Center for Health, Environment & Justice · Clean Water Action
Committee to Bridge the Gap · Environment America · Food and Water Watch Friends of the Earth · Greenpeace · Massachusetts Citizens for Safe Energy
Natural Resources Defense Council · Nuclear Information and Resource Service
Professor Richard Clapp · Public Citizen · Sierra Club

5 August 2009

The Honorable Gina McCarthy
Assistant Administrator
Office of Air and Radiation

The Honorable Mathy Stanislaus
Assistant Administrator
Office of Solid Waste and Emergency Response

The Honorable Peter Silva
Assistant Administrator
Office of Water

The Honorable Scott Fulton
Acting Deputy Administrator and General Counsel-Nominee

The Honorable Patricia Hirsch
Acting General Counsel
Office of General Counsel

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

Dear Assistant Administrators McCarthy, Stanislaus, and Silva, and Acting Deputy Administrator Fulton and Acting General Counsel Hirsch:

We write to call to your attention several disturbing initiatives commenced during the prior Administration that are still pending before the agency and which would dramatically weaken public protections and have wide impacts across EPA, including arenas for which you have responsibility. Although all of these problematic proposals were initiated within Office of Air and Radiation's (OAR) troubled Office of Radiation and Indoor Air (ORIA), they would also have significant impacts for Office of Solid Waste and Emergency Response (OSWER), the Office of Water (OW), and the Office of General Counsel (OGC). *We ask to meet with you personally to discuss these in detail, before any action is taken.*

I. Astronomically Weakened Protective Action Guides

Perhaps the most pressing matter is a proposed revision to EPA's Protective Action Guides (PAGs) for radiological releases. The Bush Administration, literally in its last days in office, transmitted these highly controversial PAGs to the Federal Register for publication. In its first days in office, the Obama Administration pulled them back before they could be published, pending review by its new team at EPA. We presume each of you will be involved in that review. We understand that those who pushed for the PAGs in the prior Administration are encouraging you to let them go forward. This would be a serious blow to public protections and to the entire structure of EPA regulation.

The Bush Administration's proposed PAG revisions would have permitted radioactivity concentrations in drinking water *orders of magnitude higher* than EPA's long-held drinking water standards under the Safe Drinking Water Act (the MCLs or maximum contaminant levels) or the emergency drinking water standards employed under CERCLA. (See the attached graph and table showing the extraordinary proposed increases in permissible concentrations of radioactivity in drinking water.) As reported by Doug Guarino of *Inside EPA* in an award-winning series on the PAG controversy, this assault by ORIA on the agency's long-held drinking water standards appears to be a *sub rosa* effort to weaken those standards even after the agency—affirmed by the court—had previously rejected such an effort, finding it violated anti-backsliding requirements. (See attached news articles.)

The PAG revision proposal put together in the prior Administration, and which its advocates in ORIA presumably are hoping to get you to allow to still be issued, would also enormously relax long-term cleanup standards. EPA, as you know, has historically limited acceptable cancer risks to a range of one in a million to one in ten thousand (10^{-4} to 10^{-6}). For example, the nation's most contaminated sites, those on the National Priority List, must be cleaned up to within that range. **However, the Bush ORIA proposed throwing out those historical limits and replacing them with a process known euphemistically as "optimization," allowing cleanup standards that could result in exposures to the public as high as 10 rem per year over 30 years, the equivalent of approximately 50,000 chest X-rays, with a cancer risk that EPA itself estimates at a breathtaking one in four!** More recent radiation risk estimates by the National Academy of Sciences, discussed below, would place the cancer risk from doses that high at one in three (3×10^{-1}). In either case, the risk would be orders of magnitude outside EPA's historic acceptable risk range. (See attached table).

The controversial "optimization" proposal first arose in the context of a taskforce in which EPA participated during the last Administration to produce PAGs for dealing with "dirty bombs." EPA opposed the optimization plan and recommended generally using CERCLA cleanup standards. Subsequently, however, EPA succumbed to pressure from other agencies and reluctantly acceded to "optimization" in the dirty bomb PAGs, which were finalized a few months before the fall election by the Department of

Homeland Security (DHS). Scores of public health and environmental organizations repeatedly for years opposed the dirty bomb PAGs.

It would be ironic were the Obama EPA to now adopt general PAGs with provisions that the Bush Administration EPA had originally opposed as non-protective. We urge that the proposed revised EPA PAGs of general applicability not be issued with these troubling components, and that the dirty bomb PAGs issued by DHS with EPA reluctant concurrence be revised to remedy the problematic aspects therein.

The problems in the PAG revisions crafted by ORIA during the prior Administration which are pending before you are discussed in more detail in the attached correspondence and study, as well as past correspondence about the dirty bomb PAGs, and we urge you and your key advisors to review them carefully before making any decisions about the controversial PAGs.

Additionally, we understand that EPA is preparing a response to a Freedom of Information Act (FOIA) request about the proposed PAGs. Since the FOIA asks for all documents identifying concerns raised about the ORIA PAG proposal, and since we are not confident that ORIA will voluntarily disclose to you the criticisms its proposal has received, both from within and outside the agency, we urge you to not make a decision as to whether you will support release of the proposed PAGs until after you have met with us and also the FOIA response is complete so that you can be provided copies of relevant documents that identified expressed concerns about the proposed PAGs.

II. Proposals for Non-Protective Federal Radiation Guidance Outside EPA's Long-Held Acceptable Risk Range

During the prior Administration, ORIA also initiated several other disturbing efforts which were not consummated but which it might attempt to get you to now approve. For example, it has been pushing for relaxing overall radiation standards for the public. EPA has historically said that doses over approximately 15 millirem per year are unacceptable, outside an acceptable risk range. It has specifically criticized past proposals to allow public doses of 25 millirem per year or greater, deeming such dose limits "non-protective." However, ORIA during the prior Administration pushed to throw out that long position of EPA and adopt guidance endorsing a 100 millirem/year radiation standard for the public. Over 70 years, that would be a risk of about 1 in 125 ($\sim 1 \times 10^{-2}$) according to the National Academy of Sciences, two to four orders of magnitude higher risk than the EPA permissible risk range of 10^{-4} to 10^{-6}. This would be very destructive of public protections and would undermine the entire EPA regulatory structure, as every manufacturer or user of carcinogenic chemicals would also then come in and demand to be permitted to expose the public to at least a hundred times higher concentrations than now permitted by EPA. *We enclose prior correspondence sent to EPA during the Bush Administration about this matter.*

III. Ignoring National Academy of Sciences Recent Radiation Risk Findings

In 2006, the National Academy of Sciences/National Research Council issued its long-awaited study, *Health Risks from Exposure to Low Levels of Ionizing Radiation.* Since the 1970s, federal agencies with radiation protection responsibilities have asked the NAS to, from time to time, review the status of the science on risks from radiation. Called the Biological Effects of Ionizing Radiation (BEIR) reports, they are to form the basis for radiation protection regulations. The most recent NAS report, BEIR VII, had been performed at the request of and with funding from EPA.

BEIR VII found low doses of ionizing radiation to be more dangerous than previously thought. Its estimate of the number of cancers produced per unit of dose increased by about a third from the figure EPA had been using prior to the issuance of BEIR VII. EPA historically has relied upon the NAS's BEIR findings for establishing and/or reviewing a wide range of rules and guidance, from the Office of Water's Maximum Concentration Limits (MCLs) for drinking water to the Office of Solid Water and Emergency Response's CERCLA soil Preliminary Remediation Goals.

During the waning days of the last Administration, ORIA proposed to revise its "Cancer Risk Estimation from Exposure to Ionizing Radiation" (the so-called "Blue Book") which is used to establish cancer "SLOPE" factors for radionuclides. The cancer risk estimates from the Blue Book in turn drive many if not all radiation protection rules and guidance within EPA. This proposed revision was purportedly undertaken to take into account the new scientific findings from BEIR VII. **However, in fact, ORIA proposed ignoring many of BEIR VII's central findings and instead suggested using radiation risk figures almost uniformly lower than the National Academy of Sciences had recommended.** See the table taken from ORIA's draft revised Blue Book, comparing its proposed radiation cancer risk figures against what BEIR VII recommended, reprinted in the attached letter to RAC of 20 February 2009.

(It should be noted that many of us have been critical of aspects of BEIR VII which tend to underestimate risks and ignore numerous studies suggesting considerably higher risks from radiation than BEIR VII assumes. However, what is striking in the ORIA proposal is that its departures from BEIR VII risk estimates are almost uniformly in the direction of reducing the risks and consequently increasing permitted public exposures.)

This Administration has rightly pledged to end the politicization of science so endemic in the prior one. Here we have a many-year study by the National Academy of Sciences, performed at EPA request, and then in the guise of incorporating its findings into EPA guidance and rules, ORIA under the Bush Administration proposed using lower risk estimates than the Academy recommended, which would result in higher public exposures and more resulting cancers than would derive from the Academy's scientific recommendations.

Adding to concerns about the politicization of science by the prior Administration were issues raised about the composition and activities of the Science Advisory Board's Radiation Advisory Committee (RAC), which reviews certain of ORIA's proposals like its contemplated revisions to the Blue Book. Questions were raised about apparent bias, conflicts of interest, lack of balance, raising issues about compliance with the Federal Advisory Committee Act. Subsequently, just as the Administration was changing, EPA "augmented" the RAC with new members and extended the terms of the augmented RAC, in essence trying to lock in the tilt for years into the new Administration. The holdover RAC is now about to sign off on, with one exception, ORIA's proposed alterations of the National Academy's findings. *We have attached relevant communications about these matters as well.*

IV. Allowing Radioactive Waste in Landfills Neither Licensed Nor Designed for It

Finally, during the prior Administration, proposals were being considered to allow radioactive wastes to be disposed of in landfills neither licensed nor designed to receive radioactive wastes and materials. Given the sad history of leakage of radioactive wastes from improper disposal, such a move is extremely worrisome from an environmental standpoint.

Because these proposals from the prior Administration to weaken radiation protections would impact other divisions of EPA—e.g., the Superfund and drinking water programs—and because we understand that the review of the controversial PAG proposal from the prior administration will include each of you, we would hope to be able to meet with all of you during the same period of a couple of days. This is particularly important since several participants may have to travel from other parts of the country for the meetings.

So, we would very much appreciate an appointment for you to meet with us and several others who signed the associated attached letters. Whatever assistance can be provided to coordinate meetings for the same period would be much appreciated. Our point of contact is Daniel Hirsch at cbghirsch@aol.com or (831) 336-8003.

These are very important issues. President Obama was elected on a platform of change, and the efforts undertaken by the prior Administration to relax environmental protections should be high priorities for such change. We look forward to meeting with you and working with you to bring that about.

Sincerely,

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Daniel Hirsch
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Wenonah Hauter
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cc: Senator Boxer, Chair, Environment & Public Works
Senator Bernie Sanders
Congressman Henry Waxman, Chair, Energy & Commerce
Congressman Ed Markey, Chair, Subcommittee on Energy & the Environment

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PROPOSED RELAXATION OF EPA DRINKING WATER STANDARDS

Proposed Protective Action Guide [PAG] vs. Current Maximum Concentration Level [MCL]

Radionuclide	PROPOSED PAG (w/o Decay)*	CURRENT Maximum Concentration Level (MCL)*	RATIO (Factor by which permissible concentration of radioactivity in drinking water is proposed to increase)
H-3	4,420,000	20,000	**221**
C-14	319,000	2,000	**160**
Na-22	58,000	400	**145**
P-32	77,100	30	**2,570**
S-35	239,000	500	**478**
Cl-36	199,000	700	**284**
Ca-45	260,000	10	**26,000**
Sc-46	125,000	100	**1,250**
V-48	93,400	90	**1,040**
Cr-51	4,790,000	6,000	**798**
Mn-54	257,000	300	**857**
Fe-55	557,000	2,000	**279**
Fe-59	103,000	200	**515**
Co-58	247,000	300	**823**
Co-60	53,900	100	**539**
Ni-63	1,220,000	50	**24,400**
Zn-65	46,900	300	**156**
Se-75	70,900	900	**78**
Rb-86	65,900	600	**110**
Sr-89	72,000	20	**3,600**
Sr-90	6,650	8	**831**
Y-90	68,800	60	**1,150**
Y-91	78,100	90	**868**
Zr-93	167,000	2,000	**84**
Zr-95	192,000	200	**960**
Nb-95	314,000	300	**1,050**
Mo-99	306,000	600	**510**
Tc-99	288,000	900	**320**
Ru-103	252,000	200	**1,260**
Ag-110m	66,500	90	**739**
Cd-109	92,600	600	**154**
In-114m	45,400	60	**757**
Sn-113	251,000	300	**837**
Sn-125	60,100	60	**1,000**
Sb-124	72,900	60	**1,220**
Te-127	1,100,000	900	**1,220**

*Units = picoCuries per Liter (pCi/L)

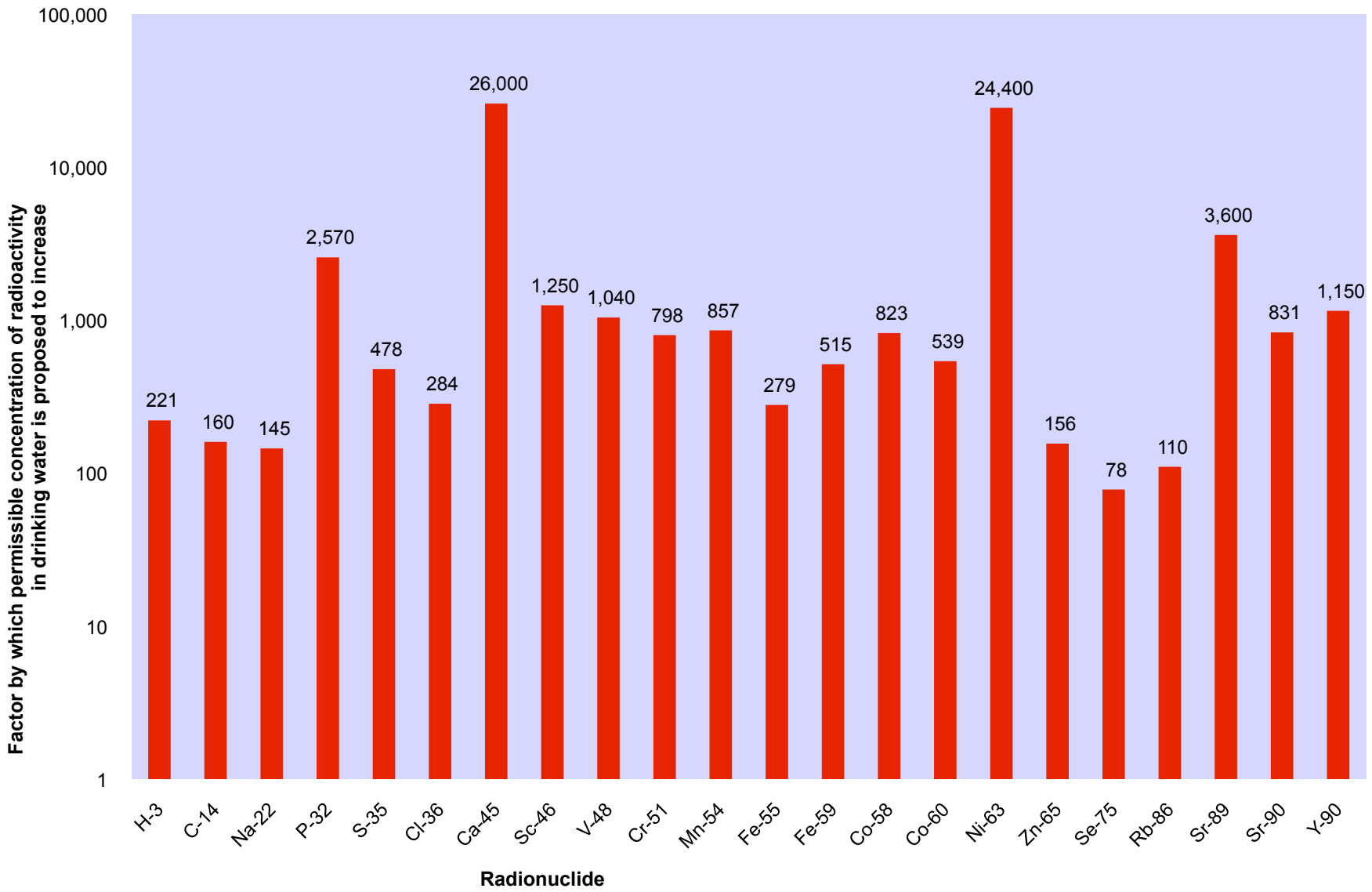
PROPOSED RELAXATION OF EPA DRINKING WATER STANDARDS

Proposed Protective Action Guide [PAG] vs. Current Maximum Concentration Level [MCL]

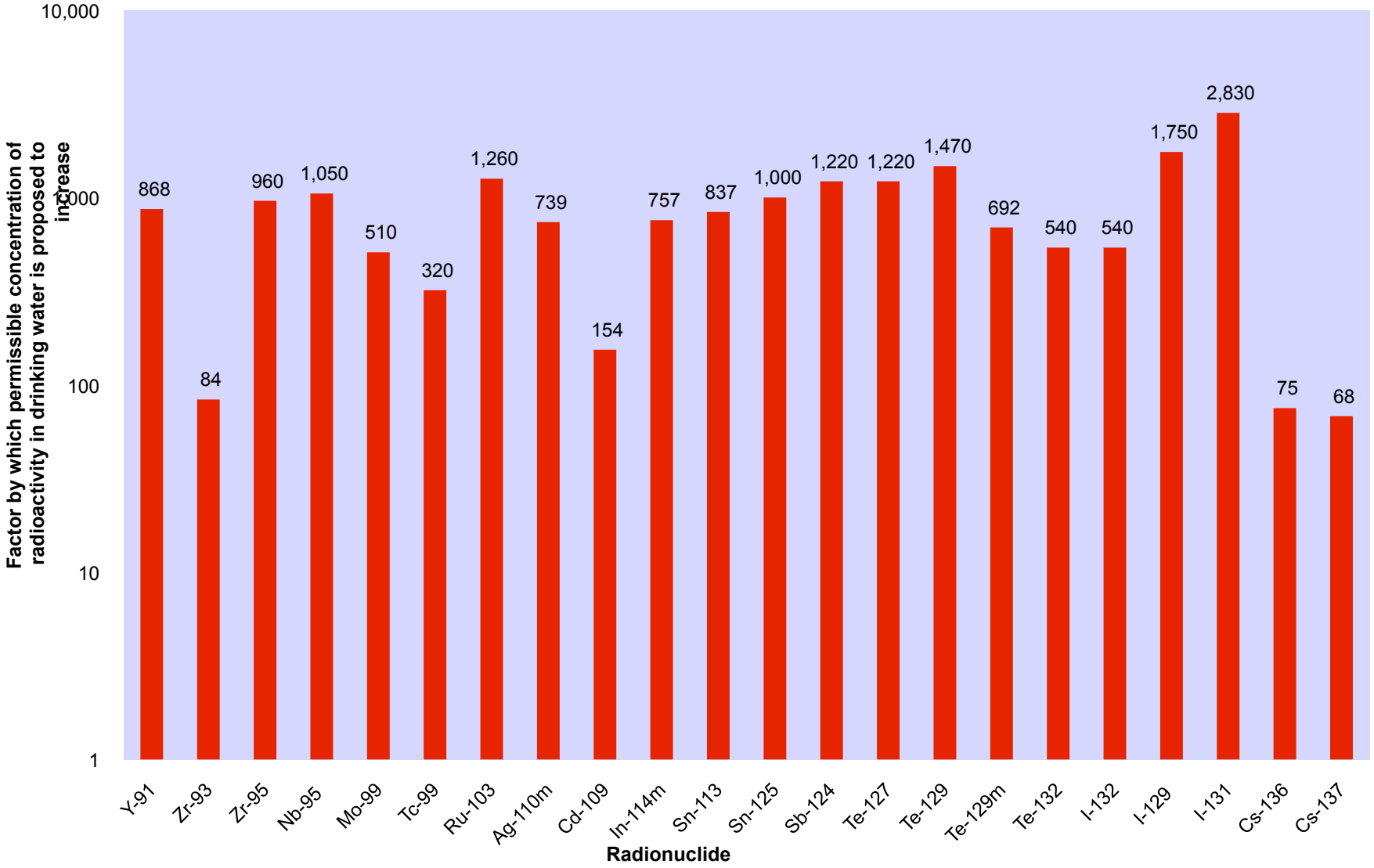
Radionuclide	PROPOSED PAG (w/o Decay)*	CURRENT Maximum Concentration Level (MCL)*	RATIO (Factor by which permissible concentration of radioactivity in drinking water is proposed to increase)
Te-129	2,940,000	2,000	**1,470**
Te-129m	62,300	90	**692**
Te-132	48,600	90	**540**
I-132	48,600	90	**540**
I-129	1,750	1	**1,750**
I-131	8,490	3	**2,830**
Cs-136	60,100	800	**75**
Cs-137	13,600	200	**68**
Ba-140	71,200	90	**791**
La-140	91,600	60	**1,530**
Ce-141	260,000	300	**867**
Ce-143	165,000	100	**1,650**
Ce-144	35,300	30	**1,180**
Nd-147	171,000	200	**855**
Pm-149	186,000	100	**1,860**
Sm-151	1,890,000	1,000	**1,890**
Eu-152	135,000	200	**675**
Eu-154	90,700	60	**1,510**
Eu-155	566,000	600	**943**
Gd-153	665,000	600	**1,110**
Tb-160	115,000	100	**1,150**
Tm-170	140,000	100	**1,400**
Hf-181	165,000	200	**825**
Ta-182	120,000	100	**1,200**
W-187	294,000	200	**1,470**
Ir-192	135,000	100	**1,350**
Au-198	116,900,000	100	**1,170,000**
Hg-203	96,900	60	**1,620**
Tl-204	156,000	300	**520**
Bi-207	146,000	200	**730**

*Units = picoCuries per Liter (pCi/L)

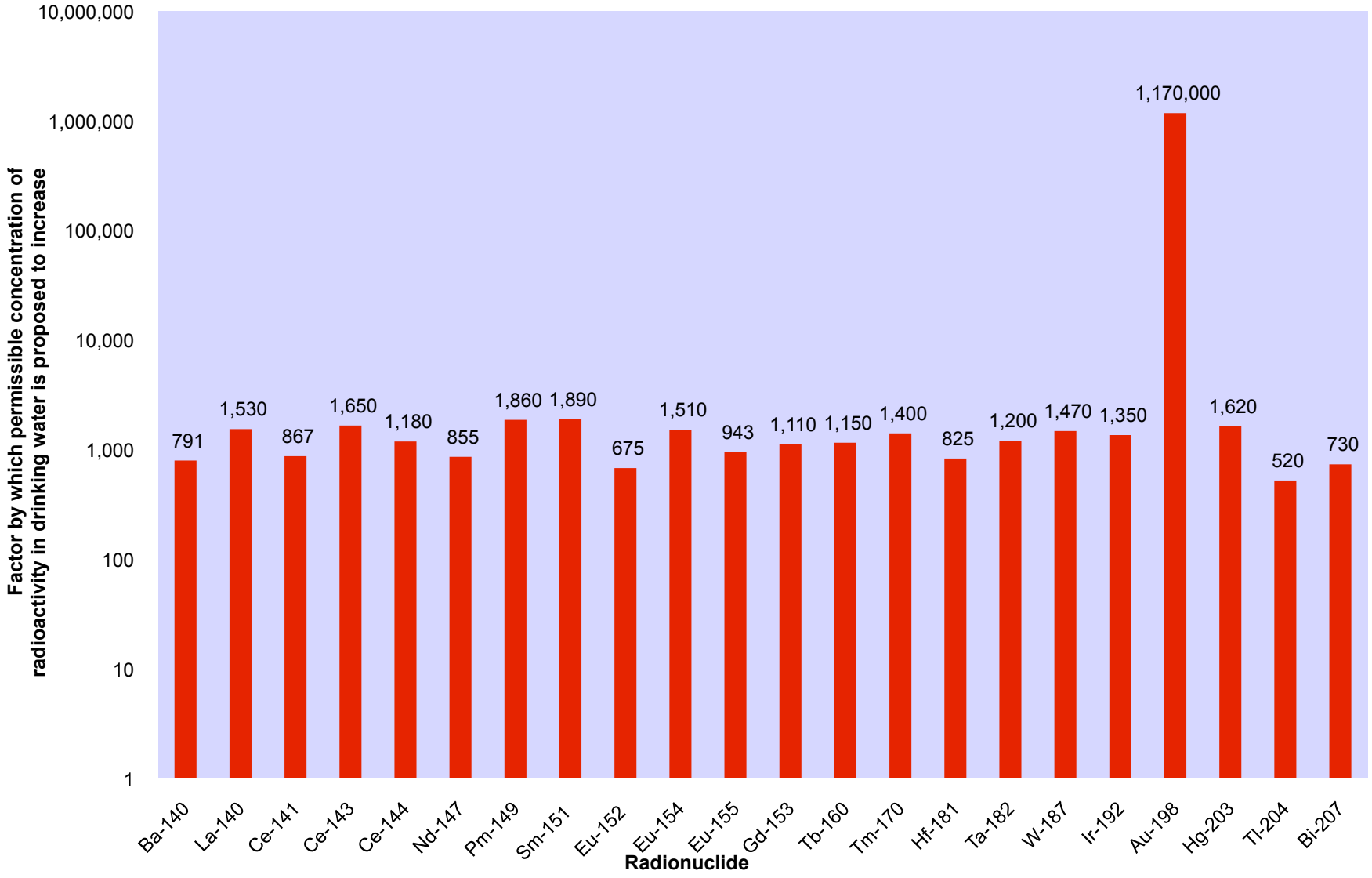
Factor by which Allowable Radioactivity in Drinking Water is Proposed to Increase
Proposed PAG (w/o Decay) vs. Current Maximum Concentration Level (MCL)



Factor by which Allowable Radioactivity in Drinking Water is Proposed to Increase
Proposed PAG (w/o Decay) vs. Current Maximum Concentration Level (MCL)



Factor by which Allowable Radioactivity in Drinking Water is Proposed to Increase
Proposed PAG (w/o Decay) vs. Current Maximum Concentration Level (MCL)



CANCER RISKS* FROM
EPA/ORIA PROPOSED PROTECTIVE ACTION GUIDE
"OPTIMIZATION" PROCESS FOR LONG TERM CLEANUP

Cleanup Benchmark	≈ equivalent # of Chest X-rays		Risk of Cancer (exponential)	=1 Cancer Per X People Exposed	Factor by Which EPA Acceptable Risk Range Is Exceeded
	Per Year	Over 30 Years			
100 mrem/year	17	500	3.4×10^{-3}	1 in 300	34-3,400
500 mrem/year	83	2,500	1.7×10^{-2}	1 in 60	170-17,000
1,000 mrem/year	170	5,000	3.4×10^{-2}	1 in 30	340-34,000
10,000 mrem/year	1,700	50,000	3.4×10^{-1}	1 in 3	3,400-340,000

* Based on thirty-year exposure and most recent cancer risk estimates for ionizing radiation from the National Academy of Sciences

CORRESPONDENCE AND STUDY REGARDING EPA PROPOSED WEAKENED PAGS

30 October 2008

Administrator Stephen L. Johnson
U.S. Environmental Protection Agency
Ariel Rios Building
1200 Pennsylvania Avenue, N.W.
Washington, D.C. 20460

Dear Administrator Johnson:

We write out of concern about reports that the Environmental Protection Agency (EPA), in the last weeks remaining in this Administration, is considering a series of actions aimed at dismantling and dramatically weakening decades of EPA policies for protection of the public from ionizing radiation. We here focus on proposed revisions to EPA's existing Protective Action Guides (PAGs) for protecting the public from a wide range of radiological incidents, whether accidental or intentional. The PAGs cover events such as a fire at a fuel manufacturing plant, an accident at a commercial nuclear power or Department of Energy nuclear site, a release from a facility manufacturing or using radioisotopes or from a transportation accident, and many other radiation releases for which a protective response may be considered.

The new PAGs would permit long-term contamination of areas, without cleanup, at radiation levels far higher than ever contemplated by EPA in the past; permit much larger radiation doses in the intermediate phase without protective actions taken to reduce public exposures than previously allowed; and substantially increase "acceptable" exposures for most radionuclides during the early phase. The most extraordinary aspect of the proposed PAGs is the inclusion of permissible concentrations of radioactivity in drinking water at levels orders of magnitude above the levels EPA has historically used. We discuss these matters below, but first provide some background.

EPA's Earlier Acquiescence to Lax Radiation Standards for Responding to a "Dirty Bomb"

Over the last few years, a taskforce including representatives of EPA, the Department of Homeland Security (DHS), and other agencies drafted PAGs for responding to an attack involving a radiological dispersal device ("dirty bomb") or an improvised nuclear device. Many of us wrote DHS and EPA deeply concerned about the standards proposed at that time. (See the attached correspondence.[1]) In particular, a process called "optimization" was adopted for long-term cleanup after such an event, contemplating cleanup levels that could be orders of magnitude more lax than any EPA had ever countenanced before. Under optimization, rather than having the specifying cleanup levels that were health protective, officials could instead choose from an array of possible long-term "benchmarks," including doses so immensely high (the equivalent of

[1] Also available at http://www.committeetobridgethegap.org/pdf/2006Ltr102108.pdf and http://www.committeetobridgethegap.org/pdf/sfundgroup102108.pdf

tens of thousands of chest X-rays) that the government's own official risk estimates indicated one in three people so exposed would get a cancer from that exposure (i.e., above and beyond the number of cancers people would get without the radiation exposure).

Efforts by EPA to require cleanup to EPA's longstanding requirements under CERCLA were rebuffed, and, after initially raising these concerns, EPA acquiesced to long-term cleanup guidance far less protective than EPA had ever before accepted. The DHS PAGs also weakened protections for the intermediate phase after such an event, permitting higher doses generally and in particular for drinking water.

Many of us expressed concern that these markedly relaxed cleanup standards would end up being applied not just to extraordinary circumstances involving a dirty bomb or nuclear weapons attack, but for cleanups involving releases not involving terrorism, such as contamination from nuclear power plants. We were assured that the DHS PAGs were restricted to extraordinary terrorist radiological events. We nonetheless anticipated that there might be some effort to use the radiological terrorism PAGs as "the camel's nose under the tent" to go much further, to weaken public protections from all sorts of non-terrorist radioactive releases by industry, and it now appears that such an attempt is being undertaken in the form of new EPA PAGs applicable to all nuclear incidents.

The New Proposed EPA Radiological Protective Action Guides

The August 2007 draft "Protective Action Guidance for Radiological Incidents" was obtained by Doug Guarino of the industry publication *Inside EPA,* who has reported on the controversy it has caused within the agency and among state regulators. We understand that forces within EPA are pushing to release them, with some revisions, before the Bush Administration leaves office. These EPA PAGs, by their own terms, would apply to all radiological incidents, which are defined as "an event or a series of events, whether deliberate or accidental, leading to the release or potential release into the environment of radioactive materials in sufficient quantity to warrant consideration of protective actions." (p. ES-2) In short, these new PAGs would arguably apply to a wide range of radiological releases for which protection of the public should be considered.

It is therefore disturbing that EPA now proposes to permit the public to be exposed to radiation doses at levels vastly higher than the agency has historically deemed unacceptably dangerous. We here summarize some of the most significant problems in the draft PAG document and then focus on the massive increases in permitted radioactivity concentrations in drinking water proposed. Our concerns are based on the 2007 draft obtained and made public by *Inside EPA*. If revisions have resolved these problems, we congratulate the Agency. But if the problems remain, we strongly urge that you not approve release of the draft PAGs, as they will produce a firestorm of controversy and would contradict decades of EPA policy on protection of the public and the environment.

Long-term Cleanup "Optimization": Massive Doses Contemplated

EPA proposes to adopt for long-term cleanup the controversial "optimization" process that was criticized in the dirty bomb DHS PAG. Rather than require cleanup to health-protective risk levels consistent with EPA's longstanding cleanup requirements, EPA now proposes that cleanups be done on an ad hoc basis, with public health considerations being overridden by other considerations such as economic interests. This ad hoc process would rely on a range of "benchmarks," including radiation doses as enormous as 1-10 rem/year over many decades. (p.H-3) 10 rem per year for 30 years (the equivalent of approximately 50,000 chest X-rays) would produce, according to EPA's own Federal Guidance Report 13, a cancer in every fourth person so exposed, and according to the National Academy of Sciences's BEIR VII report prepared at EPA request, one cancer per three people exposed. Until the last few weeks, EPA has found cancer risks outside a risk range of one in a million to one in ten thousand to be unacceptable. [The risks associated with the "benchmarks" are detailed in the above-referenced correspondence about the earlier DHS PAGs.]

Early Phase Response: Further Relaxation of Radiation Protections

For the early phase of a response to a radiological incident, EPA proposes to permit considerably higher exposures for the majority of radionuclides than under EPA's existing PAGs. Nearly twice as many radionuclides have their permissible concentrations relaxed as those that are strengthened, and those that are relaxed are on average weakened by 76 percent whereas the smaller number that are strengthened are enhanced on average only by 34 percent. (see pp. 2-22 – 2-25 of the EPA PAGs).

Intermediate Phase Response: Allowing Significantly Larger Public Exposures

For the intermediate phase, which may last for several years, the new PAG document proposes significantly increasing permissible exposures. EPA's previous PAGs established an overall annual dose, of which food and water consumption were a component. Now EPA proposes to have three limits, but makes them additive – 2 rem general exposure for the first year (and 0.5 rem/yr for subsequent years), *plus* 0.5 rem from food, *plus* 0.5 rem from water.

Forcing the Public to Drink Water with Astronomical Radioactivity Concentrations

It is the new drinking water PAGs that are perhaps the most troubling. In the past, drinking water was a component of the food PAGs, which in turn were a component of the overall dose limit in the intermediate phase. Now EPA has proposed new and separate water PAGs and sets concentration limits for each radionuclide in water.

These proposed acceptable radiological drinking water concentrations, called Derived Response Levels (DRLs) in the EPA PAG document, are extraordinarily high. One cannot conceive what EPA officials could possibly be thinking in contemplating allowing the public to drink water with radioactivity levels that immense.

The DRL proposed for cesium-137, for example, is nearly 14,000 picocuries per liter (pCi/l) of water. For decades EPA has forbidden cesium-137 in drinking water at levels higher than 200 pCi/L. For strontium-90, the new DRL is nearly 7000 pCi/L; EPA's longstanding Maximum Concentration Limit (MCL) under the Safe Drinking Water Act is 8, nearly one thousand times lower. The limits for iodine-131 are relaxed by factors of approximately three thousand to one hundred-thousand compared with the MCL. Nickel-63 has a new DRL of 1,220,000 pCi/L compared to an MCL of 50. Radionuclide by radionuclide, the new limits would expose people to vastly larger concentrations in drinking water. In the most extreme example, limits are increased more than seven million-fold. Even when comparing against EPA's current limits for emergencies, the Removal Action Level, the new drinking water levels range from about two orders of magnitude to at least one hundred thousand times less protective. These astronomical increases in drinking water concentrations are detailed, radionuclide by radionuclide, in the attached report.[2] Your attention is called particularly to Table 1, which compares the new concentrations in drinking water, for each radionuclide, with EPA's longstanding standards, and the subsequent graphs that show the magnitude of the proposed increases.

Several years ago, EPA funded the National Academy of Sciences (NAS) to examine the most up-to-date science on risks from ionizing radiation in order to update EPA's then-current risk estimates. The NAS, in the BEIR VII report, concluded that cancer incidence risks from radiation were higher than the risk estimates EPA and other agencies had been using, indeed substantially higher than the figures used by EPA in deriving its past radiation standards. It is inexplicable that EPA would now, in the face of knowledge of the increased danger from radiation, dramatically relax rather than tighten radiation protections.

There is a major push to expand the use of nuclear power, about which its advocates make the Orwellian claim that it is a safe form of energy. We must ask why, when the Administration pushes for more nuclear power and proclaims its safety, does the same Administration at the same time quietly attempt to dramatically weaken radiation safety standards so as to expose the public to vastly higher levels of radiation? If it is so safe, why immensely increase the permissible exposures to the public?

Much mischief is done in the last weeks of an outgoing Administration. We strongly urge you to decline to approve the issuance of the draft *Protective Action Guidance for Radiological Incidents* as long as it proposes to relax protections against radiation exposure. The Environmental Protection Agency must protect, not radically endanger, public health and the environment.

Sincerely[3],

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[2] The report is at http://www.committeetobridgethegap.org/pdf/PAGreport102208.pdf

[3] Signatory groups and individuals on following pages. Point of contact: Daniel Hirsch, Committee to Bridge the Gap, 605 Waldeberg Road, Ben Lomond, CA 95005 phone: (831) 336-8003; email: contact.cbg@gmail.com

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James Riccio
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Friends of the Earth
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PROPOSED RELAXATION OF EPA DRINKING WATER STANDARDS FOR RADIOACTIVITY

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Proposed Relaxation of EPA Drinking Water Standards for Radioactivity

The U.S. Environmental Protection Agency has drafted extraordinary new radiological standards for responding to radiological releases from a wide range of events. A copy of the secret draft "Protective Action Guidance for Radiological Incidents," dated August 2007 and marked "Please Do Not Distribute" and "Do Note Cite or Quote," was obtained and made public by Doug Guarino of the trade publication *Inside EPA*, who has written about the concerns the document has triggered within EPA and among state regulators.[1] We understand EPA is contemplating soon issuing the draft.[2] Here we analyze one of the most controversial aspects of the document, its proposal to allow the public to ingest drinking water with radioactive concentrations orders of magnitude higher than EPA's longstanding radiological drinking water standards permit.

Background

In the early 1990s, EPA issued its "Manual of Protective Action Guides and Protective Actions for Nuclear Incidents."[3] Protective Action Guides, or PAGs, are radiation levels that when exceeded trigger protective actions. For example, if a nuclear incident would in contamination of soil at levels above the PAGs, people may be evacuated so as to keep their radiation dose below the specified amount.

The PAGs applied to a range of nuclear incidents "at a variety of facilities, including, but not limited to, those that are part of the nuclear fuel cycle, defense and research facilities, and facilities that produce or use radioisotopes, or from the transportation or use of radioactive materials at locations not classified as 'facilities.'" The original PAG guidance and the current proposed revision thereto divide the responses to a nuclear incident into: the early phase, the intermediate phase, and long-term cleanup activities. The early phase last hours to days, the intermediate phase months to years, and the long-term cleanup phase potentially many years.

The new draft PAGs EPA is reported to be contemplating soon releasing revise the existing PAGs in numerous ways that have triggered great controversy. Despite the fact that radiation is now officially deemed to be more dangerous than previously thought, virtually all of the changes to the PAGs have been in the direction of permitting higher exposures to the public.[4]

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[1] The EPA document is available at http://www.committeetobridgethegap.org/pdf/pag102108.pdf

[2] Although no substantive revisions to the August 2007 draft have been reported, it is possible that there may have been some. The analysis here is based on the August 2007 draft.

[3] Issued by the EPA Office of Radiation Programs, Revised 1991, second printing 1992. Posted at http://www.epa.gov/radiation/docs/er/400-r-92-001.pdf We will here refer to the existing PAGs as the 1992 PAGs.

[4] EPA and other agencies requested and funded the National Academy of Sciences to prepare updated cancer risk estimates for ionizing radiation based on the most current research. The report, *Health Risks from Exposure to Low Levels of Ionizing Radiation*, National Academy Press, 2006, estimated cancer risk at 1.14 cancers per 1000 person-rem, considerably higher than

For example, permitted exposures for the majority of radionuclides in the early phase have increased. For 33 radionuclides, the permissible concentrations to which the public may be exposed without protective actions being taken in the early phase have been increased, while for only 19 have they been tightened.[5] Furthermore, those that have had their limits relaxed have done so by an average of 76%, whereas the radionuclides that have more limiting concentrations have been tightened by only 34%.

Long-term cleanup is now proposed to use a much opposed process called "optimization" that would allow the choice of radiation "benchmarks" as immensely high as 10 rem per year, the equivalent of about 50,000 chest X-rays over a 30 year period and an associated cancer risk of 1 in 3, according to current risk estimates prepared for EPA and other agencies.[6] EPA historically has insisted on an "acceptable" risk range of one in a million to one in ten thousand, so contemplating "benchmarks" with a risk as high as every third person so exposed getting a cancer from the exposure would be a radical departure from its entire history and ethically very difficult to defend.[7]

These are deeply troubling proposed relaxations of longstanding EPA radiation protections, for the early and late phase responses to a radiological releases. Without diminishing our concern about those phases, we here focus on the intermediate phase PAGs, and particularly those related to drinking water.

The Intermediate Phase PAGs

Under EPA's longstanding PAGs for the intermediate phase, total dose to the public without protective action is limited to 2 rem for the first year and 0.5 rem (500 millirem) per year for subsequent years. The 1992 PAGs provide guidance in determining when those limits would be exceeded. Part of that guidance were Protective Action Guides for the Intermediate Phase for Food and Water (chapter 3 of the 1992 PAGs). The food PAGs were prepared by the Food and

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past estimates used by EPA and other agencies, including the figures used by EPA in creating the 1992 PAGs.

[5] See Table 2-5 of the new PAGs (pp. 2-22 to 2-26) which compares, radionuclide by radionuclide, the revised early phase PAGs with the 1992 ones.

[6] For a discussion of the problems of "optimization" and the employment of "benchmarks" in long-term cleanup decisions, and the cancer risks associated with the radiation levels contemplated, see the correspondence by dozens of organizations and individuals criticizing new PAGs issued by the Department of Homeland Security for responding to "dirty bomb" attacks. http://www.committeetobridgethegap.org/pdf/2006Ltr102108.pdf and http://www.committeetobridgethegap.org/pdf/sfundgroup102108.pdf The controversial DHS guidance for dirty bombs is now being proposed by EPA to be expanded to cover a wide range of non-terrorist events involving radiological releases.

[7] Note that when we speak of cancer risks from exposure to radiation, these risks are *in addition* to one's normal risk of getting cancer; i.e., these are *excess* cancers, ones that would not have appeared had it not been for the radiation exposure.

Drug Administration and included by EPA in the 1992 guidance. They specified that no more than 0.5 rem per year should come from the ingestion pathway and calculated radioactive concentrations to meet that limit. Importantly, the existing food PAGs include drinking water. Also importantly, they were not additive on top of the overall dose limits, but a component of them.

EPA is now proposing to turn its past guidance on its head. It now proposes to permit one to *add* the 500 millirem food PAG to the overall dose limit. And it now proposes – even though the food PAG already contains a water ingestion component – to create an entirely new Drinking Water PAG, which would be added onto the general intermediate PAG *and* the food PAG. In other words, if the existing overall intermediate dose limit is 2 rem for the first year and 0.5 rem for subsequent years, the proposed PAG would be for the first year 2 + 0.5 + 0.5 rem, or 3 rem; and for subsequent years 0.5 + 0.5 + 0.5 rem, or 1.5 rem – a tripling of permissible dose.

EPA would not just be double- or triple-counting, it would be doing so twice. Since drinking water is already included in the 0.5 rem food ingestion PAG, creating a separate water PAG that can be added to the food PAG counts the water radiation twice. And then permitting the already duplicative food and water PAGs to the existing overall PAG radiation limit only compounds the injury to public health.

Astronomically High Levels of Radioactivity in Drinking Water Proposed

Most troubling, however, are the absolutely astronomical values for radionuclides put forward in the new Drinking Water PAGs, levels that are hundreds, thousands, and even millions of times higher than EPA's current drinking water standards for radiation.

For decades EPA has set permissible concentrations of radionuclides in drinking water. These limiting levels, called Maximum Concentration Levels (MCLs), are established via the Safe Drinking Water Act. Under certain emergency situations, levels higher than MCLs can be used in determining when to take an urgent response (e.g., providing replacement water supplies such as bottled water or requiring treatment of the water). Those longstanding EPA emergency limits are called Removal Action Levels (RALs).

In the new draft PAGs, EPA proposes taking no response to protect people from radioactivity in drinking water until concentrations rise to levels that are so high as to be frankly beyond comprehension. It is difficult to believe any responsible EPA official would sign off on radioactivity concentrations in drinking water that high. Yet, buried deep in the new PAGs is a table – Table 4.1 – that puts forward radioactivity levels for drinking water so immense as make it difficult to imagine what those responsible for the table could possibly have been thinking. No comparison to existing EPA drinking water standards is provided in the new PAG document, so it is likely responsible decision-makers who are asked to sign off on these revisions would have no inkling of the significance, of how much a departure this is from EPA's historical practices of protecting members of the public from excessive radioactivity in their drinking water.

We here have performed the missing analysis, comparing the new proposed drinking water radioactivity levels with EPA's current drinking water requirements, radionuclide by radionuclide. We can only hope that responsible officials within EPA and the Administration more generally will, upon seeing the extraordinary magnitude of the dramatic change from longstanding protective requirements proposed, not wish to carry the ethical stain of having approved exposing the American public to radioactivity levels in their drinking water that would shock the conscience.

The New Radioactivity Drinking Water PAGs

The draft PAG document calls the new drinking water limits Derived Response Levels, or DRLs. The DRLs simply are the level of radioactivity in drinking water that EPA would allow people to be exposed to without EPA taking a protective action like providing alternative clean drinking water supplies. Like the existing EPA drinking water standards of MCLs and RALs discussed above, the DRLs are measured in units of pico-Curies of radioactivity per Liter of water – pCi/L.

Without discussion as to when one should use one or the other, two sets of DRLs are set forth in the new PAGs – Derived Response Levels with and without decay. The DRLs with decay apparently presume that the levels detected in drinking water will promptly decay based on the half-life of the radionuclide, and therefore permit higher concentrations –and in some cases, very much higher concentrations – than in the case where they don't presume decay.

The assumption that you can permit people to be exposed to very high concentrations of radioactivity in their drinking water because it will subsequently decay to lower levels is questionable and contrary to most EPA practice. There are other factors besides radioactive decay that affect concentrations in water. One frequently sees concentrations *increase*, as more radioactivity from the contamination source moves into the groundwater. Increasing concentrations wouldn't be possible if the only factor involved were radioactive decay. Additionally, some radionuclides decay into other radionuclides ("daughter products"), so rather than the level of daughter products declining by decay, they actually increase in concentration. EPA practice has historically been to take action when concentrations exceed permissible limits and then stop those actions if and when the concentrations decline below those limits, not allow exceedances based on the hope that sometime thereafter they will through decay or other means go back down.

So there are two sets of proposed drinking water limits in the PAGs –DRLs with and without decay.[8] We here compare both to the longstanding EPA drinking water standards for radioactivity, the MCLs and the RALs. The MCL is EPA's primary drinking water standard under the Safe Drinking Water Limit. Under CERCLA, EPA has also established emergency response levels, the Removal Action Levels. (These aren't long-term cleanup standards, which

[8] One finds the DRLs with an without Decay in the last two columns of Table 4-1 in the new PAGs.

use the MCLs, but time-urgent response standards that determine when actions like providing alternative water supplies are immediately needed.)

The RALs are based on the MCL or the concentration of radioactivity in drinking water that would produce a 10^{-4} (one in ten thousand) cancer risk, whichever is greater. The EPA method for deriving the 10^{-4} concentration is described in Table 6 of this report. Many EPA Regions simply use the MCLs for their emergency response levels for radioactivity rather than the RALs, and EPA has now, for chemicals, established new RALs which are the MCLs. So the primary comparison of the new proposed drinking water levels, DRLs, should be with the MCLs, but for completeness purposes, we have also compared them with the RALs.

The Magnitude of Increased Permissible Radiation Exposure Proposed

Table 1 of this report compares the new with the existing drinking water standards. For example, the DRL without decay for strontium-90 is 6,650 pCi/L without decay and 6730 with decay (not much different because of its long life), whereas the current EPA MCL is 8 and the RAL is 39. Thus EPA now proposes to permit people to be exposed at levels roughly a thousand times higher than its current Safe Drinking Water Act limit (the MCL), and 170 times higher than its emergency response level, the RAL. Iodine-131 has a DRL without decay of 8490 an with decay of 267,000; the MCL is 3, thousands to hundreds of thousands of times lower. Plutonium-239's DRLs are 732, versus an existing MCL and RAL of 15. Sm-151's DRLs are 1,890,000 pCi in the new PAGs, versus an existing MCL of 1000 (and RAL of 6250), about a factor of 2000-fold increase over Safe Drinking Water Levels. Nickel-63 has DRLs of 1,220,000 compared to an MCL of 50. And on and on, radionuclide by radionuclide, one sees massive relaxation of standards

Figures 2-5 and Tables 2-5 show the vastly increased concentrations of radioactivity that would be permitted under the new limits. For example, in Figure and Table 2, one sees that limits for all radionuclides are increased by at least roughly two orders of magnitude, with many increased by tens of thousands or even hundreds of thousands, with one increased by more than seven million-fold. In Figure and Table 3, comparing the new DRL without decay to the current MCL, the increases are all at least about two orders of magnitude, extending up to more than a million-fold increase. In Figure and Table 4, the DRL with decay ranges from about two orders of magnitude higher than the current RAL to about million times higher. And in Figure and Table 5, the DRL without decay is up to a hundred thousand times higher than the RAL. The radionuclide by radionuclide graphs that follow Table 5 show the astronomical increases in radioactivity concentrations in drinking water proposed compared to current limits.

Discussion

The proposal to permit radioactive concentrations hundreds, thousands, tens and hundreds of thousands, and even millions of times higher than current drinking water standards is simply breathtaking. One cannot conceive what the EPA staffers who put forward these new limits were thinking.

Providing replacement drinking water or requiring treatment of water supplies, when regular water supplies are contaminated, is a relatively simple matter done all the time by EPA. There simply is no reason to force people to drink highly contaminated water.

The EPA staffers who snuck these new limits into the PAG document may argue that it is not appropriate to compare these levels to EPA's Maximum Concentration Limits established under the Safe Drinking Water Act, as they are supposedly based on more routine exposures, and the DRLs are designed for nuclear incidents. However, the new PAGs define their scope as applicable to any radioactivity release, which is defined as any release that could require consideration of a protective action. They make clear they are for a wide range of releases, from a full nuclear power plant accident to fires at fuel cycle facilities to releases from radiopharmaceutical facilities to incidents involving transportation of radioactive materials.

Although there is a note in the PAGs saying they do not apply to site cleanups under Superfund or the NRC decommissioning program, or other federal or state cleanup programs (p. i), there is confusion as to how that assertion meshes with the statement of applicability of the PAGs referred to above that says they apply to all radioactive releases for which a response may be considered. Indeed, some within EPA have already pushed for abandoning EPA's CERCLA rules for Superfund cleanups and using instead the far more lenient PAGs. As Doug Guarino reported in *Inside EPA* on 24 October 2008, "EPA in a new draft guidance on how the agency's regional Superfund officials should justify emergency response actions at toxic waste sites suggests that for sites contaminated by radioactive substances, the officials should consult guidelines for catastrophic nuclear emergencies [the new EPA PAGs] that are significantly less stringent than traditional Superfund guidelines." There thus appears to be an effort to undermine the entire structure of EPA's radiation protection regime.

Additionally, EPA already has special standards for responding to radiological emergencies – the Superfund RALs, which provide guidance for when immediate response in an emergency situation is required. And the proposed DRLs are orders of magnitude less protective than the existing RALs.

EPA staff may also argue that because the exposure in the intermediate phase of a nuclear incident is expected to last only a year, they should be able to exposure people to a lifetime's worth of radiation in that one year. This is absurd. One isn't going to be able to guarantee that someone will have no additional radiation for the rest of their life, or hasn't already had prior exposures. And this is completely contradictory to longstanding EPA policy. EPA doesn't permit people to be exposed to higher than the MCL in any single year, irrespective of whether prior years have been lower or one can somehow hope that future years will be as well. Similarly, one doesn't permit exposures over the RAL in any one year by claiming future years may hopefully be brought under control. Furthermore, the PAGs make clear that the intermediate phase may continue for years.

Conclusion

In short, the draft EPA Protective Action Guidelines would increase by hundreds, thousands, and tens and hundreds of thousands of times or more the amount of radioactivity the public may be forced to consume in drinking water. It is irresponsible, and senior EPA and Administration officials should refuse to sign off on any such attempt.

TABLE 1

COMPARISON OF EPA's PROPOSED PROTECTIVE ACTION GUIDES [DERIVED RESPONSE LEVELS (DRLs)] FOR RADIOACTIVITY IN DRINKING WATER

vs.

EPA's LONGSTANDING

MAXIMUM CONCENTRATION LIMITS (MCLs)

and

REMOVAL ACTION LEVELS (RALs)

TABLE 1: COMPARISON OF PROPOSED PROTECTIVE ACTION GUIDE'S DERIVED RESPONSE LEVELS (DRLs) vs. CURRENT MAXIMUM CONCENTRATION LIMITS (MCLs) and REMOVAL ACTION LEVELS (RALs) for RADIOACTIVITY IN DRINKING WATER

Radionuclide	DRL w/o Decay*	DRL With Decay*	MCL*	RAL*
H-3	4,420,000	4,540,000	20,000	56,022
C-14	319,000	319,000	2,000	2,000
Na-22	58,000	66,100	400	400
P-32	77,100	1,370,000	30	315
S-35	239,000	731,000	500	5,960
Cl-36	199,000	199,000	700	891
Ca-45	260,000	513,000	10	1,116
Sc-46	125,000	397,000	100	513
V-48	93,400	1,460,000	90	417
Cr-51	4,790,000	43,700,000	6,000	18,405
Mn-54	257,000	374,000	300	1,345
Fe-55	557,000	631,000	2,000	2,924
Fe-59	103,000	591,000	200	389
Co-58	247,000	909,000	300	1,014
Co-60	53,900	57,600	100	192
Ni-63	1,220,000	1,220,000	50	4,902
Zn-65	46,900	75,400	300	300
Se-75	70,900	170,000	900	900
Rb-86	65,900	892,000	600	600
Sr-89	72,000	363,000	20	1,205
Sr-90	6,650	6,730	8	39
Y-90	68,800	6,530,000	60	196
Y-91	78,100	341,000	90	221
Zr-93	167,000	167,000	2,000	2,339
Zr-95	192,000	773,000	200	746
Nb-95	314,000	2,260,000	300	1,389
Mo-99	306,000	28,100,000	600	1,696
Tc-99	288,000	288,000	900	1,236
Ru-103	252,000	1,620,000	200	901
Ag-110m	66,500	106,000	90	315
Cd-109	92,600	120,000	600	612
In-114m	45,400	233,000	60	137
Sn-113	251,000	620,000	300	807
Sn-125	60,100	1,580,000	60	176
Sb-124	72,900	311,000	60	264
Te-127	1,100,000	712,000,000	900	3,435
Te-129	2,940,000	15,300,000,000	2,000	16,529

* units = picoCuries per Liter (pCi/L)

TABLE 1: COMPARISON OF PROPOSED PROTECTIVE ACTION GUIDE'S DERIVED RESPONSE LEVELS (DRLs) vs. CURRENT MAXIMUM CONCENTRATION LIMITS (MCLs) and REMOVAL ACTION LEVELS (RALs) for RADIOACTIVITY IN DRINKING WATER

Radionuclide	DRL w/o Decay*	DRL With Decay*	MCL*	RAL*
Te-129m	62,300	468,000	90	221
Te-132	48,600	3,780,000	90	90
I-132	48,600	3,780,000	90	90
I-129	1,750	1,750	1	24
I-131	8,490	267,000	3	77
Cs-136	60,100	1,160,000	800	800
Cs-137	13,600	13,800	200	200
Ba-140	71,200	1,410,000	90	230
La-140	91,600	13,800,000	60	318
Ce-141	260,000	2,030,000	300	763
Ce-143	165,000	30,400,000	100	495
Ce-144	35,300	5,330,000	30	30
Nd-147	171,000	3,940,000	200	473
Pm-149	186,000	21,300,000	100	532
Sm-151	1,890,000	1,890,000	1,000	6,250
Eu-152	135,000	139,000	200	1,087
Eu-154	90,700	94,300	60	309
Eu-155	566,000	607,000	600	1,835
Gd-153	665,000	1,070,000	600	2,290
Tb-160	115,000	415,000	100	400
Tm-170	140,000	320,000	100	395
Hf-181	165,000	984,000	200	550
Ta-182	120,000	297,000	100	437
W-187	294,000	74,700,000	200	948
Ir-192	135,000	477,000	100	472
Au-198	180,000	16,900,000	100	559
Hg-203	96,900	529,000	60	60
Tl-204	156,000	170,000	300	553
Bi-207	146,000	147,000	200	604
Np-237	1,730	1,730	15	32
Pu-239	732	732	15	15
Am-241	907	908	15	19
Cm-243	1,240	1,260	15	21

* units = picoCuries per Liter (pCi/L)

TABLES 2-5
FIGURES 2-5

SUMMARY COMPARISONS OF EPA'S PROPOSED NEW PERMISSIBLE CONCENTRATIONS OF RADIONUCLIDES IN DRINKING WATER [DERIVED RESPONSE LEVELS (DRLS)]

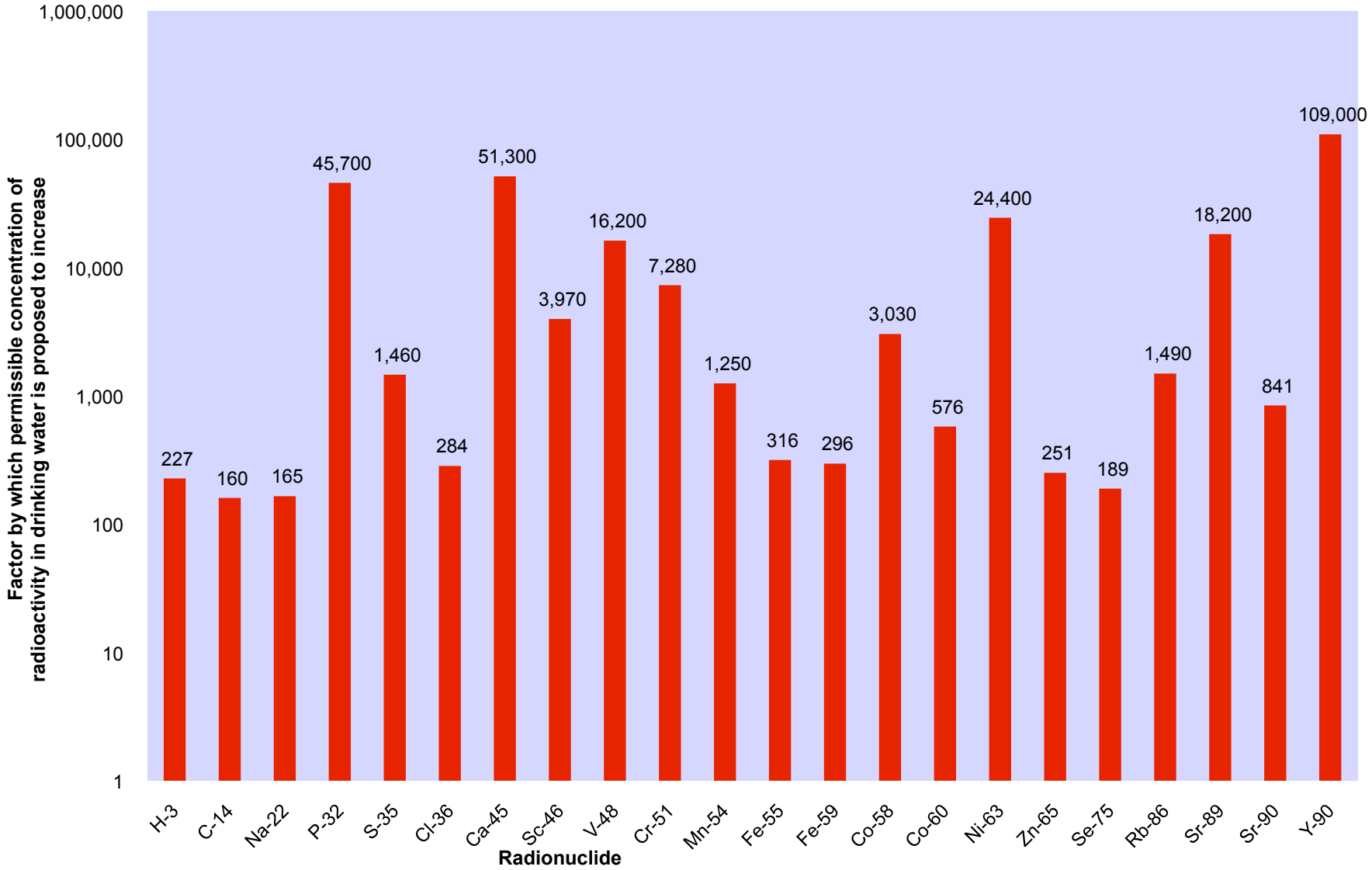
VS.

EPA'S LONGSTANDING RADIOACTIVITY DRINKING WATER STANDARDS-- MAXIMUM CONCENTRATION LIMITS (MCLS) AND REMOVAL ACTION LEVELS (RALS)

NOTE: These comparisons focus on the beta particle- & photon-emitting radionuclides. Similar differences exist with the new limits for alpha-emitting radionuclides. For the convenience of the reader, the Figures are numbered to correspond to the associated Table; there is no Figure 1.

Factor by which Allowable Radioactivity in Drinking Water is Proposed to Increase

FIGURE 2: Proposed DRL (with Decay) vs. Current Maximum Concentration Level (MCL)



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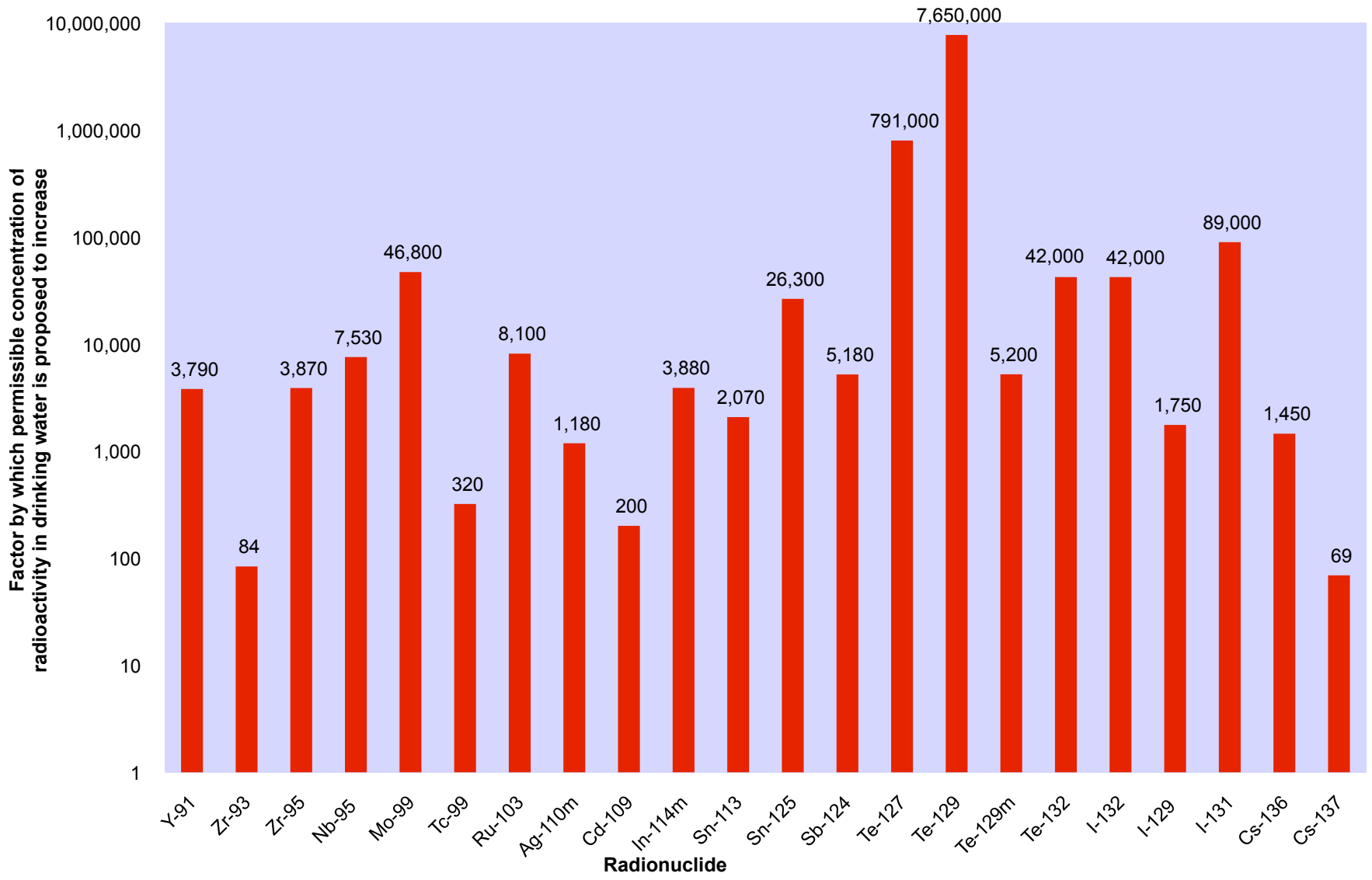

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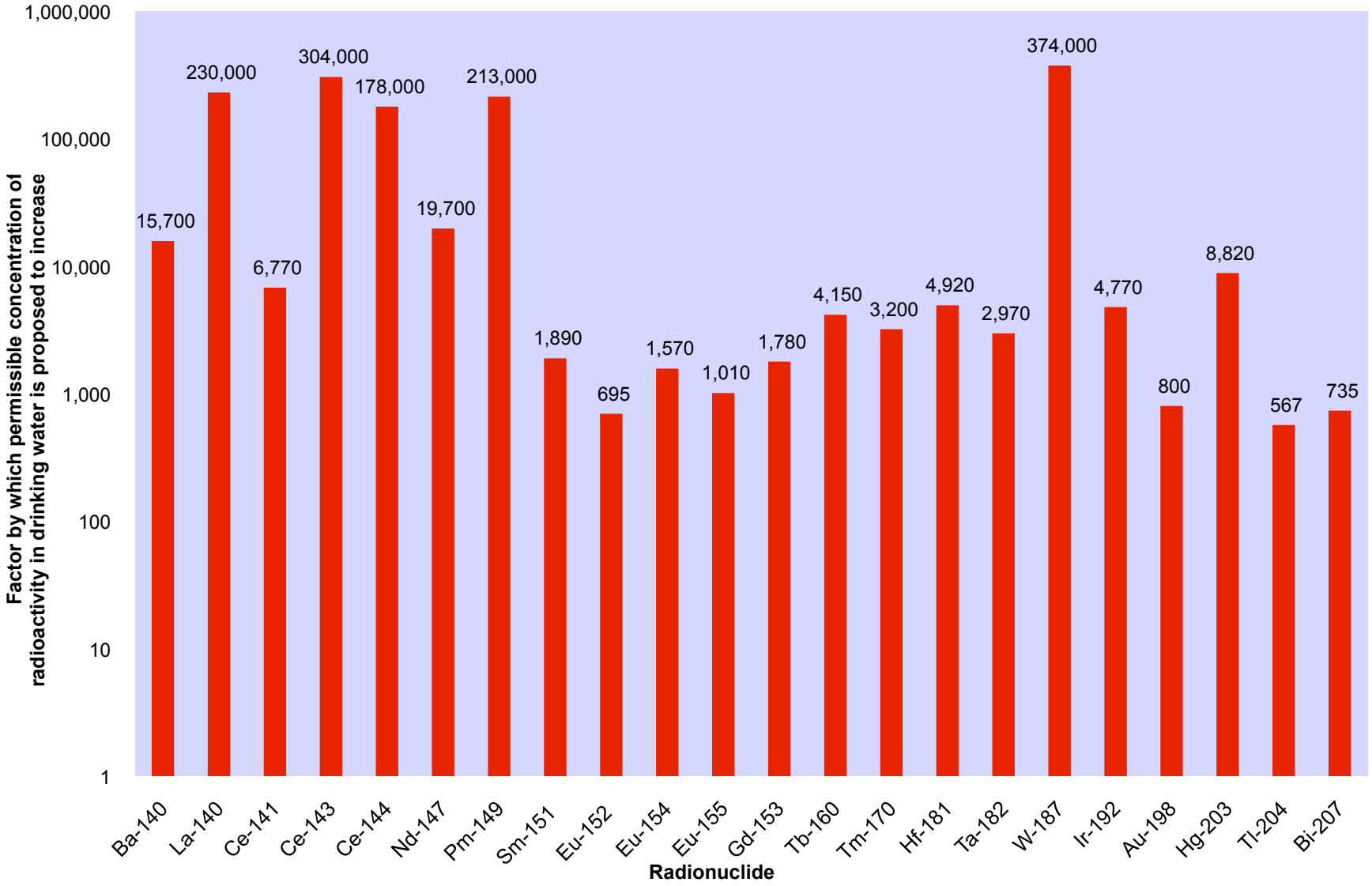


PROPOSED RELAXATION OF EPA DRINKING WATER STANDARDS

TABLE 2: Proposed Derived Response Level [DRL] (with Decay) vs. Current Maximum Concentration Level (MCL)

Radionuclide	PROPOSED DRL w/ Decay*	CURRENT Maximum Concentration Level (MCL)*	RATIO (Factor by which permissible concentration of radioactivity in drinking water is proposed to increase)
H-3	4,540,000	20,000	**227**
C-14	319,000	2,000	**160**
Na-22	66,100	400	**165**
P-32	1,370,000	30	**45,700**
S-35	731,000	500	**1,460**
Cl-36	199,000	700	**284**
Ca-45	513,000	10	**51,300**
Sc-46	397,000	100	**3,970**
V-48	1,460,000	90	**16,200**
Cr-51	43,700,000	6,000	**7,280**
Mn-54	374,000	300	**1,250**
Fe-55	631,000	2,000	**316**
Fe-59	591,000	200	**296**
Co-58	909,000	300	**3,030**
Co-60	57,600	100	**576**
Ni-63	1,220,000	50	**24,400**
Zn-65	75,400	300	**251**
Se-75	170,000	900	**189**
Rb-86	892,000	600	**1,490**
Sr-89	363,000	20	**18,200**
Sr-90	6,730	8	**841**
Y-90	6,530,000	60	**109,000**
Y-91	341,000	90	**3,790**
Zr-93	167,000	2,000	**84**
Zr-95	773,000	200	**3,870**
Nb-95	2,260,000	300	**7,530**
Mo-99	28,100,000	600	**46,800**
Tc-99	288,000	900	**320**
Ru-103	1,620,000	200	**8,100**
Ag-110m	106,000	90	**1,180**
Cd-109	120,000	600	**200**
In-114m	233,000	60	**3,880**
Sn-113	620,000	300	**2,070**
Sn-125	1,580,000	60	**26,300**
Sb-124	311,000	60	**5,180**
Te-127	712,000,000	900	**791,000**

*Units = picoCuries per Liter (pCi/L)

PROPOSED RELAXATION OF EPA DRINKING WATER STANDARDS

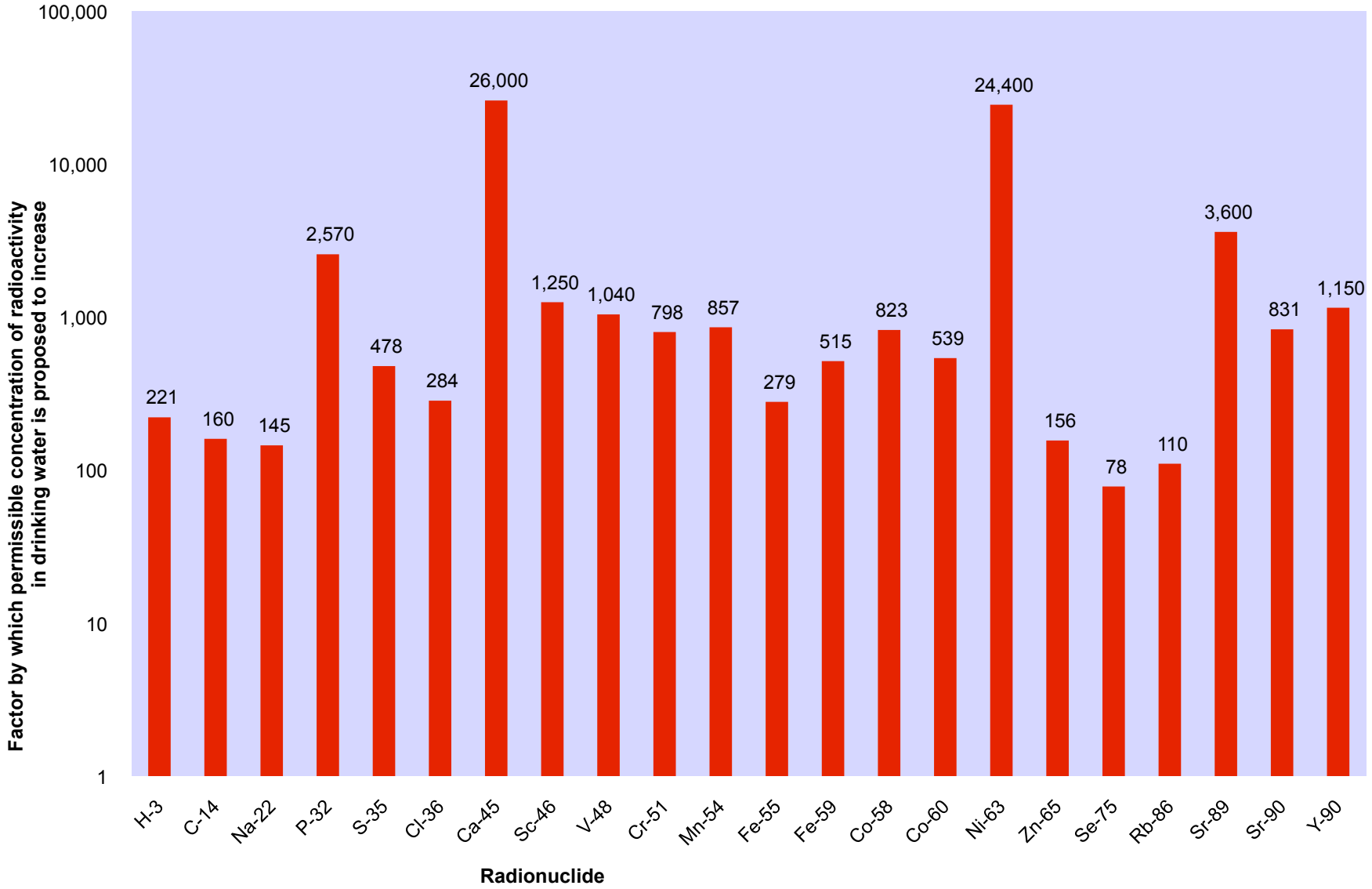
TABLE 2: Proposed Derived Response Level [DRL] (with Decay) vs. Current Maximum Concentration Level (MCL)

Radionuclide	PROPOSED DRL w/ Decay*	CURRENT Maximum Concentration Level (MCL)*	RATIO (Factor by which permissible concentration of radioactivity in drinking water is proposed to increase)
Te-129	15,300,000,000	2,000	**7,650,000**
Te-129m	468,000	90	**5,200**
Te-132	3,780,000	90	**42,000**
I-132	3,780,000	90	**42,000**
I-129	1,750	1	**1,750**
I-131	267,000	3	**89,000**
Cs-136	1,160,000	800	**1,450**
Cs-137	13,800	200	**69**
Ba-140	1,410,000	90	**15,700**
La-140	13,800,000	60	**230,000**
Ce-141	2,030,000	300	**6,770**
Ce-143	30,400,000	100	**304,000**
Ce-144	5,330,000	30	**178,000**
Nd-147	3,940,000	200	**19,700**
Pm-149	21,300,000	100	**213,000**
Sm-151	1,890,000	1,000	**1,890**
Eu-152	139,000	200	**695**
Eu-154	94,300	60	**1,570**
Eu-155	607,000	600	**1,010**
Gd-153	1,070,000	600	**1,780**
Tb-160	415,000	100	**4,150**
Tm-170	320,000	100	**3,200**
Hf-181	984,000	200	**4,920**
Ta-182	297,000	100	**2,970**
W-187	74,700,000	200	**374,000**
Ir-192	477,000	100	**4,770**
Au-198	80,000	100	**800**
Hg-203	529,000	60	**8,820**
Tl-204	170,000	300	**567**
Bi-207	147,000	200	**735**

*Units = picoCuries per Liter (pCi/L)

Factor by which Allowable Radioactivity in Drinking Water is Proposed to Increase

FIGURE 3: Proposed DRL (without Decay) vs. Current Maximum Concentration Level (MCL)



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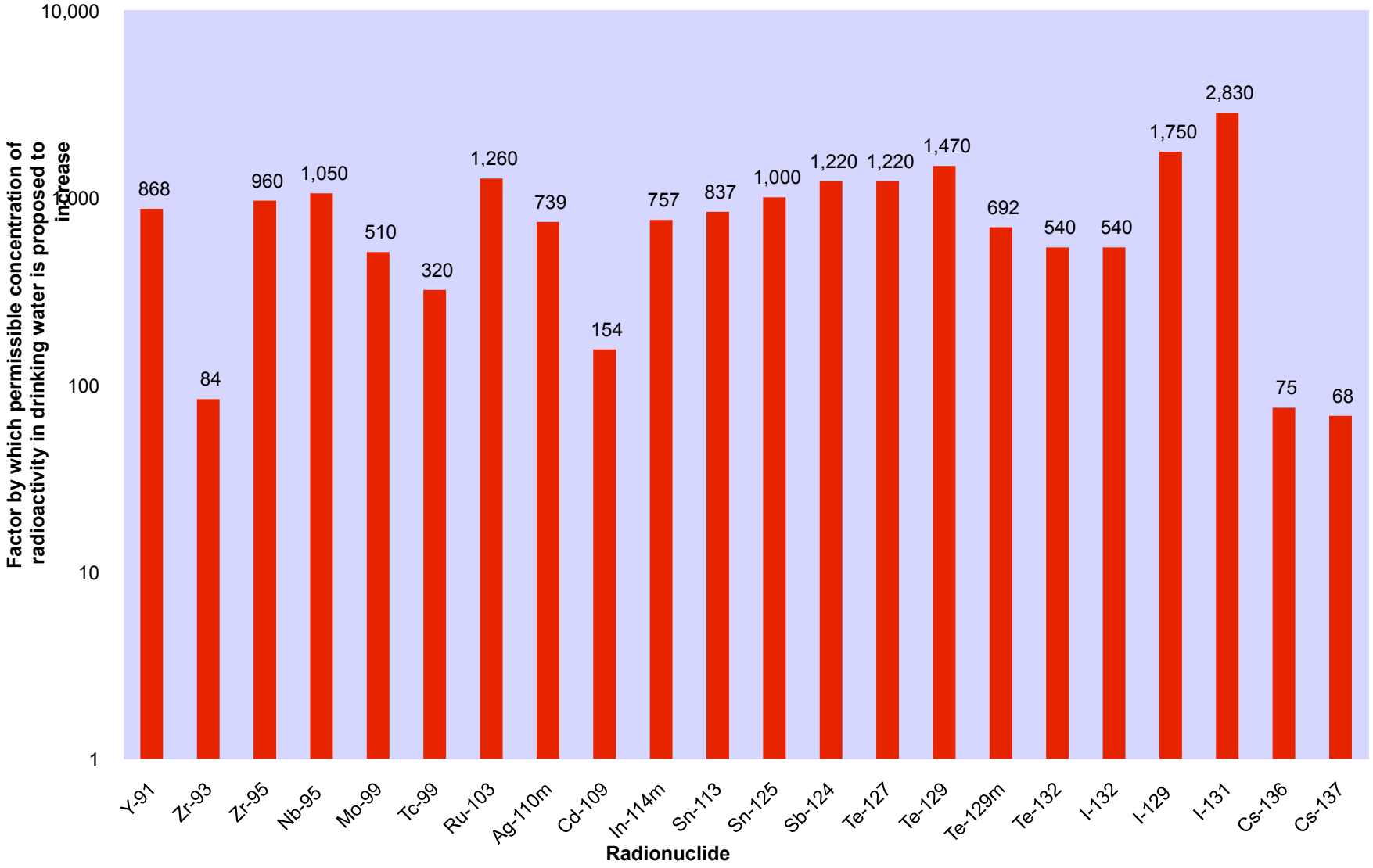

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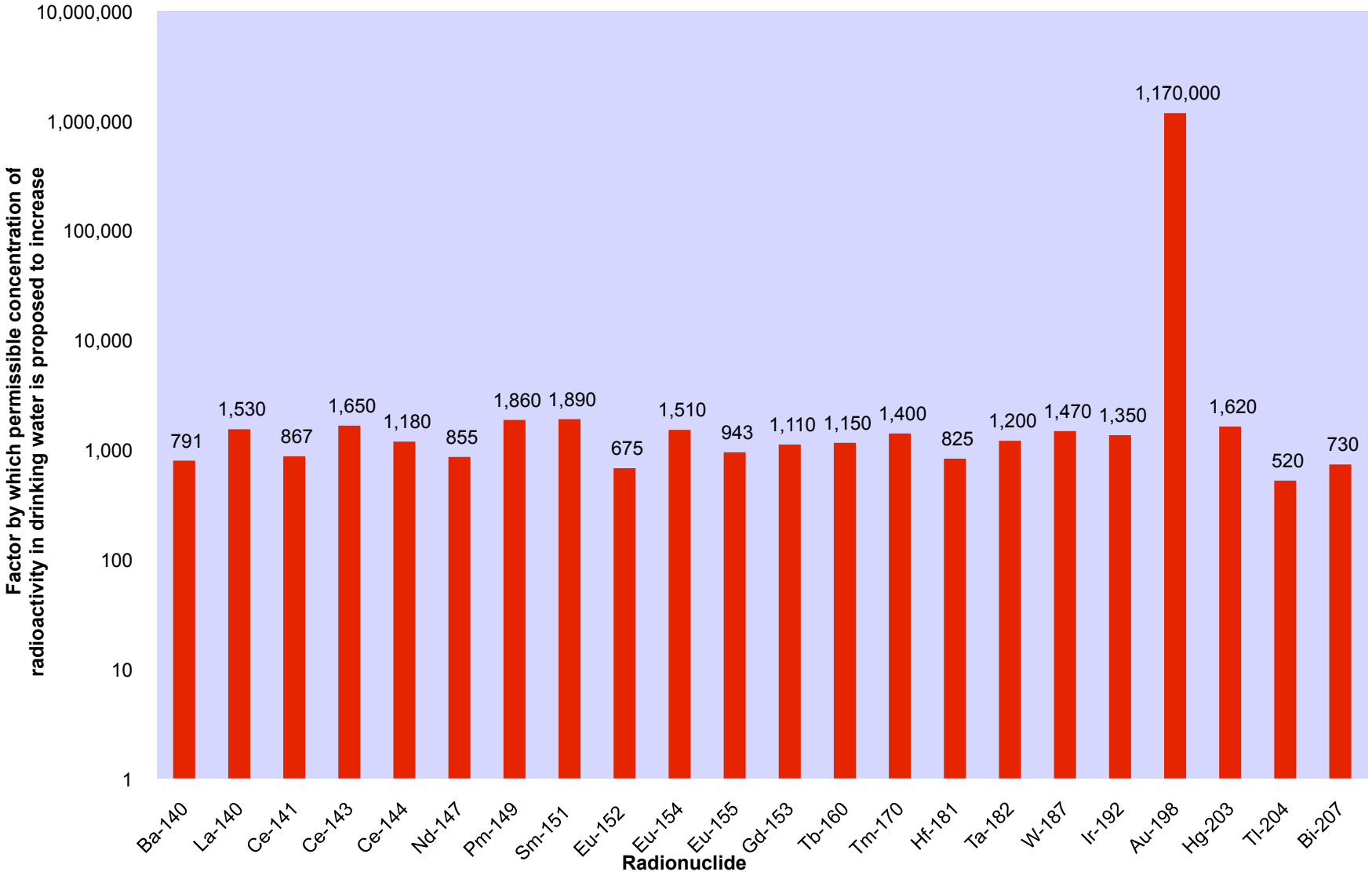

PROPOSED RELAXATION OF EPA DRINKING WATER STANDARDS

TABLE 3: Proposed Derived Response Level [DRL] (without Decay) vs. Current Maximum Concentration Level [MCL]

Radionuclide	PROPOSED DRL w/o Decay*	CURRENT Maximum Concentration Level (MCL)*	RATIO (Factor by which permissible concentration of radioactivity in drinking water is proposed to increase)
H-3	4,420,000	20,000	**221**
C-14	319,000	2,000	**160**
Na-22	58,000	400	**145**
P-32	77,100	30	**2,570**
S-35	239,000	500	**478**
Cl-36	199,000	700	**284**
Ca-45	260,000	10	**26,000**
Sc-46	125,000	100	**1,250**
V-48	93,400	90	**1,040**
Cr-51	4,790,000	6,000	**798**
Mn-54	257,000	300	**857**
Fe-55	557,000	2,000	**279**
Fe-59	103,000	200	**515**
Co-58	247,000	300	**823**
Co-60	53,900	100	**539**
Ni-63	1,220,000	50	**24,400**
Zn-65	46,900	300	**156**
Se-75	70,900	900	**78**
Rb-86	65,900	600	**110**
Sr-89	72,000	20	**3,600**
Sr-90	6,650	8	**831**
Y-90	68,800	60	**1,150**
Y-91	78,100	90	**868**
Zr-93	167,000	2,000	**84**
Zr-95	192,000	200	**960**
Nb-95	314,000	300	**1,050**
Mo-99	306,000	600	**510**
Tc-99	288,000	900	**320**
Ru-103	252,000	200	**1,260**
Ag-110m	66,500	90	**739**
Cd-109	92,600	600	**154**
In-114m	45,400	60	**757**
Sn-113	251,000	300	**837**
Sn-125	60,100	60	**1,000**
Sb-124	72,900	60	**1,220**
Te-127	1,100,000	900	**1,220**

*Units = picoCuries per Liter (pCi/L)

PROPOSED RELAXATION OF EPA DRINKING WATER STANDARDS

TABLE 3: Proposed Derived Response Level [DRL] (without Decay) vs. Current Maximum Concentration Level [MCL]

Radionuclide	PROPOSED DRL w/o Decay*	CURRENT Maximum Concentration Level (MCL)*	RATIO (Factor by which permissible concentration of radioactivity in drinking water is proposed to increase)
Te-129	2,940,000	2,000	**1,470**
Te-129m	62,300	90	**692**
Te-132	48,600	90	**540**
I-132	48,600	90	**540**
I-129	1,750	1	**1,750**
I-131	8,490	3	**2,830**
Cs-136	60,100	800	**75**
Cs-137	13,600	200	**68**
Ba-140	71,200	90	**791**
La-140	91,600	60	**1,530**
Ce-141	260,000	300	**867**
Ce-143	165,000	100	**1,650**
Ce-144	35,300	30	**1,180**
Nd-147	171,000	200	**855**
Pm-149	186,000	100	**1,860**
Sm-151	1,890,000	1,000	**1,890**
Eu-152	135,000	200	**675**
Eu-154	90,700	60	**1,510**
Eu-155	566,000	600	**943**
Gd-153	665,000	600	**1,110**
Tb-160	115,000	100	**1,150**
Tm-170	140,000	100	**1,400**
Hf-181	165,000	200	**825**
Ta-182	120,000	100	**1,200**
W-187	294,000	200	**1,470**
Ir-192	135,000	100	**1,350**
Au-198	116,900,000	100	**1,170,000**
Hg-203	96,900	60	**1,620**
Tl-204	156,000	300	**520**
Bi-207	146,000	200	**730**

*Units = picoCuries per Liter (pCi/L)

Factor by which Allowable Radioactivity in Drinking Water is Proposed to Increase

FIGURE 4: Proposed DRL (with Decay) vs. Current Removal Action Level (RAL)

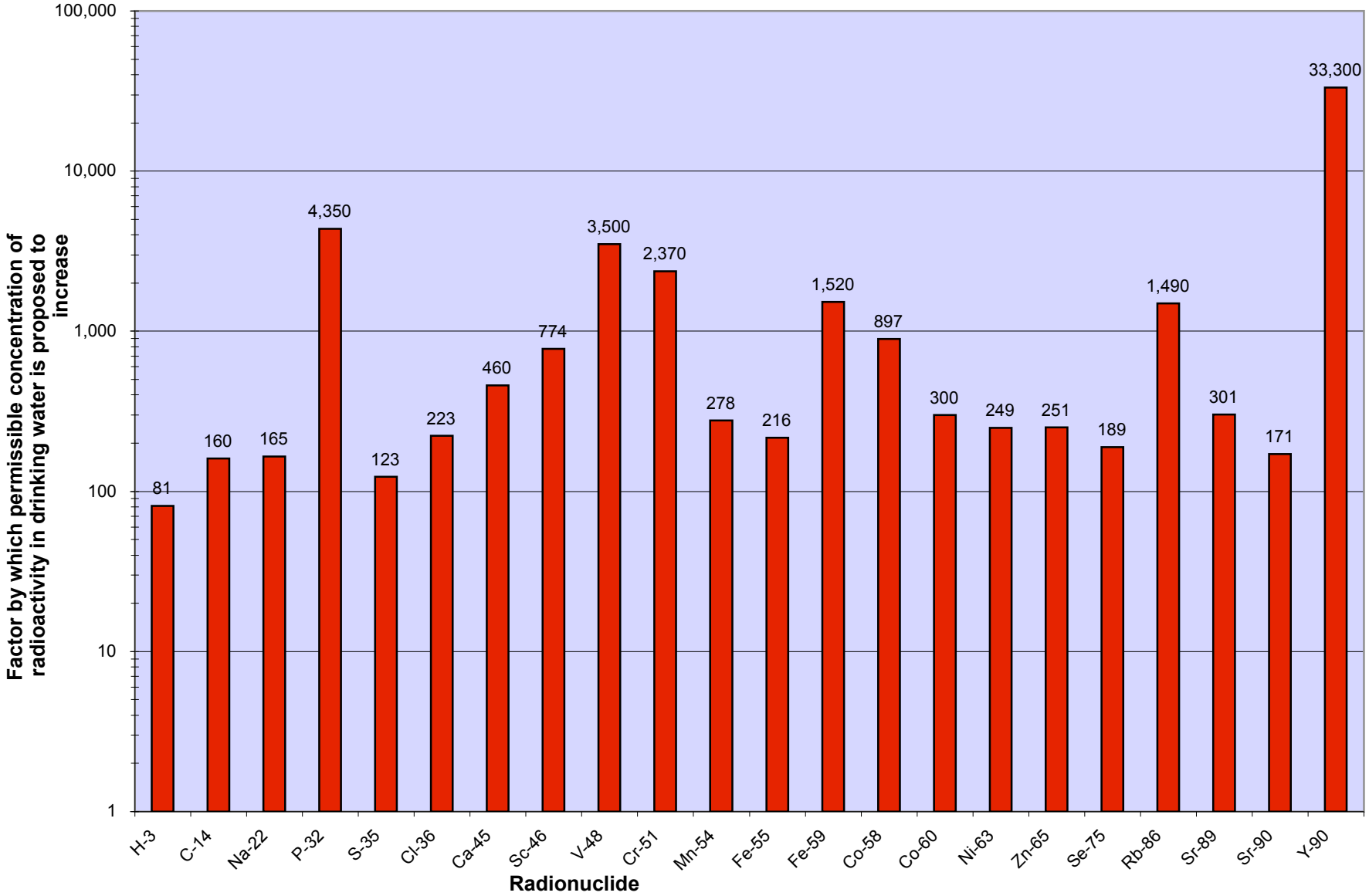

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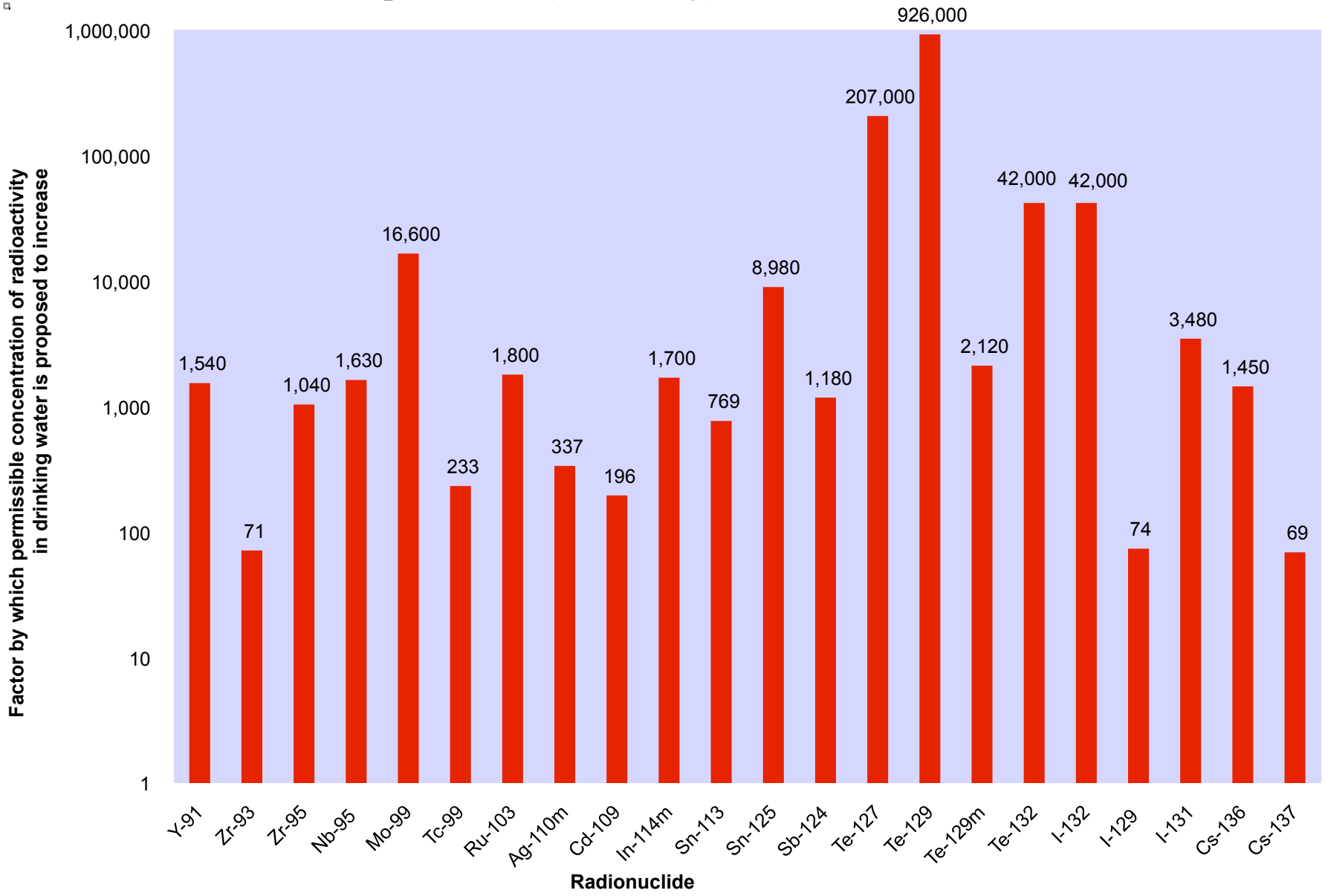
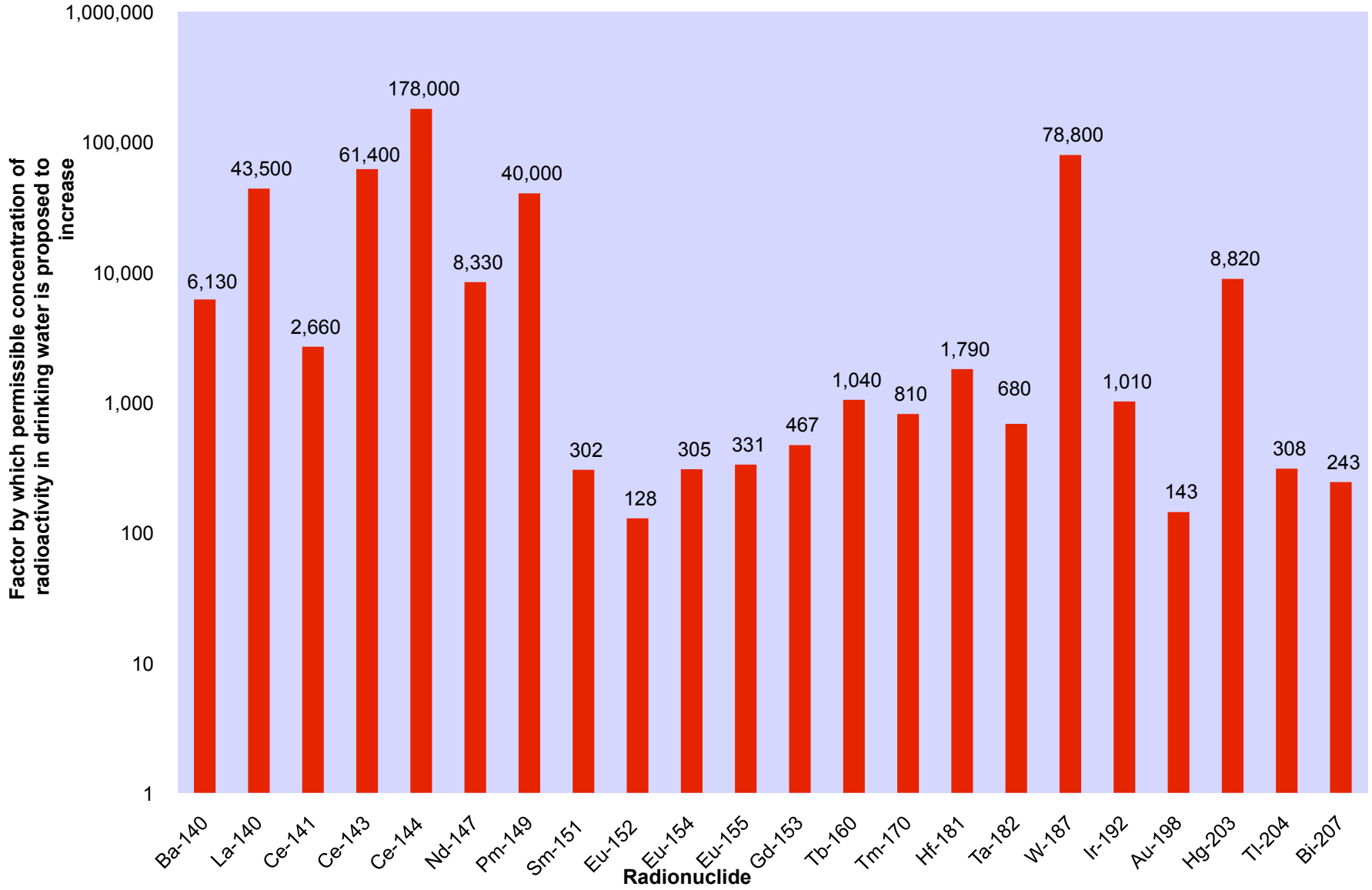
FIGURE 4: Proposed DRL (with Decay) vs. Current Removal Action Level



Factor by which Allowable Radioactivity in Drinking Water is Proposed to Increase

FIGURE 4: Proposed DRL (with Decay) vs. Current Removal Action Level



PROPOSED RELAXATION OF EPA DRINKING WATER STANDARDS

TABLE 4: Proposed Derived Response Level [DRL] (with Decay) vs. Current Removal Action Level [RAL]

Radionuclide	PROPOSED DRL w/ Decay*	CURRENT Removal Action Level (RAL)*	RATIO (Factor by which permissible concentration of RADIOACTIVITY IN DRINKING WATER IS PROPOSED TO INCREASE)
H-3	4,540,000	56,022	**81**
C-14	319,000	2,000	**160**
Na-22	66,100	400	**165**
P-32	1,370,000	315	**4,350**
S-35	731,000	5,960	**123**
Cl-36	199,000	891	**223**
Ca-45	513,000	1,116	**460**
Sc-46	397,000	513	**774**
V-48	1,460,000	417	**3,500**
Cr-51	43,700,000	18,405	**2,370**
Mn-54	374,000	1,345	**278**
Fe-55	631,000	2,924	**216**
Fe-59	591,000	389	**1,520**
Co-58	909,000	1,014	**897**
Co-60	57,600	192	**300**
Ni-63	1,220,000	4,902	**249**
Zn-65	75,400	300	**251**
Se-75	170,000	900	**189**
Rb-86	892,000	600	**1,490**
Sr-89	363,000	1,205	**301**
Sr-90	6,730	39	**171**
Y-90	6,530,000	196	**33,300**
Y-91	341,000	221	**1,540**
Zr-93	167,000	2,339	**71**
Zr-95	773,000	746	**1,040**
Nb-95	2,260,000	1,389	**1,630**
Mo-99	28,100,000	1,696	**16,600**
Tc-99	288,000	1,236	**233**
Ru-103	1,620,000	901	**1,800**
Ag-110m	106,000	315	**337**
Cd-109	120,000	612	**196**
In-114m	233,000	137	**1,700**
Sn-113	620,000	807	**769**
Sn-125	1,580,000	176	**8,980**
Sb-124	311,000	264	**1,180**
Te-127	712,000,000	3,435	**207,000**

*Units = picoCuries per Liter (pCi/L)

PROPOSED RELAXATION OF EPA DRINKING WATER STANDARDS

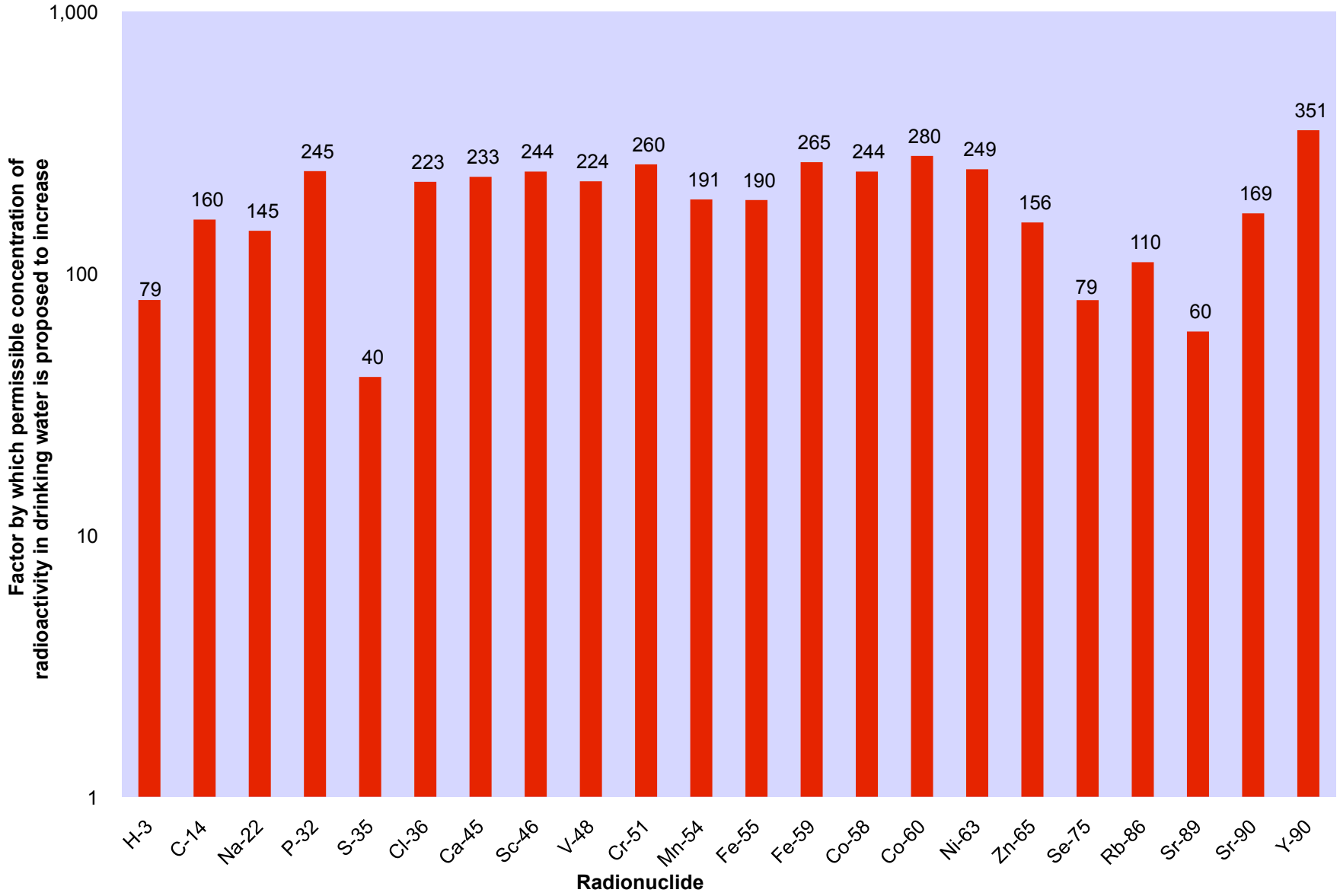
TABLE 4: Proposed Derived Response Level [DRL] (with Decay) vs. Current Removal Action Level [RAL]

Radionuclide	PROPOSED DRL w/ Decay*	CURRENT Removal Action Level (RAL)*	RATIO (Factor by which permissible concentration of RADIOACTIVITY IN DRINKING WATER IS PROPOSED TO INCREASE)
Te-129	15,300,000,000	16,529	**926,000**
Te-129m	468,000	221	**2,120**
Te-132	3,780,000	90	**42,000**
I-132	3,780,000	90	**42,000**
I-129	1,750	24	**74**
I-131	267,000	77	**3,480**
Cs-136	1,160,000	800	**1,450**
Cs-137	13,800	200	**69**
Ba-140	1,410,000	230	**6,130**
La-140	13,800,000	318	**43,500**
Ce-141	2,030,000	763	**2,660**
Ce-143	30,400,000	495	**61,400**
Ce-144	5,330,000	30	**178,000**
Nd-147	3,940,000	473	**8,330**
Pm-149	21,300,000	532	**40,000**
Sm-151	1,890,000	6,250	**302**
Eu-152	139,000	1,087	**128**
Eu-154	94,300	309	**305**
Eu-155	607,000	1,835	**331**
Gd-153	1,070,000	2,290	**467**
Tb-160	415,000	400	**1,040**
Tm-170	320,000	395	**810**
Hf-181	984,000	550	**1,790**
Ta-182	297,000	437	**680**
W-187	74,700,000	948	**78,800**
Ir-192	477,000	472	**1,010**
Au-198	80,000	559	**143**
Hg-203	529,000	60	**8,820**
Tl-204	170,000	553	**308**
Bi-207	147,000	604	**243**

*Units = picoCuries per Liter (pCi/L)

Factor by which Allowable Radioactibity in Drinking Water is Proposed to Increase

FIGURE 5: Proposed DRL (without Decay) vs. Current Removal Action Level (RAL)



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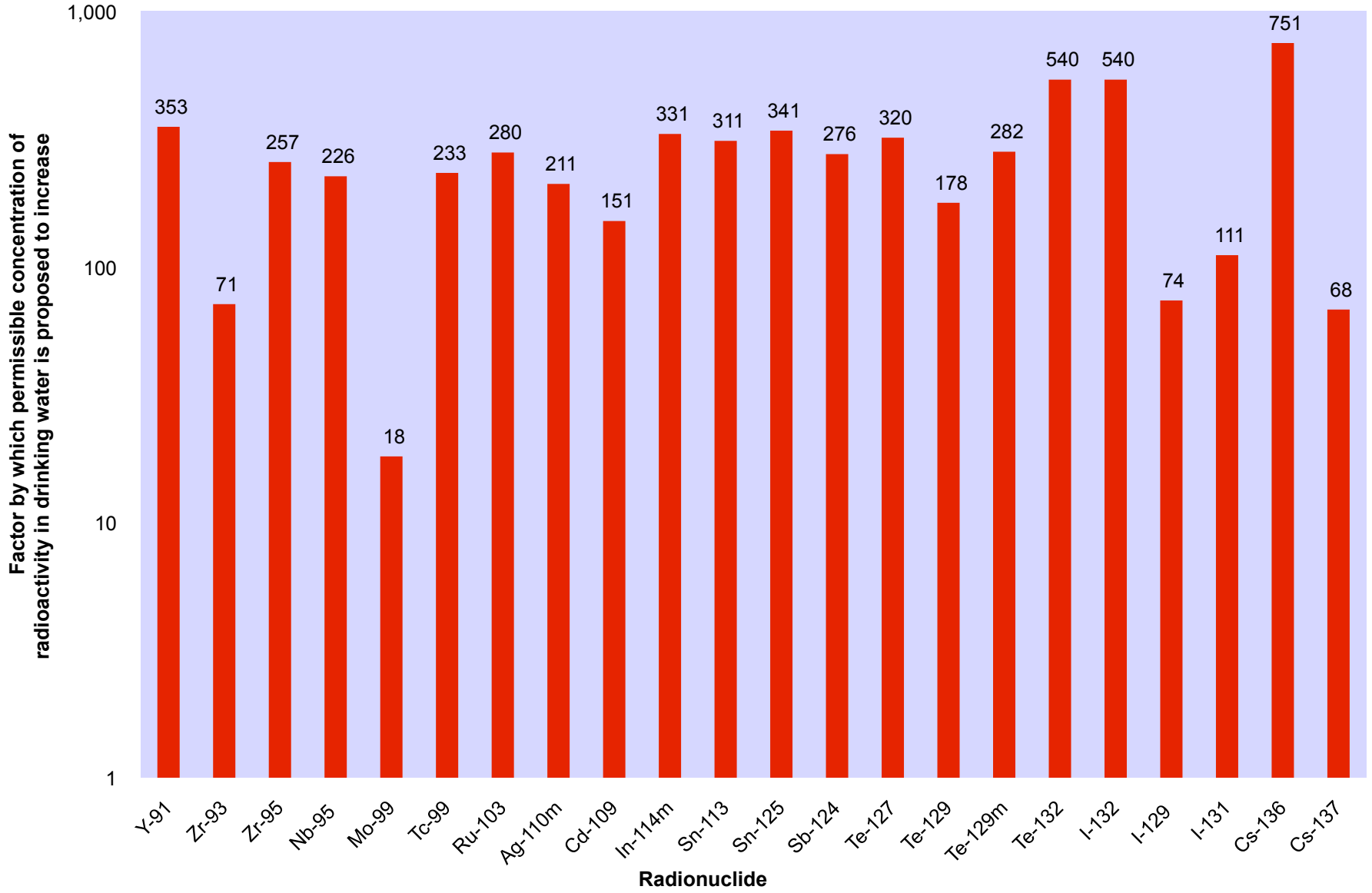

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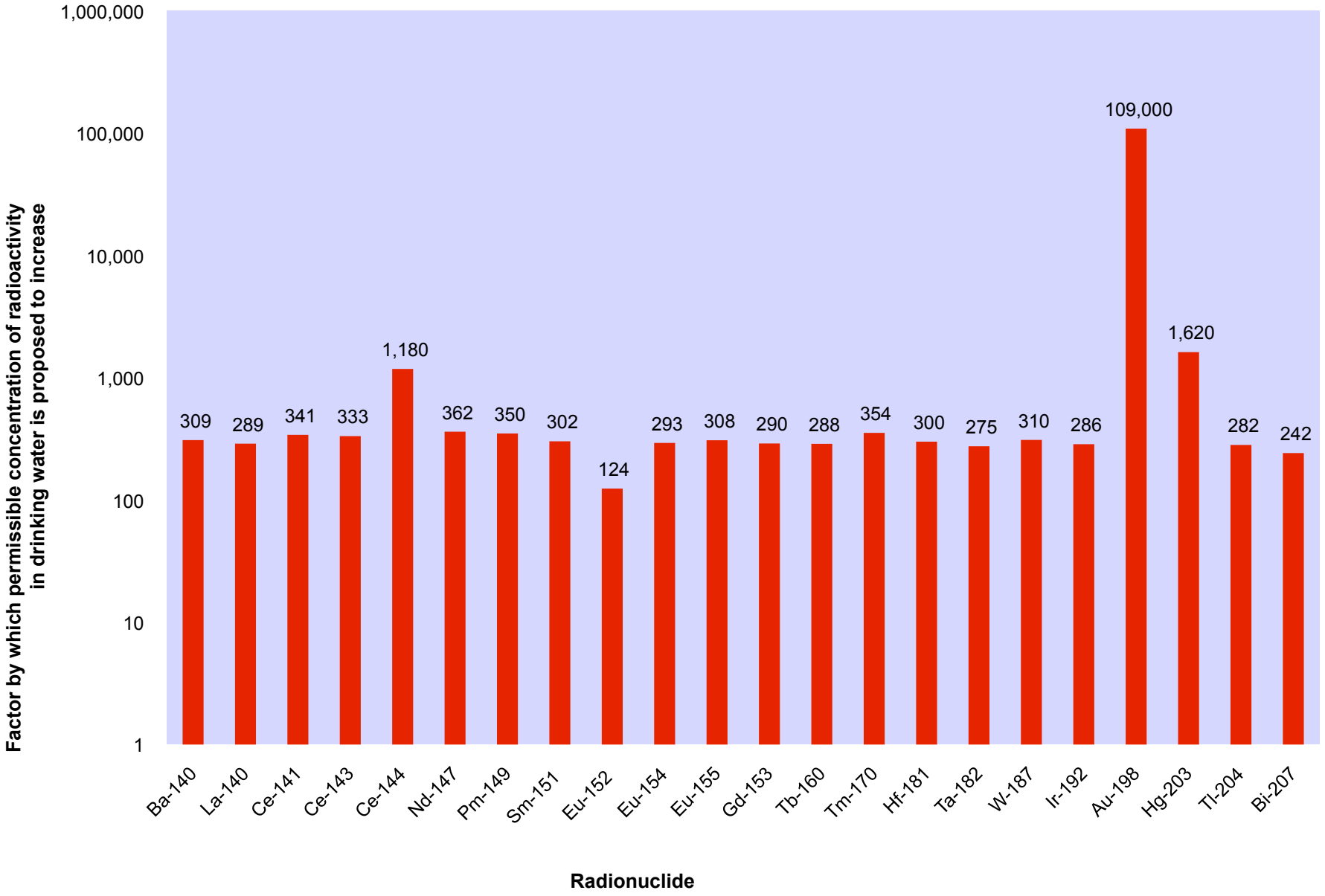


PROPOSED RELAXATION OF EPA DRINKING WATER STANDARDS

TABLE 5: Proposed Derived Response Level [DRL] (without Decay) vs. Current Removal Action Level [RAL]

Radionuclide	PROPOSED DRL w/o Decay*	CURRENT Removal Action Level (RAL)*	RATIO (Factor by which permissible concentration of RADIOACTIVITY IN DRINKING WATER IS PROPOSED TO INCREASE)
H-3	4,420,000	56,022	**79**
C-14	319,000	2,000	**160**
Na-22	58,000	400	**145**
P-32	77,100	315	**245**
S-35	239,000	5,960	**40**
Cl-36	199,000	891	**223**
Ca-45	260,000	1,116	**233**
Sc-46	125,000	513	**244**
V-48	93,400	417	**224**
Cr-51	4,790,000	18,405	**260**
Mn-54	257,000	1,345	**191**
Fe-55	557,000	2,924	**190**
Fe-59	103,000	389	**265**
Co-58	247,000	1,014	**244**
Co-60	53,900	192	**280**
Ni-63	1,220,000	4,902	**249**
Zn-65	46,900	300	**156**
Se-75	70,900	900	**79**
Rb-86	65,900	600	**110**
Sr-89	72,000	1,205	**60**
Sr-90	6,650	39	**169**
Y-90	68,800	196	**351**
Y-91	78,100	221	**353**
Zr-93	167,000	2,339	**71**
Zr-95	192,000	746	**257**
Nb-95	314,000	1,389	**226**
Mo-99	306,000	16,946	**18**
Tc-99	288,000	1,236	**233**
Ru-103	252,000	901	**280**
Ag-110m	66,500	315	**211**
Cd-109	92,600	612	**151**
In-114m	45,400	137	**331**
Sn-113	251,000	807	**311**
Sn-125	60,100	176	**341**
Sb-124	72,900	264	**276**
Te-127	1,100,000	3,435	**320**

*Units = picoCuries per Liter (pCi/L)

PROPOSED RELAXATION OF EPA DRINKING WATER STANDARDS

TABLE 5: Proposed Derived Response Level [DRL] (without Decay) vs. Current Removal Action Level [RAL]

Radionuclide	PROPOSED DRL w/o Decay*	CURRENT Removal Action Level (RAL)*	RATIO (Factor by which permissible concentration of RADIOACTIVITY IN DRINKING WATER IS PROPOSED TO INCREASE)
Te-129	2,940,000	16,529	**178**
Te-129m	62,300	221	**282**
Te-132	48,600	90	**540**
I-132	48,600	90	**540**
I-129	1,750	24	**74**
I-131	8,490	77	**111**
Cs-136	60,100	800	**751**
Cs-137	13,600	200	**68**
Ba-140	71,200	230	**309**
La-140	91,600	318	**289**
Ce-141	260,000	763	**341**
Ce-143	165,000	495	**333**
Ce-144	35,300	30	**1,180**
Nd-147	171,000	473	**362**
Pm-149	186,000	532	**350**
Sm-151	1,890,000	6,250	**302**
Eu-152	135,000	1,087	**124**
Eu-154	90,700	309	**293**
Eu-155	566,000	1,835	**308**
Gd-153	665,000	2,290	**290**
Tb-160	115,000	400	**288**
Tm-170	140,000	395	**354**
Hf-181	165,000	550	**300**
Ta-182	120,000	437	**275**
W-187	294,000	948	**310**
Ir-192	135,000	472	**286**
Au-198	116,900,000	559	**109,000**
Hg-203	96,900	60	**1,620**
Tl-204	156,000	553	**282**
Bi-207	146,000	604	**242**

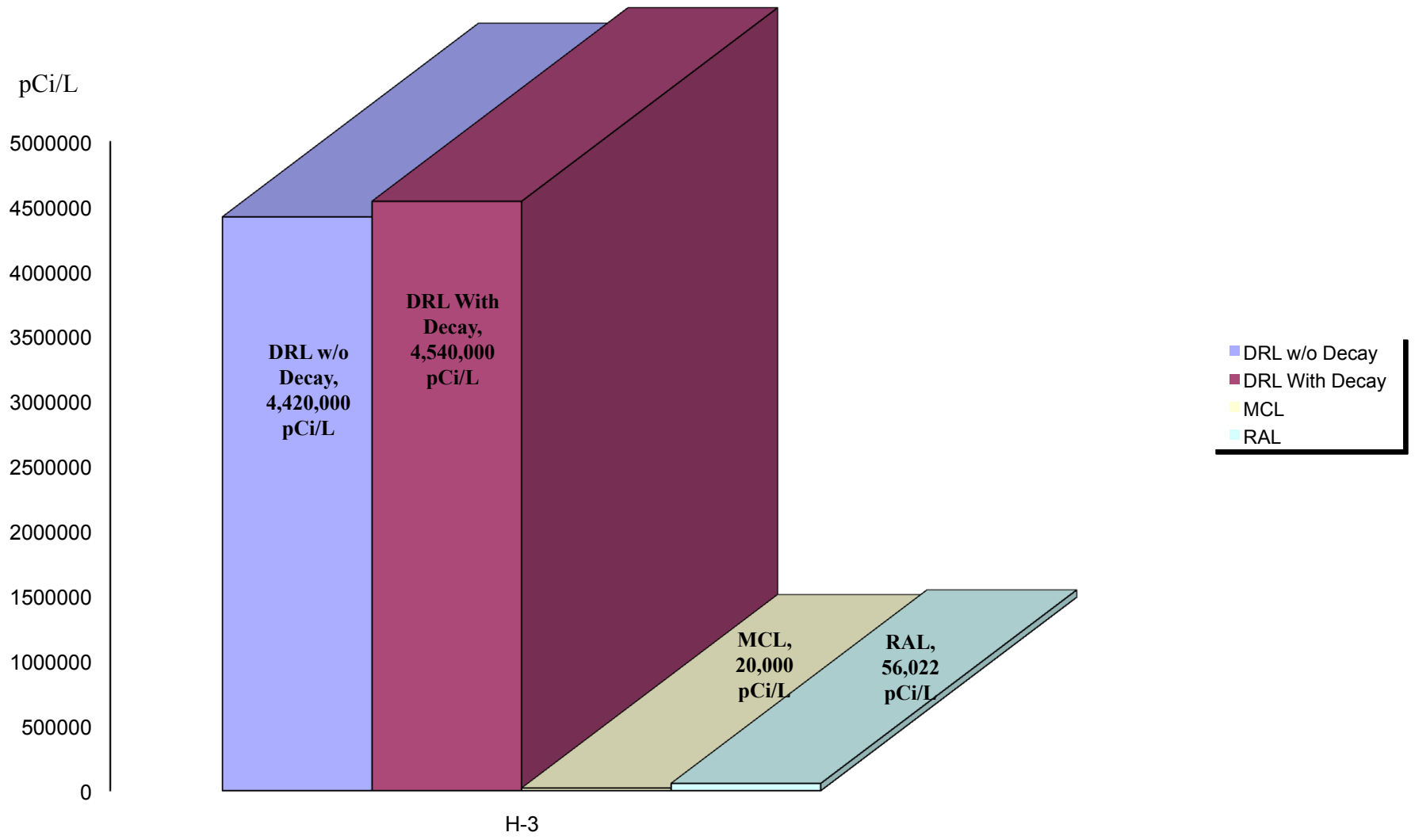
*Units = picoCuries per Liter (pCi/L)

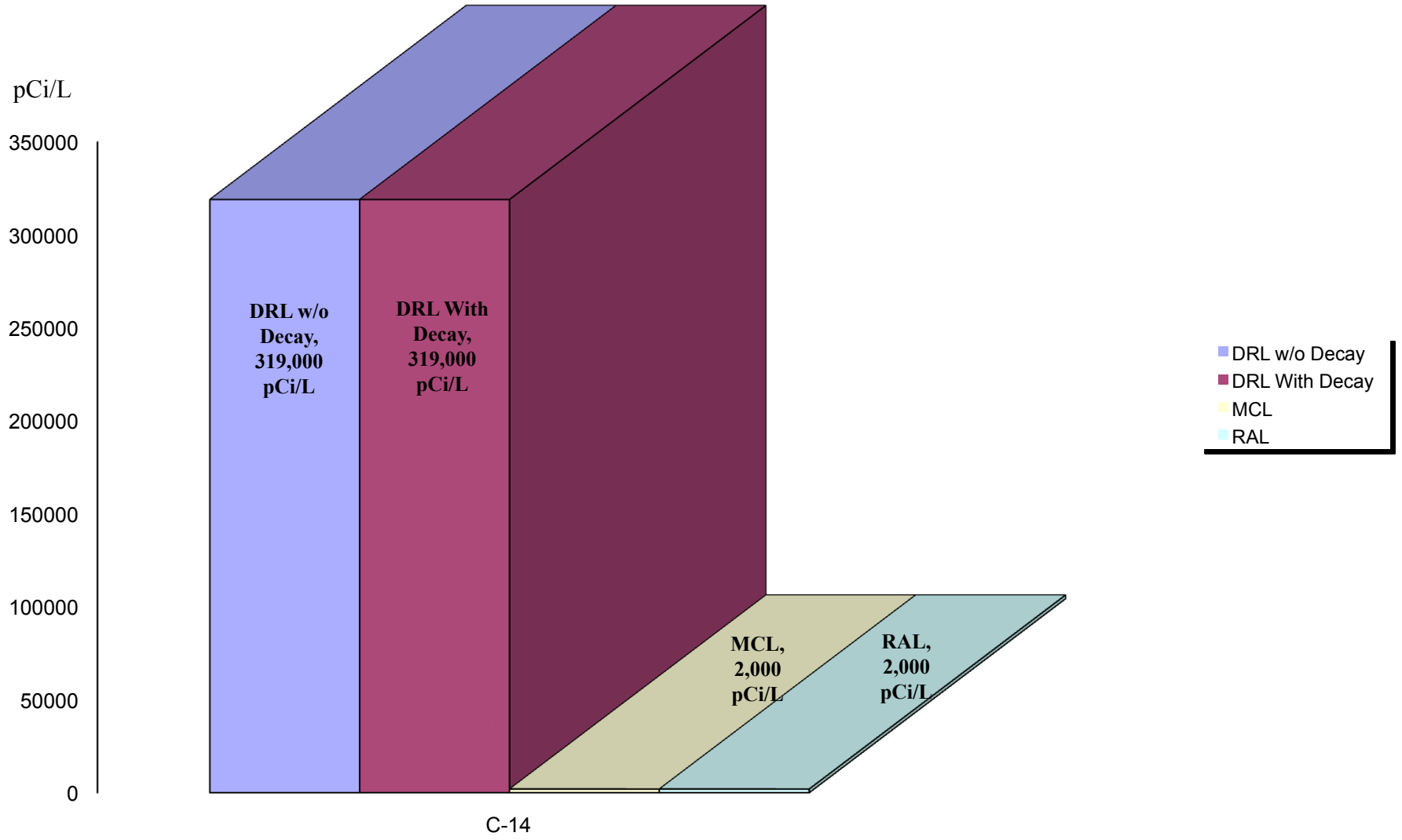
RADIONUCLIDE BY RADIONUCLIDE COMPARISON

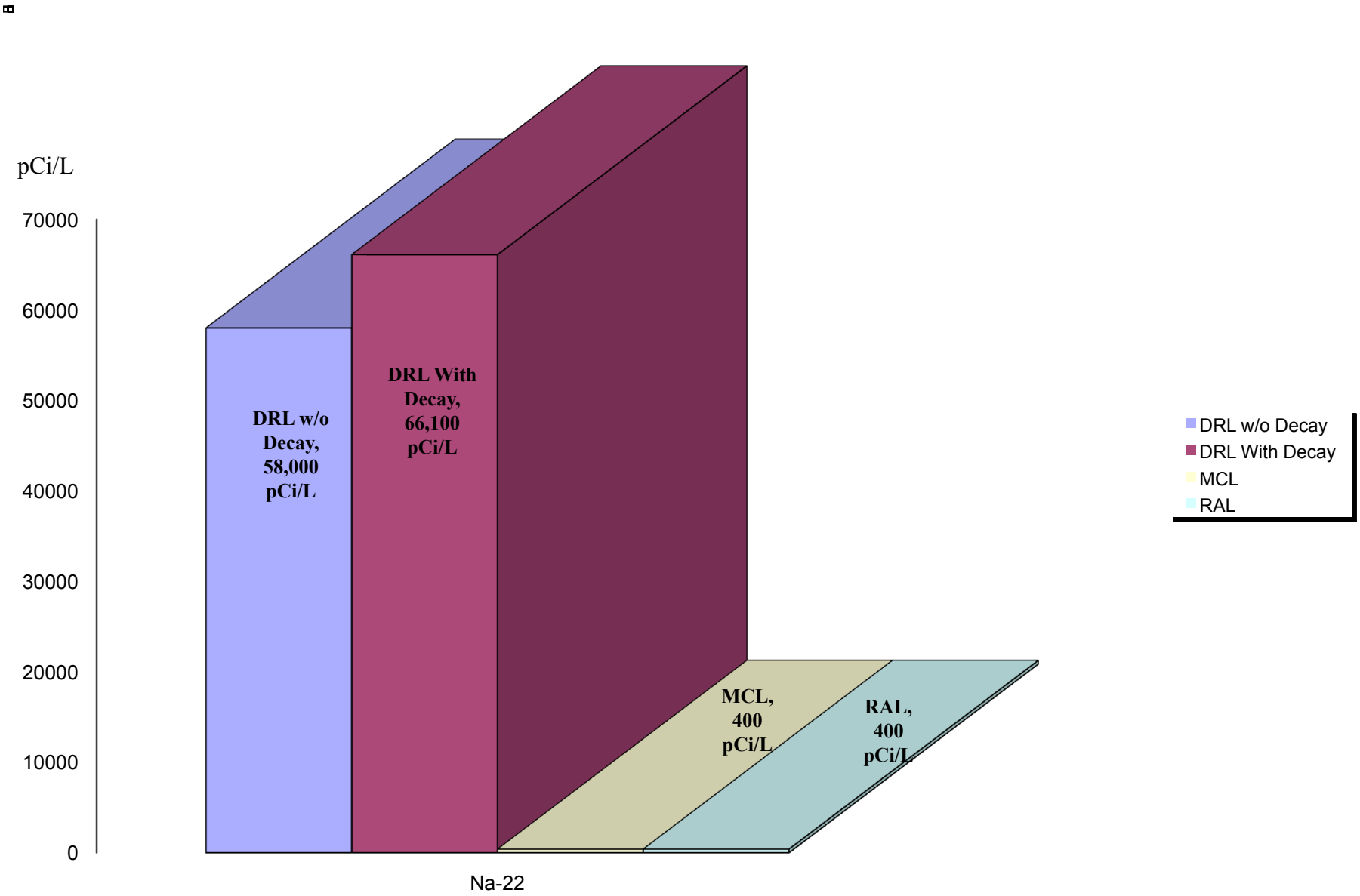
PROPOSED NEW PERMISSIBLE CONCENTRATIONS OF RADIONUCLIDES IN DRINKING WATER (DRLS)

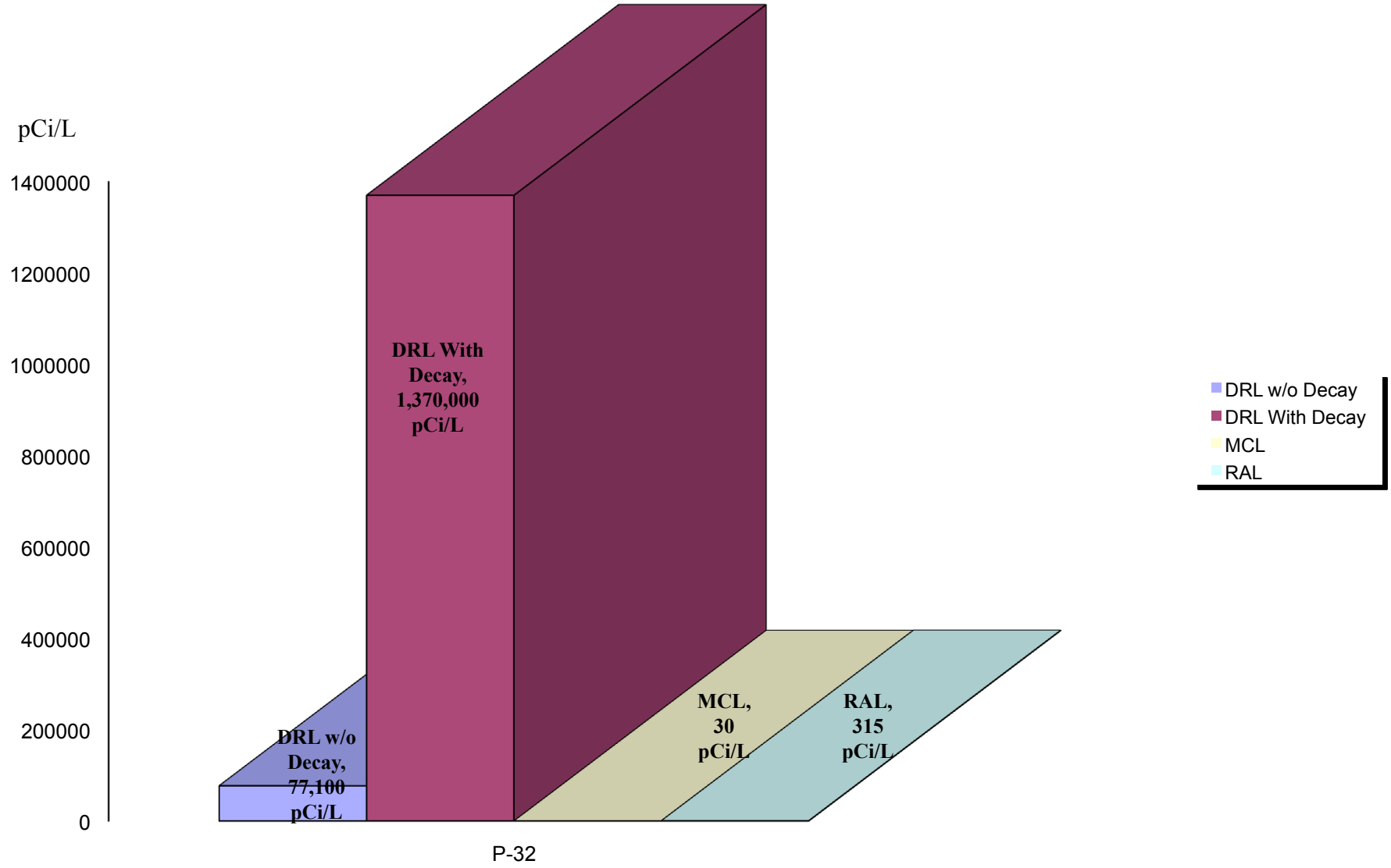
VS.

EPA'S LONGSTANDING DRINKING WATER STANDARDS (MCLS) AND (RALS)

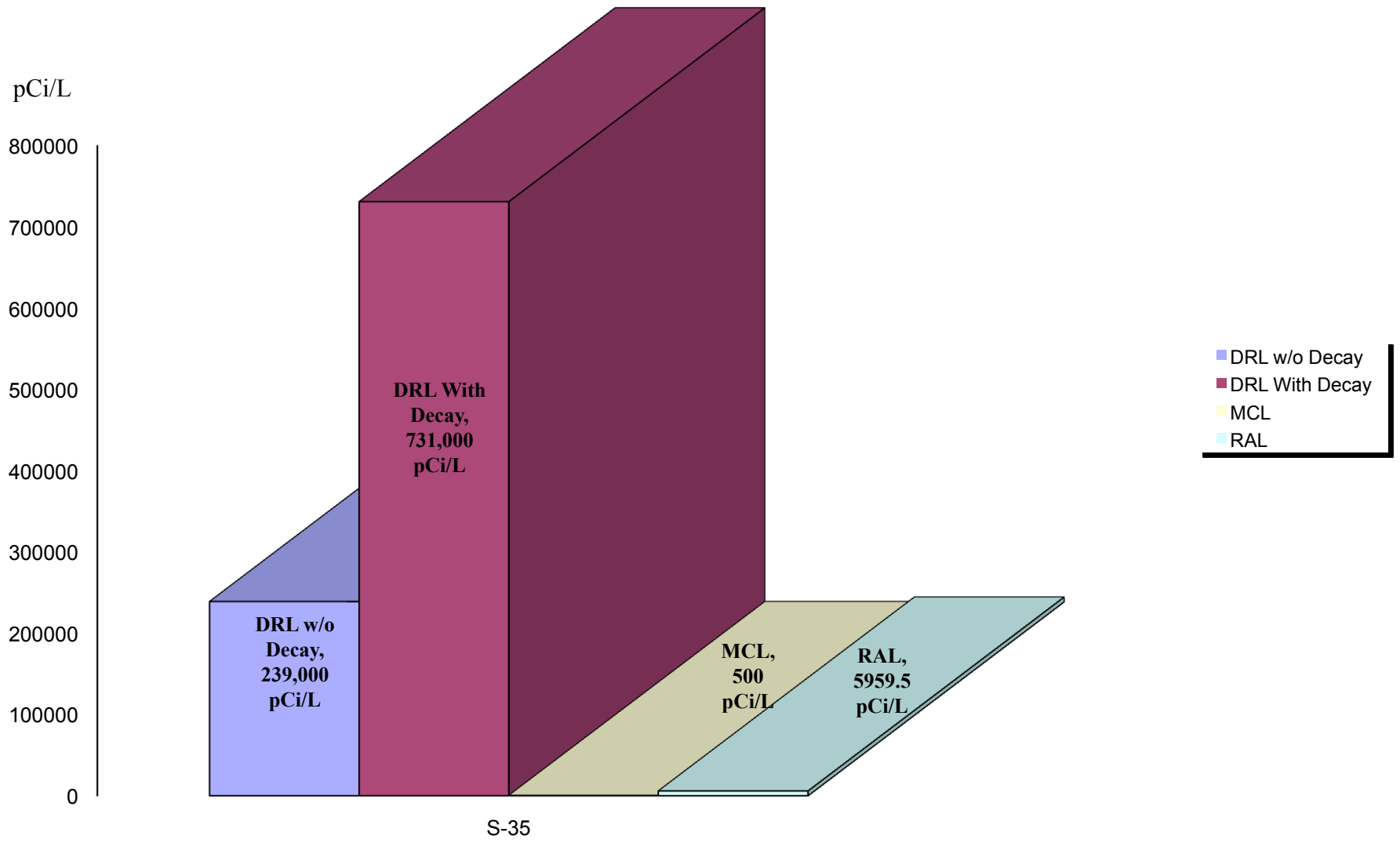

pCi/L
5000000
4500000
4000000
3500000
3000000
2500000
2000000
1500000
1000000
500000
0
DRL w/o Decay, 4,420,000 pCi/L
DRL With Decay, 4,540,000 pCi/L
MCL, 20,000 pCi/L
RAL, 56,022 pCi/L
H-3
DRL w/o Decay
DRL With Decay
MCL
RAL

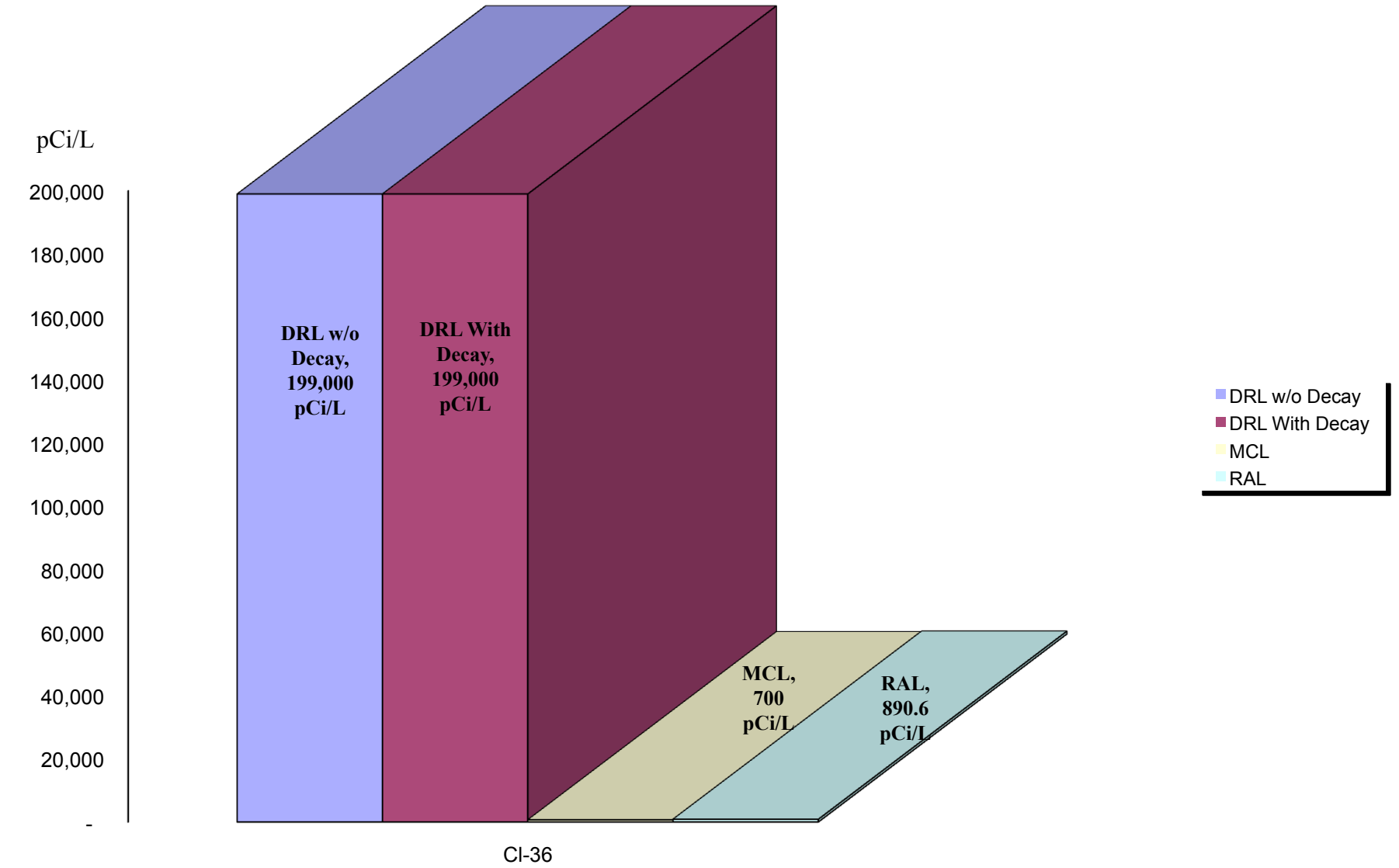

pCi/L
350000
300000
250000
200000
150000
100000
50000
0
DRL w/o Decay, 319,000 pCi/L
DRL With Decay, 319,000 pCi/L
MCL, 2,000 pCi/L
RAL, 2,000 pCi/L
DRL w/o Decay
DRL With Decay
MCL
RAL

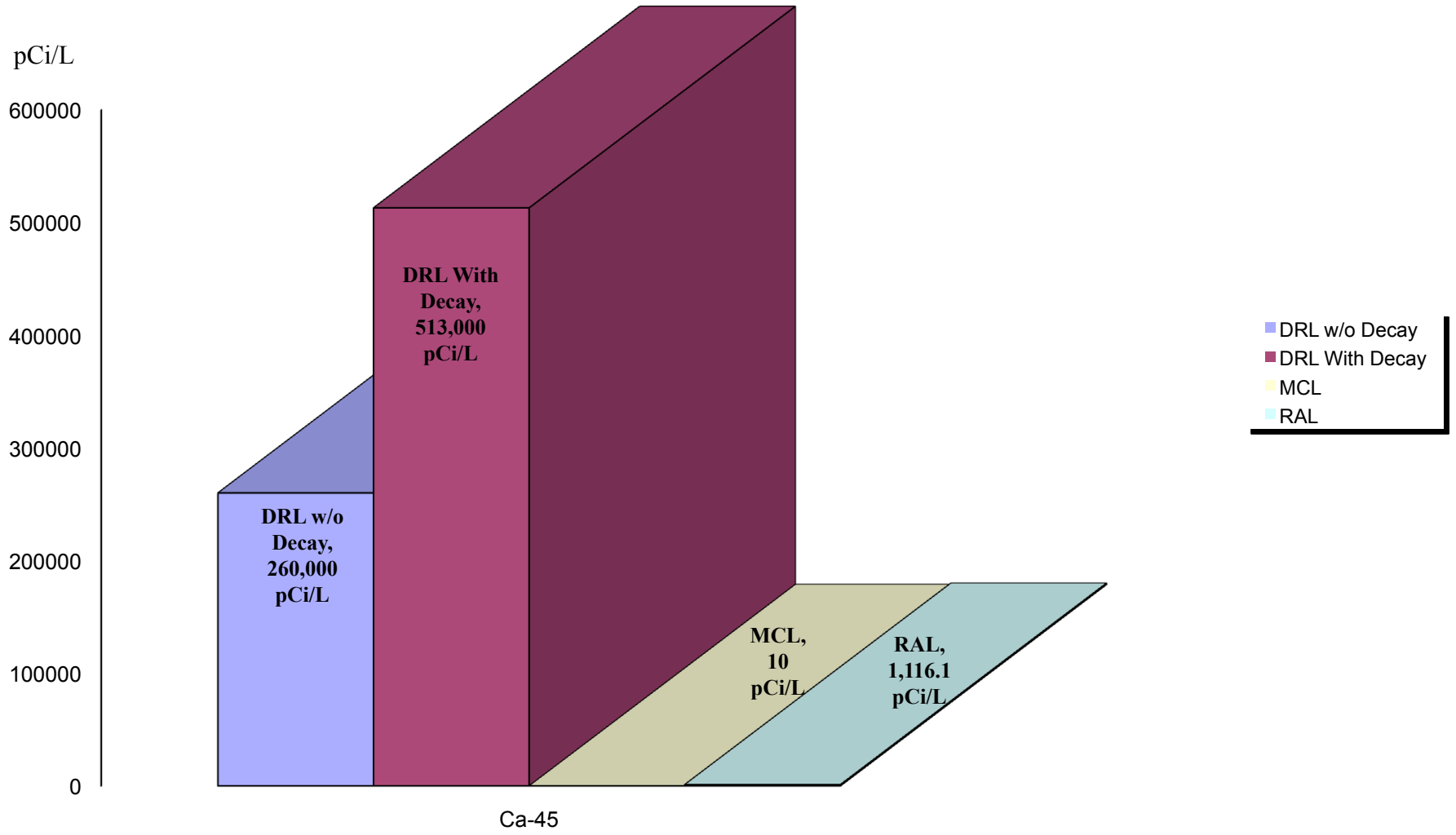

pCi/L
70000
60000
50000
40000
30000
20000
10000
0
DRL w/o Decay, 58,000 pCi/L
DRL With Decay, 66,100 pCi/L
MCL, 400 pCi/L
RAL, 400 pCi/L
Na-22
DRL w/o Decay
DRL With Decay
MCL
RAL

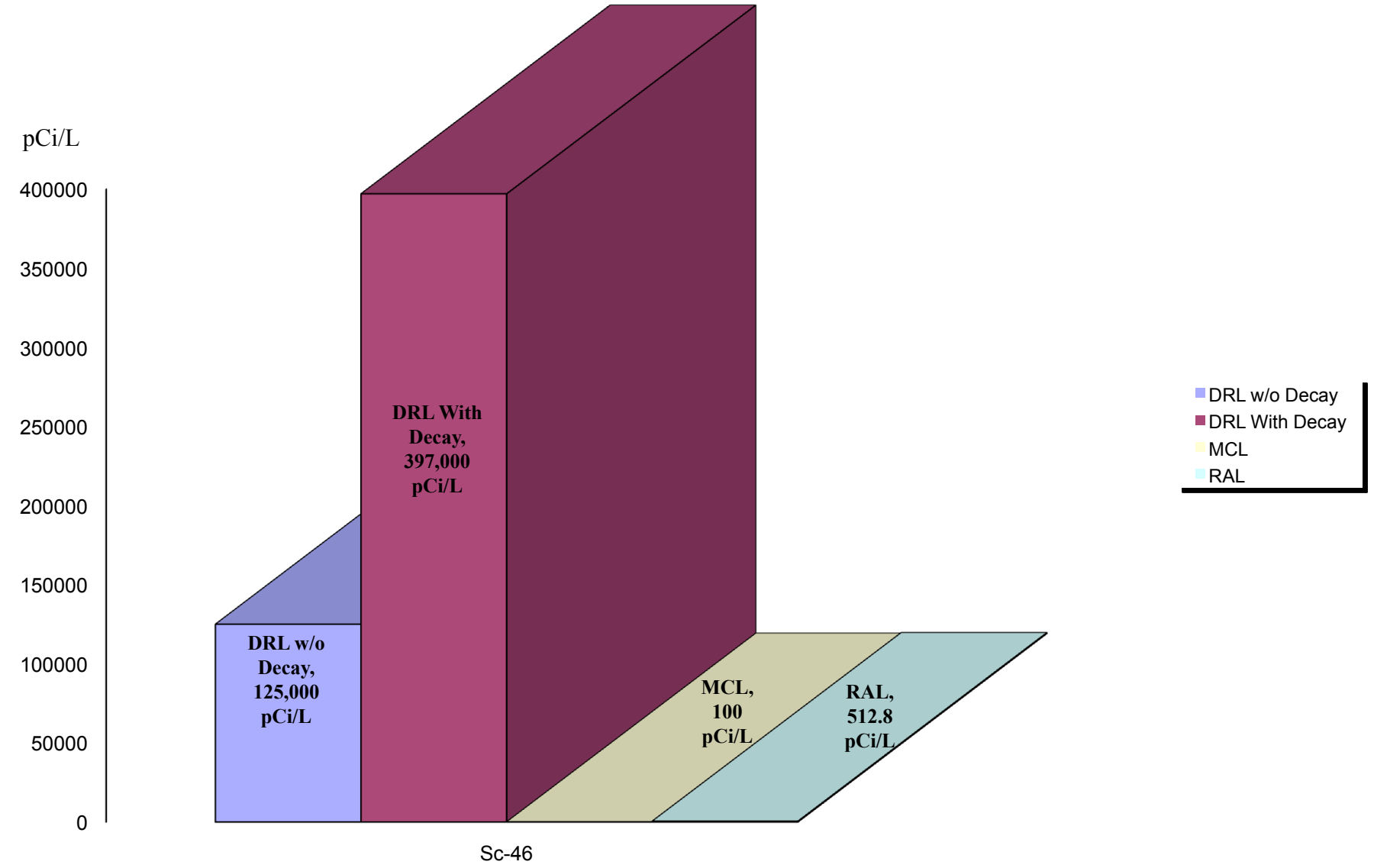

pCi/L
1400000
1200000
1000000
800000
600000
400000
200000
0
DRL With Decay, 1,370,000 pCi/L
DRL w/o Decay, 77,100 pCi/L
MCL, 30 pCi/L
RAL, 315 pCi/L
DRL w/o Decay
DRL With Decay
MCL
RAL

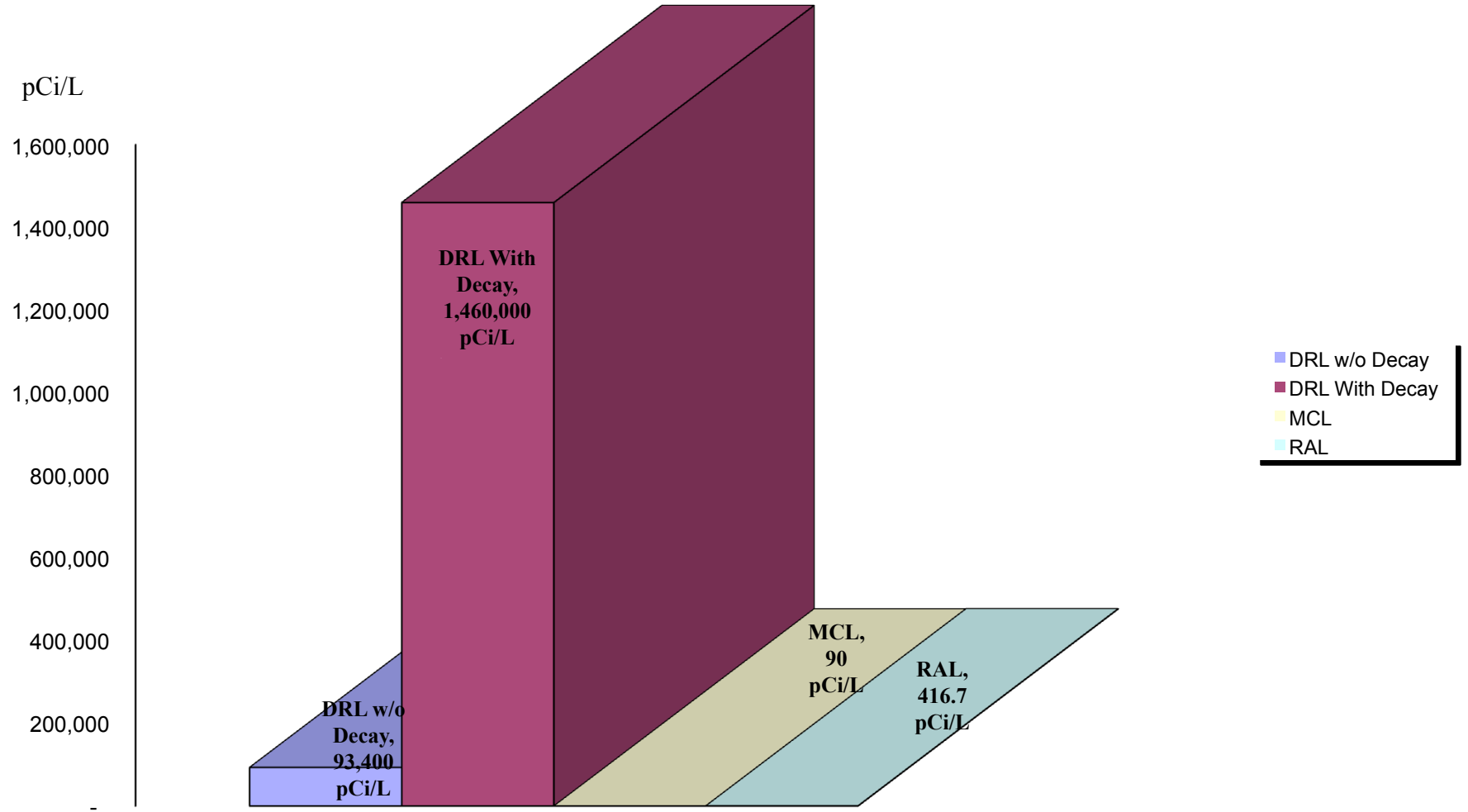
P-32

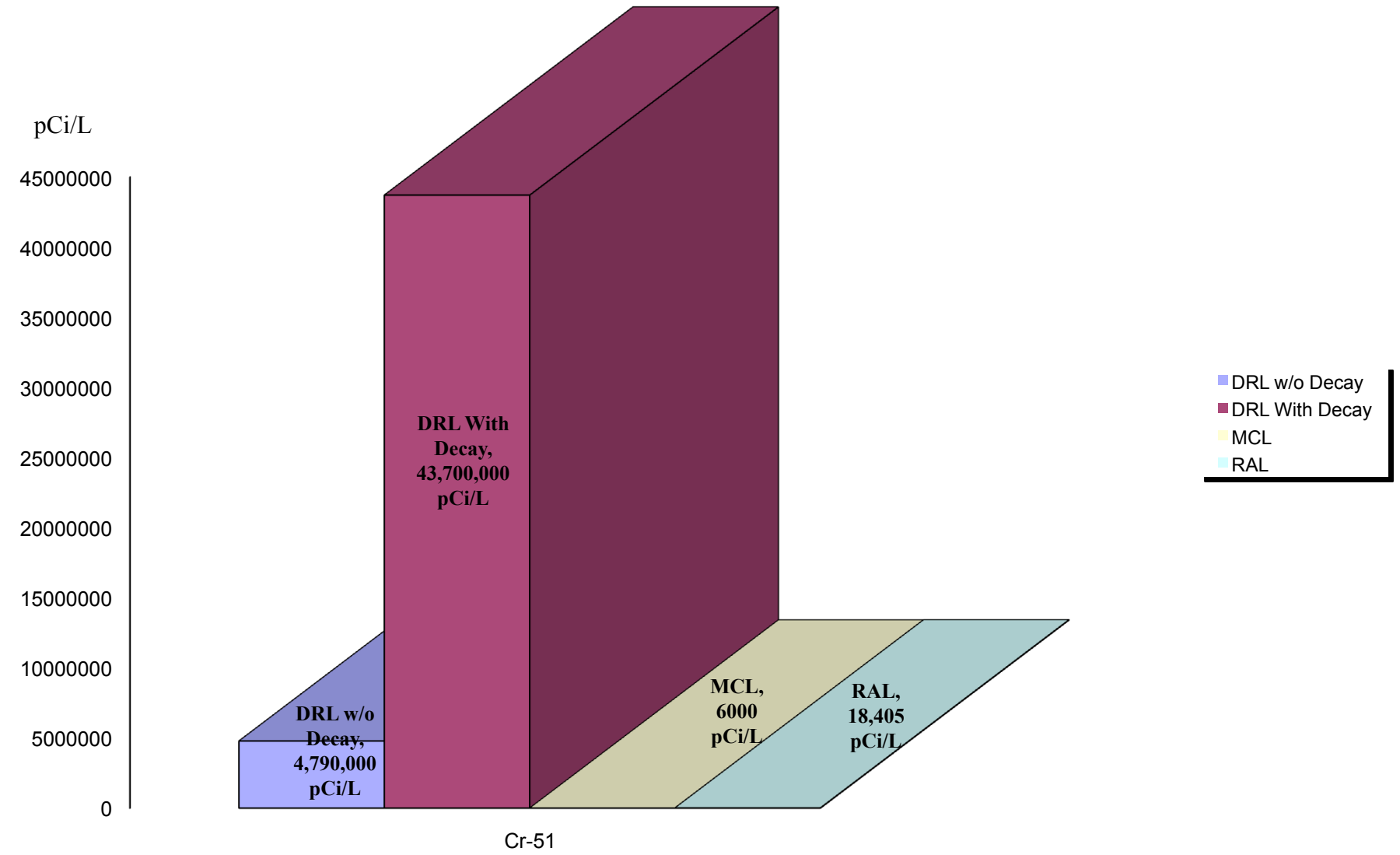

pCi/L
800000
700000
600000
500000
400000
300000
200000
100000
0
DRL w/o Decay, 239,000 pCi/L
DRL With Decay, 731,000 pCi/L
MCL, 500 pCi/L
RAL, 5959.5 pCi/L
DRL w/o Decay
DRL With Decay
MCL
RAL
S-35

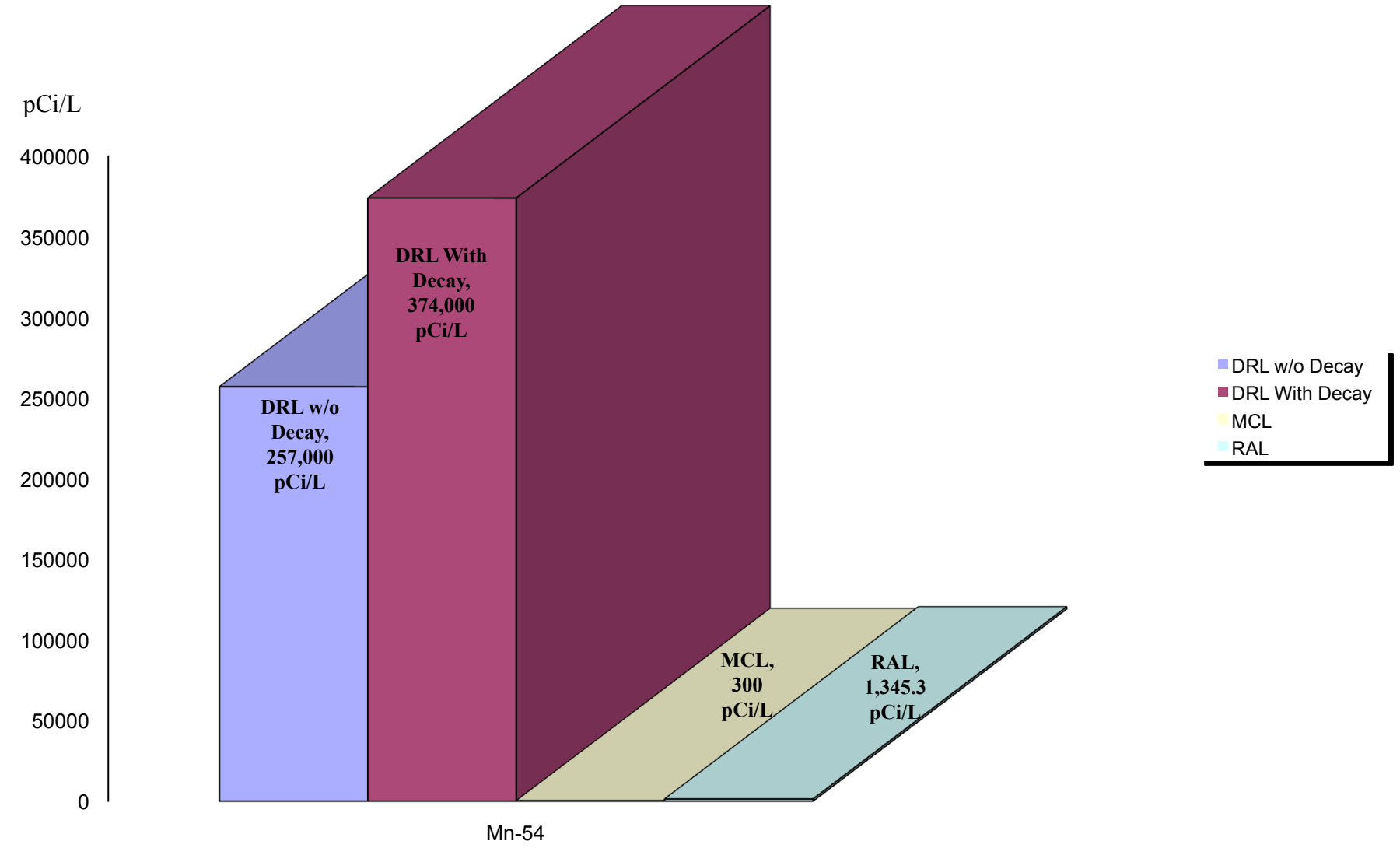

pCi/L
200,000
180,000
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
-
DRL w/o Decay, 199,000 pCi/L
DRL With Decay, 199,000 pCi/L
MCL, 700 pCi/L
RAL, 890.6 pCi/L
DRL w/o Decay
DRL With Decay
MCL
RAL
Cl-36

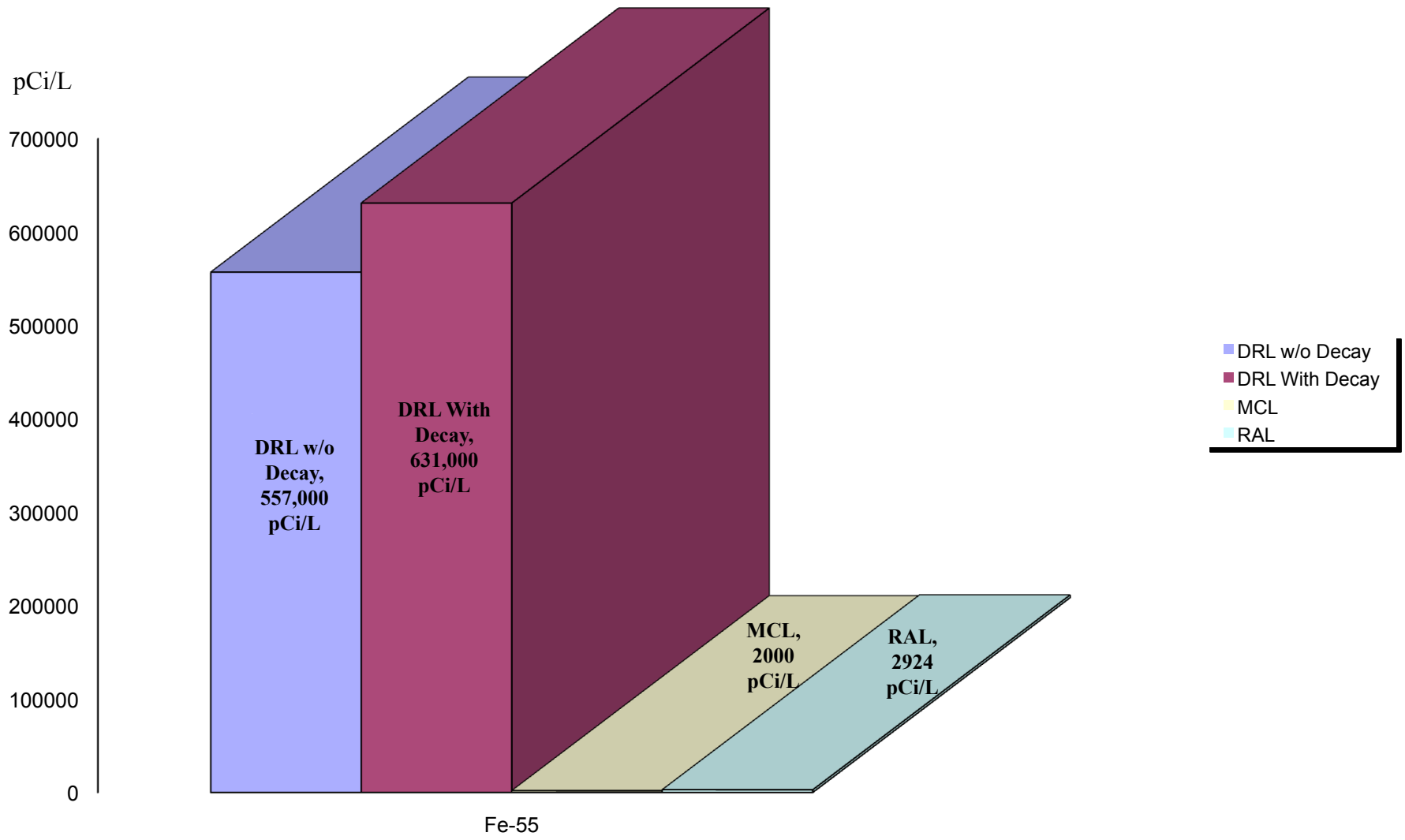

pCi/L
600000
500000
400000
300000
200000
100000
0
DRL w/o Decay, 260,000 pCi/L
DRL With Decay, 513,000 pCi/L
MCL, 10 pCi/L
RAL, 1,116.1 pCi/L
Ca-45
DRL w/o Decay
DRL With Decay
MCL
RAL

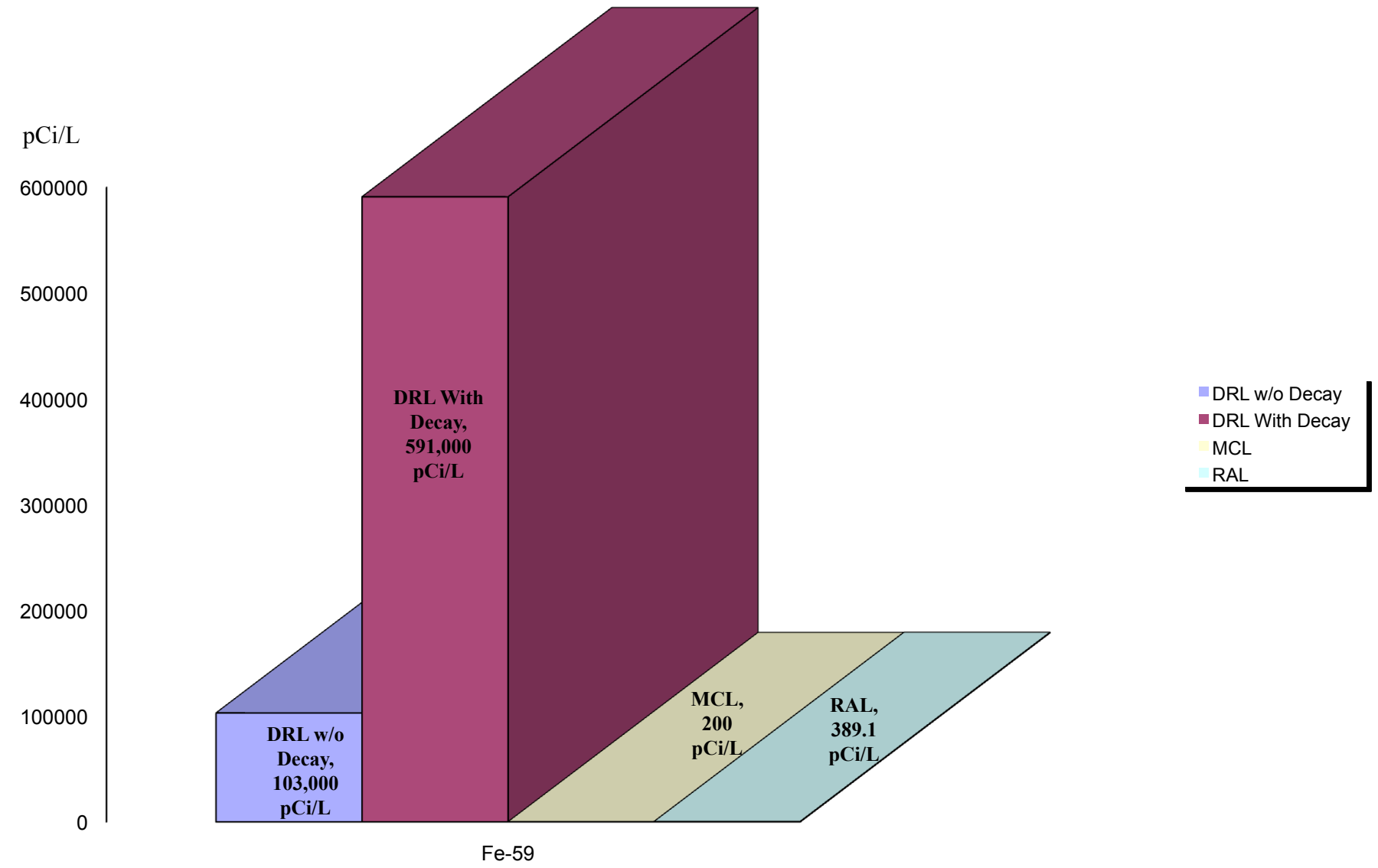

pCi/L
400000
350000
300000
250000
200000
150000
100000
50000
0
DRL w/o Decay, 125,000 pCi/L
DRL With Decay, 397,000 pCi/L
MCL, 100 pCi/L
RAL, 512.8 pCi/L
DRL w/o Decay
DRL With Decay
MCL
RAL
Sc-46

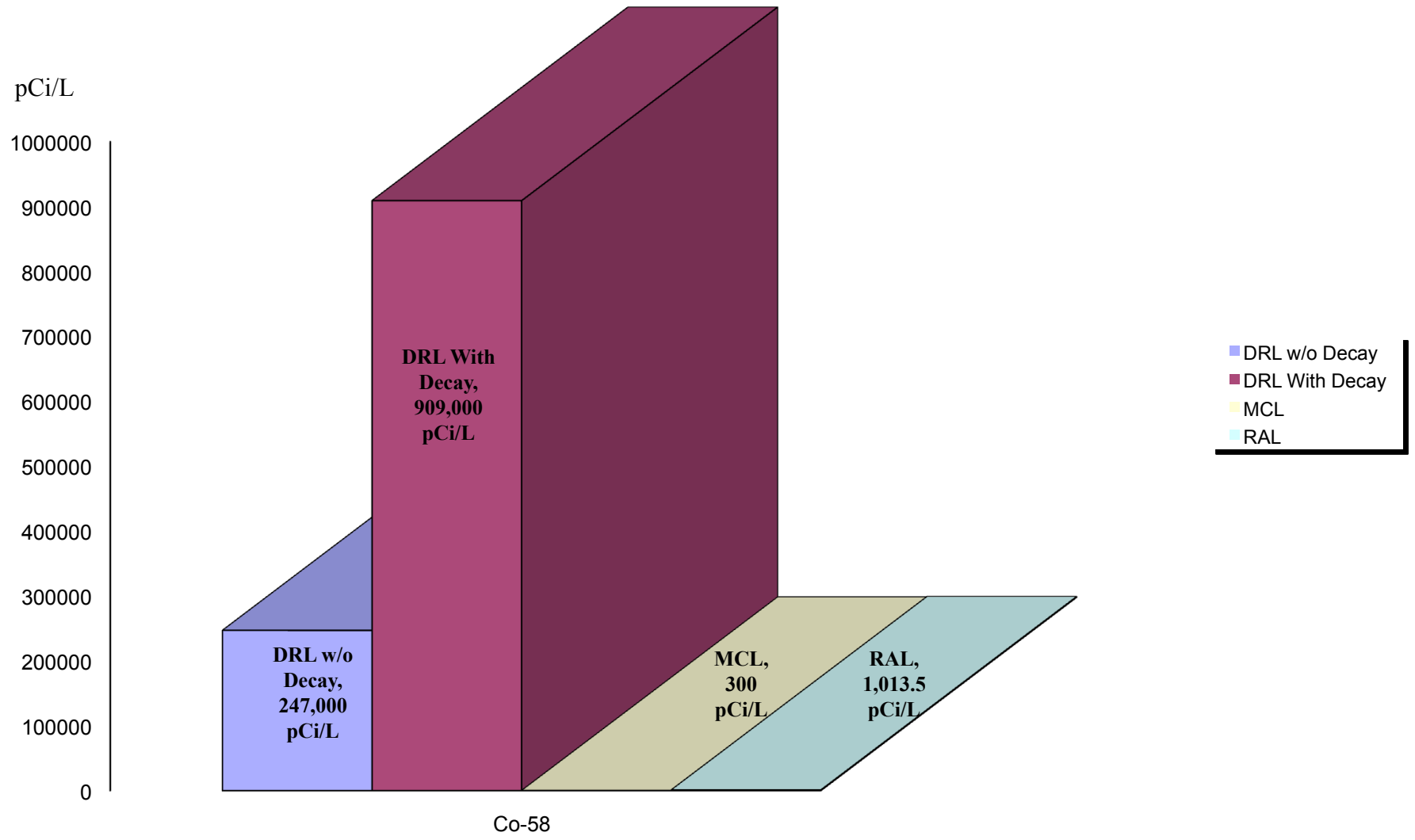

pCi/L
1,600,000
1,400,000
1,200,000
1,000,000
800,000
600,000
400,000
200,000
-
DRL With Decay, 1,460,000 pCi/L
DRL w/o Decay, 93,400 pCi/L
MCL, 90 pCi/L
RAL, 416.7 pCi/L
DRL w/o Decay
DRL With Decay
MCL
RAL

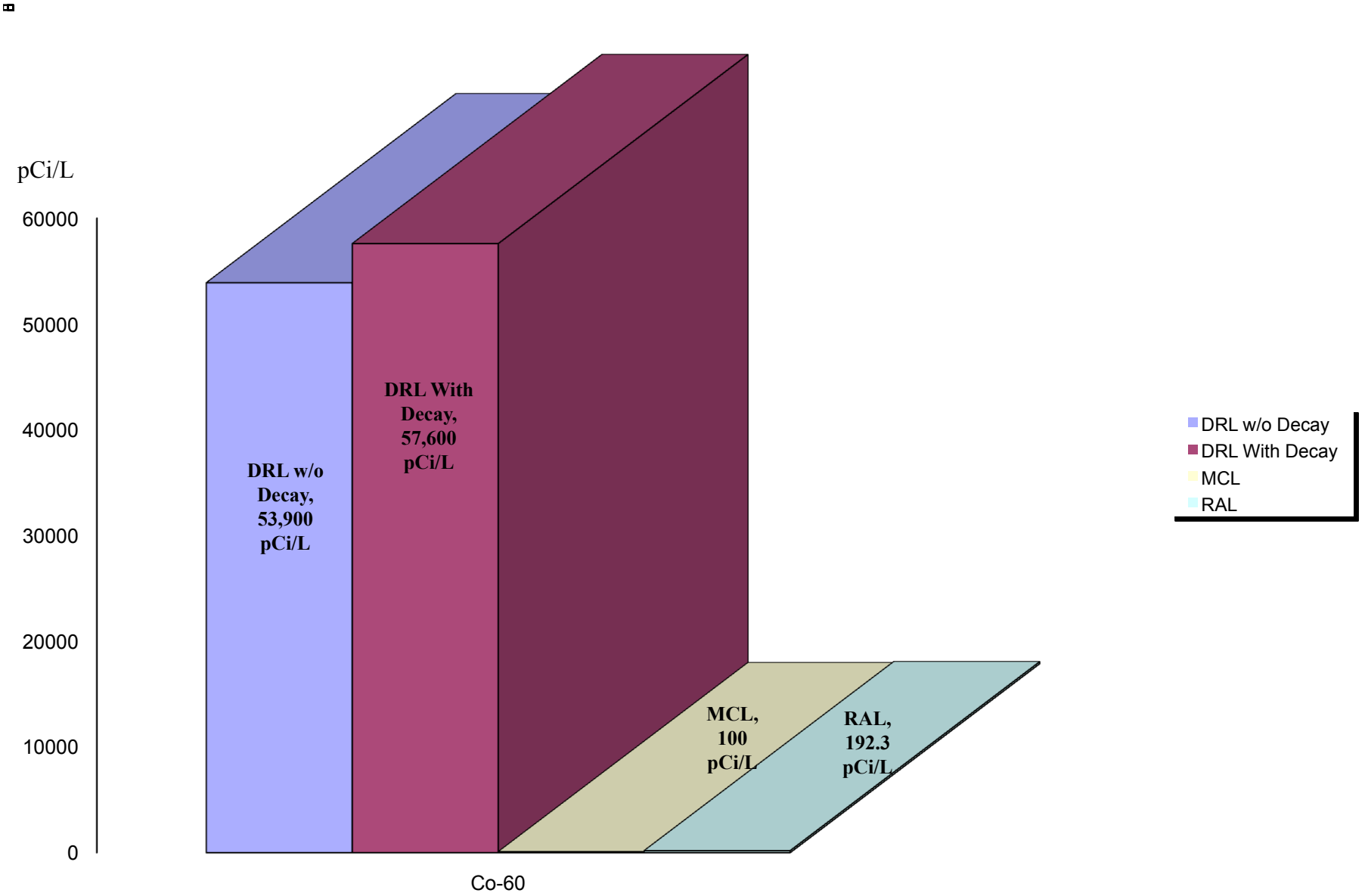

pCi/L
45000000
40000000
35000000
30000000
25000000
20000000
15000000
10000000
5000000
0
DRL w/o Decay, 4,790,000 pCi/L
DRL With Decay, 43,700,000 pCi/L
MCL, 6000 pCi/L
RAL, 18,405 pCi/L
Cr-51
DRL w/o Decay
DRL With Decay
MCL
RAL

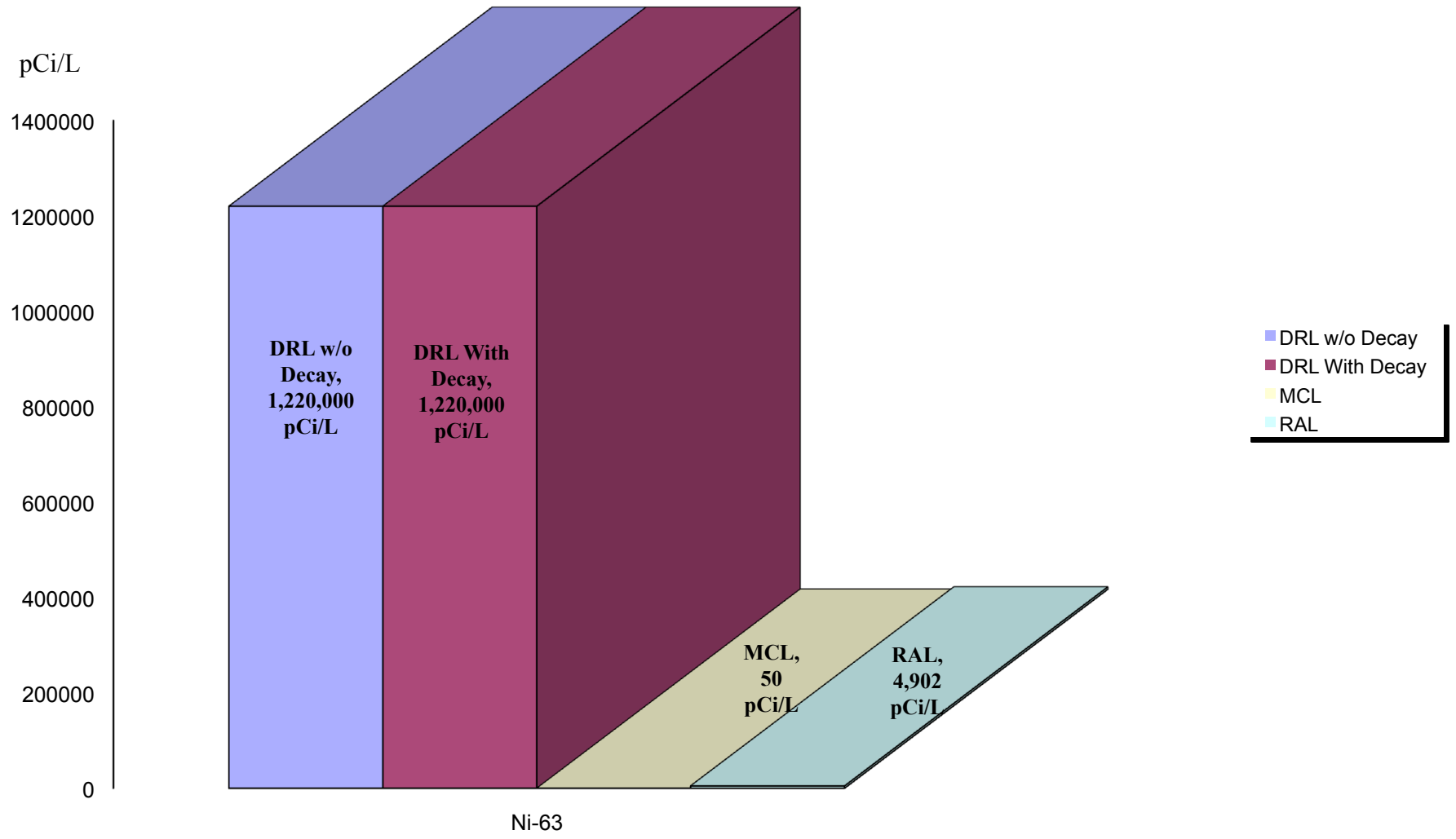

pCi/L
400000
350000
300000
250000
200000
150000
100000
50000
0
DRL w/o Decay, 257,000 pCi/L
DRL With Decay, 374,000 pCi/L
MCL, 300 pCi/L
RAL, 1,345.3 pCi/L
Mn-54
DRL w/o Decay
DRL With Decay
MCL
RAL

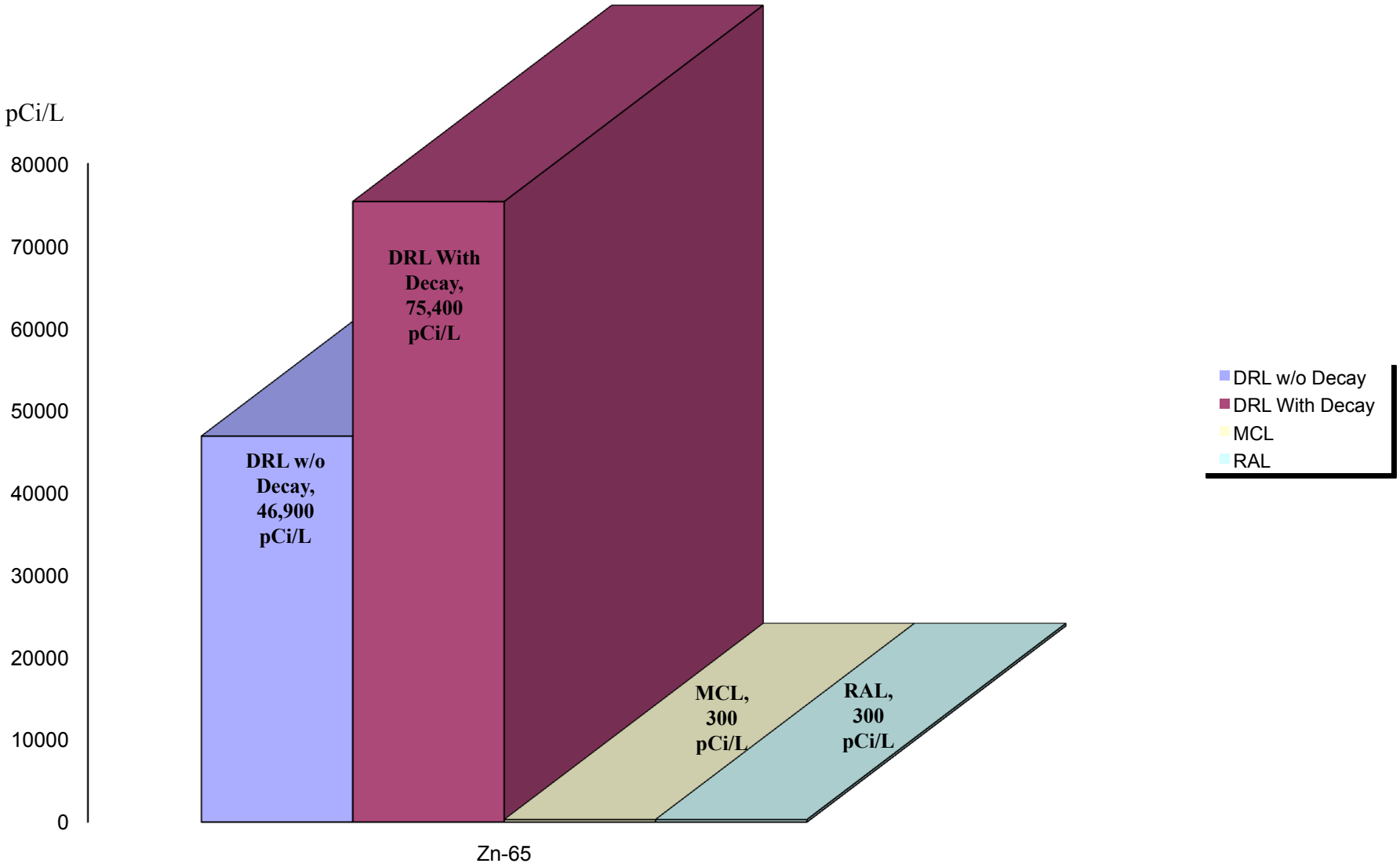

pCi/L
700000
600000
500000
400000
300000
200000
100000
0
DRL w/o Decay, 557,000 pCi/L
DRL With Decay, 631,000 pCi/L
MCL, 2000 pCi/L
RAL, 2924 pCi/L
Fe-55
DRL w/o Decay
DRL With Decay
MCL
RAL

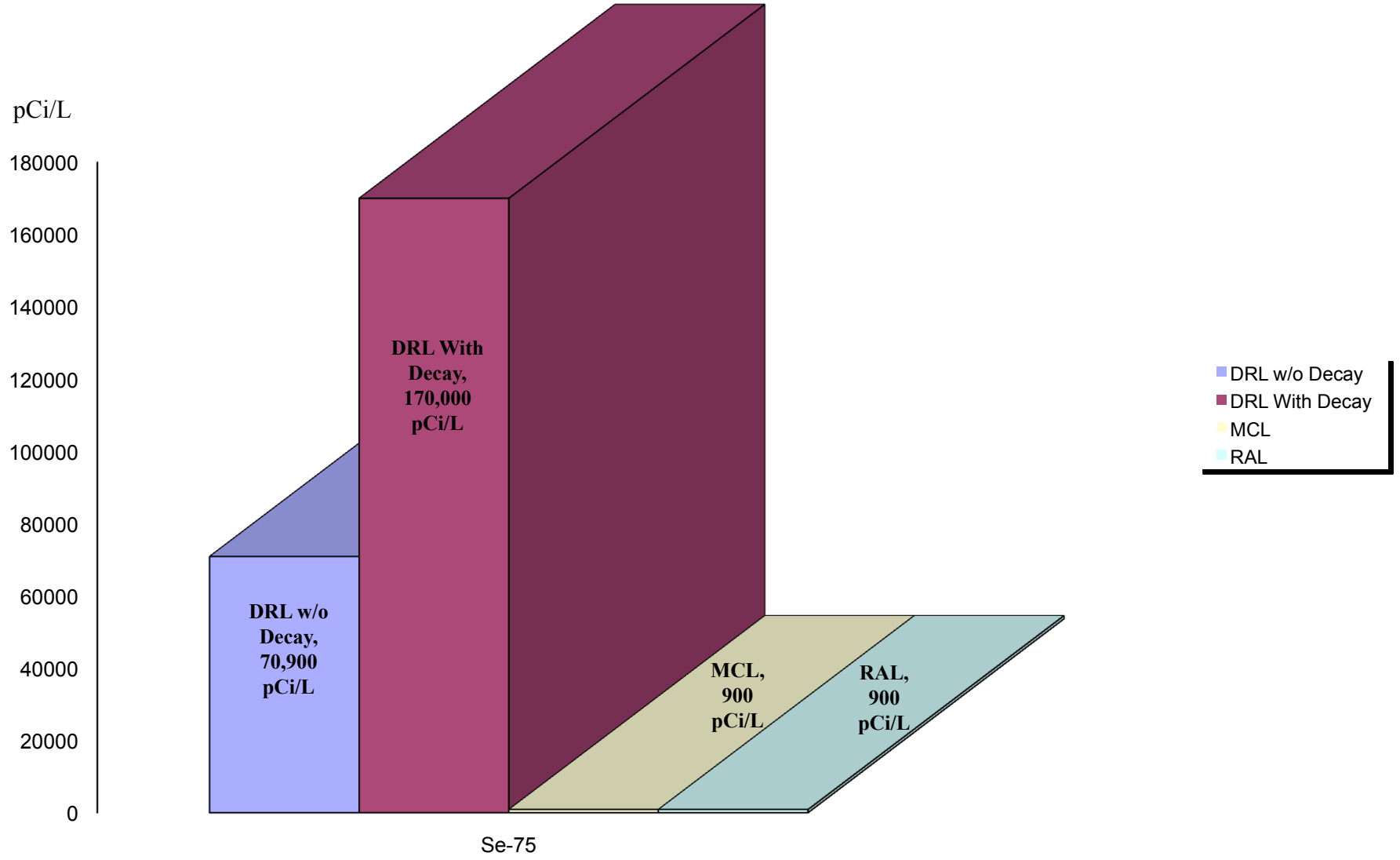

pCi/L
600000
500000
400000
300000
200000
100000
0
DRL With Decay, 591,000 pCi/L
DRL w/o Decay, 103,000 pCi/L
MCL, 200 pCi/L
RAL, 389.1 pCi/L
DRL w/o Decay
DRL With Decay
MCL
RAL
Fe-59

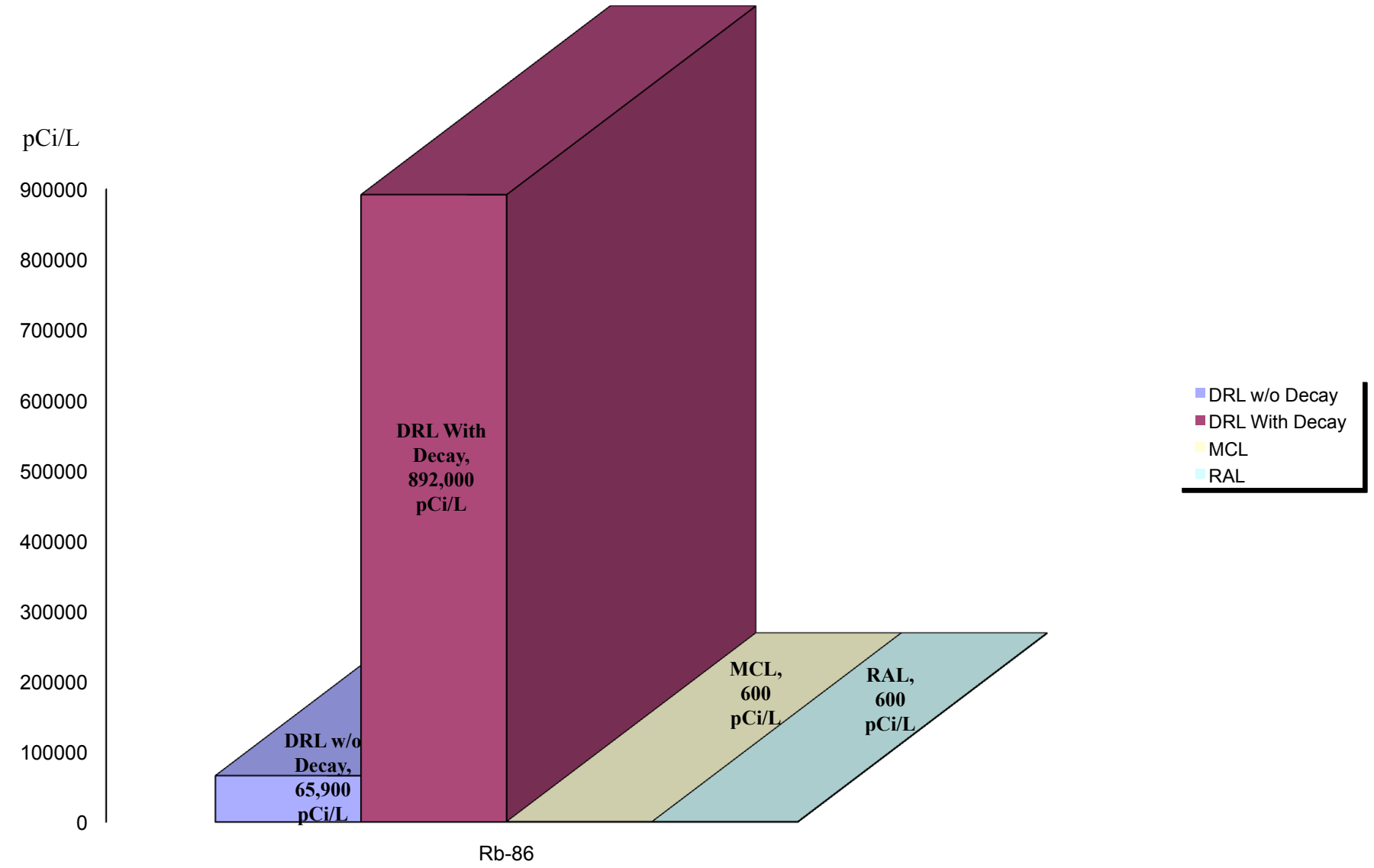

pCi/L
1000000
900000
800000
700000
600000
500000
400000
300000
200000
100000
0
DRL With Decay, 909,000 pCi/L
DRL w/o Decay, 247,000 pCi/L
MCL, 300 pCi/L
RAL, 1,013.5 pCi/L
Co-58
DRL w/o Decay
DRL With Decay
MCL
RAL

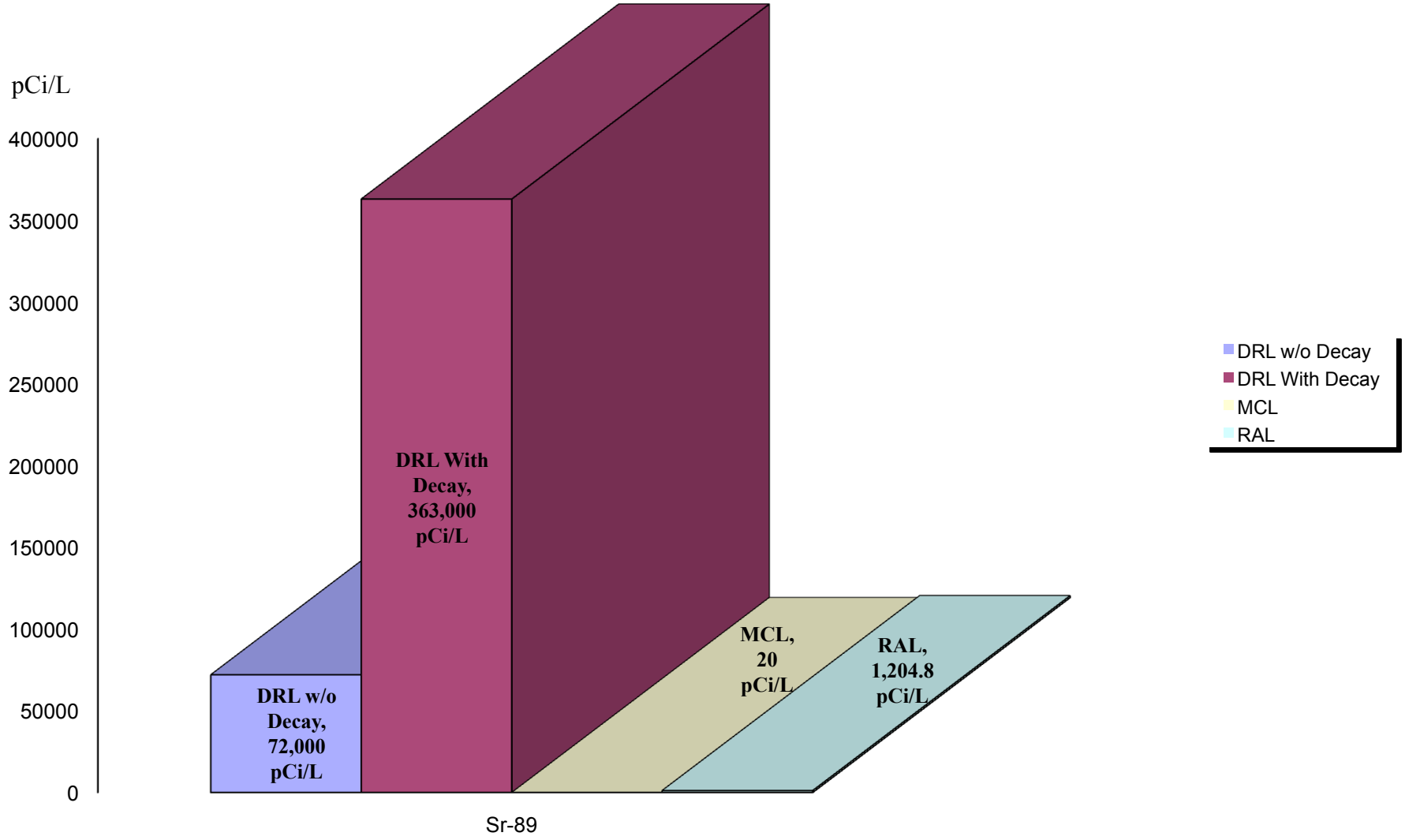

pCi/L
60000
50000
40000
30000
20000
10000
0
DRL w/o Decay, 53,900 pCi/L
DRL With Decay, 57,600 pCi/L
MCL, 100 pCi/L
RAL, 192.3 pCi/L
Co-60
DRL w/o Decay
DRL With Decay
MCL
RAL

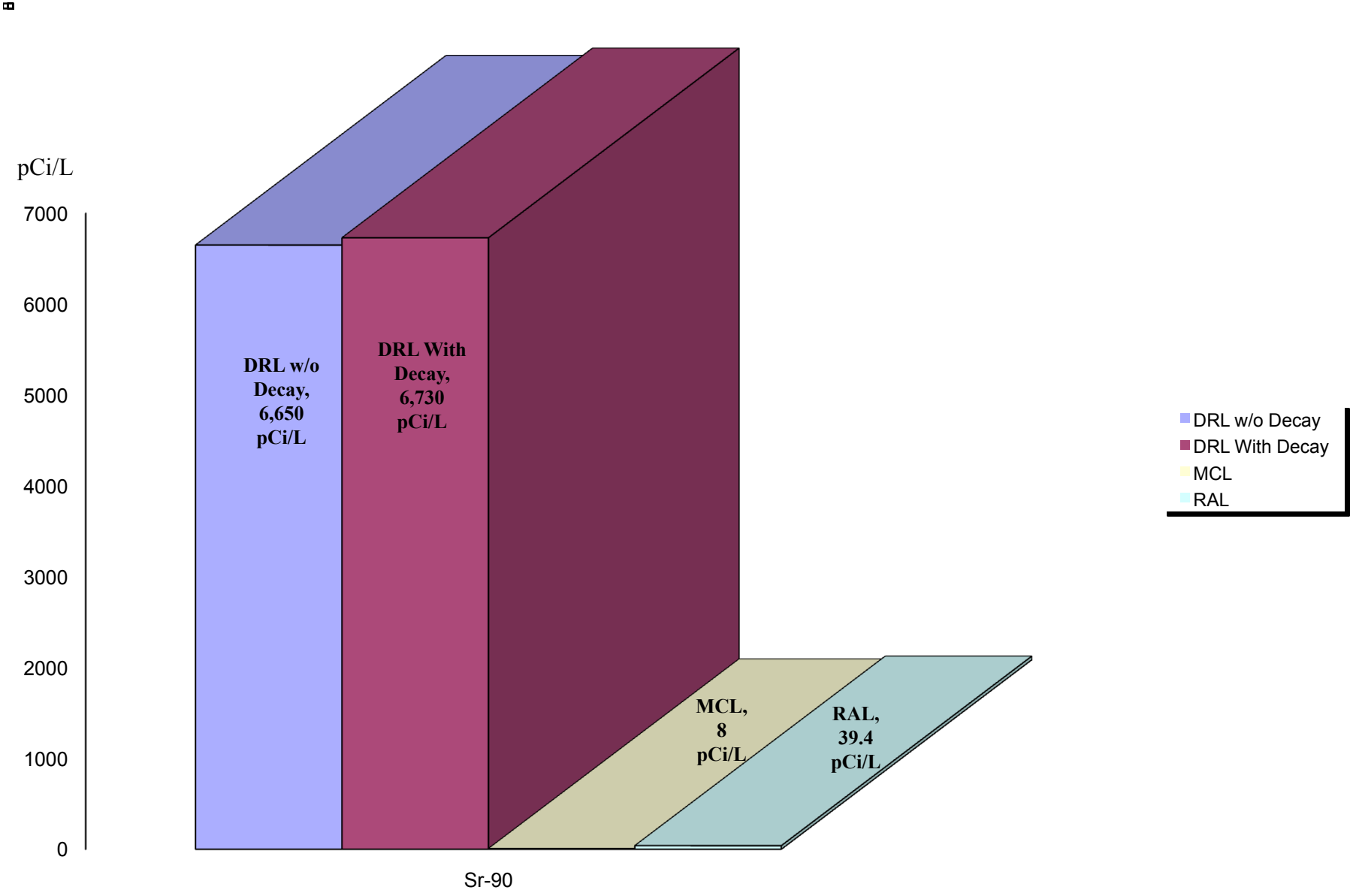

pCi/L
1400000
1200000
1000000
800000
600000
400000
200000
0
DRL w/o Decay, 1,220,000 pCi/L
DRL With Decay, 1,220,000 pCi/L
MCL, 50 pCi/L
RAL, 4,902 pCi/L
Ni-63
DRL w/o Decay
DRL With Decay
MCL
RAL

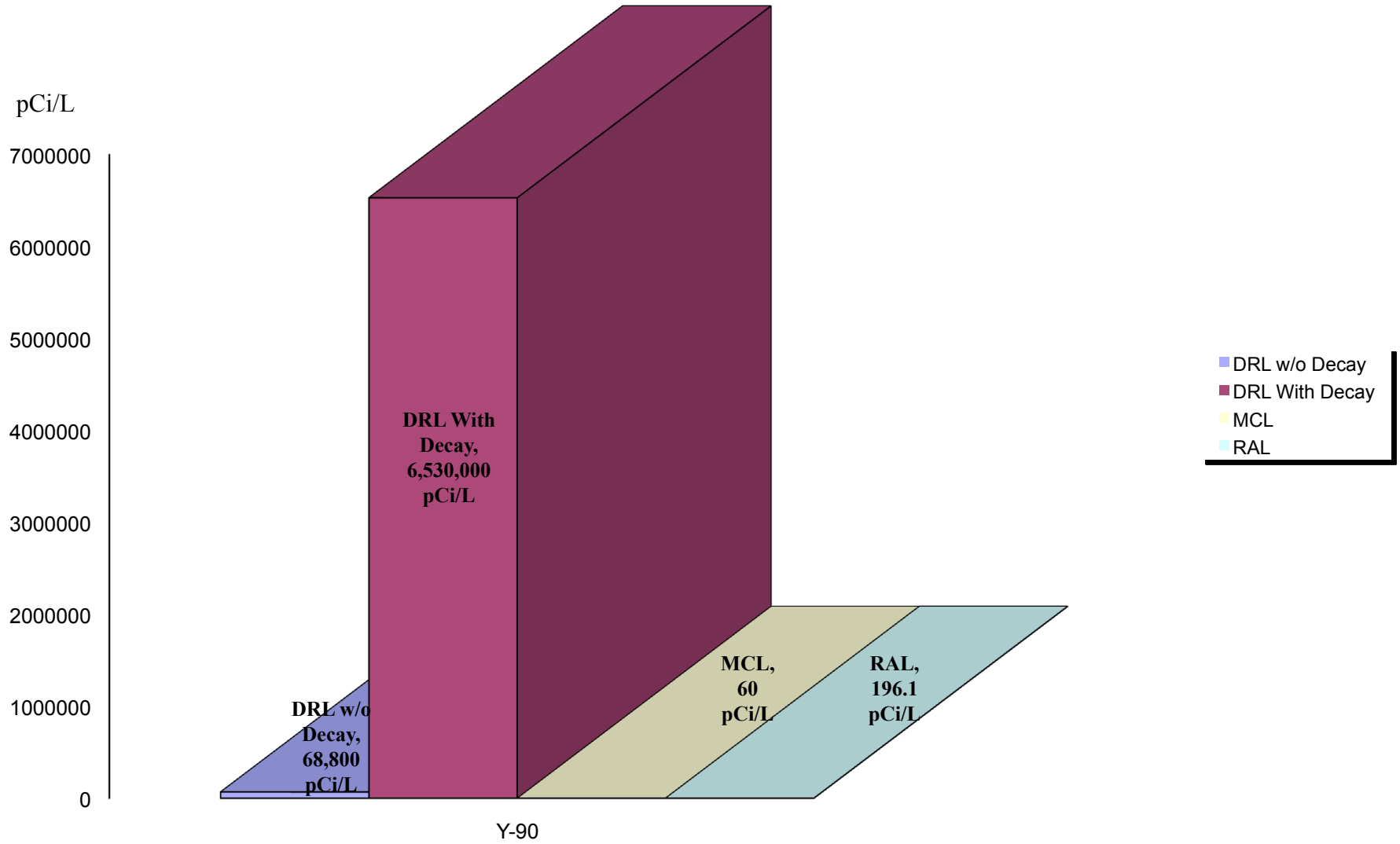

pCi/L
80000
70000
60000
50000
40000
30000
20000
10000
0
DRL w/o Decay, 46,900 pCi/L
DRL With Decay, 75,400 pCi/L
MCL, 300 pCi/L
RAL, 300 pCi/L
Zn-65
DRL w/o Decay
DRL With Decay
MCL
RAL

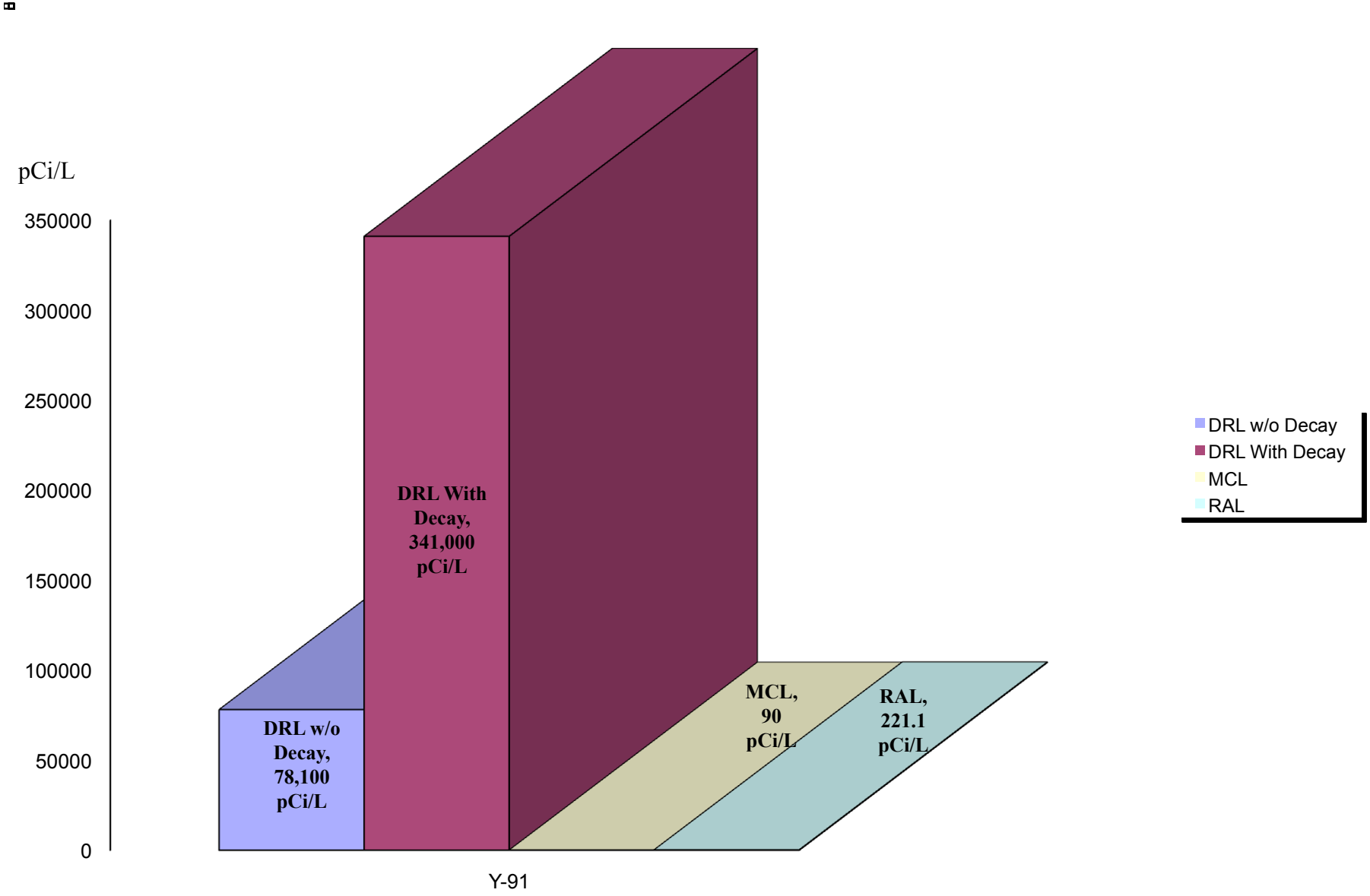

pCi/L
180000
160000
140000
120000
100000
80000
60000
40000
20000
0
DRL w/o Decay, 70,900 pCi/L
DRL With Decay, 170,000 pCi/L
MCL, 900 pCi/L
RAL, 900 pCi/L
Se-75
DRL w/o Decay
DRL With Decay
MCL
RAL

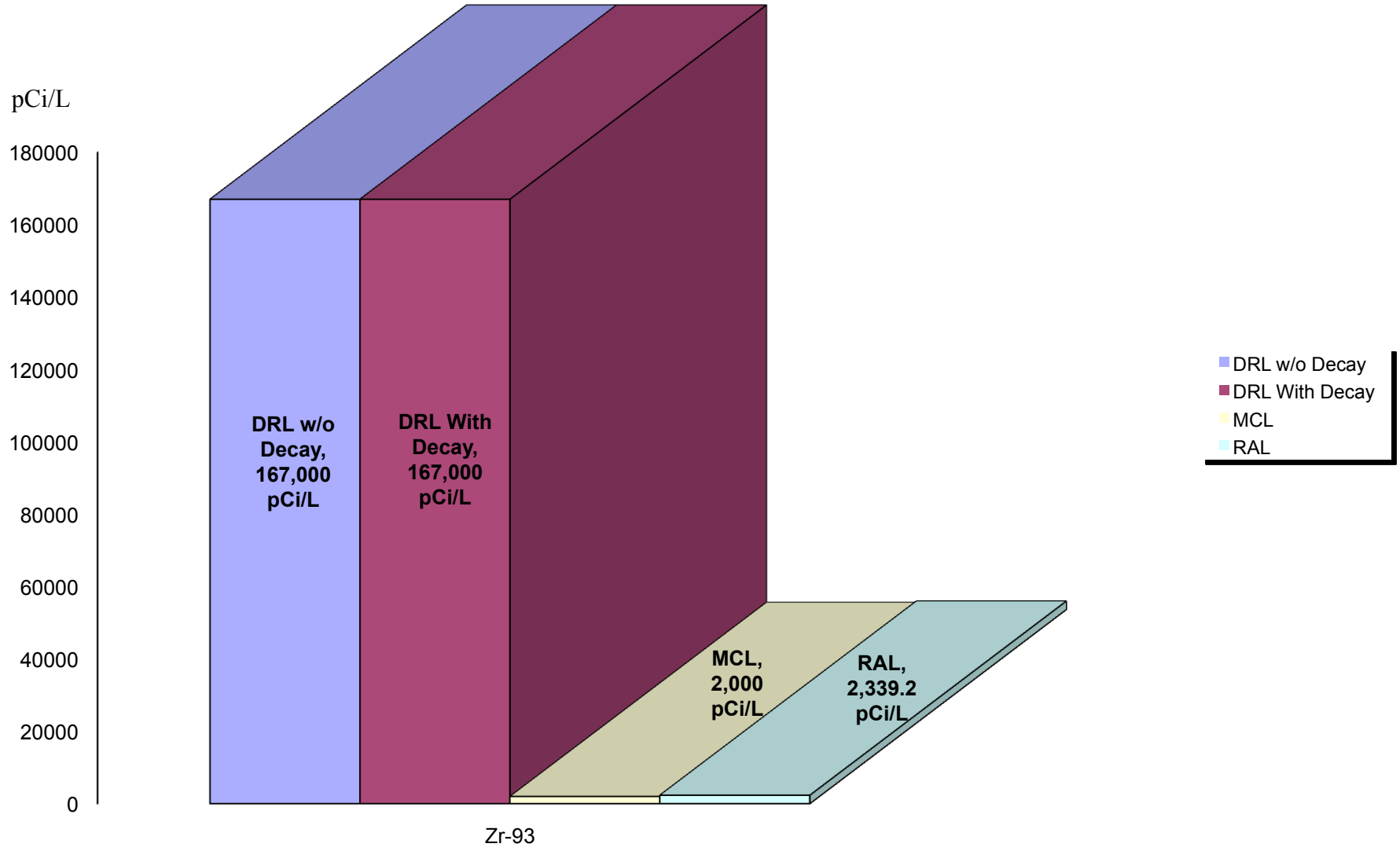

pCi/L
900000
800000
700000
600000
500000
400000
300000
200000
100000
0
DRL w/o Decay, 65,900 pCi/L
DRL With Decay, 892,000 pCi/L
MCL, 600 pCi/L
RAL, 600 pCi/L
Rb-86
DRL w/o Decay
DRL With Decay
MCL
RAL

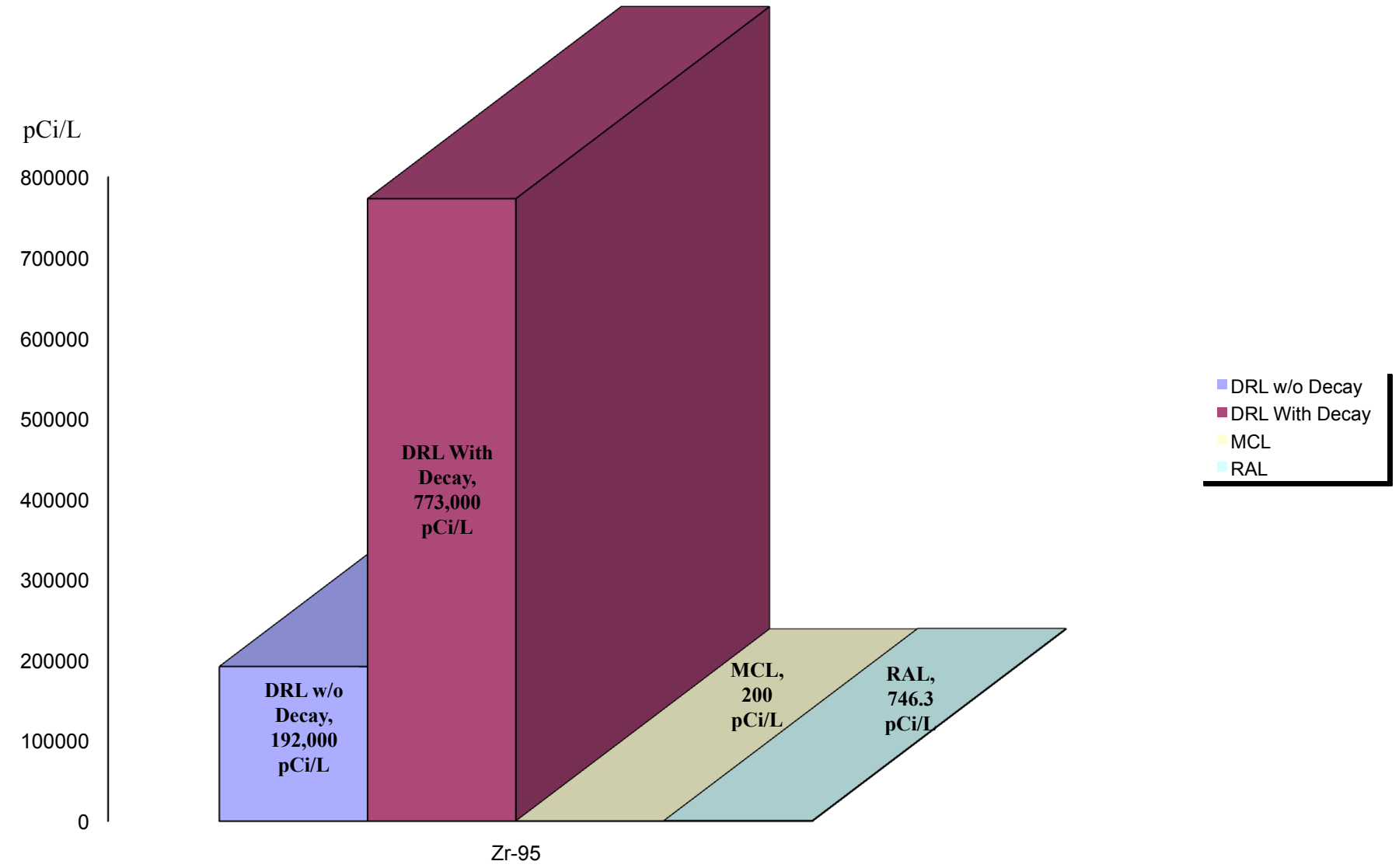

pCi/L
400000
350000
300000
250000
200000
150000
100000
50000
0
DRL w/o Decay, 72,000 pCi/L
DRL With Decay, 363,000 pCi/L
MCL, 20 pCi/L
RAL, 1,204.8 pCi/L
Sr-89
DRL w/o Decay
DRL With Decay
MCL
RAL

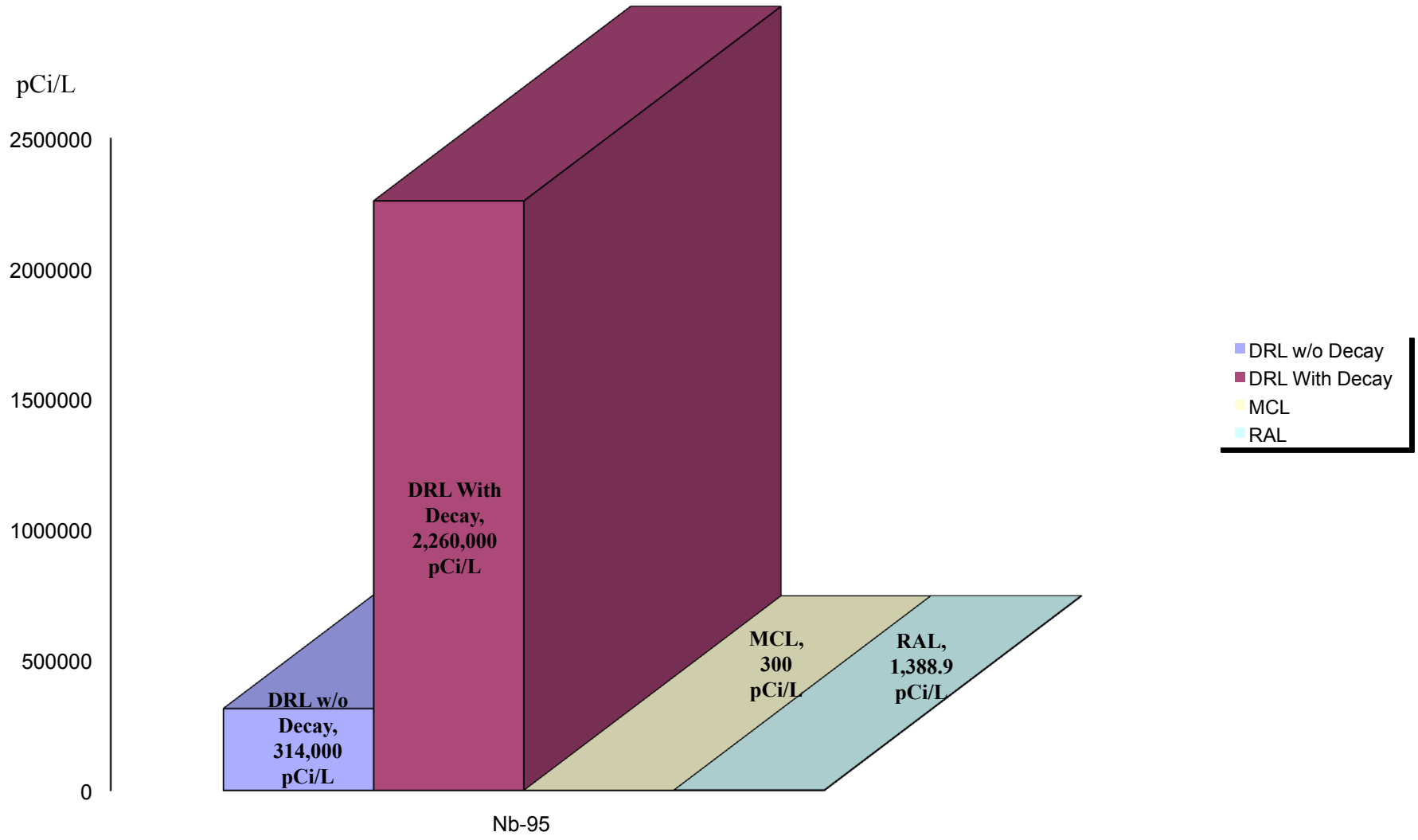

pCi/L
7000
6000
5000
4000
3000
2000
1000
0
DRL w/o Decay, 6,650 pCi/L
DRL With Decay, 6,730 pCi/L
MCL, 8 pCi/L
RAL, 39.4 pCi/L
Sr-90
DRL w/o Decay
DRL With Decay
MCL
RAL

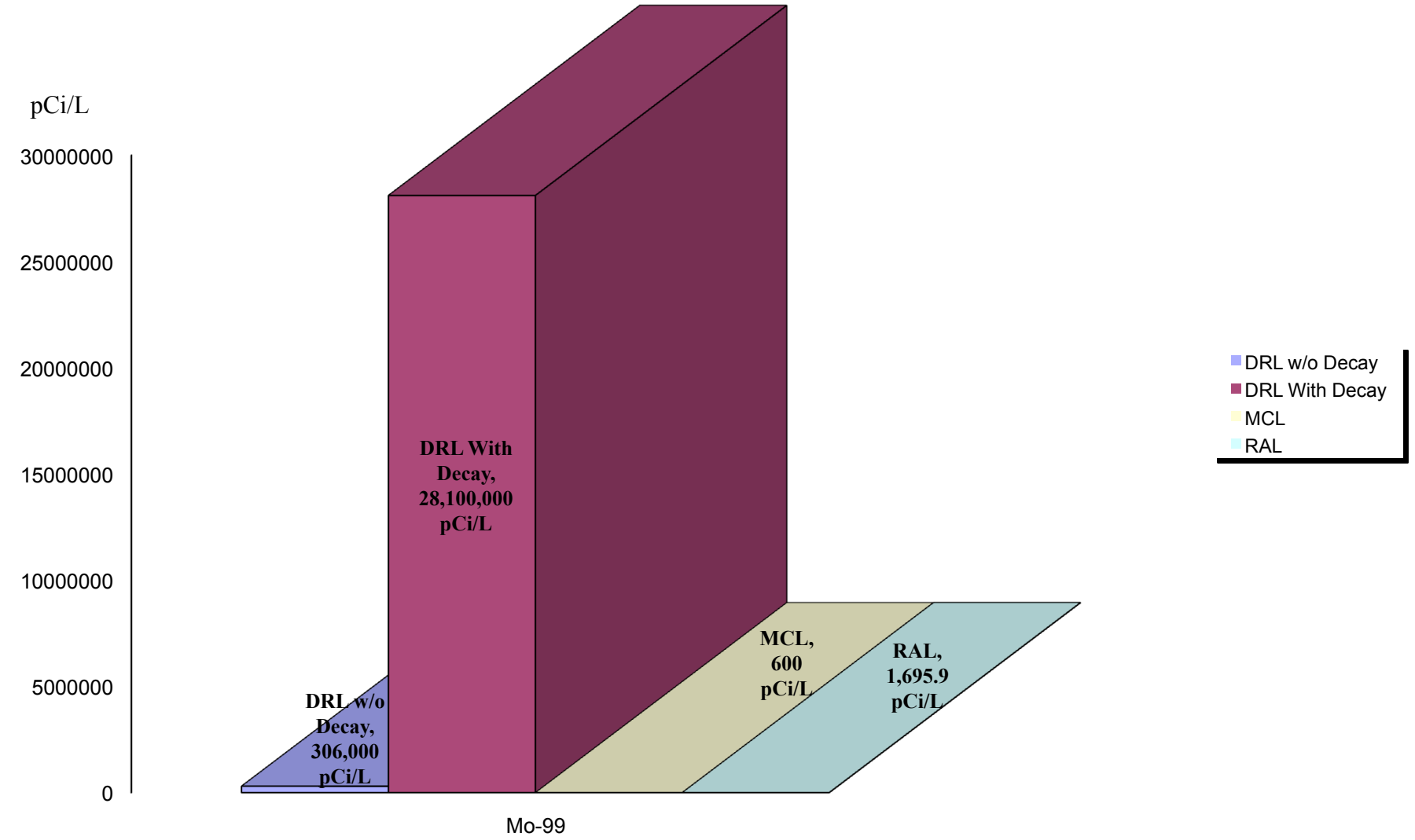

pCi/L
7000000
6000000
5000000
4000000
3000000
2000000
1000000
0
DRL With Decay, 6,530,000 pCi/L
DRL w/o Decay, 68,800 pCi/L
MCL, 60 pCi/L
RAL, 196.1 pCi/L
Y-90
DRL w/o Decay
DRL With Decay
MCL
RAL

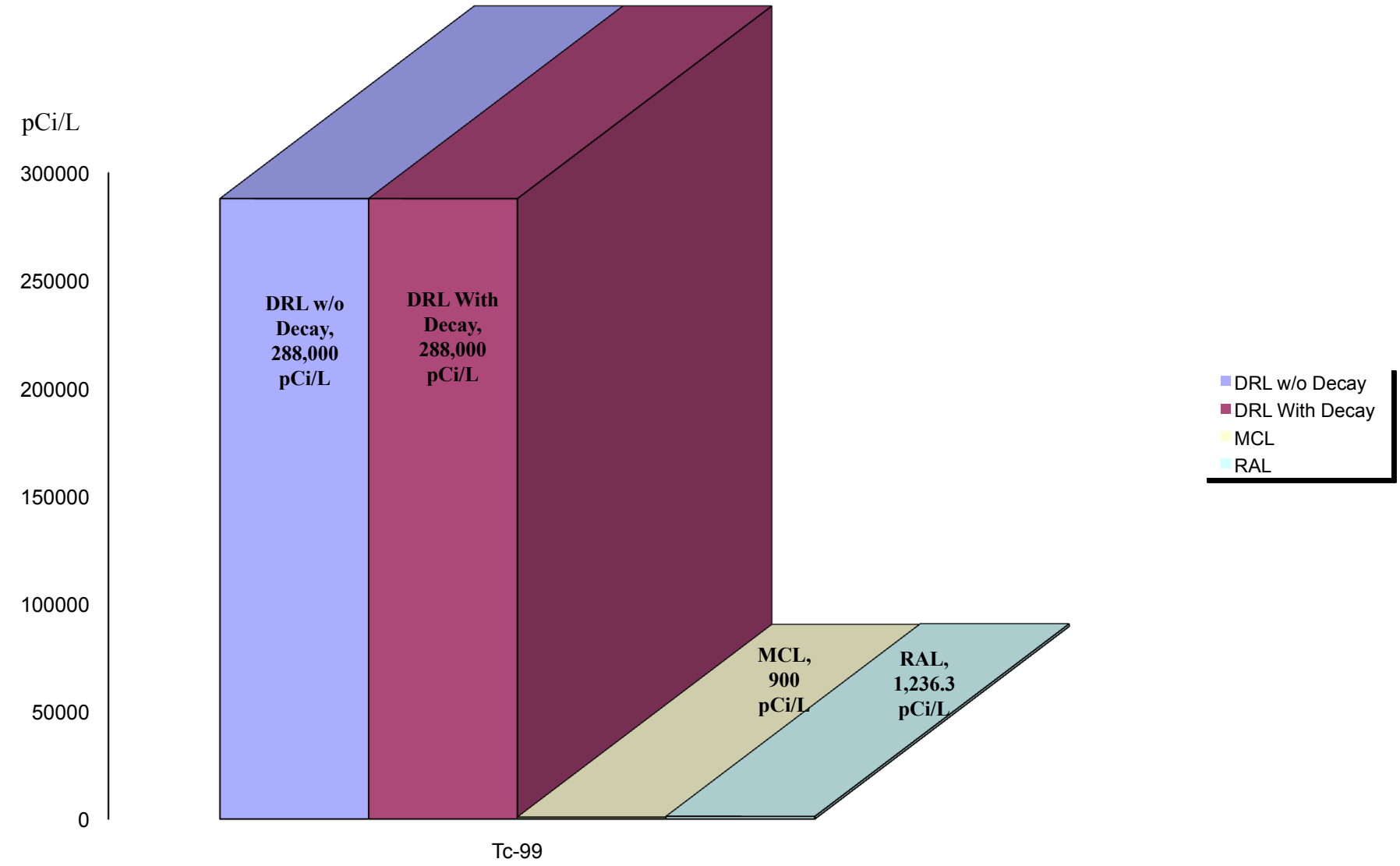

pCi/L
350000
300000
250000
200000
150000
100000
50000
0
DRL w/o Decay, 78,100 pCi/L
DRL With Decay, 341,000 pCi/L
MCL, 90 pCi/L
RAL, 221.1 pCi/L
Y-91
DRL w/o Decay
DRL With Decay
MCL
RAL

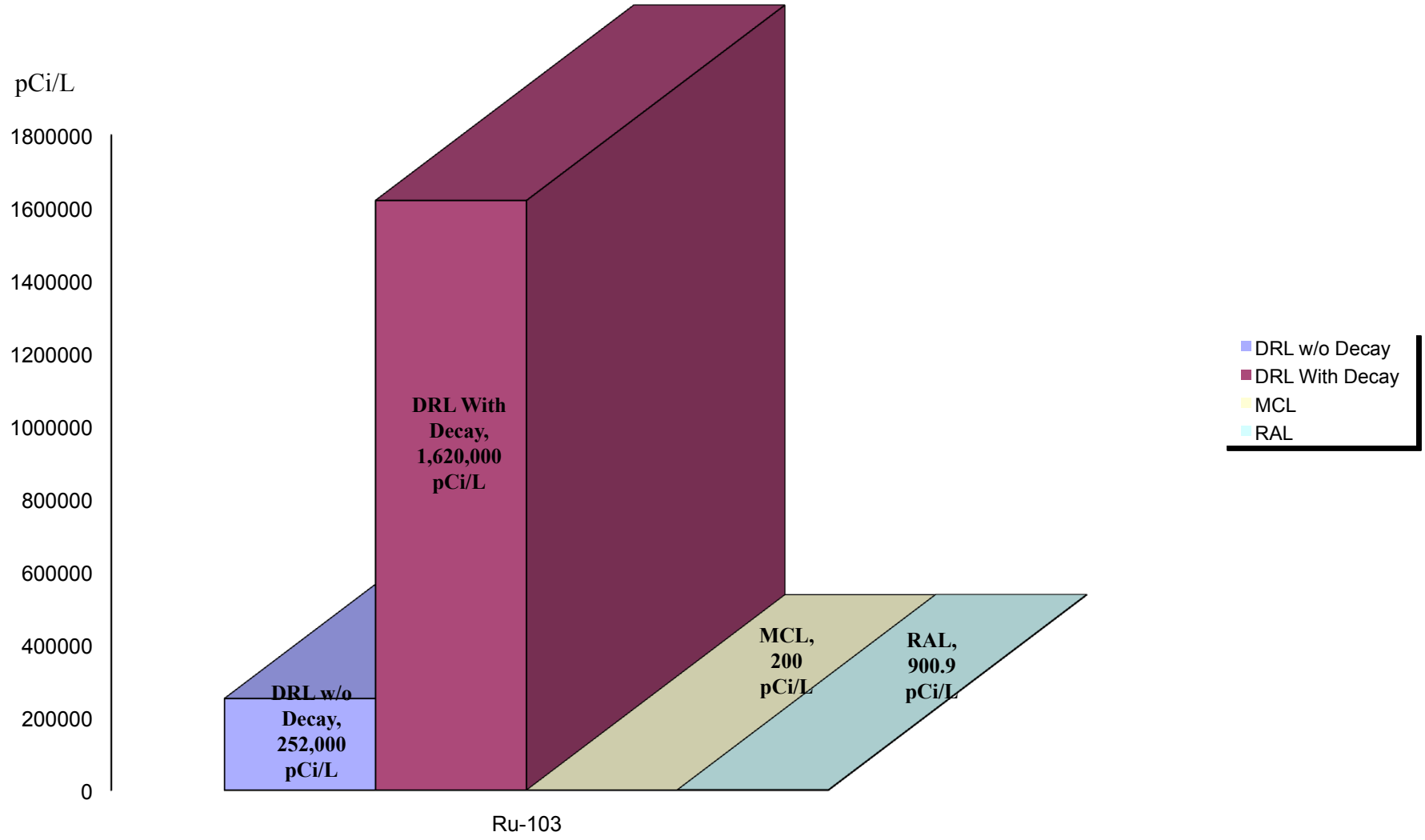

pCi/L
180000
160000
140000
120000
100000
80000
60000
40000
20000
0
DRL w/o Decay, 167,000 pCi/L
DRL With Decay, 167,000 pCi/L
MCL, 2,000 pCi/L
RAL, 2,339.2 pCi/L
Zr-93
DRL w/o Decay
DRL With Decay
MCL
RAL

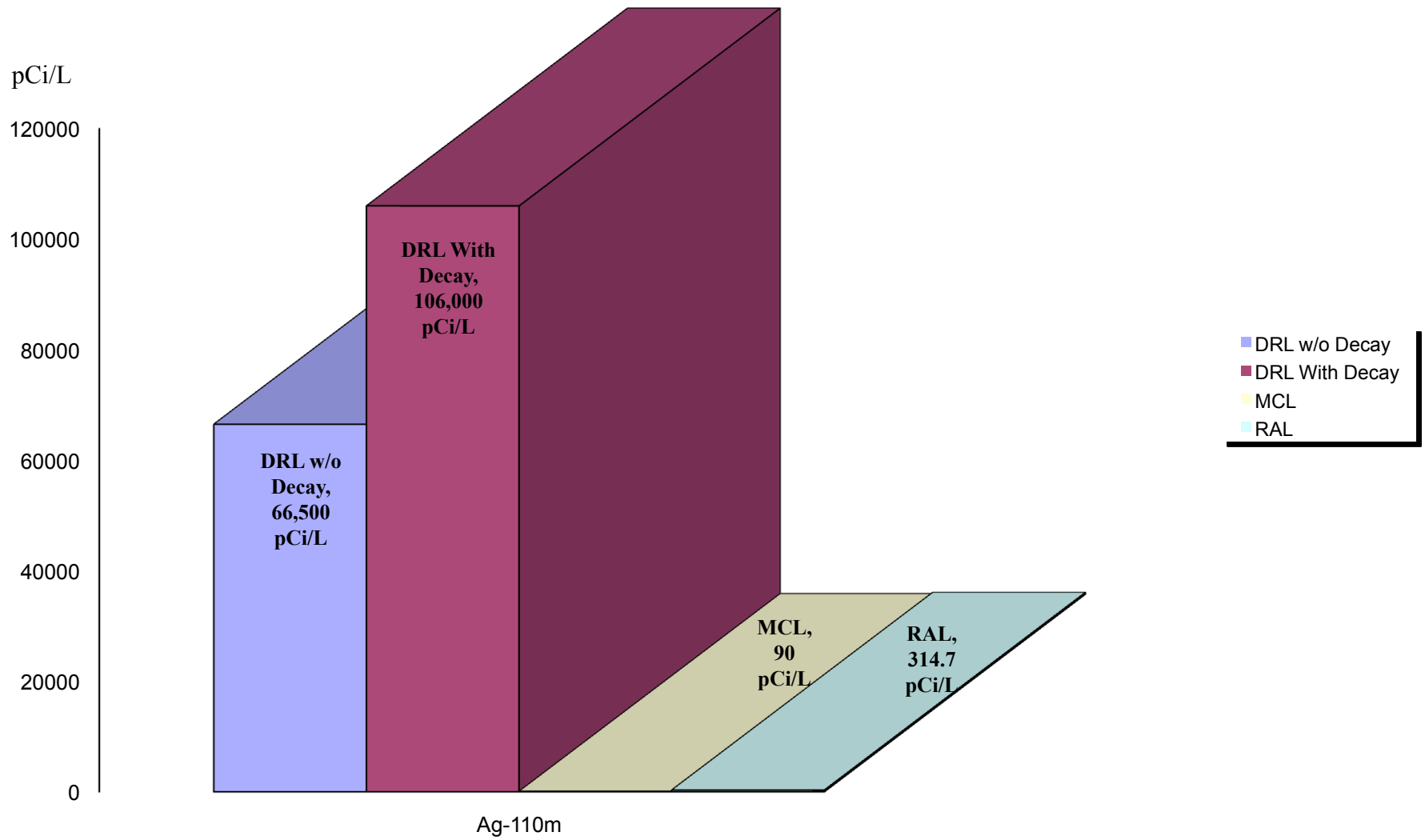

pCi/L
800000
700000
600000
500000
400000
300000
200000
100000
0
DRL w/o Decay, 192,000 pCi/L
DRL With Decay, 773,000 pCi/L
MCL, 200 pCi/L
RAL, 746.3 pCi/L
Zr-95
DRL w/o Decay
DRL With Decay
MCL
RAL

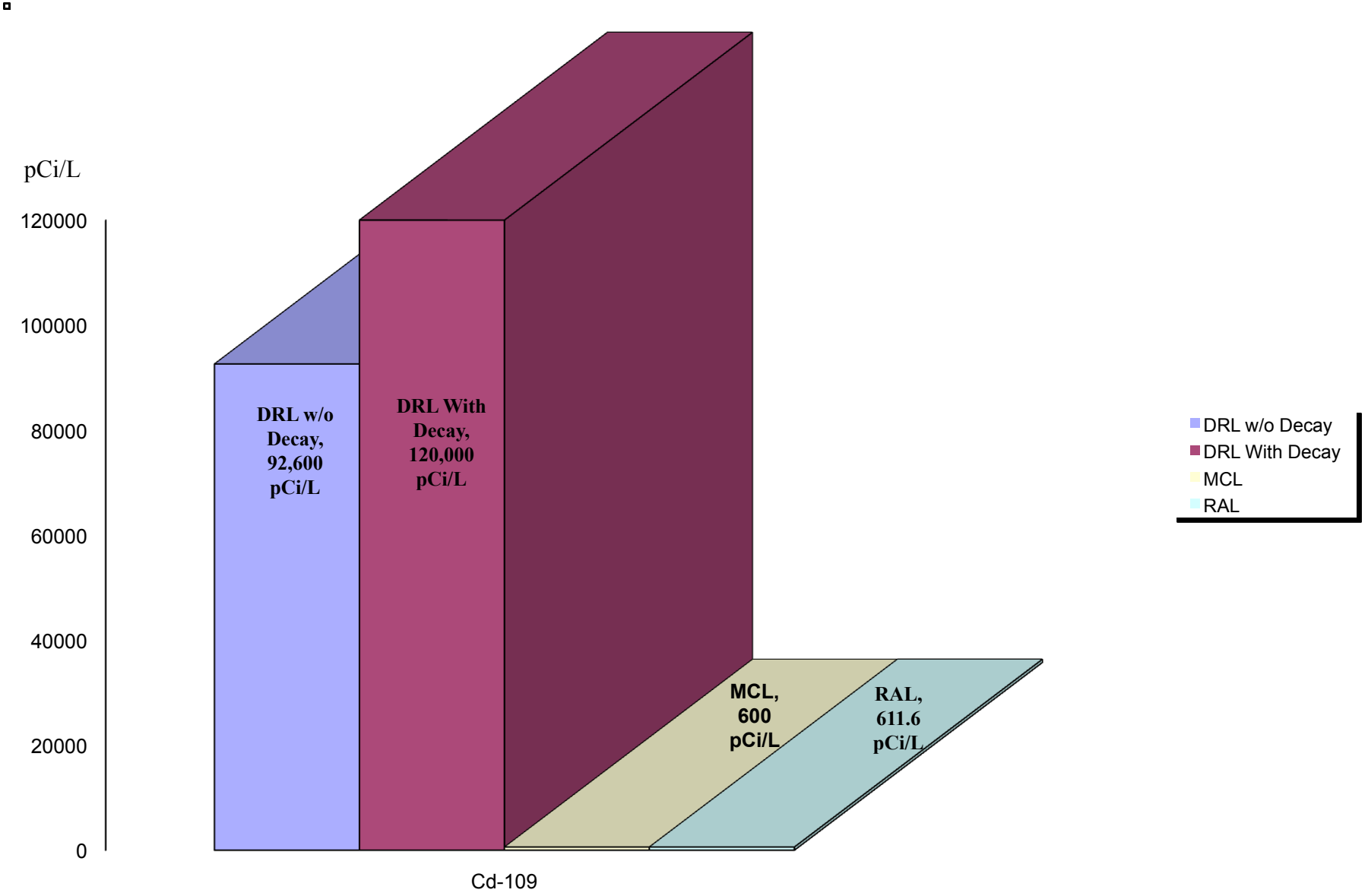

pCi/L
2500000
2000000
1500000
1000000
500000
0
DRL w/o Decay, 314,000 pCi/L
DRL With Decay, 2,260,000 pCi/L
MCL, 300 pCi/L
RAL, 1,388.9 pCi/L
Nb-95
DRL w/o Decay
DRL With Decay
MCL
RAL

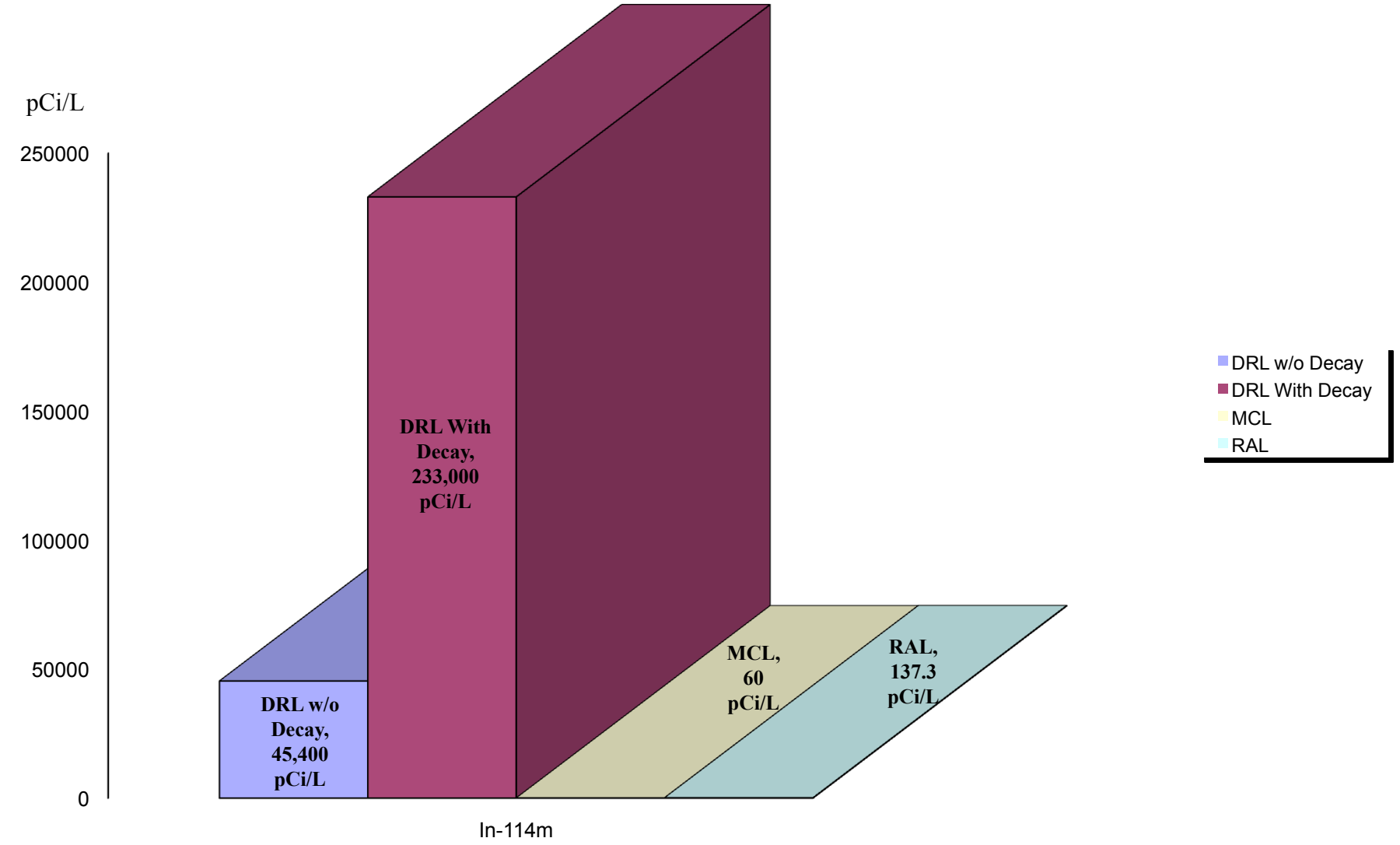

pCi/L
30000000
25000000
20000000
15000000
10000000
5000000
0
DRL w/o Decay, 306,000 pCi/L
DRL With Decay, 28,100,000 pCi/L
MCL, 600 pCi/L
RAL, 1,695.9 pCi/L
Mo-99
DRL w/o Decay
DRL With Decay
MCL
RAL

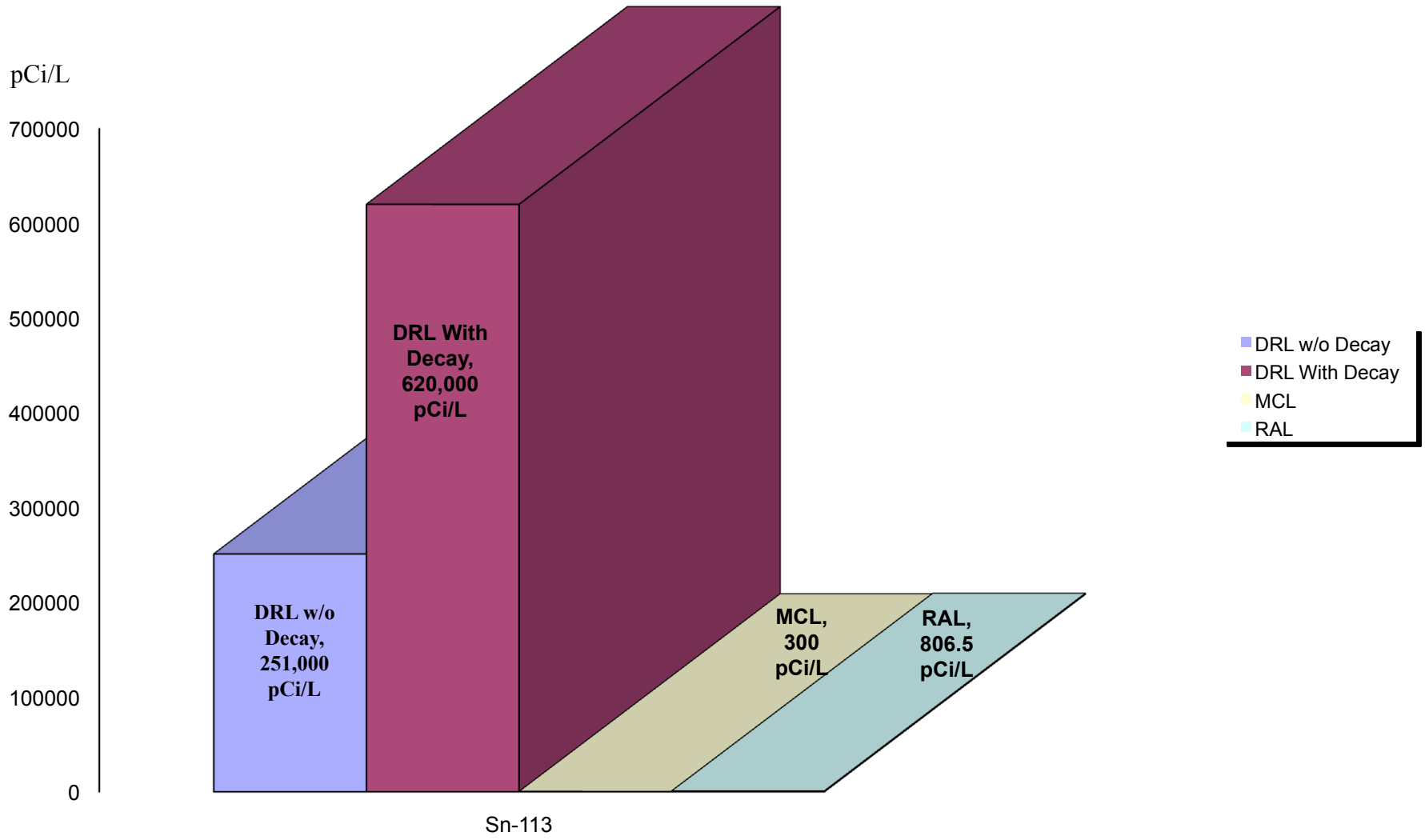

pCi/L
300000
250000
200000
150000
100000
50000
0
DRL w/o Decay, 288,000 pCi/L
DRL With Decay, 288,000 pCi/L
MCL, 900 pCi/L
RAL, 1,236.3 pCi/L
Tc-99
DRL w/o Decay
DRL With Decay
MCL
RAL

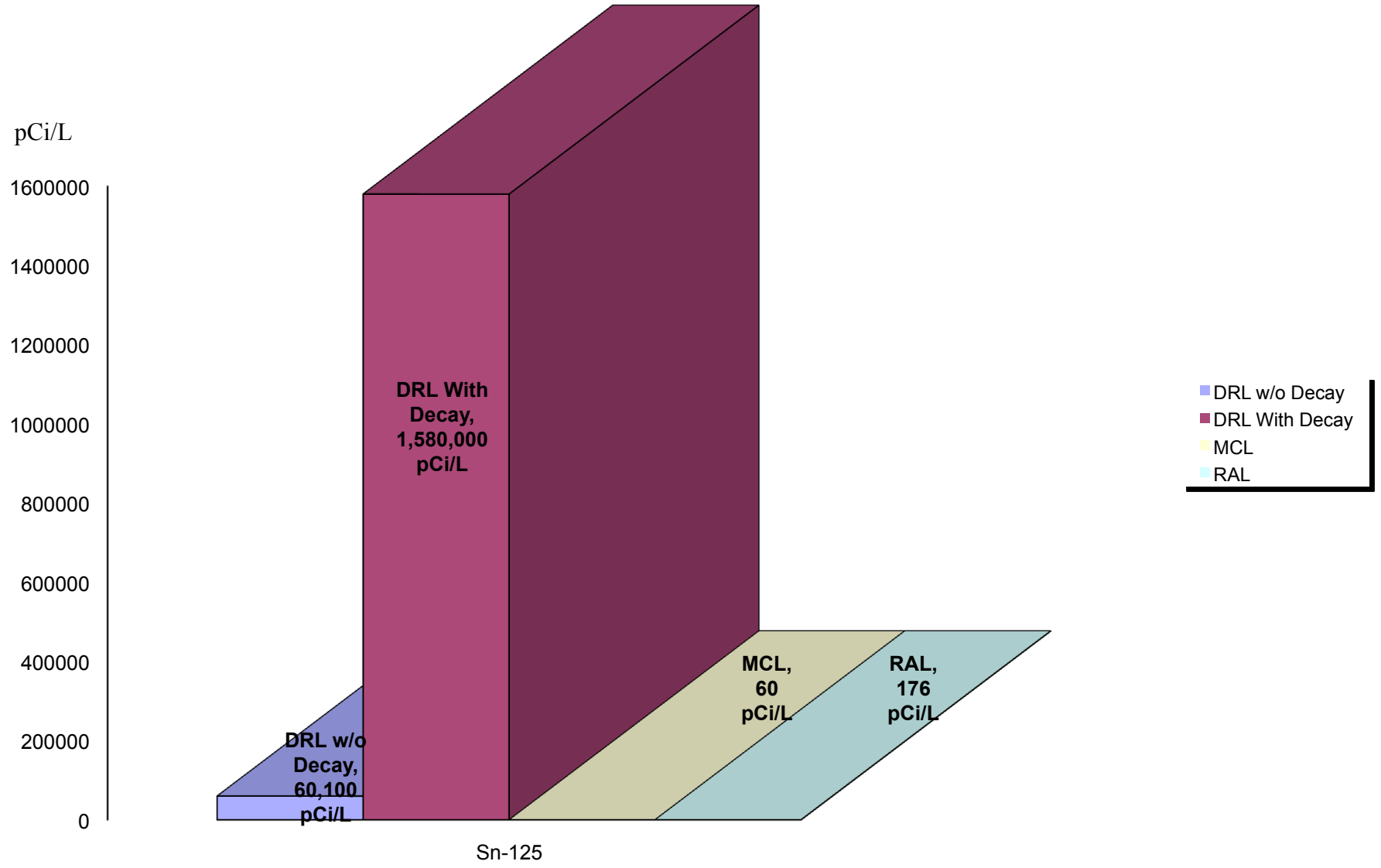

pCi/L
1800000
1600000
1400000
1200000
1000000
800000
600000
400000
200000
0
DRL w/o Decay, 252,000 pCi/L
DRL With Decay, 1,620,000 pCi/L
MCL, 200 pCi/L
RAL, 900.9 pCi/L
DRL w/o Decay
DRL With Decay
MCL
RAL
Ru-103

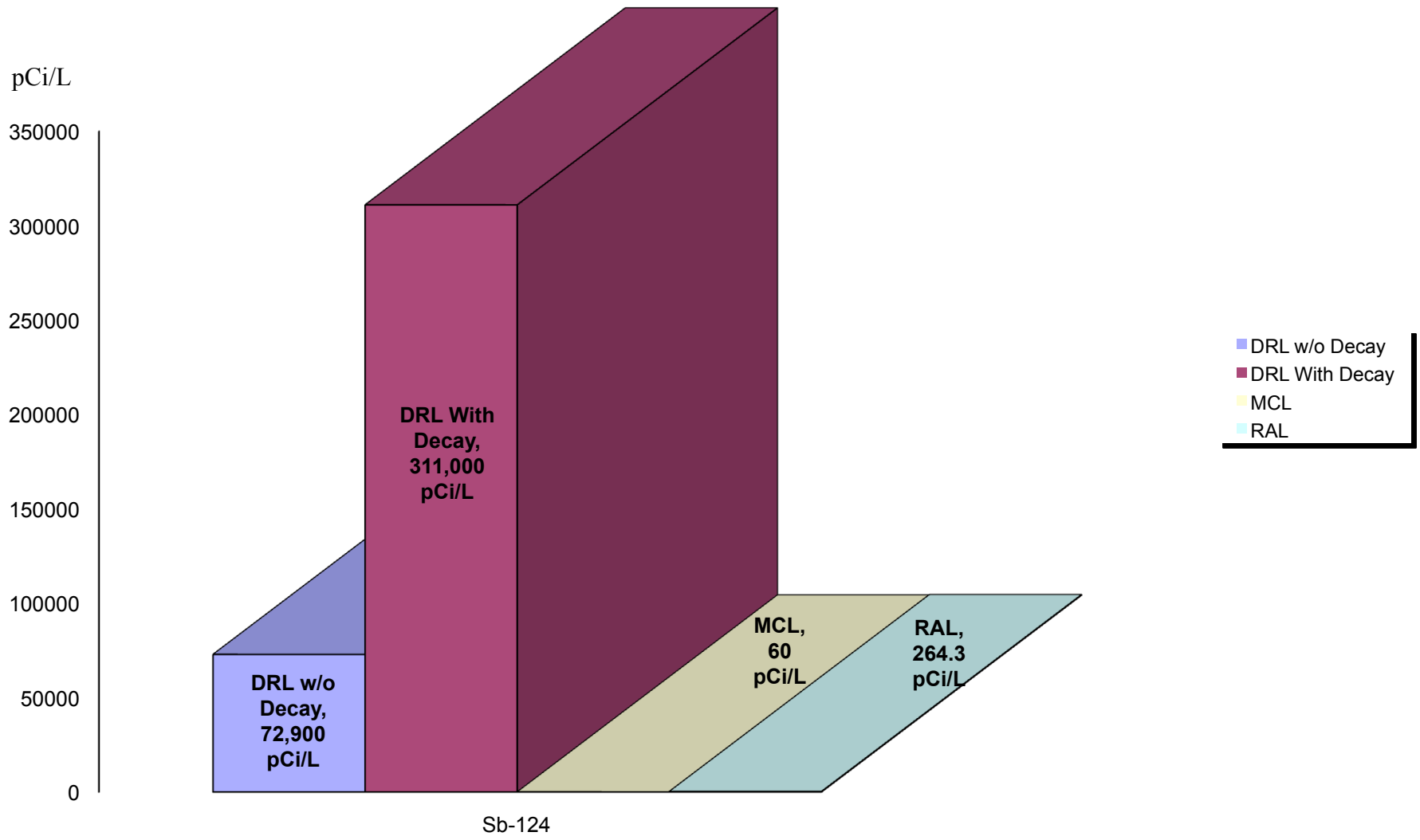

pCi/L
120000
100000
80000
60000
40000
20000
0
DRL w/o Decay, 66,500 pCi/L
DRL With Decay, 106,000 pCi/L
MCL, 90 pCi/L
RAL, 314.7 pCi/L
Ag-110m
DRL w/o Decay
DRL With Decay
MCL
RAL

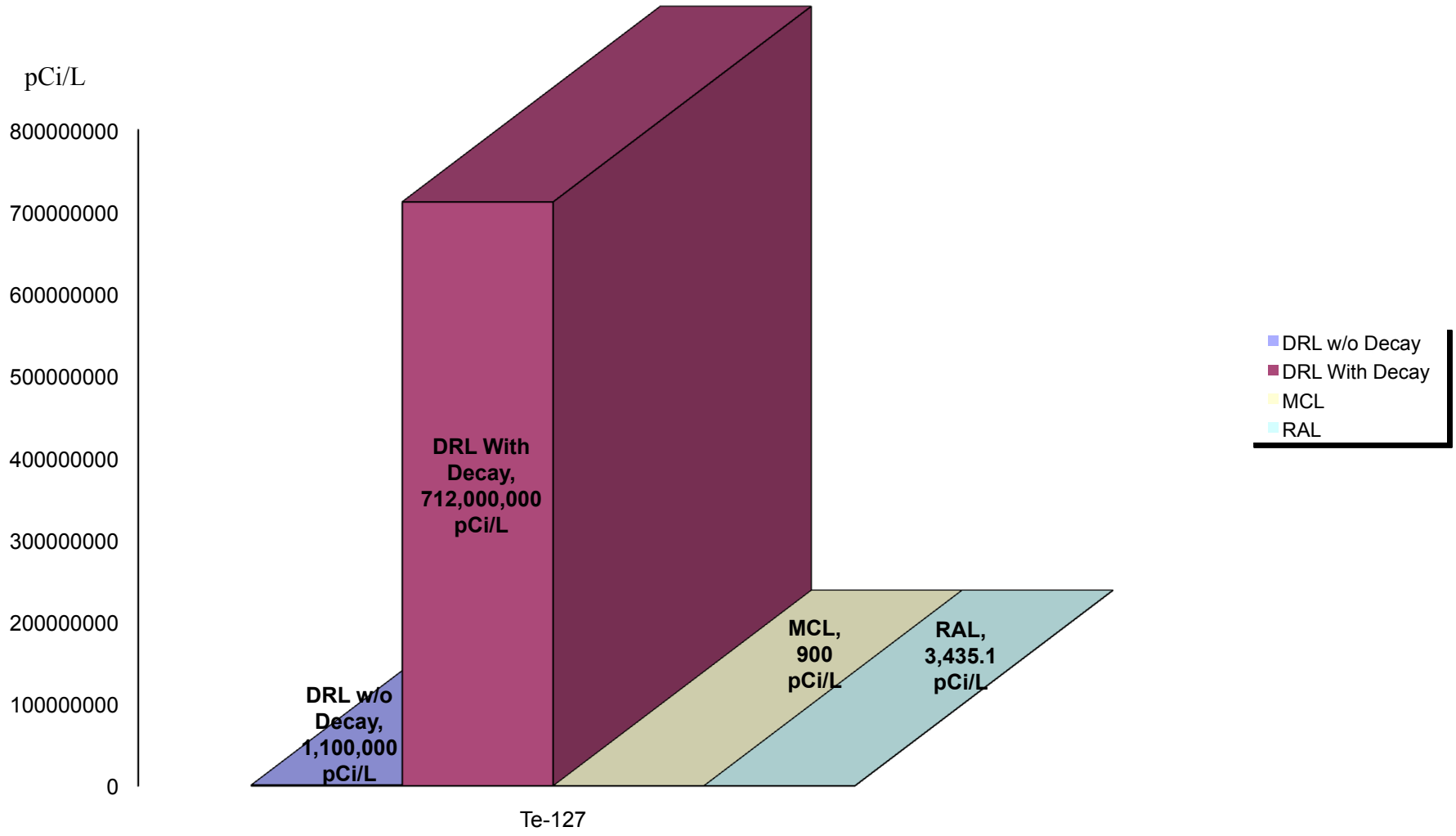

pCi/L
120000
100000
80000
60000
40000
20000
0
DRL w/o Decay, 92,600 pCi/L
DRL With Decay, 120,000 pCi/L
MCL, 600 pCi/L
RAL, 611.6 pCi/L
Cd-109
DRL w/o Decay
DRL With Decay
MCL
RAL

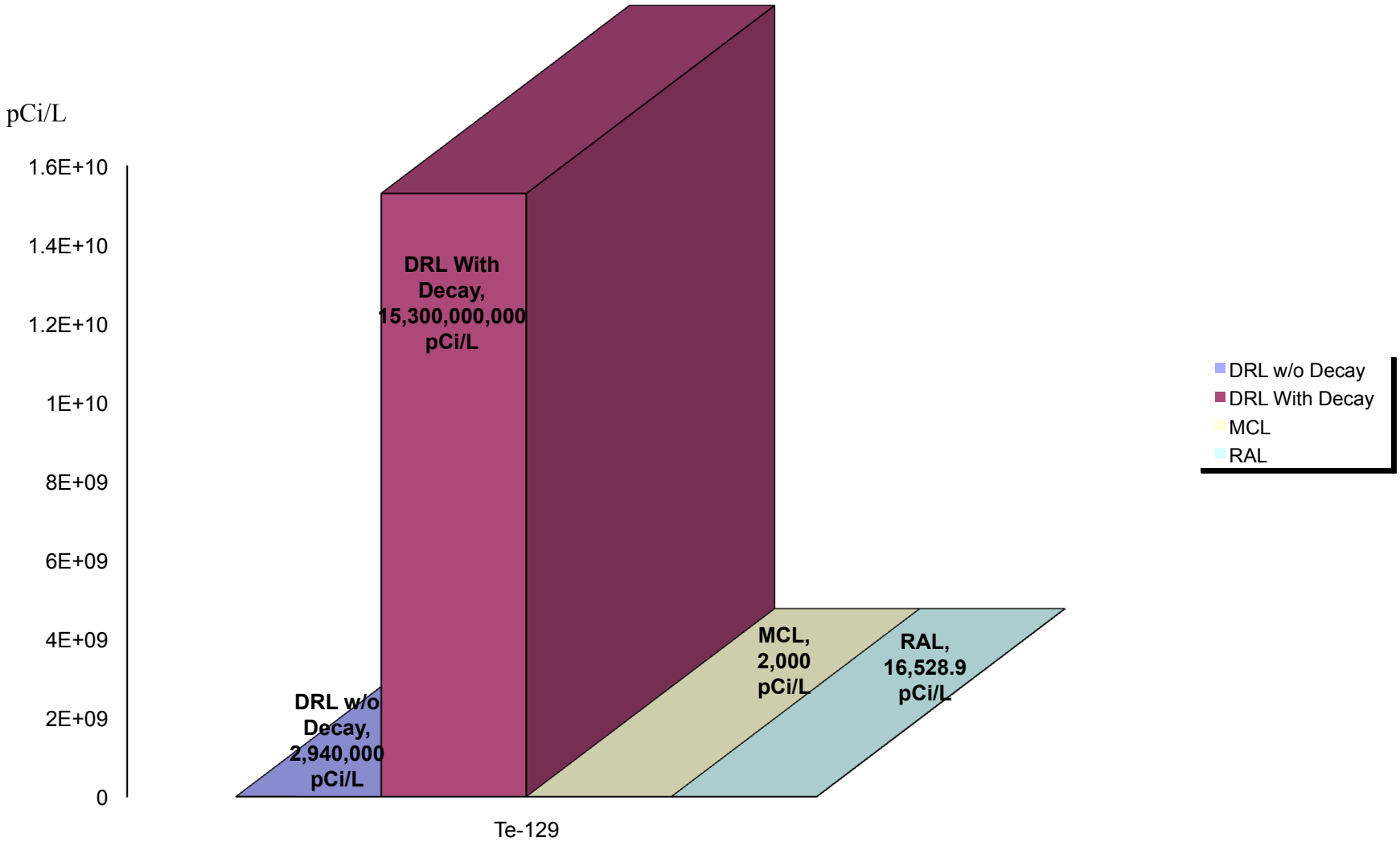

pCi/L
250000
200000
150000
100000
50000
0
DRL With Decay, 233,000 pCi/L
DRL w/o Decay, 45,400 pCi/L
MCL, 60 pCi/L
RAL, 137.3 pCi/L
In-114m
DRL w/o Decay
DRL With Decay
MCL
RAL

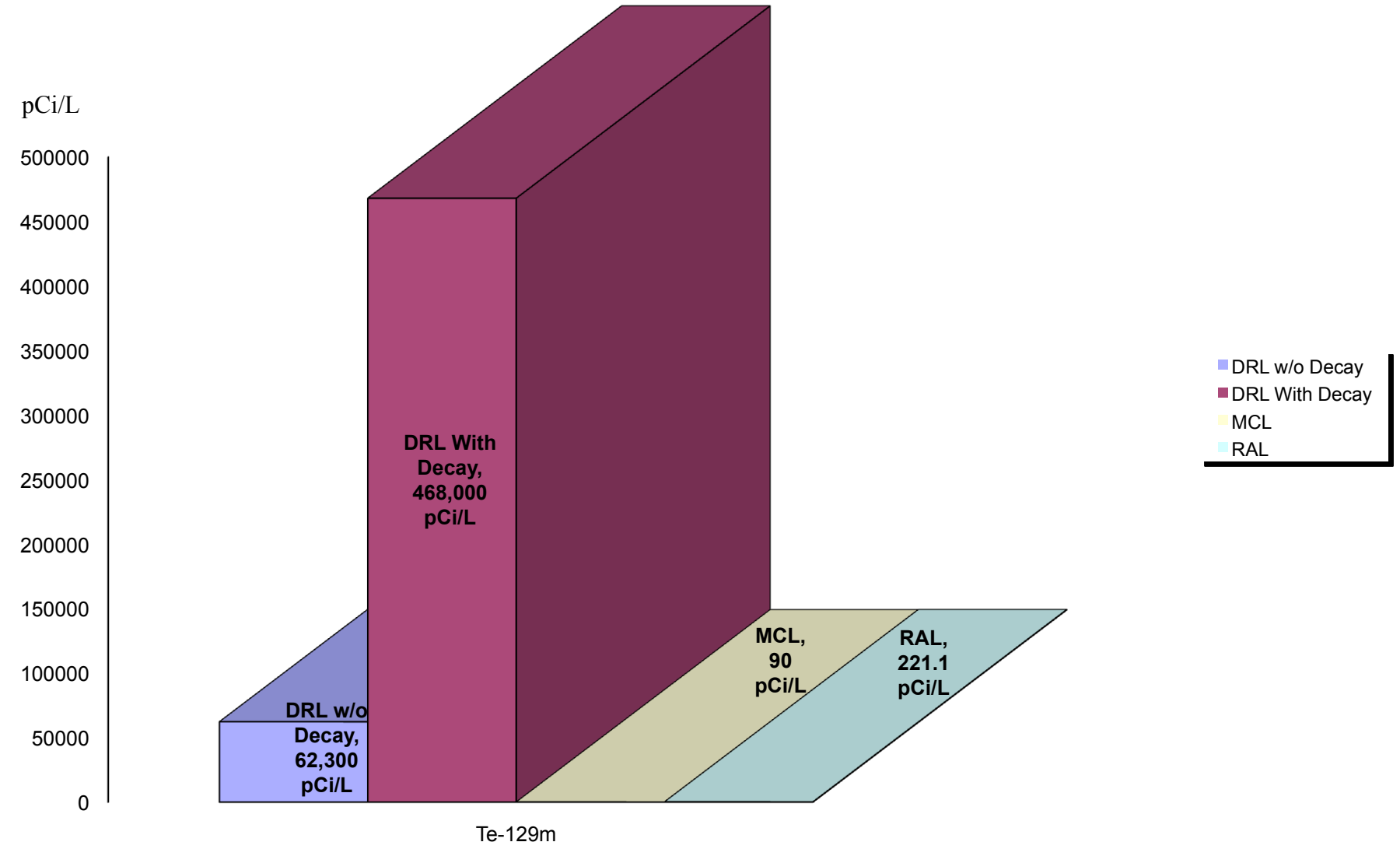

pCi/L
700000
600000
500000
400000
300000
200000
100000
0
DRL w/o Decay, 251,000 pCi/L
DRL With Decay, 620,000 pCi/L
MCL, 300 pCi/L
RAL, 806.5 pCi/L
Sn-113
DRL w/o Decay
DRL With Decay
MCL
RAL

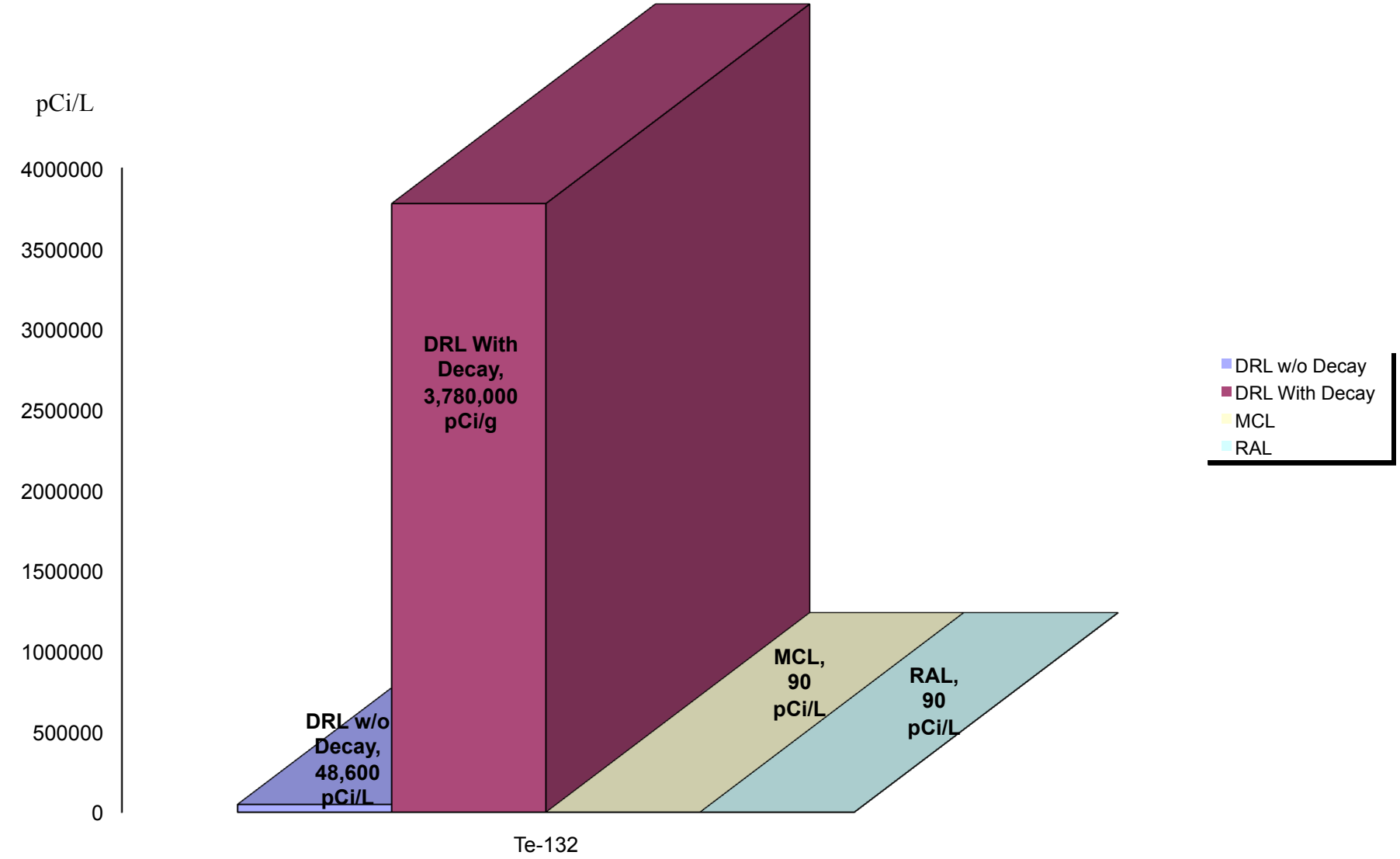

pCi/L
1600000
1400000
1200000
1000000
800000
600000
400000
200000
0
DRL With Decay, 1,580,000 pCi/L
DRL w/o Decay, 60,100 pCi/L
MCL, 60 pCi/L
RAL, 176 pCi/L
Sn-125
DRL w/o Decay
DRL With Decay
MCL
RAL

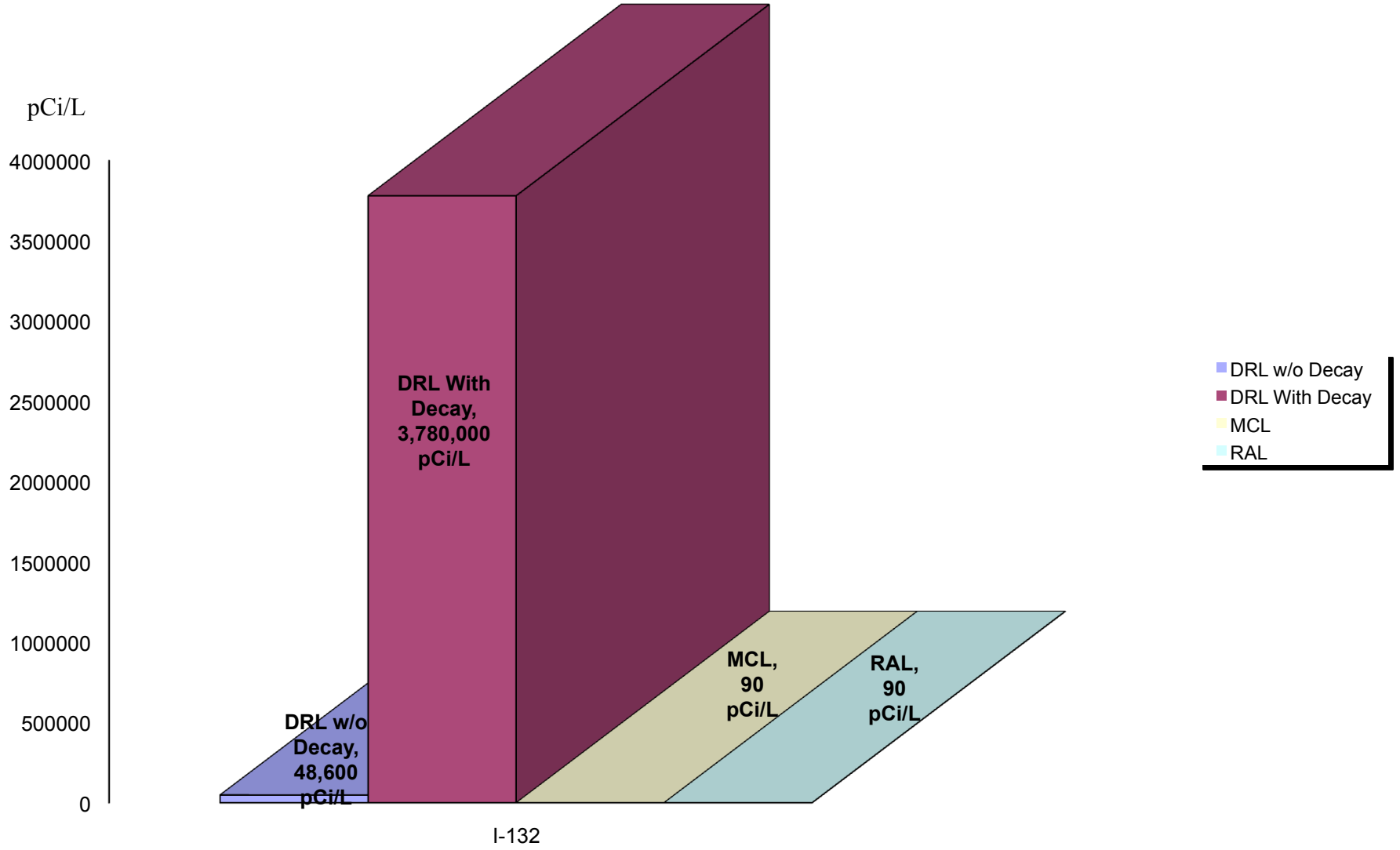

pCi/L
350000
300000
250000
200000
150000
100000
50000
0
DRL w/o Decay, 72,900 pCi/L
DRL With Decay, 311,000 pCi/L
MCL, 60 pCi/L
RAL, 264.3 pCi/L
Sb-124
DRL w/o Decay
DRL With Decay
MCL
RAL

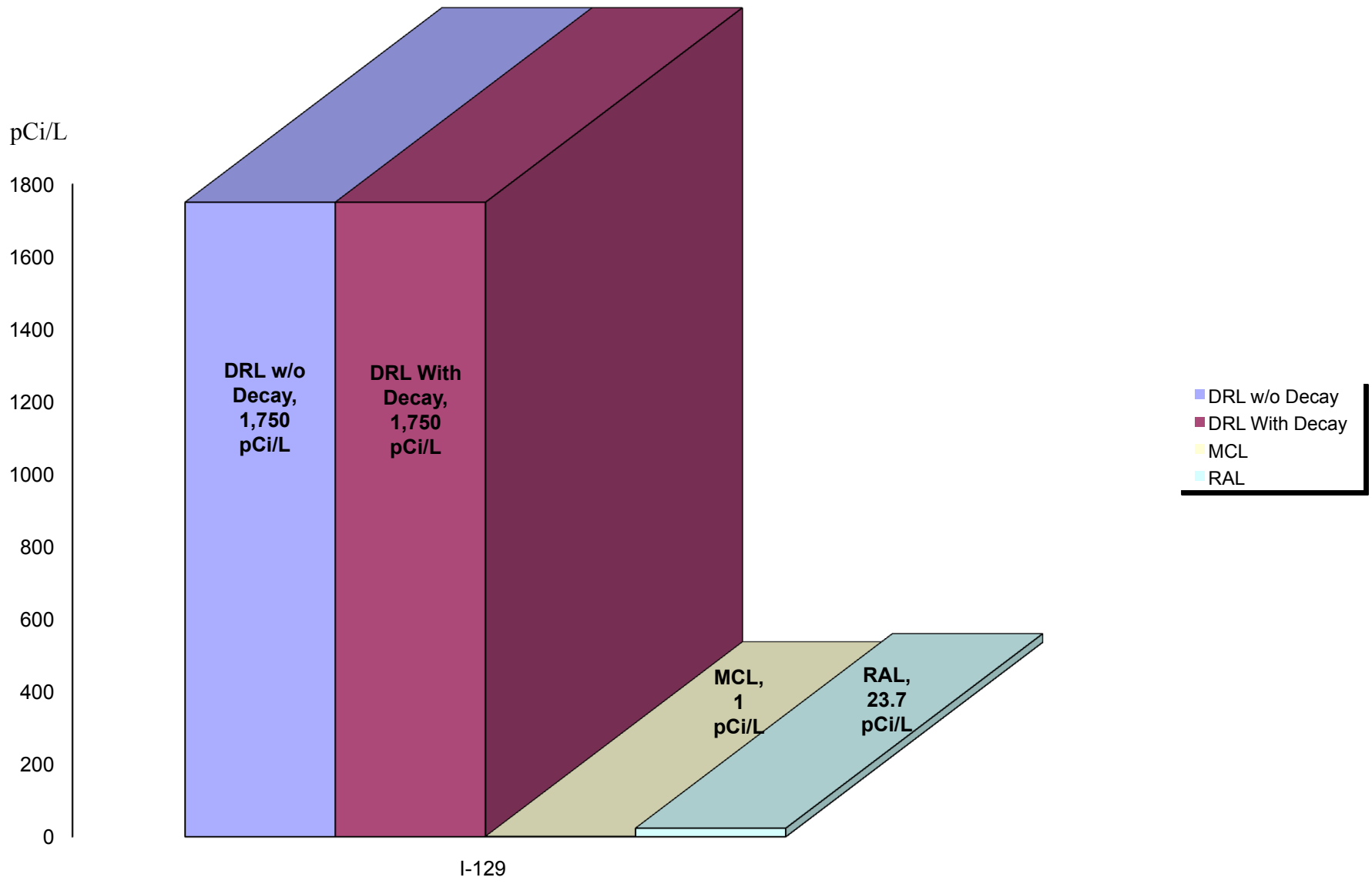

pCi/L
800000000
700000000
600000000
500000000
400000000
300000000
200000000
100000000
0
DRL w/o Decay, 1,100,000 pCi/L
DRL With Decay, 712,000,000 pCi/L
MCL, 900 pCi/L
RAL, 3,435.1 pCi/L
Te-127
DRL w/o Decay
DRL With Decay
MCL
RAL

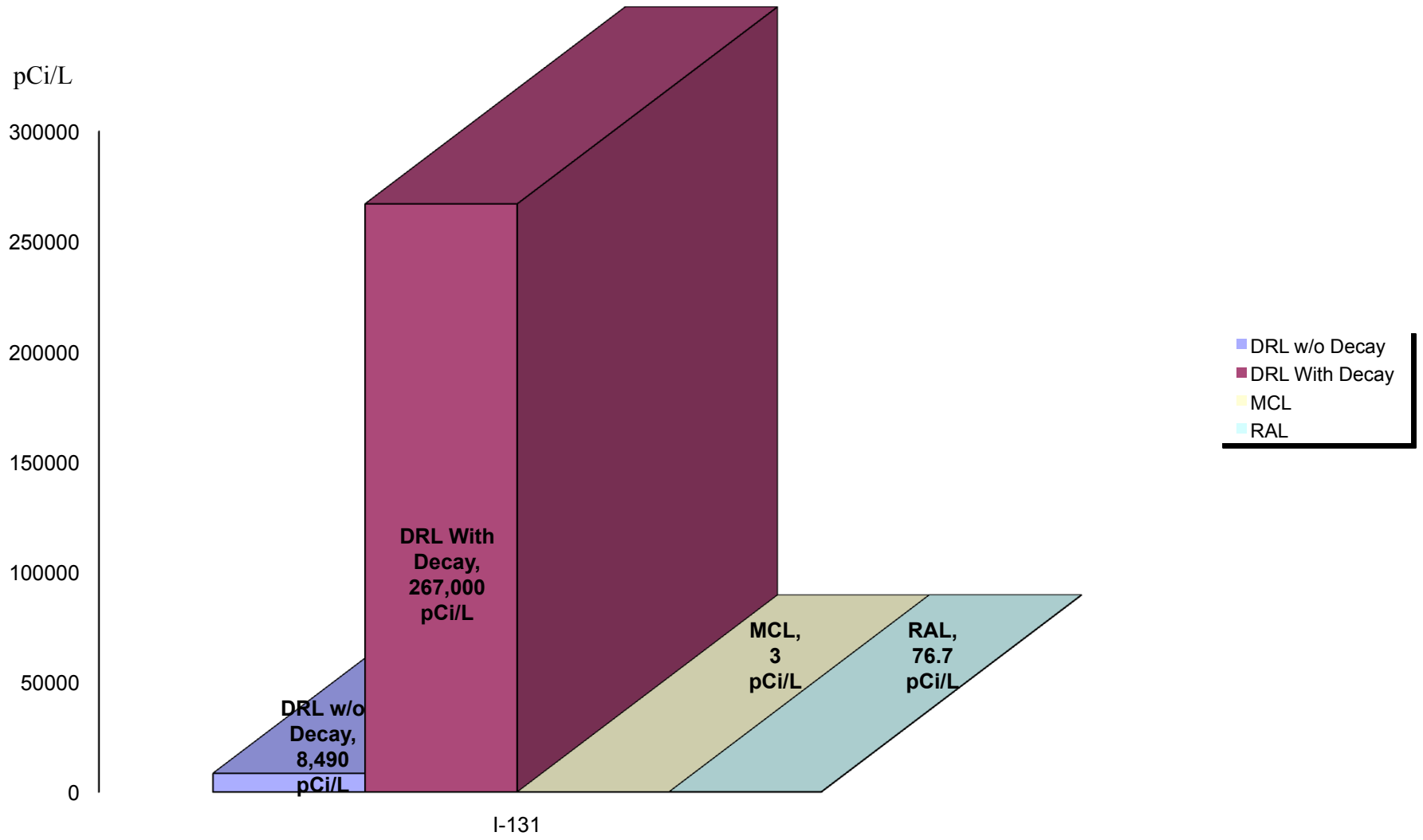

pCi/L
1.6E+10
1.4E+10
1.2E+10
1E+10
8E+09
6E+09
4E+09
2E+09
0
DRL With Decay, 15,300,000,000 pCi/L
DRL w/o Decay, 2,940,000 pCi/L
MCL, 2,000 pCi/L
RAL, 16,528.9 pCi/L
Te-129
DRL w/o Decay
DRL With Decay
MCL
RAL

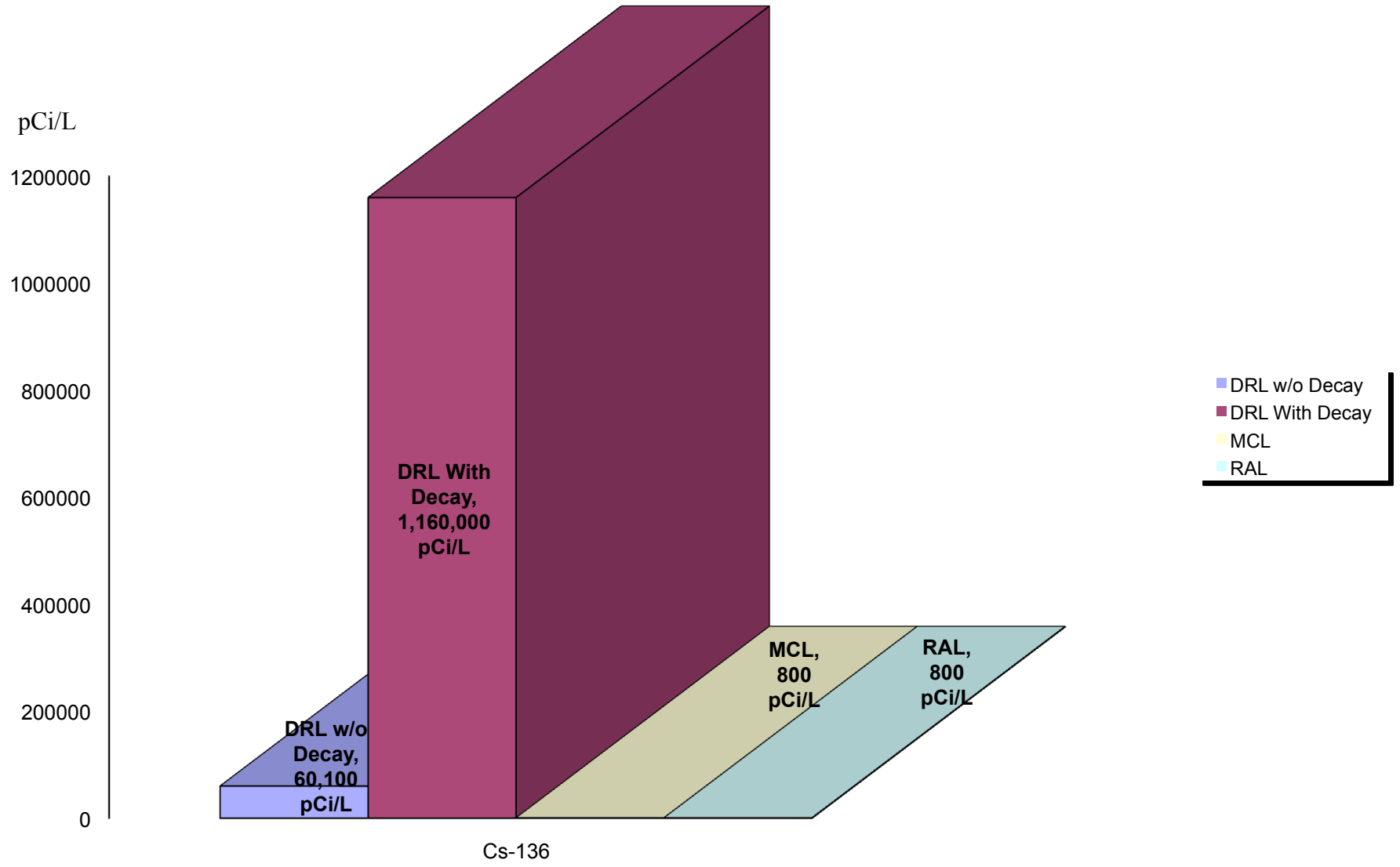

pCi/L
500000
450000
400000
350000
300000
250000
200000
150000
100000
50000
0
DRL w/o Decay, 62,300 pCi/L
DRL With Decay, 468,000 pCi/L
MCL, 90 pCi/L
RAL, 221.1 pCi/L
Te-129m
DRL w/o Decay
DRL With Decay
MCL
RAL

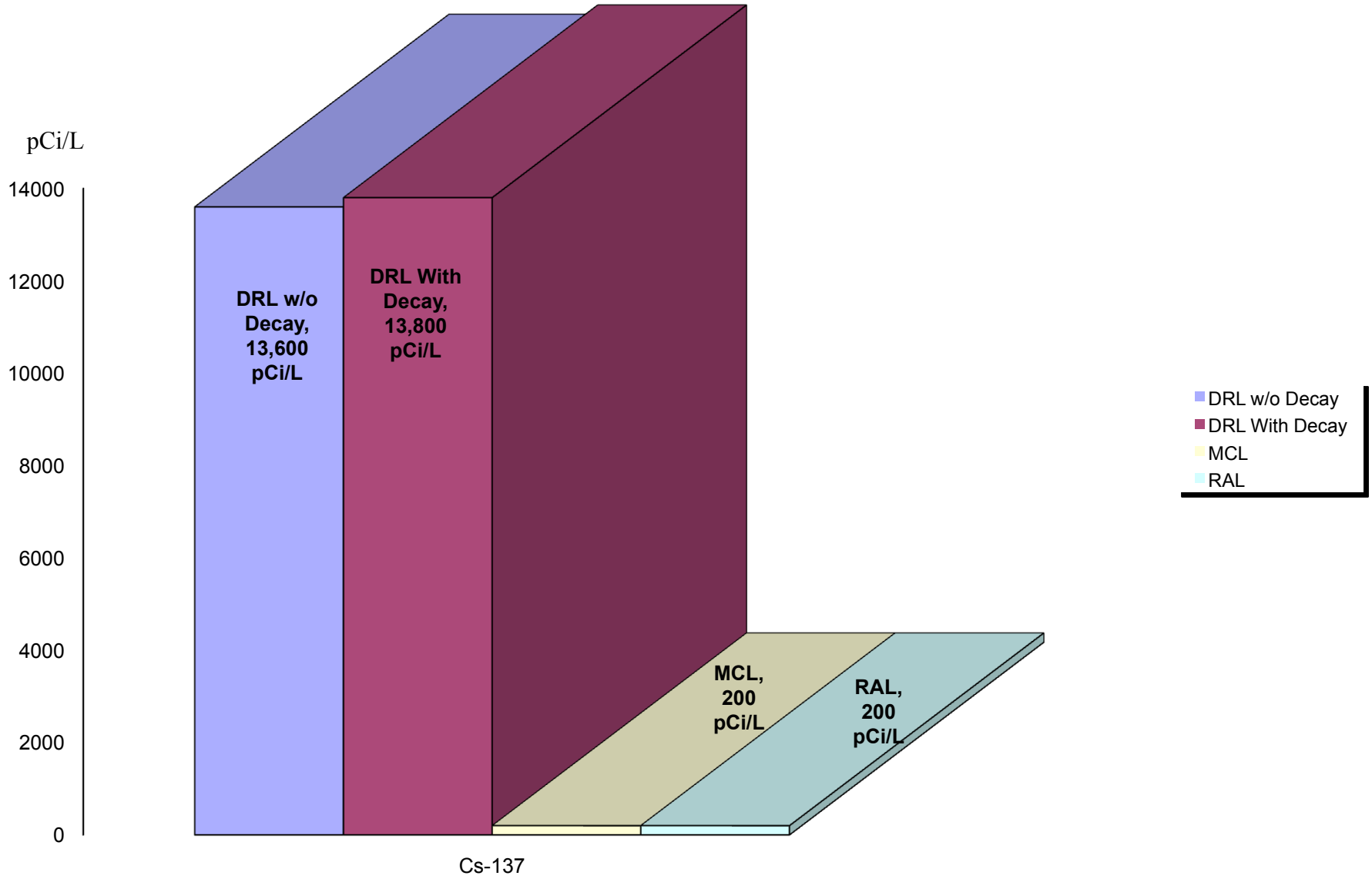

pCi/L
4000000
3500000
3000000
2500000
2000000
1500000
1000000
500000
0
DRL With Decay, 3,780,000 pCi/g
DRL w/o Decay, 48,600 pCi/L
MCL, 90 pCi/L
RAL, 90 pCi/L
Te-132
DRL w/o Decay
DRL With Decay
MCL
RAL

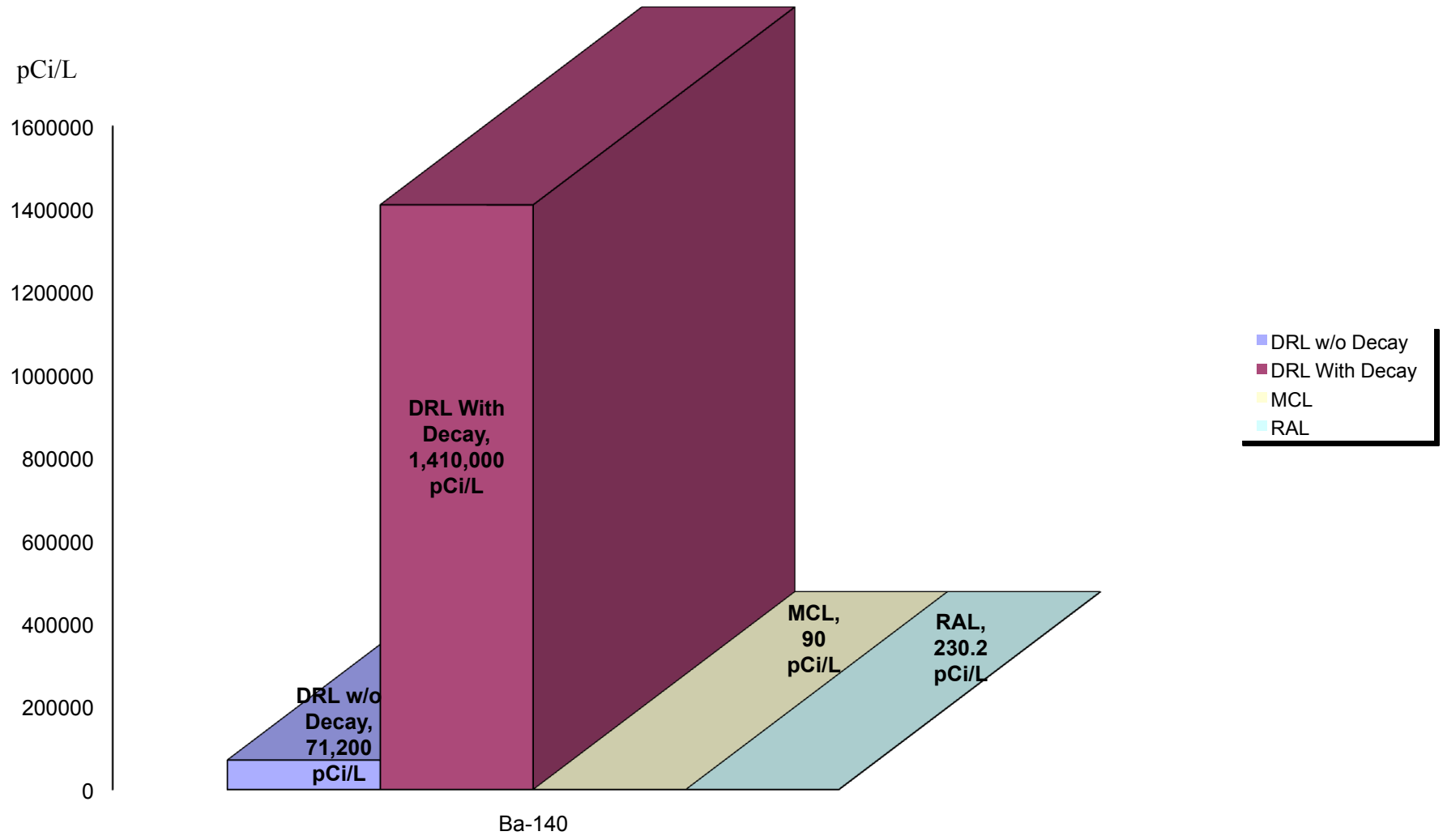

pCi/L
4000000
3500000
3000000
2500000
2000000
1500000
1000000
500000
0
DRL With Decay, 3,780,000 pCi/L
DRL w/o Decay, 48,600 pCi/L
MCL, 90 pCi/L
RAL, 90 pCi/L
DRL w/o Decay
DRL With Decay
MCL
RAL
I-132

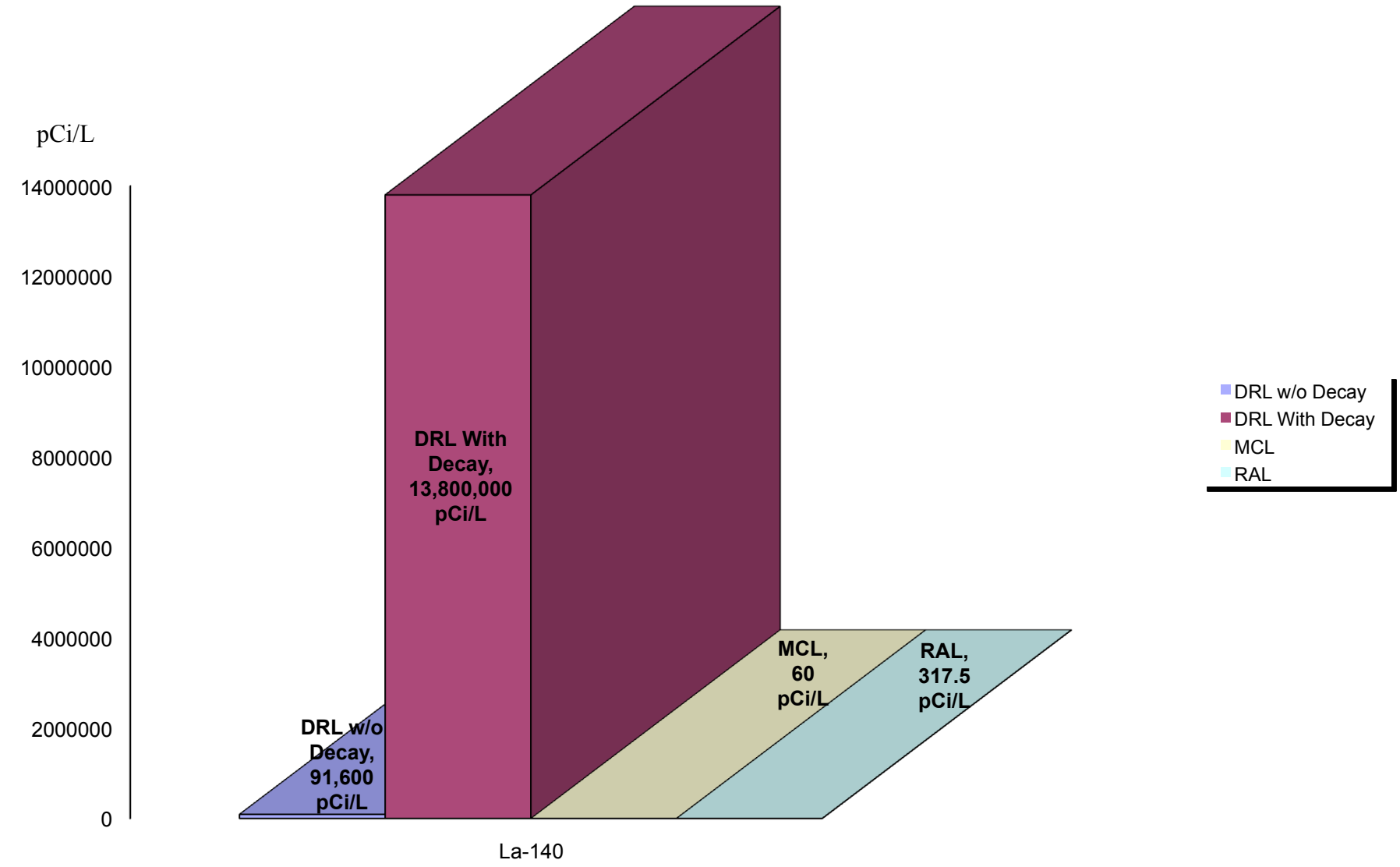

pCi/L
1800
1600
1400
1200
1000
800
600
400
200
0
DRL w/o Decay, 1,750 pCi/L
DRL With Decay, 1,750 pCi/L
MCL, 1 pCi/L
RAL, 23.7 pCi/L
I-129
DRL w/o Decay
DRL With Decay
MCL
RAL

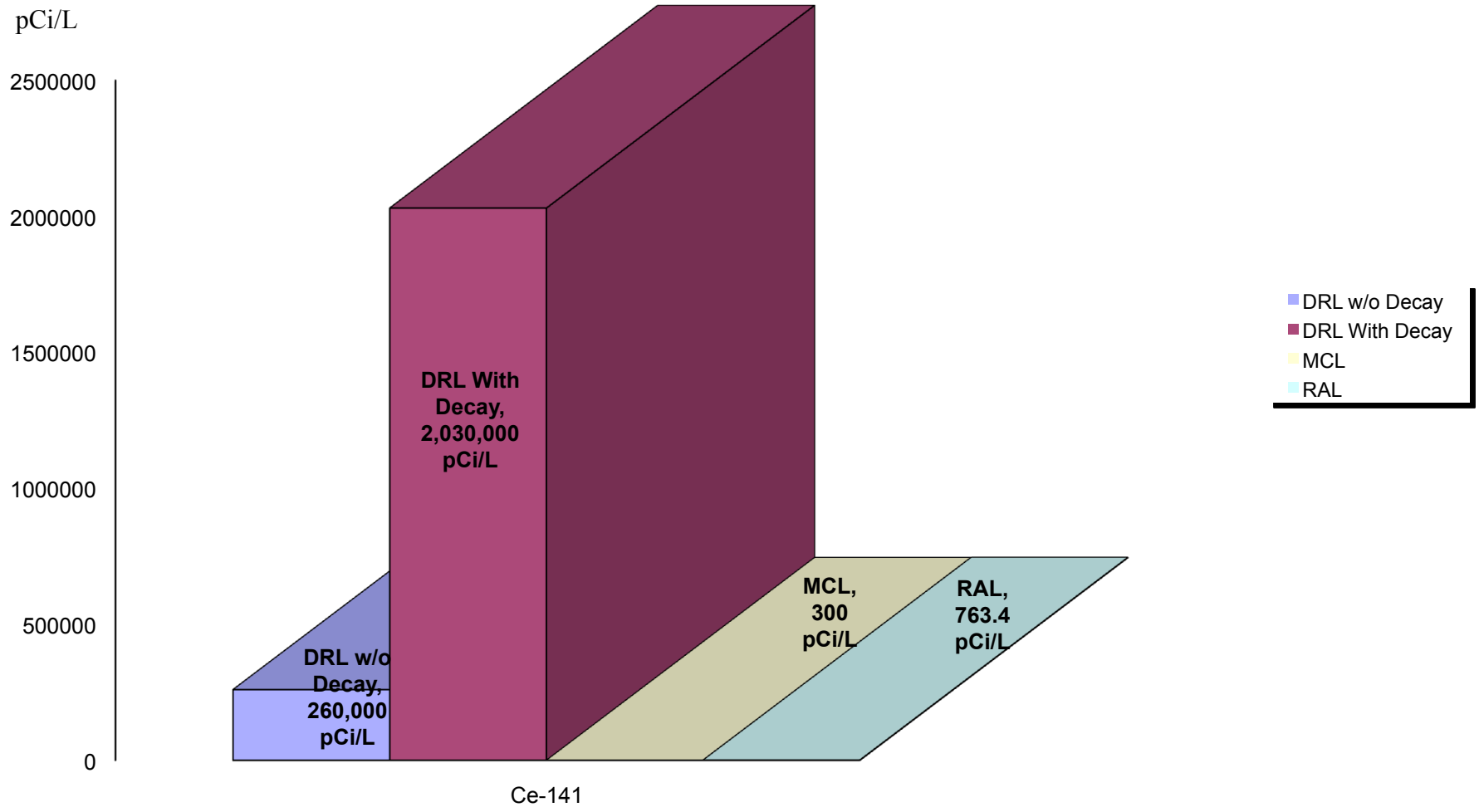

pCi/L
300000
250000
200000
150000
100000
50000
0
DRL w/o Decay, 8,490 pCi/L
DRL With Decay, 267,000 pCi/L
MCL, 3 pCi/L
RAL, 76.7 pCi/L
I-131
DRL w/o Decay
DRL With Decay
MCL
RAL

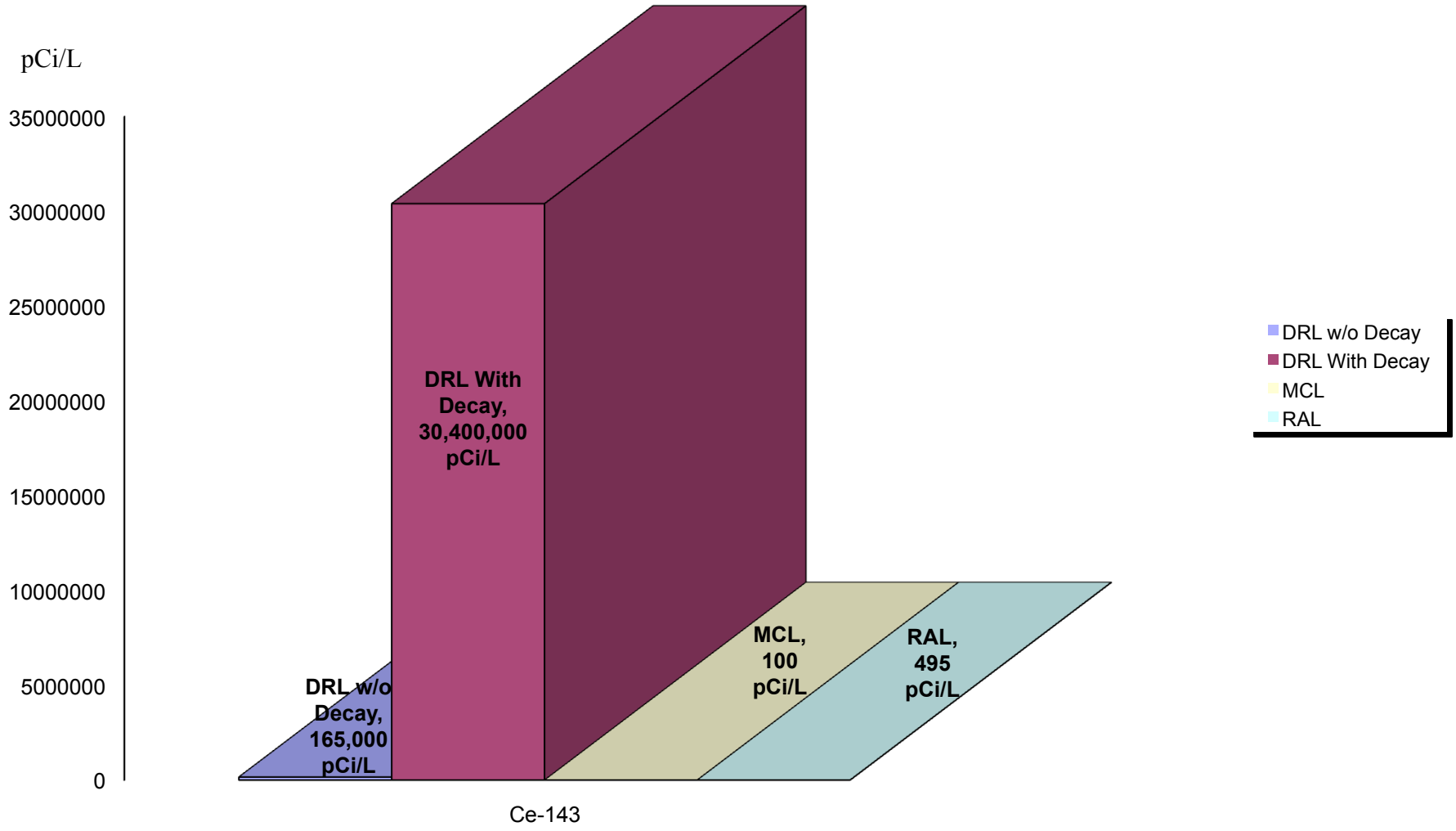

pCi/L
1200000
1000000
800000
600000
400000
200000
0
DRL w/o Decay, 60,100 pCi/L
DRL With Decay, 1,160,000 pCi/L
MCL, 800 pCi/L
RAL, 800 pCi/L
Cs-136
DRL w/o Decay
DRL With Decay
MCL
RAL

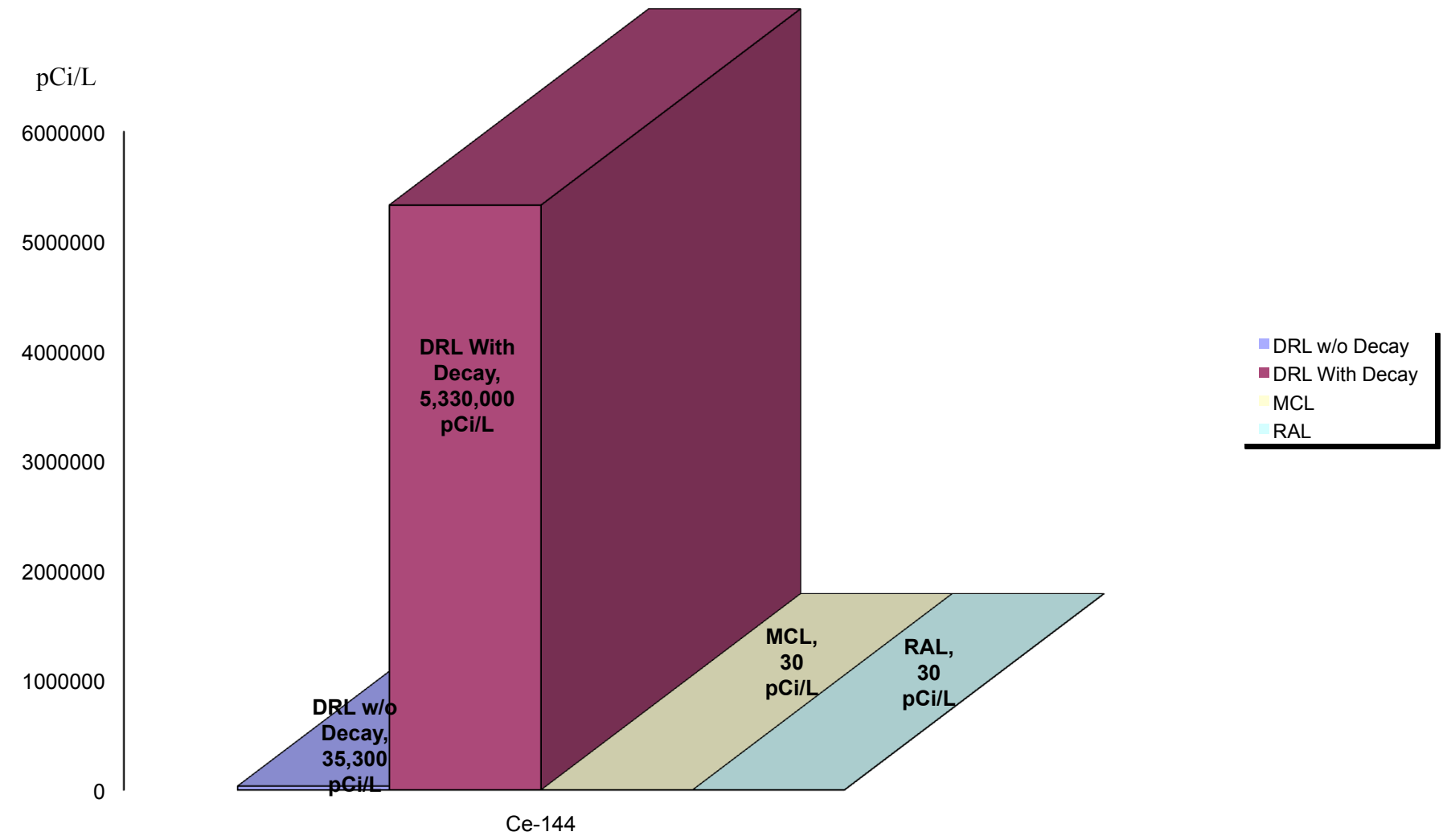

pCi/L
14000
12000
10000
8000
6000
4000
2000
0
DRL w/o Decay, 13,600 pCi/L
DRL With Decay, 13,800 pCi/L
MCL, 200 pCi/L
RAL, 200 pCi/L
Cs-137
DRL w/o Decay
DRL With Decay
MCL
RAL

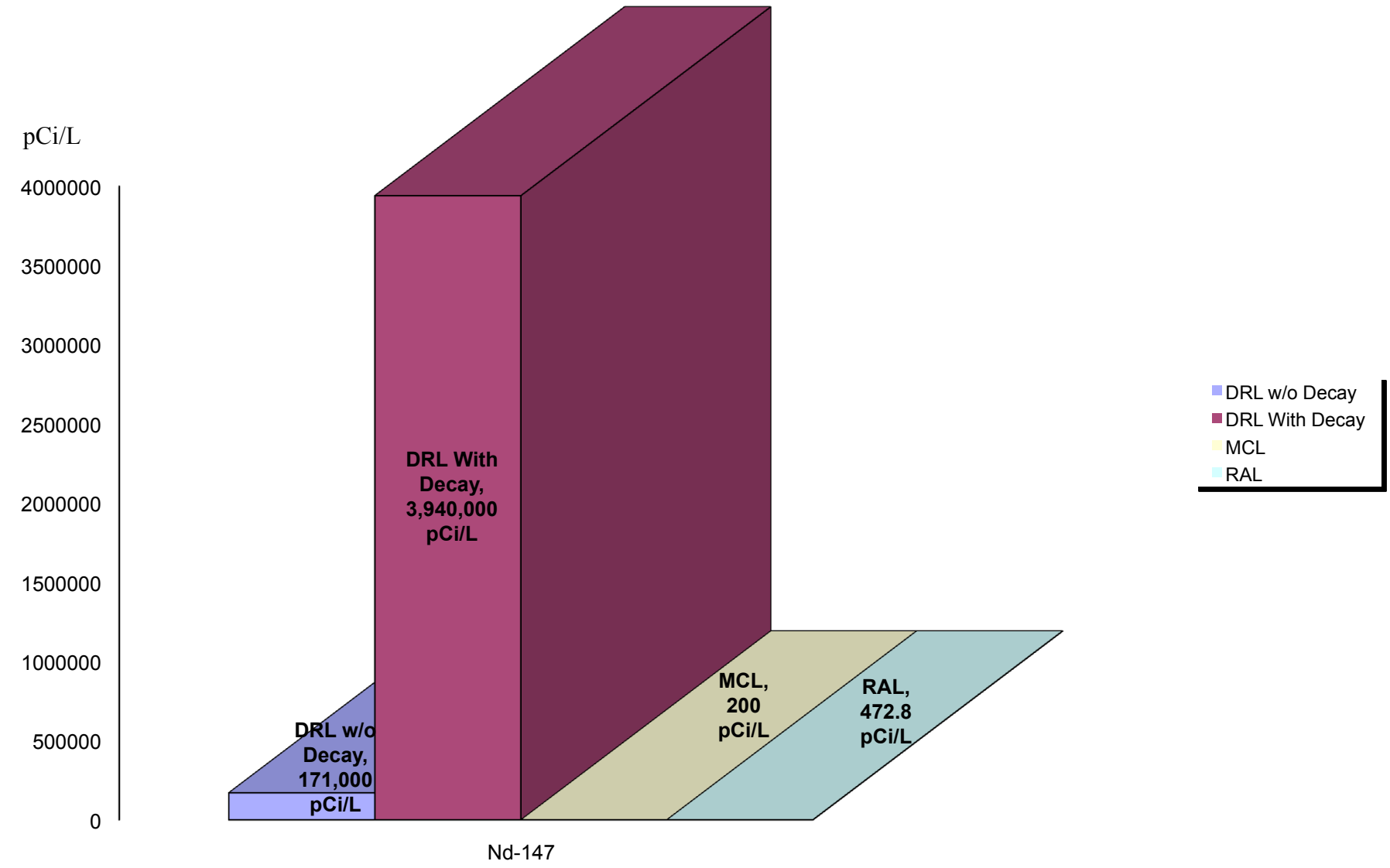

pCi/L
1600000
1400000
1200000
1000000
800000
600000
400000
200000
0
DRL w/o Decay, 71,200 pCi/L
DRL With Decay, 1,410,000 pCi/L
MCL, 90 pCi/L
RAL, 230.2 pCi/L
Ba-140
DRL w/o Decay
DRL With Decay
MCL
RAL

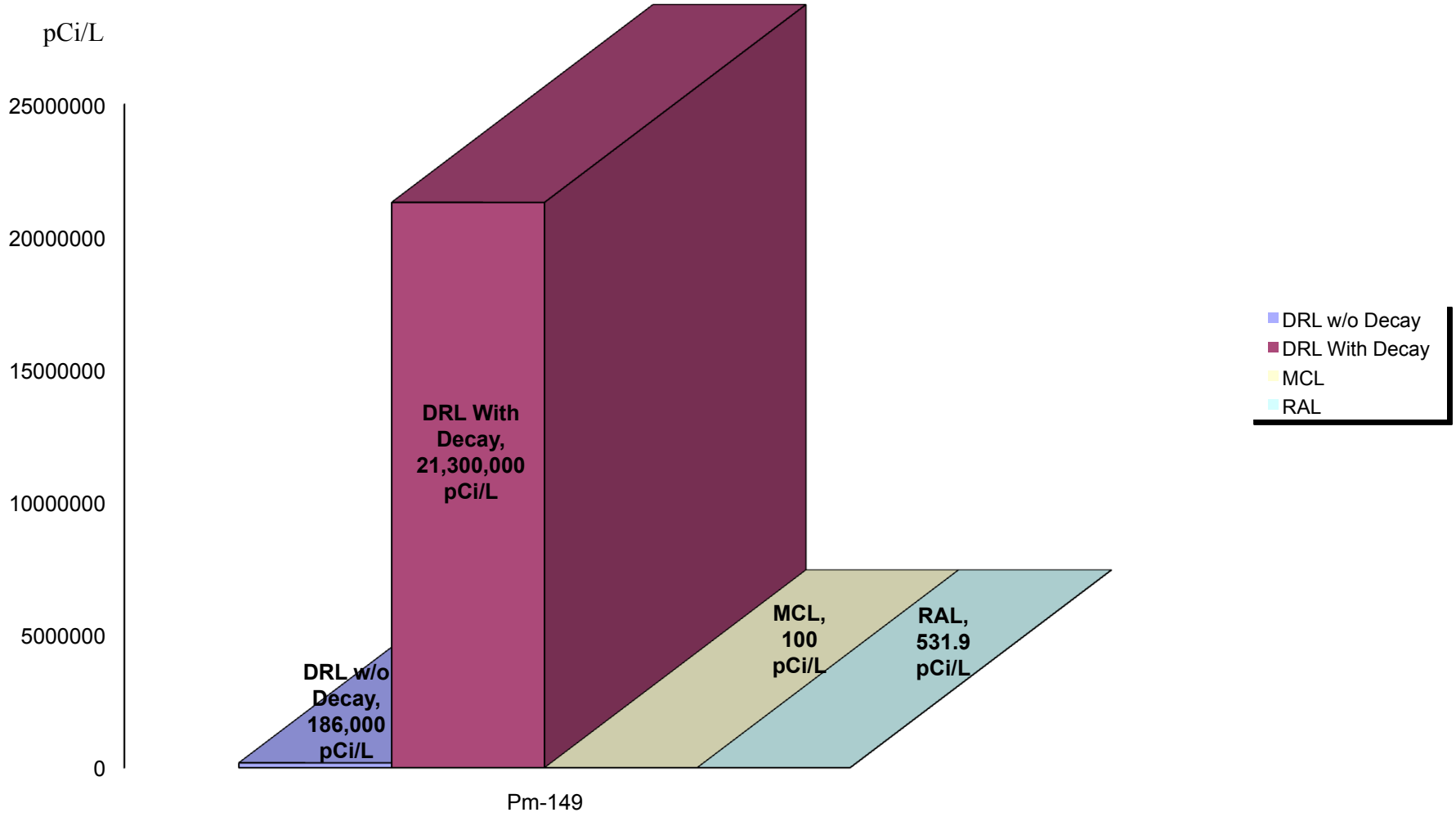

pCi/L
14000000
12000000
10000000
8000000
6000000
4000000
2000000
0
DRL w/o Decay, 91,600 pCi/L
DRL With Decay, 13,800,000 pCi/L
MCL, 60 pCi/L
RAL, 317.5 pCi/L
La-140
DRL w/o Decay
DRL With Decay
MCL
RAL

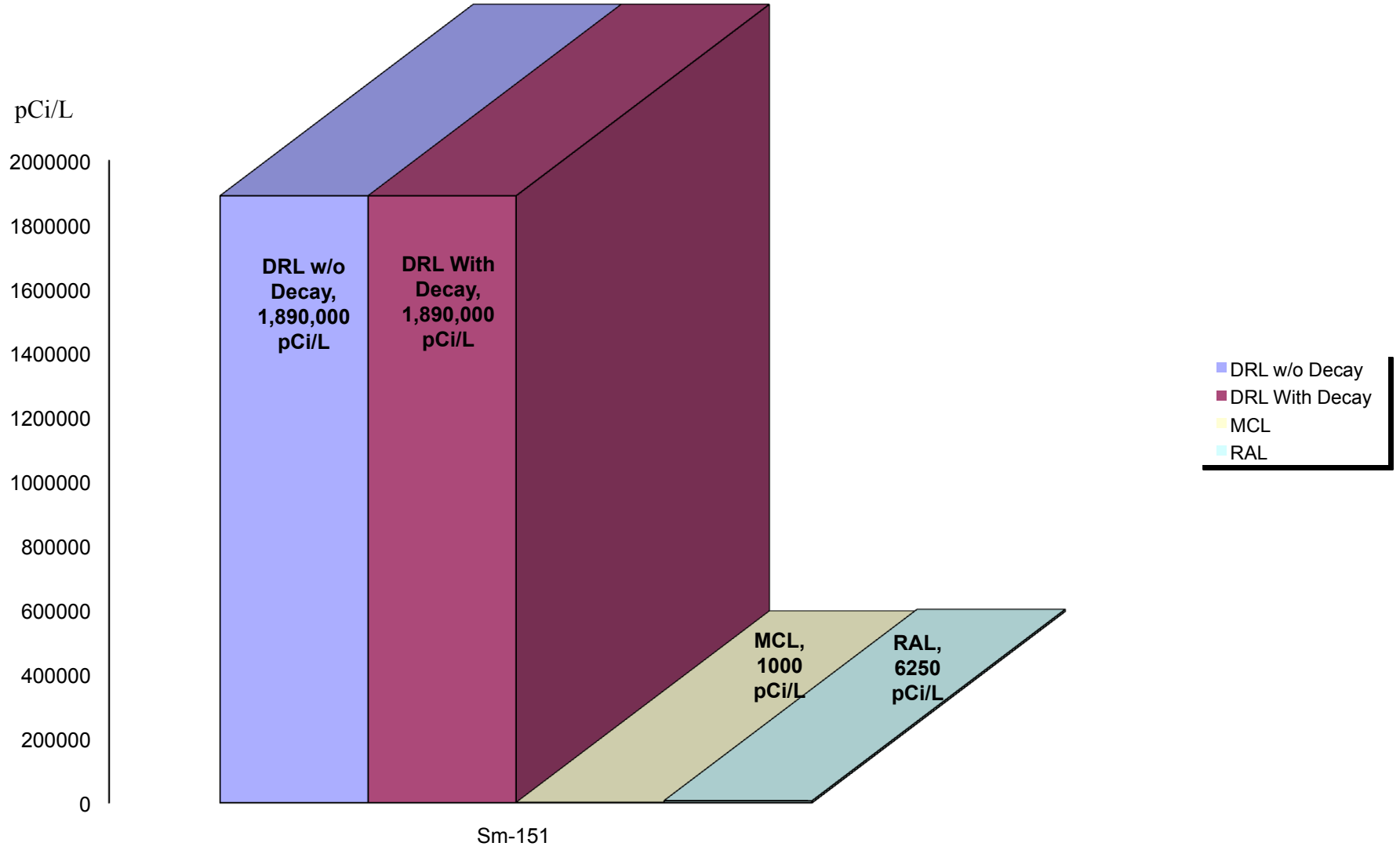

pCi/L
2500000
2000000
1500000
1000000
500000
0
DRL w/o Decay, 260,000 pCi/L
DRL With Decay, 2,030,000 pCi/L
MCL, 300 pCi/L
RAL, 763.4 pCi/L
Ce-141
DRL w/o Decay
DRL With Decay
MCL
RAL

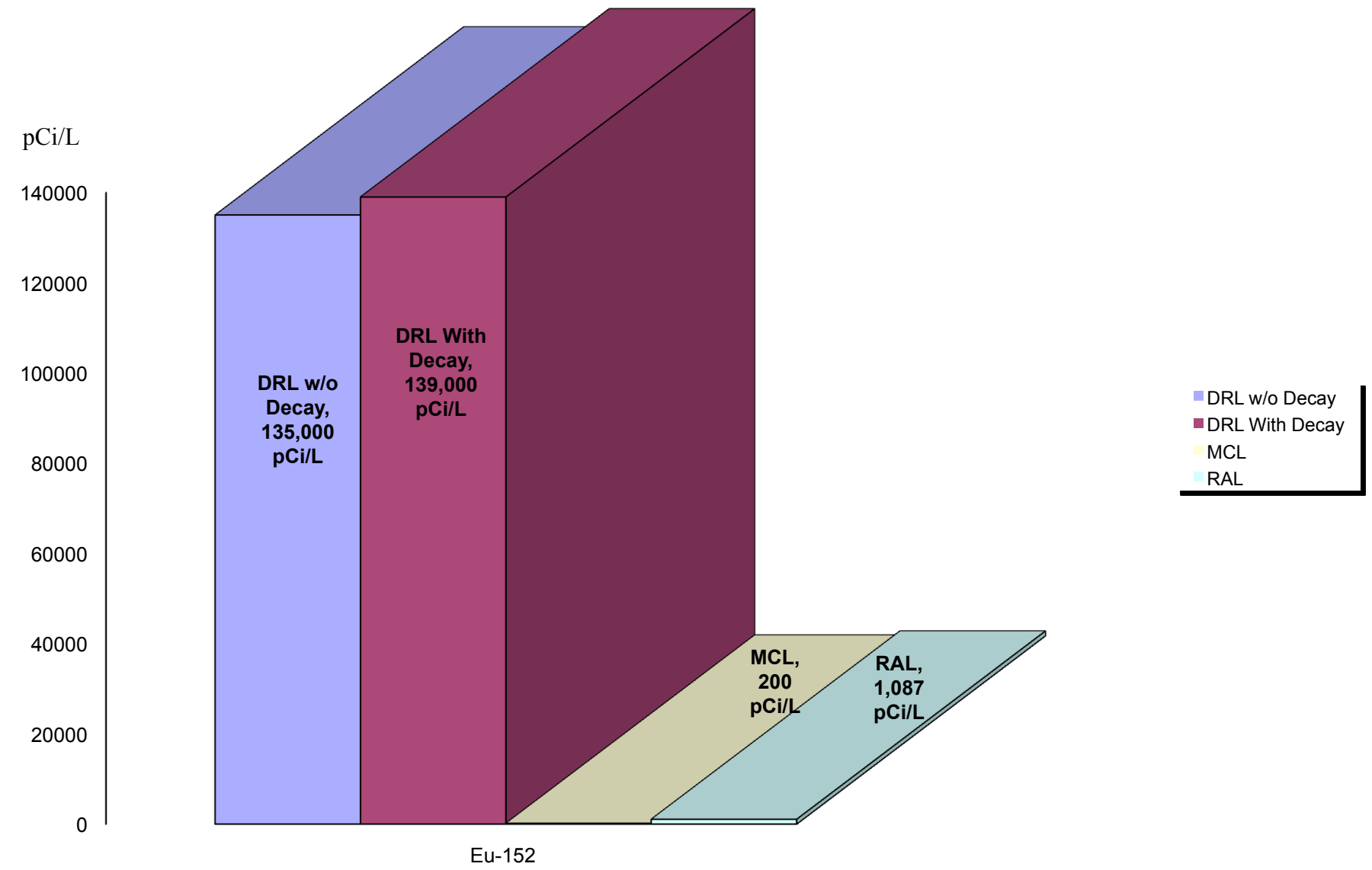

pCi/L
35000000
30000000
25000000
20000000
15000000
10000000
5000000
0
DRL w/o Decay, 165,000 pCi/L
DRL With Decay, 30,400,000 pCi/L
MCL, 100 pCi/L
RAL, 495 pCi/L
Ce-143
DRL w/o Decay
DRL With Decay
MCL
RAL

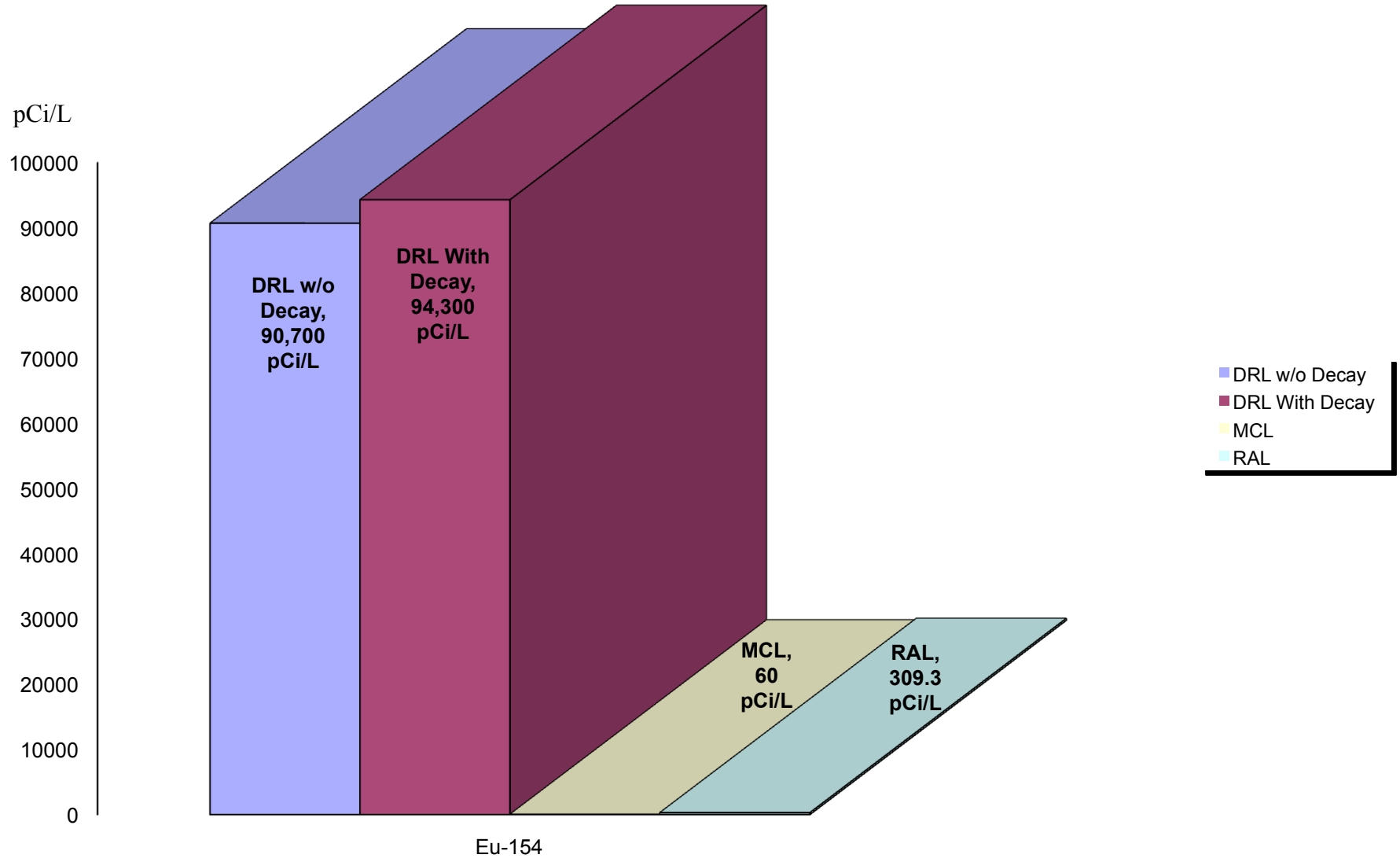

pCi/L
6000000
5000000
4000000
3000000
2000000
1000000
0
DRL With Decay, 5,330,000 pCi/L
DRL w/o Decay, 35,300 pCi/L
MCL, 30 pCi/L
RAL, 30 pCi/L
Ce-144
DRL w/o Decay
DRL With Decay
MCL
RAL

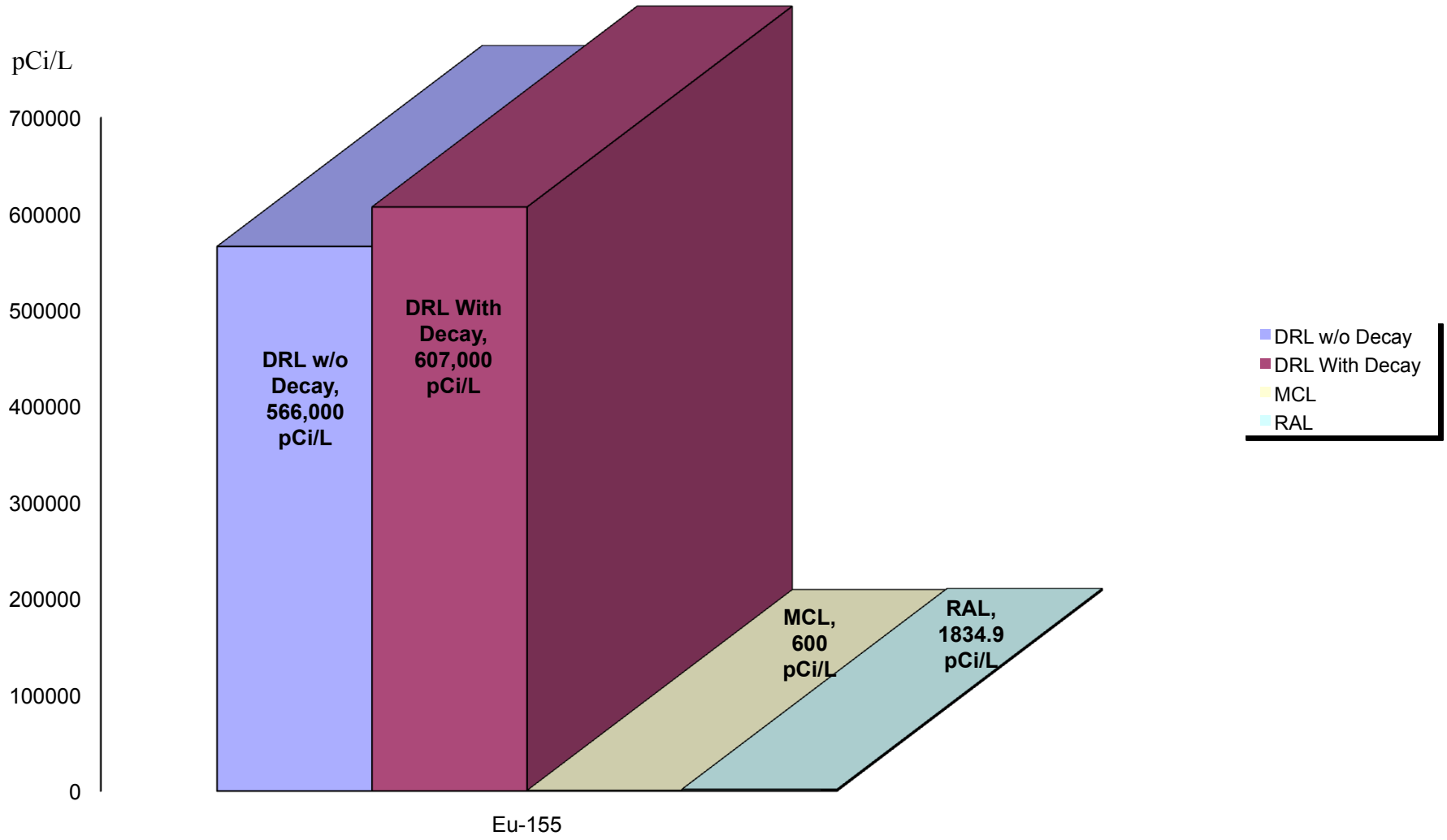

pCi/L
4000000
3500000
3000000
2500000
2000000
1500000
1000000
500000
0
DRL With Decay, 3,940,000 pCi/L
DRL w/o Decay, 171,000 pCi/L
MCL, 200 pCi/L
RAL, 472.8 pCi/L
Nd-147
DRL w/o Decay
DRL With Decay
MCL
RAL

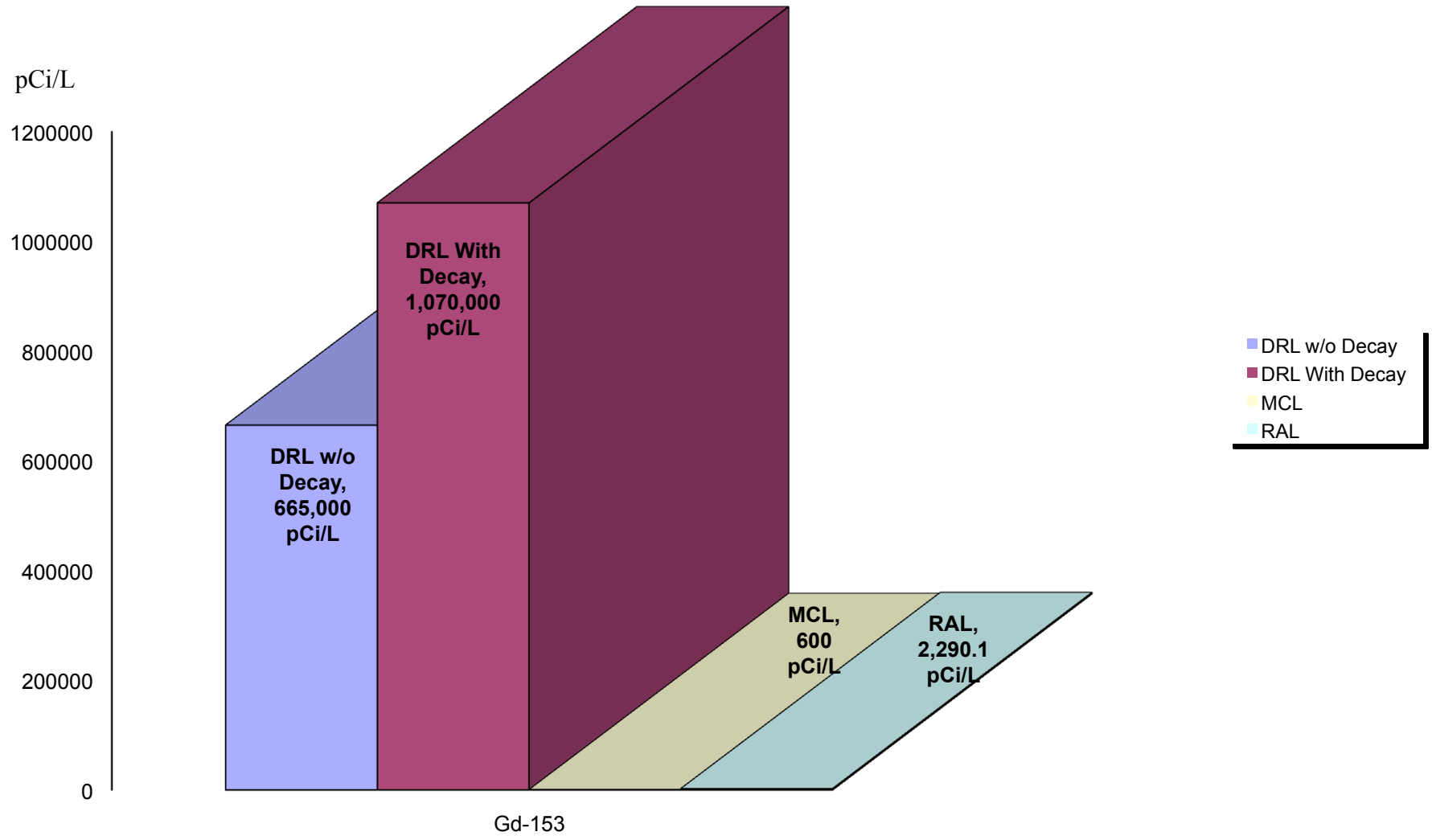

pCi/L
25000000
20000000
15000000
10000000
5000000
0
DRL w/o Decay, 186,000 pCi/L
DRL With Decay, 21,300,000 pCi/L
MCL, 100 pCi/L
RAL, 531.9 pCi/L
Pm-149
DRL w/o Decay
DRL With Decay
MCL
RAL

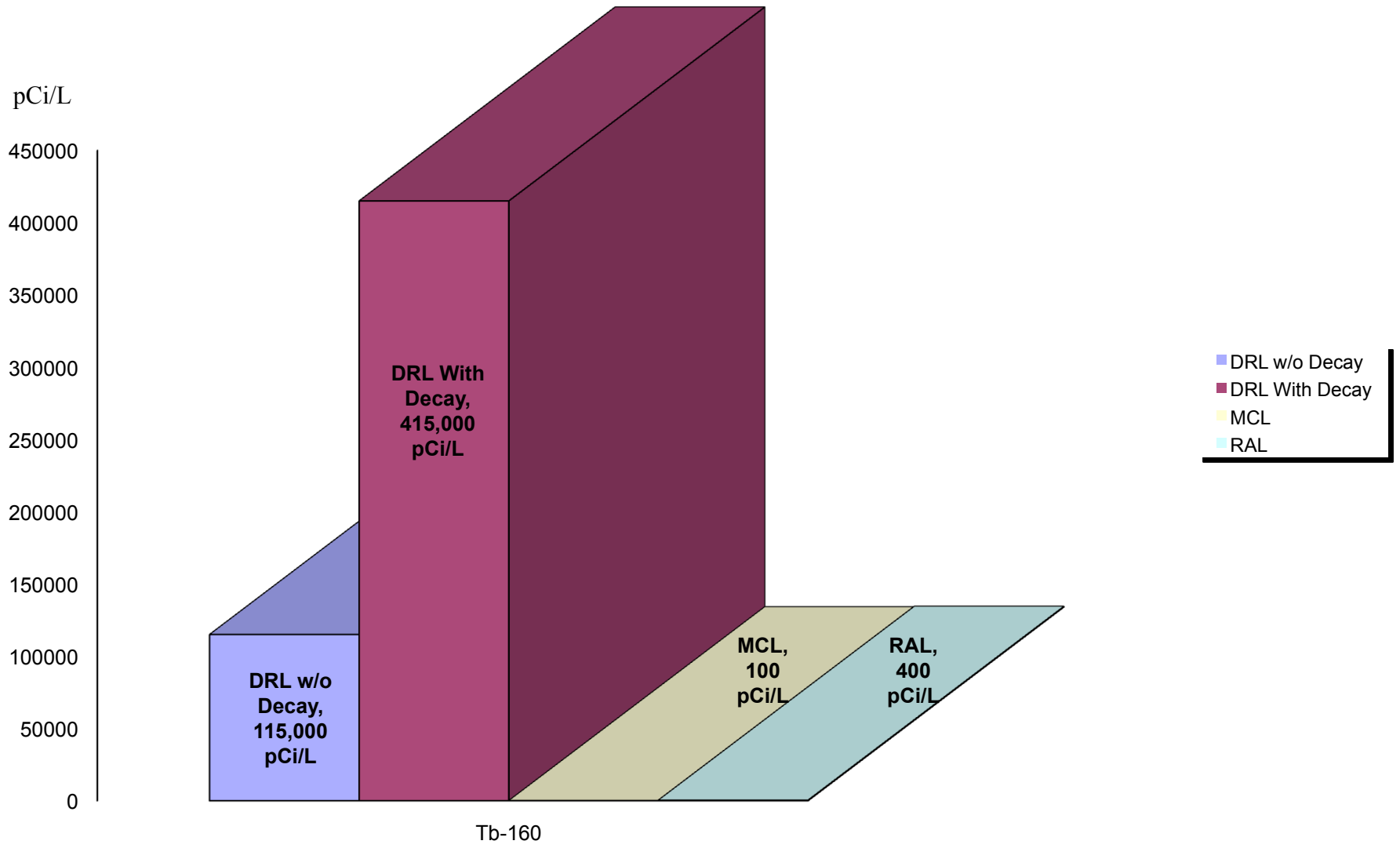

pCi/L
2000000
1800000
1600000
1400000
1200000
1000000
800000
600000
400000
200000
0
DRL w/o Decay, 1,890,000 pCi/L
DRL With Decay, 1,890,000 pCi/L
MCL, 1000 pCi/L
RAL, 6250 pCi/L
Sm-151
DRL w/o Decay
DRL With Decay
MCL
RAL

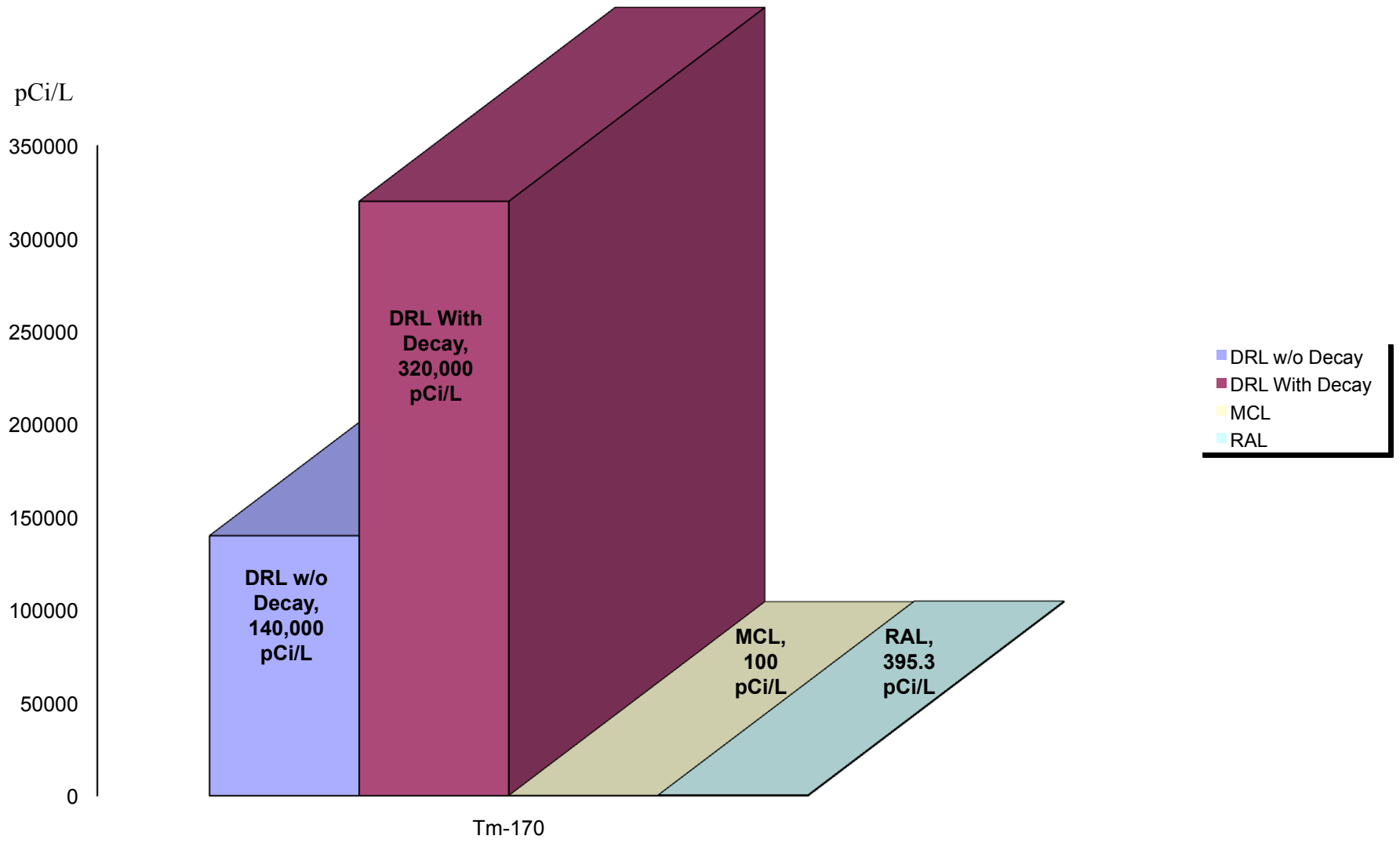

pCi/L
140000
120000
100000
80000
60000
40000
20000
0
DRL w/o Decay, 135,000 pCi/L
DRL With Decay, 139,000 pCi/L
MCL, 200 pCi/L
RAL, 1,087 pCi/L
Eu-152
DRL w/o Decay
DRL With Decay
MCL
RAL

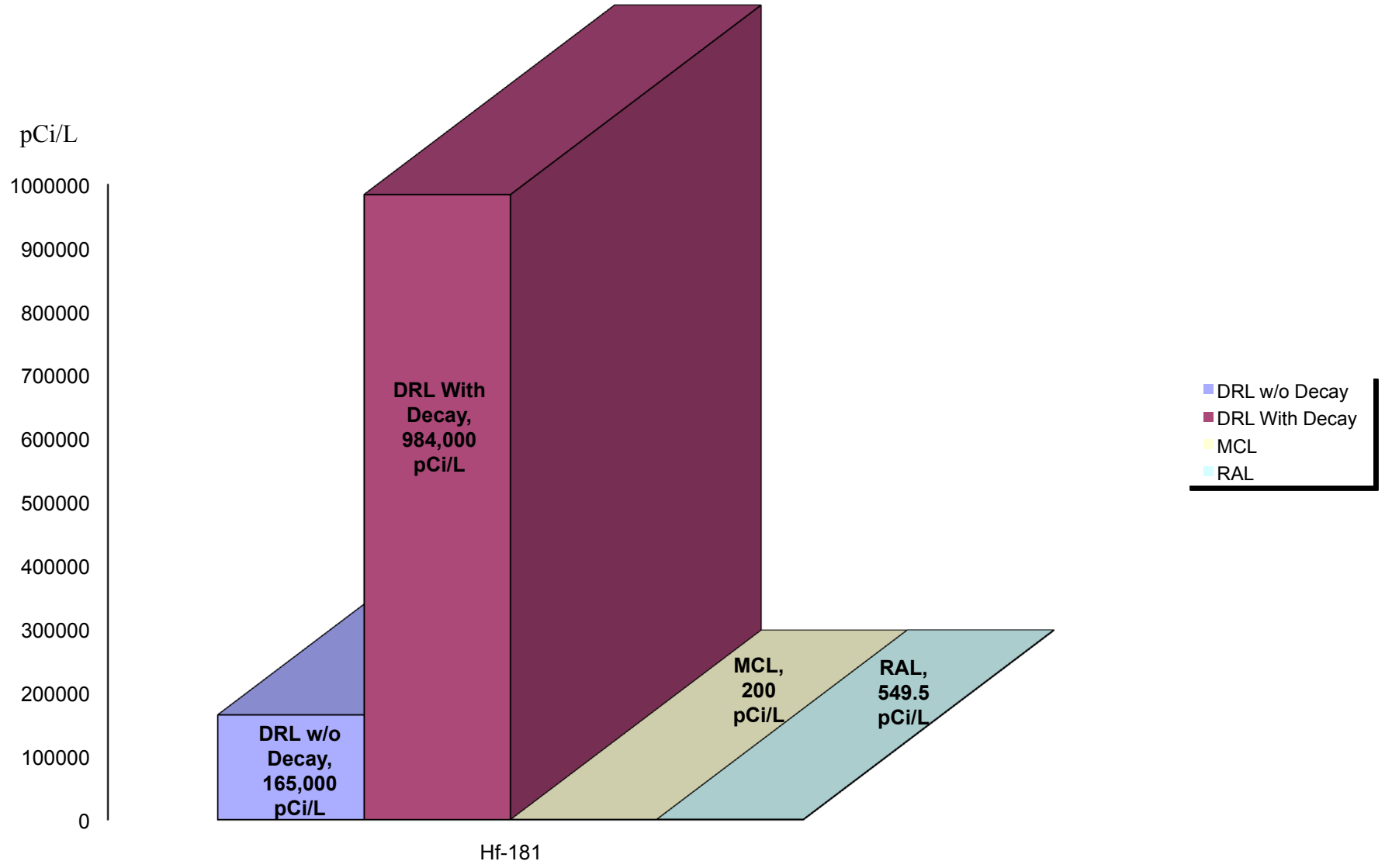

pCi/L
100000
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
DRL w/o Decay, 90,700 pCi/L
DRL With Decay, 94,300 pCi/L
MCL, 60 pCi/L
RAL, 309.3 pCi/L
Eu-154
DRL w/o Decay
DRL With Decay
MCL
RAL

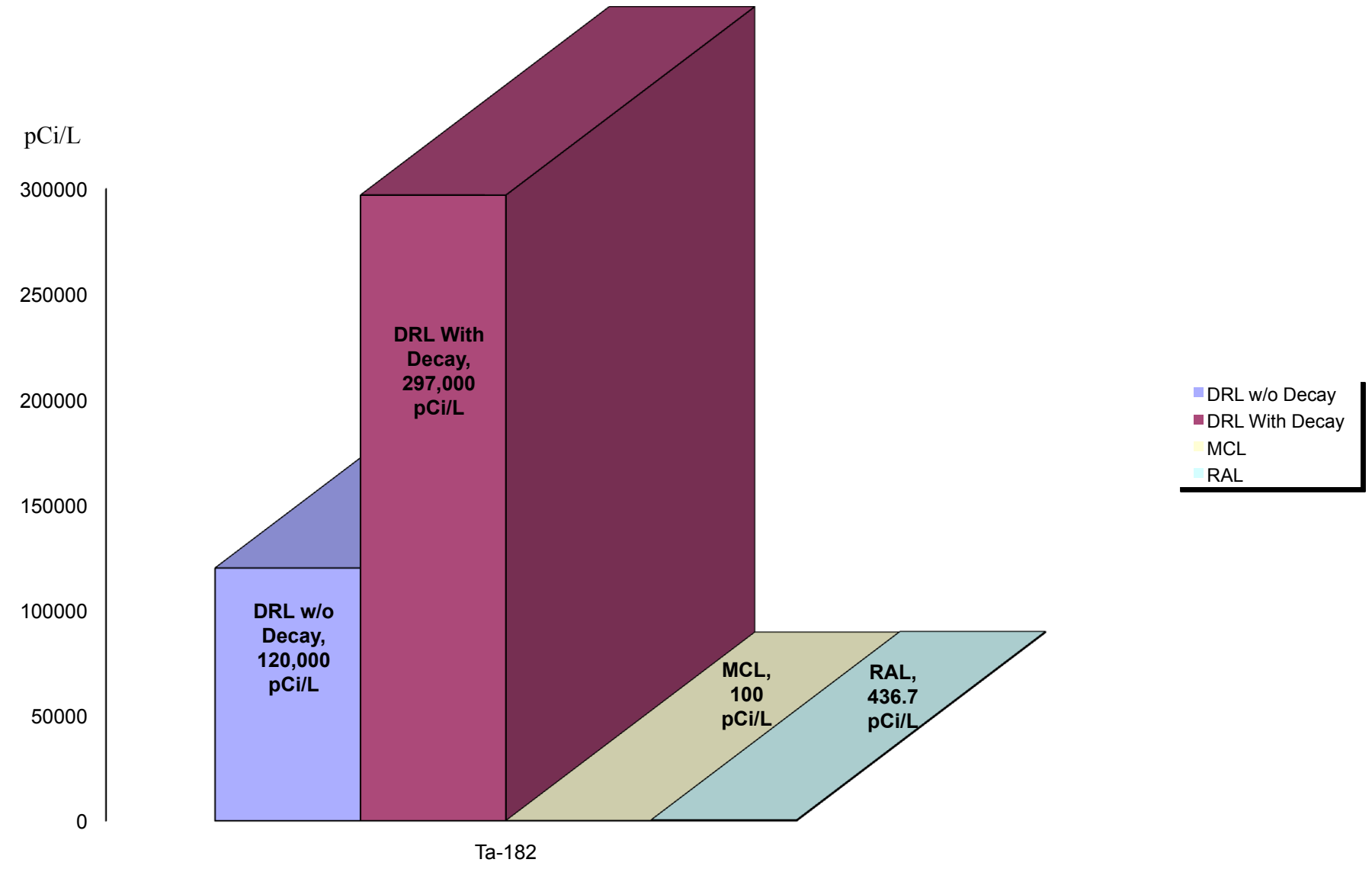

pCi/L
700000
600000
500000
400000
300000
200000
100000
0
DRL w/o Decay, 566,000 pCi/L
DRL With Decay, 607,000 pCi/L
MCL, 600 pCi/L
RAL, 1834.9 pCi/L
Eu-155
DRL w/o Decay
DRL With Decay
MCL
RAL

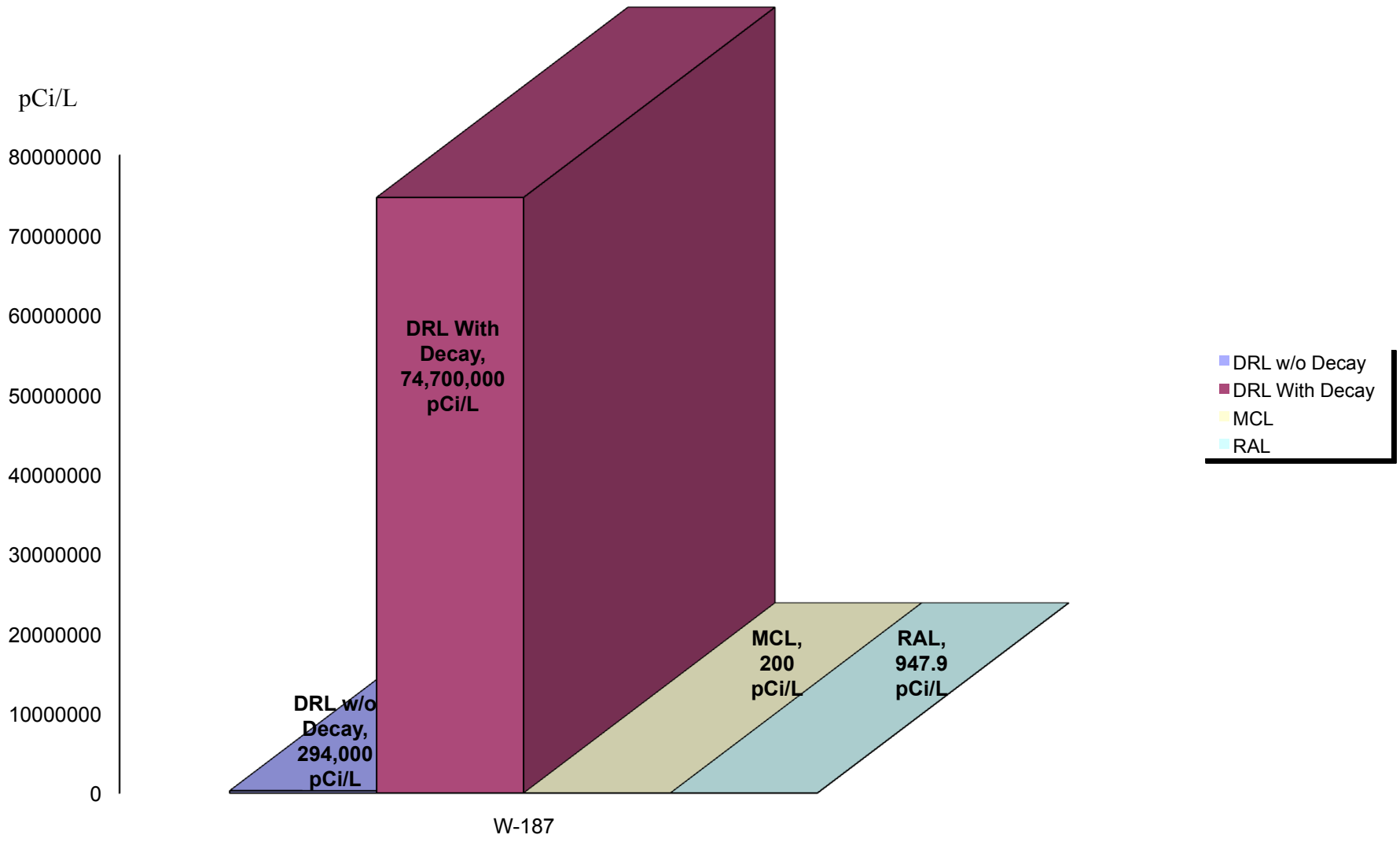

pCi/L
1200000
1000000
800000
600000
400000
200000
0
DRL w/o Decay, 665,000 pCi/L
DRL With Decay, 1,070,000 pCi/L
MCL, 600 pCi/L
RAL, 2,290.1 pCi/L
Gd-153
DRL w/o Decay
DRL With Decay
MCL
RAL

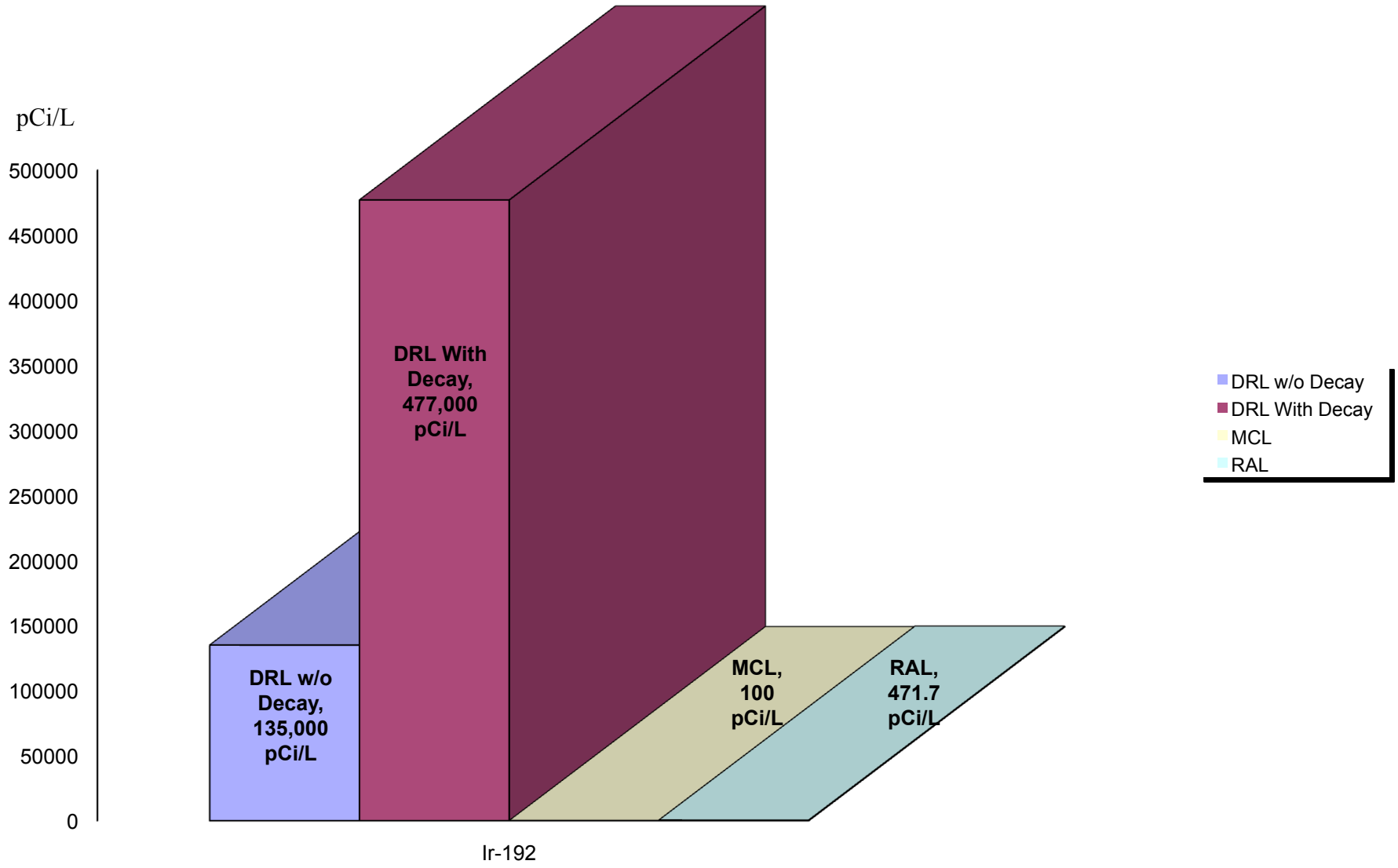

pCi/L
450000
400000
350000
300000
250000
200000
150000
100000
50000
0
DRL With Decay, 415,000 pCi/L
DRL w/o Decay, 115,000 pCi/L
MCL, 100 pCi/L
RAL, 400 pCi/L
Tb-160
DRL w/o Decay
DRL With Decay
MCL
RAL

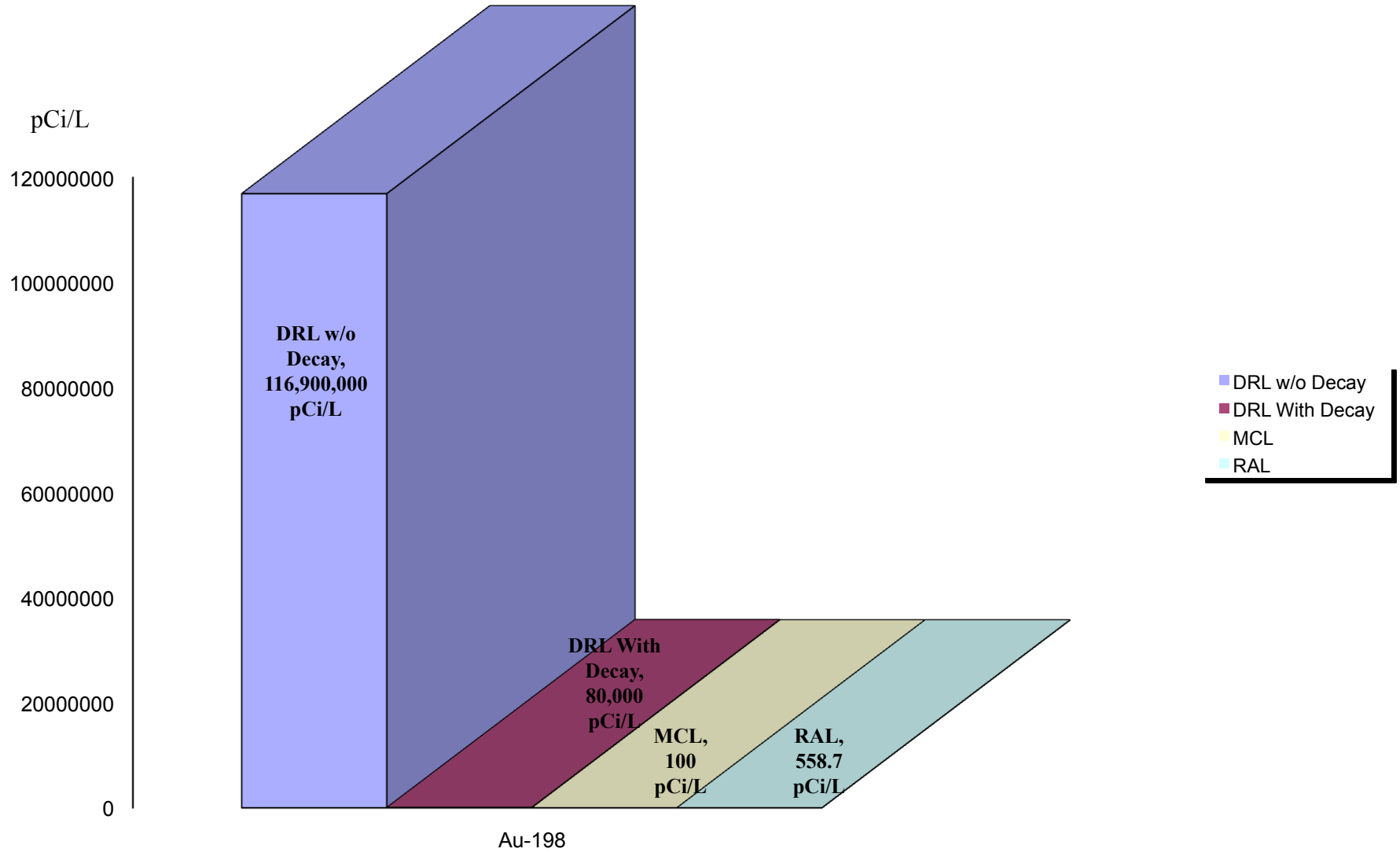

pCi/L
350000
300000
250000
200000
150000
100000
50000
0
DRL w/o Decay, 140,000 pCi/L
DRL With Decay, 320,000 pCi/L
MCL, 100 pCi/L
RAL, 395.3 pCi/L
Tm-170
DRL w/o Decay
DRL With Decay
MCL
RAL

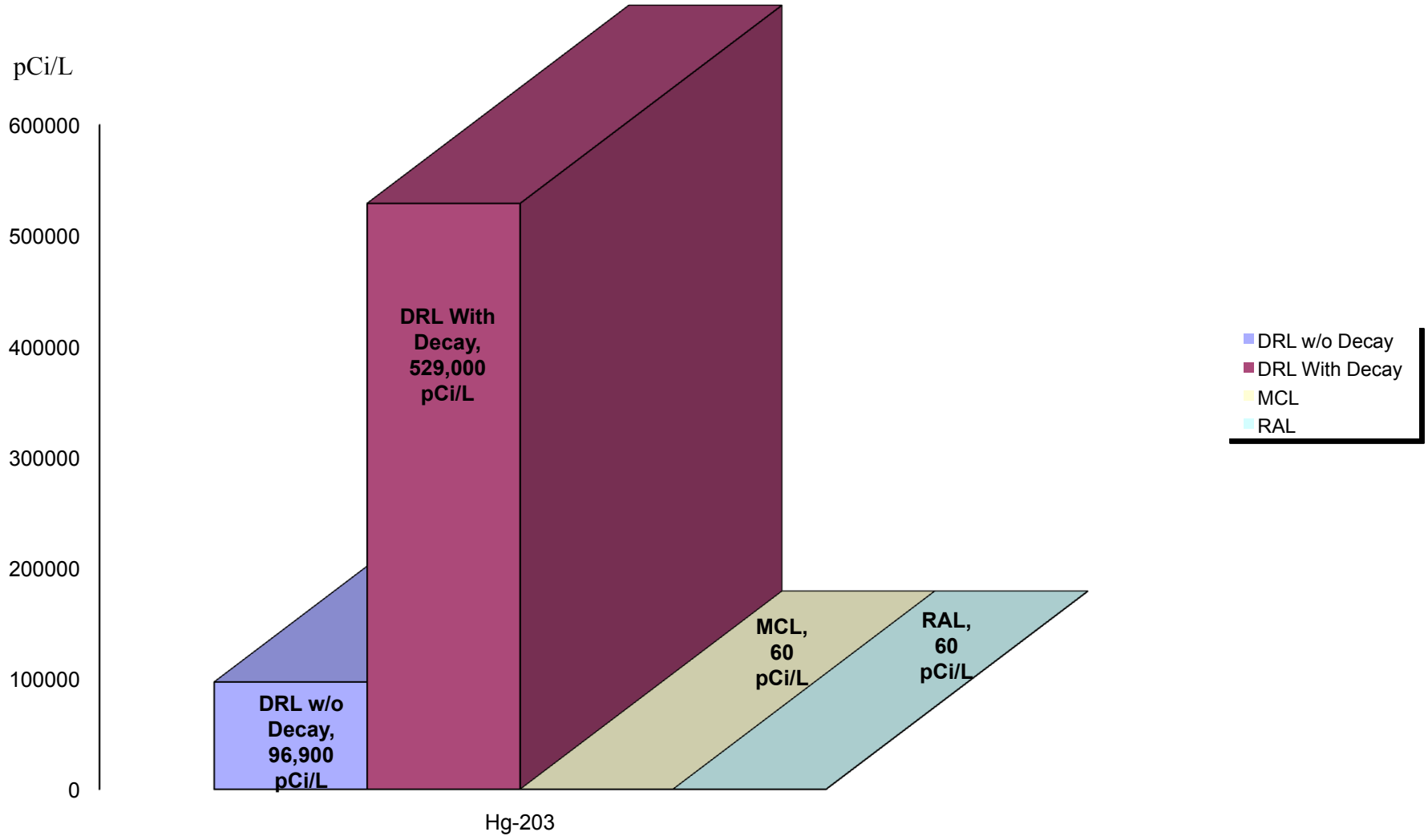

pCi/L
1000000
900000
800000
700000
600000
500000
400000
300000
200000
100000
0
DRL With Decay, 984,000 pCi/L
DRL w/o Decay, 165,000 pCi/L
MCL, 200 pCi/L
RAL, 549.5 pCi/L
Hf-181
DRL w/o Decay
DRL With Decay
MCL
RAL


pCi/L
300000
250000
200000
150000
100000
50000
0
DRL w/o Decay, 120,000 pCi/L
DRL With Decay, 297,000 pCi/L
MCL, 100 pCi/L
RAL, 436.7 pCi/L
Ta-182
DRL w/o Decay
DRL With Decay
MCL
RAL


pCi/L
80000000
70000000
60000000
50000000
40000000
30000000
20000000
10000000
0
DRL With Decay, 74,700,000 pCi/L
DRL w/o Decay, 294,000 pCi/L
MCL, 200 pCi/L
RAL, 947.9 pCi/L
W-187
DRL w/o Decay
DRL With Decay
MCL
RAL


pCi/L
500000
450000
400000
350000
300000
250000
200000
150000
100000
50000
0
DRL w/o Decay, 135,000 pCi/L
DRL With Decay, 477,000 pCi/L
MCL, 100 pCi/L
RAL, 471.7 pCi/L
Ir-192
DRL w/o Decay
DRL With Decay
MCL
RAL


pCi/L
120000000
100000000
80000000
60000000
40000000
20000000
0
DRL w/o Decay, 116,900,000 pCi/L
DRL With Decay, 80,000 pCi/L
MCL, 100 pCi/L
RAL, 558.7 pCi/L
Au-198
DRL w/o Decay
DRL With Decay
MCL
RAL


pCi/L
600000
500000
400000
300000
200000
100000
0
DRL With Decay, 529,000 pCi/L
DRL w/o Decay, 96,900 pCi/L
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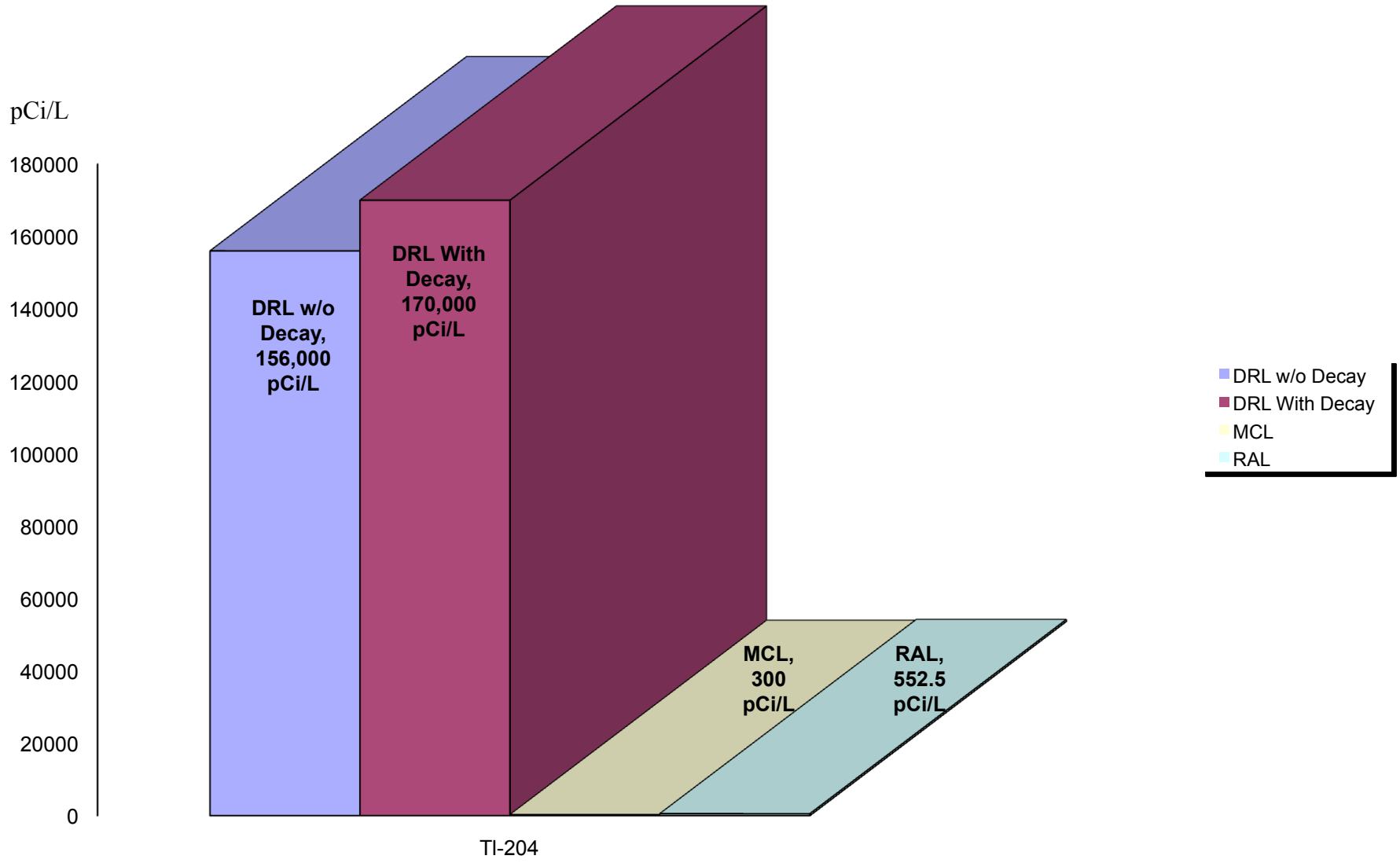
RAL, 60 pCi/L
DRL w/o Decay
DRL With Decay
MCL
RAL
Hg-203


pCi/L
180000
160000
140000
120000
100000
80000
60000
40000
20000
0
DRL w/o Decay, 156,000 pCi/L
DRL With Decay, 170,000 pCi/L
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Tl-204
DRL w/o Decay
DRL With Decay
MCL
RAL

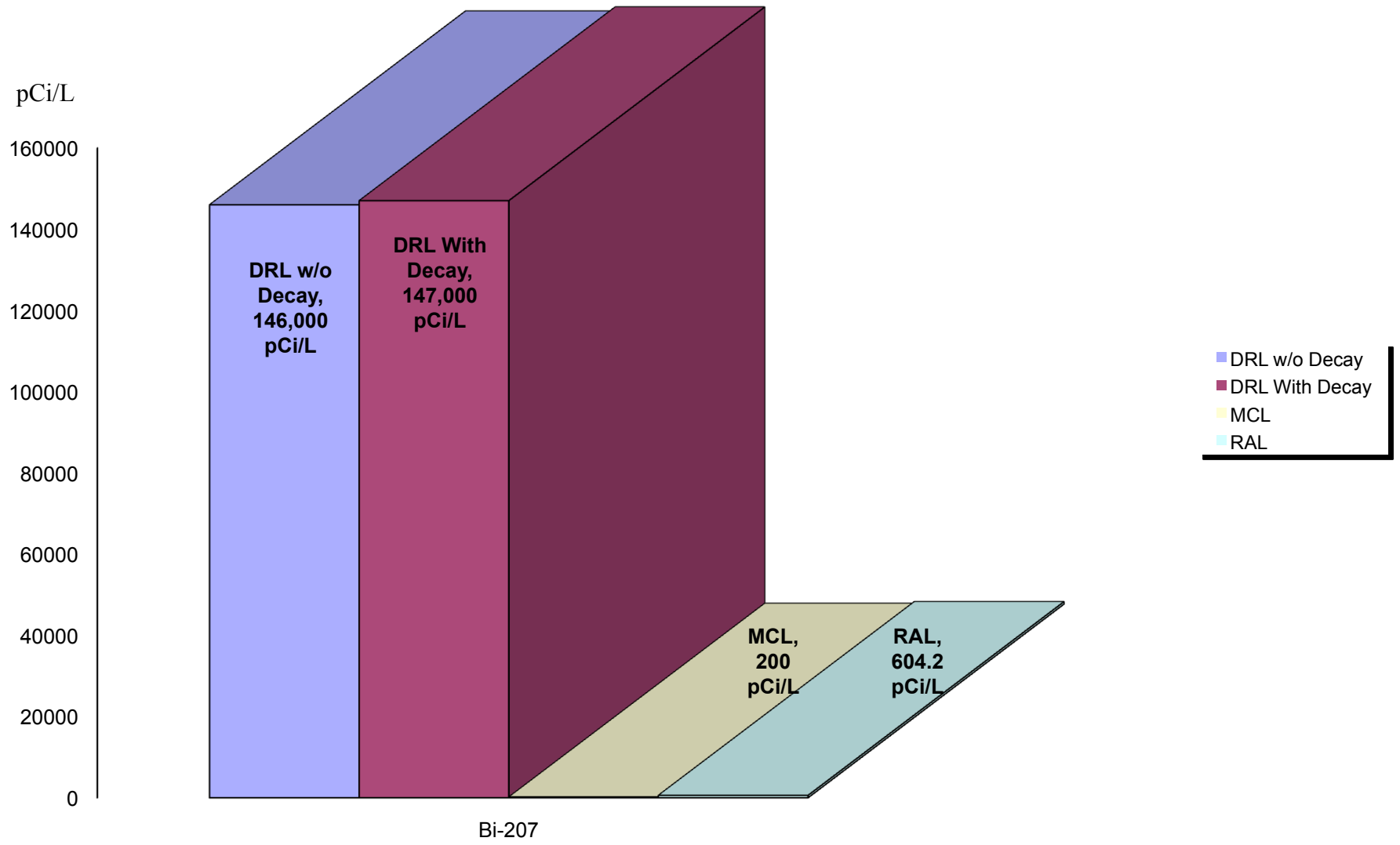
pCi/L
160000
140000
120000
100000
80000
60000
40000
20000
0
DRL w/o Decay, 146,000 pCi/L
DRL With Decay, 147,000 pCi/L
MCL, 200 pCi/L
RAL, 604.2 pCi/L
Bi-207
DRL w/o Decay
DRL With Decay
MCL
RAL

TABLE 6

DERIVATION OF CURRENT EPA REMOVAL ACTION LEVELS (RALS) FOR RADIOACTIVITY IN DRINKING WATER

NOTE: Existing EPA standards for when alternative drinking water supplies are to be provided in emergency situations are the Removal Action Levels (RALs). They are derived by calculating the concentration of a particular radionuclide that will produce a 10^{-4} (1 in 10,000) cancer risk and then comparing that concentration with the Maximum Concentration Limit (MCL) specified by EPA under the Safe Drinking Water Act. Whichever is greater is used as the RAL. See EPA policy for when to provide drinking water during emergencies and the method for deriving RALs in *Final Guidance on Numeric Removal Action Levels for Contaminated Drinking Water Site*s, 25 October 1993, from Deborah Dietrich, Director, Emergency Response Division, EPA. EPA's current risk figures for converting MCLs to RALs are found in *Radionuclides Notice of Data Availability,* prepared by Targeting and Analysis Branch, Standards and Risk Management Division, USEPA Office of Ground Water and Drinking Water, in collaboration with USEPA Office of Indoor Air & Radiation and the U.S. Geological Survey, March 2000. The following table for beta particle and photon-emitting radionuclides calculates the 10^{-4} concentration using the above EPA-specified methodology (the risk figures are from Table III-3 of the *Radionuclides Notice of Data Availability*), compares it to the MCL, and identifies the RAL that derives therefrom. [The 10^{-4} concentrations for determining RALs for alpha-emitting radionuclides are reported directly in Table III-4 of that document.]

TABLE 6: CALCULATION OF REMOVAL ACTION LEVELS (RALs) and comparisons with Proposed Derived Response Levels (DRLs) and Existing Maximum Concentration Levels (MCLs)

Radionuclide	DRL w/o Decay*	DRL With Decay*	Maximum Containment Level (MCL)*	Cancer Risk for (MCL)	10-4 Cancer Risk	Removal Action Level (RAL)*
H-3	4,420,000	4,540,000	20,000	**3.57E-05**	56,022	56,022
C-14	319,000	319,000	2,000	**1.09E-04**	1,835	2,000
Na-22	58,000	66,100	400	**1.36E-04**	294	400
P-32	77,100	1,370,000	30	**9.53E-06**	315	315
S-35	239,000	731,000	500	**8.39E-06**	5,959	5,960
Cl-36	199,000	199,000	700	**7.86E-05**	891	891
Ca-45	260,000	513,000	10	**8.96E-07**	1,116	1,116
Sc-46	125,000	397,000	100	**1.95E-05**	513	513
V-48	93,400	1,460,000	90	**2.16E-05**	417	417
Cr-51	4,790,000	43,700,000	6,000	**3.26E-05**	18,405	18,405
Mn-54	257,000	374,000	300	**2.23E-05**	1,345	1,345
Fe-55	557,000	631,000	2,000	**6.84E-05**	2,924	2,924
Fe-59	103,000	591,000	200	**5.14E-05**	389	389
Co-58	247,000	909,000	300	**2.96E-05**	1,014	1,014
Co-60	53,900	57,600	100	**5.20E-05**	192	192
Ni-63	1,220,000	1,220,000	50	**1.02E-06**	4,902	4,902
Zn-65	46,900	75,400	300	**1.23E-04**	244	300
Se-75	70,900	170,000	900	**2.65E-04**	340	900
Rb-86	65,900	892,000	600	**2.06E-04**	291	600
Sr-89	72,000	363,000	20	**1.66E-06**	1,205	1,205
Sr-90	6,650	6,730	8	**2.03E-05**	39	39
Y-90	68,800	6,530,000	60	**3.06E-05**	196	196
Y-91	78,100	341,000	90	**4.07E-05**	221	221
Zr-93	167,000	167,000	2,000	**8.55E-05**	2,339	2,339
Zr-95	192,000	773,000	200	**2.68E-05**	746	746
Nb-95	314,000	2,260,000	300	**2.16E-05**	1,389	1,389
Mo-99	306,000	28,100,000	600	**3.54E-05**	1,695	1,695
Tc-99	288,000	288,000	900	**7.28E-05**	1,236	1,236
Ru-103	252,000	1,620,000	200	**2.22E-05**	901	901
Ag-110m	66,500	106,000	90	**2.86E-05**	315	315
Cd-109	92,600	120,000	600	**9.81E-05**	612	612
In-114m	45,400	233,000	60	**4.37E-05**	137	137

* Units - picoCuries per Liter (pCi/L)

TABLE 6: CALCULATION OF REMOVAL ACTION LEVELS (RALs) and comparisons with Proposed Derived Response Levels (DRLs) and Existing Maximum Concentration Levels (MCLs)

Sn-113	251,000	620,000	300	**3.72E-05**	806	807
Sn-125	60,100	1,580,000	60	**3.41E-05**	176	176
Sb-124	72,900	311,000	60	**2.27E-05**	264	264
Te-127	1,100,000	712,000,000	900	**2.62E-05**	3,435	3,435
Te-129	2,940,000	15,300,000,000	2,000	**1.21E-05**	16,529	16,529
Te-129m	62,300	468,000	90	**4.07E-05**	221	221
Te-132	48,600	3,780,000	90	**2.13E-04**	42	90
I-132	48,600	3,780,000	90	**1.98E-04**	45	90
I-129	1,750	1,750	1	**4.22E-06**	24	24
I-131	8,490	267,000	3	**3.91E-06**	77	77
Cs-136	60,100	1,160,000	800	**2.42E-04**	331	800
Cs-137	13,600	13,800	200	**1.27E-04**	157	200
Ba-140	71,200	1,410,000	90	**3.91E-05**	230	230
La-140	91,600	13,800,000	60	**1.89E-05**	317	318
Ce-141	260,000	2,030,000	300	**3.93E-05**	763	763
Ce-143	165,000	30,400,000	100	**2.02E-05**	495	495
Ce-144	35,300	5,330,000	30	**2.60E-04**	12	30
Nd-147	171,000	3,940,000	200	**4.23E-05**	473	473
Pm-149	186,000	21,300,000	100	**1.88E-05**	532	532
Sm-151	1,890,000	1,890,000	1,000	**1.60E-05**	6,250	6,250
Eu-152	135,000	139,000	200	**1.84E-05**	1,087	1,087
Eu-154	90,700	94,300	60	**1.94E-05**	309	309
Eu-155	566,000	607,000	600	**3.27E-05**	1,835	1,835
Gd-153	665,000	1,070,000	600	**2.62E-05**	2,290	2,290
Tb-160	115,000	415,000	100	**2.50E-05**	400	400
Tm-170	140,000	320,000	100	**2.53E-05**	395	395
Hf-181	165,000	984,000	200	**3.64E-05**	549	550
Ta-182	120,000	297,000	100	**2.29E-05**	437	437
W-187	294,000	74,700,000	200	**2.11E-05**	948	948
Ir-192	135,000	477,000	100	**2.12E-05**	472	472
Au-198	116,900,000	80,000	100	**1.79E-05**	559	559
Hg-203	96,900	529,000	60	**5.70E-04**	11	60
Tl-204	156,000	170,000	300	**5.43E-05**	552	553
Bi-207	146,000	147,000	200	**3.31E-05**	604	604

* Units - picoCuries per Liter (pCi/L)

Errata

The Au-198 DRLs are correct in Table 1 but were incorrectly transcribed in the subsequent tables and figures. The correct DRL without decay is 180,000 pCi/L and with decay 16,900,000 pCu/L.

ARTICLES ABOUT THE PAG CONTROVERSY

Last Act: Bush 'sign off' weakened radiation exposure limits

Posted By News Staff On Monday, February 16, 2009 @ 5:00 am In Business, News | 4 Comments

Huge hikes in allowable radioactivity in drinking water, air and soil

Washington, DC : In January, the U.S. Environmental Protection Agency moved to dramatically relax public protections against radioactive releases, according to the Committee to Bridge the Gap (CBG) and Public Employees for Environmental Responsibility (PEER). The new standards permit public exposure to radiation levels vastly higher than EPA had previously deemed unacceptably dangerous.

Outgoing Acting EPA Administrator Marcus Peacock signed off on the new Protective Action Guide on January 15th, but the late signing prevented the document from being printed in the Federal Register before Inauguration Day. CBG and PEER are calling on the incoming Obama administration to withdraw it from the Federal Register before it is published within the next few days.

The radiation "PAGs" are supposed to be protocols for protecting the public from radiological incidents ranging from nuclear power-plant accidents to transportation spills to "dirty" bombs to contamination events at metal recycling facilities. In October, the Bush administration shrugged off objections filed by more than 60 public health and environmental groups to the emerging draft rewrite of the 1992 PAGs.

The groups objected to numerous aspects of the plan, such as –

- Drinking Water. EPA has radically increased permissible public exposure to radiation in drinking water, including a nearly 1000-fold increase in permissible concentrations of strontium-90, 3000 to 100,000-fold for iodine-131, and a nearly 25,000 increase for nickel-63. In the most extreme case, the new standard would permit radionuclide concentrations seven million times more lax than permitted under the Safe Drinking Water Act;
- Lax Cleanups. Rather than specifying long-term cleanup levels that were health protective, officials could instead choose from a range of "benchmarks" including doses so immensely high that the government's own official risk estimates indicate one in four people exposed would get cancer from the radiation exposure, on top of their normal risk of cancer. The PAGs also permit cleanup public health considerations to be overridden by economic considerations;
- Higher Exposures to More Sources. EPA relaxed exposure limits for all phases of responding to a radioactive release. For example, concentration limits for nearly twice as many radionuclides have their permissible concentrations relaxed as those that are strengthened for the early phase response, and those that are relaxed are on average weakened by more than double the rate of the smaller number that are enhanced. This despite the fact that the National Academy of Sciences' estimates of cancer risk from radiation have markedly

increased since the 1992 PAGs.

"In their last days in office, the departing Bush Administration shovels out the door astronomical increases in permitted public exposures to radioactivity," said Daniel Hirsch, the Committee to Bridge the Gap President. "Have they no shame?"

In an unusual move, approximately two-thirds of the text of the new standards are not even being published for review and public comment and presumably have already gone into effect. The remaining third would be subject to public comment but may be relied upon in the meantime.

The relaxation of radiation protection being embraced by EPA has been sought by the nuclear industry and its allies in the Department of Energy and Nuclear Regulatory Commission. The genesis of this action arose in Department of Homeland Security "dirty bomb" policies designed to provide broad flexibility in the aftermath of an attack. EPA has now expanded the relaxed dirty bomb standards to include virtually every type of radioactive release.

"This is yet another lovely parting gift from the Bush administration," stated PEER [1] Executive Director Jeff Ruch. "The Obama administration can pull this back in the next few days before it gets published and we strongly urge them to do so."

For more information:

View the letter of opposition [2] from 60 public health groups

See the Committee to Bridge the Gap [3] study detailing the effects of EPA's action

Lean about the EPA Protective Action Guide [4] process

SOURCE: Daniel Hirsch (Committee to Bridge the Gap) and Luke Eshleman (PEER) as viewed in Transition Vermont [5].

URLs in this post:

[1] PEER: **http://www.peer.org/news/news_id.php?row_id=1151**
[2] letter of opposition: **http://www.committeetobridgethegap.org/pdf/EPAAdministratorJohnson1...**
[3] Committee to Bridge the Gap: **http://www.committeetobridgethegap.org/pdf/PAGreport102208.pdf**
[4] EPA Protective Action Guide: **http://www.epa.gov/radiation/rert/pags.html#publish**
[5] Transition Vermont: **http://transitionus.ning.com/notes/index/show?noteKey=Transition_U.S._Activities_%26_Resources**

Inside EPA
Series of Articles
by
Doug Guarino
on the
PAG Controversy

The series won the Sigma Delta Chi award for Public Service In Newsletter Journalism from the Society of Professional Journalists

DRAFT EPA NUCLEAR GUIDE MAY BE WEAKER THAN SUPERFUND REMOVAL LEVELS

Date: January 14, 2008

A draft EPA guide for responding to nuclear emergencies may set significantly weaker benchmarks for when government officials should provide alternative water sources than levels set in the agency's current Superfund removal policies, an /Inside EPA /analysis of agency documents shows.

EPA officials, however, are defending the new guide, arguing the document is intended for purposes different from that of the agency's more protective Superfund removal policies.

In EPA's draft /Protective Action Guidance for Radiological Incidents/, the agency provides emergency management officials at the federal, state and local levels with guidance on responding to nuclear incidents including terrorist attacks involving the use of so-called "dirty bombs" and radiological emergencies at and around nuclear power plants.

The document, which is currently undergoing internal review, provides guidelines as to what concentrations radionuclides should reach in drinking water in the days and weeks immediately following a nuclear emergency before responders should provide the public with alternative water sources.

The concentrations, known as derived response levels (DRLs), have been under fire from environmentalists, who point out that they are thousands of times higher than what EPA allows in its traditional drinking water standards, known as maximum contaminant levels (MCLs).

Since /Inside EPA/ obtained a draft of the document late last year, environmentalists have also complained that the document adopts a controversial method the Department of Homeland Security (DHS) proposed in 2006 known as "optimization," which allows authorities to develop long-term cleanup standards based on incident-specific criteria, rather than relying on stricter, numeric standards (/Superfund Report/, Sept.

10, p3).

But EPA officials are defending the document, with an agency spokeswoman telling /Inside EPA/ last month that the DRLs address relatively short-term radiological exposure anticipated immediately following a nuclear emergency. In contrast, the MCLs are based on a lifetime of exposure, the spokeswoman says.

However, current EPA guidance suggests that even in the short-term, emergency officials should provide alternative drinking water sources such as bottled water when contamination reaches levels significantly lower -- and in some cases thousands of times lower -- than the levels the agency suggests in the draft nuclear guidance.

In 1993, EPA's Office of Solid Waste & Emergency Response (OSWER) issued its /Final Guidance on Numeric Removal Action Levels for Contaminated Drinking Water Sites/, which is intended to assist its personnel in deciding when they should use their Superfund removal authority -- which is typically used in short-term, emergency situations -- to provide alternative sources of drinking water to people adversely affected by a release of hazardous substances into the environment.

The 1993 document says that for class "A" carcinogens such as radionuclides, EPA officials should consider providing alternative water supplies when concentrations reach levels that either meet or exceed their prescribed MCLs or the level at which one or more in 10,000 people would be expected to develop cancer as a result of exposure -- whichever level is greater.

The thresholds for providing alternative water sources in the new EPA guidance are significantly higher than those that would be calculated under the 1993 methodology for radionuclides such as Strontium-90, Iodine-131 and Caesium-137, which environmentalists have raised particular concerns about due to their prevalence in fallout from both nuclear weapons and power plant meltdowns and their known ability to adversely impact human health.

For Strontium-90, the MCL is 8 picocuries per liter (pCi/L), a cancer risk of approximately two in 100,000 according to EPA data, meaning the 1-in-10,000 cancer risk level is reached at a concentration of

approximately 39 pCi/L. The 1993 guidance would therefore suggest providing alternative water sources at the 39 pCi/L concentration, since that is the higher level.

The new EPA guidance, however, suggests emergency responders need not provide an alternative water source until Strontium-90 concentrations reach 6,730 pCi/L -- a level 173 times higher than the 39 pCi/L level. /Relevant documents are available on InsideEPA.com. /See page 2 for details.

The situation is similar for Iodine-131 and Caesium-137.

For Iodine-131, the MCL is 3 pCi/L, which according to the EPA data has a cancer risk of nearly four in 1 million, meaning the 1-in-10,000 risk is reached at a concentration of 77 pCi/L. Under the 1993 guidance EPA officials should consider providing alternative water sources at the 77 pCi/L concentration, since that is the higher value, but that level is still 3,468 times lower than the 267,000 pCi/L level EPA suggests in the new guidance.

And for Caesium-137, the MCL is 200 pCi/L, which according to the EPA data has a cancer risk of just over two in 10,000, meaning the 1-in-10,000 risk is reached at a concentration of approximately 93 pCi/L. Under the 1993 guidance, EPA officials should consider providing alternative water sources at the 200 pCi/L concentration, since that is the higher value, but that level is still 68 times lower than the 13,600 pCi/L concentration EPA suggests in the new guidance.

EPA, however, is maintaining its defense of the document, arguing that addressing the aftermath of a catastrophic radiological incident is different from a removal action. “The numbers don’t coincide because they are being used for different purposes,” the EPA spokeswoman says.

Agency officials have also argued in the past that the new nuclear guidance is needed because it provides flexibility “to balance the risk to the public from short-term exposure to radiation with other potential risks associated with the protective actions themselves,” such as going without water, “or with the technical difficulty of implementing a specific protective action during a crisis.”

However, EPA already provides decision makers with flexibility in the 1993 guidance, while still suggesting that agency personnel consider the stricter thresholds as their benchmarks.

The 1993 guidance explains that the drinking water concentrations of contaminants it suggests should be "considered, along with other factors, in determining whether to provide alternate water supplies under Superfund removal authority."

In addition, the 1993 document says the concentrations are "one factor, along with cost and affordability considerations, used in making unreasonable risk to health determinations under the Safe Drinking Water Act." /-- Douglas P. Guarino/

Source: Superfund Report via InsideEPA.com

Date: January 14, 2008

Issue: Vol. 22, No. 1

Superfund Report - 4/21/2008

NUCLEAR EMERGENCY GUIDE PROMPTS ALARM AMONG EPA STAFF, STATES

Emergency response and nuclear waste cleanup experts, including EPA staff, state regulators and environmentalists, say they have serious concerns that a new EPA draft guide for when government officials should provide alternative water sources to people living in areas affected by a radiological emergency is not protective of human health.

In addition, as the Bush administration nears finalization of a similar document proposed by the Department of Homeland Security (DHS), many of the experts fear that the draft EPA guide, if published, could bolster arguments by industry and other federal agencies for weaker response actions at a broad range of contaminated sites.

At issue is EPA's draft /Protective Action Guidance for Radiological Incidents/, which suggests emergency officials responding to a wide

range of nuclear emergencies, including so-called “dirty bomb” attacks and accidents at nuclear power plants, weapons facilities and manufacturing plants, need not consider providing alternative drinking water sources such as bottled water until contamination reaches levels significantly higher -- in some cases thousands of times higher -- than current EPA guidance on when to supply alternative drinking water in the event of an emergency at a Superfund site (/Superfund Report/, Jan. 14, p3).

EPA has defended the new guidance since /Inside EPA/ obtained a copy of it late last year, arguing that addressing the aftermath of a catastrophic radiological incident is different from the type of emergencies addressed in the existing Superfund guide, known as the /Final Guidance on Numeric Removal Action Levels for Contaminated Drinking Water Sites./ The agency’s Office of Solid Waste & Emergency Response (OSWER) published in the existing Superfund guide 1993.

But statements an EPA spokeswoman has made in recent correspondence with /Inside EPA /have prompted renewed fears among environmentalists and some EPA staffers that the agency might suggest its emergency response personnel should use the dramatically less protective benchmarks in the new draft guide, rather than the 1993 guidance, as a reference when deciding whether to supply alternative water sources to people living in areas affected by a Superfund emergency.

The EPA spokeswoman says that the method for determining when agency officials should consider providing alternative drinking water in the 1993 document is “not currently being implemented” and that a forthcoming update to the 1993 guide will only address chemical -- as opposed to radioactive -- contaminates (/see related story/).

The spokeswoman argues that Removal Action Levels (RALs), which are the subject of the 1993 document, “only address chemical contaminates” and says “EPA developed Protective Action Guides (PAGs),” which are the subject of the new draft guide obtained by /Inside EPA/,/ /“to provide guidance on actions to protect the public during a radiological emergency.”

Asked to clarify whether the agency was in fact suggesting that PAGs be substituted for the more protective RALs when determining whether an emergency response action was necessary at a Superfund site with radiological contaminants, the EPA spokeswoman said the agency publishes PAGs “for use in a multi-agency radiation emergency response, per the National Response Framework’s Nuclear-Radiological Incident Annex” and that the “PAGs are guidance designed primarily for use by state and local responders.”

When asked what guidance EPA personnel should refer to when deciding whether to initiate an emergency response action under Superfund, the EPA spokeswoman declined to comment further. “We’ve said everything we plan to say,” the EPA spokeswoman said.

For environmentalists, the EPA spokeswoman’s statement added to previous concerns that the draft guide, along with the similar DHS document the administration proposed in 2006, could lead to a weakening of Superfund responses at sites with radiological contaminates.

“Something is amiss,” an environmentalist following the issue says. “EPA’s feet are shifting like crazy.”

Some state regulators and EPA staffers also are concerned that, if finalized, the new EPA guide will provide officials in industry and other federal agencies such as the Department of Energy (DOE) with a powerful tool to argue for weaker responses at a wide variety of sites.

Some EPA staffers and state regulators had urged DHS to adopt strict Superfund standards in its proposed dirty bomb guidance. But DHS and other federal agencies, including DOE and the Nuclear Regulatory Commission (NRC), rebuffed the push, arguing that meeting Superfund standards would be too costly.

Instead, DHS’ proposed guide uses a controversial method known as “optimization,” which allows authorities to develop response standards based on incident-specific criteria. State regulators, some EPA staffers and environmentalists are now concerned that the new draft EPA document, which addresses a broader ranger of incidents than the DHS proposal, not only adopts the optimization method, but goes even further by recommending the weaker benchmarks for emergency drinking water.

“Once these kind of numbers are published in a guidance they tend to be misused,” a state source says, “even though the footnotes may say” they should not be applied to a broad range of sites. In addition, EPA “seems to be abandon well established, risk-based methodology in the guidance, which leads us at least at first to question” the agency’s motives, the source says.

A former EPA emergency response official says the benchmarks the agency suggests in the draft guidance appear to be an attempt on behalf of the Bush administration and its constituents “to maximize the politics of the day.” The “only reason” EPA would raise the benchmarks as high as it does in the draft is to cut costs, the former EPA official says. “It’s definitely not a health feature,” the former official says.

In the past, DOE officials have sought response actions weaker than EPA's Superfund standards when fires have occurred at their nuclear facilities, the former official says, and adds that codifying weaker benchmarks in the new EPA guide could give federal agencies and industry leverage to classify such incidents as emergencies and therefore subject to the weaker thresholds.

The state source notes that while states often have the final say at cleanup sites, federal law "doesn't give us very broad authority over radionuclides."

A second state source says it is "troubling that the federal government would suggest those levels are appropriate -- I can't envision a scenario where drinking that water is better than not drinking it."

Despite the EPA spokeswoman's claims that the methods in the 1993 RAL guidance "are not currently being implemented," EPA's Web site continues to recommend that officials refer to the document when deciding whether to take an emergency Superfund action.

The 1993 document does not make any statements suggesting it is not applicable to radiological contaminates, despite the spokeswoman's assertions that RALs "only address chemical contaminates."Additionally, other Superfund guidance documents have generally maintained that the agency's approach to handling radioactive contaminates should be consistent with how it handles chemical contaminates.

For example, a 1997 guide titled /Establishment of Cleanup Levels for [Superfund] Sites with Radioactive Contamination/ states that "[c]leanup levels for radioactive contamination at [Superfund] sites should be established as they would for any chemical that poses an unacceptable risk and the risks should be characterized in standard Agency risk language consistent with [Superfund] guidance.

And several EPA sources familiar with emergency response told /Inside EPA/ that the agency's maximum contaminant levels (MCLs) under the Safe Drinking Water Act, on which the benchmarks suggested in the 1993 guidance are largely based, are still commonly referred to by agency officials when deciding whether to initiate an emergency response action under Superfund at sites with radioactive contaminates.

Regardless of the administration's motives, many EPA sources familiar with emergency response downplay the prospect of their EPA colleagues adopting the benchmarks in the draft PAG document for anything short of major nuclear catastrophe, and even in that case, many agency officials would likely be reluctant to use those weaker benchmarks as a guide, the

sources say.

One EPA source argues that the agency's emergency response officials already ignore the existing PAG document.

"Those levels in the PAG will never be accepted, at least not once an actual response begins," a second EPA source says. "Our partners will insist on the MCLs . . . we already ignore the other PAGs."

But while state regulators acknowledge that they do usually maintain final say over such decisions, they nonetheless say they have serious concerns with the suggested benchmarks in the new EPA draft guide, and note that they are dramatically less protective then current standards that are widely accepted as being protective of human health.

"It's certainly hard not to be skeptical when the numbers are that drastically different," the first state source says, adding that the benchmarks in the new guide "seem so drastically different" that they will likely be "hard to justify." EPA officials who developed the draft guidance "probably misjudged the public's willingness to remain or return to an area" affected by a catastrophic nuclear incident, the source says.

Like the similar guide DHS proposed in 2006, the draft EPA guide appears to assume a "public desire to return to work" quickly following such a catastrophe, but state regulators are skeptical of that assumption, the state source says.

OSWER's 1993 RAL guide says that for class "A" carcinogens such as radionuclides, EPA officials should consider providing alternative water supplies when concentrations reach levels that either meet or exceed their prescribed MCLs or the level at which one or more in 10,000 people would be expected to develop cancer as a result of exposure -- whichever level is greater.

But the thresholds for providing alternative water sources in the draft PAG guidance are significantly higher than those that would be calculated under the 1993 methodology for radionuclides such as Strontium-90, Caesium-137 and Iodine-131, which environmentalists have raised particular concerns about due to their prevalence in fallout from both nuclear weapons and power plant meltdowns and their known ability to adversely impact human health.

For Strontium-90, the MCL is 8 picocuries per liter (pCi/L) of water, a cancer risk of approximately two in 100,000 according to EPA data, meaning the 1-in-10,000 cancer risk level is reached at a concentration

of approximately 39 pCi/L. The 1993 guidance would therefore suggest providing alternative water sources at the 39 pCi/L concentration, since that is the higher level.

The new EPA guidance, however, suggests emergency responders need not provide an alternative water source until Strontium-90 concentrations reach 6,730 pCi/L -- a level 173 times higher than the 39 pCi/L level. The situation is similar for Caesium-137 and Iodine-131. /Relevant documents are available on InsideEPA.com./

EPA officials have defended the drinking water benchmarks in the draft PAG guide by arguing that while the MCLs assume a life time of exposure to radioactive contaminates, the PAG numbers are meant to address relatively short-term exposure following a catastrophic incident.

And some EPA and state sources argue the higher benchmarks may be justifiable in some catastrophic situations, particularly if the only alternative to drinking contaminated water is not drinking at all. But the PAG levels are so high they are not justifiable, the second EPA source says.

The second state source calls the concentrations suggested in the draft guide "eye-popping," and adds, "I would not want to drink water that contaminated for any period of time myself."

"As someone [with experience dealing with nuclear materials], I wouldn't want to be anywhere near those levels," the former EPA official says. /-- Douglas P. Guarino

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Superfund Report - 5/19/2008

ACTIVISTS EYE REPORT TO AID OPPOSITION TO EPA NUCLEAR EMERGENCY GUIDE

Activists are preparing a report to detail significant disparities between a draft EPA guide for responding to nuclear emergencies and EPA's current guide for responding to such incidents under Superfund authority as part of an effort to derail the draft guide that they say is insufficiently protective of human health.

At issue is EPA's draft /Protective Action Guidance for Radiological Incidents/, which says when responding to a wide range of nuclear emergencies, including so-called "dirty bomb" attacks and accidents at nuclear power plants, weapons facilities and manufacturing plants, emergency officials need not consider providing alternative drinking

water sources, such as bottled water, to people living in affected areas until contamination reaches levels significantly higher -- and in some cases thousands of times higher -- than current EPA guidance on when to supply alternative drinking water in the event of an emergency at a Superfund site.

After /Inside EPA/ obtained a copy of the draft guide late last year, the agency defended the document, saying it is only intended only to address the aftermath of a catastrophic radiological incident, which it argues is different from the type of emergencies addressed in the existing Superfund guide.

Nevertheless, emergency response and nuclear waste experts -- including EPA staff, state regulators and environmentalists -- say they continue to have serious concerns the benchmarks the draft documents suggests are not protective of human health (/Superfund Report/, April 21, p8). In addition, as the Bush administration nears finalization of a similar document proposed by the Department of Homeland Security (DHS), many of the experts fear the draft EPA guide, if published, could bolster arguments by industry and other federal agencies for weaker response actions at a broad range of contaminated sites.

The report that environmentalists are now preparing will compare all 110 radionuclide-specific benchmarks -- called derived response levels -- at which the draft EPA guide suggests emergency responders should consider providing alternative drinking water sources to those calculated using the methodology the agency suggests in the existing Superfund guide, known as the /Final Guidance on Numeric Removal Action Levels for Contaminated Drinking Water Sites/, an activist source says.

A previous /Inside EPA/ review of the documents found that for three radionuclides of particular concern to environmentalists -- Caesium-137, Strontium-90 and Iodine-131 -- the benchmarks EPA suggests in the new draft guide are significantly less protective than those calculated using the methodology the agency suggests in the current Superfund guide, which its Office of Solid Waste & Emergency Response published in 1993.

For Caesium-137, the benchmark suggested in the new draft guide is about 68 times higher than the one calculated using the 1993 methodology. For Strontium-90 the 1993 level is 173 times lower than that suggested in the new draft guide and for Iodine-131 it is 3,468 times lower (/Superfund Report, /Jan. 14, p3).

The environmentalist report will show that the benchmarks in the draft guide “are just astronomically” higher than those derived using the

Superfund methodology and that EPA in the new document is "relaxing by orders of magnitude protections for drinking water," according to the activist.

Once the report is complete, activists intend to use it in an effort to persuade a coalition of environmentalist groups to join a letter writing campaign directed at EPA and members of Congress urging that the draft guidance be abandoned, the activist says. The effort will likely be similar to one environmentalists launched in response to a proposed DHS guide for responding to "dirty bomb" attacks, the source adds.

Like the proposed DHS guide, called/ Protective Action Guides for Radiological Dispersal Devices (RDD) and Improvised Nuclear Device Incidents/, the new EPA document also endorses a controversial concept known as "optimization," which allows authorities to develop long-term cleanup standards based on incident-specific criteria.

Environmentalists, along with some state regulators and EPA staffers, are concerned that since the new draft EPA document addresses a broader range of incidents than the DHS proposal, it could provide officials in industry and other federal agencies such as the Department of Energy with a powerful tool to argue for weaker responses at a wide variety of sites.

The Bush administration is now close to finalizing the DHS document and a state regulator source, who has concerns with both documents, fears that EPA may be able to push forward its new guide without strong opposition from state environmental agencies.

Given EPA's assertion the document is only aimed at catastrophic nuclear incidents, state environmental regulators may not realize the guide's potentially broader significance, the state regulator says. "I could see it slipping by," the state regulator says. /-- Douglas P. Guarino/

Superfund Report - 7/28/2008

DHS SET TO FINALIZE 'DIRTY BOMB' GUIDE AMID DELAY TO BROADER EPA PLAN

The Department of Homeland Security (DHS) is set to finalize in the coming week its guide for addressing so-called dirty bomb attacks that critics fear may lead to weaker radiological cleanup standards than EPA currently recommends, just as the Bush administration is opting to delay

issuing a broader, also contentious EPA guide for responding to a wide range of nuclear emergencies, federal government and activist sources say.

DHS' final /Protective Action Guides for Radiological Dispersal Devises and Improvised Nuclear Device Incidents /has been signed by top department officials and is slated for /Federal Register/ publication in the coming week, the sources say. The document, which aims to provide emergency responders at the federal, state and local levels with guidance on responding to "dirty bomb" attacks, has been pending interagency review at the White House Office of Management & Budget (OMB) since 2006.

It is unclear what, if any, changes have been made to the DHS guide since its proposal, but the federal government and activist sources say they anticipate only minor alterations. Environmentalists and some EPA officials have strongly opposed the guide's finalization, fearing it could lead to a weakening of cleanup standards.

However, a separate draft EPA guide, which is similar to the DHS document but covers a broader range of nuclear emergencies -- including not only dirty bomb attacks, but also accidents at nuclear power plants, weapons facilities and manufacturing plants -- will likely not be released for public comment for at least several months, the federal government and activist sources say.

OMB officials recently indicated they would like to make some changes to the draft EPA document, titled /Protective Action Guidance for Radiological Incidents/, which will likely mean months of additional review involving OMB and EPA staff, the sources say. OMB officials have indicated the review will occur during the remainder of the Bush administration, but it is unclear when the draft guide will be published in the /Federal Register/ for public comment, the sources say.

Spokeswomen for DHS and OMB declined to comment. An EPA spokeswoman said the agency anticipates the draft EPA guide will be released for public comment in the fall.

After /Inside EPA/ obtained a copy of the draft EPA guide late last year, emergency response and nuclear waste cleanup experts -- including EPA staff, state regulators and environmentalists -- said they have serious concerns with the document, in part because, like the soon-to-be-finalized DHS guide, the EPA document endorses a controversial concept known as "optimization," which allows authorities to develop long-term cleanup standards based on incident-specific criteria (/Superfund Report/, April 21, p8).

Environmentalists, along with some state regulators and EPA staffers, have expressed concern that the endorsement of optimization in the guides could provide officials in industry and other federal agencies such as the Department of Energy with powerful tools to argue for weaker responses at a wide variety of sites.

In addition, the draft EPA guide suggests that when responding to a wide range of nuclear emergencies, emergency officials need not consider providing alternative drinking water sources, such as bottled water, to people living in affected areas until contamination reaches levels significantly higher -- and in some cases thousands of times higher -- than current EPA guidance on when to supply alternative drinking water in the event of an emergency at a Superfund site.

An /Inside EPA/ review of the documents found that for three radionuclides of particular concern to environmentalists -- Caesium-137, Strontium-90 and Iodine-131 -- the benchmarks EPA suggests in its new draft guide are significantly less protective than those calculated using the methodology the agency suggests in its current Superfund guide -- called /Final Guidance on Numeric Removal Action Levels for Contaminated Drinking Water Sites/ -- which its Office of Solid Waste & Emergency Response published in 1993.

For Caesium-137, the benchmark suggested in the new draft guide is about 68 times higher than the one calculated using the 1993 methodology. For Strontium-90, the 1993 level is 173 times lower than that suggested in the new draft guide and for Iodine-131, it is 3,468 times lower (/Superfund Report/, Jan. 14, p3).

EPA defends the document, saying it is only intended to address the aftermath of a catastrophic radiological incident, which it argues is different from the type of emergencies addressed in the existing Superfund guide. -- /Douglas P. Guarino/

SUPERFUND-22-15-1

Superfund Report - 7/28/2008

EPA RADIATION GUIDE REVISIONS RENEW ACTIVISTS' FEARS OVER WEAK LIMITS

EPA's recent withdrawal of its proposed guide on radiation exposure limits for the general public in order to revise the document following new recommendations by the International Commission on Radiological Protection (ICRP), appears to underscore environmentalists' fears that the controversial ICRP recommendations that critics say are too weak could influence the agency's radiation policy, sources familiar with the issue say.

EPA June 10 withdrew its proposed /Federal Radiation Protection Guidance for Exposure of the General Public/, which had been pending interagency review at the White House Office of Management & Budget (OMB) since October 2005. At the time of the withdrawal, an agency spokesman told /Inside EPA/ only that the proposal "has been withdrawn to be updated" because "more information is available since the package was sent in 2005" and declined to comment further (/Superfund Report/, June 16, p7).

But an EPA official says that the agency withdrew the guide in part to reevaluate it in light of the ICRP recommendations finalized earlier this year. The proposal was pending OMB review "for quite some time," the official notes, adding that EPA wants to make sure it is up-to-date with the ICRP document.

An EPA revision of its proposed general public exposure guide based on the ICRP recommendations could realize environmentalists' fears that the controversial recommendations would influence federal policy, one activist says. While also strongly opposed to the ICRP recommendations, a second activist source stops short of criticizing EPA for withdrawing its guide from White House review, noting that the EPA document itself is highly controversial and that environmentalists have fought hard against its finalization.

Even if EPA does not make any changes to its proposed guide after comparing it to the ICRP document, the agency could cite the ICRP recommendations as justification for finalizing the controversial standards it already contains, the first activist says.

The ICRP recommendations have drawn fierce criticism from environmentalists since the commission released a draft version of the recommendations early last year. Activists and EPA sources say the recommendations generally support weakening radiation exposure limits and may serve as an endorsement of contentious approaches to setting limits favored by some EPA and Department of Energy officials but opposed by environmentalists and some agency Superfund officials (/Superfund Report/, Jan. 29, 2007, p19).

For example, ICRP suggests "abandoning" the process of establishing

standard radiation limits for all exposure situations, including limits at waste facilities. Instead, ICRP recommends a "situation-based approach" that would likely lead to a wide range of standards tailored to fit individual sites -- a concept often referred to as "optimization."

Environmentalists and some EPA officials have long opposed optimization in favor of strict Superfund standards, and have fought efforts to include the concept in federal guidance documents, including those that EPA and the Department of Homeland Security have proposed relating to nuclear emergencies (/see related story/).

EPA first proposed the radiation guide under the Clinton administration in 1994, but later shelved it following an internal dispute between the agency's Superfund program and its Office of Radiation & Indoor Air, in which Superfund officials argued the guide's standard was too weak and that other federal agencies could use it to justify radiation cleanups weaker than those EPA typically requires under Superfund.

Activists vowed "the mother of all fights" if EPA re-proposed the guide with the controversial standard, which the agency did in October 2005 by sending a somewhat modified version of the draft proposal to OMB for review.

Like the version proposed under the Clinton administration, the 2005 document included an option suggesting an overall radiation exposure limit of 100 millirem (mrem) per year, which environmentalists strongly criticized. The critics noted that while the Superfund National Contingency Plan sets a one-in-10,000 cancer risk standard, some projections estimate the 100 mrem level prevents a cancer risk of greater than one in 1,000.

The first activist questions whether the finalization of the ICRP recommendations this year is really the main driver behind the agency's delay in finalizing the document, saying the Bush administration may be looking to avoid publishing the controversial guide during an election year, and that the agency could use the ICRP recommendations to justify finalizing it in the future. It is unclear what is new in the final ICRP recommendations that merits EPA revising its guide, the activist adds.

Another informed source following the issue agrees, saying EPA officials were aware of the key ICRP recommendations since the release of its draft document early last year, meaning they would have had ample time to adjust their own proposed guidelines. /-- Douglas P. Guarino/

Superfund Report - 6/15/2009

EMERGENCY GUIDE MAY REVIVE FAILED EFFORT TO RELAX WATER STANDARDS

EPA's use of a controversial method to calculate the drinking water protections in its draft nuclear emergency guide is prompting some activists to accuse agency officials of trying to use the document as a vehicle for reviving a decades-old proposal to relax the agency's drinking water standards that a federal court previously rejected.

The accusations come as activists are gearing up to pressure newly confirmed Obama appointees to the agency to abandon the nuclear emergency guide, and activists say their contention that the drinking water protections are at least in part based on the old proposal bolsters their argument against the controversial draft document.

Agency officials under the Bush administration calculated the drinking water protections in the draft /Revisions to the Protective Action Guides Manual for Radiological Incidents/ using radiation dose conversion factors from EPA's /Federal Guidance Report 13/ (FGR-13), which is based on models from a document known as International Commission on Radiological Protection (ICRP) Publication 60, an EPA spokeswoman recently told /Inside EPA/. The draft guide has been on hold pending further review since the Obama administration halted its publication in the /Federal Register/ shortly after taking office in January.

Activists -- who have been critical of the draft guide for suggesting that emergency responders need not consider providing people with alternative sources of drinking water until contamination in their regular water supply reaches levels thousands of times higher what the agency allows for in its formal regulations -- say FGR-13 and ICRP Publication 60 use what is commonly known as the effective dose equivalent (EDE) method of calculating radiation exposure limits. EPA used the EDE method in a 1991 proposal to relax its drinking water standards -- called maximum contaminant levels (MCLs) -- for radioactive substances. But the agency ultimately withdrew the proposal and reverted back to its previous calculation method after 1996 amendments to the Safe Drinking Water Act (SDWA) made relaxing MCLs illegal, the activists note.

Major industry groups, including the Nuclear Energy Institute and the National Mining Association, filed lawsuits challenging EPA's assertion that it could not relax the MCLs in light of the SDWA amendments, arguing in part that the agency's decision ignored the "best available science" and that the agency did not properly evaluate the costs and benefits of its decision.

But the U.S. Court of Appeals for the District of Columbia Circuit upheld the agency's decision in a 2003 ruling. The "anti-backsliding provision" of the SDWA amendments "would still prevent the agency from raising the MCLs" even if the "best available science" or a cost-benefit analysis suggested otherwise, the court ruled. /Relevant documents are available on InsideEPA.com./

Activists are now accusing officials in EPA's Office of Radiation & Indoor Air (ORIA) of using the new nuclear emergency guide as a vehicle for reviving the unsuccessful 1991 proposal to use the EDE method to relax drinking water standards.

While the agency has been blocked from using the method to relax its enforceable MCL regulations, the non-binding nuclear emergency guide provides ORIA officials with a vehicle to revive the 1991 proposal and "sneak it through the back door," one activist says.

The emergency guide is aimed at government officials responding to a wide array of nuclear incidents. Since /Inside EPA/ obtained a 2007 draft of the new nuclear emergency guide, activists, along with some EPA and state officials, have feared that if published, the document could be used by other federal agencies and industry groups to justify weaker emergency responses and cleanups at a wide range of nuclear sites, including Superfund sites (/Superfund Report/, April 21, 2008). To underscore their fears, activists have pointed to a separate new draft guidance /Inside EPA/ obtained in November that suggests the nuclear emergency guide is one of several documents EPA Superfund officials should consult when justifying emergency response actions at waste sites (/Superfund Report/, Nov. 3).

An EPA spokeswoman in a June 11 statement to /Inside EPA/ maintains however that the nuclear emergency guide "in no way impact[s] or affect[s] regulatory drinking water standards, which exist to protect public health on a day-to-day basis." The emergency guide is "used as guidance during immediate response to radiological emergencies," the spokeswoman says.

EPA officials have defended the nuclear emergency guide similarly in the past, arguing that the drinking water protections in the document address the relatively short-term radiological exposure anticipated after a nuclear emergency. In contrast, the more stringent MCLs are based on a lifetime of exposure, agency officials have argued.

However, the new nuclear emergency guide suggests the relaxed drinking water protections are applicable up to a year after an emergency, and suggests that emergency officials need not consider providing alternative drinking water sources until contamination reaches levels significantly higher -- and in some cases thousands of times higher -- than EPA's prior removal action level (RAL) guidance on responding to emergencies under the agency's Superfund authority. The RALs, though more stringent that the draft emergency guide, are less-stringent than the MCLs (/Superfund Report/, Jan. 14, 2008).

The EDE calculation method generally yields less-stringent exposure limits than the method the agency used to derive its MCLs, and is likely one reason the drinking water protections in the emergency guide are dramatically weaker than the MCLs, activists say. Another reason is that the emergency guide aims only protect people from being exposed to more than 500 millirems (mrem) of radiation in contrast to the MCLs, which seek to protect people from being exposed to no more than 4 mrem of radiation.

But activists remain dissatisfied with the amount of information EPA is providing about the calculations, and are vowing to pressure recently confirmed Obama appointees to the agency to abandon the nuclear emergency guide. The activists' contention that ORIA officials are using the

document as means of reviving the 1991 EDE proposal bolsters their arguments against the document, one activist says.

One activist group -- Public Employees for Environmental Responsibility (PEER) -- recently canceled a planned meeting with ORIA officials in protest after PEER officials complained ORIA staff did not provide them with all the background information on the nuclear emergency guide that activists had hoped to discuss during the meeting, which had been scheduled for May 26.

Among the information PEER sought in advance of the meeting was "backup documentation detailing how the proposed water [emergency guidelines] were derived, including all input parameters, their sources, and the resulting calculations," according to e-mails obtained by /Inside EPA/.

When ORIA Radiation Protection Division Director Jon Edwards responded that "the derivation of the drinking water [protection] is fully contained within [the nuclear emergency guide] itself," PEER Executive Director Jeff Ruch canceled the meeting, complaining that "[a]ll one finds [in the document] is a generic formula, without the inputs to it, and the sky-high concentrations you propose, without any detail as to their derivation."

Ruch wrote that Edwards' response "leads us to believe that a meeting would not be productive at this time," adding that activists would "seek to elevate our concerns to agency decision-makers" and that "this interaction has convinced us that we will need to aggressively pursue formal avenues in order to obtain meaningful information on this topic from the ORIA staff."

While they have not ruled out a lawsuit against the agency, one activist says they will likely first seek to meet with recently confirmed Obama EPA appointees -- including air and radiation chief Regina McCarthy and waste chief Mathy Stanislaus -- to discuss the issue first. Activists will also send the new appointees copies of an extensive report analyzing the draft emergency guide, the activists say. A coalition of more than 60 environmental and public health groups -- including the Sierra Club, Physicians for Social Responsibility and the Natural Resources Defense Council -- originally sent the report, along with a letter opposing the guidance, to then-EPA Administrator Stephen Johnson on Oct. 30.

McCarthy, who now oversees ORIA, did not face any questions about the nuclear emergency guide during her Senate confirmation hearing, although Sen. Bernard Sanders (I-VT) asked McCarthy to address the issue in written follow-up questions for the hearing record.

Sanders asked McCarthy whether she would "support stronger, science-based" nuclear emergency guidelines as compared to those "the Bush Administration approved . . . which would have increased the allowable levels of radioactive exposure during an emergency."

In her response, McCarthy said that "[i]f confirmed, I will work with scientists and emergency response experts in [ORIA] to review the proposed [nuclear emergency] guidance and assess what action should be taken." McCarthy added that "Administrator [Lisa] Jackson has committed to making science the cornerstone of EPA's work" and that "[i]f confirmed, I will

uphold that commitment in reviewing and advising the Administrator on the proposed guidance for protecting the public from harmful levels of radiation during radiological emergencies." /--Douglas P. Guarino/

CORRESPONDENCE REGARDING DHS "DIRTY BOMB" PAGS

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.

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[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

Organizations

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Los Angeles, California

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Nuclear Information and Resource Service
Washington, DC

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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

EPA Administrator Michael O. Leavitt
US EPA Headquarters 1101A
Ariel Rios Building
1200 Pennsylvania Ave., N.W.
Washington, DC 20460 January 27, 2005

Dear EPA Administrator Leavitt:

We urge EPA to maintain and strengthen its cleanup standards particularly at radioactively contaminated sites.

We ask for your active role in preventing adoption of the draft proposals for radioactive cleanup standards being proposed by the Department of Homeland Security in response to a dirty bomb attack. The guidance, which is expected to be published for comment shortly, is absolutely unacceptable as it would permit dangerously contaminated sites and serve as a precedent for weakening the EPA's existing cleanup standards, especially at Superfund sites.

EPA's current standards, including Superfund, require cleanup to a cancer-incidence risk range of one in a million to one in 10,000 cancers. Some of EPA's radiation standards are expressed in dose and do not exceed 15 millirems per year. Although many of us do not believe that this is protective enough, we strongly oppose any further weakening of it. The latest publicly available DHS draft allows the risk of getting cancer from the "cleaned up" site to be increased to 1 in 4! This is done by reference to international recommendations which would allow contamination to remain at a level of 10,000 millirems per year. DHS would allow routine lifetime annual exposures orders of magnitude higher than current background. As the attached letter indicates this is the equivalent of 50,000 chest x-rays (over 30 years of exposure and even more if people live and work in the area longer).

Attached are letters of opposition to these standards sent to EPA and DHS in December 2004 with supplemental technical details. We ask you to prevent any weakening of EPA's standards and to work to prevent DHS from adopting anything weaker than EPA's risk range.

Sincerely,

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Elizabeth Crowe

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14 April 2006

Rules Docket Clerk
Office of the General Counsel
Federal Emergency Management Agency
Room 840
500 C Street SW
Washington, DC 20472

Re: Preparedness Directorate/Department of Homeland Security
Docket # DHS-2004-0029 and Z-RIN 1660-ZA02

To Whom It May Concern:

We hereby submit comments on the controversial Department of Homeland Security (DHS) guidance for response to radiological dispersal devices (RDDs or "dirty bombs").

On 3 January 2006, DHS published in the Federal Register a request for public comment on the dirty bomb guidance. However, at the same time, DHS made the guidance immediately effective. Providing an after-the-fact opportunity for public input diminishes public confidence in the process, ironic in light of the guidance's discussion of steps necessary to involve stakeholders.

The DHS decision to issue the guidance in immediately effective form, prior to opportunity for formal public comment, was not due to time constraints. The text now published is largely identical to the draft that has been in existence since June of 2004.

Furthermore, that 2004 draft, obtained by the trade press, resulted in a storm of public concern. A detailed critique was submitted by 57 organizations on 2 December 2004, followed by a similar letter from 46 additional organizations on 27 January 2005, identifying serious failings in the 2004 draft guidance. All of these concerns have been ignored in issuance of the final guidance, with no substantive response let alone any changes made regarding any of the specific problems identified.

Rather than repeating in detail the concerns specified in the December 2004 and January 2005 group letters, we attach them here as Exhibits 1 and 2 respectively and incorporate them by reference. We do summarize the matters here, and update them based on new developments that have transpired since.

The guidance document proposes long-term cleanup criteria be based on proposals such as those of the International Commission on Radiation Protection (ICRP) that would allow the public to be exposed to doses approaching 10,000 millirem per year over many decades – the equivalent of 50,000 chest X-rays over the assumed exposure period – without any cleanup to reduce risk to public health. Such a dose, according to the federal government's official radiation risk estimates at the time the guidance was drafted (e.g., Federal Guidance Report 13), would result in a quarter of the people exposed getting cancer from that radiation exposure (i.e.,

in excess of the number of people who would have gotten cancer in the absence of that radiation). This is wholly unacceptable.

In the December 2004 letter, a chart was included as Attachment A showing the official risk estimates for the doses proposed in the guidance as "acceptable." When taking into account the early, intermediate, and late phase proposals, the guidance would allow exposures to the public that would produce a risk of 1 in 4 to 1 in 80 chance of cancer, depending on which long-term dose limit contemplated in the guidance is in fact utilized. Again, such public risks from exposures exceed by orders of magnitude anything historically considered acceptable by EPA, whose normal acceptable risk range is from 1 in a million to 1 in 10,000 chance of cancer.

Since the 2004 draft of the guidance and the public letters of concern in late 2004 and 2005, there has been an important new development. The National Academy of Sciences (NAS) has recently issued its long-awaited BEIR VII report (Biological Effects of Ionizing Radiation). The BEIR reports are used by federal agencies to estimate risks and establish regulations and guidance on radiation exposures.

The BEIR VII report expressly rejects the claims by some nuclear proponents that there might be a threshold below which radiation exposure was not harmful and affirms that risk is linear with dose. Furthermore, BEIR VII estimates excess cancer incidence from "low level" radiation exposure to be about 35% greater than the figures used by federal agencies (e.g., Federal Guidance Report 13) based on the earlier BEIR V. In other words, the risks from the huge doses contemplated as acceptable in the DHS guidance are even higher than estimated in the group letters of late 2004/early 2005.

Additionally, the largest study of nuclear workers ever conducted, based on 400,000 workers from 154 nuclear facilities in 15 nations, has recently been published; Cardis et al. "Risk of cancer risk after low doses of ionising radiation: retrospective cohort study in 15 countries." *British Medical Journal* (2005) 331:77. The study, conducted by a large international team convened by the International Agency for Research on Cancer, finds cancer mortality risks per unit of "low dose radiation" to be approximately six times higher than the estimate currently used by regulatory agencies to set acceptable doses. The results of the 15-nation study are similar to a series of other occupational studies, including several from the Department of Energy's Santa Susana Field Laboratory, Oak Ridge, and Hanford nuclear facilities, all suggesting current agency risk estimates may be low by as much as an order of magnitude. The 15-nation study came out too late to be considered by the NAS in making the risk estimates in the body of its report.

Although we believe the NAS BEIR VII estimates may thus be low, we have revised the table from the 2004 letter to reflect the BEIR VII new risk figures. It is included here as Appendix I. It demonstrates that the doses to the public proposed to be "acceptable" in the DHS guidance would result in between *a third of the people exposed getting a cancer from the excess radiation to one in sixty*, depending on which long-term "benchmark" was utilized in the "optimization" process suggested by DHS. In other words, DHS suggests letting the public go back into contaminated areas, without steps to clean them up, at radiation doses high enough to result in up to a third of those exposed getting cancer from the additional radiation. This is based

on the National Academy of Sciences' estimates of radiation risk, not ours. A discussion of the official federal government cancer risk figures, used in the original table for the 2004 group, and the National Academy of Sciences updated estimates, used in our revised table here, is included in Appendix II hereto.

We find doses and risks this high to be grossly nonprotective and urge DHS to promptly abandon all such suggestions that these doses could be allowed. Instead, the guidance for long-term cleanup should be revised to require use of EPA's Superfund cleanup criteria. In other words, cleanup from a dirty bomb should be no less protective than the levels we use in cleaning up the nation's most contaminated sites.

In addition to the massive doses contemplated in the guidance for long term reoccupation of an area without any cleanup, we are troubled by the proposals for high doses in the intermediate phase – i.e., presuming people would have to drink contaminated water and that contaminated agricultural products would continue to be sold rather than interdicted. EPA routinely requires at contaminated sites the provision of alternative drinking water supplies during emergency responses; there is no reason that shouldn't be done here. People shouldn't be forced to drink contaminated water. Additionally, Chernobyl makes clear the importance of interdicting contaminated foodstuffs. There is no reason that the guidance should presume or allow seriously contaminated food grown in contaminated soil to be used or sold for consumption, thereby spreading the adverse impacts of a terrorist attack far and wide.

The NRC, in an early submission to the DHS taskforce, suggested applying these grossly lax cleanup standards eventually to regularly contaminated nuclear sites. We strongly opposed any such suggestion. Additionally, the DHS guidance suggests that radioactively contaminated materials from the site of a dirty bomb attack could be freely released as part of any cleanup – i.e., not disposed of in a licensed radioactive waste disposal facility. We oppose such suggestions as well.

In conclusion, the DHS guidance is seriously deficient and would permit exposures of the public, without protective actions by government, that are so high as to result in grossly unacceptable harm to the public. A terrorist attack would be bad enough; a prior governmental decision to not clean the contamination up and allow the public to be exposed to very high radiation levels would only compound the harm done and multiply the terrorists' power. Government should be attempting the opposite instead – minimization of harm and of the destructive capability of terrorists.

FEMA was widely criticized for failing to act protectively in the wake of Katrina. We believe the DHS/FEMA guidance for dealing with a dirty bomb active would be a radioactive Katrina in the making. We urge a different course.

Sincerely,

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APPENDIX I

REVISED CANCER RISKS FROM DEPARTMENT OF HOMELAND SECURITY DIRTY BOMB CLEANUP GUIDANCE BASED ON LATEST NATIONAL ACADEMY OF SCIENCES RADIATION RISK FIGURES

APPENDIX I

REVISED CANCER RISKS FROM
DEPARTMENT OF HOMELAND SECURITY DIRTY BOMB CLEANUP GUIDANCE
BASED ON LATEST NATIONAL ACADEMY OF SCIENCES RADIATION RISK FIGURES*

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]	3.4×10^{-3}	300	34-3,400
500 mrem/year[6]	83 [2,500]	1.7×10^{-2}	60	170-17,000
1,000 mrem/year[7]	170 [5,000]	3.4×10^{-2}	30	340-34,000
2,000 mrem/year[8]	340 [10,000]	7×10^{-2}	15	700-70,000
10,000 mrem/year[9]	1,700 [50,000]	3.4×10^{-1}	3	3,400-340,000

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	1.14×10^{-3}	880	11-1100
5,000 mrem/year[11]	830	5.7×10^{-3}	175	57-57,000

***** The 2004 table was based on cancer risk estimates from Federal Guidance Report 13 (FGR 13). Since that time, the National Academy of Sciences has issued *Health Risks from Exposure to Low Levels of Ionizing Radiation*, the so-called BEIR VII Report, which updates cancer risk estimates from radiation based on review of the latest research, increasing cancer risk figures by approximately a third over the FGR 13 levels. The NAS BEIR reports are relied upon by all U.S. agencies for establishing radiation risks. The BEIR VII work was performed by the NAS at the request and with the funding of NRC, DOE, and EPA. We have therefore updated our table based on the latest NAS radiation risk figures.

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	2.3×10^{-3}	430	23-2,300
	500 mrem/year– general exposure	83 *[250]*	1.7×10^{-3}	580	17-1,700
	+500 mrem/year – food interdiction	83 *[250]*	1.7×10^{-3}	580	17-1,700
	500 mrem/year drinking water interdiction	83 *[250]*	1.7×10^{-3}	580	17-1,700
	Total 1,500 mrem/yr	250 *[750]*	5.1×10^{-3}	190	51-5,100

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	5.7×10^{-3}	175	57	
Intermediate – 1st yr	2,000 mrem 1st year	333	2.3×10^{-3}	440	23	
Yrs 2-4 (total)	4,500 mrem	750	5.1×10^{-3}	190	51	
Late Phase[17]	3,000- 300,000 mrem[18]	500- 50,000	3.4×10^{-3} – 3.4×10^{-1}	290- 3	25- 2,500	
Total[19]	**14,500 – 311,500 mrem**	**2,400 – 52,000**	**1.7×10^{-2} – 3.5×10^{-1}**	**60- 3**	**170 – 3,500**	**170-17,000 - 3,500-350,000**

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] Our original 2004 table was based on the then-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].

Awaiting the newest National Academy of Sciences Report on Biological Effects of Ionizing Radiation (BEIR VII), all federal agencies have used 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 old agency risk estimates from radiation described above were 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.

Since our original table was prepared, but prior to the release by DHS of the dirty bomb cleanup guidance in interim effective form for comment, the National Academy of Sciences has released the latest, updated BEIR Report (BEIR VII). It increases the risk estimates for cancer incidence by approximately a third over the FGR 13 figures cited above. The new risk figure, based on review of the latest research, is 1.14×10^{-3} cancers per person-rem of exposure to a population of standard age and gender distribution. (See e.g., Table 12-9, summing for leukemia and all solid cancers and averaging across gender.) We have revised our table here to reflect the latest National Academy of Sciences risk estimates.

[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 3.4×10^{-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 7.4×10^{-3}, or 74 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.

APPENDIX II

BACKGROUND ON MATTERS RAISED IN 14 APRIL 2006 COMMENT LETTER TO DHS ON DIRTY BOMB GUIDANCE

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BACKGROUND ON MATTERS RAISED IN 14 APRIL 2006 COMMENT LETTER TO DHS ON DIRTY BOMB GUIDANCE

Supporting background information is provided here regarding issues raised in the group letter to DHS commenting on the dirty bomb guidance.

1. The Government's Own Official Radiation Risk Figures Show That the Doses Contemplated by the DHS Dirty Bomb Cleanup Guidance Would Result in As High As a Quarter of the People Exposed Getting Cancer from the Radiation Exposure

Nowhere in the DHS dirty bomb response guidance is there an explanation of the excess cancer risk associated with the radiation doses the guidance would allow. There is a single paragraph in the text (at 71 FR 187) which that briefly discusses the cancer risk to a worker receiving 10 or 25 rem, but nowhere in the guidance is there any explication of the cancer risk to the public receiving the doses the guidance contemplates under its "optimization" process relying on "benchmarks."[1]

In Attachment A to the group letters of 2 December 2004 (enclosed here in its entirety as Exhibit 1), tables are produced that does what the DHS guidance failed to do—disclose the cancer risks from the proposed "acceptable" doses. The tables calculate cancer risk for each of the primary "benchmarks" contemplated by DHS in this guidance, as well as translating the proposed doses into more understandable terms (equivalent number of chest X-rays). To be "conservative" in terms of presentation, although non-conservative in terms of public health, the tables rely entirely on the federal government's own assumptions about exposure and risk. It is assumes that no individual resides in his or her neighborhood or works in the same area for more than thirty years, although many people obviously do. Furthermore, the conversion of dose to cancer risk is based entirely on the federal government's own official guidance – as embodied in

[1] Furthermore, the guidance makes numerous mistakes in that paragraph. For example, it says Federal Guidance Report 13 sets the cancer mortality risk at about 6×10^{-4} per rem (6 cancer deaths per 10,000 person-rem) and 7×10^{-4} for cancer incidence. But FGR 13 sets cancer incidence at 8.46×10^{-4} cancers per rem. See FGR 13 at p. 182) [Having cancer incidence rates per rem almost the same as cancer mortality rates of course makes no sense, as it would imply virtually all cancers are fatal and treatment the vast majority of the time ineffective. Indeed, the FGR 13 cancer incidence figure turns out to be low, as the new BEIR VII report estimates it at 1.14×10^{-3} per rem, as will be discussed in the body of this appendix.] Additionally, the guidance asserts that the cancer mortality risk to workers receiving 25 rem is 15 deaths per thousand people exposed, but that the risk to younger workers is higher and to older workers lower, claiming the former risk is 9.1 deaths per thousand and the latter 5.3. These assertions are contradictory, as the guidance asserts the risks to both younger and older workers are *markedly lower* than the risks to workers as a whole (i.e. 9.1 and 5.3 are both lower than the average risk of 15 deaths per 1000). Furthermore, the guidance cites FGR 13 for its claim of these figures for younger and older workers; but it appears those figures in fact come from EPA's 1991 *Manual of Protective Action Guides and Protective Actions for Nuclear Incidents,* which in turn was based on BEIR III – two generations outdated compared to the most current BEIR report, BEIR VII.

Federal Guidance Report 13 (FGR 13) – despite significant evidence that those risk figures significantly understate risk.

Federal Guidance Report 13, *Cancer Risk Coefficients for Environmental Exposure to Radionuclides*, was funded by Environmental Protection Agency (EPA), Department of Energy (DOE) and the Nuclear Regulatory Commission (NRC) and issued in 1999. It, in turn, relies upon the National Academy of Sciences' BEIR V Report (Biological Effects of Ionizing Radiation), which, as will be discussed below, has since been superseded by BEIR VII, which significantly increases the cancer incidence risk estimates over those used in FGR 13. All federal agencies use cancer risk estimates for radiation exposure similar to FGR 13. The estimates of risk put forward in the 2 December 2004 group letter to DHS thus rely *on the government's own official radiation risk estimates.*

The key number from FGR 13 is the estimate of 5.75×10^{-4} fatal cancers per rem and 8.46×10^{-4} cancers (fatal and non-fatal) per rem. See FGR 13 pp. 179, 182.[2] Therefore, the risk to the public of the "benchmark" proposed by ICRP and referenced in the Federal Register notice can readily be calculated, for example. That benchmark is 10 rem/year exposure before long-term cleanup must be performed.[3] [The NRC itself proposed cleanups not be required below 10 rem per year, relying on ICRP proposals, and urged such lax standards be applied also to cleanups for all types of radiological events, including commercial reactors.[4]] 10 rem per year over 30 years is the equivalent of approximately 50,000 chest X-rays and is a massive dose. The risk can be readily calculated as follows:

$$10 \text{ rem/ year} \times 30 \text{ years} \times 8.46 \times 10^{-4} \text{ cancers/rem} = 2.5 \times 10^{-1} \text{cancers}$$

or 2.5 cancers per 10 people exposed (1 cancer per 4 people exposed)

The other "benchmarks" contemplated (2 rem/year, 1 rem/year, 500 and 100 millirem/year) can be similarly converted into cancer risk, resulting in risks of 1 in 20, 1 in 40, 1 in 80, and 1 in 400 respectively. See Table 1 in Attachment 1 of the 2 December 2004 letter. These risks exceed by orders of magnitude the acceptable risk range long set by EPA.

However, the risks associated with the long-term cleanup standard are not the end of the story. The DHS guidance proposes very high doses to the public in the immediate and intermediate phases as well, without intervention to reduce the doses. When the full set of

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[2] FGR 13 gives the values in International Units, converted here into rems.

[3] International Commission on Radiation Protection Report Number 96, *Protecting People Against Radiation Exposure in the Event of a Radiological Attack*, October 2004, p. 70. ICRP 96 proposes that cleanup is virtually never merited below doses of 1 rem/year and is only mandatory above 10 rem/year, with the range 1-10 rem/year such that officials can choose to do no cleanup or to take action, as they see fit. Again, international units have been translated into rems here.

[4] *OHS RDD/IND Subgroup for Consequence Management/Site Restoration, Clean-up and Decontamination White Paper on Recovery, Decontamination, and Cleanup Levels including Acceptable risk Assessment and Technology (CMS005),* 3-1-03, p. 3, "NRC Recommendations".

standards is taken into account—and thus the total dose to the public—the cancer risk ranges from 1 cancer per 4 people exposed to 1 in 80. It is hard to conceive that the public would find "acceptable" such doses –nor that decisionmakers who are to rely on the DHS guidance would do so were DHS to have disclosed the magnitude of these proposed doses and the associated cancer risks. *It should be noted once again that these estimates of cancer come entirely from using the federal government's own official risk estimates.*

2. The Recent National Academy of Sciences' Biological Effects of Ionizing Radiation Report Increases Risk Estimates; the DHS Guidance is Therefore Even More Dangerous Than Previously Assumed.

Federal radiation risk estimates and radiation protection regulations are based largely on reports by the National Academy of Sciences (NAS) called the BEIR Reports, for Biological Effects of Ionizing Radiation. Studies of the effects of penetrating radiation are conducted by NAS for the federal government every ten or fifteen years, reviewing the scientific literature that has accumulated since the last BEIR report. As indicated above, FGR 13 and other governmental risk estimates currently in use are based on the 1990 BEIR V report. EPA, NRC, and DOE requested and sponsored the BEIR VII study, which was released on 29 June 2005. Entitled *Health Risks from Exposure to Low Levels of Ionizing Radiation*, the study rejected claims that there might be a threshold below which radiation exposures weren't dangerous. It found all levels of radiation increased cancer risk, and that the risk increased linearly with dose.

Importantly, BEIR VII's estimate for cancer incidence from radiation is about 35% higher than the estimates federal agencies have up until now been using. BEIR VII estimates the risks for cancer incidence for men and women, for a population of 100,000 people of all ages exposed to 0.1 Gray (~10 rem)[5]:

	Males	Females	Average for Both Sexes
leukemia	100	72	86
all solid cancer	800	1310	1055
all cancers	900	1382	**1141**

Thus the BEIR VII cancer incidence risk estimate is 1141 cancers per million person-rem, or **1.14×10^{-3} per rem**. Put differently, the risk is 1.14 cancers per thousand person-rem.

With the new BEIR VII cancer incidence risk figures, one can calculate the risks from the DHS proposed doses using the most up-to-date NAS estimates. Those figures are found in Appendix I to this letter. The result: *the doses to the public proposed as acceptable by DHS would cause an excess cancer in between a third of all people exposed to one in sixty, depending*

[5] see Tables ES-1 and 12-9. BEIR VII gives the figures for males and females for leukemia and all solid cancer; we have summed the cancer types and included the average for both sexes.

upon which long-term cleanup "benchmark" is employed.[6] Again, these risk estimates derive not from our estimates of cancer risks, but from the National Academy of Sciences' most current study, a study sponsored by DOE, NRC, and EPA and which will be used to updated all agency risk figures.

It must be noted that much of the DHS guidance is based on Protective Action Guides (PAGs) established at least fifteen years ago and relying on BEIR III, which is in itself now a quarter of a century outdated and which has been superseded by two subsequent BEIR reports that have markedly increased radiation risk estimates. Reliance on permissible doses that are now known to produce risks far higher than presumed when initially adopted is troubling.

3. Other Studies Suggest the Risks Could Be Even Higher than Either FGR13 or BEIR VII Estimates

Too late to be considered by the NAS BEIR VII panel in establishing its estimates, a massive 15-nation study of nuclear workers has been recently published. The largest study ever of workers in the nuclear industry, it collected information on nearly 600,000 workers. The international collaboration was chaired by the International Agency for Cancer Research (IARC). The lead author, Elizabeth Cardis, was a member of the NAS BEIR panel. The BEIR VII report included a brief appendix indicating that the study results were not available in time to be included in the cancer risk estimates in the body of the report, but that the Cardis et al. study found higher risks than the BEIR report itself, which was based largely on A-bomb survivor data.

The study, *Risk of Cancer After Low Doses of Ionising Radiation: Retrospective Cohort Study in 15 Countries,* was published in the British Medical Journal 29 June 2005, the same day the BEIR report was released. It found cancer mortality associated with radiation exposure about **six times** higher than BEIR VII presumes. In this regard, it reinforces a string of studies that have reached similar conclusions – studies, for example, of DOE workers at Santa Susana, Oak Ridge, and Hanford, and Canadian workers, showing excess cancer from radiation about an order of magnitude higher than the BEIRVII/FGR13 estimates.[7]

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[6] The risk is not driven entirely by the long-term cleanup standard, as DHS is proposing very high doses to the public in the immediate and intermediate phases as well, which must be summed with the doses in the long-term phase to determine overall risk.

[7] It has long been postulated – most effectively by the late Dr. Alice Stewart – that exclusive reliance on the A-bomb survivor data may artificially skew downward radiation risk estimates, in part because of the "healthy survivor" effect. The A-bomb survivor cohort is not a representative population, as it represents the only group ever to experience nuclear weapons attacks. Those who died in the immediate aftermath from the blast, thermal, and other prompt effects of the weapon may well have been different to some degree than those who survived. The survivors may preferentially have been stronger – stronger immune systems, stronger ability to resist challenges to health. So the latent cancer effects in the Hiroshima and Nagaski populations might well have been higher had the weaker members of the cohort not died from the initial effects of the explosions.

Thus, the true risks associated with the radiation doses proposed as acceptable in the DHS guidance may be even higher than estimated based on FGR 13 and BEIR VII.

4. Cancer Risks from Dirty Bomb Radiation Would Be <u>In Addition</u> to Existing Cancer Risks, Including from Background. ***Background Radiation Is Harmful, In Itself Causing Cancer in Approximately One Out of Every Thirty-Five People.***

Some who wish to trivialize the cancer risks estimated by either the official agency pre-BEIR VII figures or from BEIR VII point out that approximately of the population already will contract cancer, implying that the estimate of 25% of those exposed to 10 rem/year over thirty years is less than the number getting cancer anyway and therefore no increase. It must be stressed that the cancer risk estimates, whether based on FGR 13 or BEIR VII, are for *excess* cancers, i.e., those induced by the radiation exposure and occurring *in addition to* the cancers that would have occurred in the absence of the radiation.

Others have pointed out that people in the United States are exposed to something on the order of 350 millirem per year from background radiation, suggesting any radiation exposures in that range are of no consequence. But again, the radiation doses being considered here are *on top of* any background exposures. And background radiation is *not* harmless.

The National Academy of Sciences' BEIR VII panel estimated that one person in 100 develops cancer just from the "low-Linear Energy Transfer" component of background radiation (about 100 of the 350 millirem estimated total background). Much of the rest of background is from indoor radon. The whole risk from total background is thus on the order of 3% of the population in the U.S. contracts cancer from background radiation.[8] And any additional radiation exposure is added on top of radiation that is already causing ~1 in 35 of us to get cancer, according to NAS. In a U.S. population of approximately 300,000,000, something on the order of ten million of us currently alive will get a cancer from background radiation. Background radiation may be natural, we may not be able to escape from it, but is clearly not safe.

5. The DHS Proposal to Make People Continue to Drink Radioactively Contaminated Water Contradicts Federal Policy at Other Contaminated Sites.

It is standard EPA Policy to provide replacement sources of drinking water (e.g., bottled water) at contaminated sites where drinking water supplies are otherwise affected over drinking water limits developed for a lifetime of exposure. For what EPA considers a confirmed human carcinogen, such as radionuclides, EPA will provide drinking water if the level of contamination is over Maximum Concentration Levels (the primary MCL for radionuclides is 4 millirem/year) or concentrations that correspond to a 1×10^{-4} cancer risk based on 70 years of drinking the

[8] 350 millirem/year, the figure EPA gives in its proposed Yucca rule as the average background dose in the U.S., would thus yield 0.35 rem/year x 70 years lifetime x 1.14×10^{-3} cancers/rem (BEIR VII) = 2.8×10^{-2} or 1 cancer per 36 people exposed. Technically, the radon exposure is of a high-LET type, but the conversion to risk for that type of radiation results in similar cancer rates.

water.[9] It makes no sense in the dirty bomb case to not do the same. Providing drinking water is not that difficult. For years the government has been able to provide drinking water after natural disasters.

We have not yet seen the concentrations that correspond to the DHS 500 mrem/yr drinking water Protective Action Guideline, so a direct comparison to EPA's standards for emergency response is not possible. However, it is likely the DHS drinking water approach for the *intermediate* phase will allow the drinking of water with contamination at least one hundred times higher than EPA would allow in *emergency* situations, and possible much higher than that. See EPA policy for providing drinking water during emergences in *Final Guidance on Numeric Removal action Levels for Contaminated Drinking Water Sites*, 25 October 2993, from Deborah Dietrich, Director, Emergency Response Division, EPA; *Numeric Removal Action Levels for Contaminated Drinking Water Sites,* 10 November 1998, OSWER Memorandum 9360.1-02B-P; and *Guidance Document for Providing Alternate Water Supplies,* February 1988, OSWER Directive 9355.3-03.

6. The DHS Proposal to Permit Contaminated Foodstuffs to Be Consumed and Placed into Commerce is Unwise from a Public Health Standpoint

One of the lessons of the Chernobyl experience is the importance of interdiction of contaminated foodstuffs. If soil and water are contaminated, and thus crops and other agricultural commodities such as milk and meat, interdicting the contaminated foodstuffs so that residents of the area consume clean food is essential. Additionally, one must prevent contaminated agricultural products from leaving the area in commerce, exposing people outside the immediately affected area to unacceptable radiation doses through consumption of foods grown in the affected area and shipped out in commerce. The DHS guidance will allow the spreading of cancer cases from the area of attack to other Americans.

[9] Furthermore, the MCLs are based on older, stricter methods of converting concentration to dose, so the difference between the MCLs and DHS's proposed 500 millirem/year water ingestion pathway is even larger than the apparent difference between 4 and 500 mrem.

SECTION II

PROPOSALS FOR NON-PROTECTIVE RADIATION GUIDANCE OUTSIDE EPA'S LONG-HELD ACCEPTABLE RISK RANGE

4 April 2005

Stephen L. Johnson, Acting Administrator, Administrator-Nominee
U.S. Environmental Protection Agency
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USEPA Headquarters
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Dear Acting Administrator and Administrator-Nominee Johnson:

As you know, EPA has for decades consistently required the protection of the public from radiation and chemical carcinogens so as to not permit risks greater than approximately one cancer in ten thousand people exposed. We were therefore very concerned to read in *Inside EPA* that some staff within EPA are proposing that the Agency release new radiation guidance, reversing this longstanding position, and authorizing radiation doses to the public of 100 millirem per year, far outside EPA's acceptable risk range and equivalent to someone receiving approximately 1200 additional chest X-rays over a lifetime. We write to urge you to stop any such reversal.

EPA has historically opposed radiation dose limits over 15 millirem per year. It has repeatedly said that dose limits of 25 millirem per year and 100 millirem are not protective of the public. It is extraordinary that the Agency would now consider adopting the very dose limits it has consistently said are not protective.

According to the Agency's own official radiation risk estimates contained in Federal Guidance Report 13 [EPA 402-R-99-001, pp. 179, 182], doses of 100 millirem per year would result in a lifetime risk of 1 cancer incidence in 169 people exposed over a 70-year lifespan (for fatal cancer, the risk would be approximately 1 fatal cancer for every 248 people exposed). This is two orders of magnitude greater than the upper limit of EPA's acceptable risk range, and four orders of magnitude greater than its preferred lower end of that risk range.

If you approve this guidance, you would, for the first time in EPA's history, be saying that cancer risks of roughly 1 in 100 are acceptable, relaxing protections by huge amounts. And, if you approve these massive cancer risks as acceptable for radiation, you would open the Agency to the immediate demand by chemical polluters that toxic material regulations similarly be relaxed by orders of magnitude. We urge you to block any such relaxation and insist that radiation and chemical carcinogens be restricted to public exposures in the longstanding acceptable EPA risk range.

On a related matter, in a letter to Mr. Leavitt, before he left the agency, many of us expressed concern that a taskforce established by the Department of Homeland

Security and including EPA was attempting to relax dramatically cleanup standards for radiological "dirty" bombs. We urged Mr. Leavitt to assure that the Agency took steps to assure no such relaxation occurred, pointing out that even the lowest of the proposed relaxed standards, 100 millirem per year, was grossly outside EPA's acceptable risk range and had for years been opposed by EPA as non-protective. A copy of that letter and its attachments is enclosed here. We call your special attention to Appendix B, which recites some of EPA's longstanding opposition to doses of 25 millirem per year and above as non-protective.

We respectfully urge you to not approve EPA radiation guidance that would allow doses above what EPA has previously said was the upper limit of acceptable risk (15 millirem/year), and to make clear to the Department of Homeland Security that cleanup standards of 100 millirem per year, or more, as contemplated in its draft guidance, are non-protective and should not be adopted.

Sincerely,

Signers of 4/4/05 Letter to US EPA Administrator/Administrator-Nominee Stephen L. Johnson Opposing EPA adoption of Federal Radiation Guidance that weakens public protection:

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SECTION III

ORIA PROPOSALS TO WEAKEN NATIONAL ACADEMY OF SCIENCES RADIATION RISK ESTIMATES

COMMITTEE TO BRIDGE THE GAP

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20 February 2009

Members of and Consultant to
The "Augmented" Radiation Advisory Committee (RAC)
c/o EPA Science Advisory Board Staff Office (1400F)
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, NW
Washington, DC 20460

Re: **Draft "EPA Radiogenic Cancer Risk Models and Projections for the U.S. Population" and the Bush EPA Politicization of Science**

Dear "Augmented" RAC Members and Consultants:

We write this letter in case there are a couple of you – hopefully more – who did not know what you were getting into when you agreed to requests by the last Administration to serve as members of or consultants to this committee and its controversial undertaking and who might be concerned about the damage to your professional reputation that may result should you not promptly and forcefully disassociate yourself from it.

The Bush EPA had requested the National Academy of Sciences/National Research Council (hereafter "NAS") to update the best science on health risks from "low doses" of ionizing radiation. When the NAS came back with results EPA didn't like – e.g., finding cancer incidence risk about 33% higher than the values EPA and other agencies had previously employed – your committee was tasked with ignoring the NAS findings and adopting risk estimates lower than NAS had recommended. The only purpose of such an effort is to produce radiation protection standards more lax than would otherwise be the case, increasing permissible exposures to the public and thus the numbers of cancers and other health effects. This would be a boon to nuclear interests, which could save money by relaxed regulation, but an injury to public health. More than that, however, science itself would be damaged by such politicization.

On the one hand are the nuclear interests -- the Department of Energy and other nuclear agencies, along with the nuclear industry itself – who very much desired weaker standards, irrespective of the science which says standards need to be strengthened, which would result in significant cost savings by reducing the degree of cleanup required at contaminated sites and

relaxing control of ongoing releases of radioactivity. On the other hand is the public interest – the need to protect real human beings from the cancers, genetic defects, and heart disease associated with exposure to ionizing radiation. During the last eight years in particular, the nuclear interests trumped the public health interests by far, and science was an impediment not to be tolerated. What the Bush Administration assembled you to do was to carry that distortion of science and suppression of public health considerations into the critical arena of radiation protection.

The Bush Administration had a well-deserved reputation for radically politicizing science. Scientists concerned about global warming were muzzled; scientific advisory committees were packed with people whose views were favorable to relaxing regulations; scientific reports were rewritten by political appointees to produce results helpful to polluting industries. EPA was the victim of much of this abuse of science for political ends. The Office of Radiation and Indoor Air (ORIA) as well as the Radiation Advisory Committee of the Science Advisory Board were unfortunately among those EPA entities infected by this untoward effort to assure that science didn't get in the way of producing weaker public safeguards than the science merited. For a discussion of the ORIA politicization of radiation science during the last Administration, see the attached "History of the Bush EPA (ORIA) Assault on Radiation Protection."

In short, during the Bush years, science was perverted for political purposes at EPA, not just about global warming, perchlorate, mercury, asbestos, and the various other scandals that erupted, but also consistently about radiation. Your committee, "augmented" in the last days of the Bush Administration so as to extend into the new Administration, is perhaps the most controversial of all of these efforts. While the magnitude of the changes you are asked to make is less than those summarized in the attached history of other recent ORIA efforts at relaxing radiation standards, your proposed assault on the National Academy of Sciences for the political purpose of relaxing radiation protection standards from what they would be were NAS followed is more explicit. Unless you take steps to stop this, the new EPA Administrator's pledge to end the politicization of science at the agency will be placed at risk by this hold-over activity from the prior Administration, and when the problem erupts publicly, an unnecessary embarrassment to the new Administration will result. *We urge any of you who may be troubled by being used for such an untoward purpose to affirmatively block it or, failing that, to strenuously and publicly dissent.*

The Mandate of the Augmented RAC

Your Committee – the "augmented" membership of which was selected in the last weeks and months of the Bush Administration, although the announcement was made a few days after it left office – was supposedly tasked with the job of reviewing "proposed changes to EPA's methodology for estimating radiogenic cancers, based on the contents of the 2007 National

Research Council BEIR VII report."[1] However, that task was modified to *not* base the changes to EPA's guidance on the BEIR VII report, but instead to *relax virtually every risk estimate NAS made.*

Now, there might be good reasons to modify BEIR VII for EPA's purposes if that was to *increase* the BEIR risk figures to reflect EPA's mandate to err on the side of protecting the environment. BEIR VII's central estimates are not based on conservative assumptions, but are its "best estimates" from the science alone. Given the significant uncertainty bands, EPA, whose statutory purpose is environmental protection, would be perhaps well served by erring on the side of public health and using conservative assumptions. This would result in pushing up the risk estimates used by EPA for radiation protection regulatory purposes from the central estimates put forward by BEIR VII without such considerations. For example, were EPA to say that it would use the upper 95th confidence level from BEIR VII as the basis of its regulatory protections, that would be justifiable, particularly in light of the history of radiation science, in which radiation risk estimates have increased over and over again as new science came in (compare, e.g., just the history of the BEIR estimates over time.)

However, rather than increase the BEIR VII risk figures to reflect the public health mission of EPA to be conservative and err on the side of health and the environment, ORIA instead recommends and this Committee is poised to approve *reducing* virtually every BEIR VII risk estimate. Bias and political agendas can be the only explanation.

It should not be inferred that we are great fans of BEIR VII. BEIR VII did ignore a whole body of literature that suggests risks are higher than it estimated. Some new studies, such as the 15-nation radiation worker study, came in too late to be integrated into BEIR VII; had they been considered, BEIR VII's risk estimates might have been substantially higher.

However, here is the central fact: EPA requested the National Academy of Sciences to conduct the BEIR VII review, and paid for it. The BEIR studies have always formed the basis for the radiation regulations of EPA and other radiation protection agencies. At the outset of the BEIR VII process, ORIA assumed it would get what it was paying for: findings of lower radiation risks than previously estimated. When, to the disappointment and surprise of ORIA and the nuclear industry, the BEIR VII report did not so find, but instead concluded cancer incidence risks were about a third *higher* than previously estimated [Federal Guidance Report 13 uses 8.46×10^{-4} per person-rem, while the BEIR VII figure is 1.14×10^{-3}], ORIA staff were placed in a quandary. They were supposed to use BEIR VII to produce the Blue Book revisions, but had hoped the revisions would be downward, to help DOE and industry. With BEIR VII figures going up instead, they had to pretend to adopt BEIR VII figures while in fact gutting them. That is what ORIA has done in the draft before you—in the guise of adopting BEIR VII, actually throw it out -- and what they are asking you to rubberstamp.

We have no illusions that the majority of your augmented committee will do anything else.

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[1] See RAC website, at http://yosemite.epa.gov/sab/SABPRODUCT.NSF/b5d8a1ce9b07293485257375007012b7/636ed207faad0aa38525734c0064b52b!OpenDocument

The membership was picked by the Bush Administration and is heavily skewed toward positions favorable to relaxation of radiation protections. In choosing members for the Radiation Advisory Comnittee, the Bush Administration attempted to evade the requirements of the Federal Advisory Committee Act (FACA), which requires balance and freedom from bias and conflict of interest, plus a meaningful opportunity for public comment on apparenat violations of those requirements for prospective members. EPA failed to publish any notice in the Federal Register identifying whom it intended to place on the augmented RAC and providing an opportunity for response by the public.[2] Nor did it even notify those of us who have previously expressed concern about FACA compliance in the composition of the earlier RAC.[3] Instead, buried deep on a back webpage was the only indication, and one would have had to check the RAC website virtually daily for a year to find it in time. This was a clear effort to pack the RAC and evade public scrutiny and input.

To compound the problem, shortly before Bush left office, terms on the RAC were, we are informed by RAC staff, extended from 2 to 3 years. This has the effect of trying to lock in the biases on the committee and making it difficult for a new Administrator to rectify the politicized nature of the appointments. The committee was "augmented" and the terms extended; something like trying to pack the court and handcuff the incoming Administration from correcting the problem.

And in a puzzling development, the "augmented" RAC also has associated with it a group of consultants. We have been unable to get clarity from RAC staff whether the consultants are considered members of RAC or not. We are told that the consultants cannot vote whether to approve the Blue Book; but that staff try to avoid votes anyway, and try to arrange it so that there is "consensus," and that consensus would include the consultants. There are at least two of you who are consultants who should be very concerned about the misuse of your names to provide cover for this attack on the National Academy and BEIR VII.

Substance of ORIA Blue Book Recommendations

The core of what you have been asked to rubberstamp is found in Table 3-14 of the Draft Blue Book, attached hereto. The table provides the BEIR VII risk figures for incidence and mortality, by organ and gender, and compares those values with what EPA is instead proposing to adopt. In virtually every case, EPA proposes to use a lower risk figure than that recommended by BEIR VII.

For total incidence risk, for example, for women, **BEIR** VII's value is 1382 cancers per 10,000 person-Gy. EPA asks you to sign off on ignoring that NAS conclusion and use 1230 instead. For men, the BEIR VII figure is 900; EPA wants to instead use 785. Over and over again, the values EPA proposes to adopt are lower than the findings of the NAS in BEIR VII –

[2] Interestingly, EPA did earlier publish a Federal Register notice soliciting nominations. But once it had made its decision, and there was supposed to be an opportunity for public review and comment on potential biases and conflicts of interests associated with those EPA intended to name, no Federal Register notice was published.

[3] See 26 September 2006 letter to the RAC from Committee to Bridge the Gap, Nuclear Information and Resource Service, and Public Citizen, attached.

which, to repeat, was performed at EPA's request. One can't pretend this is based on science; the EPA rejection of the National Academy of Sciences' figures in virtually every case go in only one direction – toward lower estimated risk, and thus, relaxed regulations.

Remarkably, ORIA is now proposing that you agree to *lower* the mortality risk figures that EPA has historically used. Federal Guidance Report 13 has a higher estimate of mortality than what EPA now wishes to employ, despite the fact that BEIR VII found no basis for lowering mortality estimates. What ORIA is trying to do is politics, pure and simple, not science.

To get to these remarkable results, ignoring the very BEIR VII study on which the Blue Book is supposed to be based, ORIA also ignored even its own uncertainty analysis. See, for examples, Tables 4-3a through 4-4b. EPA reports its uncertainty distribution and the mean and median values for the uncertainty range, and then its own recommended projected value. In virtually every case, EPA recommends using a risk figure that is below the mean or median value for its own uncertainty distribution! Its own central values are close to those of BEIR VII, but it rejects both BEIR VII and its own central values from its own uncertainty analysis.

One might say that the differences are not huge and that it is OK to go along with this bad science. But when one reduces risk estimates 15% or so, say, from what the NAS recommends, one is permitting a roughly concomitant increase in public exposures and cancers so generated. The Blue Book drives EPA's SLOPE factors, and those in turn drive a whole set of EPA radiation guidance and standards. You will end up allowing the public to be exposed to higher concentrations of radionuclides in soil at contaminated sites, for example, or in releases from nuclear plants than if BEIR VII were followed. People will die.

Conclusion

The Augmented RAC and the Blue Book drafted by ORIA for you to lend your names to is a final push by the former Bush Administration to politicize science even after it has left office. Many of you on the RAC, chosen as you were by that controversial Administration, may have no problem with that. We hope there are a few who do. To those who fit the latter category, we strongly urge you to take whatever steps you can to prevent this from going forward. Failing that, dissent, vigorously, clearly, and publicly.

Sincerely,

Daniel Hirsch
President

Enclosures: Table 3-14 from draft "Blue Book"
History of the Bush EPA (ORIA) Assault on Radiation Protection
26 September 2006 ltr to RAC

Table 3-14: Comparison of EPA and BEIR VII LAR calculations

Site	Sex	Incidence[1]		Mortality[1]	
		EPA	BEIR VII	EPA	BEIR VII
Stomach	M	31	34	16	19
	F	40	43	22	25
Colon	M	142	160	66	76
	F	90	96	40	46
Liver	M	28	27	21	20
	F	13	12	12	11
Lung	M	125	140	117	140
	F	272	300	227	270
Breast	F	281	310	121	73
Prostate	M	42	44	8	9
Uterus	F	17	20	4	5
Ovary	F	32	40	22	24
Bladder	M	94	98	20	22
	F	87	94	25	28
Thyroid	M	22	21	3	None
	F	110	100	8	None
Residual	M	194	290	91	120
	F	201	290	98	132
Kidney	M	24	None	8	None
	F	20	None	7	None
Bone	M	2	None	1	None
	F	2	None	1	None
Solid cancers	M	703	800	350	410
	F	1170	1310	585	610
Leukemia	M	81	100	56	69
	F	60	72	42	52
Total	M	785	900	406	479
	F	1230	1382	628	662

[1] Cases or deaths per 10,000 person-Gy.

HISTORY OF THE BUSH EPA (ORIA) ASSAULT ON RADIATION PROTECTION

Perhaps the most remarkable example of the politicization of radiation protection science during the Bush Administration was the effort by ORIA to get the outgoing Bush Administration's EPA leadership to issue, on its way out the door, new standards for permissible levels of radioactivity in drinking water. On the second to last full business day in office, departing EPA Acting Administrator Marcus Peacock, approved for release ORIA's proposed revisions to EPA's Protective Action Guides (PAGs) for radioactivity. By their own terms, the new PAGs would apply to all radioactive releases for which a protection action might be considered.

The ORIA PAGs proposed permissible drinking water concentrations that are astronomical – from two to six orders of magnitude higher than EPA's longstanding drinking water standards. Let me repeat that. The PAG drinking water levels were between two and six orders of magnitude higher, depending on the radionuclide, than EPA's Maximum Concentration Limits (MCLs) under the Safe Drinking Water Act. The magnitude of the differences is similar when compared with EPA's existing emergency response levels (RALs). No science was given whatsoever to support these extraordinarily high levels; indeed, ORIA has persistently refused to disclose even how those new levels were derived.

The PAGs also contemplated long-term cleanup standards as high as 10 rem per year, resulting in an excess cancer risk for 30 years of exposure of one in four, according to EPA's own current risk figures—an outrageous risk level, orders of magnitude higher than EPA's longstanding acceptable risk range of 10^{-6} to 10^{-4}.

Scores of public health and environmental organizations wrote EPA urging that it not release the ORIA PAGs, particularly in the waning days of the Bush Administration.[4] Nonetheless, on 15 January 2009, outgoing EPA Acting Administrator Peacock signed off on the PAGs and sent them to the Federal Register for publication. However, it takes approximately five business days for something to get published in the Federal Register, which thus could not happen before the Inauguration. The new Obama Administration prevented this by acting immediately after coming into office and pulling the PAGs back before publication.

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[4] The group letter and a detailed study comparing, radionuclide by radionuclide, the proposed PAG levels against EPA's longstanding MCLs and RALs can be viewed at http://www.committeetobridgethegap.org/radiation.html

Similar examples of politicization of radiation science by the Bush ORIA in order to relax public health regulations and help move ahead controversial projects include the Yucca Mountain radiation standards and a proposal to relax EPA's longstanding general radiation standards. In order to help get the proposed Yucca Mountain high level waste repository approved, EPA initially adopted regulations requiring the site need be shown only to meet radiation protection standards for the first 10,000 years. This was done despite the fact that DOE's own studies showed radiation exposure levels to the public would peak at about 300,000 years, at levels an order of magnitude greater than the standard proposed by EPA. Furthermore, NAS had recommended there be no such time cutoff, and Congress had mandated that EPA follow the NAS recommendations. Federal courts struck down the politicized EPA rule and ORIA had to go back to the drawing board.

By this time DOE had massaged its computer models enough that it felt it could meet a 15 millirem/year standard for the first 10,000 years and 100 millirem/year thereafter, so ORIA adopted those levels as its new regulation. The problem is that EPA has historically repeatedly stated that 100 mrem/yr is an unacceptable risk level, far outside its acceptable risk range. A lifetime exposure at that level would produce an excess cancer incidence risk of 8×10^{-3}, or one excess cancer for each 125 people so exposed, using BEIR VII's risk figures (1.14×10^{-3} cancers/person-rem). This excess risk is four orders of magnitude higher than EPA's preferred risk level and two orders of magnitude above the upper end of EPA's acceptable risk range. ORIA took this action for purely political reasons – overriding science and EPA's longstanding requirements – solely to help a sister agency and a powerful industry advance a controversial high level radioactive waste project.

But ORIA didn't stop there. It drafted new guidance that would adopt 100 millirem/year as an acceptable radiation exposure level for the public for a whole range of routine exposures, now, not 10,000 years in the future. Again, EPA had historically opposed proposals by sister agencies for such a standard, saying it was far outside the acceptable risk range and that radiation should not be treated as a "privileged pollutant," permitted to cause cancer in the public at risk levels far higher than that permitted any other pollutant (e.g., chemically carcinogenic materials).

The remarkable thing about all these ORIA assaults on science and efforts to relax protections is that they occurred in the face of the findings by the NAS that low dose exposure to ionizing radiation is more dangerous than previously thought and more dangerous than the risk figures EPA had previously employed. Thus, the science said one should tighten protections, yet ORIA under the Bush Administration tried hard to weaken them compared to EPA's historic requirements.

Committee to Bridge the Gap
Nuclear Information and Resource Service
Public Citizen

Dr. Jill Lipoti, Chair and Members
Radiation Advisory Committee (RAC)
Science Advisory Board (SAB)
1200 Pennsylvania Avenue, NW
Washington, DC 20460-0001

September 26, 2006

Re: *EPA Office of Radiation and Indoor Air Staff Proposal to Reject the Findings of the National Academy of Sciences on Radiation Risks and Adopt Instead Relaxed Radiation Protection Requirements*

Dear Dr. Lipoti and Members of the SAB-RAC:

As you know, the current Administration has been widely criticized as anti-science, permitting vested political and economic interests to override the conclusions of the scientific community. This pattern of conduct was repeated most recently a few days ago by EPA's refusal – in the face of massive scientific evidence of the number of lives affected– to tighten protections against chronic exposure to particulates in air.

Therefore, it is sadly consistent that some EPA staff from the Office of Radiation and Indoor Air (ORIA) now propose to set the stage to weaken the agency's radiation protection standards. EPA's White Paper rejects the findings of the National Academy of Sciences (NAS) which concluded that radiation causes more cancer than previously believed. This proposal to defy the NAS conclusions is particularly striking in that EPA requested and funded the study. We write to urge the Radiation Advisory Committee to reject the White Paper and recommend that EPA not subordinate science to the interests of the nuclear industry.

Background

Every decade or two the National Academy of Sciences' National Research Council is asked to conduct a definitive examination of the state of scientific knowledge on the effects of so-called low-dose ionizing radiation. These "BEIR" reports – Biological Effects of Ionizing Radiation – become the basis for revised radiation protection standards in this country and abroad.

In recent years, some individuals at the extreme of the radiation protection debate have argued that there is a threshold below which radiation is harmless or if there is no threshold that low dose radiation is much less dangerous than the linear-no-threshold dose-response model predicts. A few have even gone so far as to argue that low doses of radiation are good for you. Such positions obviously could save agencies such as the Department of Energy and private interests associated with the nuclear industry a great deal of money if adopted and used to relax radiation exposure and cleanup standards. But these were not scientific conclusions of the BEIR VII report.

EPA had requested that NAS assemble the BEIR VII committee to evaluate these claims and update the science on radiation risks. NAS issued the BEIR VII report in 2005. To the disappointment of some at the EPA's Office of Radiation and Indoor Air, DOE, and the nuclear industry, who had hoped that NAS would endorse the idea of a threshold, BEIR VII found that *there is no safe level of radiation, that all doses carry the risk of causing cancer.* Similarly, BEIR VII concluded that *the risk was essentially linear with dose*. And BEIR VII *rejected claims that low doses were beneficial*.

Most critically, the Academy panel found that *low-dose ionizing radiation is about a third more dangerous than assumed by current EPA and other agency standards in causing cancer.* BEIR VII's cancer incidence risk figure is 1.14 cancers per 1000 person-rem. EPA's current figure (from Federal Guidance Report 13) is 0.846 cancers per 1000 person-rem. EPA should be markedly tightening its radiation standards in the wake of the National Academy of Sciences study but unfortunately, the Office of Radiation and Indoor Air White Paper proposes the opposite.

The ORIA White Paper

The same EPA Office of Radiation and Indoor Air which has suggested that radioactive and mixed waste could be deregulated and sent to solid and hazardous waste facilities or to other unlicensed destinations, now proposes that radiation risk coefficients be reduced, misleadingly implying that radiation will cause fewer cancers. These unjustifiably reduced risk coefficients will be used to relax EPA's radiation standards, some of which are the most protective in the country. This weakening flies in the face of the National Academy of Sciences and does so in a particularly disingenuous fashion, titling the White Paper "Modifying EPA Radiation Risk Models Based on BEIR VII." A careful reading of the White Paper reveals that what ORIA proposes is to modify EPA radiation risk models by ignoring and rejecting the NAS's BEIR VII report rather than make changes based on its conclusions.

Recognizing the firestorm of criticism that such an action would produce, ORIA staff hide the significance of their proposed changes in the paper. The only place where they actually compare their proposed new radiation risk figures with those found by the Academy is in Table 6, and even there some of the new figures are not included; indeed, they are not disclosed anywhere in the paper. But some are shown in Table 6.

Table 6 compares EPA proposed radiation risk values for nine cancer sites, for both cancer incidence and mortality, and by gender, with those recommended by the National Academy of Sciences. There are thus a total of 28 comparisons. If EPA were indeed modifying its risk models based on BEIR VII, as the white paper's title implies, all 28 comparisons should be identical, EPA & BEIR VII. If EPA's primary mission were indeed protection of public health and the environment, one might expect changes to BEIR VII values to be weighted more on the side of the scientific evidence that suggests a need to increase public protection.

So, what does EPA radiation staff in fact propose? **For 27 of the 28 comparisons, EPA's proposed risk figures would result in reduced public radiation protections compared to what the National Academy of Sciences, at EPA's request, recommended. Only one of the 28 comparisons is an enhancement of BEIR VII recommendations. Not a single one actually adopts the BEIR VII recommendations.**

The data of bias are incontrovertible. ORIA staff, apparently rebuffed in their effort to have the National Academy of Sciences give its blessing to claims that radiation is less dangerous than previous thought and that therefore industry can be freed up to expose the public to higher levels currently permitted, has simply gone ahead and proposed to ignore the Academy study. This anti-science politicization of public policy on behalf of polluting interests is unacceptable, and will backfire.

Had EPA staff wished to consider additional evidence not considered by NAS, it would have addressed those new developments that demonstrate radiation is more dangerous than assumed by the Academy. For example, the largest study of occupational radiation exposures ever conducted has recently been released by a large international team headed by Elisabeth Cardis – too late for consideration by the BEIR committee. It found, by examining nuclear workers in 15 nations, cancer induction per unit dose that is about 6 times higher than currently assumed by EPA. Similar findings have recently come out from an international team studying villagers downwind of the Mayak nuclear weapons complex in the Urals. **Science Magazine** reports that both studies provide powerful evidence that radiation is considerably more dangerous than currently presumed. Yet EPA staff does not fully consider these important new studies, considering solely suggestions that one should downgrade rather than upgrade radiation risk estimates.

We share the concerns expressed by Lynn Ehrle about the conflicts of interest, biases, and lack of balance among the appointees on this advisory panel. It appears that several are tied closely to nuclear industry and DOE interests that have been pushing for relaxed radiation standards, whose views have been rejected by the National Academy BEIR study. Ehrle raises legitimate questions about the apparent violation of the Federal Advisory Committee Act posed by the composition and actions of this committee.

Nonetheless, we urge this Committee to recommend rejection of the ORIA White Paper (which dismisses the NAS radiation risk estimates), to oppose the weakening of public protection that would result from adoption of the White Paper and to encourage EPA to use the precautionary principle in all future efforts.

Sincerely,

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