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**ENVIRONMENTAL
RESTORATION
PROGRAM**

**Best Management Practices Plan
for Phase II
of the Bear Creek Valley
Treatability Study
Oak Ridge Y-12 Plant,
Oak Ridge, Tennessee**

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LOCKHEED MARTIN ENERGY SYSTEMS, INC.
FOR THE UNITED STATES
DEPARTMENT OF ENERGY

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**Best Management Practices Plan
for Phase II
of the Bear Creek Valley
Treatability Study
Oak Ridge Y-12 Plant,
Oak Ridge, Tennessee**

Date Issued—May 1997

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Science Applications International Corporation
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Environmental Management Activities at the
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Oak Ridge, Tennessee 37831
managed by
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
for the
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PREFACE

The Bear Creek Valley Treatability Study Best Management Practices was prepared under the Environmental Restoration Program to support the investigation of the practicality of the use of passive, in situ treatment systems to remove contaminants from the Bear Creek Valley Characterization area. This work was performed under Work Breakdown Structure (WBS) 1.1.02.41.10.34.20. This report will be used to direct investigations during Phase 2.

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ARARS FOR THE BCV TREATABILITY STUDY

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ABBREVIATIONS

BCV	Bear Creek Valley
Energy Systems	Lockheed Martin Energy Systems
ETTP	East Tennessee Technology Park
FCO	field change order
HASP	Health and Safety Plan
ORNL	Oak Ridge National Laboratory
SAP	Sampling and Analysis Plan
WMP	Waste Management Plan
ZVI	zero valent ion

1. INTRODUCTION

1.1 SITE DESCRIPTION

The Oak Ridge Y-12 Plant site is currently under a Federal Facilities Agreement to define soil and groundwater contamination and develop remedies to protect human health and the environment. The western end of the site is known to have a former nitric acid disposal pit that has been remediated and capped. Remedial investigation data indicate this pit was a source of nitrate, uranium, technetium, and other metals contamination in groundwater. The downgradient receptor of this contamination includes Bear Creek and its tributaries (Fig. 1). A feasibility study is underway to develop a remedy to prevent further contaminant migration to this receptor. To support the feasibility study, a treatability study is being completed to examine groundwater treatment at the S-3 site.

This document serves as the top level command medium for Phase II and as such will be the primary resource for management and implementation of field activities. Many of the details and standard operating procedures referred within this document can be found in other Lockheed Martin Energy Systems (Energy Systems) documents. Several supporting documents specific to this project are also cited. These include the Sampling and Analysis Plan (SAP), the Health and Safety Plan (HASP), and the Waste Management Plan (WMP).

Section 1 describes the results of Phase I efforts. Section 2 describes the objectives of Phase II. Section 3 provides details of field testing. Section 4 addresses the HASP. Section 5 describes the SAP. Section 6 introduces the WMP. Environmental compliance issues are discussed in Section 7, and sediment and erosion control is addressed in Section 8. Information about the project team is provided in Section 9.

1.2 PREVIOUS TREATABILITY STUDY ACTIVITY

A three-phase treatability study has been developed to examine the feasibility of using in situ and ex situ systems to remove metals and nitrate from groundwater prior to its entry into Bear Creek. Phase I produced a ranking of applicable treatment media through preliminary laboratory screening tests using site water. It also delineated three major contaminant pathways that extend from the S-3 Ponds to Bear Creek and its tributaries. The results provided valuable guidance on which media may be effective; however, no long-term performance data exist. Before a successful treatment system can be designed, the implementability of the conceptual approach must be determined. Phase II is planned to develop long-term treatment efficiencies and to identify design considerations. Phase III will design and implement an early action treatment system.

2. OBJECTIVES

The Bear Creek Valley (BCV) Treatability Study is intended to provide site-specific data defining potential treatment technologies applicable to contaminated groundwater and surface water. This project directly supports Alternative 5 of the base action in the BCV Feasibility Study, and indirectly supports other alternatives through proof of concept. In that role, the ultimate goal is to

LEGEND:

- BEAR CREEK & TRIBUTARIES
- SUBWATERSHED BOUNDARY
- ▽ NT-2..... SURFACE WATER SAMPLE (OU4)
- SS-1..... AT SPRINGS (OU4)

URANIUM IN SOURCE AREAS

Fig. 1.1. Bear Creek Valley showing the relationship between the main waste units and contaminants flux in tributary streams.

install a treatment system that will remove uranium and nitrate from groundwater before it reaches Bear Creek. An additional goal is the concurrent removal of technetium and several metals. This project is intended to produce treatment performance data required to design the treatment system to reach those goals.

In addition, this project will generate information that can be applied to other sites within the Y-12 Plant, East Tennessee Technology Park (ETTP) (formerly referred to as Oak Ridge K-25 Site), and Oak Ridge National Laboratory (ORNL) (formerly referred to as X-10). The objectives are categorized as follows.

Media Performance Objective

Operate in-field continuous flow tests over an extended time period (6 weeks) to generate data on long-term treatment effects on potential treatment media including Dowex 21K anion exchange resin, peat moss, zero valent iron (ZVI), iron oxide, constructed wetlands, and algal mats treatment. The product will be performance data required to begin a treatment system design and recommended treatment media for locations within the S-3 area.

3. OPERATING PLANS

3.1 MEDIA PERFORMANCE OPERATING PLAN

This plan for operating the media columns in Phase II of the BCV Treatability Study was developed to meet the objectives taken from the *Bear Creek Valley Treatability Study Phase I Report* (SAIC 1997). The references for the objectives are noted in parentheses. The objectives are numbered for procedural purposes.

3.1.1 Dowex

1. Measure sorption capacity at breakthrough and effluent quality for uranium at GW-835 (pp xi, 3-4, and B-23).
2. Compare sorption capacity at breakthrough and effluent quality for uranium at GW-835 with same for peat moss (pp 3-4 and B-23). Does Dowex have technical advantages (in terms of sorption capacity at breakthrough and/or long term stability) to overcome factor of 60 in difference of cost (\$4.16/lb vs \$0.07/lb)?

3.1.2 Peat Moss

1. Measure sorption capacity at breakthrough and effluent quality for uranium at GW-835 and GW-837 (pp xi and B-23).
2. Verify sorption capacity at breakthrough and effluent quality for uranium are unaffected by high ionic strength (pp xi and B-23).

3. Verify removals and effluent qualities for up to six other non-rad metals in both wells (p 3-7).
4. Verify stability of peat moss over a long period of time (p 3-6).

3.1.3 Zero Valence Iron

1. Investigate the mechanism of the removal of uranium (pp xii and 3-27).
2. Demonstrate long-term fate of uranium and/or stability of the iron oxide floc (pp xii, 3-27, and D-10).
3. Demonstrate that iron flocs containing sorbed uranium can be controlled especially in passive system (p 3-22) and watch out for colloidal ferrihydrate at high pH (pp D-56, D-65, and D-66).
4. Verify which design scaleup model describes removal of uranium by ZVI; i.e., is it by chemical reaction such that half life is the key design variable or is it by adsorption such that loading capacities and/or isotherms are the key design variables? (p 3-7).
5. Mix ZVI with other products to enhance the retainment of uranium (p 3-27).
6. Compare sorption capacities at breakthrough of uranium between GW-835 and GW-837 (p 3-27).
7. Confirm that OH^- formed by the corrosion of iron is flushed from a media bed so that the adverse effect of passivating the iron at high pH is avoided (pp D-9 and D-66).
8. Verify removal of up to six other non-rad metals in both wells (p D-10).
9. Measure pressure drop to determine if bed is plugging due to cementation of iron (p D-10).
10. Test a system that avoids the plugging/passivating of a ZVI bed by mixing an inert medium (sand) or reactive matrix (pelletized iron oxide) with ZVI. The objective is to separate iron particles so that they won't cement together and perhaps minimize the self-passivation of iron substrates by allowing for better dilution of OH^- byproduct (p D-10).

3.1.4 Goethite (iron oxide)

1. Measure sorption capacity at breakthrough and effluent quality for uranium of pelleted forms (p 3-27).
2. Compare sorption capacities at breakthrough and effluent qualities for uranium between GW-835 and GW-837 (p 3-27).
3. Demonstrate that iron flocs containing sorbed uranium can be controlled especially in passive system (p 3-22).

3.1.5 Native Soil

1. Measure compatibility of treated water with the surrounding subsurface environment (p 4 of Phase II Project Plan).

3.1.6 Combined Treatment

1. Test effectiveness of sequence that removes uranium and heavy metals from GW-837 and then treats nitrate biologically (p D-67).

3.1.7 Operating Conditions

The conditions for the tests are presented in Table 1. They were developed by considering the interaction of several factors including:

- the sizes of the columns,
- the flow rates,
- the bulk densities of the media,
- the superficial velocities (low enough to be compatible with low available pressure of the passive design configuration but high enough to give good flow distribution),
- the loading capacity observed in Phase I, and
- the estimated times to breakthrough (trying to keep breakthrough time between 7 and 35 days).

3.1.8 Operational Considerations

The objective of each test is to measure the sorption capacity at breakthrough and effluent quality. Each column will be run until the effluent uranium concentration is 50% of the feed concentration because the sorption capacity needs to be measured to breakthrough. Sorption capacity will be computed by integrating the breakthrough curve up through the breakthrough point.

Based on information currently available, the trailer from Portsmouth Gaseous Diffusion Plant containing test columns and auxiliary hardware will be used for the tests at GW-835 and the panel fabricated by Y-12 Plant will be used for the tests at GW-837. The trailer was selected for the tests at GW-835 because it has the capability to monitor and record flows, pressures, and pressure drop, which is desirable for unattended operation. This will help assure that the volume of water treated by each column is known throughout the test. The trailer will be retrofitted with 1.5- or 3-in. diameter columns, as noted in Table 1, because the data generated in these columns will meet the objectives of this project. The existing 12-in. diameter columns are too big for the available flow rates. A schematic of the columns and ports are provided in Fig. 2.

The volume of water treated by each column will be verified by collecting and measuring the volume of effluent every 1 to 2 days. This will give an independent verification of the readings taken from the flow meters. This backup measurement is a precaution against the probability of the flow to one or more columns varying due to changing pressure drops in the system. The effluents will be pumped to the water dissipation area.

Table 1. Sequence of operations for media columns

Column/feed source	Bed media		Column dimensions		Flow Liters per min.	Est'd break-through Days	Daily volume of effluent 55-gal drums	Sampling	
	Objective (see text)	Specification	Dia. (in.)	Length (ft.)				Location	Frequency ^a
A-1 835	Dowex 1,2	Dowex 21k resin	1.5	1.25 each for 2 columns in series	0.15	18 for lead column	0.98	1-F, 1-M, 1-Eff.	Daily 1st 5 days, then every 2 days
A-2 835	Peat Moss 1,3,4	Peat Moss	3.0	2.5	0.10	27	0.67	2-Feed, 2-Eff.	Daily 1st 5 days, then every 2 days
A-3 835	ZVI 1,2,3,4,6	Masterbuilders (40 mesh)	3.0	2.5	0.05	30	0.33	3-Feed, 3-Eff.	Daily 1st 5 days, then every 2 days
A-4 835	Goethite 1,2,3	Goethite (foam)	3.0	2.5	0.10	30	0.67	4-Feed, 4-Eff.	Daily 1st 5 days, then every 2 days
A-5 837	Peat Moss 1,2,3,4	Peat Moss	3.0	2.5	0.05	4.8	0.33	5-Feed, 5-Eff.	Daily 1st 5 days, then every 2 days
A-6	ZVI 1,3,4,6,7,8	Masterbuilders (40 mesh)	3.0	2.5	0.05	30	0.33	6-Feed, 6-Eff.	Daily 1st 5 days, then every 2 days
B-1 835	Dowex ^b	Dowex 21k resin	1.5	1.25 each for 2 columns in series	0.15		0.98	1-F,1-M, 1-Eff.	Daily 1st 5 days, then every 2 days
B-2 835	^b							2-Feed, 2-Eff.	Daily 1st 5 days, then every 2 days
B-3 835	^b							3-Feed, 3-Eff.	Daily 1st 5 days, then every 2 days
B-4 835	^b							4-Feed, 4-Eff.	Daily 1st 5 days, then every 2 days
B-5 837	Goethite 1,2,3	Goethite (foam)	3.0	2.5	0.10	30	0.67	5-Feed, 5-Eff.	Daily 1st 5 days, then every 2 days
C-1 835	^b								Daily 1st 5 days, then every 2 days
C-2 835	^b								Daily 1st 5 days, then every 2 days
C-3 835	^b								Daily 1st 5 days, then every 2 days
C-4 835	^b								Daily 1st 5 days, then every 2 days

Table 1. (continued)

Column/feed source	Bed media		Column dimensions		Flow Liters per min.	Est'd break- through Days	Daily volume of effluent 55-gal drums	Sampling	
	Objective (see text)	Specification	Dia. (in.)	Length (ft.)				Location	Frequency ^a
C-5 837	ZVI-5	ZVI and peat moss	3.0	2.5	0.05		0.33	5-Feed, 5-Eff	Daily 1st 5 days, then every 2 days
D-1 835	^b								Daily 1st 5 days, then every 2 days
D-2 835	^b								Daily 1st 5 days, then every 2 days
D-3 835	^b								Daily 1st 5 days, then every 2 days
D-4 835	^b								Daily 1st 5 days, then every 2 days
D-5 837	^b								Daily 1st 5 days, then every 2 days

^a Many samples will be archived but analyzed only to fill in gaps in the data. In addition, sampling Frequency will be optimized based on results of samples early in each series of runs.

^b Conditions for these runs will be selected based on the results of the tests in earlier series.

55-gal drums to totalize flow will be pumped once every 1-3 days and discharged to the ground.

- Columns 1A and 1B are each 1.25' x 1.5" DIA.
- Columns 2-3 are 2.5' x 3" DIA.
- Columns 4-6 are 2.5' x 3" DIA.

Fig. 2. Schematic of columns and ports.

Samples will be taken from the feed to the system and effluents of each column on the schedule shown in Table 1 and archived. Selected samples will be analyzed based on the expected breakthrough time so that 8 to 15 data points are obtained for each effluent breakthrough curve. This means that samples will be analyzed more frequently for tests with short breakthrough cycles. Archived samples will be analyzed to fill in data gaps identified by analytical results. The analyses of the sample of the common feed to the columns in the trailer will be used for all of the pertinent tests.

The media will be loaded in the columns as slurries with precautions taken to prevent air from entering the columns. This is because any portion of the bed that has air will be taken out of service because it is no longer in contact with the water being treated. This also means that the columns should be maintained liquid full and never drained out.

The quantity of media used in each column will be carefully measured on a dry basis so that sorption capacities can be computed in terms of grams of uranium per gram of dry media.

The pressure drop across each column will be monitored throughout each test to measure the pressure required to push the water through the media and how it changes with time (if at all). These data in conjunction with the superficial velocity can be used to determine the hydraulic conductivity of the media in this service.

Since one of the purposes of the tests with the ZVI and goethite is to verify that the iron flocs that are produced stay in the column, the effluent from these tests will be individually filtered to measure the amount of suspended solids and uranium that are in the effluent. In addition, solid samples of the used ZVI will be examined visually at the completion of the study. Subsequent column testing details will be generated based on the results of the first test. These tests may repeat media and flow rates to confirm breakthrough or other observations that may impact design. It is during these follow-on tests that the interaction of effluent with native soil will be examined.

3.2 ALGAL MATS BIOREACTOR OPERATING PLAN

Objective: To determine the long-term capacity of mats to remove metals and nitrate from groundwater. In addition, a preliminary engineering study will be completed to determine possible configurations for in-stream deployment of this system.

During the column tests, an algal mat reactor will be plumbed to receive a continuous flow of groundwater from the same well used to feed the columns. Operating conditions are summarized in Table 2. Sampling and analysis details can be found in the project SAP. The mats will be monitored twice weekly for influent and effluent water quality criteria (pH, Eh, conductivity, temperature, nitrate). Effluent samples will be collected once per week for metals analysis. The mats reactor will be inspected 5 days per week. The inspection will include visual observation of mats physical status and water flow rate. Observations will be noted in a bound field notebook. The mats will be maintained for 24 weeks to establish a long-term uptake rate. At the completion of the treatment period, solids samples will be collected from three locations within the reactor to determine uptake relative to biomass. The results of this testing will document the full denitrification and metal removal capacity relative to influent concentration.

Table 2. Mats test conditions

Operating condition	Details
Location	Well GW-837
Duration	24 weeks
Flow rate	60 mls/min, continual
Sampling locations (water)	effluent only
Sampling frequency (water)	twice per week
Solids sampling	3 locations at termination of test

3.3 WETLANDS OPERATIONS

Objective: To determine the denitrifying capacity and metal uptake capacity of mature wetlands systems operating without supplemental carbon. In addition, testing will determine the relative uptake of metals into the solid plant mass so that accumulation capacity can be predicted over longer treatment periods. The results of this work will provide the basis for design of constructed treatment wetlands to address the contaminated surface water tributaries.

The Phase I wetlands testing program provided preliminary data relative to removal of uranium and nitrate from spring SS-4 water. The test period was too short to demonstrate the full capacity of a mature wetlands system. A summary of Phase II operating conditions is provided in Table 3. Activities in this task will focus on re-establishing flow at approximately 200 mls/min through the wetlands and documenting uranium and metal uptake during the spring and summer season. A schematic of the wetland system and its sampling ports are shown in Fig. 3. During this period, field data (pH, oxidation-reduction potential, conductivity, temperature, nitrate) will be collected weekly, and water samples will be collected bi-weekly and archived. Monthly samples will be submitted for metals analysis as described in the SAP. Additional archived samples will be submitted based on technical observations of performance. At the beginning and end of the program, solid root mass will be collected and analyzed for metal uptake. Details of sampling and analysis are described in the SAP. The program will continue for 28 weeks. This information is required to produce an effective model for long-term treatment capacity.

Table 3. Wetlands test conditions

Operating condition	Details
Location	SS-4
Duration	28 weeks
Flow rate	200 mls/min, continual
Sampling locations (water)	influent and effluent, each cell
Sampling frequency (water)	twice per month
Solids sampling	3 locations per cell at beginning and termination of test

Fig. 3. Sampling locations.

3.4 BASELINE SAMPLING

To determine the pretreatment characteristics of the downgradient receptor, six locations have been chosen for monthly monitoring. The locations are shown in Fig. 3. Three locations are surface water and three are groundwater wells. Details of sampling and analysis are provided in the SAP. These locations will be sampled over a period of 7 months so that the impact of wet and dry seasons will be recorded.

4. HEALTH AND SAFETY

A project HASP has been developed using Energy Systems standard practices when applicable. This plan describes all of the requirements to conduct project activities at the Y-12 Plant site. It is the responsibility of the project managers, field managers, and site safety and health officers to ensure that this work is done safely. These personnel will verify that the HASP is sufficiently protective. If it is determined that the requirements of the HASP are not sufficiently protective, a field change order (FCO) will be prepared. FCOs will include a completed job hazard analysis or similar worksheet to ensure complete hazard assessment. FCOs must be approved by the Program Manager, Health and Safety Manager, subcontractor project or field manager, and subcontractor Health and Safety representative. As a minimum, FCOs will be prepared if additional tasks will be performed.

5. SAMPLING AND ANALYSIS

A SAP has been developed for each of the tests planned during Phase II. This plan is provided under separate cover and includes tabulated sample descriptions, methods, quality assurance, and data management plans.

6. WASTE MANAGEMENT

A WMP has been developed for this project. This plan has been approved by the West End site environmental coordinator and by an Energy Systems waste management professional. This plan is subject to modification if variations in waste production occur.

7. ENVIRONMENTAL COMPLIANCE

The Tennessee Department of Environmental Conservation has been informed of the described project activity including the intention to follow a best management practices plan. Compliance requirements will be maintained throughout all construction, testing, and sampling activity. The applicable or relevant and appropriate requirements for the BCV Treatability Study are in Appendix A.

8. SEDIMENT AND EROSION CONTROL

Sediment and erosion control is specifically addressed to mitigate environmental stress during the Tennessee Dace mating season. To achieve this goal, all construction activity will occur as far from Bear Creek as is practical. In addition, silt fencing and water filtration using standard construction protocols will be implemented throughout the construction phase.

9. PROJECT TEAM

The project team is shown in Fig. 4. The key individuals and communication information are provided in Table 4. This team will be informed of all progress and project changes for the duration of activity.

The responsibility matrix (Table 5) describes the role of each team member according to tasks. A single team member is primarily responsible for each tasks, with secondary or supporting responsibility from other team members as needed.

Fig. 4. Project team.

Table 4. BCV team roster

Name	Organization	Address	Phone No.	Pager No.	Fax No.	E-mail address
John H. Vanderlan	LMES/Project Manager	9734, MS-8130	576-2745	873-6229	574-1660	vanderlanjh@ornl.gov (JHV)
Mike A. Travaglini	DOE/Program Manager	IRC, MS-EW911	576-0848	-	576-6074	travaglinima@oro.doe.gov
Rick Adkisson	Entech	560 Oak Ridge Turnpike, Suite 2, Oak Ridge 37830	481-3231	-	481-3501	entechoakridge@sprintmail.com
Jim A. Davis	LMES/ER Sample Mgmt.	K-1001, MS-7169	241-5066	873-4382	574-9433	davisjal@ornl.gov (J9D)
Virginia M. Forsberg	LMES/Data Mgmt.	9734, MS-8130	574-7000	-	574-1660	forsbergvm@ornl.gov (VMF)
Jeff C. Henderson	LMES/WMO	K-1037, MS-7346	241-2410	873-6112	241-2533	hendersonjc@ornl.gov (HCJ)
Maureen Leavitt	SAIC	SAIC/Jackson Plaza	481-4614	-	481-8797	leavittm@orjt1.saic.com
Rebecca L. Marcum	PWT/LMES	9983-67, MS-8248	576-0539	873-1623	576-3808	marcumr@onrl.gov (6RM)
Larry E. May	LMES/Health & Safety	K-1330, MS-7298	576-4018	873-6115	574-9538	mayle@ornl.gov (L4M)
P. Duncan Moss	SAIC	SAIC/Jackson Plaza	481-4752	-	481-8797	philip.d.moss@cpmx.saic.com
Becky Sams	Jacobs	3 Main, MS-Jacobs	220-4869	-	220-4848	becky.sams@jacobs.com
L. Gay Schaffer	LMES/Project Secretary	9734, MS-8130	576-6189	-	574-1660	schafferlg@ornl.gov (GSQ)
Dave B. Watson	LMES/Tech Lead	1509, MS-6400	241-4749	873-4822	574-7420	watsondb@ornl.gov (V6I)
Steve A. White	LMES/Civil	K-1550-U, MS-7233	576-6492	-	241-4634	whitesal@ornl.gov (WHZ)
Mick C. Wiest	LMES/Compliance	9116, MS-8098	574-3390	417-5261	574-9041	wiestmcjr@ornl.gov (MXY)

Table 5. BCV responsibility matrix

Task	SAIC	Entech	LMES WM	LMES SMO	LMES WETF	LMES Eng'g	LMES ESD	LMES HP
1. Hydraulic Performance								
1.1 Existing Systems Review	2	1						
1.2 Field Preparation & Mobilization								
1.2.1 Permits		1	2					
1.2.2 Readiness Review	2	1	2		2	2		
1.3 Field Installation								
monitoring wells		1						
trench		1					2	
horizontal well		1				2	2	
IDW/Demob		1	2			2	2	
H&S compliance	1	2						2
1.4 System Performance								
Hydraulic Testing		1						
Sampling								
hydraulic		1						
surface Water	1							
Analytical				1				
Waste Management		1	2		2			
Technical Memo	2	1				2		
1.5 Modeling								
1.5.1 Calibration	1	2					2	
1.5.2 Treatment Simulation	1	2					2	
2. Media Performance								
2.1 Existing Systems Review	1		2				2	
2.2 Field Panel Studies								

- 1 = primary responsibility
2 = secondary responsibility

Table 5. (continued)

Task	SAIC	Entech	LMES WM	LMES SMO	LMES WETF	LMES Eng'g	LMES ESD	LMES HP
2.2.1 Workplan finalization	1		2	2	2		2	
2.2.2 Installation/start-up	1		2			2	2	
2.2.3 Maint/sampling	1		2	2				
2.2.4 Wetlands/Algal Design	1						2	
2.2.5 Technical lab mgmt	1						2	
2.2.6 Analytical	1			2				
2.2.7 H&S Compliance	1							2
2.3 Technical Memo	1						2	
3. Project Management								
3.1 Work Plans								
3.1.1 BMP	1	2						
3.1.2 SAP	1	2						
3.1.3 HASP	1	2						
3.1.4 WMP	2	1	1			2	2	
3.1.5 Trench Designs	2	1				2	2	
3.1.6 Well Designs	2	1					2	
3.1.7 Hydraulic Test Design	2	1						
3.2 Monthly reports	1	1						
3.3 Meeting minutes	1							
3.4 Envirowall Coordination	2						1	
3.5 Data Management	1	2						
3.6 Phase 2 Report	1	2					2	

1 = primary responsibility

2 = secondary responsibility

APPENDIX A

ARARs FOR THE BCV TREATABILITY STUDY

Treatability studies involving Superfund wastes are subject to various requirements under the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA). On-site treatability studies may be conducted without any federal, state, or local permits [40 *CFR* 300.400(e)(1)]. However, EPA has determined that such studies must comply with applicable or relevant and appropriate requirements (ARARs) under federal and state environmental laws to the extent practicable or justify a waiver under CERCLA Section 121(d)(4)(OSWER Directive 9380.3-10, November 1992). The NCP identifies two factors that should be considered in determining whether identifying and complying with ARARs is practicable: (1) the urgency of the situation, and (2) the scope of the action to be taken. This treatability study is designed to test various treatment media and treatment system conceptual designs for the removal or destruction of particular COCs (i.e., uranium, nitrates, metals, VOCs, TDS). Based on the above guidance, ARARs identified for this groundwater interception treatability study are listed on Table A-1 and highlighted below. ARARs apply to those federal and state regulations that are designed to protect the environment and do not generally apply to occupational safety or worker protection regulations. EPA requires compliance with OSHA and worker protection regulations in §300.150 of the NCP, not through the ARARs process. Therefore, these regulations are not included as ARARs; these standards will be addressed through the Health and Safety Plan for this project.

No endangered or threatened species or habitats, or archeological or historic resources which might be impacted were identified at the site. The horizontal trench at NT-1 may need to be placed in a floodplain/wetlands area; the project has been designed, however, to minimize impacts to the area from trench activities. As currently designed, no activities will take place within the streams.

Concentration of contaminants in the various treatment media as the groundwater flows through them could be sufficient to cause the exhausted treatment media to test as RCRA-characteristic waste, as well as low-level waste, when they are removed from the system. All such media must be characterized and, if necessary, managed and disposed of as a mixed waste under the FFCA and the TDEC Commissioner's Order for the ORR STP. Some of the soil excavated during the trench and treatment systems installation activities will be reused as fill and, therefore, is not considered a waste. Any remaining soils will remain within the AOC. These soils, as well as any PPE or secondary waste streams, will be characterized and, if contaminated, will be managed or disposed of as RCRA-characteristic, low-level, or mixed waste under the FFCA and the TDEC Commissioner's Order for the ORR STP.

Although there is a low potential for VOC emissions during operations (e.g., not greater than 200 ppb range for PCE at NT-1), TDEC exempts pilot plants (i.e., test facilities or operations) from its standards provided the operation would not significantly impact ambient air quality and is operated only for the purpose of defining the design of a future process or plant [TDEC 1200-3-9-.04(5)(f)(107)].

Table A-1. ARARs for the BCV Treatability Studies

Activity	Requirement	Prerequisite	Citation
Location-specific			
Installation of intercept trench in or across wetlands	Whenever possible, actions must avoid or minimize adverse impacts on wetlands and act to preserve and enhance their natural and beneficial values. New construction in wetlands areas should be particularly avoided unless there are no practicable alternatives. Wetlands protection consideration shall be incorporated into planning, regulating, and decision-making processes.	Presence of wetlands as defined in EO 11990 §6(c) - applicable	EO 11990 (May 24, 1977) 10 <i>CFR</i> 1022
Installation of intercept trench in or across floodplains	The potential effects of actions in floodplains shall be evaluated and consideration of flood hazards and floodplain management ensured. If action is taken in floodplains, alternatives that avoid adverse effect and minimize potential harms shall be considered.	Presence of floodplains as defined in EO 11988§6(c) - applicable	EO 11988 (May 24, 1977) 10 <i>CFR</i> 1022
Chemical-Specific			
Control of radionuclide emissions	Exposures to members of the public from all radiation sources released into the atmosphere shall not cause an EDE to be greater than 10 mrem (0.1 mSv) per year	Point source discharge of radionuclides into the ambient air from DOE facilities - applicable	40 <i>CFR</i> 61.92 TDEC 1200-3-11-.08
	Radiological emission measurements must be performed at all release points that have a potential to discharge radionuclides into the air in quantities which could cause an EDE in excess of 1% of the standard (0.1 mrem/yr). All radionuclides which could contribute greater than 10% of the standard (1 mrem/yr) for the release point shall be measured.		40 <i>CFR</i> 61.93 TDEC 1200-3-11-.08
	DOE will carry out all DOE activities to ensure that radiation doses to individuals will be ALARA	Release of radionuclides into the environment - TBC	DOE Order 5400.5(L4) 10 <i>CFR</i> 834 (proposed)
	Exposures to members of the public from all radiation sources shall not cause an EDE to be greater than 100 mrem (1 mSv) per year		DOE Order 5400.5(IL.1a) 10 <i>CFR</i> 834 (proposed)

Table A-1. (continued)

Activity	Requirement	Prerequisite	Citation
Action-specific			
Control of surface water runoff	<p>Implement good site planning and best management practices to control storm water discharges including:</p> <ul style="list-style-type: none"> • document best management practices in a stormwater control plan or equivalent document • minimal clearing for grading • removal of vegetation cover only within 20 days of construction • perform weekly erosion control inspections and maintenance • control measures to detain runoff • discharges must not cause erosion 	<p>Applicable to the control of stormwater discharges associated with construction activities at industrial sites that result in a disturbance of greater than 5 acres of total land area. For those sites with less than 5 acres affected</p> <p>- relevant and appropriate</p>	TDEC 1200-4-10-.05 40 <i>CFR</i> 122
Control of fugitive dust emissions	Take reasonable precautions to prevent particulate matter from becoming airborne; no visible emissions are permitted beyond property boundary lines for more than 5 min/hr or 20 min/day.	Nonpoint source air emissions from environmental restoration activities - applicable	TDEC 1200-3-8-.010
Characterization/management of excavated soils, PPE and any secondary wastes streams generated	A person who generates solid waste must determine whether that waste is hazardous using various methods, including application of knowledge of the hazardous characteristics of the waste based on information regarding the materials or processes used. If the waste is determined to be hazardous, the waste must be handled in accordance with 40 <i>CFR</i> 260-268.	Wastes/soils generated/ excavated potentially contaminated with RCRA-characteristic waste - applicable	DOE <i>CFR</i> 262.11 TDEC 1200-1-11.03(1)(b)

Table A-1. (continued)

Activity	Requirement	Prerequisite	Citation
	LLW generators must characterize and segregate LLW from uncontaminated waste and otherwise minimize the amount of LLW generated. Subsequent management of LLW must be accordance with DOE Order 5820.2A. The Commissioner's Order for the STP and §105 of the FFCA will allow storage of mixed waste on the ORR for periods longer than 1 year pending development of treatment capacity.		

ALARA = as low as reasonably achievable

ARARs = applicable or relevant and appropriate requirements

BCV = Bear Creek Valley

CFR = *Code of Federal Regulations*

CWA = Clean Water Act

DOE = Department of Energy

EO = Executive Order

EDE = effective dose equivalent

FFCA = Federal Facilities Compliance Act

FR = *Federal Register*

LLW = low level waste

NPDES = National Pollution Discharge Elimination System

ORR = Oak Ridge Reservation

PPE = personal protective equipment

RCRA = Resource Conservation and Recovery Act

STP = Site Treatment Plan

TBC = to be considered

TDEC = Tennessee Department of Environment and Conservation

WAC = waste acceptance criteria

WETF = West End Treatment Facility

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