FAX

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To: Dept of Homeland Security Secretary Tom Ridge
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Re: Following this cover sheet is an important letter to you from over 100 signers including over 50 organizations regarding Homeland Security and potential radiation standards. It is followed by a letter we sent to Environmental Protection Agency Administrator Leavitt and two attachments (Attachment A: Tables and Attachment B: Summary of EPA Radiation Standards).

Thank you for your attention to our concerns about this important issue.

2 December 2004

Secretary Tom Ridge
Department of Homeland Security
Washington, D.C. 20528

Dear Secretary Ridge:

We write to urge you to not issue lax cleanup standards for dirty bombs. The New York Times, National Public Radio, and other media outlets report that the Department of Homeland Security (DHS) may soon issue guidance for responding to and cleaning up after the detonation of a radiological weapon ("dirty bomb") or improvised nuclear device, should such an event ever occur in the United States. The news reports suggest that the guidance would relax cleanup standards compared to existing requirements for contaminated sites. What has not been formally disclosed to date is the degree of relaxation contemplated, and how many extra cancers could result from these radiation doses.

Two drafts of the guidance, however, have been obtained by the trade publication Inside EPA and posted on its website. These drafts suggest permitting very high radiation levels to remain after final cleanup, resulting in a significant number of cancers in the exposed population.

For example, the upper long-term cleanup standard recommended by the Department of Energy in the July 2003 draft was 2,000 millirem/year, including background. That is the equivalent, subtracting out average background values, of more than 8000 chest X-rays over the assumed 30 year exposure period. Such doses are estimated to produce one cancer in every twenty-five people exposed, according to the official radiation risk estimates used by the U.S. Government (see, e.g., Federal Guidance Report 13, Cancer Risk Coefficients for Environmental Exposure to Radionuclides). In the same draft, the Nuclear Regulatory Commission proposed a standard of 500 millirem/year, the equivalent of approximately 2,500 chest X-rays over thirty years, which would result in approximately one cancer in every eighty people exposed.

In the original draft, EPA objected to such lax long-term cleanup standards, arguing that they were far outside acceptable risk ranges, which generally will not permit exposures sufficient to produce more than one cancer per ten thousand people exposed. EPA recommended use of its existing standards for cleanups of contaminated sites under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, or Superfund). EPA, reportedly under pressure from the other agencies, subsequently withdrew its insistence that cleanup standards not exceed existing acceptable risk ranges. ["EPA Drops Backing for Superfund Levels in 'Dirty Bomb' Cleanups," Inside EPA, 21 November 2003].

The more recent "interim final" draft made public by Inside EPA attempts to finesse the differences between the agencies by removing any specific numerical values for long-term cleanup standards. Instead, the guidance merely refers to using "benchmark" values from national and international advisory bodies and federal and state agencies, which would presumably include the DOE and NRC proposals from the previous draft, as well as recommendations from outside organizations. Unfortunately, those cleanup "benchmarks" –

ranging from 100 millirem/year over thirty years to one hundred times that dose – and associated cancer risks fall far outside generally accepted risk ranges.

The 100 millirem/year benchmark over thirty years of exposure is officially predicted to result in one person developing cancer from that radiation for every few hundred people exposed. The 10,000 millirem/year upper "benchmark"—the equivalent of 50,000 chest X-rays over the assumed exposure period—is estimated to *result in radiation-induced cancer in approximately one quarter of the population exposed.* These benchmarks are 25 to 2,500 times greater than the maximum risk values considered acceptable by EPA for Superfund site cleanups.

These are not our risk estimates for such doses but those of the federal government. (All federal agencies use similar figures for estimating the number of cancers generated by radiation, derived primarily from studies by the National Academy of Sciences).

We recognize that early- and intermediate-phase response actions to a terrorist use of a radiological or nuclear device may require extraordinary measures, with initial doses outside of those allowed in normal circumstances. *However, we oppose final cleanup goals that allow long-term radiation exposures to the public and resulting cancer risks that are orders of magnitude greater than currently accepted for remediation of the nation's most contaminated sites* (i.e., those on the Superfund National Priority List).

An attack by a terrorist group using a "dirty bomb" or improvised nuclear device would be a terrible tragedy. Significantly enhanced measures should be taken to control the radioactive and fissile materials that can be used for such weapons, to prevent their falling into terrorist hands. But should such a radiological weapon go off in the U.S., our government should not compound the situation by employment of standards for cleaning up the radioactive contamination that are inadequately protective of the public.

(There is an apparent contradiction between claims by some that "dirty bombs" would cause little harm aside from public fear and the argument by agencies on the DHS taskforce establishing these guidelines that radioactive contamination could be so high that radiation doses to the public far beyond those normally permitted should be allowed for decades thereafter.)

We are concerned that such lax cleanup standards, with associated high radiation and cancer risk levels, would be considered. We urge you to assure that no cleanup guidance is adopted that—implicitly or explicitly—would permit radiation doses to the public of the magnitudes considered in earlier drafts.

We have enclosed correspondence with EPA Administrator Mike Leavitt and supporting material that provides more detail on these concerns.

Sincerely,

cc: EPA Administrator Michael Leavitt

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ATTACHMENT A

Table 1 Long-Term Cleanup Phase

Proposed Cleanup Benchmark[1]	= # of Chest X-rays Per Year[2] [Over 30 Years]	Risk of Cancer[3] (exponential)	=1 Cancer Per X People Exposed	Factor by Which EPA Acceptable Risk Range[4] Is Exceeded
100 mrem/year[5]	17 [500]	2.5×10^{-3}	400	25-2,500
500 mrem/year[6]	83 [2,500]	1.3×10^{-2}	80	130-13,000
1,000 mrem/year[7]	170 [5,000]	2.5×10^{-2}	40	250-25,000
2,000 mrem/year[8]	340 [10,000]	5×10^{-2}	20	500-50,000
10,000 mrem/year[9]	1,700 [50,000]	2.5×10^{-1}	4	2,500-250,000

Table 2 Early Phase

Proposed Protective Action Level	= # of Chest X-rays Per Year	Risk of Cancer (exponential)	=1 Cancer Per X People Exposed	Factor by Which EPA Acceptable Risk Range Is Exceeded
1,000 mrem[10]	170	8.46×10^{-4}	1,200	8-850
5,000 mrem/year[11]	830	4.23×10^{-3}	240	42-42,000

Table 3 Intermediate Phase

Proposed Levels 1st Year	Proposed Levels subsequent years[12]	# of Chest X-rays Per Year *[Over 3 Years[13]]*	Risk of Cancer (exponential)[14]	=1 Cancer Per X People Exposed	Factor by Which EPA Acceptable Risk Range Is Exceeded[15]
2,000 mrem 1st year		333	1.7×10^{-3}	600	17-1,700
	500 mrem/year– general exposure	83 *[250]*	1.3×10^{-3}	800	13-1,300
	+500 mrem/year – food interdiction	83 *[250]*	1.3×10^{-3}	800	13-1,300
	500 mrem/year	83 *[250]*	1.3×10^{-3}	800	13-1,300

	drinking water interdiction				
	Total 1,500 mrem/yr	250 *[750]*	3.8×10^{-3}	260	38-3,800

Table 4 Total Dose to Public from DHS Proposed Radiation Guidelines

Phase	Proposed Dose Level	= # of Chest X-rays	Risk of Cancer (exponential)	=1 Cancer Per X People Exposed	# of cancers produced if the exposed population is 10,000 people[16]	Factor by Which EPA Acceptable Risk Range Is Exceeded
Early	5,000 mrem	833	4.23×10^{-3}	240	42	
Intermediate – 1st yr	2,000 mrem 1st year	333	1.7×10^{-3}	600	17	
Yrs 2-4 (total)	4,500 mrem	750	3.8×10^{-3}	260	38	
Late Phase[17]	3,000-300,000 mrem[18]	500-50,000	2.5×10^{-3} – 2.5×10^{-1}	400-4	25-2,500	
Total[19]	**14,500 – 311,500 mrem**	**2,400 – 52,000**	**1.2×10^{-2} – 2.6×10^{-1}**	**80-4**	**120 – 2,600**	**120-12,000 - 2,600-260,000**

Endnotes

[1] The current draft Department of Homeland Security cleanup guidance, as released by the trade press, has no specific cleanup standards for the late phase cleanup, implicitly turning away from existing cleanup standards such as EPA's CERCLA requirements, and instead referring to unspecified "benchmark" values proposed by nuclear advisory groups, and federal and state government agencies. We have therefore focused on such proposals, as from HPS and ICRP, and the DOE and NRC proposals made in an earlier draft of the DHS guidance, recognizing that there are far more protective standards in existence, such as EPA's historical cleanup standards, that could be – and should have been – adopted in the DHS guidance as the preferred benchmark.

[2] Standard chest X-ray ≈ 6 mrem. (General Accountability Office Report GAO/RCED-00-152, "Radiation Standards," fn. 3, page 7.) Doses vary by machine.

[3] Based on the official figure for cancer incidence risk of 8.46 x10^{-4}/person-rem, as set forth in Federal Guidance Report 13 (FGR 13). (Put more simply, 8-9 people are expected to come down with cancer from their radiation exposure if 10,000 people each receive 1 rem, or if 1000 people each receive 10 rem). Federal Guidance Report No. 13, *Cancer Risk Coefficients for Environmental Exposure to Radionuclides*, EPA 402-R-99-001, US EPA Office of Radiation and Indoor Air, funded by EPA, NRC, and DOE, September 1999, pp. 179, 182; http://www.epa.gov/radiation/docs/federal/402-r-99-00.pdf. FGR 13 provides estimates of fatal cancer risk of 5.75 x 10^{-4} per person-rem [5.75 x 10^{-2} per person-gray] and total cancer incidence or morbidity (fatal and nonfatal combined) of 8.46 x 10^{-4} per rem [8.46 x 10^{-2} per person-gray].

All federal agencies use approximately the same mortality risk factors, i.e. the Federal Guidance Report 13 figures cited above. See, e.g., *NRC Policy Statement on Below Regulatory Concern*, 3 July 1990, p. 8, and *NRC 10 CFR Part 20, et al. Radiological Criteria for License Termination; Final Rule*, July 21, 1997, Vol. 62 Federal Register 39058, 39061, noting its reliance on and the similarity of the Federal Guidance 13 and ICRP Publication 60 risk figures; and DOE *Environmental Assessment for the Energy Technology and Engineering Center*, DOE/EA-1345, p. C-3, March 2003. The minor differences between agencies – DOE and NRC at times use mortality figures of 5 x 10^{-4} / person-rem instead of the Federal Guidance Report 13 figure of 5.75 x 10^{-4}, particularly in pre-FGR 13 documents -- are inconsequential for the discussion here because of the high magnitude of the risk of the dose limits represented.

The agency risk estimates from radiation are in turn derived in large part from *Health Effects of Exposure to Low Levels of Ionizing Radiation*, the report by the National Academy of Sciences' Committee on the Biological Effects of Ionizing Radiation (BEIR V), 1990, which sets the risk of fatal cancer at 8 x 10^{-4} per person-rem. (See NAS BEIR V Report p. 6 and 172-3,5). EPA and other agencies rely upon the NAS numbers, but reduce the risk factor by a Dose and Dose Rate Effectiveness Factor (DDREF). No agency – nor the NAS – accepts the controversial argument put forward by some in the nuclear industry that there is a threshold below which radiation is completely safe, or may even be beneficial ("hormesis"), but all agencies depart from the linear model at low doses by reducing risks at low doses and dose rates by a DDREF of approximately 2, beyond the reduction from just linear scaling from higher doses.

When conducting site-specific risk assessments at Superfund sites, EPA uses isotopic-specific risk coefficients rather than rely on the more generic rem-to-cancer risk estimates cited here. However, this type of more accurate risk assessment is not possible prior to a radiological attack.

The assumed exposure period is 30 years, the presumption generally used by EPA's Superfund program for estimating exposure at Superfund sites (although EPA has in other instances assumed a full lifetime of exposure of 70 years.) For simplicity, we

have used the official government risk figures for cancer induction from radiation exposure and the less conservative 30-year rather than lifetime exposure assumption. True risks therefore may be higher than presented here, as people may live or work at the same location longer than 30 years, and several studies (e.g., of DOE radiation workers at Oak Ridge, Hanford, and Santa Susana) suggest ten-fold higher cancer risks than assumed in Federal Guidance 13.

If the half-life of the radioniuclide(s) involved were short, there may be a reduction of dose over the 30 year exposure period and therefore a reduction in risk from the figures cited above. If, however, the radionuclide(s) half-life were long, there may be no significant dose reduction in that period. Additionally, effects of weathering would need to be taken into account, but that would involve site-specific considerations.

[4] EPA has long set the acceptable risk range for cancer induction from exposure to contaminants (chemicals and radionuclides combined) as $10^{-4} - 10^{-6}$, or one cancer per 10,000 to 1,000,000 people exposed, with the starting point for acceptable risk being one in a million, falling back to no more than one in ten thousand if there are good reasons why the one in a million level cannot be obtained. See, e.g., CERCLA statute and EPA's implementing guidance. As EPA acknowledged in an earlier draft of the DHS guidance, there may be extraordinary circumstances regarding a dirty bomb requiring, in a particular case, going outside the normal risk range, but the basic cleanup standards should be based on the existing EPA CERCLA risk range.

[5] HPS suggested lower range [*Guidance for Protective Actions Following a Radiological Terrorist Event - Position Statement of the Health Physics Society*, January 2004. Ramona Trovato, in the EPA statement quoted in our letter, says NRC estimates the cancer risk of a 100 mrem/year cleanup standard as 1 in 200 (5×10^{-3}). We give it here as 2.5×10^{-3}. NRC presumably used a longer exposure time (e.g., lifetime) than the 30 years we assumed. Our risk figures here thus might be low (i.e., underestimate true risk) on that basis alone.

[6] HPS suggested upper range; DOE & NRC suggested benchmark [*Risk Management Framework for Radiological Dispersal Device (RDD)/ Improvised Nuclear Device (IND) Incidents (Guidance for Development of Countermeasures)*, Rough Draft July 18, 2003, pp. 25, made by public by the trade publication *Inside EPA*

[7] ICRP suggested lower range [*Protecting People Against Radiation Exposure in the Aftermath of a Radiological Attack-- A Report from a Task Group of the ICRP*, Final TG Draft April 2004, p. 79

[8] DOE suggested upper range for long-term cleanup standard, DHS Rough Draft July 18, 2003, p. 28. The 2,000 mrem/year proposed limit includes background, which averages in the U.S. ~330 mrem/year, most of it from indoor radon. The 2,000 mrem/year limit

with background thus would average ~1,670 mrem/year above background. The contradiction between this value and the 500 mrem/year above background recommendation in the same paragraph is not explained in the DOE appendix to the DHS draft. The X-ray equivalence and risk figures in the succeeding columns for that row are based on the 2,000 mrem/yr figure (i.e., including background). Since all other of the proposed cleanup levels do not include background, to make them comparable, one would reduce the X-ray and risk figures for this one proposed standard by 330/2,000 = 16.5% to get the contribution from the radiation from the dirty bomb alone.

[9] ICRP suggested upper range

[10] Lower range of recommended protective actions of sheltering and/or evacuation of public

[11] Upper range of recommended protective actions of sheltering and/or evacuation of public

[12] These permitted doses are additive – i.e., one is permitted 500 mrem/year from general contamination such as soil contamination, 500 mrem/year from contaminated food, and 500 mrem/year from contaminated drinking water, for a total of 1,500 mrem/year each year of the intermediate phase after the first year.

[13] These limits are for subsequent years prior to the late phase cleanup. We here assume this takes three years, but it could be longer and the doses thus higher.

[14] For 1st year, risk for dose in that year. For subsequent years, risk for the 3 years following.

[15] The World Trade Center benchmark of aggressive cleanup of chemical toxic materials in apartments–comparable to the intermediate phase here – was accomplished with a 1×10^{-4} lifetime cancer risk cleanup benchmark assuming one year of exposure. These proposed radiation cleanup standards for the intermediate phase would be many times more lax than EPA permitted for the World Trade Center cleanup—a total risk of 5.5×10^{-3}, or 55 times the risk standard used by EPA for the World Trade Center cleanup. See *World Trade Center Indoor Air Assessment: Selecting Contaminants of Potential Concern and Setting Health-Based Benchmarks*, Prepared by the Contaminants of Potential Concern (COPC) Committee of the World Trade Center Indoor Air Taskforce Working Group, Peer Review Draft, September, 2002, pp. 11-12. The overall 30-year long-term cleanup benchmark used by EPA for cleanup of the surrounding area after the World Trade Center attack was also 1×10^{-4}. See *World Trade Center Indoor Environment Assessment: Selecting Contaminants of Potential Concern and Setting Health-Based Benchmarks* May 2003 Prepared by the Contaminants of Potential Concern (COPC) Committee of the World Trade Center Indoor Air Task Force Working Group, p. 58.

[16] Assume, for example, a dirty bomb going off in a crowded downtown metropolitan area where 10,000 people live and/or work in the affected zone. The number could be significantly larger under some radiological weapon scenarios in highly populated areas.

[17] Uses EPA common assumption of 30-year total exposure after cleanup is completed.

[18] Lower figure is based on 100 mrem/year benchmark, upper figure based on 10,000 mrem/year benchmark

[19] Similarly, the range for total exposure--taking into account immediate, intermediate, and late phase cleanup--is bracketed by the totals including the lower long-term cleanup benchmark on the one hand and the upper long-term cleanup benchmark on the other.

Attachment B

Summary of EPA Radiation Standards

Historically, EPA has employed cleanup standards that keep resulting risks of cancer incidence within a range of one in a million (1×10^{-6}) to one in ten thousand (1×10^{-4}). In non-cleanup settings, it has generally not permitted doses greater than 15 millirem/year.[1] It has consistently opposed proposed radiation limits that exceed these risk and dose ranges. The "benchmark" cleanup recommendations contemplated in the Department of Homeland Security dirty bomb cleanup guidance, from 100 mrem/year to 10,000 mrem/year, significantly exceed doses and risks EPA considers protective of public health.

Background and Explanation

EPA's Superfund (CERCLA) site cleanup program sets a goal of one-in-a-million (1×10^{-6}) excess risk of cancer as the point of departure; if that goal cannot be met, after consideration of nine balancing criteria, one can fall back to cancer incidence risk levels of no more than about one in ten thousand (1×10^{-4}). See 40 CFR 300.430(e)(2)(i)(A)(2). As noted below, EPA uses risk rather than dose for such cleanup standards, set for individual radionuclides; as a rough approximation, the 1×10^{-4} risk level corresponds to about 5 mrem/year over 30 years of exposure.)

EPA states that dose levels above 15 mrem/yr and drinking water levels over the maximum contaminant levels (MCLs, pegged for most radionuclides at 4 mrem/year) would not be considered protective for Superfund. In a letter to the Nuclear Regulatory Commission from its then Administrator Carol Browner, EPA opposed several changes NRC was considering in a final decommissioning rule from its proposed rule, stating that it considered

> "...increasing the proposed dose limit from 15 mrem/yr to as much as 30 mrem/yr and eliminating a separate requirement for protecting ground water that could be used as drinking water to the Maximum Contaminant Levels (MCLs) established under the Safe Drinking Water Act, to be disturbing... EPA would also consider NRC's rule to not be protective under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and not consistent with this and previous Administration's Ground Water Policy... If NRC were to promulgate its rule with the above-referenced changes, EPA would be forced to reconsider its policy exempting NRC sites from the NPL. This change in

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[1] EPA has determined that its older radiation standards, set at doses of (a) 25 mrem/year whole body, 75 mrem/year to the thyroid, or 25 mrem/year to any critical organ other than the thyroid, or (b) 25 mrem/year whole body, 75 mrem/year to any critical organ, are equivalent to approximately 10 or 15 mrem/year ede respectively. See "Establishment of Cleanup Levels for CDERCLA Sites with Radioactive Contamination," August 22, 1997 EPA Memorandum from Stephen Luftig, Director, Office of Emergency and Remedial Response, and Larry Weinstock, Acting Director, Office of Radiation and Indoor Air, pp. 16, 17.

> EPA listing policy for the NPL would reflect the EPA view that NRC regulation would not be adequately protective of human health and the environment under CERCLA..."[2]

EPA does not use dose limits for its own standards for site cleanup, but rather the same cancer risk range that it uses for chemicals and that was used during cleanup efforts after the attack on the World Trade Center (e.g., the WTC cleanup was to 10^{-4} risk levels). In a policy statement to its regional offices that perform Superfund cleanups, EPA's Headquarters stated that "...site decision-makers should not use dose-based guidance rather than the CERCLA risk range in developing cleanup levels. This is because for several reasons, using dose-based guidance would result in unnecessary inconsistency regarding how radiological and non-radiological (chemical) contaminants are addressed at CERCLA sites."[3]

Under other environmental laws, EPA has at times used dose limits to protect the public from exposures to radionuclides. However, even under these non-Superfund laws, EPA has used the same 10^{-4} to 10^{-6} cancer risk range as its measure of acceptable exposure when developing dose limits.

For example in its recent rulemaking for the proposed Yucca Mountain nuclear waste repository, EPA picked a 15 mrem/yr standard with a separate groundwater standard of MCLs. EPA specifically rejected comments asking for dose levels of 25 and 70 mrem/yr. The Agency wrote that "EPA disagrees that the standard should be set at 25 mrem."[4] As part of its rationale EPA further wrote that 25 mrem/yr would be "...outside the preferred EPA lifetime risk range. In general, the Agency does not regulate above a risk of 1×10^{-4}...."[5]

The Agency stated that "EPA disagrees particularly strongly with the commenter who recommended a 70 mrem standard as adequately protective."[6] EPA wrote that a 70 mrem/yr standard "would result in a risk level at Yucca Mountain that is significantly higher than at any facility that falls under 40 CFR part 191, such as WIPP and future radioactive waste disposal facilities."[7]

In EPA's original rulemaking for the disposal of high level radioactive waste which was the source of its 15 mrem/yr standard for the Waste Isolation Pilot Project (WIPP), EPA cautioned that it considered this dose level to be so high that it was acceptable because "it involves only a small number of potential sites and would result in

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[2] Letter from Carol Browner to NRC Chairman Shirley Ann Jackson. February 7, 1997.
[3] Letter from Stephen Luftig, Director of EPA's Office of Emergency and Remediation Response and Stephen Page, Director of EPA's Office of Radiation and Indoor Air, to EPA's regional Superfund and radiation managers, December 17, 1999.
[4] Public Health and Environmental Radiation Protection Standards for Yucca Mountain, Nevada (40 CFR Part 197)—Final Rule; Response to Comments Document. June 2001. See page 4-5.
[5] ibid. In nuclear cleanup matters, EPA generally sets acceptable risk based on cancer incidence, not deaths. In the Yucca rulemaking, however, it relied upon cancer mortality risks.
[6] ibid.
[7] ibid.

only a small number of potential sites and would result in only a small number of people potentially being exposed to the maximum allowed individual risk."[8]

When developing standards that may result in large numbers of people being exposed to radionuclides, EPA has issued a dose limit of 10 mrem/yr. In a rulemaking for limiting exposure to radionuclides under the Clean Air Act, the Agency stated "the EPA will generally presume that if the risk to that individual is no higher than approximately 1 in 10 thousand, that risk level is considered acceptable and EPA, then considers the other health and risk factors to complete an overall judgment on acceptability. The presumptive level provides a benchmark for judging the acceptability of maximum individual risk, but does not constitute a rigid line for making that determination."[9] EPA issued a 10 mrem/yr standard (a cancer risk of approximately 2 x 10^{-4}) for DOE facilities, non-DOE facilities, NRC licensees, and uranium fuel cycle facilities.

In rejecting a comment calling for a 25 mrem/yr standard, EPA stated that "regarding the maximum lifetime risk limit, the EPA has considered the recommendation of the NCRP, ICRP, and other expert advisory committees and in the context of the source categories herein considered, has concluded that individual dose levels greater than 10 mrem/y ede are inconsistent with the requirements of section 112"[10] of the Clean Air Act.

For protecting the public from beta particle and photon radioactivity in drinking water, EPA has a standard of 4 mrem/yr.

The Department of Homeland Security (DHS) proposed limit for drinking water of 500 mrem/yr (this is 125 times greater than the EPA standard). However, it is probably significantly worse. This is because the EPA standard is based on an older dose methodology of 4 mrem/yr to the total body or any internal organ. EPA considered changing this standard to 4 mrem/yr using a newer dose methodology (effective dose equivalent or ede) that most federal agencies are using, including presumably DHS with its 500 mrem/yr limit for drinking water. Using the latest risk estimates in Federal Guidance Report 13, EPA found that "FGR-13 demonstrates that the current MCL of 4 mrem/year results in concentration limits that are within the 10^{-6} to 10^{-4} range." EPA rejected the idea of changing to the newer 4 mrem/yr ede MCL since Federal Guidance Report 13 demonstrates that the "proposed MCL of 4 mrem-ede/year results in concentration limits that are outside the 10^{-6} to 10^{-4} range." It is impossible to say how much worse the DHS limit might be without seeing a list of concentrations in drinking water that correspond to its 500 mrem/yr level and comparing these concentrations to the MCL federal drinking water limits.

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[8] Environmental Radiation Protection Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes; Final Rule (December 20, 1993) see Volume 58 Federal Register, page 66402

[9] National Emission Standards for Hazardous Air Pollutants; Radionuclides. December 15, 1989. see Volume 54 Federal Register, page 51658

[10] ibid., page 51686