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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2 December 2004

Administrator Mike Leavitt
U.S. Environmental Protection Agency
Ariel Rios Building
1200 Pennsylvania Avenue, N.W.
Washington, DC 20460

Dear Administrator Leavitt:

A taskforce established by the Department of Homeland Security (DHS), including the Environmental Protection Agency (EPA), Department of Energy (DOE), Nuclear Regulatory Commission (NRC), and other agencies has been preparing guidance for responding to and cleaning up after the detonation of a radiological weapon ("dirty bomb") or improvised nuclear device ("IND"), should such an event ever occur in the United States. The New York Times, National Public Radio, and other media outlets report that DHS may soon issue guidance which suggests relaxing cleanup standards compared to those currently required for contaminated sites.

What has not been disclosed to date is the degree of relaxation contemplated, and how many extra cancers could result from these high radiation levels. We are troubled by the weakened cleanup standards apparently being contemplated and concerned that EPA has not made sufficiently clear to DHS that leaving behind such high levels of radioactivity would pose unacceptable risks to public health and safety.

Drafts of the guidance have been obtained and released by the trade publication Inside EPA. They suggest the use of "benchmarks" from national and international advisory bodies and state and federal agencies for setting final cleanup criteria. Those benchmarks range from allowing doses to the public of 100 millirem per year over thirty years (the equivalent of approximately 500 chest X-rays) to up to 10,000 millirem per year (equivalent to 50,000 chest X-rays). A quarter of the people exposed to doses at the upper benchmark level would develop cancer from their radiation exposure, according to the EPA's own official risk figures (see, e.g., Federal Guidance Report 13, Cancer Risk Coefficients for Environmental Exposure to Radionuclides). The lowest benchmark, 100 millirem/year, would result in a cancer in one out of every few hundred people exposed, according to the EPA official risk estimates.[1]

Leaving behind such high levels of radioactivity would pose risks to public health and safety long deemed unacceptable by EPA, which has historically defined acceptable exposures as those that would cause a cancer in one in a million to an outer limit of one in ten thousand people exposed.

[1] See Attachment A for a detailed explication of the cleanup "benchmarks" being considered, the magnitude of the radiation doses, what the cancer risk is from those doses according to EPA, and the degree to which these cleanup standards would exceed EPA's acceptable risk range.

As you know, EPA's longstanding position[2] has been that radiation exposures to the public are unacceptable in excess of:

- 4 millirem/year from beta- and photon-emitting radionuclides in drinking water (EPA's National Primary Drinking Water Regulations, 40 CFR 141.66)
- 10 millirem/year from air (EPA's National Emissions Standards for Hazardous Air Pollutants, 40 CFR 61)
- 15 millirem/year from high level waste disposal (Yucca Mt. rule, 40 CFR 197)
- ~5 - .05 millirem/year (1 in 10,000 to 1 in 1,000,000 risk) from contaminated sites (CERCLA/Superfund, 40 CFR 300.430(e)(2)(i)(A)(2))

Indeed, when other agencies have proposed setting relaxed cleanup standards for contaminated nuclear sites, EPA has consistently advocated doses and risks no greater than those identified above. For example, EPA strongly criticized a Nuclear Regulatory Commission proposal for a fallback cleanup standard of 100 millirem/year for nuclear reactor sites, noting that such a cleanup level would, according to NRC itself, cause a cancer in one in every two hundred people exposed.[3] Describing such doses and risks as "simply unacceptably high," EPA pointed out that "a 100 mrem dose would result in a risk that is seven times higher than would be permitted for other environmental pollutants under the Nation's laws governing the cleanup of contaminated sites.... To put it bluntly, radiation should not be treated as a privileged pollutant."[4]

EPA has insisted on cleanup of chemical carcinogens from terrorist attacks at levels consistent with its historic acceptable risk range of 1 excess cancer in 10,000 people exposed to 1 in a million. The cleanup of contaminants in the vicinity of the World Trade Center was performed to a 1 in 10,000 risk level. We do not understand why EPA should accede to the extraordinarily higher cancer risk levels contemplated in the new DHS guidance.

The DHS draft guidance, however, as released by Inside EPA, would permit doses in the immediate aftermath of a dirty bomb or IND attack of 5,000 millirem; 2,000 millirem additional dose through the rest of the first year; and subsequent years of the intermediate phase up to 1,500 millirem per year (500 mrem direct exposure, 500 mrem from contaminated food, and 500 mrem from drinking water). These latter figures alone are one hundred times what EPA generally permits in normal situations and at risk levels far above those permitted by EPA for the World Trade Center cleanup.

But even if one could argue that extraordinary radiation doses need to be permitted in the immediate and intermediate aftermath of a dirty bomb explosion (and EPA's current Protective Action Guides contemplate some emergency situations where such high doses may be

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[2] For a more detailed summary of EPA's standards for acceptable radiation exposure levels, see Attachment B.

[3] Statement on the NRC's Rule on Radiological Criteria for License Termination, Ramona Trovato, Director, EPA Office of Radiation and Indoor Air, 21 April 1997.

[4] ibid.

inescapable in the early phase), there is no reason why the long-term cleanup criteria should be dramatically more lax than EPA's current long-term cleanup criteria for radioactively contaminated sites. Yet, the draft DHS guidance suggests deferring to dose and/or risk "benchmarks" from sources such as national and international nuclear industry advisory organizations. Their proposed "benchmarks" range from a low of 100 millirem/year – a figure four times higher than the 25 millirem/year figure long opposed by EPA as far outside any acceptable risk range—to a high of 10,000 millirem/year.

As shown in the enclosed Table 1 in Attachment A, the proposed 100 millirem/year benchmark is estimated by EPA to produce a cancer in every few hundred people exposed, for an overall risk that is 25-2500 times higher than EPA's longstanding acceptable risk range. The proposed benchmark of 10,000 millirem per year would – by EPA's own official risk estimates for radiation-induced cancer, as set forth in Federal Guidance Report 13 – produce a cancer in one in every four members of the public exposed, 2,500-250,000 times higher than EPA's acceptable risk range.

When one looks at the total radiation doses the guidance contemplates would be permitted the public without triggering governmental protective actions such as relocation or cleanup through all phases of the post-explosion period, the cancer risks as estimated by your agency are very high. The aggregate lifetime dose to the public from exposure to radiation levels proposed by DHS as acceptable for the early, intermediate, and late response phases after a "dirty bomb" attack is approximately 14,000 millirem to more than 300,000 millirem, depending on which "benchmark" recommendation ends up being applied in the late cleanup stage (see Table 4). This is the equivalent of an exposed person receiving about 2,400 to 52,000 chest X-rays. The lower standard is assumed to result, according to the official risk estimates of EPA, in one cancer in roughly every 80 people exposed, while the upper benchmark would cause cancers in one quarter of the exposed population.

These are not our estimates of the cancer risks from the amounts of radiation being proposed as "acceptable" for response to and cleanup after a dirty bomb, but the estimates of your own agency. As the National Academy of Sciences (NAS) has pointed out, all agencies use "essentially the same assumptions about the risks posed by radiation exposure, in establishing radiation standards...." (Indeed, the agency radiation risk factors are derived from the NAS.) "[D]etermination of an acceptable risk for any exposure situation clearly is entirely a matter of judgment (risk-management policy) which presumably reflects societal values."[5] It is therefore disturbing that agencies would even contemplate such inadequate standards. This is particularly important since relaxation of cleanup standards for dirty bombs and INDs may create a precedent to relax such standards across the board.

EPA has consistently taken the position that doses to the public of 25 millirem/year are inappropriate, not protective of human health, and far outside EPA's acceptable risk range. However, DHS is considering permitting radiation levels to remain at the site as much as 400 times that unprotective level. Such a lax cleanup standard would pose a grave cancer risk to any exposed population.

---

[5] Evaluation of Guidelines for Exposures to Technologically Enhanced Naturally Occurring Radioactive Materials, National Academy Press, 1999, p. 234.

In a large populated area affected by such a dirty bomb or IND, the remediation requirements contemplated in the draft DHS guidance could permit hundreds or thousands of cancer deaths. Indeed, contamination at these levels would be so high that it is almost certain that such an area – after being "cleaned up" consistent with these guidelines – would still be so radioactive that it would, under EPA's Hazard Ranking System, score far above the criteria for listing as a Superfund site, potentially requiring cleanup to begin all over again.

An attack by a terrorist group using a radiological weapon or IND in the United States would be a terrible tragedy. But we should not compound the situation by employing insufficient and dangerous radioactive cleanup standards that fail to protect the public.

EPA has historically stood fast against efforts to permit exposures in the 25 mrem/year range, let alone these other much higher levels. As Senator Dianne Feinstein said in her October 28, 2003, speech on the Senate floor during your confirmation:

> Among the most serious issues we face as a country is the risk of terrorism, and among the most worrisome of those threats is that a radiological dispersal device--a so-called "dirty bomb"—could be detonated. The Homeland Security Agency, with input from a number of other agencies including EPA, has been attempting to develop cleanup standards to remediate the radioactive contamination that could result from such an event. Some agencies have pushed for cleanup standards far more lax than EPA historically has viewed as protective of human health and the environment.
>
> Given the concern many in this Chamber have about EPA's public pronouncements regarding health risks from the World Trade Center tragedy, *I will be looking to the EPA Administrator to stand firm in insisting that any cleanup standards established for the aftermath of a ``dirty bomb'' terrorist event be fully protective of human health and the environment. These standards should be no less protective than EPA's existing standards for cleaning up radioactive contamination from non-terrorist causes such as spills and accidents.*
>
> (emphasis added)

We urge EPA to not abandon its longstanding positions regarding protecting the public from such hazards. We ask you to decline to sign off on these unacceptable dirty bomb cleanup standards, and take steps to assure the guidance that is finalized is truly protective of public health and the environment.

Sincerely,

cc w/ enclosures: DHS Secretary Ridge

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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 5.75×10^{-4} per person-rem [5.75×10^{-2} per person-gray] and total cancer incidence or morbidity (fatal and nonfatal combined) of 8.46×10^{-4} per rem [8.46×10^{-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 5×10^{-4} / person-rem instead of the Federal Guidance Report 13 figure of 5.75×10^{-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 8×10^{-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

[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 x 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