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Chemical Agent Health-Based Standards and Guidelines Summary Table 2: Criteria for Water, Soil, Waste, as of July 2011

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USAPHC

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USAPHC* Chemical Agent Health-Based Standards and Guidelines Summary Table 2. Criteria for Water, Soil, Waste, etc. (as of July 2011)**

Media	Standard Name	Population	Exposure Scenario	H/HD/HT (Mustard)	GA (Tabun)	GB (Sarin)	GD/GF	VX	Lewisite	Notes/Status
Water	**MFWS** *Military Field Water Standards* **ug/L**	Designed for military but conservative assumptions can address civilian applications	Short term (~7 day) high volume (15 L/day) consumption	**47** [a,b,]	**4** [a,b ‡]	**4** [a,b ‡]	**4** [a,b ‡]	**4** [a,b ‡]	**27** [a,b]	These new multi-service criteria (2010 [a]) supersede old values – previous Field Drinking water Standards (FDWS) are now referred to as these MFWS . However actual values are based on same toxicological assessment as past [b] [These values supersedes two previous sets of military FDWS (2005) which include two sets of values, one for 5/L/day consumption, the other for 15 L/day consumption) as well as even older criteria (200 ug/L for Mustard agents/Lewisite and 20 ug/L for nerve agents)]. [‡] All nerve agent values reflect lowest estimated ingestion toxicity based on GD. See Notes.
Soil *Health Based Environmental Screening Levels (HBESL)*	**HBESL – Residential mg/kg**	General population: adults and children	Daily exposure, lifetime	**0.01** [c,d,e, f,n]	**2.8** [c,d,e,n]	**1.3** [c,d,e,n]	**0.22** [c,d,e,n]	**0.042** [c,d,e,n]	**0.3** [c,d,e,n]	See Note 1 on Soil HBESL on back of table.
	HBESL – Industrial g/kg	General adult population	Frequent exposure 250 days/yr for 30 yrs	**0.3** [c,d,n]	**68** [c,d,n]	**32** [c,d,n]	**5.2** [c,d,n]	**1.1** [c,d,n]	**3.7** [c,d,n]	
Waste (solid and liquid)	**$HWCL_{sol}$ [e] mg/kg** *Solid Hazardous Waste (HW) Control Limit*	Worker civilian/DoD	Possible occasional exposure at HW treatment facility	**6.7** [h,i,n]	**680** [h,i,n]	**320** [h,i,n]	**52** [h,i,n]	**10** [h,i,n]	**37** [h,i,n]	Were derived by Army (***ref h, i***) using the chronic toxicity criteria below with risk assessment model similar to that used by EPA Region IX and assumptions denoting specific exposure scenarios associated with waste materials and workers potentially exposed to them. Values were initially documented in a Department of Army proposed hazardous waste management rule presented to the State of Utah (***ref i)*** and later in an October 2000 CHPPM memo to PMCD (***ref g***). Values are endorsed in DA Policy (***ref f, n***) for site specific use/consideration.
	HWC_{liq} [e] mg/L *Liquid HW Control Limit*	Worker civilian/DoD	Possible occasional exposure at HW treatment facility	**0.7** [h,i,n]	**20** [h,i,n]	**8.3** [h,i,n]	**0.3** [h,i,n]	**0.08** [h,i,n]	**3.3** [h,i,n]	
	NHWCL [e] mg/kg *Non-HW Control Limit (e.g., HW exemption level)*	Worker civilian/DoD	At non HW disposal facility, possible occasional exposures	**0.3** [h,i,†]	**68** [h,i,†]	**32** [h,i,†]	**5.2** [h,i,†]	**1.1** [h,i,†]	**3.7** [h,i,†]	
Chronic Toxicity Reference Criteria (Used in risk assessment calculations)	**RfD** *Reference Dose* **mg/kg/day**	General population: adults and children	Lifetime ingested dose at or below which no adverse health effects expected	**0.000007** [j, k, l]	**0.00004** [j, k, l]	**0.00002** [j, k, l]	**0.000004** [j, k, l]	**0.0000006** [j, k, l]	**0.0001** [j, k, l]	NRC/COT (***ref j***, 1999) gave general endorsement of values; addressed in Final DA OTSG endorsement letter of final RFDs (***ref k***, 2000); most current documentation of basis and overall status of these values is in peer reviewed article: ***ref l***
	Cancer Slope Factor $(mg/kg/day)^{-1}$	General population: adults and children	Represents the potency of the agent by ingestion to cause increased cancer risk	**7.7** [j, k, l]	**Not determined to be a carcinogen**					The NRC/COT ***ref j*** endorsed a less conservative HD Slope Factor of [1.6 mg/kg/day-[1]]; DA OTSG (2000) has currently endorsed use of the 7.7; ***ref k, ref l.***
	Inhalation Unit Risk $(ug/m^3)^{-1}$	General population: adults and children	Represents the potency of the agent by inhalation to cause increased cancer risk	**4.1x10E-3**						See Table 20 HD HCD, November 2000 ***ref m.***

NOTES and REFERENCES for Chemical Agent Multi Media/Toxicity Standards Status Table: Existing and Proposed Criteria as of July 2011

* USAPHC was formerly known as the U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM).

Application of military drinking water criteria (MFWS): It is noted that contamination of large water supplies with warfare agents is relatively unlikely die to effects of hydrolysis, dilution, and the neutralizing effects of common water treatment processes (*e.g. chlorine). The cited MFWS values were designed for a military scenario in which smaller containerized water supplies directly used for consumption might be intentionally contaminated with significant amounts of agents. Theoretically this situation could result in residual agent levels of concern for several days. The values here assume up to 30 days exposure for up to 15 liters/day consumption which though does occur in extreme heat military environments with high physical activity - is an extremely high rate of drinking water consumption not anticipated for civilians. By comparison USEPA basis its drinking water standards on a 2 L/day consumption rate. As such, MFWS would be appropriate screening criteria for a general population scenario where ingestion rates range from 1-2 liters/day and where most releases to a water supply would involve the hydrolysis, dilution, and treatment processes. It also noted that the nerve agent values all reflect the most acutely toxic ingestion estimate which was based on GD – a single criteria is used because most field detection kits/techniques do not differentiate the type of nerve agent. Alternatively, the ATSDR Oral Minimal Risk Levels (MRLs) are presently available for sulfur mustard agent HD which may also be useful for specific screening assessments - HD MRL for acute-duration exposure of ≤14 days is a dose value 0.0005 **mg/kg/day** (*not a concentration – must be converted*); MRL for intermediate-duration exposure of 15 to 364 days is 0.00007 mg/kg/day;(ATSDR 2003).

(Soil) HBESLs: were endorsed by headquarters Army (ESOH) in May 1999 (***ref c***) were derived (by Army, ***ref d – which had criteria reevaluated (and reaffirmed) in 2007; see ref d1)***) using chronic toxicity criteria below with risk assessment model and assumption like that used by USEPA Reg IX to develop soil preliminary remediation goals (PRGs). These are conservative screening criteria for assessing potential long term human exposure/ contact with soil contaminated from (liquid) agent (ambient vapor alone is not expected to result in deposition or soil contamination). Also identified as criteria to determine public release of decontaminated items/ property (***ref e***) Note that where there is potential HD or VX soil contamination, breakdown products may also warrant evaluation (see *App f* ***of ref d***, and ***ref g***).

REFERENCES:

a. TB Med 577, *Sanitary Control and Surveillance of Field Water Supplies*, **May 2010**.
b. Memorandum, DASG-HS-PE, **16 April 1997**, Subject: Tri-Service Field Water Standards for Nerve Agents.
c. Memorandum, Headquarters Department of the Army, Office o**f** the Assistant Secretary for Installations, Logistics, and Environment, SUBJ: Derivation of Health Based Environmental Screening Levels (HBESLs) for Chemical Warfare Agents, **May 28, 1999.**
d. USACHPPM/ORNL Technical Report: Health *Based Environmental Screening Levels for Chemical Warfare Agents*, **March 1999.**
e. ORNL/TM 080 (2007) Watson and Dolislager " Re-Evaluation of 1999 HBESLs for CWA" **2007**.
f. DA Pamphlet 385-61, *Toxic Chemical Agent Safety Standards*, **17 December 2008.**
g. Munro et al; *The Sources, Fate, and Toxicity of Chemical Warfare Agent Degradation Products*, Environmental Health Perspectives, Volume 107, Number 12, **December 1999**, pp933-974.
h. Memorandum, Department of the Army – Center for Health Promotion and Preventive Medicine; MCHB-TS-EES; SUBJ: Response to State of Oregon Comments on the Utah Chemical Agent Rule (UCAR), *23 October 2000*; NOTE: This response includes **USACHPPM Information Paper *"Management Criteria for Chemical Warfare Agent (CWA)-Contaminated Waste and Media"* 10 October 2000 as well as USACHPPM Technical Paper: *"Chemical Warfare Agent Health Based Waste Control Limits"* dated September 2000.**
i. U.S. Army-Proposed Utah Chemical Agent Rule (UCAR), **May 1999** (Volume 1, Section XI. Development of Health Based Waste Management Concentration Levels."
j. *Review of the US Army's Health Risk Assessments for Oral Exposure to Six Chemical Warfare Agents*, National Research Council, National Academy Press, Wash DC, **1999.** www.nap.edu.
k. Memorandum, (Army OTSG) MCHB-CG-PPM, Chronic Toxicological Criteria for Chemical Warfare Compounds, **16 February 2000.**
l. Opresko, D.M., et al, **2001**. Chemical Warfare Agents: Current Status of Oral Reference Doses, *Reviews of Environmental Contamination and Toxicology* Vol. 172 pp 65-85.
m. USACHPPM Technical Report: *Evaluation of Airborne Exposure Limits for Sulfur Mustard (HD): Occupational and General Population Exposure Criteria*, Technical Report 47-EM-3767-00, **November 2000.**
n. Memorandum, Department of the Army, Subject: Interim Guidance for Chemical Warfare Material (CMW) Responses, **April 1, 2009.**