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APPENDICES

Appendix A Supplemental RI/FS Report
Appendix B Institutional Controls
Appendix C Camp Bonneville Cultural and Historical Resources Protection Plan

LIST OF ACRONYMS AND ABBREVIATIONs

2, 4 DNT	2,4 Dinitrotoluene
AAOC	Additional Areas of Concern
ACES	Area Covered by Environmental Services
AEM	Atlanta Environmental Management, Inc.
AOC	Area of Concern
AOPC	Area of Potential Concern
APP	Accident Prevention Plan
AR	Army Regulation
ARARs	Applicable or Relevant and Appropriate Requirements
ARNG	Army National Guard
ARPA	Archaeological Resource Protection Act
ASB	Anomaly Selection Board
ASR	Archives Search Report
bgs	Below Ground Surface
BOCC	Board of County Commissioners
BRAC	Base Realignment and Closure
BCRRT	Bonneville Conservation Restoration and Renewal Team, LLC
BMV	Benchmark Values
CAA	Clean Air Act
CAAA	Clean Air Act Amendment
CAP	Clean-up Action Plan
CBMR	Camp Bonneville Military Reservation
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CCA	Conservation Conveyance Authority
CCC	Civilian Conservation Corps
CERFA	Community Environmental Response Facilitation Act
CITA	Central Impact Target Area
CMTC	Citizens Military Training Camps
COPC	Chemicals of Potential Concern
CRAP	Conceptual Remedial Action Plan
CRZ	Contamination Reduction Zone
CSM	Conceptual Site Model
CWA	Clean Water Act
DA	Department of Army
DAESC	Department of the Army Explosive Safety Council
DGM	Digital Geologic / Geophysical Mapping
DNR	Department of Natural Resources
DOD	Department of Defense
DOE	Washington State Department of Ecology
EA	Environment Assessment
E&R	Excavation and Restoration
EBS	Environment Baseline Study
EIS	Environmental Impact Statement
EE/CA	Engineering Evaluation / Cost Analysis
EHS	Environmental Health and Safety

LIST OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

EOD	Explosive Ordnance Disposal
EPA	Environmental Protection Agency
ESA	Environmental Study Area
ESCA	Environmental Services Cooperative Agreement
ESH	Explosive Safety Hazard
ESS	Explosive Safety Submission
FBI	Federal Bureau of Investigation
FS	Feasibility Study
FOSET	Finding of Suitability for Early Transfer
GIS	Geographical Information System
GOCO	Government Owned, Contracts Operated
GPS	Global Positioning System
HASP	Site Wide Health and Safety Plan
HAZWOPER	Hazardous Waste Operation and Emergency Response Standard
HE	High Explosive
HEAT	High Explosive Anti-Tank
HSR	Hazard Severity Ranking
HSWA	Hazardous and Solid Waste Amendments
HWMA	Hazardous Waste Management Act
IAWP	Interim Action Work Plan
ICs	Institutional Controls
ID	Identification
IDW	Investigation Derived Waste
LAW	Light Anti-tank Weapon
LDR	Land Disposal Restrictions
LRA	Local Redevelopment Authority
MD	Munition Debris
MEC	Munitions and Explosives of Concern
mg/L	milligrams per liter
MRE	Meal, Ready-to-Eat
msl	mean sea level
MTCA	Model Toxics Control Act
N/A	Not Applicable
NAAQS	National Ambient Air Quality Standards
NCP	National Contingency Plan
NFA	No Further Action
N/A	Not Applicable
NESHAPs	National Emission Standards for Hazardous Air Pollutants
NEPA	National Environmental Policy Act
NPDES	National Pollutant Discharge
NPL	National Priority List
NSPS	New Source Performance Standards
OB/OD	Open Burn / Open Detonation

LIST OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

OE	Ordnance and Explosive
OSHA	Occupational Safety and Health Act
PETN	Pentaerythritol Tetranitrate
PHA	Project Hazard Analysis
PDA	Personal Digital Assistant
PPCD	Prospective Purchaser Consent Decree
PPCE	Personal Protective Clothing and Equipment
PPE	Personal Protective Equipment
PRG	Preliminary Remediation Goals
PSD	Prevention of Significant Deterioration
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance / Quality Control
RAU 2 A	Remedial Action Unit 3
RCRA	Resource Conservation and Recovery Act
RCW	Revised Code of Washington
RI	Remedial Investigation
RI/FS	Remedial Investigation / Feasibility Study
ROTC	Reserve Officer Training Corps
RP	Regional Park
RPC	Reuse Planning Committee
RTES	Rare, Threatened Endangered Species
RV	Recreational Vehicle
SAP	Sampling and Analysis Plan
SARA	Superfund Amendments and Reauthorization Act
SEPA	State Environmental Policy Act
SI	Site Investigation
SIPS	State Implementation Plans
SOP	Standard / Standing Operating Procedure
SOW	Statement of Work
SPRT	Sequential Probability Ratio Test
TCLP	Toxicity Characteristic Leaching Procedure
TCRA	Time Critical Removal Action
TEC	Topographic Engineering Center
TLVs	Threshold Limit Values
TSDF	Treatment, Storage and Disposal Facility
TSRS	Technical Specifications and Requirement Statements
UPL	Upper Confidence Level
USACE	United States Army Corps of Engineers
USAESCH	United States Army Engineering and Support Center, Huntsville
USAR	United States Army Reserve
USATCES	United States Army Technical Center for Explosives Safety
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service

LIST OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

UXO	Unexploded Ordnance
WAC	Washington Administrative Code
WMA	Wildlife Management Area
WP	White Phosphorus

1.0 INTRODUCTION

1.1 Cleanup Action Authorization and Summary

This Cleanup Action Plan (CAP) presents selected cleanup actions for all areas in Remedial Action Unit (RAU) 3, the Site-Wide Munitions of Explosive Concern (MEC) Cleanup, for the former Camp Bonneville Military Reservation (CBMR) in Clark County, Washington (**Figures 1.1** and **1.2**). This CAP has been prepared for and is submitted by the Bonneville Conservation Restoration and Renewal Team, LLC (BCRRT), the current owner of the CBMR. The CAP is based on the Final Draft Remediation Investigation/Feasibility Study (RI/FS) for RAU 3 Revision 1 (Final RI/FS; BCRRT, 2008**a**) and the Supplemental RI/FS report (**Appendix A**), which was developed using results from the implementation of Interim Actions and investigations at CBMR and direction given by Washington Department of Ecology (WDOE).

The general objectives and scope of MEC cleanup actions evaluated in this CAP were established in the RAU 3 Final RI/FS. The Final RI/FS subdivided the MEC concerns of RAU 3 into eight general categories of Remedial Work Areas (RWAs) requiring MEC surface and/or subsurface clearance and cleanup. These areas (**Figure 1.3**) are identified as:

1. Target Areas
2. Central Impact Target Area (CITA) Targets (CITA-Targets) and Non-Target Zone (CITA-NT)
3. Open Burn/Open Demolition Areas (OB/OD)
4. Firing Points
5. Roads and Trails (R&T)
6. Central Valley Floor and Associated Wetlands (CVF)
7. Regional Park Western Slopes Area
8. Wildlife Management Area (WMA)

In order to address the MEC and Munitions Debris (MD) findings resulting from the Interim Actions and investigations undertaken to date for RAU 3 and the related need for additional site characterization, the WDOE requested that a Supplemental RI/FS be conducted to augment the analyses presented in the previously approved Final RI/FS (BCRRT, 2008a) for generation of this comprehensive RAU 3 CAP. The Supplemental RI/FS (**Appendix A**).incorporated the results of MEC surface clearance work conducted in the: CVF, Environmental Study Area (ESA), R & T Buffer Zones, subsurface MEC clearance of the expanded 2.36 in. Rocket Target Area, and transect investigations through Training Areas 4, 5, and 12.

This CAP identifies specific cleanup actions selected for each of the RWAs identified in the Final RI/FS for RAU 3 and the methods employed in the selection of these cleanup actions. The CAP also summarizes the information presented in the Supplemental RI/FS which identifies new discovered RWAs requiring MEC-related cleanup actions.

This CAP meets the specifications of regulations promulgated under the Washington State Model Toxics Control Act (MTCA) as set forth in Title 173-340 of the Washington Administrative Code (WAC) Sections 380 – Cleanup Action Plans and 400(4) – Plans Describing Cleanup Actions [WAC 173-340-380 and WAC 173-340-400(4)].

The Final RI/FS (**BCRRT 2008a**) and the Supplemental RI/FS (**Appendix A**) provided risk evaluations for each area potentially requiring MEC cleanup, described cleanup standards and preliminary cleanup action components, identified site-wide areas needing cleanup, presented remedial objectives, identified response actions, identified specific cleanup technologies along with cleanup action alternatives. The cleanup action alternatives where evaluated for each of the RWAs with respect to the requirements contained in WAC 173-340-360, and preferred cleanup actions were identified or cleanup action determinations were made by WDOE for each of the RWAs.

When the work described in this CAP is completed, it will have satisfied all the MEC cleanup and clearance requirements identified in the Final RI/FS, Supplemental RI/FS and WDOE determinations. In addition, this CAP satisfies the applicable requirements of the Prospective Purchaser Consent Decree (PPCD; WDOE, 2006) as it relates to the RAU 3 Site-Wide MEC Cleanup.

1.2 Additional Cleanup Requirements due to Supplemental RI/FS munitions finds.

Following the Final RI/FS issuance and resulting from MEC and MD findings during the Supplemental RI/FS investigations, a number of newly discovered munitions or munitions areas have been encountered at the CBMR. Consideration of these conditions has resulted in the WDOE either: 1) changing an area's associated MEC cleanup requirements; or 2) identifying additional areas requiring MEC cleanup. The cleanup actions for these newly discovered munitions areas include:

- MEC subsurface clearance for the entire Central Valley Floor (CVF) and the associated wetlands (previously designated as the Accessible High and Medium Intensity Reuse Areas; Final RI/FS).

  WDOE based this determination on the data that indicates the CVF and associated wetlands are an extensively used direct and indirect fire weapon target area, and an extensively used training area due to the number of sub-surface anomalies and surface MEC and MD findings discovered during the Interim Actions. In addition, a number of newly discovered RWAs in the form of specific target areas and/or waste disposal areas were identified in the CVF, including;

  - Stokes Mortar Target Area,
  - MEC Disposal Area (Burial Pit),
  - OB/OD Area,
  - 37 mm Artillery/Stokes Mortar Target Area,
  - Rifle Grenade Target Area, and
  - 2.36 in. Rocket Target Area near the Former Sewage Lagoons.

- MEC surface clearance and Institutional Controls are being required for accessible portions (areas with slope less than 25 degrees) of the Regional Park Western Slopes Area. The Western Slopes had been designated as the Limited Access Medium Intensity Reuse in the Final RI/FS).

- Expansion of the CITA fence line northward to encompass an additional 107 acres believed to have been impacted by artillery and mortar firing.

- MEC Surface Clearance of Demolition Area 1/Landfill 4 Kick-out Area encompassing 104 acres.

1.3 Site Location and Current Site Uses

1.3.1 Location and General Description

The 3,840-acre CBMR site is located northeast of Vancouver, Washington, in the southeastern region of Clark County (**Figure 1.1**). The property is approximately five miles northeast of the corporate limits of the City of Vancouver, Washington and approximately seven miles north of the Columbia River. The CBMR is located along the western foothills of the Cascade Mountain Range, with Camp Hill and Little Elkhorn Mountain to the northwest, Munsell Hill to the west, and Little Baldy Mountain to the south. Vehicular access to the CBMR is restricted to a single entrance from NE Pluss Road. The entrance is gated and monitored by site security and facility managers. In its last years of service as an active military base, the facility had been used for weekend and summer training by Army Reserve and National Guard components from Southern Washington and Northern Oregon and by the Federal Bureau of Investigation (FBI) and local law enforcement units. Since its closing by the US Army in 1995, CBMR has not been actively used with the exception of training for FBI and local law enforcement personnel conducted at the designated FBI Firing Range.

1.3.2 Facility Information

Project Name:	Camp Bonneville Military Reservation
Project Coordinator:	Jerry Barnett, Project Manager Clark County Public Works 1300 Franklin Street, 4th Floor P. O. Box 9810 Vancouver, WA 98666-9810 Phone: (360) 397-6118 ext. 4969

1.4 Proposed Future Land Use

1.4.1 Camp Bonneville Local Redevelopment Authority and Clark County

A Local Redevelopment Authority (LRA) was initially responsible for determining cost-effectiveness and feasibility of land reuse plans for the CBMR. In 1995, the Clark County Board of County Commissioners (BOCC), appointed a five member Reuse Planning Committee (RPC) to oversee the reuse planning process. The LRA, in April 1997, received approval for a land reuse-planning grant from the Office of Economic Adjustment. A land reuse plan was developed and submitted to the BOCC. The draft Camp Bonneville Land Reuse Plan was published in 1998 (Clark County, 1998).

Negotiations for a Public Benefit Conveyance and/or the Economic Development Conveyance of the CBMR proved unsuccessful in 2000 and 2003. After the 2003 attempt, the LRA was disbanded.

Discussion of a potential Conservation Conveyance for the CBMR began in 2005, and the BOCC determined to represent Clark County directly in negotiations. In October 2006, the CBMR was transferred to the Clark County under Conservation Conveyance for remediation and subsequent development as a regional park..

1.4.2 Camp Bonneville Land Reuse Plan

Clark County has published an updated Preliminary Site Plan. The Camp Bonneville Reuse Plan identifies future uses of specific areas of the CBMR (Clark County, 2003). Following extensive public involvement, the reuse plan was revised on November 15, 2005 and again on March 17, 2006.

The Land Reuse Plan divides the CBMR into a Regional Park and Wildlife Management Area as is depicted on **Figure 1.4.** The central focus of the proposed CBMR Land Reuse Plan consists of approximately 1,200 acres located between the western boundary of the site and the floodplain of the Lacamas Creek Valley which comprises the planned Regional Park. The majority of the park will be subsurface cleared and/or surface cleared of munitions and munitions debris as described in this cleanup plan. The park area is designed to provide recreational opportunities for the local community and will be managed by Clark County. The recreational activities proposed in the reuse plan for the Regional Park include, but are not limited to, the following:

- Recreational trails (hiking and equestrian use);
- Group picnic areas and picnic shelters;
- Amphitheater and stage (for outdoor school and small local events);
- Meadow area for group picnicking and recreational sports activities;
- Restroom facilities;
- Tent camping facilities;
- Recreational vehicle (RV) camping facilities;
- Park directors' residences;
- Vehicular access roads;
- Parking areas;
- Native American cultural center at the Bonneville cantonment area; and
- Environmental Study Area at the southwest corner of the site.

The majority (approximately two-thirds) of the CBMR site will be classified as the WMA which includes approximately 2,188 acres. The WMA would be located east of the Lacamas Creek valley and would contain approximately 25 miles of trails. Access to these trails will be limited to hiking and equestrian uses. Informational kiosks, signage and written materials will be used to inform the users of these trails of the former military use of the CBMR and the importance of remaining on roads and trials. The majority of these trails will consist of pre-existing four-wheel drive roads, but as additional funding becomes available, more trails may be added. The WMA will be left in its current state

The remaining 572 acres of the CBMR are contained within the original Central Impact Target Area (CITA) and Central Impact Area, where no public access will be allowed.

1.5 Purpose and Scope of the CAP

In order to organize the CBMR site for remedial action planning purposes, the site was divided into three Remedial Action Units (RAUs). Brief definitions and status descriptions of the three RAUs, including RAU 3, are provided below:

- RAU 1: Consists of twenty discrete areas where hazardous substances have been encountered; RAU 1 remedial actions have been completed for all of the areas and a No Further Action (NFA) letter has been received from the WDOE.

- RAU 2A: Consists of twenty-one small arms ranges; a final CAP (BCRRT 2008a) has been approved by WDOE to address the residual lead. Soil lead remediation will be completed in 2009.

- RAU 2B: Consists of two former open burn/demolition areas, Demolition Areas 2 & 3; a RI Report has been completed (BCRRT 2007a), remedial actions have been completed at both areas and a NFA letter has been received from the WDOE.

- RAU 2C: Consists of the Demolition Area 1 /Landfill 4 (DA1/LF4) and the Site-Wide groundwater evaluation for potential explosive residuals and perchlorates. The Site-Wide evaluation consists of soil sampling at firing points, target areas and Pop-up Pond sediments and ongoing quarterly groundwater sampling and reporting at DA1/LF4 and the Boundary wells near Lacamas Creek. A report on the results of soil sampling and analyses at firing points, target areas and Pop-up Pond sediments and was submitted to and approved by WDOE (BCRRT 2007b). A Perchlorates Evaluation Report has also been submitted to WDOE (BCRRT 2008b, 2009).

- RAU 3: Consists of the Site-Wide MEC Cleanup at CBMR. The Final RI/FS and Supplemental RI/FS documents serve as the basis for this RAU 3 CAP.

The primary purpose of this RAU 3 CAP is to present the cleanup actions selected for all areas in RAU 3, and to describe the procedures used in selecting these actions. Specifically the RAU 3 CAP provides:

- Site description and a description of the proposed future uses of the CBMR.
- Summary of applicable Laws, Regulations, and Cleanup Standards.
- Discussions of each of the RWAs for RAU 3 including: MEC and Munition Debris (MD) findings to date; accessibility, reuse and hazard ranking considerations; cleanup action evaluation and selection
- Recommended cleanup actions
- Long term Institutional Controls (ICs) that will be implemented at specific areas of the CBMR and site-wide.
- Preliminary Schedule and Cost Conclusions

1.6 Organization of the RAU 3 CAP

Table of Contents

Section 1.0 – Introduction and General Information

Section 1 presents an overview of:

- The regulatory basis for this CAP
- The site location and facility information
- The current and proposed future land use of CBMR
- The purpose and scope of the CAP
- The organization of the CAP document

Section 2.0 - Applicable Laws, Regulations, Standards, and Cleanup Standards

Section 2 identifies the relevant State, Federal and County controlling laws/regulations, and the standards governing this cleanup action. The relevant "Controlling Documents": (BCRRT, Army, State, County) are also discussed as well as the eight cleanup action protection standards.

Section 3.0 – Institutional and Engineering Controls Applicable Site Wide

Section 3 discusses the Institutional Controls (ICs) used at the CBMR and the engineering controls applied (fencing and signage).

Section 4.0 - Cleanup Actions Initially Identified in the Final RI/FS

Section 4 details the cleanup actions required at a number of RWAs identified in the Final RI/FS. Cleanup actions at the following areas are presented:

- Target Areas
- Central Valley Floor
- Central Impact (Target) Area (non-target)
- CITA Target Areas
- Open Burn/Open Demolition Areas
- Firing Points
- Roads and Trails
- Wildlife Management Area

For each of the RWAs identified above, the following information will be provided:

- The specific RWA background and the MEC and MD findings
- Accessibility rating, future reuses, and hazard ranking (modified from the Final RI/FS findings to reflect recent MEC and MD findings, as appropriate).
- The rationale for the cleanup action and selection.
- The recommended cleanup action or that action determined appropriate by WDOE.

Section 5.0 - Additional Cleanup Action Requirements due to Supplemental RI/FS Characterization.

Section 5 details cleanup action determinations for several RWAs based on MEC and MD findings obtained during Interim Actions conducted at a number of RWAs identified in the Final RI/FS. Cleanup actions at the following areas are presented:

- Central Valley Floor and Associated Wetlands
- Western Slopes Area
- Northern Central Impact (Target) Area Expansion
- MEC Surface Clearance of Demolition Area 1/Landfill 4 Kick-out Area

For each of the RWAs identified above, the following information will be provided:

- The specific RWA background and the MEC and MD findings to date
- Accessibility rating, future reuses, and hazard ranking (modified from the Final RI/FS findings to reflect recent MEC and MD findings, as appropriate)
- The rationale for the cleanup action and selection.
- The recommended cleanup action

Section 6.0 – Preliminary Schedule and Remedial Action Cost

Section 6 provides a preliminary schedule and remedial action cost for the CAP activities described herein.

Section 7.0 – Conclusions

This section provides an overview and conclusions regarding the MEC cleanup actions necessary for CBMR.

Section 8.0 – References

Appendices

Appendix A **Supplemental RI/FS Report**
Appendix B **Institutional Controls**
Appendix C **Camp Bonneville Cultural and Historical Resources Protection Plan**

2.0 APPLICABLE LAWS, REGULATIONS AND CLEANUP STANDARDS

- This CAP is completed under the authority of the Model Toxic Control Act (MTCA), Chapter 70.105DRCW and the MTCA Cleanup Regulation, Chapter 173-340 WAC. MTCA requires that cleanup actions under its authority shall also comply with applicable Washington State and Federal laws (WAC173-340-710). In addition, remedial actions shall comply with the substantive requirements of applicable local government requirements. MTCA requires the investigation and subsequent remedial actions of any release of hazardous substances. This investigation/remedial action will include at a minimum:

  - Notification by owner/ operator of a release is required within ninety days of discovery.
  - Establish reasonable deadlines for initiating the investigation of a hazardous waste site.
  - Provide for public participation.
  - Establish a hazard ranking system for hazardous waste sites.
  - Define a process for selecting and implementing site cleanup activities.
  - Application of permanent and effective IC's that are necessary for a remedial action to be protective of human health and the environment.

  The Final and Supplemental RI/FS for CBMR were developed in compliance with the MTCA and, if approved, the work plans developed to implement the recommended remedial activities detailed in this CAP will also follow the review, approval and public participation requirements of this law.

2.1 Applicable State Laws, Regulations and Standards

State Dangerous Waste Regulations: The Washington State Dangerous Waste Regulations [WAC 173-303] is fully authorized under the Federal Resource Conservation and Recovery Act (RCRA) statute.. This statute regulates the management of Dangerous (RCRA) Waste by designating those wastes and properly managing storage, sifting, and disposal of those wastes. The Dangerous Regulations will be adhered to for proper designation, temporary storage, and proper transport and disposal of any dangerous waste generated during the investigation and cleanup of RAU-3.

- **State Environmental Policy Act (SEPA):** The Washington State Environmental Policy Act (SEPA) [Chapter 43.21C RCW] is the state statutory program to prevent or control and mitigate ecological impacts arising from public or private actions, specifically including cleanup actions conducted under the Model Toxics Control Act (MTCA). It requires WDOE to assess possible environmental impacts that may result from its decision or actions. SEPA provides for a "Determination of Nonsignificance (DNS)" or a "Mitigated Determination of Nonsignificance" for cleanup actions under MTCA where the absence of significant negative ecological impact is demonstrated by the party conducting the cleanup. A SEPA Environmental Checklist has been prepared assessing the potential environmental impacts that may occur as a result of the implementation of the RAU 3 CAP activities.

- **State Clean Water Act:** The Washington State Clean Water Act [Chapter 90.48 RCW] is a state program whose purpose is to maintain the highest possible standards to insure the purity

of all waters consistent with public health and public enjoyment and the protection of wild life, birds, game, fish and other aquatic life. While the remedial activities outlined in the CAP do not involve the discharge of wastewater to a surface water body, should those remedial activities change, BCRRT will comply with the requirements of the Clark County NPDES Phase I program.

- **State Clean Air Act:** The purpose of the Washington State Clean Air Act [Chapter 70.94 RCW] is to secure/maintain levels of air quality that protect human health and safety and to prevent injury to plant, animal life, and property. Compliance with this Act will be addressed to include worker breathing zones and work area perimeter monitoring for dust; measures to be implemented on an as-needed basis depending on weather and dust monitoring and may require dust suppression methods; gives the authority to temporarily stop excavation and soil handling activities should the dust suppression measures be inadequate during times of dry weather and/or low humidity. Additionally, air quality requirements have been addressed in the SEPA checklist prepared for this CAP.

2.2 Applicable Federal Laws, Regulations And Standards

Explosives Safety Program: Federal explosives safety regulations and guidance are applicable to all military munitions including those remaining at CBMR. Compliance with these regulations is addressed through Explosives Safety Submittals (ESSs) along with the Interim Action Work Plan (IAWP) and amendments for the RAU 3 site-wide MEC cleanup areas. This IAWP and amendments have been approved by WDOE. Two ESSs have been reviewed and approved for RAU 3 by the United States Army Technical Center for Explosives Safety (USATCES).

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- Occupational Safety and Health Act (OSHA): This Cleanup Action at RAU 3 – Site-Wide MEC Cleanup Areas will comply with the applicable provisions of the Federal Occupational Safety and Health Act (as amended) and the regulations there under. This includes, but is not limited to, the OSHA Construction and Hazardous Waste Operations and Emergency Response (HAZWOPER) standards found in the OSHA regulations in the Code of Federal Regulation (CFR). The applicable regulations include: OSHA General Industry Standards (29 CFR 1910); OSHA Construction Industry Standards (29 CFR 1926); and OSHA HAZWOPER Standards (29 CFR 1910.120 and 1926.120).

For this program the following have been developed and will be implemented throughout the RAU 3 cleanup defined in this CAP:

- Accident Prevention Plan **(**APP**; Baker 2006**) and attachments:
  - Health and Safety Plan (HASP)
  - Hazard Analysis
- Explosives Safety Submittal (ESS), as amended (MKM 2007)

- **Clean Water Act (CWA):** Several portions of the Federal Clean Water Act (as variously amended and updated since original enactment and codification) can be triggered through Section 404 under the Corps of Engineers jurisdiction. A Section 404 permit will be obtained by the BCRRT prior to the implementation of Remedial Activities in the wetlands adjacent to Lacamas Creek as outlined in this CAP.

- **Clean Air Act (CAA):** Portions of the Federal Clean Air Act are applicable to the implementation of the CAP for RAU 3. The applicable provisions govern emissions of fugitive dust at the perimeter of the work area during excavation and soil handling. Compliance with these provisions will be addressed to include the following: worker breathing zone and work area perimeter monitoring for dust; measures to be implemented on an as-needed basis depending on weather and dust monitoring results for dust suppression; and a requirement to temporarily stop excavation and soil handling activities should the dust suppression measures be inadequate during times of dry weather and/or low humidity. Additionally, air quality requirements have been addressed in the SEPA checklist prepared for this CAP.

- **Endangered Species Act (ESA):** the federal ESA is administered by the US Fish and Wildlife service (wildlife, plants, and some fish species) and the National Oceanic and Atmospheric Administration (NOAA; anadromous fish). This law requires protection of listed species and associated habitat. Per the Biological Assessment completed for the project, No Effect is anticipated for the implementation of this project. Biological Opinions have been issued by each agency confirming the effect determination in the Biological Assessment (USACE, 2001).

- **National Historic Preservation Act (NHPA):** Section 106 of the NHPA requires identification and protection of archaeological, cultural and historic resources. Concurrence of the project has been issued by the Department of Archaeological and Historic Resources**.** In 1998 a Section 106 Programmatic Agreement was obtained completed among the stakeholder for CBMR. That agreement was amended in 2006 to address issues related to the MEC remediation and reuse of CBMR (Washington State Historic Preservation Officer [SHPO], 2006) Additionally, a Cultural and Historical Resources Protection Plan (CHRPP) was prepared to address remedial activities anticipated at CBMR in 2006 (Baker, 2006a) and has been updated to address the remedial activities detailed in this CAP and is provided as **Appendix C**.

- **National Environmental Policy Act (NEPA**): NEPA requires federal agencies to integrate environmental values into their decision making processes by considering the environmental impacts of their proposed actions and reasonable alternatives to those actions. The NEPA process consists of an evaluation of the environmental effects of a federal undertaking

including its alternatives. There are three levels of analysis depending on whether or not an undertaking could significantly affect the environment. These three levels include: categorical exclusion determination; preparation of an environmental assessment/finding of no significant impact (EA/FONSI); and preparation of an environmental impact statement (EIS). An EA (USACE, 2001) addressing the potential impacts of the disposal and reuse of CBMR was prepared by the Army in 2001. The conclusion documented in the EA was that implication of the proposed action (i.e. site remediation and development of a regional park) would have no significant direct, indirect, or cumulative effects on the quality of the natural or human environment (FONSI).

2.3 Substantive Requirements of Applicable County Laws, Regulations and Standards

- Habitat Conservation Ordinance: This ordinance is detailed in Clark Counties Unified Development Code (UDC) Title 40.440 [CC 40.440]. The purpose of the Ordinance is to protect fish/ wildlife habitat while allowing reasonable use of property. Habitat areas that are protected by this ordinance include streamside riparian areas, priority habitat and species areas and species buffers for endangered, threatened or sensitive species. A new habitat conservation permit or equivalent will be obtained by the BCRRT prior to the implementation of Remedial Activities outlined in this CAP.

- Wetland Conservation Ordinance: This ordinance was designed to protect wetlands and streams that are not applicable according to the Shoreline Management and Habitat Conservation programs [CC 40.450]. A new wetlands conservation permit or equivalent may be obtained by the BCRRT prior to the implementation of Remedial Activities in the wetlands adjacent to Lacamas Creek as outlined in this CAP.

- Clark County Grading Permit: The Grading Permit allows the County to review the proposed grading activities prior to any land movement to ensure the activity will not negatively impact the environment. [CC 40.380]. One of the activities outlined in this CAP is the excavation and removal of MEC disposal pits. A grading permit or equivalent may be obtained for this activity and any other activity requiring significant land movement or grading.

2.4 Controlling Documents

Prospective Purchaser Consent Decree (PPCD; WDOE 2006) and attached Conceptual Remedial Action Plan (CRAP), including the following specific sections:

- Section 57 (C) – Definition of RAU 3 – Site-Wide MEC Cleanup Areas
- Sections 75 through 80 – Status of RAU 3
- Section 99, 100, and 101 – Deliverables and Schedules for the Final Action at RAU 3
- Section titled “Remedial Action Unit 3” in the CRAP

2.5 Cleanup Standards

The Washington Administrative Code (WAC) regulations under the Model Toxics Control Act (MTCA) require, at WAC 173-340-700 that cleanup standards be established for every cleanup action involving hazardous substances conducted in Washington State. These cleanup standards

must be appropriately protective of human health and the environment. These cleanup standards are the basis for the CAP.

Cleanup standards consider current and future uses of the site in terms of assessing any residual risk. If a cleanup standard is developed on the basis of specific current or future land uses, institutional and/or engineering controls may be part of the CAP. These Institutional/engineering controls specify that the prescribed land use is maintained after the cleanup action itself has been implemented. If a hazardous substance remains on a site after cleanup action implementation, the cleanup action must include containment measures to prevent that hazardous substance from coming into contact with humans or other ecological receptors.
These cleanup standards have been developed by following the letter of these MTCA regulations to the extent those regulations are relevant and appropriate to MEC in RAU 3 and the intent and spirit of these MTCA regulations throughout. The cleanup standards would provide a very low level of risk to human receptors (including park users, park personnel, construction personnel, and cleanup action personnel) and ecological receptors during and after cleanup action implementation.

The cleanup level is the condition where "the likelihood for MEC and receptor interaction is negligible" and in conjunction with the point of compliance (i.e. the area to be remediated) for each RWA constitutes the cleanup standard. The point of compliance is measured in both horizontal and vertical dimensions and is based on those areas where MEC and receptor interactions are likely to occur. This compliance point will be the physical limits of MEC clearance activities for each RWA. The horizontal compliance point/cleanup standard is limited by the horizontal extent of contamination for each of the MEC Source Sites as determined by step outs, or Land Reuse Area. These /areas are described and illustrated in Section 8.0 of the RI/FS (BCRRT, 2007). The vertical points of compliance are the cleanup depths for the RWAs (MEC surface clearance, clearance to frost depth, clearance to 24 or 48 inches, and excavation and restoration) and are described in Section 7.0 of the RI/FS (BCRRT, 2007).

These cleanup standards are designed to conform to the MTCA Method B process as that is described in WAC 173-340-705. Method B is applicable to all sites and is based on attaining a very low level of residual risk after the cleanup action is implemented. MTCA Method B does not provide quantitative cleanup standards for MEC; however MTCA does provide useful qualitative guidance and direction for a cleanup action for MEC. These cleanup standards have been developed by applying that guidance and direction.

2.5.1 Protection of Human Health

The intent of MTCA is to select cleanup standards that are protective of human health and the environment. Proposed site-specific cleanup standards (cleanup level and points of compliance) to address the explosive safety risk posed for areas located within the CBMR are based on the baseline explosive safety exposure assessment, described in the Final RI/FS and Supplemental RI/FS. Specifically, the cleanup level and points of compliance are defined to ensure protection of human health and the environment and to be consistent with the planned future land use, which for the CBMR is as a regional park and wildlife refuge. Eliminating all risk at the CBMR is not feasible, even after MEC cleanup is complete. Since exposure to MEC is assumed to result in some level of

explosive safety risk, "a clean MEC site" generally means that a site is cleaned up to a point that the likelihood for MEC and receptor interaction is negligible. The cleanup level proposed for the CBMR is this condition. The points of compliance will be based on those areas (measured in both horizontal and vertical dimensions) where the MEC and receptor interactions are likely to occur. MEC clearance actions should be limited to the extent of contamination resulting from the munitions-related activity identified for the specific area and its proposed reuse (e.g. four ft below ground surface [bgs] MEC clearance for building foundations).

In General, the cleanup standards for the CBMR can be classified as follows:

- For general park areas where no construction activities or other intrusive uses will be permitted, the cleanup action will be MEC surface clearance (USACE 2004). Areas where MEC surface clearance has been or will be conducted include, but are not limited to, portions of the western slopes of the CBMR as well as roads and trails (R&T) buffers. This MEC surface clearance consists of three steps: (1) an initial survey clearance to find and remove anomalies (anomaly avoidance) conducted for worker safety during subsequent clearance activities; (2) brush removal to make the surface visible and accessible; and (3) a second instrument aided MEC surface clearance to confirm that surface MEC and MD items have been identified and removed. Each of these steps will be subject to oversight and QA/QC inspection to confirm the quality and adequacy of the MEC surface clearance actions. MEC typically consists of discrete items with minimal physical mobility in environmental media barring human intervention. There is some potential for MEC items to remain below the site surface in these areas; containment of these items will be provided by the in-place soils and by deed restrictions on intrusive activities. Additional discussion of the potential for and movement of these MEC items are discussed in **Appendix A, Section 2.2.2**. Institutional controls, in the form of recorded deed restrictions and park management policies, signage and written materials will be implemented to assure that the land use will be non-intrusive park-related activities in perpetuity (**Appendix B**). Prior to CBMR being transferred to Clark County for public use a formal Institutional Control Manual will be developed. This document will contain easy to understand reference materials to assist site personnel in managing the institutional controls required by the deed restrictions. This cleanup action will provide for a very low level of residual risk for park users.

- For those specific park areas where:

    - MEC and MD findings (as indicators of prior usage of that specific area) require MEC subsurface clearance
    - where future construction of park facilities will require excavation, or
    - where park-related activities have a significant potential to lead to subsurface intrusions,

The cleanup standard will consist of MEC subsurface clearance to an appropriate and defined depth. This MEC subsurface clearance will consist of four steps: (1) an initial survey clearance to find and remove anomalies (anomaly avoidance) conducted for worker safety during subsequent clearance activities; (2) brush removal to make the surface visible and accessible; and (3) a second instrument aided MEC surface clearance to confirm that surface MEC and MD items have been identified and removed; and (4) excavation with MEC identification support to find and remove MEC items from below the site surface to the specified depth. Each of these steps will be subject to oversight and QA/QC inspection by personnel from the site team and from WDOE to confirm the quality and adequacy of the MEC surface and subsurface clearance actions. There is some potential for MEC items to remain below the level of the subsurface MEC clearance in these areas; containment of these items will be provided by the in-place soils and by restrictions on intrusion into those soils. Institutional controls, in the form of recorded deed restrictions and park management policies, signage and written materials will be implemented to assure that the subsurface intrusions from construction and park-related activities will be consistent with the implemented MEC clearance depths in perpetuity (**Appendix B**). This cleanup standard will provide for a very low level of residual risk for park users and construction personnel.

- For the WMA, the cleanup standard will be institutional controls in the form of deed restrictions, written materials and engineering controls in the form of fences, signage, and public information programs (**Section 3.0** and Appendix B). The institutional controls will be implemented to assure that the WMA will remain an ecological preserve in perpetuity. The engineering controls will be maintained to minimize unauthorized access to this area. In addition, county personnel will be trained in MEC anomaly avoidance so that necessary access to this area for maintenance and management can be done safely. In the event that a MEC trained county employee encounters a munition they will coordinate with Army Emergency Response personnel for the removal of that item. This cleanup standard will provide for a very low level of residual risk for park users and construction personnel.

2.5.2 Protection of Ecological Receptors

The cleanup standards described above for human health also function to protect ecological receptors. These standards will reduce the risk of MEC-related explosions or fires to very low levels. This risk reduction will also operate to protect ecological receptors (both animal and plant species) from adverse impacts.

2.5.3 Protection of Natural and Cultural/Historic Resources

Cleanup standards addressing protection of Natural and Cultural/Historic Resources are drawn from the applicable or relevant and appropriate regulatory programs (ARARs). Specific standards will include the following:

- Protection of Federal and state listed rare, threatened or endangered species, including both animals and plant communities.

- Protection of surface water bodies including streams, ponds, and wetlands by conducting clearing and excavation activities within specified buffer zones around these resources with hand tools and by implementing other appropriate measures to eliminate, minimize, or mitigate the impact of the necessary cleanup actions on these resources.

- Implementation of specified measures to prevent erosion and sediment impacts on surface water bodies where and when excavation or other soil disturbing activities are necessary to implement this cleanup action.

- Re-establishment of disturbed vegetation communities to minimize addition runoff and intrusion by invasive plants.

An updated Cultural and Historic Resources Protection Plan has been prepared (**Appendix C**) and will be implemented where this cleanup action requires significant soil excavation..

3.0 INSTITUTIONAL AND ENGINEERING CONTROLS APPLICABLE SITE WIDE

In support of and to augment the area-specific cleanup actions set forth in **Sections 4.0 and 5.0** below, there are several cleanup action components which will be applied site-wide. These cleanup action components will also address the entire site of the former Camp Bonneville Military Reservation (CBMR) including those areas, such as certain training maneuver areas and range safety fans not specifically addressed in these following sections. These cleanup action components, which will be applied site-wide, are defined as follows:

- **Institutional Controls Plan** detailing the cleanup action components outlined below will be developed as part of the execution of this CAP. This plan will serve as a guide to future CBMR managers and will document the IC requirements and obligations associated with the site.

- **Land use controls** in the form of recorded deed covenants that ensure the former CBMR remains a regional park and WMA and is only used for park activities, wildlife management, and timber management. These site-wide land use restrictions protect the public from conducting activities that might lead to some inadvertent exposure to the low level of residual explosive risk that may remain after the area-specific actions outlined in Sections 4 through 12 have been completed. Deed covenants and land use restrictions were filed as part of the CAP for RAU 1.

- To supplement and support the deed covenants, a **detailed boundary** was also recorded with these covenants. This survey has been completed, documented, and prepared in detailed map format using the relevant specifications of the United States Public Land Survey System.

- **Engineering Controls** (ECs) are containment or treatment systems designed to prevent or limit the exposure to potentially hazardous substances. In the case of CBMR the principle ECs will be in the form of **fencing** and **signage** along the perimeter of the facility as well as the fencing and signage used to isolate the Central Impact (Target) Area. Both the perimeter and the Central Impact (Target) Area fencing (a total of 15 miles of fencing) were replaced/repaired under the completed Emergency Actions (BCRRT, 2007c). These fences will be maintained as an extension of Regional Park and WMA operations. In addition warning signs identifying the potential of unexploded military munitions have been installed at 50 ft intervals around both the Perimeter and CITA fences.

- Park operations and management will include a **public information program** to inform interested citizens in the nature and extent of the low level of residual explosive risk that may remain after implementation of the area-specific cleanup actions. This public information program will include a permit notification program, and printed media program, and an on-site information kiosk, as follows:

    - The **permit notification program** will consist of standard notices in on-site permits for the construction or installation of building foundations, underground and above-

ground utility lines, roads and other paved or graded and graveled areas, land surveying, timber management, and other tasks which will or may involve land disturbance activities.

- The **printed media program** will include broc**hures, public service news**paper advertisements, public service television and radio spots, fact sheets, and press kits.

- The **on-site information kiosk** will consist of an exhibit and display depicting the history of the former CBMR, summaries of the explosives-related cleanup actions and findings, and the residual risk issues. This kiosk will be installed near the main entrance to the regional park. The kiosk will be supplemented by additional displays, including demilitarized samples of munitions type found on the site during the cleanup actions, in the park headquarters or the environmental resources training center.

- The permit notification program cited above will be supported and reinforced by **standard operating procedures (SOPs) for construction and maintenance** related excavation activities and other potential land disturbing tasks.

- To facilitate implementation of the procedures for land disturbing activities, **two Clark County park service employees will be trained in Unexploded Ordnance and anomaly avoidance techniques**. This training will be provided by an appropriately accredited unexploded ordnance training center. These two employees will be certified as Level I MEC technicians. In the event that these two county employees encounter munitions, they will isolate the area and coordinate with Army Emergency Response personnel for the removal of that item.

It is also noted that several of the area-specific cleanup actions, outlined in the following sections, include specific land use controls for those locations. As part of the development of this CAP, Clark County, WDOE, and BCRRT Representatives met to evaluate the potential for site specific ICs and a number of RWAs within CBMR. The results of those discussions are summarized in the following **Table 3-1**. This table contains a preliminary evaluation of the need for site specific IC's such as a printed media program, permits and signage that are currently being planned for various locations within the CBMR. Both site- specific and site-wide ICs and Engineering Controls for CBMR will be detailed in a final Institutional Control Plan for review and approval by WDOE and Clark County during the implementation of the remedial activities detailed in this CAP.

Table 3-1 SUMMARY OF PROPOSED CBMR INSTITUTIONAL CONTROLS

Area Designation	Comments
CBMR SITE WIDE INSTITUTIONAL CONTROLS[1]	
All areas will have one or more of the following:	1) Land use controls 2) Deed restrictions -- no dig restrictions 3) Fencing 4) Signage 5) Public information program
APPLICATION OF INSTITUTIONAL CONTROLS TO SITE FOLLOWING MEC CLEARANCE ACTIONS	
Fencing and Signage	
Property Perimeter Fence Line	Key site-wide engineering control, fencing and signage to be maintained
Central Impact Target Area Perimeter Fence Line	Key site-wide engineering control, fencing and signage to be maintained
Central Impact Target Area - Specified Target Areas	No area-specific IC required
Central Impact Target Area - Non-Target Areas	No area-specific IC required
Public Information Program and Signage:	
Roads and Trails (R&T)	Area-specific IC required, signage to remain on roads and trails
Firing Points - includes 9 artillery firing points, 6 mortar firing points, one rifle grenade firing point, and one 3.5-inch rocket firing point	No area-specific IC required
REGIONAL PARK (RP) INSTITUTIONAL CONTROLS	
Public Information Program	
Airfield	Determined clear of MEC, No area-specific IC required
Camp Bonneville Cantonment	Determined clear of MEC, No area-specific IC required
Camp Killpack Cantonment	Determined clear of MEC, No area-specific IC required
Public Information Program and Signage:	
West Slopes Area (WSA)	Area-specific IC required, signage to remain on roads and trails
Reuse Construction Areas	Signs should be posted near newly constructed areas detailing the procedures needed to do additional excavation in this area.
CENTRAL VALLEY FLOOR (CVF) INSTITUTIONAL CONTROLS	
Public Information Program	
Parade Ground	No area-specific IC required

Table 3-1 SUMMARY OF PROPOSED CBMR INSTITUTIONAL CONTROLS

Area Designation	Comments
M203 HE Grenade Range Target Area	QC work will determine whether area-specific ICs will be needed.
M203 Practice Grenade Range Target Area	QC work will determine whether area-specific ICs will be needed.
New 2.36-inch Rocket Range Target Area Near Former Sewage Lagoon	No area-specific IC required
New Rifle Grenade Target Area in NE CVF	No area-specific IC required
New MEC Disposal Area (burial pit)	After the excavation of this disposal pit, no area-specific IC required.
Public Information Program and Signage:	
Tent and Yurt Camping Area in South Central CVF	Additional area-specific signage and literature (provided as part of the campground permitting paperwork) may be warranted.
RV and Tent Camping Area in North Central CVF	Additional area-specific signage and literature (provided as part of the campground permitting paperwork) may be warranted.
Public Information Program, Fencing and Signage:	
Central Valley Floor	No area-specific IC required
Wetlands Areas in Central Valley Floor	No area-specific IC required
WILDLIFE MANAGEMENT AREA (WMA) INSTITUTIONAL CONTROLS	
Public Information Program	
Demolition Area 2	Limited accessibility, No area-specific IC required
Rifle Grenade Target Area	Site specific signage required
3.5-inch Rocket Range Target Area	Site specific signage required
Public Information Program and Signage:	
Wildlife Management Area	Additional signage at trailheads
Landfill 4 - Demolition Area 1	No area-specific IC required

Notes

1. Institutional Controls (IC) include land use controls, deed restrictions, fencing and signage, a public information program with brochures and other written documentation (some developed specifically for children) to detail the history and current condition of CBMR, describe MEC items that could be encountered, review park rules (stay on trails) and provide information to report suspected MEC items to park personnel. Additionally, on-site information kiosks will contain exhibits and displays depicting the history of the former CBMR, summaries of the explosives-related cleanup actions and findings, and the residual risk issues. Signage will also be posted at parking areas and trailheads detailing park rules. Permits, including details of MEC residual risk and park rules, will be issued for all camping sites.

3.1 Cleanup Actions for Specific RWAs

The following sections address the individual RWAs that resulted from the Final RI/FS (**Section 4.0**) and those additional cleanup requirements necessary due to the Supplemental RI/FS information. (**Section 5.0**). All of the recommended cleanup actions of the Site-Wide RWAs are depicted on **Figure 3.1.**

4.0 CLEANUP ACTIONS INITIALLY IDENTIFIED IN THE FINAL RI/FS

During the development of the Final RI/FS RAU 3, a number of RWAs requiring cleanup were identified and appropriate cleanup actions proposed. These initially identified RWAs formed part of the basis for planning the early transfer of CBMR to BCRRT (some RWAs were managed as Emergency or Interim actions). In the text that follows, these RWAs are identified, described, and the rationale for the selected cleanup action presented.

4.1 Target Areas

4.1.1 Description

This section addresses Target Areas, including the 3.5-in. Rocket Range, Rifle Grenade Range, and Hand Grenade (HE) Range. These sites are located outside the boundary of the proposed regional park. Additionally, the two M203 Grenade Ranges and a 2.36 in. Rocket Ranges are Target Areas that are located within the proposed regional park boundary. Locations of Target Areas are shown in Figure 4.1. The locations of Target Areas were confirmed during the site reconnaissance. Evidence of Target Areas included target area features, such as automobile / appliance targets, engineered wooden structures, and expended MEC items located downrange.

No MEC were recovered or removed during the site characterization in the 3.5-in. Rocket Range, Rifle Grenade Range or Hand Grenade (HE) Range.

A total of four MEC items were recovered in the intrusive grid sampling at the two M203 Grenade Ranges (one High Explosives Range and one Practice Range) during the 1998 site characterization. An additional four MEC items were recovered on the ground surface as the intrusive sampling teams were moving between sampling grids at the M203 Ranges. The recovered items were 35 mm M73 practice rockets. The 35 mm M73 practice rocket may still contain a small explosive safety risk due to the unconsumed signaling charge, if it was fired and failed to function. No 40 mm HE or LAW HEAT munition items were encountered and observations of the ranges revealed no indication of their presence (i.e., fragmentation marks, singed holes, and explosive component debris). A time-critical removal action (TCRA) was performed at the M203 ranges in 1999. This clearance was conducted on a total of 19 acres at the two ranges to a depth of two feet. UXO and OE scap items were recovered during this interim removal action at these Grenade Ranges. Over 3,800 pounds of inert MD scrap were recovered from the M203 Grenade Ranges during this clearance action.

One intact 2.36 in. rocket was identified embedded near a tree on the east side of Munsell Hill during the 2001 site reconnaissance. This area was selected for reconnaissance due to the presence of ground scars that were identified from historic aerial photos. The 2.36 in. rocket was destroyed in place by the 707th Ordnance Company (Explosives and Ordnance Disposal) from Fort Lewis, Washington in February 2003. A buried 3.5-in. practice rocket was also reported as being found near this location in the ASR (USACE, 1997). No evidence of any 3.5-in. rockets was found during the site reconnaissance at the reported location.

The remedial actions for this RWA, - 2.36 in. Rocket Range, have already been completed, as documented in the "2.36 in. Rocket Range After Action Report" (BCRRT 2008c). The completed actions consisted of anomaly avoidance, brush clearance, surface MEC clearance and subsurface MEC clearance to 14 inches bgs. During the 2.36 in. Rocket Target Range investigation, 69 MEC items were found. Sixty-two were 2.36 in. rockets, four were 3in. Stokes mortars, and 1 was a rifle grenade. All but three of the MEC items were found on the surface.

During more than 800 MEC subsurface clearance phase excavations ("Mag and Dig" surveys to Frost Depth - 14 inches bgs), only two 2.36 in. rockets (12 and 14 inches bgs), and one Stokes Mortar (4 inches bgs) were found.

Since this RWA consisted of an expansion of a previously evaluated 2.36 in. range and the indicated remedial action has already been completed and approved, no further action is required or appropriate at this location.

4.1.2 Hazard Severity Ranking

The munition release mechanism resulting in the presence of MEC in the vicinity of the Target Areas is from deployed munitions that failed to function (UXO) properly when initially fired. Residual UXO poses the greatest explosive safety threat to the public as these items are fuzed and armed but failed to function. The hazard severity ranking for a Target Area is the most severe of all site types. While implementing the Central Valley Floor and Roads and Trails Interim Actions, it was observed that almost all of the items identified have been determined to be training rounds. While these rounds would have a significantly lower explosive risk, the overall explosive risk ranking is maintained at the conservative levels established in the Final RI/FS. The explosive safety relative risk ranking for Target Areas is 1 on a scale of 1 – 7, with 1 representing the highest explosive risk.

4.1.3 Accessibility Rating and Reuse Intensity

The accessibility of the M203 Grenade Ranges and Hand Grenade (HE) Range Target Area are designated as accessible based on a flat or gentle topographic slope and adjacent roadways. The accessibility of the other Target Areas is categorized as limited, based on a moderate topographic slope. Portions of the 3.5 in. Rocket Range, Rifle Range, and Hand Grenade (HE) Range Target Areas, are designated as high reuse intensity. The activities that will be conducted at the proposed firing range locations that overlie the historical Target Areas are categorized as surficial and non-intrusive activities.

4.1.4 Explosive Hazard Ranking

The explosive hazards exposure assessment ranking for Target Area sites was assigned Rank A on a scale of A – E, with A representing the greatest exposure risk. This ranking is due to the high relative explosive safety risk of Target Areas and their locations within the proposed Regional Park and/or co-location with high reuse areas. The M203 Grenade Ranges was assigned Rank D because of the prior removal action completed in that area

and medium (non-intrusive) future reuse. The explosive hazards exposure characteristics associated with Target Areas are summarized in **Table 4.1**.

TABLE 4.1
SUMMARY OF EXPLOSIVE HAZARDS EXPOSURE CHARACTERISTICS FOR TARGET AREAS

Site	MEC Source	Receptor Interaction			Explosive Hazards Exposure Rank
	Explosive Relative Risk Ranking	Accessibility	Future Land Reuse	Depth of Activity / Reuse	
3.5-in. Rocket Range Target	1	Limited	Low	Surface / WMA	B
Rifle Grenade Range Target	1	Limited	Low	Surface / WMA	B
Hand Grenade (HE) Range	1	Limited	Low	Surface/ WMA	B
M203 Grenade Ranges (includes both TA-8 and TA-9)	See note (1)	Accessible	Medium	Surface / Regional Park	D
2.36 in. Rocket Target Area	See note (2)	Limited	Medium	Surface / Regional Park	E

(1) Removal Action completed to a depth of two feet in the M203 HE Grenade Range Target in 1999 removed MEC items from site.

(2) Removal Action completed to a depth of 14 in. as detailed in the "2.36 in. Rocket Range After Action Report" (BCRRT 2008c).

4.1.5 Recommended Cleanup Action

For the M203 Grenade Ranges (TA8 and TA9) which had been previously cleared under the 1999 TCRA, a quality assurance validation assessment of previous clearance activities will be performed.

The validation assessment methodology will consist of QA of 20% of the previous Army cleanup for each of the M203 Grenade Ranges. (TA-8 & TA-9). The assessment failure criteria will be the discovery of any MEC or MD item in a previously cleared area. In the event of a MEC or MD item discovery, additional actions for the area would be determined by the Anomaly Selection Board (ASB). Upon successful completion of the assessment, and recommendation of the ASB to the Ecology Project coordinator, Site-specific Institutional Controls (ICs) may be the recommended action for the M203 Grenade Ranges.

The remedial action (subsurface clearance to 14 in.) for the 2.36 in. Rocket Range have already been completed, therefore, the most feasible permanent solution is Site-specific ICs.

For the three remaining Target Areas, the MEC surface clearance cleanup action alternative with ICs, is determined to be the most feasible permanent solution for three of these former Target Areas (**BCRRT 2008a**). MEC surface clearance at the 3.5-in. Rocket Range Target, Rifle Grenade Range, and the Hand Grenade (HE) Range Target, would substantially reduce the explosive hazard at these sites since the future activities anticipated to occur in these Target Areas are surficial and non-intrusive. In addition, the 3.5 in. Rocket Range Target and Rifle Grenade Range Target Areas are considered to have limited accessibility based on the topography. The implementation of the Site-specific ICs (included as part of Alternative 3) would provide for the necessary public awareness of the former military use of the site. The MEC surface clearance cleanup action combined with the ICs will achieve the cleanup standard at the Target Areas. **Table 4.2** summarizes the recommended cleanup actions for the Target Areas.

TABLE 4.2
SUMMARY OF RECOMMENDED CLEANUP ACTIONS FOR TARGET AREAS

Target Sites	Explosive Risk Rank	Depth of Activity/Reuse	Recommended Alternative
M203 HE Grenade	Negligible[1]	Surface/Parking Lot for Regional Park	ICs with subsurface QA validation
M203 Practice Grenade Range	Negligible[1]	Surface/Regional Park	ICs with subsurface QA validation
Rifle Grenade Target	Highest	Surface/WMA	MEC surface clearance with Site-specific ICs
Hand Grenade (HE) Target	Highest	Surface/WMA	Surface clearance with Site-specific ICs
2.36 in. Rocket Target	Highest	Surface/Regional Park	ICs. (MEC Subsurface Clearance to 14-inch depth. Completed [2])

[1] Assuming TCRA cleanup was effective, which will be determined by QA validation.
[2] Documented in the 2.36 in. Rocket Range After Action Report (BCRRT. 2008c).

The area and extent of the targets is based upon prior characterization and reconnaissance efforts. Clearance actions will be initiated at the presumed target center and will proceed outward in a grid-based manner. The MEC surface clearance area is roughly 2.6 acres for each of the three Target Areas. The actual clearance areas will be adjusted based upon items recovered during fieldwork. The step-out procedures described in **Section 4.8** will be deployed. Site-specific ICs will include installation of signage at each of the Target Areas to increase the publics' awareness of the past military activities conducted at the site.

4.2 Central Impact Target Area – Non-Target Zone

4.2.1 Description

The central portion of the CBMR was formally used as the location of a number of artillery and mortar practice targets and a surrounding buffer zone. This area was determined by the US Army to be roughly 465 acres in extent and is generally referred to as the Central Impact Target Area (CITA; **Figure 4.2**).

For the purposes of this CAP, the targets themselves (CITA-Targets) and the remaining buffer or Non-Target Zone (CITA-NT) will be managed separately. The CITA-Targets are comprised of 15 targets that cover roughly 10 acres and are discussed in **Section 4.3**. The CITA-NT encompasses the 455 remaining acres surrounding the targets and is part of the former artillery and mortar Range Safety Fans. As such, the CITA-NT has ordnance-related characteristics common to both Target Area and Range Safety Fan sites. The CITA-NT was selected for explosive hazard exposure assessment due to its remote location and its varied MEC exposure characteristics, suggesting that this area may require a unique risk management strategy. The entire CITA (both Targets and NT) is wholly fenced with a five-strand barbed wire fence encircling the area. Additionally, signage warning of the potential danger to trespassers is in place around the CITA at 50-ft intervals.

4.2.2 Hazard Severity Ranking

Munition release mechanisms that may have resulted in the presence of MEC in the vicinity of the CITA-NT are from deployed munitions that failed to function. Residual HE-filled UXO items potentially present in the CITA-NT pose the greatest hazard severity ranking of all site types. The likelihood that additional UXO items are present in the CITA-NT is considered low – medium, as the vast majority of the CITA-NT is located within the Range Safety Fans. The high severity ranking and low – medium presence of additional UXO result in an explosive safety relative risk ranking of 3 on a scale of 1 – 7 for the CITA-NT.

4.2.3 Accessibility Rating and Reuse Intensity

The overall accessibility of the CITA-NT considered extremely limited as the entire CITA is fenced and signed with only a small portion of this area accessible by four-wheel drive vehicles. The majority of the CITA is essentially inaccessible due to very steep terrain. It is designated as a no-reuse, restricted access area since it is isolated by fencing and signage and located within the WMA. There are no overlying proposed future use sites or facilities planned in this area. People will not be allowed to venture into the area because of the fencing, signage, written documents and steep terrain; therefore the number of potential human receptors is considered negligible.

4.2.4 Explosive Hazard Ranking

The low – medium likelihood of MEC combined with the very limited number of potential receptors in the area, result in an explosive hazards exposure assessment

ranking of Rank C. The explosive hazards exposure characteristics associated with the CITA-NT is summarized in **Table 4.3**.

TABLE 4.3
SUMMARY OF EXPLOSIVE HAZARDS EXPOSURE CHARACTERISTICS FOR CENTRAL IMPACT TARGET AREA-NON-TARGET ZONE

Site	MEC Source	Receptor Interaction			Explosive Hazards Exposure Rank
	Explosive Relative Risk Ranking	Accessibility	Future Land Reuse	Depth of Activity / Reuse[1]	
CITA-NT	3	Limited to Regional Park Personnel	None	NA / Restricted Access Area	C

(1) The level of subsurface intrusion or depth of activity is designated as not applicable (NA) for those sites that are located in the CITA. No reuse is proposed for this area.

4.2.5 Completed Cleanup Action CITA-NT

As part of the Emergency Action summarized in the "Emergency Actions-Emergency Action Report, Remedial Action Unit 3" (BCRRT 2007c), the fencing surrounding the entire CITA was repaired and upgraded to five-strand barb wire. New warning signs were installed at 50-ft intervals around the 3.5-mile perimeter of the CITA.

These engineering controls (fencing and signage), along with warnings contained in written materials to be provided to future park visitors and implementation and enforcement of land use controls (restrictive covenants), will achieve the stated cleanup standard for Camp Bonneville of negligible interaction with the CITA. Site-specific ICs included installation of additional signs, maintenance of the existing fence surrounding the CITA. The signage will inform the public about this area's past usage and the fence will restrict the entry to this area. The restrictive covenants will prohibit any future development and/or forestry activities within the CITA.

4.3 CITA-Targets

4.3.1 Description

The CITA-Targets are comprised of 15 targets (**Figure 4.2**). This area is unique in that all six mortar and nine artillery firing positions could each fire at the various CITA-Targets. Four MEC items were recovered during the site characterization in 1998 and included one 2.36 in. HE rocket and three 105 mm HE-filled artillery rounds. During the site reconnaissance in 2001, one additional 105 mm artillery round was identified. An additional 155-mm projectile was discovered in May 2007during the Roads and Trails Interim Action.

4.3.2 Hazard Severity Ranking

Documents report that artillery units conducted firing exercises at CBMR twice a year from 1969 – 1985, resulting in approximately 50 rounds being fired into the CITA during each training session. Sometime in the 1970's, however the military switched from live ammunition to sub-caliber rounds for training purposes.

MEC release mechanisms that may have resulted in the presence of MEC at the CITA-Targets are from deployed munitions that failed to function. UXO items that are potentially present and pose the greatest explosive safety threat include HE-filled munitions ranging in size from 37 mm mortars to 155 mm artillery rounds.

Residual HE-filled UXO items potentially present at the CITA-Targets pose the greatest hazard severity ranking of all site types. The likelihood that additional UXO items are present at the CITA-Targets is considered high. The high severity ranking and likely presence for additional UXO result in an explosive safety relative risk ranking of 1 on a scale of 1 – 7 for the CITA-Targets.

4.3.3 Accessibility Rating and Reuse Intensity

The overall accessibility of the CITA-Targets are considered extremely limited as the targets are located well within the CITA-NT and entire CITA is fenced and signed with only a small portion of this area accessible by four-wheel drive vehicles. The majority of the CITA is essentially inaccessible due to very steep terrain. This area is designated a no-reuse restricted access area as it is located within the CITA-NT and WMA, and there are no designated reuse or facilities planned in this area. The CITA-Targets are wholly contained within a fenced area with signage warning trespassers of potential danger. People are not expected to venture into this area due to the fencing, signage ICs and steep terrain. As a result, there will be very few potential human receptors.

4.3.4 Explosive Hazard Ranking

The high likelihood of MEC combined with the very limited number of potential receptors in the area, results in an explosive hazards exposure assessment ranking of Rank B for each of the targets in the CITA-Targets. The explosive hazards exposure characteristics associated with the CITA-Targets is summarized in **Table 4.4**.

TABLE 4.4
SUMMARY OF EXPLOSIVE HAZARDS EXPOSURE CHARACTERISTICS FOR CENTRAL IMPACT TARGET AREA-TARGETS

Site	MEC Source	Receptor Interaction			Explosive Hazards Exposure Rank
	Explosive Relative Risk Ranking	Accessibility	Future Land Reuse	Depth of Activity / Reuse[1]	
CITA-Targets	1	Limited to Regional Park Personnel	None	NA / Restricted Access Area	B

(1) The level of subsurface intrusion or depth of activity is designated as not applicable (NA) for those sites located in the CITA.

4.3.5 Recommended Cleanup Actions CITA Targets

Institutional Controls for the entire CITA, frost depth (14 in.) clearance in select areas of the CITA-Targets, and hard target removal were determined to be the most feasible permanent solutions for the CITA-Targets. Implementation of engineering controls (during the Emergency Actions) included signage to inform the public about this area's past usage, fencing to restrict access, and land use controls (restrictive deed covenants) to prohibit any future development and/or forestry activities at this site. Removal of the hard targets and frost depth MEC clearance around each target will significantly reduce the explosive hazard.

In order to implement the frost depth clearance and hard target removal actions, a temporary access road will be constructed to provide entry to the CITA-Targets. MEC frost-depth clearance will be conducted over a 200 x 200 ft area around each target, for a total of about 10acres. All hard targets (old vehicles and appliances) would be removed after surface clearance of the areas adjacent to the target. After hard-target removal, each of the 15 target locations will be MEC cleared to frost-depth (14 in.; see **Figure 4.2**). The Step-out procedures described in **Section 4.8** will be used. Site-specific ICs include both installation and maintenance of signage and fencing, and land use controls. A new hiking trail (to replace the lower DNR road) will be constructed and surface cleared with 20 foot buffers to the north of the expanded CITA.

4.4. Open Burn/ Open Demolition Areas

4.4.1 Description

The OB/OD MEC sites consist of three OB/OD sites at CBMR, known as Demolition Areas 1, 2 and 3. Demolition Area 1(DA1) is located in the northwest quadrant of the site, east of Little Elkhorn Mountain; Demolition Area 2(DA2) is located adjacent to and

west of the CITA; while Demolition Area 3(DA3) is located in the southwest quadrant of the CBMR, adjacent to Lacamas Creek and the natural gas pipeline (**Figure 4.3**).

DA 1 sits atop Landfill 4. Landfill 4 was used for disposal of building demolition debris from the Vancouver Barracks and possible military wastes (Shannon and Wilson, 1999). In 2004, the USACE physically removed the contents and associated contaminated soils at DA 1, as part of the Landfill 4 Interim Removal Action. (Tetra Tech, 2006).

4.4.2 Hazard Severity Ranking

The explosive hazards exposure assessment ranking for DA 2 is Rank B because of site accessibility and high relative explosive risk ranking. DA 3 while located in the CVF is not within any designated reuse area, but is north of the planned Environmental Study Area (ESA); it is designated a medium (non-intrusive) reuse intensity. The explosive hazards exposure ranking for DA 3 is Rank A because of the potential for human interaction due to its accessibility and proximity to the planned ESA in combination with the high relative explosive risk ranking.

DA 1 was reportedly used by the Air Force and Army Explosive Ordnance Disposal (EOD), local fire departments and law enforcement agencies (USACE, 1997). It was used for destruction of unserviceable munitions, and confiscated firearms and fireworks since the late 1950's. Reports state that the Demolition Areas were used to destroy 20 mm ammunition, 2.75 in. rockets, and one AIM 7E missile. The rocket motors were destroyed by burning and the warheads destroyed by detonation. It was also reported that automobiles, railroad ties, and other objects were brought onto the range for explosive training. Since 1993, the destruction of unserviceable munitions by any method (burning or detonation) was not permitted.

A wide range of explosives and ordnance were disposed of at the OB/OD areas. During the site characterization, a 2.36 in. rocket and an HE-filled 2.75-in. rocket were recovered in the vicinity of Demolition Area 1/Landfill 4 (DA1/LF4). As a result of these findings, a 10-acre MEC surface clearance was performed at DA1/LF4. Eight UXO items were recovered during the MEC surface clearance and included two HE-filled 2.75-in. rockets and six 35 mm M73 practice rockets. In 2004 under contract with the Department of the Army, Tetra Tech, Inc. conducted an Interim Removal Action and physically removed DA1. During this action 894 MEC items, 12,778 MD Items, and approximately 13,300 pounds of scrap metal were removed during the various phases of the project (Tetra Tech, 2006).

The demolition of discarded or unused military munitions may sometimes result in the "kick-out" of munitions to some distance from the demolition area. Munition release mechanisms that may have resulted in the presence of MEC in the vicinity of an OB/OD Areas are from MEC kick-outs, and low-order or incomplete detonation. At an OB/OD area, the unsuccessful demilitarization of a MEC item poses the greatest explosive safety threat to the public. The hazard severity ranking for an OB/OD Area is the second most severe of all MEC Source site types (marginal/critical explosive safety hazard). The explosive safety relative risk ranking for OB/OD Areas is 2 on a scale of 1 – 7 with 1 representing the highest explosive risk.

4.4.3 Accessibility Rating and Reuse Intensity

The three OB/OD sites are accessible by roads and trails. DA 1and 2 are located outside the boundary of the proposed regional park. A "Logging Camp" that had been previously proposed at the DA 2, will either be eliminated or located within the WMA but outside of the CITA and DA 2.

4.4.4 Explosive Hazard Ranking

The explosive hazards exposure assessment ranking for DA 2 is Rank B because of the potential intrusive activities, site accessibility, and high relative explosive risk ranking.

DA 3 is not within any designated reuse area, but is north of the planned ESA; it is designated a medium (non-intrusive) reuse intensity. The explosive hazards exposure ranking for DA 3 is Rank A because of the potential for human interaction due to its accessibility and proximity to the planned ESA in combination with the high relative explosive risk ranking.

The explosive hazards exposure ranking for DA 1 can be subdivided into two areas. The immediate OB/OD area for DA 1 (2.5 acres) is Rank E because it has physically been removed in 2004 as part of the Landfill 4 removal action (Tetra Tech, 2006). The surrounding kick-out area associated with DA 1 is Rank B. The kick-out area associated with DA 1 is lower than the other two OB/OD areas primarily because a ten acre MEC surface clearance was conducted in 1998, and there are expected to be fewer potential receptors as it is located in the proposed WMA which is a low reuse intensity area. The explosive hazards exposure characteristics associated with each of the OB/OD Areas are summarized in **Table 4.5**.

Table 4.5
SUMMARY OF EXPLOSIVE HAZARDS EXPOSURE CHARACTERISTICS FOR OB/OD AREAS

Site	MEC Source	Receptor Interaction			Explosive Hazards Exposure Rank
	Explosive Relative Risk Ranking	Accessibility	Future Land Reuse	Depth of Activity / Reuse	
Demolition Area 1 (1)	5	Accessible	Low	Surface / WMA	E
Demolition Area 2	2	Accessible	Low	Surface / WMA	B
Demolition Area 3	2	Accessible	Medium	Surface / Regional Park	A

(1) The OB/OD area associated with Demolition Area 1 was removed in 2004.

4.4.5 Recommended Cleanup Actions

MEC surface clearance with ICs is the recommended cleanup action for the DA1, DA2, and DA3 areas. The area and extent of the OB/OD Areas is based upon prior characterization and reconnaissance efforts. MEC surface clearance will be performed in a 500 ft x 500 ft grid centered over DA1, DA2 and DA3. Step-out procedures will be implemented as described in **Section 4.8** of this report.

For the DA1 area, additional surface clearance is proposed to augment the previously conducted 10-acre clearance (Tetra Tech, 2006). The DA1/LF4 MEC surface clearance will be performed for the portions of the "kick out" zone that had not been covered during previous actions and at an area south of DA1/LF4 where MEC was previously found (**Figure 4.3**). A 100 by 200 ft grid will be established around a single location which represents a possible MEC or munitions debris "kick out" zone. A 500-ft x 500-ft grid at the center of DA1 will also be cleared. The actual clearance area will be adjusted based upon items recovered during fieldwork. Step-out procedures will be implemented as described in **Section 4.8** of this report.

The total area for the MEC surface clearance at DAs 1, 2, and 3 is approximately 17 acres. Performing this recommended cleanup action alternative will achieve the cleanup standard of negligible interaction with the MEC. The recommended alternatives are summarized in **Table 4.6**.

TABLE 4.6
SUMMARY OF RECOMMENDED CLEANUP ACTIONS – OB/OD AREAS

OB/OD Sites	Acres	Explosive Risk Rank	Depth of Activity/Reuse	Recommended Alternative
Demo Area 1 (portions of the kick-out area only)	5.8	High\1	Surface/ WMA	MEC surface clearance with ICs(for portions of the kick-out area)
Demo Area 2	5.8	Highest	Surface/ WMA	MEC surface clearance with ICs
Demo Area 3	5.8	Highest	Surface/ Regional Park	MEC surface clearance with ICs

(1) Demo Area 1 removed as part of 2004 removal action.

4.5 Firing Points

4.5.1 Description

The Firing Points at CBMR consist of six mortar firing positions, nine artillery firing positions, one rifle grenade range firing point, one 3.5-in. rocket range firing point, and

one M203 40 mm HE Grenade Range (Range 4). Firing Points are located near the apex of each range. The location of each Firing Point was confirmed during the site reconnaissance. No MEC items were discovered at any Firing Points locations during the reconnaissance efforts. The location of each Firing Point is shown on **Figure 4.4**.

A wide variety of ordnance may have been used at the Firing Point locations. Weapons systems used at the six mortar firing points may have included 4.2-in., 60 mm and 81 mm mortars filled with either HE or pyrotechnics. Artillery employed at the artillery firing positions included 105 mm and 155 mm Howitzers and 37 mm sub-caliber devices. A variety of rifle grenade munitions may have been used at the rifle grenade range including practice, smoke, white phosphorus (WP), fragmentation, and HEAT Practice, HEAT, WP, or smoke-filled 3.5 in. rockets may have been used at the 3.5 in. rocket range.

4.5.2 Hazard Severity Ranking

The ordnance release mechanism at Firing Points is a result of abandonment, burial, or mishandling of non-deployed munitions in shallow pits. Any residual military munitions would likely be located at a close distance behind the Firing Point location where the munitions were prepared. The likelihood that military munitions are present at a Firing Point location is medium.

Only non-deployed military munitions are anticipated to be present at Firing Points. The type of ordnance utilized at a particular firing position would determine if the item was internally or externally fuzed. Military munitions require a specific action, i.e., turning of timer rings, or applying power or force in order to activate the fusing system. Most artillery munitions are required to be fired in order to activate the fusing mechanism. If a military munition has not been acted upon, the fusing has not been activated, and the overall probability that the munition can be detonated by a person uncovering or picking up the item is extremely remote. However, if the item were to be acted upon in an inappropriate, specific and forceful manner, i.e., applying heat or pressure to the outside casing, it could detonate. The hazard severity ranking for a Firing Point location is considered very low (negligible explosive safety hazard). Due to the “medium” likelihood of MEC occurrence, however, the explosive safety relative risk ranking for Firing Points is 3 on a scale of 1 – 7, with 1 representing the highest explosive risk.

4.5.3 Accessibility Rating and Reuses Intensity

The Firing Points are categorized as accessible based on their proximity to roads. Although the 3.5 in. Rocket Range, Rifle Grenade Range firing positions Mortar Firing Positions 1, 2, and 5, are located outside the proposed regional park, within the WMA, they are in very close proximity to the proposed park boundary and are therefore designated a medium reuse intensity. Any Clark County proposed future use areas which overlie the Firing Point locations are limited to activities which will be non-intrusive. Former Artillery Positions 1, 2 and Artillery Position 5 underlie the planned Trailhead & Parking Area.

4.5.4 Explosive Hazard Ranking

The explosive hazards exposure assessment ranking for firing points which overlie a proposed future use area was assigned rank B on a scale of A to E, with A representing the greatest exposure risk. Other firing points were assigned rank C based on a combination of accessibility and future land reuse criteria. The M203 HE grenade range firing point was assigned rank D because of the prior removal action completed in that area. The explosive hazards exposure characteristics associated with firing points are summarized in **Table 4.7.**

TABLE 4.7
SUMMARY OF EXPLOSIVE HAZARDS EXPOSURE CHARACTERISTICS - FIRING POINTS

Site	MEC Source	Receptor Interaction			Explosive Hazards Exposure Rank
	Explosive Relative Risk Ranking	Accessibility	Future Land Reuse	Depth of Activity / Reuse	
Mortar Firing Pos 1	3	Accessible	Medium	Surface / WMA	C
Mortar Firing Pos 2	3	Accessible	Medium	Surface / WMA	C
Mortar Firing Pos 3	3	Accessible	Medium	Surface/ Regional Park	C
Mortar Firing Pos 4	3	Accessible	Medium	Surface/ Regional Park	C
Mortar Firing Pos 5	3	Accessible	Medium	Surface / WMA	C
Mortar Firing Pos 6	3	Accessible	Medium	Surface/ Regional Park	C
Artillery Pos 1	3	Accessible	Medium	Surface/ Regional Park	C
Artillery Pos 2	3	Accessible	Medium	Surface/ Regional Park	C
Artillery Pos 3	3	Accessible	Medium	Surface/ Regional Park	C
Artillery Pos 4	3	Accessible	Medium	Surface/ Regional Park	C
Artillery Pos 5	3	Accessible	High	Surface / Trail Head & Parking	B
Artillery Pos 6	3	Accessible	Medium	Surface/ Regional Park	C
Artillery Pos 7	3	Accessible	Medium	Surface/ Regional Park	C
Former Artillery Firing Pos 1	3	Accessible	Medium	Surface / Trail Head & Parking	B
Former Artillery Firing Pos 2	3	Accessible	Medium	Surface / Trail Head & Parking	B
Rifle Grenade Range	3	Accessible	Medium	Surface / WMA	C
3.5-in. Rocket Range	3	Accessible	Medium	Surface / WMA	C
M203 Grenade Ranges	*[1]	Accessible	Medium	Surface/ Regional Park	D

(1) Removal Action completed to a depth of two feet in the M203 Grenade Ranges in 1999.

4.5.5 Recommended Cleanup Actions

To achieve the cleanup standard of negligible interaction with MEC, subsurface clearance using Digital Geophysical Mapping (DGM) coupled with ICs is determined to be the most feasible permanent solution for the Firing Point sites, based on the analysis presented in the Final RI/FS (**BCRRT 2008a**). The depth of MEC clearance for each of the Firing Points would be 14 inches bgs and is based on the future surficial and non-intrusive reuse activities: the potential for unfired ordnance to have been intentionally buried in order to expedite end-of-fire exercise procedure; and the accessibility of the various firing points. Site-specific ICs will include installation of signage at each of the Firing Points to increase the publics' awareness of the past military activities conducted at these sites.

The total area for the cleanup action is approximately 21 acres. This is based on an approximate 2 acre clearance around each of the artillery firing positions, a 0.5 acre clearance around each of the mortar firing positions, and a 1-acre clearance around the 3.5 in. Rocket and Rifle Grenade firing points.

In order to facilitate the MEC subsurface clearance, the brush will be removed around each site and MEC surface cleared. Subsurface investigations will be based upon site-specific work plans developed to address the specific MEC issues that are likely to be encountered. Step-out procedures will be implemented as described in **Section 4.8**.

4.6 Roads and Trails

4.6.1 Description

There are approximately 46 miles of Roads and Trails throughout CBMR of which 25 miles are located within the proposed regional park (**Figure 4.5**). In addition, approximately 11 miles of Property Boundary and 3.5 miles of CITA perimeter fencing were addressed as part of the Emergency Actions, as documented in the Emergency Action Report, Remedial Action Unit 3 (BCRRT 2007c).

The Roads and Trails have the same munitions related historical use and characteristics as the Maneuver Areas. Roads and Trails were segregated for analysis because of the greater potential for human use which may require a different risk management strategy.

4.6.2 Hazard Severity Ranking

The reconnaissance efforts resulted in sampling of nearly all of the Roads and Trails in CBMR. While MEC and MD items were recovered within the buffer along the Road and Trails during the reconnaissance, almost all of these items were located within the CVF, CITA, or other RWAs. The buffer zones in these RWAs will be managed as part of those work areas. The few remaining items included expended pyrotechnics, small arms ammunition, Stokes Mortars and smoke grenades. The hazard severity ranking for Roads and Trails is considered low with a low explosive safety hazard and low probability for

encountering MEC. The explosive safety relative risk ranking for Roads and Trails is 5 on a scale of 1 – 7, with 1 representing the highest explosive risk.

4.6.3 Accessibility Rating and Reuse Intensity

Roads and Trails are located throughout CBMR. The future reuse intensity of Roads and Trails is considered high. In addition to pedestrian and equestrian traffic, maintenance will be conducted along the Roads and Trails. These activities are non-intrusive.

4.6.4 Explosive Hazard Ranking

The explosive hazards exposure assessment ranking for Roads and Trails is Rank D, despite the relatively large number of potential receptors, because of its low explosive safety risk. The explosive hazards exposure characteristics associated with Roads and Trails is summarized in **Table 4.8**.

TABLE 4.8

SUMMARY OF EXPLOSIVE HAZARDS EXPOSURE CHARACTERISTICS FOR ROADS AND TRAILS

Site	MEC Source	Receptor Interaction			Explosive Hazards Exposure Rank
	Explosive Relative Risk Ranking	Accessibility	Future Land Reuse	Depth of Activity / Reuse	
Roads and Trails	5	Accessible	High	Surface / Hiking and Horseback Riding	D

4.6.5 Completed Cleanup Action

A relatively large number of potential receptors were expected along the Roads and Trails located in the proposed regional park, with fewer receptors expected on the Roads and Trails in other areas. The results of the qualitative explosive hazards exposure assessment indicated a very low level of exposure risk along the Roads and Trails. An Interim Action consisted of MEC surface clearance of a 20 foot wide buffer zone along the existing roads and trails with step-outs (see **Figure 4.5**). Site-specific ICs included installation of signs along the roads and trails at appropriate intervals to inform the public about the past military use of the site. The Draft Interim Action Work Plan for RAU 3 (BCRRT 2007d) presented the details for the implementation for this interim action and an Interim Action Completion Report is pending.

4.7 Wildlife Management Area

4.7.1 Description

The Wildlife Management Area (WMA) is comprised of approximately 2,188 acres and includes the former DNR leased lands (**Figure 4.6**). The WMA does not include the Central Impact (Target) Area which requires a separate risk management strategy and is addressed separately in **Section 5.0**. The majority of the WMA overlies one or more Range Safety Fans.

4.7.2 Hazard Severity Ranking

The WMA is categorized as having the ordnance related historical use and characteristics similar to those as the Range Safety Fans (critical/catastrophic explosive safety risk and low likelihood of munitions contamination). The explosive safety relative risk ranking for the WMA is 5 on a scale of 1 – 7 with 1 representing the highest explosive risk similar to Range Safety Fans.

4.7.3 Accessibility Rating and Reuse Intensity

The overall accessibility of the WMA is considered limited as only a small portion of this site is accessible by road. The vast majority of the WMA is categorized as either limited or inaccessible due to very steep terrain. It is designated as low reuse intensity, with no overlying proposed future use sites or facilities planned in this area. Timber harvesting and subsequent timber planting are the sole human activities proposed for the WMA. People are not expected to venture into the area because of the steep terrain; therefore the number of potential human receptors is considered very low.

4.7.4 Explosive Hazard Ranking

The low likelihood of an MEC source combined with the very limited number of potential receptors in the area, result in an explosive hazards exposure assessment ranking of Rank D. The explosive hazards exposure characteristics associated with the WMA is summarized in **Table 4.9**.

TABLE 4.9
SUMMARY OF EXPLOSIVE HAZARDS EXPOSURE CHARACTERISTICS FOR WILDLIFE MANAGEMENT AREA

Site	MEC Source	Receptor Interaction			Explosive Hazards Exposure Rank
	Explosive Relative Risk Ranking	Accessibility	Future Land Reuse	Depth of Activity / Reuse	
Wildlife Management Area	5	Limited	Low	Surface and Subsurface / Silviculture, Short-cuts	D

4.7.5 Recommended Cleanup Action

Institutional Controls are determined to be the most feasible permanent solution for the WMA, based on the analysis to achieve the cleanup standard of negligible interaction with MEC. The ICs at the WMA will include implementation of Site-Wide ICs as described in **Section 3.0**. These Site-Wide ICs will inform the public and the forestry workers about the past military history of the CBMR. The Site-Wide ICs will also aid in MEC recognition and the proper response and reporting procedures. Construction support activities will also be provided as described in the Final RI/FS (**BCRRT 2008a**) for forest management and fire suppression logging work. The Site-Wide ICs will likely modify the timber worker and public behavior, resulting in a decrease in the potential for receptor interaction with potential MEC items. Implementation of these Site-Wide ICs will achieve the cleanup for this area. A new hiking trail (to replace the lower DNR road) will be constructed and surface cleared with 20 foot buffers to the north of the expanded CITA.

4.8 Central Valley Floor and Associated Wetlands

4.8.1 Description

The Central Valley Floor (CVF) and associated wetlands (adjacent to Lacamas Creek) comprise the major portion of the proposed regional park that has a gentle topographic slope, and low vegetative cover. Therefore, these areas provide the opportunity to draw people together for informal recreational activities. These areas cover approximately 445 acres along the Lacamas Creek valley floor. The CVF includes both future High Intensity Reuse Areas (e.g., tent camping areas) as well as Accessible Medium Intensity Reuse Areas. Surface clearance of the CVF has been completed except for the wetlands.

4.8.2 Associated Wetlands

Wetlands extend throughout the CVF along the Lacamas Creek basin and total roughly 110 acres. These wetlands are discussed separately due to the existence of sensitive ecological habitats, easily disturbed soils, flora and fauna, additional regulatory Agency oversight and work safety concerns (i.e. unstable saturated soil conditions and stream banks).

As described in the PPCD (WDOE 2006) and RAU 3 RI/FS (Section 6.3.3), an aerial survey was originally proposed for the identification of magnetic anomalies (i.e., potential MEC items) in the limited area of these wetlands where MEC surface clearance is practical most of the year due to terrain or saturated conditions (i.e. wetlands and stream banks).

The wetlands aerial survey was to be conducted using a magnetometer system deployed beneath a helicopter flying as low as possible above these wetlands. The resulting magnetometer data would be used to develop an inventory of metallic anomalies and their GPS coordinates. After the survey, the anomalies would be manually located for identification as either metallic scrap or MEC items and removed.

After the start of the project and discovery of numerous MEC items in the adjacent CVF, the practicality of the aerial survey came into question for the following reasons:

- The size and density of trees and brush along Lacamas Creek and the wetlands would result in the helicopter having to fly over the wetlands at higher than optimal altitudes, further reducing the effectiveness of the aerially deployed magnetometer in detecting smaller MEC items.

As a result of these and other factors, WDOE determined that the use of an aerial survey was not an appropriate technology to employ at CBMR as a substitute for MEC surface clearance. Therefore, surface investigation and surface clearance of the wetlands will need to be completed manually using standard instrument aided surface clearance techniques.

4.9 Step-Out Procedure for Clearance Activities

Step-out Procedures will apply to every clearance action and be completed as a separate task at the end of the Phase 1 cleanup in accordance with the Prospective Purchaser Consent Decree (PPCD; WDOE 2006) and attached Conceptual Remedial Action Plan (CRAP).

4.9.1 Standard Step-out Procedure

Step-out clearance is employed to insure that isolated discoveries of MEC are not evidence of additional areas of concern. Step-Out clearance procedures will be done in accordance with the following steps:

1. If a MEC or MD item, of a particular (hazardous) military munition, is found within a boundary grid of a designated clearance area, then the clearance area shall be expanded by adding a new (100 ft. x 100 ft.) grid adjacent to the grid of concern.
2. The new grid will be brush cleared.
3. The new grid will be surface cleared and if a MEC or MD item of a hazardous military munitions is discovered, the procedure will repeat until no MEC or MD items are found.

4.9.2 Exceptions to the Procedure

The following exceptions will stop/modify the Step-out Procedures**:**

- If the new grid extends beyond the property perimeter fence line.
- If the new grid extends to an adjacent cleanup area requiring clearance or a previously cleared area.
-
- If worker safety compromised due to extremely steep terrain making the area inaccessible.

5.0 ADDITIONAL CLEANUP ACTION REQUIREMENTS DUE TO SUPPLEMENTAL RI/FS CHARACTERIZATION

While conducting the Supplemental RI/FS (**Appendix A**), numerous MEC and MD findings were reported in areas of the CBMR where such findings were not anticipated, based on the results of the Army's previous site work. These findings lead to the discovery of a number of new target impact areas and waste disposal areas. Analysis of these findings in the Supplemental RI/FS led to the conclusion that additional cleanup actions are required for some areas. In addition, the WDOE has made the determination that the findings in a number of areas change the associated cleanup requirements. This section (**Section 5.0**) details both the cleanup actions and cleanup action recommendations made in the Supplemental RI/FS.

5.1 Central Valley Floor and Associated Wetlands

5.1.1 Description

The Central Valley Floor (CVF) and associated wetlands (adjacent to Lacamas Creek) comprise the major portion of the proposed regional park that has a gentle topographic slope, and low vegetative cover. Therefore, these areas provide the opportunity to draw people together for informal recreational activities. These areas cover approximately 445 acres along the Lacamas Creek valley floor. The CVF includes both future High Intensity Reuse Areas (e.g., tent camping areas) as well as Accessible Medium Intensity Reuse Areas.

Data shows that the CVF and associated wetlands were extensively used as direct and indirect fire target areas, and an extensively used training area. The discovery of numerous subsurface anomalies, as well as surface MEC findings led WDOE to the determination that MEC subsurface clearance would be necessary. A number of newly discovered target areas and/or waste disposal areas were discovered during the CVF MEC surface clearance activities, including;

- Stokes Mortar Target Area,
- MEC Disposal Area (Burial Pit),
- Open Burn/Open Demolition Area ,
- 37 mm Artillery/Stokes Mortar Target Area,
- 2.36 in. Rocket Target Area near the Former Sewage Lagoons,
- Rifle Grenade Target Area
- Associated Wetlands

Each of these specific areas is presented on **Figure 5.1** and is briefly described in the subsections below.

During the Supplemental RI/FS and associated MEC surface clearance of the northernmost edge of the CVF, approximately 12.5 acres were determined to be permanently saturated with significant standing water. The saturated conditions and standing water made this area inaccessible for MEC surface clearance. BCRRT, Clark County and WDOE agreed that clearing the equivalent acreage in another area of the

Regional Park would meet the requirements of the PPCD. In discussion with WDOE and Clark County, BCRRT has relocated 12.5 acres of MEC surface/subsurface clearance to the southwest corner of the site adjacent to the wetlands, western slopes, and ESA.

5.1.1.1 Newly Discovered Stokes Mortar Target Area

The newly discovered Stokes Mortar Target Area is located just south of the midpoint of the CVF. Throughout the Stokes Mortar investigation area, multiple subsurface anomalies have been identified in areas co-located with MEC on the surface that are indicative of this area being used as a target. Prior to transfer to BCRRT, the area had not been identified as a target area. However, the MEC and MD findings in the Stokes Mortar investigation area include numerous 3 in. Stokes mortars (fired, some fuzed and some unfuzed), 2.36 in. rockets (fired, some fuzed and some unfuzed) and 1- 37 mm projectile (fired and fuzed), a HE M-9 Rifle Grenade and numerous MD findings (see **Appendix A**).

5.1.1.2 Newly Discovered MEC Disposal Area (Burial Pit)

The newly discovered MEC disposal pit is located within a flat-lying open field in the central portion of the CVF, west of Lacamas Creek. Several layers of grenade spoons, rocket parts (some can be identified as HE rocket parts), and miscellaneous munitions-related debris were identified. The pit has not been investigated vertically, but has been defined laterally. Lateral delineation of burial pit defines it as a 50 ft x 50 ft area. Vertical excavation limits will be based upon the actual depth of MEC/MD encountered in the excavation.

The recommended cleanup action for the burial pit is complete excavation of the pit contents and proper disposal of the excavated material and implementation of ICs. This alternative is determined to be the most feasible permanent solution for this area and would achieve the RAU 3 remediation standard. The area is about 50 by 50 ft with an estimated depth of 10 ft for a total of approximately 4000 cubic yards of material.

A Soil and Groundwater Sampling Program will be implemented for the burial pit to address potential explosives residues from historic OB/OD activities. The sampling will be conducted per site-specific Work Plans that focus on the potential for groundwater impacts related to the OB/OD operations/material explosive residuals and will be prepared as a separate document. The Sampling Program will be conducted in a phased approach based upon the results of the Recommended Cleanup Action, field observations, and analytical sample results.

5.1.1.3 Newly Discovered Open Burn/Open Demolition Area

The newly discovered OB/OD area is located in the southern part of the CVF on its eastern border and just north of the ESA. This newly identified demolition area covers approximately 16.33 acres and was discovered during the CVF clearance action. Several inert 5 in. rocket warheads were identified on the

surface as well as rocket slag from a thermite burn. The recent findings show the area has several subsurface anomalies indicative of additional potential MEC or MD. In addition, the area has several demolition craters indicative of past surface demolition activities. The majority of the area is located within an open flat area of the CVF. Recent MEC and MD findings include 2.36 in. rockets (one fired, fuzed), 3" Stokes mortars (fired, unfuzed), a 5" rocket warhead, a 37 mm HE (unfired and unfuzed), and other miscellaneous items (see **Appendix A**).

A Soil and Groundwater Sampling Program will be implemented for OB/OD areas to address potential explosives residues from historic OB/OD activities. The sampling will be conducted per site specific Work Plans that focus on the potential for groundwater impacts related to the OB/OD operations/material explosive residuals and will be prepared as a separate document. The Sampling Program will be conducted in a phased approach based upon the results of the Recommended Cleanup Action, field observations, and analytical sample results.

5.1.1.4 Newly Discovered 37 mm Artillery/Stokes Mortar Target Area

The newly identified 37 mm and Stokes mortar target area is located east of the newly discovered Stokes Mortar Target Area (Section **5.1.1.1**, above) and was identified during investigation of the CVF. The area has several subsurface anomalies co-located with MEC discovered on the surface, indicative of additional potential MEC or MD. The area was also posted with a newly discovered "Impact Area" warning sign during the brush clearance as part of the CVF Interim Action and investigation. Numerous MEC and MD items requiring demolition (3 in. Stokes mortars and 2.36 in. rockets (fired, some fuzed and some unfuzed); smoke grenades; 37 mm projectiles (fired, fuzed), have been found in this area, some of the items found were HE type munitions (see **Appendix A**).

5.1.1.5 Newly Discovered 2.36 in. Rocket Target Area Near Former Sewage Lagoons

The newly discovered 2.36 in. Rocket Target Area is located east of the former sewage lagoon ponds in the northern part of the CVF. Based upon the density and type of findings discovered during MEC surface clearance, conducted as part of the CVF Interim Action and investigation, the area is considered a newly discovered target area. MEC and MD findings included numerous 2.36 in. rockets and a smoke grenade.

5.1.1.6 Newly Discovered Rifle Grenade Target Area

A number of M9 Rifle Grenades (fired, fuzed) and MD items have been recovered from an area east of former Field Small Arms Ranges 1 and 2 near or in Grid N-17 (**Figure 5.1**). Based upon the density and type of findings the area is considered a newly discovered target area.

5.1.1.7 Associated Wetlands

Wetlands extend throughout the CVF along the Lacamas Creek basin and total roughly 110 acres. Although part of the CVF these wetlands are discussed separately due to the existence of sensitive ecological habitats, easily disturbed soils, flora and fauna, additional regulatory Agency oversight and work safety concerns (i.e. unstable saturated soil conditions and stream banks).

As described in the PPCD (WDOE 2006) and RAU 3 RI/FS (Section 6.3.3), an aerial survey was originally proposed for the identification of magnetic anomalies (i.e., potential MEC items) in the limited area of these wetlands where MEC surface clearance is practical most of the year due to terrain or saturated conditions (i.e. wetlands and stream banks).

The wetlands aerial survey was to be conducted using a magnetometer system deployed beneath a helicopter flying as low as possible above these wetlands. The resulting magnetometer data would be used to develop an inventory of metallic anomalies and their GPS coordinates. After the survey, the anomalies would be manually located for identification as either metallic scrap or MEC items and removed.

After the start of the project and discovery of numerous MEC items in the adjacent CVF, the practicality of the aerial survey came into question for a number of reasons, including:

- The size and density of trees and brush along Lacamas Creek and the wetlands would result in the helicopter having to fly over the wetlands at higher than optimal altitudes, further reducing the effectiveness of the aerially deployed magnetometer in detecting smaller MEC items.

As a result of these and other factors, WDOE determined that the use of an aerial survey was not an appropriate technology to employ at CBMR as a substitute for MEC surface clearance. In addition, WDOE has also determined that the adjacent CVF and the wetlands areas require subsurface clearance to frost depth (14-in bgs). Therefore, MEC surface and subsurface clearance in the wetland areas must be conducted in accordance with already established clearance technologies (Schoenstadt and/or EM-61) as modified with a separate wetland protocol. The wetland protocol will include specific brush cutting, worker safety, and MEC anomaly investigation procedures to reduce the impact to potentially sensitive habitat and in consultation with the appropriate governmental oversight agencies prior to MEC clearance activities in the wetland areas.

During site reconnaissance efforts prior to the start of MEC surface clearance activities in the northeastern end of the CVF, an area of approximately 12.5 acres was discovered that is permanently saturated with significant standing water and wetland habitat. The area is extremely difficult to access due to terrain and dense vegetation. The restricted access of this habitat, along with the saturated

conditions and standing water make this area nearly impossible for MEC surface clearance work to be conducted safely and without significant damage to the habitat. BCRRT, Clark County and WDOE agreed that clearing the equivalent acreage in another area of the Regional Park would meet the requirements of the PPCD. In discussion with WDOE and Clark County, BCRRT has relocated 12.5 acres of MEC surface/subsurface clearance to the southwest corner of the CVF adjacent to the Western slopes and north of the ESA (**Figure 5.1**).

5.1.2 Hazard Severity Ranking

During the Interim Action in the CVF (adjacent to the wetlands), over 500 MEC and over 1,000 MD items were addressed. MEC items that could pose an explosive safety threat included 2.36 in. rockets, 3 in. Stokes Mortars, rifle grenades, smoke grenades, practice hand grenades, 105 mm HE projectile, M73 rocket practice 35 mm, and M49 trip flares. The likelihood that MEC items are present in the wetlands is considered moderate to high.

Given the numbers and types of MEC and MD findings encountered across the CVF, the WDOE has made a determination as to the appropriate cleanup action for this area, which is detailed below.

5.1.3 Accessibility Rating and Reuse Intensity

The greatest amount of visitor activity in the CVF and adjacent wetlands will occur in the High Intensity Reuse Areas and these uses may be considered intrusive, that is disturbing the soil surface. Examples of intrusive activities include tent camping and construction. Non-intrusive activities include RV camping, parking, archery or firing range training. The Accessible Medium Intensity Reuse Areas differ only from the High Intensity Reuse Areas in the number of people and type of activities likely to occur in these areas. The Accessible Medium Intensity Reuse Areas are categorized to be those areas where people may gather to conduct impromptu recreational activities. These recreational activities are likely to be surficial, non-intrusive activities. A moderate number of people are expected to enter the Accessible Medium Intensity Reuse Areas.

5.1.4 Explosive Hazard Ranking

The WDOE has determined (letter dated February 6, 2009) that MEC subsurface clearance is required for the entire CVF (including the specific RWAs identified above) for the following reasons:

- Data collected from areas of the CVF already cleared show significant surface MEC and subsurface anomalies. Over 38,000 subsurface anomalies have been detected, and a percentage of them are likely to be munitions. There are significantly more Target Areas and munitions being found in the CVF than were anticipated during early cleanup planning efforts and development of the conceptual site model. In addition to clusters of munitions found in several areas of the valley, scattered munitions have also been found randomly distributed across investigated areas of the valley floor. Although these are surface or near-surface findings, Schoenstadt data and the limited EM-61 geophysical data indicate similar distribution of subsurface anomalies at the CVF.

- These areas constitute over 70% of the CVF (a large percentage of the Valley Floor that is proposed as a high-intensity public access area).

- The majority of the new Munitions Areas of Concern have been found in the CVF.

- Munitions findings and observation since the draft CAP continue to show that the MEC distribution across the CVF is at consistently greater numbers than originally anticipated. Greater than 650 MEC items were found at the Camp, approximately 3/4 of these items have been found in the CVF.

5.1.5 Recommended Cleanup Action

While the MEC surface clearance of the CVF was completed, WDOE determined that MEC subsurface clearance (frost depth clearance to 14-in. bgs) is the most appropriate long-term cleanup action alternative for the CVF.

This determination is based upon finding significant new Target Areas, demo areas, surface MEC and subsurface anomalies in the CVF, the intended medium to high intensity reuse of the area in the Regional Park and high degree of public access anticipated for the CVF. This action will address the entire CVF and will require additional vegetation removal and (likely) additional subsurface investigation using EM-61 to develop an inventory of subsurface anomalies for future investigation and removal of MEC and MD.

After clearance, ICs will be employed to ensure that this is the most feasible permanent solution for the CVF (both High Intensity and Accessible Medium Intensity Reuse Areas), based on the analysis to achieve the cleanup standard of negligible interaction with MEC. The clearance action will be conducted in the footprint of the Accessible Medium Intensity Reuse Area as shown in **Figure 5.1**. The ICs will include signage to inform the public about the past military use of the area. Implementation of the MEC

surface and subsurface clearance action and these ICs will achieve the desired cleanup standard.

5.2 Regional Park Western Slopes Area

5.2.1 Description

CBMR contained a wide variety of troop training areas. Training Areas 1, 2, 3, 4, 5, 11, 12 and a portion of 13 have been grouped together as the Western Slopes area; previously described as the "Limited Access Medium Intensity Reuse" area in the RAU 3 RI/FS (**BCRRT 2008a**). Usage of the Western Slopes area was listed by the U. S. Army as limited to non-live fire exercises such as troop movement, hand-to-hand combat, practice assaults/defense bayonet and obstacle courses. The Western Slopes Area covers roughly 600 acres along the western portion of the CBMR and are part of the regional park (see **Figure 5.2**). Pyrotechnics and blank ammunition were typically employed to evaluate the reactionary responses of troops and convoys to an ambush and to train in tactics. Military munitions containing high explosives were not used for reactionary training.

5.2.2 Hazard Severity Ranking

The Western Slopes Area was primarily used for troop training and the historical documentation on the CBMR suggests a low probability of encountering MEC. However, during transect investigations conducted in Training Areas 4, 5 and 12, 2-Stokes mortars (fired, unfuzed) were recovered from the northeastern corner of Training Area 12. There is also a possibility that pyrotechnic devices (i.e. flares, smoke grenades) may be present as a result of abandonment, mishandling, or loss while troops were training in this area. Any residual non-deployed pyrotechnics that may be present are potentially flammable, and may contain a small, low-order explosive charge that may cause bodily injury. However, large portions of the pyrotechnics were constructed with fiberboard containers and are therefore extremely susceptible to exposure to the elements and resultant weathering. Over time, the photo-flash powder has likely been exposed to moisture and deteriorated.

5.2.3 Accessibility and Reuse Intensity

The Western Slopes are classified as Limited Access Medium Intensity Reuse areas in the future Regional Park and have limited future reuse intensity due to terrain, vegetation and location outside the Central Valley in the Regional Park.

5.2.4 Explosive Hazard Ranking

During the implementation of the Interim Actions, far more MEC (over 650 items) and 1600 MD items have been recovered from the CBMR site than was ever anticipated. The large disparity between BCRRT's actual findings and the site conditions anticipated from review of the Army's historical site documentation has cast significant doubt on the reliability of the historical documentation. As a result of the numbers of MEC and MD findings in the CVF, the WDOE has determined that additional clearance of the Western Slopes is warranted.

5.2.5 Recommended Cleanup Action

The WDOE has determined (letter dated March 18, 2009) that MEC surface clearance of all areas with a slope of 25 degrees or less, which is based on access limitations of steep slopes, and Intuitional Controls are the preferred permanent solution for the Western Slopes Area (**Figure 5.2).** Of the 609 acres in the Western Slopes Area, over 425 acres will be MEC surface cleared through the cleanup actions detailed in this CAP.

5.3 Northern Central Impact Target Area Expansion

5.3.1 Description

The Northern Central Impact (Target) Area Expansion consists of approximately 107 acres, located north of the current CITA boundary, and extends approximately 500 - 1,000 feet north of Lower DNR road. MD debris findings (including 105 and 155 mm projectile fragments) along the Lower DNR Road buffer zones clearance area (20 feet on both sides of road) indicate the strong potential for targets existing north of the current CITA boundary in a roughly 107 acre area (see **Figure 5.1**). The new fence will be a five strand barb wire fence with the same signage requirements as the original CITA fence. Construction will include an external access road with 30 feet of surface clearance outside of the fence, and a ten foot buffer inside of the new CITA fence.

5.3.2 Characterization

MEC and MD findings in this area include 32 MD findings of various sizes of projectile fragments which can be attributed to 105 mm and 155 mm projectiles (27 along Lower DNR Road and 5 along the northern CITA Boundary Road).

While the CITA boundaries were established and fenced to include firing targets and a safety buffer zone, the MD findings indicate the potential for new additional targets to be located in the area north of the currently established CITA and beyond the Lower DNR Road, some 1000 ft to the north of the CITA.

5.3.3 Proposed Reuse

Because this area is becoming a portion of the CITA, no reuse is planned for this restricted access area.

5.3.4 Hazard Severity Ranking

The presence of the extensive MD findings suggests the potential of a target area. The munition release mechanism resulting in the presence of MEC in the vicinity of potential target area would be from deployed munitions that failed to function properly (UXO). Residual UXO poses the greatest explosive safety threat to the public as these items could be fuzed and armed but failed to function. The hazard severity ranking for a target area would be the most severe of all site types. Should a target be found in this area, its explosive safety relative risk ranking would be 1 on a scale of 1 – 7, with 1 representing the highest explosive risk.

5.3.5 Accessibility Rating and Reuse Intensity

The overall accessibility of the Northern CITA Expansion is considered extremely limited as the entire area will be fenced and signed. The vast majority of the Northern CITA Expansion is either limited or inaccessible due to very steep terrain. It is designated as no-reuse to very low reuse intensity since it will be isolated by fencing and signage and located within the WMA. There are no overlying proposed future use sites or facilities planned in this area. People are not expected to venture into the area because of the fencing, signage, written documents and steep terrain; therefore the number of potential human receptors is considered negligible.

5.3.6 Recommended Cleanup Actions

Implementation of Site-specific ICs and installation of fencing and signs will limit access. This fencing will extend from the northern CITA Interim Action fencing and enclose the entire 107 acre area.

Based upon the nature of the munitions found and the potential for targets being located north of the current CITA boundary, WDOE has determined that fencing and signage will provide the most permanent solution. .The fence will include a 5 strand barbed wire fence with the same signage requirement as the original CITA boundary. The remedy also include the construction of external access road along the perimeter of the fence with a 30 foot clearance on the outside of the fence and a 10 foot buffer on the inside of the fence line (see **Figure 5.1**).
An alternative hiking, biking and equestrian trail is being planned for the area north of the Lower DNR which will be outside the new CITA fence line.

5.4 MEC Surface Clearance of Demolition Area 1/Landfill 4 Kick-Out Area

5.4.1 Description

Historical Army investigations of the Demolition Area 1/Landfill 4 (DA1/LF4), previously certified as clean by USACE (USACE 1997), included a 10 acre MEC surface

clearance, and a 4 acre subsurface clearance. However, due to the recent MEC and MD findings within the previously cleared area and in areas adjacent to DA1/LF4, the area requiring MEC surface clearance has now been expanded from a 500 ft x 500 ft to a 1200 ft radius area; encompassing 103.82 acres (**Figure 5.2**).

5.4.2 Characterization

The recent investigations completed to date include:

- Anomaly avoidance, brush clearance, and MEC surface clearance of the roads traversing north and south and east of the DA1/LF4 area (approximately 2 acres);
- Anomaly avoidance of DA1/LF4 area (approximately 4 acres).

Recent MEC and MD findings in or adjacent to the DA1/LF4 included (**Appendix A**):

- 16 MEC findings: 2.36 in. (unfuzed) and 2.75 in. (fuzed and HE) rockets, 20 mm rocket (fired, fuzed), CS and smoke grenades (some live), anti-tank practice land mines (spotting charge), HE warheads; fuses and flares, and 3 in. Stokes mortars (fired, unfuzed);
- 130 MD findings of various sizes and various munitions related items including 68 pieces of M51A1, 37mm APT (counted as 1 MD finding).

5.4.3 Proposed Reuse

DA1/LF4 Kick-Out Area represents an expansion of the area delineating the DA1/LF4 (expanding from 500 ft x 500 ft to 1200 ft radius). The proposed reuse of this area is the same as the proposed reuse of the previously identified area (500 ft x 500 ft.): that is, DA1/LF4 Kick-Out Area will be included within the WMA with the same restrictions, controls, and cleanup actions.

5.4.4 Hazard Severity Ranking

At an OB/OD area, the unsuccessful demilitarization of a UXO item poses the greatest explosive safety threat to the public. The hazard severity ranking for an OB/OD Area is the second most severe of all demolition area site types (marginal/critical explosive safety hazard). The explosive safety relative risk ranking for DA1/LF4 Kick-Out Area is 2 on a scale of 1 – 7, with 1 representing the highest explosive risk.

5.4.5 Accessibility Rating and Reuse Intensity

DA1/LF4 Kick-Out Area is accessible by roads and trails however; it is located outside the boundary of the proposed regional park and within the WMA and is, therefore, low reuse intensity.

5.4.6 Explosive Hazard Ranking

DA1/LF4 Kick-Out Area is Ranked B, on a scale of A – E, with A representing the greatest exposure risk. There are expected to be fewer potential receptors as it is located in the proposed WMA, which is a low reuse intensity area. The explosive hazards exposure characteristics associated with DA1/LF4 is summarized in **Table 5.1**.

TABLE 5.1
SUMMARY OF EXPLOSIVE HAZARDS EXPOSURE CHARACTERISTICS FOR DEMO AREA 1/LANDFILL 4 KICK-OUT AREA

Site	MEC Source	Receptor Interaction			Explosive Hazards Exposure Rank
	Explosive Relative Risk Ranking	Accessibility	Future Land Reuse	Depth of Activity / Reuse	
DA1/LF4 Kick Out Area	2	Accessible	Low	Surface / WMA	B

5.4.7 Recommended Cleanup Action

The recommended cleanup action for the expanded DA1/LF4 Kick-Out Area is MEC surface clearance with ICs. This alternative is determined to be the most feasible permanent solution for this area and would achieve the RAU 3 cleanup standard. The approximate area to be surface cleared is shown in **Figure 5.2** and is 103.82 acres in size.

5.5 Step-Out Procedure for Clearance Activities

Step-out Procedures will apply to every clearance action and be completed as a separate task at the end of Phase 2 and in accordance with the Prospective Purchaser Consent Decree (PPCD; WDOE 2006) and attached Conceptual Remedial Action Plan (CRAP).

5.5.1 Standard Step-out Procedure

Step-out clearance is employed to define the extent of contamination and to insure that isolated discoveries of MEC are not evidence of additional areas of concern. Step-Out clearance procedures will be done in accordance with the following steps:

1. If a MEC or MD item, of particular (hazardous) military munitions, is found within a boundary grid of a designated clearance area, then the clearance area shall be expanded by adding a new (100 ft. x 100 ft.) gird adjacent to the grid of concern.

2. The new grid will be surface cleared and if a MEC or MD item of a hazardous military munitions is discovered the procedure will repeat until no MEC or MD items are found.

5.5.2 Exceptions to the Procedure

The following exceptions will stop/modify the Step-out Procedures**:**

- If the new grid extends beyond the property perimeter fence line.
- If the new grid extends to an adjacent cleanup area requiring clearance or a previously cleared area.
-
- If worker safety is compromised due to impassible terrain making the area inaccessible.

6.0 PRELIMINARY SCHEDULE AND REMEDIAL ACTION COST

In order to provide the reader with a sense of the time and cost that will be involved in implementing the cleanup actions detailed in this CAP,, the nature of the MEC cleanup intended for each area, a preliminary cost estimates of the cleanup action, and a schedule to begin each cleanup action identified in this CAP is summarized and presented in **Table 6-1.**

Table 6-1
PRELIMINARY COST ESTIMATES AND SCHEDULE FOR RAU 3 CLEANUP

REMEDIAL WORK AREA	ACRESS	COST	START YEAR	Cleanup Action
Central Valley Floor (CVF) and associated Wetlands	440	$9,314,000	2011	MEC Subsurface Clearance to Frost Depth (14-in bgs)
Western Slopes Area	425	$10,625,000	2011	MEC Surface Clearance
Firing Points - includes 9 artillery firing	19	$665,000	2011	MEC Surface and Subsurface Clearance to Frost Depth (14-
Reuse Construction Areas - 4 ft Clearance	6	$63,600	2011	MEC Surface and Subsurface Clearance to Depth (48-in
Reuse Construction Areas - 14 inch	12	$111,000	2011	MEC Surface and Subsurface Clearance to Frost Depth (14-
Both M203 Grenade Range's	2	$45,000	2011	10% Quality assurance validation assessment of previous clearance activities
Rifle Grenade Target Area	5	$92500	2011	MEC Surface Clearance; acreage and cost included in firing points task
3.5-inch Rocket Range Target Area	5.2	$96,200	2011	MEC Surface Clearance
HE and Grenade Range Target Areas	5	$92,500	2011	MEC Surface Clearance; acreage and cost included in firing points task
Central Impact Target Area - Target Area Clearance	15	$675,000	2012	MEC Surface and Subsurface Clearance to Frost Depth (14-in bgs) of 200-ft x 200-ft area centered on target locations
Northern Central Impact Target Area Expansion Perimeter Fence Line	N/A	$260,000	2012	MEC Surface Clearance of 10-ft wide corridor along fence line-of travel. Installation of 5-strand barb wire fence with
MPPEH/Demilitarization Processing	N/A	$32,000	2012	Heat-Treatment of MPPEH to remove explosive
Demolition Area 2	5.8	$145,000	2012	MEC Surface Clearance of a 500 ft x 500 ft grid centered
Landfill 4 - Demolition Area 1 - Kick Out	67	$1,675,000	2012	MEC Surface Clearance
Step-outs sub surface	40	$1,800,000	2012	MEC sub Surface Clearance
Step-outs surface	40	$1,000,000	2012	MEC Surface Clearance
10% buffer	N/A	$2,700,000	2012	MEC Surface and Subsurface Clearance in step-outs over estimated 40 acres

7.0 CONCLUSIONS

This CAP presents the recommended cleanup actions for each component area of the eight RWAs identified as comprising RAU 3, the Site-Wide MEC Cleanup, for the former CBMR in Clark County, Washington (**Figure 1.3**).

The CAP is based on the Final RI/FS; (BCRRT, 2008) for RAU 3 Revision 1 (**BCRRT 2008a**) and the Supplemental RI/FS report (**Appendix A**), which was developed using results from implementation of both Emergency and Interim Actions at CBMR.

A critical component of the cleanup of the CBMR and its' future use as a Regional Park is the establishment and maintenance of Institutional Controls and an IC Plan that will inform both park visitors and staff of the CBMR's history and the restrictions on the use of the facility. In **Section 3.0** of this CAP, key site-wide ICs are identified and the need for site-specific ICs at various RWAs evaluated. This information, along with that presented in **Appendix B**, will be used as the basis for development of a long-term IC Plan.

The general objectives and scope of MEC cleanup action recommendations presented in this CAP were identified in the analyses presented in both the RAU 3 Final RI/FS and the Supplemental RI/FS and through the cleanup action determinations made by WDOE. A summary of the RWA and the recommended cleanup action for each is presented in **Table 7-1**. Consistent with the organization of the CAP, **Table 7-1** divides the MEC cleanup actions recommended for the CBMR into those RWA initially identified in the Final RI/FS and PPCD and those discovered during the implementation of Emergency and Interim Actions at CBMR following the early transfer of the facility. These newly discovered RWAs were delineated through the recovery of hundreds of MEC and MD items in areas thought to have had a low potential for munitions impact. As a result of these findings, the WDOE has made the determination that the degree of cleanup required at these newly discovered target or disposal areas had to increase to provide sufficient protectiveness for the proposed future reuse of these areas within the Regional Park. The specific cleanup action determinations made by WDOE include:

- Frost depth subsurface MEC clearance (14 in. bgs) for the CVF, due to the numbers and types of MEC and MD items recovered during surface clearance of this 322-acre parcel (**Section 5-1**).
- MEC surface clearance, access limitations based on steep slopes and Intuitional Controls will be required for the Regional Park Western Slopes Area, due to concerns regarding prior site characterization (**Section 5-2**).
- Extension of the CITA to the north to include a 107-acre parcel that potentially contains additional targets (Northern CITA Expansion; **Section 5-3**).
- MEC surface clearance of a 1200 foot radius circle centered on the Demolition Area 1/Landfill 4 to encompass the Kick-out zone of 104 acres (**Section 5-4**).

The increase in subsurface MEC clearance proposed in this CAP necessitates that the Cultural and Historical Resources Protection Plan (CHRPP; Baker 2006) for the CBMR be updated to include procedures for the preservation of artifacts that may be encountered during subsurface "mag and dig" operations. An updated CHRPP Is included here as **Appendix C**.

A preliminary assessment of the potential cost of RAU 3 CAP cleanup actions and schedule for implementation of these cleanup actions are summarized and presented in **Table 6-1**. Implementation of Emergency and Interim Actions at the CBMR over the 2-$^{1}/_{2}$ years since its' early transfer to BCRRT has greatly changed our understanding of the nature and extent of munitions use across the facility, particularly in the CVF. The information gained during the Emergency and Interim Actions has been employed in the Supplemental RI/FS and this CAP to develop recommended cleanup actions for the RWA at CBMR that will be protective of human health and the environment and consistent with the proposed future reuse as a Regional Park.

Table 7-1

REMEDIAL WORK AREAS AND RECOMMENDED MEC CLEANUP ACTIONS FOR CAMP BONNEVILLE

REMEDIAL WORK AREA DESIGNATION	ACREAGE	RECOMMENDED CLEANUP ACTION
M203 HE and Practice Grenade Range Target Areas	2	10% Quality assurance validation assessment of previous clearance activities
3.5-inch Rocket Range Target Area	5.2	MEC Surface Clearance
Central Impact Target Area - Work Road Clearance	Up to 10	MEC Surface Clearance
Central Impact Target Area - Target Area Clearance	15	MEC Surface and Subsurface Clearance to Frost Depth (14-in bgs) of 200-ft x 200-ft area centered on target locations
Demolition Area 1 / Landfill 4 and Kick Out Areas	67	MEC Surface Clearance
Demolition Area 2	5.8	MEC Surface Clearance of a 500 ft x 500 ft grid centered over DA 2
Firing Points - includes 9 artillery firing points, 6 mortar firing points, one rifle grenade firing point, and one 3.5-inch rocket firing point	19	MEC Surface and Subsurface Clearance to Frost Depth (14-in bgs)
Reuse Construction Areas	3	MEC Surface and Subsurface Clearance to Depth (48-in bgs)
Reuse Construction Areas	12	MEC Surface and Subsurface Clearance to Frost Depth (14-in bgs)
Step-Outs	--	Lump Sum Allowance for MEC Clearance as determined by Anomaly Selection Board (ASB)
Demilitarization of Accumulated Materials Posing Potential Explosive Hazard (MPPEH)	--	Heat-Treatment of MPPEH to remove explosive residues and allow recycling of scrap metal
Central Valley Floor (CVF) and Newly Discovered Components	322	MEC Subsurface Clearance to Frost Depth (14-in bgs)
Stokes Mortar Target Area in South Central CVF		MEC Subsurface Clearance to Frost Depth (14-in bgs)
MEC Disposal Area (Burial Pit)		MEC Surface Clearance, Debris Excavation and Disposal

Table 7-1

REMEDIAL WORK AREAS AND RECOMMENDED MEC CLEANUP ACTIONS FOR CAMP BONNEVILLE

REMEDIAL WORK AREA DESIGNATION	ACREAGE	RECOMMENDED CLEANUP ACTION
Open Burn/Open Demolition Area in SE CVF		MEC Surface Clearance, Debris Excavation and Disposal, Subsurface Clearance to Frost Depth (14-in bgs)
37 mm Artillery/Stokes Target Area in South Central CVF		MEC Subsurface Clearance to Frost Depth (14-in bgs)
2.36 in. Rocket Target Area near the Former Sewage Lagoons		MEC Subsurface Clearance to Frost Depth (14-in bgs)
Rifle Grenade Target Area in NE CVF		MEC Subsurface Clearance to Frost Depth (14-in bgs)
Wetlands Associated with the CVF - Expanded Acreage and Subsurface Clearance	110	MEC Surface and Subsurface Clearance to Frost Depth (14-in bgs)
Western Slopes Area	425	MEC Surface Clearance
Landfill 4 - Demolition Area 1 - Kick Out Area	104	MEC Surface Clearance
Northern Central Impact Target Area Expansion Perimeter Fence Line	1.5	MEC Surface Clearance of 10-ft wide corridor along fence line-of-travel. Installation of 5-strand barb wire fence with warning signs at 50-ft intervals
CITA Step-Outs	TBD	MEC Surface and Subsurface Clearance to Frost Depth (14-in bgs) of areas determined by the ASB

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