

# RFCA Stakeholder Focus Group

## June 6, 2001

### Meeting Minutes

#### INTRODUCTION AND ADMINISTRATIVE

A participants list for the June 6, 2001 Rocky Flats Cleanup Agreement (RFCA) Stakeholder Focus Group meeting is included in this report as Appendix A.

Reed Hodgkin of AlphaTRAC, Inc., meeting facilitator, reviewed the purpose and meeting rules. Introductions were made.

Reed asked if there were any questions or comments regarding the May 9, 2001 meeting minutes, noting that the Focus Group would again be asked after the break, as the meeting minutes were just out that day.

Reed reviewed the meeting agenda, which included:

- RSAL Working Group Update
- Task 1 Peer Review Discussion
- RSALs Task 2, Model Evaluation Discussion
  - RFCA parties' responses to peer review comments
  - EPA RAGs modeling overview
  - Focus Group Summary of Task 2 Issues
- End State Presentation and Discussion: Surface Water
- RFCA Parties Feedback – What Heard, How Used, Decisions / Choices Made
- Set Future Agendas and Review Meeting

#### RSAL WORKING GROUP UPDATE

Reed noted that the objective for this discussion was to:

- Keep up to date on working group progress

**ADMIN RECORD**

SW-A-006545

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Steve Gunderson of the Colorado Department of Public Health and Environment (CDPHE) briefed the Focus Group on the status of the Radiological Soil Action Levels (RSALs) Working Group.

Steve stated that the RSAL Working Group had been finalizing parameter selection and calculations in preparation for risk and dose calculations. Recent efforts had focused on:

- Plant ingestion, especially differentiation between leafy and non-leafy vegetables,
- Mass loading distribution, especially the shape of the distribution curve above the 80<sup>th</sup> percentile, and
- Soil ingestion, and incorporation of results from the Anaconda, Montana Superfund studies.

Steve indicated that risk and dose calculations were imminent and that the RSAL Working Group might have results for presentation at the RFCA Focus Group meeting on July 11, 2001.

The Focus Group discussed the basis for the soil ingestion input parameter at some length. Some members questioned if multiple studies had been examined before settling on the Anaconda study as a basis for the input distribution. Others were concerned with the sample size of the Anaconda study might be too small. Others were concerned that the soil ingestion rate developed might be lower (thereby resulting in lower doses and risks) than that calculated by RAC in its earlier analysis.

Reed summarized the discussion by communicating to the agencies that it will be very important to justify that soil ingestion number used in the RSAL calculations - why those data are most appropriate to use and why the sample size is appropriate for this purpose. It will also be important to demonstrate clearly the degree to which the results are "conservative" - tending to overestimate health impacts as a compensation for uncertainties.

## **RSALS TASK 2, RAGS MODEL OVERVIEW**

Reed noted the objectives for the Risk Assessment Guidance for Superfund (RAGS) model overview:

- Get overview understanding of RAGS
- Understand RAGS role in RSAL process

Susan Griffin of the U. S. Environmental Protection Agency (EPA) provided an overview briefing on EPA's RAGS risk assessment model and its application to the Rocky Flats Radioactive Soil Action Level (RSAL) setting process. A copy of Susan's presentation is included as Appendix B.

Susan discussed the risk assessment approach that EPA uses at all CERCLA sites. She described the use of site conceptual models and showed examples from the RSAL project.

Susan then explained the theory and equations that make up the RAGS risk modeling approach. She referred to the documentation that had been included in the meeting packet.

She showed how risk is calculated using a reasonably maximum exposure analysis using RAGS. She indicated that the highest exposure that is reasonable to expect is calculated for every scenario. She stated that site-specific input values are used where possible, with EPA-specified national values used when local data are not available.

Susan also compared the RAGS approach to the probabilistic method used in the RESRAD model. Susan discussed risk vs. dose modeling and their applications to this project.

Susan then held a discussion with the Focus Group.

Members of the Focus Group moved the discussion back to the Anaconda ingestion study with a concern again raised about the size of the sample in the study. Susan responded by stating the importance of examining study design and noted other studies that had corroborated the Anaconda tests.

Members asked about the approach used in RESRAD for probabilistic calculations. Susan explained that thousands of individual calculations are performed, each with different values from the distributions that describe the different input parameters. Then the thousands of individual results are grouped and examined statistically.

## RSALS TASK 2, MODEL EVALUATION DISCUSSION

Reed noted the objectives for the RSALs Task 2, Model Evaluation discussion:

- Get agency response to peer review comments
- Discuss task 2 report and peer review
- Reach closure for focus group

Russell McAllister of the U. S. Department of Energy (DOE) presented the agencies' response to the Peer Review comments. He distributed a written response to the Focus Group at the meeting (see the June 20, 2001 packet). He also distributed a written response to comments received from LeRoy Moore and Victor Holm (see the June 20, 2001 packet).

Russell noted that the peer reviewers had come to very different conclusions in their reviews of the Task 2 report. He stated that Reviewer 1 found that the approach was sound and justified by the analysis. He indicated that a number of small issues and editorial comments raised by this reviewer would be addressed in the revision to the Task 2 report.

Russell noted that Reviewer 2 was much more critical of the report. He believed that the reviewer found the overall approach to be sound and appropriate, with the exception of two major deficiencies:

- CERCLA regulatory requirements are not addressed in the Task 2 report, and
- The requirement that the model be in the public domain is overly restrictive.

Russell stated that the first issue was addressed in the Task 1 report, and thus not repeated in the Task 2 report. He noted that the bottom line of the regulatory

requirements for modeling is that both Nuclear Regulatory Commission and EPA requirements must be met, resulting in modeling for both dose and risk.

Russell indicated that the public domain requirement had been established to ensure that a thorough scrutiny of the modeling methodology could be made by the agencies and members of the community.

Russell also noted that the reviewers had asked for more background information about approaches and methodologies. He stated that more information would be included in the next revision of the report, including an executive summary, the choice and application of the probabilistic approach, and the conceptual site model.

Reed asked that members of the Focus Group submit specific comments on the response documents after they had a chance to read the document. He then turned the meeting over to the Focus Group for an initial discussion.

The group first discussed the RAC application of RESRAD and its role in the Task 2 review. It was noted that the agencies believe that most of the issues around the RAC application of RESRAD were really related to choice of parameters rather than modeling methodology. Russell noted that a comparison of RAC's RESRAD to RESRAD 6.0 for air resuspension showed similar results.

A member of the Focus Group noted that the recent modeling workshop was very helpful on this issue. He suggested that some of the materials and findings be included in the revised Task 2 report.

It was clarified during the discussion that risk would be calculated using both RESRAD 6.0 and RAGS. It was requested that the agencies' overall approach to evaluating risk, including how RESRAD and RAGS would both be used, be included in the Task 2 report.

It was noted that the Task 2 report should specifically state how the evaluation criteria established in the review are necessary and sufficient to meet the objectives of the model review.

The discussion returned to parameters for a few minutes. Some concern was voiced about the use of mean values (rather than extreme values) for RESRAD input parameters that were being assigned point values rather than distributions. Russell responded that point values were being used only for those parameters that had minimal affect on model results, so it would not matter whether a mean or extreme was used. It appeared from the discussion that further explanation of the use of distributions and point estimates would be beneficial – either in the Task 2 or Task 3 report.

The agencies requested that the Focus Group answer two questions when reviewing agency responses to the peer reviews:

- Did the response document adequately address the issues raised by the peer reviewers, and
- Are there any remaining major unresolved issues in Task 2?

Reed discussed the path forward with the Focus Group. The group agreed that they could not close their discussion of Task 2 until they had read and commented on the agencies' response documents.

## **TASK 1 PEER REVIEW DISCUSSION**

Reed introduced this agenda item as a continuation of a discussion that had begun at the last Focus Group meeting. He noted the objectives for the Task 1, Peer Review discussion:

- Obtain issues from the Focus Group regarding the Task 1 peer review and response;
- Communicate these issues to the agencies; and
- Get responses from the agencies.

Reed turned the floor over to the Focus Group to raise and address their issues.

The discussion focused on the choice of the anticipated land use scenario. Some members of the Focus Group asked why the wildlife refuge worker had been chosen as

the anticipated land user instead of the more conservative resident rancher scenario. These members felt that a more conservative scenario would be more protective of any possible future use at Rocky Flats. It was asked if the decision to use the wildlife refuge worker scenario was final.

EPA responded that the scenario was not absolutely set because the final decision rested with the agency Principals. However, all three agency Project Coordinators (EPA, CDPHE, and DOE) stated clearly that, based on the information so far on the table, they would recommend to their Principals that the wildlife refuge worker scenario be considered the anticipated land user.

CDPHE reminded the group that all of the planned scenarios would be evaluated and the results of all considered in the analysis.

The agencies provided a perspective on the requirements and guidance (especially associated with CERCLA) and how they set bounds on the assessment and the choices that could be made. EPA noted that the law does not require a dependence on anticipated future use, but stated that this approach is strong EPA policy.

DOE noted that the current analysis is constrained in practice by the laws and guidance and compared this to the 1996 RAC analysis, which was deliberately NOT constrained in this way.

A member of the Focus Group noted that the law did not prohibit the agencies from being more protective than the minimum required and suggested that the resident rancher or another scenario more cautious than the wildlife refuge worker could be recommended by the agencies.

The agencies responded that they had evaluated the different scenarios and considered the wildlife refuge worker to be an appropriately conservative scenario to represent anticipated future land use.

Another member of the Focus Group noted that the choice of an anticipated land use scenario for Rocky Flats is being viewed as potentially policy setting across the DOE Complex. He noted that the choice will thus be evaluated against national needs as well as local needs. He suggested that the community should expect the precedent-setting

aspect of this decision to affect the degree of conservatism that DOE and Congress would support at Rocky Flats.

A member of the Focus Group confirmed that the law allows the adoption of a more conservative scenario and that he would continue to oppose any anticipated land use scenario that was less conservative than the resident rancher scenario.

Another member of the Focus Group pointed out that, while the law allows a more conservative approach, the most conservative approach is not required. The law also allows the approach being used.

CDPHE explained that the agency's charge from its Principal was to work within the laws and guidance. The legal staff at the agency had thoroughly evaluated the intent of the law and guidance and had determined that the approach currently being used was most consistent with the intent and application of the laws and guidance.

A member of the Focus Group expressed confusion on how ALARA was going to be conducted as part of the regulatory framework. CDPHE responded that the approach to ALARA would be precedent setting, was yet to be developed, and would be a major policy topic for both the agencies and the Focus Group.

A member of the Focus Group stated that one of the most important policy discussions with the community was to determine where cleanup should go beyond that required by law for reasons that make sense to everyone. EPA noted that the 903 pad cleanup could be a specific example – where surface water protection produced a cleanup beyond the CERCLA requirements.

DOE stated that the challenge to the agencies and the community is to determine the smartest way to spend the cleanup up funding at Rocky Flats.

## **END STATE PRESENTATION AND DISCUSSION: SURFACE WATER**

Reed indicated that the objective for the surface water end state presentation was:

- Provide an overview of the issues and options associated with surface water end state at Rocky Flats.

John Rampe of DOE presented the overview (see the June 6, 2001 packet).

John discussed four components of the surface water picture at Rocky Flats:

1. Basic studies,
2. Environmental restoration,
3. Land reconfiguration, and
4. Water management.

He then addressed policy / technical questions that were being considered as the discussion gets underway:

- Are there specific areas where removing contamination will significantly improve water quality and/or lessen DOE's stewardship obligations?
- Is stabilization "as good as" removal when it comes to long term surface water quality protection?
- Given that Site water quality is already reasonably good, to what extent should water quality protection be a goal of environmental restoration projects? Where is it appropriate?
- Regarding passive treatment systems, have they been designed to be commensurate with the expected lifetime of the contaminant? Is additional subsurface source removal warranted?

The Focus Group then discussed the surface water end state picture. The discussion was limited by available time.

A technical discussion centered on the effects of colloidal suspension and states of plutonium on transport in surface water. Both the actinide migration study at Rocky Flats and a study at Yucca Mountain were discussed.

Another topic discussed was compliance obligations. This discussion centered on the surface water standard. DOE was asked if it was proposing a change to the water standard. DOE responded that it had not proposed a change to the Water Quality Control Commission, though there was a potential that this discussion could occur. The focus right now is more on where and how water quality will be measured for comparison to the standard. There is also a focus on the design of a water quality monitoring system that will be effective into the Stewardship period.

A member of the Focus Group asked if the Fish and Wildlife Service would be involved in developing the monitoring plan. DOE responded that the Service would be involved.

The discussion was closed due to time constraints.

## **NEXT MEETING AGENDA**

Members of the Focus Group expressed concern that there was insufficient time on the agendas to properly discuss the topics presented. It was noted that this was especially true for the end state discussion; that Surface Water Management needed much more time for dialog than had been available.

Reed agreed to address this problem with the Agenda Group.

The meeting was adjourned at 6:35 p.m.

**RFCA Stakeholder Focus Group  
June 6, 2001  
Meeting Minutes**

**Appendix A  
Participants List**

**RFCA Stakeholder Focus Group  
June 6, 2001  
Meeting Minutes**

**Appendix B  
Susan Griffin, U. S. Environmental Protection Agency:  
Development of Risk-based Soil Action Levels at Rocky Flats**

June 21, 2001

Dear Stakeholder:

The Rocky Flats Cleanup Agreement (RFCA) Stakeholder Focus Group will meet at the Broomfield Municipal Center at One DesCombes Drive on July 11, 2001 from 3:30 to 6:30 p.m.

Enclosed are the meeting minutes for the June 6, 2001 RFCA Focus Group meeting.

I hope you enjoy your 4<sup>th</sup> of July!

You may call either Christine or me if you have any questions, comments, or suggestions concerning the RFCA Stakeholder Focus Group or the enclosed meeting minutes.

Sincerely,

C. Reed Hodgkin, CCM  
Facilitator / Process Manager

JS: We're talking about probabilistic numbers where we can do them, save one. We have decided ahead of time we're not going to do it. That's the number of hours we've spent on site. It's my understanding that the RSALs will be based on a refuge worker scenario. A resident rancher calculation spends 4 times the time onsite. RAC used the resident rancher scenario because it was the most conservative. Is the resident rancher scenario dead? Can we at least do a probabilistic determination spreading from 2,000 hours to 8,600 hours?

TR: It's not absolutely set because the RSAL's not absolutely set. For the reasons set forth in the Task 1 report, mainly that we base our risk assessment on the reasonable maximum exposure, I do not believe that the resident rancher is the reasonable maximum exposure, and I'm not going to make that recommendation to my boss.

SG: Tim's right. CERCLA's under... there's a series of laws... There's laws and regulations and guidance on CERCLA that we're bound by. We'll see what the numbers are. It's important to remember that those numbers are going to have a hundred-fold difference. Those numbers will include the wildlife refuge worker.

TR: CERCLA law does not say you have to chose... reasonably maximum exposure is not the law, per se. In thinking the wildlife refuge worker is not the law, but the anticipated future use is certainly strong EPA policy. That's what we based it on. I disagree with a non-conservative assessment.

JG: Does that mean you're going to use 2,000 hours a year of exposure for the wildlife worker?

TR: I believe that's correct. Based on the anticipated land use.

JK: The agencies are constrained by laws and regulations. The RAC study, as commissioned by the oversight panel, explicitly ... unconstraint ... They were told explicitly, "Don't be constrained. Use 15 mrem dose limit. In other respects, you're not limited by CERCLA." We do not have the freedom. We are constrained by public policy, laws, and regulations.

JS: Thank you for laying that out on the table.

LM: CERCLA has many points of consideration. One of them is the concerns of the public community. It is always possible to be more cautious than the law requires. That kind of recommendation can be made by the three agencies. Let's identify the reasonably maximally exposed individual. If it's not the wildlife worker, then what is it?

JL: Just to be clear, I've seen nothing to compel me to make a recommendation different than the wildlife refuge worker. Where we stand right now is absolutely going to be the recommendation, regardless how the numbers come out, because the numbers just reflect the things ... I think the composition of the Bill pointed us in that direction. In fact, it is more conservative than the open space ... that was evaluated previously. It gives us comfort that if

worst case the bill wasn't passed, we have something more conservative ... regulatory agreement, which is RFCA.

DA: LeRoy said that the precedent we set here helps other sites. If we're vigilant here, then it's the domino effect at other sites. My understanding is that that is the very essence. If you at Rocky Flats, because what we hear from Congress is what we hear from DOE, but if you pick a cleanup scenario that is a resident rancher at Rocky Flats, how much would it cost the federal government to then cleanup Hanford and INEEL and the other sites to that standard? When Jeremy talks about public policy considerations, those are the very types of things that people at DOE and EPA headquarters, that congress is looking at, in setting cleanups of nuclear facilities. Look at Hanford, where there was one cleanup project they went to resident scenario. Next thing you know, DOE's office of the Inspector General is investigating, saying that is preposterous. There's a setting for open space that has to be open space cleanup.

SG: At the project coordinator level and RFCA, the project coordinator is kind of a point person for the environmental cleanup. A lot of decisions are made at my level. Technical decisions are made below me. With respect to this one, ... has the attorneys. Tim has the lead to compile it, but we had heavy involvement with the attorneys to look at the laws, look at what their guidance is, look at the regulations, and try to carve that Task 1 report. We briefed the principals in spring saying this is what we've come up so far. Ultimately, the principles will have the decision in what the RSAL is. Clearly, what we say will have some impact in that. In my RFCA Project Coordinator job description, it says right up front that I'm supposed to use the laws and regulations that give us the authority to make our decisions. I am bound by what our legal counsel and what the guidance is to doing the work.

LM: Doesn't CERCLA specify the rural resident as the most effective scenario for cleanup?

TR: The draft guidance that came out with the defunct cleanup rule suggested that.

DA: The question of doing ALARA analysis for ... contamination that is below the given RSAL. I'm getting conflicting responses. During Tim's last Task 1 presentation, there was some confusion on how that issue would be addressed.

SG: We'll have to discuss that.

JG: I don't know of any legal restriction that says there is a law that says we cannot cleanup to a level at Rocky Flats. It has yet to be proven that the amount of money that has to be spent is unreasonably high.

DA: Joe, there is nothing that says you can't go further as a matter of law. It is equally true that there is nothing that says you must go through. There is nothing that says it is the obligation of the federal government to go further beyond 10-4. There's nothing that says what we're spending is breaking the bank. But what I'm hearing from the regulators is we may not support those additional funds, and that's how policy is made. There's nothing that compels Congress to fund it to get that extra million.

JG: There's nothing that says we need to accept that. That's why I'll continue opposing it.

DA: I think the point that there is no legal mandate, there's nothing ... say you have to do additional provided it meets the regulatory requirements. If it meets the regulatory requirements, then it becomes a matter of how community members work the issues as a matter of law unless they're prepared to go into court and sue. What we're trying to do here in the focus group is to say, what do we do beyond the regulatory minimum in order to assure a safe cleanup?

TR: I agree with what Joe was saying about the 903 pad. It's not going to break the bank to go to 35. DOE may disagree, but there may be a very good reason to go to 35. I don't think it's to protect a hypothetical future ..., but you need to protect the surface water and reduce the risk of a failure over long-term stewardship.

JL: One of our working assumptions is, there's about this much money we're going to get. Let's figure out the smartest way to spend it.

**Response to Comments made by LeRoy Moore  
On the Rocky Flats Cleanup Agreement (RFCA)  
Radionuclide Soil Action Level (RSAL) Working Group (RWG)  
Task 2 Report Computer Model Selection**

June 6, 2001

*The following is the Agency's response to Comments made by LeRoy Moore of the Rocky Mountain Peace and Justice Center received May 24, 2001. Our response will be italicized.*

The cover page of this report does not identify it as the RSAL Task 2 report. Nor is the author of the report anywhere named. I assume it is Russell McCallister only because we were told he wrote the initial draft. It would help to have both of these identifiers on the title page. It is also not clear whether this version of the report is supported by all the agencies or whether it represents the point of view of the author only.

*Agency Response: The report will be modified to reflect that it is part of the RFCA RSAL review process, Task 2 and that the original was drafted by the Department of Energy and Kaiser-Hill. It will also reflect that it is a pre-decisional draft and not endorsed by DOE, EPA or CDPHE management.*

This version differs only slightly from the original draft dated Oct. 26, 2000, and received by the Focus Group in late Nov. But slight changes in this version of the report make its inherent weaknesses stand out. The following comments refer mainly to areas where some change has been made from the original draft.

2.3 Perhaps it is appropriate to refer to RESRAD 5.82 as modified by RAC as the "RAC Code," but it seems something of an overstatement to assert that "the RAC developed computer model should not be considered associated with RESRAD" for the reasons cited. Since RAC launched its work from the platform of RESRAD 5.82, wouldn't it be more accurate and less abrasive to say: "RAC's modifications of RESRAD 5.82 do not have the endorsement of ANL; in ANL's view [if it is ANL's view--if not, whose opinion is this?], modifications made by RAC may have altered the initial integrity of the original RESRAD code." As is, this statement is an allegation with no demonstrated basis.

*Agency Response: The language will be modified to say, "RAC's modifications of RESRAD 5.82 provide an air pathway calculation that differs from that of the original code. This modification constitutes a departure from RESRAD's formulation, in a manner that has not been fully documented."*

4.1.7 The final sentence states that "the computer codes [for RESRAD 6.0] themselves can only be obtained with special permission from Argonne National Laboratory." Given the fact that Joe Legare has several times stated to the Focus Group that these codes would be provided for the current RSAL work, have they been requested? Have they

been received? Will they be made available to all stakeholders and specialists participating in the upcoming computer workshop? In sum, will it become possible to have an independent review of the guts of the RESRAD 6.0 codes?

*Agency Response:* The source code will not be made available. The executable code is available and has been provided to the various working groups. An independent review of RESRAD is being conducted, but will not be available for six months.

4.3.2 through 4.3.6 These sections of the report provide the basis for the eventual negative evaluation of the "RAC Code" (as summarized in Table 1 on p. 20). To begin with, these sections state the author of the report [perhaps others] is unavailable to use RESRAD 5.82 as modified by RAC.

1) Was RAC asked to provide the technical assistance to help overcome this problem?

*Agency Response:* The RWG was not formed to assist vendors to develop code for its use; the RWG was formed to review any new information that might require a change to the RSALs. The group chose to seek existing codes that could assist in this purpose. The RAC's contract was with the RSALOP/RFCAB. It would be inappropriate for the RWG to request additional work from RAC. The RAC Code is not readily available for use, nor is it documented and benchmarked, as were the other candidate codes.

2) Was RAC told what criteria would be utilized to evaluate RAC's computer work?

*Agency Response:* None of the potential providers, including RAC were consulted regarding the selection criteria. The criteria developed as part of the Task 2 Computer Evaluation were developed independent of questioning any provider's ability to meet them.

3) Was RAC given an opportunity to meet said criteria?

*Agency Response:* The issue is availability of existing codes, not the ability to develop codes and documentation to meet custom needs. None of the potential providers were asked to modify their codes to meet the criteria established for this evaluation.

4) Was RAC told that their work would be downgraded (as per 4.3.3) if they had not documented how and why they modified RESRAD 5.82 in peer-reviewed journals?

*Agency Response:* It is common practice in industry to document computer code in a manner sufficient for others to use and understand its uses and limitations. The RWG had no obligation or need to contact code providers with its selection criteria prior to the evaluation: the RWG chose to evaluate codes whose bases were well proven. RAC was not told by the RWG, nor were any other vendors, that the NRC developed a regulatory guide, "Demonstrating Compliance with the Radiological Criteria for License Termination" (DG-4006)(1998) that explains the acceptance criteria for selection of site-specific codes/models at nuclear facilities. The guidance explains that software used

*must in be conformance with the recommendations of the Institute of Electrical and Electronics Engineers (IEEE) Std.830-1984, Guide for Software Requirement Specifications. This is the industry standard for the development/modification of computer software and should be known companies doing that type of work if their code is to be readily accepted and used by the nuclear community.*

- 5) In RAC's original work for the RSAL Oversight Panel, RAC was expected to calculate a scientifically defensible RSAL. They were asked to select a computer code for their work; they were not asked to produce a computer code or a modification of a computer code that would satisfy the several criteria spelled out in this report. Isn't it inappropriate to judge RAC's computer work by criteria it was never asked to meet in the first place?

*Agency Response: The RFP issued to review the RSALs at RFETS dated June 1, 1998 had as it's purpose "...to conduct an independent scientific review of the RSALs established to cleanup RFETS. The review will evaluate the methods used as well as the accuracy and applicability of the input parameters used to calculate the current RSALs. The review will also encompass models, methodologies, and cleanup standards that may exist or are being for other sites..." The fact that RAC went beyond selecting a model that had been validated and verified was their decision. In the RFP section IV, Project Description and Scope, page 5, Computer Models, requires "Whichever model or models are recommended should be thoroughly validated. It is not necessary that the contractor perform this validation, peer reviewed, published studies will suffice". There is nothing in the Task 2 report that is not industry practice for selecting/modifying or using computer software. The selection criteria were developed by the RWG independently of any previous work done on the RSALs. The fact that RAC's work did not produce an acceptable code under these criteria does not denigrate the work RAC did, nor the value obtained from the code execution and resultant discussions. RAC's work was not judged in this selection process.*

- 6) Should not this portion of the report be deleted and replaced by some discussion of RAC's work that adheres more closely to the facts of the matter?

*Agency Response: The Task 2 Report is not intended to be review of RAC's work. The DOE requirements for cleanup of residual radioactive material (including soil) are contained in DOE Order 5400.5, Chapter IV. To be found acceptable for computing cleanup levels for radioactively contaminated soil, the computer code must meet specific regulatory criteria. The criteria the RWG developed was designed to meet those criteria and cannot be ignored.*

- 7) If what is suggested in question 6 is done, would it not be pertinent to indicate how and why RAC modified RESRAD 5.82, then consider whether what RAC did should be incorporated into computer work now being contemplated?

*Agency Response: The Agencies are proceeding using RESRAD 6.0 to calculate an RSAL. The RAC work contributed valuable information and insight that is being*

*considered and incorporated into the ongoing discussions of parameter inputs. If the Stakeholder Focus Group or some other group wants to explain how and why RAC modified the inputs to RESRAD, that might be an appropriate presentation to the Focus Group. The results of the recent workshop, however, seem to provide adequate evidence that the RAC Code did not result in significantly different results than would be obtained with RESRAD 6.0, assuming the same parameter inputs. The issues of greatest importance and controversy seem to occur in the area of parameter selection and application.*

In conclusion to the foregoing, this report seems to confuse two things: deciding which computer code is best to use for current calculations of the RSALs, and assessing how RAC used RESRAD 5.82. The first can be done without looking at RAC. The second, which is really not done here, must be done somewhere, perhaps in the parameter paper. Still, this report should at least refer to how RAC used RESRAD 5.82, since a discussion of this issue would help clarify modifications that may need to be made to RESRAD 6.0, if this is the model being used for current calculations.

*Agency response: The RWG has decided, based on current information that RESRAD 6.0 is the best computer code to proceed with. The group based this decision on the Task 2 criteria, and considered the available codes that might be acceptable, including the RAC Code. Assessing how RAC modified and used RESRAD is not a RWG responsibility, nor is it the subject of future planned reports.*

On p. 19 there are two minor matters of wording. First, the final phrase of the first long paragraph contains no subject for the verb; what exactly is intended here? Second, on line nine of the final long paragraph, what precisely is meant by "EPA's proposed cleanup rule"?

*Agency Response: The intent was to explain that from the comparison done by Radian between RESRAD 6.0 and RAC Code, the computer codes generate similar RSALs if similar parameters are used. The language will be changed to reflect this.*

**Responses to Peer Reviewers' Comments on the Rocky Flats Cleanup Agreement  
(RFCA) Radionuclide Soil Action Level (RSAL) Working Group (RWG)  
Task 2 Report Computer Model Selection**

June 6, 2001

At the request of the Stakeholder Focus Group, the Task 2, Computer Model Selection report of the RWG RSAL review was peer reviewed by two anonymous people hired by Reed Hodgins of AlphaTrac. Since the reviewers are not identified by name we will present italicized responses to their comments in two sections, one for each reviewer.

***General Response to Peer Review Comments***

*Both Peer Reviewers considered the overall approach "basically sound and appropriate" with one peer reviewer finding no "major and substantive inadequacies in the approach used" and the other peer reviewer finding two critical deficiencies. We will address the two major deficiencies found by the second reviewer here.*

*The second reviewer found that the evaluation criteria were inadequate because the report ignored the CERCLA regulatory requirement to look at risk. Since the action to determine whether a risk based vs. dose based approach was handled in the Task 1 report, Conduct a Regulatory Analysis, the effort was not duplicated in the Task 2 report, Model Evaluation. The Task 1 report explains the roles of the EPA and NRC in the low-dose health effects debate. The proposed framework or the path forward identified in Task 1 is that although the NRC Decommissioning Rule would be a key requirement in the generation of a RSAL at Rocky Flats, any RSAL must meet all applicable CERCLA requirements. Task 1 states a "Dose assessment will be performed to calculate an RSAL that meet the 25-mRem/yr dose limit to a future user. Given the concern that the 25 mRem/yr dose limit may not be protective of human health... the DOE, EPA, and CDPHE will also calculate RSALs based on risk". The revision Task 2 report will include a discussion of the methodology that will be used to calculate risk and the specific equations to be used in the calculation of the RSALs.*

*In addition, EPA slope factors were used in the development of RESRAD and MEPAS to estimate cancer risk. The slope factor represents the probability of cancer incidence as a result of a unit daily intake or exposure over a lifetime. The slope factors for radionuclides were derived on the basis of the linear nonthreshold dose-response model. Accordingly, radiological cancer risk can be calculated as the product of the slope factor and the radionuclide intake or exposure to external radiation. Both models have the capability to calculate risk.*

*The second critical deficiency, is the requirement that the model be in the public domain. Although it could be argued that this Criterion is the least important of the seven we chose, it is still important. While DOE orders or other regulations do not require this, benchmarking has become an industry standard to demonstrate a new computer codes validity. Benchmarking is an exercise that consists of solving the same set of problems*

*with several different computer codes and comparing results. This can only occur if the executable code is available in the public domain and available to many different users.*

*A few other general comments made by both reviewers included that more background information is needed and that the RAC Code is poorly characterized in the report. Since the original intent of the Task 2 report was to document the computer model selection for the working group, it was generally understood that most of its readers would be familiar with what was being discussed. However, since the report now finds a larger audience, more background, with references to the source documents and appropriate websites, will be added.*

*The second comment is that the RAC Code is poorly characterized in the report. The primary difference between the RAC Code and RESRAD 6.0 is the way the two codes calculate air mass loading. The report "RESRAD Air Calculations", prepared by Martha Hyder of Radian for KH (report available upon request), provides a detailed comparison of how "old" RESRAD, RESRAD 6.0 and the RAC code do the ciphering. Based on this comparison, it appears that the new RESRAD and the RAC Code calculate values very similar for mass loading. This work is further illustrated by the attached comparison performed by Jim Benetti from EPA's Las Vegas Laboratory.*

## **Specific Responses to Peer Review Comments**

### **Reviewer One**

- 1. Is the approach for evaluating models for the development of Radioactive Soil Action Levels (RSALs) at the Rocky Flats Environmental Technology Site (RFETS) sound and appropriate for the application?**

Reviewer's answer: yes.

*Agency Response: Agree*

- 2. If the model evaluation approach is inadequate in any way, why is it inadequate and what approaches would be appropriate?**

Reviewer's answer: I find no major substantive inadequacies in the approach used, and therefore do not believe an alternate approach is needed.

*Agency Response: Agree*

- 3. Is the list of candidate models evaluated in the report appropriate for this site and application? Have any appropriate candidate models been excluded from the list (and why should they be included)? Have any inappropriate models been included in the list (and why are they inappropriate)?**

Reviewer's answers: In general, the candidate models selected for evaluation were reasonable choices (see detailed comments below). Given my agreement with the final

results of the evaluation, I do not believe it necessary to consider any other candidate models.

*Agency Response: Agree*

**4. Is the analysis of models against evaluation criteria as presented in the draft report sound? If not, in what specific ways is the analysis incorrect?**

Reviewer's answer: The analysis is sound. No major deficiencies exist in the analysis.

*Agency Response: Agree*

**5. Are the conclusions of the model selection process supported by the analysis? Is the modeling methodology chosen appropriate for the site and application? If not, which approach would be a better choice and why?**

Reviewer's answers: the basic conclusion, to use the newest version of RESRAD, is sound and is justified by the analysis. The RESRAD 6.0 approach is appropriate for use in developing RSALs.

*Agency Response: Agree*

**Additional substantive analysis and comments**

In this part of the review, I present substantive observations and comments. Important editorial matters are dealt with in the next part, and specific editorial suggestions can be found on the marked-up copy of the draft enclosed with this peer review report.

While the report is pleasantly brief and to the point, it would benefit from an Executive Summary that presents, in one paragraph, the essence of the analysis and the final conclusion endorsing RESRAD 6.0.

*Agency Response: An executive summary will be added to the final report.*

Section 1. Introduction. This section is generally satisfactory from the perspective of someone familiar with the Rocky Flats facility and in particular with all that has led up to the current effort to revisit (and potentially revise) the RSALs. However, this section requires a leap of faith for those who are not familiar with Rocky Flats and/or computer models. For example, while I strongly endorse the inclusion of a probabilistic approach, a naïve reader is not likely to be persuaded just by the second paragraph of this section.

*Agency Response: More background information will be included to help readers unfamiliar with computer models, probabilistic approaches, and the Rocky Flats history of RSALs. The use of a probabilistic approach was one put forth by RAC and included in the new RESRAD 6.0. It had been discussed by the RWG previously and agreed this was*

*a better approach to allow variability in the input parameters. Further discussion will be included in the report revision to clearly explain the differences between the deterministic and probabilistic approach and why the choice to use a probabilistic approach was chosen.*

Section 2. Model Descriptions. The various models and their subcomponents are well described, especially given the short length of the overall document. In my opinion, the RAC Code is, however, poorly characterized. The RAC Code does not have, nor was it developed to have, the regulatory status of DandD. Neither was it designed to have the potential flexibility to be used at multiple sites. Given the recent history at Rocky Flats, it is appropriate that the RAC Code be considered as a candidate. However, with the inadequate description of the RAC Code's genesis and role, this section and the subsequent evaluation could be interpreted to cast doubt on the many insights that can be gleaned from the RAC approach (e.g., the importance of probabilistic considerations; the air exposure route). It seems fairer to revise this portion of the section accordingly.

*Agency Response* More information has been obtained since the original writing of our report. Any new information will be incorporated in this section. The important insights that RAC has brought to the attention of the RWG will be captured in the Task 3 report.

Section 3. Model Selection Criteria. Overall, I agree with the set of criteria presented in this section.

However, the first sentence in the second paragraph notes that the "criteria were developed after reviewing the current literature on computer modeling...", implying: 1) there was an extensive literature review, and 2) this review included very recent publications. The list of references in Section 6 is pretty sparse, and only three of them are more recent than 1996 (of these three, only two seem relevant to the development of criteria). There is extensive more recent work that could have been reviewed, and cited in the reference section. This is not simply an editorial issue. However, since overall the report and its conclusions are satisfactory, and because a more accurate statement of what apparently actually was done can deal with this problem, I suggest the first sentence in this paragraph read:

"These criteria were developed after reviewing the literature on computer modeling identified in Section 6 and developing criteria based on this review."

Criterion #1 correctly emphasizes the importance of the Conceptual Site Model (CSM), and identifies key components of a CSM, both in general and for Rocky Flats. However, the actual CSM for Rocky Flats is not specifically described or sufficiently outlined for the reader to understand what it includes, and I doubt that the full CSM is included in any of the references in Section 6. The easiest way to fix this flaw is to specifically cite in this section a recent document that presents the most current CSM. If there is an effort to make this document more of a "stand alone" report (see Editorial Comments and

Suggestions later), then a description of the current CSM should be included as an Appendix.

*Agency Response: More literature than referenced was reviewed. Additional references will be listed as well as a reference for the Site Conceptual Model.*

Section 4. Model Criteria Evaluation. In Section 1, the report notes that RESRAD 6.0 includes probabilistic features, which I believe is an important new addition. Obviously the verification efforts on earlier versions of RESRAD will not have considered this feature. If time allows, it would be appropriate to delay use of RESRAD 6.0 for RSAL calculations at Rocky Flats until the completion of the independent verification of RESRAD 6.0 scheduled for completion in early summer. Further, assuming the RESRAD 6.0 is the final choice, it might be wise for the RCFA Stakeholder Focus Group to inform Argonne right away how important this verification project is, *particularly* regarding the probabilistic features of RESRAD 6.0. In Section 4.1.4, it should probably be pointed out that the probabilistic features of RESRAD 6.0 have not (or not yet) been validated. Given the overall robustness of earlier versions of RESRAD, this is not a fatal flaw, in my opinion.

*Agency Response: The only change made to RESRAD 6.0 is the inclusion of the ability to use ranges of values instead of a single value or average. The verification of RESRAD 6.0, although important, was not considered to be a major issue given the modifications only effected the input variables, not the computations or calculations themselves. Argonne is in the process of an independent validation of the probabilistic modules used in RESRAD 6.0, but is at least six months from completion.*

Regarding 4.3.5 and 4.3.6, earlier I noted that it is important to avoid wrongly characterizing the RAC Code. As I understand it, it was not developed for the purpose of “competing” with RESRAD or any other models evaluated, and this should be stated at some point in the report.

*Agency Response: The reviewer is correct that the RAC Code was developed independently, but to some Stakeholders, it appears to be competing with the other models available. Although not designed to "compete" with RESRAD, RAC has presented to the public that their modifications made RESRAD much more applicable to Rocky Flats. The results from the radian report and calculations performed by Jim Benetti seem to indicate that the results obtained from the RAC Code do not differ significantly from those of RESRAD 6.0 for the same inputs, and therefore we chose RESRAD 6.0 because of its extensive benchmarking, use at other sites, public domain criterion, etc. However, more information explaining the purpose of the RAC Code will be included in the revision of Task 2.*

Section 5. Conclusions. I agree with the fundamental conclusion that of the four approaches evaluated, only RESRAD 6.0 and the MEPAS group meet all the criteria. While it is not a technical matter, I also agree with the conclusion that since earlier work based on RESRAD is already familiar to many interested parties, RESRAD 6.0 should

get the nod over the MEPAS group. However, this point need not be stated twice on page 19 (see marked up draft).

The paragraph on page 19 beginning “In February 2001 a report...” probably has no place in this report. Certainly the “(emphasis mine)” phrase should be taken out. This comment also reinforces the first point under Editorial Comments and Questions about the authorship/preliminary endorsement of the full report—is this report the product of a single (anonymous) individual or does it in fact have at least the tentative concurrence of the three parties to the Rocky Flats Cleanup Agreement?

In the same vein, I doubt that the paragraph on page 19 beginning “In addition, it should be noted...” belongs in this report. If it is included, because of its important technical content and also as a prelude to the Task 3 report, a footnote may be a better choice.

*Agency Response: The redundant sentence will be removed in the final report. The last two paragraphs, however, will remain as they add pertinent information to the reader to understand the whole process of the RSAL review. Additional information will be added to incorporate these paragraphs into the report and clarify their importance.*

### **Editorial Comments and Questions**

The March 22 Task 2 draft is termed a Final Draft, with no other specific information as to its authors (individuals/agencies) nor of its potential “status” in the broader process. In contrast, the Task 1 Report, Regulatory Analysis, is identified as a Pre-Decisional Draft; while the footer states that the Task 1 document is “not endorsed by the DOE, EPA, or CDPHE”, its importance and potential use is clearly indicated. The Task 2 report should provide similar information.

*Agency Response: The report is the same as Task 1, a Pre-Decisional draft, and will be identified in the same manner as Task 1.*

Understandably, this document requires any reader to generally be familiar with the history of Rocky Flats. If it is certain that the entire audience for the final Task 2 report has that familiarity, then the basic format, level of detail, etc. is satisfactory. If however the final report is intended to reach a broader audience, then it needs to be revised so that it is more “free-standing”. One specific suggestion, regarding the Conceptual Site Model, was made earlier.

*Agency Response: As mentioned above, more background information will be added to allow the report to be "free-standing".*

In Section 4.1.4, page 10, reference to two validation efforts hardly justifies characterizing RESRAD as “extensively” validated. Also, Section 4.1.6, page 11, should probably state that RESRAD *as a whole* has been well documented, not specifically RESRAD 6.0. The confidence to be placed on RESRAD 6.0 is in large part based on the

documentation of the earlier versions. It is very important to include the first reference in this section, because it specifically covers the probabilistic feature found in version 6.0.

*Agency Response: Although the RWG does feel RESRAD has been "extensively" validated, we can understand the reviewers concern and will make the change in the report.*

Page 22 has no content. The possessive pronoun "its" is spelled incorrectly throughout the document. In Section 3, each specific evaluation feature is (one) *Criterion*, not one *Criteria*. Page 19 has one spelling error (In for It). These are the only errors in spelling and grammar I detected. However, there is a need for some editorial work, such as word changes. Several suggestions can be found in the marked-up draft that is being sent along with this peer review report.

Spacing between sections and sub-sections is inconsistent throughout the document. Line lengths need to be adjusted at several places, especially where the MEPAS string of models is included (see, e.g., Section 5 on page 18).

As stated earlier, some specific editorial suggestions can be found in the enclosed marked-up copy of the draft.

*Agency Response: The Agency's appreciate the editorial suggestions and will make the necessary changes.*

## **Reviewer Two**

### Summary

1. This very rough draft report is substantially inadequate for use as the basis for making a decision on the appropriate choice of a model for establishing Radionuclide Soil Action Levels (RSALs) for the Rocky Flats Environmental Technology Site (RFETS). The main body of the report (see final comment on the last minute addendum) reflects an incomplete assessment of the requirements that must be met by models for application to the RFETS, and a superficial analysis of the particular models chosen for evaluation. Some of the many examples of these deficiencies are cited in the detailed comments that follow.

*Agency Response: The Agency's address this reviewer's major deficiency in our first general comment above, page 1.*

2. The report essentially ignores the regulatory criterion that is quite likely to be controlling at the RFETS; the Superfund risk range of  $10^{-4}$  to  $10^{-6}$  lifetime risk of incurring cancer (40 CFR Part 300.450(e)(2)(I)(2)), even though it is clearly identified in the previous Task 1 report, "regulatory Analysis." This criterion is implemented using models that calculate the lifetime risk, rather than annual dose, and must do so using

Superfund risk factors and assumptions for lifetime residency. The report largely fails to address the capabilities of the models and assumptions to do those assessments.

*Agency Response: The Agency's address this reviewer's major deficiency in our second general comment above, page 1*

3. From the limited information presented, it is not clear to this reviewer that any of these models, in their current form, are adequate to the task at hand. The most promising approach appears to be one similar to that pursued by the Risk Assessment Corporation (RAC) in its extensive and highly competent analysis conducted a year or two ago. Perhaps the current version of RESRAD (6.0) or a similar code can be adopted for use in a similar manner. Although this report does not provide enough information to reach a definitive conclusion, the fact that RAC successful did so using a previous version of RESRAD leads credence to the prospects for such an approach.

*Agency Response: As was pointed out by RAC at the April public workshop, they used RESRAD with only a modification to the input response for the air pathway. It is not clear that this modification provided any considerable benefit to the overall results of the code application. Please refer to the reports done by Radian and Jim Benetti.*

### **Specific Areas, Issues, and Questions of Interest to the RFCA Stakeholder Focus Group**

- Is the approach for evaluating models for development of RSALs at the RFETS sound and appropriate for the application?
- If the model evaluation approach is inadequate in any way, why is it inadequate and what approaches would be appropriate?

The overall approach is basically sound and appropriate, but there are two critical deficiencies: The criteria are incomplete, and also include an important restrictive requirement that is not essential. Specifically, the criteria are incomplete because they are not matched to one of the key regulatory requirements that they will be used to satisfy (see summary comment 2 above). Indeed, at one point the report states (3.0): "A major assumption in developing these criteria is that the RSALs will be developed based on radiation dose...in accordance with the NRC's License Termination Rule." It is essential that the models be evaluated for use against all of the regulatory criteria that will be relevant. The failure to consider model requirements for implementing the Superfund risk criterion is a fatal omission in the main body of this analysis.

In addition, the criterion that the model be in the public domain is unnecessarily restrictive, at least as it is applied in the report, and would appear to preclude use of any of the models if they are to simultaneously satisfy all of the regulatory criteria that apply to RFETS. That is, the report unnecessarily precludes modification of any of the models to accommodate special requirements at RFETS. The essential element is that any model, in whatever form is finally used, be available for review in the public domain

prior to adoption of the RSALs. For example, it is not clear to this reviewer that some of the models considered can directly accept probabilistic distributions of all key input parameters or provide direct outputs in terms of lifetime risk using Superfund criteria. Clearly, none can do both without modification. (MMSOILS can, but it does not calculate dose, and was not included.) The freedom to make such input and output adjustments should be provided by requiring only that models be available and amenable to review in the public domain after any such modifications. Of course, for practical reasons the basic environmental transport and radionuclide transformation capabilities will have to be present in the model and available in the public domain up front. But most of these models satisfy that criterion. Since Criterion #6 already requires that the model be well documented (i.e., have a user's manual and a technical basis document that is de facto in the public domain) I suggest that this criterion (#7) can be dropped, or at least modified to simply require public access to and review of any code modifications and additions that are specific to the regulation of RFETS cleanup.

*Agency Response: Criterion #7 will not be dropped and is important to the general acceptability of the results. The DOE requirements for cleanup of residual radioactive material (including soil) are contained in DOE Order 5400.5, Chapter IV. To be found acceptable for computing cleanup levels for radioactively contaminated soil, the computer code must meet specific regulatory criteria. It is not in the public interest to develop "fixes" to a code that addresses the specific desires of any individual or special interest group, either internal or external to the regulator community. Well-documented, tested, and benchmarked codes are necessary for the regulating managers who must ultimately make decisions based on the results of the code implementation.*

- Is the list of candidate models evaluated in the report appropriate for this site and application? Have any appropriate candidate models been excluded from the list (and why should they be included)? Have any inappropriate models been included in the list (and why are they inappropriate)?

Most of the relevant models are included. However, it would have been useful to consider the EPA model MMSOILS, with a review of the current status of that model's consideration of radionuclide decay chains, and an evaluation of the possibilities for addressing any deficiencies in that regard. The attractiveness of MMSOILS is that it not only includes a Monte Carlo mechanism for handling parameter uncertainties, but also directly calculates health risk.

*Agency Response: MMSOILS was developed by the EPA's Office of Research and Development, National Exposure Research Laboratory for estimation of human exposure and health risk from chemically contaminated hazardous waste sites. MMSOILS was considered by the RWG early on in the model selection Task, but was eliminated from further consideration because it was not felt possible to make it work for radionuclides, beyond simple radioactive decay*

It is not clear why it was useful to consider D &D at all, since this is a screening model that has limited ability to accommodate realistic site-specific parameters, has a highly conservative fixed set of dose conversion factors, and apparently does not calculate risk.

*Agency Response:* The Agency's did not want to preclude the use of DandD without basis. The reviewer is correct that DandD is a screening approach for compliance with the dose criteria with limited ability for site-specific parameters. Hence, by following the Task 2 approach, it did not make the final selection.

- Is the analysis of models against evaluation criteria as presented in the draft report sound? If not, in what specific ways is the analysis incorrect?

The analysis is in many respects incomplete. Completely lacking is an identification of the key elements of modeling that have been the subject of concern at RFETS and a comparative analysis of how the various models handle these elements. There is no discussion of the key radionuclides, and the accuracy with which they are handled in the various models. Key pathways that are handled quite differently in the various models (e.g., resuspension and ground water transport) are not evaluated at all. As noted earlier, there is a consistent lack of discussion of the capabilities of these codes to assess lifetime risk. The assessment of the RAC code documentation appears to be superficial and biased. For example, the report states (4.3.2): "The maximum radiation dose in this period [1000 years] can be calculated by RAC Code (sic), but the RSAL associated with this maximum concentration cannot be delineated by RAC Code." Perhaps the authors have not seen the Final Report issued in February 2000 by the RAC. If not, they might wish to review pp. 24-26 of the summary, and chapter 11 of the Task 5 Independent Calculation, which contain scenario-specific RSALs for each of the radionuclides of interest, for any degree of assurance of compliance the reader wishes to select. Although there is not enough detail provided to comment further, the impression is strong that the authors of this report had already decided to exclude the RAC code prior to any analysis.

*Agency Response:* As part of the RWG review process, many of the issues mentioned above were discussed. A total of about 10 to 15 radionuclides can be found at Rocky Flats, with uranium and plutonium found most frequently. For these dominant isotopes, radioactive daughters may be created that have different chemical, physical, and biological properties from their parents. Key radionuclides were not discussed in Task 2 of the model selection because each model would have strengths and weaknesses depending on which isotope you were modeling. While the physical and chemical processes that control the concentration of a given substance may be complex, it is possible to describe contaminant behavior with relatively simple approaches and paying close attention to specific input parameters. In addition, the RWG had access to "Benchmarking Analysis of Three Multimedia Models: RESRAD, MMSOILS, and MEPAS" Prepared by DOE, October 1995; the American Society for Testing and Materials report Risk-Based Corrective Action (RBCA) Fate and Transport Models: Compendium and Selection Guidance document, November 1998; the USEPA, Office of Radiation and Indoor Air Fact Sheet: Computer Models Used to Support Cleanup Decision Making at Hazardous and Radioactive Waste Sites January 1996; DOE/Nevada

*Operations Office report Comparison of Computer Codes in Determining Correction Action Levels, and RAC's Final Report, February 2000.*

*The RAC Code is a version of RESRAD, with minor modifications to the manner in which inputs are handled. The Agency's did not "preclude" the RAC Code and since even the reviewer agrees that there "is not enough details to comment" will address it no further.*

- Are the conclusions of the model selection process supported by the analysis? Is the modeling methodology chosen appropriate for the site and application? If not, which approach would be a better choice and why?

No, the conclusions are not supported. See the comments above. The modeling methodology chosen by the report may or may not be appropriate for the site and application, but this report does not provide a sufficient basis for a decision. It is likely that no model will do the job without some modification, most obviously to accommodate risk outputs for comparison to the Superfund regulations. There may also be specific pathways that require specialized attention.

*Agency Response: The models do incorporate a degree of risk outputs and each result will also be compared with a risk-based approach to ensure the dose based result falls within the acceptable risk range. See above first general comment, page 1.*

### **Specific comments**

1. The objective should be to calculate RSALs that satisfy all of the regulatory criteria, not just dose, as stated by the report.

A deterministic evaluation is not limited to use of a "simple mathematical form." It can be as complex as desired. This description of deterministic and probabilistic dose assessments needs amplification and clarification. The conclusion – that the model selected be able to calculate output dose distributions as a function of their probability of occurrence – is not justified by what is said here.

*Agency Response: Agreed that an RSAL must satisfy all appropriate regulatory requirements. As mentioned previously, further clarification of deterministic and probabilistic approaches will be added.*

- 2.3 The RAC Code is not adequately described. The opening two sentences are puzzling. Didn't the author(s) just say that all the models selected must be able to handle uncertainty in input parameters? And why is the controversy about handling resuspension not specifically identified and addressed for all of the models? What is the basis for the statement "...nor can all the changes that RAC made guarantee the initial integrity of the original RESRAD code." (Aside from the fact that the initial integrity of the RESRAD code is not at issue!)

*Agency Response:* It is clear from the information provided in the other models reviewed how air resuspension is handled. The controversy is that RAC provides inadequate documentation concerning how it incorporated its resuspension calculations into their computation runs using RESRAD. The changes cannot be replicated using the RAC Code and the RAC report, nor have the changes been benchmarked.

2.4.3 This discussion appears to be lifted from another source, and is not easily related to the balance of the discussion. E.g., "FRAMES is an open-architecture, object-oriented system that provides an environmental database." And how, pray, does it do that? And why is that relevant or important to the issue at hand?

*Agency response:* This section is a brief discussion of the various different models. It is provided as background to those readers unfamiliar with environmental computer models.

3.1 Criterion. Criteria is a plural noun. Also, why are residents or ranchers any more hypothetical than are office workers, and how does this adjective affect the modeling?

*Agency Response:* All of the exposure scenarios are hypothetical and the language will be changed. Criterion will also be used where appropriate.

3.5 Incorrect statement: A deterministic analysis is not required to use conservative input parameters, and may not produce a conservative RSAL.

The description of the probabilistic analysis is also incorrect and garbled. In addition, as before, the basis for the conclusion that it is required is not given, it is simply asserted.

In general, it should be noted that, while a probabilistic analysis is more elegant and informative, a deterministic analysis can also give a perfectly acceptable result if the input values are properly chosen.

It should also be noted that use of a probabilistic analysis necessitates choice of a numerical value for the degree of assurance of compliance (e.g., 95% probability that the regulatory criterion used to set the RSAL will not be exceeded by the individual modeled). Where is this discussed?

*Agency Response:* The reviewers first three comments are correct, although in practice if an exact parameter value is not known, the more conservative value is usually used. The use of a probabilistic approach was one put forth by RAC and included in the new RESRAD 6.0. It had been discussed by the RWG previously and agreed this was a better approach to allow variability in the input parameters. Further discussion will be included in the report revision to clearly explain the differences between the deterministic and probabilistic approach and why the choice to use a probabilistic approach was chosen. In addition, not all parameters will be entered probabilistically. Parameters

*that are well defined, or are of little importance in the final calculation will be entered deterministically. These parameters will be identified in Task 3. The discussion for the applicable degree of assurance is not appropriate in Task 2, but Task 3.*

3.6 These models do not use radiation dosimetry algorithms; they look up tables created by others.

*Agency Response: The point the Agency's were trying to make is that the model contain enough documentation that all technical aspects be able to be checked if needed.*

4.3.5 An output set of dose (or risk) distributions over time is not required. What is needed is the maximum dose or risk over the model period (1000 Years), and the code provides that.

*Agency Response: Since the RAC Code uses RESRAD as it's basis, the RAC Code meets this requirement and the change will be reflected in the revision.*

5.0 The statement "Both of these computer models would produce accurate results for Rocky Flats parameters if selected," while possibly true, is not demonstrated by any factual information directly relevant to the Rocky Flats site that is cited in this report.

The final three paragraphs apparently have been added to the conclusion section of the report, after it was completed, that address air pathways and the calculation of risk. (Note the identical repeated short summary paragraphs "Since RESRAD has been used...should be used to calculate RSALs at RFETS.") These paragraphs reference new material about air pathway calculations that are not identified or discussed in the main body of the report. The conclusions drawn are therefore inappropriate. The assertion made reference a report unavailable to this review, without any cited data. Further, these assertions are phrased in a manner that admits multiple inferences, and therefore the conclusion that the RAC code and RESRAD are similar with respect to the air pathway is not convincing. The description of the proposed use of RESRAD, Crystal Ball and EPA 'slope factors' is equally incomplete and unconvincing.

*Agency Response: Further information will be added to clarify this position. The additional information that was added at the end of the report was done after the second draft of the report and was added to clarify some different approaches the RWG was proposing. The appropriate references will be included in the final report along with additional explanation.*

# RFCA Stakeholder Focus Group

June 6, 2001

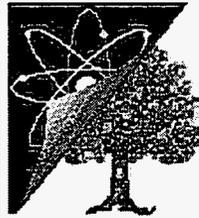
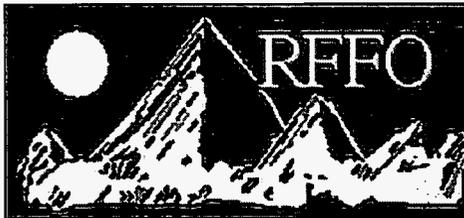
## Participants List

NAME		ORGANIZATION / COMPANY
David	Abelson	RFCLOG
Lorraine	Anderson	City of Arvada
Christine	Bennett	AlphaTRAC, Inc.
Kent	Brakken	U.S. DOE - RFFO
Laura	Brooks	Kaiser-Hill Company, LLC
Kimberly	Chleboun	RFCLOG
John	Ciolek	AlphaTRAC, Inc.
John	Corsi	Kaiser-Hill Company, LLC
Carol	Deck	Kaiser-Hill Co, LLC
Rick	DiSalvo	US DOE - RFFO
Shirley	Garcia	City of Broomfield
Steve	Gunderson	CDPHE
Mary	Harlow	City of Westminster
Jerry	Henderson	RFCAB
Reed	Hodgin	AlphaTRAC, Inc.
Victor	Holm	RFCAB
Jeremy	Karpatkin	US DOE - RFFO
Ken	Korkia	RFCAB
Joe	Legare	DOE
Joshua	Levin	Decision Research
Carol	Lyons	City of Arvada
Sandi	MacLeod	U.S. DOE
John	Marler	RFCLOG
Tom	Marshall	Rocky Mountain Peace and Justice Center
Russell	McCallister	DOE-RFFO
LeRoy	Moore	RMPJC
Tami	Moore	DOE
Patricia	Powell	U.S. DOE - RFFO
John	Rampe	U.S. DOE - RFFO

**RFCA Stakeholder Focus Group  
Participants List**

**Broomfield City Hall  
January 31, 3:30-6:30 p.m.**

Tim	Rehder	US EPA
Joel	Selbin	
Dave	Shelton	Kaiser-Hill Company, LLC
Carl	Spreng	CDPHE
Noelle	Stenger	RFCAB
Honorable Hank	Stovall	City of Broomfield
George	Vancil	City of Arvada

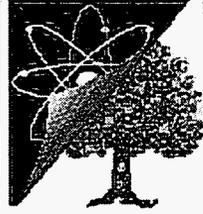


Rocky Flats Field Office  
Looking Toward the Future

# **Response to Peer Reviewer's Comments on the Rocky Flats Cleanup Agreement (RFCA) Radionuclide Soil Action Level (RSAL) Working Group (RWG)**

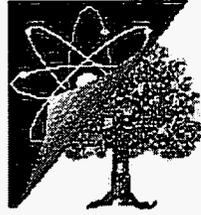
## **Task 2 Report Computer Model Selection**

**June 6, 2001**



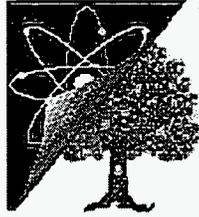
## Received Comments from Four Peer Reviewers

- ✘ Two anonymous people hired by AlphaTrac
- ✘ Victor Holm (Received 9/12/00, response 9/28/00)
- ✘ LeRoy Moore



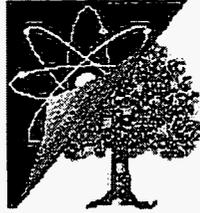
## Two Anonymous Peer Reviewer's

- ✘ First Reviewer's basic conclusion "The use of the newest version of RESRAD is sound and is justified by the analysis."
- ✘ Second Reviewer's basic conclusion "The overall approach is basically sound and appropriate, but there are two critical deficiencies."
  - ✓ The report ignores the CERCLA regulatory requirements for risk
  - ✓ The requirement that the model be in the public domain is unnecessarily restrictive



# Agency's Comment - 1st Deficiency

- ✘ The Task 1 Report explains the roles of EPA and NRC
  
- ✘ Task 1 report says that any RSAL will have to meet the protective requirements of both the NRC and EPA
  
- ✘ The RSAL will be calculated using Dose and Risk

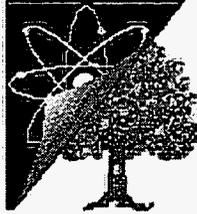


# Agency's Comment - 2nd Deficiency

- ✘ Benchmarking is the industry standard for demonstrating a new computer codes validity
- ✘ Can only occur if the executable code is available in the public domain and available to many different users
- ✘ RAC precluded the use of MEPAS because it could not obtain code



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## Other Peer Review Findings

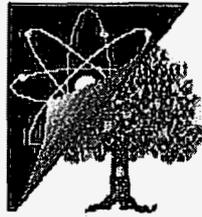
✗ Needs more background information

✓ Conceptual Site Model

✓ Explain Probabilistic vs. Deterministic

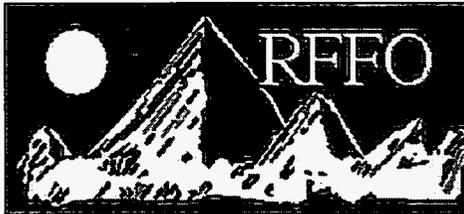
✓ Need for Executive Summary

✓ And the most important.....

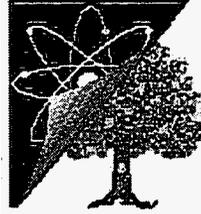


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# Criterion, not Criteria



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# Conclusion

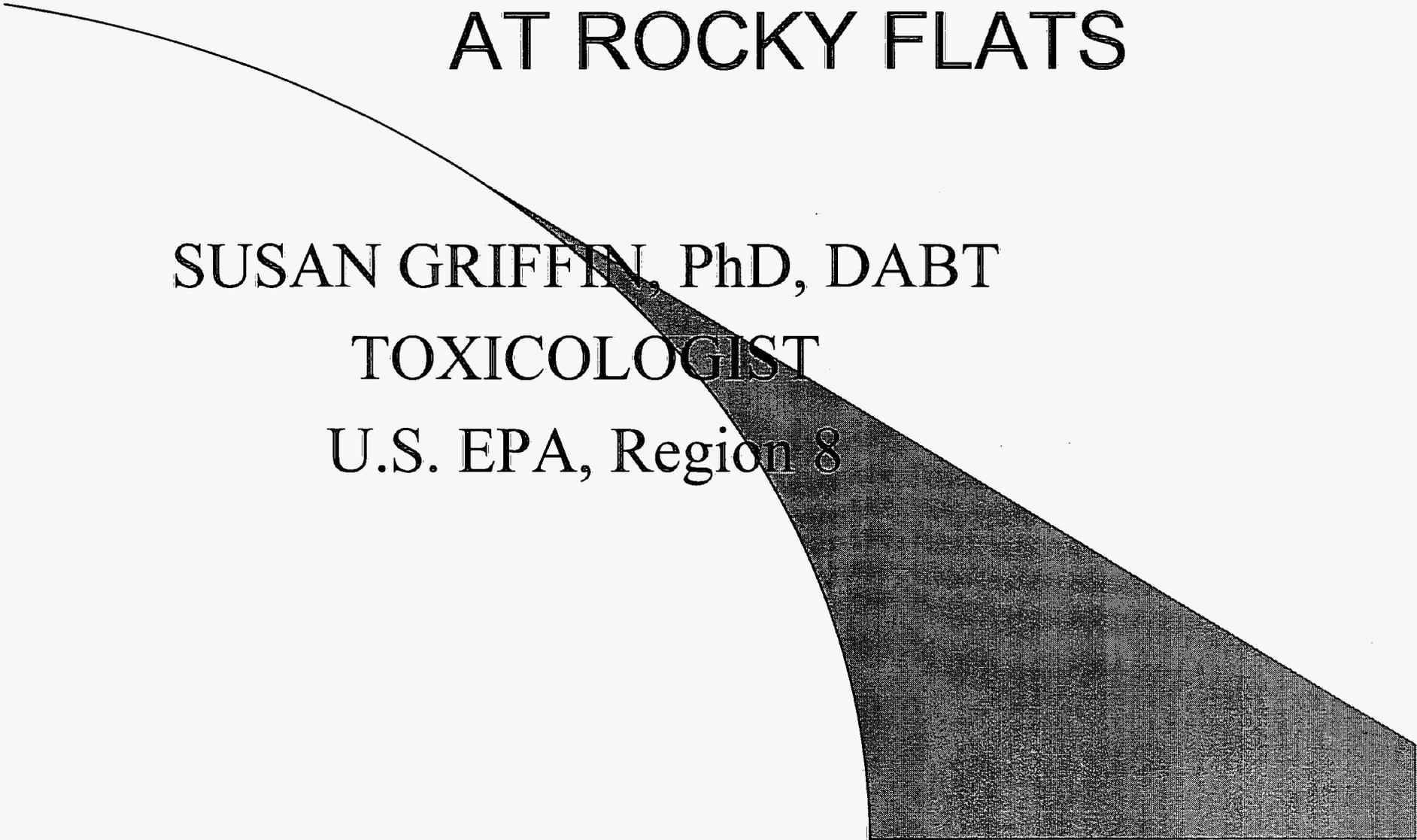
- ✘ Will make revisions to add background information, explain more detail
- ✘ No major changes to Criteria
- ✘ Agency's proceeding using RESRAD 6.0 as the best computer code
- ✘ Final Task 2 Revision June 29, 2001

Radioactive Soil Action Levels  
Task 2  
Model Evaluation

Agencies' Responses to Peer Reviewers' and  
Stakeholders' Comments

# DEVELOPMENT OF RISK- BASED SOIL ACTION LEVELS AT ROCKY FLATS

SUSAN GRIFFIN, PhD, DABT  
TOXICOLOGIST  
U.S. EPA, Region 8



# Dose vs. Risk

- Absorbed Dose

- Mean energy imparted by ionizing radiation to matter per unit mass ( $D=e/m$ )

- Risk

- An estimation of the qualitative and quantitative potential (expressed as a probability) for an event to occur. (i.e., a one in a million probability of an individual coming down with cancer)

# Dose vs. Risk

- Dose

- A dose equivalent (such as 15 mrem) needs to be placed within the context of existing information relating dose with known cancer effects
- Risk
- Risk already includes a comparison between site-specific exposures and a known toxicity benchmark
- EPA is required to perform an evaluation of risk at all CERCLA sites

# Risk Assessment Guidances For Superfund

- National Academy of Sciences. 1983. *Risk Assessment in the Federal Government: Managing the Process*
- U.S. EPA. 1989. *Risk Assessment Guidance for Superfund: Volume 1. Human Health Evaluation Manual*
- U.S. EPA. 1991a. *Human Health Evaluation Manual, Part B. Development of Risk-based Preliminary Remediation Goals*
- U.S. EPA, 1991b. *Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors*
- U.S. EPA 1992. *Guidance on Risk Characterization for Risk Managers and Risk Assessors*

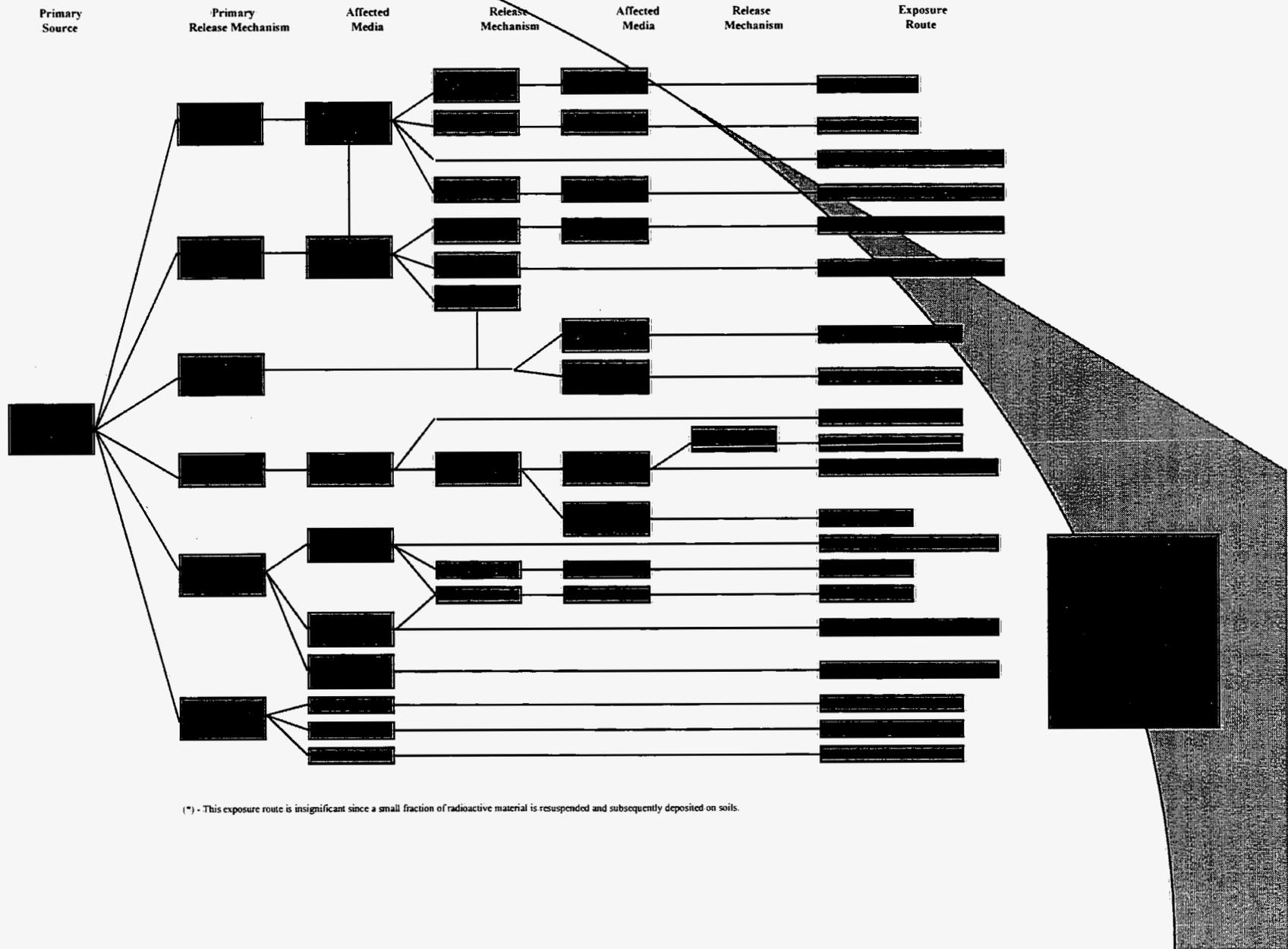
# Site Conceptual Models

- Risk assessments are expected to look at both current and probable future land uses at a site.
  - Once the risk assessment is completed, risk decision makers (including stakeholders) will choose the most likely land use and the appropriate remediation strategy

# Site Conceptual Models

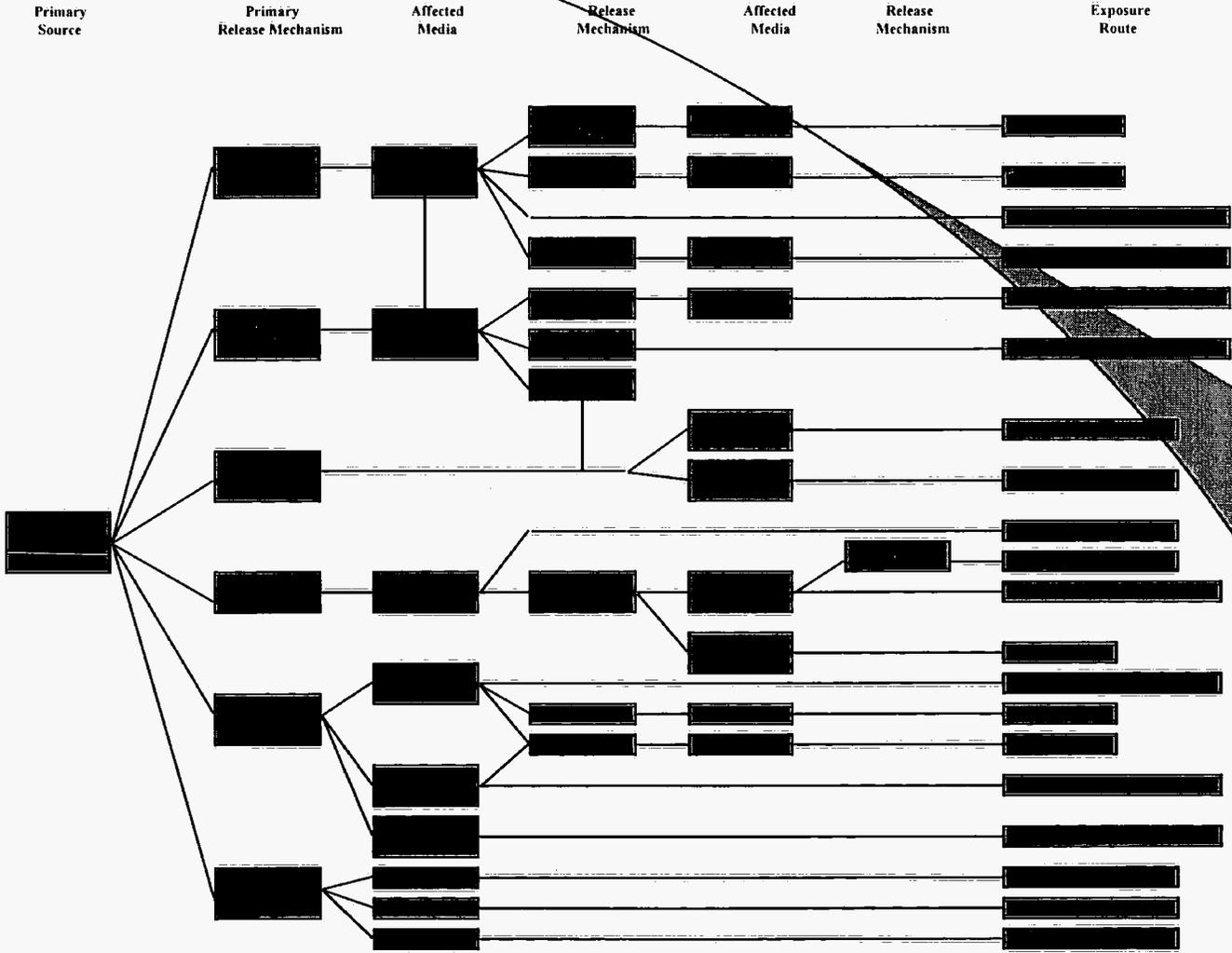
- Definition of a site conceptual model
  - A graphical illustration of where the contamination originates, how it moves through the environment, and how humans come into contact with the contaminated media
  - Value of a site conceptual model
  - Illustrates which pathways are important (and which are not)
  - Illustrates which pathways are complete
  - Guides and focuses data collection
  - Illustrates where remediation efforts will be most effective

# Residential Site Conceptual Model



(\*) - This exposure route is insignificant since a small fraction of radioactive material is resuspended and subsequently deposited on soils.

# Wildlife Worker



(\*) - This exposure route is insignificant since a small fraction of radioactive material is resuspended and subsequently deposited on soils.

# Exposure Assessment

Definition

Estimation of the magnitude, frequency, duration, and routes of exposure

- Routes of exposure
- Ingestion of soil/sediment
- Ingestion of homegrown produce
- Inhalation of particulates
- External gamma irradiation

# Exposure Assessment

Assessing magnitude and duration of exposure  
Ingestion of radionuclides in residential soil

$$PRG = TR / SF \times IR \times 1 \times 10^{-3} \times EF \times ED$$

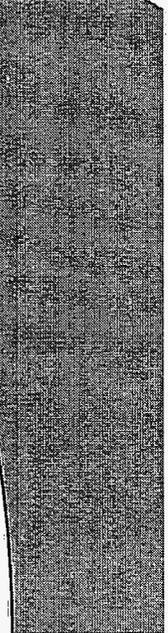
PRG = preliminary remediation goal

TR = target cancer risk

SF = soil ingestion slope factor

EF = exposure frequency

ED = exposure duration



# EXPOSURE ASSESSMENT

- External exposure to radionuclides in soil

- $PRG = TR/Sf_e \times (EF/365) \times ED \times ACF \times [ET_o + (ET_i \times GSF)]$

- PRG = preliminary remediation goal
- TR = target cancer risk
- SFe = external slope factor
- EF = exposure frequency
- ED = exposure duration
- ACF = area correction factor
- ET<sub>o</sub>, ET<sub>i</sub> = exposure time fraction outdoors, indoors
- GSF = gamma shielding factor

# EXPOSURE ASSESSMENT

- What values are input to the parameters?
  - CERCLA law requires EPA to base human health remedial decisions on an estimate of the Reasonable Maximum Exposure (RME)
  - The intent of the RME is to estimate a conservative exposure case that is within the range of possible exposures
  - If adequate site-specific data is available it should be used in the exposure assessment
  - If not, EPA recommends the use of standard RME default values (USEPA, 1991a)

# TOXICITY ASSESSMENT/ RISK CHARACTERIZATION

The preliminary remediation goal includes a toxicity benchmark (i.e., cancer slope factors) in addition to the exposure assessment

Cancer slope factors for radionuclides represent lifetime excess cancer risk per unit intake (risk/pCi)

Slope factors are available for the ingestion, inhalation, and external exposure pathways

Updated slope factors are available on EPA's web site

# RISK CHARACTERIZATION

Risk is described as a probability of coming down with cancer over a lifetime as a result of chronic exposure to a contaminant

Risk can be expressed as a one in a million chance of cancer, as a 0.000001 chance, or in scientific notation  $1 \times 10^{-6}$

In the Superfund program action is typically not warranted unless cumulative carcinogenic risks exceed  $1 \times 10^{-4}$ , unless there are adverse environmental impacts or ARARs are exceeded (USEPA, 1991b)

State regulatory agencies may have other programmatic guidance

# RISK CHARACTERIZATION

In addition to a quantitative estimate of risk, an assessment should discuss what we know, what we don't know, and how it impacts the outcome(e.g., Does the model include the pathways of exposure and exposed populations at a site? What are the limitations of the data used to develop parameter inputs?)



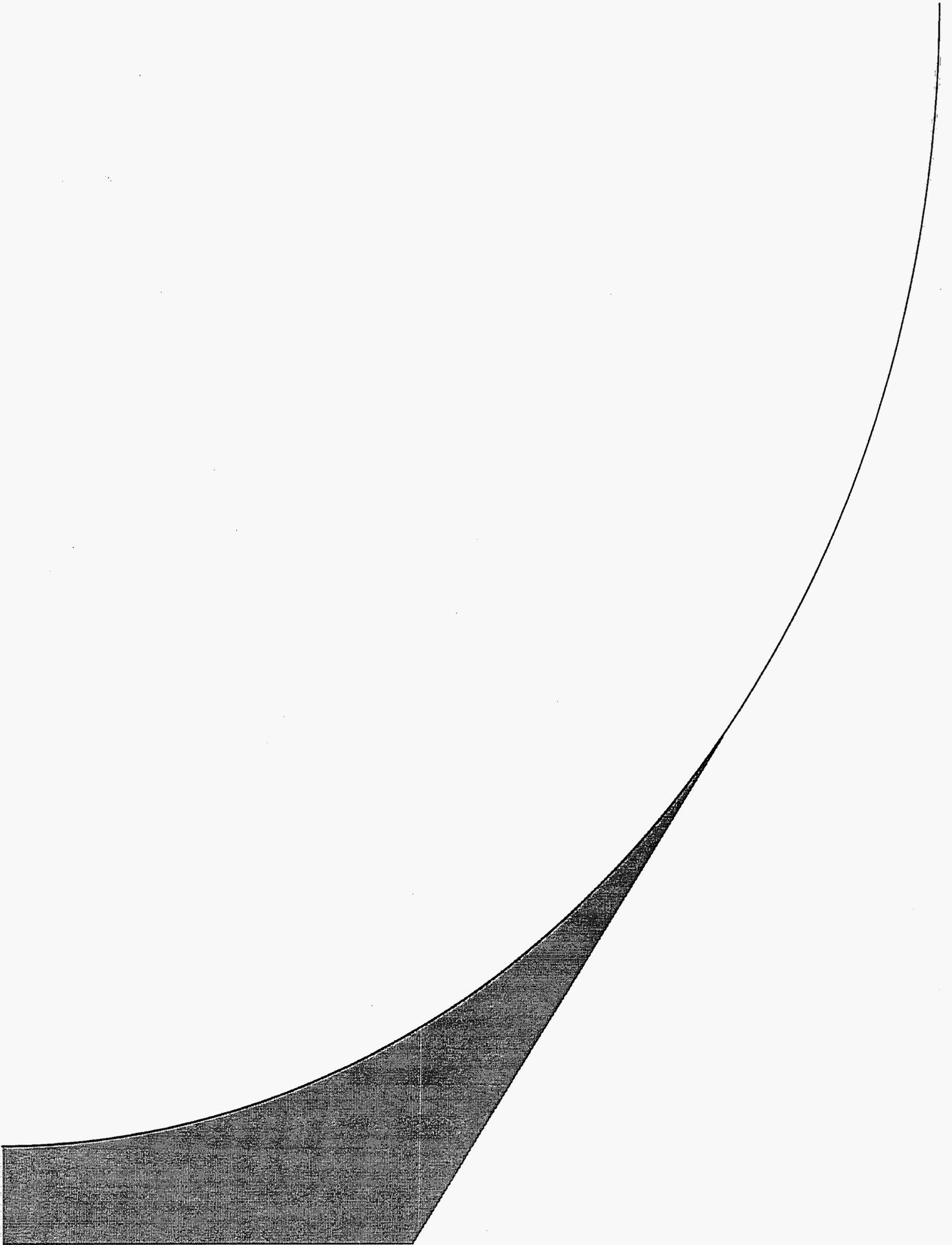
# SUMMARY

Development of preliminary remediation goals begins with the site conceptual model

Equations and models should include all complete and significant exposure pathways identified in the site conceptual models

In a point estimate approach, inputs to the parameters should represent an RME individual

In addition to a quantitative estimate of risk, the uncertainty surrounding the risk estimate should be discussed



# TYPES OF MODEL INPUTS

- Model:  $Y = f(A, B, C, D)$
- A, B, C, and D are model inputs
- Each input can be either
  - Constant
  - Variable

# BODY WEIGHT OF MEN

## Summary Statistics

$N = 1000$

Mean = 69.7 kg

Stdev = 15.2 kg

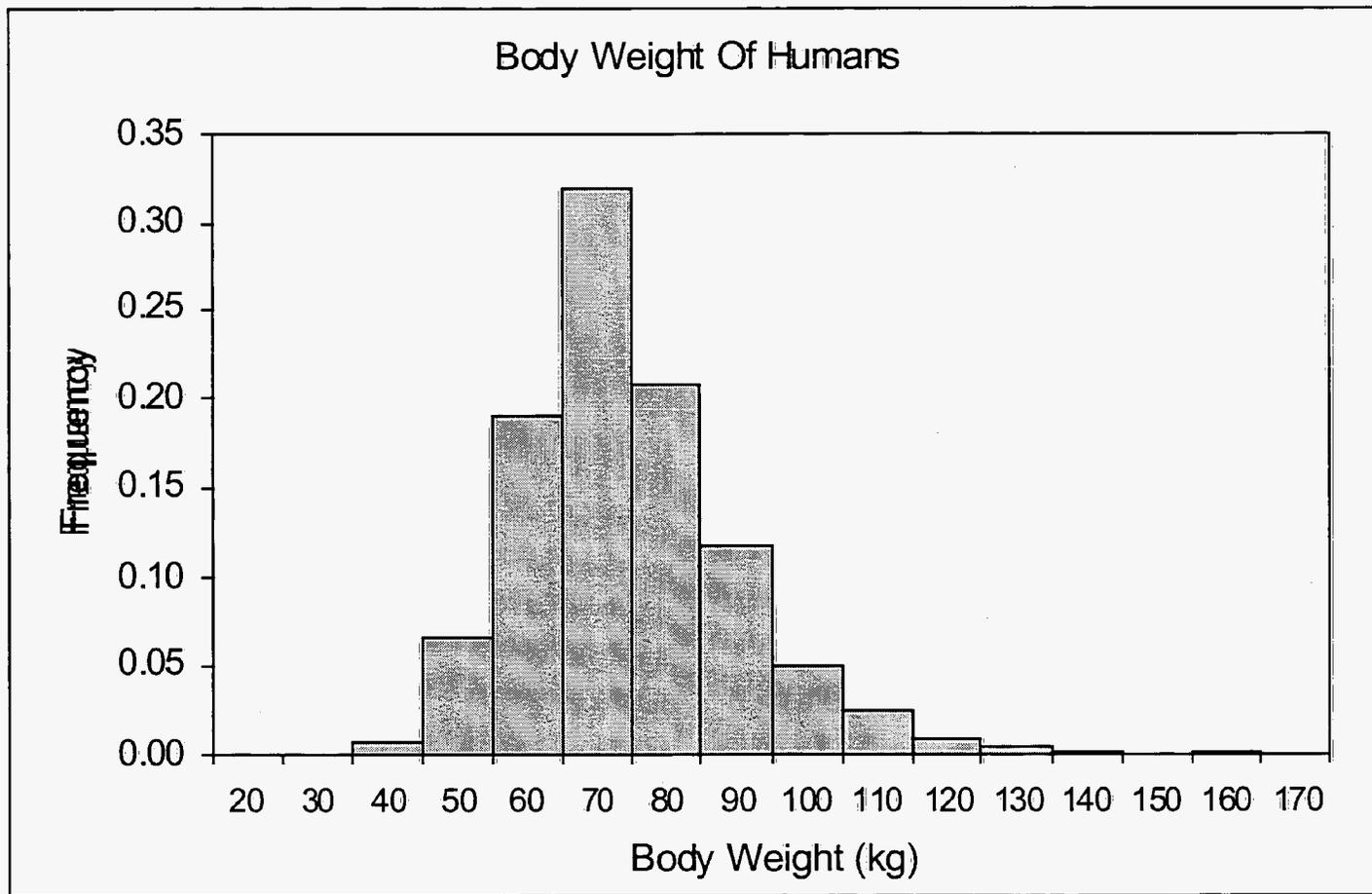
Min = 38 kg

Max = 157 kg

95th percentile = 98 kg

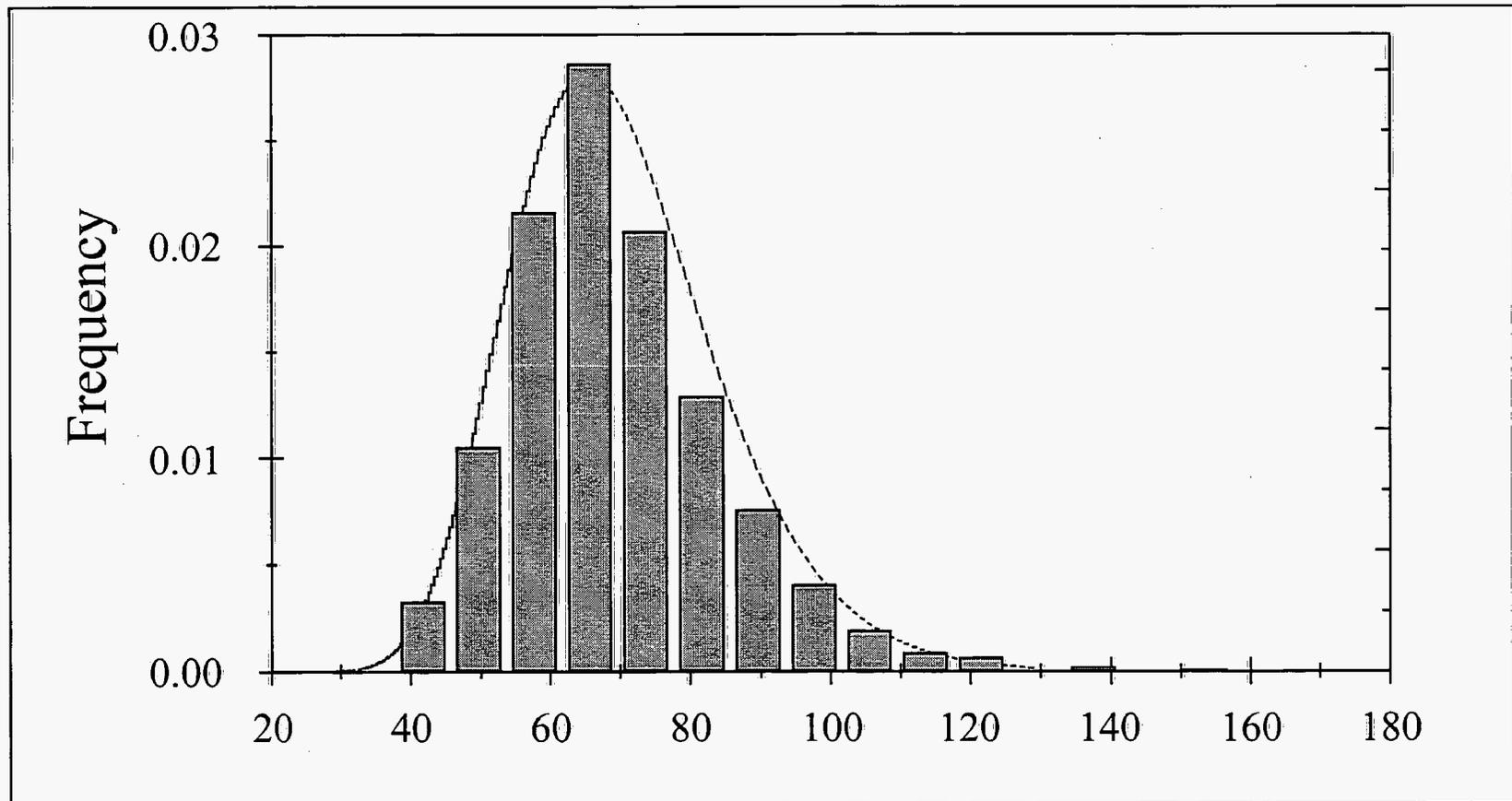
# BODY WEIGHT OF MEN

## Histogram



# BODY WEIGHT OF MEN

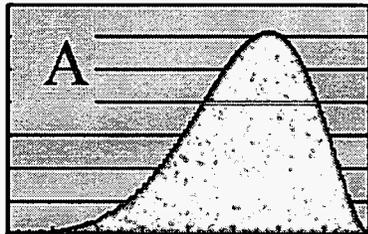
## Probability Density Function



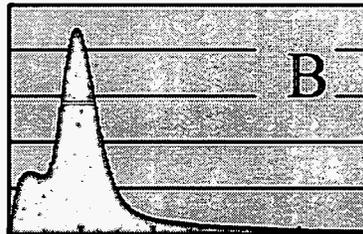
Problem: How Do You Get the Result?

$$Y = \frac{A H B H C}{D}$$

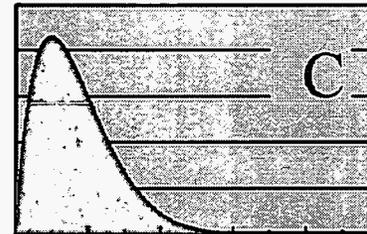
D



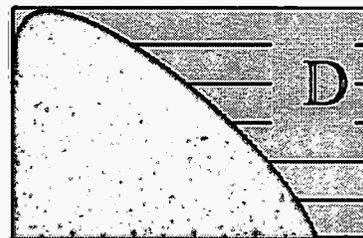
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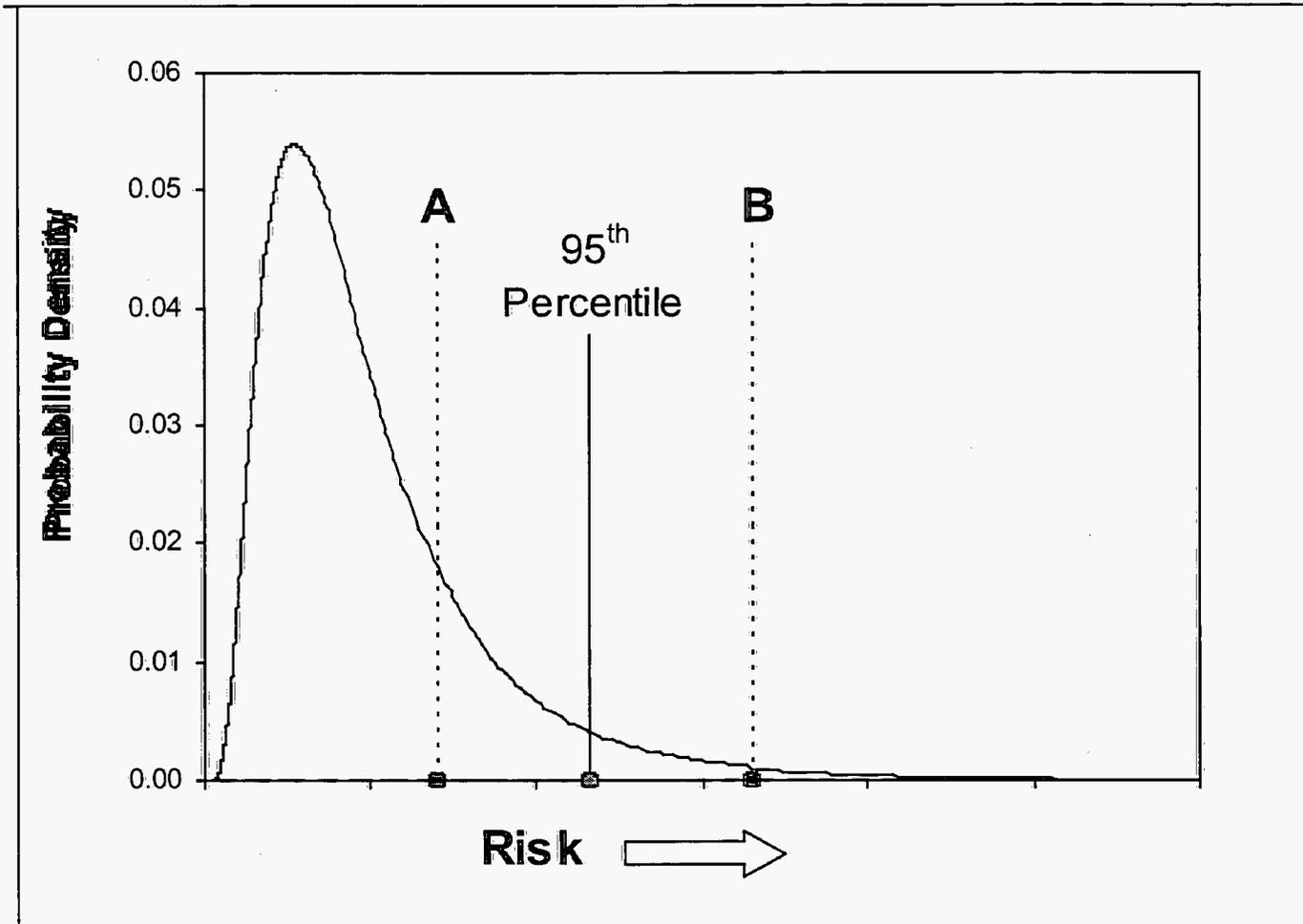
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# Does the RME Risk exceed the Target Risk?



# Advantages and Disadvantages of Point Estimate Approaches

Advantages	Disadvantages
Uses conservative assumptions to ensure protection of human health	Results in a single point estimate of risk, which may be viewed as a “bright line”
Useable as a screening method	Provides little insight regarding variability and uncertainty in risks
Employs consistent approach and standardized reporting methods	Provides fewer incentives for collecting better or more complete information
Easily understood and communicated	Addresses uncertainty in a qualitative manner
Requires less time to complete; not resource intensive	Uses less information on exposure and toxicity, which may lead to greater uncertainty
Based on standard equations and exposure assumptions	

# POINT ESTIMATE APPROACH

## Upper Bound (RME)

Assume target RME = 95th percentile  
(this is a risk management choice)

How do you calculate the 95th?

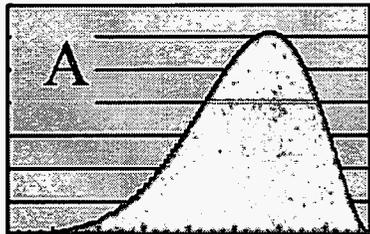
$$Y_{95} ? f(A_{95}, B_{95}, C_{95}, D_{95})$$

$$Y_{95} \cup f(A_{mean}, B_{95}, C_{mean}, D_{95}) \quad (\text{maybe})$$

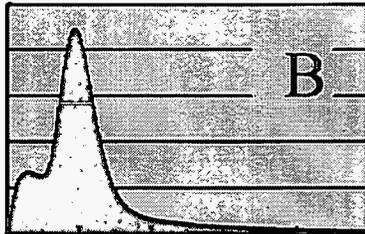
Problem: How Do You Get the Result?

$$Y = \frac{A H B H C}{D}$$

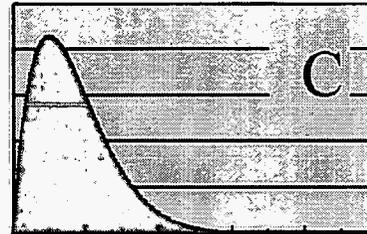
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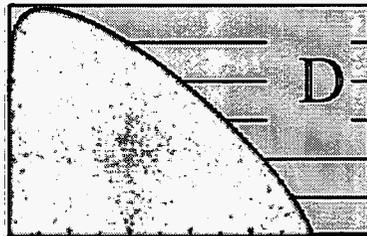
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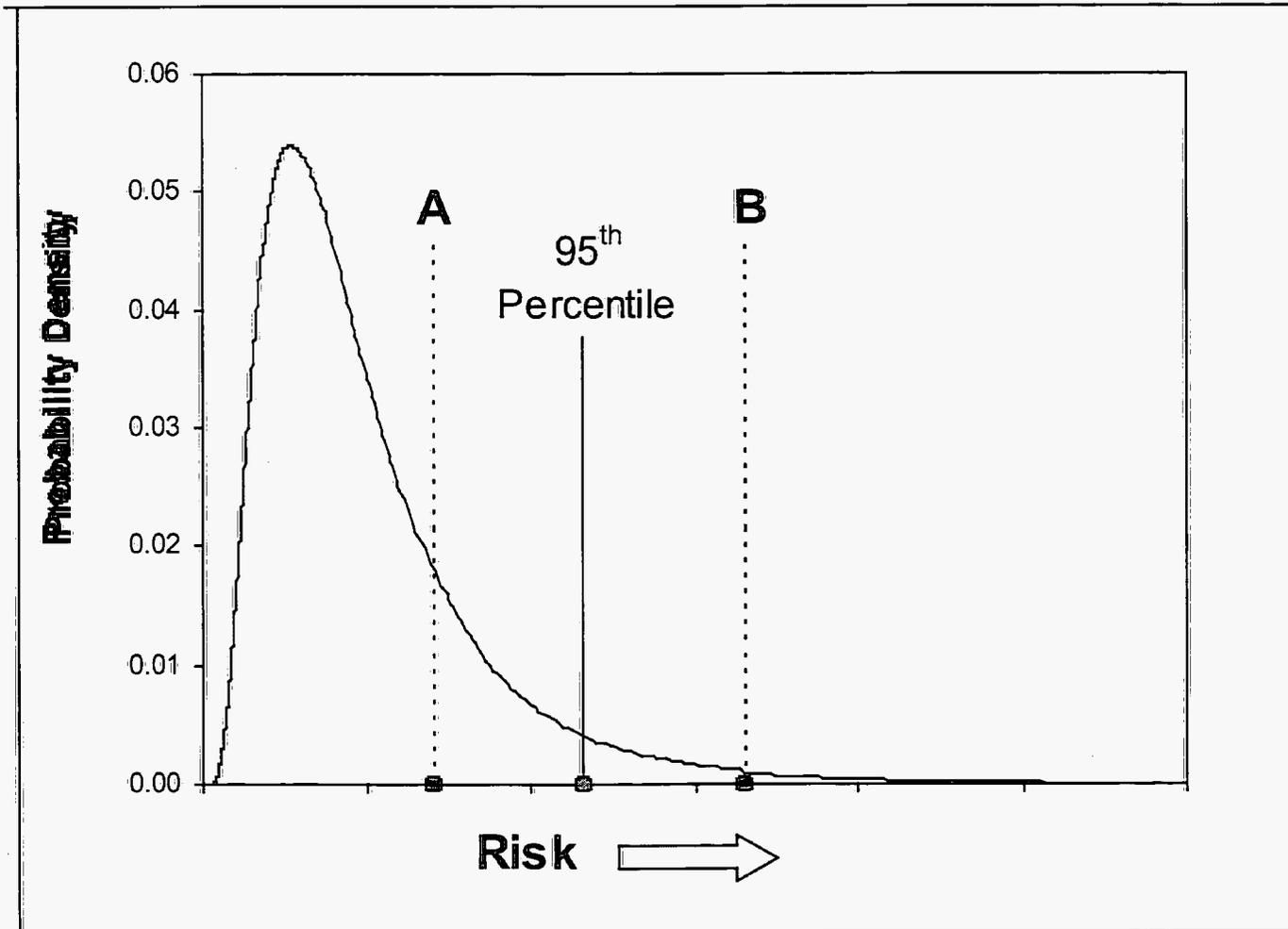
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# Does the RME Risk exceed the Target Risk?



# Advantages and Disadvantages of Probabilistic Approach

Can make more complete use of site data to characterize variability and uncertainty in risk	Sufficient information may be lacking on variability and uncertainty for important exposure variables
Quantitative data on the uncertainty in exposure variables can be modeled and may support statistical confidence limits on risk assessments	May require more time and resources to select and fit probability distributions
Sensitivity analysis can identify pathways and parameters which strongly influence the risk outcome	May convey false sense of accuracy unless the exposure models and distributions are representative of site conditions
Can identify data gaps for further evaluation/data collection	May introduce inconsistency in risk estimates across sites due to different choices of distributions and risk percentile

June 6, 2001 RFCA Meeting Minutes

JS: One of the things I did not see had to do with the question about the scenario we seem to be heading toward irrevocably; namely, the wildlife refuge scenario. I raised the question, "why are we not looking at the most conservative scenario?" I thought I had a very adequate and appropriate response from Jeremy which I don't see in here at all. For the first time I heard the agencies use the exact word, constrained. They're under certain constraints, which is what I have been fearing for a long time. There are restrictions, there are limitations, there are restraints, whatever that probably mostly have to do with money. I was hoping they would be in the minutes.

RH: We'll get them in there.

July 11, 2001 RFCA Meeting Minutes

NS: On page 5, there's a discussion concerning the memorandum issued by Tom Pentacost. That question came up because there was a slide from the ALARA process that said that in addition to using ALARA to go backwards if you have an RSAL, you can use the ALARA analysis to get a more stringent cleanup. The slide also indicated it could go the other way to justify not reaching the RSAL. If it's not technically feasible or if it's too expensive and you could justify having a less conservative cleanup level than the RSAL. Joe confirmed that that's what the slide meant. There's no indication of that in the minutes, though there is an indication that Tom Pentacost hinted at that in his memorandum. I would like to capture that.

RH: Would you look at the last paragraph at the bottom of page 6? See if that helps any on that issue.

NS: It sort of does. I think it could be stronger. I think it could be ... more firmly, since it's such an important aspect of the discussion that we had.

RH: Okay. I will do that.