



July 24, 2000

## **Preliminary Comments on the Seaway FUSRAP Site Draft Documents: Feasibility Study Addendum, Proposed Plan & Technical Memoranda**

### **Background:**

Oak Ridge National Laboratory conducted initial site surveys and investigations of the four Tonawanda properties in 1976, 1981, and 1986. The Seaway Site was one of four properties comprising the Tonawanda Site which was included in DOE's FUSRAP program in 1988. The U.S. Department of Energy (DOE), through its contractors, conducted surveys and investigations of the Tonawanda Site from 1988 - 1991, the results of which were summarized by DOE in the 1993 RI and FS Reports. DOE issued a Proposed Plan for the Tonawanda Site in 1993. The Proposed Plan recommended that remedial wastes from all four properties be disposed in an engineered on-site disposal facility to be located at Ashland 1, Ashland 2, or Seaway (these sites, together with the Linde Site, comprised the Tonawanda Site). In 1994, DOE suspended the decision-making process on the 1993 Proposed Plan due to community opposition. In October 1997, the responsibility for FUSRAP and the Tonawanda Site was transferred to the US Army Corps of Engineers (USACE). USACE is managing the investigation and remediation of the four Tonawanda properties separately. In 1998, USACE conducted a limited investigation for radionuclide contamination at the Seaway Site.

The three rounds of site surveys and investigations have left a number of significant questions regarding:

- Nature and extent of contamination;
- Waste characteristics;
- Sources of contamination;
- Physical site characteristics; and
- Current and potential risks posed by the Seaway site to human health and the environment.

The USACE *FS Addendum* and the *Proposed Plan* issued in June 2000 are based on the presumption that MED wastes have not commingled with non-MED wastes. This presumption is not supported by the site surveys and investigations performed to date. In addition, there is no assessment of current and potential future impacts to ground water from contaminants; thereby leaving unanswered the question of the total impact to ground water from MED-related and landfill wastes.

The preferred remedy (preferred alternative), as outlined by USACE in the draft *Addendum to the Feasibility Study (FS Addendum)* and draft *Proposed Plan*, consists of containment and institutional controls for the Seaway Site, Areas A, B and C. Two of the six remedial alternatives which were evaluated for Seaway -- Alternative 3 (complete excavation and onsite

disposal) and Alternative 5 (partial excavation and onsite disposal) -- were eliminated from further evaluation in the *FS Addendum* based on community input received by the DOE in 1993 on a previous draft Proposed Plan for the Seaway Site.

CERCLA Section 121 requires that remedies be consistent with the requirements of the NCP. The NCP describes nine specific criteria for use in evaluating and comparing remedial alternatives. Under CERCLA, the selected remedy must provide the best balance of trade-offs among alternatives, measured against the five balancing criteria (short-term effectiveness; long-term effectiveness; reduction of toxicity, mobility or volume; implementability; and cost). Of these criteria, the CERCLA remedy selection process emphasizes long-term effectiveness and reduction of toxicity, mobility, or volume. It has not been sufficiently demonstrated that the preferred remedy, as currently described in the *FS Addendum* and the *Proposed Plan*, provides the best balance among the criteria. The preferred remedy provides for no reduction in the toxicity, mobility or volume of contaminants and two alternatives were eliminated from comparative analysis prematurely based on community input prior to the public comment period. All in all, the nine remedy selection criteria have not been properly applied in the evaluation and comparative analysis of remedial alternatives. Furthermore, it is difficult to gauge the overall effectiveness of the remedial alternatives and preferred remedy because of lack of information on and questions surrounding site characterization and risk assessment.

Because of these concerns EPA recommends that USACE postpone public release of the *Proposed Plan*. Our general review comments on the *FS Addendum*, draft *Proposed Plan* and technical memoranda are categorized below according to the three major areas of concern. Specific comments, which are categorized according to document, follow the general comments.

### **Site Characterization General Comments:**

- (1) No chemical characterization of the solid waste landfill area was performed "*since they are assumed to be present.*" (*FS Addendum*, page 14). The site has RCRA-listed and -characteristic wastes, yet no human health risks from exposure to chemicals was specifically evaluated for the Seaway Site in the *Baseline Risk Assessment (BRA)*. Chemical risks to current site users, future site users, and to site workers during remedial action should be evaluated.
- (2) According to the *Technical Memorandum on Modeling of Radiological Risks from Residual Radioactive Materials Following Implementation of Remedial Alternatives for Seaway Landfill Areas A, B, and C*, the radiological risks were derived assuming a certain ratio exists between Th-230 and each of the other radionuclides (Ra-226, Ac-227, Pa-231, U-234, U-238) also present. Ratios or assumptions of equilibrium were used because only the 1999 reported data set provided complete analyses of all the non-short-lived radionuclides of interest (Ra-226, Ac-227, Th-230, Pa-231, U-234, U-235, U-238). In

some cases, samples collected during the 1970s-1990s were analyzed for two, but rarely more than three, of the radionuclides of interest. Since the dose and risk calculations rely on the analytical data obtained from related sites or from the Seaway site over a span of two decades, additional information is needed to determine if the concentration of the other radionuclides of interest can be reliably estimated, when analytical data are not available, for use in calculating the radiological risks for the Seaway site.

- (3) Ground water has not been adequately characterized. The presence of RCRA characteristic and listed wastes, in drums and other biodegradable containers, poses a likely future threat of release to ground water in the future, if there isn't currently a release. The *FS Addendum* (p. 27) concludes that "*ground water at the Seaway Site is not impacted by MED-contamination located in Seaway Areas A, B and C*". This is not sufficiently supported in facts. The below statements taken from the *FS Addendum* raise a number of concerns regarding potential impacts to ground water from the Seaway landfill.

*"Ground water under unconfined, or water table, conditions, is found within virtually all portions of the landfill." [FS Addendum, page 17]*

*"Therefore, it is clear that a water table developed in the landfill following deposition of the solid waste and that the solid waste was not deposited into the water table." [FS Addendum, page 17]*

*"It is clear that the vast majority of the landfill's impact on the area's water resources will manifest itself as pollution of surface water streams emanating from the landfill. The only potential avenue of what would technically be considered as ground water contamination is the migration of leachate into the recent alluvial deposits. This occurrence is the second mechanism by which the impact of the landfill on water resources is felt beyond the property's boundaries." [FS Addendum, page 18]*

## **Remedial Alternatives Screening & Remedy Development General Comments:**

- (4) The *FS Addendum* remedial alternatives and the *Proposed Plan's* preferred remedy are based on the assumption that the wastes are not commingled. If it can not be demonstrated to the contrary, the *FS Addendum* remedial alternatives and the preferred remedy should be based on the reasonable presumption that Manhattan Engineer District (MED) radiological wastes are commingled with RCRA-listed and characteristic wastes at the Seaway Site. It is logical to arrive at this conclusion, and more protective of human health and the environment, given the typical nature of landfill disposal methods and the 50 - 60 year length of time that the landfill was in operation.

The statements below, which were taken from the *FS Addendum* for the Seaway Site, lead to the conclusion of likely commingling of wastes:

*"The Seaway Site has been used as a landfill for more than 50-60 years and a wide range of materials have been disposed on the Seaway property." [FS Addendum, page 6]*

*"...hazardous substances were placed in the landfill that could fail RCRA hazardous waste characteristics tests for several of the D-listed wastes, including metals, organics, acids, and others. The NYSDEC has classified the Niagara Landfill as an inactive hazardous waste disposal site and has reported that confirmed hazardous waste disposal at the site includes unknown quantities of printing inks and solvents." [FS Addendum, page 7]*

Table 2-1 of the *FS Addendum* includes the following industrial wastes reported to have been disposed at the Niagara Landfill: spent cleaning solvents, waste oils, pit sludge (steel sealer, graphite, oil resin, and sodium carbonate), Diisocyanate (drummed liquid), mixtures of polyether, polyol, chloroethene & catalysts and other chemicals or wastes with chemical constituents

*"No chemical characterization of the solid waste landfill area was performed for non-radiological contaminants in the landfill area since they are presumed to be present." [FS Addendum, page 14]*

- (5) The *FS Addendum* should explain the rationale behind, or regulations/policy which govern, the following statement: *"...USACE will not remediate any radioactive or chemical contamination that is not MED-related or is not mixed or commingled with MED-related contamination. Any MED-related materials commingled with chemical hazardous substances could possibly be considered a radioactive mixed waste should the hazardous substance fail the RCRA hazardous waste characteristics tests." [FS Addendum, pages 14 and 15]*

And if it can be demonstrated that there is no commingling of MED with non-MED wastes, the *FS Addendum* and the *Proposed Plan* should describe how the risks or potential risks from non-MED wastes will be addressed, should those risks be determined to be outside the CERCLA risk range.

- (6) There is no discussion of which ARARs will be applied to the preferred remedy -- Alternative 6 (containment).
- (7) It has not been sufficiently demonstrated that the remedial alternatives, including the preferred remedy, meet the Attainment of ARARs criteria -- one of two Threshold Criteria which each alternative must meet to get carried forward through comparative analysis:

The ARARs discussion focuses on soil cleanup standards which would be applicable for Alternatives 2 and 4. The NYSDEC has requested, but thus far have not received, the calculations that support the development of the soil cleanup numbers which would be used for Alternative 2 (complete excavation and offsite disposal) and Alternative 4 (partial excavation and offsite disposal). The values stated in the *Proposed Plan* are similar to the ones EPA - Region 2 had issues with in the Linde ROD. Thus EPA likely will have similar issues with the Seaway site soil cleanup criteria. The *FS Addendum* and the *Proposed Plan* should provide a rationale for why meeting a cleanup "guideline" of 40 pCi/g for Th-230 (the number developed by DOE in 1993) will result in complying with the other soil cleanup levels.

The containment structure should meet standards in 10 CFR40, Appendix A as well as the ARAR for radon emissions.

The ARARs should include all the ARARs that will be used at the site during remedial action as well as final cleanup criteria. This will include the rad-NESHAP 10 mrem/yr number as an ARAR.

ARARs for non-MED wastes should be included in the development of remedial alternatives.

Although the *Proposed Plan* lists the maximum contaminant limits in 40 CFR192, Subpart A, for gross alpha, radium and uranium in groundwater as relevant and appropriate, there is no information to support the claim that "existing controls provide sufficient protection to prevent any MED material from adversely impacting the ground water outside of the capped landfill structure."

There needs to be data and analysis that demonstrate the ground water will not be impacted in excess of the MCLs.

- (8) The assertion that the remedy meets the Short Term Effectiveness criteria is not supported (in fact, the *FS Addendum* states that there are "limited" risks to site workers and the community during remedial action, but does not quantify those risks -- this could significantly reduce the short-term effectiveness of the preferred remedy);
- (9) The preferred remedy does not meet one of the primary balancing criteria (Reduction of Toxicity, Mobility, or Volume), as stated through the following statement taken from the *FS Addendum*: "*The preferred remedy does not provide any reduction in toxicity, mobility, or volume of site contaminants through treatment.*" [*FS Addendum*, page 50]
- (10) It has not been sufficiently demonstrated that the preferred remedy meets the implementability criteria -- USACE does not demonstrate who or how the institutional controls will be implemented or enforced over the long period of time that the radionuclides and chemicals will be at the site.
- (11) On page 54 of the *FS Addendum*, two of the remedial alternatives were described as nearly non-implementable based on the presumption that there are no commercial

disposal facilities available to accept excavated materials which contain both radionuclides at "higher concentrations" and RCRA hazardous constituents. This presumption should be supported and a quantitative description of what is considered "higher concentrations". Also, the Envirocare facility in Utah may be an acceptable disposal site.

- (12) Because community acceptance was cited by USACE as the basis for elimination of two alternatives, the Proposed Plan should contain a summary statement on the nature of the community's comments on the 1993 Proposed Plan alternatives, especially their comments on the 1993 Proposed Plan's Preferred Alternative. Section 1 - *Proposed Plan* and Section 5 - *Summary of Remedial Alternatives* would be logical places to insert a summary statement.
- (13) Community acceptance of the preferred remedy is highly uncertain at this point, considering its containment nature. The community previously expressed opposition to DOE's 1993 plans for leaving waste in-place. It is important for the community to be made aware (at a minimum through the *Proposed Plan*) that containment is not an engineered disposal cell. Containment is essentially leaving the waste in place for an unknown period of time, with an engineered cover and institutional control.
- (14) The *FS Addendum* should carry Alternatives 3 and 5 through the complete evaluation and comparison of alternatives, and the *Proposed Plan* revised accordingly. Alternatives 3 and 5 were eliminated prematurely based on public comments on DOE's 1993 remedial alternatives. Seven years have passed and it is possible that community acceptance has changed, especially when evaluated against the containment nature of the preferred remedy. Alternatives 3 and 5 and the assumptions and information they were based on have changed based on USACE's 1998 re-assessments and investigations at the site. To eliminate alternatives based on a Modifying Criteria's perceived or projected impact is contrary to CERCLA's remedy selection process. Only the two Threshold Criteria can be used to exclude an alternative from comparative analysis.
- (15) Given the complexities of the site, nature of the preferred remedy, and the amount of time that has passed since the public last reviewed and commented on the remedial alternatives, the public may need, and should be given, a 60-day public comment period on the *Proposed Plan*.

### **Adequacy of Remedy General Comments:**

There are a number of significant characterization and remedy development questions, as described in the above comments, which should be addressed before a remedy is selected at the Seaway Site. If necessary, a revised preferred remedy should be developed once those questions

and issues have been adequately addressed. Additionally, there are three major areas which are currently not addressed by the preferred remedy, and which should be addressed by any remedy which is selected for the Seaway Site. These are: (1) how and to whom will the USACE transfer the site to following remedial action; will that organization will be responsible for the long-term (1,000 years) maintenance and monitoring of the site following remedial action; and has that organization committed to the USACE in writing to do so; (2) are there assurances that the NYSDEC will enforce institutional controls throughout the 1,000+ years that the preferred remedy heavily relies upon; and (3) the selected remedy must address the totality of site risks, from both MED wastes and non-MED wastes, either by mitigating those risks through remedial action, or carving out and deferring remediation of the non-MED, non-commingled wastes which pose or could pose unacceptable risks to human health and the environment. As currently written, the *FS Addendum* and the *Proposed Plan* do not address, or even discuss possibilities for how to address, a potentially significant amount of risks.

- (16) The Proposed Plan should discuss what can be expected once containment is in place - currently there is no such discussion. The risk analysis should discuss consequences (risk and mitigation) if institutional controls do not work. Under what conditions will DOE accept the site back? Is there any expectation that some agency in the future will address the waste left in containment? Is containment the permanent solution for this waste?
- (17) USACE should coordinate with DOE prior to release of a preferred remedy and confirm that DOE will take over maintenance of the site and enforcement of institutional controls. It is not known if USACE has had any substantive discussions with DOE on the preferred remedy.
- (18) The Proposed Plan should contain a brief explanation of why USACE will not or can not remediate radioactive or chemical contamination that is not MED-related or is not mixed or commingled with MED-related contamination.
- (19) The Proposed Plan should describe what landfill monitoring requirements the selected remedy will prescribe for the period following the 30-year post-closure period. Will there be no monitoring during the 1,000-year cap maintenance period, after the 30-year post-closure period? If so, state it.
- (20) It is not understood what is meant by "Area A Remove Top 4 ft." Does this mean a remedial action will be performed to remove the top 4 ft of material [which includes the 40% of Area A land area covered with 10 ft of cover]? [see Page 18, Table 7 of *Technical Memorandum, Modeling of Radiological Risks from Residual Radioactive Materials Following Implementation of Remedial Alternatives*:

Likewise, does "Area C Remove Top 4 ft" mean a remedial action will remove the top 4 ft from Area C where the MED waste is supposedly covered with 40 ft of refuse and fill material?

- (21) The *Proposed Plan* and *Technical Memorandum on Modeling of Radiological Risks* focus on the cleanup criterion of 40 pCi/g with the *Proposed Plan* (page 16) also mentioning cleanup criteria for Ra-226 of 5 pCi/g, Th-230 of 15 pCi/g and total U of 605 pCi/g for surface contamination, and Ra-226 of 15 pCi/g, Th-230 of 44 pCi/g and total U of 3039 pCi/g for the subsurface. Unclear is the relationship between the Th-230 criterion of 40 pCi/g and the surface and subsurface criteria. In addition, the cleanup criteria for Ra-226 in the surface and Th-230 in surface and subsurface contamination are not consistent with 40 CFR 192.

The issue remains as to specific cleanup levels/goals for radionuclides (i.e., isotopes of radium, thorium, uranium, actinium, et. al.).

## **Specific Comments on Each Document:**

### ***Proposed Plan - Specific Comments:***

- (22) Section 1 - *Proposed Plan*, pages 2 & 3:  
The *Proposed Plan* should contain a brief summary of the results of USACE's 1998 investigations and re-assessments of Seaway site conditions. For example, USACE reassessed the volume estimates of radioactively contaminated material present at Seaway and re-evaluated the risks posed by the presence of radioactively contaminated material. Although the findings of these re-assessments were presented in technical memoranda and the *Proposed Plan* directs the reader to specific documents, the *Proposed Plan* should contain a brief summary statement of the findings as they greatly impact the evaluation and comparison of remedial alternatives in the *Proposed Plan*.
- (23) Section 1 - *Proposed Plan*, page 4, last paragraph:  
This may be a good place to insert an explanation of why USACE will not or can not remediate radioactive or chemical contamination that is not MED-related or is not mixed or commingled with MED-related contamination.
- (24) Section 2.1.1 - *Site History and Site Conditions*, page 5, first full paragraph:  
One sentence is needed on why it was necessary to construct a clay cutoff wall and leachate collection system in 1983.
- (25) Section 2.1.3 - *Contaminants of Concern at Seaway*, page 6, third paragraph:  
One sentence is needed on why Thorium-232 is not considered to be MED-related.

- (26) Section 2.1.3 - *Contaminants of Concern at Seaway*, page 6, last paragraph:  
This may be another good place to insert an explanation of why USACE will not or can not remediate radioactive or chemical contamination that is not MED-related or is not mixed or commingled with MED-related contamination.
- (27) Section 2.1.4 - *Landfill Closure Conditions*, page 7:  
One sentence is needed on the overall conclusions of the annual and quarterly monitoring conducted pursuant to the Environmental Monitoring Plan (EMP) for the Niagara Landfill. The summary statement should answer the question of "Do operations at the facility impact ground water and/or surface water quality?"
- (28) Section 2.2 - *Environmental Conditions at the Seaway Site*, last sentence:  
What is a "*transient individual*"? Is this a human or an animal?
- (29) Section 2.3.2.1 - *NYSDEC Solid Waste Regulations*:  
This section should describe what happens, or what the regulations envision happening, to landfill monitoring activities after the 30-year post-closure period? Will there be no monitoring during the 1,000-year cap maintenance period, after the 30-year post-closure period?
- (30) Section 3.1 - *Radiological Health Risk*:  
This section should quantify average and reasonable maximum exposure risks under a No Action Alternative for both current-use and future-use scenarios.
- (31) Section 3.2 - *Chemical Health Risk*:  
The last sentence of this section states: "*No chemical data were developed in the RI (BNI 1993) for the Seaway Site itself and human risks for chemicals were not specifically evaluated for the Seaway Site in the BRA.*" This is confusing when compared to the statement contained in the first paragraph of Section 3.2, which states: "*The 1993 BRA also evaluated cancer and chemical toxicity risks.*" Does the first sentence mean that the chemical risks were evaluated for the Tonawanda sites as a whole, but not individually for each site, such as the Seaway Site? Please provide a clarification.
- (32) Section 8 - *Seaway Site Areas A, B and C - Preferred Alternative*, second paragraph:  
The purpose of CERCLA's remedy review requirement is to ensure that, for sites where contaminants remain on-site post-remedial action, above health-based levels, the remedy remains protective of human health and the environment. Section 8 states that the purpose of the review is to "*ensure that institutional controls are effective and that operations and maintenance are conducted in accordance with the plan.*" A review of institutional controls and O & M can be a part of the overall protectiveness review, but Section 8 should be revised to state that remedy reviews shall be conducted every 5 years from the initiation of remedial action to review the remedy's protection of human health and the environment.

In the second paragraph, what is "*appropriate funding*" as it relates to long-term funding of O & M of the capped areas to ensure cap integrity?

***FS Addendum - Specific Comments:***

- (33) Section 6.2 - *Protection of Human Health and the Environment*:  
This paragraph states "...the estimated risks for alternatives involving capping assume that the cap is maintained for 1,000 years." Who or what organization has agreed to, or is reasonably assumed to undertake, cap maintenance over the 1,000 year period?

***Technical Memorandum, Modeling of Radiological Risks from Residual Radioactive Materials Following Implementation of Remedial Alternatives for Seaway Landfill Areas A, B and C, Tonawanda, New York - Specific Comments:***

- (34) Section 1.2 - *Scope*, page 4, first paragraph:  
In 1997, DOE developed a soil cleanup level for thorium-230, 40 pCi/g. Were cleanup levels or preliminary remediation goals derived for the other radiological contaminants (radium, uranium, et. al)?
- (35) Section 2.1 - *Data Evaluation*, page 5, second paragraph:  
The 1998 investigation of the Seaway Site by USACE analyzed soil samples for all the radionuclides of concern, but the samples were acquired from the top 8 feet in Area B and top 4 feet in Area C. What was the purpose of this sampling, since the waste materials are presumed to be below 40 feet of refuse and fill material?

Since FUSRAP waste was placed in Areas A, B and C in the 1970s and some of it covered by landfill activities, it would be helpful to have a figure that provides a current profile of the Seaway site, illustrating the location of the FUSRAP waste with respect to the surface, fill and debris layers, groundwater table, geologic layers, and the waterfront area.

- (36) Section 2.1 - *Data Evaluation*, page 5, third paragraph:  
Is it an empirical coincidence that the actinium is in near equilibrium with radium-226, or is it that, given the types of processing that took place, radium-226 can be predicted to exist in some reliable correlation to the actinium?

Does the correlation exist primarily for protactinium-231 (with the actinium-227 in secular equilibrium) or does the process somehow preferentially isolate actinium?

How was the high concentrations of Ac-227 (Pa-231?) handled at Ashland 1? Did the cleanup goals/criteria address this?

- (37) Section 2.1 - *Data Evaluation*, page 6, first incomplete paragraph:  
Please provide the reference or information on other sites where the concentration of Ac-227 in waste material was approximately equal to the concentration of Ra-226.

With the high Ac-227 eliminated as an outlier, the document concludes that the Ac-227 concentration is 1.02 that of the Ra-226 concentration and assumes equilibrium with parent nuclide, Pa-231. What is the basis for this assumption of equilibrium (see Pa-231 comment, above)?

How do the Ac-226:Ra-226 and Sc-227:Pa-231 ratios derived compare with the ratios for the 1999 data for the top 8 and 4 feet of Areas B and C, respectively?

- (38) Section 2.1 - *Data Evaluation*, page 8, Table 2:  
If the waste is under 40 feet of refuse and fill, discuss why some samples from "Area C Upper 4 ft (Remove upper 4 ft)" have elevated Ac-227, Pa-231, Th-230, U-234, U-235, and U-238?

- (39) Section 2.2 - *Exposure Assessment*, page 10:  
The document indicated that the groundwater pathway is not evaluated because (1) it is eliminated by leachate collection system in the landfill and (2) the MED material is highly insoluble, thus immobile. This statement assumes leachate collection will continue for 1000 years. There should be an analysis performed to determine what the dose will be if leachate collection does not continue.

More information is needed to support the statement that the MED material is highly insoluble.

- (40) Section 2.2.2 - *Excavation*, page 13, :  
What is meant by excavation to an average of 40 pCi/g Th-230 (e.g., How will the averaging be done? Over what area? Over what depth? )?

What is to be gained by excavating to an average of 40 pCi/g vs. the excavation of "everything exceeding 40 pCi/g?"

- (41) Section 2.3 - *Results*, page 19, Table 8:  
Identify which alternatives listed in the table are also the alternatives discussed in the proposed plan.

- (42) Section 2.3.3 - *Radon*, page 21, second paragraph:  
What is the basis for the Rn-222 scaling factors of 6.45 and 4.17 applied to Areas A and Areas B and C?

- (43) Section 2.3.3 - *Radon*, page 22-25, Tables 9 and 10:  
Since the Th-232 isotope is not a radionuclide of concern at this site, what is the source of the Rn-220 (thoron) flux of 75 pCi/m<sup>2</sup>-s? A typical thoron diffusion rate should be less than 1.4 pCi/m<sup>2</sup>- s, the average background Rn-222 diffusion rate. If elevated Rn-220 flux exists, the ARAR is the same as for radon-222.
- (44) Section 3 - *Uncertainties*, page 26:  
This section discusses the uncertainty in the assumptions that Th-230 = (20.188) \* (Ra-226) and Ac- 227 = (1.02) \* (Ra-226). The section does not, however, indicate how these uncertainties affect the dose and risk estimates set forth in the document.