

**OPERATIONAL RANGE ASSESSMENT
PHASE II QUANTITATIVE ASSESSMENT REPORT
CAMP SMITH TRAINING SITE
CORTLANDT MANOR, NEW YORK**

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OPERATIONAL RANGE ASSESSMENT (ORA) REPORT

CAMP SMITH TRAINING SITE

CORTLANDT MANOR, NEW YORK

To meet Department of Defense (DOD) requirements and support the United States (U.S.) Army's Sustainable Range Program, the Army National Guard (ARNG) Directorate is conducting assessments to determine whether a release or substantial threat of release of munitions constituents of concern (MCOC) from an operational range to an off-range area creates a potentially unacceptable risk to human health or the environment. The initial assessment—Phase I—was a qualitative evaluation of whether (a) a MCOC source existed on the operational range footprint, (b) there is a potential migration mechanism and (c) human or sensitive ecological receptors are present. For the operational range footprints having a potentially complete source-receptor pathway, the ARNG Directorate conducted Phase II, a quantitative assessment of potentially complete pathways of MCOC. This ORA Phase II Report presents evaluation of source-receptor pathways at the Camp Smith Training Site (Camp Smith), New York. EA Engineering, Science and Technology, Inc. (EA) conducted this evaluation under contract W912DR-07-D-0042 to U.S. Army Corps of Engineers (USACE)-Baltimore District in support of the ARNG Directorate.

Initially, the ORA Phase II establishes whether the source-receptor pathway identified during Phase I is complete or new information has been identified that would impact the Phase I's conclusions. To determine whether MCOC are potentially leaving an operational range footprint by an identified pathway (e.g., groundwater or surface water) and pose a potential risk to off-site receptors, the Phase II considers existing and any new sampling data. The ORA team may accomplish Phase II through reevaluating existing literature (e.g., prior sampling and/or reports), modeling, and/or collecting additional samples. In Camp Smith's Phase II report, all available information was used to establish a weight-of-evidence case that determines whether there has likely been release from the operational range footprint that may pose a potentially unacceptable risk to an off-range receptor.

Camp Smith is located in southeastern New York. Camp Smith has an operational range complex of approximately 1,489 acres, and an approximately 88-acre cantonment area. There are 12 small arms ranges within Camp Smith which encompass approximately 38 acres, where only small arms ammunition (i.e., ammunition without projectiles that contain explosives—other than tracers—that is 50 caliber or smaller, or for shotguns) are used. Primary MCOC source areas include berms (i.e., impact backstops) associated with these operational ranges. Metal MCOC (i.e., antimony, copper, lead, and zinc) originating from these small arms ranges are the primary MCOC of concern.

The Phase II multi-season field sampling was conducted during August 2009 and April 2010. Samples were collected on Camp Smith property and also from locations immediately adjacent to Camp Smith. Surface water and sediment samples were collected from three locations along Putnam Brook: two locations (SW02 and SW03) downstream of the berm backstops and one location (background SW01) upstream of the berm backstops. Surface water and sediment samples were also collected from two locations (SW04 and SW05) within a tidal marsh, downstream of the berm backstops along Putnam Brook (Camp Smith tidal marsh), and from two locations (SW06 and SW07) within a reference marsh located upstream (**Figure 1**).

Dry and wet season surface water and sediment sampling was conducted to identify potential seasonal variations in water quality transport characteristics. Diurnal variations were accounted for in surface water quality along Putnam Brook using 24-hour composite samples at the Putnam Brook locations and weather variations were considered by collecting a 2-hour composite sample during a storm event. Due to the tidal influence at the marsh locations, diurnal variations in water quality were assessed through collection of grab samples at high and low tide. Sediment samples were collected as composited grab samples from all surface water sampling locations.

Surface water samples were analyzed for metals (i.e., lead, copper, zinc, and antimony) and water quality parameters. Sediment samples were analyzed for metals, total organic carbon, and simultaneously extracted metals/acid-volatile sulfides (SEM/AVS). The results for metals for surface water and sediment were compared to background and reference concentrations using a *t*-test of average concentrations and compared to New York State screening levels using 95 percent upper confidence limit of the mean (95% UCLM) sample concentrations.

Benthic macroinvertebrate populations were sampled to evaluate aquatic ecosystem health. Benthic macroinvertebrate surveys were conducted at each Putnam Brook sampling location, within the Camp Smith tidal marsh, and at the reference marsh.

Average surface water concentrations of lead, copper, and antimony in Putnam Brook were significantly higher than background concentrations found upstream. The 95% UCLM concentrations of lead in both downstream Putnam Brook locations also exceeded surface water screening levels (**Table 1**). Average sediment concentrations of lead, copper, and zinc from both downstream Putnam Brook locations exceeded average background concentrations. Additionally, the 95% UCLM for lead, copper, and antimony exceeded associated screening levels at both downstream Putnam Brook sampling locations (**Table 2**).

Analysis of SEM/AVS at the downstream Putnam Brook locations suggests that divalent metals may potentially be bio-available for uptake by benthic organisms. Results of the benthic macroinvertebrate sampling do not suggest that the benthic communities in the downstream portions of Putnam Brook are being impacted. However, the 95% UCLM concentrations of lead from both Putnam Brook sampling locations were an order of magnitude above sediment screening levels.

Average surface water concentrations of lead, copper, and antimony in the Camp Smith tidal marsh, downstream of the berm backstops, were significantly higher than reference concentrations taken upstream. The 95% UCLM concentration of lead in one of two Camp Smith tidal marsh locations exceeded the surface water screening level (**Table 1**). Average sediment concentrations of lead, copper, zinc, and antimony metal concentrations in the Camp Smith tidal marsh samples were significantly higher than reference concentrations. Additionally, the 95% UCLM for lead, copper, and zinc exceeded associated screening levels (**Table 2**).

Analysis of SEM/AVS at the downstream Camp Smith tidal marsh locations suggest that the bio-availability of divalent metals for uptake by benthic organisms may be limited. Results of the benthic macroinvertebrate sampling do not indicate that the benthic communities in the Camp Smith tidal marsh are being impacted. However, the 95% UCLM concentrations of lead from both sample locations in the marsh were an order of magnitude above sediment screening levels.

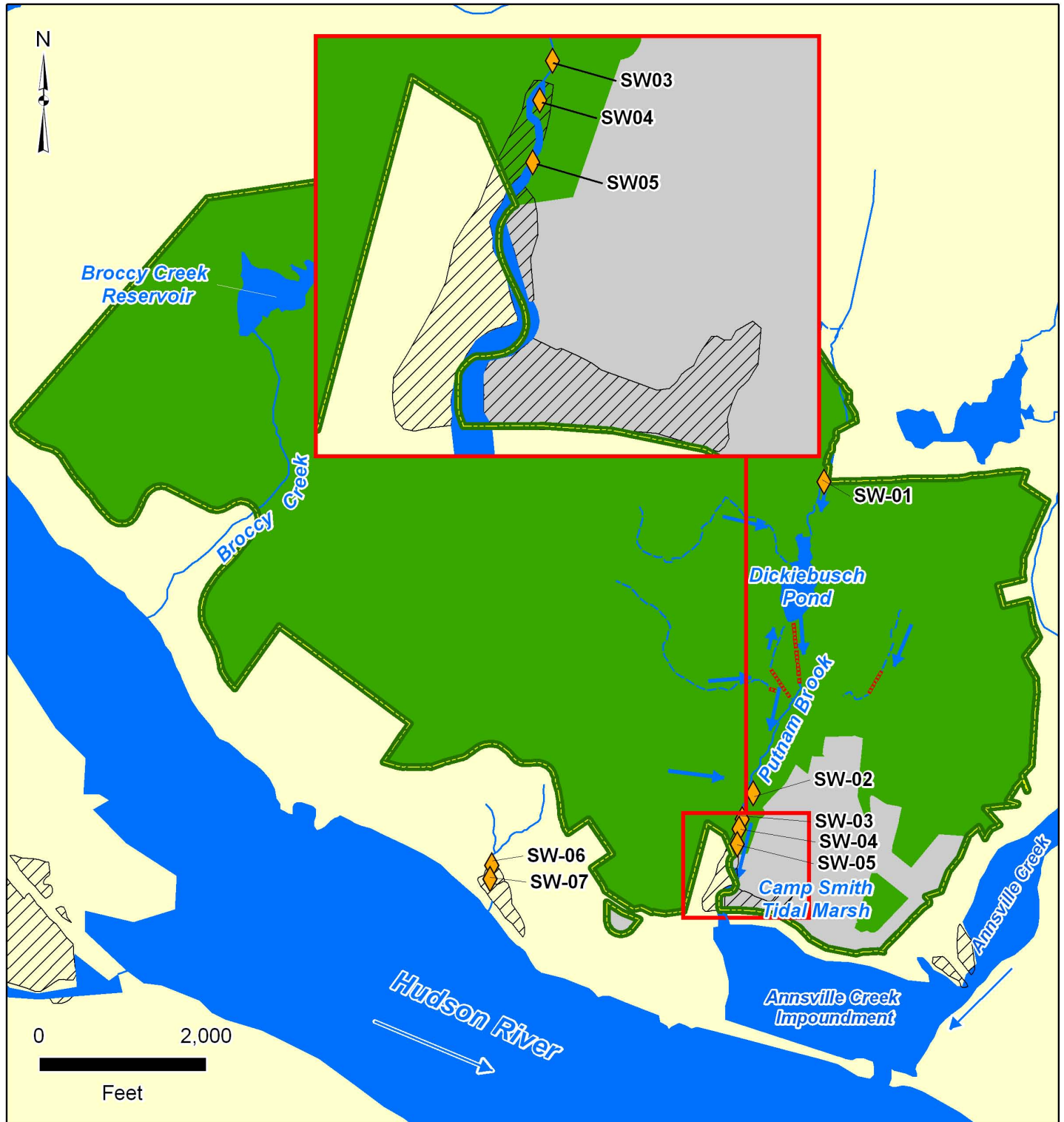
To assist in the assessment of the nature and extent of potential ecological risk from the MCOC, detected downstream of the berm backstops, a Screening Level Ecological Risk Assessment (SLERA) was performed. In addition to a quantitative assessment of potential risks using metals sampling results from the Phase II Quantitative Assessment, the SLERA incorporated the results of the SEM/AVS analyses and benthic macroinvertebrate sampling to provide an assessment of risks based on a qualitative weight of evidence approach.

The results of Camp Smith's ORA Phase II Quantitative Assessment confirm the presence of a surface water pathway and indicate that there is a reasonable expectation of a release of lead off of the operational range footprint, as evidenced by both the difference between downstream and reference locations and by screening level exceedances downstream. Based on the SLERA, the MCOC concentrations detected in Putnam Brook and the Camp Smith tidal marsh are not expected to present a potential risk to aquatic or

piscivorous ecological receptors. However, the SLERA did indicate there is a potential for risk to benthic organisms in Putnam Brook and the Camp Smith tidal marsh from exposure to lead.



Figure 1
Phase II Sampling Locations



- Installation Data**
- Installation Boundary
 - Operational Area
 - Non-Operational Area

- Phase II Sampling Locations**
- Surface Water and Sediment

- Hydrology**
- Waterbody
 - Tidal Marsh
 - Surface Water Flow
 - Culvert
 - Streams

Data Sources:
USFWS 2008
NYS DMNA 2011

Date: May 2012

TABLE 1 SURFACE WATER STATISTICAL ANALYSIS SUMMARY

Analyte	Screening Level ^(a) (µg/L)	95% UCLM (µg/L)
SW01 (Background for SW02 and SW03)		
Lead	1.38	0.03
Copper	4.09	0.67
Zinc	37.9	0.92
Antimony	30	0.05
SW02		
Lead	1.53	2.77
Copper	4.44	2.57
Zinc	41.1	2.61
Antimony	30	1.05
SW03		
Lead	1.50	2.11
Copper	4.36	2.47
Zinc	40.4	0.84
Antimony	30	1.45
SW04		
Lead	1.68	1.70
Copper	4.77	2.77
Zinc	44.2	0.63
Antimony	30	1.05
SW05		
Lead	1.73	1.58
Copper	4.89	2.60
Zinc	45.2	0.82
Antimony	30	0.97
SW06 (Reference for SW04)		
Lead	1.32	0.06
Copper	3.97	1.46
Zinc	36.8	1.04
Antimony	30	0.13
SW07 (Reference for SW05)		
Lead	2.23	0.10
Copper	5.93	2.18
Zinc	54.9	1.09
Antimony	30	0.16
<p>(a) Screening levels for lead, copper, and zinc adjusted based on mean site-specific hardness per the New York State Ambient Water Quality Standards and Guidance Values (June 1998) and New York State Regulation 6 New York Code of Rules and Regulations Part 703</p> <p>(b) Significantly higher than background from t-test ($\alpha = 0.05$)</p> <p>NOTE: µg/L = Micrograms per liter. UCLM = Upper confidence level of the mean. NA = Not applicable. Bold indicates that the 95% UCLM exceeds the associated screening level</p>		

TABLE 2 SEDIMENT STATISTICAL ANALYSIS SUMMARY

Analyte	Screening Level ^(a) (mg/kg)	95% UCLM (mg/kg)
SW01 (Background for SW02 and SW03)		
Lead	31	6.89
Copper	16	15.3
Zinc	120	27.8
Antimony	2	0.05
SW02		
Lead	31	507
Copper	16	77.6
Zinc	120	108
Antimony	2	5.83
SW03		
Lead	31	757
Copper	16	91.9
Zinc	120	140
Antimony	2	2.78
SW04		
Lead	31	512
Copper	16	51.9
Zinc	120	151
Antimony	2	1.56
SW05		
Lead	31	1,150
Copper	16	116
Zinc	120	189
Antimony	2	4.66
SW06 (Reference for SW04)		
Lead	31	60.3
Copper	16	15.3
Zinc	120	47.8
Antimony	2	0.13
SW07 (Reference for SW05)		
Lead	31	22.4
Copper	16	16.5
Zinc	120	56.1
Antimony	2	0.11
<p>(a) Screening level defined by the Lowest Effect Level in the 1999 New York State Department of Environmental Conservation Technical Guidance for Screening Contaminated Sediments.</p> <p>(b) Significantly higher than background from t-test ($\alpha = 0.05$)</p> <p>NOTE: $\mu\text{g/L}$ = Micrograms per liter UCLM = Upper confidence level of the mean NA = Not applicable</p> <p>Bold indicates that the 95% UCLM exceeds the associated screening level</p>		