Department of Energy
Washington, DC 20585
March 15, 2006

Ms. Laura J. Atwell
National Council on Radiation
Protection and Measurements
7910 Woodmont Avenue, Suite 400
Bethesda, MD 20814-3095

Dear Ms. Atwell:

Enclosed for your consideration are the Department of Energy's review comments on the National Council on Radiation Protection and Measurements' draft report, *Cesium -137 in the Environment (SC 64-23).* We applaud the Council's efforts in the compilation and synthesis of Cesium-137 source, behavior, and environmental transport information into this draft report that, with revision and inclusion of some additional material noted in the enclosed comments, will serve as a valuable technical resource to the risk assessment community.

The Department's review of the Report was coordinated by the Office of Air, Water and Radiation Protection Policy and Guidance. We appreciate the opportunity to review the Report and hope you find our comments offered from both headquarters and field operations perspectives helpful for improving the document. Please contact Mr. Stephen Domotor (Stephen.Domotor@eh.doe.gov; 202-586-0871) of my staff if you have any questions or need more information concerning our review of and comments on the Report.

Sincerely,

Andrew Wallo III
Director
Office of Air, Water and Radiation
Protection Policy and Guidance

Enclosure

NCRP Draft SC 64-23 Report
"Cesium-137 in the Environment"

Department of Energy (DOE) Comments

March 15, 2006

The Department's review of NCRP Draft SC 64-23 Report was coordinated by the Office of Air, Water and Radiation Protection Policy and Guidance (EH-41). The Department appreciates the opportunity to review and offer comments on the draft report. Please contact Stephen Domotor (Stephen.Domotor@eh.doe.gov; 202-586-0871; EH-41) for additional coordination concerning our comments. General and section- specific comments offered by field and headquarters elements are provided below.

General –

1. We applaud the NCRP's efforts in the compilation of Cs-137 source and environmental transport information and its synthesis into this draft report. The report strives to provide, in a single reference document, a significant amount of information regarding sources of Cs-137 in the environment; the physical, chemical, and behavioral properties of Cs-137 in the environment; compilations of region- and environment-specific Cs-137 environmental transfer parameters (i.e., concentration factors for a wide range of media-to-organism types; Kd values); an explanation of the reasons for observed region- and environment-specific differences in environmental transfer parameter values and the need to consider these differences in environmental pathway and public dose and risk modeling and evaluation; and distributions of Cs-137 concentrations in the United States.

2. In general qualitative terms, however, we note that the report does not completely meet its stated objectives as outlined in the Preface and Introduction. Based on this observation, we suggest that additional effort is needed so that the final report will meet the NCRP's stated purpose and objectives for it. Alternatively, the report's objectives could be revised and "scaled back" to more accurately reflect its current content. The general and specific comments that follow will highlight and give specific details and recommendations regarding these general observations.

3. The report needs greater consistency and integration across chapters and sections. Currently, discussions on a particular topic are provided in several separate sections, often in different terms or with different emphasis.

4. While the report discusses Cesium-137 in the environment, it also addresses issues that concern assessment and modeling of its impacts as well as

technologies, issues, and considerations for its cleanup in the environment. This should be reflected in the title of the report. For this reason, we recommend that it be retitled "*Behavior and Distribution of Cs-137 in the Environment and Considerations for its Assessment and Management*."

5. While the report states that one of its overall goals is to *"…summarize the current state of knowledge on radiocesium in the environment and to identify future management issues concerning Cs-137 contaminated ecosystems…"* there are very few references from the late 1990's and beyond. We recommend that a literature search be conducted for 1999 – 2006 to identify potentially significant information that should be added to the report.

6. Specific stated objectives and goals of the report are presented in several different sections, often inconsistently. For example, goals and objectives are mentioned in the Preface (page i, lines 27-31; page ii, lines 1-7), then again late in the Introduction (page 4, lines 4-11). In other places some general suggested ancillary uses of the report are made. We recommend making all discussions on the objectives, purpose, and value of the report consistent, and suggest stating these in the report's Introduction.

7. If the principal target audience or principal user of the report is "the professional risk assessor," we recommend that the format, organization, and presentation of the data and information in the report should be re-oriented and re-packaged as a "handbook" (with labeled tabs) so that it is most useful and most easily accessed in the report by risk assessment professionals.

8. As the report is formatted, Cs-137 concentration data and environmental transfer parameter data are currently presented in separate chapters on a site-specific basis. It may be helpful to rollup all Cs-137 concentrations in various media and biota, and all environmental transfer parameter data (i.e., Bivs; Kds) in one appendix in a few master tables with "site" as a column entry. In this way the risk assessor can go to one section of the report (in this case an appendix) to find the data she/he is looking for in one table or location by site or region. The descriptions of *"Unique Pathways, Parameters, and Conditions"* currently presented in each site-specific chapter should be rolled up along with the data tables in the same appendix. The user could go to one section to access all the data, with some brief explanations on why there are site-specific differences and the drivers for these regional differences. The user could then go to the site-specific chapter to get more information.

9. Since future management issues concerning Cs-137 contaminated ecosystems is a key overall goal of the report, much more attention to these issues is needed. Alternatively, the report could be scaled back to present only scientific information and data compilations of use to a risk assessor, without any discussions on policy and management issues. Finally, it would be useful to pull the key future management issues and recommendations from each of the three

site-specific sections and list the common and site-specific themes in one summary section or in a text box. For example, this summary could include end-state land use; comparison of arid and wet environment types; tank-specific considerations; technology selection; and other factors such as analysis of cost-risk benefit and limited resources that drive remediation and stewardship decisions.

10. The report would benefit from an up-front summary section. In it, among other things, the authors should summarize what new insights or information has been learned since the 1977 NCRP report on Cesium.

11. There needs to be a consistency check regarding units (Bq; Ci).

12. The report should address the fact that Cs is one of the very few radionuclides that is known to biomagnify in the environment (i.e., food chain). And while the report rightly focuses on the fate and transport of Cs-137 in the environment and its potential impacts to public health, greater attention should be paid to the potential impacts of Cs-137 contamination to ecosystems (i.e., non-human biota), and how the data presented (Kd values; bioconcentration factors; observed tissue concentrations) could be useful to risk assessors in evaluating risk assessments to non-human biota as well as humans. This aspect needs to be discussed and integrated throughout the report.

13. The treatment of the selected DOE sites in chapter four of the report appears somewhat out of balance. There seems to be much more data and information presented for the Savannah River Site, followed by Oak Ridge, and the least for Hanford. And some of the data and information presented for each site is incorrect or outdated. We recommend that additional literature searches be conducted to provide additional Cs-137 data and information for each site so that its treatment within and across sites is more balanced, consistent, and current.

14. There is a lack of data and fate-transport science information from non-DOE environments. The report's central focus is on Cs-137 data, environmental transfer parameter information, and fate-transport behavioral studies at selected DOE sites. We suggest that a wider literature search be conducted to highlight Cs-137 information from environments outside of DOE and from additional regions of the U.S. As an example, there are published studies on the distribution, fate and transport of Cs-137 in the Susquehanna River - Chesapeake Bay ecosystem originating from weapons test fallout and ongoing operations of commercial nuclear power plants (see for example, McLean et. al, 1991, *"Sediment Accumulation Rates in Conowingo Reservoir as Determined by Man-Made and Natural Radionuclides*." Estuaries; Vol. 14, No. 2, p. 148-156, and associated papers cited). There are likely many other studies reported in peer-reviewed journals and State environmental and natural resource protection agencies regarding other U.S. ecosystems influenced by historical and commercial sources of Cs-137. The report's treatment of data and fate-transport

science information from non-DOE environments should be as thorough, where feasible, as that presented for DOE sites. Alternatively, chapter four's current extensive treatment of Cs-137 data and information at DOE sites should be reduced to summary discussions that are limited to pertinent facts needed to support later sections of the report.

Specific Comments -

1. *Page 2, line 13*. How big is "sizable"? Suggest another term or provide specific quantification.

2. *Page 2, line 22*. *"Historical special nuclear materials production and testing operations at these sites gave rise to hundreds (and depending on how they are counted, perhaps thousands) of local ecosystems contaminated with Cs-137, including streams, ponds, reservoirs, wetlands, and terrestrial environments."* Given the significance of this sweeping statement, it needs to be supported by one or more references. Also, the strength of this statement begs the question: what are the potential impacts of this widespread Cs-137 contamination to the actual environment (i.e., these hundreds and perhaps thousands of streams, ponds, wetlands)? Following up on comment 12 in our "General Comments" section, the protection and impacts to the environment issue needs to be discussed in this report.

3. *Page 2, lines 27-30 and then next page*. Some quantification of the degree of Cs-137 contribution from these other sources should be provided for perspective. Currently there is no data given for comparison to DOE sources.

4. *Page 5, lines 16-17*. "*This report avoids recommendation of generic transport parameter values because of the large uncertainty in their application to specific sites."* How "large" is the uncertainty? And a general question: is this uncertainty greater than, less than, or the same as for other radionuclides (or for that matter chemicals), given that Cs-137 is one of the most studied radionuclides? Applies to page 6, lines 4-11 as well.

5. *Page 5, lines 16 to 19*. This sentence is bothersome in that it could be read that Federal agencies and more generally all of us within the scientific community don't currently have sufficient data to do "accurate" risk assessments. The acceptable level of accuracy or uncertainty (looking from the other perspective) should be defined by data quality objectives and we contend that for Cs-137 there are many if not most situations where the analyses are accurate enough to support the decision that needs to be made. As scientists it is always valuable to have better and more information, but for decision makers this is often not the case. In many cases having the decision maker wait for more and better information can result in costly mistakes and can increase the risks or spread of contamination. But we also agree that in some cases additional research can lead to better decisions. We suggest rewording this sentence to *"…it will be clear from this*

report that in some situations additional research to further improve dose and risk assessments will support better (i.e., more protective and less costly) decisions."

6. *Page 6, lines 31 and on to next page*. Question of clarification: is it true that uncertainties are greatest regarding these behavioral parameters (e.g., time spent outdoors; intake rates; others mentioned)? If so then the point should be made that this is where a large degree of our uncertainty in modeling and assessing Cs-137, and other radionuclides, exists.

7. *Page 6, lines 1 to 7*. This paragraph does a better job in recognizing the fact that data and analysis need not be perfect but again the last sentence sounds a bit strong. Such uncertainty may result in overly conservative assumptions to address the uncertainty but rendering *"intelligent decision-making problematical"* may be better stated identifying an optimal remedial alternative difficult.

8. *Page 7, lines 1 to 2*. Federal Guidance Report no. 13 provides risk conversion factors for intakes. The guidance in this section of the report suggests that the use of dose conversion factors and dose-to-risk factors increases uncertainties. It is for this reason that the Federal Guidance Report provides intake-to-risk factors without using dose. In general, the recommended approach for Federal agencies is to employ intake-to-dose conversion factors for dose calculations (where dose is the metric used in the decision or regulatory process). If decisions are to be made on the basis of risk, the Federal Guidance Report no. 13 intake-to-risk conversion factors are recommended. See *DOE/EH-412/0015/0802 rev.1* (January 2003*)* and ISCORS Technical Report 2002-02 (http://www.iscors.org/library.html).

9. *Page 7, lines 23 to 28*. This again presents a very demanding standard for risk assessment. The statement that it is critical for risk analyses to be conducted with the *"utmost…scientific rigor"* is not always appropriate. Risk assessments should be conducted with the "necessary scientific rigor" to support the decision-making process. The data quality objectives process should be conducted openly considering public needs but guidance from prestigious groups like the NCRP suggesting that anything short of the utmost scientific rigor will result in loss of credibility of good assessments that have the necessary but not the utmost rigor and in itself will cause public distrust.

10. *Page 13, lines 3 to 9:* The values for Cs-137 referenced here (75-900 Bq per sq. m) appear very low for the ranges of soil deposition across the U.S. DOE published a paper for the 1994 Health Physics Society meeting (*Investigations of Natural Variations of Cesium-137 in Residential Soils*, A.Wallo, M.Moscovitch, J.E.Rodgers, D.Duffey and C. Soares; June 28, 1994) which included a review of the literature on fallout at that time as well as specific measurements taken in residential areas in New York, Pennsylvania, and Massachusetts. The upper estimates for fallout deposition from the literature were significantly higher (more

than 5000 Bq per sq. m) and the measurements in drainage areas were even higher which is consistent with and confirms the discussion here and at the end of the section (page 15, lines 10-12). However, the referenced "typical" values given here are also not consistent with Table 3.5 or Figure 3.1 (page 31) which are more in line with other references. Therefore, we suggest that the 75-900 value be confirmed and explained. If they are correctly referenced at least explain the differences between these concentrations and those shown in Figure 3.1 in the next section which shows typical depositions of a few thousand and maximum over ten thousand Bq/sq.m.

11. *Page 15, and text on page 14*. A figure illustrating general transport pathways and processes would be helpful to accompany the text.

12. *Page 23, line 20*. Given the recent (previous 1-2 month) acquisition activities relative to these facilities, please verify that company names are still correct.

13. *Page 26, Table*. Why is the SL-1 accident listed to the exclusion of the other 10 accidents, since no release was recorded? Suggest deletion.

14. *Pages 29, 31 and 32*. The figures (3.1 and 3.2) are interesting but it would be better if a table similar to Table 3.5 presented estimates of activity levels. It need not be by latitude. Even a sampling of fallout deposition for a few locations in different states representing the northeastern, northwestern, central, southeastern and southwestern parts of the country or ranges by region would add greatly to the report.

15. *Page 32*. Although the report notes that the DOE sites discussed in this section are covered because they represent areas where significant quantities of Cesium have been discharged and disposed, another reason that this level of information can be assessed is that DOE requires aggressive effluent monitoring, environmental surveillance and dose analyses of its sites to ensure protection of the public from its radionuclide releases and radioactive waste disposal. It is because of these monitoring and assessment programs, and DOE's leadership in sponsoring and conducting research in health physics, radioecology, and the environmental fate and transport of contaminants, that much of the data in this report is available. Therefore we believe that greater recognition of DOE's active monitoring and research programs established to protect the public and environment is warranted in the report.

16. *Page 34, section 4.1, SRS*. Specific SRS analytical results in this section of the report are from 1996 (10 years ago). If possible, suggest using more current data or indicate reason for the data used.

17. *Page 35, figure 4.1*. There are only 7 "monitors" illustrated in this figure for the whole SRS site. Are these the only water sampling locations on the entire site? Are they only for water? Water and sediment? Biota? The figure gives an

impression that there is very limited monitoring going on at SRS. Clarify the figure key.

18. *Page 35, line 27*. Four Mile Branch (FMB) should be referred to as Four Mile Creek (FMC). This is the historically correct name, as early site maps and early site surveys refer to the stream in this manner. This comment applies throughout the document.

19. *Page 36, lines 6-8*. Please provide reference. This statement cannot be verified using available references. If unable to verify, delete the statement.

20. *Page 39, line 7.* Change "…the sand filter…" to "…a sand filter…"

21. *Page 39, line 28.* Change "H-Areas" to H-Area"

22. *Page 44, lines 23-24*. This statement is speculative. Provide reference or delete if the statement cannot be verified.

23. *Page 46, lines 6-9*. The statement is incorrect. Ten basins were sampled. This level of detail for a single year, although illustrative of a competent environmental surveillance program, is not germane or required in this report. One could question why similar numbers for remaining media are not presented. Many such details are presented in the referenced site environmental report. Therefore, the statement should be deleted.

24. *Page 46*. The list of monitoring sites is not exclusively locations prior to entry to the Savannah River, and in two cases (Four Mile Creek and Steel Creek) are not the last points prior to discharge. Please clarify point selection rationale and description. The sampling point descriptions do not match those listed in Table 4.1. One location (Upper Three Runs at Rd C) is not listed in the table. Correct descriptions are: (1) Upper Three Runs at Rd. A; (2) Four Mile Creek at Rd. A-7 [Note that this is the incorrect location prior to discharge to the river, the correct point is Four Mile Creek at Rd A-12.2]; (3) Pen Branch at Rd A; (4) Steel Creek above L-Lake (above Rd B) [Note that this is the incorrect location prior to discharge to the river, the correct point is Steel Creek at Rd A-13.2]; (5) Lower Three Runs at Patterson Mill Rd; and (6) Lower Three Runs at SC 125. Also need to apply consistency in road naming conventions (both SC-125 and Rd A are used; use only one).

25. *Page 67, Section 4.1.5*. We found the sections on *"Unique Pathways, Parameters, Conditions"* very informative and significant. Perhaps the key elements of each of these sections for each site can be brought up to the front of the document and presented in a summary, along with other key information of particular interest to a risk assessor.

26. *Pages 68, 98 and 123*, *Future Management Issues*: Although these three sections have some limited but good information, they seem to come out of nowhere at the end of these three summaries of largely technical data. The reader needs to be aware of much of the discussion elsewhere in the report before being able to connect this material. We recommend that the management issues be incorporated into Chapter 7, *Managing Contaminated Ecosystems*. Although it would require some rewrite, the recommendations and concepts discussed in the Management Issues sections would be better understood if the reader had already read the information in Chapter 7 (and before) and these discussions were addressed as examples of applying some of the general concepts discussed in Chapter 7. Chapter 7 would also benefit from specific examples of management issues, and their resolution and degree of success as a model for other users to follow.

27. *Page 52, lines 1-19*. These two paragraphs contain duplicative information and descriptions: the first one appears to be taken from SRS reports, while the second one is an attempt to reword the first. Combine into a single, coherent paragraph.

28. *Page 52, lines 27-28*. The description of comprehensive survey actions is in addition to the cursory survey actions. As written, it implies exclusion, not inclusion of cursory survey actions.

29. *Page 53, lines 26-27*. This program description was correct as of 1996 but is not accurate now.

30. *Page 69-70, Section 4.1.6.* One DOE field commenter suggested that a discussion of site-specific projects and management issues relative to site cleanup and release is clearly beyond the scope of a high-level summary report. This section delves into speculation (with little merit or bearing on the report's stated purpose) and site negotiated end-states. Consider this comment in the refinement of this and other sections dealing with "Future Management Issues."

31. *Page 70, lines 8-16*. This section mentions that *"SRS is large enough to serve as a buffer zone to provide protection to the offsite public from radiation risks, should large releases occur in the future."* This touches on the issue of scenarios whereby for some land management and stewardship options, access to contaminated areas could be restricted to humans, but the non-human biota may remain exposed. This point may need to be made, and it ties to earlier comments that potential impacts to biota also need to be discussed in the report relative to Cs-137 in the environment.

32. *Page 72, figure 4.11*. There is no key describing features of the map, or what the numbers in the inset box mean. Improve the figure. This comment applies to all site-specific figures in all sections.

33. *Page 79, line 26*. Unbold the "W" in White Oak Lake.

34. *Page 82, line 26. "This variability makes it difficult, if not impossible, to present average values for Cs-137…."* The statement ***"If not impossible"*** is very strong. Is variability of time and place of sampling really more so at Oak Ridge aquatic systems than other site aquatic systems? Suggest reconsidering this statement and the justification for "if not impossible" statement.

35. *Page 101, Section 4.3.* Much of the information provided in this section on the Hanford Site is dated and should be reviewed and made current as appropriate prior to publishing this NCRP report as a final product. Many specific examples of this comment are identified below:

    - The most recent work referenced is the 2003 annual report (cited as Poston et. al., 2004). The 2004 annual report was published in September 2005. It would be best if the most recent report was used.

    - There is no recent referencing of the site-wide groundwater report for 2004. The most recent groundwater report cited was for CY 1996.

    - The National Environmental Policy Act Characterization Report is cited as Cushing 1992 and Neitzel et. al., 1999 and 2002. More recent reports have been written and it may be appropriate to cite Neitzel's September 2005 revision.

    - It may be prudent to identify the electronic links to these documents (annual report, groundwater report, NEPA Characterization Report) within the text of the report. This would allow the reader to acquire the most recent data produced no matter how old this NCRP Cs-137 report becomes. This also could be done for references to site-specific data and reports in other site-specific sections of this report.

    - A number of studies are cited from historical sources from the 1970s and 1980s. Please note that a lot of good reports which are more recent from DOE's Public Safety and Resource Protection Program could be incorporated into this NCRP report. This comment, however, is not meant to imply that the older reports are not still useful sources of information. Examples would be the Surface Environmental Surveillance Project trend reports, and the Washington Department of Health collaborative reports.

    - Reference is made to Hanford Kd values, Napier 1988. Please note that Cantrell has recently reviewed Hanford site Kd values (circa 2003-2004) and they should be referenced as the appropriate source for this information.

    - Reference should be made to the work of Keith Price on the distribution of Cs in the upper soil horizons in Hanford soils. In 1990, Price published a scientific article on the migration of atmospherically deposited radionuclides

through the upper horizons of Hanford soils. (See: *"The Depth Distribution of Sr-90, Cs -37 and Pu-239 and 240 in Soil Profile Samples."* Radiochimica Acta 54:145-147).

- The report on the vascular plants of Hanford has been updated and a new revision dated 2001 by Sackschewsky and Downs has been published. The old report of 1992 is outdated.

36. *Page 102, second paragraph.* Suggest that you add the size of ALE at 77,000 acres to this paragraph and the size of the National Monument to read: "*On 9 June 2000, the 77,000 acre Reserve and other portions of the Site totaling 195,000 acres were designated…"*

37. *Page 115, top of page, partial paragraph*. The reviewers were confused about the statement that *"…the highest concentrations occurred in the deeper portions of the pond."* Most of the text is consistently stating that Cs is trapped in the first few centimeters of the surface. Please reconsider this section for clarity and accuracy.

38. *Page 124, top of page, second sentence.* Is this word *surry* or *slurry?*

39. *Page 126, last sentence in first paragraph.* At this time (i.e., as of March 5, 2006) 6.4 million tons of material has been deposited in ERDF (this can be converted to kg for the report).

40. *Page 126, lines 9-21*. Again – the implication is regarding potential pathways to humans. But what about the impacts *to* these burrowing animals and penetrating plants into waste areas of elevated concentrations? Non-human biota potential issues again that may need to be considered by the risk assessor.

41. *Page 177, Table 5.14*. Per an earlier comment, this table and other similar tables may be of value to risk assessors who are evaluating radiation doses/risks to non-human biota. Somewhere in the report it should be mentioned that there is data in this report that will assist not only in human assessment but in environmental (non-human biota) assessments.

42. *Page 218, lines 14-20*. Suggest providing specific references for these codes, and for RESRAD-BIOTA and the DOE Technical Standard on evaluating radiation doses to biota, upon which it is based. For example, there is a DOE and ISCORS Technical Report that serves as the user's guide for the RESRAD-BIOTA code. The references are:

    DOE, 2002. *A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota*. DOE Technical Standard DOE-STD-1153-2002.

DOE, 2004. *RESRAD-BIOTA: A Tool for Implementing a Graded Approach to Biota Dose Evaluation.* DOE Technical Report DOE/EH-0676; Interagency Steering Committee on Radiation Standards Technical Report 2004-02.

43. *Page 259, Section 7.* There is some general discussion of the "No Treatment Option" for remediation, but no discussion of "Active Controls of Future Use" of affected areas. Clearly the modeling of risk from Cesium-137 in the environment is highly dependent on available pathways, and the report does not discuss limiting these pathways as a means of controlling future risk. This report could be an excellent place in which to discuss all the ways in which future risk may be avoided or reduced.

44. *Page 222, lines 8-19.* There are some very good NRC documents on parameter distributions that should be referenced somewhere in this report in the appropriate places. The references are highlighted below:

NRC, 2000b, *Development of Probabilistic RESRAD 6.0 and RESRAD-BUILD 3.0 Computer Codes,* NUREG/CR-6697 and ANL/EAD/TM-98, prepared by C. Yu et al., Argonne National Laboratory, Argonne, Ill., for U.S. Nuclear Regulatory Commission, Washington, D.C., Nov.

NRC, 2000c, *Probabilistic Dose Analysis Using Parameter Distributions Developed for RESRAD and RESRAD-BUILD Codes,* NUREG/CR-6676 and ANL/EAD/TM-89, prepared by S. Kamboj et al., Argonne National Laboratory, Argonne, Ill., for U.S. Nuclear Regulatory Commission, Washington, D.C.

NRC, 2000a, *Probabilistic Modules for the RESRAD and RESRAD-BUILD Computer Codes,* NUREG/CR-6692 and ANL/EAD/TM-91, prepared by D. LePoire et al.,Argonne National Laboratory, Argonne, Ill., for U.S. Nuclear Regulatory Commission, Washington, D.C., Nov.

NRC, 2000d, *Probabilistic Dose Analysis Using Parameter Distributions Developed for RESRAD and RESRAD-BUILD Codes,* NUREG/CR-6676, July.

45. *Page 261, Section 7.2, Remediation Technologies.* The report states that "This section briefly examines ….methods of contaminant remediation of soils and sediments." This section provides only a very cursory overview of some remediation technologies. It would be most useful to risk assessors and remediation technical representatives and decision makers to have more information on: more specific examples of failure and success stories on implementation of these methods and technologies; regulatory and stakeholder acceptance issues for innovative methods; cost/benefit of these methods compared to more traditional, higher site disturbance approaches; qualitative rankings or

ratings of the various methods and technologies from the perspective of those who have already implemented them (i.e., a "consumer reports" summary table approach with pros and cons identified).

46. *Page 273-274, Section 7.3.* Throughout the report, there are numerous mentions of risk from Cs-137 in the environment, but only a somewhat general discussion and no specific information on this topic. A tremendous amount has been published on the costs for each of the remediation methods described since the last NCRP report on Cesium-137, and that is valuable information missing from this report. The report details much about the release and translocation of Cs-137 in the environs of three DOE sites, but does not provide much information about the costs associated with environmental remediation actions either underway or planned at these sites, which have been estimated to cost hundreds of billions of dollars. This topic deserves far greater and more detailed attention in this report.