Yakima Training Center, Washington

June 2021

Background

DoD uses and manages operational ranges to support national security objectives and maintain the high state of operational readiness essential to its mission requirements. The Department conducts non-regulatory, proactive, and comprehensive operational range assessments (ORAs) to support the long-term sustainability of these ranges while protecting human health and the environment. The purpose of an ORA is to determine if there is a release or substantial threat of a release of munitions constituents (MC) from an operational range to an off-range area that exceeds an applicable regulatory standard or creates a potential unacceptable risk to human health or the environment.

The Army ORA effort was developed to address DoD requirements detailed in DoD Directive 4715.11 (10 May 2004) and DoD Instruction 4715.14 (15 November 2018). The overall objective of the ORA is to assess operational ranges/range complexes to determine if an off-range MC release or substantial threat of an off-range MC release exists; if an off-range MC release exists, does it exceed an applicable regulatory reporting standard; and if an MC release or substantial threat of a release exists, determine whether it creates a potentially unacceptable risk to off-range human health or the environment. Army ORAs assess potential off-range migration of MC along surface water system and groundwater migration pathways.

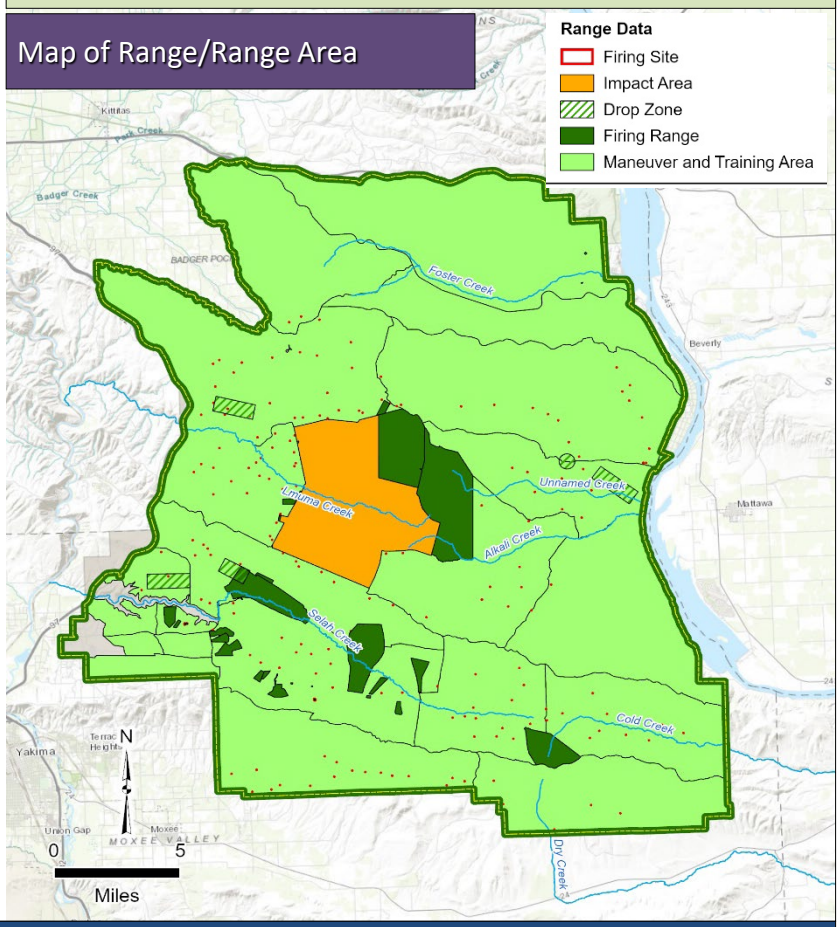
Operational Range Assessment Findings (06/2021)

Based on observed conditions, updated data, and Advanced Assessment results, the conclusions of the 2013 Phase II remain valid. No off-range MC release or substantial threat of an off-range MC release currently exists. MC associated with the most heavily used ranges are not migrating and are therefore not present at levels that pose an unacceptable risk to off-range human and/or ecological receptors.

Next Steps

Yakima Training Center's operational ranges should be included in the FY 23–27 cycle of ORAs to satisfy re-assessment requirements.

Map of Range/Range Area



Installation Overview

Yakima Training Center (YTC) is located within Yakima and Kittitas counties in south-central Washington state, 4 miles east of the city of Selah and 9 miles north of the city of Yakima. Based on current GIS data, YTC encompasses 327,231 acres that consists of a 323,803-acre operational footprint and 3,428 acres of non-operational area. The operational area is composed of 212 firing sites, 29 live-fire ranges, 22 maneuver and training areas, 5 impact areas, and 5 drop zones.

All branches of the Army train at YTC to sustain and improve unit readiness for both wartime and contingency operations. YTC provides training support for transient units and organizations by sustaining training lands, range complexes, and support facilities in order to enhance readiness, serving as the military's premier training destination in the Pacific Northwest.

Previous ORA Investigations

In 2006, a Phase I ORA Qualitative Assessment was conducted at YTC to evaluate the 78 operational ranges to determine whether or not the potential existed for a release, or a substantial threat of a release of MC to off-range human and/or ecological receptors. Additionally, a Phase I Addendum was completed in 2009 that included an investigation into the potential presence of DU based on three historical Davy Crocket Light Weapon System range fans that overlie six operational ranges at YTC. As a result, the revised Phase I concluded that 34 ranges were Unlikely to have a source-pathway-receptor interaction as there were limited to no munitions use on the ranges. The remaining 44 operational ranges were categorized as Inconclusive based on the presence of a source, potential surface water and/or groundwater migration pathways, and off-range human and ecological receptors. These 44 Inconclusive ranges were recommended for further evaluation through a Phase II ORA.

In 2013, a Phase II ORA Quantitative Assessment was conducted to determine whether MC were migrating off-range from YTC's 44 Inconclusive ranges via surface water and/or groundwater migration pathways at concentrations that posed an unacceptable risk to human health or the environment. The Phase II field sampling events were conducted in September 2012 for groundwater, and May 2013 for sediment (surface water was not collected due to drought-like conditions which resulted in a lack of streamflow during the 2012 and 2013 wet seasons). Sediment samples were collected at three locations downstream of the Phase I Inconclusive Ranges and were analyzed for metals, explosives, and uranium and simultaneous extracted metals/ acid volatile sulfide (SEM/AVS). Groundwater samples were collected from five wells along the south/southwestern installation boundary downgradient of the Inconclusive Ranges and were analyzed for explosives and perchlorate. Metals and uranium were not analyzed due to physiochemical soil characteristics, which inhibited metals and uranium from migrating via groundwater.

Based on sampling results, MCOC were not migrating off-range at levels that posed an unacceptable risk to human health or the environment. YTC's Inconclusive ranges were re-categorized as Unlikely for the following reasons:

- No concentrations of metals MCOC in sediment exceeded ecological screening levels and no average downstream concentrations were statistically higher than average reference concentrations.
- SEM/AVS analysis indicated divalent metals are not expected to cause direct toxicity to benthic organisms within sediments.
- Uranium ratios calculated from sediment samples indicated the detected isotopes originated from naturally occurring sources (not range-related).
- No explosives were detected in groundwater or sediment samples.
- Only trace concentrations of perchlorate were detected in groundwater (below screening levels and the range of uncertainty).
- Overall weight-of-evidence and statistical analysis indicated that no MCOC were migrating from operational areas that posed an unacceptable risk to off-range human and ecological receptors.

For more information on Yakima Training Center, contact the PAO Office: 253-967-0148
For more information on the DoD Operational Range Assessment Program visit https://www.denix.osd.mil/orap/home/

ORA Advanced Assessment (2021)

As part of the Advanced Assessment, each component of the previous CSM (developed during the 2013 Phase II Investigation) was re-evaluated to determine if any changes to associated sources, pathways, or receptors had occurred. The updated CSM was then used to help determine whether potential MC was migrating off-range.

Because the 2013 Investigation concluded that there was no risk and minimal migration of MCOC from source area ranges, media sampling was not necessary. Instead, the Training Range Environmental Evaluation and Characterization System (TREECS) was used to perform an updated Tier 1 and Tier 2 assessment specific to YTC's worst-case source area and its associated drainage area. This conservative, worst-case module was used to predict if MCOC concentrations in off-range media (groundwater, surface water, and sediment) would exceed protective health benchmarks.

The surface water modeling approach included the development of a Tier 1 (USACE 2010) and subsequent Tier 2 (USACE 2011) TREECS model to predict if MC concentrations of metals (copper and lead), explosives (RDX, HMX, and TNT), and perchlorate in off-range media exceeded or may exceed protective human health and ecological screening benchmarks in the future. The model focused on an Area of Interest (AOI), which encompassed 43,155 acres of Selah Creek Sub-Watershed within YTC **(Figure 1**), which represented the worst-case scenario for MCOC migration via surface water and groundwater. The AOI contains most of the live-fire ranges and the primary source areas within the installation.

Surface water, sediment, and groundwater were initially modeled through TREEC's Tier 1 model. Tier 1 is a conservative model for leaching and transport of constituent concentrations over a 100-year period. Results from the Tier 1 indicated that copper and lead exceeded the state regulatory ecological criteria in surface water and the federal screening levels in sediment.

Additionally, RDX exceeded federal screening levels in sediment **(Charts 1 and 2).** No modeled concentrations of RDX, HMX, TNT, or perchlorate were predicted to exceed the applicable ecological screening levels in surface water and no modeled concentrations of HMX or TNT were predicted to exceed the applicable ecological screening levels in sediment (perchlorate was not modeled in sediment). The results for the groundwater Tier 1 model indicated no explosives or perchlorate would exceed the EPA drinking water standards based on loading over a 1,400-year period (the time period required to reach equilibrium conditions).

Based on the results of the Tier 1 model, the more detailed Tier 2 model was applied to refine the average annual loading mass and site-specific input values for copper and lead in surface water and copper, lead, and RDX in sediment. Results from the Tier 2 model indicated that the maximum concentrations of copper (1.29E-05 mg/L) and lead (2.48E-04 mg/L) in surface water would not exceed state regulatory ecological criteria (1.10E-02 mg/L and 2.50E-03 mg/L, respectively) in the 100-year loading period used by the model **(Chart 3).** Additionally, results from the Tier 2 model indicated that the maximum concentrations of copper (1.69E-02 mg/kg), lead (1.23E-00 mg/kg), and RDX (7.56E-03 mg/kg) in sediment would not exceed their respective federal ecological screening levels (31.6 mg/kg, 35.8 mg/kg, and 0.013 mg/kg respectively) in the 100-year loading period used by the model **(Chart 4).**

In order to evaluate modeled sediment concentrations for potential migration, comparisons to the Phase II reference results indicated that modeled concentrations of all MCOC at Selah Creek were significantly below reference concentrations, and therefore MCOC migration from range-related activities is not predicted to occur. Although there is no direct reference comparison to previous sampling data for surface water, it is unlikely that MCOC is migrating off-range via surface water based on the significantly low MCOC concentrations predicted by the model.

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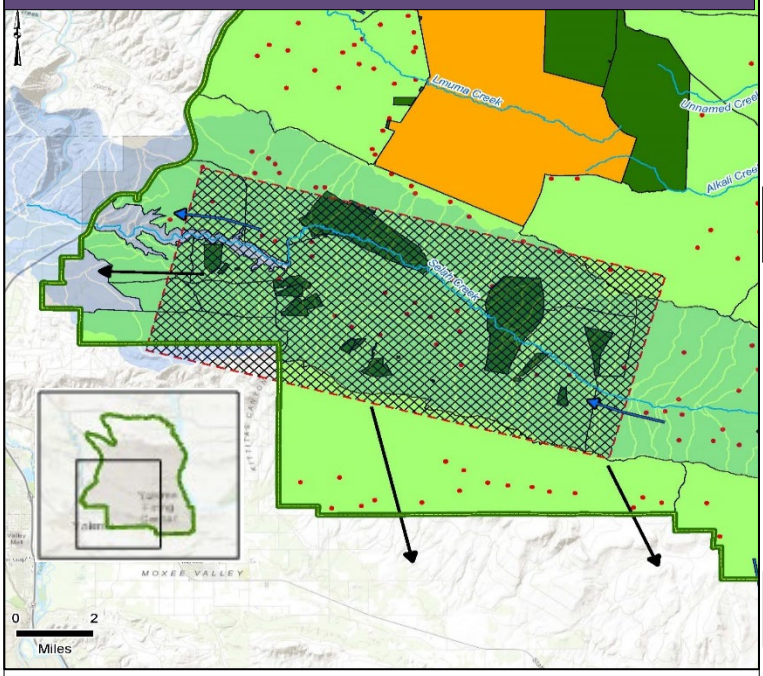
ORA Advanced Assessment (2021) (cont'd)

The results of the TREECs modeling indicated no MCOC are migrating at concentrations that pose an unacceptable risk to off-range human or ecological receptors. For surface water and sediment, no modeled constituents were predicted to exceed the applicable screening levels for the next 100 years. For groundwater, no modeled constituents were predicted to exceed the applicable screening levels for over 1,400 years. Therefore, the operational ranges at YTC remain categorized as Unlikely.

Figure 1: TREECS AOI



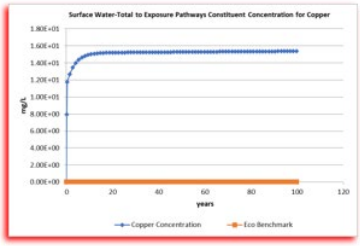
Installation Data
- Installation Boundary
- TREECS Areas of Interest

Range Data
- Firing Site
- Impact Area
- Drop Zone
- Firing Range
- Maneuver and Training Area

Hydrology/Hydrogeology
- Groundwater Flow Direction
- Surface Water Flow Direction
- Stream/Creek
- Selah Creek Sub-Watershed

Chart 1: Tier 1 Surface Water Exceedances

Tier 1- Copper



Tier 1- Lead

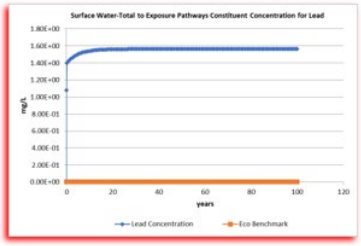
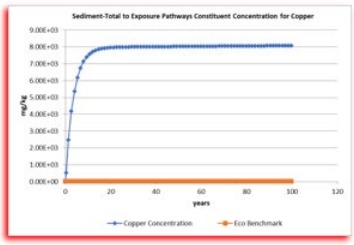
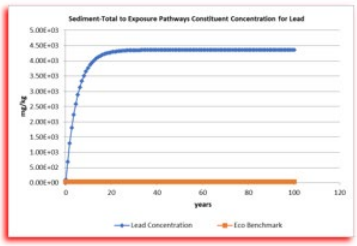


Chart 2: Tier 1 Sediment Exceedances

Tier 1- Copper



Tier 1- Lead



Tier 1- RDX

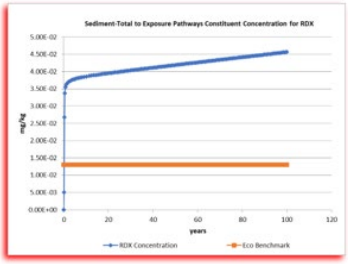
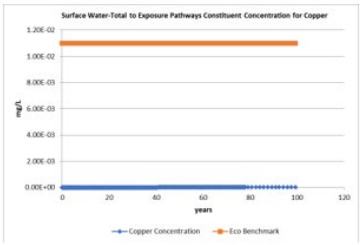


Chart 3: Tier 2 Surface Water Results

Tier 2- Copper



Tier 2- Lead

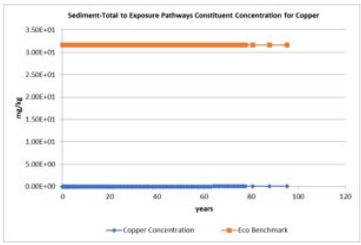
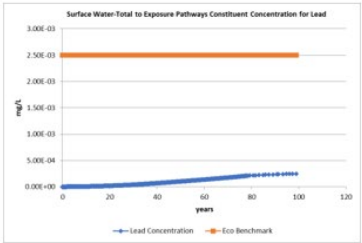
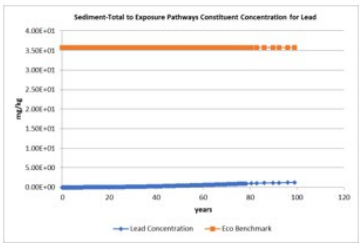


Chart 4: Tier 2 Sediment Results

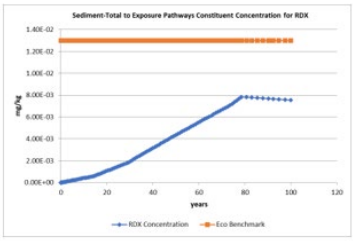
Tier 2- Copper



Tier 2- Lead



Tier 2- RDX



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