

## **Rocky Flats Citizens Advisory Board**

### **Recommendation 96-15**

**to the Department of Energy, the Environmental Protection Agency and the Colorado  
Department of Public Health and Environment**

### **Soil Action Levels:**

### **Recommendations for Further Study**

**Approved November 7, 1996**

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RFCAB recommends that a variety of studies need to be developed in order to provide greater confidence in the Soil Action Levels for the site. These include:

- A study of the spatial distribution of radionuclides on site. This study would collect additional soil samples and analyze them. The number of additional samples to be collected should be determined by recognized statistical methods to meet some confidence standard, that all hot spots have been identified.
- A study characterizing the speciation of the actinides. This study would determine if the current distribution of actinides will be stable for the next 1,000 years.
- A study of inputs to the dose-response model (RESRAD) to ensure that the site specific parameters are indeed factual and appropriate. Specifically, the erosion rate and runoff coefficient need to be substantiated as there will likely be different values at various locations on the Rocky Flats site. (see attached Specific Comments on RESRAD, the Soil Action Levels document, and the EPA Radiation Site Cleanup Draft Regulation for additional points)
- A complete mapping of the erosional components and gradational agents at Rocky Flats needs to be completed. A comparison of this data with the plutonium migration data of Dr. Iggy Litaor should be done. The same type of study should be completed down drainage to at least Standley Lake.
- Further studies into the effects of low dose exposure utilizing a supralinear approach to calculate risk rather than a linear model. The linear approach is built into the RESRAD model used to calculate the proposed SALs.

- Calculations of soil action levels using upper bound values for the relative biological effectiveness (RBE) for plutonium. Currently, site models only use the average value for alpha emitters, 20. RBEs for all physiological end-points or maladies that could result from exposure to a dose of plutonium must be included.
- Development of means to determine soil contamination levels that take into better consideration specific soil samples rather than relying on an averaging methodology that dilutes high readings.
- Development of a model that includes the possible effects of disturbance to radionuclides in soil from events such as fire, floods, earthquakes, windstorms, mechanical disturbance, and surface slope.
- Independent evaluation of current and potential future pathways for both ground water and drinking water.

Besides the aforementioned studies, RFCAB recommends the following also happen:

- There must be full participation of affected public at relevant DOE sites in a full debate regarding any standards that may be proposed nationally.
- The agencies should indicate what measures they will take to provide maximum protection for the work force and the public in the process of remediation activities.
- The agencies should indicate what real-time monitoring will occur to ensure that the workforce and the public are adequately protected during remediation activities.
- The agencies must stay abreast of technological innovations that may be applicable to the situation at Rocky Flats.

## **Specific Comments on Soil Action Level Issues**

RFCAB has the following specific comments on Soil Action Level Issues:

- Offsite exposure: The SALs do not account for, measure, or contemplate any migration off of the site, such as that which is carried by the wind. The SALs must consider off-site exposures and the safety of off-site populations.
- Choice of dose model: A linear risk/dose model is used for this process. CAB understands that the only actual data regarding dose and effects are from acute high doses as opposed to low chronic doses. Contamination from Rocky Flats arguably creates chronic low-dose exposures. The linear model is widely contested. CAB would argue that a decision of this magnitude should

not be based on a contested model whose accuracy is uncertain.

- RESRAD Defaults: default values were used when site-specific data were not available. Because RESRAD was developed at Argonne, RESRAD defaults are based on conditions in Illinois--climatic, geographic, background radiation, etc. This may make a difference when applied to conditions at Rocky Flats.
- RESRAD Site-Specific Values: It is not clear that the site-specific values used in the RESRAD modeling adequately considered peak values.
- Erosion: The CAB consultants reported that the SAL claim that the soil is "stable and relatively mobile" is faulty because while the contamination does not move vertically, it does move horizontally, i.e., erosion. They went on to explain that erosion is a very important factor in determining long-term fate. Fire, mechanical disturbance, surface slope and storm events all affect erosion rate. The model assumes that the plutonium concentration is uniform throughout the top 15 cm of dirt, but the contamination is actually in the top 2-3 cm. Because as much as the top few inches of soil can be eroded away over time, it makes sense that data has shown that plutonium in soil decreases over time. The model does not consider these facts. Besides the inadequate treatment of the erosion factors, the assumption of uniformity in the top 15 cm may result in inaccurate and overly-costly estimates and remediations.
- Surface Water and Ground Water: RESRAD does not model the groundwater pathway, based on the assumption that on-site groundwater will not be used for 1,000 years, and regardless of the fact that the SALs must be protective of surface water standards. Although SALs are set to protect state surface water standards, RESRAD doesn't specifically model to be protective of surface water. It is essentially assumed that the SAL will be protective of surface water. RESRAD does not appear to tie hydrological geological characteristics of the site together.
- Food Chain: The CAB consultants reported that the fate and transport portion of the model does not adequately consider the food chain.
- Soil Particle Size: Concentrations of plutonium are directly dependent upon soil particle size--fine particles carry the most--the model does not consider this. Specifically, finer particles have greater affinity for plutonium and thus have greater concentrations of plutonium than coarser particles. The finer materials are more readily dispersed. Thus, the model must take into account the fact that finer particles will make up a greater percentage of the material that is transported, and because finer particles have greater affinity for plutonium, there will be a higher concentration of plutonium in the suspended material than is found in the soil on average.
- Fate and Transport of Plutonium: The Plutonium Panel convened by Kaiser Hill has been studying fate and transport. They emphasized that the mobility of plutonium in the soil depends upon the chemical form (speciation). Speciation, they say, is crucial to tie all the unanswered

questions regarding fate and transport together. They opined that RESRAD doesn't evaluate speciation, i.e., particulates vs. diluted species, and therefore does not give a complete picture of fate and transport.

### **Concerns with Specific Parameters:**

- Regarding erosion, the runoff coefficient of 0.0004 seems low for western rangeland. RESRAD default is 0.02. More investigation into the erosion rate and runoff coefficient needs to be completed as there is likely different values for various locations on site. This is especially true for areas to the east of the industrial complex. The primary problem is the constant attempt to complete calculations as if the area is the same (average) everywhere. It is not. A more specific study using different values for the necessary parameters at the various locations would enable a more accurate evaluation to be done. Such a process has been done in hazard recognition situations and has been shown to assist in developing more accurate evaluations of hazardous sites. An averaging of such locational data identification could then be computed.
- Experts have stated that the mass loading for inhalation factor is too low -- 26 as opposed to the default of 200 -- if the default is for the Illinois area, wouldn't the Front Range be "dustier" and therefore result in a larger inhalation factor?
- The breathing rate values should be carefully examined to determine the most conservative application.

### **Ecological Impacts**

- RFCA's basis for action levels for surface and subsurface soils state that the levels will be protective of ecological resources. The draft SAL document (page ES-7), however, does not mention protection of ecological resources. It is not clear that the ecological impacts of this decision were adequately considered.

### **Surface Water**

- Soil action levels are to be protective of surface water, i.e., the proposed surface water standard of 0.15 pCi/l (up from existing standard of 0.05 pCi/l) will not be exceeded. However, RESRAD does not model exposure pathways or impacts to surface water. The assumption is apparently that because the water standard of 0.15 pCi/l has never been exceeded under existing soil conditions, that there never will be exceedances because the soil conditions will only improve through remediation. It has also been stated that the Watershed Improvement Activities and pond maintenance and upgrades will assist in protecting surface water from exceedances.

In response to the question, "How does RFCA's approach to groundwater ensure that surface water will not be affected?", the Response to Comments for RFCA states, "RFCA cannot

guarantee that the surface water will not be affected. However, RFCA does ensure that whenever surface water is affected at levels that exceed water quality standards at the points of compliance, evaluation of possible contaminant sources will occur and appropriate mitigation action will be taken." This reasoning fails to recognize natural erosion as well as erosion and other disturbances caused by restoration activities, and therefore seems unreasonably inaccurate.

## **Comments on the EPA Radiation Site Cleanup Draft Regulation**

- The Draft EPA Regulation states:

" Accessible environment (i.e., environment to which the standards apply) means the areas outside the boundary of a location under the control of the implementing agency...where radioactive materials are possessed or used...includes those on-site portions of a Federal facility that are being released, as well as ground water moving off-site that was contaminated by site-related activities."

One can interpret this passage as including areas off-site. The Soil Action Levels do not address off-site contamination.

- The Draft EPA Regulation states:

"Passive control measures means control measures that control radiation dose or prevent exposure...by methods other than physical removal of radioactive material...(including) easements, covenants, and the closure of existing groundwater wells."

It is disturbing that easements and covenants (lease / deed restrictions) would be relied upon for radiation protection.

- The Draft EPA Regulation states:

"Remediation or remedial action refers to those actions consistent with a permanent remedy to prevent or minimize the release of radioactive material into the accessible environment."

Is this consistent with current claims in setting the Soil Action Levels that these are interim action levels?

- The Draft EPA Regulation states:

"Remediation shall provide a reasonable expectation that, for 1,000 years after completion of the remedial action, radioactive material (in excess of background radiation levels) shall not exceed concentrations that could cause any reasonably maximally exposed member of the public to receive, through all potential pathways under a residential land use exposure scenario, an

effective dose equivalent of 15 mrem/yr."

The phrase "all potential pathways" does not appear to mean "all potential pathways given institutional controls."

- The Draft EPA Regulation states:

"In the event that remediation of a site will not meet the (15 mrem) conditions without the use of passive control measure, the implementing agency shall:" (use passive controls to ensure 15 mrem, and ensure 85 mrem should passive controls fail.)

What incentive does a site have to meet the 15 mrem without passive (institutional) controls?

- The Draft EPA Regulation states:

"Reevaluation shall occur every 5 years to ensure that passive control measures have not failed."

Is it reasonable to assume that such reevaluation will go on for 1,000 years?

- The Draft EPA Regulation states:

Groundwater standards are to apply to "radiation doses received by (public) through exposure to ground water contaminated at any site" as well as that which is a current or potential source of drinking water.

This seems to say that any type of potential exposure--on or off-site-- would require ground water remediation. While the standard allows for the assumption that ground water will not be used for drinking, the regulation does not appear to address potential off-site groundwater exposures.

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Note: This recommendation is a followup to [CAB recommendation 96-14](#).

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The Rocky Flats Citizens Advisory Board is a community advisory group that reviews and provides recommendations on cleanup plans for Rocky Flats, a former nuclear weapons plant outside of Denver, Colorado.

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