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Energy Systems Environmental Restoration Program
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Source Areas Investigation Plan and Recommendation for Removal
Actions at Waste Area Grouping 5 at Oak Ridge National Laboratory,
Oak Ridge, Tennessee

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ACRONYMS

CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CSL	Close Support Laboratory
EE/CA	engineering evaluation/cost analysis
ER	Environmental Restoration
OHF	Old Hydrofracture Facility
ORNL	Oak Ridge National Laboratory
PWTF	Process Waste Treatment Facility
RAP	Remedial Action Program
RI	remedial investigation
SWSA	solid waste storage area
WAG	waste area grouping
WOC	White Oak Creek

EXECUTIVE SUMMARY

This Source Area Investigation Plan and Recommendation for Removal Action (SAIP/RRA) was prepared in support of the regulatory working group for Oak Ridge National Laboratory (ORNL) Waste Area Grouping (WAG) 5. The purpose of the plan is to focus the investigation of and initiate potential groundwater seepage control actions for contaminant source areas at WAG 5. The SAIP/RRA addresses four discrete groundwater discharge areas (seeps) in or near WAG 5 that have been identified as significant contributors to the contaminant flux released from ORNL at White Oak Dam. Combined, these four seeps (designated Areas A, B, C, and D) contribute 25–50% and 20–45% of the total flux of tritium and strontium-90, respectively, in the White Oak Creek watershed. To reduce the release of contaminants from these areas and prevent further degradation of surface water, non-time-critical removal actions are proposed at the two areas characterized by discrete seeps: Areas C and D. An Engineering Evaluation/Cost Analysis will be initiated to identify and evaluate feasible removal actions for these areas. Further investigation activities are planned at all four areas, and will emphasize identifying and characterizing the contaminant source terms and migration pathways.

The proposed investigation will incorporate elements of ongoing investigation activities associated with site characterizations currently under way or planned at WAG 5 and WAG 2. WAG 5 activities include sampling and analysis of groundwater and surface water, surface water flow monitoring, identification of groundwater flow paths, and nonintrusive surveys designed to delineate trench boundaries and the extent of radioactive contamination. Planned activities for WAG 2 include characterization of contaminant transport processes and delineation of contaminant plumes in selected seep areas as well as surface water sampling, and analysis. The SAIP/RRA also proposes additional investigation activities that focus on contaminant transport properties and further characterization of source trenches. Additional surface water flow monitoring, sampling, and analysis activities are also proposed. The contaminant transport investigation will involve both laboratory and field-scale studies designed to determine whether the tritium source term is related to primary sources (i.e., wastes) or secondary matrix sources. Proposed investigation activities related to the characterization of source trenches involve the completion of drive-point piezometers at the downslope ends of trenches. The trench piezometers will be sampled to identify contaminant concentrations, and water levels will be monitored to assess hydrologic relationships between trench liquids and surrounding groundwater.

1. INTRODUCTION

In support of the regulatory working group for Oak Ridge National Laboratory (ORNL) Waste Area Grouping (WAG) 5, we propose this plan to improve the investigation of and initiate potential groundwater seepage control actions for source areas at WAG 5. The WAG 5 remedial investigation (RI) is in progress under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Provisional data collected as part of the WAG 2 RI are being used to help direct the WAG 5 source areas investigation to specific contaminant sources within the boundaries of WAG 5.

Data from the WAG 2 RI FY 1992 seep sampling program identified four relatively discrete groundwater discharge areas (seeps) in or near WAG 5 that contribute significant percentages to the total contaminant flux release from ORNL at White Oak Dam. These four seeps and their suspected associated source areas are shown in Fig. 1 as Source/Seep Areas A, B, C, and D. Preliminary results from the WAG 2 seep sampling program indicate that contaminated groundwater discharging from Area A contributes 10–20% of the total tritium flux in the White Oak Creek (WOC) watershed. The results also indicate that approximately 15–30% of the total tritium flux comes from Area B, approximately 10–20% of the total strontium-90 flux comes from Area C, and approximately 10–15% of the total strontium-90 flux comes from Area D.

Our goal in the March 3 regulatory working group meeting was to evaluate the four source/seep areas and determine what removal actions, if any, are appropriate. As a result of discussions, our objective is to reduce the release of contaminants from these areas and thus prevent further degradation of surface water. Using this as a platform, recommendations were made for removal actions to control the source of contamination leaving source/seep areas. Non-time-critical removal actions are proposed at Areas C and D, and continued investigations are recommended at all four areas with a sharper focus on finding the specific contaminant sources (e.g., trench or group of trenches). This focus will assist in the final remediation of the area and may help determine whether future removal actions need to be initiated.

2. BACKGROUND

2.1 AREA A

Stream transect sampling in 1988 along Melton Branch and Melton Branch tributary (HRT) during base flow conditions was the first study to identify Area A (Fig. 2) on the southeast edge of WAG 5, where a fairly discrete discharge of tritiated groundwater enters the stream (Wickliff et al. 1991). Most of the tritium in the Melton Branch tributary reach was found to be entering at a seep in the stream channel with low discharge but very high tritium activity (370 $\mu\text{Ci/L}$) (Fig. 2). Provisional data from the ORNL WAG 2 program seep task in 1992 found that the seep had 100 $\mu\text{Ci/L}$ tritium and that Area A is still a significant source of tritium to the WOC watershed.

Fig. 2. WAG 5 Source Area A: existing features/proposed sampling locations.

A survey of tritium concentrations in evapotranspired water was conducted in 1989 in the grassy southeast portion of WAG 5. Elevated levels of tritium were present over the whole area, and the highest activities were found near the end of two long trenches near piezometer 2034 (Fig. 2). In 1991, the area between these trenches and the seep was selected to investigate the contaminant plume and to gain understanding of processes (particularly matrix diffusion) that may be affecting the transport of contaminants from the burial grounds to streams (Wickliff et al. 1991). To define the vertical profile and extent of tritium and strontium-90, soil core and groundwater samples were collected from various depths at three locations near piezometers 2034, 2045, and 2047 (Fig. 2).

Wickliff et al. (1991) found that tritium activities in the groundwater and soil core samples increase with depth and range from 0.02 to 279 $\mu\text{Ci/L}$ in the sample interval (0–10 ft). The very smooth vertical distribution of tritium suggests that matrix diffusion is an important transport mechanism in WAG 5. Peak strontium-90 activities did not coincide with peak tritium activities, which may indicate that strontium-90 and tritium come from physically distinct primary sources (e.g., the strontium-90 source may be shallow in nearby trenches, whereas the tritium source may be more distant and at greater depth).

In addition to determining groundwater flow zones, samples were collected monthly from a small drive-point well (2039) and the seep to determine seasonal variability in the transport of tritium and strontium-90 from Area A. Variations in hydrologic conditions (seasons) appear to govern the activities of both tritium and strontium-90 in the seep; the activities are lowest during the wetter (winter) season and higher in the late spring and summer when conditions are drier.

As part of an Environmental Restoration (ER) site investigation study, activities in 1992 in Area A consisted of drilling a 27-ft borehole, performing tests using an electromagnetic borehole flowmeter developed by Tennessee Valley Authority, and conducting borehole dilution (point-dilution) tests. The flowmeter and dilution tests were designed to delineate permeability zones and to determine the vertical distribution of groundwater flow rates, respectively. The flowmeter results suggest that the zone from 15 to 18 ft is the most permeable in the borehole, and the borehole dilution test results indicate that the most permeable zone is from 13 to 16.25 ft.

2.2 AREA B

Existing data pertaining to Area B include groundwater quality data from the WAG 5 perimeter monitoring wells, data from contaminant scoping sampling and analysis of nearby Remedial Action Program (RAP) piezometers, results of stream transect sampling in Melton Branch as part of the WAG 2 RI, and data from shallow groundwater sampling along the WAG 5 perimeter (Spalding and Munro 1984). The principal contaminant released from Area B is tritium—observed at high concentrations in perimeter monitoring wells along the southern edge of WAG 5, detected in RAP piezometers on the Melton Branch floodplain, and seeping into the bed of Melton Branch in the area shown on Fig. 3.

2.3 AREA C

The current known release at Area C consists of a discrete discharge from a seep location (Figs. 4 and 5) downgradient of the trench source(s). Strontium-90 is the primary contaminant of concern, although there are also elevated levels of tritium and gross alpha. This location, known in previous studies as Seep 5, has been designated 05.SP006 by WAG 5 and SW5-4 by WAG 2. A discussion of previous actions in this area is given below.

Trench Cover and Diversion Dam. Seepage in the southeast corner of Solid Waste Storage Area (SWSA) 5 was found to be relatively high in strontium-90. Duguid (1975) measured the strontium-90 concentrations in 16 seeps around SWSA 5 and found Seep 4 (Fig. 4) in the southeast corner to be the highest ($\sim 14,000$ nCi/L). In 1975, about 2 ft of overburden was removed from the area overlying the four burial trenches (105, 83, 72, and 69) thought to be responsible for the strontium-90 releases. Two underground dams, one of concrete and one of bentonite and shale, were placed across trenches 105 and 83 (Fig. 4). At the same time, the dammed trenches and adjacent trenches 72 and 69 were covered with a 0.25-mm-thick PVC membrane. Finally, the 2 ft of overburden was replaced on the area and the area was seeded with grass to help control surface erosion.

Subsequent sampling by Spalding and Munro (1984) indicated that the effort was successful in diverting the flow of water from the source of contaminants in the area of these trenches. At the time of their sampling, Seep 4 was dry. The strontium-90 concentration of Seep 05.SP006, just south of Seep 4, was approximately the same (~ 180 nCi/L) in both the Duguid (1975) and Spalding and Munro (1984) studies.

Groundwater Treatment. The strontium-90 contaminated groundwater seep (Seep 05.SP006, Figs. 4 and 5) was treated in 1983 by burying 315 kg of soda ash in the groundwater flow path leading to the seep and placing 45 kg of soda ash on the surface of the seep (Spalding and Munro 1983). The concentration of strontium-90 in the seep water fell from an average of 190 nCi/L to 24 nCi/L for the 90 days after burial, followed by a period of gradual rise back to pretreatment levels over the next 100 days. The electrical conductivity and pH of the seep water increased following soda ash burial, while water hardness fell. Hardness was highly correlated ($r = 0.84$) with strontium-90 concentrations over the entire 2-year observation period, indicating the similar behavior of strontium-90 and soluble calcium and magnesium. This in situ softening and strontium-90 precipitation from the seep water was achieved by coprecipitation of strontium-90 with $\text{Ca}(\text{Mg})\text{CO}_3$ until the buried soda ash was depleted by dissolution in the groundwater.

The soda ash treatment of groundwater seeps appears to be practical as an interim technique for those situations requiring an immediate, but temporary, corrective action. Affected radionuclides may be limited to strontium-90 and possibly cobalt. During this limited but effective period, more permanent corrective actions could be planned at the source of contamination. The electrical conductivity, pH, and hardness of Melton Branch, the stream into which this seep discharges, were not affected by the soda ash burial, probably due to the approximately 2000-fold dilution effected by this stream (Spalding and Munro 1983).

WAG5 05F103.DGN
3/26/93

Fig. 4. WAG 5 Source Area C.

WAG5 05F100.DGN
3/26/93

Fig. 5. WAG 5 Source Area C: existing features/proposed sampling locations.

WAG 2 Seep Sampling Program. Preliminary results from samples collected during wet and dry season base flow conditions in 1992 found levels of strontium-90 in Seep 05.SP006 (WAG 2 SW5-4) to be around 500 nCi/L. Tritium concentrations were about 7000 nCi/L, and gross alpha activity was ~ 13 nCi/L.

2.4 AREA D

As shown on Fig. 6, Area D is a strontium-90 seep in the bank and bed of Melton Branch about 25 m upstream of the confluence with WOC. The source of this seep is unknown but is suspected to be near the boundary of WAG 5 and WAG 2 below the Old Hydrofracture Facility (OHF). Existing data characterizing this seep are restricted to the results from the WAG 2 seep sampling effort along Melton Branch. Available data from nearby WAG 5 perimeter monitoring well 977 and RAP piezometer 728 show the presence of elevated tritium in this area, but no major beta activity was detected.

3. STRATEGY AND RESPONSE ACTION

In accordance with the National Contingency Plan and as briefed in our previous regulatory working group meeting, we have followed a decision process that leads us to non-time-critical removal actions and the need for additional investigation within WAG 5. The process led us to either a removal action or remedial action. Our data currently point to a removal action. Then one must decide between emergency actions, time-critical actions, and non-time-critical actions. We decided that this situation falls into a non-time-critical action approach. Following the process, our preliminary assessments have resulted in this document. Recommendations for removal actions are summarized in the table below. The next step is to begin an engineering evaluation/cost analysis (EE/CA) for Areas C and D. In parallel we will focus our investigation on sources of contamination in Areas A, B, C, and D.

Response actions summary

Area		Response action	
		Removal	SIWP
A	Source	N	Y
	Discharge	N	Y
B	Source	N	Y
	Discharge	N	Y
C	Source	N	Y
	Discharge	Y	Y (EE/CA)
D	Source	N	Y
	Discharge	Y	Y (EE/CA)

Potential removal actions for each area are described below.

WAG5 05F102.DGN
3/26/93

Fig. 6. WAG 5 Source Area D: existing features/proposed sampling locations.

3.1 AREA A

Area A is characterized by a relatively discrete discharge at a seep in the bank of the Melton Branch tributary; the primary contaminant of concern is tritium. Because there is no effective treatment for tritiated water, collection and treatment of the groundwater discharging from Area A would not be a practical removal action. Instead, future efforts should be focused on source containment by hydrologic isolation or, perhaps, cryogenics (freezing). Identification and characterization of the source term and contaminant pathways are still needed for Area A. In addition, future hydrologic isolation will require a better understanding of the groundwater and surface water contribution to contaminant movement in this area to evaluate the need for surface water (e.g., diversion ditches and cap) and groundwater control systems (e.g., slurry walls and subsurface mats).

3.2 AREA B

Area B is not characterized by a discrete discharge but instead is identified by an increase in tritium along this reach of Melton Branch as identified by the WAG 2 seep sampling effort. In addition, little is known about the contaminant pathways or sources in this area. Like Area A, where tritium is the primary contaminant of concern, hydrologic isolation of sources would be the most effective action for reducing releases in Area B. Investigations are needed to identify and characterize the source term and contaminant pathways in this area.

3.3 AREA C

Area C is characterized by a discrete discharge (Seep 05.SP006) that flows into Melton Branch; the primary contaminant of concern is strontium-90. Potential source control actions include treating in place, collecting and treating the seep discharge, and identifying and hydrologically isolating the source. Therefore, with a better understanding of the contaminant flux at the seep, a non-time-critical removal action should be implemented with the EE/CA document. This strontium-90 contaminated water can be collected either at the seep or via an interception trench upgradient of the seep that would intercept the contaminated groundwater. Important issues include determining whether the ORNL Process Waste Treatment Facility (PWTF) can process the volume of collected water and whether other contaminants (e.g., tritium, gross alpha) can also be treated without exceeding the facility's permit requirements.

In situ treatment or collection and treatment are early actions that may significantly reduce the strontium-90 being released from this area. Containment of identified source areas (e.g., trenches) by hydrologic isolation of the source term from the groundwater pathway may also significantly reduce releases at the seep. Hydrologic isolation will require a better understanding of the groundwater and surface water contribution to contaminant movement in this area to evaluate the need for surface water (diversion ditches and cap) and groundwater (slurry walls and subsurface mats) control systems. Other options include the use of either a horizontal interceptor well or an in situ treatment fence, but both require more research and development.

3.4 AREA D

Similar to Area C, Area D is also characterized by a fairly discrete strontium-90 discharge (i.e., seep) into Melton Branch. With a better understanding of the flow path, a non-time-critical removal action should be implemented with the EE/CA document. The strontium-90 contaminated water may be collected via a french drain with an extraction sump in the seep area adjacent to Melton Branch that would collect the contaminated groundwater. Important issues include determining whether the PWTF can process the volume of collected water and whether other contaminants (e.g., tritium, gross alpha) can also be treated without exceeding the facility's permit requirements.

Collection and treatment is an early action that may reduce the strontium-90 being released from this area. Containment of identified source areas is a more long-term solution. However, unlike the other source/seep areas, Area D is not characterized by upgradient trenches that are likely sources. Area D is downgradient of the OHF pond, tanks, and spill sites, as well as SWSA 5. The task of source area identification may be more difficult in this area.

4. PLANNED ACTIVITIES SUPPORTING SOURCE AREA INVESTIGATIONS

Current plans for WAG 5 site characterization investigations are described in the *Remedial Investigation Plan for Waste Area Grouping 5 at Oak Ridge National Laboratory, Oak Ridge, Tennessee, Volume 2: Appendixes and Addendum 1 to Appendix A*. These investigations will also support the proposed source area investigations. Specific supporting activities that include the source/seep areas are

- characterization of groundwater movement through and away from WAG 5,
- characterization of groundwater quality in the vicinity of WAG 5,
- assessment of types and concentrations of contaminants associated with releases from WAG 5,
- assessment of interactions between surface water and groundwater systems,
- surface geophysical surveys to identify trench boundaries, bedrock topography, and the presence of radiological constituents at the ground surface, and
- surface water and seep sampling during high and low groundwater table and storm events; analysis includes Target Compound List/Target Analyte List compounds and radiological constituents.

Current plans for WAG 2 site characterization investigations are described in the Remedial Investigation Plan, ORNL Waste Area Grouping 2. These investigations will also support the proposed source areas investigations. Specific supporting activities include

- characterization of contaminant transport in Area A,

- identification of contaminant plumes and pathways in Areas B and D, and
- surface water sampling along Melton Branch and Melton Branch tributary.

5. PROPOSED ACTIVITIES FOR SOURCE AREA INVESTIGATIONS

5.1 CONTAMINANT TRANSPORT PROPERTIES

A significant limitation in defining remedial actions at WAG 5 results from the poorly defined source terms associated with the burial areas. It is not well known whether primary tritium sources are still active and what the consequences of secondary matrix sources may be. Because the primary tritium source is ill-defined, quantifying the processes associated with the secondary source becomes very difficult. This presents a problem for environmental remediation because predictive simulations of transport phenomena become an inaccurate means of risk assessment.

A Br⁻ tracer study is proposed to define the diffusive mass transfer kinetics of tritium within the secondary matrix source at WAG 5. By utilizing the tracer Br⁻ as a well-characterized primary source, quantification of solute diffusion rates within the subsurface media will be possible.

Thus, the objectives of this study are to

- define the relative importance of primary vs. secondary source regimes to the total off-site transport of tritium from WAG 5,
- quantify the advective and diffusive mass transfer of tritium within secondary source regimes at WAG 5, and
- provide an improved understanding and predictive capability of tritium release from WAG 5.

Our approach will involve the installation of three drive-point wells and tracer injection studies at both the laboratory and field scales using undisturbed soil columns and groundwater monitoring wells at Area A. The drive-point wells will be located in an arch perpendicular to the suspected tritium pathway and sampled to verify the pathway and determine the extent of the secondary source (primarily tritium) in this area. Large undisturbed columns will be extracted horizontally from the subsurface media in a clean area, and transport experiments will be conducted using transient saturated and unsaturated flow with periodic flow field interruptions to simulate groundwater recharge scenarios. The experiments are designed to investigate multiregion flow and transport and quantify the diffusive mass transfer of solutes in heterogeneous porous media. Field-scale studies will involve two independent experiments focusing on the natural gradient injection of a known pulse concentration of Br⁻ within a fast-flowing fracture regime and the slow-flowing matrix in Area A. The spatial and temporal distribution of Br⁻ will be monitored at several downgradient wells using multilevel piezometric sampling arrangements. The observed data will demonstrate whether the lateral transport of Br⁻,

thus tritium, occurs through subsurface matrix porosity that is not dominated by fracture flow. This information is critical for assessing the rate of tritium transport off site and determining the relative contribution of primary and secondary source regimes.

Using a numerical transport model and the information gained from the column and in situ transport, experiments will provide a better understanding of subsurface transport processes and contaminant sources.

5.2 IDENTIFICATION OF SOURCE TRENCHES

The objective of the source trenches investigation in the source/seep areas is to determine the probable source locations for contaminants of concern by measuring trench saturation conditions and contaminant concentrations in trench water. Existing trench wells and shallow groundwater wells within the source area boundaries (Figs. 2, 3, 5, and 6) will be monitored and sampled. New trench piezometers will be installed by driving well points for monitoring and sampling. Water levels will be measured to assess the presence and occurrence of trench water and its hydrologic relationship with groundwater. Sampling and analysis of trench water will be conducted for determination of contaminant concentration trends and for comparison with groundwater analytical results. Identification of contaminant sources will help identify pathway(s) that contribute to releases at each area.

Piezometers will be installed at the downslope end of each trench as shown on Figs. 2, 3, and 5; 48 piezometers are estimated. The actual number of piezometers installed may vary, but a minimum of one location per trench is anticipated. Actual locations will be selected to correlate with visible evidence of trenches (e.g., surface depressions). Other site-specific field conditions such as access and installation difficulty may also affect the number installed and their locations. If additional data needs are identified after assessment of initial sampling and monitoring information, additional piezometers may be installed in trenches and adjacent areas.

During piezometer installation, the penetration rate/blow count and driving energy source will be recorded. Driving will laterally displace subsurface materials; no upward displacement of below-grade materials is anticipated. Soil sampling is not planned for the trench piezometers. Maximum piezometer depth is estimated to be 15 ft, in accordance with the anticipated maximum trench depth.

Sampling frequency for trench waters will be planned to determine variability in contaminant concentrations in response to storm events and provide a base level concentration profile.

Analysis of trench water and groundwater samples will be performed at the Close Support Laboratory (CSL). The initial round of samples will include (at a minimum) tritium and volatile organics, filtered and nonfiltered analyses for gross alpha and beta activity, total radioactive strontium, and gamma spectroscopy. Subsequent samples will focus on contaminants of concern (i.e., tritium and strontium) and any other significant contaminants detected in the initial round. At least two full sampling rounds are anticipated; specific areas of interest may require additional, more focused sampling efforts.

5.3 SURFACE WATER SAMPLING

The objectives of additional surface water/seep investigations planned at Area C are to

- determine contaminant distribution and seasonal trends of the existing seep discharge and
- identify and quantify contaminant flux and discharge volumes to support removal action.

The seep location is identified as 05.SP006 on Figs. 4 and 5. At a minimum, grab samples will be collected to assess seasonal variations in contaminant flux. Automatic samplers may be used to obtain discrete samples during storm events. Flow measuring devices will be used to quantify discharge volumes and seasonal variability.

Seep sampling frequency should be planned to determine variability in contaminant concentrations in response to storm events and provide a base level concentration profile. Sampling and monitoring of Area C wells/piezometers should be consistent with seep sampling. At least two storm sampling events are anticipated.

Sample analyses to be performed at the CSL will include (at a minimum) tritium and volatile organics, filtered and nonfiltered analyses for gross alpha and beta activity, total radioactive strontium, and gamma spectroscopy. Additional sampling may be required to focus on contaminants of concern (i.e., tritium and strontium) and any other significant contaminants detected.

6. DOCUMENTATION

The regulatory working group meeting minutes will be the formal documentation needed to proceed with our actions.

Information obtained during the investigation will be shared by WAG 5 and WAG 2 personnel. The information will be integrated into the WAG 5 and WAG 2 RI Reports as appropriate.

REFERENCES

- Duguid, J. O. 1975. *Status Report on Radioactive Movement from Burial Grounds in Melton and Bethel Valleys*, ORNL-5017, Oak Ridge National Laboratory, Oak Ridge, Tennessee.
- Spalding, B. P. and I. L. Munro 1984. *Determination of the Areal Distribution of Sr-90 in Groundwater Via Single-Use Boreholes*, ORNL/TM-8991, Oak Ridge National Laboratory, Oak Ridge, Tennessee.
- Spalding, B. P. and I. L. Munro. 1983. "Soda Ash Treatment of a Strontium-90 Contaminated Groundwater Seep," *Journal of Environmental Quality*, Vol. 12 No. 3.
- Wickliff, D. S. , D. K. Solomon, and N. D. Farrow. 1991. *Preliminary Investigation of Processes that Affect Source Term Identification*, ORNL/ER-59, Oak Ridge National Laboratory, Oak Ridge, Tennessee.

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