

EPA ORD baseline analysis of COCs at KD Range East

Soil investigation was conducted in 1999 (one sample location), 2002 (11 sample locations), and 2013 (3 sample locations). For each location, three depth intervals were sampled (surface, 0-3 inches bgs; intermediate, 3-6 inches bgs; and deep, 6-12 inches bgs). Only surface soil data were presented in the 2014 Final Small Arms Ranges Investigation Report. Soil porewater was not collected in sufficient amount for analysis, and two groundwater monitoring well samples were collected and analyzed (one in 2003 and one in 2012).

Table 1. Total soil metal concentrations (mg/kg) at KD Range East (1999 sampling data, one surface soil sample, ND: non-detect). Data from FinalSARIR_Jan2014.pdf (Impact Area Groundwater Study Program Final Small Arms Ranges Investigation Report, Camp Edwards, Massachusetts Military Reservation Cape Cod, Massachusetts, January 2014, Prepared for: U.S. Army Corps of Engineers New England District, Concord, Massachusetts for Army National Guard Impact Area Groundwater Study Program Camp Edwards, Massachusetts Prepared by: Tetra Tech, Inc. 160 Federal St., Boston, MA 02110 Contract No. DACW33-03-D-0006)

COC	Range of total soil metal conc	Number of ND	Number of Detection	Mean of Detected	Standard Deviation
Antimony	1	0	1	-	-
Copper	26.5	0	1	-	-
Lead	5.3	0	1	-	-
Zinc	No info	-	-	-	-
Vanadium	No info	-	-	-	-
Chromium	57.4	-	1	-	-
Tungsten	No info	-	-	-	-

Table 2. Total soil metal concentrations (mg/kg) at KD Range East

(2002 sampling data, 10 surface soil samples, ND: non-detect). Data from Figure 5-18A in FinalSARIR_Jan2014.pdf (Impact Area Groundwater Study Program Final Small Arms Ranges Investigation Report, Camp Edwards, Massachusetts Military Reservation Cape Cod, Massachusetts, January 2014, prepared for: U.S. Army Corps of Engineers New England District, Concord, Massachusetts for Army National Guard Impact Area Groundwater Study Program, Camp Edwards, Massachusetts Prepared by: Tetra Tech, Inc. 160 Federal St., Boston, MA 02110 Contract No. DACW33-03-D-0006)

COC	Range of total soil metal conc	Number of ND	Number of Detection	Mean of Detected	Standard Deviation
Antimony	0.79 – 1.7	4	6	1.16	0.32
Copper	6.2 – 16.9	0	10	10.4	3.8
Lead	20.3 – 147	0	10	73.7	46.7
Zinc	No info	-	-	-	-
Vanadium	No info	-	-	-	-
Chromium	5.3 – 18	0	10	10.5	3.5
Tungsten	No info	-	-	-	-

Table 3. Total soil metal concentrations (mg/kg) at KD Range East

(2013 sampling data, 3 surface soil samples, ND: non-detect). Data from Table 5-5 in FinalSARIR_Jan2014.pdf (Impact Area Groundwater Study Program Final Small Arms Ranges Investigation Report, Camp Edwards, Massachusetts Military Reservation, Cape Cod, Massachusetts, January 2014, prepared for: U.S. Army Corps of Engineers New England District, Concord, Massachusetts for Army National Guard Impact Area Groundwater Study Program, Camp Edwards, Massachusetts Prepared by: Tetra Tech, Inc. 160 Federal St., Boston, MA 02110, Contract No. DACW33-03-D-0006)

COC	Range of total soil metal conc	Number of ND	Number of Detection	Mean of Detected	Standard Deviation
Antimony	0.75 – 1.6	0	3	1.25	0.44
Copper	10.7 – 13.4	0	3	11.8	1.4
Lead	41.7 – 49.5	0	3	45.5	3.9
Zinc	No info	-	-	-	-
Vanadium	No info	-	-	-	-
Chromium	No info	-	-	-	-
Tungsten	0.54 – 1.1	0	3	0.8	0.3

Groundwater monitoring well MW-60S sampled in 2003 showed 2.2 µg/L for total dissolved copper, and non-detect for antimony, lead, tungsten, 2,4-dinitrotoluene, RDX, nitroglycerin, N-nitrosodiphenylamine, and perchlorate.

Groundwater monitoring well MW-109S sampled in 2012 showed 3 µg/L for total dissolved copper and 0.96 µg/L for total dissolved lead, and non-detect for antimony, tungsten, 2,4-dinitrotoluene, RDX, nitroglycerin, N-nitrosodiphenylamine, and perchlorate.

EPA ORD baseline analysis of COCs at KD Range West

Soil investigation was conducted in 1999 (56 samples), 2000 (19 samples), 2015 (3 samples) with soil sampling depth (ft) for most locations: 0-0.25, 0.25-0.5, 0.5-1, 1.5-2 ft, and 2018 (3 samples at 0.25 ft at SSKD 0004). Soil was excavated to a depth of 1 foot from a 35-ft by 35-ft grid centered on the former primary target armored personnel carrier in February 2020. Post-excavation monitoring of soil was conducted in February 2020 and June 2020.

Table 4. Concentrations of metals of surface soil (0-0.25 ft, 0.25-0.5 ft, 0.5-1 ft, 1.5-2 ft) (mg/kg) collected at KD Range West (1999 sampling data, 56 samples, ND: non-detect). Data from APP B-22FromTR_IR_KD Range West Soil Data.pdf (633 pages, Soil data Table from Training Areas IR)

COC	Range of total soil metal conc	Number of ND	Number of Detection	Mean of Detected	Standard Deviation
Antimony	ND – 12.9	29	27	1.84	2.76
Copper	ND – 1820	3	53	48.2	250
Lead	3.4 – 816	0	56	79.1	182
Manganese	19 – 146	0	56	47.8	20.3
Zinc	5.7 – 199	0	56	17.3	26.5
Vanadium	5.7 – 28.7	0	56	15.1	5.5
Chromium	4.0 – 78.3	0	56	11.7	11.9
Tungsten	No info				

Table 5. Concentrations of metals of surface soil (0-0.25 ft, 0.25-0.5 ft, 0.5-1 ft, 1.5-2 ft) (mg/kg) collected at KD Range West (2000 sampling data, 19 samples). Data from APP B-22FromTR_IR_KD Range West Soil Data.pdf (633 pages, Soil data Table from Training Areas IR)

COC	Range of total soil metal conc	Number of ND	Number of Detection	Mean of Detected	Standard Deviation
Antimony	ND	19	0		
Copper	2.4 – 7.2	0	19	4.5	1.7
Lead	4.5 – 51.2	0	19	14.0	11.3
Manganese	31.2 – 102	0	19	50.9	16.3
Zinc	9.2 – 31.3	0	19	12.7	4.8
Vanadium	8.2 – 21.7	0	19	15.1	4.3
Chromium	5.5 – 14.6	0	19	10.1	2.9
Tungsten	No info				

Table 6. Concentrations of metals of surface soil (0-0.25 ft) (mg/kg) collected at KD Range West (2015 sampling data, 3 samples). Data from Final JBCC Training Areas Investigation Report.pdf (Final JBCC Training Areas Investigation Report, Camp Edwards Joint Base Cape Cod, Cape Cod, Massachusetts April 2018, Prepared for: U.S. Army Corps of Engineers New England District Concord, Massachusetts For Army National Guard Impact Area Groundwater Study Program, Camp Edwards, Massachusetts Prepared by: Tetra Tech, Inc., 160 Federal St., Boston, MA 02110, Contract No. DACW33-03-D-0006).

COC	Range of total soil COC conc	Number of ND	Number of Detection	Mean of Detected	Standard Deviation
Antimony	0.51 – 0.79	0	3	0.67	0.14
Copper	6.8 – 9.1	0	3	8.3	1.3
Lead	38.4 – 45	0	3	42.6	3.7
Zinc	No info				
Vanadium	No info				
Chromium	No info				
Tungsten	4.3 – 5.3	0	3	4.8	0.5

Table 7. Concentrations of explosives compounds of surface soil (0-0.25 ft, 0.25-0.5 ft, 0.5-1 ft, 1.5-2 ft) (mg/kg) collected at KD Range West (1999 sampling data, 56 samples). Data from APP B-22FromTR_IR_KD Range West Soil Data.pdf (633 pages, Soil data Table from Training Areas IR)

COC	Range of total soil COC conc	Number of ND	Number of Detection	Mean of Detected	Standard Deviation
Nitroglycerin	ND – 130	36	20	27.7	39.5
Picloram	ND – 0.015	55	1		
RDX	0.280 – 43.0	54	2	21.6	30.2
HMX	0.130 – 10.0	51	5	2.52	4.25
Perchlorate	No info				

Table 8. Concentrations of explosives compounds of surface soil (0-0.25 ft, 0.25-0.5 ft, 0.5-1 ft, 1.5-2 ft) (mg/kg) collected at KD Range West (2000, 19 samples). Data from APP B-22FromTR_IR_KD Range West Soil Data.pdf (633 pages, Soil data Table from Training Areas IR)

COC	Range of total soil COC conc	Number of ND	Number of Detection	Mean of Detected	Standard Deviation
Nitroglycerin	6.2 – 16	13	6	9.6	3.9
HMX	0.16	18	1		

In 1999, one soil sample, and in 2000, 10 soil samples were collected and analyzed for the 19 explosives compounds for the KD Range West primary target area. They were all non-detect (Data from Draft KD Range Post-DD Geo. & Soil Inv. Findings PN.pdf (Impact Area Groundwater Study Program, KD Range Post-DD Confirmatory Geophysical Program, Camp Edwards, MA. Subject: KD Range Post-DD Confirmatory Geophysical and Soil Investigation Findings, Date: 29 July 2020).

Table 9. Concentrations of explosives compounds of surface 0.25-foot soil in the 100-ft × 100-ft grid (mg/kg) at KD Range West

(2015, 3 samples). Data from Draft KD Range Post-DD Geo. & Soil Inv. Findings PN.pdf (Impact Area Groundwater Study Program, KD Range Post-DD Confirmatory Geophysical Program, Camp Edwards, MA. Subject: KD Range Post-DD Confirmatory Geophysical and Soil Investigation Findings, Date: 29 July 2020)

COC	Range of total soil COC conc	Number of ND	Number of Detection	Mean of Detected	Standard Deviation
HMX	0.0843 – 0.219	0	3	0.141	0.0696
Perchlorate	0.00028 – 0.00085	0	3	0.00049	0.00032

Table 10. Concentrations of explosives compounds of surface 0.25-foot soil in the 25-ft × 25-ft grid (mg/kg) at KD Range West

(2018, 3 samples). Data from Draft KD Range Post-DD Geo. & Soil Inv. Findings PN.pdf (Impact Area Groundwater Study Program, KD Range Post-DD Confirmatory Geophysical Program, Camp Edwards, MA. Subject: KD Range Post-DD Confirmatory Geophysical and Soil Investigation Findings, Date: 29 July 2020)

COC	Range of total soil COC conc	Number of ND	Number of Detection	Mean of Detected	Standard Deviation
2,4,6-TNT	0.0489 – 4.150	0	3	1.578	2.241
4-Amino-DNT	ND – 0.208	2	1		
RDX	2.600 – 18.30	0	3	9.547	8.004
HMX	3.440 – 6.320	0	3	4.423	1.643
Perchlorate	0.0052 – 0.0109	0	3	0.0079	0.0029

2,4,6-TNT: 2,4,6-Trinitrotoluene; 4-Amino-DNT: 4-Amino-2,6-dinitrotoluene

Table 11. Concentrations of explosives compounds of surface 1-foot soil in the 35-ft x35-ft grid post-excavation (mg/kg) at KD Range West (February 2020, 3 samples). Data from Draft KD Range Post-DD Geo. & Soil Inv. Findings PN.pdf (Impact Area Groundwater Study Program, KD Range Post-DD Confirmatory Geophysical Program, Camp Edwards, MA. Subject: KD Range Post-DD Confirmatory Geophysical and Soil Investigation Findings, Date: 29 July 2020)

COC	Range of total soil COC conc	Number of ND	Number of Detection	Mean of Detected	Standard Deviation
4-Amino-DNT	ND – 0.0187	2	1		
RDX	0.0433 – 0.246	0	3	0.123	0.108
HMX	0.451 – 3.69	0	3	1.576	1.832

4-Amino-DNT: 4-Amino-2,6-dinitrotoluene

Table 12. Concentrations of explosives compounds of surface 1-foot soil in the 35-ft x35-ft grid post-excavation (mg/kg) at KD Range West (June 2020, 3 samples). Data from Draft KD Range Post-DD Geo. & Soil Inv. Findings PN.pdf (Impact Area Groundwater Study Program, KD Range Post-DD Confirmatory Geophysical Program, Camp Edwards, MA. Subject: KD Range Post-DD Confirmatory Geophysical and Soil Investigation Findings, Date: 29 July 2020)

COC	Range of total soil COC conc	Number of ND	Number of Detection	Mean of Detected	Standard Deviation
2-Amino-DNT	0.0321 – 0.0379	0	3	0.0345	0.0030
4-Amino-DNT	0.0262 – 0.0313	0	3	0.0287	0.0026
RDX	0.060 – 0.160	0	3	0.104	0.051
HMX	0.225 – 0.328	0	3	0.284	0.053

2-Amino-DNT: 2-Amino-2,6-dinitrotoluene

4-Amino-DNT: 4-Amino-2,6-dinitrotoluene

Soil Porewater, no information

Table 13. Maximum groundwater dissolved metal concentrations at KD Range West (1999–2014) as compared to EPA national primary drinking water regulations maximum contaminant level (MCL). Data from Table4-2X_TAIR_KDMaxDetectsGW.pdf (Table 4-2X, Training Area KD West Representative Groundwater Data Maximum Detections)

COC	GW Metals Conc (mg/L)	MCL (mg/L)	Secondary Standard (mg/L)
Antimony	0.0023	0.006	
Chromium	0.0025	0.1	
Copper	0.0083	1.3	
Lead	0.0015	0.015	
Manganese	0.0874	NA	0.05
Strontium	No info	NA	
Vanadium	No Info	NA	
Tungsten	No info	NA	
Zinc	0.129	NA	5