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Proposed Plan for Surface Impoundments Operable Unit, Waste Area Grouping 1, Oak Ridge National Laboratory, Oak Ridge, Tennessee

June 1997

This Fact Sheet Describes:

- The Surface Impoundments Operable Unit
- Current and future risks to human health and the environment
- Remedial action alternatives considered
- The U.S. Department of Energy preferred alternative
- How to participate in the selection or modification of the preferred alternative
- Where to get more information

Your opinion is invited

The U.S. Department of Energy invites you to express your opinion of its preferred alternative and all other alternatives considered for environmental restoration of the Surface Impoundments Operable Unit. This report tells how to obtain further information. Interested citizens are encouraged to read the remedial investigation and feasibility study reports for additional background, more detailed technical information, and regulatory history. A form has been attached for comments, but you are not restricted to the form. Any written comments will be considered by the decision makers.

The reports and other documents are available at the Information Resource Center, 105 Broadway Avenue, Oak Ridge, Tennessee.

Hours: Monday–Friday
7:30 a.m.–5:30 p.m.
Telephone (423) 241-4582

Public Comment Period

June 30 to July 30, 1997

Public Meeting

July 15, 1997

INTRODUCTION

This proposed plan identifies the U.S. Department of Energy's (DOE's) preferred alternative for protecting human health and the environment from the effects of contaminated sediments within the Surface Impoundments Operable Unit (SIOU). SIOU is part of Waste Area Grouping (WAG) 1 of the Oak Ridge National Laboratory (ORNL) in Oak Ridge, Tennessee (Fig. 1). This operable unit is located in the south-central part of the main ORNL plant area, just north of White Oak Creek. SIOU consists of four impoundments formerly used as part of the ORNL waste management system to receive and contain various liquid waste streams containing radiological and hazardous constituents.

Investigations of the sediments in the impoundments indicate that they pose a potential risk to human health and the environment. This proposed plan acquaints the public with issues relating to contaminated sediments within SIOU and offers the public an opportunity to participate in the selection of the final remedial action for this site.

A 30-day public comment period has been designated for review and comment on this proposed plan. A public meeting will be held July 15, 1997, to discuss the cleanup alternatives and to address any questions and concerns the public may have about the preferred alternative. The shaded boxes on this page and on page 15 describe how to participate in the process and how to obtain additional information. This plan presents summaries of the remedial alternatives analyzed and considered for the site and is being issued as part of the public participation requirements under Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA).

This plan is based on the results of a remedial investigation (RI)/feasibility study (FS) report (DOE/OR/02-1346&D2, November 1995), an engineering support study report (X-OE-791, September 12, 1996), and subsequent information and analyses. The RI and support study characterize the nature and extent of contamination associated with the SIOU sediments and examine present and future risks, based on this information. The FS identifies a range of alternatives developed by screening and evaluating available technologies and comparing those alternatives against the remedy selection criteria (see box

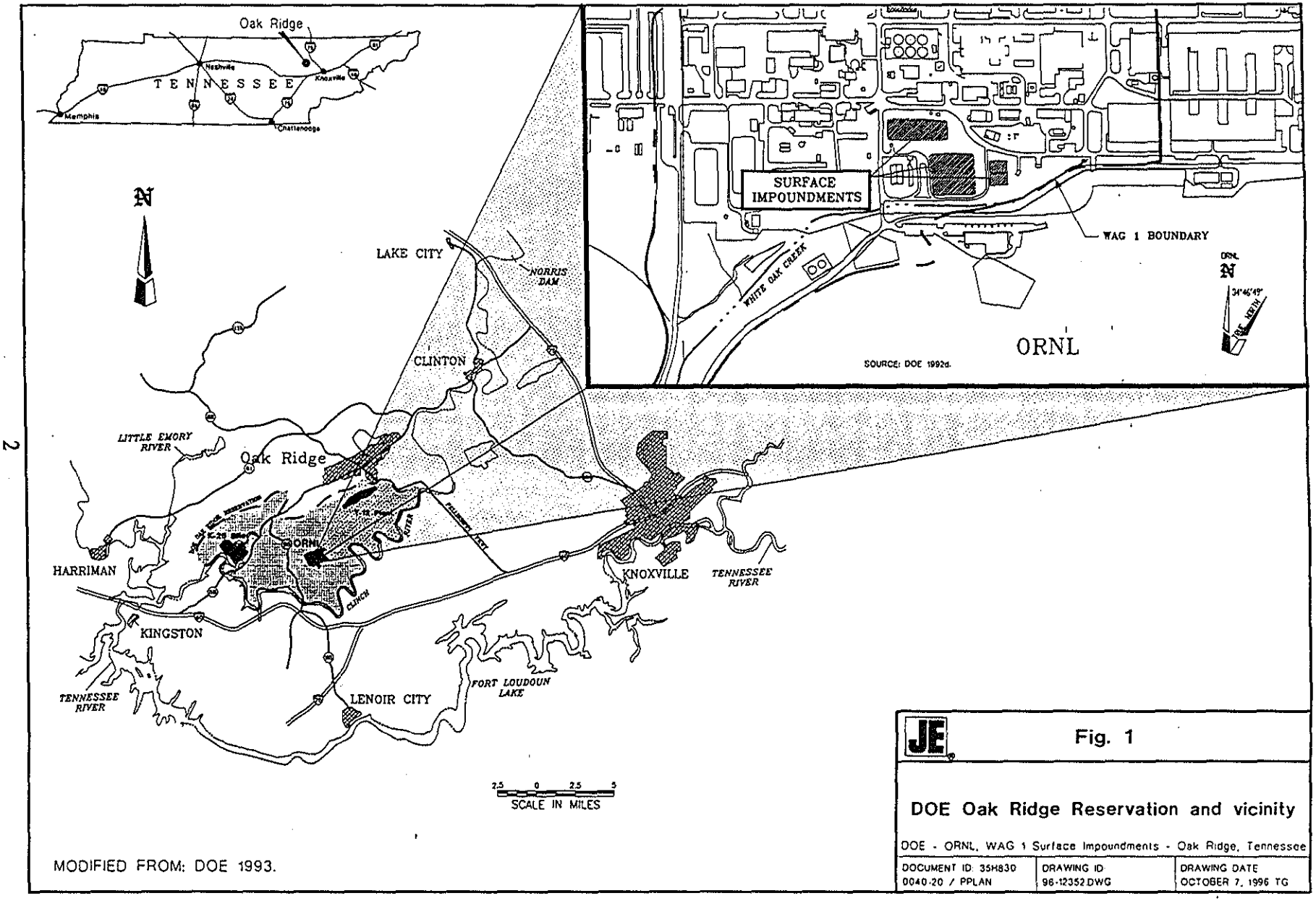

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Fig. 1

DOE Oak Ridge Reservation and vicinity

DOE - ORNL, WAG 1 Surface Impoundments - Oak Ridge, Tennessee

DOCUMENT ID: 35H830 0040-20 / PPLAN	DRAWING ID: 96-12352.DWG	DRAWING DATE OCTOBER 7, 1996 TG

page 13) in the National Contingency Plan [40 *Code of Federal Regulations* (CFR) 300.430].

This plan identifies the alternatives developed in the FS. It summarizes the no action alternative and the two alternatives considered by DOE, U.S. Environmental Protection Agency (EPA), and Tennessee Department of Environment and Conservation (TDEC) to be the most reasonable and presents DOE's preferred alternative. Public comments are requested for all alternatives considered, in addition to DOE's preferred alternative. The preferred alternative may be modified or a different alternative selected as a result of public input. After the public comment period and consideration of public response, DOE will prepare a record of decision (ROD) presenting the selected remedy and will forward the ROD to EPA and to TDEC for final approval. After the three parties approve and issue the ROD, DOE will prepare an action plan and will implement remedial actions at SIOU.

SITE BACKGROUND

SIOU is on the DOE Oak Ridge Reservation (ORR) in Oak Ridge, Tennessee. ORNL is one of three major DOE installations on ORR and is subdivided into various waste area groupings. SIOU is part of WAG 1 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).

The impoundments were used as part of the system for management of low-level radioactive liquid wastes generated from experiments and material processing at ORNL. They contain radiologically and chemically contaminated sediments. Impoundments A and B are unlined and release contaminants to the environment through groundwater intrusion. A water cover is maintained over the sediments in these two impoundments to provide radiation shielding and to prevent 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 WAG 1 also contribute to groundwater contamination, which could continue to contaminate surrounding soils after remediation of the impoundments. These sources will be addressed in the Bethel Valley Watershed CERCLA decision-making process.

The primary chemicals of concern identified in the SIOU sediments are mercury and polychlorinated biphenyls (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). Attachment 2 includes fact sheets on each of the impoundments described in the following paragraphs. The fact sheets specify impoundment size, configuration, construction, waste types and classification, and contaminant concentrations.

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. Initially this impoundment consisted of two unlined impoundments separated by a berm. In the early 1950s, the berm separating the two impoundments was removed, forming one impoundment that received process wastewater only. From 1949 to 1957, effluent from Impoundment A was pumped to Impoundment B (3513). In 1957, the Process Waste Treatment Plant was placed on line, and Impoundment A was used as an equalization basin for intermediate storage and collection of process wastewater for the treatment plant until 1989. It was used recently as an emergency storage basin to provide backup overflow capacity for the process wastewater storage tanks during storms. This impoundment is no longer needed as backup for overflow because a new surge tank installed in 1996 provides adequate storage capacity.

About 1,100 m^3 (1,400 yd^3) of low-level radioactive sediment are in Impoundment A. 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 various low-level radioactive waste streams that were diluted with process wastewater. From 1944 to 1947, excess water in the impoundment exited through pipes on the impoundment's southern berm directly into White Oak Creek. These pipes were plugged in 1947. From 1957 to 1976, this impoundment received waste that did not require treatment in the Process Waste Treatment Plant. Wastewater exiting the Process Waste Treatment Plant was also discharged into the impoundment to allow settling

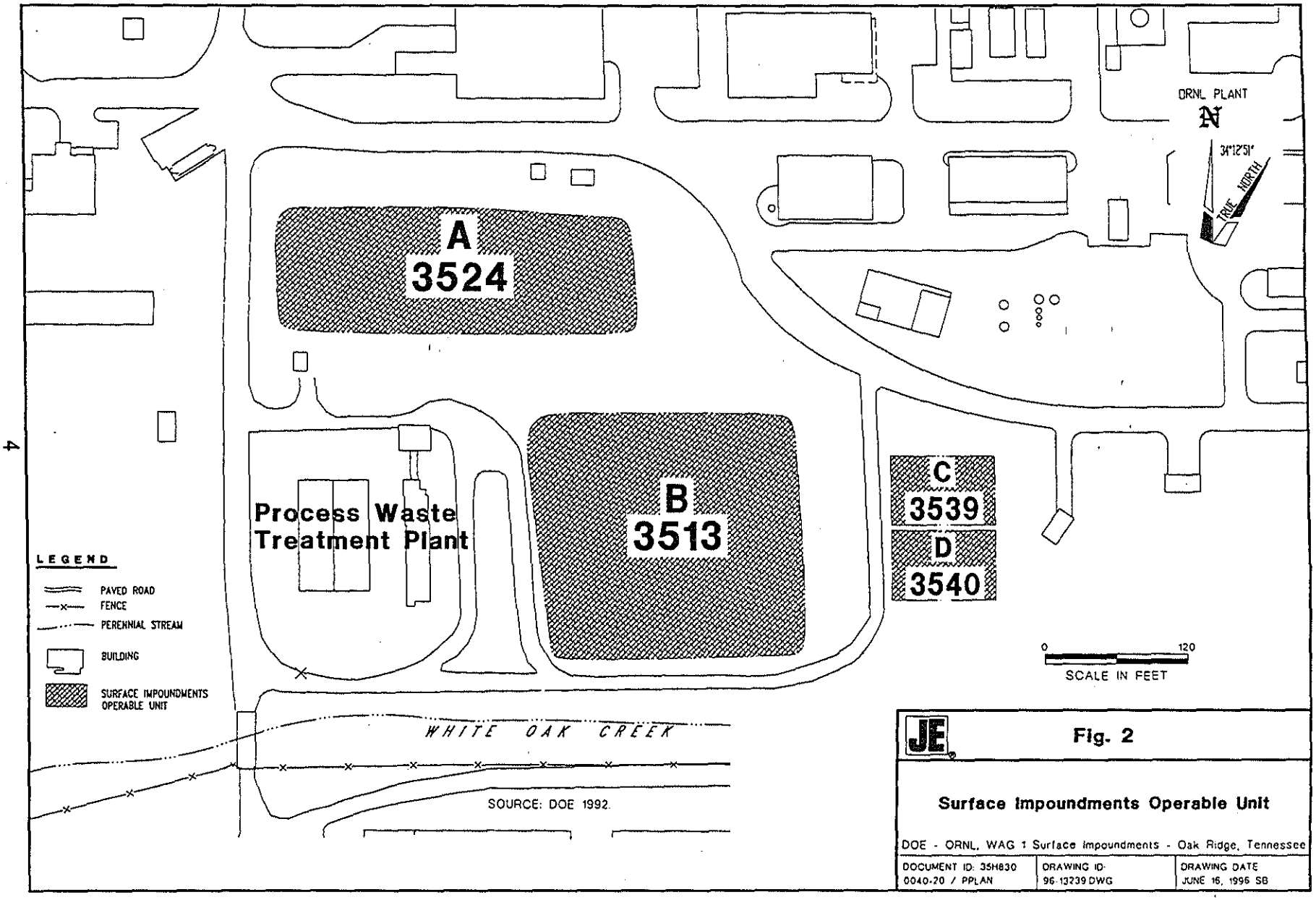
ORNL PLANT
N
34°12'51"
TRUE NORTH
A
3524
B
3513
C
3539
D
3540
Process Waste
Treatment Plant
LEGEND
PAVED ROAD
FENCE
PERENNIAL STREAM
BUILDING
SURFACE IMPOUNDMENTS
OPERABLE UNIT
WHITE OAK CREEK
0
120
SCALE IN FEET
SOURCE: DOE 1992.
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Fig. 2
Surface Impoundments Operable Unit
DOE - ORNL, WAG 1 Surface Impoundments - Oak Ridge, Tennessee
DOCUMENT ID: 35H830
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of particulates. The impoundment was taken out of service in 1976 and is currently not in use. 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.

About 2,400 m^3 (3,160 yd^3) of low-level radioactive sediment are in Impoundment B. 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 the water in the ponds. Wastewater from Building 4500 exceeding acceptable limits was pumped to Impoundment A (3524) before treatment at Process Waste Treatment Plant. Impoundments C and D were taken out of service in 1990, but they were available as backup overflow capacity for the process wastewater storage tanks during storms until installation of the new surge tank in June 1996.

Impoundments C and D together contain < 30 m^3 (40 yd^3) of sediment that has very low levels of radioactive contamination (0.3 Ci). PCB levels are between 50 and 500 ppm. The waste may meet the definition of RCRA hazardous waste, but further characterization is needed to confirm this.

PROJECT SCOPE

The scope of this project is the cleanup and remediation of the four surface impoundments. Groundwater and surface soils within the boundaries of SIOU will be specifically addressed under the Bethel Valley Watershed ROD. The waste materials specifically addressed by this project are the surface water and the 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. For remediation alternatives involving waste removal, DOE anticipates that the impoundments will be excavated to an elevation 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.

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 risk and human health radiological and chemical 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 the wildlife receptors in the impoundments were clearly unacceptable. Exposure levels are exceeded for aquatic receptors in White Oak Creek and White Oak Lake, but not completely due to contamination originating from SIOU. The SIOU contribution to ecological risk is currently reduced because of mitigation used to control leaks in the Impoundment B berm.

Human Health Radiological Risks

Radiation levels in the sediments at SIOU are extremely hazardous. Without the water cover on the impoundments 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 a 5-day period during which the water cover over Impoundment A (3524) is lost. Risks to on-site employees and residents, primarily from direct external exposure to gamma radiation from the unshielded sediments, 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 also have unacceptable risks from radioactive contaminants should institutional controls be lost. For these receptors, the main risk is inhalation of wind-blown 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 so that it is very unlikely that the risks are underestimated. However, even if risks are 100 times less than estimated, they remain unacceptable, and remediation is still warranted.

If uncontrolled, the principal short-lived radionuclides of concern (^{90}Sr, ^{137}Cs, and ^{60}Co) are 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. 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.

SUMMARY 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:

- 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 (X-OE-791) was performed and additional characterization information was obtained. These data were incorporated into the alternatives discussed in this plan. EPA, TDEC, and DOE agreed that only three alternatives warranted detailed discussion in this proposed plan. They are Alternative 1—no action,

Alternative 3—on-site consolidation cell, and Alternative 6—removal, treatment, and disposal.

The other alternatives were fully evaluated in the FS. Alternative 2 is eliminated from consideration in the proposed plan because it would not meet ARARs nor the objective of preventing movement of contaminants to groundwater and surface water. Alternative 4 is eliminated because the extra treatment step would increase cost and would provide no additional risk reduction compared to Alternative 3. Alternative 5 is the same as Alternative 3, but the consolidation cell is in a different location. This would not provide additional long-term risk reduction but would increase waste transfer cost and potential worker risk.

The alternatives assume that all water removed from the impoundments will be treated at the existing Process Waste Treatment Plant. 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 requires 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) are included for each alternative to address radiation hazards.

The costs presented are revisions to the initial estimates in the RI/FS developed almost 2 years ago. Detailed cost estimates are available to support the cost shown under each alternative.

ALTERNATIVE 1—NO ACTION

Total Capital Cost: $0 million
Time to implement: 0 years
Annual O&M Cost, years 1–30: $216,000
Present Value Cost: $2.5 million

Alternative 1 assumes that existing institutional controls are maintained for a reasonable period of time (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 3—ON-SITE CONSOLIDATION CELL

Total Capital Cost: $18.6 million
Time to implement: 4 years
Annual O&M Cost, year 5: $233,000
Annual O&M Cost, years 6–30: $91,440
Present Value Cost: $16.3 million

Alternative 3 includes constructing an engineered containment cell in the location of Impoundment A (3524) and consolidating the waste from all impoundments into the 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.

The proposed construction sequence is as follows. First, the small volume of 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. Then the waste in Impoundment A would be transferred to Impoundment B. The bottom liner of a disposal cell with a leachate collection/detection system would be installed in the location of the cleaned out Impoundment A. All of the sediment in Impoundment B, which would also be storing waste originally in Impoundments A, C, and D, would be transferred to the disposal cell and 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. Institutional controls and maintenance would ensure the continued integrity of the disposal cell. Additional detail is provided below and can be found in Section 5.2.3 of the RI/FS.

Transfer of waste from Impoundments C and D to Impoundment B would use manually operated pumping or dredging equipment operated from scaffolding erected over the impoundments. Sediment and incidental subimpoundment soil would be discharged through pipes below the water surface of Impoundment B. Risk to workers would be minimal because of the small waste volumes and low radioactivity.

To construct the disposal cell, sediment and incidental subimpoundment soil would be transferred from Impoundment A to Impoundment B with a remotely operated hydraulic dredge or other appropriate equipment. During waste transfer, the water cover on both impoundments would be maintained as needed for radiation shielding by pumping water between ponds, adding water if necessary, and treating excess water at the existing Process Waste Treatment Plant, which is adjacent to the site (see Fig. 2). Preliminary stability calculations for the berm between Impoundment B (3513) and White Oak Creek indicate the berm is stable. The stability of the berm will be confirmed during remedial design. The potential for additional seepage from Impoundment B to White Oak Creek will increase as wastes are added to the impoundment. A seepage control system will be designed during remedial design and implemented during remedial action. Figure 3 is a cross section of the consolidation cell during different phases of construction and operation. A clay liner extending above the high water table would be placed in the former location of Impoundment A, and a multilayer leachate collection/detection system would cover the clay liner (Fig. 3, Detail A). The clay liner would be designed to be structurally stable and contain the waste under all expected loading conditions during remedial actions and for the operational life of the cell or as long as the cap is maintained.

Approximately 3,800 m^3 (5,000 yd^3) of sediment would then be transferred from Impoundment B into the liner using the same equipment, shielding, and water management methods detailed previously (Fig. 3, Step 1). Although the scope of the project is to address only sediment and water in the impoundments, incidental contaminated subimpoundment and surface soil may be encountered. For the cost estimate, a volume of 380 m^3 (500 yd^3) of surface soil and about 260 m^3 (340 yd^3) of subimpoundment soil was assumed to be placed in the consolidation cell.

A fabric filter and geogrid structural frame would be placed through the water cover over the sediment and an interim cover of riprap or other porous fill would be placed over the filter. When the interim cover provided sufficient shielding, the water cover would be removed by pumping surface water and operating the leachate collection system. The sediment would be dewatered by surcharging the waste with a temporary cap (Fig. 3, Step 2) and removing leachate for an estimated 1 year, or by other means, until no further settlement of the cap was expected. The temporary cap would be designed to prevent infiltration of rainfall into the cell (Fig. 3, Detail B).

The water collected during initial and long-term dewatering would be transferred to the Process Waste Treatment Plant. The Process Waste Treatment Plant currently accepts surface water containing metals, volatile and semivolatile organic compounds, and radionuclides from the impoundments during periods of high runoff. The same constituents are expected in the leachate from the consolidation cell and, therefore, should meet the Process Waste Treatment Plant waste acceptance criteria.

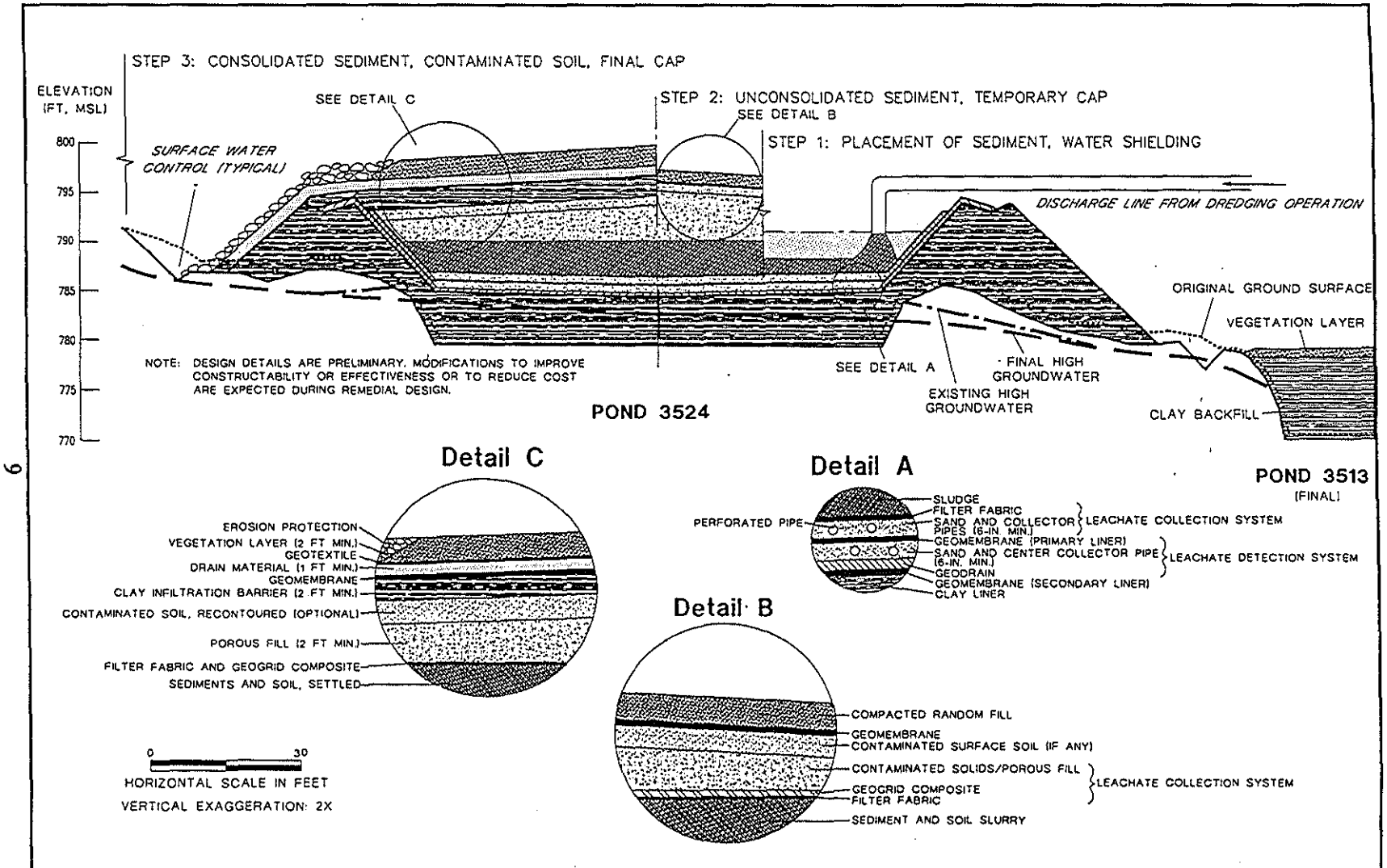
A final, multilayer engineered cap on the cell would be completed (Fig. 3, Step 3), and the cell would be inspected and maintained on a regular basis.

Alternative 3 would require a CERCLA waiver from the Toxic Substances Control Act of 1976 (TSCA) requirement that wastes be disposed of at least 15 m (50 ft) above the high water table [40 CFR 761.75 (b) (3)]. The waiver request would be based on equivalent protection provided by the liner. Alternative 3 would comply with all other applicable or relevant and appropriate requirements (ARARs).

ALTERNATIVE 6—REMOVAL, TREATMENT, AND DISPOSAL

Total Capital Cost: $64.3 million
Time to implement: 4 years
Annual O&M Cost, year 5: $212,,000
Annual O&M Cost, years 6–9: $70,500
Present Value Cost: $53.1 million

Alternative 6 includes removal of all sediments within SIOU, treatment of sediments to meet



JE® Fig. 3	Alternative 3 section - liner, placement of wastes, temporary cap, and final cap DOE - ORNL, WAG 1 Surface Impoundments - Oak Ridge, Tennessee	DOCUMENT ID 35H630 0040-20 / PPLAN	DRAWING ID 96-12996 DWG	DRAWING DATE OCTOBER 7, 1996 TG

ARARs and applicable disposal facility waste acceptance criteria, containerization of treated wastes, and transport of all treated waste to appropriate waste disposal facilities as shown in Figure 4.

First, 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. Based on the sampling results, the waste removed from the small impoundments will be treated as needed to meet waste acceptance criteria at Envirocare of Utah, Inc. (Envirocare). Current data suggest that treatment will be required to reduce PCB concentrations to below 50 ppm. The treatment technology considered in the cost estimate is chemical dechlorination. An alternate treatment method for PCBs under EPA regulations (rather than incineration or disposal in a PCB landfill) is required because of the presence of radionuclides in the waste materials. Costs for removal, treatment, packaging, and transportation according to U.S. Department of Transportation (DOT) requirements and disposal at Envirocare are estimated at $5–10 million for the < 61 m^3 (80 yd^3) of sediment and incidental soil removed. Remediation of Impoundments C and D will be a stand alone project and may use other innovative treatment options if cost-effective.

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.

Remediation of Impoundments A and B relies on stabilization/solidification as the representative treatment method. The 1996 treatability study developed a recipe of dry cement, dry fly ash, and sediment at an appropriate water content that produces a waste form that meets DOT transport requirements, and Nevada Test Site (NTS) waste acceptance criteria. The treatment facility would 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 the Process Waste Treatment Plant. 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. Disposal fees are estimated based on current charges at NTS for disposal of contact-handled waste in standard containers.

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 at NTS. Uncontaminated material, including the treatment building, would be released for other use. The impoundments would be backfilled with clean soil and the site would be restored.

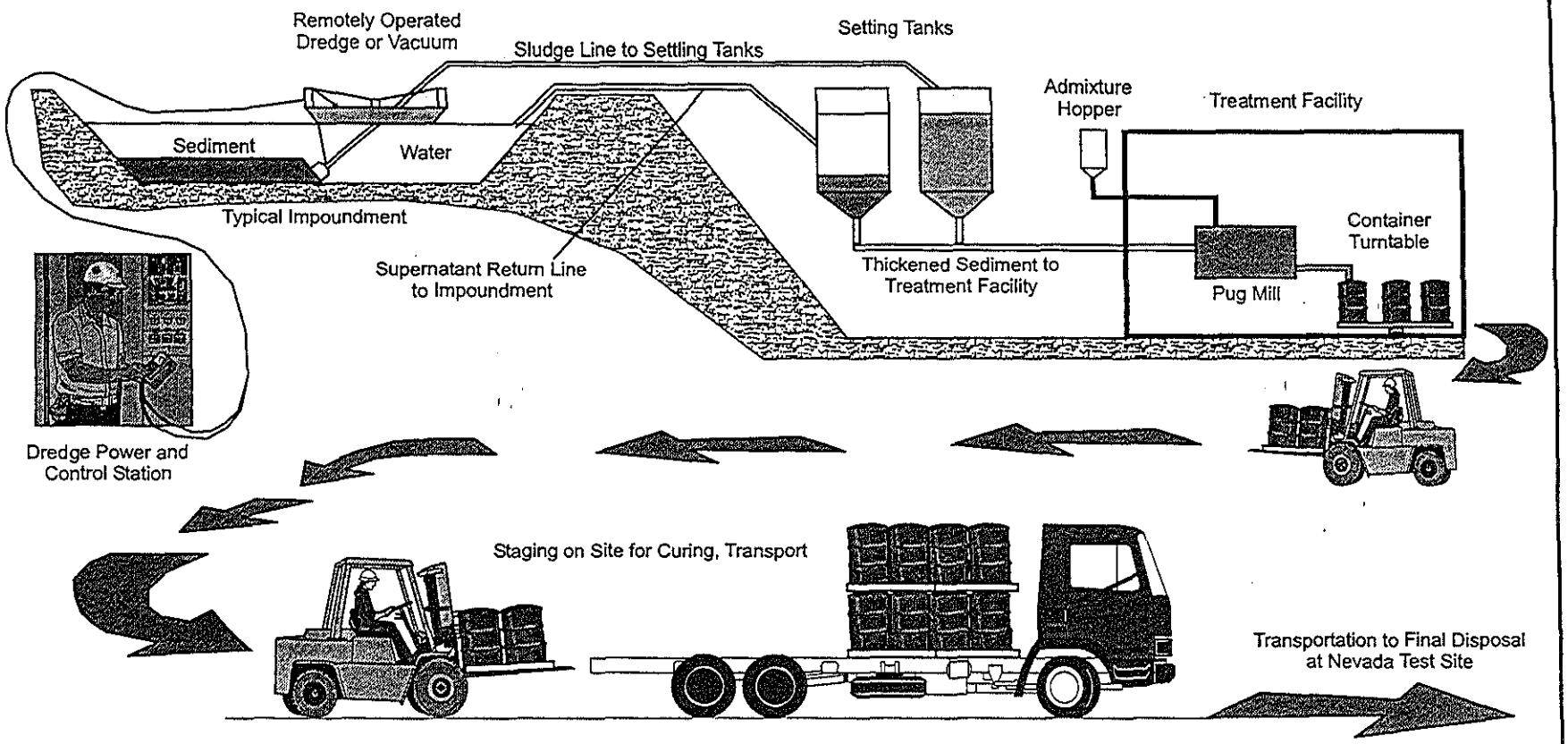
Institutional controls would not be needed at the site for SIOU contaminants but could be needed because of other contaminant sources. Institutional controls at the NTS (or other final disposal location) would be needed indefinitely. The cost for these controls is assumed to be included in the disposal fee.

This alternative meets all remedial action objectives and ARARs.

EVALUATION OF ALTERNATIVES

Table 1 summarizes the performance of the alternatives against seven of the nine CERCLA criteria (see box on page 13). 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) will be evaluated after a regulatory agency review and a public comment period. Community acceptance of the preferred alternative will be evaluated based upon public comments received. Details of the selected alternative will be described in the ROD for the site. Following is a discussion of the evaluation of the alternatives presented in this proposed plan.

Overall protection of human health and the environment. Alternative 6 offers greater protection than Alternative 3 at the SIOU site because the waste is removed from the site. Alternative 1 (no action) is not protective.



Note:
Conceptual design for removal, treatment, and transportation of Surface Impoundment 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. 4	Alternative 6 - Removal, Treatment, and Off-site Disposal DOE - ORNL, WAG 1 Surface Impoundments - Oak Ridge, Tennessee	DOCUMENT ID: 35H830 0040-30 / PPLAN	DRAWING ID: 97-14821.CDR	DRAWING DATE: JUNE 26, 1997 TG

Table 1. Evaluation of alternatives for CERCLA criteria, WAG 1, SIOU, ORNL, Oak Ridge, Tennessee

CERCLA criteria	Alternative 1 No action	Alternative 3 On-site consolidation cell	Alternative 5 Removal, treatment, and off-site disposal
1. Overall protection of human health and the environment			
Future RME Risk		Total risk	Total risk
Employee on site	8×10^{-2}	$< 1 \times 10^{-6}$	$< 1 \times 10^{-6}$
Resident Clinch River	5×10^{-3}	$< 1 \times 10^{-6}$	$< 1 \times 10^{-6}$
Resident White Oak Dam	5×10^{-3}	$< 1 \times 10^{-6}$	$< 1 \times 10^{-6}$
Resident White Oak Creek	7×10^{-2}	$< 1 \times 10^{-6}$	$< 1 \times 10^{-6}$
Resident on site	2×10^{-1}	$< 1 \times 10^{-6}$	$< 1 \times 10^{-6}$
Human health risk	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 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 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
2. Compliance with ARARs	No ARARs under CERCLA. Not protective as required by CERCLA	One waiver required	Meets all ARARs
3. Long-term effectiveness	Not effective	Effective for period of institutional control	Very effective at site
4. Reduction of toxicity, mobility, or volume through treatment	None	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 moderate, adverse short-term effects	Potential for very high, adverse short-term effects
6. Implementability	Very easy to implement	Somewhat difficult to implement	Difficult to implement, technically and administratively
7. Present value cost	$2.5 million	$16.3 million	$53.1 million

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

EVALUATION CRITERIA

The following criteria are based on guidance published by EPA and are used to evaluate potential alternatives. The first seven criteria are highlighted in this proposed plan. The last two criteria, state and community acceptance, will be addressed during the public comment period.

1. *Overall protection of human health and the environment* addresses whether an alternative eliminates, reduces, or controls threats to public health and the environment.
2. *Compliance with applicable or relevant and appropriate requirements (ARARs)* addresses whether an alternative meets federal and state environmental laws and regulations.
3. *Short-term effectiveness* considers the time needed for an alternative to achieve remedial response objectives and the risks posed to workers, residents, and the environment during the remedial action.
4. *Long-term effectiveness* considers the ability of an alternative to protect public health and the environment long after remedial action is complete.
5. *Reduction of toxicity, mobility, and volume through treatment* evaluates an alternative's use of treatment to reduce the harmful nature of contaminants, the contaminants' ability to move in the environment, and the amount, or volume, of contamination present.
6. *Implementability* addresses the feasibility of an alternative from a technical and an administrative standpoint.
7. *Cost* considers the amount of money it will take to design, construct, operate, and maintain the alternative.
8. *State acceptance* addresses TDEC comments concerning the alternatives considered.
9. *Community acceptance* addresses the public comments on the alternatives being considered. One opportunity for the public to voice its opinion is to complete the attached comment sheet and send it to DOE. At the end of the public comment period, DOE will respond to every relevant question and comment. These responses will become part of the ROD.

Compliance with ARARs. Alternative 6 meets all ARARs. Alternative 3 requires one waiver, and Alternative 1 does not meet the intent of CERCLA.

Long-term effectiveness. Alternative 6 is preferred because most waste is disposed of at NTS. NTS uses areas already contaminated from nuclear bomb tests for waste disposal. SIOU waste is similar in nature to waste received in the past at NTS and represents only a small fraction of a percent of the volume or hazards of contamination at the site. Substantial volumes of waste streams from other sources have been and will be disposed of there. Furthermore, NTS is in a remote area in a desert. Human intrusion into the facility would be precluded through federal control of the area and access restrictions. Even if institutional controls lapse, the inhospitable climate would reduce the likelihood that humans would settle the area and be exposed to contamination. There is no accessible potable groundwater source, and the low rainfall at the site precludes contaminant migration via the groundwater pathway. For the small volume of waste in Impoundments C and D, Envirocare would provide excellent long-term protectiveness because of the features of the disposal facility and the arid, remote environment.

Alternative 3 does prevent direct contact, direct exposure, airborne exposure, and contact of waste with groundwater. However, the engineered cell may not effectively contain the contaminants for the duration needed for long-lived radioisotopes (half-lives > 10,000 years) to become nonhazardous. Institutional controls to prohibit unacceptable uses and to maintain the cap would be needed to ensure long-term protection.

Alternative 1 would not provide long-term protectiveness.

Reduction of toxicity, mobility, and volume through treatment. Alternative 6 would reduce toxicity of the sediment in Impoundments C and D by removing PCBs. PCB treatment would not significantly affect sediment volumes, but a large liquid waste stream would result. The liquid waste would be treated at ORNL before discharge at an existing permitted outfall. Stabilization/solidification of the sediment from the large impoundments in Alternative 6 would increase volume but would greatly reduce mobility of contaminates in the sediment from Impoundments A and B. Toxicity would not be affected.

Alternative 3 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.

Alternative 1 would not provide treatment of the sediments.

Short-term effectiveness. Alternative 3 is preferred because of the shorter time to complete the project and the lower risk to remediation workers because handling of radioactive materials would be limited. Safety measures taken would protect workers during handling. Environmental risks would be eliminated when the temporary cap is placed on the disposal cell about 2 years after construction begins.

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 Administration 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 during treatment would significantly increase worker exposure to radiation and the potential for spills or other releases. Transportation of waste would increase the likelihood of accidents.

Alternative 1, the no action alternative, proposes minimal maintenance actions only and therefore would pose little risk to remediation workers. Existing environmental risks would continue.

Implementability. The maintenance actions proposed for Alternative 1, the no action alternative, are already in place, and continued implementation would be very easy.

Alternative 3 would be the easier of the two action alternatives to implement. The sediment and water handling and cell construction equipment, material, and techniques are readily available. Engineered cells are routinely designed and built throughout the country. The proposed in-cell dewatering method has not been widely used, but it is expected to be reliable based on results of the treatability study and alternate methods are available. If this alternative were selected through the CERCLA process, there would be no administrative impediments (e.g., licenses, permits) to implementation.

Technical implementability of Alternative 6 would be more 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, the waste from Impoundments C and D is expected to meet Envirocare waste acceptance criteria.

The proposed stabilization/solidification of sediment from Impoundments A and B for Alternative 6 would ensure that the 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 Council 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/EIS-0200-F, May 1997). Once approved, a record of decision for the programmatic EIS will set forth terms and conditions under which shipments may resume. 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 waste acceptance criteria,

SIOU wastes may be sent to the ORR disposal facility rather than to NTS.

Cost. Alternative 6 is the most costly of all the alternatives at an estimated $53.1 million (present value). 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 $5.5 million compared to disposal at NTS may result from reductions in transportation costs and disposal fees.

Alternative 3 is an economical solution to remediation of the impoundments at a present value cost of $16.3 million. It does, however, require limitations on use of roughly a third of the 2.4 ha (6-acre) site and requires long-term maintenance and institutional controls. According to EPA guidance, the cost for maintenance and institutional controls 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.

The present value cost of Alternative 1 is lowest at $2.5 million. This is also based on 30 years of institutional control, although controls would be needed forever.

State acceptance. Alternative 6 meets all TDEC recommendations; Alternative 3 does not. In a letter to DOE dated September 20, 1996, 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.

Community acceptance. Input from stakeholders will be analyzed during the public comment period and the ROD will respond to all stakeholder concerns. The selected remedy in the ROD may change from the preferred alternative presented here based on public comment.

SUMMARY OF THE PREFERRED ALTERNATIVE

Based on current information, Alternative 6—removal, treatment, and disposal—appears to offer the best balance of the nine CERCLA criteria developed by EPA (see box on page 13 for a description of evaluation criteria). This alternative offers the greatest overall protection of human health and the environment because the waste is removed from the site. It 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). It does not depend on institutional controls for long-term effectiveness (except for those already in place at NTS and Envirocare, the representative off-site disposal facilities). Alternative 3 is better than Alternative 6 in meeting short-term effectiveness, implementability, and cost criteria.

Alternative 6 meets the end-use criteria recommended by the citizens group Site Specific Advisory Board for ORNL, the expressed recommendations of TDEC, requirements and statutory preferences of EPA, and the goals and objectives of the DOE Accelerated Cleanup Plan.

The availability of NTS for disposal of solid low-level radioactive waste is likely; however, a contingency plan would be required should administrative considerations impede or delay shipments of waste. If an ORR disposal facility with waste acceptance criteria compatible with SIOU wastes is developed through a separate decision-making process, it would serve as the contingency disposal facility for this alternative. If the new ORR disposal facility is available, it will likely be chosen because of reduced transportation costs and disposal fees.

Based on information available at this time, DOE believes that Alternative 6 would protect human health and the environment, would comply with ARARs, and would be cost-effective. EPA and TDEC concur with the release of this proposed plan for public comment.

This proposed remedy is also being 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 was established to promote cost-effectiveness and national consistency in remedy selection at Superfund sites.

The review board's input will be incorporated along with public input in the ROD for this action.

COMMUNITY PARTICIPATION

Community involvement is critical to the CERCLA RI/FS process.

DOE encourages public participation in the determination of the selected remedy for remediation of SIOU. Opportunities for public involvement are described in the shaded box on page 16.

Comments will be responded to and documented as part of the subsequent ROD. Based on public comments or new information, DOE may modify the preferred alternative or select another.

THE NEXT STEP

Following the public comment period and consideration of public concerns, DOE will prepare a ROD. The ROD will describe the selected remedy and include the responses to public comments. A remedial design plan for implementing the alternative will be prepared after EPA, TDEC, and DOE sign the ROD.

The proposed strategy and schedule for executing the preferred alternative is:

Fiscal Year 1997. The ROD for SIOU will be issued. The ROD will:

- define the schedule for treating waste in Impoundments C and D and disposing of generated waste at Envirocare,
- designate NTS as the disposal facility for waste generated from remediation of Impoundments A and B and define the schedule as contingent on the availability of approved disposal at NTS, and
- identify the proposed on-site CERCLA disposal cell as an alternate disposal facility pending the results of the ROD for the evaluation of waste disposal alternatives for all ORR CERCLA environmental restoration waste.

Fiscal Year 1998. Begin remediation planning including:

- prepare request for proposal for removal and treatment of waste in Impoundments C and D and
- resolve administrative issues regarding potential disposal locations.

The administrative issues regarding disposal of ORR waste at NTS should be resolved (outside the scope of this action) in 1998. The ROD for waste disposal alternatives for ORR CERCLA environmental restoration waste (also outside SIOU scope) is also scheduled to be issued in 1998.

Fiscal Year 1999. Begin remediation and continue planning including:

- identify final disposal location for waste from Impoundments A and B;
- remove, treat, and dispose of waste from Impoundments C and D per plans; and
- prepare request for proposal for removal, treatment, transport, and disposal of waste from Impoundments A and B.

Fiscal Year 2000. Begin remediation of Impoundments A and B.

OPPORTUNITIES FOR PUBLIC INVOLVEMENT

Public Comment Period: DOE will hold a 30-day public comment period for this proposed plan. The comment period provides an opportunity for local residents and interested parties to express their views and concerns on the remedial alternatives being considered. Copies of the proposed plan and supporting documents are available at the following location:

DOE Information Resource Center
105 Broadway Avenue
Oak Ridge, TN 37830

Hours: Monday through Friday, 7:30 a.m.–5:30 p.m.

Telephone: (423) 241-4582

A 30-day public comment period (June 30 to July 30, 1997) has been designated for review and comment on this proposed plan. A public meeting is scheduled for July 15, 1997, to discuss the cleanup alternatives and address any questions and concerns the public may have about the preferred alternative.

ATTACHMENT 1

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS FOR THE REMEDIAL ALTERNATIVES EVALUATED FOR THE SURFACE IMPOUNDMENTS OPERABLE UNIT AT THE OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE

Attachment 1. Applicable or relevant and appropriate requirements[a] for the remedial alternatives evaluated for the Surface Impoundments Operable Unit at the Oak Ridge National Laboratory, Oak Ridge, Tennessee

Requirements	Citation	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6
Location-specific						
NHPA requirements for impacts to historic resources	NHPA, 16 USC 470a-w; EO 11593; 36 CFR 800; DOE-ORO Programmatic Agreement (May 9, 1994)	X	X	X	X	X
Chemical-specific						
NESHAP for radionuclide emissions from DOE facilities	40 CFR 61.92; 40 CFR 61.93	X	X	X	X	X
DOE Order radiation exposure limitations (TBC guidance)	DOE Order 5400.5 (I.4); DOE Order 5400.5 (II.1a)	X	X	X	X	X
DOE Order requirements for management of radioactivity left in place (TBC guidance)	DOE Order 5400.5 (IV); DOE Order 5400.5(II)(3)(b)	X	X	X	X	
EPA guidance for PCBs left in place (TBC guidance)	OSWER 9355.4-01, "Guidance on Remedial Actions for Superfund Sites with PCB Contamination"	X	X	X	X	
Action-specific						
Institutional control requirements	40 CFR 300.430(e)(3)(ii)(TBC); 40 CFR 264.14; Rules of the TDEC 1200-1-11-.06(11); DOE Order 5400.5 (IV)(6)(c) (TBC)	X	X	X	X	
Stormwater runoff control requirements	40 CFR 122; Rules of the TDEC 1200-4-10-.05	X	X	X	X	X
Fugitive dust emissions control requirements	Rules of the TDEC 1200-3-8-.010	X	X	X	X	X
RCRA design and operating requirements for a surface impoundment/landfill	40 CFR 264.221(c); 40 CFR 264.301; Rules of the TDEC 1200-1-11-.06(11); Rules of the TDEC 1200-1-11-.06(14)		X	X	X	
TSCA general design requirements for a chemical waste landfill	40 CFR 761.60(a)(4 and 5); 40 CFR 761.75(b); OSWER 9355.4-01, "Guidance on Remedial Actions for Superfund Sites with PCB Contamination" (TBC)		X[b]	X[b]	X[b]	
TDEC radiation protection standards (performance objectives for limiting human exposure)	Rules of the TDEC 1200-2-11-.16(1), (2), and (5)	X[c]	X	X	X	
TDEC radiation protection standards (technical requirements for land disposal)	Rules of the TDEC 1200-2-11-.17(1)(a),(b),(d-j); Rules of the TDEC 1200-2-11-.17(2)(b) and (c)		X		X	

Attachment 1 (continued)

Requirements	Citation	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6
TDEC radiation protection standards (technical requirements for land disposal)	Rules of the TDEC 1200-2-11-.17(2)(a),(d)(e)(f); Rules of the TDEC 1200-2-11-.17(3)(g),(h),(j),(k); Rules of the TDEC 1200-2-11-.17(4)(b),(c) and (d); Rules of the TDEC 1200-2-11-.17(7)(b)(1)	X[c]	X	X	X	
RCRA and TDEC closure requirements [including simple capping (Alternative 2)] TDEC requirements for elimination of free liquids under radiation protection standards	40 CFR 264.228(a)(2)(i-ii); Rules of the TDEC 1200-11-.06(11); Rules of the TDEC 1200-2-11-.17(7)(a)(3)	X[c]	X[d]	X	X[d]	X
TSCA requirements for elimination of free liquids	40 CFR 761.75(b)(8)(ii)		X[d]	X	X[d]	
TDEC radiation protection standards (technical requirements for land disposal)	Rules of the TDEC 1200-2-11-.17(7)(b)(2) and (3); Rules of the TDEC 1200-2-11-.17(3)(d)			X		
RCRA land disposal requirements	40 CFR 268; 40 CFR 268.40; 40 CFR 268.44; 40 CFR 268.48; Rules of the TDEC 1200-1-11-.10			X	X[c]	X
RCRA requirements for tanks used for storage or treatment RCRA requirements for miscellaneous treatment unit	40 CFR 264.191-197; 40 CFR 264.553; Rules of the TDEC 1200-1-11-.06(10)			X		X
TSCA requirements for alternative treatment for PCB dredged material	40 CFR 761.60(e)					X
Characterization/storage of residuals from treatment (and storage of treated waste, if necessary)	40 CFR 264.601; Rules of the TDEC 1200-1-11-.06(27)(a); 40 CFR 262.11; 262.34; 264.170 et seq.; Rules of the TDEC 1200-1-11-.03(1)(b); Rules of the Rules of the TDEC 1200-1-11-.03(4)(e); Rules of the TDEC (1200-1-11-.06(9); FFCA Sect. 105; TDEC Comm. Order for the ORR STP[e] (Oct. 2, 1995)			X		X
Closure requirements for a surface impoundment/landfill	40 CFR 264.310; 40 CFR 264.228(a)(2); Rules of the TDEC 1200-11-.06(11) and (14); DOE Order 5400.5(IV)(6)(b)(1)and(4)(TBC)		X	X	X	

Attachment 1 (continued)

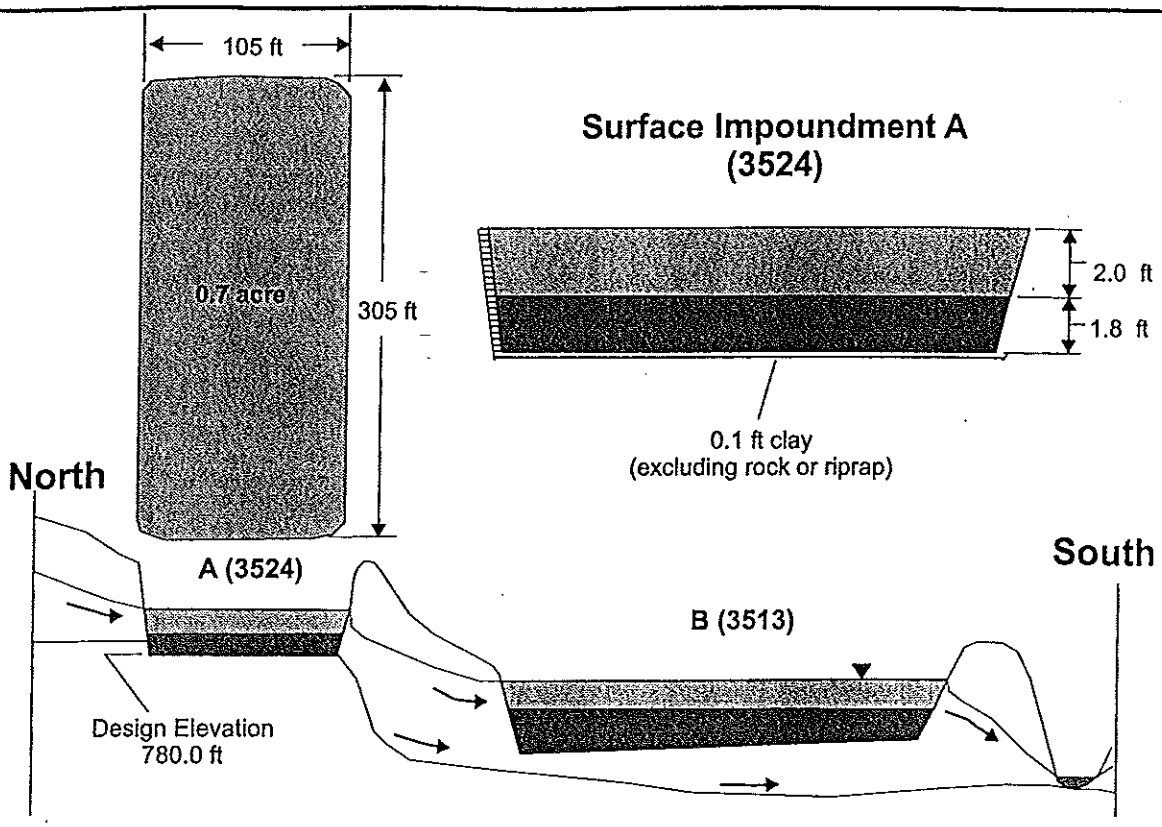
Requirements	Citation	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6
Postclosure care requirements	40 CFR 264.117; 40 CFR 264.228(b); 40 CFR 264.310; 40 CFR 264 Subpart F; Rules of the TDEC 1200-1-11-.06(7); Rules of the TDEC 1200-1-11-.06(11); Rules of the TDEC 1200-1-11-.06(14); DOE Order 5400.5(IV) (TBC)		X	X	X	
DOT/RCRA transportation requirements	49 CFR 171, 172, 173, 177, 178, 179 and 180; 49 CFR 195				X	X
DOE requirements for transportation off site (TBC guidance)	DOE Order 5820.2A(III)					X

[a]An "X" is used to indicate that the requirement is ARAR for the alternative at the column header.
[b]A CERCLA waiver from 40 CFR 761.75(b)(3) would be required pursuant to 40 CFR 761.75(c)(4) (see text).
[c]A CERCLA waiver would be required for one or more of the requirements [see text for discussion of the specific requirements and CERCLA Sect. 104(d) justifications].
[d]A CERCLA interim waiver may be required from RCRA, TDEC, and TSCA requirements for elimination of free liquids from the waste with the expectation that the requirements will ultimately be met.
[e]Required under another project for the Environmental Management Waste Management Facility.

ARAR = applicable or relevant and appropriate requirement
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR = *Code of Federal Regulations*
DOE = U.S. Department of Energy
DOT = U.S. Department of Transportation
EO = Executive Order
EPA = U.S. Environmental Protection Agency
FFCA = Federal Facility Compliance Agreement
NESHAP = National Emission Standards for Hazardous Air Pollutants
NHPA = National Historic Preservation Act
ORO = Oak Ridge Operations
ORR = Oak Ridge Reservation
OSWER = Office of Solid Waste and Emergency Response
PCB = polychlorinated biphenyl
RCRA = Resource Conservation and Recovery Act of 1976
STP = site treatment plant
TBC = to be considered
TDEC = Tennessee Department of Environment and Conservation
TSCA = Toxic Substances Control Act of 1976
USC = *United States Code*

ATTACHMENT 2

SURFACE IMPOUNDMENTS FACT SHEETS



Operational History

- Unlined; sediment in contact with natural clay and bedrock
- Active operations from 1943 to 1989
- Emergency overflow only from 1989 to 1996

Scope of Operable Unit

1,400 yd^3 sediment
300 yd^3 soil
624,000 gal water

Characterization of Sediment

- Approximately 75 Ci total activity

Major Radionuclides	pCi/g	
	Concentration in Impoundment	Reference level*
Americium-241	16,000	800
Cesium-137	210,000	17-20**
Cobalt-60	3,000	2.2
Plutonium-238	1,100	1,100
Plutonium-239, -240	17,000	1,000
Strontium-90	91,000	<100**

Contaminants of Concern

Chemical	Concentration in Impoundment	Reference level*
Mercury mg/kg	396	320
PCBs ppm	35	14

**Reference level for 10^{-4} industrial use: inhalation, ingestion, and direct exposure for radionuclides and PCBs; hazard index = 1 for mercury.*

***Includes parent and daughter products*

Regulatory Status of Sediments

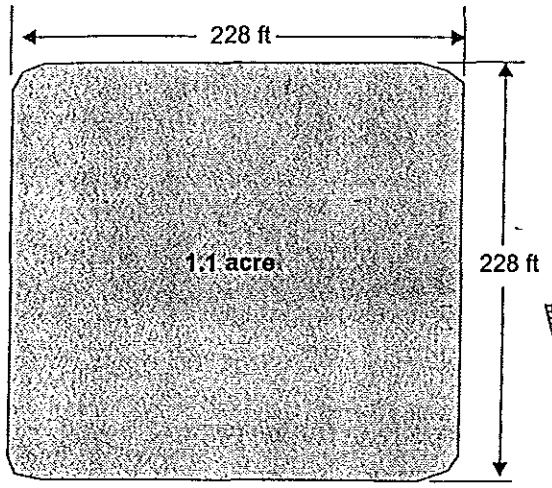
- Low-level waste
- Not RCRA waste (i.e., not listed, passes TCLP)
- Not TSCA waste

Attachment 2-A

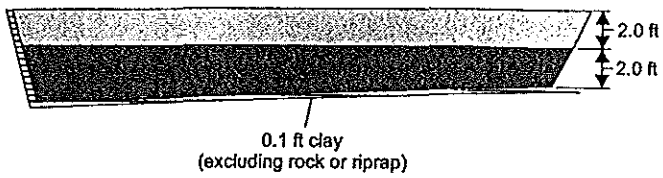
Surface Impoundment A (3524)

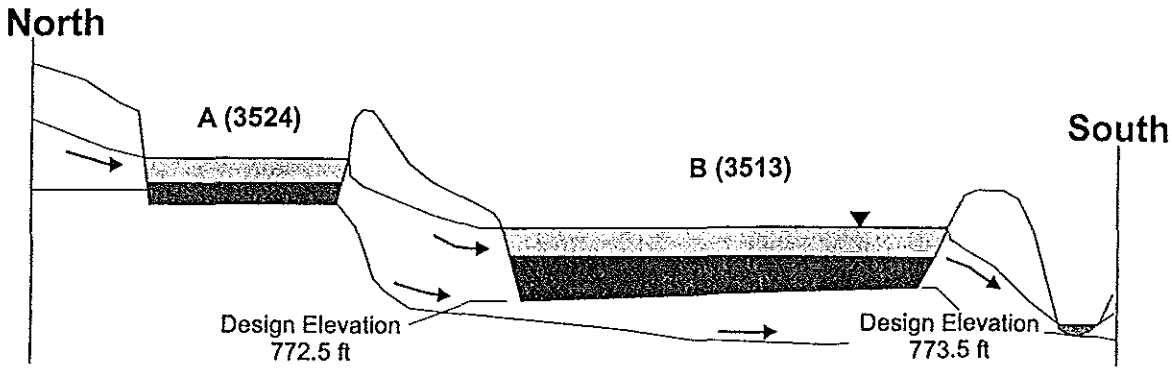
DOE - ORNL, WAG 1 Surface Impoundments - Oak Ridge, Tennessee

DOCUMENT ID: 35H830 0049-10 / SI	DRAWING ID: 97-14827.CDR	DRAWING DATE: JUNE 27, 1997 TG



Surface Impoundment B (3513)





Operational History

- Berm leaks
- Unlined; sediment in contact with groundwater
- Active operations from 1944 to 1976
- Emergency overflow only from 1976 to 1989

Characterization of Sediment

- Approximately 110 Ci total activity

Major Radionuclides	pCi/g	
	Concentration in Impoundment	Reference level*
Americium-241	4,200	800
Cesium-137	450,000	17-20**
Cobalt-60	1,300	2.2
Plutonium-238	630	1,100
Plutonium-239, -240	19,000	1,000
Strontium-90	73,000	<100**

Regulatory Status of Sediments

- Low-level waste
- Not RCRA waste (i.e., passes TCLP)
- Not TSCA waste

Scope of Operable Unit

3,163 yd^3 sediment
500 yd^3 soil
1,000,000 gal water

Contaminants of Concern

Chemical	Concentration in Impoundment	Reference level*
Mercury (mg/kg)	340	320
PCBs (ppm)	41	14

**Reference level for 10^{-4} industrial use: inhalation, ingestion, and direct exposure for radionuclides and PCBs; hazard index = 1 for mercury.*

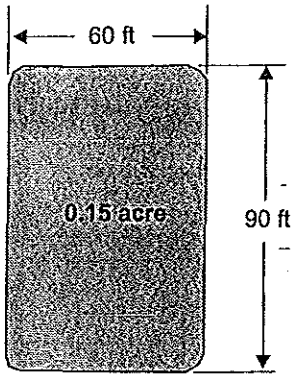
***Includes parent and daughter products*

Attachment 2-B

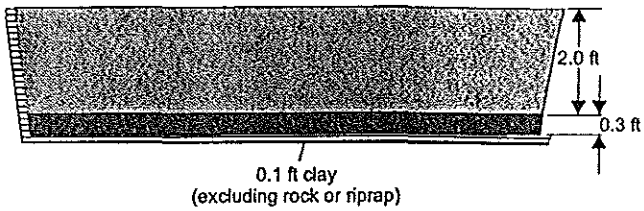
Surface Impoundment B (3513)

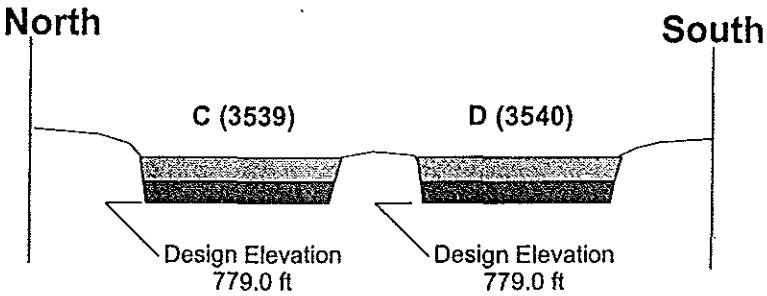
DOE - ORNL, WAG 1 Surface Impoundments - Oak Ridge, Tennessee

DOCUMENT ID: 35H830 0049-10 / SI	DRAWING ID: 97-14828.CDR	DRAWING DATE: JUNE 26, 1997 TG



Surface Impoundment C (3539)





Operational History

- Clay lined; sediment not in contact with groundwater
- Received process wastewater from Building 4500 from 1964 to1990

Characterization of Sediment

- Less than 1 Ci total activity

Major Radionuclides	pCi/g	
	Concentration in Impoundment	Reference level*
Americium-241	< 270	800
Cesium-137	18	17-20**
Cobalt-60	16	2.2
Plutonium-238	Not detected	1,100
Plutonium-239, -240	162	1,000
Strontium-90	60	<100**

Regulatory Status of Sediments

- Mixed TSCA/NRC Class A low-level waste
- No TCLP data available
- Contains PCBs

Scope of Operable Unit

< 20 yd^3 sediment
25 yd^3 soil
83,000 gal water

Contaminants of Concern

Chemical	Concentration in Impoundment	Reference level*
Mercury mg/kg	760	320
PCBs ppm	170	14

**Reference level for 10^{-4} industrial use: inhalation, ingestion, and direct exposure for radionuclides and PCBs; hazard index = 1 for mercury.*

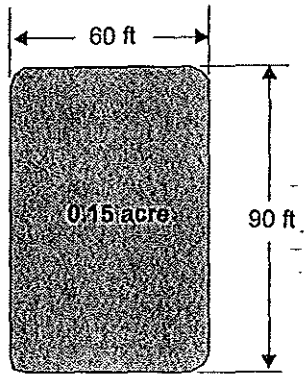
***Includes parent and daughter products*

Attachment 2-C

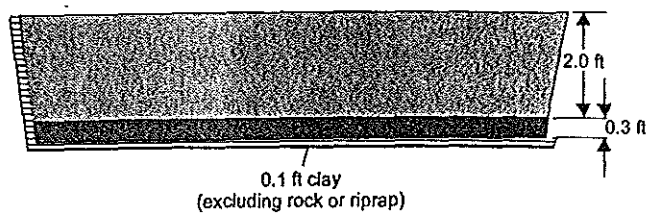
Surface Impoundment C (3539)

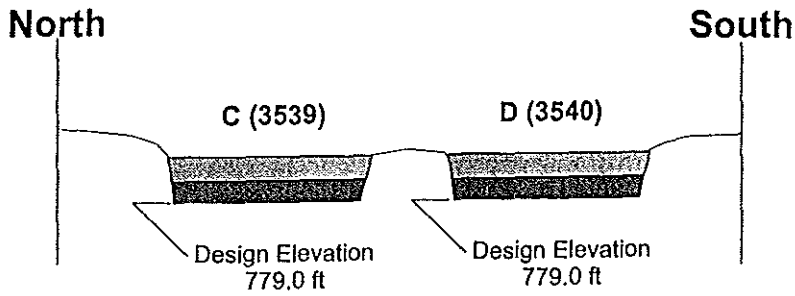
DOE - ORNL, WAG 1 Surface Impoundments - Oak Ridge, Tennessee

DOCUMENT ID: 35H830 0049-10 / SI	DRAWING ID: 97-14829.CDR	DRAWING DATE: JUNE 27, 1997 TG



Surface Impoundment D (3540)





Operational History

- Clay lined; sediment not in contact with groundwater
- Received process wastewater from Building 4500 from 1964 to 1990

Scope of Operable Unit

< 20 yd^3 sediment
25 yd^3 soil
83,000 gal water

Characterization of Sediment

- **Less than 1 Ci total activity**

Major Radionuclides	pCi/g	
	Concentration in Impoundment	Reference level*
Americium-241	<270	800
Cesium-137	109	17-20**
Cobalt-60	9	2.2
Plutonium-238	40	1,100
Plutonium-239, -240	24	1,000
Strontium-90	170	<100**

Contaminants of Concern

Chemical	Concentration in Impoundment	Reference level*
Mercury (mg/kg)	700	320
PCBs (ppm)	190	14

**Reference level for 10^{-4} industrial use: inhalation, ingestion, and direct exposure for radionuclides and PCBs; hazard index = 1 for mercury.*

***Includes parent and daughter products*

Regulatory Status of Sediments

- Mixed TSCA/NRC Class A low-level waste
- No TCLP data available
- Contains PCBs

Attachment 2-D

Surface Impoundment D (3540)

DOE - ORNL, WAG 1 Surface Impoundments - Oak Ridge, Tennessee

DOCUMENT ID: 35H830 0049-10 / SI	DRAWING ID: 97-14830.CDR	DRAWING DATE: JUNE 27, 1997 TG

SURFACE IMPOUNDMENTS OPERABLE UNIT, WASTE AREA GROUPING 1, OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE
PUBLIC COMMENT SHEET

DOE is interested in your comments on the alternatives being considered in the *Proposed Plan for the Surface Impoundments Operable Unit, Waste Area Grouping 1, Oak Ridge National Laboratory, Oak Ridge, Tennessee*, including the preferred alternative. The mailing address is preprinted on the back of this form. You may use this form to submit your comments. We must receive your comments on or before the close of the public comment period. If you have questions, please contact Ms. Margaret Wilson, FFA Projects Manager; Oak Ridge Remediation Management; DOE Oak Ridge Operations; 3 Main Street, Oak Ridge, TN 37830; (423) 576-8528.

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Name: _____

Address: _____

City: _____ State/Zip: _____

Phone: _____

MAILING LIST ADDITIONS:

Please add my name to the Environmental Management Program mailing list to receive additional information on the progress at the Oak Ridge Reservation: ☐ Yes ☐ No

Place
Stamp
Here

Ms. Margaret Wilson, FFA Projects Manager
Oak Ridge Remediation Management
DOE Oak Ridge Operations
3 Main Street
Oak Ridge, TN 37830