



5.0 CLEANUP ACTION DESIGN AND METHODS

5.1 Cleanup Action Objectives

The proposed cleanup actions at the Small Arms Ranges at CBMR have the overall objective of preventing the potential exposure of human and ecological receptors to lead contamination at concentrations greater than cleanup standards to support the proposed re-use and/or redevelopment of the CBMR. Potential human receptors at the Small Arms Ranges include on-site workers, visitors to the CBMR, and adjacent residents. Potential ecological receptors at the Small Arms Ranges include plants and wildlife that may use affected areas.

5.1.1 Protection of Human Health – Residential Standards (MTCA)

Cleaning up a Small Arms Range to MTCA Method A residential land use cleanup standards will provide protection of human health because they provide the most protective cleanup levels. A quantitative human health risk assessment is not required under MTCA if a site is cleaned up to residential land use standards. The cleanup action proposed for the Small Arms Ranges will meet these criteria. Therefore, the cleanup action proposed for the ranges will be protective of human health if the ranges are cleaned up to residential land use cleanup standards or 250 mg/kg.

5.1.2 Protection of Ecological Receptors (MTCA)

MTCA requires the soil cleanup levels be based on estimates of the reasonable maximum exposure expected under both current and future site use conditions. Historically, the CBMR was a Army military reservation with controlled access and used for short-term, small unit training exercises. Future uses proposed for the CBMR may include development of a regional park and wildlife management area. The proposed future land uses may include educational activities, hiking, camping, horse and bicycle riding and public recreation. The possible public uses may involve short-term camping and group use of existing or new structures for overnight programs.

Based on these potential future land uses, the appropriate cleanup level for lead was selected from MTCA Table 749-3, Ecological Soil Concentrations (mg/kg) for Protection of Terrestrial Plants and Animals and presented here as **Table 5-1**. Therefore, the proposed cleanup level for lead in soil at the Small Arms Ranges is 50 mg/kg for plant protection. If future land use at CBMR differs from the proposed land use, the appropriate cleanup level should be reevaluated at that time.



Table 5-1. MTCA Ecological Indicator and Cleanup Levels for Lead in Soil

	Ecological Indicator for Plants ¹	Ecological Indicator for Wildlife ²	Ecological Indicator for Soil Biota	Unrestricted Land Use ³	Industrial Properties
Lead Concentration (mg/kg)	50	118	500	250	1,000

Notes:

- 1 From MTCA Table 749-3, Ecological Soil Concentrations (mg/kg) for Protection of Terrestrial Plants and Animals:
 - § A lead concentration of 50 mg/kg is specified for or protection of plants.
 - § A lead concentration of 118 mg/kg is specified for protection of wildlife.
 - § A lead concentration of 500 mg/kg is specified for soil biota.
- 2 From MTCA Table 740-1, Method A Soil Cleanup Levels for Unrestricted Land Uses. The lead cleanup level is based on preventing unacceptable blood lead levels.
- 3 From MTCA Table 745-1, Method A Soil Cleanup Levels for Industrial Properties, the cleanup level is based on direct contact.

In developing Method A cleanup levels for unrestricted land use, MTCA [(WAC 173-340-740 (2))] requires that the cleanup level must be as stringent as the following:

- Concentrations in MTCA Table 740-1 and compliance with the corresponding footnotes (this table specifies a lead cleanup level of 250 mg/kg for unrestricted land use);
- Concentrations established under applicable state and federal laws;
- Concentrations that result in no significant adverse effects on the protection and propagation of terrestrial ecological receptors using the procedures specified in WAC 173-340-7490 through 7493 (tables in this section specify ecological indicator soil lead concentrations for plants, soil biota, and wildlife at 50, 500, and 118 mg/kg, respectively).
- Concentrations that are protective of groundwater [Method A cleanup levels were designed to be protective of groundwater, that is, lead concentrations in soil less than 3,000 mg/kg (WDOE, 2001)].



5.1.3 Protection of Surface Water and Erosion Prevention (CWA)

Stormwater and/or erosion could transport contaminated soil particles to surface water bodies. Investigations of potential groundwater and surface water contamination at Camp Bonneville have been conducted. There is no evidence of lead impacting surface water or groundwater at CBMR. Appropriate precautions will be taken during cleanup of the small arms ranges to protect surface water and prevent erosion (see Appendix B for draft stormwater and erosion control permits).

5.1.4 Protection of Worker and Public Safety (OSHA)

A site-wide APP has been developed for the Camp Bonneville project to cover all remedial activities required to achieve site closure as defined in the PPCD (Michael Baker, 2006a). A Health and Safety Plan (HASP) was part of the APP developed in compliance with WDOE and OSHA requirements and was submitted under separate cover to Ecology. The requirements of the HASP will be followed throughout the implementation of the actions defined in this CAP.

5.1.5 Protection of Natural Resources

A number of plant and vertebrate animal species that are either federally or state-listed as endangered or threatened, or are candidates for such listing, have either been documented at CBMR or are likely to occur there. These species are described in **Section 4.1.10**. Therefore, care will be required to avoid unnecessary disruption of such species should they be present (see also **Appendix B**).

5.1.6 Protection of Cultural and Historic Resources

As required by the PPCD (Section X-E, Paragraph 112), BCRRT prepared a Cultural and Historical Resources Protection Plan (Michael Baker, 2006b) This Plan will be in effect throughout the implementation of the cleanup actions detailed in this CAP. This plan includes information and guidance to prepare workers in identifying and protecting any cultural and historical resources which may be encountered during CAP implementation.

All workers involved in implementing this CAP will receive review videotapes of Cultural and Historical Resources Protection training previously provided to BCRRT by representatives of the Cowlitz tribe and associated archaeological experts. This training addressed the history of Native American cultures at the CBMR and provided guidance relating to identification and protection of any cultural or historical artifacts which might have been encountered during CAP implementation.

5.1.7 Appropriate Management of Solid and Hazardous Waste (RCRA)

RCRA protocols will be followed for all eligible waste materials excavated during the cleanup of RAU-2A. In addition, Washington State solid waste management regulations will be followed, as applicable, for handling and disposal of soils in Washington.



Host state disposal site regulations will be followed for any soil disposed outside of the State of Washington.

5.2 Cleanup Action Design

The design of this cleanup action is based on excavation, screening, and off-site disposal of lead-containing soils exceeding the applicable cleanup criteria. This is the cleanup action recommended by the Final RI/FS Report (BCRRT, 2007b).

Cleanup action implementation for the small arms ranges will be organized and conducted in two major elements based on the differing requirements and approaches of the Draft Final Work Plan for Interim Actions at Small Arms Range Berms and Fire Support Areas (Calibre, 2005) and the Final RI/FS Report for RAU-2A (BCRRT, 2006). The Draft Final Work Plan for Interim Actions focuses on the berms, and the Final RI/FS Report focuses on the range floor areas. (As noted above, the fire support areas or firing points are actually addressed as parts of the range floor areas where applicable.)

Excavated soils will be managed in three categories, depending on lead content as observed in the field or as confirmed by laboratory test results. These three categories are summarized as follows:

- Category I soil waste contains Toxicity Characteristic Leaching Procedure (TCLP) extractable lead at levels that make the soils subject to management as hazardous waste under RCRA.
- Category II soil waste contains TCLP levels below the hazardous criteria but contains total lead at levels that require management under MTCA.
- Category III soil waste contains total lead at lower levels allowing reuse within the site.

Management of the waste soil in each category is described in **Section 5.5**, and in **Figures 5-8** and **5-9** below.

5.2.1 Firing Range Berms

The cleanup action design for the firing range berms and the fire support areas includes four scenarios depending to the physical conditions at each of the Small Arms Ranges. These scenarios are identified as follows:

- Scenario 1 – Removal of Freestanding Earthen Berm
- Scenario 2 – Removal of Pop-Up Target Berm
- Scenario 3 – Excavation of Hillside Face Berm
- Scenario 4 – Excavation of Impact Zones Located Behind Berm



Table 5-2 summarizes which of these four scenarios are to be applied at each of the nine small arms ranges where cleanup is required. **Table 5-3** provides estimated excavation volumes for the berms. Berm excavation is required only at seven of the nine small arms ranges identified for cleanup; two small arms ranges – the Undocumented Pistol Range (RAU 2A-15) and the 25-Meter Record Firing Range/Field Firing Range – require range floor cleanup only. Each of these four scenarios is briefly described below in terms of applicability and methodology. A schematic diagram of each scenario is also provided on the following pages.

Scenario 1 – Removal of Freestanding Earthen Berm is applicable only at the 25-Meter Machine Gun Range (Range RAU 2A-18). **Figure 5-1** presents a schematic profile of the excavation procedure for this berm. This approach is based on previous experience at other ranges and also on the history of the range in question. The freestanding earthen berm will be removed in three phases or work areas, as follows:

- The face of this berm is Work Area 1 which is anticipated to be the area of highest lead impact. Initial excavation of this berm will be the face of the berm, from the surface to two feet deep. Initial excavation will be completed in two one-foot lifts. For planning purposes, the material generated by the initial excavation of the berm face is assumed to be Category I waste. If no visible lead impact is identified during excavation, the excavated materials will be considered Category II wastes.
- The next layer of the berm face and the top of the berm are Work Area 2. This area is anticipated to have some lead impact, but to be Category II waste. Work Area 2 will include a two foot additional depth of the berm face, to be removed in two lifts of one foot each, and a one foot depth from the berm top.
- The balance of the berm is Work Area 3. Because of the history of this berm, which is reported to include prior use of these soils in other berms, it is possible that this soil may have some lead impact. Based on sampling results, this soil will either be included in the Category II wastes for offsite disposal or retained for use as fill and grading at Camp Bonneville.

Scenario 2 – Removal of Pop-Up Target Berms is applicable to the Combat Pistol Range (Range RAU 2A-4) and the Field Fire Ranges No. 1 and No. 2 (Range RAU 2A-22). These berms are soil mounds placed to protect the pop-up target mechanism including the electric power supplies. **Figure 5-2 and 5-3** presents a schematic plan and profile of the removal approach to these berms. It is anticipated that the front side of each berm – the segment between the berm and the firing line – will have greater lead contents than the sides. Therefore, these berms will be excavated in two work areas, as follows:

- The front of each berm, consisting of the soil in front of the concrete structure, will be excavated and examined for visible lead. It is anticipated that this soil will be Category I waste. However, if the soil does not appear to contain significant lead (as evidenced by the presence of lead bullets), it will be tested for



potential management as Category II waste. This material will be excavated in a single lift due to the shallow vertical height of these berms.

- The sides of each berm, consisting of the soils off of the direct line of fire at each berm, will be excavated and examined separately from the fronts of these berms. It is anticipated that this soil will be Category II waste. This material also will be excavated in a single lift due to the shallow vertical height of these berms.

Scenario 3 – Excavation of Hillside Face Berms applies to five ranges – the Combat Pistol Range (Range RAU 2A-4), the 1,000-Inch Rifle Range and Machine Gun Range (Range RAU 2A-16), the 25-Meter M60 and Pistol Range (Range RAU 2A-17), the Field Fire Ranges No. 1 and No. 2 (Range RAU 2A-20), and the Rifle Ranges No. 1 and No. 2 (Range RAU 2A-21). **Figure 5-4** present a generalized schematic profile of the excavation of the hillside face berms. As with the freestanding earthen berm, it is anticipated that lead levels will decrease with depth as excavation proceeds into each hillside face. Therefore, these berms will be excavated in two work areas as follows:

- The first two feet of the surficial soils at each hillside berm will be excavated in two lifts of one foot each. For planning purposes, the material generated by the initial excavation of the berm face is anticipated to be Category I waste. However, if the soil does not appear to contain significant lead, it will be tested for potential management as Category II waste.
- The next two feet will be excavated in two lifts of one foot each. It is anticipated that this material will be Category II waste.
- If necessary based on observations and analytical results, the grid excavation approach defined for the small arms range floors in Section 5.2.2 will be applied to portions or all of the face of a hillside berm after the initial excavation has been conducted.

Scenario 4 – Excavation in Impact Zone behind Berm applies only to the 25-Meter Machine Gun Range (Range RAU 2A-18). **Figure 5-5 and 5-6** presents a schematic profile of the excavation approach in the impact zone behind the berm. The initial excavation in this area will be a single six-inch scraping lift. It is anticipated that this material will be Category II waste. Also, if necessary based on observations and analytical results, the grid excavation approach defined for the small arms range floors in Section 5.2.2 will be applied to portions or all of the face of a hillside berm after the initial excavation has been conducted.



Table 5-2 Remediation Scenarios for Berms by Small Arms Range Number

RAU 2A Subunit Number	Range Designation/Description	Scenario 1 Removal of Freestanding Earthen Berm	Scenario 2 Removal of Pop-Up Target Berms	Scenario 3 Excavation of Hillside Face Berm	Scenario 4 Excavation in Impact Zone Behind Berm
4	Combat Pistol Range		X	X	
15	Undocumented Pistol Range	Range Floor Excavation Only			
16	1,000-Inch Rifle Range & Machine Gun Range			X	
17	25-Meter M60 & Pistol Range			X	
18	25-Meter Machine Gun Range	X			X
19	25-Meter Record Firing Range & Field Firing Range	Range Floor Excavation Only			
20	Field Ranges 1 & 2			X	
21	Rifle Ranges 1 & 2			X	
22	Field Fire Ranges 1 & 2		X		

Source: Table 5-1 Draft Final Work Plan for Interim Actions at Small Arms Ranges Berm and Fire Support Areas at Camp Bonneville (Calibre, March 2005)

Table 5-3 Estimated Excavation Volumes for Berms and Small Arms Range

RAU 2A Range Number	Range Designation/Description	Estimated Excavation Volumes in Cubic Yards				Totals
		Scenario 1 Removal of Freestanding Earthen Berm	Scenario 2 Removal of Pop-Up Target Berms	Scenario 3 Excavation of Hillside Face Berm	Scenario 4 Excavation of Impact Zone Behind Berm	
4	Combat Pistol Range		84	576		660
15	Undocumented Pistol Range	Range Floor Excavation Only				0
16	1,000-Inch Rifle Range and Machine Gun Range			850		850
17	25-Meter M60 and Pistol Range			800		800
18	25-Meter Machine Gun Range	4,032			796	4,828
19	25-Meter Record Firing Range and Field Firing Range	Range Floor Excavation Only				0
20	Field Ranges 1 and 2		84			84
21	Rifle Ranges 1 and 2 (Long Berm and Short Berm)			1,850		1,850
22	Field Fire Ranges 1 and 2			500		500
	TOTALS	4,032	168	4,576	796	9,572