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Record of Decision for the Surface Impoundments Operable Unit, Oak Ridge National Laboratory, Oak Ridge, Tennessee

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Record of Decision for the Surface Impoundments Operable Unit, Oak Ridge National Laboratory, Oak Ridge, Tennessee

Date Issued—September 1997

Prepared by
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under contract DE-AC05-93OR22028

Prepared for
U.S. Department of Energy
Office of Environmental Management

PREFACE

This *Record of Decision for the Surface Impoundments Operable Unit, Oak Ridge National Laboratory, Oak Ridge, Tennessee* (DOE/OR/02-1630&D2) was prepared in accordance with requirements under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 to present the selected remedy for the Surface Impoundments Operable Unit (SIOU) to the public. This work was performed under Work Breakdown Structure 1.4.12.6.1.01 (Activity Data Sheet 3301, "ORNL WAG 1"). This document provides information about the selected remedy, which includes removal of surface water and sediments within the SIOU; construction of treatment facilities; treatment of the sediments, as required to meet disposal facility waste acceptance criteria; containerization of treated waste; and transport of all treated waste to Envirocare of Utah, the Nevada Test Site, or other appropriate facilities. This document also relies on information from the remedial investigation/feasibility study (DOE/OR/02-1346&D2), the proposed plan (DOE/OR/01-1427&D3/R1), and an engineering support study (X-OE-791).

ACRONYMS AND ABBREVIATIONS

Am	americium
ARAR	applicable or relevant and appropriate requirement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	*Code of Federal Regulations*
Ci	curie
Co	cobalt
Cs	cesium
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
EIS	environmental impact statement
Envirocare	Envirocare of Utah, Inc.
EPA	U.S. Environmental Protection Agency
FFA	Federal Facility Agreement
FS	feasibility study
ft	foot
ha	hectare
km	kilometer
LDR	land disposal restriction
m	meter
M&I	management and integration
mrem	millirem
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEPA	National Environmental Policy Act of 1969
NPDES	National Pollutant Discharge Elimination System
NTS	Nevada Test Site
O&M	operation and maintenance
ORNL	Oak Ridge National Laboratory
ORR	Oak Ridge Reservation
ORREMSSAB	ORR Environmental Management Site Specific Advisory Board
OU	operable unit
PCB	polychlorinated biphenyl
ppm	parts per million
PWTP	Process Waste Treatment Plant
Pu	plutonium
RCRA	Resource Conservation and Recovery Act of 1976
rem	roentgen equivalent man
RFP	request for proposal
RI	remedial investigation
ROD	record of decision
SIOU	Surface Impoundments Operable Unit
Sr	strontium
TDEC	Tennessee Department of Environment and Conservation
TSCA	Toxic Substances Control Act of 1976

ACRONYMS AND ABBREVIATIONS (continued)

USC	*United States Code*
WAC	waste acceptance criteria
yd	yard

PART 1. DECLARATION

SITE NAME AND LOCATION

U.S. Department of Energy
Oak Ridge Reservation
Surface Impoundments Operable Unit
Oak Ridge National Laboratory
Oak Ridge, Tennessee

STATEMENT OF BASIS AND PURPOSE

This record of decision (ROD) presents the selected remedial action for the Surface Impoundments Operable Unit (SIOU) on the U.S. Department of Energy (DOE) Oak Ridge Reservation (ORR) in Oak Ridge, Tennessee. The action was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986, 42 *United States Code* (USC) 9601 et seq. and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

This decision is based on the administrative record for SIOU, including the remedial investigation (RI)/feasibility study (FS) (DOE 1995), proposed plan (DOE 1997a), the engineering support study (Energy Systems 1996), and other documents for this site.

DOE is the lead agency for this action. The U.S. Environmental Protection Agency (EPA) and the Tennessee Department of Environment and Conservation (TDEC) are supportive agencies as parties of the Federal Facility Agreement (FFA) for this response action. EPA and TDEC concur with the selected remedy.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from SIOU, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

DESCRIPTION OF THE SELECTED REMEDY

This response action fits into the overall ORR cleanup strategy by addressing treatment and removal of contaminated sediment, water, and incidental soils at SIOU. The selected remedy addresses the principal threats to industrial workers and mitigates the release of contamination to groundwater by (1) removal of the sediments from SIOU and (2) transport of all treated waste to an approved disposal facility [e.g., Nevada Test Site (NTS) and Envirocare of Utah, Inc. (Envirocare)]. The selected remedy, which is Alternative 6 in the FS and the proposed plan and is described in Part 2 of this ROD, includes (1) removal of surface waters, sediments, and approximately 0.03 m (0.1 ft) of subimpoundment soil within SIOU; (2) discharge of surface water to the existing Process Waste Treatment Plant (PWTP); (3) treatment of sediments to meet applicable or relevant and appropriate requirements (ARARs) and disposal facility waste acceptance criteria (WAC); (4) containerization of the treated wastes; and (5) transport of treated waste to appropriate waste disposal facilities and disposal therein. The remedy calls for wastes other than those characterized as polychlorinated biphenyl (PCB) waste to be disposed of at NTS or another appropriate facility.

The remedy calls for wastes characterized as PCB waste to be treated to a level equivalent to destruction by incineration (< 2 ppm PCB) before off-site disposal at Envirocare. EPA is promulgating a revision to the Toxic Substances Control Act of 1976 (TSCA) PCB disposal regulations, which may impact the requirements for this action at Impoundments C and D. Should 40 *Code of Federal Regulations* (CFR) 761 be revised to offer other options in the handling, treatment, and disposal of PCB wastes, alternate endpoints in compliance with the new regulation will be documented and used, as appropriate. Concurrence from EPA and TDEC will be obtained before altering the selected remedy to follow the revised regulation, if promulgated.

STATUTORY DETERMINATIONS

The selected remedy protects human health and the environment, complies with federal and state requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. This remedy uses permanent solutions and alternative treatment or resource recovery technologies to the maximum extent practical and satisfies the statutory preference for remedies that reduce toxicity, mobility, or volume as a principal element.

The selected remedy effectively addresses the contaminant sources that are included in the scope of the action for SIOU and, on completion of the remedial action, no additional studies or

reviews will be required under this ROD to ensure that the remedy for SIOU surface water and sediment continues to adequately protect human health and the environment. While sources within the scope of the SIOU are addressed, it is recognized that the surface impoundments are within an industrial complex with other sources of contamination and impacted environmental media, including contamination in groundwater and surface soils within the boundaries of SIOU. The Bethel Valley watershed decision-making process, which includes the surface impoundments area, will address residual contamination at the site.

APPROVALS

9/16/97

Rodney R. Nelson, Assistant Manager
U.S. Department of Energy
Oak Ridge Operations

Date

9/18/97

Earl C. Leming, Director
U.S. Department of Energy Oversight Division
Tennessee Department of Environment and Conservation

Date

24 SEP 97

Richard D. Green, Acting Director
Waste Management Division
U.S. Environmental Protection Agency—Region 4

Date

PART 2. DECISION SUMMARY

SITE NAME, LOCATION, AND DESCRIPTION

Figure 2.1 shows ORR in Anderson and Roane Counties near the city of Oak Ridge in East Tennessee, approximately km (20 miles) northwest of Knoxville, Tennessee. The reservation comprises 14,300 ha (35,300 acres) of federally owned land and houses three major installations—the Oak Ridge National Laboratory (ORNL), the Oak Ridge Y-12 Plant, and the East Tennessee Technology Park (formerly the Oak Ridge K-25 Site or Oak Ridge Gaseous Diffusion Plant).

ORNL is subdivided into various watersheds. SIOU is in the Bethel Valley watershed and consists of Impoundment A (3524), Impoundment B (3513), and Impoundments C and D (3539 and 3540). SIOU is in the south-central part of ORNL's main plant area, north of White Oak Creek (Fig. 2.2).

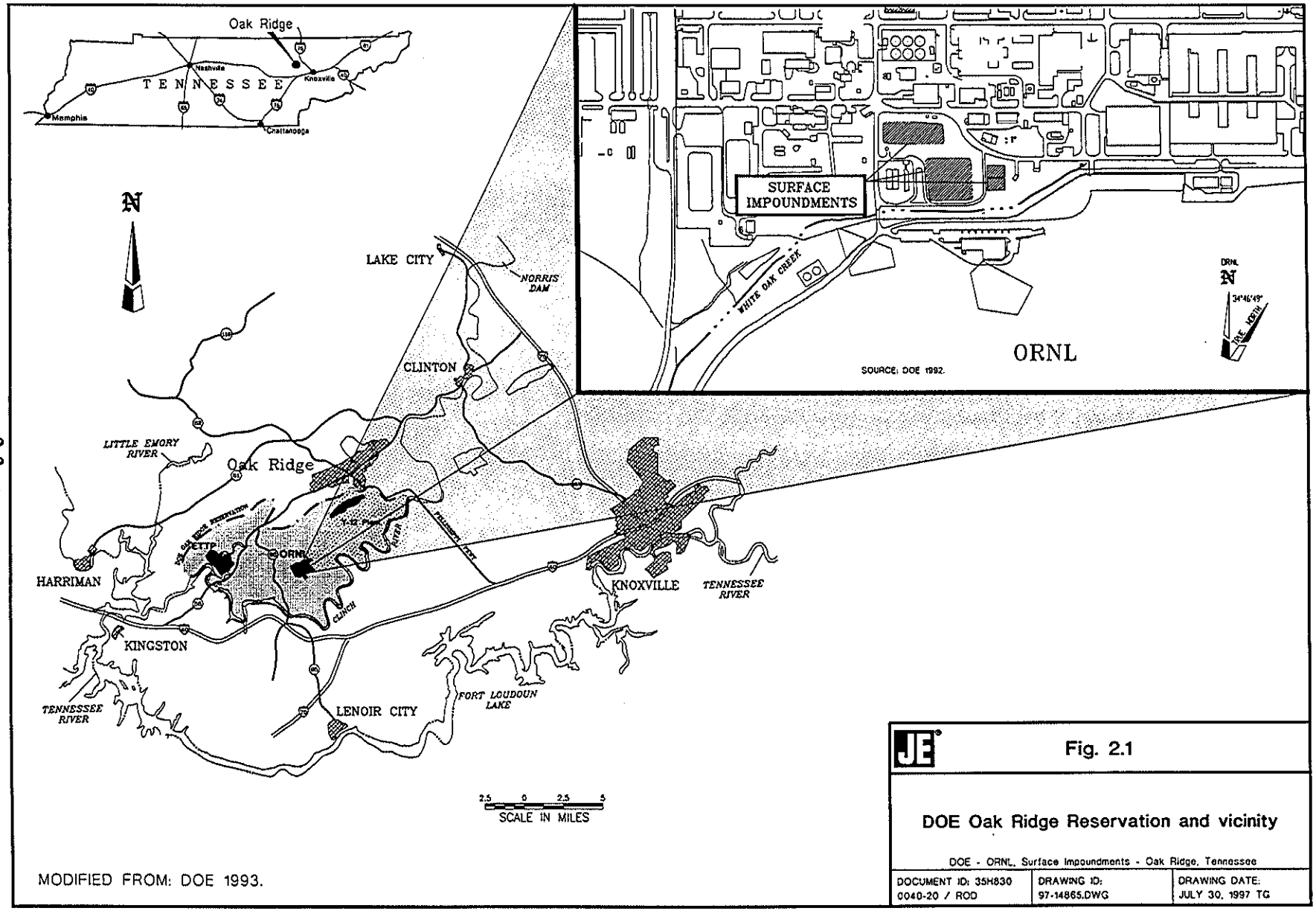
SITE HISTORY AND ENFORCEMENT ACTIVITIES

The impoundments were used to manage low-level radioactive liquid wastes generated from experiments and material processing at ORNL. Sediments are radiologically and chemically contaminated. Impoundments A and B are unlined and release contaminants to the environment as a result of groundwater intrusion. Water covering the sediments in these two impoundments provides radiation shielding and prevents airborne release of sediments. Impoundments C and D are clay-lined, not in contact with groundwater, and are not known to be leaking. Other sources in Bethel Valley also contribute to groundwater contamination, which could continue to contaminate surrounding soils after remediation of the impoundments.

The primary chemicals of concern identified in the SIOU sediments are mercury and PCBs. The principal radionuclides of concern and their estimated activity (in curies) are ^{241}Am (3), ^{137}Cs (133), ^{60}Co (1), ^{238}Pu (< 1), ^{239}Pu (7), and ^{90}Sr (36).

IMPOUNDMENT A (3524)

Impoundment A was excavated in natural clay in 1943 and used for short-term storage of wastewater and final precipitation of radioisotopes before discharge to White Oak Creek. This impoundment initially consisted of two unlined impoundments separated by a berm. In the early 1950s, the berm separating the impoundments was removed, forming one impoundment that received process wastewater only. From 1949 to 1957, effluent from Impoundment A was



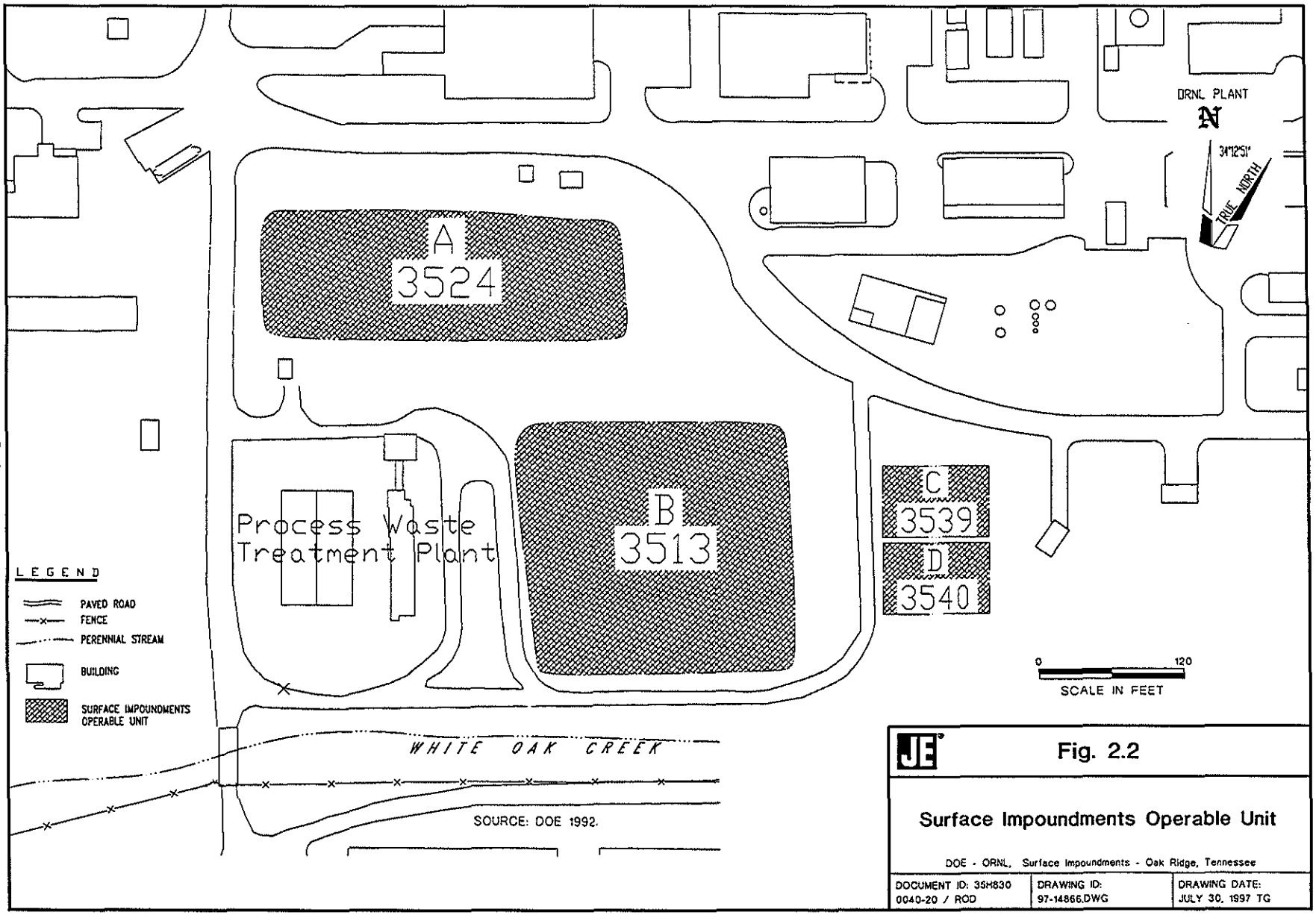
MODIFIED FROM: DOE 1993.

Fig. 2.1

DOE Oak Ridge Reservation and vicinity

DOE - ORNL, Surface Impoundments - Oak Ridge, Tennessee

DOCUMENT ID: 35H830 0040-20 / ROD	DRAWING ID: 97-14865.DWG	DRAWING DATE: JULY 30, 1997 TG


ORNL PLANT
N
34°12'51"
TRUE NORTH
A
3524
B
3513
C
3539
D
3540
Process Waste
Treatment Plant
LEGEND
PAVED ROAD
FENCE
PERENNIAL STREAM
BUILDING
SURFACE IMPOUNDMENTS
OPERABLE UNIT
WHITE OAK CREEK
0
120
SCALE IN FEET
SOURCE: DOE 1992.
JE
Fig. 2.2
Surface Impoundments Operable Unit
DOE - ORNL, Surface Impoundments - Oak Ridge, Tennessee
DOCUMENT ID: 35H830
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DRAWING ID:
97-14866.DWG
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pumped to Impoundment B (3513). In 1957, the PWTP was placed on line; Impoundment A was used as an equalization basin for intermediate storage and collection of process wastewater for the treatment plant until 1989. Impoundment A was used recently as an emergency storage basin for overflow from the process wastewater storage tanks during storms. This impoundment is no longer needed for overflow because a surge tank installed in June 1996 provides adequate storage capacity.

Impoundment A contains approximately 1,100 m^3 (1,400 yd^3) of low-level radioactive sediment. The sediment is not hazardous waste as defined by the Resource Conservation and Recovery Act of 1976 (RCRA), and PCB levels are < 50 ppm.

IMPOUNDMENT B (3513)

Impoundment B was excavated in natural clay in 1944, is unlined, and was used as a settling basin for low-level radioactive waste streams that were diluted with process wastewater. From 1944 to 1947, excess water in the impoundment flowed through pipes on the impoundment's southern berm directly into White Oak Creek. These pipes were plugged in 1947. From 1957 to 1976, Impoundment B received waste that did not require treatment in PWTP. Wastewater from PWTP was also discharged into the impoundment to allow particulate settling. The impoundment has not been used since 1976. Over the past few years, seeps through the southern berm of this impoundment have discharged to White Oak Creek. Temporary corrective actions have been implemented to mitigate this problem until a final remedy for the impoundments is completed.

Impoundment B contains approximately 2,400 m^3 (3,160 yd^3) of low-level radioactive sediment. The sediment is not RCRA-hazardous waste, and PCB levels are < 50 ppm.

IMPOUNDMENTS C AND D (3539 AND 3540)

Impoundments C and D are compacted clay-lined impoundments built in 1964 to receive process wastewater from Building 4500. Historically, if contaminant levels were acceptable, the process waste was discharged into White Oak Creek after verification of radionuclide content and pH adjustments of water in the ponds. Wastewater from Building 4500 exceeding acceptable limits was pumped to Impoundment A (3524) before treatment at PWTP. Impoundments C and D were taken out of service in 1990 but were available for overflow from the process wastewater storage tanks during storms until the new surge tank was installed in June 1996.

Impoundments C and D contain < 30 m^3 (40 yd^3) of sediment with very low levels of radioactive contamination (0.3 Ci). PCB levels are between 50 and 500 ppm. Further characterization is needed to confirm whether the waste meets the definition of RCRA-hazardous waste. Details of the sampling and characterization plan will be approved by TDEC and EPA.

HIGHLIGHTS OF COMMUNITY PARTICIPATION

DOE issued the proposed plan for SIOU June 30, 1997. DOE published a public notice about the project in *The Knoxville News-Sentinel, The Roane County News,* and *The Oak Ridger* June 30, 1997, and set a public comment period from June 30, 1997 to July 30, 1997. DOE held a public meeting March 30, 1995, to provide information about SIOU. A public meeting July 15, 1997, presented the preferred alternative described in the proposed plan and solicited public input. All public comments on the proposed plan are identified and addressed in the "Responsiveness Summary" section of this ROD.

PROJECT SCOPE AND SUMMARY OF SITE CHARACTERISTICS

The purpose of this project is reduction of risk by cleanup and remediation of the four surface impoundments. Media specifically included in the scope of this project are the surface water and sediment in the impoundments that resulted from liquid waste treatment. Incidental soil that may be encountered during sediment and water remediation will be handled appropriately. Groundwater and surface soils within the boundaries of SIOU will be specifically addressed under the Bethel Valley watershed ROD.

For remediation options involving waste removal or relocation on site, DOE anticipates that the impoundments will be excavated to 0.03 m (0.1 ft) below the as-built elevation of the floor of the impoundment excluding bedrock and riprap. Depths of subimpoundment soil removal will be developed in the remedial action work plan. Sediments and surface water are the media of concern at SIOU and account for more than 95 percent of the site contamination. Excavation of the sediment and an additional 0.03 m (0.1 ft) of the natural or compacted subimpoundment clay will ensure that the remedial action objectives have been met, releases from SIOU contaminant sources will be minimized, and risks resulting from these releases will not exceed acceptable levels in nearby surface waters of White Oak Creek.

Table 2.1 provides a summary of contaminant concentrations and sediment volumes in the impoundments. Other site characteristics are provided under "Site History and Enforcement Activities."

SUMMARY OF SITE RISKS

The risk assessment presented in Chapter 3 and Appendix C of the RI/FS contains a detailed discussion of site risks. Ecological and human health risk summaries follow.

ECOLOGICAL RISKS

The ecological risk assessment evaluated risks to aquatic (such as fish) and piscivorous (fish-eating, such as raccoons and birds) wildlife receptors. Risk and hazards were calculated at likely exposure locations using current contaminant concentrations, and contaminant concentrations were modeled for future conditions. Estimated contaminant concentrations were compared to acceptable wildlife exposure levels based upon National Ambient Water Quality Criteria.

In the RI, exposures of wildlife receptors in the impoundments were clearly unacceptable. Exposure levels are exceeded for aquatic receptors in White Oak Creek and White Oak Lake, although exposures are not completely due to contamination originating from SIOU. The SIOU contribution to ecological risk is reduced because leaks are controlled in the Impoundment B berm.

HUMAN HEALTH RADIOLOGICAL RISKS

Radiation levels in the sediments at SIOU are extremely hazardous. Without the water cover on Impoundments A and B providing shielding from radiation, an industrial worker on the bank of an impoundment would receive the maximum allowable annual occupational dose of 5 rem in approximately 100 hours from direct exposure to gamma radiation. In addition, if the sediments dried up and became airborne, inhalation of alpha-emitting radionuclides, including plutonium and americium, would greatly increase the risk of lung cancer over a widespread area.

DOE mandates institutional controls to ensure regulatory compliance for exposures to on-site individuals and to prevent long-term direct contact with the sediments, which would result in a near certain probability of cancer. Radiological risks to future on-site employees and residents were evaluated, assuming 5 days during which the water cover over Impoundment A

Table 2.1. Site characteristics at SIOU, ORR, Oak Ridge, Tennessee

	Impoundment A	Impoundment B	Impoundments C and D
Radioactive COCs	Average (pCi/g dry)	Average (pCi/g dry)	Average (pCi/g dry)
^{241}Am	16,000	4,200	< 270
^{137}Cs	210,000	450,000	54
^{60}Co	3,000	1,300	5
^{238}Pu	1,100	630	0
$^{239,240}Pu$	17,000	19,000	93
^{90}Sr	91,000	73,000	96
Primary chemical COCs	Mean (mg/kg)	Mean (mg/kg)	Mean (mg/kg)
Mercury	396	340	760
PCBs	35	41	180
Sediment volume (yd^3)	1,400	3,163	< 40

Am = americium
Co = cobalt
COC = contaminant of concern
Cs = cesium
g = gram
kg = kilogram
< = less than
mg = milligram
ORR = Oak Ridge Reservation
PCB = polychlorinated biphenyl
pCi = picocurie
Pu = plutonium
SIOU = Surface Impoundments Operable Unit
Sr = strontium
yd = yard

(3524) is lost. Risks to on-site employees and residents, primarily from direct external exposure to gamma radiation from the unshielded sediments, would range up to 8×10^{-2} and 2×10^{-1}, respectively (i.e., 8 in 100 and 2 in 10 additional cases of cancer over those expected under natural conditions). These risks greatly exceed the EPA target risk range of 1×10^{-4} to 1×10^{-6} (i.e., 1 in 10,000 to 1 in 1 million additional cases of cancer over those expected under natural conditions).

Potential future off-site residents would also have unacceptable risks from radioactive contaminants should institutional controls be lost. For these receptors, the main risk is inhalation of windblown particulates derived from the sediments, assuming the sediments dry out for a 5-day period. The risks range up to 7×10^{-3} for receptors at White Oak Creek and 5×10^{-3} for receptors at White Oak Dam and Clinch River (i.e., 7 in 1,000 and 5 in 1,000 additional cases

of cancer over those expected under natural conditions). Sufficiently conservative assumptions were used to estimate these risk levels; it is very unlikely that the risks are underestimated.

If uncontrolled, the principal, short-lived radionuclides of concern (^{90}Sr, ^{137}Cs, and ^{60}Co) would be expected to present unacceptable risks for hundreds of years. The principal long-lived radionuclides of concern (^{238}Pu, ^{239}Pu, and ^{241}Am) would present unacceptable risks for thousands of years or more.

HUMAN HEALTH CHEMICAL RISKS

Risks to current and future on-site employees from heavy metals and organic chemical carcinogens were calculated to be acceptable, as were risks to future residents beyond the current DOE boundary at Clinch River near White Oak Creek.

Based on the results of modeling contaminant migration, unacceptable risks were estimated for future residential use of surface water by receptors at White Oak Creek (2×10^{-3}) and at White Oak Dam (8×10^{-4}) (i.e., 2 in 1,000 and 8 in 10,000 additional cases of cancer over those expected under natural conditions).

Chemical carcinogenic risks calculated for the exposure scenarios were always less significant than radiological risks in all scenarios. For example, the maximum chemical risk calculated was 2×10^{-3} for future on-site residents, compared to a radiological risk of 2×10^{-1} for the same exposure scenario (i.e., 2 in 1,000 and 2 in 10 additional cases of cancer over those expected under natural conditions). Actions taken to reduce radiological risk would effectively reduce chemical risk.

DESCRIPTION OF ALTERNATIVES

Alternatives were developed in Chapters 4 and 5 and Appendix D of the RI/FS to achieve the following remedial action objectives:

- prevent direct exposure to, direct contact with, and inhalation or ingestion of contaminated sediments by humans and animals;
- prevent movement of contaminants to groundwater and surface water;

- control failure of the impoundments' berms and embankments; and

- prevent the bioaccumulation of contaminants in ecological receptors.

The alternatives evaluated in the FS ranged from no action to complete removal of contaminated sediments with off-site disposal. The alternatives were screened, based on effectiveness, implementability, and cost, to develop a shorter list of alternatives for detailed analysis. The final alternatives retained for detailed development and analysis in the FS include the following:

- Alternative 1—no action
- Alternative 2—multilayer cap and institutional controls
- Alternative 3—consolidation cell with simple dewatering
- Alternative 4—consolidation cell with ex situ treatment
- Alternative 5—off-SIOU consolidation cell
- Alternative 6—removal, treatment, and disposal

After the FS for SIOU was issued, an engineering support study (Energy Systems 1996) was performed and additional characterization information was obtained. These data were incorporated into the alternatives discussed in the proposed plan. EPA, TDEC, and DOE agreed that only three alternatives warranted detailed discussion in the proposed plan. They are Alternative 1—no action, Alternative 3—on-site consolidation cell, and Alternative 6—removal, treatment, and disposal.

All alternatives assume that all water removed from the impoundments would be treated at the existing PWTP. Natural disasters such as earthquakes, floods, and tornados are considered in the design for all alternatives except the no action alternative.

The radioactivity levels of the sediment in the impoundments require that remedial design (1) protect workers from exposure to gamma radiation and (2) contain sediment to prevent airborne releases of alpha-emitting radionuclides. Engineering controls (such as radiation shielding, double-contained piping, and remotely operated equipment) and operational controls (such as establishing contamination zones, providing high levels of personal protective equipment, restricting access to only qualified and necessary personnel, monitoring exposures, and monitoring and controlling processes) were included for each alternative to address radiation hazards.

Following are descriptions of the six alternatives considered in the RI/FS. The costs are revisions to the initial estimates in the RI/FS developed nearly 3 years ago. These costs were reviewed and updated before issuing the proposed plan June 30, 1997. On July 17, 1997, DOE released the request for proposal (RFP) for the management and integration (M&I) contract. The ROD cost estimates have been revised to reflect the M&I contract approach. Detailed cost estimates from the proposed plan and this ROD are available at the Information Resource Center, 105 Broadway Avenue, Oak Ridge, Tennessee, to support the cost shown for Alternatives 1, 3, and 6. Alternatives 2, 4, and 5 were not analyzed in detail in the proposed plan; costs for these alternatives have been modified for consistency, but a less detailed analysis has been performed.

ALTERNATIVE 1—NO ACTION

Total capital cost: $0 million
Present value of capital cost: $0 million
Time to implement: 0 years
Annual operation and maintenance (O&M) cost, years 1–30: $167,000
Present value of total O&M cost: $1.82 million

Alternative 1 assumes that existing institutional controls are maintained for a reasonable period (e.g., 30 years). These controls include restricting access to contaminated areas with fences and guards, establishing and marking radiation areas, training workers, training or escorting visitors, monitoring radiation levels at the impoundments, monitoring exposure to each employee and visitor, and maintaining water cover on the impoundments for shielding and containment of the sediments. After this period, the site is assumed to be abandoned. This alternative makes no new provisions for containment, removal, treatment, or disposal of wastes. Unacceptable risks are present at all receptor locations considered after loss of institutional controls.

The no action alternative does not meet the remedial action objectives or CERCLA requirements for protection of human health and the environment.

ALTERNATIVE 2—MULTILAYER CAP AND INSTITUTIONAL CONTROLS

Total capital cost: $6.12 million
Present value of capital cost: $5.28 million
Time to implement: 1.75 years
Annual O&M cost, years 1.75–30: $77,000
Present value of total O&M cost: $586,000

Alternative 2 proposes installation of a multilayer cap over the impoundments to prevent airborne contamination and direct exposure. Institutional controls would limit access to groundwater, White Oak Creek, and White Oak Lake to control exposure to contaminants released from SIOU. Surface water in the impoundments, which would be removed during cap installation, would be treated at the PWTP. Releases of contamination to groundwater and eventually to surface water would continue.

This alternative does not meet the remedial action objective of preventing movement of contaminants to groundwater and surface water. It would not meet some ARARs, and waivers for those ARARs would not be justifiable.

ALTERNATIVE 3—ON-SITE CONSOLIDATION CELL

Total capital cost: $12.4 million
Present value of capital cost: $10.2 million
Time to implement: 4 years
Annual O&M cost, years 5–30: $86,000
Present value of total O&M cost: $554,000

Alternative 3 includes constructing an engineered consolidation cell at Impoundment A (3524) and consolidating the sediment from all impoundments into the cell. Surface water from the impoundments and leachate collected from the consolidation cell would be discharged to PWTP. Approximately 0.03 m (0.1 ft) of subimpoundment soil would be removed from all impoundments (see "Project Scope and Summary of Site Characteristics") and placed in the consolidation cell. This alternative meets all remedial action objectives and would isolate the wastes sufficiently to protect human health and the environment. Federal institutional controls at the consolidation cell site would be required indefinitely because chemical constituents in the

waste would remain hazardous forever and some radioactive constituents (americium and plutonium) have half-lives of thousands or tens of thousands of years.

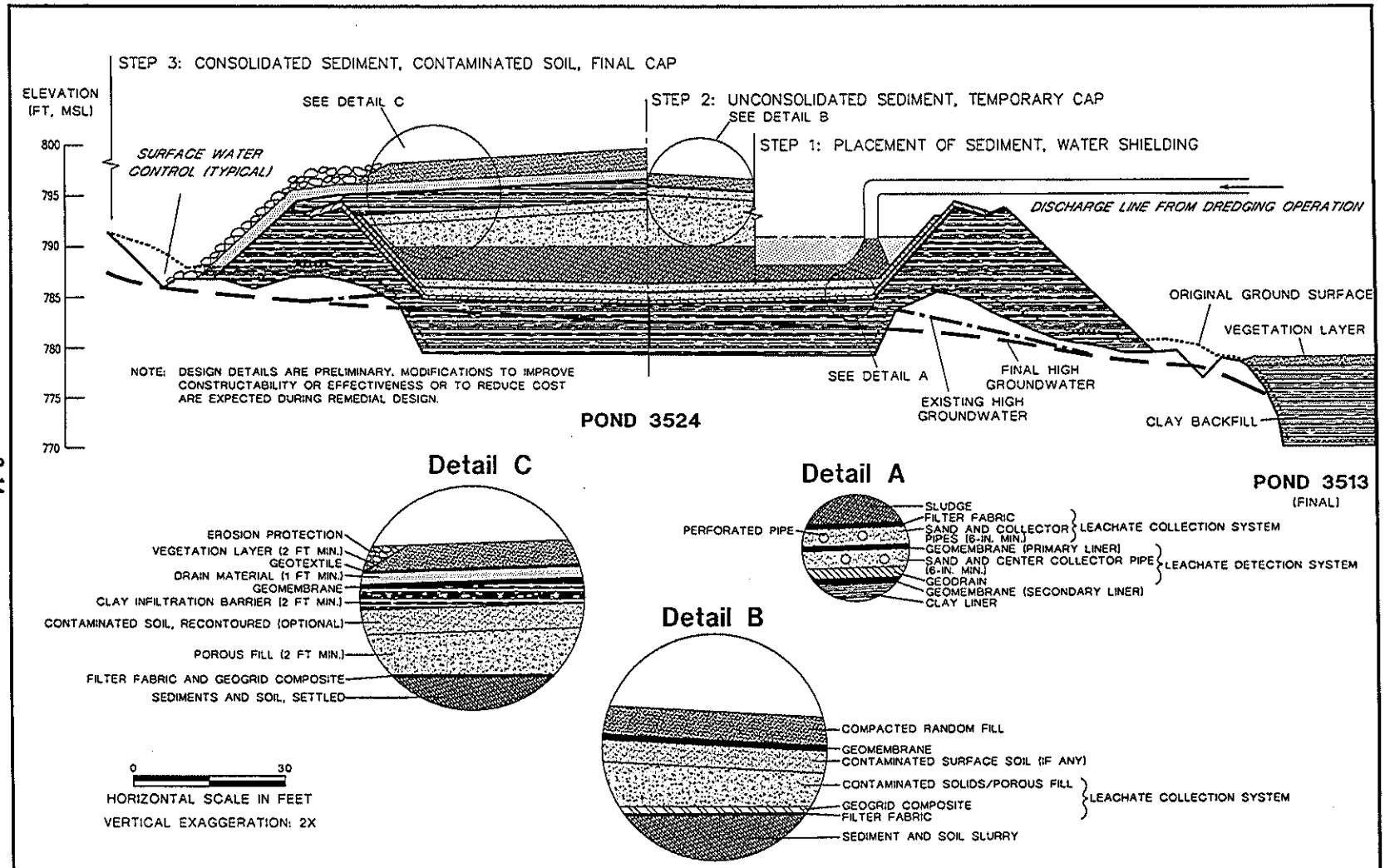
To develop the consolidation cell, the waste from Impoundments C and D would be transferred to Impoundment B, and Impoundments C and D would be filled to provide a staging area for remediating the large impoundments. The waste in Impoundment A would be transferred to Impoundment B. The bottom liner of the consolidation cell with a leachate collection/detection system would be installed in the empty Impoundment A.

All the sediment in Impoundment B—which would also store waste from Impoundments A, C, and D—would be transferred to the consolidation cell. A temporary cap would be placed over the waste. After the waste is dewatered through the leachate collection system and no further settlement is expected, a final cap would be installed.

The consolidation cell would be inspected and maintained on a regular basis. Institutional controls would prohibit industrial use of the surface of the consolidation cell, although access to the cap for recreational activities would be permissible. No activities that disturb the cap (e.g., underground utilities, building foundations, etc.) would be allowed. No institutional controls on the remainder of the site would be needed for contamination within the scope of SIOU. Residual contamination on the remainder of the site would be addressed in the Bethel Valley watershed ROD.

Additional detail can be found in Section 5.2.3 of the RI/FS. Figure 2.3 is a cross section of the consolidation cell during different phases of construction and operation.

Alternative 3 would require a CERCLA waiver from the TSCA requirement that PCB wastes be disposed of at least 15 m (50 ft) above the high water table [40 CFR 761.75(b)(3)]. TSCA regulations do not specify the permeability of the media between the waste and the water table. The proposed compacted clay liner for Alternative 3 would retard migration of PCBs more effectively than most unconsolidated soils. The proposed combination of a clay liner with a leachate collection/detection system and a geomembrane liner would provide even greater protection. A waiver would be justified based on equivalent protectiveness provided by the liner. Alternative 3 would comply with all other ARARs.



JE	Fig. 2.3	**Alternative 3 section - liner, placement of wastes, temporary cap, and final cap** DOE - ORNL, Surface Impoundments - Oak Ridge, Tennessee	DOCUMENT ID: 35H830 0040-20 / ROD	DRAWING ID: 97-14867.DWG	DRAWING DATE: AUGUST 27, 1997 TG

ALTERNATIVE 4—CONSOLIDATION CELL WITH EX SITU TREATMENT

Total capital cost: $33.9 million
Present value of capital cost: $25.9 million
Time to implement: 4 years
Annual O&M cost, years 5–30: $82,000
Present value of total O&M cost: $532,000

Alternative 4 would add an ex situ treatment step to the operations proposed for Alternative 3. After transfer of all sediment into Impoundment B and construction of the consolidation cell liner in the empty Impoundment A, waste would be solidified in a new treatment facility similar to the facility described in Alternative 6. After curing in forms, the solidified waste would be moved into the consolidation cell and the cell would be capped.

Alternative 4 was not addressed in detail in the proposed plan because it is substantially similar to Alternative 3 with treatment (solidification) incorporated. This treatment would be similar to the solidification process described for Alternative 6. As for Alternative 3, Alternative 4 would need a waiver from TSCA siting criteria. If wastes from Impoundments C and D are determined to be hazardous under RCRA regulations, additional waivers could also be needed depending on the results of engineering support studies regarding the effectiveness of the treatment process.

ALTERNATIVE 5—OFF-SIOU CONSOLIDATION CELL

Total capital cost: $16.0 million
Present value of capital cost: $12.6 million
Time to implement: 3.5 years
Annual O&M cost, years 3.5–30: $79,000
Present value of total O&M cost: $532,000

Alternative 5 is the same as Alternative 3, except that the disposal cell would not be at the SIOU site in the main area of ORNL. The location assumed in the FS is at ORNL near the Process Waste Sludge Basin, one of several small impoundments with similar wastes that could also be consolidated in the cell. Sediment would be removed from the impoundments,

transported by tanker truck or pipeline to the newly constructed disposal cell, and dewatered in the cell as described for Alternative 3. The cap and institutional controls would also be as described for Alternative 3.

Alternative 5 was not addressed in detail in the proposed plan because it is substantially similar to Alternative 3 except for the location of the constructed consolidation cell. Alternative 5 would need the same waiver from TSCA siting criteria as Alternative 3.

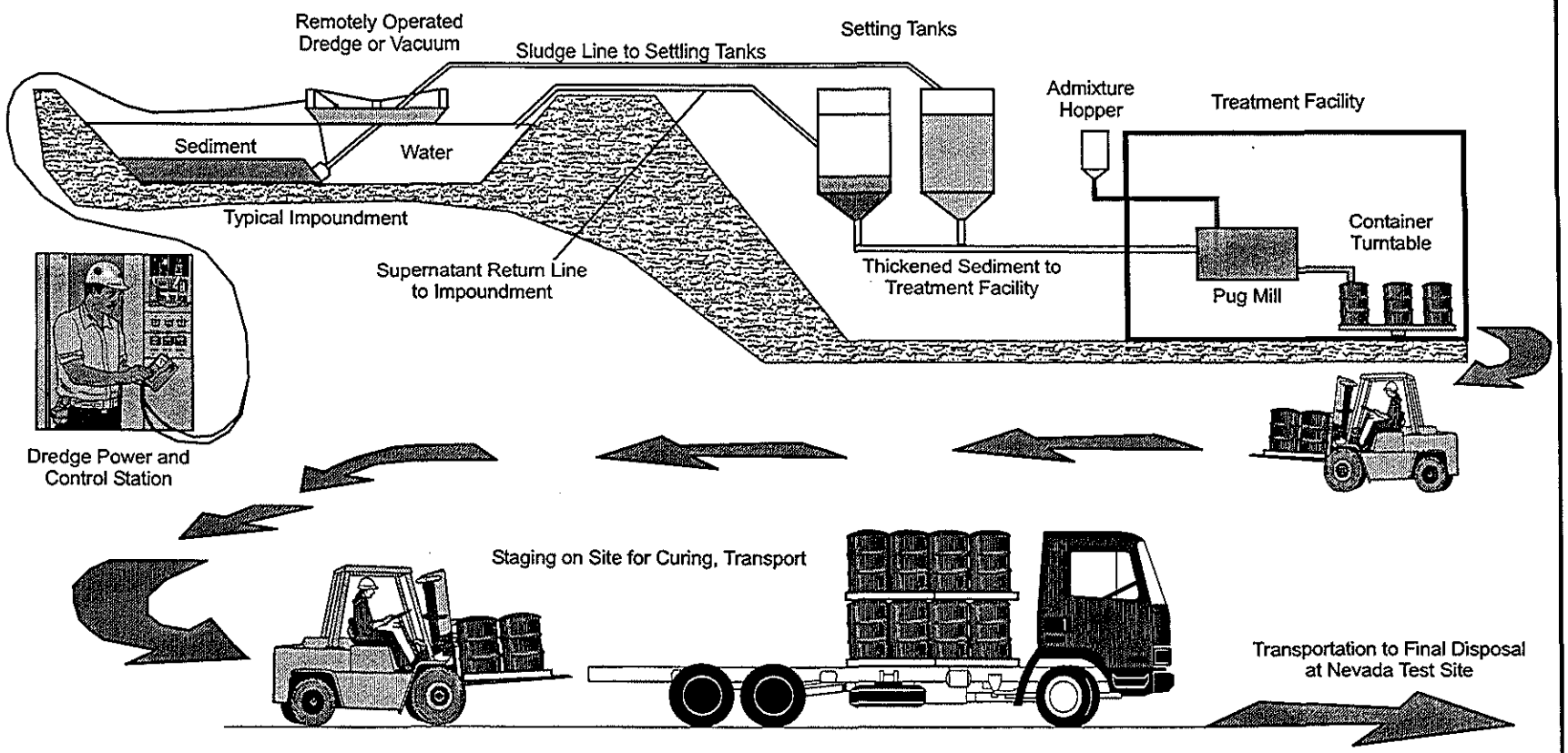
ALTERNATIVE 6—REMOVAL, TREATMENT, AND DISPOSAL

Total capital cost: $47.4 million
Present value of capital cost: $38.7 million
Time to implement: 4 years
Annual O&M cost, years 5–9: $44,000
Present value of total O&M cost: $108,000

Alternative 6 is a two-stage process that includes removal of all sediments within SIOU, treatment of sediments to meet ARARs and disposal facility WAC, containerization of treated wastes, and transport of all treated waste to appropriate waste disposal facilities. The process for addressing Impoundments A and B is shown in Figure 2.4.

The first stage, remediation of Impoundments C and D, will be a stand-alone project. Impoundments C and D will be resampled using an approved sampling plan. The sediments in Impoundments C and D will be removed by manual pumping or dredging as described for Alternative 3 or by other appropriate methods. Approximately 0.03 m (0.1 ft) of clay liner below the sediment will be excavated to ensure that the sediment has been removed. Based on the sampling results, the waste removed from the small impoundments will be treated as needed to meet WAC at Envirocare.

Current data suggest that PCB concentrations are > 50 ppm and, consequently, the wastes would require either disposal by incineration or in a permitted chemical waste landfill. Incineration requires destruction of PCBs to < 2 ppm. If concentrations > 50 ppm are verified during resampling, an alternate method of destruction for PCBs (rather than incineration or disposal in a PCB landfill) would be required because there are currently no incinerators or chemical waste landfills that can accept waste materials that contain mixed PCBs and radiological contaminants. At present, there are no known commercial vendors who have treated PCBs to < 2 ppm in a radioactive matrix containing transuranic elements. DOE will solicit proposals



Note:
Conceptual design for removal, treatment, and transportation of Surface Impoundments Operable Unit sediment from Impoundments A and B. Details of design are likely to change during remedial design.

Steps:
1. Sediment is pumped from impoundments to settling tank.
2. After settling, supernatant is decanted from tank and returned to impoundment.
3. Thickened sediment is pumped to treatment facility.
4. Cement, fly ash admixture is combined with sediment in pug mill.
5. Wet concrete-like mixture is extruded from pug mill into containers.
6. Containers are moved to staging, curing area and held until mixture solidifies.
7. Containers of solidified waste are transported to disposal site.

JE	Fig. 2.4	Alternative 6 - Removal, Treatment, and Off-site Disposal DOE - ORNL, Surface Impoundments - Oak Ridge, Tennessee	DOCUMENT ID: 35H830 0040-30 / ROD	DRAWING ID: 97-14821.CDR	DRAWING DATE: AUGUST 27, 1997 TG

from vendors of various PCB destruction technologies. DOE will evaluate the vendors and technologies and select the safest and most cost-effective technology. Chemical dechlorination is the proposed PCB destruction technology considered in the cost estimate.

EPA has proposed revisions to the regulations concerning treatment of PCB-contaminated waste that may alter the destruction requirements. If these revisions are promulgated, DOE will incorporate the modified requirements into remedial design and remedial action planning documents for Impoundments C and D, as required.

Costs for removal and treatment, packaging and transportation according to U.S. Department of Transportation (DOT) requirements, and disposal at Envirocare are estimated at \$4.6 million for $< 61\ m^3$ ($80\ yd^3$) of sediment and incidental soil removed.

Impoundments C and D would be backfilled with stone and gravel to provide an area for construction of a facility to treat the sediment from Impoundments A and B.

The second stage, remediation of Impoundments A and B, assumes that an appropriate disposal facility will be available before waste removal activities begin. Remediation of Impoundments A and B relies on stabilization/solidification as the representative treatment method. A 1996 treatability study developed a recipe of dry cement, dry fly ash, and sediment with enough water to produce a waste form that meets DOT transport requirements and NTS WAC. The treatment facility could include settling tanks, dewatering equipment, a pug mill for mixing dry ingredients with the sediment, a packaging station, and auxiliary equipment. The facility would have provisions for remote operation, shielding, high-efficiency particulate air filtration, and other provisions necessary to control worker exposure to radiation.

After construction and testing of the treatment facility, approximately $3{,}500\ m^3$ ($4{,}600\ yd^3$) of sediment would be transferred from Impoundments A and B to the facility with a remotely operated hydraulic dredge or other appropriate equipment. Excess water at the treatment facility would be returned to the impoundments or would be treated at PWTP. Incidental soil that may be encountered during sediment and water remediation will be handled appropriately. DOE anticipates that the impoundments will be excavated to an elevation of 0.03 m (0.1 ft) below the as-built elevation of the floor of the impoundment excluding bedrock and riprap. Details of soil removal will be developed in the remedial action work plan. Waste would be solidified into containers meeting DOT requirements and staged on the SIOU site for curing and transport.

After curing, waste would be shipped immediately to the disposal facility. Disposal fees are estimated based on current charges at NTS for disposal of contact-handled low-level waste

in standard containers. Development of an on-ORR mixed waste disposal facility is under consideration in a separate CERCLA decision-making process. A decision on the on-ORR facility is expected in late 1998 and, if approved, the facility is scheduled to be operational in 2000. If the facility is approved and constructed, and if SIOU wastes meet the facility's WAC, then DOE may choose to send the waste there, rather than to NTS or another appropriate facility.

When all waste is removed and shipped, the treatment facility and equipment would be decontaminated to the extent practical. Contaminated material that is not reusable would be cut up, placed in containers, and shipped for disposal. Uncontaminated material, including the treatment building, would be released for other use. Surface water in the impoundments would be discharged to PWTP, the impoundments would be backfilled with clean soil, and the site would be restored.

Institutional controls would not be needed at the site for SIOU contaminants but could be needed because of other contaminant sources. Appropriate institutional controls for residual contamination would remain in place unless and until superseded as appropriate by the Bethel Valley watershed ROD. The cost estimate assumes 5 years of monitoring and controls after remediation. Institutional controls at NTS (or other final disposal location) would be needed indefinitely. The cost for these controls is assumed to be included in the disposal fee.

This alternative meets all remedial action objectives and ARARs.

SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

Table 2.2 summarizes the performance of the alternatives against the nine CERCLA criteria. The first two criteria must be met in initial screening by any alternative considered for selection in the ROD. The next five criteria are the primary balancing criteria upon which the analysis is based. The remaining two criteria (state and community acceptance) are based on regulatory agency review and public comment. Following is a discussion of the evaluation of the alternatives.

Overall Protection of Human Health and the Environment. SIOU is in the main plant area of ORNL in proximity to numerous industrial workers and adjacent to White Oak Creek, which is a pathway for migration of contamination. Alternative 6 offers the greatest protection because the waste is transferred from SIOU to a secure disposal facility. The disposal facility would have superior hydrogeologic characteristics and/or engineering controls to contain the waste and permanent institutional controls to address hazardous wastes from many sources. If

Table 2.2. Evaluation of alternatives for CERCLA criteria, SIOU, ORNL, Oak Ridge, Tennessee

CERCLA criteria	Alternative 1 No action	Alternative 2 Multilayer cap and institutional controls	Alternative 3 Consolidation cell with simple dewatering	Alternative 4 Consolidation cell with ex situ treatment	Alternative 5 Off-SIOU consolidation cell	Alternative 6 Removal, treatment, and off-site disposal
1. Overall protection of human health and the environment						
Future RME Risk		Total risk	Total risk	Total risk	Total risk	Total risk
Employee on site	8×10^{-2}	$< 1 \times 10^{-6}$	$< 1 \times 10^{-6}$	$< 1 \times 10^{-6}$	$< 1 \times 10^{-6}$	$< 1 \times 10^{-6}$
Resident Clinch River	5×10^{-3}	$< 1 \times 10^{-6}$	$< 1 \times 10^{-6}$	$< 1 \times 10^{-6}$	$< 1 \times 10^{-6}$	$< 1 \times 10^{-6}$
Resident White Oak Dam	5×10^{-3}	6×10^{-6}	$< 1 \times 10^{-6}$	$< 1 \times 10^{-6}$	$< 1 \times 10^{-6}$	$< 1 \times 10^{-6}$
Resident White Oak Creek	7×10^{-2}	1×10^{-5}	$< 1 \times 10^{-6}$	$< 1 \times 10^{-6}$	$< 1 \times 10^{-6}$	$< 1 \times 10^{-6}$
Resident on site	2×10^{-1}	1×10^{-5}	$< 1 \times 10^{-6}$	$< 1 \times 10^{-6}$	$< 1 \times 10^{-6}$	$< 1 \times 10^{-6}$
Human health risk discussion	Risk to human health from migration of contamination to groundwater and White Oak Creek. If water cover over sediment is lost, airborne contamination resulting in widespread human health risk is possible. Very high external gamma exposures to on-site receptors	Protective to receptor at White Oak Dam. Possible risk to human health from migration of contamination to groundwater and White Oak Creek. Protective while DOE maintains institutional controls	Protective to employees and to residential receptors at White Oak Dam and at White Oak Creek. Protective at the site while DOE maintains institutional controls	Protective to employees and to residential receptors at White Oak Dam and at White Oak Creek. Protective at the site while DOE maintains institutional controls	Protective to all receptors while DOE maintains institutional controls	Protective to all receptors because of removal of source material
Ecological risk	Risk to environmental receptors from consumption of fish in impoundments. Small risk from consumption of fish in White Oak Creek	No risk to environmental receptors	No risk to environmental receptors	No risk to environmental receptors	No risk to environmental receptors	No risk to environmental receptors
2. Compliance with ARARs	No ARARs under CERCLA. Not protective as required by CERCLA	4 waivers required	1 waiver required	1 waiver required	3 waivers required	Meets all ARARs
3. Long-term effectiveness	Not effective	Effective for period of institutional control	Very effective for period of institutional control	Very effective for period of institutional control	Very effective for period of institutional control	Very effective

Table 2.2. (continued)

CERCLA criteria	Alternative 1 No action	Alternative 2 Multilayer cap and institutional controls	Alternative 3 Consolidation cell with simple dewatering	Alternative 4 Consolidation cell with ex situ treatment	Alternative 5 Off-SIOU consolidation cell	Alternative 6 Removal, treatment, and off-site disposal
4. Reduction of toxicity, mobility, or volume through treatment	None	None	Small reduction in volume	Increase in volume. Some decrease in mobility of most contaminants	Small reduction in volume	Increase in volume. Some decrease in mobility of most contaminants
5. Short-term effectiveness	No increase or reduction in short-term effects on human health and environment	Potential for small, adverse short-term effects	Potential for moderate, adverse short-term effects	Potential for moderately high, adverse short-term effects	Potential for moderately high, adverse short-term effects	Potential for high, adverse short-term effects
6. Implementability	Very easy to implement	Easy to implement	Somewhat difficult to implement	Difficult to implement	Difficult to implement	Difficult to implement, technically and administratively
7. Cost effectiveness:						
Capital present value	$0	$5.28 million	$10.2 million	$25.9 million	$12.6 million	$38.7 million
O&M present value	$1.82 million	$586,000	$554,000	$532,000	$532,000	$108,000
8. State acceptance	Not acceptable	Not acceptable	Not supported at this time	Not supported	Not supported	Preferred alternative
9. Community acceptance	No support	Not presented	Significant support	Not presented	Not presented	Significant support

ARAR = applicable or relevant and appropriate requirement
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
DOE = U.S. Department of Energy
O&M = operation and maintenance
ORNL = Oak Ridge National Laboratory
ORR = Oak Ridge Reservation
RME = reasonable maximum exposure
SIOU = Surface Impoundments Operable Unit
WAG = waste area grouping
< = less than

disposal is at NTS in unlined trenches, protection would be ensured because of the desert environment with low precipitation and high evapotransporation, depth to groundwater, remote location, and existing institutional controls. If disposal is at an engineered on-ORR disposal facility or another appropriate facility, protection would be ensured by robust design of engineering controls and institutional controls.

Alternatives 3, 4, and 5 would protect all human receptors as long as DOE maintains institutional controls at the disposal site. The engineering controls would be designed for long-term protection, but they may not be as robust as the controls or environmental isolation for Alternative 6. Alternative 2 would protect receptors at White Oak Dam, but it would require institutional controls along White Oak Creek as well as at the SIOU site, and the engineering controls at the site would be the least effective. Alternative 1 would not be protective in the long term and would pose some risk to workers maintaining the impoundments. Short-term risks to workers and the public would be lowest for Alternative 2, low for Alternative 3, higher for Alternatives 4 and 5, and highest for Alternative 6. All alternatives would control risks to workers to within acceptable levels. DOE considers the long-term protection offered by Alternative 6 to outweigh the increased short-term risks. Therefore, Alternative 6 is considered to provide greatest overall protection of human health. Alternatives 2 through 6 protect environmental receptors.

Compliance with ARARs. Alternative 6 could potentially meet all ARARs if a treatment process is developed that can reduce PCBs to < 2 ppm. Alternatives 2, 3, 4, and 5 require a waiver from the TSCA requirement for disposal of PCB wastes that are more than 15 m (50 ft) above high groundwater. Alternative 5 also requires waivers for the disposal of TSCA waste within 15 m (50 ft) of the high water table [40 CFR 761.75(b)(3)] and RCRA land disposal restriction (LDR) requirements (40 CFR 268). If LDRs could not be met, a third waiver would be requested on basis of the attainment of an equivalent standard of performance. Treatment for Alternative 4 would also trigger LDRs, and waivers could potentially be required depending on the effectiveness of the treatment process. Alternative 2 would also need waivers for inadvertent intrusion requirements and monitoring in a contaminated area, elimination of free liquids from wastes, and leaving waste in contact with groundwater.

Long-Term Effectiveness. Alternative 6 provides the best long-term effectiveness because waste is removed from SIOU and disposed of at NTS or placed in an on-ORR or other appropriate engineered disposal facility. Waste would be treated to reduce toxicity and mobility before disposal. The proposed off-SIOU disposal facility would offer superior containment and better protection from inadvertent intrusion than the facilities proposed for other alternatives. The hydrogeology at the proposed disposal facilities for Alternative 6 is more suitable than the on-

SIOU disposal location for Alternatives 2, 3, and 4, which is about 100 m (330 ft) from White Oak Creek and where fractured bedrock is near the base of the liner. It is also more suitable than the Melton Valley location proposed for Alternative 5. The off-site disposal facility for Alternative 6 would have long-term institutional controls in place that are considered effective.

Alternatives 3–5 effectively reduce human health risk to below EPA targets. Alternative 2 reduces risks to within the EPA target risk range. Alternatives 2–6 eliminate ecological risks during the period of institutional control. Because receptors must be prevented from intruding into the waste and from long-term exposures (e.g., building a house with a basement penetrating the cap), the effectiveness after institutional controls are abandoned would be reduced. In the very long term, degradation of the engineered containment facilities would reduce long-term effectiveness. The caps for Alternative 2, the cap and liner for Alternatives 3 and 5, and the cap, liner, waste containers, and waste form for Alternative 4 would eventually degrade. These containment elements would have an expected effective life on the order of a few hundred years for Alternatives 2, 3, and 5, and of perhaps 1,000 years for Alternative 4. In the long term, Alternative 1 cannot effectively reduce risks to human health. Estimated future risks exceed the EPA target risk range, and there is no reduction in risk to the environment for either the long or short term.

Reduction of Toxicity, Mobility, and Volume Through Treatment. Alternative 6 would reduce toxicity of the sediment in Impoundments C and D by treating PCBs. PCB treatment would not significantly affect sediment volumes, but a large liquid waste stream could result depending on the chosen PCB treatment process. The liquid waste would be treated at ORNL before discharge at an existing permitted outfall. Stabilization/solidification of the sediment from Impoundments A and B in Alternative 6 would increase volume but would greatly reduce mobility of contaminants in the sediment from Impoundments A and B. Toxicity would not be affected. Alternative 4 would treat the waste from all impoundments with stabilization/solidification, which would increase volume, decrease mobility, and not affect toxicity.

Alternatives 3 and 5 would dewater the sediments and treat the surface water and leachate. This would provide a small volume reduction through treatment. No contaminants would be destroyed, and toxicity and mobility would not be affected through treatment.

Alternatives 1 and 2 would not provide treatment of the sediments.

Short-Term Effectiveness. For all alternatives, short-term effects to workers during construction and other remedial efforts would be controlled through compliance with Occupational Safety and Health Administration requirements, DOT requirements and DOE Orders.

Appropriate health and safety plans would be developed and implemented. Proper adherence to the safety requirements would provide an adequate level of protection for remediation workers. Risk to workers would increase as the scope of the remedial actions increased. Small risks for Alternative 1 would result from continued long-term maintenance of the impoundments to stop leaks in the berm and maintain water levels. Risks during construction for Alternative 2 would be small, and risks for Alternative 3 would be moderate. Alternative 4 would include construction and operation of a treatment facility, thus increasing accident risk over that for Alternative 3. Alternative 5 would add risks for transport of slurried waste within ORNL and thus would be greater than Alternative 3. Risks from long-term maintenance of the caps for Alternatives 2, 3, 4, and 5 would be very low.

Alternative 6 would include the additional risk from construction and operation of a PCB treatment facility, a more complex stabilization/solidification treatment facility, as well as long-haul transport of the wastes from Tennessee to Nevada. Although risks would be controlled through project design, safety plans, and compliance with regulations as for other alternatives, Alternative 6 would result in the greatest worker risk, including increased worker exposure to radiation and the potential for spills or accidents. It is the only alternative that poses risk (i.e., from transportation accidents) to the public.

Other short-term effects (i.e., environmental effects, potential for sudden failure, socioeconomic impact, and time until objectives are met) are small and do not significantly differentiate between the action alternatives. The no-action alternative would continue to pose short- and long-term environmental risks.

Implementability. The maintenance actions for Alternative 1, the no action alternative, are already in place. Continued implementation would be very easy, reasonably reliable, and simple to monitor. Alternative 1 would pose no impediment to undertaking additional remedial actions. Regulatory agency approval of long-term implementation of Alternative 1 (i.e., administrative implementability) would be difficult to obtain.

Engineered caps and cells proposed for Alternatives 2–5 are routinely designed and built throughout the country. The sediment and water handling and cell construction equipment, material, and techniques for Alternatives 3–5 are readily available. The proposed in-cell dewatering method for Alternatives 3 and 5 has not been widely used, but it is expected to be reliable based on results of the engineering support study (Energy Systems 1996). Alternative dewatering methods are also available. The engineering support study also indicates that stabilization/solidification treatment for Alternative 4 is implementable. Although regulatory

agencies oppose Alternative 2 and the state prefers Alternative 6, if Alternative 2, 3, 4, or 5 were selected and approved through the CERCLA process, there would be no other administrative impediments (e.g., licenses, permits) to implementation.

Of the action alternatives, Alternative 2 would be easiest to construct and operate. Comparatively, Alternative 3 would be somewhat difficult because of the requirements for waste transfer and radiation protection. Alternatives 4 and 5 would be more difficult because of the treatment plant construction and operation or the transport of slurried waste, respectively. The reliability of Alternatives 2, 3, 4, and 5 would be similar, although Alternative 2 is not designed to prevent groundwater intrusion into the waste. All alternatives could be readily monitored; however, contamination from other sources in Bethel Valley could mask releases from on-site disposal options (Alternatives 1–4). Equipment, technologies, and specialists are readily available for Alternatives 1, 2, 3, and 5, and no permitted facilities are needed.

Technical implementability of Alternative 6 would be the most difficult because of the safety requirements necessary to ensure adequate containment and shielding of the highly radioactive waste and the complexity of the two treatment systems. Treatment of mixed radioactive and hazardous waste to reduce PCB concentrations has been done in the laboratory, but no full-scale field demonstrations are known to have been completed. Containment of potential airborne releases of alpha-emitting radionuclides increases the complexity of the treatment process. After treatment for PCBs reduces concentrations sufficiently for the waste to exit TSCA regulatory authority, the waste from Impoundments C and D is expected to meet Envirocare WAC. If treatment does not successfully meet PCB destruction requirements, no disposal facilities are currently available that can accept waste from Impoundments C and D.

Although complex, the proposed stabilization/solidification of sediment from Impoundments A and B for Alternative 6 is implementable. The solidified, containerized waste form could be safely transported according to DOT requirements and disposed of without airborne releases of contamination. Samples of the final waste form would be taken to ensure that the waste to be disposed of is not RCRA-characteristic hazardous waste and does not contain PCBs at levels > 50 ppm.

The availability of NTS for disposal of solid low-level radioactive waste is likely, but administrative considerations may impede or delay shipments of waste. Although there are no laws prohibiting shipment of low-level waste, DOE Headquarters Office of the General Counsel has recommended suspension of waste shipments from new generators to NTS pending resolution of issues associated with National Environmental Policy Act of 1969 (NEPA) review of the facility at a programmatic level. An environmental impact statement (EIS) has been prepared

under NEPA for NTS and for some generators on project-specific bases; however, not all possible generators and their actions have been addressed. A programmatic EIS has been released (DOE 1997b). Once approved, a ROD for the programmatic EIS will set forth terms and conditions under which shipments may resume. Obtaining administrative approval for shipment and disposal is considered difficult, but achievable.

DOE is currently evaluating various waste disposal alternatives for environmental restoration wastes from the entire ORR under a separate decision-making process. This evaluation includes consideration of a large-scale engineered disposal facility on ORR for most low-level radioactive, hazardous, TSCA, or mixed wastes generated from cleanup activities. If the result of this separate project is the construction of a disposal facility for the entire reservation and the treated SIOU wastes meet the new facility's WAC, SIOU wastes may be sent to the ORR disposal facility rather than to NTS or another appropriate facility.

Cost. According to EPA guidance, the cost for maintenance and institutional control is estimated only until year 30 because costs beyond that time frame are not considered accurate. However, because of the long half-lives of some of the radioactive constituents, maintenance and controls would be needed forever for Alternatives 1–5. Table 2.2 shows present value capital costs and operations and maintenance costs until year 30.

Alternative 6 is the most costly of all the alternatives at an estimated $38.7 million capital cost and $108,000 O&M cost (present value). However, the greater cost is justified because of the greater long-term effectiveness and protection offered by Alternative 6. It does not require long-term annual surveillance and maintenance expenditures. Its cost is primarily attributed to the amount of handling necessary to achieve full compliance with ARARs. Removal and disposal of the SIOU waste does allow beneficial reuse of the site and, given its location, reuse of the site should offset some of the cost. If an ORR disposal facility for low-level waste becomes available for SIOU waste, cost savings of up to $3.6 million compared to disposal at NTS may result from reductions in transportation costs and disposal fees. There may be additional savings of over $4 million if treatment for PCBs is not required. DOE considers Alternative 6 cost-effective.

State Acceptance. Alternative 6 meets all TDEC recommendations. In a letter to DOE dated September 20, 1996, specifically addressing Alternatives 3 and 6, TDEC stated that Alternative 3 is unacceptable because the long-term effectiveness of the cell is not protective for the life of the defined risk. In addition, costly, indefinite institutional controls would be required. Alternative 3 also promotes a strategy of maintaining small pockets of contaminated media throughout ORR that the state will not support. The state strongly opposes Alternatives 1 and

2, in which waste remains in contact with groundwater. Although the state has not officially commented on Alternatives 4 and 5, the same arguments made regarding Alternative 3 apparently would apply.

Community Acceptance. Community acceptance addresses the issues and concerns the public may have about each alternative. The proposed plan (DOE 1997a) presented Alternative 6 as the preferred alternative. The "Highlights of Community Participation" section summarizes community participation. The selected remedy is the same as the preferred alternative in the proposed plan. The Responsiveness Summary, Part 3 of this ROD, provides comments submitted during the public comment period and responses to these comments.

The proposed plan has also been reviewed by the EPA National Remedy Review Board. This review organization was established as part of the EPA Superfund Administrative Reforms in January 1996 and is comprised of technical experts and senior managers from EPA regional offices and headquarters. The board promotes cost-effectiveness and national consistency in remedy selection at Superfund sites. Specific comments from the board are included in the responsiveness summary of this ROD.

Two commentors, including the ORR Environmental Management Site Specific Advisory Board (ORREMSSAB), supported Alternative 6. Four commentors supported Alternative 3. No other alternatives were supported. Recommendations from the EPA National Remedy Review Board and responses from EPA Region 4 are included in the Responsiveness Summary.

SELECTED REMEDY

DOE, with the concurrence of EPA and the state of Tennessee, has determined that the preferred alternative (Alternative 6) presented in the proposed plan is the most appropriate remedy for protection of human health and the environment and for elimination of the primary source of groundwater contamination at the SIOU. This selection is based on the comparative analysis of the alternatives presented in this ROD. This alternative satisfies the two threshold criteria and provides the best balance of trade-offs with respect to the CERCLA criteria used to evaluate remedial alternatives. DOE considers Alternative 6 to be an acceptable remedy for the following reasons.

- Action is needed to address these impoundments because of their continuing releases to groundwater and White Oak Creek and the risk of airborne releases if the water cover is lost.

- TDEC and ORREMSSAB prefer Alternative 6. They are opposed to promoting a strategy of maintaining isolated pockets of contamination requiring long-term monitoring and institutional controls, as needed for Alternatives 2, 3, 4, and 5.

- Alternative 6 is consistent with the overall national approach to radioactive wastes. At other DOE sites, wastes are either consolidated in existing facilities (e.g., NTS or Envirocare) or into centralized facilities on site. For example, Fernald and Hanford have facilities similar to the contingency on-ORR disposal facility discussed in the context of Alternative 6.

Alternative 6 satisfies the statutory preference for remedial actions that use treatment to reduce toxicity, mobility, and volume. The preferred alternative provides long-term effectiveness and permanence over other alternatives. Specific details on the selected remedy follow.

Alternative 6, the selected remedy, offers the greatest overall protection of human health and the environment because the waste is removed from the site. Alternative 6 meets all ARARs, has the greatest long-term effectiveness, and meets the statutory preference for treatment of wastes by reducing toxicity (of PCBs) and mobility (of radioactive and heavy metal contaminants) and is preferred by the state of Tennessee. Alternative 6 does not depend on institutional controls for long-term effectiveness (except for those already in place at NTS and Envirocare, or those existing or proposed at other appropriate off-site disposal facilities). Alternative 6 is acceptable in meeting short-term effectiveness, implementability, and cost effectiveness criteria.

The selected remedy meets the end-use criteria recommended by the citizens group site-specific advisory board for ORNL, the expressed recommendations of TDEC, EPA requirements and statutory preferences, and the goals and objectives of the DOE Accelerated Cleanup Plan.

The materials removed from Impoundments A and B will be treated, packaged, and shipped for disposal at NTS or another appropriate facility. If an on-ORR disposal facility with WAC compatible with SIOU wastes is developed through a separate decision-making process, it would serve as the contingency disposal facility for this alternative. If a new on-ORR disposal facility is available, it will likely be chosen because of reduced transportation costs and disposal fees.

DOE will issue an RFP for removal, treatment, and disposal of the sediment, water, and incidental soil in Impoundments C and D. DOE will submit the recommended methodology to

EPA and TDEC. A contract will be awarded and substantial remedial actions will begin within 15 months of approval of this ROD. The project will be completed by September 2, 2003.

STATUTORY DETERMINATIONS

Under CERCLA Section 121, selected remedies must be protective of human health and the environment, comply with ARARs (unless a statutory waiver is justified and granted), be cost-effective, and use permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. CERCLA includes a preference for remedies that permanently and significantly reduce the volume, toxicity, or mobility of hazardous wastes as their principal element.

PROTECTION OF HUMAN HEALTH AND ENVIRONMENT

The selected remedy protects human health and the environment by removing the source sediment contaminants at the SIOU; preventing the continued migration of contaminants from the SIOU; and designating the Bethel Valley watershed decision-making process to appropriately address any residual contamination remaining at the site.

COMPLIANCE WITH ARARS

The selected remedy will meet all ARARs, which are summarized here and listed in Table 2.3.

Chemical-specific requirements set health- or risk-based concentration limits or discharge limitations in various environmental media for specific hazardous substances, pollutants, or contaminants. These requirements generally set protective cleanup levels for the chemicals of concern in the designated media or indicate a safe level of discharge that may be incorporated when considering a specific remedial activity. There are no specified cleanup levels for SIOU because the scope of the action is limited to source removal of contaminated sediments; residual contamination of surrounding media will be addressed as part of the Bethel Valley watershed project.

Chemical-specific ARARs for SIOU consist of limits on radionuclide emissions. Subpart H of 40 CFR 61 addresses atmospheric radionuclide emissions from DOE facilities and will be applicable to airborne emissions during remedial activities. EPA has issued a final National Emission Standards for Hazardous Air Pollutants rule that limits emissions of

Table 2.3. ARARs and TBCs for remedial action at SIOU, ORR, Oak Ridge, Tennessee

Action	Requirement	Prerequisites	Citation
		Location-specific	
	Action(s) that will affect such resources must adhere to the DOE/ORO Programmatic Agreement (May 6, 1994). When alteration or destruction of the resource is unavoidable, steps must be taken to minimize or mitigate the impacts and to preserve data and records of the resource	Any action that will impact historic or archaeologic resources—**applicable**	National Historic Preservation Act (16 USC 470a-w) EO 11593; 36 CFR 800 DOE/ORO Programmatic Agreement (May 6, 1994) (TBC)
		Chemical-specific	
Control of radionuclide emissions	Exposures to members of the public from all radiation sources released into the atmosphere shall not cause an EDE to be > 10 mrem (0.1 mSv)/year	Point source discharge of radionuclides into the ambient air from a DOE facility—**applicable**	40 CFR 61.92 Rules of the TDEC 1200-3-11-.08
	Radiological emission measurements must be performed at all release points with a potential to discharge radionuclides into the air in quantities that could cause an EDE in excess of 1% of the standard (0.1 mrem/year). All radionuclides that could contribute > 10% of the standard (1 mrem/year) for the release point shall be measured		40 CFR 61.93 Rules of the TDEC 1200-3-11-.08
Protection of the public	DOE will carry out all DOE activities to ensure that radiation doses to individuals are ALARA	Release of radionuclides into the environment—**TBC**	DOE Order 5400.5(I.4) 10 CFR 834 (proposed)
	Exposures to members of the public from all radiation sources shall not cause an EDE to be > 100 mrem (1 mSv)/year		DOE Order 5400.5(II.1a) 10 CFR 834 (proposed)
		Action-specific	
Surface water control	Implement good site planning and best management practices to control stormwater discharges including: • documentation of best management practices in a stormwater control plan or equivalent	Control of stormwater discharges associated with construction activities at industrial sites that result in a disturbance of > 5 acres of total land area. For those sites with < 5 acres affected—**relevant and appropriate**	40 CFR 122 Rules of the TDEC 1200-4-10-.05

Table 2.3. (continued)

Action	Requirement	Prerequisites	Citation
	• minimal clearing for grading • removal of vegetation cover only within 20 days of construction • weekly erosion control inspections and maintenance • control measures to detain runoff • discharges that do not cause erosion		
Fugitive emissions from excavation activities	Take reasonable precautions to prevent particulate matter from becoming airborne; no visible emissions are permitted beyond property boundary lines for more than 5 minutes/hour or 20 minutes/day. Potential nonpoint sources of fugitive emissions are included in the plant-wide fugitive emissions plan	Nonpoint source air emissions—**applicable**	Rules of the TDEC 1200-3-8-.01
Characterization/management of excavated wastes, PPE and other secondary wastes streams generated during remediation	A person who generates solid waste must determine whether that waste is hazardous using various methods, including application of knowledge of hazardous characteristics of the waste based on information about the materials or processes used	Wastes generated during activities potentially contaminated with RCRA-characteristic waste—**applicable to secondary wastes from remediation of Impoundments C and D if further sampling indicates the wastes are RCRA-characteristic**	40 CFR 262.11 Rules of the TDEC 1200-1-11-.03(1)(b)
	All RCRA-restricted waste generated during remedial activities must be treated to meet LDR before land disposal		40 CFR 268.40 Rules of the TDEC 1200-1-11-.10(3)(a)
	LLW generators must characterize and segregate LLW from uncontaminated waste and otherwise minimize the amount of LLW generated. Subsequent management of LLW must be accordance with DOE Order 5820.2A	Generators of LLW—**TBC**	DOE Order 5820.2A(III.3)

Table 2.3. (continued)

Action	Requirement	Prerequisites	Citation
Treatment of RCRA-characteristic waste	Must treat to meet LDRs for those RCRA-characteristic wastes	Wastes that are determined to be RCRA-characteristic wastes—**applicable to remediation of Impoundments C and D if further sampling indicates the wastes are RCRA-characteristic**	40 CFR 268
	Where a treatment technology specified in 40 CFR 268 is not appropriate to the waste, the generator may apply for a treatability variance to comply with LDRs	Hazardous wastes (soils) for which the technology specified in 40 CFR 268 is inappropriate—**applicable to remediation of Impoundments C and D if further sampling indicates the wastes are RCRA-characteristic**	40 CFR 268.44
Treatment of contaminated soil and sediment to meet the disposal requirements of 40 CFR 761.60(a)(4)	The regional administrator may approve an alternate disposal method that can achieve a level of performance equivalent to incineration or high-efficiency boilers	Disposal of PCB-contaminated soil and sediment—**applicable to remediation of Impoundments C and D** if further sampling indicates the wastes contain PCBs above 50 ppm	40 CFR 761.60(e)
Tank requirements for treatment	Ensure that existing and new tanks have sufficient structural strength and are compatible with the waste to prevent collapse or rupture	Storage or treatment of RCRA-characteristic waste in a tank—**applicable to treatment of Impoundments C and D wastes if further sampling indicates the wastes are RCRA-characteristic**	40 CFR 264.191-192 Rules of the TDEC 1200-1-11-.06(10)(b)-(c)
	Ensure that waste is compatible with the tank material unless the tank is protected by a liner or by other means		40 CFR 264.191 Rules of the TDEC 1200-1-11-.06(10)(b)
	Provide tanks with secondary containment and controls to prevent overfilling and maintain sufficient freeboard in open tanks to prevent overtopping by wave action or precipitation		40 CFR 264.193–194 Rules of the TDEC 1200-1-11-.06(10)(d)-(e)
	Inspect the following: overfilling control, control equipment, monitoring data, waste level (for uncovered tanks), tank condition, above-ground portions of tanks (to assess their structural integrity), and the area surrounding the tank (to identify signs of leakage)		40 CFR 264.195 Rules of the TDEC 1200-1-11-.06(10)(f)

Table 2.3. (continued)

Action	Requirement	Prerequisites	Citation
	Repair any corrosion, crack, or leak		40 CFR 264.196 Rules of the TDEC 1200-1-11-.06(10)(g)
	At closure, remove all hazardous waste and hazardous waste residues from tanks, discharge control equipment, and discharge confinement structures		40 CFR 264.197(a) Rules of the TDEC 1200-1-11-.06(10)(h)
Closure of impoundments	Remove or decontaminate all waste residues, contaminated containment system components (liners, etc.), contaminated subsoils, and structures and manage them as hazardous wastes	Closure of surface impoundments—**relevant and appropriate to closure of Impoundments C and D if further sampling indicates the wastes are RCRA-characteristic**	40 CFR 264.228(a)(2)(1) Rules of the TDEC 1200-1-11-.06(11)
Transportation to disposal facility	The waste must meet packaging, labeling, marking, placarding, and pretransport requirements in accordance with DOT regulations	Transportation of hazardous and radioactive materials above exempt quantities—**applicable**	49 CFR 171, 172, 173, 174, 177, 178, and 179; DOE Order 460.1 (TBC)
	Waste must meet packaging requirements based on the maximum activity of radioactive material in a package	Packaging of radioactive materials above exempt quantities for public transport—**applicable**	49 CFR 173.431; 49 CFR 173.433; 49 CFR 173.435; 49 CFR 173.411
	Waste must be marked with hazardous waste marking, generator's name and address, and the manifest docket number	Transportation of hazardous waste in containers of 110 gal or less—**applicable to transport of Impoundments C and D wastes if further sampling indicates the wastes are RCRA-characteristic**	40 CFR 262.32(b) Rules of the TDEC 1200-1-11-.03(4)
	Shipment must be manifested according to 40 CFR 262 and 263	Transportation of hazardous waste for off-site treatment, storage, or disposal—**applicable to transport of Impoundments C and D wastes if further sampling indicates the wastes are RCRA-characteristic**	40 CFR 262 Subpart B 40 CFR 263 Subpart B Rules of the TDEC 1200-1-11-.03 Rules of the TDEC 1200-1-11-.04
	Generators must certify before shipment that the waste meets the waste acceptance criteria of the receiving facility	Waste shipped from one field organization to another for disposal—**TBC**	DOE Order 5820.2A(III)

Table 2.3. (continued)

Action	Requirement	Prerequisites	Citation
	LLW must be disposed of on site; if off-site disposal is required due to lack of capacity, disposal must be to a DOE facility	Shipments of LLW—TBC	DOE Order 5820.2A
	Off-site disposal of LLW to a commercial facility requires an exemption from the on-site disposal requirements of DOE Order 5820.2A; requests for exemption must be approved by the DOE ORO. Must meet DOE Order and implementing procedural requirements for off-site shipments	Shipments of LLW—TBC	DOE Order 5820.2A

ALARA = as low as reasonably achievable
ARAR = applicable or relevant and appropriate requirement
CFR = *Code of Federal Regulations*
DOE = U.S. Department of Energy
DOT = U.S. Department of Transportation
EDE = effective dose equivalent
EO = Executive Order
> = greater than
gal = gallon
< = less than
LDR = land disposal restriction
LLW = low-level (radioactive) waste
mrem = millirem
mSv = millisievert
ORO = Oak Ridge Operations
ORR = Oak Ridge Reservation
% = percent
PCB = polychlorinated biphenyl
PPE = personal protective equipment
ppm = parts per million
RCRA = Resource Conservation and Recovery Act of 1976
SIOU = Surface Impoundments Operable Unit
TBC = to be considered
TDEC = Tennessee Department of Environment and Conservation
USC = *United States Code*

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 or more (40 CFR 61.92). 40 CFR 61.93(b)(4)(i) requires radiological emission measurements at all release points with a potential to discharge radionuclides into the air in quantities that could cause an effective dose equivalent in excess of 1 percent of the standard (0.1 mrem/year). All radionuclides that could contribute > 10 percent of the standard (1 mrem/year) for a release point shall be measured. TDEC has proposed an equivalent rule in *Rules of the Tennessee Department of Environment and Conservation*, Chapter 1200-3-11. Containment and filtration of emissions as needed during treatment will be required, and dust control measures discussed under the "Fugitive Emissions" heading will prevent unacceptable emissions of radionuclides during remedial action at SIOU.

To-be-considered guidance from DOE Order 5400.5, "Radiation Protection of the Public and the Environment," of February 8, 1990, limits exposures to an effective dose equivalent of 100 mrem/year from all exposure pathways and all DOE sources of radiation. The overriding principle of the DOE Order is that all releases of radioactive material shall be as low as reasonably achievable.

Location-specific requirements set restrictions on the concentration of hazardous substances or the conduct of activities solely because they are in special locations. Based on current information for SIOU, the only condition or resource present on or near SIOU that would trigger location-specific ARARs is that SIOU is located within an historic district. The mitigation requirements associated with cultural resources and consultation with the State Historic Preservation Office have already been satisfied.

Performance, design, or other action-specific requirements set controls or restrictions on particular kinds of activities related to the management of hazardous waste. Selection of a particular remedial action at a site will invoke action-specific ARARs that may specify particular performance standards or technologies, as well as environmental levels for discharged or residual chemicals. The following text summarizes the action-specific ARARs triggered by various types of activities anticipated during implementation of the remedial action.

Stormwater Runoff

Stormwater discharges from industrial site activities involving construction operations that result in the disturbance of 2 ha (5 acres) of land or more have been included in the final rule for the National Pollutant Discharge Elimination System (NPDES) permits for stormwater discharges and incorporated into the TDEC permitting regulations [40 CFR 122; Rules of the TDEC 1200-4-10-.05]. Stormwater discharge requirements are applicable if 2 ha (5 acres) or more are disturbed; otherwise, they are relevant and appropriate requirements. Compliance with the

substantive requirements of the NPDES permitting process for stormwater discharges during construction activities (Rules of the TDEC 1200-4-10-.05) will be required. In particular, implementation of good site planning and best management practices to control stormwater discharges will be required. Stormwater flow controls such as berms, silt fences, hay bales, and other best management practices will be followed during implementation of the selected remedy to comply with stormwater runoff ARARs.

Fugitive Emissions

Elevation of airborne particulate concentrations could result if excavation at SIOU were not controlled. The TDEC Air Pollution Commission has promulgated applicable requirements in Rules of the TDEC 1200-5-8-.010, for the control of fugitive dust. An operator must take reasonable precautions to prevent particulate matter from becoming airborne. In addition, fugitive dust may not be released as a visible emission beyond property boundary lines for more than 5 minutes/hour or 20 minutes/day. To ensure compliance with the ORNL site air permit and to meet the substantive requirements of fugitive dust emissions, dust suppression measures (such as water, organic agents, or foams sprayed over the area of concern to prevent dust generation) combined with ambient air monitoring stations shall be used as a best management approach for activities during SIOU remediation.

Treatment of Surface Water Removed from SIOU

All waters removed from the impoundments during remedial activities will be sent to PWTP. The water must first be tested to ensure it meets the WAC for PWTP, and if necessary, treated before being sent to the facility. PWTP is a part of a permitted NPDES. If PWTP cannot accept any of the water, a contingency is to use a package treatment plant consisting of zeolite ion exchange canisters and from there transferring the water to the Nonradiological Waste Treatment Plant. Any spent zeolite packs must be characterized, and if necessary, managed and disposed of as a hazardous waste in accordance with 40 CFR 261, 262, and 263 or as a mixed waste under the Commissioner's Order for the site treatment plan, Section 105 of the FFA, and DOE Order 5820.2A, "Radioactive Waste Management."

Treatment of Sediments from Impoundments C and D

Sediments and incidental soils from Impoundments C and D will be treated using an alternate method of disposal per 40 CFR 761.60(e). An alternate method of disposal is required because no TSCA-permitted incinerators or permitted chemical-waste landfills are currently available that can also accept the radiological and potentially RCRA-contaminated sediments. The alternate method of disposal has not yet been finalized; however, chemical dechlorination is the method used in the cost estimate for the selected remedy. Treatment systems must be evaluated

to determine the destruction efficiency for PCBs in the sediments. If a method other than chemical dechlorination is used, it will be reviewed and approved by EPA and TDEC with appropriate documentation. Protectiveness of human health and the environment will be paramount in selection of the alternate method of disposal. EPA guidance requires that PCBs be destroyed to a level of < 2 ppm to demonstrate equivalency of performance with a TSCA-permitted incinerator. Once destruction requirements for PCBs have been met, the sediments will exit TSCA regulatory authority and be eligible for disposal at Envirocare as a mixed waste, if all other WAC are met.

Proposed revisions to the TSCA rules, if finalized, would allow destruction to risk-based level [proposed Sect. 761.61(c)] or disposal in a landfill that has been deemed protective (proposed Sect. 761.62). Should methodology capable of the required efficiency be unavailable for environmental media such as the sediments, the remaining wastes would of necessity be stored until suitable treatment and disposal facilities are developed.

The sediments from Impoundments C and D may also be RCRA-characteristic waste. The sediments and incidental soils must be properly characterized per 40 CFR 261. If the sediments are a RCRA-hazardous waste, LDRs (40 CFR 268) will be legally applicable for disposal of the wastes at an off-site facility. The sediments will then be treated to meet LDRs and any other disposal facility WAC. Treatability variances may be required for some of the potential RCRA constituents. If so, the EPA guidance for obtaining and complying with treatability variances for soil contaminated with RCRA-hazardous wastes for which treatment standards have already been set will be followed (Office of Solid Waste and Emergency Response Directive 9347.3-06FS, July 1989). Tanks associated with treatment of the RCRA wastes must comply with RCRA tank requirements in 40 CFR, Subpart J. Requirements such as secondary containment and closure of a tank system are included here.

Stabilization of Sediments from Impoundments A and B

Stabilization of sediments and incidental soils from Impoundments A and B will involve requirements for physically stabilizing the wastes such that the waste can pass the paint filter test per RCRA, Subtitle D, and can meet WAC of NTS or other disposal facilities. In addition, sufficient shielding of the radiological activity must be provided that all other requirements for transportation, worker safety, public exposure limits, and disposal facility WAC are met.

Closure of Impoundments

The SIOU scope includes removal and treatment of the sediments and surface water of the impoundments. Remediation of incidental soils is included only as necessary to support remediation of the sediments. Contaminated subsoils surrounding the impoundments will be addressed as part of the Bethel Valley watershed operable unit (OU) and will be included with actions for other subsoils. Thus, requirements for closure with waste in place, while relevant, are not appropriate.

Transportation of Waste for Disposal

Mixed or low-level wastes will be generated during the SIOU remediation. In accordance with DOE Order 5820.2A, radioactive waste is to be disposed of on the site where it is generated if possible; if off-site disposal is necessary because of lack of on-site capacity, disposal must be at another DOE facility. Because disposal capabilities for the SIOU sediments currently do not exist on ORR, the selected remedy includes off-site disposal of the sediments.

DOT requirements for shipping and packaging (49 CFR 172 and 175) and for transport on a public highway (49 CFR 177) of hazardous materials will be applicable to remedial actions at SIOU. General requirements for shipping hazardous materials are defined in 49 CFR 172, with specific marking, labeling, and placarding regulations for radioactive materials in 49 CFR 172.510, 172.405, and 172.556, respectively.

Regulations governing transportation of hazardous materials by public highway are found in 49 CFR 177, and specific loading and unloading requirements for radioactive materials are in 49 CFR 177.842. The number of packages in any one motor vehicle must be limited so that the total transport index number does not exceed 50. The total transport index is the sum of the numbers expressing the maximum radiation level in millirems per hour at 1 m (3.3 ft) from the external surface of each package (49 CFR 173.403bb).

EPA and TDEC regulations governing generators and transporters of hazardous waste found in 40 CFR 262-263 and Rules of the TDEC 1200-1-11-.03 to .04, are also ARAR for remedial activities at the SIOU. Rules of the TDEC 1200-1-11-.03 (40 CFR 262) requires generators to ensure and document that the hazardous waste they generate is properly identified and transported to a treatment, storage, and disposal facility.

Requirements for manifesting [Rules of the TDEC 1200-1-11-.03(3); 40 CFR 262.20–23], packaging, labeling, marking, and placarding [Rules of the TDEC 1200-1-11-.03(4); 40 CFR 262.30–33] will be followed. In addition, there are record-keeping and reporting requirements

[Rules of the TDEC 1200-1-11-.03(5); 40 CFR 262.40-43]. Pretransport requirements referenced under DOT regulations 49 CFR 172, 173, 178, and 179 are also applicable.

In the event that an on-ORR disposal facility becomes available, the above regulations for packaging, labeling, and transport would be relevant and appropriate rather than applicable.

Off-Site Disposal of Low-Level Wastes

CERCLA Section 121(d)(3) requires that the off-site transfer of any hazardous substance, pollutant, or contaminant generated during CERCLA response actions be to a facility that is in compliance with RCRA and applicable state laws. EPA has established procedures and criteria at 40 CFR 300.440 for determining whether facilities are acceptable for the receipt of off-site waste. Per 40 CFR 300.440(a)(4), EPA will determine the acceptability of the facility selected for disposal of CERCLA wastes. DOE will request the determination from EPA once facility availability is apparent. Once wastes generated from a CERCLA response action are transferred off site, all administrative as well as substantive provisions of all applicable requirements must be met.

An off-site facility licensed for disposal of radiological waste and approved by EPA to accept CERCLA waste will be used for sediments from Impoundments A and B. The wastes must also meet the acceptance criteria of the off-site disposal facility. If the sediments from Impoundments C and D are RCRA hazardous, they would be treated to meet LDRs before disposal. After destruction of PCBs and treatment to remove RCRA characteristics, the sediments would be disposed of as low-level waste.

Decontamination of Equipment

Decontamination activities will include washing equipment and collecting the decontamination water with temporary sumps connected to PWTP. The decontamination water must meet WAC for this facility before treatment.

Institutional Controls

Institutional controls will remain in place for SIOU until superseded by the Bethel Valley watershed ROD. No regulatory requirements specify institutional controls for CERCLA units.

For the containment and long-term management of residual contamination at inactive hazardous waste sites, Rules of the TDEC 1200-1-12-.08(3)(a)4.(iv) controls are to include, at a minimum, deed restrictions for sale and use of the property and securing the area to prevent human contact with hazardous substances. Also, RCRA contains general requirements for

institutional controls following closure of RCRA units (40 CFR 264.14), which are relevant and appropriate for any RCRA waste left on site. Although residual contamination will remain in the surrounding media, these requirements have not been included as ARARs for SIOU because removal of the sediments will not leave waste in place as defined by the scope of this action.

DOE Order 5400.5, Chapter IV, requires administrative (institutional) controls for long-term management in areas containing residual radioactivity above guidance levels based on basic dose limits in the DOE Order.

These and other measures mandated by health and safety standards will continue to protect workers and the public after remedial action at SIOU is completed and pending remedial action on the Bethel Valley watershed OU.

COST EFFECTIVENESS

Actions taken under CERCLA must consider the estimated total present-worth cost of alternatives. Alternative 6 meets regulatory requirements, reduces risk to human health and the environment to acceptable levels, and allows beneficial reuse of the site, which offsets some of the cost associated with this remedy. Alternative 6 is considered a cost-effective remedy for the protection of human health and the environment.

USE OF PERMANENT SOLUTIONS TO THE MAXIMUM EXTENT PRACTICABLE

The selected remedy represents the maximum extent to which permanent solutions can be used in a cost-effective manner for the SIOU sources at this time. Of the remediation alternatives, the selected remedy provides the best balance of trade-offs in terms of long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; and cost. The impact of any residual contamination will be assessed in the Bethel Valley ROD; additional action could be taken pursuant to that decision.

PREFERENCE FOR TREATMENT

CERCLA Section 121 establishes a preference for alternatives that use treatment to permanently reduce toxicity, mobility, or volume of hazardous substances. The selected remedy will use stabilization/solidification to reduce mobility of the contamination in the waste removed from Impoundments A and B. If sampling results indicate that treatment of waste removed from

Impoundments C and D is needed to meet TSCA regulations or disposal facility WAC, permanent reductions of toxicity or mobility could result from implementation of the selected remedy.

The selected remedy, therefore, meets the CERCLA preference for treatment.

EXPLANATION OF SIGNIFICANT CHANGES

The proposed plan, which was released for public comment on June 30, 1997, identified Alternative 6 as the preferred alternative. DOE received oral comments during the public meeting on July 15, 1997, and written comments as documented in the "Responsiveness Summary." DOE, EPA, and TDEC reviewed the comments and determined that no significant changes to the remedy, as originally identified in the proposed plan, were necessary.

REFERENCES

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Yu., C., A. J. Zielen, J. J. Cheng, Y. C. Yuan, and L. G. Jones. 1993. *Manual for Implementing Residual Radioactive Material Guidelines Using RESRAD, Version 5.0*, ANL/ESD/LD-2. DOE, Washington, DC.

PART 3. RESPONSIVENESS SUMMARY

RESPONSIVENESS SUMMARY

This responsiveness summary serves three major purposes. First, it informs DOE, EPA, and TDEC of community concerns about the site and the community's preferences regarding the proposed remedial alternative. Second, it demonstrates how public comments are integrated into the decision-making process. Finally, it allows DOE to formally respond to public comments.

This responsiveness summary documents all public comments on the *Proposed Plan for the Surface Impoundments Operable Unit, Oak Ridge, Tennessee* (DOE 1997a). The proposed plan was issued in June 1997; the public comment period was June 30–July 30, 1997. DOE announced the availability of the proposed plan in *The Knoxville News-Sentinel, The Roane County News,* and *The Oak Ridger* June 30, 1997. A public meeting was held July 15, 1997. Comments made during the public meeting and those received in writing during the public comment period are addressed here.

This summary is prepared pursuant to the terms of the 1992 FFA among DOE, EPA, and TDEC, as well as other requirements, including:

- CERCLA as amended by the Superfund Amendments and Reauthorization Act of 1986 (42 USC Sect. 9601, et seq);
- NCP (40 CFR 300.430); and
- *Community Relations in Superfund, A Handbook* (Yu et al. 1993).

COMMUNITY PREFERENCES

DOE received 36 comments on the proposed plan. These comments are summarized with DOE's responses. DOE recorded 19 public comments at the July 15, 1997, public meeting. Written comments were received from the EPA National Remedy Review Board, ORR Environmental Management Site Specific Advisory Board (ORREMSSAB), Mr. Alfred A. Brooks, Ms. Janet L. Westbrook, and a commentor whose signature was illegible. Two commentors (including ORREMSSAB) supported selection of the preferred alternative (Alternative 6) presented in the proposed plan. Four commentors supported selection of Alternative 3. Clarifications or modifications to alternatives were suggested by 18 of the comments.

INTEGRATION OF COMMENTS

The selected remedy described in this ROD includes clarifications of the preferred alternative based on public input. These clarifications did not change the intent or the selection of the preferred alternative.

ISSUES, COMMENTS, AND RESPONSES

Because many comments dealt with similar issues, the comments are categorized into the issues identified below. The transcript of the public meeting and all written comments are included in the Administrative Record. Comments from that meeting and written comments received during the public comment period are either summarized below or presented in full. DOE's response to each issue follows the statements and summaries of comments for that issue.

ISSUE 1: ALTERNATIVE 6 SHOULD BE THE SELECTED REMEDY

Comment 1: **ORREMSSAB, July 9, 1997.**

[ORREMSSAB] is in general agreement with the preferred alternative (Alternative 6) of removal, treatment and disposal of surface impoundment sediments as presented in [DOE's] proposed plan of June 30, 1997.

Alternative 1 (no action) is unacceptable because of the continued release of contaminants to groundwater, leakage through Impoundment B berm, migration of contaminants to surface water, and resultant unacceptable risk to ecological receptors. The possibility of flooding of the impoundments also remains a concern under the no action scenario. In addition, the potential risk to human health if the water cover over the impoundment sediments is lost would be at an unacceptable level.

Although both Alternative 3 (on-site consolidation cell) and Alternative 6 would prevent continued releases of contaminants to groundwater, Alternative 6 is preferable because the source material would be removed and this portion of the Bethel Valley area of [ORNL] would not be restricted from future surface use. This area is desirable for future surface use as it is adjacent to other well-developed and highly used areas of [ORNL]. Alternative 6 is also preferable to Alternative 3 because long-term stewardship of the SIOU would not be required. It is also desirable to create as few waste disposal areas as possible, and by transporting the impoundment

sediments to either an on-site waste management facility (which would accept CERCLA wastes from many areas on [ORR]) or [NTS], the creation of a waste disposal area solely for the impoundment sediments would be avoided.

Comment 2: **Mr. Pride, Transcript of Public Meeting, July 15, 1997.**

From my own personal view I want to also favor Alternative 6, the cleanup alternative. Some comments were made to the rem exposure [see Issue 3]. I certainly believe that the costs probably could be improved from a personal standpoint. But even more so from Janet [Westbrook]'s viewpoint, I think that the rem exposure is probably very, very high.

And, of course, if you do use this, there's a probability that the transport and disposal cost to [NTS] would run $20 million–$25 million just for that. So that doesn't count the actual work activity there. It will be contributing costs.

DOE Response: DOE agrees that Alternative 6 should be the selected remedy. Comment 1 states that, for Alternative 6, "... long-term stewardship of the SIOU would not be required." While this is true for the wastes included in the SIOU scope, the level of cleanup or long-term stewardship required to address the residual contamination in soil and groundwater on the SIOU site will be determined in the Bethel Valley Watershed ROD. For Comment 2, please see the response to Issue 3 regarding radiation exposures and the response to Issue 4 regarding costs.

ISSUE 2: ALTERNATIVE 3 SHOULD BE THE SELECTED REMEDY

Comment 1: **Ms. Westbrook, Transcript of Public Meeting, July 15, 1997; and Janet L. Westbrook, [Written] Comments Made at the DOE Surface Impoundments Project Public Meeting, Oak Ridge, Tennessee, July 15, 1997, with Notes Added 16 July 1997.**

I am a radiological engineer, a Registered Professional Engineer, a Certified Health Physicist, a resident of Oak Ridge, and a taxpayer. Since some of you will recognize me as being in the rad protection organization at [ORNL], I must state that I am speaking for myself, as a concerned person, and not for Lockheed Martin or ORNL.

Most of my work involves evaluating radiation work and the associated dose. The choice of Alternative 6 over Alternative 3 disturbs me for several reasons. [See Issue 3, Comment 1; Issue 10, Comment 2; and Issue 13, Comment 9.]

I suggest that Alternative 3 be chosen. Then take the cost difference between the alternatives, about $40 million. Take half of it and use it for other projects. Take the other half, $20 million, and invest it at, say, 8 percent for 30 years. At the end of that time you'll have grown the $20 million to $200 million. Then, if ORNL does go away in 30 years, you can further remediate the capped Alternative 3. It will be easier and cost less dose, because the cesium and strontium will have decayed to half of their original values and the cobalt to about 5 percent of its original value.

I made this suggestion in jest, of course, since DOE would never establish a $20 million trust fund for the impoundments. Yet DOE is willing to spend $53 million and 36 man-rem or more on it now. Why?

In the DOE method, as best as I could tell from the project fact sheet, each [CERCLA evaluation] criterion was treated separately and more or less equally (e.g., five criterion check marks in the criterion table might be taken to beat three check marks, even though the criteria were in fact not of equal importance).

In an optimization study, any "trump" or veto criteria would cause an alternative to be weeded out at once. However, DOE apparently did not realize that the state would oppose any action that did not immobilize the waste essentially forever or else did not completely remove the waste from the site (from the fact sheet: "TDEC stated that Alternative 3 is unacceptable because the long-term effectiveness of the cell is not protective for the life of the defined risk ... and also promotes a strategy of maintaining small pockets of contaminated media throughout ORR that the state will not support"). Thus it appeared that there were two options, 3 and 6, when in fact there was only one. In that case, the money to evaluate Alternative 3 was unfortunately just wasted.

I also did not have time in the meeting to go into the engineering uncertainties of the project and this point was only lightly touched on by others. But these uncertainties should be considered seriously especially since, as I did note, the company performing the remediation may choose to deviate from the method proposed in Alternative 6 and is not required to keep under the dose estimated. As a radiological engineer, I favor the proven technology, the tested technique, over less predictably controllable methods that may result in more dose, take longer than planned to execute, etc. I also favor a method that, once the project begins, will minimize external impacts on schedule, e.g., that will depend on the fewest entities or organizations and will not depend on political decisions, such as the opening of NTS to ORNL waste, to be completed. This is a reason to favor Alternative 3.

Comment 2: **Mr. Brooks, Transcript of Public Meeting, July 15, 1997.**

I have a question on cost. Offhand comment that roughly $35 million an acre is a high price to pay for land. I would point out that the [End-Use Working Group] did not recommend Alternative 6, and Alternative 3 would fully meet their criteria, which was not to leave any exclusion areas, and I think, as indicated [by DOE during July 15, 1997, presentation], will be a satisfactory recreational area.

Frankly, my own personal preference would be for [Alternative 6], but only if you can assure me that you're not going to jeopardize some other project down the road ... [only] if we could be assured that there is plenty of money to do the things that we have to do and something of equal importance ... or several things of lesser importance will not be set aside under fully endorsed Alternative 6.

But under these circumstances, since Alternative 3 does meet all the acceptance criteria, and considering that land across the road certainly wouldn't go more than $10,000 an acre, then I really can't see the need to return this ... to the pristine state ... especially since right in that same valley you've got White Oak Creek, and on the next valley over, there will be acres of sites that have material left, all of those contributing to White Oak Creek. Granted that this is a big contribution, but that can be another way to lower costs.

We went through a process [East Fork Poplar Creek CERCLA decision] where EPA was persistent on certain cleanup levels. The public was dissatisfied. It's a matter of record what the outcome was. EPA listened to the public. I think as a part of this process now, you have the public with you to help you discuss it and reach what seems to be a reasonable conclusion. I don't think the other conclusion [East Fork Poplar Creek] really factored in public opinion, and I think now the EPA knows how intensive it can be.

Comment 3: **Ms. Sigal, Transcript of Public Meeting, July 15, 1997.**

[T]he [End-Use Working Group] has already provided community input on the surface impoundments, and it's my understanding that we recommended a controlled industrial use, which our definition of that term means that industrial service use is appropriate, soil should be clean to a depth of 2 ft, shall the soil disturbance permit it, to a depth of 2 ft. No groundwater use, no use of surface water, and federal government ownership. So you have the community input for this project, and I think maybe you ought to take another look at it and maybe revisit your alternative because I don't think Alternative 6 is what we had in mind when we talked about controlled industrial use.

Comment 4: **Alfred A. Brooks, Letter to Margaret Wilson, July 17, 1997.**

These comments are based on the CERCLA Criteria, the End-Use Working Group Community Guidelines, and the Recommendations for the End Use of Bethel Valley.

Both Alternatives 3 and 6 generally meet the above requirements; however, in the areas of remediation worker safety and cost, Alternative 3 is more in tune with the CERCLA criteria and community's expressed wishes. Contrary to some public statements, the End-Use Working Group did not endorse Alternative 6. The [End-Use Working Group's] objectives are to recommend end uses for contaminated areas, not to recommend remediation methods.

In comparing these alternatives, consideration has been given to the fact that some of the alleged advantages of Alternative 6 over 3 is simply the transfer of liabilities for ORR to other sites which are only incrementally better for their accommodation. In addition, the fact that SIOU and Melton Valley, which will contain future similar subsurface wastes, are on the White Oak Creek is considered. The uncertainties associated with estimated costs and future budgets have also been considered in making these judgments.

1. The additional remediation worker exposure of Alternative 6 is significant and contrary to the Community Guidelines.

2. The cost of Alternative 6 exceeds the cost of Alternative 3 by $37 million for which about [1.5] acres are restored from recreational or site beautification use to light building use. Given that a site needs some green areas, this is a high price to pay per acre for the additional benefit especially with the ready availability of land near by. A choice of Alternative 6 seems contrary to CERCLA requirements.

3. The requirement to reduce the PCB levels to below 2 ppm when the disposal level is 50 ppm is not cost effective especially since the sediment concentrations are only slightly above 50 ppm. DOE should request a waiver and EPA should grant it. To enforce this regulation would incur the needless expenditure of several millions of dollars that could be better spent on other cleanup. This would be contrary to CERCLA's requirement for cost effectiveness.

For the above reasons, [Alternative 3] is preferable to [Alternative 6].

Comment 5: **Signature Not Legible, Letter to Margaret Wilson, July 20, 1997.**

I disagree with the selection of Alternative 6 as the preferred alternative for remediation of SIOU. I believe that Alternative 3, as presented in the proposed plan, is the option that should be the selected remedy in the [ROD] for this project.

DOE Response: On evaluation of the nine CERCLA criteria, Alternative 6 offers superior performance in five criteria (overall protectiveness, compliance with ARARs, long-term effectiveness, preference for treatment, and state acceptance). Alternative 3 is better in three criteria (short-term effectiveness, implementability, and cost). Regarding public acceptance, the last evaluation criterion, both alternatives have received support. Two commentors, including ORREMSSAB, provided four comments supporting Alternative 6. Four commentors provided 16 comments supporting Alternative 3.

Remedies such as Alternative 3, which incorporates disposal at or near SIOU, can result in small pockets of contaminated media distributed throughout ORR. The state and ORREMSSAB oppose the formation of small pockets of contaminated media (see Issue 1, Comment 1). The permanent requirement for maintenance and monitoring is not reflected in the cost estimate, which assumes a 30-year project life per EPA guidance. Land use would remain restricted in perpetuity.

Comment 1 says that the state's "veto" of Alternative 3 indicates the money spent to evaluate it was wasted. The evaluation of all alternatives was performed according to CERCLA guidance to develop a range of potential remedial actions. This is done to truly evaluate the technical ramifications of varying remediation options.

Comment 1 states that the remediation contractor "is not required to keep under the dose estimated." The estimated doses (see Issue 3, Comment 1) were prepared recently and were not reviewed by DOE. All DOE contractors are required to ensure that workers are protected and that radiation exposures are maintained ALARA (see Issue 13, Comment 9).

Commentor 1 favors "the proven technology, the tested technique, ... a method ... that will minimize external impacts on schedule ... such as the opening of NTS to ORNL waste ...." Although DOE agrees that these are valuable elements to strive for in the selection of an alternative, the methods of addressing uncertainties associated with Alternative 6 are considered reliable. See responses for Issues 7, 8, 9, 10, 11, and 13.

Comments 1, 2, and 4 address the cost differential between Alternatives 3 and 6, and the concern that funding for other projects will not be available if Alternative 6 is selected. DOE recognizes that funding is limited and that expenditures on SIOU may reduce funding available for other ER projects. However, DOE believes that the expenditures for Alternative 6 are appropriate for remediation of the impoundments (see response to Issue 4). Furthermore, DOE expects to significantly reduce costs from those projected for Alternative 6 in the proposed plan, based on the use of a competitive procurement process. Although Alternative 3 would remain less costly to implement, the cost difference is not expected to approach the amounts discussed in the comments.

Comments 2, 3, and 4 address the effectiveness of Alternatives 3 and 6 in meeting the End-Use Working Group Community Guidelines and the Recommendations for the End Use of Bethel Valley. DOE agrees that both alternatives meet the land use recommendations as stated in the comments. Alternative 6 is superior to Alternative 3 in meeting the following End-Use Working Group guidelines:

- End-use decisions for contaminated lands should not impede the continuing use and development of ORR lands, and should allow for future employment and research opportunities.

- Institutional controls in lieu of remedial actions should only be used in cases where DOE has satisfied the community that further restoration is not feasible.

- End-use decisions should strive to reduce the amount of land requiring long-term control.

Comment 4 states that "... additional remediation worker exposure of Alternative 6 is significant and contrary to the Community Guidelines." Please see response to Issue 3. Comment 4 addresses the EPA requirement for PCB treatment for Alternative 6. Please see response to Issue 7.

Specific responses to Comment 5 are provided under Issues 5, 6, 7, 8, 9, 10, and 12.

ISSUE 3: RADIATION EXPOSURE TO WORKERS WILL BE HIGH FOR ALTERNATIVE 6

Comment 1: **Janet L. Westbrook, [Written] Comments Made at the DOE Surface Impoundments Project Public Meeting, Oak Ridge, Tennessee, July 15, 1997, with Notes Added July 16, 1997; and Transcript of Public Meeting, July 15, 1997.**

Most of my work involves evaluating radiation work and the associated dose. The choice of Alternative 6 over Alternative 3 disturbs me for several reasons.

First consider the collective dose estimates. Alternative 3 is estimated to cost around 13 man-rem, while Alternative 6 costs 36 man-rem, nearly three times as much. Note that the Alternative 6 estimate does not include the dose from babysitting the drums until they are shipped to Nevada, and that the company doing the remediation is not constrained to use this method or to keep under the dose estimates.

How much is [36] man-rem conceptually? According to a published DOE report, the DOE complex and all of DOE in the United States, annual collective external dose ranged from 1,500 to 1,600 man-rem in the years 1990 to 1994. The 36 man-rem would increase that total by about 2.5 percent.

The ORNL annual collective dose was between 40 and 45 man-rem for the years 1993 to 1995 and was 59 man-rem last year; the 36 man-rem for Alternative 6, if most of the work were done over a year, would thus nearly double the typical annual collective dose for ORNL, and would increase it by 60 percent over last year, a very high year. This would mean that ORNL's typical contribution to the DOE collective dose would be increased to about 80 man-rem, or about five percent of the typical total.

Second, consider the individual worker's dose. What does 36 man-rem mean when we consider individuals? If the work is done over about a year, is that one rem to each of 36 people? Is it 2 rem to each of 18 people? Three rem to each of nine people? In each of the years 1992 to 1994 in the DOE complex, between 40 and 90 people received 1 to 2 rem of external dose; having 36 people receiving a rem would thus increase that number by 40 to 90 percent. In those years, nobody in the DOE complex got between 2 and 3 rem. And according to the DOE report, only one person and in only one year got more than 3 rem. Obviously, giving 36 people 1 rem or more, or fewer people more in a single operation is not typical of work in the DOE complex.

In each of the years 1993 to 1995, ORNL's highest single dose was about 950 man-rem, that is, just under 1 rem; in 1996 the highest dose was 1.3 rem, which only 1 person got. Obviously, 36 people getting 1 rem, or 18 getting 2 rem etc., would constitute a huge increase in the number of people in the higher bracket at ORNL.

Possibly the collective and individual doses will be spread over more than one year. But even so, this is a substantial chunk of dose to a relatively large group of people.

Well, third, if it is urgently necessary to remediate these impoundments, then surely it's necessary to spend all that dose for the good of the community. As every person involved in rad work knows, we sometimes have to give some dose to some people in order to save dose to other people. In this case, those other people are mainly members of the public. But how much dose to them is being saved? What is the dose to the maximally exposed member of the public if the impoundments are unremediated? That's Alternative 1. How many people would get a dose over, say, 10 mrem? I don't know, as these numbers do not appear in the DOE fact sheet, only risks; but the risks have wrapped up in them the assumptions of particular scenarios, usually very conservative ones.

Still, the doses are presumably fairly significant, or why remediate at all? Significant, that is, if the water is lost, if the wind is blowing in the right direction, and so forth. Then what are the respective doses to the members of the public from Alternative 3 as compared to Alternative 6? We are not told what these are, but the risks for these two are given in the fact sheet as the same over 30 years. Why would there then be a preference for Alternative 6?

The bottom line seems to be that the state wants the radiation to be out of there, period, end of sentence. That is because to have it off the site and completely out of Tennessee would leave the site pristine and available. A baby could play in the grass growing on the site. But available for what? It makes sense to insist on cleanup for a site like K-25 which has lost its mission and would be a community asset if it were made unrestricted or at least only lightly limited industrial use. But ORNL is not something that's supposed to go away in 30 years. Its mission is not ended yet. For example, ORNL and DOE are looking for ways to extend the [High Flux Isotope Reactor's] life another 30 years. Why is it that if today we clean up the surface impoundments to where they no longer constitute a threat to the public or worker health, we must clean them up to pristine standards and must achieve that <u>today</u>? Why clean up an area to final release criteria (which, per DOE Order 5400.5, aren't supposed to apply until the area is actually released), until it is released? I submit that this is not justified.

Also, the ALARA process, as described and required by 10 CFR 835 (occupational and rad protection), DOE Order 5400.5 (protection of the public), etc., has not been applied here in a rigorous form. Optimization procedures as described in the various authoritative rad protection standards and reports, do not appear to be employed in the way that one would expect to see. This is why the more costly alternative from the money and dose point of view, and the more dubious, from the technical point of view, seems to be chosen on a single basis—to get the radioactivity out of here. This is a pretty parochial view for our radiologically sophisticated community to take.

DOE Response: DOE agrees that the cumulative dose to all workers during the remedial action for the selected remedy will be higher than the dose would be if Alternative 1 (no action) or Alternative 3 were selected. However, doses will be received over a 4-year period and annual doses will be reduced accordingly. Controls will be maintained to ensure that no individual worker receives a dose in excess of allowable DOE or regulatory limits. Furthermore, the remediation contractor will be required to develop and implement remedial design and health and safety work plans will institute procedures to ensure that doses to workers implementing the selected remedy are ALARA. Although upcoming remediation of this site and other ORR sites to meet the goals established in the June 1997 draft *Accelerating Cleanup: Focus on 2006* will require actions that expose a larger work force to more cumulative dose, this occupational risk is considered necessary to better manage wastes that are currently releasing contamination to groundwater and surface water and could potentially release contamination to the atmosphere. Because exposures of each individual worker will be maintained within acceptable limits and ALARA for the given remediation scenario, the benefits resulting from cleanup will outweigh the risks.

DOE agrees that current exposures are acceptable and that extraordinary events (loss of water cover or direct hit by a tornado) would be required to disperse airborne contamination that would expose the community to an unacceptable dose. These events are possible, and the resulting exposed population and internal doses received would be severe. This low-probability, high-adverse-effect scenario is one driver for remediation. Another is the continuing release of contamination to groundwater and to White Oak Creek.

DOE also agrees that exposures after completion of Alternative 3 would be no greater than exposures resulting from Alternative 6 for the time frame (30 years) considered in the comment. CERCLA requires consideration of long-term effectiveness, which favors Alternative 6. DOE agrees that cleanup to "pristine" standards is not necessary today to meet DOE requirements. However, this would allow release of the site for other beneficial uses and would eliminate the need for future actions to address the same wastes.

In summary, although DOE agrees that worker exposure, as evaluated under the CERCLA short-term effectiveness criterion, favors Alternative 3, this alone is not sufficient to warrant selection of Alternative 3 over Alternative 6.

ISSUE 4: COST PROJECTIONS ARE INCORRECT FOR ALTERNATIVE 6

Comment 1: **Mr. Unger, Transcript of Public Meeting, July 15, 1997.**

I have a question about the cost estimate .... You said that Alternative 6 is three times Alternative 3, yet you don't know how you're going to treat this water for PCBs or sludge for PCBs, and you also said that there's going to be a lot of other contaminants to be treated. Will those contaminants be treated by an off-site or by a private company, or will they go through [ORNL's] treatment system? Does the $64 million [for Alternative 6] include the programmatic costs, or does that include the contractors coming and taking the waste away and treating it and disposing of this waste? You want to presuppose maybe letting a contractor come up with an idea there because I can't imagine that costing $64 million to do that job. I'd like to offer to do that job for half that right now.

Comment 2: **Mr. Brooks, Transcript of Public Meeting, July 15, 1997.**

A concern about cost is that the estimated cost for [Alternative 6] was between $20 million and $30 million, and now it's gone up to $52 million. Furthermore, we have said that the numbers that we were using in the end-use exercise were consistent with the $6 billion budget [proposed in Congress for DOE nationwide for FY 1998].

DOE Response: The cost projection of $53.1 million present worth in the proposed plan is based on a detailed analysis of direct costs (equipment and materials needed, actions to be performed, crew sizes needed to perform those actions, personnel protective equipment, and productivity losses necessary to ensure adequate protection of remediation personnel) and indirect costs (contractor profit and overhead, oversight personnel including profit and overhead, project design and planning, and others). Contingencies were added to each line item based on the assumed difficulty or uncertainty associated with the action. The capital and operating costs (e.g., equipment, materials, worker salaries) are well defined and based on industry standards, previously executed projects, and standard cost estimating procedures. The indirect costs (e.g., profit, overhead, inflation, discount rate) are based on the contracting methodology in place at ORNL. The remediation contractor's costs in the estimate are on the order of half of the total project cost.

The cost for treatment of PCBs and, potentially, for RCRA hazardous materials was estimated based on an assumed technology with adequate contingency to address any likely treatment method. Vendors will be approached to propose any treatment technologies and remediation methodologies that would meet ARARs and performance specification requirements. Liquid wastes, pretreated by the vendor as necessary, are assumed to be discharged to the Process Waste Treatment Plant at ORNL, adjacent to the SIOU site. DOE expects the selected vendor's proposal to be less than the costs used in the estimate.

The purpose of the cost projections in the proposed plan is to allow a comparison between alternatives. The same team of engineers and estimators used the same methods for estimating costs for all alternatives. The relative cost, with Alternative 6 about three times more costly than Alternative 3, is considered accurate. Innovative contracting methodologies could significantly reduce costs, but the relative comparison would remain the same. Part 2 of this ROD shows the revised cost estimates that reflect the M&I contracting methodology.

Disposal of treated waste from Impoundments A and B in an on-ORR disposal cell could reduce costs by up to $3.6 million. If final revisions to EPA regulatory requirements allow (see response to Issue 7), treatment of waste from Impoundments C and D for PCBs could be eliminated, reducing costs by over $4 million. Even with these potential savings, Alternative 6 would be almost three times the cost of Alternative 3.

In response to Comment 2, the $20 million–$30 million cost for off-SIOU disposal previously presented to the End-Use Working Group was based on assumptions and a different scope of work that are not considered valid in the proposed plan. Those cost estimates assumed no treatment of waste before transport, no requirement to meet DOT containerization or transport requirements, and stabilization of the sediment in the disposal facility at no cost. The difference between the costs previously used and the current projections are not a significant change to the $6 billion budget, but DOE Oak Ridge Operations will have to revise their budget before remediation begins.

Cost was not a key factor in the selection of Alternative 6 as the selected remedy. Although more costly, Alternative 6 is the most appropriate remedy for protection of human health and the environment. To implement the remedy, DOE will select the most advantageous contracting methodology and develop the most cost-effective design practical that meets the then-current regulatory requirements.

ISSUE 5: COST VERSUS RISK REDUCTION BENEFITS FAVORS ALTERNATIVE 3

Comment 1: **Signature Not Legible, Letter to Margaret Wilson, July 20, 1997. See Also Issue 7, Comment 3.**

The primary reason that Alternative 3 should be selected is that the projected risks are less than 1×10^{-6} for either Alternative 6 or Alternative 3, yet the cost for Alternative 6, $53.1 million (present value) is 3 times or almost $37 million greater than the cost for Alternative 3 ($16.3 million). Selection of Alternative 6 will allow less restricted use of about 2 acres of the 6-acre SIOU site. The difference in remediation costs necessary to reduce, but not eliminate, industrial land use restrictions comes to over $18 million per acre. Even in the main area of ORNL, property is not worth this investment.

Although no engineered facility can be guaranteed forever, the proposed plan states that the Alternative 3 cell will be protective as long as institutional controls are maintained. The risk assessment in Table 1 indicates that the risk at all receptor locations is less than 1×10^{-6} for Alternatives 3 and 6. In other words, Alternative 6 offers no better long-term reduction of risk as long as institutional controls are maintained at the site for Alternative 3. Even if maintenance is discontinued, a properly designed disposal cell will last for hundreds or even thousands of years if no one deliberately disturbs the containment features. This level of protection will eliminate the risk from direct radiation from short-lived gamma emitters which will decay to nonhazardous elements. The transuranic elements would only be hazardous if they become airborne. Substantial erosion or intrusion would be needed to expose significant quantities of transuranics to the atmosphere. The long-term effectiveness of Alternative 3, while not as high as Alternative 6, is sufficient to preclude tripling the costs to ship the wastes out of Tennessee.

Although the [End-Use Working Group's] goal to reduce the number of sites requiring long-term institutional controls and maintenance is admirable, there is not enough funding available to greenfield all currently contaminated sites. In some cases, remediation in place is warranted, particularly when risk reduction is the same and significant funds can be saved for remediation of other sites. SIOU is such a case where remediation in place (Alternative 3) is warranted and the costs for shipping waste out of my back yard (Alternative 6) is not warranted.

DOE Response: DOE agrees that risks to workers and the public are the same for Alternatives 3 and 6, while institutional controls for Alternative 3 are effective. DOE also recognizes that costs for Alternative 3 are much lower. In the very long term (i.e., > 1,000 years), short-lived radionuclides would have decayed away and risks from direct exposure to gamma radiation would be negligible. However, if institutional controls are lost, an

inadvertent intruder would be subject to unacceptable risks from inhalation of long-lived alpha-emitting transuranic radionuclides. The selection of Alternative 6 eliminates the need for permanent institutional controls for wastes in the scope of this project.

ISSUE 6: SHORT-TERM RISKS FAVORS ALTERNATIVE 3

Comment 1: **Signature Not Legible, Letter to Margaret Wilson, July 20, 1997. See Also Issue 2, Comment 1; Issue 8, Comment 1.**

[T]he short-term risk to workers for constructing and operating two treatment facilities and transporting waste across the country must be significantly greater than the simple operations proposed for Alternative 3. The remediation and attempted treatment of the K-25 Pond Waste cost several times the original estimates and resulted in the death of a remediation worker, not from radiation exposure, but from a simple industrial accident. The likelihood of such an accident is far greater for Alternative 6.

DOE Response: DOE agrees that short-term risks favor Alternative 3 as stated in the above comment. However, key factors for determination of the selected remedy were long-term effectiveness, reduction of toxicity and mobility through treatment, and state acceptance. DOE believes the short-term risks are controllable through the use of ALARA studies, engineering, design, and operations.

ISSUE 7: TREATMENT OF PCBS, REGULATORY ISSUES

Comment 1: **Mr. Brooks, Transcript of Public Meeting, July 15, 1997.**

[PCBs] are officially designated as B-2 carcinogens, evidence of cancer in test animals, no evidence in humans. They actually are probably not far different than the B-1 carcinogen known as saccharine. I would suggest that the public apply coercion to EPA as to that rather ridiculous requirement where you have to reduce something by a factor of 25 over [a disposal facility's waste] acceptance criteria before you can dispose of it.

Comment 2: **Ms. Gawarecki, Transcript of Public Meeting, July 15, 1997.**

If EPA can issue waivers under CERCLA action, why cannot there be a reasonable waiver for the TSCA issues whereas the higher PCB waste could be treated to bring it down in line with the impoundments that have lower levels of PCBs, which some are considerably higher than

2 ppm. You know, this is a situation where the regulations really get in the way of getting the job done effectively. I think that EPA needs to recognize that and work with it.

It's my understanding that it's the waste in the two smaller ponds that has the higher levels of PCBs. Would there be a waiver available, for example, if that waste were to be pumped into the larger ponds and then composite samples taken?

(In response to EPA presentation of EPA requirements, see response below.) Okay. Well, be sure and send us all the house and senate bill numbers so we can write in support of this. Thank you.

Comment 3: **Signature not legible, Letter to Margaret Wilson, July 20, 1997.**

Alternative 3 does not need to meet [the] unnecessary and costly PCB treatment requirement that does not reduce overall risk. PCB treatment is, however, required to comply with applicable regulations for Alternative 6. If treatment does not sufficiently reduce PCB concentrations, then the waste will remain classified as TSCA waste, there will be no disposal facilities that can accept the waste, and the waste would have to be stored indefinitely with associated maintenance costs and risks of releases not accounted for in the proposed plan.

DOE Response: DOE agrees that, although PCB treatment will reduce toxicity, the contribution to overall risk from PCBs is negligible, and any of the disposal options considered (including Alternative 3) would adequately contain the PCBs present in the waste without treatment. However, if waste is removed from a site and transported off site, CERCLA will not allow waivers from meeting any applicable regulations. If further characterization confirms current data showing Impoundments C and D contain TSCA-regulated waste, once the waste leaves the site EPA cannot waive the TSCA requirements.

EPA has proposed revisions to the TSCA rules regarding treatment of PCB waste that may offer some relief to the treatment requirements. The new rules are scheduled to be promulgated in the first quarter of fiscal year 1998. If the new rules are promulgated before Impoundments C and D are remediated, DOE will incorporate the modified requirements into the remedial design and remedial action planning documents for Impoundments C and D, as required.

If the wastes from Impoundments C and D are removed and placed into Impoundments A and B, all of the waste would be regulated under TSCA.

If resampling data indicate that the concentration of PCBs in the waste removed from Impoundments C and D is < 50 ppm, the waste would not be regulated under TSCA and the treatment requirement would no longer apply.

ISSUE 8: TREATMENT OF PCBs, TECHNICAL IMPLEMENTABILITY ISSUES

Comment 1: **Signature Not Legible, Letter to Margaret Wilson, July 20, 1997.**

The technical implementability and regulatory uncertainties for Alternative 6 should preclude its selection. Treatment of mixed waste containing gamma emitters and transuranics to reduce PCBs to 2 ppm, as would be required for Impoundments C and D, has never been performed full scale.

DOE Response: As noted in the comment, DOE is not aware of any fully developed treatment technologies that have been demonstrated to reduce PCB concentrations < 2 ppm in sediment contaminated with fission products and transuranic elements. The activity levels of radionuclides in Impoundments C and D are very low, thus reducing the concerns regarding mixed waste treatment somewhat. DOE intends to solicit proposals from private industry to propose technologies that will meet the then-current regulatory requirements (see response to Issue 7) based on the final characterization of the waste. Based on the proposals, the remedial design including the DOE-recommended technology will be submitted to the regulators for approval. If necessary, a treatability study will be performed to ensure that the selected technology will meet all regulatory and disposal facility requirements. DOE believes that the uncertainties regarding PCB treatment can be reasonably addressed within the cost allocated to this phase of the project and that no revisions to the preferred alternative are necessary.

ISSUE 9: TREATMENT OF RCRA HAZARDOUS WASTE, TECHNICAL ISSUES

Comment 1: **Signature Not Legible, Letter to Margaret Wilson, July 20, 1997.**

[I]f it is not known whether Impoundments C and D are RCRA hazardous, how do you know if the waste can be treated to meet RCRA Land Disposal Restrictions?

DOE Response: DOE agrees that if the waste in Impoundments C and D is characterized as RCRA hazardous based on new sampling data, the waste would have to meet RCRA LDRs before disposal. As discussed under the response to Issue 8, DOE will request treatment proposals from vendors based on final waste characterization results. Vendors may choose to treat the waste on site to meet RCRA LDRs (if applicable). In addition, Envirocare will accept

mixed waste for treatment and disposal provided PCB and radionuclide concentrations are within acceptable levels. After treatment by the vendor for PCBs (if necessary based on new characterization and then-current regulations), wastes from Impoundments C and D are expected to meet Envirocare waste acceptance criteria for treatment. As an option, Envirocare could then treat the wastes, most likely using a stabilization process, to meet RCRA LDRs and other Envirocare disposal criteria. DOE expects that the waste will pass TCLP without treatment and has not included additional treatment costs for mixed waste treatment. However, even if treatment is required, overall project costs will not significantly increase because of the small volume of waste in Impoundments C and D. DOE believes that the uncertainties regarding waste that may be classified as RCRA hazardous are acceptable and that no revision to the preferred alternative is necessary.

ISSUE 10: AVAILABILITY OF DISPOSAL FACILITIES, STORAGE

Comment 1: **ORREMSSAB, July 9, 1997.**

On page 10 of the Proposed Plan, it is stated that "Waste would be solidified into containers meeting DOT requirements and staged on the SIOU site for curing and transport. After curing, waste would be immediately shipped to the disposal facility." These statements presume that either [NTS], an on-site waste management facility, or some other facility will be available when remediation of the impoundment begins. ORREMSSAB hopes that this is the case. It would be undesirable to store the treated sediments in DOT containers indefinitely.

Comment 2: **Janet L. Westbrook, [Written] Comments Made at the DOE Surface Impoundments Project Public Meeting, Oak Ridge, Tennessee, July 15, 1997, with Notes Added July 16, 1997.**

If the drums of Alternative 6 are generated but cannot be shipped to NTS immediately, then where will they be stored? Have the costs of building and maintaining a warehouse for them for several months or years or even decades been considered?

Comment 3: **Ms. Walton, Transcript of Public Meeting, July 15, 1997.**

I like the NTS thing, and if it's only a DOE order [that prohibits ORNL from shipping waste to NTS], you should be able to get them to change it. I would hope that would be a feasible equity-type consideration with regard to the ROD that's coming out of the waste PEIS. Because if you can't store at NTS, then possibly [Alternative 3] would be better, or we might

need to do some more work. Because 10,000 years is a long, long time, and you don't want to have to have institutional controls on anything that long because you cannot guarantee the long life of the institutions.

And ... I do have one question. The funding for the NTS disposal versus the funding for the on-site cell. Is that a wash? Do they cost the same?

Comment 4: **Mr. Pride, Transcript of Public Meeting, July 15, 1997.**

You indicated that you would not favor going out and solidifying the Nevada option, and I disagree with that. I think if the process is done correctly you will not have the ground situation you have at K-25, if you use the correct process control on this. And above-ground storage or enclosed storage certainly are going to be an alternative in here, relative to no action, because the Nevada Test Site might not be available from the regulator standpoint.

So I very strongly disagree with no action, if Nevada is not available. I think we should include the possibility of the storage here either on concrete pads, as the other transuranic contaminants are stored, or other options, and go ahead and do this and get this action done.

Comment 5: **Signature Not Legible, Letter to Margaret Wilson, July 20, 1997.**

[N]one of the proposed disposal facilities can currently accept the waste from Impoundments A and B. Radionuclide concentrations are too high for Envirocare. ORR is not on the NTS list of approved generators and the state of Nevada is fighting additional shipment to the state. The proposed disposal facility on ORR may never be approved and built, and if it is, may not accept wastes from SIOU. If neither facility is available to accept SIOU wastes, then either the project would be delayed and releases to the environment would continue or the waste would have to be stored indefinitely at great expense and risk akin to the K-25 Pond Waste Management Project. Alternative 3 could be implemented immediately with none of the technical and regulatory uncertainties.

DOE Response: DOE agrees that as of the date of this ROD, no facilities are available that can accept treated waste from Impoundments A and B for disposal. DOE believes that it is highly likely that NTS will be authorized to accept waste from ORR by the time remediation of those impoundments is scheduled to begin in FY 2000. There is also uncertainty regarding the availability of a mixed waste disposal facility on ORR that can accept SIOU wastes, but the possibility exists that such a facility will be available.

Comment 3 suggested that the administrative impediments to disposal at NTS are internal to DOE and should be overcome. DOE agrees and expects this will occur, but the decision is a nationwide issue that is outside the control of this project.

Comment 3 requested a comparison of disposal costs at NTS versus an on-ORR disposal facility. The proposed plan stated that cost savings of up to $5.5 million would result from disposal on ORR. This was based on expected savings in transportation, overhead, and contingency and assumed that there would be no disposal fee at any on-site facility. Current DOE policy is to consider that capital construction costs for an on-site facility would be funded separately, and that remediation projects would be assessed a fee of $200/yd^3 for disposal. This would reduce the projected savings to about $3.6 million.

Comment 4 suggests that remediation of the impoundments should continue regardless of the availability of disposal capacity, and that waste removed should be stored after treatment. DOE and several commentors disagree. Such storage would require acres of enclosed storage facilities, more robust (and more costly) containers, multiple handling and transportation operations for the same containers, and surveillance and maintenance of the storage facilities and waste. This would greatly increase worker risk and restrict land use for the interim period until disposal capacity is available. Total present value costs would increase by almost $7 million.

DOE has determined that no changes to the preferred alternative are appropriate based on the availability of disposal facilities.

ISSUE 11: EFFECTIVENESS OF DISPOSAL AT NTS, CONTINGENT DISPOSAL AT AN ON-ORR DISPOSAL FACILITY

Comment 1: **ORREMSSAB, July 9, 1997.**

If it is determined that an on-site waste management facility can be safely operated at [ORR] and that waste acceptance criteria include the surface impoundment sediments, it would be preferable to dispose of the impoundment sediments on-site rather than at an off-site location because of reduced risks of transportation accidents and reduced costs.

Comment 2: **Ms. Walton, Transcript of Public Meeting, July 15, 1997.**

What you just said [NTS is in the middle of a desert, there's no public within miles, it's a dry atmosphere] is a very good reason not to have an on-site disposal cell. I am opposed to that part of Alternative 6.

This idea of an on-site cell as a disposal site isn't very much different from an Alternative 3 solution. So I would be very unwilling as a taxpayer to do an Alternative 6, and then put in an on-site cell. Because we do have the wrong hydrology and et cetera to have a long-term storage of this kind of stuff here in Oak Ridge.

Is the on-site disposal cell for a particular class of waste, maybe small level? Because, you know, a lot of this stuff is lower-level stuff and this is very high activity. So I don't like that you're mixing high activity material with low activity material, and then having low activity material stored in on-site cells is an awful lot different than storing high activity.

Comment 3: **Ms. Gawarecki, Transcript of Public Meeting, July 15, 1997.**

About 10,000 years ago there was an event known as a Pluvial in which all of the enclosed basins out West and Nevada and Utah were giant lakes. So keep in mind [geologic changes that can occur] in 10,000 years time.

DOE Response: DOE agrees with Comment 1 that on-site disposal would be preferable to disposal at NTS if such a facility is available when needed and SIOU wastes meet the waste acceptance criteria.

DOE understands the concern expressed in Comment 2 that disposal in Tennessee is not as secure as disposal in Nevada based on climate, hydrogeology, and population. These issues are being considered and analyzed in a separate CERCLA decision-making process regarding the evaluation of waste disposal alternatives. On-ORR and off-ORR disposal are being thoroughly reviewed, and a RI/FS and a proposed plan will be available for review by the public. These documents will evaluate the on- and off-ORR options based on all CERCLA criteria. If the ROD for the waste disposal alternatives selects on-ORR disposal based on analysis of CERCLA criteria including public input, and if SIOU waste meets on-ORR disposal facility's waste acceptance criteria, it is presumed that disposal at such a facility would be safe and acceptable. Therefore, designation of an on-ORR facility as a contingency disposal site is considered reasonable and appropriate.

DOE recognizes the information provided in Comment 3.

ISSUE 12: LAND USE ISSUES

Comment 1: **Mr. Brooks, Transcript of Public Meeting, July 15, 1997.**

I have a question on cost. Offhand comment that roughly [$35 million] an acre is a high price to pay for land. I would point out that the [End-Use Working Group] did not recommend Alternative 6, and Alternative 3 would fully meet their criteria, which was not to leave any exclusion areas. I think, as indicated, [Alternative 3] will be a satisfactory recreational area.

Comment 2: **Signature Not Legible, Letter to Margaret Wilson, July 20, 1997.**

Alternative 3 meets land-use recommendations and guidelines established by the [End-Use Working Group] as reported in *The Oak Ridger* on June 16, 1997. In particular, the [End-Use Working Group] states that "waste should be relocated only to reduce total risks to people and the environment." Alternative 3 matches this guideline much better than Alternative 6. Recommendations for Bethel Valley Watershed land use are "... it is essential that DOE remediation decisions achieve, at a minimum, a controlled industrial end use for the entire ORNL Bethel Valley area. A controlled industrial use should at least provide for surface use of contaminated lands." Alternative 3 meets this standard. [End-Use Working Group] land use recommendations continue: "Currently, there are areas where contamination results in the need for controlled access. Reducing such areas would enhance the overall viability of the laboratory. Remediation should result in lands that are safe for surface use by laboratory employees." Alternative 3 meets this standard. "DOE should make the best practical use of existing brownfields while recognizing that <u>not all land needs to be available for every use</u>. If situations occur where DOE cannot meet the surface use criteria due to excessive risks or costs, these exceptions need to be discussed openly in a public forum." Alternative 3 provides the fullest release possible for two thirds of the 6 acre site. The remaining 2 acres would be available for surface use, provided no excavation, drilling, or structures penetrate the consolidation cell. Alternative 3, therefore, already meets the surface use criterion for the entire site and exceeds the criterion for 2/3 of the site. The extra $37 million necessary to allow building construction on 2 acres in ORNL is not warranted given the availability of underutilized buildings at the East Tennessee Technology Park, the declining missions and excess facilities at Y-12 and ORNL, and the releases of significant acreage (for example, the Parcel A golf course and subdivisions and the 1,000 acres at Parcel ED-1) of [ORR].

DOE Response: DOE recognizes the high cost of reducing restrictions on the small area of land that would be permanently impacted by the consolidation cell in Alternative 3 by shipping the waste off site per Alternative 6. This cost is justified, in part, because of the unique nature

of the property in the heart of ORNL. The facility across the street is the High Temperature Materials Laboratory. ORNL's long-term plan is to construct an advanced materials characterization laboratory at the site of SIOU. A consolidation cell could interfere with development of this or other facilities in their optimal locations. In addition, the selected remedy was determined based on all of the nine CERCLA evaluate criteria, and not just on cost and associated land use issues.

ISSUE 13: MISCELLANEOUS ISSUES AND RESPONSES

Comment 1: **ORREMSSAB, July 9, 1997.**

In descriptions of the preferred alternative (Figure 4 and Page 10), there is discussion that sediment from Ponds A and B would be removed and allowed to settle in a settling tank. After settling, the supernatant would be decanted from the tank and returned to the impoundment. Sometime later, the impoundments would be back-filled with clean soil. There is no discussion about what would happen to the supernatant. Would it be treated? Would it be allowed to percolate into soils and groundwater? The [ROD] needs to specify that any significantly contaminated supernatant would be treated before release.

DOE Response: DOE agrees. The proposed plan states on page 7, column 1, second full paragraph that "all water removed from the impoundments will be treated at the existing [PWTP]." The FS provides additional detail regarding the treatment sequence and the discharge of all water to PWTP. The description of Alternative 6 in this ROD has been modified to clarify that surface water in the impoundments will be treated at PWTP.

Comment 2: **ORREMSSAB, July 9, 1997.**

In Table 1, the short-term effectiveness of the preferred alternative is described as having the potential for very high, adverse short-term effects. The [ROD] needs to describe how this potential will be avoided or mitigated.

DOE Response: The proposed plan states on page 14, paragraph 2 under "Short-term effectiveness," that "For Alternative 6, short-term risks to remediation workers and the public along the transportation route would be controlled to acceptable levels through compliance with Occupational Safety and Health and DOT requirements, DOE as-low-as-reasonably-achievable principles, and project specific health and safety plans as for Alternative 3. However, much greater control would be needed than for Alternative 3, and more intensive handling of radioactive waste would significantly increase worker exposure to radiation and the potential for

spills or other releases. Transportation of waste would increase the likelihood of accidents." The analysis remains accurate, and the mitigation proposed will control risks to acceptable levels. DOE requirements such as spill prevention, control, containment, and cleanup plans; waste management plans; operational readiness reviews; and other oversight requirements will help mitigate risks. See also response to Issue 3 comments.

Comment 3: **Mr. Bernard, Transcript of Public Meeting, July 15, 1997.**

What is the maximum exposure that you expect a citizen, a nonworker, to receive over the life of [the Alternative 3] cell?

DOE Response: Assuming that there is no failure of the engineered consolidation cell over the life of the risk and no intrusion into the cell, no exposures to workers or the public would result from the waste contained in the cell.

Comment 4: **Ms. Greer, Transcript of Public Meeting, July 15, 1997.**

Can you compare [Alternative 3] to ... [the] Y-12 ... S-3 ponds which are now a viable ... parking lot. *Ms. Walton, Transcript of Public Meeting, July 15, 1997.* I attended a meeting on that recently. The problem is the cell hitting the groundwater. So that's why the state wants them to do something better than that here because it's very hard to guarantee institutional control for 10,000 years because institutions don't last that long.

DOE Response: A cap was placed over the S-3 ponds at the Y-12 Plant and a parking lot was constructed on the cap. No liner was placed under the wastes at the S-3 ponds. Significant quantities of contamination, mostly uranium, technetium, and nitrates, were released to groundwater before the S-3 site was capped. These contaminants continue to migrate downgradient. New releases since placement of the cap have been greatly reduced. Alternative 3 proposes removing the wastes from SIOU, constructing a liner at the former location of Impoundment A with a double leachate collection/detection system, replacing the wastes in the liner and constructing a cap. This would contain the wastes that have not already been released much more effectively than the cap at the Y-12 S-3 ponds. The cap at SIOU could be used as green space (e.g., grass and picnic tables). It is possible that a parking lot could be constructed on the cap, but that would depend on the final configuration of the consolidation cell, the elevations if the cap and the surrounding roads, and other considerations.

Comment 5: **Ms. Gawarecki, Transcript of Public Meeting, July 15, 1997.**

[If] this waste does not meet the criteria to be TRU waste, could [it] then be treated under the [request for proposals on TRU waste] that was just discussed earlier this evening?

DOE Response: There is a potential, depending upon the selected technology for treatment of TRU waste, that SIOU waste could be treated using the same technology and equipment. Treatment of wastes other than TRU waste has not been considered in the TRU RFPs. Many details would have to be considered to make use of the TRU facility including schedule and availability, transportation of sludge, and cross contamination. This idea will be considered during remedial design.

Comment 6: **Ms. Gurney, Transcript of Public Meeting, July 15, 1997.**

I wanted to ask a question about the cleanup criteria. We've talked about the groundwater becoming contaminated because it had a connection with the sediments when the groundwater levels rose. That says, to me, there's a connection through the clay. Therefore, I'm wondering have we located the bottom, the depth of contamination, and also, if not, then how are we calibrating our model that is going to predictably tell us what we've got to clean up?

We don't have any even source term, from what I understand, because we don't have a good random sampling that will allow us to know that from the top to the bottom what contamination we're dealing with throughout the pond. My question is, how can you calibrate the model without proper sampling?

A lot of us here may know that those kinds of contaminants are not going to travel very far through this type of matrix, and one thing that I'm wondering why it wasn't looked at is why not look at lowering the groundwater level there just to keep that—you know, a couple of more alternatives.

DOE Response: The prediction of the radionuclide concentration at a hypothetical receptor location on White Oak Creek was determined for various levels of sludge removal and/or stabilization in the impoundments by assuming the following elements:

- assessment of contaminant volumes and radionuclide concentrations from existing sampling data;

- source-term modeling to determine the leaching of hazardous constituents from the impoundments and release to the surrounding soil, bedrock, or man-made features due to groundwater interacting with the waste;

- groundwater flow and transport modeling from the impoundments to White Oak Creek (where the near-surface groundwater has been shown to discharge); and

- estimation of modeled contaminant concentrations at White Oak Creek resulting from surface water dilution of the groundwater flux of contaminants by the Creek's flow.

Because of uncertainties associated with the hydrogeologic system underlying the surface impoundments and the leaching characteristics of the contaminated sediment, conservative assumptions were applied to ensure that the predicted concentrations were not underestimated. In addition, the predicted concentrations from the model were compared with actual samples from White Oak Creek and the surrounding groundwater monitoring wells, and there was good correlation between the two results.

For source-term modeling, it is assumed that lateral groundwater flow contacts the waste after liner failure, which releases contaminants from the sediments. Contaminant releases are modeled using a surface rinse with a solid-to-liquid partitioning mechanism (K_p) for unstabilized sludge and a matrix diffusion-controlled mechanism (effective diffusion coefficient, D_e) followed by a surface rinse without partitioning for cement-stabilized sludge. Contaminated groundwater flow in the stratigraphic units underlying the impoundments and the flow regime to White Oak Creek were then modeled.

For groundwater transport from the impoundments to White Oak Creek, a conservative, but realistic, scenario is assumed. Contaminated groundwater travels 30–300 ft in or around groundwater suppression pipes and storm drain lines until it discharges into White Oak Creek. To complete the transport pathway, an effective 3-m (10-ft) soil/upper bedrock pathway is incorporated to hydraulically connect the groundwater suppression and storm drain systems or to represent other preferential flow paths through porous man-made features.

All radionuclides in the impoundments were modeled, and their relative impact on White Oak Creek water quality was gauged by comparing modeling concentrations with criteria set forth in 40 *Code of Federal Regulations* 141 and DOE Order 5400.5. Strontium-90, which is highly mobile in the groundwater regime, was the only contaminant significantly affecting White Oak Creek's water quality. Therefore, this radionuclide was the only contaminant comprehensively modeled to predict concentrations in White Oak Creek.

The commentor suggested evaluating lowering the water table or evaluation of other alternatives. Many other remedial technologies and alternatives were evaluated in the feasibility study that were not presented in detail in the proposed plan. Lowering the water table was among the technologies considered. That concept was determined to be ineffective because of the hydrogeology at the SIOU site. The site is in a recharge area and receives groundwater from most of the main ORNL plant area. Significant volumes of water would have to be pumped continuously to keep the water table from encroaching on the sediment in its current location. This water most likely would need to be treated at great cost. Furthermore, dewatering could also draw water out of nearby White Oak Creek, and concentrate the contamination in the creek. This concept was screened out of the feasibility study before development into an alternative.

Comment 7: **Ms. Walton, Transcript of Public Meeting, July 15, 1997.**

[W]hen I got this I thought I had a plan and now ... I see it's called a fact sheet ....

And when I heard about the dosage I started looking through this. Well, I didn't see that in here anywhere. Because my first reaction when I got this, I looked at it, and I looked at your response to the state, and the EPA comment was, "Well, this looks pretty good," and I liked it.

DOE Response: The document is a final proposed plan. All recent proposed plans issued in Oak Ridge have been presented in the "fact sheet" format. The dosage information discussed in Issue 3 was based on information recently prepared at ORNL that was not reviewed by DOE, considered in the proposed plan, or placed in the Administrative Record. The commentor, though employed at ORNL, commented as a private citizen, not on behalf of ORNL or DOE (see Issue 13, Comment 9).

Comment 8: **Mr. Kimmel, Transcript of Public Meeting, July 15, 1997.**

What was the risk level associated with the contamination or the migration [of] contamination at present?

DOE Response: The surface impoundments are in an industrial setting typical of most national laboratories, with institutional controls such as posted areas, fencing, engineering controls, and security features. Access to contaminated areas is restricted, and employees entering SIOU are medically monitored. Because of these active institutional control measures, risk levels to current human receptors are acceptable and well below EPA criteria.

Ecological risks are unacceptable only for those receptors (e.g., fish) living in the impoundments, and to birds and mammals that eat those fish. Institutional controls are in place to discourage predation by fish-eating animals. These include small mesh fencing to prevent the entrance and exit of frogs, snakes, turtles, etc. and a gridwork of wires above the impoundment to deter the entrance of water foul and other birds.

Comment 9: **Janet L. Westbrook, [Written] Comments Made at the DOE Surface Impoundments Project Public Meeting, Oak Ridge, Tennessee, July 15, 1997, with Notes Added July 16, 1997.**

As I noted as an aside in the meeting, I did not have time to go into the details of how an optimization (ALARA) study, which is part of the ALARA process, would have been done for a project such as this. However, such a study should have been done as part of the feasibility study, (i.e., ALARA methods are supposed to be applied from the earliest conceptualizing of the project, not just when the project is about to begin. In an optimization study, the cost and dose estimates would have been handled first, then the criteria other than cost and dose would have been evaluated in a ranking system established for the purpose.

DOE Response: ALARA methods were considered in the development of every alternative in the FS. Significant attention was given to development of methods of accomplishment that would reduce dose to remediation workers. The cost estimates included substantial costs associated with personal protective equipment, reductions in productivity due to dress-out requirements, shielding, remote operations, health physics and industrial hygiene support, and other safety considerations. ALARA optimization studies will be performed, as appropriate, during remedial design. Under CERCLA, worker dose (as evaluated under short-term effectiveness) and cost are only two of the evaluation criteria. Determination of the selected remedy was based on evaluation of all criteria.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

JUL 15 1997

OFFICE OF
SOLID WASTE AND EMERGENCY
RESPONSE

MEMORANDUM

SUBJECT: National Remedy Review Board Recommendations on the Surface Impoundment Unit for the Oak Ridge National Laboratory Site

FROM: Bruce K. Means, Chair
National Remedy Review Board

TO: Richard D. Green, Acting Director
Waste Management Division
EPA Region 4

Purpose

The National Remedy Review Board (NRRB) has completed its review of the proposed remedial action for the Surface Impoundment Operable Unit of the Oak Ridge National Laboratory site in Oak Ridge, Tennessee. This memorandum documents the NRRB's advisory recommendations.

Context for NRRB Review

As you recall, the Administrator announced the NRRB as one of the October 1995 Superfund Administrative Reforms to help control remedy costs and promote consistent and cost-effective decisions. The NRRB furthers these goals by providing a cross-regional, management-level, "real time" review of high cost (and thus potentially controversial) proposed response actions. The Board will review all proposed cleanup actions where: (1) the estimated cost of the preferred alternative exceeds $30 million, or (2) the preferred alternative costs more than $10 million and is 50% more expensive than the least-costly, protective, ARAR-compliant alternative.

The NRRB review evaluates the proposed actions for consistency with the National Contingency Plan and relevant Superfund policy and guidance. It focuses on the nature and complexity of the site; health and environmental risks; the range of alternatives that address site risks; the quality and reasonableness of the cost estimates for alternatives; Regional, State/tribal, and other stakeholder opinions on the proposed actions (to the extent they are known at the time of review); and any other relevant factors.

Generally, the NRRB makes "advisory recommendations" to the appropriate Regional decision maker before the Region issues the proposed plan. The Region will then include these recommendations in the Administrative Record for the site. While the Region is expected to give the Board's recommendations substantial weight, other important factors, such as subsequent public comment or technical analyses of remedial options, may influence the final Regional decision. It is important to remember that the NRRB does not change the Agency's current

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NRRB Advisory Recommendations

The NRRB reviewed the site package for the Oak Ridge site and discussed related issues with EPA Remedial Project Manager Edward Carreras on July 30, 1997. Based on this review and discussion, the NRRB:

- Finds that the Department of Energy (DOE) proposal does not adequately demonstrate the cost effectiveness and environmental benefits of the preferred alternative (off-site disposal). Based on the proposed plan, other alternatives are protective and achieve remedial objectives at significantly lower cost.

- Finds that the absence of a site wide management plan impairs the remedy selection process for this facility. The Board understands that DOE will conduct a number of actions at the Oak Ridge reservation. In order to enhance the cost effectiveness of overall site remediation, the Board strongly recommends a comprehensive site-wide waste management plan be developed expeditiously. This plan should address the feasibility of the centralized waste management facility described as a contingency under alternative 6 in the proposed plan. However, development of this plan should not delay timely and appropriate action for the impoundment areas.

The NRRB appreciates the Region's efforts to work closely with the State and community to identify the current proposed remedy. The Board members also express their appreciation to the Region for their participation in the review process. We encourage Region 4 management and staff to work with their Regional NRRB representative and the Region 4/10 Accelerated Response Center at Headquarters to discuss any appropriate follow-up actions.

Please do not hesitate to give me a call if you have any questions at 703-603-8815.

cc: S. Luftig
T. Fields
B. Breen
E. Cotsworth
J. Cunningham

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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AUG 21 1997

MEMORANDUM

SUBJECT: National Remedy Review Board Recommendations on the Surface Impoundments Operable Unit for the Oak Ridge National Laboratory Site

FROM: Richard D. Green, Acting Director
Waste Management Division
EPA Region 4

TO: Bruce K. Means, Chair
National Remedy Review Board

Region 4 has received the National Remedy Review Board's (NRRB) memorandum, dated August 15, 1997, regarding the Surface Impoundments Operable Unit of the Oak Ridge Reservation in Oak Ridge, Tennessee. The Region has carefully reviewed the NRRB's input and has considered it in addition to other input received on this project from the Department of Energy (DOE), the State of Tennessee, the Oak Ridge Site Specific Advisory Board (SSAB), and other stakeholders.

In brief, the NRRB found that the DOE proposal for this operable unit did not adequately demonstrate the cost effectiveness and environmental benefits of the preferred alternative (off-site disposal). The NRRB further recommended that DOE "expeditiously" develop a "comprehensive site-wide management plan." However, the NRRB further noted that this comprehensive plan should not delay timely and appropriate action for the Surface Impoundments Operable Unit.

The Region fully understands the points made by the RRB. The Region initially concurred with a proposal from the DOE for an alternative that would have resulted in the construction of an on-site waste cell within the operable unit. The Region's support for this alternative was based upon an evaluation of the threshold and balancing criteria of the National Contingency Plan (NCP). However, information was incomplete at that time concerning the NCP's modifying criteria: state acceptance and community acceptance. The three parties to the Oak Ridge Reservation Federal Facility Agreement (FFA) agreed to embark upon a major public outreach effort, through the SSAB, that resulted in the formation of the "End Use Working Group," made up of local citizens and representatives of the SSAB. The purpose of this effort was to solicit more public input prior to the FFA parties publicly noticing a preference for a remedial alternative.

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The End Use Working Group began meeting in January 1997 and produced a set of recommendations for the Oak Ridge Reservation Bethel Valley area, including the location of the surface impoundments, titled "Recommendations for the End Use of Contaminated Lands in the Bethel Valley Area of the Oak Ridge National Laboratory." The SSAB also produced a set of recommendations for the Surface Impoundments and issued a letter stating their concurrence with the preferred alternative presented in the final proposed plan (off-site disposal). Copies of these letters and recommendations were included in the remedy selection briefing package provided to the NRRB for the July 30, 1997, review of this project.

In preparation for the release of the final proposed plan, the Region had many discussions with the DOE and State regarding consideration of the modifying criteria (state and community acceptance) in addition to the other remedy selection criteria. It was the determination of the Region that the off-site disposal option, which has the support of the State and community, was the best alternative considering all of the nine criteria for remedy selection. The DOE decided to issue the proposed plan for formal public review with off-site disposal as the preferred alternative.

The Region has reevaluated its support of the off-site disposal remedy in view of the input received from the NRRB. However, after consideration of all of the NCP's criteria - including state acceptance and community acceptance - the Region has concluded that we should reaffirm the appropriateness of our decision that the off-site disposal remedy (with an on-site disposal contingency should a "Centralized Waste Management Facility" be approved and constructed under a separate action) represents the best remedy. The need for timely action, the State's strong opposition to other alternatives, the likelihood of reductions to the total cost based upon our experience with other DOE projects, and the support of the SSAB were all significant factors in reaching this decision.

The Region appreciates the efforts of the RRB in their review of this project. If you have any questions regarding this matter, please contact Mr. Jon Johnston, Chief, Federal Facilities Branch, at 404/562-8527, or Camilla Warren, Chief, DOE Remedial Section, at 404/562-8519.

cc: S. Luftig
T. Fields
B. Breen
J. Woolford
E. Cotsworth
J. Cunningham

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SEP 2 4 1997

MEMORANDUM

SUBJECT: National Remedy Review Board Recommendations on the Surface Impoundments Operable Unit for the Oak Ridge National Laboratory

FROM: Richard D. Green, Acting Director
Waste Management Division
EPA Region 4

TO: Bruce K. Means, Chair
National Remedy Review Board

The purpose of this memorandum is to provide additional information in response to the National Remedy Review Board's (NRRB) August 15, 1997 recommendations concerning final remedy selection at the Surface Impoundments Operable Unit of the Department of Energy (DOE) Oak Ridge Reservation (ORR), Oak Ridge Tennessee. As you know, DOE, with the support of the Tennessee Department of Environment and Conservation and EPA Region 4, has proposed a remedial alternative for these surface impoundments involving removal, treatment, and off-site disposal of contaminated materials, with a contingent alternative for disposal at the centralized waste facility at ORR now under consideration, in the event that such a facility is constructed.

As indicated in our August 21, 1997 memorandum to you, Region 4's support for selecting this remedial alternative has been based upon consideration of all nine of the remedy selection criteria specified in the National Contingency Plan, including the modifying criteria of state and community acceptance to be applied before final remedy selection, as required by the NCP at 40 C.F.R. §300.430(f)(4). In supplementation of our previous memorandum, we are herein providing additional information to clarify the basis for our conclusion that this off-site disposal remedy meets the NCP's cost-effectiveness criterion.

Pursuant to 40 C.F.R. §300.430(f)(1)(ii)(D), cost-effectiveness is to be determined by evaluating a remedy's long term effectiveness and permanence, reduction of toxicity, mobility, or volume, and short term effectiveness to determine the remedy's overall effectiveness. Overall effectiveness is then compared to cost. A remedy is considered to be cost effective if its costs are proportional to its overall effectiveness.

Cost and Potential Savings

The cost for the preferred alternative presented in the proposed plan was $53.1 million in present worth value. The DOE has since refined this estimate and the revised estimated cost is $38.7

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million in present worth value. The differences in cost are due to the elimination of certain contingency factors built into DOE's cost estimates and a change in overall site operations strategy from a Management and Operations Contractor approach to a Management and Integration Contractor approach. However, in evaluating the overall cost-effectiveness of this estimated outlay of $38.7 million, one must consider a number of factors which will offset this initial outlay by added future value and/or savings which will be realized from implementation of this alternative.

The cost of the remedial action will be partially offset by the value of reutilization of the specific parcel of land currently occupied by the impoundments. The DOE currently has preliminary plans for the use of that parcel for a new research facility. Beneficial reuse of this land parcel, located within the heavily industrialized portion of the Laboratory, will help to ensure the overall continued economic contribution to the local and regional economy.

The cost of the remedial action will be additionally offset by the continued viability and desirability of the overall Laboratory for future use. The Oak Ridge National Laboratory is a national resource that has historically distinguished itself by making many significant contributions to national research and development efforts. This Laboratory and its highly skilled scientific community is a major economic engine supporting eastern Tennessee. Relocation of these waste materials will avoid stigmatizing the Laboratory area by commingling waste disposal areas with research facilities. This will help maintain the attractiveness of the facility and thereby enhance the likelihood that it will continue to be a national scientific resource.

Utilization of a centralized waste disposal facility (either off Oak Ridge Reservation or, under the contingent scenario, within its boundaries) will significantly reduce overall DOE costs for maintenance, monitoring, and other controls, when compared with the need to maintain many smaller disposal cells. The Reservation is pursuing a strategy where CERCLA generated wastes will be consolidated into one large (1 million yds^3) modern waste management facility. The utilization of one large facility is expected to result in a lower cost over the long term than would numerous small and scattered disposal cells. Significantly, such consolidation of radioactive waste, including use of both off-site disposal and centralized on-site disposal in combination, has been key to the overall strategy for remediation of other major DOE sites -- with the full support of EPA.

The preferred alternative also may avoid significant future costs which would be incurred for readdressing remedial alternatives not in compliance with current Tennessee policy specifying a State goal that ORR radioactive wastes which require long-term institutional controls ultimately be relocated. If maintained, this policy could cause future costs to be incurred for all disposal alternatives except for the preferred alternative.

Long Term Effectiveness and Permanence

The preferred alternative involves the consolidation of the impoundment's waste with other similar wastes at the Nevada Test Site. Environmental conditions at the Nevada Test Site are much more compatible with the long term containment of radioactive wastes when compared to the hydrogeology of eastern Tennessee. The low rainfall and deep groundwater conditions present at the

Nevada Test Site make that facility more effective as a permanent disposal facility for these radioactive wastes than presently available on-site alternatives. If the Centralized Waste Management Facility, similar in construction to a large RCRA subtitle C facility, is constructed at the Reservation, that facility will also provide greater permanence than presently available alternatives (and at a lower cost than disposal at the Nevada Test Site).

Accordingly, a significant part of the increased cost associated with the preferred alternative is justified by the increase in permanence achieved by this alternative. Such permanence is particularly important here because of the transuranic constituents within the surface impoundment waste materials.

Reduction of Toxicity, Mobility, or Volume

The treatment provided under the preferred alternative will significantly reduce the mobility of the radioactive contaminants being remediated. This reduction in mobility will enhance the permanence of the preferred alternative over the other alternatives not including treatment. Another enhancement to permanence will be achieved by the preferred alternative's provision for the reduction of the toxicity through destruction of the PCBs in two of the impoundments.

These enhancements to permanence achieved through treatment, in accordance with CERCLA's expressed preferences, also justify a portion of the preferred alternative's incremental cost.

Short Term Effectiveness

Although no part of the cost increase associated with the preferred alternative is justified by short-term effectiveness considerations, it should be noted that this alternative fully satisfies this remedy selection criterion. The preferred alternative includes engineered and administrative controls to ensure that protection of the public, workers, and environment are maintained during implementation of the remedy, which is achieved within a reasonable time period.

Conclusion

Based on the analysis summarized above, Region 4 has concluded that the cost associated with the preferred remedial alternative for the Surface Impoundments Operable Unit at the Oak Ridge National Laboratory are proportional to this remedy's overall effectiveness. Increases in cost over other alternatives -- especially considering added future value and/or savings -- are justified by this remedy's long-term effectiveness and permanence with respect to the radioactive contaminants being remediated and the remedy's utilization of treatment which reduces the mobility and toxicity of the waste materials in accordance with statutory preferences.

If you have any questions regarding this matter, please contact Mr. Jon Johnston, Chief, Federal Facilities Branch, at 404/562-8527, or Camilla Warren, Chief, DOE Remedial Section, at 404/562-8519.