (C)	0 (6.0 E-01)	0 (41.8)
1,1,2,2-Tetrachloroethane (C)	0 (1.7 E-01)	0 (10.7)
Hexachloroethane (C)	0 (1.9)	0 (8.74)
Chlorinated phenols		
2,4-Dichlorophenol	3,090	NA
2,4,5-Trichlorophenol	2,600	NA
2,4,6-Trichlorophenol (C)	0 (1.2)	0 (3.6)
Pentachlorophenol	1,000	NA
Chloroalkyl ethers		
bis-(2-Chloroethyl) ether (C)	0 (3.0 E-02)	0 (1.36)
bis-(2-Chloroisopropyl)ether	34.7	4,360
Chloroform (C)	0 (1.9 E-01)	0 (15.7)
Chromium (IV)	50	NA
Chromium (III)	170,000	3,433,000
Copper	1,000	NA

Table 5 (continued)

Chemical	WQC for aquatic organisms and drinking water	WQC for aquatic organisms alone
Cyanide	200	NA
DDT (C)	0 (2.4 E-05)	0 (2.4 E-05)
Dichlorobenzidine (C)	0 (1.0 E-02)	0 (2.0 E-02)
Dichloroethylenes		
1,1-Dichloroethylene (C)	0 (3.3 E-02)	0 (1.85)
Dichloropropanes/dichloro-propenes		
Dichloropropenes	87	14,100
Dieldrin (C)	0 (7.1 E-05)	0 (7.6 E-05)
2,4-Dinitrotoluene (C)	0 (1.1 E-01)	0 (9.1)
1,2-Diphenylhydrazine (C)	0 (4.2 E-02)	0 (5.6 E-01)
Endosulfan	74	159
Endrin	1.0	NA
Ethylbenzene	1,400	3,280
Fluoride	1,000	NA
Fluoranthene	42	54
Halomethanes (C)	0 (1.9 E-01)	0 (15.7)
Heptachlor (C)	0 (0.28 E-03)	0 (2.9 E-04)
Hexachlorobutadiene (C)	0 (4.5 E-01)	0 (50)
Hexachlorocyclohexanes (HCCH)		
Alpha-HCCH (C)	0 (9.0 E-03)	0 (3.1 E-02)
Beta-HCCH (C)	0 (1.6 E-02)	0 (5.5 E-02)
Gamma-HCCH (C)	0 (1.9 E-02)	0 (62.5 E-03)
Technical-HCCH (C)	0 (1.2 E-02)	0 (41.4 E-03)
Hexachlorocyclopentadiene	206	NA
Isophorone	5,200	520,000
Lead	50	NA
Manganese	50	NA
Mercury	144	14.6 E-02
Nickel	13.4	100
Nitrates	10,000	NA
Nitrobenzene	19,800	NA
Nitrophenols		
2,4-Dinitro-o-cresols	13.4	765
Dinitrophenol	70	14,300
Nitrosamines		
n-Nitrosodimethylamine (C)	0 (1.4 E-03)	0 (16)
n-Nitrosodiethylamine (C)	0 (0.8 E-03)	0 (1.24)
n-Nitrosodi-n-butylamine (C)	0 (6.4 E-03)	0 (5.9 E-01)

Table 5 (continued)

Chemical	WQC for aquatic organisms and drinking water	WQC for aquatic organisms alone
n-Nitrosodiphenylamine (C)	0 (4.9)	0 (16)
n-Nitrosopyrrolidine (C)	0 (1.6 E-02)	0 (92)
Pentachlorophenol	1,000	NA
Phenol	3,500	NA
Phthalate esters		
Dimethylphthalate	313,000	2,900,000
Diethylphthalate	350,000	1,800,000
Dibutylphthalate	34,0001	54,000
Di-2-ethylhexylphthalate	15,000	50,000
Polychlorinated biphenyls (C)	0 (7.9 E-05)	0 (7.9 E-05)
Polynuclear aromatic hydrocarbons (C)	0 (2.8 E-03)	0 (31.1 E-03)
Selenium	10	NA
Silver	50	NA
Sulfates and chlorides	250,000	NA
2,3,7,8-Tetrachlorodibenzo-p-dioxin (C)	0 (1.3 E-08)	0 (1.4 E-08)
Tetrachloroethylene (C)	0 (8.0 E-01)	0 (8.85)
Thallium	13	48
Toluene	14,300	424,000
Toxaphene (C)	0 (7.1 E-04)	0 (0.73 E-03)
Trichloroethylene (C)	0 (2.7)	0 (80.7)
Vinyl chloride (C)	0 (2.0)	0 (525)

[a]All potential carcinogens are noted with a (C) in the list of chemicals. The EPA criterion value of zero for all potential carcinogens is listed in the table. Concentrations in parentheses for potential carcinogens correspond to a risk of 10^{-6}. Kentucky also uses a risk of 10^{-6} for potential carcinogens.

[b]Kentucky Water Quality Regulations. Kentucky Administrative Record Title 401, Chapter 5:031 (Surface Water Standards).

[c]Read as 5.8×10^{-2}.

NA = not available.

However, because the EPA Region IV WQC have been calculated based on the most current scientific information, they may be considered relevant and appropriate to cleanup at PGDP. The NCP states that if two ARARs are available for a chemical, the most stringent applies [40 CFR 300.400(g)(4)]. In addition, CERCLA stipulates that WQC must be based on the most current scientific information [CERCLA §121(d)(2)(B)]. The use of the appropriate WQC for cleanup at PGDP will depend on the use classification of the stream in question and the scientific rationale for calculation of the WQC; these will be analyzed on a site-specific basis. When the Kentucky Office of Water Quality revises its current WQC, this table will be revised accordingly.

The Kentucky regulations list six use-designation categories for Kentucky's surface waters and groundwaters (Title 401 KAR 5:026). Specific water quality standards are promulgated

for each use category. Kentucky has classified the Ohio River in McCracken and Ballard counties for domestic water supply, warm water aquatic habitat, and primary and secondary contact recreation (401 KAR 5:026). In addition, certain portions of the Ohio River are designated as outstanding resource waters (see Sect. 4.6). The Kentucky standards also state that "all other surface waters which have not been specifically listed for use classifications shall be classified for domestic water supply, warm water aquatic habitat, and primary and secondary contact recreation" (401 KAR 5:026). Little and Big Bayou Creeks would therefore have these use classifications by reference.

Table 6 lists federal WQC for the protection of freshwater aquatic life. When the designated use classification requires protection of aquatic life or when environmental factors are being considered at a remedial action site, WQC for the protection of aquatic life that are more stringent than the SDWA MCL may be relevant and appropriate (55 *FR* 8754) for CERCLA cleanup. The Kentucky WQC for a warm water habitat are found in Title 401 KAR 5:031 (Table 2 of Kentucky surface water standards); these criteria are identical to the federal WQC.

2.2 AIR

Primary National Ambient Air Quality Standards (NAAQS) for six chemicals appear in 40 CFR 50; these standards are based on the direct health effects of those chemicals to sensitive groups, with no economic factors considered. The NAAQS take into consideration all sources of exposure to a given chemical and establish ceilings that are not to be exceeded in the United States. Only major new sources, or major modifications to existing sources, must attain NAAQS. Although PGDP is in a Kentucky "attainment area," it is unlikely that any emissions from remediation at PGDP will be considered a "major" source.

NAAQS are established as the criteria state and local governments must plan to achieve and thus are not directly enforceable. Under §110 of the CAA, states are required to implement regulations to achieve the NAAQS. The ambient air quality standards appear in Title 401, KAR Chapter 53:010, Appendix A. The Kentucky state air emission standards are considered "hybrid" ARARs and will be summarized as action-specific ARARs in Sect. 5.2.

National Emission Standards for Hazardous Air Pollutants (NESHAPs) for various industrial sources that emit one of several pollutants are established in 40 CFR 61. Most of the NESHAPs are generally neither applicable nor relevant and appropriate to cleanup at CERCLA sites because they regulate particular types of sources that would not be expected to be found at a CERCLA site. However, the NESHAPs will be considered as potential "hybrid" ARARs on a site-specific basis during the selection of remedial alternatives; in particular, the NESHAPs for radionuclides will be reviewed (see Sect. 3.1).

The Clean Air Act Amendments of 1990 establish a list of 189 additional hazardous air pollutants for which technology-based standards must be promulgated. These standards will be applicable to categories of emissions rather than to the substances emitted and will be analyzed when proposed.

Table 6. Federal ambient water quality criteria for the protection of freshwater organisms

Chemical	Maximum (μg/L)[a]	24-h (μg/L)[b]
Aldrin	3	NA
Aluminum	750[c]	87[c]
Ammonia	Concentrations are temperature and pH dependent	
Arsenic (III)	360	190
Cadmium	1.8[d]	0.66[d]
Chlordane	2.4	4.3E-03[e,f]
Chloride	860,000	230,000
Chlorine	19	11
Chlorpyrifos	0.083	0.041
Chromium (VI)	16	11
(III)	984[d]	117[d]
Copper	9.22[d]	6.54[d]
Cyanide	22	5.2
Dichlorodiphenyl-trichloroethane (DDT)	1.1	1.0E-03[g]
Demeton	NA	0.1
Dieldrin	2.5	1.9E-03[f]
Endosulfan	0.22	0.056
Endrin	0.18	2.3E-03[f]
Guthion	NA	0.01
Heptachlor	0.52	3.8E-03[f]
Heptachlor epoxide	0.52	3.8E-03[f]
Hexachlorocyclohexanes (HCCH) gamma-HCCH (Lindane)	2	0.08
Hydrogen sulfide	NA	2
Iron	NA	1,000
Lead	33.8[d]	1.32[d]
Malathion	NA	0.1
Mercury	2.4	0.012[f]
Methoxychlor	NA	0.03
Mirex	NA	1.0E-03
Nickel	789[d]	88[d]
Parathion	0.065	0.013
Pentachlorophenol	3.32[h]	2.1[h]
pH	NA	6.5–9
Polychlorinated biphenyls	NA	0.014[g]
Selenium (inorganic selenite)	20	5
Silver	1.23[d]	NA
Sulfides	NA	2
Zinc	65[d]	59[d]

[a]One-hour average concentration not to be exceeded more than once every 3 years.
[b]Four-day average concentration not to be exceeded more than once every 3 years.
[c]pH 6.5–9.0.
[d]Water hardness dependent criteria (50 mg/L as $CaCO_3$).
[e]Read as 4.3×10^{-3}.
[f]Based on marketability of fish.
[g]Final residue value based on wildlife feeding study.
[h]pH-dependent criteria.
Source: EPA 1991a, EPA Region IV Criteria Chart (October).

2.3 SOIL

Very little legislation or guidance is available governing cleanup criteria for contaminated soils at CERCLA sites. Land disposal of treated hazardous wastes is addressed in RCRA in the form of land disposal restrictions (LDR) (40 CFR 268), and these are addressed as "hybrid" ARARs in Chapter 5. If a site is identified as a RCRA Sect. 3004(u) SWMU, or if RCRA characteristic or hazardous waste as defined in 40 CFR 261 is present at the site, it is subject to RCRA corrective action regulations. The proposed RCRA corrective action regulations address risk-based cleanup standards for soils (55 *FR* 30798); these are briefly discussed in Sect. 5.1.3. Treatment standards for contaminated soil and debris at CERCLA sites are discussed in Sect. 5.1.1.

The regulations found in the Toxic Substances Control Act (TSCA) contain storage, disposal, and cleanup requirements for materials contaminated with polychlorinated biphenyls (PCBs). These regulations limit concentrations of PCBs disposed of in soil to 50 ppm and require that any soils containing concentrations of PCBs greater than 50 ppm (40 CFR 761.60) be incinerated (40 CFR 761.70) or stored in a chemical waste landfill (40 CFR 761.75). Requirements that must be achieved for PCBs disposed of by incineration (40 CFR 761.70), in a chemical waste landfill (40 CFR 761.75), or by other disposal methods [40 CFR 761.60(a)(5)(iii)] are also specified in TSCA.

2.4 OTHER "TO-BE-CONSIDERED" (TBC) GUIDANCE

EPA has suggested cleanup values for lead in soils based on studies of lead levels in blood of exposed children. The EPA Office of Solid Waste and Emergency Response (OSWER) has issued a directive (Directive 9355.4-02, dated September 7, 1989) which recommends a cleanup level for soils of 500 to 1000 ppm lead.

Although not an ARAR, EPA has published a TSCA PCB spill cleanup policy (52 *FR* 10688) which recommends cleanup standards for PCBs of 25 ppm for sites with restricted access; a 10-ppm cleanup level is recommended for residential and unrestricted access rural areas. In this latter case, a 10-in. cap of clean soil must cover the site. In the EPA guidance report for remedial actions at Superfund sites containing PCBs, preliminary remediation goals are set at 1 ppm for residential land use (a risk of 10^{-5}) and between 10 ppm and 25 ppm for industrial and/or remote areas (a risk of 10^{-4}) (EPA 1990). Remedial alternatives should reduce concentrations to these levels or limit exposures. EPA also presents an approach to deriving cleanup levels of PCBs in sediments (EPA 1990). This approach results in "sediment quality criteria" as a function of organic carbon concentrations and is meant to protect wildlife that consumes freshwater benthic species. These values are considered TBC guidance, not ARARs.

In addition, the Kentucky Division of Waste Management uses an internal guidance value of 1 ppm, 0.1 ppm, and 65 parts per trillion for cleanup of PCBs in soils, sediments, and water, respectively (Taylor 1991). This value has no regulatory or statutory basis, but may be considered as TBC guidance for cleanup of PCBs at PGDP.

In the absence of federally or state-promulgated ARARs or in the case where ARARs are not adequately protective, EPA states a preference for Office of Drinking Water (ODW)

Health Advisories (HAs), RfDs or Reference Concentrations (RfCs) for systemic toxicants, and CSFs for carcinogens (EPA 1988).

The EPA ODW has developed nonregulatory HAs for concentrations of noncarcinogenic contaminants in drinking water at which no adverse health effects would be expected to occur. Table 7 lists 1-d, 10-d, and longer-term (several months to several years) HAs for a child weighing 10 kg. These advisories have been developed as guidance values for short-term exposure situations such as spills or accidents and are not intended for use in estimating acceptable lifetime intakes (50 *FR* 46936). Longer-term and lifetime advisory levels for a 70-kg adult are also listed in Table 7.

EPA uses the lifetime HA (for noncarcinogens only) to develop MCLs and MCLGs; HAs will most likely represent future MCL proposals. However, these values assume that 20% of a person's exposure to a compound is via the drinking water pathway. Therefore, if site-specific information indicates that there are no other sources of exposure to a particular compound, the lifetime HA may be increased by a factor of 5. This will be considered as site-specific exposure pathways are developed. The EPA ODW has also determined the concentration of specific carcinogens in drinking water that will result in one excess cancer in one million people (a risk of 10^{-6}) following a lifetime exposure. Although not HAs, which are only developed for noncarcinogens, the carcinogenic values are listed in Table 7 as they were developed by the ODW.

EPA has also developed other TBC guidance values in the form of RfDs, RfCs, and CSFs which are available through *IRIS* (EPA 1991b) and the EPA *Health Effects Assessment Summary Tables* (EPA 1991c). The information found in *IRIS* is frequently in flux, as it is constantly undergoing EPA review and verification. Therefore, chemical-specific values are not listed here.

Table 7. EPA drinking water health advisories[a]

Chemical	Child[b] (μg/L)			Adult[d] (μg/L)		Adult 10^{-6} Cancer risk[f]	Cancer group
	1-d	10-d	Longer-term	Longer-term[c]	Lifetime[e]		
Acrylamide[g]	1500	30	20	70	NA	0.01	B2
Acrylonitrile	20	20	1	4	NA	0.07	B1
Adipates (diethylhexyl)[h]	NA	NA	NA	NA	500		C
Alachlor[g]	100	100	NA	NA	NA	0.40	B2
Aldicarb[g,i]	NA	NA	NA	NA	1		D
Aldicarb sulfone[g,i]	NA	NA	NA	NA	2		D
Aldicarb sulfoxide[g,i]	NA	NA	NA	NA	1		D
Aldrin	0.3	0.3	0.3	0.3	NA	0.002	B2
Antimony[h]	15	15	15	15	3		D
Atrazine[g]	100	100	50	200	3		C
Barium[g]	NA	NA	NA	NA	2000		D
Benzene[g]	200	200	NA	NA	NA	1.0	A
Beryllium[h]	30,000	30,000	4000	20,000	NA	0.008	B2
bis-2-Chloroisopropyl ether	4000	4000	4000	13,000		300	D
Boron	4000	900	900	3000	600	deleted	D
Bromacil	5000	5000	3000	9000	90		C
Bromochloromethane	50,000	1000	1000	5000	90		-
Bromodichloromethane[g]	7000	7000	400	13,000	NA	0.30	B2
Bromoform[g]	5000	2000	2000	6000	NA	4.0	B2
Bromomethane	100	100	100	500	10		D
Butylate	2000	2000	1000	4000	350		D
Cadmium[g]	40	40	5	20	5		D
Carbon tetrachloride[g]	4000	200	70	300	NA	0.30	B2
Chlordane[g]	60	60	NA	NA	NA	0.03	B2
Chlorodibromomethane[g]	7000	7000	2000	8000	20		C
Chloroform[g]	4000	4000	100	500	NA	6.0	B2

Table 7 (continued)

Chemical	Child[b] (μg/L)			Adult[d] (μg/L)		Adult 10^{-6} Cancer risk[f]	Cancer group
	1-d	10-d	Longer-term	Longer-term[c]	Lifetime[e]		
Chloromethane	9000	400	400	1000	3		C
(4-Chloro-2 methyl-phenoxy)-acetic acid	100	100	100	400	10		E
Chlorophenol (2-)	50	50	50	200	40		D
o,p-Chlorotoluene	2000	2000	2000	7000	100		D
Chromium (total)[g]	1000	1000	200	800	100		D
Cyanide[h]	200	200	200	800	200		D
Dibromoacetonitrile	2000	2000	2000	8000	20		C
Dibromochloropropane[g]	200	50	NA	NA	NA	0.03	B2
Dichloroacetonitrile	1000	1000	800	3000	6		C
o-Dichlorobenzene[g]	9000	9000	9000	30,000	600		D
m-Dichlorobenzene	9000	9000	9000	30,000	600		D
p-Dichlorobenzene[g]	10,000	10,000	10,000	40,000	75		C
Dichlorodifluoromethane	40,000	40,000	9000	30,000	1000		D
1,2-Dichloroethane[g]	700	700	700	2600	NA	0.4	B2
1,1-Dichloroethylene[g]	2000	1000	1000	4000	7		C
cis-1,2-Dichloroethylene[g]	4000	3000	3000	11,000	70		D
trans-1,2-Dichloroethylene[g]	20,000	2000	2000	6000	100		D
Dichloromethane[h]	10,000	2000	NA	NA	NA	5.0	B2
2,4-Dichlorophenol	30	30	30	100	20		D
2,4-Dichlorophenoxy-acetic acid (2,4-D)[g]	1000	300	100	400	70		D
1,2-Dichloropropane[g]	NA	90	NA	NA	NA	0.5	B2
1,3-Dichloropropene	30	30	30	100	NA	0.2	B2
Dieldrin	0.5	0.5	0.5	2	NA	0.002	B2

Table 7 (continued)

Chemical	Child[b] (μg/L)			Adult[d] (μg/L)		Adult 10^{-6} Cancer risk[f]	Cancer group
	1-d	10-d	Longer-term	Longer-term[c]	Lifetime[e]		
Diethylhexyl phthalate[h,j]	NA	NA	NA	NA	NA	3.0	B2
1,3-Dinitrobenzene	40	40	40	140	1		D
p-Dioxane	4000	400	NA	NA	NA	7.0	B2
Endrin[g,h]	20	20	3	10	2		D
Epichlorohydrin[g]	100	100	70	70	NA	4.0	B2
Ethylbenzene[g]	30,000	3000	1000	3000	700		D
Ethylene dibromide[g]	8	8	NA	NA	NA	0.0004	B2
Ethylene glycol	20,000	6000	6000	20,000	7000		D
Fluorotrichloromethane	7000	7000	3000	10,000	2000		D
Formaldehyde	10,000	5000	5000	20,000	1000		B1
Glyphosate[h]	20,000	20,000	1000	1000	700		D
Heptachlor[g]	10	10	5	5	NA	0.008	B2
Heptachlor epoxide[g]	10	NA	0.1	0.1	NA	0.004	B2
Hexachlorobenzene[h]	50	50	50	200	NA	0.02	B2
Hexachlorobutadiene	300	300	100	400	1		C
Hexachloroethane	5000	5000	100	500	1		C
n-Hexane	10,000	4000	4000	10,000	NA		D
Isophorone	15,000	15,000	15,000	15,000	100		C
Lindane[g]	1000	1000	30	100	0.2		C
Mercury[g]	NA	NA	NA	2	2		D
Methoxychlor[g]	6000	2000	500	200	40		D
Methyl ethyl ketone	80,000	8000	3000	9000	200		D
Methyl tert butyl ether	3000	3000	500	2000	40		D
Molybdenum	80	80	10	50	50		D
Monochlorobenzene[g]	2000	2000	2000	7000	100		D

Table 7 (continued)

Chemical	Child[b] (μg/L)			Adult[d] (μg/L)		Adult 10^{-6} Cancer risk[f]	Cancer group
	1-d	10-d	Longer-term	Longer-term[c]	Lifetime[e]		
Naphthalene	500	500	400	1000	20		D
Nickel[h]	1000	1000	100	600	100		D
Nitrate (as N)[g,j,k]	NA	10,000	NA	NA	NA	NA	D
Nitrite (as N)[g,j,k]	NA	1000	NA	NA	NA	NA	D
p-Nitrophenols	800	800	800	3000	60		D
Pentachlorophenol[g]	1000	300	300	1000	NA	0.3	B2
Phenol	6000	6000	6000	20,000	4000		D
PCBs[g]	NA	NA	NA	NA	NA	0.005	B2
Silver[l]	200	200	200	200	100		D
Strontium	25,000	25,000	25,000	90,000	17,000		D
Styrene[g]	20,000	2000	2000	7000	100		C
2,3,7,8-Tetrachlorodibenzo- *p*-dioxin (dioxin)[n]	0.001	1.0E-04[m]	1.0E-05	4.0E-05	NA	2.0E-07	B2
1,1,1,2-Tetrachloroethane	2000	2000	900	3000	70	1.0	C
Tetrachloroethylene[g]	2000	2000	1000	5000	NA	0.7	B2
Thallium[h]	7	7	7	20	0.4		-
Toluene[g]	20,000	2000	2000	7000	1000		D
Toxaphene[g]	500	40	NA	NA	NA	0.03	B2
Trichloroactonitrile	50	50	NA	NA	NA		-
1,2,4-Trichlorobenzene[h]	100	100	100	500	9		D
1,3,5-Trichlorobenzene	600	600	600	2000	40		D
1,1,1-Trichloroethane[g]	100,000	40,000	40,000	100,000	200		D
1,1,2-Trichloroethane[h]	600	400	400	1000	3		C
Trichloroethylene[g]	NA	NA	NA	NA	NA	3.0	B2

Table 7 (continued)

Chemical	Child[b] (μg/L)			Adult[d] (μg/L)		Adult 10^{-6} Cancer risk[f]	Cancer group
	1-d	10-d	Longer-term	Longer-term[c]	Lifetime[e]		
2,4,5-Trichlorophenoxy-acetic acid (2,4,5-T)	800	800	800	1000	70		D
2-(2,4,5-Trichlorophenoxy) propionic acid (Silvex)[g]	200	200	70	300	50		D
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	3.0	B2
1,2,3-Trichloropropane	600	600	600	2000		40	-
Vanadium	80	80	30	110	20		D
Vinyl chloride[g]	3000	3000	10	50	NA	0.015	A
Xylenes (total)[g]	40,000	40,000	40,000	100,000	10,000		D
Zinc	4000	4000	2000	9000	2000		D

[a]Environmental Protection Agency, Office of Drinking Water, Final Health Advisories.

[b]10-kg child consuming 1 liter of water per day.

[c]Longer-term health advisories may cover a period of several months to several years.

[d]70-kg adult consuming 2 liters of water per day.

[e]Lifetime health advisories are estimated for daily ingestion of contaminated drinking water for a 70-year lifetime. This is the value from which MCLs and MCLGs are derived. This value assumes that 20% of a person's exposure to a compound is via the drinking water pathway. Therefore, if site-specific information indicates that there are no other sources of exposure to a particular compound, the lifetime health advisory may be increased by a factor of 5.

[f]The concentration in drinking water which will result in one excess cancer death in one million people (a 10^{-6} cancer risk).

[g]Compounds for which final MCLs and MCLGs exist (see Table 1).

[h]Compounds for which MCLs and MCLGs have been proposed or reproposed (55 *FR* 30370, July 25, 1990).

[i]Based on public comment, the longer-term and lifetime health advisories for these chemicals will be revised.

[j]Under review by the Office of Drinking Water.

[k]Based on an infant weighing 4 kg.

[l]The interim MCL for this chemical will be revoked effective July 30, 1992 (56 *FR* 3526, January 30, 1991).

[m]Read as 1.0×10^{-4}.

NA = Not available.

Source: 52 *FR* 34294 (September 10, 1987); 54 *FR* 7599 (February 22, 1989); 55 *FR* 29893 (July 23, 1990).

3. RADIATION PROTECTION STANDARDS

Very few applicable standards are available for the cleanup of radioactively contaminated CERCLA sites. The Atomic Energy Act (AEA) of 1954 and its amendments delegated authority for control of nuclear energy to DOE, the U.S. Nuclear Regulatory Commission (NRC), and EPA. In addition, certain states have regulatory authority and programs for radioactive waste. EPA's regulations are derived from several other statutes as well and cover many types of activities and all types of radioactive materials. The NRC licenses the possession and use of various types of radioactive materials at certain types of facilities. Kentucky is an NRC-agreement state and, as such, has its own authority and licensing regulations.

DOE is authorized to control all types of nuclear materials at sites under its jurisdiction and is exempt from the NRC licensing and regulatory requirements. Therefore, NRC regulations are not considered to be ARARs for CERCLA cleanup at DOE facilities; however, a summary of the general content of NRC regulations will be presented here. DOE regulations for handling and cleanup of radioactive materials are outlined in a series of internal DOE orders that are legally binding to DOE contractors but are not considered by EPA to be ARARs. Therefore, for the purposes of development of ARARs, DOE orders will be treated, along with the NRC regulations, as TBC guidance.

Radionuclide contamination has been detected in groundwater, surface water, soils, and sediments; low-level radioactive waste as well as transuranic (TRU) waste may be present at PGDP. The proper definition of "mixed low-level radioactive and hazardous waste" has caused considerable debate with regard to dual jurisdiction by EPA and NRC. However, EPA has published a clarification of the problem (53 *FR* 37045, September 23, 1988), as did DOE previously [52 *FR* 15937, May 1, 1987 and DOE Order 5400.3 (Hazardous and Radioactive Mixed Waste Program, dated February 22, 1989)]. In effect, mixed wastes are those containing a RCRA hazardous waste as defined in 40 CFR 261 and a radioactive waste subject to the AEA. RCRA regulations apply to the hazardous component of the waste, and AEA regulations apply to the radioactive component. When the application of both standards is conflicting or inconsistent, RCRA yields to the AEA. Kentucky received final authorization to regulate radioactive mixed waste on December 19, 1988 (53 *FR* 41164, October 20, 1988); however, the state has not implemented any regulations governing the radioactive component of mixed waste (Jeffs 1991).

3.1 EPA REGULATIONS

EPA has promulgated MCLs for radionuclides in community water systems (see Table 8). These MCLs appear in two forms—concentration limits for certain alpha-emitting radionuclides (40 CFR 141.15) and an annual dose limit for the ingestion of certain beta- and gamma-emitting radionuclides (40 CFR 141.16). Kentucky lists identical MCLs in the Kentucky Public and Semipublic Drinking Water Regulations, Title 401 KAR Chapter 8:550, Sect. 4.

MCLs and MCLGs were proposed for radon and uranium and reproposed for ^{226}Ra and ^{228}Ra and beta emitters and photon emitters on July 18, 1991, and are included in Table 8.

Table 8. Radionuclide-specific ARARs for groundwater and surface water contamination at the Paducah Gaseous Diffusion Plant

Radionuclide	SDWA MCLs[a]	Proposed SDWA MCLs[b]
Radium[c]	5 pCi/L	20 pCi/L
Gross alpha[d]	15 pCi/L	15 pCi/L
Gross beta	4 mrem/year	4 mrem/year
Natural uranium		20 μg/L[e]
Radon-222		300 pCi/L
Strontium-90	8 pCi/L	8 pCi/L
Tritium	20,000 pCi/L	20,000 pCi/L
All other manmade radionuclides	4 mrem/year[f]	4 mrem/year[f]

[a]SDWA MCL = Safe Drinking Water Act maximum contaminant level; 40 CFR 141.15 and 141.16 and 401 KAR 8:550, Sect. 4.

[b]Proposed rule, July 18, 1991 (56 *FR* 33050); final rule expected April 1993.

[c]The present MCL applies to combined ^{226}Ra and ^{228}Ra; the proposed MCL applies to each separately.

[d]The present MCL excludes radon and uranium but includes ^{226}Ra; the proposed MCL excludes all three radionuclides.

[e]Approximately equal to 30 pCi/L.

[f]If two or more radionuclides are present, the sum of their annual dose equivalent to the total body or to any organ shall not exceed 4 mrem/year.

Final promulgation of the concentration limits is not expected until April 1993. As with the chemical-specific MCLs, these may be relevant and appropriate for cleanup of contaminated groundwater at PGDP. Table 9 lists EPA, NRC, and DOE radiation protection standards that are described below.

Subpart H of 40 CFR 61 addresses atmospheric radionuclide emissions from DOE facilities and may be applicable to airborne emissions during cleanup of PGDP. EPA has issued a final NESHAP rule (54 *FR* 51654, December 15, 1989) that limits emissions of radionuclides to the ambient air from DOE facilities to amounts that would not cause any member of the public to receive an effective dose equivalent of 10 mrem/year (40 CFR 61.92).

Environmental protection standards for the management, storage, and disposal of spent nuclear fuel, high-level wastes, and TRU wastes are found in 40 CFR 191. Management and storage shall be conducted so as to provide a reasonable assurance that no member of the public in the general environment shall receive a combined annual dose equivalent of greater than 25 mrem to the whole body and 75 mrem to any organ (40 CFR 191.03). Disposal systems for the wastes defined above must be designed "to provide a reasonable expectation that, for 1000 years after disposal, undisturbed performance of the disposal system shall not cause the annual dose equivalent from the disposal system to any member of the public in the accessible environment to exceed 25 mrem to the whole body and 75 mrem to any critical organ." All potential pathways must be considered (40 CFR 191.15). These standards may be relevant and appropriate for the storage or disposal of radioactive materials at PGDP. In 40 CFR 191.04 alternative standards are established for DOE facilities when EPA determines that such standards prevent any member of the public from receiving a continuous exposure

Table 9. Radiation protection standards that may be ARAR[a] for the Paducah Gaseous Diffusion Plant

Regulation	Applicability	Exposure conditions	Standard
40 CFR 61	NESHAPs[b] for DOE facilities	Public exposure, airborn emissions	10 mrem/year
40 CFR 141	Drinking water maximum contaminant levels	Community water systems, gross beta	4 mrem/year
40 CFR 191	Spent nuclear fuel, high-level and transuranic wastes	Public exposure, all sources	25 mrem/year (total body) 75 mrem/year (thyroid)
10 CFR 20	Radiation from facilities licensed by the Nuclear Regulatory Commission	Worker exposure limits in unrestricted areas	5 rem/year[c]
		Public exposure, unrestricted areas	100 mrem/year[c]
10 CFR 61	Licensing requirements for land disposal of radioactive waste	Public exposure, all sources	25 mrem/year (total body) 75 mrem/year (thyroid)
DOE Order 5400.5	Radiation Protection of the Public and the Environment	Public exposure, all sources	100 mrem/year
		Single acute exposure	500 mrem/year
		Aquatic organism exposure, absorbed dose	1 rad/d
DOE Order 5820.2A	Radioactive Waste Management	Public exposure, all sources, excluding air	25 mrem/year
		Public exposure, atmospheric releases	10 mrem/year
DOE Order 5480.11	Radiation Protection for Occupational Workers	Worker exposure limits, continuous exposure	5 mrem/year, cancer effects[d]
			50 mrem/year, noncancer effects[d]
		Public exposures, controlled areas	100 mrem/year[d]

[a]ARAR = applicable or relevant and appropriate requirement

[b]NESHAPs = National Emission Standards for Hazardous Air Pollutants

[c]Final rule of May 22, 1991 (56 *FR* 23360), effective June 21, 1991. Implementation of this regulation by NRC licensees may be deferred until January 1, 1993. This rule deleted the quarterly limits for occupational exposures and lowered the limit for public exposure from 500 mrem/year to 100 mrem/year.

[d]Proposed as 10 CFR 835 (56 *FR* 64334, December 9, 1991)

of more than 100 mrem/year effective dose equivalent or an infrequent exposure of more than 500 mrem/year effective dose equivalent from all sources, excluding natural background and medical exposures. However, EPA plans to revise its standards and promulgate generally applicable environmental standards to establish limits for the release of radioactive materials to the environment (NPRM, May 1992; final rule, June 1993). Whether this proposed rule will contain the alternative standards clause is unknown. When promulgated, these standards will supersede those mentioned above as potential ARARs.

EPA intends to develop environmental radiation protection standards for the disposal of low-level waste (LLW) (possibly including naturally occurring and accelerator-produced radioactive material) under 40 CFR 193 and 764. The intent of these standards will be to protect the public health and general environment from potential adverse effects from LLW disposal. These proposed regulations may provide TBC guidance for cleanup of PGDP and, when promulgated, will be considered as ARARs. This proposed rule is currently on hold, however, pending resolution of the issue with the NRC (Houlberg et al. 1991).

In addition, EPA is developing public health and environmental radiation protection criteria for cleanup of residual radioactive materials at decommissioned DOE, Department of Defense, and NRC-licensed sites, as well as other sites. These criteria may provide useful TBC guidance for remedial response at PGDP. However, this rulemaking initiative is also on hold. (Houlberg et al. 1991).

3.2 NRC REGULATIONS

As mentioned previously, DOE is not regulated by the NRC; however, NRC regulations might provide some TBC guidance for cleanup of radioactive waste at PGDP. Thus the regulations are summarized here. The standards for protection against radiation (10 CFR 20) were revised recently (56 *FR* 23360, May 21, 1991). They are designed to limit radiation exposures from NRC-licensed activities. They provide permissible worker exposure limits for restricted areas of 5 rem/year (10 CFR 20.1201) and lowered radiation exposure limits to the general public in unrestricted areas from 500 to 100 mrem/year (10 CFR 20.1301).

Appendix B of 10 CFR 20.1001-20.2401 sets annual average concentration limits for radionuclides in airborne and liquid effluents. These represent the radionuclide concentrations which, if inhaled or ingested, would produce a total annual effective dose equivalent of 50 mrem.

The Kentucky Radiation Control Branch has promulgated licensing regulations that are almost entirely the same as the 10 CFR 20 regulations (902 KAR 100 *et seq*), so they will not be repeated here. These regulations are currently under revision to incorporate the changes in the 10 CFR 20 regulations described above, with promulgation anticipated for late 1992 (Jeffs 1991).

The NRC has promulgated licensing requirements for land disposal of radioactive waste (10 CFR 61). Part 61 contains procedural requirements and performance standards applicable to any method of land disposal, with specific technical requirements for near-surface disposal of radioactive waste (see Table 10). Although not an ARAR, the substantive requirements found in this regulation might provide TBC guidance for disposal options selected at PGDP.

Table 10. TBC guidance from 10 CFR Part 61 — licensing requirements for land disposal of radioactive waste

Action	Requirement	Prerequisites for applicability	Citation
Closure of land disposal facilities	Closure must ensure protection of inadvertent intruders at any time after active institutional controls are removed	Closure of Nuclear Regulatory Commission (NRC)-licensed land disposal facility	10 CFR 61.42
	Closure must achieve long-term stability of the disposal site and eliminate the need for ongoing active maintenance following closure so that only surveillance, monitoring, or minor custodial care are required		10 CFR 61.44
	Wastes designated as Class A pursuant to 10 CFR 61.55, must be segregated from other wastes.	Existence of an NRC-licensed disposal facility designed for near-surface radioactive land disposal.	10 CFR 61.52a(1)
	Wastes designated as Class C pursuant to 10 CFR 61.55 must be disposed of under 5 meters of cover or with intruder barrier protection for at least 500 years.		10 CFR 61.52a(2)
	Waste must be placed and covered in a manner that limits the radioactive dose rate at the surface of the cover to levels consistent with an effective dose equivalent of 500 mrem/year		10 CFR 61.52a(6)
	A buffer zone of land must be maintained between the disposal unit and the disposal site boundary to allow for adequate environmental monitoring and site mitigation, if necessary		10 CFR 61.52a(8)
	Closure and stabilization measures established in the approved closure plan must be carried out as the disposal unit is filled and covered		10 CFR 61.52a(9)
	Postoperational surveillance of the disposal site shall maintain a monitoring system capable of providing early warning of releases from the disposal site before they leave the site boundary		10 CFR 61.53d

According to 10 CFR 61.41, concentrations of radioactive materials released to the environment in all media must not result in an annual dose exceeding 75 mrem to the thyroid and 25 mrem to total body or all other organs of any member of the public (Table 9). In addition, reasonable effort must be made to maintain releases of radioactive materials to "as low as reasonably achievable" (ALARA). It is stated in 10 CFR 61.42 that inadvertent intruders must be protected following cessation of active institutional controls, and 10 CFR 61.41 provides that operations at land disposal facilities must be carried out in compliance with 10 CFR 20.

3.3 DOE ORDERS

DOE orders are not promulgated regulations and thus are not considered to be ARARs by EPA. They are, however, legally binding between DOE and Energy Systems because of contractual agreements. The radiation exposure limits defined in DOE Order 5400.5 (*Radiation Protection of the Public and the Environment*) are: an effective dose equivalent of 100 mrem/year from all exposure pathways and all DOE sources of radiation and a dose of less than 5 rem/year for a single acute exposure (see Table 9). In addition, effluent releases to surface water must not result in exposures to aquatic organisms exceeding an absorbed dose of 1 rad/d. The overriding principle of the DOE Order is that all releases of radioactive material shall be ALARA. Table 11 summarizes the contents of DOE Order 5400.5 with regard to remedial actions.

DOE Order 5820.2A (*Radioactive Waste Management*) states that the management of low-level radioactive waste must ensure that external exposure to the waste and concentrations of radioactive material that may be released into surface water and soil does not exceed 25 mrem/year to any member of the public. Releases to the atmosphere shall not exceed 10 mrem/year (Table 9). Reasonable effort should be made to maintain releases to the environment to ALARA levels. The order pertains to the management of radioactive waste that is not mixed with RCRA hazardous waste; Table 12 summarizes the substantive requirements of this order.

DOE Order 5480.11 (*Radiation Protection for Occupational Workers*) contains guidelines for worker protection that are similar to those of 10 CFR 20 (i.e., 5 rem/year annual effective dose equivalent from both internal and external sources for continuous exposures). Also included in the order are standards for the general public when entering a controlled area. Exposures to the public are limited to 100 mrem/year. As with the other DOE orders, the ALARA principle prevails. Remediation of radionuclide-contaminated soils must ensure that exposures to on-site workers or public intruders will not exceed these standards. DOE has proposed for codification in 10 CFR 835 the primary standards for radiation protection of occupational workers from normal operation of DOE facilities (56 *FR* 64334, December 9, 1991). No date for a final rule has been established; however, when promulgated, these standards will then be legally applicable for CERCLA cleanup at DOE sites.

3.4 TBC GUIDANCE FOR RADIOLOGICAL RISK ASSESSMENT

The EPA Office of Radiation Programs has derived slope and unit risk factors for radionuclides of concern at remedial sites for each of three major exposure pathways (inhalation, ingestion, and external exposure to contaminated soil). These are available in the EPA *Health Effects Assessment Summary Tables* (EPA 1991c).

Table 11. DOE Order 5400.5 "Radiation Protection of the Public and the Environment"

Action	Requirement	Chapter
Planning and performance of all DOE activities	DOE will carry out all DOE activities to ensure that radiation doses to individuals will be as low as reasonably achievable (ALARA).	I.4
Routine DOE activities including remedial action	DOE must comply with all legally applicable requirements of 40 CFR 61 (NESHAPS[a] for DOE facilities) and 40 CFR 91 (Spent Nuclear Fuel, High-level, and TRU[b] Wastes).	I
	Exposures to members of the public from all radiation sources shall not cause an effective dose equivalent to be greater than 100 mrem (1 mSv) per year.	II.1a
	Exposures to members of the public from all radiation sources released into the atmosphere shall not cause an effective dose equivalent to be greater than 10 mrem (0.1 mSv) per year.	II.1b
Management and storage of spent nuclear fuel, high-level or TRU waste at a disposal facility that is not regulated by the NRC	Members of the public shall not receive an effective dose equivalent greater than 25 mrem (0.25 mSv) to the whole body or 75 mrem (0.75 mSv) to a single organ per year.	II.1c
	Radioactive materials released into public drinking water supplies shall not cause an effective dose equivalent to be greater than 4 mrem (0.4 mSv) to an individual per year. Gross alpha activity shall not exceed 1.5×10^{-8} μCi/ml.	II.1d
	Liquid effluents shall not cause private or public drinking water systems downstream of the facility to exceed the MCL(s) of 40 CFR 141.	II.1d(3)
Discharge of liquid waste containing radionuclides to surface water	Implementation of best available technology (BAT) treatment required if discharge is at an annual average concentration greater than the derived concentration guide (DCG) level.	II.3a(1)
	Discharge of liquid waste containing radionuclides to surface water at an annual average concentration less than the DCG level does not require the implementation of BAT treatment.	II.3a(2)
	The absorbed dose to native aquatic animal organisms shall not exceed 1 rad/d from exposure to liquid wastes discharged to natural waterways.	II.3a(5)
	Liquid wastes containing concentrations of radioactive materials greater than 5 times the DCG(s) may be discharged to a federal sanitary sewerage system which provides liquid waste treatment prior to discharge to surface water according to II.3a(1). ALARA process considerations are required.	II.3d(3)
	If a waste stream contains multiple radionuclides, then the DCG shall be the sum of the fractional DCG values.	II.3a(3)

Table 11. (continued)

Action	Requirement	Chapter
Management of low-level radioactive solid waste containing no RCRA constituents	Design, operational, and monitoring requirements are found in DOE Order 5820.2A (Radioactive Waste Management).	II.4
Demonstration of compliance with the dose limits	DOE shall make appropriate documentation containing information about compliance with dose limits for members of the public in the immediate vicinity and within 80 km of the site.	II.6
Conduct of radiological environmental protection programs	DCG(s) for water ingestion, air inhalation, and immersion in a gaseous cloud are provided as reference values. These DCG(s) are based on a committed effective dose equivalent of 100 mrem for the radionuclide taken into the body by ingestion or inhalation during one year.	III.2
	The DCG values apply to only one mode of exposure (i.e., either ingestion -or- inhalation).	III.2a
	For known mixtures of radionuclides the sum of the ratios of the observed concentration of each radionuclides to its corresponding DCG must not exceed 1.0.	III.2c
Cleanup of residual radioactive material and management of resulting wastes or residues	DOE facilities shall develop plans and protocols for the implementation of this guidance.	IV.1 & 2
	These guidelines are for levels of residual radioactive material that is acceptable for public use of property without restrictions because of residual radioactive material.	IV.2c
	Generic guidelines are taken from existing radiation protection standards.	IV.2c(1)
	Authorized limits are levels of residual radioactive material that shall not be exceeded if the remedial action is to be considered completed and the property is to be released without restrictions on use.	IV.2d
	Monitoring, cleanup, and control of residual radioactive material are subject to the ALARA policy.	IV.2e
	The basic dose limits for exposure to residual radioactive material is 100 mrem (1 mSv) annually.	IV.3a
	Under unusual circumstances, the dose limit for exposure to residual radioactive material is increased from 100 (1 mSv) to 500 (5 mSv) mrem annually.	IV.3b
	Residual radioactive material in soil are those concentrations in excess of background concentrations averaged over an area of 100 m^2. These derivations are obtained by means of environmental pathway analysis and basic dose limits.	IV.4a

Table 11. (continued)

Action	Requirement	Chapter
	Residual concentrations of radionuclides in the air and water shall not exceed 100 mrem (1 mSv) per year.	IV.4e
	Limits for hot spots shall be developed in cases where the average concentration in any surface or below surface area equal to or less than 25 m^2 exceeds the limit or guidelines by a factor of $(100/A)^{0.5}$. Reasonable effort must be made to remove any radionuclide source that exceeds 30 times the limit.	IV.4a(1)
Cleanup of residual radioactive material and management of resulting wastes or residues (continued)	The generic guidelines for ^{226}Ra, ^{228}Ra, ^{230}Th, and ^{232}Th are 5 pCi/g averaged over the first 15 cm of soil or 15 pCi/g averaged over 15-cm-thick layers of soil below the first 15 cm.	IV.4a(2)
Management of residual radioactivity above the guidelines specified in IV.1-4.	Interim storage control and stabilization features shall be planned to have a minimum life of 25 years and if reasonably achievable an effective life of 50 years.	IV.6b(1)
	Control features must be designed so that radionuclide concentration in the groundwater shall not exceed applicable federal and state standards.	IV.6b(3)
	If residual radioactive material is in inaccessible locations and would be unreasonably costly to remove and when residual radioactive material exceeds guideline values, an interim management plan may be arranged to maintain the property.	IV.6c(1)
	Administrative controls shall include (but are not limited to): • periodic monitoring as appropriate; • appropriate shielding; • physical barriers to prevent access; and • appropriate radiological safety measures.	IV.6c(2)
	Control and stabilization for uranium, thorium, and their decay products must be designed to last at a minimum of 200 years and if reasonably achievable have an effective life of 1000 years.	IV.6d(1)(a)
	In accordance with legally applicable federal and state standards, DOE facilities shall protect groundwater.	IV.6d(1)(d)
	Use of and access to residual radioactive material shall be controlled through appropriate administrative and physical controls.	IV.6d(1)(e)
	Long-term management of other radionuclides shall be controlled by applicable requirements in Chapters II, III, and IV of DOE 5820.2A	IV.6d(2)

[a]NESHAPS = National Emission Standards for Hazardous Air Pollutants
[b]TRU = transuranic

Table 12. DOE Order 5820.2A "Radioactive Waste Management"

Action	Requirement	Chapter
Management of low-level radioactive waste	Development of site-specific comprehensive closure plans shall address: • Disposal site's closure after the site has been filled for 5 years *-and-* • National Environmental Policy Act (NEPA) requirements	III.3j(1)
	Residual radioactivity levels for surface soil shall comply with DOE decommissioning guidelines (DOE Order 5400.5)	III.3j(2)
	The Paducah Gaseous Diffusion Plant must correct problems that could jeopardize the attainment of this order's performance objectives	III.3j(3)
	All disposal sites and units shall be maintained to conform with Resource Conservation and Recovery Act; Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA); and Superfund Amendments and Reauthorization Act (SARA) standards	III.3j(4)
	An appropriate field organization shall review and approve any closure plans for new and existing low-level waste disposal sites	III.3j(5)
	An analysis of site performance will be the basis for terminating the monitoring and maintenance activity at closed facilities or sites at the end of the institutional control period	III.3j(6)
Management of buried transuranic waste	All disposal sites and units shall be maintained to conform with CERCLA and SARA standards	II.1
	Transuranic waste shall be managed to protect the health and safety of the public and the workers at the site	II.2
	Each DOE facility will develop a site closure plan which will include: • NEPA requirements • Applicable federal, state, and local regulations • Permits required • Selected closure strategy and justification • Postclosure monitoring and control	II.3i(4)

4. LOCATION-SPECIFIC ARARs

Location-specific requirements "set restrictions upon the concentration of hazardous substances or the conduct of activities solely because they are in special locations" (53 *FR* 51394). In determining the use of location-specific ARARs for selection of remedial actions at CERCLA sites, one must investigate the jurisdictional prerequisites of each of the regulations. Basic definitions, exemptions, etc., should be analyzed on a site-specific basis to confirm the correct application of the requirements. Table 13 lists the major federal and state location-specific ARARs that might be pertinent to remedial actions at PGDP. These will be considered further as site-specific remedial alternatives are selected for cleanup at PGDP.

4.1 CAVES, SALT-DOME FORMATIONS, SALT-BED FORMATIONS, AND UNDERGROUND MINES

PGDP is located in the Coastal Plain Physiographic Province of western Kentucky. A variety of geologic formations underlie PGDP; the most important formations are the Cretaceous, Paleocene McNairy, and Clayton groups. The bedrock consists of interlaminated and interlensing clay, silt, and sand. The formations are described as micaceous and lignitic, gray-to-dark-gray clay, interlaminated with silt and fine-grained sand. There are no indications of caves, salt-dome formations, salt-bed formations, or underground mines on or near PGDP.

4.2 FAULTS

Although reports indicate that there are no faults within the PGDP Reservation, faults lie to the east and west of PGDP (K. R. Davis 1991). These faults near PGDP are ancient (pre-Holocene) and stable. The possibility of fault movement is considered extremely unlikely. In 1811 and 1812, the largest reported earthquake for the area was recorded along the New Madrid fault, 15 miles west of PGDP. However, there has been no reported faulting in Holocene time (K. R. Davis 1991).

PGDP is exempted, however, from compliance with the RCRA seismic requirements of 40 CFR 264.18 because 40 CFR 264.18(a) stipulates that all facilities that are located within political jurisdictions other than those listed in Appendix VI of 40 CFR 264.18 are assumed to be in compliance for location of new TSD facilities. Kentucky is not listed in the Appendix. However, EPA intends to propose additional floodplain and seismic restrictions for location of TSD facilities (NPRM, March 1992; Final Rule expected March 1994), and these restrictions may be ARARs for remedial actions at PGDP.

4.3 WILDERNESS AREAS, WILDLIFE REFUGES, AND SCENIC RIVERS

There are no federal wilderness areas, wildlife refuges, or scenic rivers near PGDP. However, the land between the plant boundary and the Ohio River was deeded or leased to the Kentucky Department of Natural Resources and Environmental Protection as part of the West Kentucky Wildlife Management Area (WKWMA). The WKWMA and the surrounding rural farm land provide habitat for many mammalian and avian species. There are no federal

Table 13. Location-specific applicable or relevant and appropriate requirements (ARARs) for the Paducah Gaseous Diffusion Plant

Location Characteristic(s)	Operating Condition(s)	Requirement(s)	Citation(s)
Floodplains			
Within 100-year floodplain	Treatment, storage or disposal facility RCRA[a]-defined listed or characteristic hazardous waste (40 CFR 261) -or- RCRA-permitted facility	Facility must be designed, constructed, operated, and maintained to prevent washout of any hazardous waste by 100-year flood.	40 CFR 264.18(b)
Within "low land and relatively flat areas adjoining inland and coastal waters and other floodprone areas such as offshore islands, including at a minimum, that area subject to a one percent or greater chance of flooding in any given year." [Executive Order 11988 §6(c) and 40 CFR 6, Appendix A §4(d)]	Federal agency action which involves: - acquiring, managing, and disposing of lands and facilities - providing federally undertaken, financed, or assisted construction and improvements - conducting federal activities and programs affecting land use	Federal agencies shall take action to reduce the risk of flood loss, minimize the impact of floods on human safety, health and welfare, and restore and preserve the natural and beneficial values of floodplains. Federal agencies shall evaluate potential effects of actions in floodplains and ensure consideration of flood hazards and floodplain management. If action is taken in floodplains, federal agencies shall consider alternatives to avoid adverse effects, incompatible development, and minimize potential harm.	Executive Order 11988 40 CFR 6.302(b) 40 CFR 6 (Appendix A) 10 CFR 1022
Within a regulatory floodway, as defined in 401 KAR[b] 4:060, Sect. 2	All construction across, along, or adjacent to a stream (i.e., the base floodplain), or in the floodway of a stream for which a construction permit is required.	No fill, deposit, obstruction, excavation, storage of materials, or structure is allowed which adversely affects the efficiency or the capacity of the regulatory floodway, existing streams, or drainage facilities.	Kentucky Water Resources Regulations, Title 401 KAR 4:060

Table 13 (continued)

Location Characteristic(s)	Operating Condition(s)	Requirement(s)	Citation(s)
Wetlands			
Presence of wetlands as defined in Executive Order 11990 §7(c) and 40 CFR 6, Appendix A §4(j)	Federal agency action which involves: - acquiring, managing, and disposing of lands and facilities - providing federally undertaken, finances, or assisted construction and improvements - conducting federal activities and programs affecting land use	Whenever possible, federal agency actions must avoid or minimize adverse impacts on wetlands and act to preserve and enhance their natural and beneficial values. Agencies should particularly avoid new construction in wetlands areas unless there are no practicable alternatives. Federal agencies shall incorporate wetlands protection considerations into planning, regulating, and decision-making processes.	Executive Order 11990 40 CFR 6.302(a) 40 CFR 6, Appendix A 10 CFR 1022
Presence of wetlands as defined in 40 CFR 230.3(t) and 33 CFR 328.3(b)	Action involving discharge of dredge or fill material into wetlands	Action must be taken to avoid degradation or destruction of wetlands to the extent possible. Discharges for which there are practicable alternatives with less adverse impacts or those which would cause or contribute to significant degradation are prohibited. If adverse impacts are unavoidable, action must be taken to enhance, restore, or create alternative wetlands.	Clean Water Act § 404 40 CFR 230 33 CFR 320-330

Table 13 (continued)

Location Characteristic(s)	Operating Condition(s)	Requirement(s)	Citation(s)
Wilderness areas, wildlife resources, wildlife refuges and scenic rivers			
Within area affecting stream or river -and- presence of fish or wildlife resources	Action which results in the control or structural modification of a natural stream or body of water	The effects of water-related projects on fish and wildlife resources must be considered. Action must be taken to prevent, mitigate, or compensate for project-related damages or losses to fish and wildlife resources. Off-site actions which alter a resource require consultation with the FWS[c] and/or the appropriate state agency. Consultation with the responsible agency is also strongly recommended for on-site actions.	Fish and Wildlife Coordination Act (16 USC 661 *et seq.*) 40 CFR 6.302(g) (applies to federal agencies only)
Location encompassing aquatic ecosystem with dependent fish, wildlife, other aquatic life, or habitat	Action involving the discharge of dredge or fill material into aquatic ecosystem	Degradation or destruction of aquatic ecosystems must be avoided to the extent possible. Discharges which cause or contribute to significant degradation of the water of such ecosystem are prohibited.	Clean Water Act §404 40 CFR 230 33 CFR 320-330
Waters designated as "outstanding resource water" under 401 KAR 5:026	Action affecting the existing water quality	Water quality criteria of 401 KAR 5:031 must be maintained as well as appropriate criteria for other designated use classifications in 401 KAR 5:026	Kentucky Water Quality Regulations, Title 401 KAR 5:031

Table 13 (continued)

Location Characteristic(s)	Operating Condition(s)	Requirement(s)	Citation(s)
Archaeological and Historic Resources			
Presence of archaeological resources on public land	Action which would impact resources	Steps must be taken to protect archaeological resources and sites.	Archaeological Resources Recovery Act of 1979 (16 USC 470aa-ll) 43 CFR 7
Presence of archaeological or historic resources	Action involving dam construction or other alteration of terrain which might cause irreparable loss or destruction of significant scientific, prehistoric, historic, or archaeological data	The Secretary of the Interior must be advised of the presence of such data. A survey must be conducted of affected areas for resources and data. Steps must be taken to recover, protect, and preserve data therefrom or DOI[d] formally requested to do so.	Archaeological and Historic Preservation Act (16 USC 469a-c) 40 CFR 6.301
Presence of federally owned, administered, or controlled prehistoric or historic resources -or- the likelihood of undiscovered resources		Cultural resources included on, or eligible for inclusion on, the National Register of Historic Places (36 CFR 60) or National Historic Landmark Program (36 CFR 65) must be identified.	National Historic Preservation Act (16 USC 470a-w) Executive Order 11593 40 CFR 6.301 36 CFR 800
		When alteration or destruction of the resource is unavoidable, steps must be taken to minimize or mitigate the impacts and to preserve records and data of the resource.	
		A determination must be made as to whether proposed action(s) will affect such resources and, if so, alternatives to the action(s) must be examined and considered.	

Table 13 (continued)

Location Characteristic(s)	Operating Condition(s)	Requirement(s)	Citation(s)
Archaeological and Historic Resources (continued)		When all or part of a remedial action is off-site, the consultation requirements of 16 USC 470f must be completed. Consultation is also strongly recommended for on-site actions.	
Endangered, Threatened, or Rare Species			
Presence of endangered or threatened species -or- critical habitat of such species as designated in 50 CFR 17, 50 CFR 226, or 50 CFR 227	Action which is likely to jeopardize species or destroy or adversely modify critical habitat	Actions which jeopardize species/habitat must be avoided or appropriate mitigation measures taken. Consultation with the responsible agency is also strongly recommended for on-site actions. Off-site actions which affect species/habitat require consultation with DOI, FWS, and/or state agencies, as appropriate, to ensure that proposed actions do not jeopardize the continued existence of the species or adversely modify or destroy critical habitat.	Endangered Species Act of 1973 (16 USC 1531 *et seq.*) 50 CFR 402 40 CFR 6.302(h) (applies to federal agencies only) Fish and Wildlife Coordination Act (16 USC 661 *et seq.*)
Waters that support federally recognized endangered or threatened species under 16 USC 1531 *et seq.*	Action affecting the existing water quality	Existing water quality and habitat shall be maintained and protected in these waters	Kentucky Water Quality Regulations, Title 401 KAR 5:031

Table 13 (continued)

Location Characteristic(s)	Operating Condition(s)	Requirement(s)	Citation(s)
Endangered, Threatened, or Rare Species (continued)			
Presence of endangered or threatened species or critical habitat (see above citation) of same within an aquatic ecosystem as defined in 40 CFR 230.3(c)	Action involving discharge of dredge or fill material into aquatic ecosystem	Dredge or fill material shall not be discharged into an aquatic ecosystem if it would jeopardize such species or would likely result in the destruction or adverse modification of a critical habitat of the species	Clean Water Act §404 40 CFR 230.10(b)

[a]RCRA = Resource Conservation and Recovery Act; definitions appear at 40 CFR 260.10.
[b]KAR = Kentucky Administrative Regulation.
[c]FWS = U. S. Fish and Wildlife Service.
[d]DOI = Department of Interior.

or state regulations specifically applicable to wildlife management areas. However, the Kentucky Department of Fish and Wildlife (KDFW) manages the area. In the event that any remedial activities occurring within the WKWMA would impact the area, consultation with the KDFW would be necessary (W. L. Davis 1991).

Two intermittent streams, Big Bayou Creek and Little Bayou Creek, flow through PGDP and discharge into the Ohio River, which is located 3.6 miles from the PGDP site. Surface runoff, process effluents, and stormwater systems from PGDP flow into Big Bayou Creek and Little Bayou Creek, both of which show chemical and radiological contamination. If any remedial action is taken which would impact the fish and wildlife resources in those creeks, regulations found in the Fish and Wildlife Coordination Act, CWA §404, 33 CFR 320-330, and 40 CFR 230 may be ARAR (see Table 13).

4.4 WETLANDS AND FLOODPLAINS

The United States Fish and Wildlife Service identified several sites on the WKWMA as wetlands areas; however, this classification may change because of the new federal approach to identifying and delineating wetlands (W. L. Davis 1991). One of these areas, a tupolo swamp, has been designated as an area of ecological concern by the Kentucky Nature Preserves Commission (KNPC), in conjunction with the KDFW.

PGDP is not located within a 100-year floodplain; however, portions of the WKWMA are within the 330-ft contour of a 100-year floodplain. There is no information regarding the location of a 500-year floodplain in the area of PGDP (Jones 1991a).

If any remedial alternatives are selected that would impact floodplains or wetland areas, the requirements found in Executive Order (EO) 11988 and EO 11990, 10 CFR 1022, and §404 of CWA might be ARARs for PGDP (Table 13). In addition, 40 CFR 264.18(b) specifies that new TSD facilities must be sited so as to prevent washout from a 100-year flood (Table 13). Title 401 KAR 4:060 provides minimum standards to protect the state's flood-prone areas (Table 13); certain activities are excluded from these regulations, providing they do not result in increases of flood elevations (401 KAR 4:060, Sect. 4). These include storage yards, certain sand and gravel operations, and dredging of stream material, providing that disposal of the dredged material is outside the floodplain area. The permitting process of the 401 KAR 6:060 regulations would not be considered ARAR for CERCLA cleanup at PGDP.

4.5 HISTORIC SITES AND ARCHEOLOGICAL FINDINGS

Some historic sites and/or archeological findings have been identified near the PGDP site (Jones 1991a). Between the WKWMA and the Ohio River, 21 archeological sites and several archeological findings have been recorded (Schenian 1991). There are also buildings at the adjacent Kentucky Ordnance Works and several old homesteads that could be placed on the National Register. In the WKWMA, several cemeteries and areas containing cultural artifacts have been identified (Jones 1991a). In addition, Building 340, within the security fence, may qualify for the National Register of Historic Places. A cultural resources study may be initiated by the PGDP NEPA Office and the building submitted as a candidate for listing (Jones 1991b).

If any remedial action is taken that would cause irreparable harm, loss, or destruction of any prehistoric or historic archeological sites, regulations found in the Archaeological Resources Recovery Act, the Archaeological and Historic Preservation Act, and in the National Historic Preservation Act may be ARARs (See Table 13). There are no state regulations protecting historic or archeological sites.

4.6 RARE, THREATENED, OR ENDANGERED SPECIES

The Indiana bat (*Myotis sodalis*), a federally listed endangered species, has been reported in the WKWMA (Hendricks 1991). Although Indiana bats winter in caves, their breeding areas include mature stands of trees near water, especially rivers and wetlands (McCracken 1991).

There is no Kentucky Endangered Species Act or official state list of endangered and threatened species. However, the Kentucky Academy of Science (KAS) in conjunction with the KNPC has published a list of Kentucky animals and plants that are rare, threatened, endangered, or considered to be of "special concern" at the federal or state level as of 1986 (KAS-KNPC 1986). In addition, the KDFW maintains a database of threatened or endangered species listed by county and U. S. Geological Survey quadrant.

A recent survey at the WKWMA indicated the presence of state-listed threatened or endangered bats, birds, amphibians, and plants (see Table 14). There are also several species listed as of special concern by the state which have been collected in the WKWMA (Hendricks 1991). The results of this survey are found in a KNPC database. Metropolis Lake also contains several state-listed animals (see Table 14). There is fairly good agreement between the McCracken County/Joppa Quadrangle list supplied by the KDFW and the KNPC database. However, three species listed by the KDFW as occurring in McCracken County have not been reported in the Nature Preserves Commission database. These are the lake chubsucker (*Erimyzon sucetta*), listed as state threatened, and the black buffalo (*Ictiobus niger*) and northern madtom (*Noturus stigmosus*), both listed as of "special concern" for the state. The black buffalo is found in large rivers and the northern madtom occurs in large creeks to moderate rivers; the lake chubsucker may be found in swampy habitat or oxbow lakes (Etnier 1991). None of these three species were found to occur in Little or Big Bayou Creeks during a recent stream survey (Ryon 1991), although the lake chubsucker was reported as rare in these creeks in an earlier survey.

The Kentucky Water Quality regulations designate streams, rivers, and surface waters that support endangered or threatened species as defined under the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*), as "outstanding resource waters" (ORW). The presence of federally endangered or threatened species, or waters within a formally dedicated nature preserve, are used in designating ORWs (401 KAR 5:031, Sect. 7, The Ohio River, from river mile 940.7 to river mile 943.3 and river mile 966.3 to river mile 969.5 in McCracken and Ballard counties has been designated as ORW (401 KAR 5:026) because of the presence of a federally listed endangered clam (*Lampsilis orbiculata*), and as such is protected (401 KAR 5:031, Sect. 7). Metropolis Lake presents a unique floodplain habitat which is ecologically interesting and so has also been designated ORW (Schneider 1991).

If a site investigation reveals the presence of breeding colonies of Indiana bats or any other federally listed threatened or endangered animals or plants in the vicinity of PGDP, the federal Endangered Species Act of 1973 may be ARAR (Table 13).

Table 14. Federally listed and state-listed threatened and endangered species found at West Kentucky Wildlife Management Area and Metropolis Lake[a]

Species name (common name)	Federal listing[b]	State listing[b]
	West Kentucky Wildlife Management Area	
Silphium lacinietum (Compass plant)	—	S
Hyla cinerea (Green tree frog)	—	T
Rana areolata (Crawfish frog)	—	S
Lophodytes cucullatus (Hooded merganser)	—	E
Vireo belli (Bell's vireo)	—	S
Nycticeius hummeralis (Evening bat)	—	T
Myotis septentrionalis (Keen's Myotis)	—	S
Myotis sodalis (Indiana bat)	E	E
	Metropolis Lake	
Orconectes lucifer (Crayfish)	—	E
Esox niger (Chain pickerel)	—	S
Hybognathus hayi (Cypress minnow)	—	E
Notropis maculatus (Tailgate shiner)	—	T
Lepomis punctatus (Spotted sunfish)	—	T

[a]Kentucky Nature Preserves Commission database, September 1991 (Hendricks 1991).

[b]S = species of special concern; T = threatened species; E = endangered species; C2 = species under consideration for federal listing but for which insufficient data exist to support a listing.

5. ACTION-SPECIFIC ARARs

Performance, design, or other action-specific requirements set controls or restrictions on particular kinds of activities related to the management of hazardous waste (52 *FR* 32496). Selection of a particular remedial action at a site will invoke the appropriate action-specific ARARs that may specify particular performance standards or technologies, as well as specific environmental levels for discharged or residual chemicals. Action-specific ARARs are established under RCRA, CAA, CWA, SDWA, and TSCA. These regulations are briefly summarized here and will be expanded as site-specific ARARs are developed.

Several Kentucky statutes also apply to remedial actions at PGDP. These include the air quality regulations found at 401 KAR, Chapters 50-65; the underground storage tank (UST) regulations at 401 KAR 42:60 (corrective action) and 401 KAR 42:70 (closure); and the waste management regulations at 401 KAR Chapters 30-49.

5.1 RESOURCE CONSERVATION AND RECOVERY ACT

RCRA has nine distinct sections (subtitles) that regulate various aspects of hazardous waste. Three of these, Subtitle C "Hazardous Waste Management," Subtitle D "Solid Waste Management," and Subtitle I "Regulation of Underground Storage Tanks," provide the regulatory guidance for RCRA and will be considered for ARAR selection for on-site cleanup at PGDP. In considering compliance of CERCLA remedial actions with RCRA requirements, the Subtitle C and Subtitle I regulations will most likely be applicable or relevant and appropriate. Although the Subtitle D regulations will not be legally applicable, they may prove relevant and appropriate to remediation of sites at PGDP.

5.1.1 RCRA Subtitle C Regulations

RCRA Subtitle C regulates the generation, transportation, treatment, storage, and disposal of hazardous waste. Standards for the management of hazardous waste at RCRA-permitted TSD facilities were promulgated July 26, 1982, and appear as 40 CFR 264. Standards for interim TSD facilities are found in 40 CFR 265.

The Subtitle C Part 264 standards will be considered first as ARARs, and the interim standards will be considered only if Part 264 does not address a particular issue. In general, this text will address the Part 264 rather than the Part 265 standards as they are the more stringent. Table 15 lists the pertinent subparts of the federal RCRA permitted and interim standards and the equivalent section of the Kentucky hazardous waste management regulations.

The administrative requirements of RCRA (e.g., permitting, reporting, and record-keeping) are not required for on-site CERCLA remedial actions [CERCLA § 121(e)]. However, under CERCLA §121(d)(3), any removal or remedial action involving the off-site transfer of hazardous substances, pollutants, or contaminants must involve a facility in compliance with all RCRA substantive and administrative requirements. In the event that PGDP is placed on the NPL, it is assumed that CERCLA response actions will be coordinated with and supplement the corrective measures required and conducted by DOE under its current RCRA permit.

The RCRA Part 264 regulations apply to particular waste management processes (eg., capping or incineration) or to general procedures (eg., treatment, disposal, or closure), and it may be necessary to combine the two types of categories to adequately address the action-specific ARARs for a selected remedial action. These issues will be addressed on a site-specific basis following selection of remedial alternatives.

Table 15. RCRA[a] Subtitle C - standards for the treatment, storage, and disposal of hazardous waste

Federal	Kentucky	Category
40 CFR Part 264	**401 KAR[b] 34**	
Subpart I	Sect. 180	Containers
Subpart J	Sect. 190	Tanks
Subpart K	Sect. 200	Surface impoundments
Subpart L	Sect. 210	Waste piles
Subpart M	Sect. 220	Land treatment
Subpart N	Sect. 230	Landfills
Subpart O	Sect. 240	Incinerators
Subpart X	Sect. 250	Miscellaneous treatment units
40 CFR Part 265	**401 KAR 35**	
Subparts I-O	Sects. 180-240	As listed above
Subpart P	Sect. 250	Thermal treatment
Subpart Q	Sect. 260	Chemical, physical, and biological treatment
Subpart R	Sect. 270	Underground injection

[a]RCRA = Resource Conservation and Recovery Act
[b]KAR = Kentucky Administrative Code

5.1.2 Land Disposal Restrictions

For each hazardous waste, EPA has established treatment standards that are protective of human health and the environment when the wastes are land disposed. Land disposal includes placement in a landfill, surface impoundment, waste pile, land treatment facility, etc. In the final NCP, EPA reaffirms that movement of waste within a unit does not constitute "land disposal" for purposes of application of the RCRA LDR; however, waste consolidation from different units at a CERCLA site are subject to the restrictions (55 *FR* 8759).

These LDR apply only to RCRA hazardous waste placed after the effective prohibition date. Land diposal is acceptable for wastes that have been treated with the best demonstrated

available technology (BDAT) set by EPA and meet the treatment standards. A final rule listing provisions for specific treatment standards and prohibiting land disposal has appeared. Table 16 lists the waste categories for which LDR have been promulgated, the *Federal Register* citation, and the corresponding section in 40 CFR 268. Title 401 KAR, Chapter 37, contains the Kentucky Waste Management Land Disposal Restrictions. These are similar to the RCRA LDR, and will be analyzed for site-specific disposal options, if necessary.

Table 16. Federal RCRA[a] land disposal regulations

Waste category	Citation	40 CFR Part
Spent-solvent and dioxin-containing wastes	51 *FR* 40572 (November 7, 1986)	268.30 268.31
"California List" wastes	52 *FR* 25760 (July 8, 1987)	268.32
First third wastes[b]	54 *FR* 31138 (August 17, 1988)	268.33
Second third wastes[b]	54 *FR* 26594 (June 23, 1989)	268.34
Final third wastes[b]	55 *FR* 22520 (June 1, 1990)	268.35

[a]RCRA = Resource Conservation and Recovery Act.
[b]All listed hazardous wastes identified under 40 CFR 261.

EPA has determined that the RCRA treatment standards are generally inappropriate or infeasible when applied to contaminated soil or debris (55 *FR* 8760). Therefore, EPA is proposing separate rulemakings to establish treatment standards for disposal of such contaminated soil and debris. The Advance Notice of Proposed Rulemaking (ANPRM) for debris appeared in 56 *FR* 24444, May 30, 1991; the NPRM January 9, 1992 (57 *FR* 958); final rule, June 1992. The proposed rule requires contaminated debris to be treated prior to land disposal using extraction, destruction, or immobilization technologies. Six different categories of debris and ten different categories of contaminants are specified in the rule. As with mixed waste, debris contaminated with both hazardous and radioactive waste must comply with the treatability standards for contaminated debris as well as those under the AEA. Disposal of treated debris and resultant wastes are discussed in the proposed rule.

The ANPRM for soil appeared October 24, 1991 (56 *FR* 55160); the NPRM is scheduled for May 1992; final rulemaking May 1993. These will be analyzed as ARARs or TBC when available. In the interim, EPA has devcloped guidance for obtaining and complying with a treatability variance for soil and debris that are contaminated with RCRA hazardous wastes for which treatment standards have already been set (OSWER Directive 9347.3-06FS, July 1989). Alternate treatment levels are presented for structural functional groups of organics and for ten inorganics based on actual treatment of soil and best management practices for

debris. These will be considered as TBC guidance when remedial alternatives are selected and more information becomes available on waste types.

5.1.3 Corrective Action Requirements

Several sections of RCRA require promulgation of corrective action regulations; when finalized, these requirements will most likely be ARARs for CERCLA remedial actions. Currently, only the 40 CFR 264 Subpart F regulations on groundwater protection at units regulated by RCRA are potential ARARs to CERCLA corrective actions within facility boundaries, and these include groundwater protection standards [40 CFR 264.92 and 264.94 (see Sect. 2.1.1)] and groundwater monitoring requirements (40 CFR 264.97). The corrective action standards developed under RCRA § 3004(u) will be applicable to any CERCLA cleanup site that is also an active or a formerly active RCRA facility with an active SWMU; thus, the standards will also be applicable to a CERCLA site where disposal is currently occurring. In addition, RCRA § 3004(v) authorizes cleanup beyond facility boundaries.

Requirements for corrective action for SWMUs have been proposed (55 *FR* 30798, July 27, 1990). A final rule is expected to appear in January 1993. EPA proposes a risk-based approach to establish media cleanup standards for surface water, groundwater, soil, and air. These standards are to be established at concentrations that ensure protection of human health and the environment and are to be set for each media of concern during the remedy selection process. Target cleanup levels may initially be set at the RCRA action levels, but modified as appropriate to reflect site-specific exposure assumptions (55 *FR* 30826).

5.1.4 RCRA Subtitle I Regulations

RCRA §9003 requires promulgation of regulations pertaining to detection, prevention, and correction of releases from USTs; implementing regulations appear in 40 CFR 280.60, "Release Response and Corrective Action for UST Systems Containing Petroleum or Hazardous Substances," and 40 CFR 280.70, "Out-of-Service UST Systems and Closure," and will be considered as ARARs for cleanup of USTs at PGDP. The corresponding state UST regulations are found at 401 KAR 42:060 and 42:070, respectively, and cite the 40 CFR 280 regulations as governing requirements. 40 CFR 280.66 specifies that corrective action plans designed to protect human health and the environment must be submitted to the state "implementing agency" (UST Program, Division of Waste Management, Kentucky Department for Environmental Protection) for approval. The state must be notified of permanent closure plans not taken in response to corrective action (40 CFR 280.71); suggested cleaning and closure procedures are recommended in 40 CFR 280.71 and may be considered TBC guidance for closure of tanks at PGDP.

5.1.5 RCRA Subtitle D Regulations

EPA has promulgated a final rule establishing a new 40 CFR Part 258, which sets forth revised minimum federal criteria for municipal solid waste landfills (56 *FR* 50978, October 9, 1991). These include closure and postclosure care requirements (40 CFR 258.60 and 258.61). Although not legally applicable to remedial action sites found at PGDP, they may prove relevant and appropriate for closure of some of the sites. These regulations will be analyzed as site-specific ARARs are addressed.

In addition, the Kentucky state and federal RCRA regulations governing solid waste management facilities may be relevant and appropriate. Specifically, 40 CFR 257.3-3 prohibits non-point-source contamination of surface waters from solid waste management facilities. 40 CFR 257.3-3 also prohibits point-source discharges of pollutants into surface waters which are in violation of the requirements of the NPDES (401 KAR 37.030 Sect. 4). 40 CFR 257.3-4 prohibits contamination of an underground drinking water source above SDWA MCLs (401 KAR 37.030 Sect. 5).

5.1.6 Federal vs State RCRA Regulations

Table 17 gives a preliminary list of action-specific ARARs established under RCRA and various other statutes discussed below. Action alternatives are listed alphabetically, followed by a summary of the requirements found in the particular statute cited. The prerequisites for applicability are also given; however, the regulations must be related to site-specific conditions to determine whether the regulation cited is legally applicable or relevant and appropriate. This table does not represent a complete listing of action-specific ARARs; analysis of the regulations on a site-specific basis will be necessary to ensure a comprehensive summary.

Kentucky received final authorization of its hazardous waste program on January 31, 1985 (50 *FR* 2550), and has since received authorization for several revisions to its program (53 *FR* 41164, October 20, 1988; 54 *FR* 1940, January 18, 1989; 54 *FR* 10986, March 16, 1989). The Kentucky Department for Environmental Protection, Division of Waste Management, is responsible for regulating hazardous waste. The standards for owners and operators of TSD facilities are found at 401 KAR Chapters 30-49. The Kentucky hazardous waste management regulations closely resemble the federal RCRA regulations (Government Institutes, Inc. 1991), and are listed in Table 17 with the appropriate federal RCRA citation.

5.2 CLEAN AIR ACT

The primary ambient air quality standards were established by the Kentucky Division of Air Quality to define levels of air quality which are necessary to protect human health. The implementing regulations are found in 401 KAR 53:010 and are listed in Appendix A of that statute. However, as mentioned previously (Sect. 2.2), these air quality standards apply only to major sources and are unlikely to be ARAR for CERCLA cleanup actions. Similarly, the state regulations governing emissions from existing sources (401 KAR 61 and 401 KAR 63:021) will not generally be considered as ARARs for CERCLA cleanup.

The Kentucky Air Quality regulations contain General Standards of Performance governing fugitive emissions (401 KAR 63:010). Fugitive emissions are emissions of any air contaminant into the open air other than from a stack or air pollution control device. Reasonable precaution must be taken to prevent particulate matter from becoming airborne during handling, processing, construction, road grading, land clearing, etc. Site remedial activities that generate dust will be subject to the provisions of this regulation.

The CAA (§111) requires EPA to promulgate standards for new sources of air emissions. This requirement has been implemented in 40 CFR 60 through the New Source Performance Standards (NSPS) that are based on the best demonstrated technology (BDT) and set minimum federal emission limitations on classes of facilities. The NSPS are probably not legally applicable to cleanup of CERCLA sites, but will be considered as potentially relevant

and appropriate for cleanup at PGDP on a site-specific basis. NESHAPs have been discussed as potential "hybrid" ARARs (see Sects. 2.2.1 and 3.1), which will be considered as remedial alternatives are selected.

5.3 CLEAN WATER ACT

The regulatory aspects of the CWA include site-specific pollutant limitations and performance standards designed to restore and maintain the chemical, physical, and biological integrity of the nation's surface waters. The National Pollutant Discharge Elimination System (NPDES) permit program includes applicable effluent standards, monitoring requirements, and conditions for discharge. Kentucky has an EPA-authorized state program that is equivalent to the federal program (401 KAR 5:050-080). Although NPDES permits are not necessary for on-site discharges from CERCLA sites, the substantive CWA NPDES requirements must be complied with. KPDES permit No. KY0004049 regulates discharges from PGDP via 16 outfalls into Big and Little Bayou creeks. The effluent limitations established in this permit will be considered ARARs for discharges resulting from remedial actions at PGDP.

Direct discharge of dredge-and-fill material into navigable waters is regulated under CWA §404 and implemented through 33 CFR 320-330 and 40 CFR 230. CERCLA remedial actions that may be considered dredge-and-fill activities include dredging sediments from contaminated water bodies, disposing of contaminated soil or materials in surface water, capping a site, building berms and levees to contain wastes, excavating for the containment of effluent, and dewatering a site to obtain adequate flow (EPA 1988).

The Corps of Engineers issues dredge-and-fill permits for activities regulated under §10 of the Rivers and Harbors Act and §404 of the CWA. CERCLA §121(e) stipulates that permits are not required for on-site CERCLA cleanup; however, the applicability of these regulations for off-site remediation will be addressed on a site-specific basis.

5.4 SAFE DRINKING WATER ACT

Part C of Title XIV of the SDWA authorizes the establishment of an underground injection control (UIC) permit program designed to prevent contamination of underground sources of drinking water. An underground drinking water source is defined in the UIC regulations (40 CFR 146.3) as an aquifer or its portion that supplies drinking water for human consumption, contains a sufficient supply of groundwater to supply a public water system, and contains fewer than 10,000 mg total dissolved solids per liter of water. Although permits are not necessary for CERCLA cleanup [CERCLA §121(e)], technical criteria and standards applicable to the various classes of underground injection wells (defined in 40 CFR 146.5) appear in 40 CFR 146, and may be ARARs for CERCLA cleanup at PGDP. Kentucky does not have a UIC Program in place; therefore, the SDWA UIC regulations are implemented through the EPA Region IV UIC Section. The UIC standards will be analyzed on a site-specific basis if underground injection is a remedial option.

5.5 TOXIC SUBSTANCES CONTROL ACT

Specific TSCA standards exist for incineration or alternate disposal of liquid and nonliquid waste and for articles and soils containing PCBs, and these will be addressed during the site-specific RI/FS process. TSCA storage requirements for PCBs specify that PCBs and PCB-containing items at concentrations of greater than 50 ppm must be disposed of within 1 year after being placed in storage (40 CFR 761.65). This presents a problem for radionuclide-contaminated PCB wastes that may be generated during cleanup at PGDP because of the lack of treatment and mixed-waste disposal capabilities. However, DOE and EPA are currently negotiating the unauthorized storage of these mixed-PCB wastes.

There are also structural requirements for facilities and containers used for storage. These requirements will be addressed on a site-specific basis for those PGDP sites requiring remediation of PCBs or PCB-contaminated materials or soil.

5.6 FEDERAL INSECTICIDE, FUNGICIDE, AND RODENTICIDE ACT

The Federal Insecticide, Fungicide, and Rodenticide Act delegates authority to EPA to regulate the disposal and storage of excess pesticides and pesticide containers. To that end, EPA has published nonregulatory procedures for disposal of pesticides in 40 CFR 165, Subpart C. Although not an ARAR, these recommendations might provide guidance for cleanup of pesticides and pesticide containers at PGDP and will be analyzed on a site-specific basis, if necessary. EPA is currently updating these guidelines to make them consistent with current regulations and technologies. Regulatory initiatives for 40 CFR 165 will be published in three phases. An NPRM for Phase I, concerning suspended and cancelled pesticides, will be published in early 1992. The NPRM for Phase II, concerning container design, residue removal storage, containment, and excess, is due in 1993, and the Phase III NPRM is due in 1994.

5.7 OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION

Title I, §126(b) of CERCLA mandated that OSHA promulgate standards for regulation of employee health and safety during hazardous waste operations at RCRA or CERCLA sites and during emergency response to hazardous substance releases. The final regulations for "Hazardous Waste Operations and Emergency Response" (29 CFR 1910) have appeared in 54 *FR* 9294 (Final Rule, March 6, 1989; effective date, March 1990). These regulations are designed to protect workers involved in cleanup operations at uncontrolled hazardous waste sites and to provide for worker protection during initial site characterization and analysis, monitoring activities, materials handling activities, training, and emergency response. These regulations do not apply to those workers who would not be exposed. Federal construction activities involving no potential for hazardous substance exposure are covered by the OSHA standards in 29 CFR 1926, "Federal Service Contracts," and 29 CFR 1910, "General Industry."

In general, however, the OSHA standards are not considered to be ARARs for CERCLA remedial action, and will not be addressed unless they contain provisions pertinent to protection of the environment.

Table 17. Selected probable action-specific applicable or relevant and appropriate requirements (ARARs) for the Paducah Gaseous Diffusion Plant[a]

Actions[b]	Requirements	Prerequisites[c,d]	Federal citation	Title 401, KAR[1] Chapter
Air stripping	Standards for control of emissions of volatile organics. These are based on CAA[e,f] emission standards found in 40 CFR 60.480-60.489.	Emissions from process vents and equipment leaks at treatment, storage, and disposal (TSD) facilities handling or recycling hazardous waste containing 10% or more volatile organics.	55 *FR* 25454 (June 21, 1990)	
Capping	Placement of a cap over waste (e.g., closing a landfill, or closing a surface impoundment or waste pile as a landfill, or similar action) requires a cover designed and constructed to: • Provide long-term minimization of migration of liquids through the capped area; • Function with minimum maintenance; • Promote drainage and minimize erosion or abrasion of the cover; • Accommodate settling and subsidence so that the cover's integrity is maintained; and • Have a permeability less than or equal to the permeability of any bottom liner system or natural subsoils present.	RCRA[g,h] hazardous waste placed at site after November 19, 1980, or placement of hazardous waste into another unit will make requirements applicable when the waste is being covered with a cap for the purpose of leaving it behind after the remedy is completed. Capping without such placement will not make requirements applicable, but technical requirements are likely to be relevant and appropriate.	40 CFR 264.228(a) (Surface Impoundments) 40 CFR 264.258(b) (Waste piles) 40 CFR 264.310(a) (Landfills)	34:200.6 34:210.8 34:230.6
	Eliminate free liquids, stabilize wastes before capping (surface impoundments).		40 CFR 264.228 (a)	34:200.6(1)(b)(1)
	Restrict postclosure use of property as necessary to prevent damage to the cover.		40 CFR 264.117(c)	34:200.6(1)(b)(2)

[1]Kentucky Administrative Regulation

Table 17 (continued)

Actions[b]	Requirements	Prerequisites[c,d]	Federal citation	Title 401, KAR[1] Chapter
Capping (continued)	Prevent run-on and run-off from damaging the final cover.		40 CFR 264.228 (b); 40 CFR 264.310(b)	34:200.6(2)(c) 34:230.6(1)(e)
			40 CFR 264.310 (b)	34:230.6(1)(e)
	Protect and maintain surveyed benchmarks used to locate waste cells (landfills, waste piles).			
Clean closure (e.g., closure with no postclosure care)	Closure and postclosure standards.	Applicable to land-based unit containing hazardous waste[d].	40 CFR 264.110-120 (Subpart G)	34:070.1-11
	General performance standard requires elimination of need for further maintenance and control; elimination of postclosure escape of hazardous waste, hazardous constituents, leachate, contaminated run-off, or hazardous - waste decomposition products.	Applicable to RCRA hazardous waste (listed or characteristic) placed at site after November 19, 1980, or placement of hazardous waste into another unit. Not applicable to material undisturbed since November 19, 1980, or if treated in situ, or consolidated within area of contamination. Designed for cleanup that will not require long-term management; designed for cleanup to health-based standards.	40 CFR 264.111	34:070.2
	Removal or decontamination of waste residues, contaminated containment system components (e.g., liners, dikes), contaminated subsoils, and structures and equipment contaminated with waste and leachate, and management of them as hazardous waste.		40 CFR 264.228	34:200.6

Table 17 (continued)

Actions[b]	Requirements	Prerequisites[c,d]	Federal citation	Title 401, KAR[1] Chapter
Clean closure (e.g., closure with no postclosure care) (continued)	Closure performance standards must comply with requirements of other sections of Subpart C.	May apply to surface impoundments and container or tank liners and hazardous waste residues, and to contaminated soil, including soil from dredging or soil disturbed in the course of drilling or excavation, and returned to land.	40 CFR 264.111 40 CFR 264.178 40 CFR 264.197 40 CFR 264.258	34:070.2 34:180.9 34:190.8 34:210.8
	Must protect human health and the environment.		40 CFR 264.111(b)	34:070.2(2)
Closure with waste in place (capping)	Eliminate free liquids by removal or solidification.	Applicable to land-based unit containing hazardous waste[d].	40 CFR 264.228(a)(2) (surface impoundments)	34:200.6(1)(b)(1)
	Stabilization of remaining waste and waste residues to support cover.	Applicable to RCRA hazardous waste (listed or characteristic) placed at site after November 19, 1980, or placement of hazardous waste into another unit. Not applicable to material undisturbed since November 19, 1980, or if treated in situ, or consolidated within area of contamination.	40 CFR 264.258(b) (waste piles)	34:210.8(1)
	Installation of final cover to provide long-term minimization of infiltration.		40 CFR 264.310	34:210.6(1)
	Postclosure care and groundwater monitoring.[i]		40 CFR 264.310	34:230.6(2)(a-e)
Closure with waste in place (hybrid closure)	Removal of majority of contaminated materials.	Reproposed notice of proposed rulemaking and guidelines are on hold.	52 *FR* 8712 (March 19, 1987)	
	Application of cover and postclosure monitoring based on exposure pathways of concern.	Reproposed notice of proposed rulemaking and guidelines are on hold.	52 *FR* 8712 (March 19, 1987)	

Table 17 (continued)

Actions[b]	Requirements	Prerequisites[c,d]	Federal citation	Title 401, KAR[1] Chapter
Consolidation between units	Requirements in various sections of Subpart C may apply.[d] Consolidation in storage piles/storage tanks will trigger storage requirements.	Movement of hazardous waste (listed or characteristic) from one unit or area of contamination into another. Consolidation within a unit or area of contamination does not trigger applicability.[d,j]	See Capping, Clean Closure, Container Storage, Construction of a New Landfill On-site, Construction of a New Surface Impoundment On-site, Incineration (on-site), Land Treatment, Operation and Maintenance, Tank Storage, and Treatment.	
	Placement on or in land outside unit boundary or area of contamination will trigger land disposal requirements and restrictions.	Placement of RCRA hazardous wastes subject to land disposal restrictions.	40 CFR 268 (Subpart D)	37:010
Container storage (on-site)	Containers of hazardous waste must be: • Maintained in good condition; • Compatible with hazardous waste to be stored; and • Closed during storage (except to add or remove waste). Inspect container storage areas weekly for deterioration.	Storage of RCRA hazardous waste (listed or characteristic) not meeting small quantity generator criteria held for a temporary period before treatment, disposal, or storage elsewhere, in a container (i.e., any portable device in which a material is stored, transported, disposed of, or handled). A generator who accumulates or stores hazardous waste on-site for 90 days or less in compliance with 40 CFR 262.34 (a)(1-4) is not subject to full RCRA storage requirements.	40 CFR 264 (Subpart I) 40 CFR 264.171 40 CFR 264.172 40 CFR 264.173 40 CFR 264.174	34:180 34:180.2 34:180.3 34:180.4 34:180.5

Table 17 (continued)

Actions[b]	Requirements	Prerequisites[c,d]	Federal citation	Title 401, KAR[1] Chapter
Container storage (on-site) (continued)	Place containers on a sloped, crackfree base, and protect from contact with accumulated liquid. Provide containment system with a capacity of 10% of the volume of containers. Remove spilled or leaked waste in a timely manner to prevent overflow to the containment system.		40 CFR 264.175	34:180.6
	Keep containers of ignitable or reactive waste at least 50 ft from the facility's property line.		40 CFR 264.176	34:180.7
	Keep incompatible materials separate. Separate incompatible materials stored near each other by a dike or other barrier.		40 CFR 264.177	34:180.8
	At closure, remove all hazardous waste and residues from the containment system and decontaminate or remove all containers, liners.		40 CFR 264.178	34:180.9
	Storage of banned wastes must be in accordance with 40 CFR 268. When such storage occurs beyond one year, the owner/operator bears the burden of providing that such storage is solely for the purpose of accumulating sufficient quantities to allow for proper recovery, treatment, and disposal.		40 CFR 268.50	37:050.2
Construction of new landfill on site (see closure with waste in place and clean closure)	*Minimum Technology Requirements* Install two liners or more, a top liner that prevents waste migration into the liner and a bottom liner that prevents waste migration through the liner.[k]	RCRA hazardous waste (listed or characteristic) currently being disposed of at a new, replacement, or expanded landfill.	40 CFR 264.301	34:230.2

Table 17 (continued)

Actions[b]	Requirements	Prerequisites[c,d]	Federal citation	Title 401, KAR[1] Chapter
Construction of new landfill on site (see closure with waste in place and clean closure) (continued)	Install leachate collection systems above and between the liners.		40 CFR 264.301	34:230.2
	Construct run-on and run-off control systems capable of handling the peak discharge of a 25-year storm.		40 CFR 264.301	34:230.2
	Control wind dispersal of particulates.		40 CFR 264.301	34:230.2
	Inspect liners and covers during and after installation.		40 CFR 264.303	34:230.4
	Inspect facility weekly and after storms to detect malfunction of control systems or the presence of liquids in the leachate collection and leak detection systems.		40 CFR 264.303	34:230.4
	Maintain records of the exact location, dimensions, and contents of waste cells.		40 CFR 264.304	34:230.5
	Close each cell with a final cover after the last waste has been received.		40 CFR 264.310	34:230.6
	No bulk or noncontainerized liquid hazardous waste or hazardous waste containing free liquids may be disposed of in landfills.		40 CFR 264.314	34:230.9
	Containers holding free liquids may not be placed in a landfill unless the liquid is mixed with an absorbent or solidified.		40 CFR 264.314	34:230.9

Table 17 (continued)

Actions[b]	Requirements	Prerequisites[c,d]	Federal citation	Title 401, KAR[1] Chapter
Construction of new landfill on site (see closure with waste in place and clean closure) (continued)	*Groundwater Monitoring* Establish a detection, compliance, and a corrective action monitoring program when required by 40 CFR 264.91. All monitoring programs must meet RCRA general groundwater monitoring requirements.	Placement of RCRA hazardous waste subject to land disposal restrictions. Creation of a new landfill to treat, store, or dispose of RCRA hazardous wastes as part of a remedial action.	40 CFR 268 (Subpart D) 40 CFR 264.91-100	37:010 34:060.1-11
	Treatment by Best Demonstrated Available Technology (BDAT) before placement.		40 CFR 264.97	34:060.8
Construction of new surface impoundment on-site (see closure with waste in place and clean closure)	*Minimum Technology Requirements* Use two liners, a top liner that prevents waste migration into the liner and a bottom liner that prevents waste migration through the liner throughout the postclosure period.	RCRA hazardous (listed or characteristic) currently being placed in a new surface impoundment, or use of replacement or lateral extension of existing landfills or surface impoundments.	40 CFR 264 (Subpart K) 40 CFR 264.220	34:200 34:200.1
	Design liners to prevent failure due to pressure gradients, contact, contact with the waste, climatic conditions, and the stress of installation and daily operation.		40 CFR 264.221	34:200.2
	Provide leachate collection system between the two liners.		40 CFR 264.221	34:200.2
	Use leak detection system that will detect leaks at the earliest possible time.		40 CFR 264.221	34:200.2

Table 17 (continued)

Actions[b]	Requirements	Prerequisites[c,d]	Federal citation	Title 401, KAR[1] Chapter
Construction of new surface impoundment on-site (see closure with waste in place and clean closure) (continued)	*Groundwater Monitoring*			
	Establish a detection, compliance, and a corrective action monitoring program when required by 40 CFR 264.91.	Creation of a new landfill to treat, store, or dispose of RCRA hazardous wastes as part of a remedial action.	40 CFR 264.91-100	34:060.1-11
	All monitoring programs must meet RCRA general groundwater monitoring requirements.		40 CFR 264.97	34:060.8
Dike stabilization	Design and operate facility to prevent overtopping due to overfilling; wind and wave action; rainfall; run-on; malfunctions of level controllers, alarms, and other equipment; and human error.	Existing surface impoundment containing hazardous waste, or creation of new surface impoundment.	40 CFR 264.221	34:200.2
	Construct dikes with sufficient strength to prevent massive failure.		40 CFR 264.221	34:200.2
	Inspect liners and cover system during and after construction.		40 CFR 264.226	34:200.4
	Inspect weekly for proper operation and integrity of the containment devices.		40 CFR 264.226	34:200.4
	Remove surface impoundment from operation if the dike leaks or there is a sudden drop in liquid level.		40 CFR 264.227	34:200.5

Table 17 (continued)

Actions[b]	Requirements	Prerequisites[c,d]	Federal citation	Title 401, KAR[1] Chapter
Dike stabilization (continued)	At closure, remove or decontaminate all waste residues and contaminated materials. Otherwise, free liquids must be removed, the remaining wastes stabilized, and the facility closed in the same manner as a landfill.		40 CFR 264.228	34:200.6
	Manage ignitable or reactive waste so that it is protected from materials or conditions that may cause it to ignite or react.		40 CFR 264.227	34:200.5
Direct discharge of treatment system effluent	Use of best available technology (BAT) economically achievable is required to control toxic and nonconventional pollutants. Use of best conventional pollutant control technology (BCT) is required to control conventional pollutants. Technology-based limitations may be determined on a case-by-case basis.	Point-source discharge to waters of the United States[l,m].	40 CFR 122.44(a) (Clean Water Act)[n]	5:080.1
	The discharge must comply with applicable federal water quality requirements and more stringent state requirements under the CWA[o].		40 CFR 122.44(d) and state regulations approved under 40 CFR 131	5:080.1
	The discharge must be consistent with the requirements of a Water Quality Management plan approved by EPA under CWA § 208(b).		40 CFR 122.44(d)	5:080.1
	Discharge limitations must be established for all toxic pollutants that are or may be discharged at levels greater than that which can be achieved by technology-based standards.		40 CFR 122.44(e)	5:080.1(2)(a)

Table 17 (continued)

Actions[b]	Requirements	Prerequisites[c,d]	Federal citation	Title 401, KAR[1] Chapter
Direct discharge of treatment system effluent (continued)	Develop and implement a best management practice (BMP) program and incorporate in the National Pollutant Discharge Elimination System (NPDES) permit to prevent the release of toxic constituents to surface waters.		40 CFR 125.100	
	The BMP program must: • Establish specific procedures for the control of toxic and hazardous pollutant spills; • Include a prediction of direction, rate of flow, and total quantity of toxic pollutants where experience indicates a reasonable potential for equipment failure; • Ensure proper management of solid and hazardous waste in accordance with regulations promulgated under RCRA.	Discharge to waters of the United States[m].	40 CFR 125.104	
	To ensure compliance, discharge must be monitored for: • The mass of each pollutant; • The volume of effluent; • Frequency of discharge and other measurements as appropriate.		40 CFR 122.44(i)	
	Approved test methods must be followed for monitored waste constituents. Detailed requirements for analytical procedures and quality control are provided.		40 CFR 136.1-136.3(e)	

Table 17 (continued)

Actions[b]	Requirements	Prerequisites[c,d]	Federal citation	Title 401, KAR[1] Chapter
Direct discharge of treatment system effluent (continued)	Comply with additional permit conditions such as: • Duty to mitigate any adverse effects of any discharge; and • Proper operation and maintenance of treatment systems.	Off-site discharges.	40 CFR 122.41(d,e)	5:065.1
Discharge to publicly owned treatment works (POTWs)	Pollutants that pass through the POTW without treatment, interfere with POTW without operation, or contaminate POTW sludge are prohibited.	Off-site discharge[e]. The same regulations apply regardless of whether the waste is discharged into a sewer or trucked to a POTW.	40 CFR 403.5 (Clean Water Act)	5:055.9
	The discharge of pollutants of POTWs is prohibited if they: • Create a fire or explosion hazard in the POTW; • Are corrosive (pH < 5.0); • Obstruct slow resulting in interference; • Are discharged at a flow rate and/or concentration that will result in interference; and • Increase the temperature of wastewater entering the treatment plant that would result in interference, but in no case raise the POTW temperature above 104°F (40°C).		40 CFR 403.5(b)	5:055.9
	Discharge must comply with local POTW pretreatment program.		40 CFR 403.5(d)	5:055.9

Table 17 (continued)

Actions[b]	Requirements	Prerequisites[c,d]	Federal citation	Title 401, KAR[1] Chapter
Discharge to POTW (continued)	RCRA permit-by-rule requirements may be complied with for discharges of RCRA hazardous wastes to POTWs by truck, rail, or dedicated pipe.		40 CFR 270.61(c)	
Discharge of dredge and fill material to navigable waters	The four conditions that must be satisfied before dredge and fill is an allowable alternative are:		40 CFR 230.10 (Marine Protection, Research, and Sanctuaries Act)	
	• There must be no practible alternative.			
	• Discharge of dredge or fill material must not cause a violation of state water quality standards, violate any applicable toxic effluent standards, jeopardize an endangered species, or injure a marine sanctuary.			
	• No discharge shall be permitted that will cause or contribute to significant degradation of the water.			
	• Appropriate steps to minimize adverse effects must be taken.			
	Determine long- and short-term effects on physical, chemical, and biological components of the aquatic ecosystems.		33 CFR 320-330 (Clean Water Act)	
	Comply with additional substantive conditions such as:		40 CFR 122.41(i)	5:065.1
	• Duty to mitigate any adverse effects of any discharge and			

Table 17 (continued)

Actions[b]	Requirements	Prerequisites[c,d]	Federal citation	Title 401, KAR[1] Chapter
Discharge of dredge and fill material to navigable waters (continued)	• Proper operation and maintenance of treatment systems.			
	Monitor and report results as required by permit (minimum of at least annually).	Off-site discharges.	40 CFR 122.44(i)	
Dredging	Removal of all contaminated soil.	RCRA hazardous waste placed at site after November 19, 1980, or movement of hazardous waste from one unit, area of contamination or location into another unit or area of concentration.	40 CFR 264.228 (surface impoundments) 40 CFR 264.258 (waste piles)	34:200.6 34:210.8
Excavation	Area from which materials are excavated may require cleanup to levels established by closure requirements.	RCRA hazardous waste placed at site after November 19, 1980, or movement of hazardous waste from one unit, area of contamination, or location into another unit or area of contamination.	See Closure requirements.	
	Site excavations must be shored or sloped to prevent accidental collapse in accordance with Subpart P of 29 CFR 1926.	OSHA regulations for workers at hazardous waste sites.	54 *FR* 9294 (March 3, 1989)	
	Movement of excavated materials to new location and placement in or on land will trigger land disposal restrictions for the excavated waste or closure requirements for the unit in which the waste is placed.	Materials containing RCRA hazardous wastes subject to land disposal restrictions are placed in another unit.	40 CFR 268 (Subpart D)	37:050

Table 17 (continued)

Actions[b]	Requirements	Prerequisites[c,d]	Federal citation	Title 401, KAR[1] Chapter
Gas collection	Standards for control of emissions of volatile organics. These are based on CAA emission standards found in 40 CFR 60.480-60.489.	Emissions from process vents and equipment leaks at TSD facilities handling or recycling hazardous waste containing 10% or more volatile organics.	55 *FR*25454 (June 21, 1990)	
Groundwater diversion	Excavation of soil for construction of slurry wall may trigger closure or land disposal restrictions.	Materials containing RCRA hazardous waste subject to land disposal restrictions if moved to another unit.	40 CFR 268 (Subpart D)	37:050
	Site excavations must be shored or sloped to prevent accidental collapse in accordance with Subpart P of 29 CFR 1926.	OSHA regulations for workers at waste sites.	54 *FR* 9294 (March 3, 1989)	
Incineration (on-site)	Analyze the waste feed.	RCRA hazardous waste.	40 CFR 264.341	34:240.2
	Dispose of all hazardous waste and residues, including ash, scrubber water, and scrubber sludge.			
	No further requirements apply to incinerators that only burn wastes listed as hazardous solely by virtue of combination, and if the waste analysis shows that no Appendix VIII constituent is present that might reasonably be expected to be present.			
	Performance standards for incinerators:			
	• Achieve a destruction and removal efficiency (DRE) of 99.99% for each principal organic hazardous constituent in the waste feed and 99.999% for dioxins;		40 CFR 264.343(a)	34:240.4(1)(a)

Table 17 (continued)

Actions[b]	Requirements	Prerequisites[c,d]	Federal citation	Title 401, KAR[1] Chapter
Incineration (on-site) (continued)	• reduce hydrogen chloride emissions to 1.8 kg/hr or 1% of the HCl in the stack gases before entering any pollution control devices; and		40 CFR 264.343(b)	34:240.4(b)(2)
	Limit emissions of particulate matter.		40 CFR 264.343(c)	34:240.4(b)(3)
	EPA is *proposing* to amend the hazardous waste incinerator regulations to improve control of toxic metals, hydrogen chloride, and organic emissions.	*Proposed* rule, not yet ARAR. Final rule due June, 1992.	55 *FR* 17862 (April 27, 1990)	
	Monitoring of various parameters during operation of the incinerator is required. These parameters include:		40 CFR 264.347	34:240.7
	• Combustion temperature;			
	• Waste feed rate;			
	• An indicator of combustion gas velocity; and			
	• Carbon monoxide			
	Control fugitive emissions either by:		40 CFR 264.345(d)	34:240.6
	• Keeping combustion zone sealed or			
	• Maintaining combustion zone pressure lower than atmospheric pressure.			
	Utilize automatic cutoff system to stop waste feed when operating conditions deviate.		40 CFR 264.345(e)	34:240.6

Table 17 (continued)

Actions[b]	Requirements	Prerequisites[c,d]	Federal citation	Title 401, KAR[1] Chapter
Incineration (on-site) (continued)	Special performance standards for incineration of PCBs		40 CFR 761.70(b) (Total Substances Control Act)[g]	
	New source performance standards for incinerators.	Incinerators with a charge rate greater than 45 metric tons/d.	40 CFR 60.50-60.54 (Clean Air Act)	59:020.3
Land treatment	Ensure hazardous constituents are degraded, transformed, or immobilized within the treatment zone.	RCRA hazardous waste being treated or placed into another unit.	40 CFR 264.271(a)	34:220.2(1)
	Maximum depth of treatment zone must be no more than 1.5 meters (5 ft) from the initial soil surface; and more than 1 meter (3 ft) above the seasonal high water table.		40 CFR 264.271(c)	34:220.2(3)(a)
	Minimize run-off of hazardous constituents.		40 CFR 264.273(b)	34:220.4(2)
	Maintain run-on/run-off control and management system.		40 CFR 264.273(c)	34:220.4(4)
	Special application conditions if food-chain crops grown in or on treatment zone.		40 CFR 264.276	34:220.5
	Unsaturated zone monitoring program required.		40 CFR 264.278	34:220.6
	Special requirements for ignitable or reactive waste.		40 CFR 264.281	34:220.9
	Special requirements for incompatible waste.		40 CFR 264.282	34:220.10
	Special requirements for RCRA hazardous wastes.	RCRA waste FO20, FO21, FO22, FO23, FO26, FO27, (dioxin-containing wastes). May be superseded by new land ban regulations.	40 CFR 264.283	34:220.11

Table 17 (continued)

Actions[b]	Requirements	Prerequisites[c,d]	Federal citation	Title 401, KAR[1] Chapter
Land treatment (continued)	Prior to land disposal, waste must be treated to BDAT levels or meet a "no migration" standard.	RCRA hazardous waste being disposed of in another unit.	40 CFR 268 (Part D)	37:050
	Treatment standards and land disposal restrictions apply to:		52 *FR* 25760 (July 8, 1987) RCRA 3004(d)	
	spent solvent wastes, dioxin-containing wastes, California-list wastes, and all RCRA hazardous waste (see Treatment).			
Operation and maintenance	30-year postclosure care to ensure that site is maintained and monitored.	Closure of hazardous waste management units.	40 CFR 264.117	34:070.8
Placement of liquid waste in landfill	No bulk or noncontainerized liquid hazardous waste or hazardous waste containing free liquids may be disposed of in landfills.	Placement of a bulk or non-containerized RCRA waste in a landfill	40 CFR 264.314(b)	34:230.9
	Containers holding free liquid may not be placed in a landfill unless the liquid is mixed with an absorbent or solidified.			
Placement of waste in land disposal unit	Attain land disposal treatment standards in order to comply with "land ban" restrictions (see Treatment)	Placement of RCRA hazardous waste in a landfill, surface impoundment, waste pile, injection well, land treatment facility, salt dome formation, salt bed formation, or underground cave or mine.	40 CFR 268 (Subpart D)	37:010
Slurry wall	Excavation of soil for construction of slurry wall may trigger cleanup or land disposal restrictions.	RCRA hazardous waste placed at site after November 19, 1980, or movement of hazardous waste from one unit into another unit or area of contamination.	40 CFR 268 (Part D) See also Consolidation, Excavation, and Treatment regulations	37:010

Table 17 (continued)

Actions[b]	Requirements	Prerequisites[c,d]	Federal citation	Title 401, KAR[1] Chapter
Surface water control	Prevent run-on and control and collect run-off from at least the amount of water volume resulting from a 24-h, 25-year storm (waste piles, land treatment facilities, landfills).	RCRA hazardous waste treated, stored, or disposed at a site after November 19, 1980	40 CFR 264.251(c,d); 40 CFR 264.273(c,d); 40 CFR 264.301(c,d)	34:210.1 34:220.4 34:230.2
	Prevent over-topping of surface impoundment.		40 CFR 264.221(c)	34:200.2
Tank storage (on-site)	Existing and new tanks must have sufficient structural strength, compatible with the waste, to ensure that they do not collapse or rupture.	Storage of RCRA hazardous waste (listed or characteristic) not meeting small quantity generator criteria held for a temporary period greater than 90 days before treatment, disposal, or storage elsewhere, in a tank (i.e., any portable device in which a material is stored, transported, disposed of, or handled). A generator who accumulates or stores hazardous waste on-site for 90 days or less in compliance with 40 CFR 262.34 (a)(1-4) is not subject to full RCRA storage requirements.	40 CFR 264.191-192	34:190.2-3
	Waste must not be incompatible with the tank material unless the tank is protected by a liner or by other means.		40 CFR 264.191	34:190.2
	Tanks must be provided with secondary containment and controls to prevent overfilling, and sufficient freeboard maintained in open tanks to prevent overtopping by wave action or precipitation.		40 CFR 264.193-194	34:190.4-5

Table 17 (continued)

Actions[b]	Requirements	Prerequisites[c,d]	Federal citation	Title 401, KAR[1] Chapter
Tank storage (on-site) (continued)	Inspect the following: overfilling control; control equipment, monitoring data, waste level (for uncovered tanks), tank condition, aboveground portions of tanks (to assess their structural integrity), and the area surrounding the tank (to identify signs of leakage).		40 CFR 264.195	34:190.6
	Repair any corrosion, crack, or leak.		40 CFR 264.196	34:190.7
	At closure, remove all hazardous waste and hazardous waste residues from tanks, discharge control equipment, and discharge confinement structures.		40 CFR 264.197	34:190.8
	Store ignitable and reactive waste so as to prevent the waste from igniting or reacting. Ignitable or reactive wastes in covered tanks must comply with buffer zone requirements in "Flammable and Combustible Liquids Code," Tables 2-1 through 2-6 (National Fire Protection Association 1976, 1981).		40 CFR 264.198	34:190.9
	Storage of banned wastes must be in accordance with 40 CFR 268. When such storage exceeds one year, the owner/operator bears the burden of proving that the storage is solely for the purpose of accumulating sufficient quantities to allow for proper recovery, treatment, and disposal.		40 CFR 268.50	37:050
Treatment (in a unit)	Design and operating standards for units in which hazardous waste is treated.	Treatment of RCRA hazardous waste in a unit.	40 CFR 264.190-192 (Tanks) 40 CFR 264.221 (Surface Impoundments)	34:190.1-3 34:200.2

Table 17 (continued)

Actions[b]	Requirements	Prerequisites[c,d]	Federal citation	Title 401, KAR[1] Chapter
Treatment (in a unit) (continued)			40 CFR 264.251 (Waste Piles)	34:210.2
			40 CFR 264.273 (Land Treatment Units)	34:220.4
			40 CFR 264.343-345 (Incinerators)	34:240.4
			40 CFR 264.601 (Miscellaneous Treatment Units)	34:250.2
			40 CFR 264.373 (Thermal Treatment Units)	35:250
Treatment	Treatment of wastes subject to ban on land disposal must attain levels achievable by BDAT for each hazardous constituent in each listed waste, if residual is to be land disposed. If residual is to be further treated, initial treatment and any subsequent treatment that produces residual to be treated need not be BDAT, if it does not exceed the value in the Constituent Concentration in Waste Extract (CCWE) Table for each applicable wastewater	The following wastes have been prohibited from land disposal without treatment: • Spent solvent wastes and dioxin-containing wastes. • "California List" wastes.	40 CFR 268 (Part D) 51 *FR* 40572 (November 7, 1986) 52 *FR* 25760 (July 8, 1987)	37:010.2

Table 17 (continued)

Actions[b]	Requirements	Prerequisites[c,d]	Federal citation	Title 401, KAR[1] Chapter
Treatment (continued)		All ranked and listed hazardous wastes identified under 40 CFR Part 261:		
		• First third	53 *FR* 31138 (August 17, 1988)	
		• Second third	54 *FR* 26594 (June 23, 1989)	
		• Final third, and mixed radioactive hazardous waste	55 *FR* 22520 (June 1, 1990)	
	No-migration variance for restricted hazardous waste land disposal	*Proposed* ARAR. Land disposal of untreated hazardous waste that has been restricted from land disposal.	40 CFR 268 (Part D) Notice of Proposed Rulemaking (NPRM) January 1992; Final rule expected December 1992	37:040.2
	Treatment and disposal of hazardous soil and debris	*Proposed* ARAR. Separate treatment standards for contaminated soil and debris.	40 CFR 268 (Part D) NPRM debris January 1992 (57 *FR* 958); Final rule expected May 1992; NPRM (soil) May 1992; Final rule expected May 1993	37:040

Table 17 (continued)

Actions[b]	Requirements	Prerequisites[c,d]	Federal citation	Title 401, KAR[1] Chapter
Treatment (continued)		Effective November 8, 1990, disposal of contaminated soil or debris resulting from Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) response actions or RCRA corrective actions is subject to land disposal prohibitions and/or treatment standards established for spent solvent wastes, dioxin-containing wastes, and "California List" wastes. Disposal of soil and debris contaminated with RCRA hazardous waste for which the treatment standard is incineration is not subject to the land disposal restrictions until August 1990, July 1991, and November 1991, for the three thirds, respectively. Mixed radioactive waste is included in the final third capacity national capacity variance schedule.		
Underground injection of wastes and treated groundwater	Underground Injection Control (UIC) program prohibits: • Injection activities that allow movement of contaminants into underground sources of drinking water (USDW) and results in violation of MCLs or adversely affects health[e].		40 CFR 144 (Safe Drinking Water Act)[f] 40 CFR 144.12	

Table 17 (continued)

Actions[b]	Requirements	Prerequisites[c,d]	Federal citation	Title 401, KAR[1] Chapter
Underground injection of wastes and treated groundwater (continued)	• Construction of new Class IV wells, and operation and maintenance of existing wells.	Excludes Class IV wells used to reinject contaminated groundwater that has been treated if part of a CERCLA or RCRA remedial action.	40 CFR 144.13	
	All hazardous waste injection wells must also comply with the RCRA Part 264 permitting requirements.		40 CFR 144.14	
	The Director of the UIC program in a state may lessen the stringency of 40 CFR 144.23 construction, operation, and manifesting requirements for a well if injection does not occur into, through, or above an USDW or if the radius of endangering influence (see 40 CFR 146.06(c) is less than or equal to the radius of the well.		40 CFR 144.16	
	Owners and operators must: • Submit inventory information to the Director of the UIC program for the State; including hydrogeologic data for wells, construction record, nature or composition of injected fluids, injection rate and pressure, and groundwater monitoring data.		40 CFR 144.26 40 CFR 144.27	

Table 17 (continued)

Actions[b]	Requirements	Prerequisites[c,d]	Federal citation	Title 401, KAR[1] Chapter
Underground injection of wastes and treated groundwater (continued)	• Report noncompliance orally within 24 hours.	Class I wells.	40 CFR 144.28(b)	
	• Prepare, maintain, and comply with plugging and abandonment plan.		40 CFR 144.28(c)	
	Monitor Class I wells by:	Class I wells are used to inject hazardous waste beneath the lowermost formation containing, within one quarter mile, an USDW.	40 CFR 144.28(g)(1)	
	• Frequent analysis of injection fluid;			
	• Continuous monitoring of injection pressure, flow rate and volume; and			
	• Installation and monitoring of groundwater monitoring wells.			
	Prohibits underground injection of hazardous wastes (solvents and dioxins) in Class I wells; amendments to existing UIC regulations.	Class I injection wells	53 *FR* 28118 (July 26, 1988)	
Underground Storage Tanks (USTs) Temporary closure	Continuous monitoring for leaks; leave vent lines open and functioning; cap and secure all other lines, pumps, manways and ancillary equipment; notify implementing agency of return to service or permanent closure.	Pertains to releases of CERCLA hazardous substances from any one or a combination of tanks the volume of which is 10% or more beneath the surface of the ground (including pipes). Tanks which have been out of service for 3-24 months.	53 *FR* 37082 (September 23, 1988) 40 CFR Part 280.80(a)(b)	

Table 17 (continued)

Actions[b]	Requirements	Prerequisites[c,d]	Federal citation	Title 401, KAR[1] Chapter
USTs Permanent closure	Removal requires removing all flammable liquids from the UST, removing all pipes from the UST, removing all pipes from the UST, and purging the UST of all hazardous vapors before removal and disposal.	Pertains to releases of CERCLA hazardous substances from any one or a combination of tanks the volume of which is 10% or more beneath the surface of the ground (including pipes). Tanks which have been out of service for 3-24 months.	53 *FR* 37082 (September 23, 1988) 40 CFR Part 280.80(c-f)	
	Closure requires removal of all flammable liquids from the UST, disconnect or cap all pipes, fill tank system with an inert solid material		52 *FR* 12662 (April 17, 19870	
Waste pile	Use liner and leachate collection and removal system.	RCRA hazardous waste, non-containerized accumulation of solid, nonflammable hazardous waste that is used for treatment or storage in piles.	40 CFR 264.25(a)	
	Proposed double liner requirements.	*Proposed* rule; not yet ARAR. Final rule expected 9/92.	52 *FR* 20218 (May 29, 1987)	
	Proposed amendments to waste pile closure regulations.	Reproposed notice of proposed rulemaking and guidelines are on hold.	52 *FR* 8712 (March 19, 1987)	
	Operate and maintain run-on and run-off control systems for at least the amount of water resulting from a 14-h, 25-year storm.		40 CFR 264.251 (c)(d)	34:210.2(4)
	Pile must be managed to control wind erosion.		40 CFR 264.251(f)	34:210.2
	Pile must be monitored and inspected.		40 CFR 264.254	34:210.5
	Closure and postclosure care required.		40 CFR 264.258	34:210.8

[a]Adapted from EPA (1989). Currently only RCRA, Clean Water Act, and Safe Drinking Water Act requirements are included. Additional action-specific requirements will be added as additional statutes are analyzed.

[b]Action alternatives from record of decision keyword index, FY1986 Record of Decision Annual Report. January 1987, Hazardous Site Control Division, EPA.

[c]Community relations Requirements have been proposed but not promulgated for various remedial actions. When these regulations are promulgated, they will be included in the matrix.

[d]Some action-specific requirements listed may be relevant and appropriate even if RCRA definitions of storage, disposal, or hazardous waste are not met (40 CFR 260.10), or if the waste at the site is similar to but not identifiable as a RCRA hazardous waste.

[e]CAA = Clean Air Act.

[f]Title I of the CAA covers Air Pollution Prevention and Control, and implementing regulations are found in 40 CFR Parts 50-99.

[g]RCRA = Resource Conservation and Recovery Act.

[h]Subtitle C of RCRA governs hazardous waste management (§3001-3020). Implementing regulations appear in 40 CFR Parts 260-268, 270, 271, 280, and 124.

[i]Regional administrator may revise length of postclosure care period (40 CFR 264.117).

[j]In many cases, there are no defined "units" at a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) site. Instead, there are areas of contamination with differing concentration levels (including hot spots) of hazardous substances, pollutants, or contaminants. When RCRA hazardous wastes are moved into or out of an area of contamination, RCRA disposal requirements are applicable to the waste being managed and certain treatment, storage, or disposal requirements (such as for closure) are applicable to the area where the waste is received.

[k]Landfill units meeting the requirements of 40 CFR 264.301(f) are not subject to RCRA minimum technology requirements.

[l]The term "Waters of the U.S." is defined broadly in 40 CFR 122.2 and includes essentially any water body and wetland.

[m]Section 121 of the Superfund Amendments and Reauthorization Act (SARA) exempts on-site CERCLA activities from obtaining permits. However, the substantive requirements of a law or regulation must be met. In particular, on-site discharges to surface waters are exempt from procedural NPDES permit requirements. Off-site dischargers would be required to apply for and obtain an NPDES permit.

[n]Titles III and IV of the Clean Water Act cover Standards and Enforcement, and Permits and Licenses, respectively. Implementing regulations appear in 40 CFR Parts 110, 112, 116, 117, 122, 124, 125, 131, and 136. 40 CFR Subchapter N sets forth effluent guidelines for various point-source categories.

[o]Federal Water Quality Criteria (WQC) may be relevant and appropriate depending on the designated or potential use of the water, the media affected, the purposes of the criteria, and current information [SARA §121(d)(2)(B)(i)]. Federal WQC for the protection of aquatic life will be relevant and appropriate when environmental factors (e.g., protection of aquatic organisms) are being considered (*55 FR 8755*, March 8, 1990).

[p]Discharge to POTWs is considered an off-site activity off-site actions must comply with all legally applicable requirements, both substantive and administrative. The concept of "relevant and appropriate" is not available for off-site actions.

[q]Implementing regulations for the Toxic Substances and Control Act which are of importance to cleanup at CERCLA sites are 40 CFR Parts 717 and 761.

[r]Title IV of the Safe Drinking Water Act covers Safety of Public Water Systems. Implementing regulations are found in 40 CFR Parts 124 and 141-147.

[s]An underground source of drinking water is a nonexempted aquifer or its portion which: (1) supplies any public water system, or (2) which contains sufficient quantity of groundwater to supply a public water system and currently supplies drinking water for human consumption or contains fewer than 10,000 mg/L total dissolved solids (40 CFR 144.3).

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